GARHWAL MANDAL VIKAS NIGAM LTD.
74/1 RAJPUR ROAD, DEHRADUN

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Ref- 114 /Dus/Paach-01(2019-2020) Date 28/8/2020

To,
The Director (IA-II),
Ministry of Environment, Forest & Climate Change,
Indira ParyavaranBhawan,
Lodhi Road, JorBagh,
New Delhi-110003

Sub: Regarding Environmental Clearance for River Yamuna Lot No. 21/2 Sand, Bajri& Boulder Mining Project over an area of 34.940 ha at Village: Dhakrani, Tehsil: Vikasnagar& District: Dehradun, By GMVN Ltd. Uttarakhand
File No: J-11015/137/2013-IA-II(M)

Ref :

1. Minutes Of Meeting of 33rd meeting of the Reconstituted Expert Appraisal Committee for Environmental Appraisal of Mining Projects (Non-Coal) held on June 21-22, 2018.
2. **MoEF&CC Letter dated 06.08.2018**
3. **MOM of** 11th EAC Meeting held during November 27-28, 2019.

Dear Sir,

In compliance of the above referenced minutes of Meeting and ADS Letter Of MoEF&CC, we are herewith submitting the ADS reply report along with the necessary annexures for River Yamuna Lot No. 21/2 Sand, *Bajri*& Boulder Mining Project over an area of 34.940 ha at Village: Dhakrani, Tehsil: Vikasnagar& District: Dehradun.By GMVN Ltd, Uttarakhand.

You are requested to kindly consider our project in Next Upcoming Agenda for Environmental Clearance.

Thanking you.

Yours truly,

(Iva Ashish Srivastav)
IAS
Managing Director
M/s GMVN Ltd.

Point wise Query Reply of ADS/ Minutes of Expert Appraisal Committee (Non-Coal Mining) agenda meeting held during 21-22 June, 2018 and MoEF&CC Letter dated 06.08.2018 and agenda meeting held during 27-28 November 2019 for River Yamuna, Lot No. 21/2, Dehradun Uttarakhand by M/s Garhwal Mandal Vikas Nigam Ltd.
File No: J-11015/137/2013-IA (EM)
Proposal No:IA/UK/MIN/18558/2013

1. The Proponent should collect the baseline data in respect of initial level of the mining lease. For this permanent bench marks (BM) needs to be established at prominent location preferably close to mining leases in question and should have precisely known relationship to the level datum of the area, typically mean sea level. The entire mining lease should be divided suitably in the grids of 25 Meter x 25 Meters with the help of sections across the width of river and along the direction of flow of the river. The levels (MSL & RL) of the corner point of each grid need to be recorded. Each Grid should be suitably numbered for identification. PP should identity grids which will we worked out and grids which will come under no mining zone i.e. safety barriers from the river bank, safety barrier at lease boundary, restrictions as per condition of LoI/Mining Lease deed, restriction as Mineral Concession Rule of the Concerned State, restrictions as per sustainable sand mining management guidelines 2016 and restriction as per direction of any Court or NGT. The PP should ascertain the level of the river bed with the help of sections drawn across the width of the rivers and along the direction of flow of the river and based on this define the depth of mining of each grid. The PP should provide a detailed map and table clearly showing the grid wise material availability, dimension of grid, location of grid (latitude & longitude of the corner points), level of grid (AMSL and RL), depth of mining in each grid, grids left under no mining zone etc.

Reply

- The collection of baseline data in respect of initial level of the mining lease has been done and incorporated in Modified Mining Plan. **Mine Plan is attached as Annexure 1**
- The entire mining lease has been divided suitably in the grids of 25 Meter x 25 Meters with the help of sections across the width of river and along the direction of flow of the river. All the above points were considered and accordingly Surface Plan has been prepared and attached as **Annexure 2**
- The levels (MSL & RL) of the corner point of each grid are recorded with Proper Nomenclature and also segregating the grids which will be worked out and grids which will come under no mining zone i.e. safety barriers from the river bank, safety barrier at lease boundary, restrictions as per condition of LoI/Mining Lease deed, restriction as Mineral Concession Rule of the Concerned State, restrictions as per sustainable sand mining management guidelines 2016 and restriction as per direction of any Court or NGT. All above Points are covered in the Grid Plan attached as **Annexure 3A**
- Section plans across the river and along the direction of the river has been prepared and based on that the Depth of each grid has been recorded along with the grid wise material availability, dimension of the grid , Location of the grid, Level of the grid, depth of mining in each grid, and grid left over as no mining Zone has been calculated. Detailed grid Plan and its calculations are attached as Annexure **3A and 3B**

2. PP should suitably name each section line. Section Plan for both sections drawn across the river and along the direction of the river needs to be submitted. Each Section should have level on vertical axis and distance from the bank of river on horizontal axis. For the section along the direction of the river the levels to be shown on vertical axis and distance from upstream to downstream should be shown on horizontal axis.

Reply: The level of River bed has been recorded with the help of Section plan across the river width (X sections) and along the river (L section) for both pre monsoon and Post monsoon. Each section line have level on vertical axis and distance from river bank on horizontal axis. the L Section is attached as **Annexure 4A** and X Sections is attached as **Annexure 4B**

3. The PP should prepare the modified Mining Plan based on the above survey. The information sought above needs to be a part of the mining plan. In the mining plan year wise production plan should be prepared in three plates for each year. Plat-1 show the mine working for the pre-monsoon period (1st APR- 14th June), Plate-2 should show the status of the mine after the replenishment and no working should be proposed in this period (15thJune-1st Oct) as the mining lease area needs to be left for the replenishment of the river bed mineral and plat-3 show the mine working after replenishment of the river bed i.e. post monsoon period (2nd Oct-31st March).

Reply: Survey has been conducted during Pre-Monsoon, Monsoon and Post Monsoon and based on that quantum of mineral has been assessed.

- Plate-1 Showing the mine working for Pre monsoon (1st April – 15th June), is attached as **Annexure 5A**
- Plate-2 should show the status of the mine after the replenishment, where No Mining is Proposed in this period (15th June-1st Oct), is Attached As **Annexure 5B**
- Plat-3 show the mine working after replenishment of the river bed i.e. post monsoon period (2nd Oct-31st March), is attached as **Annexure 5C**.

4. PP should specifically mention in the mining plan that in the subsequent scheme of mining/review of mining plan, the year wise data pertaining to replenishment study (all five years) shall be provided which include the level (AMSL & RL) of river bed recorded before and after the monsoon, year wise replenishment quantity, all plan & sections of the replenishment study for the past five years.

Reply: The year wise proposed production based on the quantum of replenishment has been assessed and incorporated in Modified Mining Plan given on page 213-216. However, GMVN Ltd. will provide year wise data pertaining to replenishment study (all five years), which included the level (AMSL & RL) of river bed recorded before and after the monsoon, year wise replenishment quantity, all plan & sections of the replenishment study for the past five years.

5. The PP should also submit a kml file wherein the above-mentioned grid plans is superimposed on the satellite imaginary.

Reply: KML file wherein the above-mentioned grid plans is superimposed on the satellite imaginary is attached as **Annexure 6**.

6. PP should also submit an undertaking to the effect that each year after the replenishment study the plan & section shall be submitted to concerned Department of Mining & Geology of the State for verification and official record.

Reply: Undertaking regarding the same is attached as **Annexure 7.**

7. The methodology for conducting replenishment study needs to be mentioned in the modified mining plan. PP should ensure that plan and section that will be submitted to EAC should be in proper scale.

Reply: Complied and Modified Mining Plan is attached as **Annexure 1.**

8. PP should ensure that relevant information as per ToR Conditions needs to be provided in the EIA Report.

Reply: Complied, the revised EIA report has been prepared and attached as **Annexure 8.**

9. PP should clearly mention the designation and number of person to be engaged for Environmental Monitoring Cell. The EMC will be set up for this mine only or for all the mining lease of the GMVN in the area.

Reply: Environment Management Cell mentioning the designation and number of persons has been prepared and attached as **Annexure 9.**

10. The PP should clearly bring out the impact on environment due to cluster situation if any. Air Quality modeling needs to be done in Aermode software both for area and line source.

Reply: Air Quality modeling using Aermode software for both area and line source has been done and attached as **Annexure 10.**

11. The transportation route needs to be clearly provided in the EIA Report with other details such as width of road, length of road, type of road, impact due to transportation on the vegetation on the both side of the road, frequency of maintenance of the road, amount proposed for maintenance of the road, compensation to the land owners effected by transportation of mineral etc.

Reply: The transportation route with details such as width of road, length of road, type of road, impact due to transportation, frequency of maintenance of the road, amount proposed for maintenance of the road has been incorporated in the EIA/EMP report. Kindly refer page no. 103-106 of EIA Report attached as **Annexure 8**. An amount of Rs. 2.0 Lacs/annum has been proposed for maintenance of roads and will be done on every six months interval.

12. Detailed occupational plan needs to be submitted with budget allocation. The Committee was of the view that being handling the large number of mines the GMVN should set up a dedicated cell for the occupational health surveillance.

Reply: Detailed occupational plan with budget allocation has been prepared and is attached as **Annexure 11.**

13. PP submitted the list of Schedule -I species for core and buffer zone duly authenticated by Forest Department and same needs to be updated in the EIA Report. PP should provide the conservation plan for all Schedule -I and Schedule-II species present in the core & buffer zone.

Reply: Authenticated list of Schedule I and II species has been provided by Forest Department and attached as **Annexure 12A.** The same has been incorporated in the EIA report and the Conservation Plan for Schedule I and II species has been approved by CWLW which is attached as **Annexure 12B.**

14. Proof of submission of EIA/EMP report within the validity of ToR needs to be submitted as the EIA report uploaded on the website initially is not the correct report.

Reply: 14. Proof of submission of EIA/EMP report within the validity of ToR is attached as **Annexure 13.**

15. The budget of EMP needs to be revised as the Environmental Monitoring cost is not included in the EMP Budget.

Reply: The budget of EMP has been revised incorporating the Environmental Monitoring cost given in the EIA/EMP report at page no. 164 of attached **Annexure 8.**

16. PP should submit a plan clearly mention the area that will be covered under plantation.

Reply: Green belt development plan has been prepared with budget and is attached as **Annexure 14.**

17. Proof of submission of application for NBWL Clearance.

Reply: NBWL clearance of the said project has been granted by NBWL Committee. Minutes of the meeting is attached as **Annexure 15.**

18. In the cluster certificate submitted the ministry the total area of the cluster not mentioned. Thus it is requested to provide the cluster certificate clearly mentioned the area of the cluster as per S.O. 141(E) dated 15.01.2016 and S.O. 2269(E) dated 01.07.2016. it has also observed that letter issued by Geology and Mining Unit, Directorate of Industries, Govt. of Uttarakhand vide Lr No. 74/मू0खनि0इ0/जि0कार्या0दे0दून0/2018-19 dated 24.05.2018 wherein it has mentioned that the details provided in the cluster certificate is as per S.O. 141(E) dated 15.01.2016 and S.O.2269(E) dated 01.07.2016. But it has

found that EC was granted for mining lease having an area of 68.364 Ha. vide Lr No. J-11015/140/2013-IA.II (M) dated 07.09.2016. Further, as per S.O.2269 (E) dated 01.07.2016 the mining lease for which EC was granted on 15.01.2016 should not be counted while calculating the cluster area. As the EC for mining lease area 68.364 was granted after 15.01.2016 and should be consider while calculating the cluster area. Thus area comes up to 103.304 Ha and the proposal become category A project as per S.O. 141(E) dated 15.01.2016. Therefore, it is requested to submit the revised cluster certificate clearly mentioning the area of the cluster.

Reply: There are three other leases falls within 500m radius of the above proposed project calculating the total cluster area of 4 mines is 107.7473 Ha and out of other three, 2 private leases were granted EC on 29.03.2014 having area of 1.854 and 2.5893 ha. respectively. However, out of three other leases 1 lease belongs to GMVN Ltd. having area of 68.364 ha and granted EC on 07.09.2016 which is not operating till date. Certificate of 500m is attached as **Annexure 16**.

Now, as per the EIA Notification dated 1st July, 2016, a cluster shall be formed when the distance between the peripheries of one lease is less than 500 meters from the periphery of other lease in a homogeneous mineral area which shall be applicable to the mine leases or quarry licenses granted on and after 9th September, 2013. (Ref: Clause (B) (i), Page No-4 in EIA Notification dated 1st July, 2016) or The leases not operative for three years or more and leases which have got environmental clearance as on 15th January, 2016 shall not be counted for calculating the area of cluster but shall be included in the Environment Management Plan and the Regional Environmental Management Plan." (Ref: Note 5, Page No-5 in EIA Notification dated 1st July, 2016).

In light of above para, the said project does not involve any cluster approach. However, we are in process of getting cluster certificate from the competent authority clearly mentioning that whether the cluster is applicable or not in light of the S.O. 141(E) dated 15.01.2016 and S.O.22699 (E) dated 01.07.2016 and will submit the same during the EC presentation.

19. The above mentioned mining lease having area of 68.364 Ha is also belong to GMVN for which Ministry has issued EC vide Lr No. J-11015/140/2013-IA.II (M) dated 07.09.2016. in the special condition of this EC letter, It has mentioned at SL No. 11 that " To submit annual replenishment report certified by an authorised agency. In case the replenishment is than the approved rate of production, then the mining activity/production levels shall be decreased/stopped accordingly till the replenishment is completed". As the ministry has already issued an environmental clearance to GMVN for mining lease falling in the cluster for which PP has applied now. Thus, it is requested to submit the replenishment study conducted annually in compliance of the special condition no. 11 of stipulated in the EC already granted to GMVN. This will enable the ministry to ascertain the safe/quantum of replenishment in the river bed and ultimately help in finalizing the production capacity to granted for this project.

Reply: The above mentioned mining lease having area of 68.364 Ha belong to GMVN for which Ministry has already issued EC vide Lr No. J-11015/140/2013-IA.II (M) dated 07.09.2016 is still not operational as on date from the grant of EC.
However, replenishment study for the proposed project of River Yamuna Lot 21/2 having an area of 34.940 ha. has already been conducted and incorporated in the Modified Mining Plan which helps the ministry to ascertain the rate/quantum of replenishment in the river bed and ultimately help in finalizing the production capacity for both the mining leases as they both lies at 500m distance from each other. Modified Mining Plan is attached as **Annexure 1.**

Annexure 1

प्रेषक,

निदेशक,
भूतत्व एवं खनिकर्म इकाई,
उद्योग निदेशालय उत्तराखण्ड,
देहरादून।

सेवा में,

प्रबन्ध निदेशक,
गढ़वाल मण्डल विकास निगम,
74/1 राजपुर रोड, देहरादून।

संख्याः 755 /उ0खा0/गा0प्रसा0/दे0दू0/2019-20 दिनांक 19 अगस्त 2019

विषयः- जनपद देहरादून, तहसील विकासनगर के ग्राम ढकरानी के क्षत्रान्तर्गत यमुना नदी लीज संख्या 21/2 खसरा नम्बर 971, 969, 970, 936मि रकबा 34.940 है0 राजस्व भूमि में इस कार्यालय के पत्र संख्या 2201/गा0प्रसा0/उ0खनि0/देहरादून/2013-14 दिनांक 03 मार्च 2015 के द्वारा अनुमोदित खनन योजना का संशोधन कर अनुमोदन के सम्बन्ध में।

महोदय,

आपके द्वारा जनपद देहरादून, तहसील विकासनगर के ग्राम ढकरानी के क्षत्रान्तर्गत यमुना नदी लीज संख्या 21/2 खसरा नम्बर 971, 969, 970, 936मि रकबा 34.940 है0 राजस्व भूमि में इस कार्यालय के पत्र संख्या 2201/गा0प्रसा0/उ0खनि0/देहरादून/2013-14 दिनांक 03 मार्च 2015 के द्वारा अनुमोदित खनन योजना को संशोधित कर अनुमोदन हेतु इस कार्यालय को प्रस्तुत किया गया है, जो सम्बन्धित संशोधित खनन योजना जो की भूतत्व जोशी आर0प्र0पी0 संख्या- भू0स0/आर0प्र0पी0/डी0टी0ए0/01/2016 के द्वारा तैयार की गयी है, जो वैज्ञानिक, तकनीकी एवं पर्यावरण सुरक्षा के दृष्टिकोण से खनन संक्रियाओं के सुनियोजित संचालन हेतु उपयुक्त पाये जाने के दृष्टिगत उत्तराखण्ड उपखनिज परिहार नियमावली-2001 के नियम-34 एवं उत्तराखण्ड उपखनिज (बालू, बजरी, बोल्डर) खनन नीति, 2018 बिन्दु-22 (2) के अन्तर्गत प्रदत्त अधिकार का प्रयोग करते हुए, प्रस्तुत संशोधित खनन योजना का अनुमोदन निम्नलिखित शर्तों के अधीन किया जाता है-

शर्तें

1. खनन योजना का अनुमोदन खनन पट्टा/लीज/एग्रीमेण्ट के निष्पादन की तिथि से आगामी पांच वर्षों की अवधि के लिए किया जा रहा है।
2. पट्टाधारक द्वारा प्रश्नगत क्षेत्र के सम्बन्ध में पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय, भारत सरकार से पर्यावरणीय अनुमति प्राप्त की जायेगी तथा पर्यावरणीय अनुमति की समस्त शर्तों का अनुपालन किया जायेगा।
3. स्वीकृत क्षेत्र का सीमाबन्धन/पिलरकन्नी उपखनिज परिहार नियमावली-2001 के नियम-17 के अनुसार भूतत्व एवं खनिकर्म विभाग के द्वारा राजस्व विभाग के साथ संयुक्त रूप से किया जायेगा तथा नियम-14 के अनुसार पट्टाधारक द्वारा पट्टा लीज/एग्रीमेण्ट कराने के उपरान्त खनन क्षेत्र से उपखनिज का खनन/खुदान प्रारम्भ किया जायेगा।
4. प्रस्तावित संशोधित खनन योजना के अनुसार अधिकतम 1.5 मीटर की गहराई तक खनन/खुदान किया जायेगा। तथा तदनुसार वार्षिक उत्पादन निम्नवत किया जाना प्रस्तावित है-

YEAR	PRE- MONSOON (Tonnes)	POST- MONSOON (Tonnes)	RECOVERABLE RESERVE (Tonnes)
First Year	88,634	8,21,194	9,09,828
Second Year	88,634	8,21,194	9,09,828
Third Year	88,634	8,21,194	9,09,828
Fourth Year	88,634	8,21,194	9,09,828
Fifth Year	88,634	8,21,194	9,09,828
TOTAL	4,43,170	41,05,970	45,49,140

5. यह खनन योजना अन्य किसी अधिनियम जो कि इस खान या क्षेत्र पर लागू होते है या समय–समय पर राज्य सरकार या केन्द्र सरकार या अन्य किसी सक्षम द्वारा प्रख्यापित किये जाते है, को छोड़ कर अनुमोदित की जाती है।
6. प्रश्नगत खनन पट्टाक्षेत्र के नेशनल पार्क/सेन्चुरी के 10 कि0मी0 की परिधि के अन्तर्गत स्थिति होने की दशा में पट्टाधारक द्वारा नेशनल बोर्ड ऑफ वाइल्ड से पूर्वानुमति प्राप्त की जानी आवश्यक होगी।
7. यह खनन योजना वन (संरक्षण) अधिनियम–1980, वन संरक्षण नियमावली 1981 और अन्य सम्बन्धित अधिनियम और नियमावली, आदेश और दिशा निर्देश जो कि इस खनन पट्टे पर समय–समय पर दिये जाये लागू होंगे।
8. अनुमोदित खनन योजना किसी भी प्रभावी क्षेत्रान्तर्गत माननीय न्यायालय के आदेश एवं दिशा निर्देश के लागू होने को बाधित नहीं करती है।
9. अनुमोदित अवधि में किये गये खनन कार्य के निरीक्षण के उपरान्त यदि खनन योजना में संशोधन हेतु आदेश दिये जाते हैं तब संशोधित खनन योजना प्रस्तुत करने का पूर्ण उत्तरदायित्व आवेदक का होगा।
10. आबद्ध/नियोजित श्रमिकों को सुरक्षात्मक उपकरण प्रदान करने तथा सुरक्षित खनन कार्य करने हेतु सभी आवश्यक सावधानियाँ बरतने का दायित्व आवेदक का होगा।
11. अनुमोदित खनन योजना की एक–एक प्रमाणित प्रति सम्बन्धित जिलाधिकारी कार्यालय एवं निदेशालय के जनपदीय कार्यालय में अभिलेखार्थ यथाशीघ्र प्रस्तुत करने का दायित्व भी आवेदक का होगा।
12. अनुमोदित खनन योजना के अनुसार, आवेदक द्वारा खनन कार्य न किये जाने पर, आवेदक के विरूद्ध पट्टे की शर्त का उल्लंघन माना जायेगा और तदनुसार कार्यवाही की जायेगी।
13. खनन योजना इस शर्त के साथ अनुमोदित की जा रही है कि आवेदक द्वारा श्रमिकों की सुरक्षा एवं स्वास्थ्य की उचित व्यवस्था की जायेगी।

संलग्नकः– खनन योजना की अनुमोदित प्रति।

भवदीय

(डा0 मेहरबान सिंह बिष्ट)
निदेशक

संख्याः /मा0प्लान/उ0खनि0/दे0दू0/2019–20 तद्दिनांकित।

प्रतिलिपिः– निम्नलिखित को सूचनार्थ एवं आवश्यक कार्यवाही हेतु प्रेषित।

1. अपर मुख्य सचिव खनन, उत्तराखण्ड शासन।
2. जिलाधिकारी देहरादून।
3. पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय, भारत सरकार
4. जिला खान अधिकारी, भूतत्व एवं खनिकर्म इकाई जनपद देहरादून।

(डा0 मेहरबान सिंह बिष्ट)
निदेशक

REVISED MINING PLAN

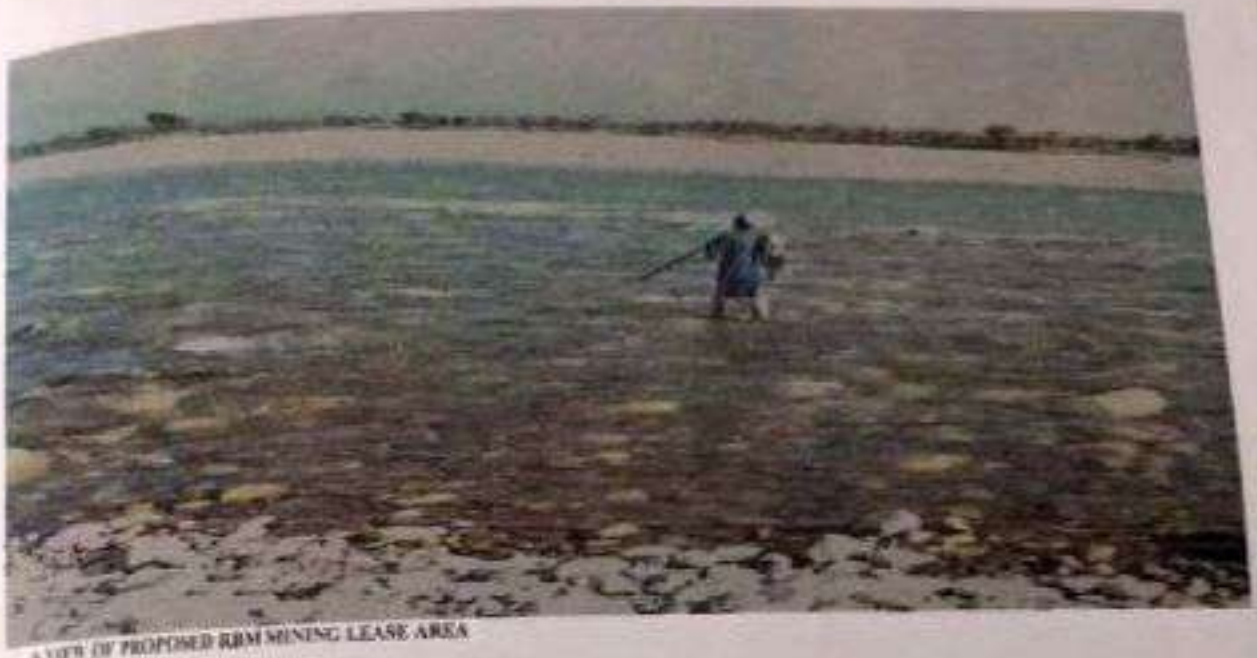
APPROVED

WITH

PROGRESSIVE MINE CLOSURE PL अनुमोदित

(Submitted under Uttarakhand Minor Mineral Rules/Policy (Gov[illegible] Uttarakhand)
& MoEF (Govt. of India) Recommendations

Name of the Mineral- RBM (Sand, Bajri, Boulders etc)
Village- Dhakrani
Tehsil- Vikasbnagar
District- Dehradun, Uttarakhand
Mining Plan Period-For Five (5) Years
Total Area-34.940 Hectare



A VIEW OF PROPOSED RBM MINING LEASE AREA

APPLICANT

M/s GARHWAL MANDAL VIKASH NIGAM LTD
(Govt. of Uttarakhand Enterprise)
74/1-Rajpur Road
Dehradun, Uttarakhand

भूतत्व एवं खनिज्कर्म इकाई
उद्योग निदेशालय, उत्तराखण्ड

देहरादून
शर्तों के अधीन अनुमोदित
पत्रांक 755/उ0क0/15
दिनांक 19-08-20

उप निदेशक

PREPARED BY

BHUWAN JOSHI
EMPANELLED GEOLOGIST, RQP, IBM, UK, J&K, HP
Forest & Rural Development Cell (FRDC)
Empanelment No. *URRDA/2008-09/3190*
Mn.Kha./RQP/DDN/01/2016
Govt. of Uttarakhand
RQP, Registration No.*RQP/DDN/180/2009/4*
Indian Bureau of Mines
Govt. of India

Progressive Geological & Geotechnical Services (PGGS)
REGD. OFFICE
House No.-6, Kamal Bhawan
Vijay Colony, Lane No.-1, Dehradun
Uttarakhand
E-mail: joshibhuwan@yahoo.co.in

MINING PLAN

FOR

PICKING/EXTRACTION OF MINOR MINERALS (SAND, BAJRI AND BOULDERS)

CONTENTS

उत्तराखण्ड सरकार

देहरादून

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Bhuwan Joshi

MINE PLAN

CHAPTER-1

1.0 INTRODUCTORY NOTE-

The **Letter of Intent (LoI)** was granted/released vide letter **No. 40/bhu.khani.ee./2012-13, Dated 18 April 2013 (Ann-II)**, in the favor of **Garhwal Mandal Vikash Nigam Ltd,** 74/1- Rajpur Road, Dehradun, District- Dehradun, Uttarakhand as per Part-1, Point No. 02 of Uttarakhand Mining Policy 2011, for extraction of Sand Bajri and Boulder (RBM), in a part of Yamuna River- Lot No. 21/2, Village- Dhakrani, Tehshil- Vikashnagar, District- Dehradun (Uttarakhand), Khasara No. 971, 969, 970, 936 Mi, Area- 34.940 Hectare.

Proposed SAND, BAJRI AND BOULDERS MINE/Mining, in a part of Village- Dhakrani, Tehsil- Vikashnagar, District- Dehradun, Uttarakhand, Applicant- Garhwal Mandal Vikash Nigam Ltd, 74/1-Rajpur Road, Dehradun, District- Dehradun, Uttarakhand is a small 'B1' category mine as per explanation furnished in MCDR, 1988 i.e. manual opencast mine, not using explosives. Mine Plan for proposed project under revised guidelines (MoEF) discussed here, in proceeding chapters.

VILLAGE	TEHSIL	DISTRICT	AREA (Hectares)	MINERAL
Dhakrani	Vikashnagar	Dehradun	34.940	RBM (Sand, Bajri, Boulder etc)

2.0 GENERAL

1.1	Name of the applicant	Garhwal Mandal Vikash Nigam Ltd
	Address	74/1-Rajpur Road, Dehradun
	District	Dehradun
	State	Uttarakhand
	Pin Code	248001
	Phone	0135-2740896, 2746817, 2749308
1.2	Status of the applicant	Garhwal Mandal Vikash Nigam Ltd (GMVN) is a Govt. of Uttarakhand Enterprise.
1.3	Mineral(s) which the applicant intends to mine	(RBM) Sand, Bajri and Boulder etc. The mineral collected/extracted from the proposed lease area shall be sold in the open market as per the demand.
1.4	Period for which the mining lease is required or granted / renewed	Letter of Intent (LoI) for the project vides letter **No. 40/bhu.khani.ee./2012-13, Dated 18 April 2013,** **Demarcated Area for Mining- 34.940 Ha.** (LoI attached as Annexure I)
1.5	Name of the RQP preparing the mining plan	Bhuwan Joshi
	Address	Kamal Bhawan, House No. 6, Vijay Colony, Lane No. 1, New Cantt Road, Dehradun (Uttarakhand) 248001

	Phone	09412152105
	Fax	-
	Registration No.	RQP/DDN/180/2009/A- IBM Mu.Kha./RQP/DDN/01/2016- State Govt.
	Valid upto	30/08/2019 & 27/12/2020
1.6	Name of the prospecting agency	The baseline data is collected from various reports, proponent, as well as detailed prospecting of the area is carried out by the RQP

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CHAPTER-3

3.0 PROJECT DESCRIPTION

3.1 NEED OF THE PROJECT-

RBM i.e. Sand, Bajri and Boulder are available everywhere and is being used from the time immemorial for wide applications in our daily life like infrastructure, building construction, highways, roads, townships, multiplexes, foundations of buildings and industrial units etc. and is an integral part of development. Over the millennia, the weathering effect, the flow of water at high velocities in rivers and the pressure of water from the high mountainous reservoirs converted and pushed the hard ground underneath into sand, gravel etc. which travelled as sediments with the flow. This sand gets deposited along the river course wherever conditions were favorable. In deep past this settled sand was not extracted in a quantity in which it is deposited, since due to less population the requirement was not enough. As a result of continuous deposit of sand, bajri etc. the river course continued changing by widening itself, eroding the fields and expanding. This started resulting in floods, inundation and breaking their banks, causing devastation of property and loss of life. There has been a severe impact on every aspect of the environment. Thus there was a need for channelization of rivers for which extraction of sand through mining was expedient. The haphazard mining of river bed material being practiced for now long through unregulated, uncontrolled and illegal manner added almost an irreversible damage to the environment, which became a cause of serious concern. Though sand is very important mineral source for development, its mining through scientific methods have also become equally imperative. It is for this purpose that 'mining plan' is being drawn so that all its aspects are taken care of justifiably, according to law, protecting the environment, removing all adverse impacts and creating a direct and indirect employment opportunities, improving socio-economic conditions of the local inhabitants and all round status of life, achieving thereby a sustainable development. Besides above, the process of mining of minor minerals is a constant source of revenue generation to the State Government through Royalty.

3.1.1 Project benefits of sustainable RBM Mining-

Physical benefits: Road Transport, Market, Enhancement of green cover & Creation of community assets.

Social benefits: Increase in Employment Potential, Increased Health related activities, Educational attainments & Strengthening of existing community facilities etc. hand

Environmental benefits

- Controlling river channel
- Protecting of river banks
- Reducing submergence of adjoining agricultural lands due to flooding.
- Reducing aggradations of river level.
- Protection of crops being cultivated along the river bank.
- A check on illegal indiscriminate mining activity.

3.2 PROJECT BACKGROUND

The Letter of Intent (LoI) was granted vide letter **No. 40/bhu.khani.ee./2012-13, Dated 18 April 2013**, to Garhwal Mandal Vikash Nigam Ltd, Rajpur Road, Dehradun, as per **Part-1, Point No. 02 of Uttarakhand Mining Policy 2011**, for extraction of Sand, Bajari, Boulders etc (RBM), from a part of Yamuna River -Lot No. 21/2, Village- Dhakrani, Tehsil- Vikasnagar, Khasara No. 971, 969, 970, 936 Mi, **Area- 34.940 Hectare**. **Mining Plan for the project approved vide letter No. 2201/Mine Plan/u.khni./Dehradun/2013-14, dated- 3 March 2015** by Geology & Mining Unit, Government of Uttarakhand, Department of Industries (Annx.3).

Environment Clarence (EC) proposal for the project was submitted to Ministry of Environment & Forest (MoEF), Proposal No: IA/UK/MIN/18558/2013. The proposal was considered by the Expert Appraisal Committee constituted by MoEF, in its 33rd meeting, held during June 21-22, 2018 wherein the committee recommended various points, (**Letter No. J-11015/137/2013-IA-II (M) dated 6 August 2018,** Annex. 1), as below-

S. N.	COMMITTEE RECOMMENDATIONS	COMPLIANCE STATUS
1-	The proponent should collect the baseline data in respect of initial level of the mining lease. For this permanent bench marks (BM) needs to be established at prominent location preferably close to mining leases in question and should have precisely known relationship to the level datum of the area, typically mean sea level. The entire mining lease should be divided suitably in the grids of 25 Meter × 25 Meters with the help of sections across the width of river and along	Baseline survey, contour map by IITR, survey Plate Annex. as plate No. 1 to 4, based on IITR survey, mining planning proposed, mining plan plates annexed as Plate 1 to 14, discussed precautions/recommendations mentioned in the text part and Plate 6 of the plan. For the optimum utilization of the mineral available in the lease area, mine working has been planned and scientific layout has been designed considering the following parameters-

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	the directions of the flow of the river. The levels (MSL & RL) of the corner point of each grid need to be recorded. Each Grid should be suitably numbered for identification. PP should identify grids which will we worked out and grids which will come under no mining zone i.e. safety barriers from the river bank, safety barrier at lease boundary, restrictions as per condition of LoI/Mining lease deed, restriction as Mineral Concession Rule of the concerned State, restrictions as per sustainable sand mining management guidelines 2016 and restrictions as per directions of any Court or NGT. The PP should ascertain the level of river bed with the help of sections drawn across the width of the rivers and along the direction of the flow of the river and based on this define the depth of mining of each grid. The PP should provide a detailed map and table clearly showing the grid-wise material availability, dimension of grid, location of grid (latitude & longitude of the corner points), level of grid (AMSL and RL), depth of mining in each grid, grid left under no mining zone etc.	• Mining operation proposed by opencast manual method. • Maximum (proposed) Height/depth of benches shall be kept 1.5m. • Maximum (proposed) width of benches shall be kept 1.5m. • As per MoEF recommendation, 3 meter safety barrier has been proposed from the outer lease boundary. • About 15% Safety barriers/left from the river bank has been proposed to stop the toe erosion phenomena. • The approach road will be repaired from time to time.
2-	PP should suitably name each section line. Section Plan for both sections drawn across the river and along the direction of the river needs to be submitted. Each section should have level on vertical axis and distance from the bank of river on horizontal axis. For the section along the direction of the river the	Survey work carried by IITR, based on IITR survey Geological Section, annexed as Mining Plate-4, pre monsoon period pit section plan, annexed as Mining Plate12 & post monsoon period pit section plan, annexed as Mining Plate-13 prepared.

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	levels to be shown on the vertical axis and distance from upstream to downstream should be shown on horizontal axis.	
3.	The PP should prepare the modified Mining plan based on the above survey. The information sought above needs to be a part of the mining plan. In the mining plan year-wise production plan should be prepared in three plates for each year. **Plate-1** show the mine working for the pre-monsoon period (1st APR-14th June). **Plate-2** should show the status of the mine after the replenishment and no working should be proposed in this period (15th June-1st Oct) as the mining lease area needs to be left for the replenishment of the river bed mineral and **Plate-3** show the mine working after replenishment of the river bed i.e. post monsoon period (2nd Oct-31st March)	On the basis of survey carried by IITR, MODIFIED/REVISED MINING PLAN been prepared by RQP, all recommended plates been attached as- Mining Plate 5 to 13 & extractable minable reserve been maintained in Mining chapter of the report.
4.	PP should specifically mention in the mining plan that in the subsequent scheme of mining/review of mining plan, the yearwise data pertaining to replenishment study (all five years) shall be provided which include the level the level (AMSL & RL) of river bed recoded before and after the monsoon, yearwise replenishment quantity, all plan & sections of the replenishment study for the past five years.	Survey & Replenishment study carried by IITR, on the basis of study carried by **Indian Institute of Technology Roorkee (IITR), (replenishment report submitted by IITR to GMVNL).** **Volume of depth increment and mineable volume available.** The average rise in the riverbed level in the post and pre monsoon period is 0.6[illegible] for one year cycle of 2018-19. Considering the area of present mining lot as 34,940 sq.mtr, the average volume of [illegible] available in one year cycle of replenishment is 2,10,339 cubic meters. However this value should not be

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taken as annual average, since the variation of river morphology and its characteristics should be studied for longer duration, with a minimum of three consecutive years' study. Then only river bed material (RBM) deposition behavior of that particular stretch of the river can be ascertained.

Carrying capacity of the river increases after controlled mining, since the cross section of the river increases due to mining. Sediment carrying capacity reflects the account of entrainment and transportation by the flow under the certain boundary condition. It is a comprehensive index characterizing the sediment carrying capacity of flow under the conditions of equilibrium of scouring and deposition (Yu, et al., 2001; Milhous, 2005; Yang, et al., 2007; Wang, 2007 and Ni et al., 2014). In order to increase the cross-section of river, either horizontal or vertical expansion can be exercised. Increase of river cross-section in horizontal direction is not advisable, since it may induce the breaching of river banks, which in turn will give rise to threat of flooding for nearby places. Therefore, increase in river cross section in vertical direction through controlled mining of the river is more viable option. The current deposition of RBM in the river for one year cycle (pre-monsoon to post monsoon) is about 60 cm. In order to increase the river section, it is proposed that controlled mining upto the depth of 1.5 m from current river bed level be allowed (may

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be for current year only), as it will enhance the carrying capacity of the river and the rate of deposition of RBM will also increase. The similar studies may be carried out in subsequent years to ascertain the impact of increase in river cross-section by controlled mining. Also, it has been observed that mining has not been carried out in the present mining lot in last years, therefore the river bed level is already quite high, thus it might have reached the saturation of deposition. Therefore, the rate of deposition of material will increase if the river bed is lowered by controlled mining. It is in line with the law of sediment transport in the natural streams. As a consequence of controlled mining in the designated lots of the river, low elevation channels are created, which have got the tendency to get filled first with sediment flow in the monsoon time. In the absence of that, the material deposition takes place along the width of river upto the banks of river and this sometimes creates the situation of breaching of the river banks causing flood havoc in the adjoining areas. The above condition will induce the deposition of RBM for the entire width of river. Severe floods in year 2013 have impacted the morphology of major and minor rivers of Uttarakhand, as it has brought huge amount of RBM and silt deposits to the downstream side. A study has been carried out using satellite remote sensing to study the morphology of current

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river-section in pre and post era of 2013 floods. Satellite images of the same river section pertaining to pre 2013 (pre-flood) and post flood time have been taken. The river bank lines for both the images have been digitized and overlaid on the satellite image to get an idea of the width of river in that year. It has been observed that river width has increased at several locations. The primary reason for the same may be the excessive RBM brought along with the 2013 flood water and the subsequent monsoon flows. It is evident that, if sufficient depth of river cross-section is not available, the RBM will have the tendency to get deposited towards the river banks, which sometimes may cause breaching of river banks, i.e. increased flood threat for the neighbouring areas.

By increasing the depth of river through controlled mining, the river flow as well as the deposition of RBM will be more regularized and will stabilize the river morphology. Hence it is proposed that mining up to a maximum depth of 1.5m may be allowed for current year and the situation may be studied for subsequent year (by ground survey of river cross-section in pre and post monsoon period of year 2019). Therefore, considering the changes in the river morphology and width of river after the 2013 floods, the volume of material for the proposed mining from this mining lot of 34.940 hectare area will be **5,24,100** cubic

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		meters approximately for excavation upto 1.5 m with respect to the present river bed level. **(Ref. - IITR Survey Report, ANNX.)**
5	The PP should also submit a KML file wherein the above-mentioned grid plans is superimposed on the satellite imaginary.	Part of GMVNL/EM consultant
6.	PP should also submit an undertaking to the effect that each year after the replenishment study the plan & section shall be submitted to concerned Department of Geology & Mining of the state for verification and official record.	Part of GMVNL/EM consultant of GMVN
7.	The methodology for conducting replenishment study needs to be mentioned in the modified mining plan. PP should ensure that plan and section that will be submitted to EAC should be in proper scale.	Survey & Replenishment study carried by IITR, methodology for replenishment study discussed in page No. 21, Chapeter-5 under sub-point 5.41 Methodology for Replenishment; all Survey Plates 1 to 5 & Mining Plates 1 to 14 are annexed with proper scale.
8.	PP should ensure that relevant information as per ToR Conditions needs to be provided in the EIA Report.	Part of EM consultant, not a part of mining plan.
9.	PP should clearly mention the designation and number of person to be engaged for Environmental Monitoring Cell. The EMC will be set up for this mine only or for all the mining lease of the GMVN in the area.	Part of EM consultant, not a part of mining plan.
10.	The PP should clearly bring out the impact on environment due to cluster situation if any. Air Quality modeling needs to be done in Aermode software both for area and line	Part of EM consultant, not a part of mining plan.

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	source.	
11.	The transportation route needs to be clearly provided in the EIA Report with other details such as width of road, length of road, type of road, impact due to transportation on the vegetation on the both side of the road, frequency of maintenance of the road, amount proposed for maintenance of the road, compensation to the land owners effected by transportation of mineral etc.	Part of EM consultant, not a part of mining plan.
12.	Detailed occupational plan needs to be submitted with budget allocation. The Committee was of the view that being handing the large number of mines the GMVN should set up a dedicated cell for the occupational health surveillance.	Part of EM consultant, not a part of mining plan.
13.	PP submitted the list of Secdule-I species for core and buffer zone duly authenticated by Forest Department and same needs to be updated in the EIA Report. PP should provide the conservation plan for all secdule-I and Schedule-II species present in the core & buffer zone.	Part of EM consultant, not a part of mining plan.
14.	Proof of submission of EIA/EMP report within the validity of ToR needs to be submitted as the EIA report uploaded on the website initially is not the correct report.	Part of EM consultant, not a part of mining plan.
15.	The budget of EMP needs to be revised as the Environmental Monitoring cost is not included in EMP Budget.	Part of EM consultant, not a part of mining plan.
16.	PP should submit a plan clearly mention the area that will be covered under plantation.	Part of EM consultant, not a part of mining plan.
17.	Proof of submission of application for	Part of GMVN, EM consultant, not a part

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	NBWL Clearance.	
18.	In the cluster certificate submitted the ministry the total area of the cluster is not mentioned. Thus, it is requested to provide the cluster certificate clearly mentioning the area of the cluster as per S.O. 141(E) dated 15.01.2016 and S.O. 2269(E) dated 01.07.2016. It has also observed that a letter issued by Geology and Mining Unit, Directorate of Industries, Govt. of Uttrakhand vide Lr. No. 74/bhu.khni.e./district office Dehradun/2018-19 dated 24.05.2018 wherein it has mentioned that the details provided in the cluster certificate is as per S.O. 141(E) dated 15.01.2016 and S.O. 2269(E) dated 01.07.2016. But it has found that EC was granted for mining lease having an area of 68.364 Ha. vide Lr. No. J-11015/140/2013-IA.II (M) dated 07.09.2016. Further, as per S.O. 2269(E) dated 01.07.2016 the mining lease for which EC was granted on 15.01.2016 should not be counted while calculating the Cluster area. As the EC for mining lease area the cluster area. Thus, the cluster area comes out to be 103.304 ha. and the proposal become category 'A' project as per S.O. 141(E) dated 15.01.2016. Therefore it is requested to submit the revised cluster certificate clearly mentioning the area of the cluster.	of mining plan plan
19.	The above mentioned mining lease having area of 68.364 ha. is also belong to GMVN	Survey & Replenishment study carried for this project by [illegible] methodology for

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for which Ministry has issued EC vide Lr No. J-11015/140/2013-IA. II(M) dated 07.09.2016. In the special condition of this EC letter, it has mentioned as SL No. 11 that "To submit annual replenishment report certified by an authorized agency. In case the replenishment is completed". As the ministry has already issued an environmental clearance to GMVN for mining lease falling in the cluster for which PP has applied now. Thus, it is requested to submit the replenishment study conducted annually in compliance of the special condition No. 11 of stipulated in the EC already granted to GMVN. This will enable the ministry to ascertain the rate/quantum of replenishment in the river bed and ultimately help in finalizing the production capacity to be granted for this project.	replenishment study discussed in page No. 23, Chapeter-5 under sub-point 5.4) Methodology for Replenishment.

On the basis of above MoEF recommendations for this project (Letter no. J-11015/137/2013-IA-II (M), Dated 6 August 2018); mining plan is being revised here, as per Environment Clearance (EC) proposal already been submitted at MoEF level.

भूतत्व एवं खनिकर्म इकाई उत्तराखण्ड शासन देहरादून

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CHAPTER-4

4.0 LOCATION, GENERAL AND ACCESSIBILITY

4.1 LOCATION

(a)	Details of Area	Location Map is attached as Plate No. 1
(b)	District and State	Dehradun, Uttarakhand
(c)	Tehsil	Vikashnagar
(d)	Village	Dhakrani
(e)	Khasra No./ Plot No./ Block Range /	Khasara No.971, 969, 970, 936 Mi
(f)	Felling Series etc.	None
(g)	Area (hectares)	34.940 Ha.
(h)	Whether the area is in forest (please specify whether protected, reserved etc.)	No, area does not fall under forest area
(i)	Ownership/ Occupancy	Letter of Intent letter released as per **Part-1, Point No. 02 of Uttarakhand Mining Policy 2011** for mining of minor minerals in [illegible]
(j)	Geographical Pillar Coordinates	**1.** Latitude- 30°26'43.04"N Longitude- [illegible]3.34"E
		2. Latitude- 30°27'23.65"N Longitude- 77° 42'22.09"E
		3. Latitude- 30°27'2.15"N Longitude- 77° 42'21.54"E
		4. Latitude- 30°26'40.54"N Longitude- 7[illegible]

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RQP [illegible] Dn
[illegible]
Govt of India
Reg. Registration No. RQP/DDN/180/2009/A

4.2 GENERAL

(a)	Mineral proposed to mine	Sand, Bajri and Boulder etc
(b)	Period of mining Lease	Letter of Intent was granted for proposed mining upto five (5) years. LoI attached as Annexure II.
(c)	Category of land use	Revenue land (Non forest land)
(d)	Elevation Range of River Bed	404.8 to 410.6 m

4.3 ABOUT THE DISTRICT- District Dehradun is situated in NW corner of Uttarakhand state and extends from N Latitude 29° 58' to 31° 02' 30" and E Longitude 77° 34' 45" to 78° 18' 30". It falls in Survey of India *Toposheet* Nos. 53E, F, G, J and K. The district is bounded by Uttarkashi district on the north, Tehri Garhwal and Pauri Garhwal districts on the east and Saharnpur district (UP) on the south. Its western boundary adjoins Sirmour district of Himachal Pradesh separated by Rivers Tons and Yamuna.

The total area of Dehradun district is 3088 km^2 with an average altitude of 640 m above MSL. The district comprises of six tehsils, namely Dehradun, Chakrata, Vikasnagar, Kalsi, Tiuni and Rishikesh. Further, it is divided into six developmental blocks, viz: Chakrata, Kalsi, Vikasnagar, Sahaspur, Raipur and Doiwala. There are seventeen towns and 764 villages in this district.

4.4 ACCESSIBILITY TO THE PROPOSED LEASE AREA- The proposed lease area is a part of a Village- Dhakrani, district- Dehradun, Uttarakhand. The village is approachable through via Route (NH-72). The proposed mine lease is connected to NH-72 through a *none-damar/none bitumen* road of about 500m. The nearest railway station is Dehradun Railway station and is approachable at a distance of about 35 kms aerial distance.

NEAREST AVAILABLE FACILITIES

Nearest approachable NH/SH	NH-72, about 500m
Nearest Railway transportation facility	At Dehradun about 35kms aerial
Nearest Air facility/Helipad etc	Helipad at Dehradun & Airport at Jollygrant Dehradun about 55kms
Nearest bank facility	Harbertpur, about 4 kms
Nearest Public Health Centre (PHC)	Dhakrani, about 3 kms

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Nearest Community Health Centre (CHC)/Dist. Hospital	Harbertpur, about 4kms
Nearest Primary School	Dhakrani, about 1 km
Nearest High School/Intermediate College	Harbertpur, about 4 kms
Nearest Degree & Post Degree College	Dehradun, about 30 kms
Nearest Vocational Educational Center/ITI	Dehradun, about 30 kms
Nearest Small market	Harbertpur, about 4 km
Nearest Major market	Harbertpur, about 4 km

4.5 ABOUT THE PROPOSED LEASE AREA- Letter of Intent (LoI) for RBM mining was granted via letter **No. 40/bhu.khani.ee./2012-13, Dated 18 April 2013,** in the a part of Village- Dhakrani, tehsil- Vikashnagar, District- Dehradun. Some of the important facts about the proposed lease area, as per mining policy, are given as below:-

- Lease area falls near the left bank i.e. river bed of the Yamuna & all Pillar Coordinates of the lease area are mentioned in page no.13 of this mine plan report & joint demarcation report (Annexure No.4)
- Distance from Upstream Bridge is- about 11 km (Dakpattar road Bridge), location point coordinate is- 30°30'14.99"N, 77°47'42.75"E
- Distance from Dowastream Bridge is- about 7 km (NH-72 Chakrata road Bridge), location point coordinate is- 30°25'59.04"N, 77°37'32.87"E

4.6 ABOUT THE MINING PLAN-

1. Quantity of minable mineral with reference to technically & environmentally safe method of mining - **Discussed at chapter 22-26, Page No. 20**
2. Description of DGPS coordinates of the proposed mining lease area must be given in the mining plan -**Page No.10 & survey plates 1 to 4**
3. DGPS Coordinates must be superimposed in ***Geo-referenced Khasara map***/Cadastral- Annex. **survey plates 1 to 4**
4. Description about the government land, private land, forest land etc within the proposed lease area shall be given & verified by the Revenue department (described/classified on joint demarcation/inspection report), as below-

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Sr. No.	Khasra No.	Status of Land	Total Area (Ha.)	Area Utilized for Mining (Ha.)
1	971, 969, 970, 936MI	Revenue/Govt. land	34.940	34.940
			34.940	**34.940**

5. Satellite map (scale 1:10000) of Public place, nearest bridges that fall in 100m circumference of lease area shall be mentioned- Annex. **survey plate 4**
6. Both bank of the river should be mentioned in satellite map, and marked mineable area clearly mentioned after leaving the specific distance from the river banks. Satellite map shall be attached with the mining plan- Annex. **survey plates 1 to 4**).
7. All DGPS Pillar coordinates of the proposed Mining lease area shall be mentioned on map (in term of larger mining lease area the DGPS point coordinates shall be taken/given at ever 100m interval- Annex. Georeferenced map, **survey plates 1 to 4**

4.6 Georeferencing- means that the internal coordinate system of a map or aerial photo image can be related to a ground system of geographic coordinates. The relevant coordinate transforms are typically stored within the image file (GeoPDF and GeoTIFF are examples), though there are many possible mechanisms for implementing georeferencing. The most visible effect of georeferencing is that display software can show ground coordinates (such as latitude/longitude or UTM coordinates) and also measure ground distances and areas. In other words, Georeferencing means to associate something with locations in physical space. The term is commonly used in the geographic information systems field to describe the process of associating a physical map or raster image of a map with spatial locations. Georeferencing may be applied to any kind of object or structure that can be related to a geographical location, such as points of interest, roads, places, bridges, buildings.

Need

Georeferencing is crucial to making aerial and satellite imagery, usually raster images, useful for mapping as it explains how other data, such as the above GPS points, relate to the imagery.

- Very essential information may be contained in data or images that were produced at a different point of time. It may be desired either to update it or compare this data

with that currently available. The latter can be used to analyze the changes in the features under study over a period of time.

- Different maps may use different projection systems. Georeferencing tools contain methods to combine and overlay these maps with minimum distortion.
- Using georeferencing methods, data obtained from surveying tools like total stations may be given a point of reference from topographic maps already available.
- It may be required to establish the relationship between social survey results which have been coded with postal codes or street addresses and other geographic areas such as census zones or other areas used in public administration or service planning.

Methods-

There are various GIS tools available that can transform image data to some geographic control framework, like the commercial ArcMap, PCI Geomatica, TNTmips (MicroImages,Inc) or ERDAS Imagine. One can georeference a set of points, lines, polygons, images, or 3D structures. For instance, a GPS device will record latitude and longitude coordinates for a given point of interest, effectively georeferencing this point. A georeference must be a unique identifier. In other words, there must be only one location for which a georeference acts as the reference.

Images may be encoded using special GIS file formats or be accompanied by a world file. To georeference an image, one first needs to establish control points, input the known geographic coordinates of these control points, choose the coordinate system and other projection parameters and then minimize residuals. Residuals are the difference between the actual coordinates of the control points and the coordinates predicted by the geographic model created using the control points. They provide a method of determining the level of accuracy of the georeferencing process.

In situations where data has been collected and assigned to postal or area codes, it is usually necessary to convert these to geographic coordinates by use of a definitive directory or gazetteer file. Such gazetteers are often produced by census agencies and mapping organizations or postal service providers. At their simplest, these may simply comprise a list of area codes or place names and another list of corresponding areas, names or coordinate locations. The range and purpose of the codes available is country-specific. An example is the UK's National Statistics Postcode Directory, which shows each postcode's membership of census, administrative, electoral and other geographical areas. In this case,

the directory also provides dates of creation and deletion, address counts and an Ordnance Survey grid reference for each postcode, allowing it to be mapped directly. Such gazetteer files support many web-based mapping systems which will place a symbol on a map or undertaken analysis such as route-finding, on the basis of postal codes, addresses or place names input by the user.

Cadastral Maps- Cadastre is a technical term for a set of records showing the extent, value and ownership (or other basis for use or occupancy) of land. Strictly speaking, a cadastre is a record of areas and values of land and of landholders that originally was compiled for purposes of taxation. In many countries there is, however, no longer any land tax and in practice the cadastre serves two other equally important purposes. It provides a ready means of precise description and identification of particular pieces of land and it acts as a continuous record of rights in land. A modern cadastre normally consists of a series of large-scale maps or plans, and corresponding registers. Both the plans and the registers may be stored in computers, as discussed in the chapter "computerization of maps and registers". The present chapter deals with the essential features of cadastral maps with particular reference to the form they take when drawn on paper or displayed on a computer screen. While the survey of an individual parcel of land has in some countries resulted in a "cadastral map" for that plot of land and may have been unconnected to any adjoining land parcels, the true cadastral map covers all parcels within an area rather than isolated plots. It can act as an index for other land parcel surveys that show more detailed information or can be of sufficiently large scale for the dimensions of each plot to be obtainable from the map. In this chapter, and throughout this monograph, the term 'cadastral map' will be associated with any parcel of land whether defined by ownership, value or use provided that the parcel has an independent identity and is relevant to the management of land as a resource. A cadastral map will show the boundaries of such parcels but may in addition indicate details of the resources associated with them, including the physical structures above or beneath them, their geology, soils, and vegetation and the manner in which the land is used. The scale of cadastral maps is of great importance. Since the object of the map is to provide a precise description and identification of the land, the scale must be large enough for every separate plot of land which may be the subject of separate possession (conveniently called a "survey plot" or "land parcel") to appear as a recognizable unit on the map. When map data are stored in a computer, they may be drawn at almost any scale and this can give an impression of greater accuracy than the quality of the survey data may warrant.

Differential Global Positioning Systems (DGPS) are enhancements to the Global Positioning System (GPS) which provide improved location accuracy, in the range of operations of each system, from the 15-meter nominal GPS accuracy to about 16 cm in case of the best implementations. Each DGPS uses a network of fixed ground-based reference stations to broadcast the difference between the positions indicated by the GPS satellite system and known fixed positions. These stations broadcast the difference between the measured satellite pseudoranges and actual (internally computed) pseudoranges, and receiver stations may correct their pseudoranges by the same amount. The digital correction signal is typically broadcast locally over ground-based transmitters of shorter range.

CHAPTER-5

5.0 GEOLOGY & EXPLORATION

5.1 GEOLOGY- Geologically, The area falls in the Intermountain *Doon Valley* and is underlain by recent to sub recent Doon Gravels, which lie over the Upper Siwalik sediments. The *Doon* gravels have been broadly divided in older *Doon* Gravels and younger *Doon* Gravels. The older *Doon* Gravel consists of partly of crushed Upper Siwalik Cobbles, Angular Pebbles of Quartzites, Slates and Shales from the Nagthat, Chandpur and Tal formations and Limestone Pebbles from Krol limestone alternating with clay beds.

The younger Doon Gravels rest unconformably over the older Doon gravels in the northern part. The disconformable relationship gradually disappears in the southern part. The younger Doon gravels are characterized by very large boulders in the alluvial fans and debris flow deposits and consist of moderately sorted mixture of clay, sand, gravels and boulders. The sandy and gravelly units are separated from each other by clay beds. The thickness of these units varies from place to place and also may be traced laterally.

Proposed mining area belongs to a Fluvial Deposit, geologically Recent Deposit, carried by River Yamuna.

5.2 EXPLORATION

Adequate amount of sand, bajri and boulder in reserve is available for meeting consumer demand. Moreover mining will be carried out by batch rotation manner and the mined out area is annually replenishable (Replenishment study carried by IITR).

5.3 ESTIMATION OF RESERVE

The method of cross section has been adopted for computing the reserves. The mining lease boundary, proven and mining limits are marked on the plan which is thereafter transferred to cross section for determining the different categories of reserve.

The geological reserves have been estimated as per UNFC in all the three axis is as below

a) **Economic Axis (E-1):** The RBM is exists within the entire stretch & having no problem selling in the market. The road is near the lease area & RBM shall be loaded into tipper with the help of labors & manual excavator & transport to open market & crusher. On the feasibility study, economics viability of deposit has been

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established & RBM in economic viable, therefore economic axis has been considered as E-1.

b) **Feasibility Status (F-1):** Feasibility study has been carried out & is considered to be feasibility status. A feasibility study provides a preliminary assessment with a level of confidence as compared to that of feasibility study. It has been revealed that exploitation of RBM is feasible & Economic viable & feasibility axis under UNFC code has been considered as F-1.

c) **Geological Axis:** The exposure of RBM is seen in the entire stretch & thickness of RBM varies 2.5m to 3.0m. Therefore geological axis has been considered as G-1.

In order to calculate the mineable reserve the geological map on the 1:1000 scale was prepared and main litho units were marked on the plan to know the surface spread of each unit. The different constituents of the deposits such as sand, bajri, boulder and mixture of clay, soil, silt, based on sized classification were considered for the reserve calculation. Although it is not possible to mark these units separately on the geological map, as such three pits of 1x1x1 meters were got dug in the mineable lease area and material so excavated was separated into different size and their percentage was worked out. This percentage was taken into account during calculation of the reserve. The cumulative result of the test pits are given in the following Table no 1.

Table No. 1. Classification of Mineral Constituents available

Sr. No.	Mineral	Size	Percentage
1.	Sand	0.06-2 mm	60%
2.	Bajri	8-64 mm	30%
3.	Boulder & Gravels	256 mm<	5%
4.	Silt/Clay	1-62.5 µm	5%

Bulk density is taken as 2.2 for calculation (as per Go UK, Industrial Development Section Notification 1033/VII-1/ 2015/ 146- Kha/ 2010, dated 31st July 2015). Calculation of reserve has been done as following:

1. Cross sections have been prepared at intervals. Refer Plate No. [illegible]

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2. Area of every cross section has been taken. For example, if the area of cross section A-A' is 'X' and area of B-B' is 'Y', then average of both calculating the reserve (i.e. (X+Y)/2).
3. Distance between the two sections has been multiplied with the average area of the two sections to get the total volume. Eg. [(X+Y)/2] x Distance between A-A' & B-B'.

The overall geological reserves have been estimated through geological cross section method. The area of each section line is calculated. The section area is multiplied by the strike influence to get the volume. The target geological reserve classified in to three categories i.e. Proved reserve, Probable reserve & possible reserve. In this project the proved reserve assessed as 3m depth & further 2m as probable reserve whereas 1m considered as possible reserve. Out of total volume the 90% considered as the recoverable reserve & 2.2 bulk density.

Table No. 2. Reserve Estimation (Proved Reserve)

Cross-Section Line	Sectional Area (m^2)	Strike influence (m)	Volume (m^3)	Quantity (MT)
1-1'	159	180	28620	56667
2-2'	240	200	48000	95040
3-3'	390	200	78000	154440
4-4'	333	200	66600	[illegible]
5-5'	1536	200	307200	[illegible]256
6-6'	4137	150	620[illegible]	[illegible]1228680
TOTAL			11,48,970	22,74,960

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Table No. 3. Reserve Estimation (Probable Reserve)

Cross-Section Line	Sectional Area (m^2)	Strike influence (m)	Volume (m^3)	Quantity (MT)
1-1'	106	180	19080	37778
2-2'	160	200	32000	63360
3-3'	260	200	52000	102960
4-4'	222	200	44400	87912
5-5'	1024	200	204800	405504
6-6'	2758	150	413700	819126
TOTAL			7,65,980	15,16,640

Table No. 4. Reserve Estimation (Possible Reserve)

Cross-Section Line	Sectional Area (m^2)	Strike influence (m)	Volume (m^3)	Quantity (MT)
1-1'	53	180	9540	18889
2-2'	80	200	16000	31680
3-3'	130	200	26000	51480
4-4'	111	200	22200	43956
5-5'	512	200	76800	152064
6-6'	1379	150	206850	409563
TOTAL	-		3,57,390	7,07,632

5.3.1 Geological **Reserves:** The summarized category-wise geological reserve estimated by is:-

Table No. - 5.

Mineral Reserve	Code	Quantity of RBM in (m^3)	Quantity of RBM in Tons
Proved Reserve	111	11,48,970	22,74,960
Probable Reserve	122	7,65,980	15,16,640
Possible Reserve	133	3,57,390	7,07,632

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5.3.2 Minable Reserve: - The minable reserve is calculated as referred in Part-1, Point No. 07 of Uttarakhand Mining Policy 2011.

- Total Area= 34.940 ha = 3,49,400 M^2
- Proposed mine working shall be confined up to 1.5 m bgl (as per replenishment report)
- Detail about the minable reserve discussed in Mining Chapter-6, of the report.

5.4 MINE REPLENISHMENT

It has been assessed that proposed mining area/ mineral picking area generally gets flooded during monsoon season and gets completely replenished. However, The Department of Geology & Mining may monitor the replenishment within the lease area and specific consultation or study i.e. replenishment studies may be conducted whenever required.

5.4.1 METHODOLOGY FOR REPLENISHMENT STUDY- Several field visits to the concerned river section have been carried out by IIT Roorkee team members (few visits with the GMVN officials and Patwari of the concerned mining lot) in the months of July to October 2018, for collecting the reconnaissance data, meta data of the ground locations including the revenue (Shajra) maps with Khasra numbers and then the surveying work in the pre and post monsoon season.

The reconnaissance survey data also helped in deciding the selection of control stations and the work strategy to be adopted for mapping in order to restrict the errors Few Khasra numbers and their respective locations (as per the information given by the Patwari – State revenue official) have been collected using GPS (Global Positioning System). However, since no written record of the spatial location of the Khasra numbers were available alongwith the ground coordinates as well as the ground identifiers for such land marks or geographic locations are not available on the revenue maps, the accuracy of the work is restricted by the accuracy of information provided by the State revenue officials of the concerned river-sections. This information has been used for georeferencing the Shajra maps. This step has helped in understanding the ground location as well as for dissemination of information regarding the mining lot vis-à-vis its surrounding area.

State-of-the-art survey equipments e.g. Electronic Total Station and Geodetic GPS have been used for carrying out the survey. Before starting the survey work, a number of ground control points have been established on each site, mainly in the form of permanent Bench Marks by construction of concrete pillars at appropriate places near the

river section for each mining lease area in such a manner that least damage of flood damage. The construction-maintenance work for the B.M. has been carried out by GMVN Ltd. The ground control points at these pillar locations have been connected with the Survey of India reference BM, which is available at PWD Inspection Banglow at Saharpur. Since the Survey of India reference BM is at more than 1 km distance from the river-sections in Tons and Yamuna, the BMs for the river-sections have been established using Geodetic GPS in the relative point positioning mode (DGPS).

Complete survey measurements were taken by Electronic Total Station. The work was started from the permanent bench mark locations in the form of concrete pillars, which were constructed specifically for providing control points of the current survey work. Since there are very less possible geographic landmarks available at or near the river sections, these pillars would be very useful, if the reference is required for the survey work to be carried out in subsequent years for continuous monitoring of the morphological behavior of the river-sections as well as for river replenishment studies.

The survey work for the river sections has been carried out for the width of the mining lot covering left bank for reference purpose, since one of reference pillar used as survey control point is situated on the left bank of the river at higher elevation, i.e. at a location which is safe from flood hazard. The Total Station is a modern survey device and a total survey solution, which is a combination of 'theodolite' for measuring the horizontal and vertical angles; 'level' for measuring the elevation difference between two or more ground locations; and 'EDM' (Electronic Distance Measuring Device) for measuring the slope distance by electro-magnetic radiations and computing the horizontal and vertical distance on that basis.

Total Station survey for a river section has been started from the reference control point (concrete pillar constructed for this purpose). Back-sight has been taken for the control point and then fore-sights are taken for different locations on the river bed. The survey observations are taken at a grid interval of 25 m in longitudinal direction (along the length of river) and in perpendicular across direction (along the width of the river). Thus the entire river-section is surveyed at a grid of 25 m by 25 m. The ETS survey measurements have been carried out in Prism mode, since it ensures better reflection of electromagnetic radiations, which are used for taking the observations.

The ETS observations have been taken for planimetric coordinates and height positions for the various points at the spacing of approximately 25 m in the longitudinal and

across direction of the river section in prism mode. The width of the river is not much, therefore the observation stations are at less distance only. The instrument has been kept approximately in the center of the river and the observations towards the river banks have been carried out. This has helped to keep all the ETS survey sightings at approx. 100-120 m distance. It may be noted that while the ETS instrument used in the survey work is capable of taking observations upto 4 km in Prism mode. This ensures that the sighting distance has been kept less to enhance the observation accuracy. The observational points for the prominent features e.g. temple, important buildings, river spur locations are also taken. The land survey has been carried out in the pre-monsoon period and then has been repeated in post monsoon period. The pre-monsoon survey has been carried out in the months of July/ August 2018, while post-monsoon survey has been conducted in the month of October 2018. The survey observations of both the periods have been compared and evaluated. The different of levels for the same location of the mining lot, in pre and post-monsoon period has been observed in the range of 0.501 m to 0.740 m. These values will act as the basis of the replenishment study of the river for the concerned mining lot.

For the Yamuna river sections, the survey work has been carried out independently, since the separation between the two mining-lots of Dumar and Dhakrani is approx. 15 km. Therefore the survey for mining lot no. 21/2 at the Dhakrani area of the Yamuna river, has been carried out independently. For Dhakrani portion of the Yamuna river (lot no. 21/2), the survey work has been carried out from the upstream side of the river, i.e. from the eastern edge of khasra no. 649. In this lot no., a reference pillar of concrete has been constructed (by GMVN officials specially for the survey work) to be used as the control point. Here the reference pillar lies on an island in between the flow of river on downstream side only, hence another concrete pillar has also been constructed on the left side river bank on downstream side, which can be a better and more convenient point to be used in future surveys, since it is situated at considerably high elevation with respect to river bed, thus having very less probability of flooding hazard. The survey has been started from the upstream side (from the eastern edge of khasra no. 974) towards downstream side. Although the reference pillar (used as control point) is constructed in the downstream side, however in order to maintain uniformity in all the survey lots, the survey has been constructed from upstream to downstream side. After that khasra nos. 970, 969 which are relatively smaller size khasras are covered and then khasra no. 971 is surveyed. The mining lot ends at the western edge of khasra no. 971.

After the surveys for the pre-monsoon and post-monsoon have been completed, the Longitudinal-sections (along the length of river) and the Cross-sections (along the width of river) have been prepared using the survey computation software. The data has been exported to the Excel file and the difference of elevation has been obtained by subtracting pre-monsoon levels from the post-monsoon levels. This elevation difference at each location will help in further analysis for studying the replenishment behavior of the river.

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CHAPTER-6

6.1 MINING

6.1.1 **METHOD OF WORKING**- Taking into consideration the matrix of deposit in the river bed and the targeted production, the mine will be worked by fully manual opencast method for collection of Minor Minerals (Sand, Bajri & Boulders) from River – Yamuna (proposed ML Area-34.940 Hectare) at a part of village- Dhakrani, Tehsil- Vikasnagar, District- Dehradun, Uttarakhand. The project does not involve any processes such as overburden removal, drilling, blasting and beneficiation. The proposed mining method is conventional opencast river bed mining primarily involves scooping the mineral through use of implements like spade, pick axe and shovel etc. and requires no drilling & blasting. Proposed mining will be started from higher levels to lower levels, going to the maximum depth of 1.5 m below ground levels (bgl). The loading of mineral shall be done manually and transported by truck/tipper to the storage points located outside the mining lease. Total lease area is workable and replenishable yearly (Replenishment study carried by IITR). After each workable year, a longitudinal wall of about 1m be may be raised and repaired thereafter, as required, on the river bank side to check toe erosion, an environment hazardous phenomenon may be induced by the heavy floods during monsoon season. Mineral extraction will be done for a period of 240 days in a year; during monsoon period mining activity will be strictly banned.

6.2 SURVEY INSTRUMENT SPECIFICATION-

<u>Proposed Area Survey</u>- Survey work & replenishment study for the project carried by Indian Institute of Technology Roorkee (IITR) as per recommendations of SEIAA/SEAC/SEF (**Letter No. J-11015/137/2013-IA-II (M) dated 06 August 2018**). (**Survey Drawing Plate 1 to 5**)

Following guidelines will be followed while carrying out mining:

1. Uttarakhand State Minor Mineral Mining Policy and Amendments.
2. The Uttarakhand Minor Mineral (Sand, Bajri, Boulder etc.) Policy 2011
3. Sustainable Sand Mining Management Guidelines 2016, MoEF, Govt. of India.
4. Other guidelines & Circulars, related to RBM mining/ Gazettes of the Ministry of Environment & Forests.

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6.7.1 SUSTAINABLE SAND MINING MANAGEMENT GUIDELINES 2016 OF MoEF & PROPOSED LEASE-

GENERAL APPROACH TO SUSTAINABLE SAND AND GRAVEL MINING (Sustainable Sand Mining Management Guidelines 2016)	FOR PROPOSED LEASE
a) Parts of the river reach that experience deposition or aggradation shall be identified first. The Lease holder/ Environmental Clearance holder may be allowed to extract the sand and gravel deposit in these locations to manage aggradation problem.	The **Letter of Intent (LoI)** was granted/released vide letter **No. 40/bhu.khani.ee./2012-13, Dated 18 April 2013 (Ann-II)**, in the favor of **Garhwal Mandal Vikash Nigam Ltd.**, 74/1- Rajpur Road, Dehradun, District- Dehradun, Uttarakhand as per Part-1, Point No. 02 of Uttarakhand Mining Policy 2011, for extraction of Sand Bajri and Boulder (RBM), in a part of Yamuna River- Lot No. 21/2, Village- Dhakrani, Tehshil- Vikashnagar, District- Dehradun (Uttarakhand), Khasara No. 971, 969, 970, 936 Mi, Area- 34.940 Hectare.
b) The distance between sites for sand and gravel mining shall depend on the replenishment rate of the river. Sediment rating curve for the potential sites shall be developed and checked against the extracted volumes of sand and gravel.	It has been assessed that proposed mining area/ mineral picking area generally gets flooded during monsoon season and gets completely replenished. Based on preliminary survey done by IITR, it is assessed that, on an about 1.5m thick RBM deposit [illegible] comes over there/within the river zone of the proposed site, so considering the replenishment of the material in this region [illegible] up to 1.5m depth considered as sustainable RBM extraction for this project. **(Replenishment study carried by IITR, Annex.)**
c) Sand and gravel may be extracted across the entire active channel during the dry	Mining is proposed within Demarcated area only

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d) Abandoned stream channels on terrace and inactive floodplains be preferred rather than active channels and their deltas and flood plains. Stream should not be diverted to form inactive channel.	Mining is proposed within Demarcated area only
e) Layers of sand and gravel which could be removed from the river bed shall depend on the width of the river and replenishment rate of the river.	Mining is proposed to maximum 1.5m depth and within Demarcated area only
f) Sand and gravel shall not be allowed to be extracted where erosion may occur, such as at the concave bank.	15% safety zone left during demarcation of the area, so erosion problem may not occur/negligible scope of erosion
g) Segments of braided river system should be used preferably falling withia the lateral migration area of the river regime that enhances the feasibility of sediment replenishment.	Mining is proposed within Demarcated area only
h) Sand and gravel shall not be extracted within 200 to 500 meter from any crucial hydraulic structure such as pumping station, water intakes, and bridges. The exact distance should be ascertained by the local authorities based on local situation.	Safety of mentioned structures ensured, accordingly demarcation carried.
i) Sand and gravel could be extracted from the downstream of the sand bar at river bends. Retaining the upstream one to two thirds of the bar and riparian vegetation is accepted as a method to promote channel stability.	Mining is proposed within the Demarcated area only, demarcation is carried by various district level authority
j) Flood discharge capacity of the river could be maintained in areas where there are significant flood hazard to existing structures	Mining is proposed within the Demarcated area only

or infrastructure. Sand and gravel mining may be allowed to maintain the natural flow capacity based on surveyed cross- section history.	
k) Alternatively, off-channel or floodplain extraction is recommended to allow rivers to replenish the quantity taken out during mining.	Mining is proposed within Demarcated area only. Based on preliminary survey done by IITR, it is assessed that, on an about 1.5m thick RBM deposit seasonally comes over there/within the river zone of the proposed site, so considering the replenishment of the material in this region mining up to 1.5m depth considered as sustainable RBM extraction for this project. **(Replenishment study carried by IITR, Annex.)**
l) The Piedmont Zone (Bhabhar area) particularly in the Himalayan foothills, where riverbed material is mined, this sandy-gravelly track constitutes excellent conduits and holds the greater potential for ground water recharge. Mining in such areas should be preferred in locations selected away from the channel bank stretches.	Mining is restricted to Demarcated area upto maximum 1.5 m depth so this will not affect to groundwater recharging system of the area.
m) Mining depth should be restricted to 3 meter and distance from the bank should be 3 meter or 10 percent of the river width whichever less.	Mining is proposed within Demarcated area only upto maximum 1.5 m depth.
n) The borrow area should preferably be located on the river side of the proposed embankment, because they get silted up in course of time. For low embankment less than 6 m in height, borrow area should not be selected within 25 m from the toe/heel of the embankment. In case of higher embankment	Mining is proposed within Demarcated area only upto maximum 1.5 m depth.

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the distance should not be less than 50 m. In order to obviate development of flow parallel to embankment, cross bars of width eight times the depth of borrow pits spaced 50 to 80 meters centre-to-centre should be left in the borrow pits.	
vi) Demarcation of mining area with pillars and geo-referencing should be done prior to start of Mining	Georeferencing of the proposed demarcated lease area done. Georeference Maps are attached as **survey plate 1 to 4**

6.3 EXTENT OF MECHANIZATION

No mechanization is required as the operation will be manual method without drilling or blasting.

6.4 MODE OF WORKING

For the optimum utilization of the mineral available in the lease area, mine working has been planned and scientific layout has been designed considering the following parameters:

- Mining operation proposed by opencast manual method.
- Maximum (proposed) Height/depth of benches shall be kept 1.5 m.
- Maximum (proposed) width of benches shall be kept 1.5 m.
- As per MoEF recommendation, 3 meter safety barrier has been proposed from the outer lease boundary.
- About 15% Safety barriers/left from the river bank has been proposed to stop the toe erosion phenomena.
- The approach road will be repaired from time to time.
- The proposed minor mineral extraction area is jointly visited by various district level department officers and boundary pillars been demarcated and informed to the applicant.

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6.5 ABOUT THE RESERVE- (Calculations of Minable Volume/Quantity)

The proved ultimate minecable reserve from the demarcated area, as per Uttarakhand Mines Mineral Policy 2015, is 11, 53,020 tonnes/year (categorized as zone C). Other aspects of the proposed lease area are as discussed below-

- Total demarcated Area= 34.940 Ha.= 3,49,400 M²
- Non-Minecable Area (area restricted for mining due to hazard safety) - 1.312 ha.
- Mineable Area after proposing safety zone = 33.628 ha.
- Deposit/material (in cum) at maximum allowable depth (as per IITR replenishment report) i.e.1.5 m Depth= 5,24,100 M³
- Total material (tonnes) available up to the maximum allowable depth (as per IITR replenishment report) i.e. 1.5 m from minable area= 11,53,020 tonnes/year.
- Based on IITR pre-monsoon and post-monsoon survey of the proposed area, the minable area have been delineated after leaving safety barriers, bench wise sustainable minor mineral (RBM) extraction evaluated.
- Bench wise total minable reserve has been calculated i.e. 10,10,923 tones/year, however considering the 10% of total minable reserve as residuals/mining waste/none economic, so net saleable mineral reserve would be **9,09,828** (-) tonnes/year. (90% considered as saleable mineral reserve/yearly production), the detail about the minable reserve & recoverable reserve/saleable production given as tabulated below-

6.6 YEARWISE DEVELOPMENT & PRODUCTION

6.6.1 FIRST YEAR-

Pre- Monsoon Period Reserve (April - June) Table No. - 6.

Bench level (mRL)	Bench Area (m2)	Depth	Volume (cum)	Total Reserve (tonnes)	Recoverable Reserve/Saleable Production (tonnes)
410-409	36400	0.50	18200	40040	36036
409-408	53130	0.50	26565	58443	52598
TOTAL			**44,765**	**98,483**	**88,634**

Post- Monsoon Period Reserve (October - March) Table No. - 7.

Bench level (mRL)	Bench Area (m2)	Depth	Volume (cum)	Total Reserve	Recoverable Reserve/Saleable

410.5-409	36490	1.00	36490	[illegible]	Production (tonnes)
409-407.5	62905	1.00	62905	[illegible]	[illegible]
407.5-406	97122	1.50	145683	[illegible]	[illegible]
406-404.5	113172	1.50	169758	[illegible]	[illegible]
TOTAL			4,14,746	9,32,440	8,21,394

6.6.2 SECOND YEAR-

Pre- Monsoon Period Reserve (April - June) Table No. - 8.

Bench level (mRL)	Bench Area (m2)	Depth	Volume (cum)	Total Reserve (tonnes)	Recoverable Reserve/Saleable Production (tonnes)
410-409	36400	0.50	18200	40040	36036
409-408	53130	0.50	26565	58443	52598
TOTAL			44,765	98,483	88,634

Post- Monsoon Period Reserve (October - March) Table No. - 9.

Bench level (mRL)	Bench Area (m2)	Depth	Volume (cum)	Total Reserve (tonnes)	Recoverable Reserve/Saleable Production (tonnes)
410.5-409	36400	1.00	36490	80080	72072
409-407.5	62905	1.00	62905	138391	124551
407.5-406	97122	1.50	145683	320502	288451
406-404.5	113172	1.50	169758	373467	336120
TOTAL			4,14,746	[illegible]	8,21,394

6.6.3 THIRD YEAR-

Pre- Monsoon Period Reserve (April - June) Table No. - 10.

Bench level (mRL)	Bench Area (m2)	Depth	Volume (cum)	Total Reserve (tonnes)	Recoverable Reserve/Saleable Production (tonnes)
410-409	36400	0.50	18200	40040	36036
409-408	53130	0.50	26565	58443	52598
TOTAL			44,765	98,483	88,634

Post- Monsoon Period Reserve (October ... Table No. - 11.

Bench level (mRL)	Bench Area (m2)	Depth (m)	Volume (cum)	Total Reserve (tonnes)	Recoverable Reserve/Saleable Production (tonnes)
410.5-409	36400	1.00	36400	80080	72072
409-407.5	62905	1.00	62905	138391	124551
407.5-406	97122	1.50	145683	320502	288451
406-404.5	113172	1.50	169758	373467	336120
TOTAL			**4,14,746**	**9,12,440**	**8,21,194**

6.6.4 FOURTH YEAR-

Pre- Monsoon Period Reserve (April - June) Table No. - 12.

Bench level (mRL)	Bench Area (m2)	Depth (m)	Volume (cum)	Total Reserve (tonnes)	Recoverable Reserve/Saleable Production (tonnes)
410-409	36400	0.50	18200	40040	36036
409-408	53130	0.50	26565	58443	52598
TOTAL			**44,765**	**98,483**	**88,634**

Post- Monsoon Period Reserve (October - March) Table No. - 13.

Bench level (mRL)	Bench Area (m2)	Depth	Volume (cum)	Total Reserve (tonnes)	Recoverable Reserve/Saleable Production (tonnes)
410.5-409	36400	1.00	36400	80080	72072
409-407.5	62905	1.00	62905	138391	124551
407.5-406	97122	1.50	145683	320502	288451
406-404.5	113172	1.50	169758	373467	336120
TOTAL			**4,14,746**	**9,12,440**	**8,21,194**

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6.6.5 FIFTH YEAR-
Pre- Monsoon Period Reserve (April - June) Table No. - 14.

Bench level (mRL)	Bench Area (m2)	Depth	Volume (cum)	Total Reserve (tonnes)	Recoverable Reserve/Saleable Production (tonnes)
410-409	36400	0.50	18200	40040	36036
409-408	53130	0.50	26565	58443	52598
TOTAL			44,765	98,483	88,634

Post- Monsoon Period Reserve (October - March) Table No. - 15.

Bench level (mRL)	Bench Area (m2)	Depth	Volume (cum)	Total Reserve (tonnes)	Recoverable Reserve/Saleable Production (tonnes)
410.5-409	36400	1.00	36400	80080	72072
409-407.5	62905	1.00	62905	138391	124551
407.5-406	97122	1.50	145683	320502	288451
406-404.5	113172	1.50	169758	373467	336120
TOTAL			4,14,746	9,12,440	8,21,194

6.6.6 YEARWISE DEVELOPMENT & PRODUCTION, Table No. - 16

YEAR	PRE-MONSOON (TONNES)	POST-MONSOON (TONNES)	RECOVERABLE RESERVE (TONNES)
FIRST YEAR	88,634	8,21,194	9,09,828
SECOND YEAR	88,634	8,21,194	9,09,828
THIRD YEAR	88,634	8,21,194	9,09,828
FOURTH	88,634	8,21,194	9,09,828
FIFTH	88,634	8,21,194	9,09,828
TOTAL	4,43,170	41,05,970★	45,49,140★

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6.7 **MINERAL PRODUCTION**- The riverbed mining will consist of sand and their production may vary to a great extent depending upon availability. Therefore quantity of sand cannot be estimated on logical parameters, the figures given here above only tentative. The production target is as above.

6.8 OTHER DEVELOPMENT PROGRAMME FOR FIVE YEARS

Prior to start production from the area, some development work has to be completed as under Plate No.5-11.

- Haul road preparation.
- Erection of a temporary site office and two rest shelter.
- Barbed wire fencing all around the mining/applied area may be provided to avoid accident and inadvertent entry.
- Retaining wall will be raised towards the valley side (river bank) to abstain from toe erosion.

CHAPTER-7

7.0 DRILLING & BLASTING

No drilling and blasting is proposed to be done to undertake mining of riverbed minerals.

CHAPTER-8

8.0 WATER AND DRAINAGE SYSTEM

As per the proposed mining the working shall be confined up to 1.5 m bgl i.e. above the ground water table Mining in the area will be done well above the water table as well as river bed water level therefore impact on water regime is not anticipated. Hence no water clogging is likely to be encountered. Therefore, there is no need of any such arrangements.

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CHAPTER-9

9.1 DISPOSAL OF WASTE MATERIAL

Exact quantitative calculation about reserve/saleable production/waste generated in RBM mining project is not possible but logical classification/assessment may be considered. As per the logical assessment of the production proposed by benching manner above (mining chapter), out of total evaluated reserve about 90% considered/assessed as saleable production for proposed mining lease and about 10% of total material has been considered as waste material, it includes wastage during transportation and unused/ low value material like silt/clay etc which gets deposited as crust material on the bed profile, shall be scrapped and carefully stored for depositing into the mine pits in the river bed or in the upper terraces earmarked for plantation purpose or may be used for river bank protection work.

9.1.1 Sewerage System:

For disposal of sewage the eco-friendly mobile Toilets will be provided/ proposed during working time near the lease area.

9.1.2 Solid Waste Management: As per the logical assessment of the production proposed by benching manner above (mining chapter), out of total evaluated reserve about 90% considered/assessed as saleable production for proposed mining lease and about 10% of total material has been considered as waste material, it includes wastage during transportation and unused/ low value material like silt/clay etc which gets deposited as crust material on the bed profile, shall be scrapped and carefully stored for depositing into the mine pits in the river bed or in the upper terraces earmarked for plantation purpose or may be used for river bank protection work. It would be in fitness of things to repeat that there will be no solid waste generated in the proposed activity (other than [illegible] waste).

CHAPTER-10

10.1 USE OF MINERALS-

Sand, bajri and boulders are used in construction activities like building, roads, bridges etc. The requirement for the mineral is always high in the nearby [illegible] towns.

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CHAPTER-11

11.1 OTHERS

11.1 HAULAGE AND SURFACE TRANSPORT- Mode of transportation of material is by trucks/tractors, of size of 10 tonnes capacity have been planned. The mine road is adequate to permit easy maneuverability of trucks allowing cross over and changing points. Water will be sprayed two times a day by tractor mounted sprinklers until dust remains airborne.

11.2 MINE MACHINERY

Mining will be done by manually open caste method using hand tools like shovel, spades, and pick-axes. Other machineries on the mining site will be water sprinkler.

11.3 SITE SERVICES

Temporary rest Shelter: A temporary rest shelter will be provided for the workers near the site for rest

First aid box: First aid box along with anti-venoms to counteract poison by certain species of small insects, if any

Sanitation facility: Facilities such as septic tank or community toilet will be provided for workers

11.4 WATER REQUIREMENT

Total water requirement for the project is 6.6 KLD, it breaks up as under:-

TABLE NO. 17. WATER REQUIREMENT

S. NO.	PURPOSE	WATER REQUIREMENT (KLD)
1.	Dust Suppression	4.2
2.	Drinking	1.6
3.	Miscellaneous (Plantation etc)	0.8
Total		6.6 KLD

11.5 EMPLOYMENT

The manpower requirement for the proposed project is given below

Table No. 18 Employment Break-up

S.NO.	CATEGORY	NUMBERS
1.	MINING COMPETENT PERSON	1
2.	ADMINISTRATIVE	
3.	SUPERVISOR	3
4.	UNSKILLED WORKERS	65
	TOTAL	70

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The part time services of following experts/ expert agencies optionally required for environment friendly sustainable sand mining, as and when required-

- Geologist
- Mining expert
- Environmental consultancy agency/NABL Accredited Laboratory
- Surveyor
- Horticulturist/Plant Expert etc

11.6 SAFETY PROVISION:- All provision in safety rules & regulation will be maintained by providing required materials to the employees. The lessee will provide safety shoes, safety helmets to all the employees. There will be no violation of safety provisions.

CHAPTER-12

12.0 MINERAL BENEFICIATION

Mineral Sand, Bajari & Boulders doesn't require processing or beneficiation.

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CHAPTER-13

13.0 ENVIRONMENT MANAGEMENT PLAN

13.1 **INTRODUCTION**- EMP identifies the extent of the environmental, social and economic impacts of a project prior to mining of mineral and systematically examines both beneficial and adverse impacts of the proposed project over and above the prevailing conditions of environmental parameters and ensure that these impacts are takes into account during the project designing stage itself and the values of the combined impacts are never allowed to exceed and remain within the statutory norms.

13.2 **SOLID WASTE MANAGEMENT**- As per the logical assessment of the production proposed by benching manner above (mining chapter), out of total evaluated reserve about 90% considered/assessed as saleable production for proposed mining lease and about 10% of total material has been considered as waste material, it includes wastage during transportation and unused/ low value material like silt/clay etc which gets deposited as crust material on the bed profile, shall be scrapped and carefully stored for depositing into the mine pits in the river bed or in the upper terraces earmarked for plantation purpose or may be used for river bank protection work. It would be in fitness of things to repeat that there will be no solid waste generated in the proposed activity (other than mining waste).

13.1.1 **Sewerage system:** There will no waste water generation from mining activity. However if there is any generation it shall be disposed through eco-friendly Mobile Toilets.

13.2 **PLANTATION**- In the river bed area/lease area the plantation is not possible however in the outer bank area & in the village panchayat land the plantation is proposed with consultation of mining officer and district/local administration.

13.3 BASELINE INFORMATION

13.3.1 **Land Use Pattern**- Entire lease area is a waste land of barren, scattered seasonal bushes & shrubs cover this area. There is no agricultural land [illegible] the land is barren. There is no existing infrastructure, however during mining temporary rest shelters for workers will be provided.

13.3.2 **Flora & Fauna**- Dehradun has a rich vegetation cover. Although the major portion of Doon is occupied by the Sal (shorea robusta) but miscellaneous forests are also found here. The hydro-geological and meteorological conditions of the valley are responsible for the condition for the different types of forest cover. Sal and its associates can be classified

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in Northern tropical moist and dry deciduous communities. They are found throughout the Sivaliks across large tracts of the valley and also along the lower foothills of the Himalayas. A presence of large proportion of clay soil and better drainage act as favorable conditions for the growth of Sal trees.

Faunal Community: in general following categories of faunal classification given in the EIA report.

(i) Core Zone: There was no unique faunal community within the core zone of the project area, except most common ones like toad, frog, crow, Sparrow and maina etc.

(ii) Buffer Zone: In 10 km radius around the project area:

Amphibians: Among amphibians toad (Bufo sp.) and frog (Rana tigrina).

English Name -Scientific Name

Common Toad- Buyo melanostictus

India bull frog-Rana tigerina

India tree frog- Polypedates maculatus

Marbled toad- Buyo stomaticus

Skipping frog- Rana Cyanophlysis

a. Reptiles: Among reptiles Indian garden lizards (Calotes versicolor), house lizards (Hemidactylus sp.).

b. Mammals: Among mammals Indian palm squirrel (Fumambulus pennanti), cat, dog (Cuon sp.), cow, Buffalo, rat (Rattus rattus) etc.

c. Aves: Among aves common birds like crow (Corves splendens), sparrow (Passer domesticus), parrot (Psittacula krameri), baya (Ploceus philippinus), peafowl (Pavo cristatos), pigeon (columba livia), Egretta sp. etc.

13.3.2 **CLIMATIC CONDITION-**

The study area is in Shivalik zone and is subjected to extaries of weather. The climate of the project area is characterized by cool and dry climate. It varies according to the altitude of the place. The entire district exhibits four broad seasons in the year (1) Winter or Cold weather (mid Dec. - mid March) (2). Summer or hot weather (mid March - mid June); (3) Season of general rains (South - West monsoon season) (4) Season of retreating monsoon (mid September to mid November).

TEMPERATURE- Dehradun town, being in a valley, is relatively warm during summer and cool during winter. During the coldest months of December and January, the tropical

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and temperate mountain ridges and high locations receive snowfall and have an average temperature of 5.5–8.0 °C (41.9–46.4 °F). Dehradun district has extreme variation in temperature due to the large variations in altitude. The temperature rises from mid- March through mid-June. The areas above 3,500 metres (11,500 ft) remain in a permanent snow cover. Regions lying at 3,000–3,500 metres (9,800–11,500 ft) become snow bound for four to six months.

RELATIVE HUMIDITY - The humidity is high during the monsoon season and to a lesser extent in the cold months. In the summer months humidity is generally low and is between 27 and 65% and high during monsoon & winter season and varies from 45% to 84%.

CLOUDINESS-In the winter season the sky is generally clear or lightly clouded except for brief spells of a day or two each time when in association with the passage of western disturbances particularly in the northern parts of the district sky become cloudy. Sky is clear or lightly clouded in the summer and post-monsoon seasons. Heavily clouded to overcast sky prevail in the monsoon season

WINDS- In the northern portions of the district winds are generally light to moderate throughout the year and blow mainly from the southwesterly or westerly directions. During the winter and south-west monsoon seasons, easterly and southeasterly winds also blow. But in the Shivalik regions westerly to northwesterly winds are predominant in the post-monsoon season, winter and the early part of summer. In the latter part of summer and monsoon season winds are mainly easterly to southeasterly.

SPECIAL WEATHER PHENOMENA-Thunder storms occur in all the months, the occurrence being least in the period November to January, and highest during May and June. Occasional hail in the winter and summer months and fog during the winter occur in the hilly regions.

RAINFALL-The annual average rainfall of Dehradun district is 1947 centimeters.

13.3.4 **Social Infrastructure-**

The nearest health & education facilities are available in all the villages of the proposed mining area.

13.4 EFFECT OF MINING ON ENVIRONMENT

Due to the mining activity following things are going to affect-

- Degradation of land

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- Destruction of Flora & Fauna
- Air Pollution
- Water Pollution
- Noise Pollution

These effects will be either minimized or nullified by adopting following measures:-

- The mining activity will take place in barren/waste land which is of no use to the inhabitants or ambient environment.
- Due to manual mining there may be generation of dust which in turn effects the ambient air. This may be maintained to the permissible limit by doing water spraying on the haul road.
- Mining will be done above the ground water table and thus it is not going to be effected/contaminate the ground water. There will be no discharge of mine water to the nearby water source, except rainwater during rainy season, and thus there will be no contamination of water of the nearby water course, if at all present.
- Due to manual mining there may be no generation of noise.
- Ground vibration & Noise pollution it is not possible because manual mining.
- The lessee has plan for plantation along the road and near civic amenities in consultation with the local authority.

MONITORING SCHEDULE FOR ENVIRONMENTAL PARAMETERS:-

Table No. - 19.

PARTICULARS	MONITORING FREQUENCIES	IMP. MONITOR PARAMETERS
Ground Water	Twice in a year	pH, SS, TDS, Iron, Cl, Hardness, Alkalinity, [illegible]
Ambient Air Quality	Twice in a year	[illegible]
Soil Analysis	Twice in a year	[illegible]
Noise	Twice in a year	[illegible] level in dBA

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CHAPTER-14

14.0 MINE CLOSURE PLAN

14.1 INTRODUCTION-

The **Letter of Intent (LoI)** was granted/released vide letter **No. 40/bhu.khani.ee./2012-13, Dated 18 April 2013 (Ann-1)**, in the favor of **Garhwal Mandal Vikash Nigam Ltd,** 74/1-Rajpur Road, Dehradun, District- Dehradun, Uttarakhand as per Part-1, Point No. 02 of Uttarakhand Mining Policy 2011, for extraction of Sand Bajri and Boulder (RBM), in a part of Yamuna River- Lot No. 21/2, Village- Dhakrani, Tehshil- Vikashnagar, District-Dehradun (Uttarakhand), Khasara No. 971, 969, 970, 936 Mi, Area- 34.940 Hectare.

Proposed SAND, BAJRI AND BOULDERS MINE/Mining, in a part of Village-Dhakrani, Tehshil- Vikashnagar, District- Dehradun, Uttarakhand, Applicant- Garhwal Mandal Vikash Nigam Ltd, 74/1-Rajpur Road, Dehradun, District- Dehradun, Uttarakhand is a small 'B1' category mine as per explanation furnished in MCDR i.e. manual opencast mine, not using explosives.

14.2 GENERAL (Table No. – 20)

1.1	Name of the applicant	**Garhwal Mandal Vikash Nigam Ltd**
	Address	Rajpur Road, Dehradun
	District	Dehradun
	State	Uttarakhand
	Pin Code	248001
	Phone	0135-2740096, 2746817, 2748308
1.2	Status of the applicant	Garhwal Mandal Vikash Nigam Ltd (GMVN) is a Govt. of Uttarakhand Enterprise.
1.3	Mineral(s) which the applicant	(RBM) Sand, Bajri and Boulder, of the

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	intends to mine	mineral collected/extracted from the proposed lease area shall be sold in the open market as per the demand.
1.4	Period for which the mining lease is required or granted / renewed	Letter of Intent (LoI) for the project vides letter **No. 589/bhu.khani.ee./2012-13, Dated 23 January 2013.** **Demarcated Area for Mining- 34.940 Ha.** (LoI attached as Annexure I)
1.5	Name of the RQP preparing the mining plan	Bhuwan Joshi
	Address	Kamal Bhawan, House No. 6, Vijay Colony Lane No. 1, New Cantt Road, Dehradun (Uttarakhand) 248001
	Phone	09412152105
	Fax	-
	Registration No.	RQP/DDN/180/2009/A- IBM Mu.Kha./RQP/DDN/01/2016- State Govt.
	Valid upto	30/08/2019 & 27/12/2020
1.6	Name of the prospecting agency	The baseline data is collected from various reports, Proponent as well as detailed prospecting of the area is carried out by the RQP

14.3 **LAND USE PATTERN OF THE AREA:- (Table No.- 2)**

Sr. No.	Land Use (Ha.)	Agriculture Land (Ha.)	Forest Land (Ha.)	Waste Land (Ha.)	Grazing Land (Ha.)

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1	Mining pits quarry	-	-	-	-
2	Approach Road	-	-	-	-
3	Dumps	-	-	-	-
4	Office, rest shelter etc	-	-	-	-
5	Balance undistributed land	-	-	34.940 Ha	-
	Total	-	-	34.940 Ha.	-

14.4 METHOD OF MINING:-

1. The mining/ collection of minerals shall involve shoveling by simple hand tool and loading into trucks/ tractors- trailers for transporting them to crusher site.
2. Picking and extraction of minor minerals/trenches and pits for the mining purpose shall be made in such a way that this should not be more than 1.5 meters.
3. With the replenishment of the pits and trenches during the high floods, the process of the controlled mining can continue year after year.
4. Though the major mining activities will be under taken during the dry seasons but restrained mining can be under taken during the dry days of rainy season.

14.5 NAME & ADDRESS OF THE RECOGNIZED PERSON:-

BHUWAN JOSHI (RQP & Geological Consultant)
C/o B.S. Rawat, Kamal Bhawan, House No. 6, Vijay Colony, Lane No. 1
New Cantt Road, Dehradun (Uttarakhand) 248001

14.6 MINE DESCRIPTION: - Picking /extractions of minor minerals (Sand, bajari & boulders), from a part village Dhakrani, deposited by the River Yamuna.

14.7 GEOLOGY: - Geologically, The area falls in the intermontain *Doon* Valley and is underlain by recent to sub recent Doon Gravels, which lie over the Upper Siwalik sediments. The *Doon* gravels have been broadly divided in to older *Doon* Gravels and younger *Doon* Gravels. The older *Doon* Gravel consists of partly cemented Upper Siwalik Cobbles, Angular Pebbles of Quartzites, Slates and Shales from the Nagthat, Chandpur and Tal formations and Limestone Pebbles from Krol limestone alternating with clay beds.

The younger Doon Gravels rest unconformably over the older Doon Gravels in the northern part. The disconformable relationship gradually disappears on the southern end. The

Bhuwan Joshi
Empaneled Geologist
BHUWAN JOSHI
RQP Registration No.RQP/DDN/190/2009/4

younger Doon gravels are characterized by very large boulders in the alluvial fans and debris flow deposits and consist of moderately sorted mixture of clay, sand, gravels and boulders. The sandy and gravelly units are separated from each other by clay beds. The thickness of these units varies from place to place and also may be traced laterally.

Proposed mining area belongs to a Fluvial Deposit, geologically Recent Deposit, carried by River Yamuna.

14.8 GEOLOGICAL RESERVES: - The method of cross section has been adopted for computing the reserve. The mining lease boundary, proven and mining limits are marked on the plan which is thereafter transferred to cross section for determining the different categories of reserve.

The geological reserves have been estimated as per UNFC in all the three axis is as below

a. **Economic Axis (E-1):** The RBM is exists within the entire stretch & having no problem selling in the market. The road is near the less area & RBM shall be loaded into tipper with the deployment of an excavator & transport to crusher. On the feasibility study, economics viability of deposit has been established & RBM is economic viable, therefore economic axis has been considered as E-1.

b. **Feasibility Status (F-1):** Feasibility study has been carried out & is considered to be feasibility status. A feasibility study provides a preliminary assessment with a level of confidence as compared to that of feasibility study. It has been revealed that exploitation of RBM is feasible & Economic viable & feasibility axis under UNFC code has been considered as F-1.

c. **Geological Axis:** The exposure of RBM is seen in the entire stretch & thickness of RBM varies 2.5m to 3.0m. Therefore geological axis has been considered as G-1.

In order to calculate the mineable reserve the geological map on the 1:2000 scale was prepared and main litho units were marked on the map to know the surface spread of each unit. The different constituents of the deposit such as sand, bajri, boulder and mixture of clay, soil, silt, based on sized classification were considered for the reserve calculation. Although it is not possible to mark these units separately on the geological map, as such three pits of 1x1x1 meters were got dug in the mineable lease area and material so excavated was segregated in different size and their percentage was worked out. This percentage was taken into account during

calculation of the reserve. The cumulative result of the test pits are given in the following Table no 22.

Table No. 22. Classification of Mineral Constituents available

Sr. No.	Mineral	Size	Percentage (%)
1.	Sand	0.06-2 mm	99%
2.	Bajri	8-64 mm	1%
3.	Boulder & Gravels	256 mm	00%
4.	Silt/Clay	1-62.5 µm	0%

Bulk density is taken as 2.2 for calculation (as per Govt. of U.K., Industrial Development Section Notification 1033/VII-1/ 2015/ 146- Khs/ 2010, dated 31st July 2015). Calculation of reserve has been done as following.

4. Cross sections have been prepared at intervals. Refer Plate No.6
5. Area of every cross section has been taken. For example, if the area of cross section A-A' is 'X' and area of B-B' is 'Y', then average of both calculating the reserve (i.e. (X+Y)/2).
6. Distance between the two sections has been multiplied with the average area of the two sections to get the total volume. Eg. [(X+Y)/2] x Distance between A-A' & B-B'.

The overall geological reserves have been estimated through geological cross section method. The area of each section line is calculated. The section area is multiplied by the strike influence to get the volume. The target geological reserve classified in to three categories i.e. Proved reserve, Probable reserve & [illegible] this project the proved reserve assessed as 3m depth & further [illegible] as probable reserve whereas 1m considered as possible reserve. Out of total volume, [illegible] considered as the recoverable/economic RBM reserve & 2.2 bulk density.

14.1 Geological Reserves: The summarized categ[illegible] estimated by is:-

Table No. - 23.

Mineral Reserve	Code	Quantity of RBM in (m^3)	Quantity of RBM in Tons
Proved Reserve	111	11,48,970	22,74,960
Probable Reserve	122	7,65,98[illegible]	15,16,640
Possible Reserve	133	3,57,39[illegible]	[illegible],632

14.9 PROGRESSIVE CLOSURE PLAN

a) The proposed mining lease area belongs to river borne deposit (RBM) deposited by Yamuna River, mostly during rainy season. The mining process is conventionally opencast river bed mining of minor minerals with hand tools, shovels and pan without drilling & blasting. Proposed mining will be started from higher levels to lower levels. Total lease area is workable and replenishable yearly. After each workable year, a longitudinal wall of about 1m be may be raised and repaired thereafter, as required, on the river bank side to check toe erosion, an environment hazardous phenomenon may be induced by the heavy floods during monsoon season. Mineral extraction will be done for a period of 240 days in a year; during monsoon period mining activity will be strictly banned.

b) On an average about 1.5 to 2 meters river deposit thickness assessed from the proposed lease area, most possibly due to excess in the core zone of the channel the boulders are spread outer both sides of the river/channel within nearby civil land, so proper channelization is essentially required for hazard safety point of view. During the monsoon rainy season 1.5 to 2m average stocking of sand, bajari & boulders assessed. So it is clear that, the deposit would be annually replenishing, as such no need to develop or plan for closure scheme but towards valley side temporarily construction of longitudinal wall is suggested to reduce the impacts of toe erosion.

c) **Mining:**

Sl. No.	Activities	Area (Ha.)
1-	Area already broken up	-
2-	Area already backfilled/reclaimed	-

Sl. No.	Activities	Area
1-	Additional Area proposed to be broken up per year	33.628 ha.
2-	Additional Area proposed to be replenished with flood water	33.628 ha.

d) **Dump:**

Sl. No.	Activities	Area (Ha.)
1-	Area already covered by dump	Nil
2-	Additional Area to be covered by soil stack	-

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3-	Additional area to be covered by interburden dump	Nil
4-	Dump area to be covered by protective measures	-

e) **Plantation:**

Sl. No.	Activities	Area
1-	Area already covered under plantation	-
2-	Area proposed to be cover under plantation & protection work	3.36 ha.
	Total	3.36 ha.

In the river bed area/lease area the plantation is not possible however in the outer bank area & in the village panchayat land the plantation is proposed with consultation of mining officer and district/local administration.

14.10 Air Quality Management

Periodic air quality monitoring will be carried out to monitor the quality and for timely corrective actions.

14.11 Waste Management- As per the logical assessment of the production proposed by benching manner above (mining chapter), out of total evaluated reserve about 90% considered/assessed as saleable production for proposed mining lease and about 10% of total material has been considered as waste material, it includes wastage during transportation and unused/ low value material like silt/clay etc which gets deposited as crust material on the bed profile, shall be scrapped and carefully stored for depositing into the mine pits in the river bed or in the upper terraces earmarked for plantation purpose or may be used for river bank protection work. It would be in fitness of things to repeat that there will be no solid waste generated in the proposed activity (other than mining waste).

14.12 Safety and Security

The picking and extractions of minor minerals shall be carried out manually to a depth of 1.5meters; no blasting is involved. Hence there is no danger and no special precaution is required. However standard precautions are always to be kept in mine for the safety of workers and general public.

14.13 Disaster Management and Risk Management- Mining is proposed over mild sloping revenue/nap land in river bed. No blasting is involved. Planning of extractions of

minor minerals (sand, bajari & boulders) shall be carried on only up to a depth of 1.5 meters therefore negligible scope of landslides & subsidence.

CHAPTER-15

CONCLUSION-

The project involves collection of sand, bajri and boulder. The river bed material extracted is in high demand in the local market which is used in making bridges, road & building material etc. The project operation will provide livelihood to the poorest section of the society. It provides employment to the people residing in the vicinity directly or indirectly by the project. The applicant (GMVN) will undertake mining activity as per the plan indicated in this Mine Plan with proper taking care of environment aspects i.e. without disturbing the environment condition.

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उत्तराखण्ड सरकार
देहरादून

Bhuwan Joshi
Empanelled Geologist
FRDC,Gc
RQP No.
Bureau

ANNEXURE & PLATES

प्रभारी खनन
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देहरादून

Bhuwan Joshi

Ministry of Environment, Forest and Climate Change
IA Division
***

3rd Floor, Vayu Block,
Indira Paryavaran Bhawan, Jor Bagh Road,
Aliganj, New Delhi-110003

Dated 06.08.2018

To,

M/s. Gharhwal Mandal Vikas Nigam Ltd
74/2, Rajpur Road
Dehradun, Uttarakhand 248001

Subject: - Mining of 3.3 LTPA of Sand, Bajri and Boulders in River Yamuna Lot No. 21/2 by M/s Garhwal Mandal Vikas Nigam Ltd. from mining lease area 34.940 Ha located at Village-Dhakrani, Tehsil- Vikashnagar, Distt-Dehradun, Uttarakhand. [File No. J-11015/137/2013-IA-II(M);Proposal No: IA/UK/MIN/18558/2013; Consultant: Grass Root Research & Creation India (P) Ltd.]- Information/Clarification Regarding.

This has reference to the aforementioned proposal of M/s Garhwal Mandal Vikas Nigam Ltd. for grant of Environment Clearance for mining of 3.3 LTPA of Sand, Bajri and Boulders in River Yamuna Lot No. 21/2 having mining lease area 34.940 Ha located at Village-Dhakrani, Tehsil- Vikashnagar, Distt-Dehradun, Uttarakhand.

2 The proposal was considered by the Expert Appraisal Committee (Mining) in its 33rd meeting, held during June 21-22, 2018, wherein, the Committee deliberated the proposal and sought requisite information.

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Regional Controller of Mines

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3. The matter was examined in the Ministry and accordingly, the undersigned is hereby directed to request to submit the requisite information (Annexure) for further necessary action on the proposal.

Yours faithfully,

(Dr. R B Lal)
Scientist 'E'/Addl. Director

Encl: as above

Copy to:-

1. The Additional Principal Chief Conservator of Forests, Ministry of Environment, Forest and Climate Change, Regional Office (NCZ), 25, Subhash Road, Dehradun – 248001.
2. MoEF&CC's Website
3. Guard File

भूतत्व एवं खनिकर्म इकाई उद्योग निदेशालय
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1) The Proponent should collect the baseline data in respect of initial level of the mining lease. For this permanent bench marks (BM) needs to be established at prominent location preferably close to mining leases in question and should have precisely known relationship to the level datum of the area, typically mean sea level. The entire mining lease should be divided suitably in the grids of 25 Meter x 25 Meters with the help of sections across the width of river and along the direction of flow of the river. The levels (MSL & RL) of the corner point of each grid need to be recorded. Each Grid should be suitably numbered for identification. PP should identify grids which will we worked out and grids which will come under no mining zone i.e. safety barriers from the river bank, safety barrier at lease boundary, restrictions as per condition of LoI/Mining Lease deed, restriction as Mineral Concession Rule of the Concerned State, restrictions as per sustainable sand mining management guidelines 2016 and restriction as per direction of any Court or NGT. The PP should ascertain the level of the river bed with the help of sections drawn across the width of the rivers and along the direction of flow of the river and based on this define the depth of mining of each grid. The PP should provide a detailed map and table clearly showing the grid wise material availability, dimension of grid, location of grid (latitude & longitude of the corner points), level of grid (AMSL and RL), depth of mining in each grid, grids left under no mining zone etc.

2) PP should suitably name each section line. Section Plan for both sections drawn across the river and along the direction of the river needs to be submitted. Each Section should have level on vertical axis and distance from the bank of river on horizontal axis. For the section along the direction of the river, the levels to be shown on vertical axis and distance from upstream to downstream should be shown on horizontal axis.

3) The PP should prepare the modified Mining Plan based on the above survey. The information sought above needs to be a part of the mining plan. In the mining plan year wise production plan should be prepared in three plates for each year. Plat-1 show the mine working for the pre-monsoon period (1st APR- 14th June).

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Bureau of Mines

plate-2 should show the status of the mine after the replenishment and no working should be proposed in this period (15thJune-1st Oct) as the mining lease area needs to be left for the replenishment of the river bed mineral and plat-3 show the mine working after replenishment of the river bed i.e. post monsoon period (2nd Oct-31st March).

4) PP should specifically mention in the mining plan that in the subsequent scheme of mining/review of mining plan, the year wise data pertaining to replenishment study (all five years) shall be provided which include the level (AMSL & RL) of river bed recorded before and after the monsoon, year wise replenishment quantity, all plan & sections of the replenishment study for the past five years.

5) The PP should also submit a kml file wherein the above-mentioned grid plans is superimposed on the satellite imaginary.

6) PP should also submit an undertaking to the effect that each year after the replenishment study the plan & section shall be submitted to concerned Department of Mining & Geology of the State for verification and official record.

7) The methodology for conducting replenishment study needs to be mentioned in the modified mining plan. PP should ensure that plan and section that will be submitted to EAC should be in proper scale.

8) PP should ensure that relevant information as per ToR Conditions needs to be provided in the EIA Report.

9) PP should clearly mention the designation and number of person to be engaged for Environmental Monitoring Cell. The EMC will be set up for the mine only or for all the mining lease of the GMVN in the area.

10) The PP should clearly bring out the impact on environment due to cluster situation, if any. Air Quality modeling needs to be done in Aermode software both for area and line source.

11) The transportation route needs to be clearly provided in the EIA Report with other details such as width of road, length of road, type of road, impact due to transportation on the vegetation on the both side of the road, frequency of maintenance of the road, amount proposed for maintenance of the road, compensation to the land owners effected by transportation of mineral etc.

12) Detailed occupational plan needs to be submitted with budget allocation. The Committee was of the view that being handling the large number of mines the GMVN should set up a dedicated cell for the occupational health surveillance.

13) PP submitted the list of Secdule-1 species for core and buffer zone duly authenticated by Forest Department and same needs to be updated in the EIA Report. PP should provide the conservation plan for all secdule-1 and Schedule-II species present in the core & buffer zone.

14) Proof of submission of EIA/EMP report within the validity of ToR needs to be submitted as the EIA report uploaded on the website initially is not the correct report.

15) The budget of EMP needs to be revised as the Environmental Monitoring cost is not included in the EMP Budget.

16) PP should submit a plan clearly mention the area that will be covered under plantation.

17) Proof of submission of application for NBWL Clearance.

18) In the cluster certificate submitted the ministry the total area of the cluster is not mentioned. Thus, it is requested to provide the cluster certificate clearly mentioning the area of the cluster as per S.O. 141(E) dated 15.01.2016 and S.O. 2269(E) dated 01.07.2016. It has also observed that a letter issued by Geology and Mining Unit, Directorate of Industries, Govt. of Uttarakhand vide Ltr No 74/भू.खनि०/जि०कार्यालय/दून/2018-19 dated 24.05.2018 wherein it has mentioned that the details provided in the cluster certificate is as per S.O. 141(E) dated 15.01.2016 and S.O. 2269(E) dated 01.07.2016. But it has found that EC

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Environmental Engineer
PPCC Cell
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was granted for mining lease having an area of 68.364 Ha vide Lr No. J-11015/140/2013-IA.II (M) dated 7.09.2016. Further, as per S.O. 2269(E) dated 01.07.2016 the mining lease for which EC was granted on 15.01.2016 should not be counted while calculating the Cluster area. As the EC for mining lease area 68.364 was granted after 15.01.2016 and should be consider while calculating the cluster area. Thus, the cluster area comes out to be 103.304 Ha and the proposal become category 'A' project as per S.O 141(E) dated 15.01.2016. Therefore it is requested to submit the revised cluster certificate clearly mentioning the area of the cluster.

19. The above mentioned mining lease having area of 68.364 Ha is also belong to GMVN for which Ministry has issued EC vide Lr No. J-11015/140/2013-IA. II(M) dated 7.09.2016. In the special condition of this EC letter, it has mentioned at SL No 11 that *"To submit annual replenishment report certified by an authorized agency. In case the replenishment is lower than the approved rat of production, then the mining activity / production levels shall be decreased/stopped accordingly till the replenishment is completed"*. As the ministry has already issued an environmental clearance to GMVN for mining lease falling in the cluster for which PP has applied now. Thus, it is requested to submit the replenishment study conducted annually in compliance of the special condition No.11 of stipulated in the EC already granted to GMVN. This will enable the ministry to ascertain the rate/quantum of replenishment in the river bed and ultimately help in finalizing the production capacity to be granted for this project.

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भूतत्व एवं खनिकर्म प्रभाग,
उत्तरांचल निदेशालय, उत्तरांचल राजकीय हैदराबाद।

पत्रांक /भू0खनि0/2012-13. दिनांक 10 अप्रैल 2013

आदेश

प्रबन्ध निदेशक, मदकान मण्डल जिला निगम लि0 के पत्रांक-12/खनन दिनांक 15 जनवरी 2013 द्वारा यह अवगत कराया गया है कि उपुल स्थलीय निरीक्षण किये जाने के उपरान्त संलग्न खनन क्षेत्रों के सम्बन्धी में निम्नांकित सूची बनी है तथा कुछ क्षेत्र खनन हेतु अनुपयुक्त है, के दृष्टिगत पूर्व में निर्गत स्वीकृति पत्र संख्या 548 भू0खनि0ई0 / 2012-13 दिनांक 23 जनवरी 2013 जिसके द्वारा उत्तरकाशी जनपद की तहसील-डुण्डा के खिन्दु संख्या-2 के प्रस्तर-1 से प्रतिस्थापित कुमार प्रबन्ध निदेशक, मदकान मण्डल निगम लि0 के पक्ष में मदकान मण्डल के राजस्व भरी उपखनिज क्षेत्रों से उपखनिज के पुनर्गत हेतु खनन पट्टा दिये जाने के आदेश क्षेत्र तथा जनपद देहरादून के 03 उपखनिज लाटो, जनपद हरिद्वार के 08 उपखनिज लाटो तथा जनपद चौदी के -8 उपखनिज खनन लाटो तथा जनपद टिहरी मदकान 29 उपखनिज लाटो से उपखनिज के पुनर्गत हेतु शासनादेश संख्या 922/VII-1/11-सि/2012 दिनांक 26 जुलाई 2012 के दिये गये निर्देशानुसार E.I.A Notification, 2006 के अन्तर्गत पर्यावरणीय स्वीकृति प्राप्त करने हेतु खनन पट्टा प्रदान का (Letter of intent) जारी किया गया था, की तालिका-1 जनपद देहरादून के खनन क्षेत्र की भूमि है ते डनन लाट सिरवन 4/3 क्षेत्रफल 2.140 है0, टौंस 3/2 क्षेत्रफल 3.970है0, टौंस 3/3 क्षेत्रफल 2.000है0, टौंस लॉट क्षेत्रफल 37.302है0, कालसाउ नदी क्षेत्रफल 3.437है0, हथपुर खोल 7/1 क्षेत्रफल 1.000 है0, सुसवा नदी 12/3 क्षेत्रफल 42.435है0, बन्दाल नदी क्षेत्रफल 4.974है0, गंगा नदी क्षेत्रफल 1.615है0 जो वर्तमान निरीक्षण आख्या के अनुसार खनन हेतु अनुपयुक्त है, को उक्त सूची से विलोपित किया जाये तथा उक्त तालिका-1के निम्न खनन लाटो के क्षेत्रफलो जो स्तम्भ-1 में अंकित है के सम्मुख स्तम्भ-2 में अंकित क्षेत्रफल पढ़ा जाय।

क्रमांक	खनन लाट का नाम	स्तम्भ-1 क्षेत्रफल (है0में)	स्तम्भ-2 क्षेत्रफल (है0में)
1	लॉट नदी 7/2	156.700	135.856
2	सिरवन 4/4 (ब्लॉक 4/4ए एवं 4/4बी)	8.100	4/4ए -2.000है0
3	टौंस 3/4	7.280	
4	टौंस 3/6	16.770	10.520
5	टौंस 3/14	7.700	6.[illegible]
6	कलौंडा 5/1	8.903	3.[illegible]
7	कल्सी 15/3 15/4	31.120	20.75[illegible]
8	टुंस 8/3	50.069	10.360
9	टुंस 8/4	19.608	21.5600

उत्तरांचल राजकीय

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प्रभारी खनन

Bhuwan Joshi

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10.	[illegible] सरखन्ध ग्राण्ट 12/2	282.114	141.500
11.	[illegible] नदी वाली बोलती ग्राण्ट 13/1	36.691	18.00
12.	[illegible] नदी पाखरी ग्राण्ट 12/2(भाग 12/2ए एवं 13/2बी)	82.340	13/2ए-38.756हे0 13/2बी-53.823हे0
	[redacted]	27.561	[redacted]
14.	[illegible] 25/3	10.350	68.364
15.	[illegible] नदी 14/1(भाग 18/1ए एवं 14/1बी)	19.00	14/1ए-13.000हे0 14/1बी-5.400हे0
16.	[illegible] नदी 14/14	15.822	13.000

[illegible] 23 जनवरी 2013 उक्त सीमा तक ही संशोधित किया जाता है, शेष यथावत रहेगा।

भवदीय,

(शैलेश बगौली)
निदेशक,

[illegible]।

[illegible] को सूचनार्थ एवं आवश्यक कार्यवाही हेतु प्रेषित।

1. [illegible] औद्योगिक विकास विभाग उत्तराखण्ड शासन।
2. [illegible] देहरादून।
3. प्रबन्ध निदेशक, मण्डियालगण्डत विकास निगम लि0 देहरादून को इस आशय से प्रेषित कि उक्त खनिज क्षेत्र का E.I.A Notification, 2006 के अन्तर्गत पर्यावरणीय स्वीकृति प्राप्त कर इस कार्यालय से उपलब्ध कराना सुनिश्चित करें।
4. गार्ड फाईल।

(शैलेश बगौली)
निदेशक,

औद्योगिक इकाई उद्योग निदेशालय
उत्तराखण्ड सरकार
देहरादून

प्रभारी खनन

Bhuwan Joshi
Empanelled [illegible]

268

/खनन/खनि0/देहरादून/2013-14

दिनांक 3 मार्च 2015

2201

विषय- पर्यावरणीय स्वीकृति प्राप्ति हेतु प्रकरण निदेशक, गढ़वाल मण्डल विकास निगम लि0 14/1 राजपुर रोड देहरादून द्वारा ग्राम ढकरानी, तहसील विकासनगर, जनपद देहरादून क्षेत्रान्तर्गत यमुना नदी लीज संख्या 971, 969, 970, 936मि रकबा रकबा 34.940 है0 राजस्व भूमि में बालू बजरी, बोल्डर के खनन हेतु एक वर्ष की अवधि हेतु आशय पत्र पर स्वीकृत क्षेत्र से सम्बन्धित खनन योजना के अनुमोदन के सम्बन्ध में।

824/खनन योजना दिनांक 01 जनवरी, 2015 के द्वारा ग्राम ढकरानी तहसील विकासनगर क्षेत्रान्तर्गत यमुना नदी लीज संख्या 21/2 खसरा नम्बर 971, 969, 970, 936मि रकबा 34.940 है0 क्षेत्र की कि भूतत्व एवं खनिकर्म विभाग के कार्यालय ज्ञाप संख्या 2 दिनांक 23 जनवरी 2013 एवं संशोधन संख्या 40/भू0खनि0ई0/2012-13 दिनांक 18 फरवरी 2013 में पर्यावरणीय अनुमति प्राप्त किये जाने हेतु आशय पत्र (Letter of Intent) प्रा सम्बन्धित प्रस्तुत खनन योजना जो भारतीय खान ब्यूरो द्वारा तदर्थ मान्यता प्राप्त संस्था आरएक्यूपी0/DDN/141/2002-A के द्वारा तैयार की गयी है को वैज्ञानिक के दृष्टिकोण से खनन सक्रियाओं के सुनियोजित संचालन हेतु उपयुक्त पाये जाने के परिप्रेक्ष्य नियमावली 2001 के नियम-34 के अन्तर्गत प्रदत्त अधिकार का प्रयोग करते अनुमोदन निम्नांकित शर्तों के अधीन किया जाता है:-

शर्तें

1. अनुमोदन खनन पट्टा विलेख के निष्पादन की तिथि से अगामी पांच वर्षों की अवधि के

2. खनन क्षेत्र के सम्बन्ध में पर्यावरण [illegible] मन्त्रालय भारत सरकार से पर्यावरणीय अनुमति एवं पर्यावरणीय अनुमति की समस्त शर्तों का अनुपालन किया जायेगा।

3. खनिजयन/विलयन्दी उपखनिज नियमावली 2001 के नियम-17 के अनुसार विभाग के द्वारा राजस्व विभाग के साथ संयुक्त सर्वे किया जायेगा तथा नियम-14 के द्वारा पट्टा विलेख के निष्पादन से पूर्व सीमांकन का पत्रीकरण कराने के उपरान्त ही खनन/खुदान प्रारम्भ किया जायेगा।

4. योजना के अनुसार वैज्ञानिक माइनिंग से निम्न प्रकार प्रथम वर्ष में आर0एल0 414.0 से 418.5 मी0 तक 330,000.00 टन द्वितीय वर्ष में आर0एल0 414.0 मी0 से आर0एल0 417.5 मी0 तक 330,000.00 टन तृतीय वर्ष में आर0एल0 414.0 मी0 से आर0एल0 418.5 मी0 तक 330,000.00

प्रभारी खनन

Bhuwan Joshi
Engineering Geologist

...आरएल0 414.0 मी0 से आरएल0 417.0 मी0 तक 330,000.00 टन एवं पंचम वर्ष में ...मी0 से आरएल0 418.5 मी0 तक 330,000.00 टन उपखनिज का खनन किया जायेगा। ...किसी अधिनियम जो कि इस खान या क्षेत्र पर लागू होते है या समय-समय पर ...राज्य सरकार या अन्य किसी सक्षम द्वारा प्रख्यापित किये जाते है, को छोड़ कर अनुमोदित

...वन (संरक्षण) अधिनियम-1980, वन संरक्षण नियमावली 1981 और अन्य सम्बन्धित ...नियमावली, आदेश और दिशा निर्देश जो कि इस खनन पट्टे पर समय-समय पर दिये जाये

...खनन योजना किसी भी प्रभावी प्रावधान अन्तर्गत माननीय न्यायालय के आदेश एवं दिशा निर्देश के ...नहीं करती है।

...किये गये खनन कार्य के निरीक्षण के उपरान्त यदि खनन योजना मे संशोधन हेतु ...तब संशोधित खनन योजना प्रस्तुत करने का पूर्ण उत्तरदायित्व पट्टाधारक का होगा।

...श्रमिकों को सुरक्षात्मक उपकरण प्रदान करने तथा सुरक्षित खनन कार्य करने हेतु सभी ...व्यवस्थायें करने का दायित्व पट्टाधारक का होगा।

...खनन योजना की एक-एक प्रमाणित प्रति सम्बन्धित जिलाधिकारी कार्यालय एवं निदेशालय के ...अभिलेखार्थ उपलब्ध प्रस्तुत करने का दायित्व भी पट्टाधारक का होगा।

...योजना के अनुसार पट्टाधारक द्वारा खनन कार्य न किये जाने के पाये जाने पर, ...पट्टे की शर्तों का उल्लंघन माना जायेगा और तदनुसार कार्यवाही की जायेगी।

...इस शर्त के साथ अनुमोदित की जा रही है कि पट्टाधारक द्वारा श्रमिकों की सुरक्षा एवं ...उचित व्यवस्था की जायेगी।

संलग्नक- ...की अनुमोदित प्रति।

भवदीय

(श्रीधर बाबू अददांकी)
निदेशक

संख्या 221 / खा0प्ला0 / उ0खनि0 / देहरादून / 2013-14 तद्दिनांकित।

प्रतिलिपि- ...की सूचनार्थ एवं आवश्यक कार्यवाही हेतु प्रेषित।

1 ...देहरादून।

2 ...भूतत्व एवं खनिकर्म विभाग, देहरादून।

भूतत्व एवं खनिकर्म इकाई उद्योग निदेशालय
उत्तराखण्ड सरकार
देहरादून

(श्रीधर बाबू अददांकी)
निदेशक

R2500

प्रभा... न

Bhuwan Joshi

MINING PLAN

FOR SAND, BAJRI AND BOULDERS
IN
RIVER YAMUNA, LOT No. 21/2
KHASRA NO. : 971, 969, 970, 936/0
AREA: 34.940 ha.

At

VILLAGE – DHAKRANI
TEHSIL – VIKASNAGAR
DISTRICT –DEHRADUN
(UTTARAKHAND)

APPLICANT

M/s GARHWAL MANDAL VIKAS NIGAM LTD.
74/1, RAJPUR ROAD,
DEHARDUN (UTTARAKHAND)
PIN- 248001,
PH. - 0135-2740896, 2740817, 2749308.

भूतल एवं खनिकर्म इकाई,
उद्योग निदेशालय, उत्तराखण्ड
देहरादून
शर्तों के अधीन अनुमोदित
पत्रांक 228/.....
दिनांक 3/3/16.....
संयुक्त निदेशक

भूतल एवं खनिकर्म इकाई उद्योग निदेशालय
PREPARED BY
देहरादून

Harish Kainthola
RQP/DDN/141/2002-A
(Valid upto 16 Jan. 2017)

प्रभारी खनन
गढ़मण्डल वि०

Bhuwan Joshi
Environmental Biologist
FRDC, Govt. of Uttarakhand

(6) संयुक्त निरीक्षण रिपोर्ट

जिलाधिकारी महोदय देहरादून के पत्र संख्या-301/खनिज-गढ़ी तप-2012, दिनांक-16 अगस्त 2012 तथा आयुक्त संख्या-302/खनिज/2012 दिनांक-30 अगस्त 2012 एवं प्रमुख सचिव, उत्तराखण्ड शासन के पत्र संख्या-2041/VII-11/46-98/2008 दिनांक-27 अक्टूबर 2008 के अनुपालन में संयुक्त निरीक्षण हेतु उपखनिज देहरादून तहसील विकासनगर के राजस्व ग्राम इकबालपुर खिला सीट सं0-21/2 गढ़ी संयुक्त का संयुक्त निरीक्षण दिनांक-14.9.2012 को किया गया। खनन पट्टे हेतु आवेदित क्षेत्रफल की राजस्व रजवाहा में प्रकाशित खतौनी वर्ष 2011 के अनुसार भारतीय खनन ब्यूरो के नक्शे के अनुसार 100 मीटर की दूरी छोड़ते हुए तथा नदी के किनारे से नदी की चौड़ाई एवं 15 मीटर की अतिरिक्त उपखनिज खनन क्षेत्र को खनन के लिए चिन्हित किया गया है, जो निम्न प्रकार है:-

क्र0 सं0	जनपद	तहसील	ग्राम का नाम	नदी का नाम	लाट संख्या	खसरा नं0	कुल क्षेत्रफल (हैक्टेयर में)	खनन योग्य क्षेत्रफल (हैक्टेयर में)	उपलब्ध उपखनिज
1	2	3	4	5	6	7	8	9	10
1	देहरादून	विकासनगर	इकबालपुर	यमुना	21/2	971 969 970 936 मि0	37.525 0.223 3.158 35.797	15.00 0.130 1.380 18.430	रेत, बजरी बोल्डर मिश्रित खनिज
						कुल	76.703	34.940	

उपरोक्त प्रस्तावित उपखनिज सिविल नदी तल क्षेत्र में प्रचुर मात्रा में उपखनिज निहित है, जिसे राजस्व हित में खनन/दुहान किया जाना अतिआवश्यक है। मौके पर उपस्थित वन विभाग, सिंचाई विभाग, भूतत्व एवं खनिकर्म विभाग तथा राजस्व विभाग (गठित समिति के सदस्य/प्रतिनिधि) की आख्या निम्नवत् है:-

1.वन विभाग- वन विभाग के प्रतिनिधि श्री एम0एस0रावत (असि0ओ0टिम्बर) द्वारा अवगत कराया गया कि उपखनिज खनन/दुहान हेतु प्रस्तावित क्षेत्र सिविल भूमि है तथा वृक्षविहीन है। उक्त प्रस्तावित स्थल से वन की सीमा 02 किलोमीटर से अधिक दूरी पर स्थित है। अतः राजस्व भूमि पर उपखनिज खनन/दुहान की अनुमति दिये जाने पर विभाग को कोई आपत्ति नहीं है।

2.सिंचाई विभाग- सिंचाई विभाग के प्रतिनिधि श्री विवेक शर्मा, अपर [illegible] अभियन्ता [illegible] निर्माण खण्ड, कालसी (गुलाबराय अम्बाड़ी) द्वारा अवगत कराया गया है कि प्रस्तावित स्थल से एक छोड़ [illegible] द्वारा निर्धारित इस्सापर से सुरक्षित दूरी छोड़कर तथा पुल निर्धारित 100 मीटर की दूरी छोड़ते हुये प्रस्तावित [illegible] पर उपखनिज खनन/दुहान की अनुमति दिये जाने पर विभाग को कोई आपत्ति नहीं है।

3.भूतत्व एवं खनिकर्म विभाग- भूतत्व एवं खनिकर्म विभाग के प्रतिनिधि [illegible] द्वारा निरीक्षण देहरा किया उक्त प्रस्तावित स्थल पर प्रचुर मात्रा में उपखनिज रेत बजरी बोल्डर मिश्रित खनन से निर्मित है, जो प्रतिवर्ष वर्षा ऋतु की बाढ़ के कारण से एकत्र होता रहता है। प्रस्तावित स्थल एक सहत खण्ड [illegible] मार्ग राज्य राजमार्ग से [illegible] उक्त राजस्व हित में उपखनिज खनन/दुहान की अनुमति दिये जाने पर विभाग को कोई आपत्ति नहीं होगी।

प्रभारी खनन
[illegible]
देहरादून

Bhuvan Joshi
Emp: Geologist
FPOC Dehradun

Scanned by CamScanner

2. राजस्व विभाग– राजस्व विभाग के प्रतिनिधि श्री कृपाल सिंह रावत, लेखपाल विकासनगर द्वारा अवगत कराया गया है कि प्रस्तावित स्थल ग्राम–ढकरानी अन्तर्गत खसरा नम्बर 971, 969, 970, 936मि0, का रकबा –76.703 है0 उत्तराखण्ड राज्य सरकार की भूमि है, जिसमें से खनन योग्य –34.940 है। खनन योग्य भूमि है। उक्त स्थल पर प्रचुर मात्रा में उपखनिज उपलब्ध है। अतः राजस्व हित में उक्त स्थल पर उपखनिज के खनन/चुगान की अनुमति दिये जाने पर कोई आपत्ति नहीं है।

उल्लेखनीय है कि शासनादेश संख्या–922/VII-1/11–रिट/2012, दिनांक–26.07.2012 द्वारा राज्य के समस्त खनिज/उपखनिज क्षेत्रों के लिये खनन पट्टा स्वीकृत किये जाने से पूर्व पर्यावरण एवं वन मंत्रालय से पर्यावरणीय अनुमति प्राप्त करना आवश्यक है।

अतः उक्त के दृष्टिगत पर्यावरणीय स्वीकृति उपरान्त उक्त प्रस्तावित क्षेत्र को उपखनिज के खनन/चुगान के पट्टे पर दिये जाने की संस्तुति की जाती है।

(एम0एस0रावत)
रेंज अधिकारी,
टिंगरी रेंज,
वन विभाग।

(एम0एस0बिष्ट)
सहायक अभियन्ता,
सिंचाई विभाग।

(वीरेन्द्र कुमार)
खान निरीक्षक
भूतत्व एवं खनिकर्म विभाग,
देहरादून।

(हर गिरी)
तहसीलदार, विकासनगर
जनपद–देहरादून।

(अशोक कुमार पाण्डेय)
उपजिलाधिकारी,
विकासनगर
जनपद–देहरादून।

भूतत्व एवं खनिकर्म इकाई उद्योग निदेशालय
उत्तराखण्ड सरकार
देहरादून

Bhuwan Joshi
Bureau of Mines

GARHWAL MANDAL VIKAS NIGAM LIMITED
DEHRADUN

SURVEY WORK FOR BASELINE DATA ASSESSMENT OF YAMUNA RIVER SECTION (LOT NO. 21/2) AT DHAKRANI IN UTTARAKHAND STATE

Project Report

by

Dr. R.D. Garg

DEPARTMENT OF CIVIL ENGINEERING
INDIAN INSTITUTE OF TECHNOLOGY
ROORKEE - 247 667, INDIA

December 2018

Attested,

Bhuwan Joshi
Empanelled Geologist
FPOC Gov
R.U.P. Kash
Govt of U.K.

EXECUTIVE SUMMARY

Geomatics Engineering Group of Civil Engineering Department at Indian Institute of Technology (IIT) Roorkee has been contacted by the officials of Garhwal Mandal Vikas Nigam (GMVN) Limited, Dehradun for the survey of Tons and Yamuna rivers sections. The main aim of the survey work and measurements is to carry out the levelling operation for getting the elevation of the river bed in pre and post monsoon period. Survey work was carried out in Yamuna river-section at Dhakrani near Herbertpur town for mining lot no. 21/2 having an area of 34.940 hectare as per Shajra map.

State of the art survey equipments e.g. Electronic Total Station and Geodetic GPS have been used for carrying out the survey. A number of ground control points have been established on each site at permanent structures at prominent locations on the banks of river. These reference control points have been connected using Geodetic GPS in the relative point positioning mode (DGPS).

The river section has approx. 2620 m length with average slope of 0.36%. The survey work has been carried out independently from the upstream side of the river, i.e. from the eastern edge of khasra no. 936 and is progressed towards downstream direction. The survey observations are taken at a grid interval of 25 m in longitudinal direction (along the length of river) and in perpendicular across direction (along the width of the river). Thus the entire river-section is surveyed at a grid of 25 m by 25 m. After the surveys for the pre-monsoon and post-monsoon periods have been completed the Longitudinal-sections (along the length of river) and the Cross-sections (along the width of river) have been prepared using the survey computation software.

The different of levels for the same location of the mining lot, in pre and post-monsoon period has been observed in the range of 0.500 m to 0.740 m. The average rise in the river bed level in the post and pre monsoon period is 0.[illegible] Considering the area of present mining lot as 34.940 hectare, the average volume of material available in one year cycle of replenishment is 2,10,339 cubic meters. However, considering the changes in the river morphology and width of river after the 20[illegible] the volume of material for the proposed mining from this mining lot of 34.940 hectare area will be 5,24,100 cubic meters for excavation upto 1.5 m with respect to the present river bed level.

Bhuwan Joshi
Environmental Scientist
FROM Gr
Regd. No.

SURVEY WORK FOR BASELINE DATA ASSESSMENT OF YAMUNA RIVER SECTION (LOT NO. 21/2) AT DHAKRANI IN UTTARAKHAND STATE

Preamble:

Geomatics Engineering Group of Civil Engineering Department at Indian Institute of Technology (IIT) Roorkee has been contacted by the officials of Garhwal Mandal Vikas Nigam (GMVN) Limited, Dehradun for the survey of Tons and Yamuna rivers sections in June 2018. The survey work is to be carried out in pre and post monsoon season. After deliberations and several field visits to ascertain the scope of work and the ground situation at the site, GMVN Ltd. Dehradun has awarded the work to IIT Roorkee. The main aim of the survey work and measurements is to carry out the levelling operation for getting the elevation of the river bed in pre and post monsoon period.

Scope of Work:

After discussions with the GMVN officials Sri M.D. Ghildiyal, Senior Manager, Mining and Sri Nikhil K. Sharma, PRO, the scope of work has been decided as follows-

1. Land Survey work will be carried out for baseline data assessment including survey of elevation of the designated mining lease areas/ river sections, as per the following list-

S.No.	Lot No.	Name of the River	Total Area
1.	3/12	Tons river	46.931 hectare
2.	3/13	Tons river	6.000 hectare
3.	21/2	Yamuna river	34.940 hectare
4.	23/1	Yamuna river	30.035 hectare

2. Along the river in longitudinal direction, the sections will be [illegible] spacing of 25 m. In lateral/across direction also, the sections will be [illegible] at a spacing [illegible] m. The number of sections along/across the river will depend upon the [illegible] width of river sections, as well as ground conditions. If there is water in the river, then [illegible] survey measurements will not be possible in that portion. The survey [illegible] will be carried out provided the ground conditions are suitable and safe for [illegible]. If the river has water in pre-monsoon or post-monsoon season, suitable number of labours will be provided by GMVN to facilitate the safety and conducive working conditions for the IITR team.

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3. 2-4 permanent bench Marks will be established at appropriate places near the river for each mining lease site at safe places, which has least danger of flood damage. The construction/maintenance work for the H.M. will be carried out by CMM/IB. The Survey of India reference HM will be made available by the CMM/IB. In case Survey of India reference HM is at more than 1 km distance from the river sections, then the HMs for the river sections will be established using GPS.

4. The land survey work will be repeated one more time in post-monsoon period at the mutually agreed time, provided the river is dry and has proper working conditions.

Description of the site:

The survey work has been carried out for two river sections each of Tons river (lot no. 3/12 and 3/13) and Yamuna river (lot no. 21/2, 23/1). The rivers sections are mostly clear from the vegetation and have deposits of river bed material in the form of boulders, cobbles, gravels etc. At one or two places, few trees are located on an island like formation. Flowing water with moderate discharge is present on several parts of the river sections due to the regular rains which have occurred this year due to more than average monsoon season. The river section has approx. 2620 m length with average slope of 0.36%. General layout of lot no 21/2 at Dhakrani region of Yamuna river has been given in Figure 1.

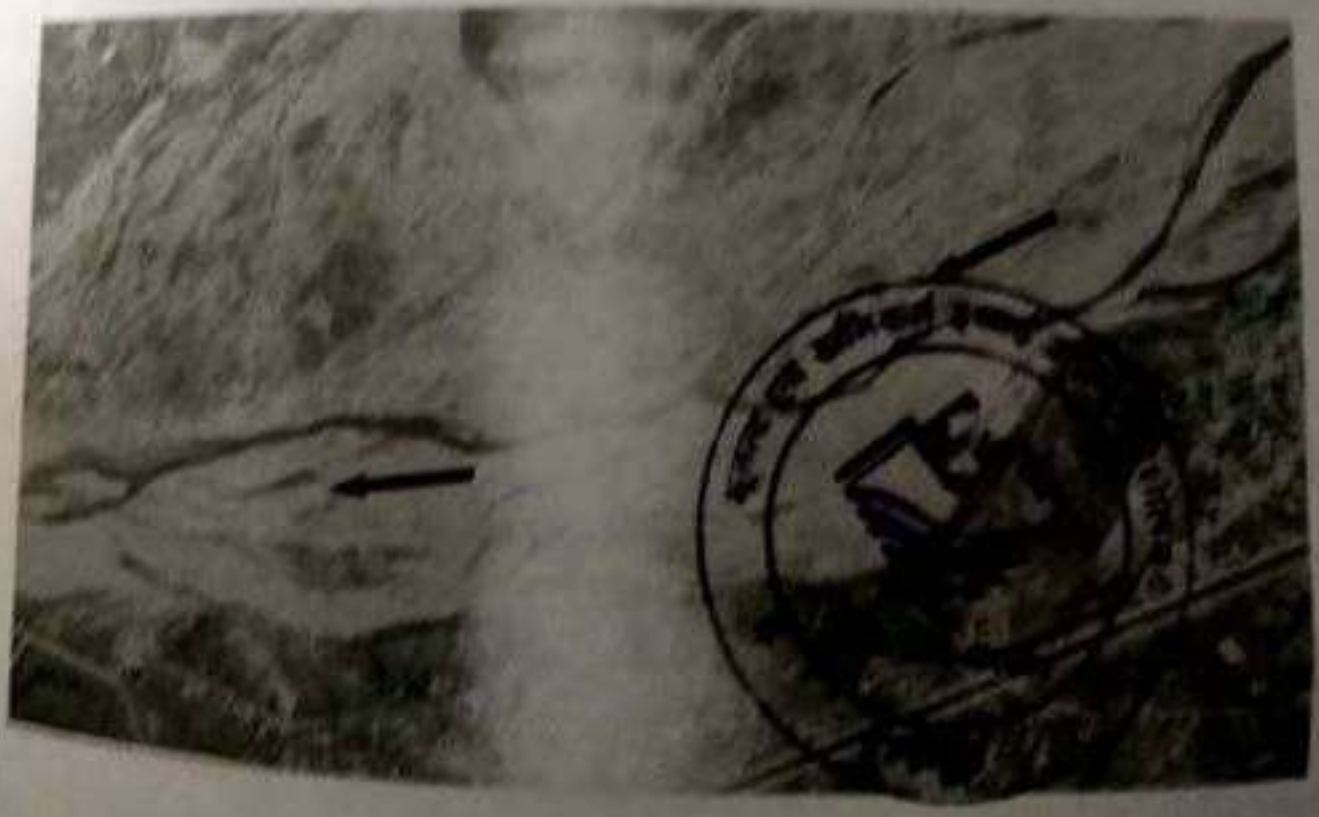

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Figure 1: General layout of the lot no. 21/2 at Dhakrani region of Yamuna river-section as viewed on Google Earth

Methodology and Work done:

Several field visits to the concerned river section have been carried out by IIT Roorkee team members (few visits with the GMVN officials and Patwari of the concerned mining lot) in the months of July to October 2018, for collecting the reconnaissance data, meta data of the ground locations including the revenue (Shajra) maps with Khasra numbers and then the surveying work in the pre and post monsoon season. The Shajra map of the mining lot no. 21/2 as provided by the revenue officials is shown in figure 2.

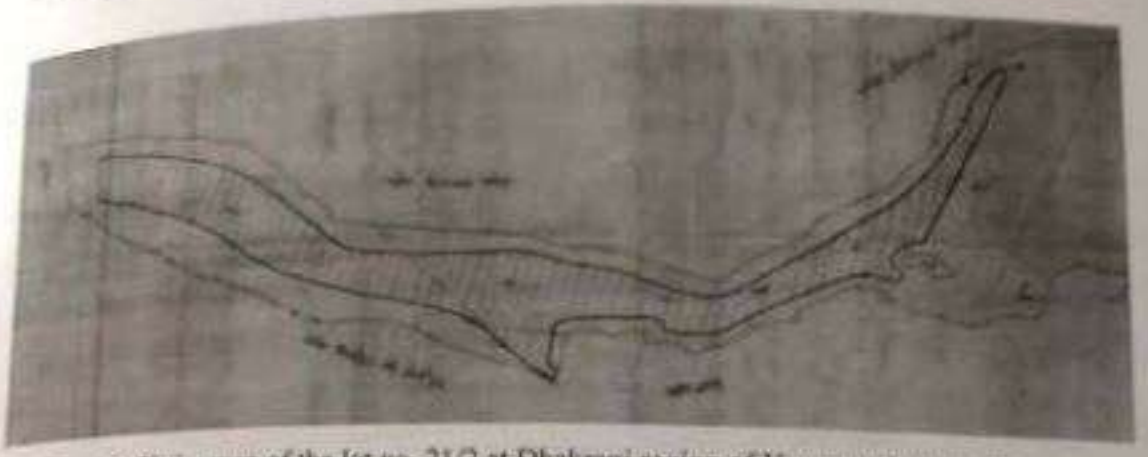

Figure 2: Shajra map of the lot no. 21/2 at Dhakrani region of Yamuna river-section

The reconnaissance survey data also helped in the selection of control stations and the work strategy to be adopted for mapping in order to restrict the errors. Few Khasra numbers and their respective locations (as per the information given by the Patwari – State revenue official) have been collected using GPS (Global Positioning System). However, since no written record of the spatial location of the Khasra numbers were available alongwith the ground coordinates as well as the ground identifiers for the [illegible] marks or geographic locations are not available on the revenue maps, the accuracy of this work is restricted by the accuracy of information provided by the State revenue officials of the concerned river-sections. This information has been used for georeferencing the Shajra maps. This step has helped in understanding the ground location as well as for dissemination of information regarding the mining lot vis-à-vis its surrounding area. The georeferenced Shajra map of the lot no. 21/2 of Yamuna river section at Dhakrani has been given in figure 3. For better

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FMQC Govt [illegible]hand
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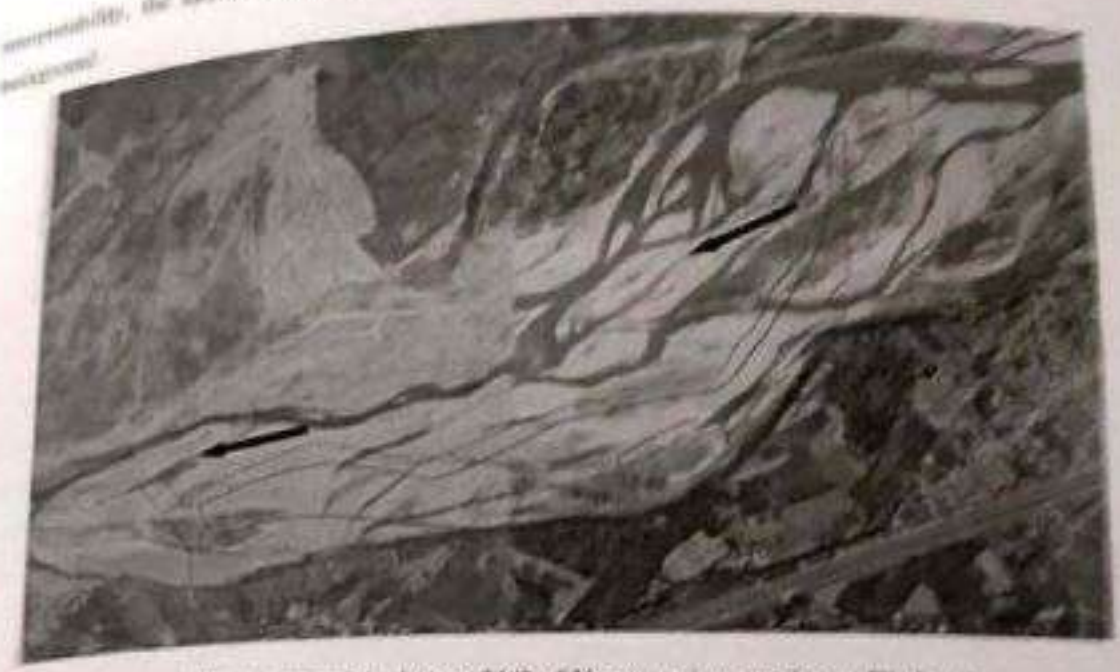

Figure 3. Georeferenced Shajra map of the lot no. 21/2 of Yamuna river section at Dhakrani overlaid on the satellite image

State-of-the-art survey equipments e.g. Electronic Total Station and Geodetic GPS have been used for carrying out the survey. Before starting the survey work, a number of ground control points have been established on each site. It was mainly in the form of permanent Bench Marks by construction of concrete pillars at appropriate places near the river section for each mining lease area at safe places, which has least danger of flood damage. The construction/maintenance work for the B.M. has been carried out by GMVN Ltd. The ground control points at these pillar locations have been connected with the Survey of India reference BM, which is available at PWD Inspection Banglow at Sahaspur. Since the Survey of India reference BM is at more than 1 km [illegible] the river-sections in Tons and Yamuna, for Shots for the river-sections have been established [illegible] Geodetic GPS in the relative point positioning mode (DGPS).

The various control points and TBM established for the Yamuna river section at Dhakrani (lot no. 21/2) are given in table no. *. These control points are also marked on the ground in the form of concrete pillars and these may be utilized as further controls for the

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survey work in subsequent years. These will act as reference as well as will reduce the efforts in subsequent surveys for the current river section.

Table 1: Control points and TBM for the Yamuna river section (lot no. 21/2)

S. No.	Easting (meters)	Northing (meters)	Elevation (meters)	Code/ ID	Remarks
1	788452.070	3371053.690	422.128	BM_3	Taken at the left bank of Yamuna river at Dhakrani at higher elevation
2	788038.336	3371163.075	404.236	BM_4	Taken at island in the Yamuna River bed at Dhakrani at downstream side

Complete survey measurements were taken by Electronic Total Station. The work was started from the permanent bench mark locations in the form of concrete pillars, which were constructed specifically for providing control points of the current survey work. Since there are very less possible geographic landmarks available at or near the river sections, these pillars would be very useful, if the reference is required for the survey work to be carried out in subsequent years for continuous monitoring of the morphological behavior of the river-sections as well as for river replenishment studies.

The Total Station is a modern survey device and a total survey solution, which is a combination of 'theodolite' for measuring the horizontal and vertical angles; 'level' for measuring the elevation difference between two or more ground locations; and 'EDM' (Electronic Distance Measuring Device) for measuring the slope distance by electro-magnetic radiations and computing the horizontal and vertical distance on that basis. The survey work for this river section has been carried out for the width of the mining lot covering left bank for reference purpose, since one of reference concrete pillars used as survey control point is situated on downstream side on the left bank of the Yamuna river at higher elevation, i.e. at a location which is safe from flood hazard. This part has better connectivity with the road connecting Herbertpur town and Dhakrani power house.

For the Yamuna river sections, the survey work has been carried out independently, since the separation between the two mining-lots of Dumta and Dhakrani is approx. 15 km. Therefore, the survey for mining lot no. 21/2 at the Dhakrani area of the Yamuna river, has been carried out independently. For Dhakrani portion of the Yamuna river (lot no. 21/2), the survey work has been carried out from the upstream side of the river, i.e. from the eastern

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edge of khasra no. 978 and is progressed towards downstream direction. In this river section, a reference pillar of concrete has been constructed by GMVN officials especially for the survey works to be used as the control point. Here the reference pillar lies on an island in between the flow of river on downstream side only, hence another concrete pillar has also been constructed at left hand side river bank on downstream side, which can be a better and more prominent bench mark for future surveys, since it is situated at considerably high elevation with respect to river bed, thus having very less probability of flooding hazard. Although the reference pillars (used as control points) are constructed in the downstream side, however in order to maintain uniformity in all the survey tasks, the survey has been conducted from upstream to downstream side. After that khasra nos. 970, 969 which are relatively smaller size khasras are covered and then khasra no. 971 is surveyed. The mining lot ends at the western edge of khasra no. 971. This mining lot has stretched to about 2620 m in the downstream direction with an average slope of 0.36%.

Total Station survey for the Yamuna river section (lot no. 21/2) has been started from the reference control point (concrete pillar constructed for this purpose). Back-sight has been taken for the control point and then fore-sights are taken for different locations on the river bed. The survey observations are taken at a grid interval of 25 m in longitudinal direction (along the length of river) and in perpendicular across direction (along the width of the river). Thus the entire river-section is surveyed at a grid of 25 m by 25 m. The ETS survey measurements have been carried out in Prism mode, since it ensures better reflection of electromagnetic radiations, which are used for taking the observations.

The ETS observations have been taken for planimetric coordinates and height positions for the various points at the spacing of approximate 25 m in the longitudinal and across direction of the river-section in prism mode. The width of the river is not much, therefore the observation stations are at less distance only. The instrument has been kept approximately in the center of the river and the observations towards the river banks have been carried out. This has helped to keep all the ETS survey-sightings at approx. 100-250 m distance. It may be noted that while the ETS instrument used in the survey work is capable of taking observations upto 4 km in Prism mode, it is ensured that the sighting distance has been kept less to enhance the observation-accuracy. The observational points for the prominent features e.g. temple, important buildings, river spur locations are also taken. The land survey has been carried out in the pre-monsoon period and then has been repeated in post monsoon

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period. The pre-monsoon survey has been carried out in the months of July/ August 2018. Although few monsoon showers had started by that time, however it was observed that those rains didn't contribute much to the river bed level. The post-monsoon survey has been conducted in the month of October 2018.

After the surveys for the pre-monsoon and post-monsoon periods have been completed the Longitudinal-sections (along the length of river) and the Cross-sections (along the width of river) have been prepared using the survey computation software. The data has been exported to the Excel file and the difference of elevation has been obtained by subtracting pre-monsoon levels from the post-monsoon levels. The survey observations of both the periods have been compared and evaluated. The different of levels for the same location of the mining lot, in pre and post-monsoon period has been observed in the range of 0.501 m to 0.740 m. The pre and post monsoon elevation of the river bed level as measured with the Electronic Total Station observations has been given in Table no. 2. These values will act as the basis of the replenishment study of the river for the concerned mining lot. This elevation difference at each location will help in further analysis for studying the replenishment behavior of the river. The longitudinal and cross-sections corresponding to the pre and post monsoon period have been given in the Annexure.

Table 2: Elevation of the river bed level in Pre and Post monsoon period for the Yamuna river section at Dhakrani (lot no. 21/2)

S. No.	Chainage (meters)	Elevation (meters)		Difference in Elevation (meters)
		Pre-monsoon	Post-monsoon	
1.	0	411.304	411.805	0.501
2.	25	411.171	411.681	0.510
3.	50	410.999	411.531	0.532
4.	75	410.521	411.033	0.512
5.	100	410.374	410.906	0.532
6.	125	410.286	410.827	0.541
7.	150	410.145	410.676	0.531
8.	175	409.946	410.485	0.539
9.	200	409.896	410.459	0.563
10.	225	409.756	410.298	0.542
11.	250	409.636	410.195	0.559
12.	275	409.688	410.222	0.534
13.	300	409.779	410.305	0.526
14.	325	409.823	410.347	0.524
15.	350	409.826	410.338	0.512
16.	375	409.424	410.035	0.611
17.	400	408.808	409.442	0.634
18.	425	408.366	408.947	0.581
19.	450	408.171	408.748	0.577
20.	475	407.866	408.445	0.579
21.	500	407.364	407.869	0.505
22.	525	406.878	407.454	0.576
23.	550	406.956	407.527	0.571
24.	575	407.267	407.829	0.562
25.	600	407.657	408.232	0.575
26.	625	407.943	408.512	0.569
27.	650	408.094	408.676	0.582
28.	675	408.119	408.67	0.551
29.	700	408.016	408.55	0.534
30.	725	407.87	408.464	0.594
31.	750	407.934	408.558	0.624
32.	775	408.023	408.587	0.564
33.	800	408.033	408.581	[illegible]
34.	825	408.027	408.562	[illegible]
35.	850	407.934	408.4[illegible]	0.547
36.	875	407.824	408.[illegible]	[illegible]
37.	900	407.645	408.[illegible]	0.5[illegible]
38.	925	407.511	408.095	[illegible]
39.	950	407.275	407.862	0.587
40.	975	407.097	407.687	[illegible]
41.	1000	406.887	407.474	0.587
42.	1025	406.7	407.295	[illegible]
43.	1050	406.467	407.063	[illegible]

S. No	Chainage (meters)	Elevation (meters)		Difference in Elevation (meters)
		Pre-monsoon	Post-monsoon	
44.	1075	406.314	406.893	0.579
45.	1100	406.179	406.753	0.574
46.	1125	406.08	406.7	0.620
47.	1150	405.907	406.56	0.653
48.	1175	405.8	406.391	0.591
49.	1200	405.693	406.31	0.617
50.	1225	405.539	406.107	0.568
51.	1250	405.324	405.951	0.627
52.	1275	405.258	405.847	0.589
53.	1300	405.297	405.921	0.624
54.	1325	405.201	405.844	0.643
55.	1350	404.931	405.57	0.639
56.	1375	405.083	405.662	0.579
57.	1400	405.175	405.798	0.623
58.	1425	404.96	405.606	0.646
59.	1450	404.592	405.176	0.584
60.	1475	404.381	404.928	0.547
61.	1500	404.466	405.012	0.546
62.	1525	404.341	404.877	0.536
63.	1550	404.208	404.849	0.641
64.	1575	404.303	404.907	0.604
65.	1600	404.16	404.86	0.700
66.	1625	403.341	404.012	0.671
67.	1650	403.244	403.884	0.640
68.	1675	403.255	403.914	0.659
69.	1700	403.289	403.928	0.639
70.	1725	403.379	404.004	0.625
71.	1750	404.217	404.877	0.660
72.	1775	404.066	404.677	0.611
73.	1800	403.807	404.474	0.667
74.	1825	403.545	404.203	0.658
75.	1850	403.324	403.95	0.626
76.	1875	403.108	403.755	0.647
77.	1900	402.841	403.485	[illegible]
78.	1925	402.566	403.163	[illegible]
79.	1950	402.174	402.804	0.630
80.	1975	401.678	402.[illegible]	[illegible]
81.	2000	401.316	401.9[illegible]	0.6[illegible]
82.	2025	401.514	402.179	[illegible]665
83.	2050	402.734	403.474	0.740
84.	2075	402.979	403.638	[illegible]
85.	2100	403.26	403.942	0.682
86.	2125	403.05	403.712	0.662
87.	2150	402.623	403.267	[illegible]
88.	2175	402.413	403.064	0.651
89.	2200	402.08	402.77	0.690

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S. No.	Chainage (meters)	Elevation (meters)		Difference in Elevation (meters)
		Pre-monsoon	Post-monsoon	
90.	2225	401.603	402.324	0.721
91.	2250	401.304	401.943	0.639
92.	2275	401.009	401.652	0.643
93.	2300	400.836	401.496	0.660
94.	2325	402.153	402.874	0.721
95.	2350	401.895	402.557	0.662
96.	2375	402.427	403.103	0.676
97.	2400	402.744	403.365	0.621
98.	2425	402.873	403.508	0.635
99.	2450	403.194	403.808	0.614
100.	2475	403.119	403.692	0.573
101.	2500	402.842	403.353	0.511
102.	2525	402.746	403.353	0.607
103.	2550	402.443	403.048	0.605
104.	2575	402.413	403.032	0.619
105.	2600	402.038	402.689	0.651
106.	2614.6	401.653	402.293	0.640
			Average	0.602
			Minimum	0.501
			Maximum	0.746

Volume of replenishment and mineable volume available

The average rise in the river bed level in the post and pre monsoon period is 0.602 m for one year cycle of 2018-19; however this value should not be taken as annual average, since the variation of river morphology and its characteristics should be studied for longer duration, with a minimum of three consecutive years' study. Then only river bed material (RBM) deposition behavior of that particular stretch of the river can be ascertained.

Carrying capacity of the river increases after controlled mining, since the cross-section of the river increases due to mining. Sediment carrying capacity reflects the account of entrainment and transportation by the flow under the certain boundary condition. It is a comprehensive index characterizing the sediment carrying capacity of flow under the conditions of equilibrium of scouring and deposition (Yu, et al., 2000; Dilhous, 2005; Yang, et al., 2007; Wang, 2007 and Ni et al., 2014). In order to increase the cross-section of river, either horizontal or vertical expansion can be exercised. Increase of river cross-section in horizontal direction is not advisable, since it may induce the scouring of river banks, which

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in turn will give rise to threat of flooding for nearby places. Therefore, increase in river cross-section in vertical direction through controlled mining of the river is a more viable option. The current deposition of RBM in the river for one year cycle (pre-monsoon to post-monsoon) is about 60 cm. In order to increase the river section, it is proposed that controlled mining upto the depth of 1.5 m from current river bed level be allowed (may be for current year only), as it will enhance the carrying capacity of the river and the rate of deposition of RBM will also increase. The similar studies may be carried out in subsequent years to ascertain the impact of increase in river cross-section by controlled mining.

Also, it has been observed that mining has not been carried out in the present mining lot in last years, therefore the river bed level is already quite high, thus it might have reached the saturation of deposition. Therefore, the rate of deposition of material will increase if the river bed is lowered by controlled mining. It is in line with the law of sediment transport in the natural streams. As a consequence of controlled mining in the designated lots of the river, low elevation channels are created, which have got the tendency to get filled first with sediment flow in the monsoon time. In the absence of that, the material deposition takes place along the width of river upto the banks of river and this sometimes creates the situation of touching of the river banks causing flood havoc in the adjoining areas. The above condition will induce the deposition of RBM for the entire width of river.

Severe floods in year 2013 have impacted the morphology of major and minor rivers of Uttarakhand, as it has brought huge amount of RBM and silt deposits to the downstream side. A study has been carried out using satellite remote sensing to study the morphology of current river-section in pre and post era of 2013 floods. Satellite images of the same river section pertaining to pre 2013 (pre-flood) and post flood time have been taken. The pre-monsoon image of February 2013 has been shown in figure 4. Figure 5 shows the satellite image of the same area of December 2018. The river [illegible] the images have been digitized and overlaid on the satellite image to get an idea of the widening of river in that year. The river bank lines of both the years (pre 2013 flood and post flood) have been overlaid on the satellite image of year 2018, for better comp[illegible]shown in figure 6. It has been observed that river width has increased at several locations. The primary reason for the same may be the excessive RBM brought along with the 2013 flood water and the subsequent monsoon flows. It is evident that, if sufficient depth of river cross-section is not available, the

monsoon flows. It is evident that, if sufficient depth of river cross-section is not available, the RBM will have the tendency to get deposited towards the river banks, which sometimes may cause breaching of river banks, i.e. increased flood threat for the neighbouring areas.

By increasing the depth of river through controlled mining, the river flow as well as the deposition of RBM will be more regularized and will stabilize the river morphology. Hence it is proposed that mining upto a maximum depth of 1.5 m may be allowed for current year and the situation may be studied for subsequent year (by ground survey of river-section in pre and post monsoon period of year 2019). Therefore, considering the changes in the river morphology and width of river after the 2013 floods, the volume of material for the proposed mining from this mining lot of 34.940 hectare area will be 5,24,100 cubic meters approximately for excavation upto 1.5 m with respect to the present river bed level.

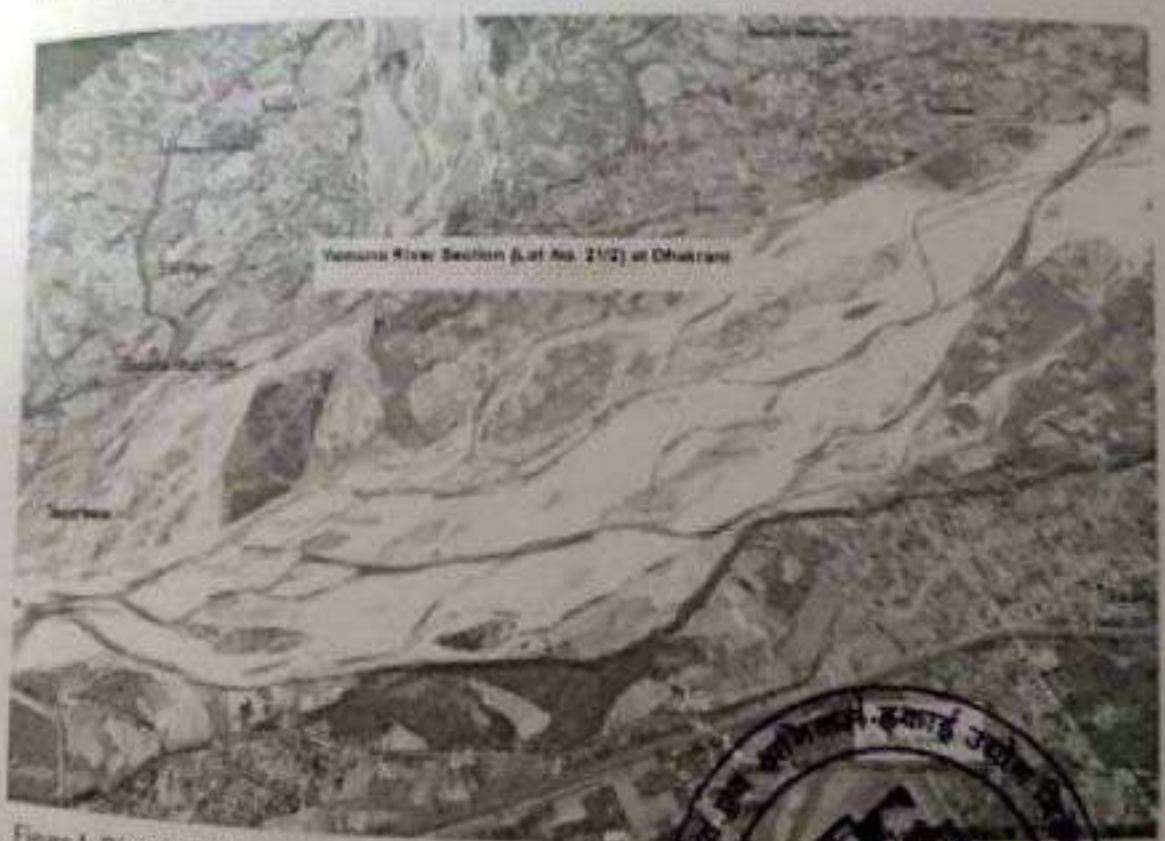

Figure 4: River bank line (shown in yellow colour) of Yamuna river section (lot no. 2/2) at Dhakrani in February 2013. Satellite image of February 2013 is shown as background.

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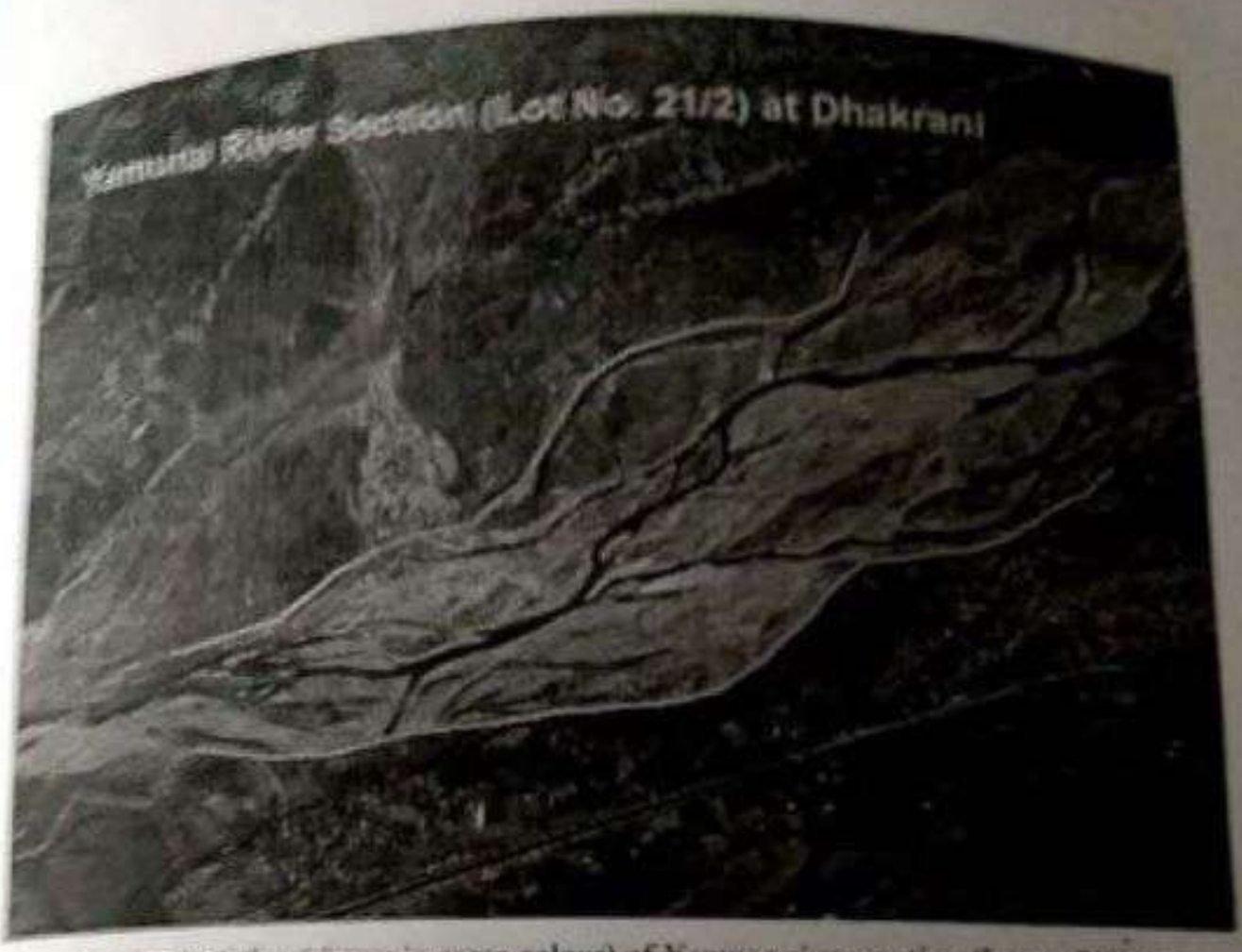

Figure 5: River bank line (shown in green colour) of Yamuna river-section (lot no. 21/2) at Dhakrani in December 2018. Satellite image of December 2018 is shown in background.

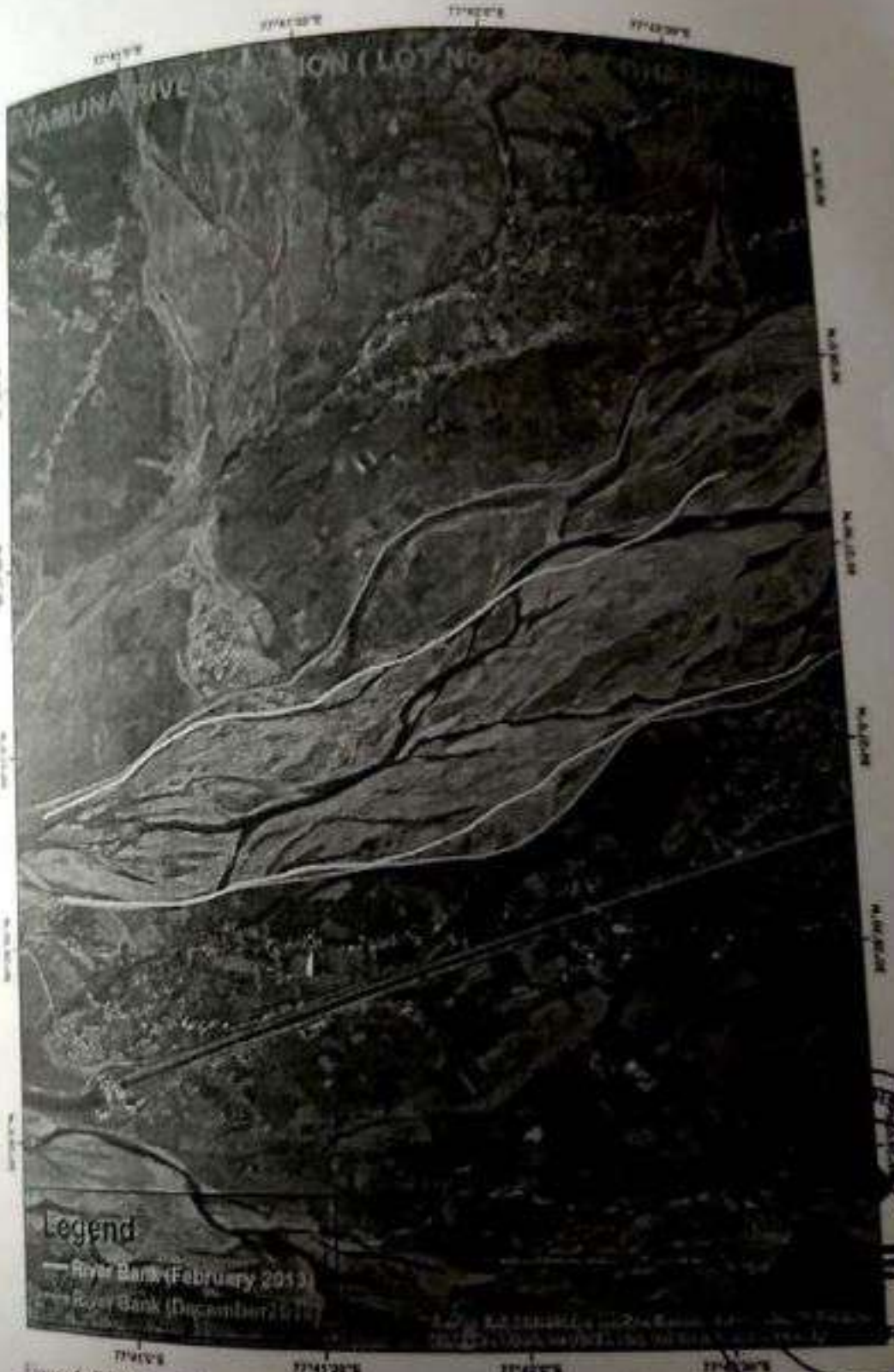

Figure 6: River bank lines of Yamuna river-section (lot no. 21/2) at Dhakrani in February 2013 and December 2018. Satellite image of December 2018 is shown in background.

A Gallery of Photographs for the survey work has been given at the end of report.

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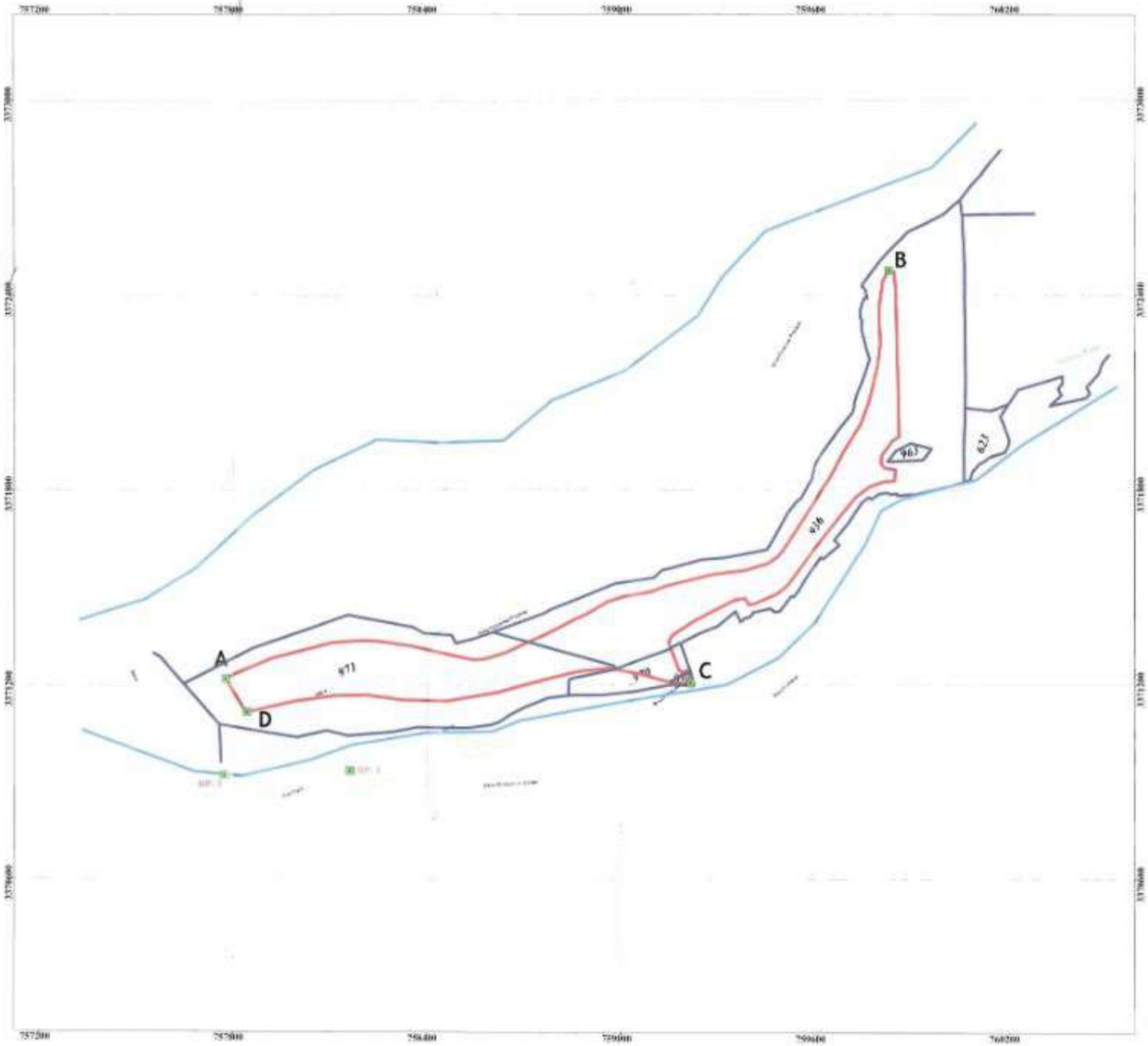
भूतत्व एवं खनिकर्म इकाई उत्तराखण्ड शासन देहरादून

Bhuwan Joshi
Empanelled Geologist
FRDC Govt of Uttarakhand
Ruf ,Indian Bureau
Registration no. [illegible]
Govt of India



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GEOREFERENCE MAP OF DHAKRANI YAMUNA RIVER LOT NO. 21/1

DGPS COORDINATES

Pillar	Latitude	Longitude
A	30°28'44.04"N	77°41'3.34"E
B	30°27'23.05"N	77°42'22.09"E
C	30°27'2.15"N	77°42'21.54"E
D	30°28'40.54"N	77°41'5.77"E

DGPS COORDINATES OF REFERENCE POINT

Pillar	Reference_P	Latitude	Longitude
1	Ex Bench Mark	30°28'30.48"N	77°41'28.39"E
2	River Bed Corner	30°28'34.54"N	77°41'3.16"E

Legend

- DGPS piller point
- River Bank
- Mining Area
- Sajra Map

Scale- 1:4000

130 65 0 130 260 390 520 Meters

Applicant: M/S GARHWAL MANDAL VIKAS NIGAM LTD. 74/1, RAJPUR ROAD, DEHRADUN(UTTARAKHAND)

PROJECT: DHAKRANI YAMUNA RIVER LOT NO.21/2 (34.940 HA.)

SURVEYED BY:
Civil Engineering Department
Indian Institute of Technology
Roorkee 247667

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GEOREFERENCE MAP OF DHAKRANI YAMUNA RIVER LOT NO. 21/1

DGPS COORDINATES

Pillar	Latitude	Longitude
1		
2		
3		
4		

DGPS COORDINATES OF REFERENCE POINT

Pillar	Reference_IP	Latitude	Longitude
1			
2			

Legend

- DGPS piller point
- River Bank
- Mining Area
- Sajra Map
- Contour

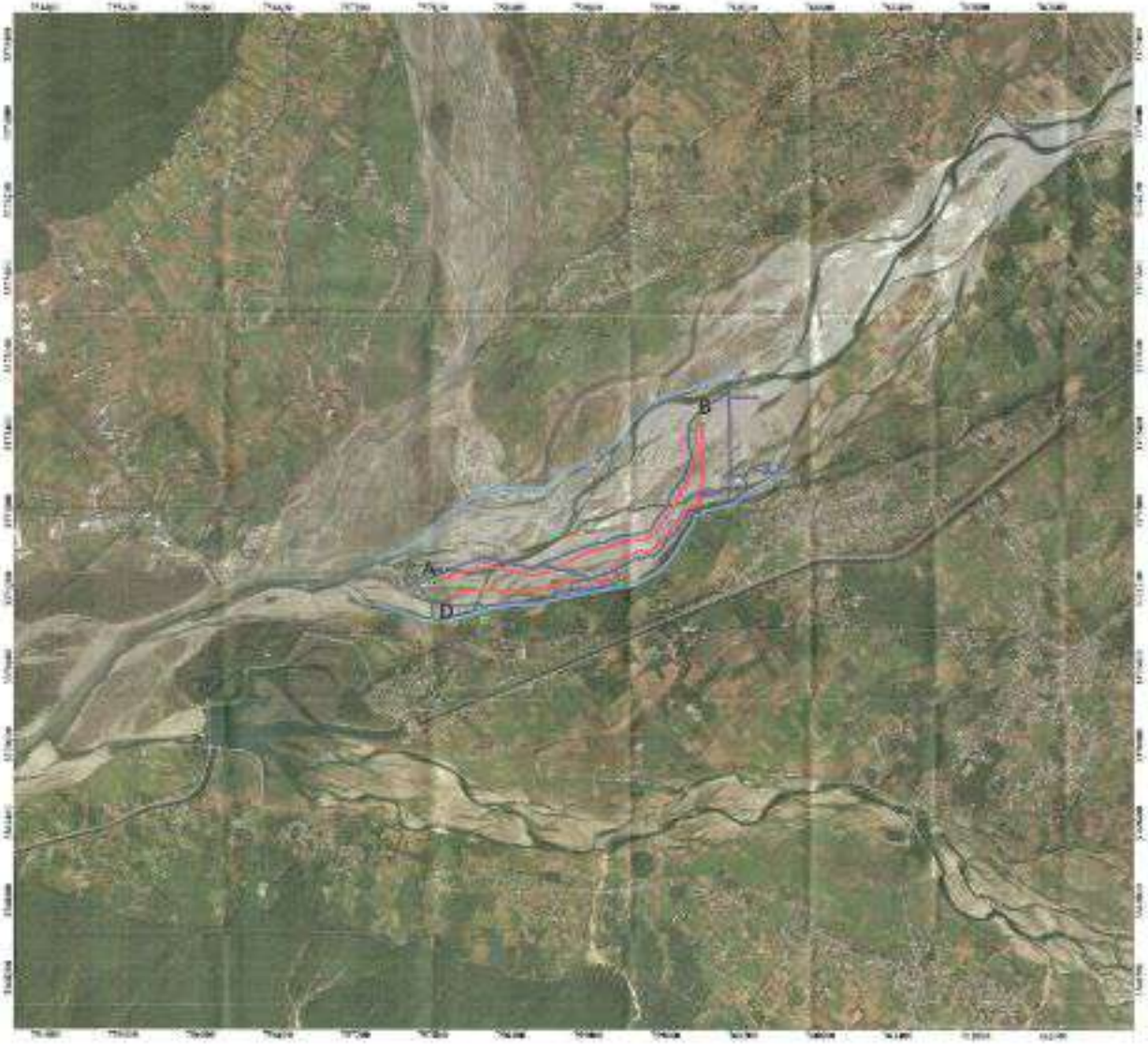
Scale- 1:4000

Meters

Applicant: M/S GARHWAL MANDAL VIKAS NIGAM LTD. 74/3, HARIPUR ROAD, DEHRADUN, UTTARAKHAND

PROJECT: DHAKRANI YAMUNA RIVER LOT NO. 21/1 (10.630 HA.)

SURVEYED BY:
Civil Engineering Department
Indian Institute of Technology
Roorkee 247667



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GEOREFERENCE MAP OF DHAKRANI YAMUNA RIVER LOT NO. 21/1

DGPS COORDINATES

Point	Latitude	Longitude
A		
B		
C		
D		

DGPS COORDINATES OF REFERENCE POINT

Name	Reference P	Latitude	Longitude
1			
2			

Legend

- DGPS piller point
- River Bank
- Mining Area
- Sajra Map

Scale- 1:10,000

Applicant: M/S GARHWAL MANDAL VIKAS NIGAM
12/D, 7/43, RAJPUR ROAD, DEHRADUN (UTTARAKHAND)

PROJECT: DHAKRANI YAMUNA RIVER
LOT NO.21/1 (54.500 HA.)

SURVEYED BY:
Civil Engineering Department
Indian Institute of Technology
Roorkee 247667

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GEOREFERENCE MAP OF DHAKRANI YAMUNA RIVER LOT NO. 21/1

DGPS COORDINATES

Point	Latitude	Longitude
A	30°23'04.83"N	77°41'1.34"E
B	30°23'23.01"N	77°42'12.89"E
C	30°23'2.18"N	77°42'17.84"E
D	30°22'50.81"N	77°41'1.77"E

DGPS COORDINATES OF REFERENCE POINT

Point	Reference_P	Latitude	Longitude
1	Yo Control Point	30°23'06.41"N	77°41'05.35"E
2	Bore Well Control	30°23'24.81"N	77°41'2.38"E

Legend

- DGPS piller point
- River Bank
- Mining Area
- Sajra Map

Scale- 1:4000

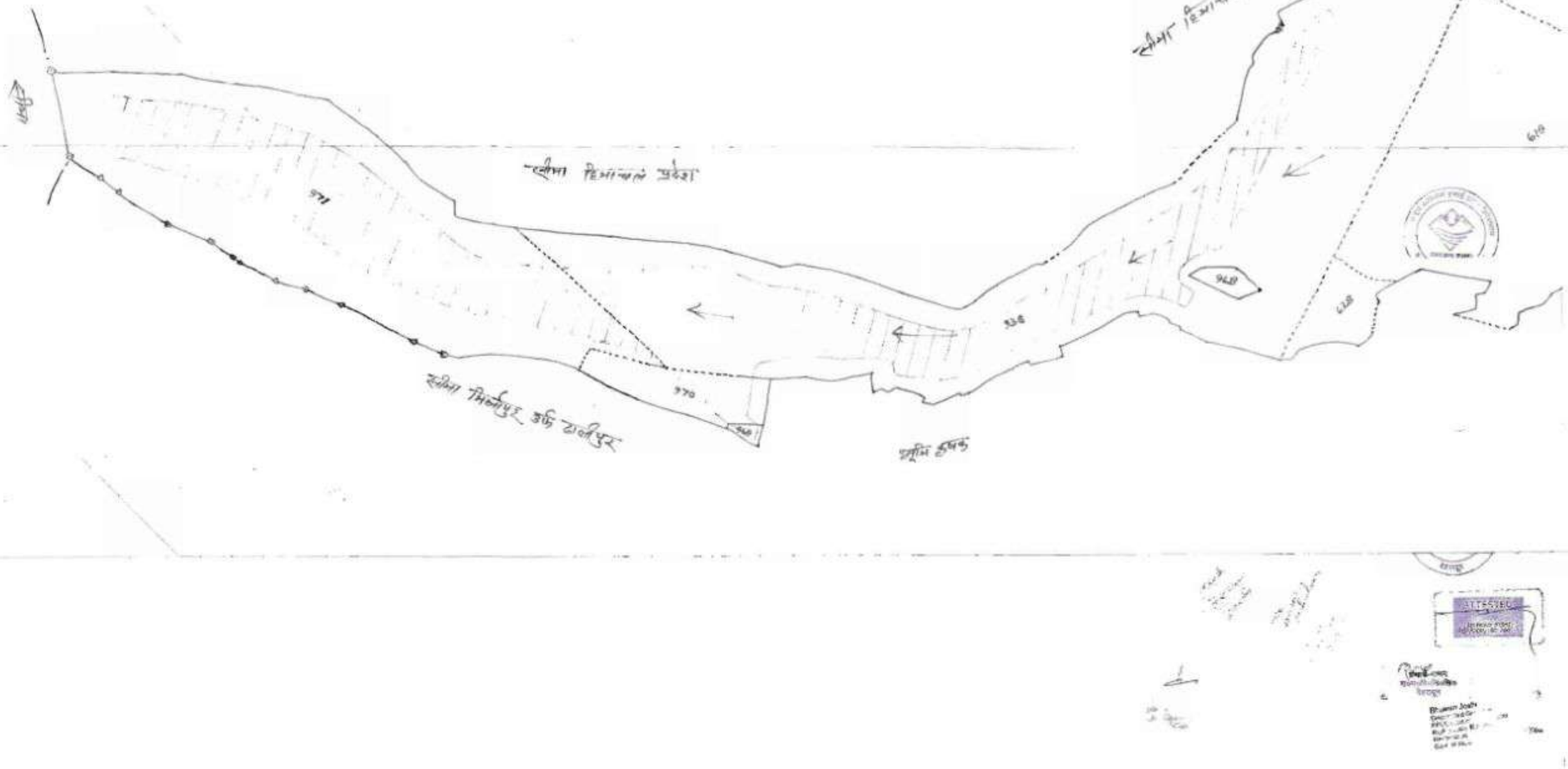
Applicant: M/S GARHWAL MANDAL VIKAS NIGAM
LTD, 74/3, RAJPUR ROAD, DEHRADUN(UTTARAKHAND)

PROJECT: DHAKRANI YAMUNA RIVER
LOT NO.21/1 (14.908 HA.)

SURVEYED BY:
Civil Engineering Department
Indian Institute of Technology
Roorkee 247667

Dhak-Jhan?

लाट सं० - 21/2
ग्राम - हकरानी
परगना - पछुवादून
तहसील - विकासनगर
जनपद - देहरादून
क्षेत्रफल - 34.940 है०
संकेत -
25 सेमी = 1 किमी०

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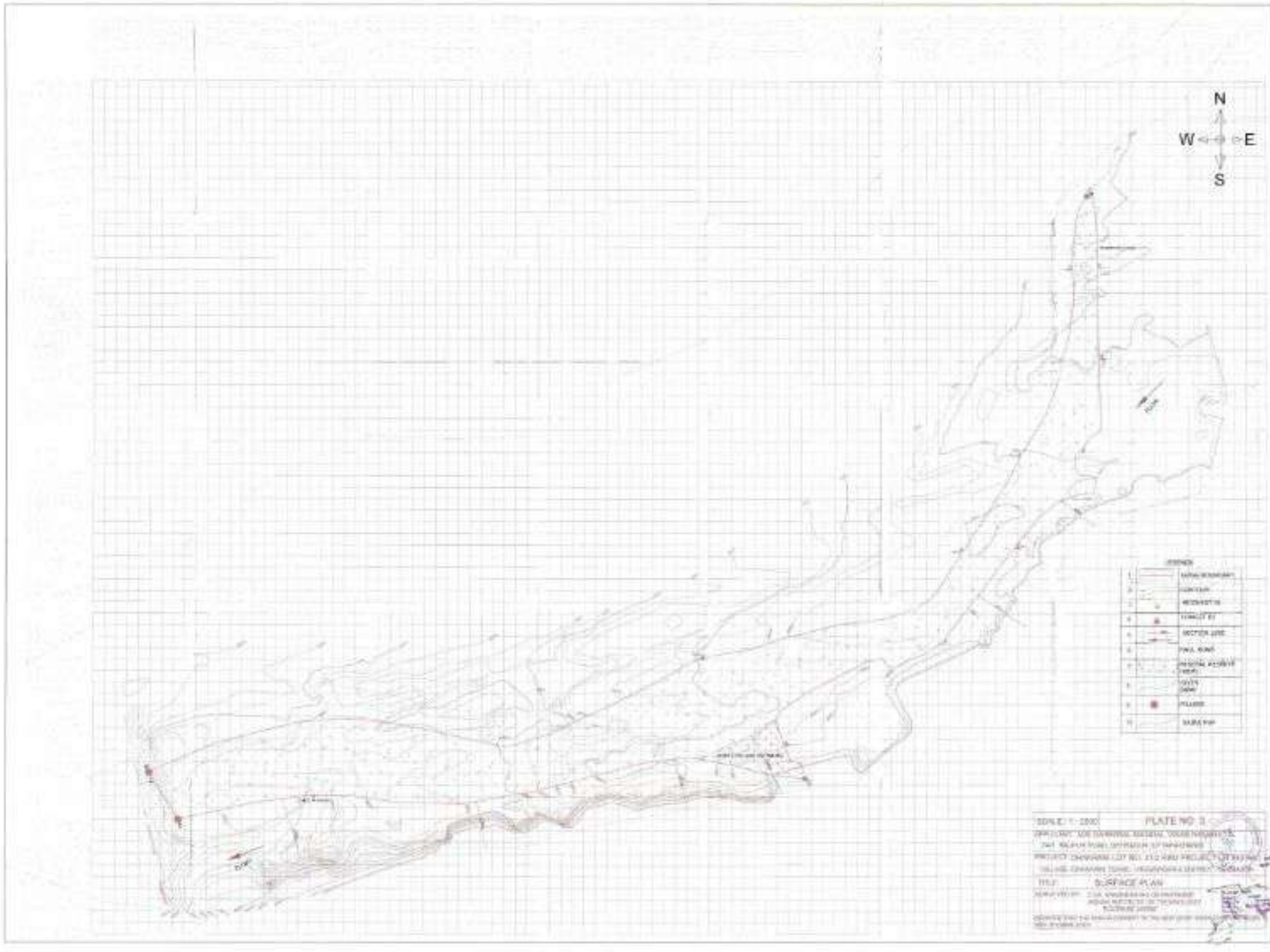
LEGEND
SURFACE PLAN
SCALE: 1:2000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SCALE 1 : 2000
PLATE NO. 3
SURFACE PLAN


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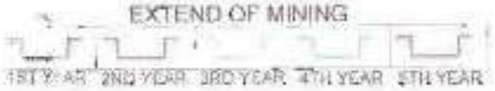
LEASE BOUNDARY
SAFETY BARRIER

EXTEND OF MINING
1ST YEAR 2ND YEAR 3RD YEAR 4TH YEAR 5TH YEAR

SCALE : 1 : 2500	PLATE NO. 13
APPLICANT : M/S GOPIKRISHNA MAHESH STONES PRIVATE LTD.	
ADD : RAIPUR ROAD, DISTRICT : KANKER	
PROJECT : DHANWAR LOT NO. 210 ROM PROJECT (4.840 HA.)	
VILLAGE : DHANWAR, TEHSIL : CHARAMA, DISTRICT : KANKER	
TITLE : PIT SECTION PLAN POST MONSOON	
SURVEYED BY : CIVIL ENGINEERING DEPARTMENT, INDIAN INSTITUTE OF TECHNOLOGY ROORKEE (UTTRA	

Sd/-
Suvira Joshi
Assistant Director
Indian Bureau of Mines
Nagpur



LEASE BOUNDARY

SAFETY BARRIER

SCALE : 2000	PLATE NO. 12
APPLICANT: M/S GARHWAL MANDAL VIKAS NIGAM LTD.	
74/1, RAJPUR ROAD, DEHRADUN (UTTARAKHAND)	
PROJECT: DHAKRANI LOT NO. 21/2 RBM PROJECT (34.940 HA.)	
VILLAGE- DHAKRANI, TEHSIL- VIKASNAGAR & DISTRICT- DEHRADUN	
TITLE: PIT SECTION PLAN PRE-MONSOON	
SURVEYED BY:- CIVIL ENGINEERING DEPARTMENT, INDIAN INSTITUTE OF TECHNOLOGY ROORKEE 247667	
CERTIFIED THAT THE PLAN IS CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF	
SIGN: BHUWAN JOSHI	

Bhuwan Joshi
Recognised Geologist
Govt. of Uttarakhand
Regd. No. Bureau of Mines
Certificate No. RQP/DEH/...
Govt. of India

प्रभारी खनन
जिला अधिकारी देहरादून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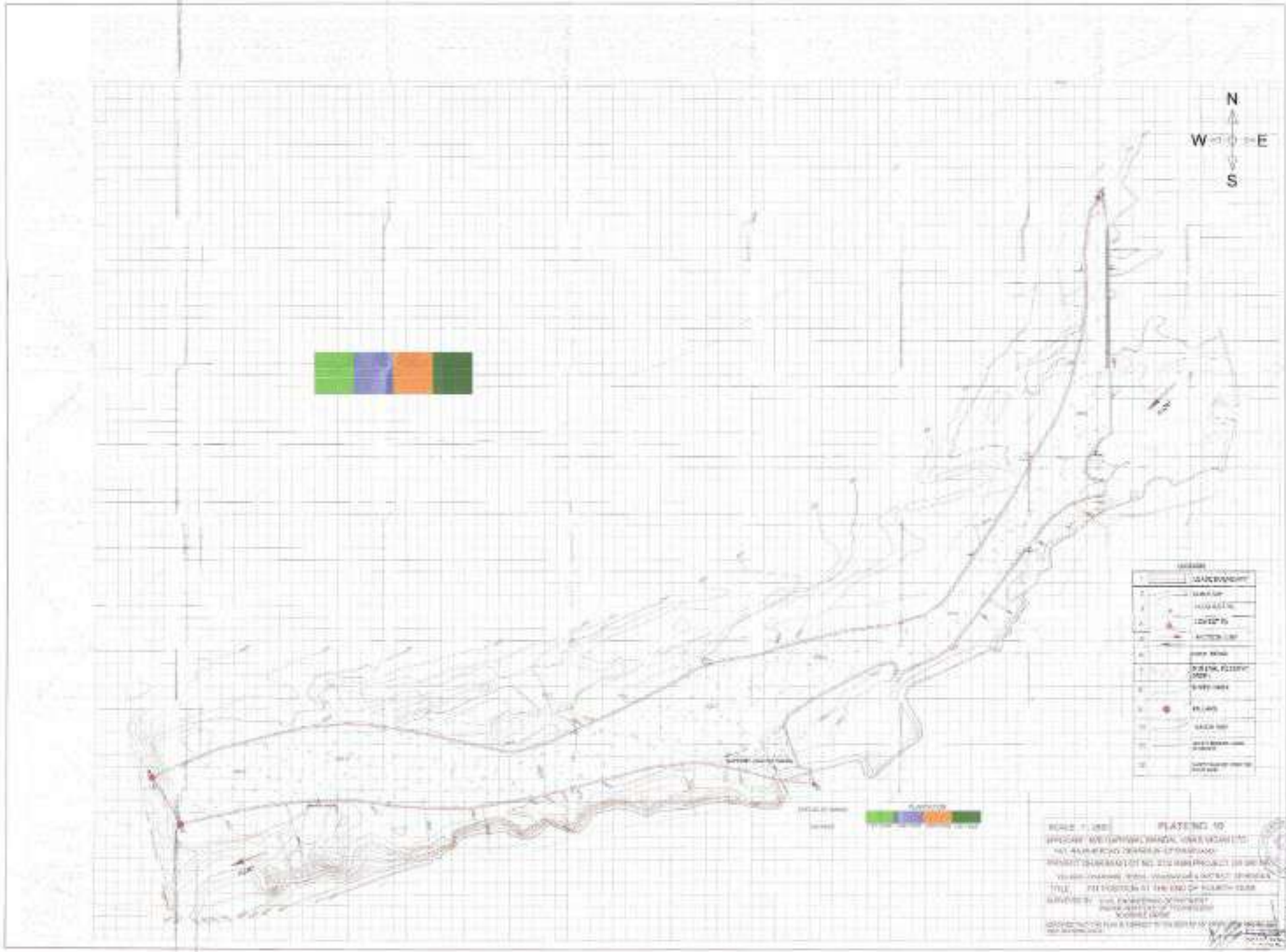
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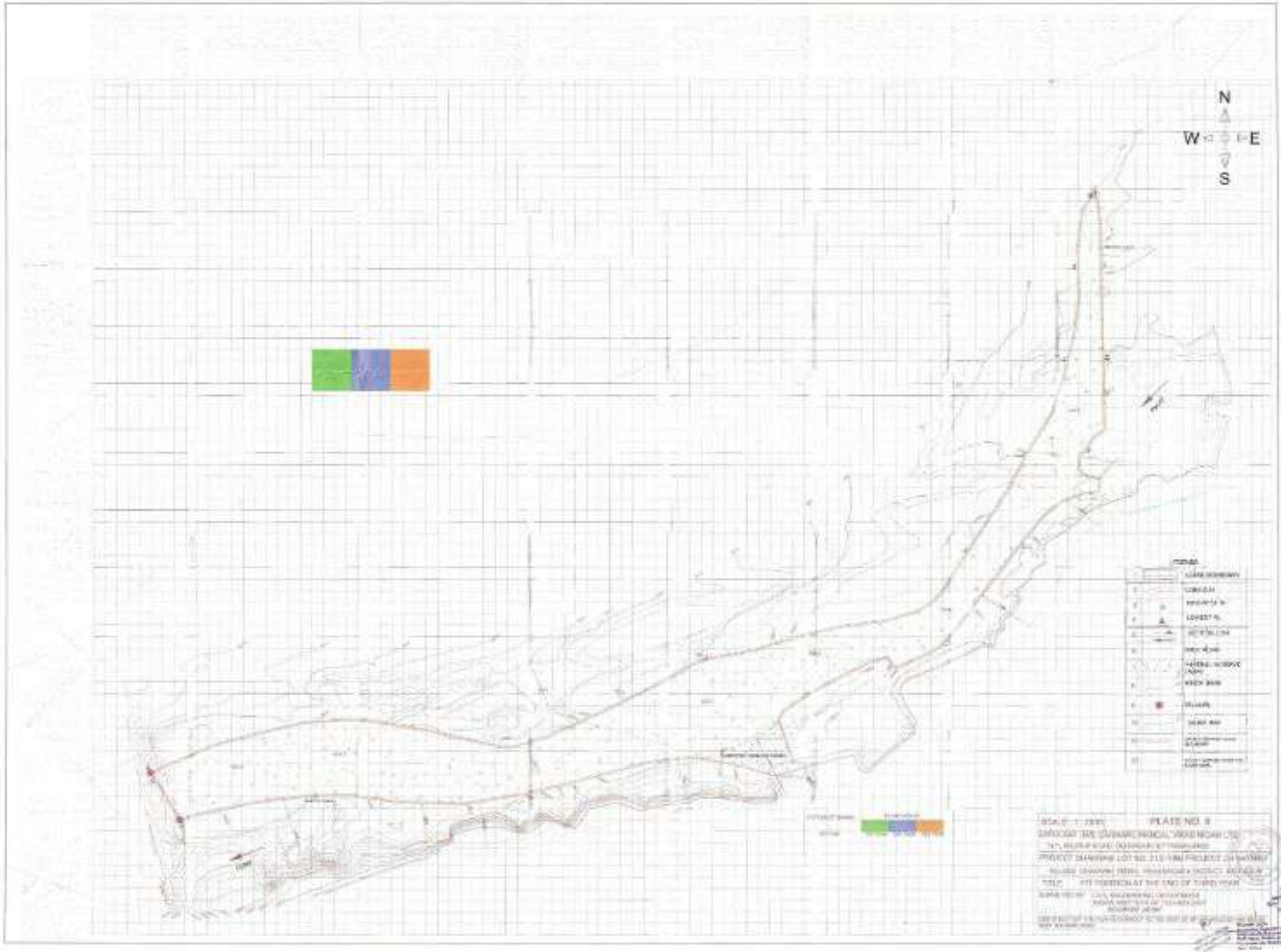
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PLATE NO. 9


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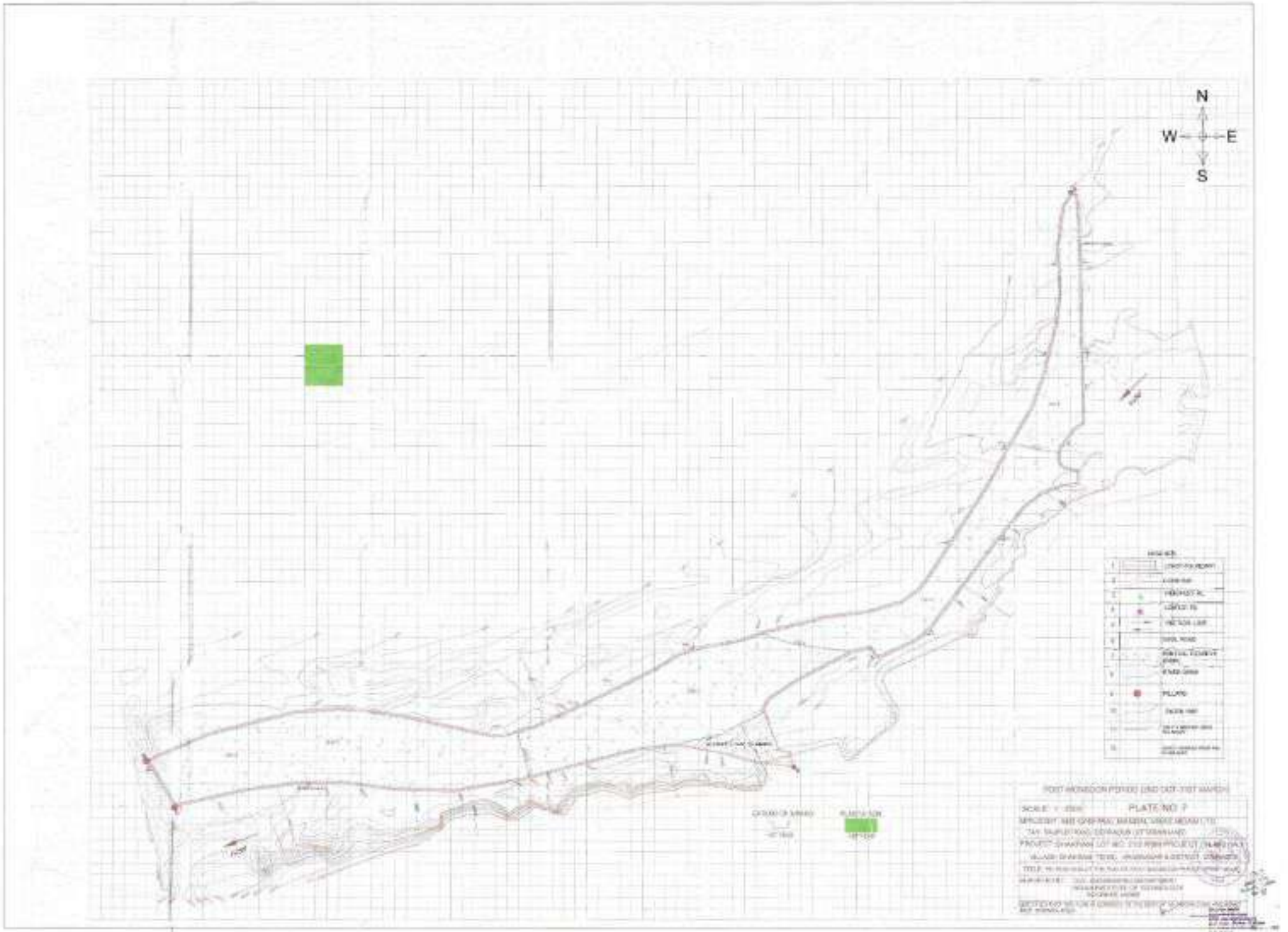
PLANTATION
SCALE 1: 2000
PLATE NO. 9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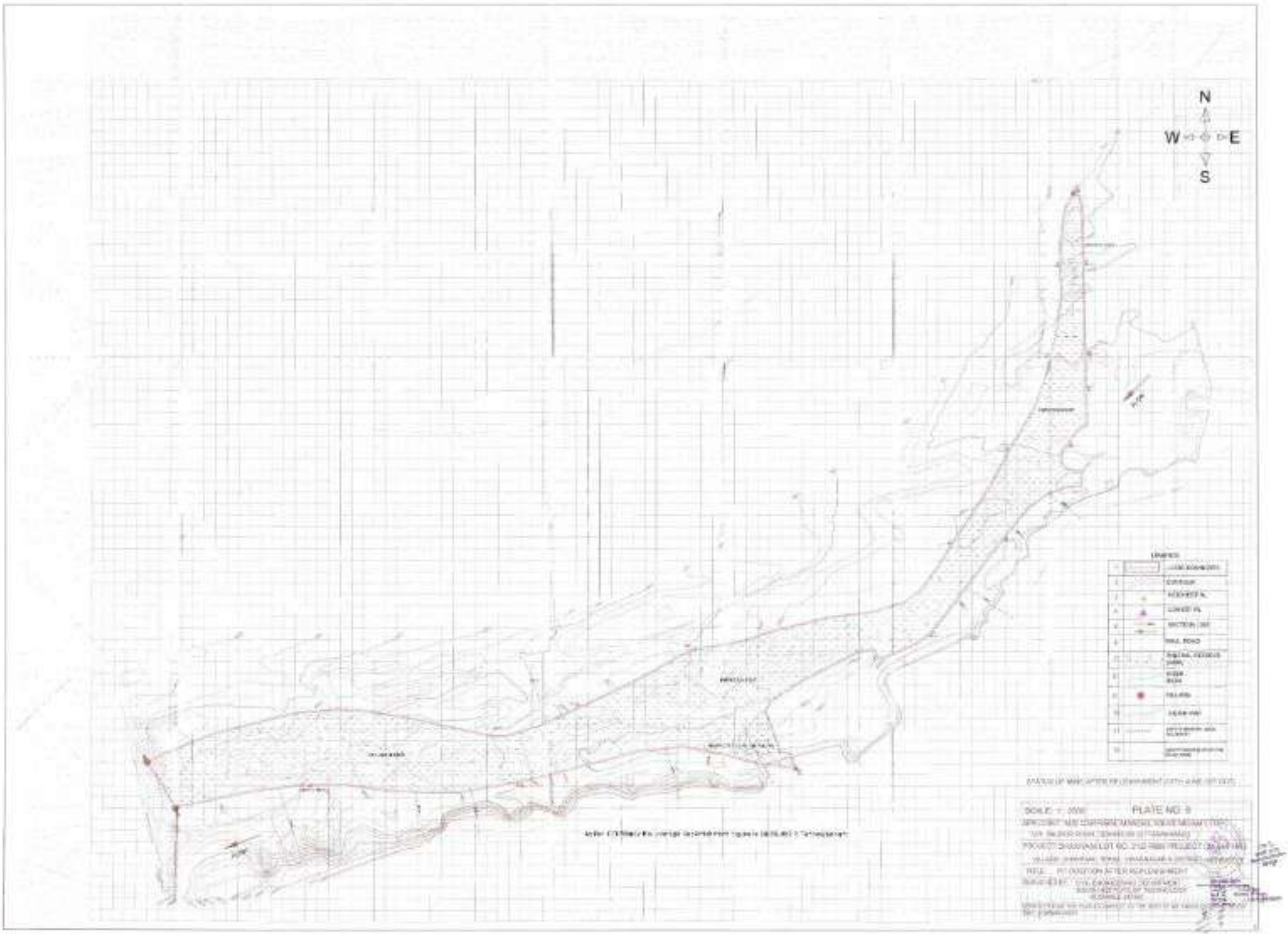
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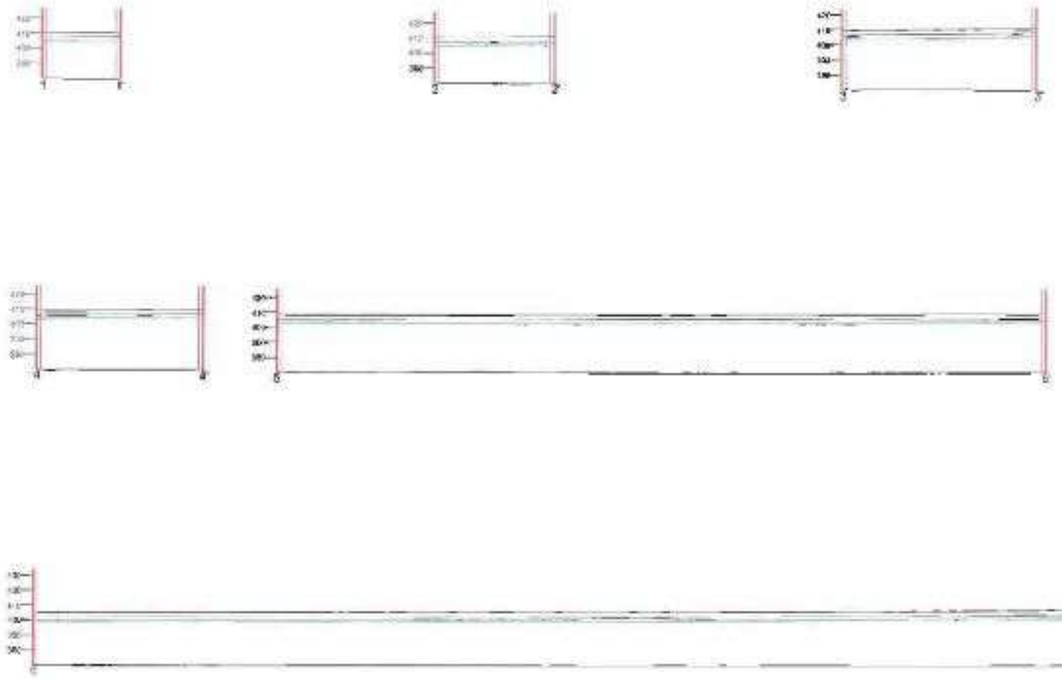
PLATE NO. 5



LEGENDS

- LEASE BOUNDARY
- SAFETY BARRIER
- PROVED MINERAL RESERVE
- PROBABLE MINERAL RESERVE
- POSSIBLE MINERAL RESOURCES

SCALE : 1 : 2000 | PLATE NO. 4

APPLICANT: M/S GARHWAL MANDAL VIKAS NIGAM LTD.
74/1, RAJPUR ROAD, DEHRADUN (UTTARAKHAND)

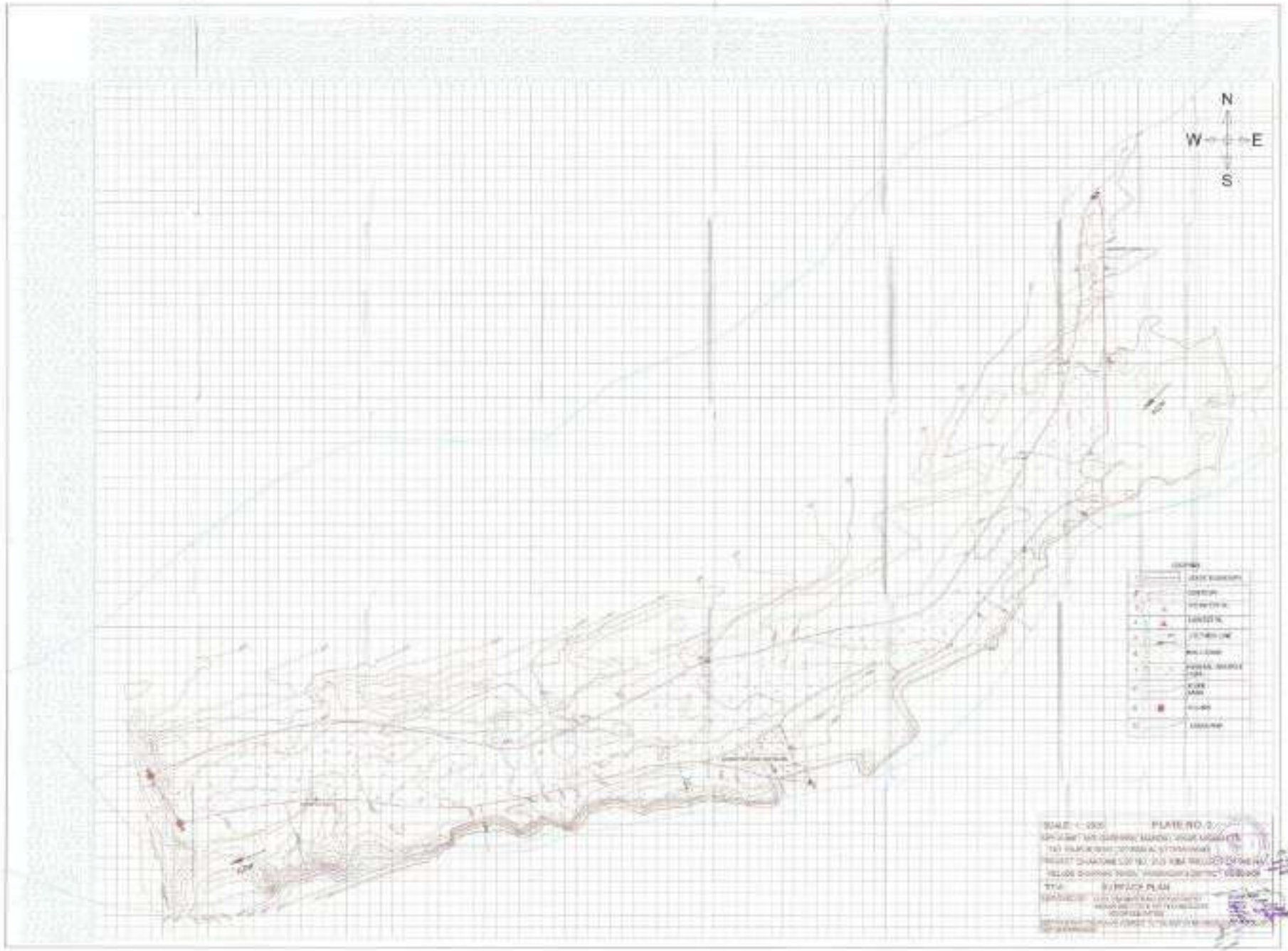
PROJECT: DHAKRANI LOT NO. 21/2 RBM PROJECT (34.940 HA.)
VILLAGE- DHAKRANI, TEHSIL- VIKASNAGAR & DISTRICT - DEHRADUN

TITLE: GEOLOGICAL SECTION PLAN

SURVEYED BY: CIVIL ENGINEERING DEPARTMENT
INDIAN INSTITUTE OF TECHNOLOGY
ROORKEE 247667

CERTIFIED THAT THE PLAN IS CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF
RQP- BHUWAN JOSHI

Bhuwan Joshi
Engineering Geologist
CP-IC, Central Ground Water
Govt. of India
Regd. No. IN-UA0018B/2004
Govt. of India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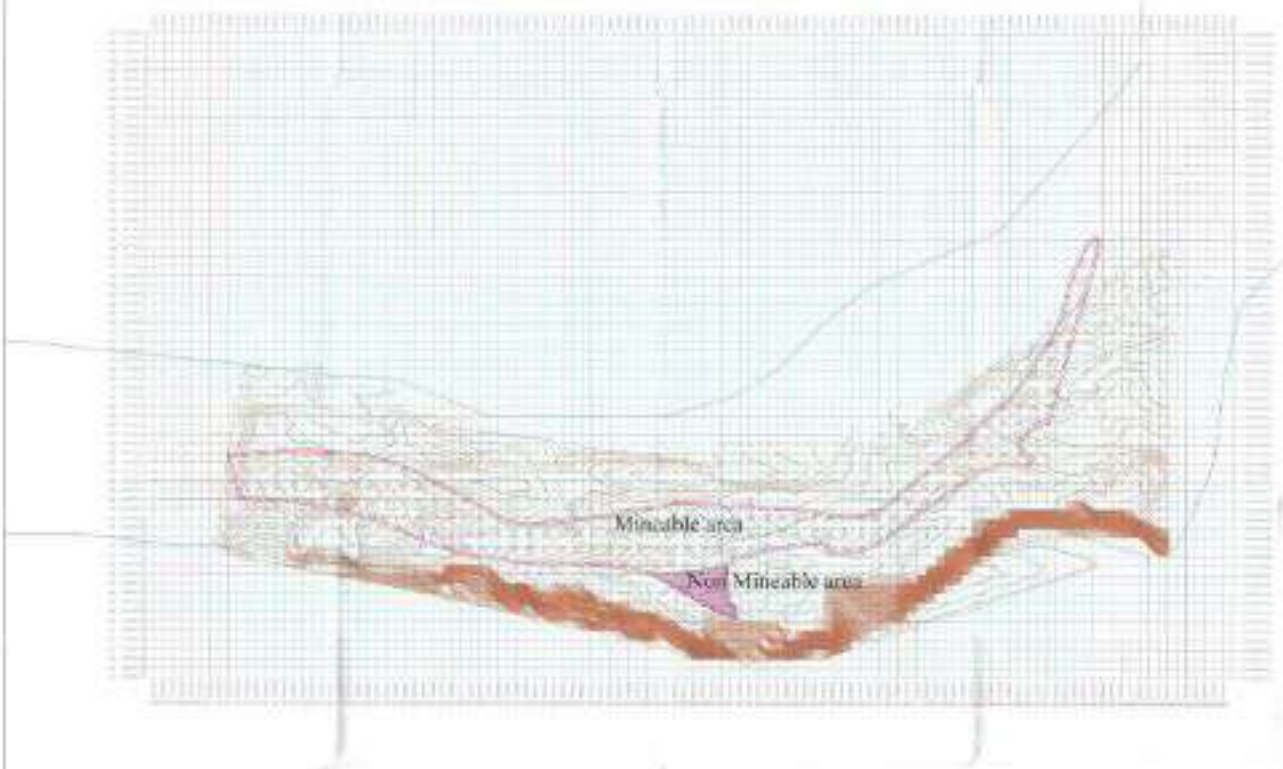
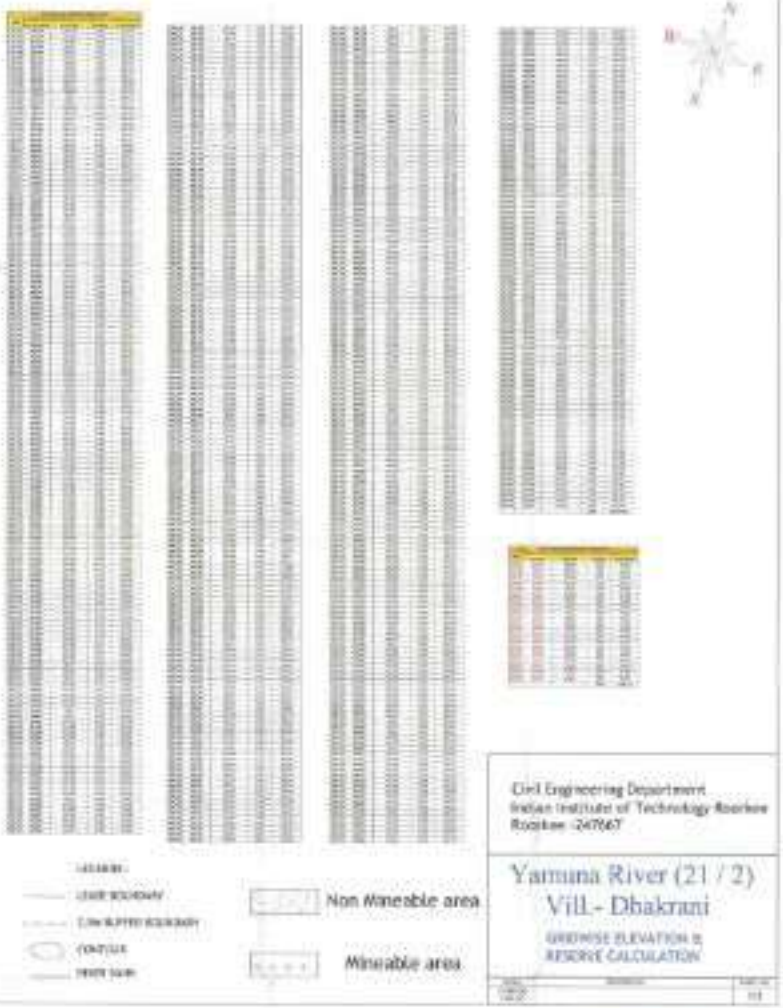
Yamuna River (Lot 21 / 2)





Replenishable Quantity	(Cubic Meter)
Replenishable Quantity in Mineable area	201543.937
Replenishable Quantity in Non Mineable area	9347.22
Total Replenishable Quantity	211353.4544

Mineable Area	33.628 ha
Non Mineable Area	1.312 ha

Civil Engineering Department
Indian Institute of Technology Roorkee
Roorkee -247667

Yamuna River (21 / 2)
Vill.- Dhakrani

GRIDWISE ELEVATION &
RESERVE CALCULATION

Annexure 3B

Mineable Area (Yamuna River Lot No 21/2, Village: Dhakrani)				
GRID	GROUND LEVEL (Pre Monsoon)	GROUND LEVEL (Post Monsoon)	Difference in Elevation	Reserve per grid (Cubic Meter)
X4,Y20	400.238	400.746	0.508	317.624
X4,Y21	400.818	401.326	0.508	317.642
X4,Y22	400.484	400.992	0.508	317.377
X4,Y23	400.090	400.597	0.507	317.065
X4,Y24	399.695	400.202	0.507	316.752
X5,Y20	401.318	401.827	0.509	318.038
X5,Y21	401.543	402.052	0.509	318.216
X5,Y22	401.441	401.95	0.509	318.135
X5,Y23	401.784	402.293	0.509	318.407
X5,Y24	401.806	402.315	0.509	318.424
X6,Y20	401.782	402.291	0.509	318.405
X6,Y21	401.694	402.203	0.509	318.336
X6,Y22	401.990	402.5	0.510	318.571
X6,Y23	402.244	402.754	0.510	318.772
X6,Y24	401.567	402.076	0.509	318.235
X7,Y20	401.945	402.455	0.510	318.535
X7,Y21	402.211	402.721	0.510	318.746
X7,Y22	402.401	402.911	0.510	318.896
X7,Y23	402.264	402.774	0.510	318.788
X7,Y24	401.767	402.276	0.509	318.393
X8,Y20	402.162	402.672	0.510	318.707
X8,Y21	402.381	402.891	0.510	318.880
X8,Y22	402.593	403.103	0.510	319.048
X8,Y23	402.415	402.925	0.510	318.907
X8,Y24	401.923	402.445	0.522	326.141
X9,Y20	402.375	402.897	0.522	326.507
X9,Y21	402.493	403.016	0.523	326.603
X9,Y22	402.612	403.135	0.523	326.700
X9,Y23	402.608	403.131	0.523	326.697
X9,Y24	402.085	402.615	0.530	331.311
X10,Y20	402.797	403.328	0.531	331.898
X10,Y21	402.908	403.439	0.531	331.989
X10,Y22	402.954	403.485	0.531	332.027
X10,Y23	402.131	402.661	0.530	331.349
X10,Y24	402.260	402.79	0.530	331.455
X11,Y20	403.187	403.719	0.532	332.220
X11,Y21	403.190	403.722	0.532	332.222
X11,Y22	403.372	403.904	0.532	332.372

BHUWAN JOSHI (RQP)
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X11,Y23	402.083	402.613	0.530	331.309
X11,Y24	401.788	402.338	0.550	343.580
X12,Y19	402.831	403.382	0.551	344.480
X12,Y20	402.922	403.473	0.551	344.558
X12,Y21	403.012	403.563	0.551	344.635
X12,Y22	402.959	403.51	0.551	344.589
X12,Y23	401.817	402.367	0.550	343.613
X12,Y24	401.993	402.543	0.550	343.764
X13,Y19	403.206	403.758	0.552	344.801
X13,Y20	403.287	403.839	0.552	344.870
X13,Y21	403.249	403.801	0.552	344.838
X13,Y22	401.848	402.414	0.566	352.714
X13,Y23	401.808	402.374	0.566	353.679
X13,Y24	402.230	402.797	0.567	354.118
X14,Y19	403.519	404.087	0.568	355.252
X14,Y20	403.644	404.213	0.569	355.363
X14,Y21	403.056	403.624	0.568	354.845
X14,Y22	402.194	402.761	0.567	354.087
X14,Y23	402.187	402.754	0.567	354.080
X14,Y24	402.477	403.052	0.575	359.381
X15,Y19	402.388	402.963	0.575	359.301
X15,Y20	403.449	404.025	0.576	360.248
X15,Y21	401.931	402.505	0.574	358.893
X15,Y22	402.549	403.124	0.575	359.445
X15,Y23	402.638	403.213	0.575	359.524
X15,Y24	402.025	402.615	0.590	368.989
X16,Y19	400.248	400.836	0.588	367.358
X16,Y20	403.192	403.784	0.592	370.060
X16,Y21	402.189	402.78	0.591	369.140
X16,Y22	402.622	403.213	0.591	369.537
X16,Y23	402.617	403.208	0.591	369.532
X16,Y24	401.018	401.607	0.589	368.065
X17,Y18	400.717	401.305	0.588	367.788
X17,Y19	400.537	401.125	0.588	367.623
X17,Y20	400.643	401.231	0.588	367.720
X17,Y21	401.390	401.979	0.589	368.406
X17,Y22	401.851	402.441	0.590	368.829
X17,Y23	402.373	402.964	0.591	369.308
X17,Y24	401.043	401.632	0.589	368.088
X18,Y18	401.154	401.743	0.589	368.189
X18,Y19	400.891	401.48	0.589	367.948
X18,Y20	400.930	401.519	0.589	367.984
X18,Y21	401.273	401.862	0.589	368.298

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X18,Y22	401.548	402.138	0.590	368.551
X18,Y23	401.967	402.557	0.590	368.935
X18,Y24	401.393	401.982	0.589	368.408
X19,Y19	402.253	402.844	0.591	369.198
X19,Y19	401.795	402.385	0.590	368.778
X19,Y20	401.313	401.902	0.589	368.335
X19,Y21	401.261	401.866	0.605	378.349
X19,Y22	401.411	402.041	0.630	393.590
X19,Y23	401.756	402.386	0.630	393.928
X19,Y24	401.464	402.094	0.630	393.642
X20,Y17	401.817	402.447	0.630	393.988
X20,Y18	401.813	402.443	0.630	393.984
X20,Y19	401.929	402.439	0.510	318.590
X20,Y20	401.708	402.217	0.509	318.414
X20,Y21	401.683	402.192	0.509	318.394
X20,Y22	401.648	402.157	0.509	318.367
X20,Y23	401.645	402.154	0.509	318.364
X21,Y17	401.875	402.385	0.510	318.547
X21,Y18	401.975	402.485	0.510	318.626
X21,Y19	402.067	402.577	0.510	318.699
X21,Y20	402.136	402.646	0.510	318.754
X21,Y21	402.072	402.582	0.510	318.703
X21,Y22	401.862	402.372	0.510	318.537
X21,Y23	401.859	402.369	0.510	318.535
X22,Y16	401.230	401.739	0.509	318.036
X22,Y17	402.247	402.757	0.510	318.842
X22,Y18	402.263	402.842	0.579	361.711
X22,Y19	402.355	402.934	0.579	361.794
X22,Y20	402.364	402.943	0.579	361.802
X22,Y21	402.070	402.648	0.578	361.537
X22,Y22	401.775	402.353	0.578	361.272
X23,Y16	401.261	401.838	0.577	360.810
X23,Y17	401.271	401.848	0.577	360.819
X23,Y18	402.944	403.576	0.632	395.093
X23,Y19	402.717	403.349	0.632	394.871
X23,Y20	402.088	402.719	0.631	394.254
X23,Y21	401.999	402.63	0.631	394.167
X23,Y22	401.705	402.335	0.630	393.878
X24,Y15	400.741	401.37	0.629	392.933
X24,Y16	400.865	401.494	0.629	393.055
X24,Y17	400.683	401.312	0.629	392.876
X24,Y18	402.262	402.893	0.631	394.424
X24,Y19	403.103	403.735	0.632	395.248

BHUWAN JOSHI (ROP)
[illegible]/ROP/DDN/01/2018

X24,Y20	401.994	402.625	0.631	394.162
X24,Y21	401.870	402.5	0.630	394.039
X25,Y15	400.741	401.37	0.629	392.933
X25,Y16	400.551	401.179	0.628	392.746
X25,Y17	401.356	401.986	0.630	393.536
X25,Y18	401.768	402.398	0.630	393.940
X25,Y19	403.329	403.962	0.633	395.471
X25,Y20	401.929	402.56	0.631	394.098
X25,Y21	401.467	402.097	0.630	393.645
X26,Y15	400.414	401.042	0.628	392.612
X26,Y16	401.319	401.949	0.630	393.500
X26,Y17	402.028	402.659	0.631	394.195
X26,Y18	401.806	402.436	0.630	393.977
X26,Y19	402.854	403.486	0.632	395.005
X26,Y20	402.077	402.708	0.631	394.243
X27,Y14	400.584	401.212	0.628	392.779
X27,Y15	401.182	401.811	0.629	393.365
X27,Y16	402.081	402.68	0.599	374.082
X27,Y17	402.228	402.827	0.599	374.218
X27,Y18	401.650	402.248	0.598	373.680
X27,Y19	403.507	404.108	0.601	375.408
X27,Y20	402.257	402.856	0.599	374.245
X28,Y14	401.434	402.032	0.598	373.480
X28,Y15	401.919	402.517	0.598	373.930
X28,Y16	402.558	403.157	0.599	374.525
X28,Y17	402.214	402.813	0.599	374.205
X28,Y18	401.143	401.74	0.597	373.208
X28,Y19	402.020	402.618	0.598	374.024
X29,Y14	401.906	402.504	0.598	373.918
X29,Y15	402.620	403.219	0.599	374.582
X29,Y16	402.512	403.111	0.599	374.482
X29,Y17	402.184	402.783	0.599	374.177
X29,Y18	401.609	402.207	0.598	373.642
X29,Y19	401.950	402.548	0.598	373.959
X30,Y14	402.681	403.28	0.599	374.639
X30,Y15	402.573	403.172	0.599	374.539
X30,Y16	402.465	403.064	0.599	374.438
X30,Y17	402.358	402.957	0.599	374.339
X30,Y18	401.770	402.368	0.598	373.792
X30,Y19	402.140	402.739	0.599	374.136
X31,Y14	402.635	403.234	0.599	374.596
X31,Y15	402.527	403.126	0.599	374.496
X31,Y16	402.419	403.018	0.599	374.396

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X31,Y17	402.311	402.91	0.599	374.295
X31,Y18	402.160	402.759	0.599	374.155
X32,Y14	402.608	403.28	0.672	420.008
X32,Y15	402.526	403.198	0.672	419.923
X32,Y16	402.445	403.117	0.672	419.838
X32,Y17	402.363	403.035	0.672	419.753
X33,Y14	402.921	403.594	0.673	420.335
X33,Y15	402.697	403.369	0.672	420.101
X33,Y16	402.623	403.295	0.672	420.024
X33,Y17	402.841	403.392	0.551	344.489
X34,Y13	402.822	403.373	0.551	344.472
X34,Y14	403.237	403.789	0.552	344.828
X34,Y15	403.004	403.555	0.551	344.628
X34,Y16	403.013	403.564	0.551	344.636
X34,Y17	403.136	403.688	0.552	344.741
X35,Y13	403.337	403.889	0.552	344.913
X35,Y14	403.275	403.827	0.552	344.860
X35,Y15	403.297	403.849	0.552	344.879
X35,Y16	403.318	403.87	0.552	344.897
X35,Y17	403.352	403.904	0.552	344.926
X36,Y13	403.547	404.099	0.552	345.092
X36,Y14	403.528	404.121	0.593	370.369
X36,Y15	403.549	404.142	0.593	370.388
X36,Y16	403.571	404.164	0.593	370.408
X36,Y17	403.592	404.185	0.593	370.427
X37,Y13	403.851	404.444	0.593	370.665
X37,Y14	403.753	404.467	0.714	446.523
X37,Y15	403.777	404.491	0.714	446.550
X37,Y16	403.664	404.378	0.714	446.425
X37,Y17	403.741	404.455	0.714	446.510
X38,Y13	404.806	405.522	0.716	447.688
X38,Y14	403.589	404.403	0.714	446.453
X38,Y15	403.661	404.375	0.714	446.422
X38,Y16	403.907	404.622	0.715	446.695
X38,Y17	403.954	404.669	0.715	446.746
X39,Y13	405.020	405.737	0.717	447.926
X39,Y14	404.208	404.923	0.715	447.027
X39,Y15	404.174	404.849	0.675	421.642
X39,Y16	404.231	404.861	0.630	393.820
X39,Y17	404.033	404.756	0.723	451.902
X40,Y13	405.104	405.829	0.725	453.100
X40,Y14	404.423	405.147	0.724	452.339
X40,Y15	404.052	404.775	0.723	451.923

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X40,Y16	403.536	404.258	0.722	451.346
X40,Y17	402.708	403.429	0.721	450.420
X41,Y13	405.373	406.098	0.725	453.400
X41,Y14	404.458	405.182	0.724	452.378
X41,Y15	403.872	404.595	0.723	451.722
X41,Y16	403.339	404.061	0.722	451.126
X41,Y17	403.518	404.208	0.690	431.080
X42,Y13	405.751	406.445	0.694	433.465
X42,Y14	404.663	405.355	0.692	432.303
X42,Y15	403.960	404.65	0.690	431.551
X42,Y16	403.222	403.911	0.689	430.763
X42,Y17	403.657	404.331	0.674	421.103
X43,Y13	406.091	406.769	0.678	423.642
X43,Y14	404.754	405.43	0.676	422.247
X43,Y15	403.886	404.56	0.674	421.341
X43,Y16	403.430	404.103	0.673	420.865
X43,Y17	403.904	404.578	0.674	421.360
X44,Y13	406.291	406.969	0.678	423.850
X44,Y14	404.718	405.394	0.676	422.210
X44,Y15	403.882	404.556	0.674	421.337
X44,Y16	402.967	403.64	0.673	420.383
X44,Y17	404.154	404.829	0.675	421.621
X44,Y18	404.628	405.303	0.675	422.115
X45,Y13	406.433	407.111	0.678	423.998
X45,Y14	405.111	405.787	0.676	422.619
X45,Y15	404.379	405.054	0.675	421.856
X45,Y16	404.275	404.942	0.667	416.677
X45,Y17	404.556	405.223	0.667	416.966
X45,Y18	404.779	405.447	0.668	417.197
X46,Y13	405.703	406.372	0.669	418.149
X46,Y14	404.891	405.559	0.668	417.312
X46,Y15	404.227	404.894	0.667	416.628
X46,Y16	404.398	405.065	0.667	416.804
X46,Y17	404.632	405.299	0.667	417.045
X46,Y18	404.868	405.536	0.668	417.288
X47,Y12	405.575	406.244	0.669	418.017
X47,Y13	405.100	405.768	0.668	417.527
X47,Y14	404.596	405.263	0.667	417.008
X47,Y15	404.249	404.916	0.667	416.650
X47,Y16	404.487	405.154	0.667	416.895
X47,Y17	404.724	405.391	0.667	417.139
X47,Y18	404.975	405.643	0.668	417.399
X48,Y12	405.597	406.321	0.724	452.277

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X48,Y13	404.906	405.628	0.722	451.505
X48,Y14	404.109	404.83	0.721	450.617
X48,Y15	404.398	405.006	0.608	379.937
X48,Y16	404.638	405.246	0.608	380.162
X48,Y17	404.874	405.483	0.609	380.385
X48,Y18	405.128	405.737	0.609	380.623
X49,Y12	405.591	406.201	0.610	381.058
X49,Y13	404.490	405.098	0.608	380.023
X49,Y14	404.163	404.771	0.608	379.717
X49,Y15	404.455	405.063	0.608	379.991
X49,Y16	404.730	405.338	0.608	380.249
X49,Y17	404.999	405.575	0.576	360.392
X49,Y18	405.217	405.794	0.577	360.387
X50,Y12	405.539	406.116	0.577	360.673
X50,Y13	405.061	405.637	0.576	360.247
X50,Y14	403.926	404.501	0.575	359.238
X50,Y15	405.169	405.746	0.577	360.344
X50,Y16	404.754	405.33	0.576	359.975
X50,Y17	405.099	405.675	0.576	360.281
X50,Y18	405.249	405.945	0.696	435.284
X50,Y19	404.891	405.587	0.696	434.900
X51,Y13	405.102	405.798	0.696	435.126
X51,Y14	404.827	405.523	0.696	434.831
X51,Y15	405.068	405.764	0.696	435.090
X51,Y16	404.999	405.695	0.696	435.016
X51,Y17	405.112	405.808	0.696	435.137
X51,Y18	405.039	405.735	0.696	435.059
X51,Y19	404.625	405.32	0.695	434.614
X52,Y13	405.065	405.806	0.741	463.034
X52,Y14	404.988	405.729	0.741	462.946
X52,Y15	405.105	405.846	0.741	463.080
X52,Y16	405.233	405.974	0.741	463.226
X52,Y17	405.230	405.971	0.741	463.222
X52,Y18	404.995	405.736	0.741	462.954
X52,Y19	405.051	405.792	0.741	463.018
X53,Y13	405.119	405.86	0.741	463.096
X53,Y14	405.256	405.997	0.741	463.252
X53,Y15	405.384	406.125	0.741	463.398
X53,Y16	405.511	406.253	0.742	463.544
X53,Y17	405.392	406.133	0.741	463.407
X53,Y18	405.123	405.864	0.741	463.100
X53,Y19	405.424	406.166	0.742	463.445
X54,Y13	404.949	405.625	0.676	422.265

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X54,Y14	405.485	406.162	0.677	422.824
X54,Y15	405.727	406.404	0.677	423.076
X54,Y16	405.723	406.4	0.677	423.072
X54,Y17	405.539	406.216	0.677	422.880
X54,Y18	405.399	406.075	0.676	422.733
X54,Y19	405.526	406.203	0.677	422.867
X55,Y13	405.079	405.755	0.676	422.400
X55,Y14	405.109	405.785	0.676	422.432
X55,Y15	406.006	406.683	0.677	423.366
X55,Y16	405.862	406.539	0.677	423.216
X55,Y17	405.614	406.291	0.677	422.958
X55,Y18	405.609	406.286	0.677	422.953
X55,Y19	405.563	406.24	0.677	422.905
X56,Y13	405.320	405.834	0.514	321.024
X56,Y14	404.951	405.464	0.513	320.741
X56,Y15	406.016	406.531	0.515	321.575
X56,Y16	405.952	406.466	0.514	321.524
X56,Y17	405.665	406.179	0.514	321.297
X56,Y18	405.983	406.497	0.514	321.548
X56,Y19	405.767	406.281	0.514	321.378
X57,Y14	405.766	406.28	0.514	321.377
X57,Y15	406.213	406.728	0.515	321.731
X57,Y16	406.047	406.562	0.515	321.600
X57,Y17	405.655	406.169	0.514	321.289
X57,Y18	405.933	406.447	0.514	321.509
X57,Y19	406.000	406.514	0.514	321.562
X58,Y14	405.978	406.492	0.514	321.545
X58,Y15	406.268	406.783	0.515	321.775
X58,Y16	406.263	406.778	0.515	321.771
X58,Y17	405.908	406.422	0.514	321.489
X58,Y18	406.206	406.721	0.515	321.726
X58,Y19	406.087	406.602	0.515	321.632
X59,Y14	406.033	406.548	0.515	321.589
X59,Y15	406.282	406.838	0.556	347.246
X59,Y16	406.438	406.994	0.556	347.379
X59,Y17	406.120	406.675	0.555	347.106
X59,Y18	406.440	406.996	0.556	347.380
X59,Y19	406.277	406.833	0.556	347.241
X60,Y14	406.048	406.603	0.555	347.045
X60,Y15	406.337	406.893	0.556	347.293
X60,Y16	406.577	407.133	0.556	347.497
X60,Y17	406.372	406.928	0.556	347.322
X60,Y18	406.714	407.27	0.556	347.614

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X60,Y19	406.508	407.064	0.556	347.438
X61,Y15	406.352	406.948	0.596	372.774
X61,Y16	406.594	407.191	0.597	372.996
X61,Y17	406.580	407.177	0.597	372.983
X61,Y18	406.948	407.545	0.597	373.321
X61,Y19	406.698	407.295	0.597	373.092
X62,Y15	406.407	407.004	0.597	372.825
X62,Y16	406.653	407.25	0.597	373.050
X62,Y17	406.827	407.424	0.597	373.210
X62,Y18	407.196	407.794	0.598	373.549
X63,Y15	406.503	407.1	0.597	372.913
X63,Y16	406.751	407.348	0.597	373.140
X63,Y17	406.966	407.563	0.597	373.337
X63,Y18	407.170	407.768	0.598	373.525
X64,Y15	406.659	407.238	0.579	361.567
X64,Y16	406.906	407.485	0.579	361.786
X64,Y17	407.122	407.701	0.579	361.978
X64,Y18	407.317	407.896	0.579	362.151
X65,Y15	406.795	407.374	0.579	361.688
X65,Y16	407.043	407.622	0.579	361.908
X65,Y17	407.260	407.839	0.579	362.101
X65,Y18	407.444	408.024	0.580	362.265
X66,Y15	406.930	407.509	0.579	361.808
X66,Y16	407.179	407.758	0.579	362.029
X66,Y17	407.413	407.993	0.580	362.238
X66,Y18	407.572	408.152	0.580	362.379
X67,Y15	407.065	407.644	0.579	361.928
X67,Y16	407.318	407.897	0.579	362.152
X67,Y17	407.583	408.146	0.563	352.040
X67,Y18	407.717	408.28	0.563	352.156
X68,Y14	406.880	407.442	0.562	351.433
X68,Y15	407.102	407.665	0.563	351.625
X68,Y16	407.485	408.048	0.563	351.956
X68,Y17	407.711	408.274	0.563	352.151
X68,Y18	407.844	408.408	0.564	352.266
X69,Y14	406.973	407.523	0.550	343.862
X69,Y15	407.243	407.794	0.551	344.091
X69,Y16	407.529	408.08	0.551	344.332
X69,Y17	407.744	408.295	0.551	344.513
X69,Y18	407.837	408.388	0.551	344.592
X70,Y14	406.986	407.536	0.550	343.873
X70,Y15	407.276	407.827	0.551	344.118
X70,Y16	407.600	408.151	0.551	344.392

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X70,Y17	407.777	408.328	0.551	344.541
X70,Y18	407.737	408.325	0.588	367.636
X71,Y15	407.094	407.681	0.587	367.057
X71,Y16	407.594	408.182	0.588	367.508
X71,Y17	407.787	408.375	0.588	367.681
X71,Y18	407.711	408.299	0.588	367.613
X72,Y15	406.978	407.565	0.587	366.952
X72,Y16	407.649	408.237	0.588	367.557
X72,Y17	407.746	408.334	0.588	367.644
X72,Y18	407.854	408.442	0.588	367.742
X73,Y15	406.926	407.464	0.538	336.301
X73,Y16	407.763	408.302	0.539	336.993
X73,Y17	407.918	408.457	0.539	337.121
X73,Y18	408.046	408.586	0.540	337.227
X74,Y16	407.809	408.348	0.539	337.031
X74,Y17	407.939	408.478	0.539	337.138
X74,Y18	408.114	408.654	0.540	337.284
X74,Y19	407.900	408.439	0.539	337.106
X75,Y17	407.683	408.222	0.539	336.927
X75,Y18	408.052	408.592	0.540	337.232
X75,Y19	407.743	408.364	0.621	388.090
X75,Y20	407.478	408.099	0.621	387.838
X76,Y18	407.756	408.377	0.621	388.102
X76,Y19	407.842	408.463	0.621	388.184
X76,Y20	407.395	408.015	0.620	387.758
X76,Y21	407.187	407.807	0.620	387.560
X77,Y19	407.929	408.55	0.621	388.266
X77,Y20	407.585	408.206	0.621	387.940
X77,Y21	407.447	408.067	0.620	387.807
X77,Y22	407.465	408.11	0.645	403.152
X78,Y19	407.872	408.518	0.646	403.555
X78,Y20	407.817	408.463	0.646	403.501
X78,Y21	407.683	408.328	0.645	403.368
X78,Y22	407.564	408.209	0.645	403.250
X78,Y23	407.319	407.964	0.645	403.008
X79,Y20	408.022	408.668	0.646	403.704
X79,Y21	407.909	408.555	0.646	403.592
X79,Y22	407.657	408.302	0.645	403.342
X79,Y23	407.367	408.012	0.645	403.056
X79,Y24	407.053	407.673	0.620	387.433
X80,Y20	408.057	408.678	0.621	388.388
X80,Y21	408.115	408.737	0.622	388.444
X80,Y22	407.758	408.379	0.621	388.104

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X80,Y23	407.509	408.13	0.621	387.867
X80,Y24	406.653	407.272	0.619	387.052
X81,Y21	408.029	408.65	0.621	388.361
X81,Y22	407.828	408.449	0.621	388.170
X81,Y23	407.336	407.956	0.620	387.702
X81,Y24	406.621	407.24	0.619	387.021
X81,Y25	406.215	406.834	0.619	386.636
X82,Y22	407.848	408.457	0.609	380.519
X82,Y23	407.260	407.868	0.608	379.971
X82,Y24	406.580	407.187	0.607	379.336
X82,Y25	406.375	406.982	0.607	379.145
X82,Y26	407.049	407.657	0.608	379.774
X83,Y22	407.700	408.309	0.609	380.382
X83,Y23	407.255	407.863	0.608	379.966
X83,Y24	406.549	407.156	0.607	379.307
X83,Y25	406.806	407.413	0.607	379.547
X83,Y26	407.647	408.256	0.609	380.332
X83,Y27	407.202	407.81	0.608	379.917
X84,Y23	406.974	407.582	0.608	379.704
X84,Y24	406.867	407.474	0.607	379.604
X84,Y25	407.198	407.806	0.608	379.913
X84,Y26	408.137	408.746	0.609	380.789
X84,Y27	408.082	408.691	0.609	380.737
X84,Y28	408.323	408.933	0.610	380.963
X85,Y23	407.207	407.815	0.608	379.921
X85,Y24	406.961	407.569	0.608	379.692
X85,Y25	407.571	408.179	0.608	380.260
X85,Y26	407.943	408.552	0.609	380.608
X85,Y27	408.227	408.836	0.609	380.873
X85,Y28	408.442	409.052	0.610	381.074
X85,Y29	408.903	409.513	0.610	381.503
X86,Y24	407.225	407.833	0.608	379.938
X86,Y25	407.762	408.371	0.609	380.439
X86,Y26	408.122	408.731	0.609	380.775
X86,Y27	408.345	408.955	0.610	380.983
X86,Y28	408.562	409.172	0.610	381.186
X86,Y29	408.226	408.835	0.609	380.872
X86,Y30	409.103	409.714	0.611	381.691
X87,Y24	407.347	407.955	0.608	380.052
X87,Y25	407.980	408.589	0.609	380.642
X87,Y26	408.249	408.858	0.609	380.893
X87,Y27	408.469	409.075	0.606	378.538
X87,Y28	408.686	409.292	0.606	378.739

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X87,Y29	408.412	409.018	0.606	378.486
X87,Y30	408.817	409.423	0.606	378.861
X87,Y31	410.378	410.986	0.608	380.307
X88,Y24	407.808	408.417	0.609	380.482
X88,Y25	408.335	408.945	0.610	380.974
X88,Y26	408.390	408.996	0.606	378.465
X88,Y27	409.075	409.682	0.607	379.100
X88,Y28	408.805	409.411	0.606	378.849
X88,Y29	408.595	409.201	0.606	378.655
X88,Y30	408.408	409.014	0.606	378.482
X88,Y31	410.752	411.361	0.609	380.654
X88,Y32	410.793	411.402	0.609	380.692
X89,Y28	409.190	409.797	0.607	379.207
X89,Y29	408.744	409.35	0.606	378.793
X89,Y30	408.649	409.255	0.606	378.705
X89,Y31	409.216	409.823	0.607	379.231
X89,Y32	410.611	411.22	0.609	380.523
X89,Y33	410.260	410.868	0.608	380.198
X90,Y28	409.328	409.935	0.607	379.334
X90,Y29	408.885	409.491	0.606	378.923
X90,Y30	408.980	409.582	0.602	376.448
X90,Y31	409.546	410.149	0.603	376.969
X90,Y32	410.113	410.717	0.604	377.491
X90,Y33	410.221	410.825	0.604	377.590
X90,Y34	409.140	409.743	0.603	376.596
X90,Y35	409.007	409.609	0.602	376.473
X91,Y28	409.545	410.148	0.603	376.968
X91,Y29	409.038	409.64	0.602	376.501
X91,Y30	409.305	409.908	0.603	376.747
X91,Y31	409.790	410.394	0.604	377.194
X91,Y32	410.108	410.712	0.604	377.486
X91,Y33	410.419	410.999	0.580	362.338
X91,Y34	409.826	410.405	0.579	361.814
X91,Y35	409.270	409.848	0.578	361.323
X91,Y36	409.348	409.926	0.578	361.392
X91,Y37	408.123	408.699	0.576	360.310
X92,Y31	409.609	410.188	0.579	361.623
X92,Y32	411.019	411.6	0.581	362.868
X92,Y33	410.615	411.195	0.580	362.510
X92,Y34	410.401	410.983	0.580	362.322
X92,Y35	409.451	410.029	0.578	361.483
X92,Y36	409.379	409.957	0.578	361.419
X92,Y37	409.637	410.216	0.579	361.647

BHUWAN JOSHI (ROP)
GS/ROP/DDN/01/2016

X92,Y38	408.277	408.85	0.573	357.888
X92,Y39	408.063	408.635	0.572	357.700
X93,Y36	409.582	410.156	0.574	359.031
X93,Y37	410.010	410.585	0.575	359.407
X93,Y38	409.493	410.067	0.574	358.953
X93,Y39	408.675	409.248	0.573	358.236
X93,Y40	408.142	408.735	0.593	370.560
X93,Y41	408.142	408.735	0.593	370.560
X93,Y42	408.142	408.735	0.593	370.560
X94,Y40	408.910	409.504	0.594	371.257
X94,Y41	408.744	409.338	0.594	371.107
X94,Y42	408.241	408.834	0.593	370.650
X94,Y43	408.241	408.834	0.593	370.650
X94,Y44	410.452	411.048	0.596	372.657
X94,Y45	410.635	411.232	0.597	372.824
X94,Y46	410.761	411.358	0.597	372.938
X95,Y42	408.834	409.428	0.594	371.188
X95,Y43	408.340	408.933	0.593	370.740
X95,Y44	410.705	411.302	0.597	372.887
X95,Y45	410.894	411.417	0.523	326.707
X95,Y46	411.096	411.619	0.523	326.868
X95,Y47	410.309	410.831	0.522	326.242
X95,Y48	410.512	411.034	0.522	326.403
X96,Y46	410.292	410.814	0.522	326.228
X96,Y47	410.517	411.039	0.522	326.407
			0.602	201543.937

NON-Mineable Area(Yamuna River Lot No 21/2, Village: Dhakrani)				
GRID	GROUND LEVEL (Pre Monsoon)	GROUND LEVEL (Post Monsoon)	Difference in Elevation	Reserve per grid (Cubic Meter)
X50,Y11	405.722	406.236	0.514	321.528
X51,Y11	405.713	406.252	0.539	336.775
X51,Y12	405.511	406.025	0.514	321.361
X52,Y10	406.396	406.936	0.540	337.342
X52,Y11	405.732	406.271	0.539	336.791
X52,Y12	405.507	406.05	0.543	339.145
X53,Y9	406.763	407.303	0.540	337.646
X53,Y10	406.279	406.819	0.540	337.245
X53,Y11	405.751	406.29	0.539	336.806
X53,Y12	405.583	406.122	0.539	336.667
X54,Y9	406.760	407.3	0.540	337.644
X54,Y10	406.414	406.954	0.540	337.357

BHUWAN JOSHI (RQP)

X54,Y11	405.943	406.474	0.531	331.878
X54,Y12	405.550	406.08	0.530	331.556
X55,Y8	407.435	407.976	0.541	338.204
X55,Y9	406.779	407.319	0.540	337.659
X55,Y10	406.547	407.087	0.540	337.467
X55,Y11	406.510	407.034	0.524	327.247
X55,Y12	405.694	406.217	0.523	326.590
X56,Y8	407.345	407.898	0.553	345.787
X56,Y9	406.941	407.453	0.512	319.944
X56,Y10	406.419	406.93	0.511	319.534
X56,Y11	406.706	407.258	0.552	345.245
X56,Y12	405.765	406.3	0.535	334.275
X57,Y8	407.284	407.821	0.537	335.527
			0.534	**8347.219**

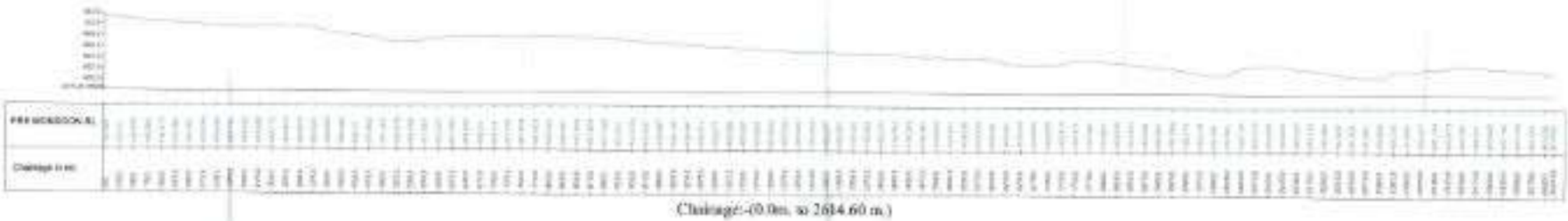
Total Replenishment Quantity

Replenishable Quantity	(Cubic Meter)
Replenishable Quantity in Minable area	201543.937
Replenishable Quantity in Non Minable area	8347.22
Total Replenishable Quantity	211353

BHUWAN JOSHI (RQP)
भू0 ख0/RQP/DDN/01/2019

Annexure-A

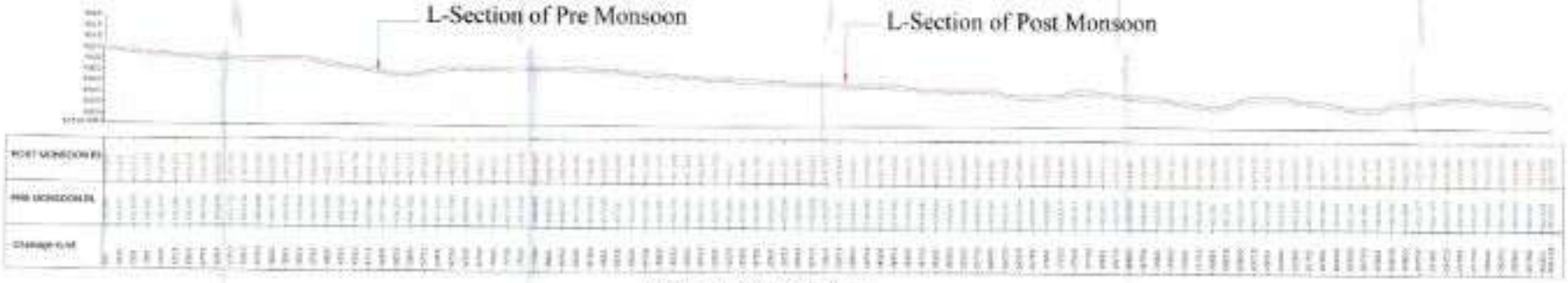
L-Section of Pre Monsoon



Chainage:-(0.0m. to 2614.60 m.)

L-Section of Post Monsoon

Chainage:-(0.0m. to 2614.60 m.)



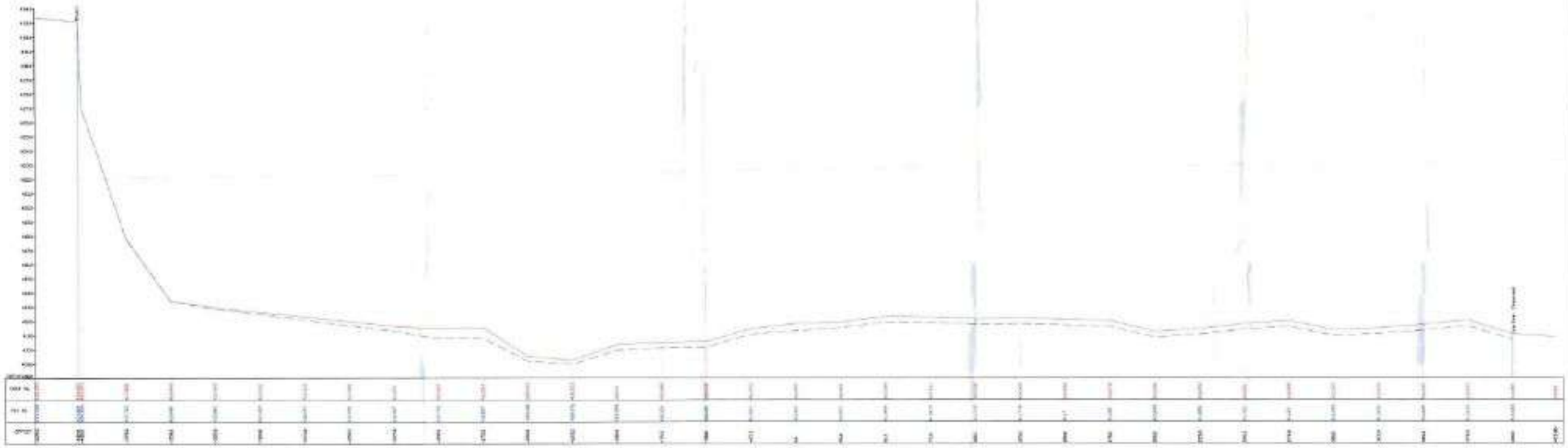
Chainage -(0.0m. to 2614.60 m.)

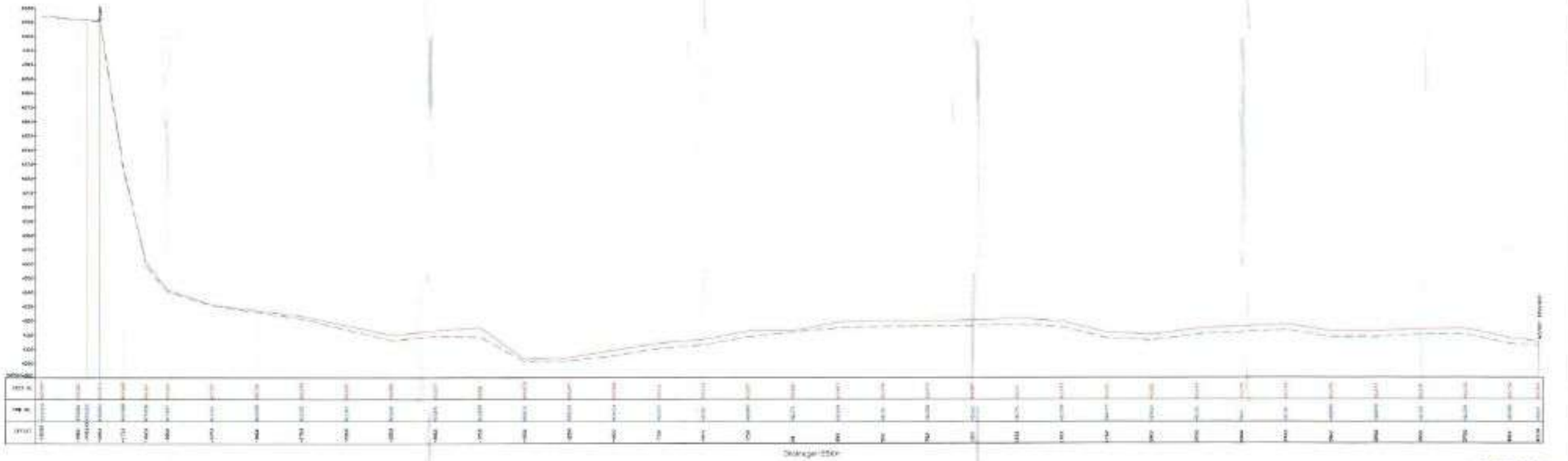
LEGEND :-

DESCRIPTION	SYMBOL				
Post Monsoon		L-Section of the Dhakrani-Yamuna River (Lot no. 21/2) in Pre and Post monsoon at Chainage from (0.0 m. to 2614.64 m.)	Civil Engineering Department Indian Institute of Technology Roorkee Roorkee -247667	SCALE	Annexure-A
Pre Monsoon				1:3000 (H) 1:300 (V)	SHEET NO. 1 of 1

Annexure 41

Annexure 83





LEGEND :-

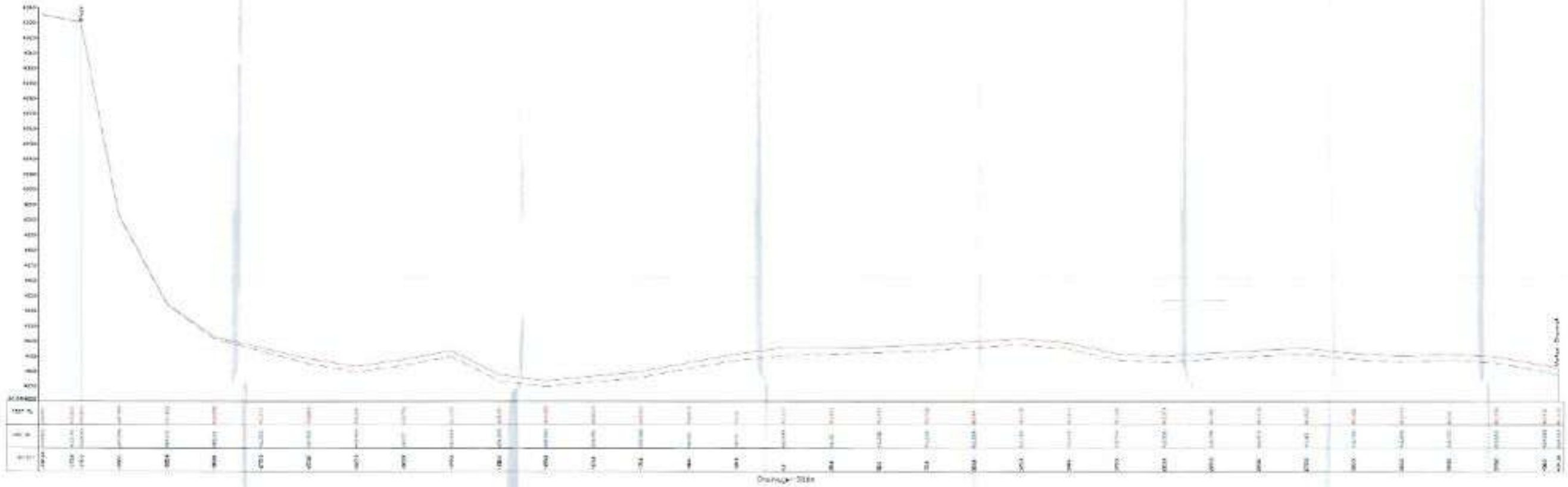
DESCRIPTION	SYMBOL
Post Monsoon	
Pre Monsoon	

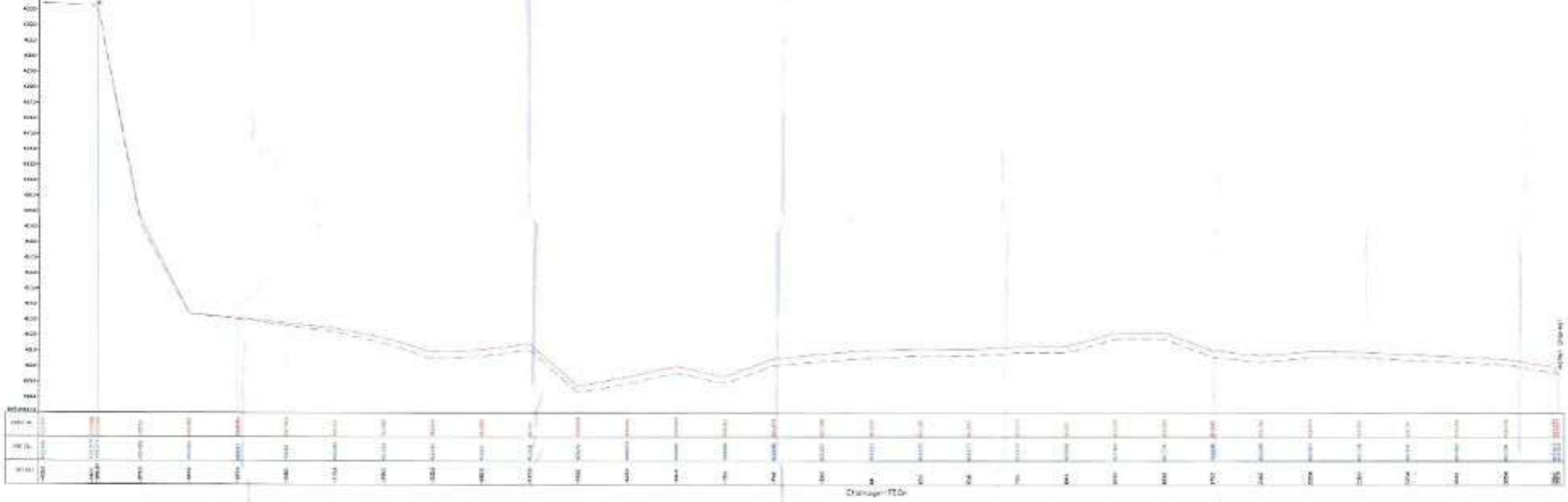
X-Section of the Dhakrani-Yamuna River (Lot no. 21/2) in Pre and Post monsoon at Chainage from (0.0 m. to 2614.64 m.)

Civil Engineering Department
Indian Institute of Technology Roorkee
Roorkee -247667

SCALE	Annexure[ ]
1:800 (H)	SHEET NO.
1:100 (V)	1 of 46

Annexure-B2





LEGEND :-

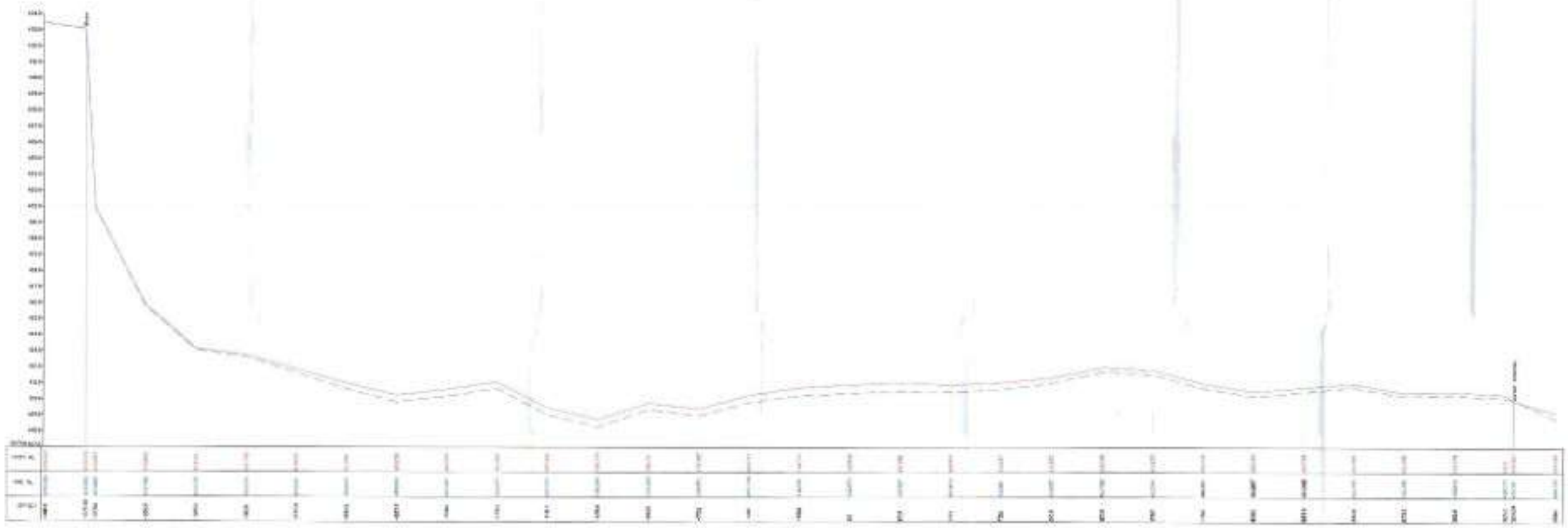
DESCRIPTION	SYMBOL
Post Monsoon	———
Pre Monsoon	- - - - - - -

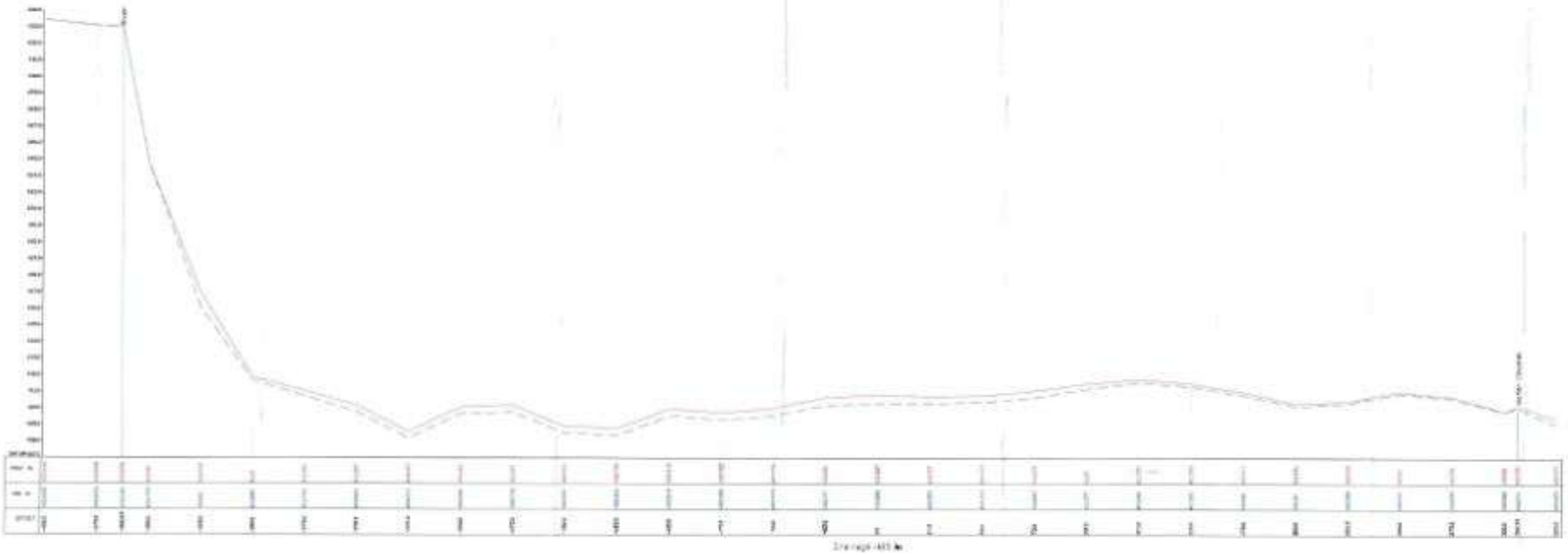
X-Section of the Dhakrani-Yamuna River (Lot no. 21/2) in Pre and Post monsoon at Chainage from (0.0 m. to 2614.64 m.)

Civil Engineering Department
Indian Institute of Technology Roorkee
Roorkee -247667

SCALE	Annexure-B2
1:800 (H)	SHEET NO.
1:100 (V)	2 of 46

Annexure-B3





LEGEND :-

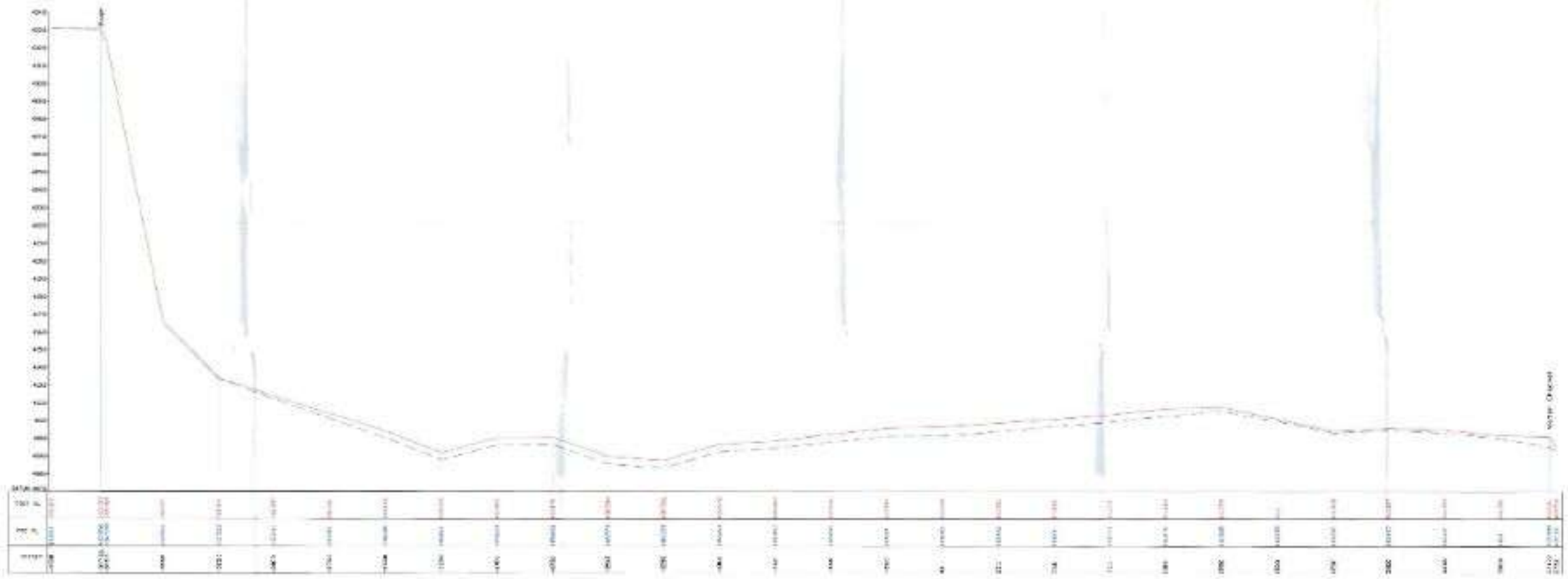
DESCRIPTION	SYMBOL
Post Monsoon	
Pre Monsoon	

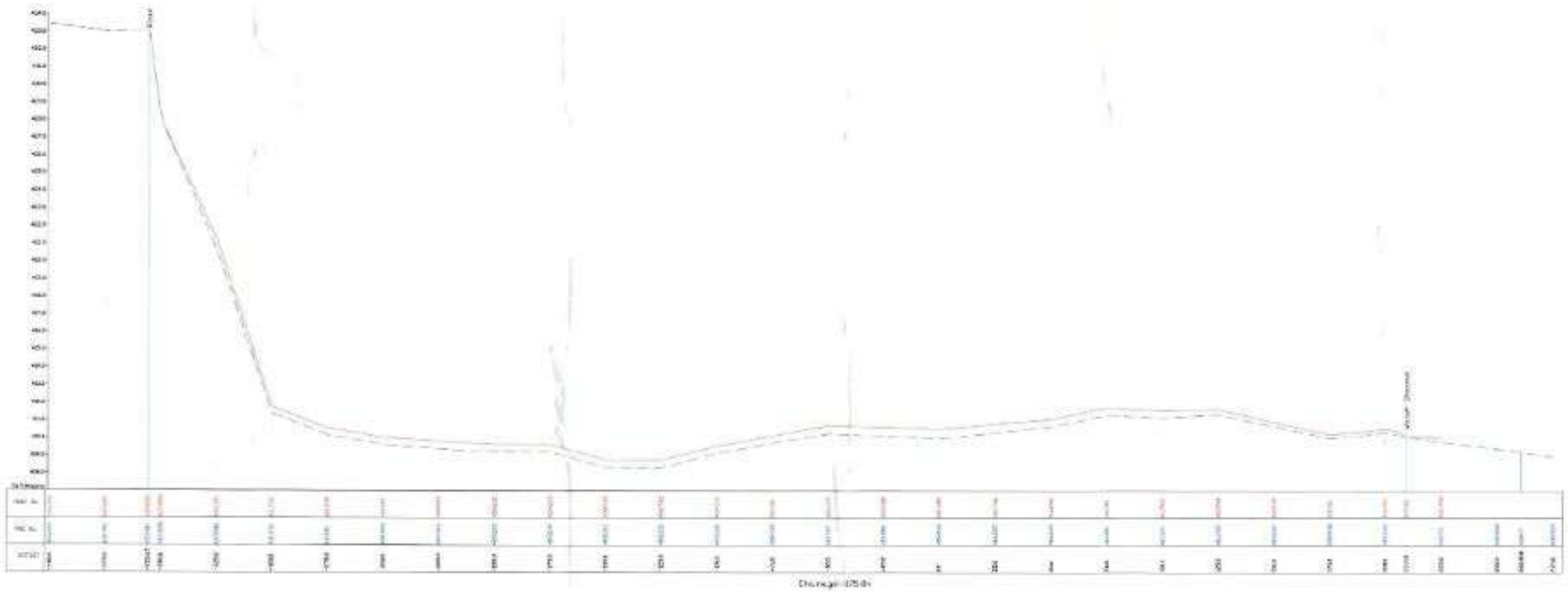
X-Section of the Dhakrani-Yamuna River (Lot no. 21/2) in Pre and Post monsoon at Chainage from (0.0 m. to 2614.64 m.)

Civil Engineering Department
Indian Institute of Technology Roorkee
Roorkee -247667

SCALE	Annexure-B3
1:800 (H) 1:100 (V)	SHEET NO.
	3 of 46

Annexure-B4

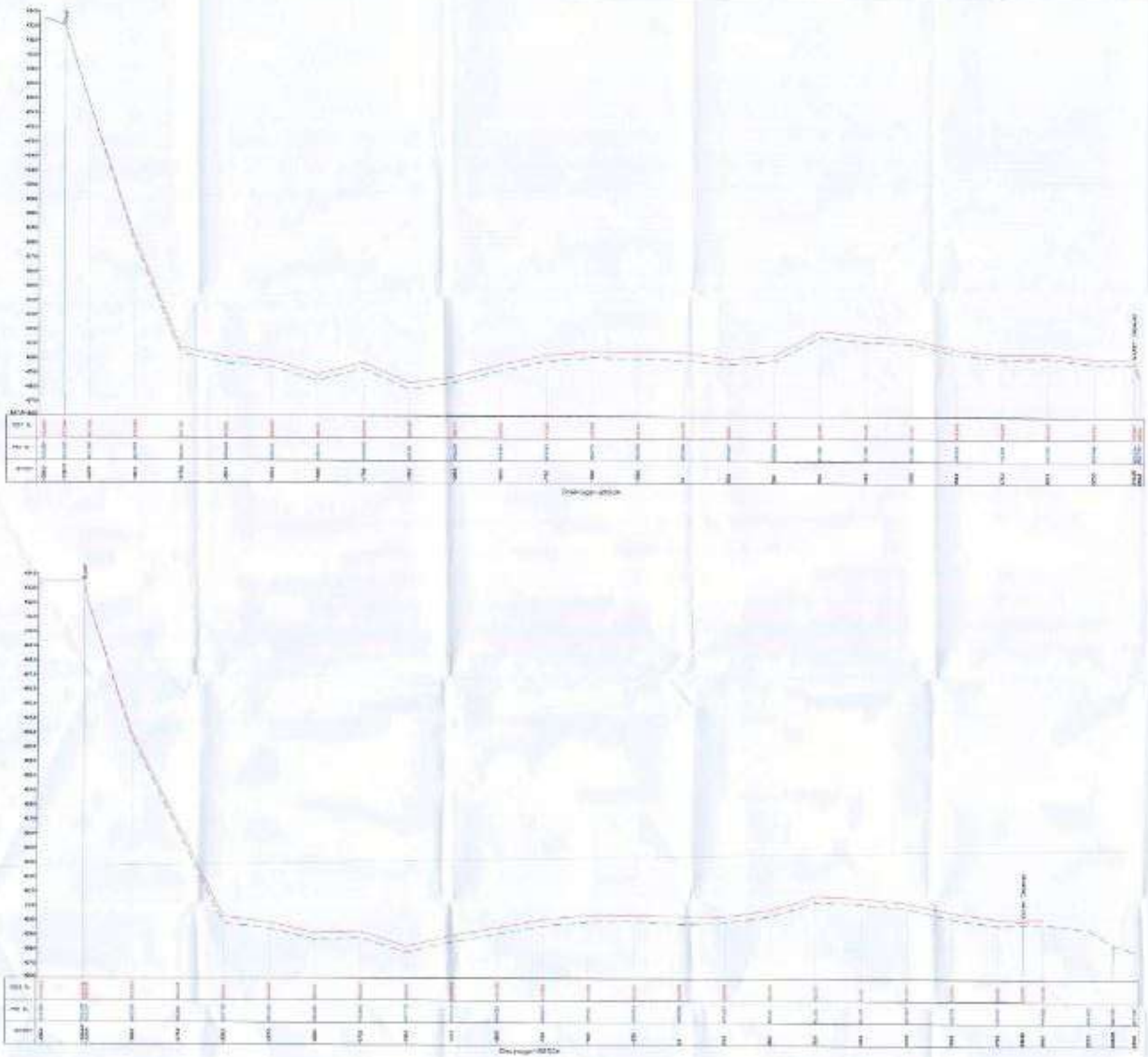




LEGEND :-

DESCRIPTION	SYMBOL				
Post Monsoon	———	X-Section of the Dhakrani-Yamuna River (Lot no. 21/2) in Pre and Post monsoon at Chainage from (0.0 m. to 2614.64 m.)	Civil Engineering Department Indian Institute of Technology Roorkee Roorkee -247667	SCALE	Annexure-B4
Pre Monsoon	- - - - - -			1:800 (H) 1:100 (V)	SHEET NO. 4 of 46

Annexure-B5



LEGEND :-

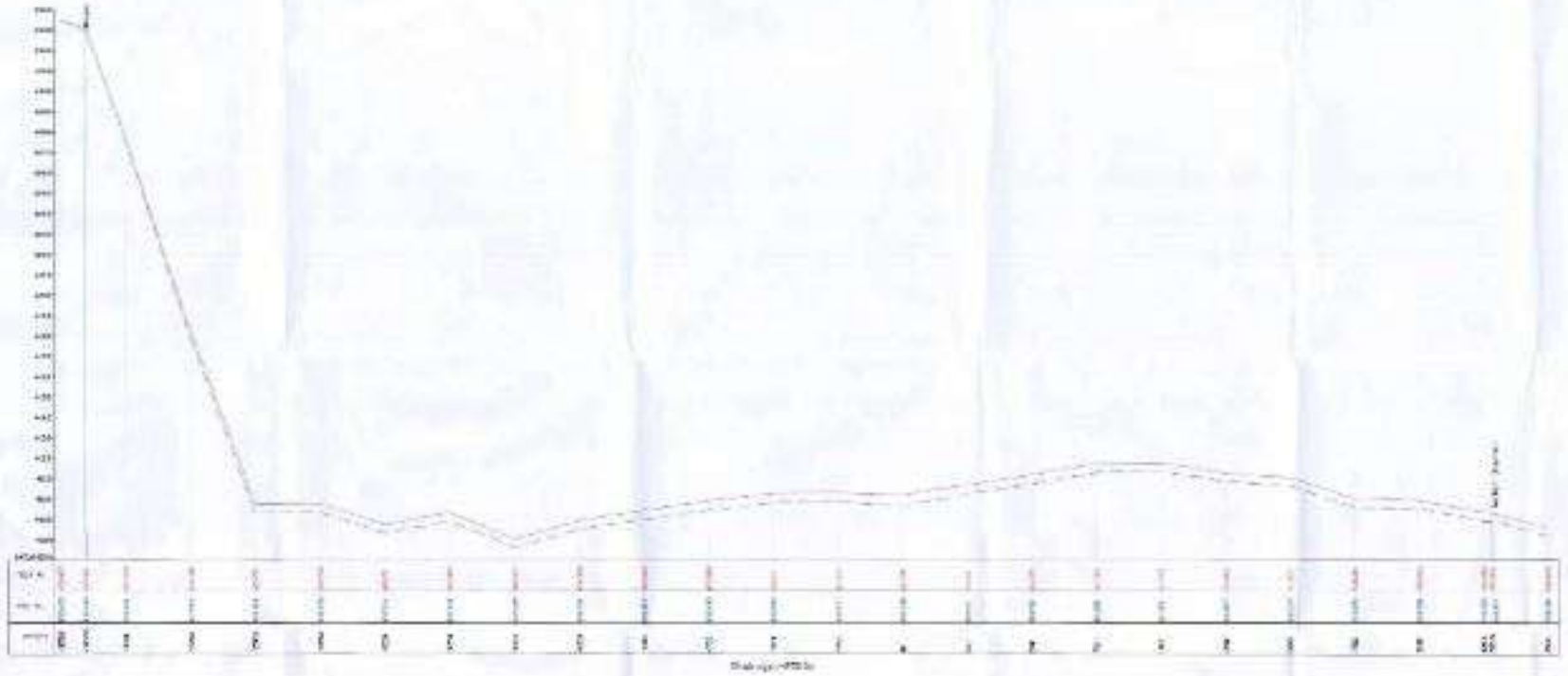
DESCRIPTION	SYMBOL
Post Monsoon	
Pre Monsoon	

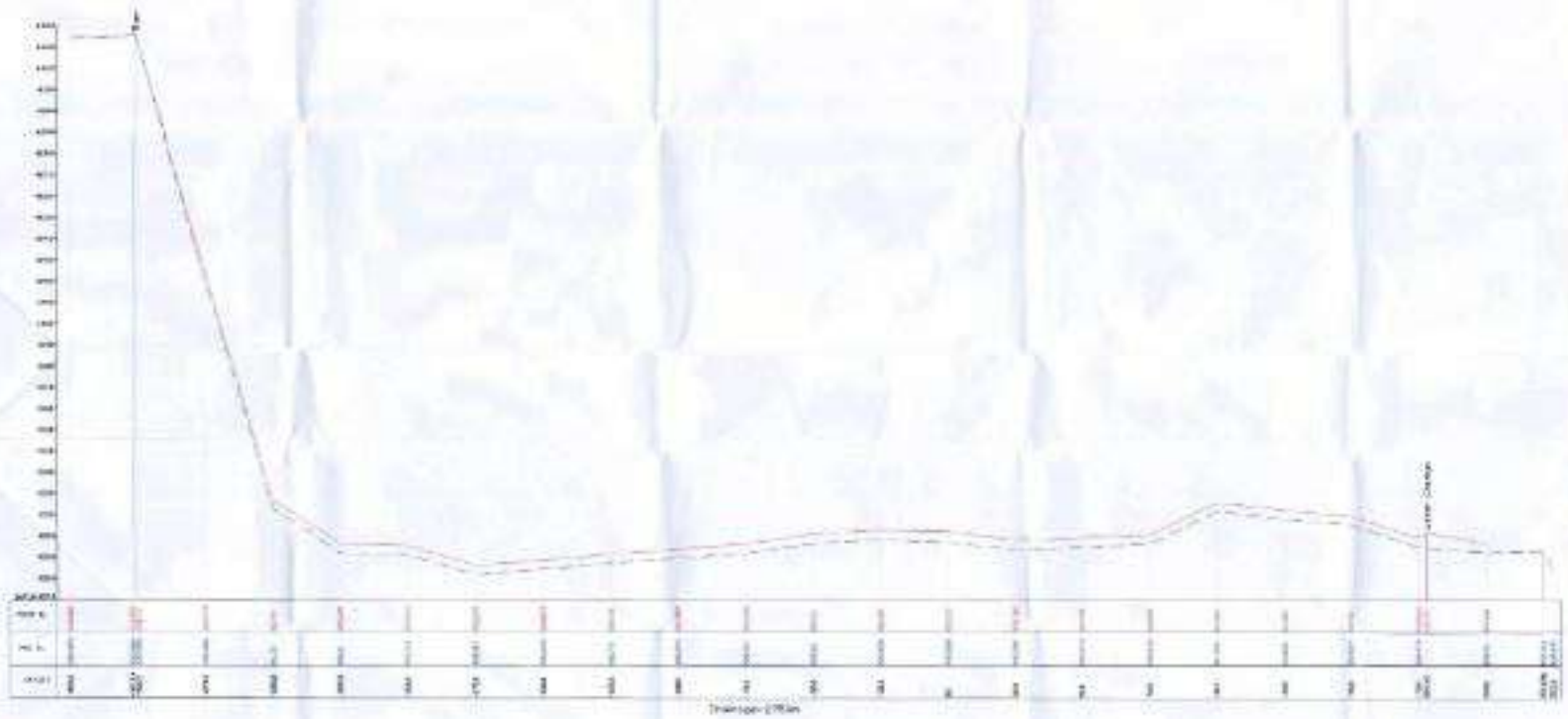
X-Section of the Dhakrani-Yamuna River (Lot no. 21/2) in Pre and Post monsoon at Chainage from (0.0 m. to 2614.64 m.)

Civil Engineering Department
Indian Institute of Technology Roorkee
Roorkee -247667

SCALE	Annexure-B5
1:800 (H)	SHEET NO.
1:100 (V)	5 of 46

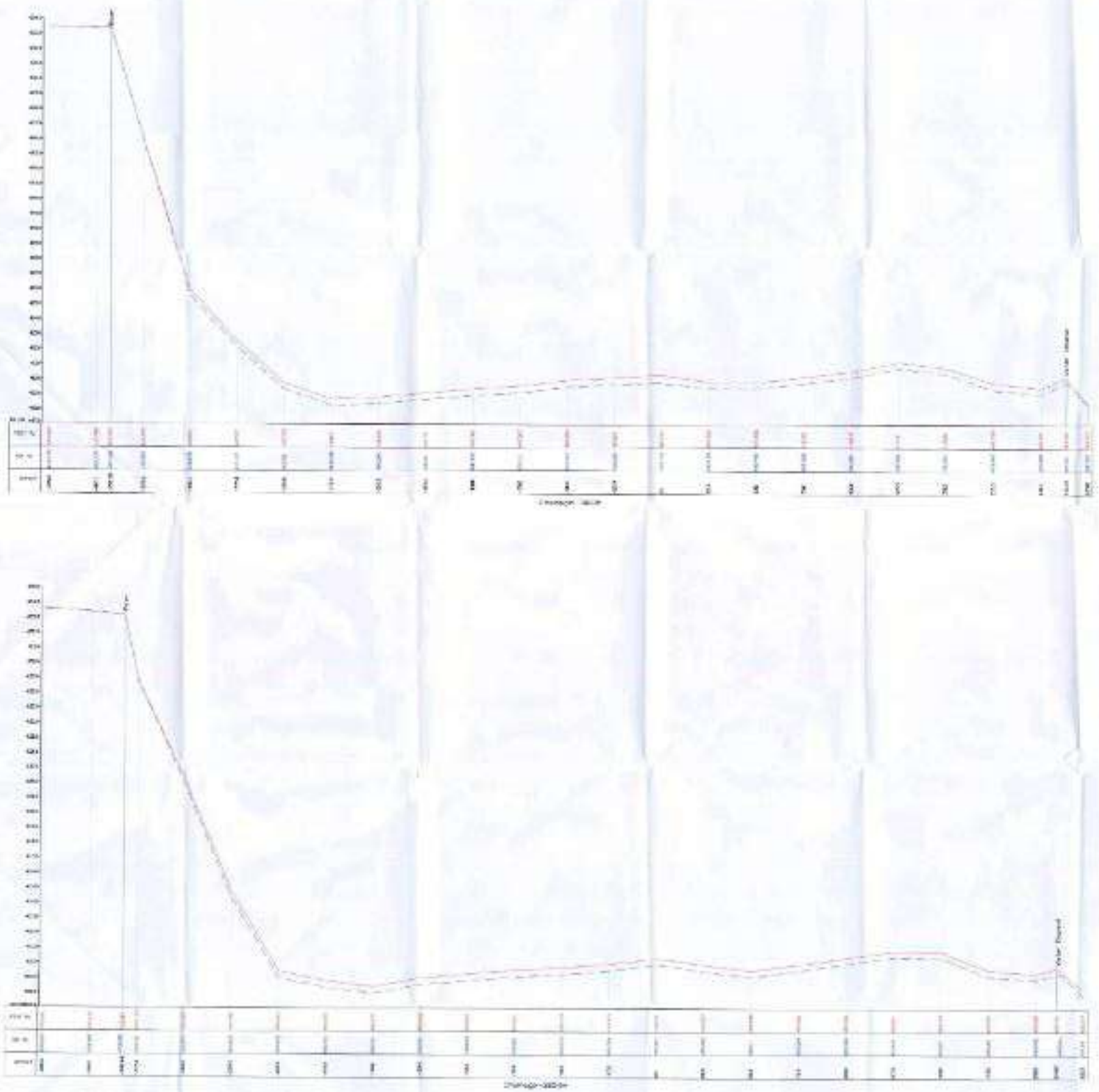
Annexure-B6





LEGEND :-

DESCRIPTION	SYMBOL	X-Section of the Dhakran-Yamuna River (Lot no. 21/2) in Pre and Post monsoon at Chainage from 0.0 m. to 2614.64 m.)	Civil Engineering Department Indian Institute of Technology Roorkee Roorkee -247667	SCALE	Annexure-B6
Post Monsoon				1:800 (H)	SHEET NO.
Pre Monsoon				1:100 (V)	6 of 46



LEGEND :-

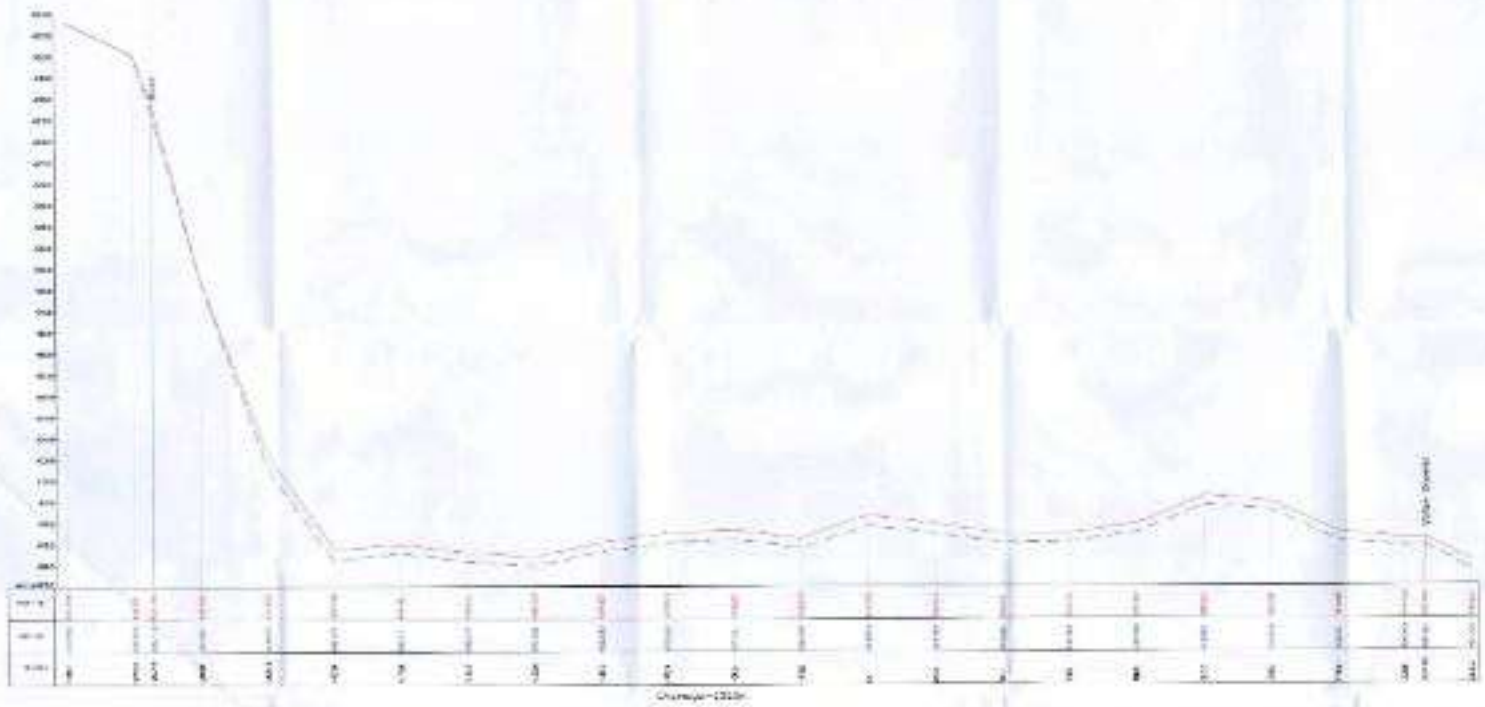
DESCRIPTION	SYMBOL
Post Monsoon	————
Pre Monsoon	- - - - - - - -

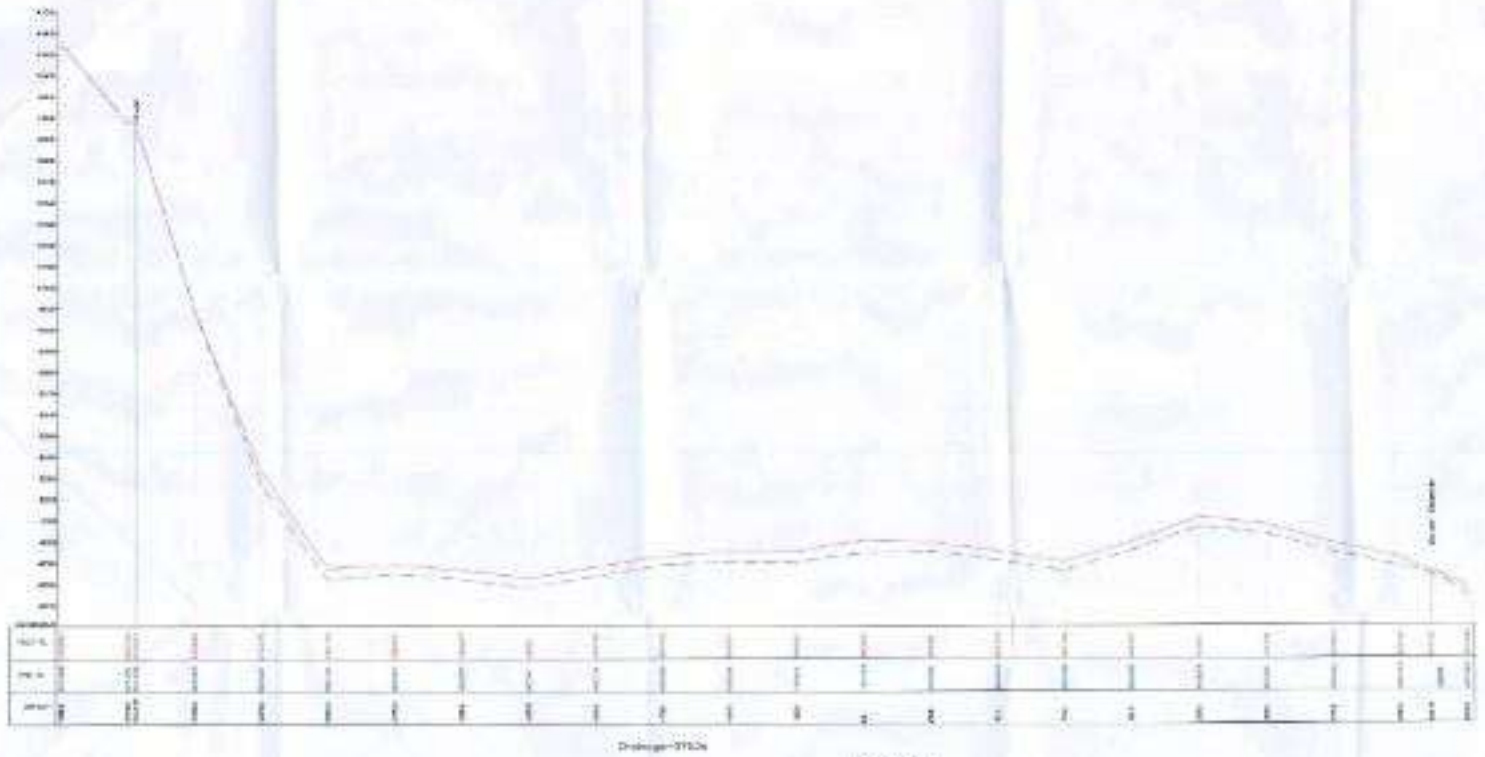
X-Section of the Dhakrani-Yamuna River (Lot no. 21/2) in Pre and Post monsoon at Chainage from (0.0 m. to 2614.64 m.)

Civil Engineering Department
Indian Institute of Technology Roorkee
Roorkee -247667

SCALE	Annexure-B7
1:800 (H) 1:100 (V)	SHEET NO. 7 of 46

Annexure-B8





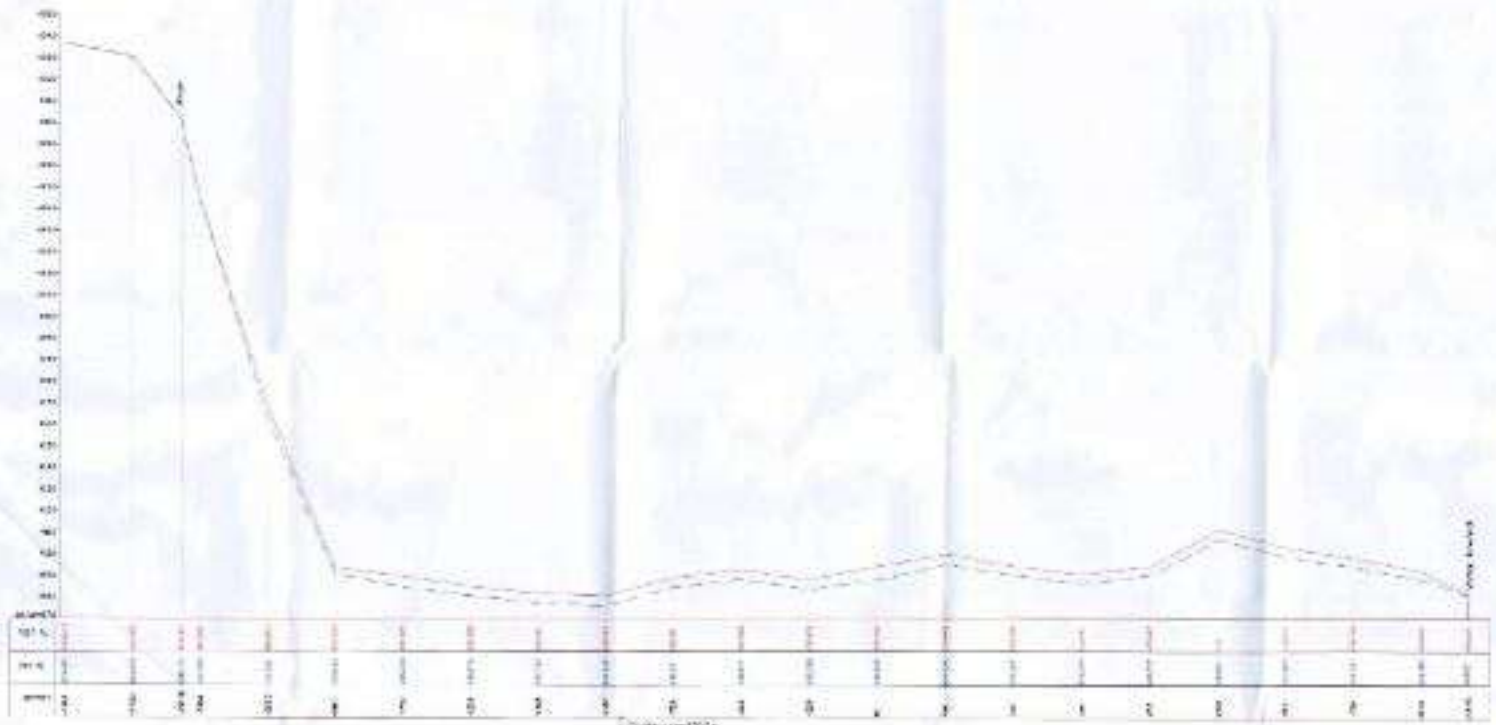
LEGEND :-

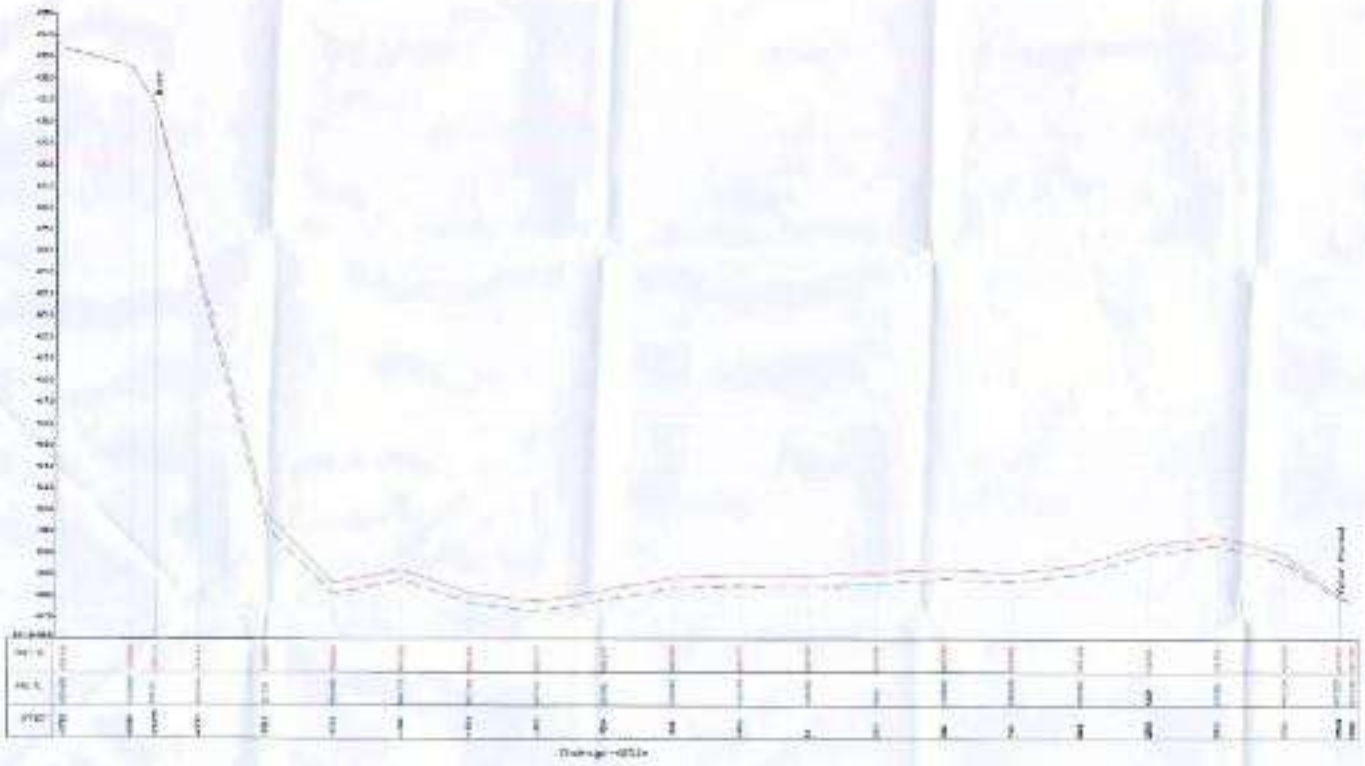
DESCRIPTION	SYMBOL
Post Monsoon	
Pre Monsoon	

X-Section of the Dhakrani-Yamuna River (Ext no. 21/2) in Pre and Post monsoon at Chainage from (0.0 m. to 2614.64 m.)

Civil Engineering Department
Indian Institute of Technology Roorkee
Roorkee -247667

SCALE	Annexure-B8
1:800 (H)	SHEET NO.
1:100 (V)	8 of 46





LEGEND :-

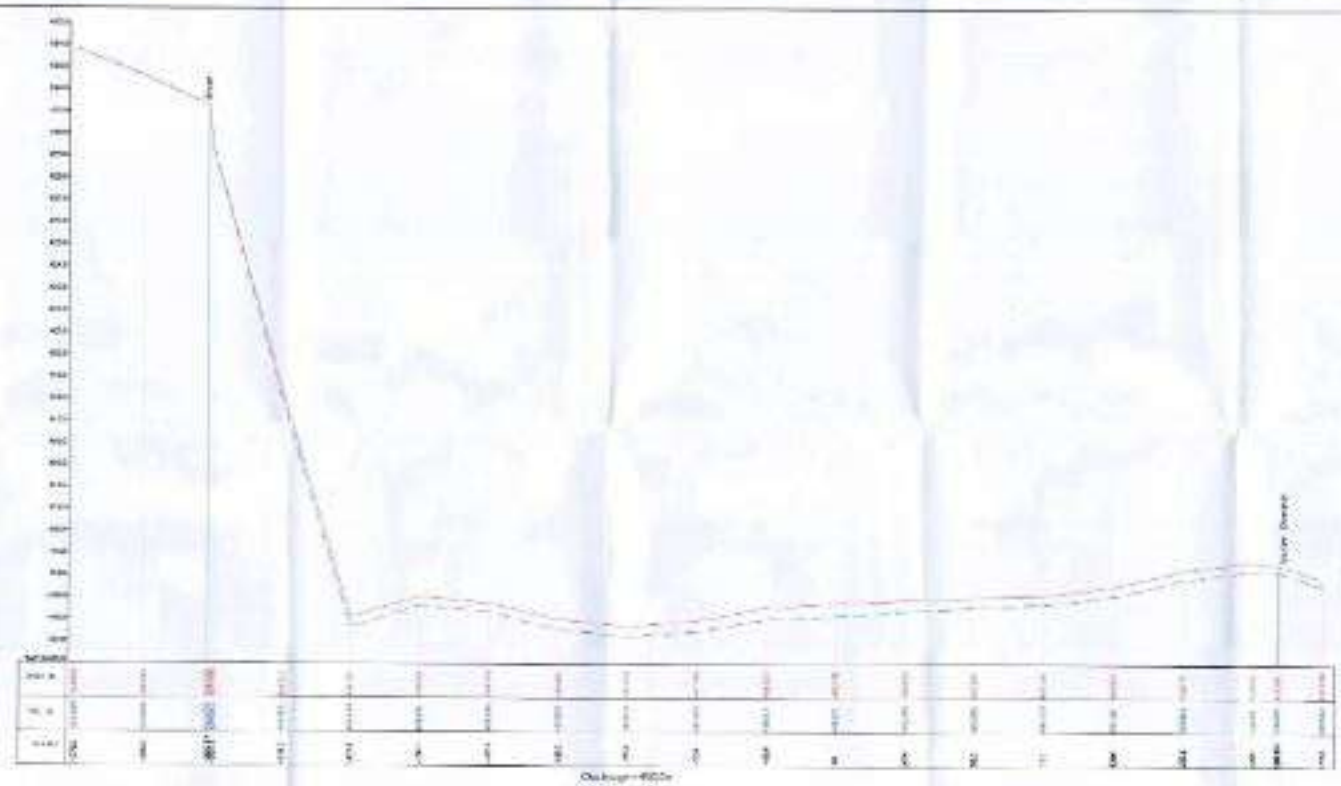
DESCRIPTION	SYMBOL
Post Monsoon	
Pre Monsoon	

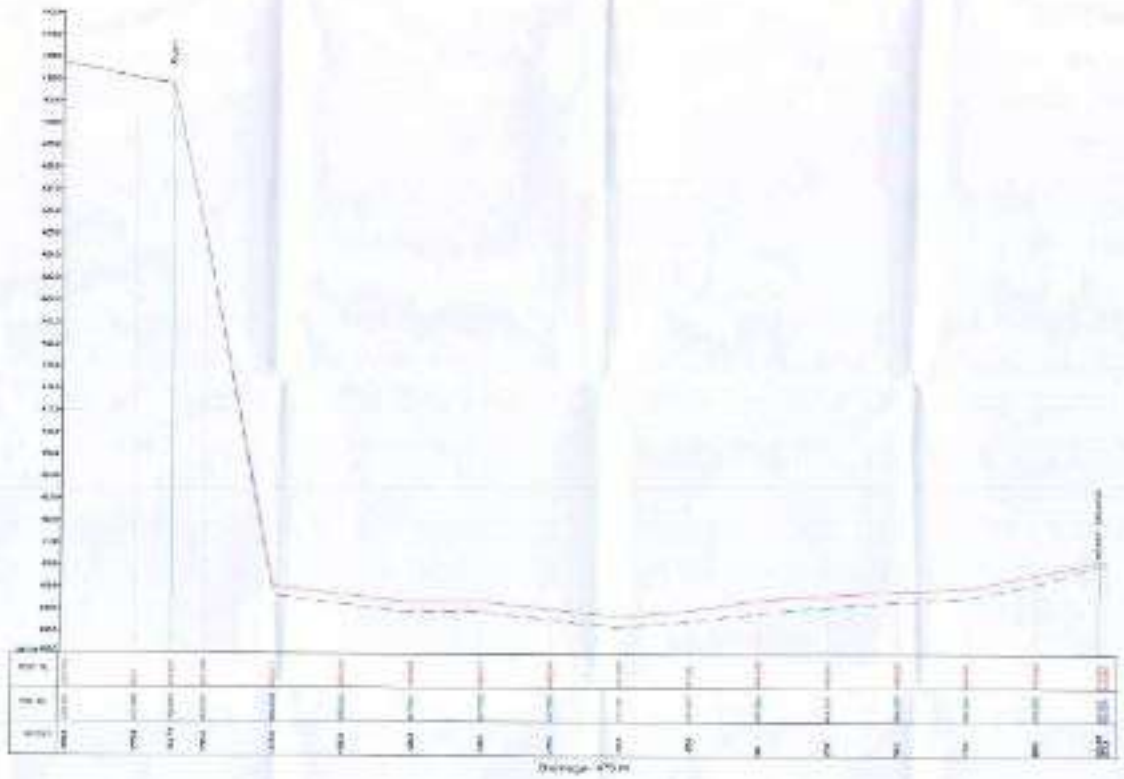
X-Section of the Dhakrani-Yamuna River (Lot no. 21/2) in Pre and Post monsoon at Chainage from (0.0 m. to 2614.64 m.)

Civil Engineering Department
Indian Institute of Technology Roorkee
Roorkee -247667

SCALE	Annexure-B9
1:800 (H) 1:100 (V)	SHEET NO.
	9 of 46

Annexure-B10





LEGEND :-

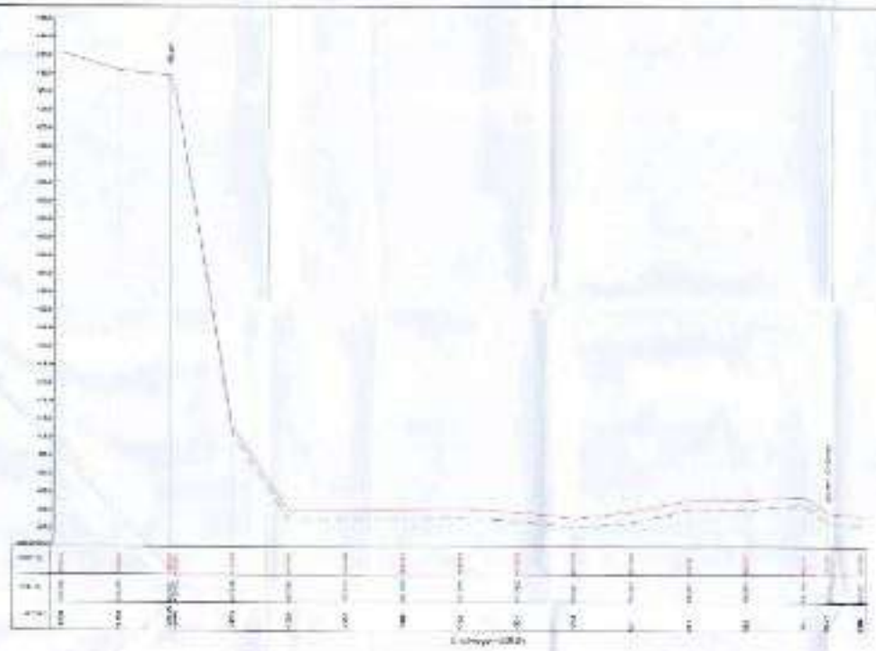
DESCRIPTION	SYMBOL
Post Monsoon	----------
Pre Monsoon	----------

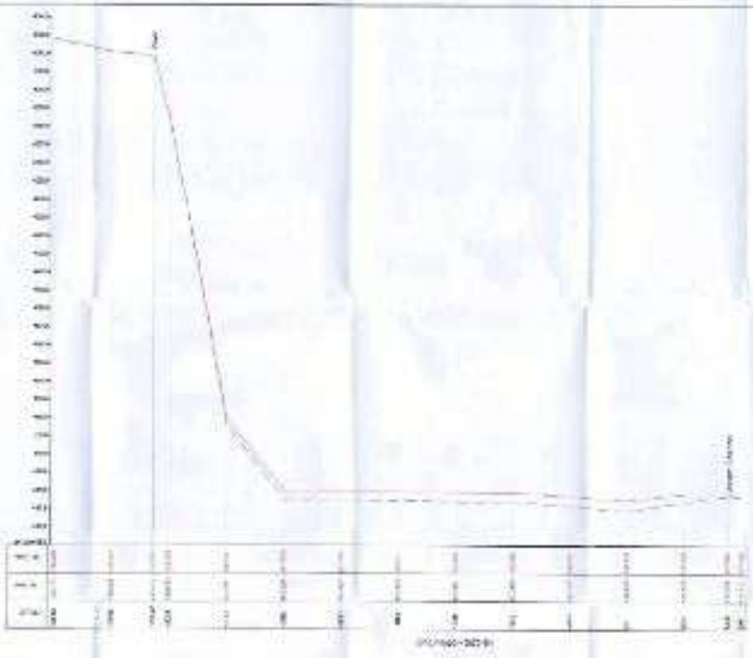
X-Section of the Dhakrani-Yamuna River (Lot no. 21/2) in Pre and Post monsoon at Chainage from (0.0 m. to 2614.64 m.)

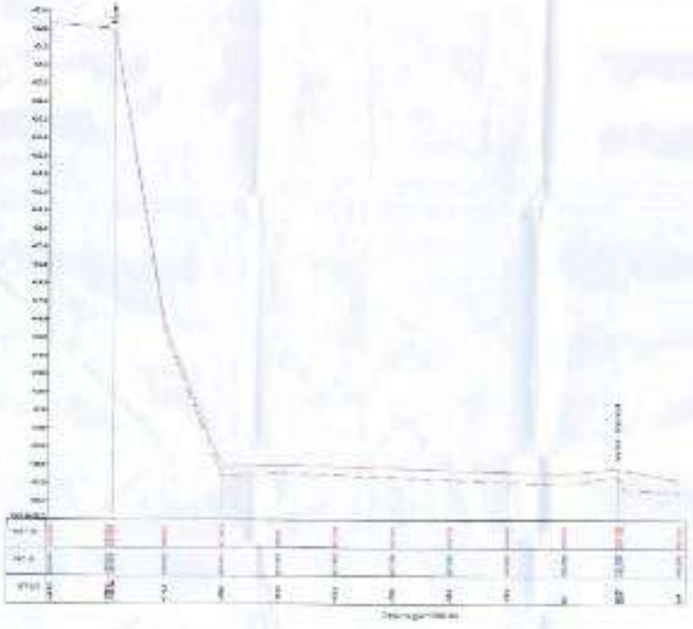
Civil Engineering Department
Indian Institute of Technology Roorkee
Roorkee -247667

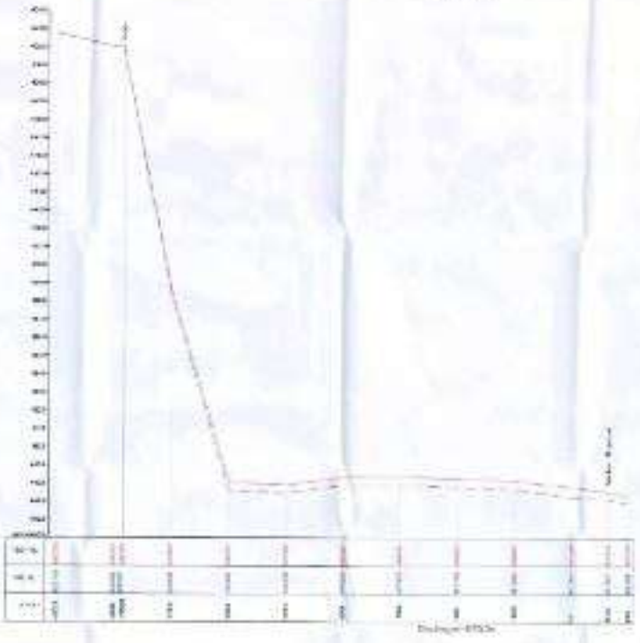
SCALE	Annexure-B10
1:800 (H) 1:100 (V)	SHEET NO. 10 of 46

Annexure-B11









LEGEND :-

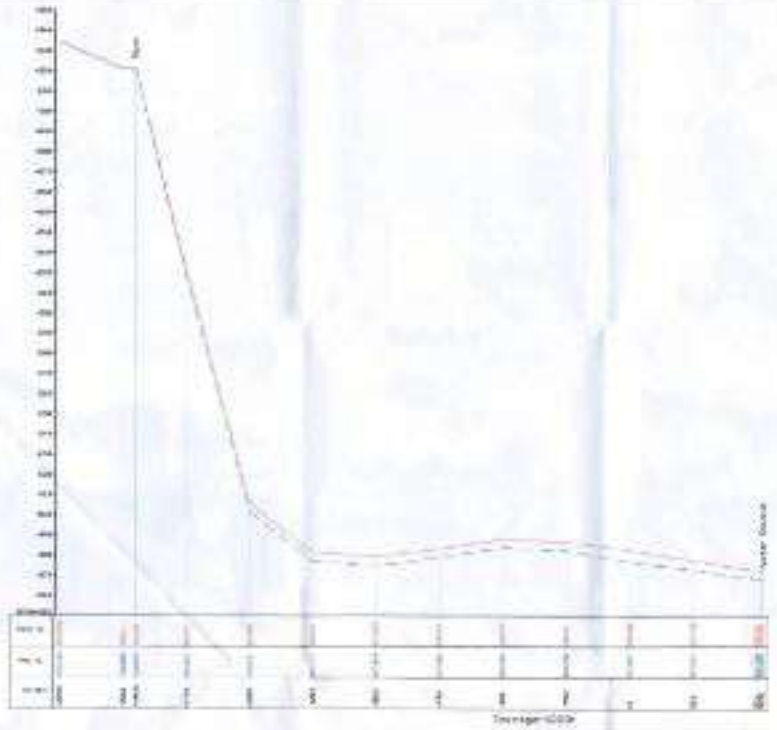
DESCRIPTION	SYMBOL
Post Monsoon	
Pre Monsoon	

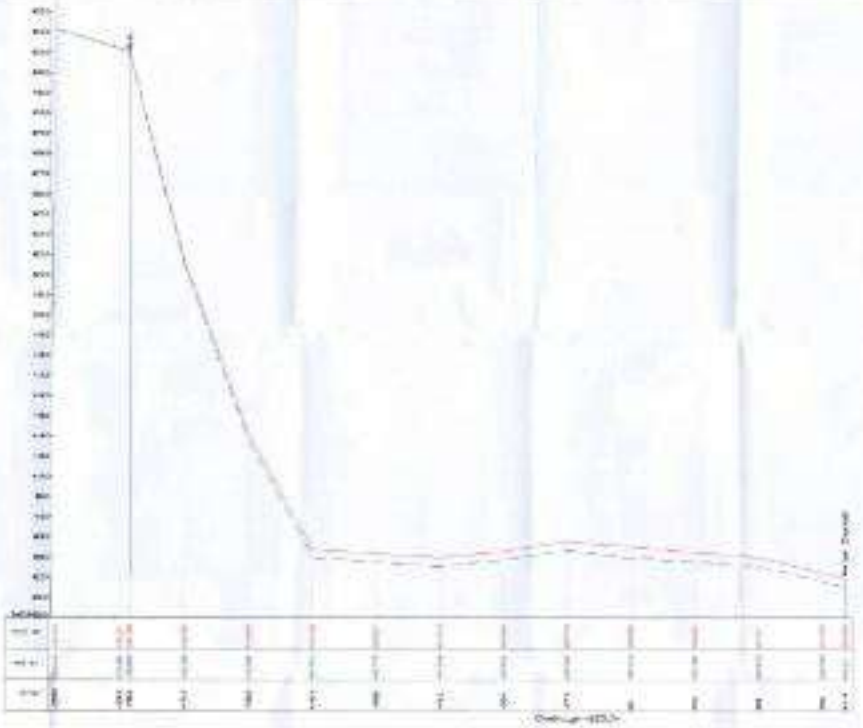
X- Section of the Dhakrani-Yamuna River (Loc no. 21/2) in Pre and Post monsoon at Chainage from (0.0 m. to 2614.64 m.)

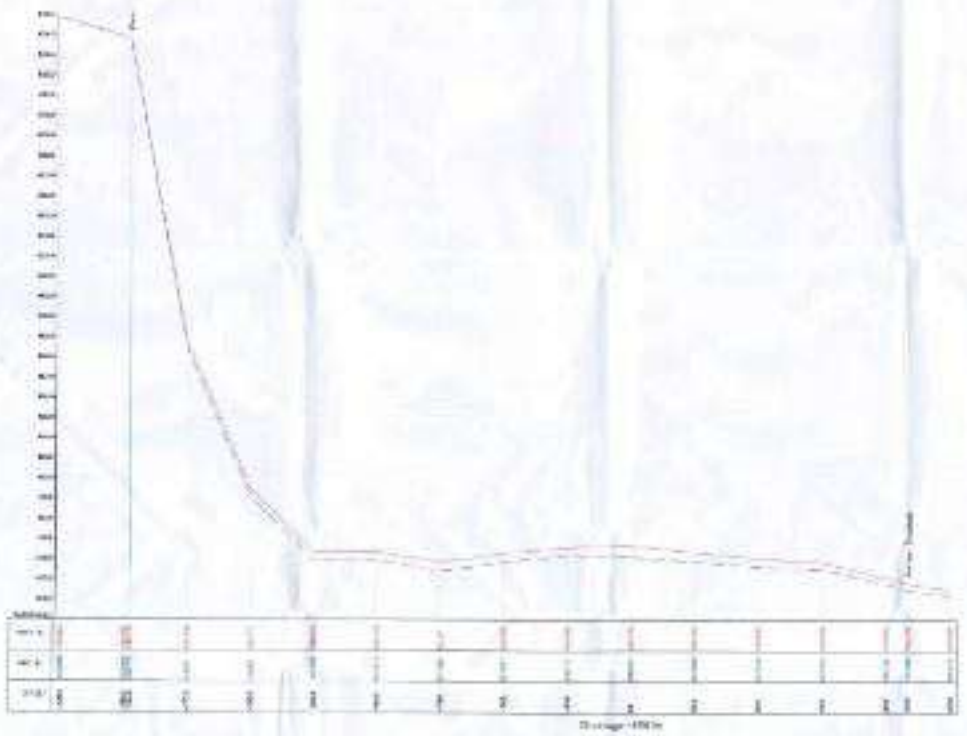
Civil Engineering Department
Indian Institute of Technology Roorkee
Roorkee -247667

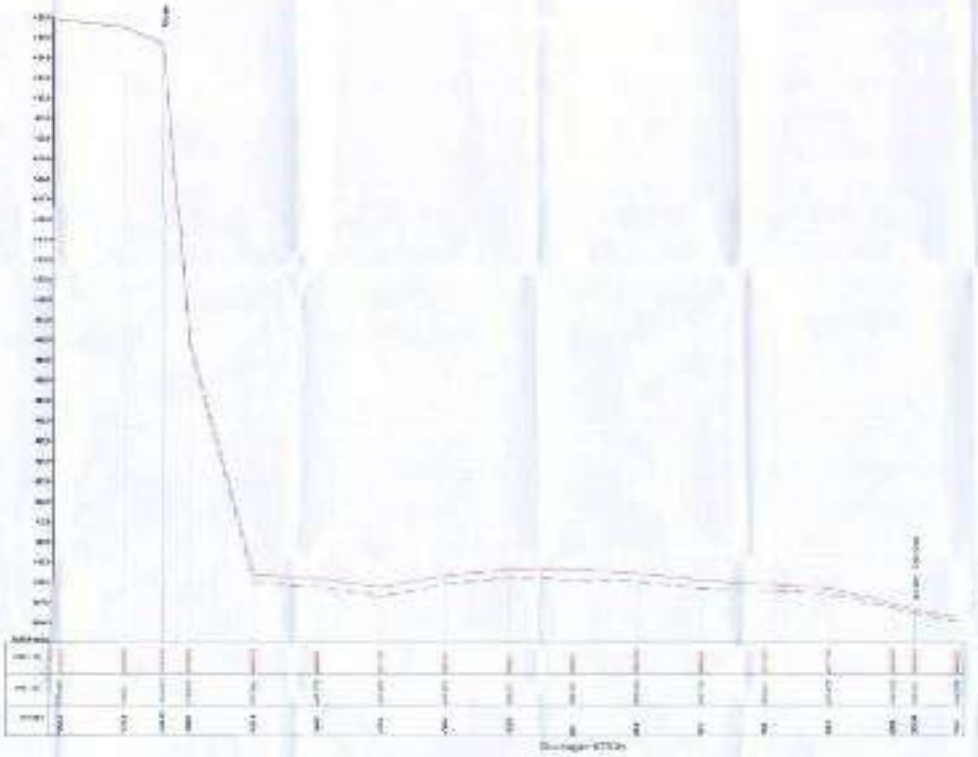
SCALE	Annexure-B11
1:900 (H)	SHEET NO.
1:100 (V)	11 of 46

Annexure-B12









LEGEND :-

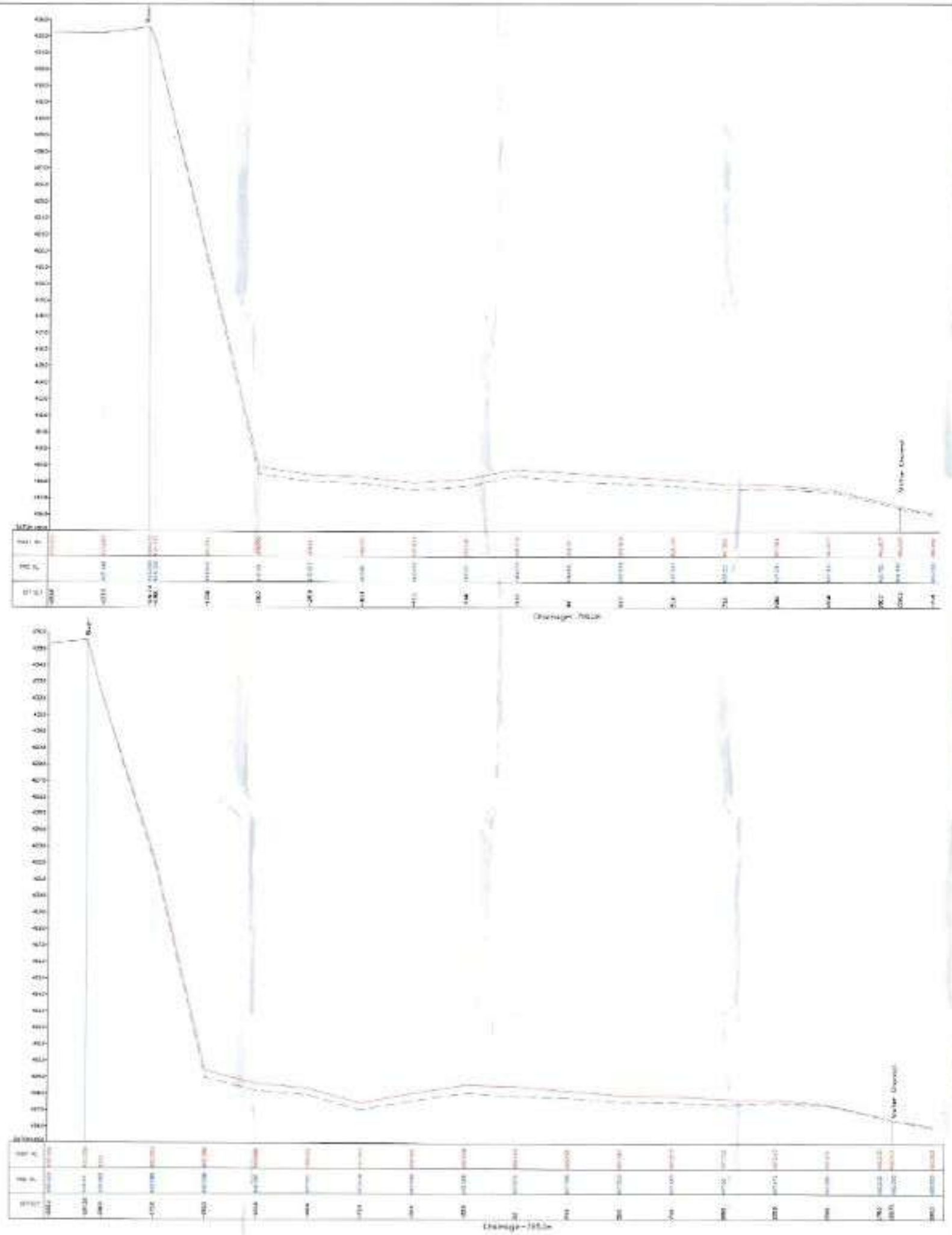
DESCRIPTION	SYMBOL
Post Monsoon	
Pre Monsoon	

X-Section of the Dhakrani-Yamuna River (Loc no. 21/2) in Pre and Post monsoon at Chainage from (0.0 m. to 2614.64 m.)

Civil Engineering Department
Indian Institute of Technology Roorkee
Roorkee -247667

SCALE	Annexure-B12
1:800 (H) 1:100 (V)	SHEET NO. 12 of 46

Annexure-B13



LEGEND :-

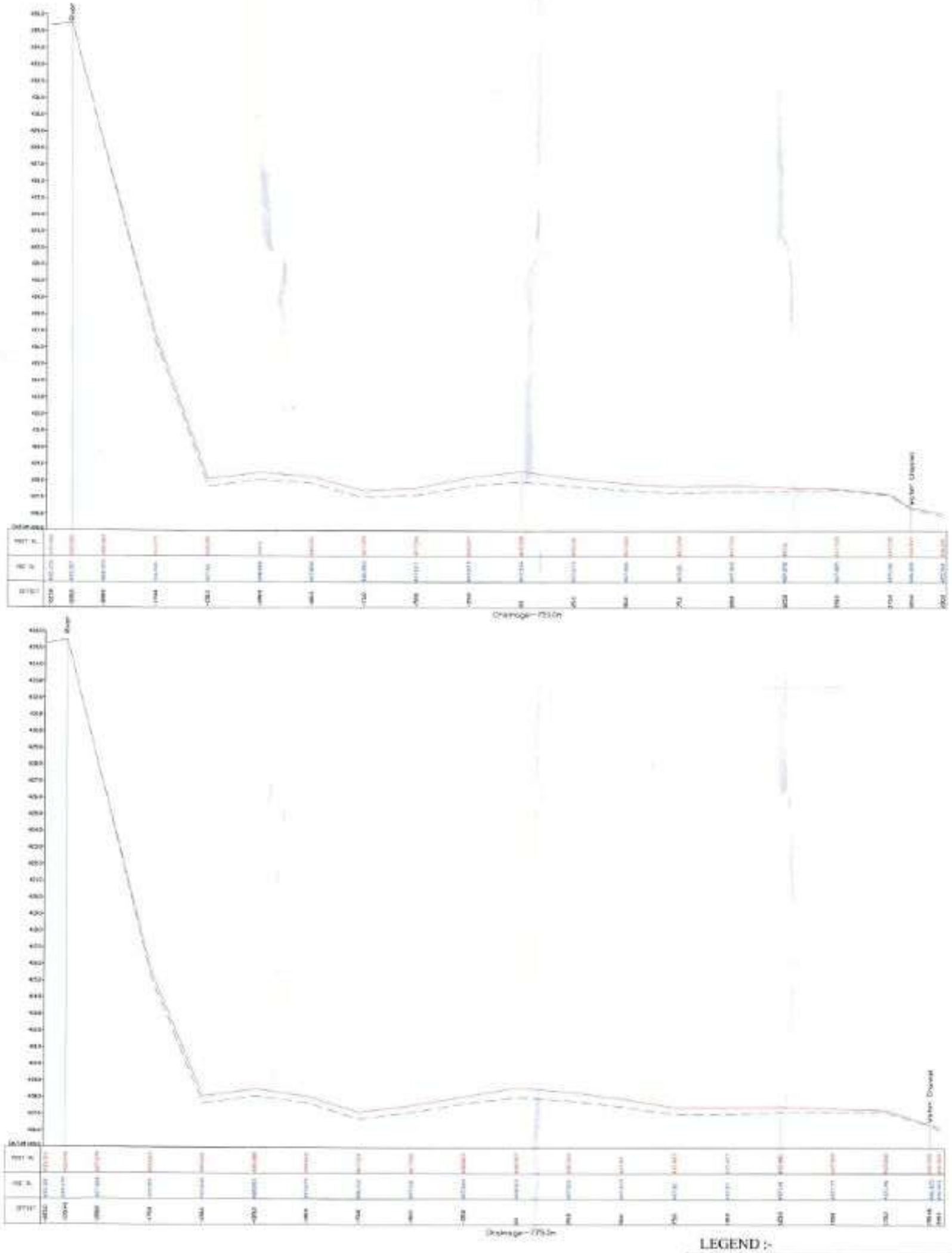
DESCRIPTION	SYMBOL
Post Monsoon	———
Pre Monsoon	- - - - -

X-Section of the Dhakrani-Yamuna River (Lot no. 21/2) in Pre and Post monsoon at Chainage from (0.0 m. to 2614.64 m.)

Civil Engineering Department
Indian Institute of Technology Roorkee
Roorkee -247667

SCALE	Annexure-B13
1:800 (H) 1:100 (V)	SHEET NO.
	13 of 46

Annexure-B14



LEGEND :-

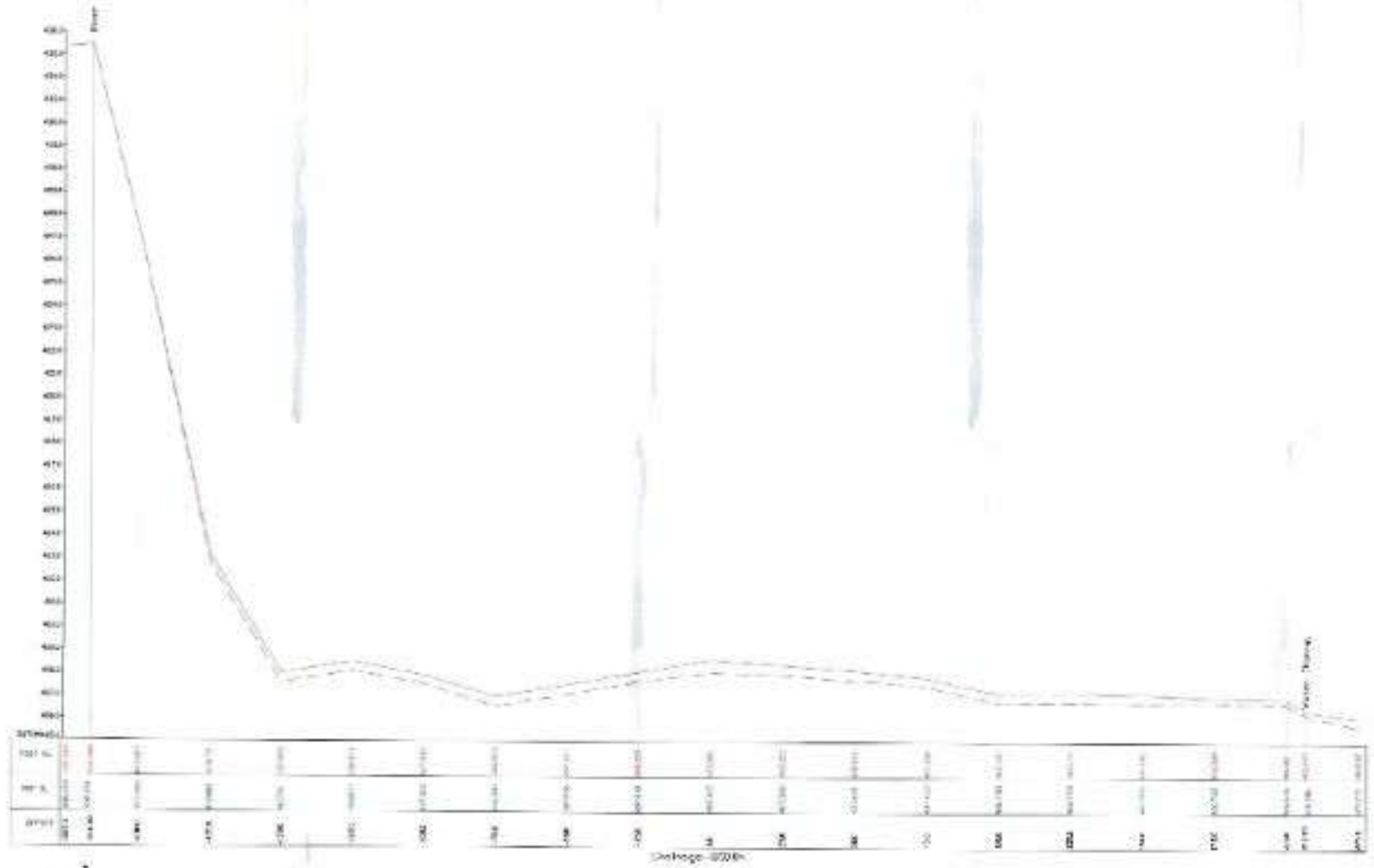
DESCRIPTION	SYMBOL
Post Monsoon	———
Pre Monsoon	- - - - - -

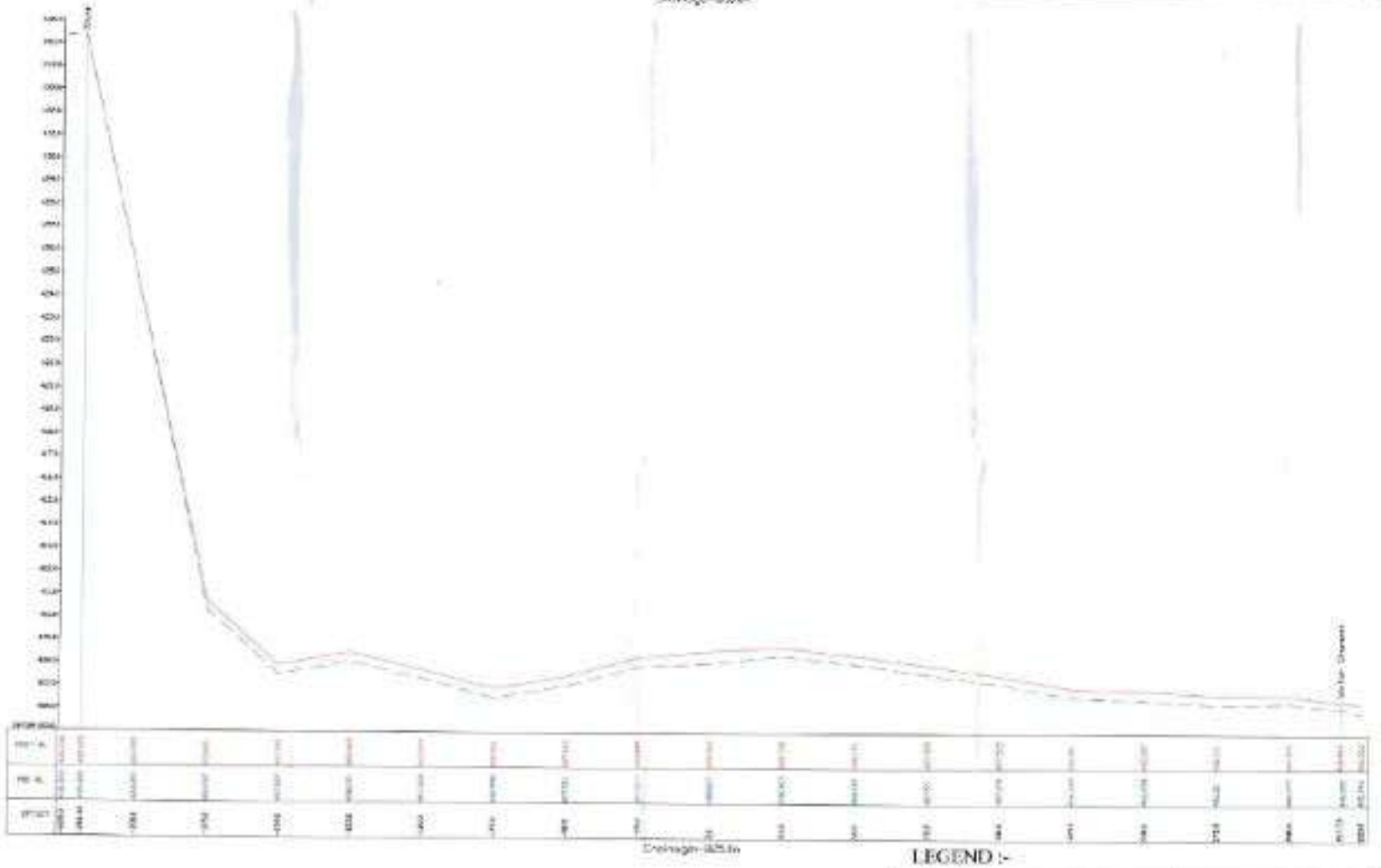
X-Section of the Dhakrani-Yamuna River (Lot no. 21/2) in Pre and Post monsoon at Chainage from (0.0 m. to 2614.64 m.)

Civil Engineering Department
Indian Institute of Technology Roorkee
Roorkee -247667

SCALE	Annexure-B14
1:800 (H)	SHEET NO.
1:100 (V)	14 of 46

Annexure-B15





LEGEND :-

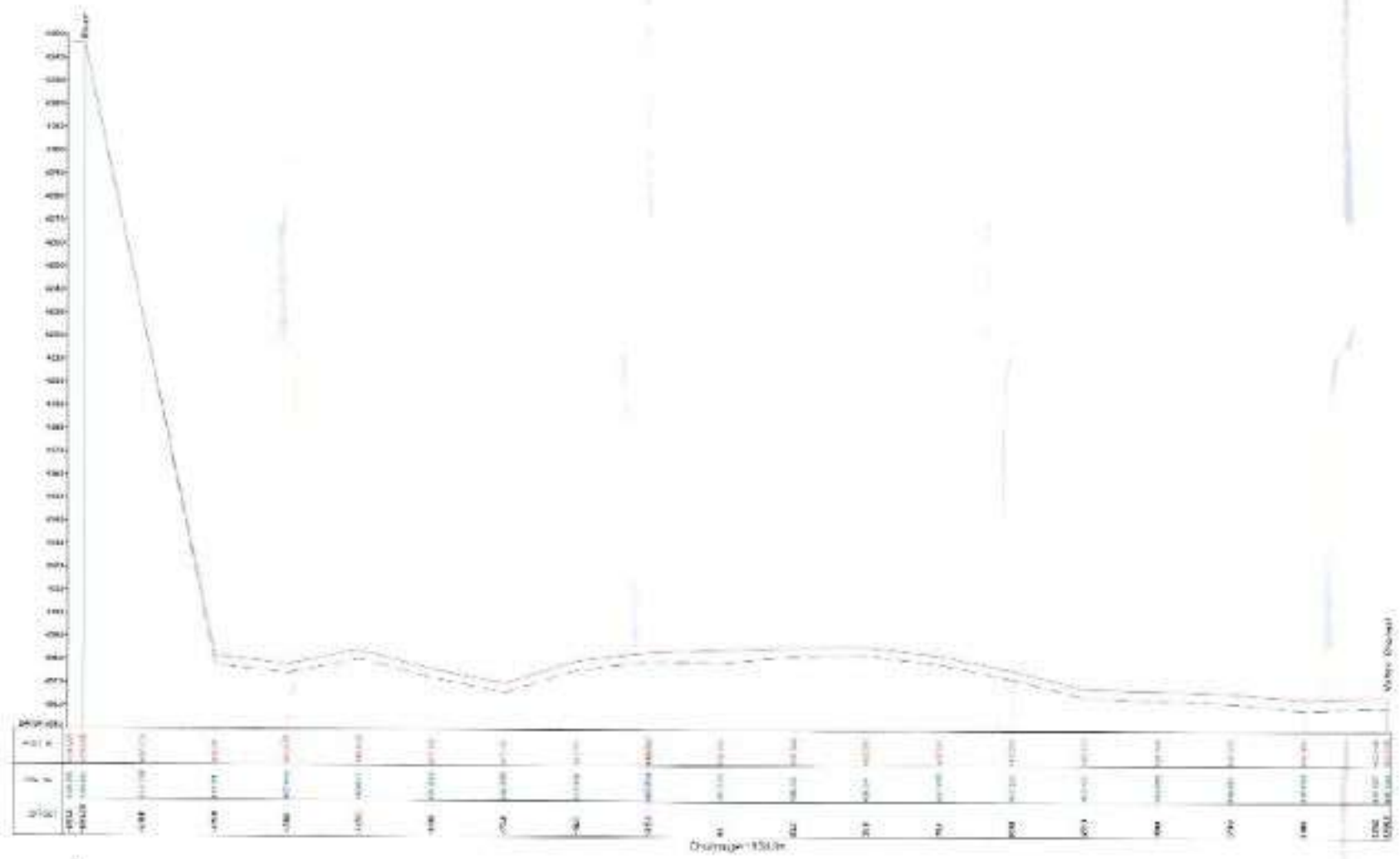
DESCRIPTION	SYMBOL
Post Monsoon	———
Pre Monsoon	- - - - - -

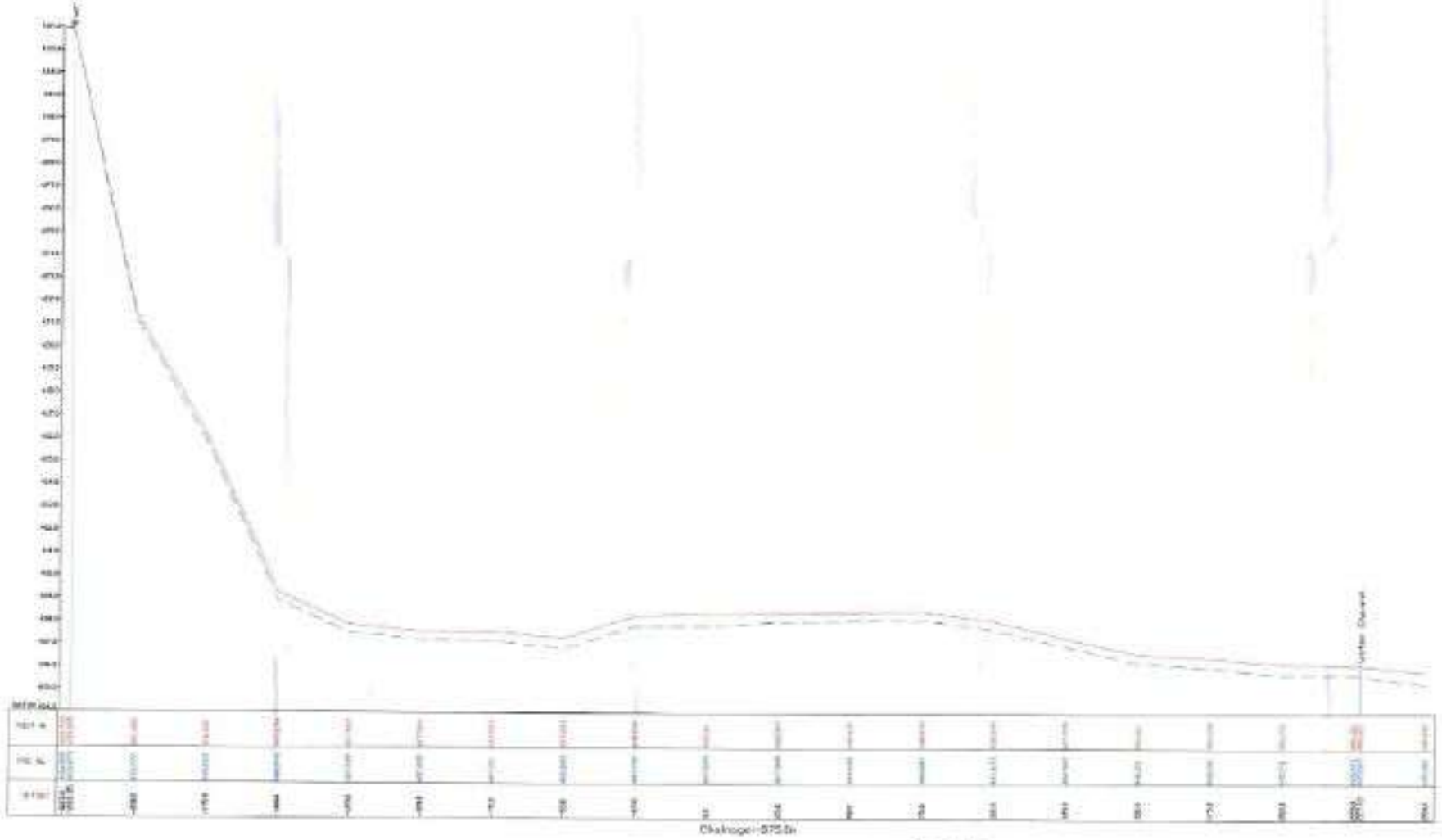
X-Section of the Dhakrani-Yamuna River (Lot no. 21/2) in Pre and Post monsoon at Chainage from (0.0 m. to 2614.64 m.)

Civil Engineering Department
Indian Institute of Technology Roorkee
Roorkee -247667

SCALE	Annexure-B15
1:800 (H) 1:100 (V)	SHEET NO.
	15 of 46

Annexure-B16





LEGEND :-

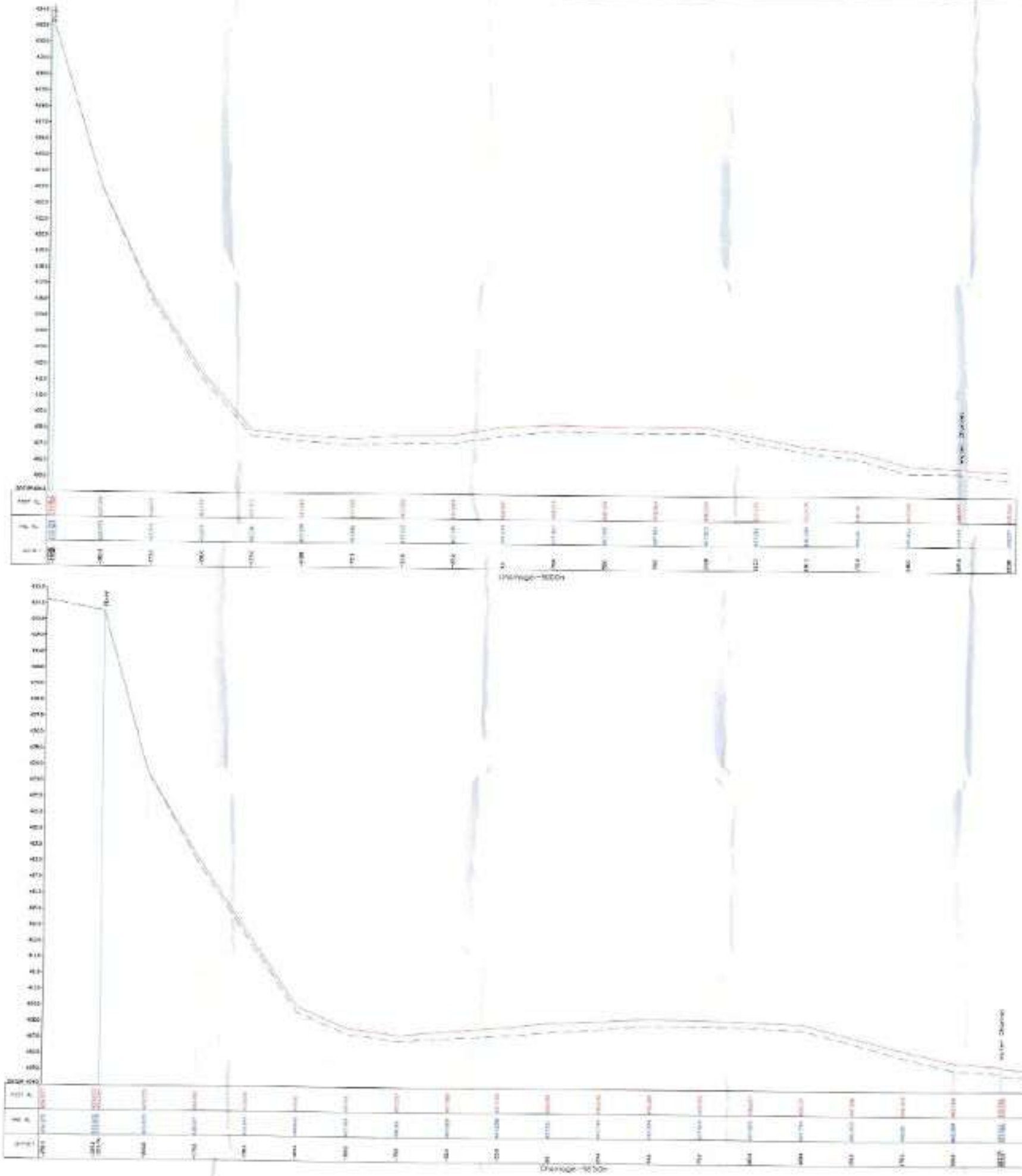
DESCRIPTION	SYMBOL
Post Monsoon	———
Pre Monsoon	- - - - -

X-Section of the Dhakrani-Yamuna River (Lot no. 21/2) in Pre and Post monsoon at Chainage from (0.0 m. to 2614.64 m.)

Civil Engineering Department
Indian Institute of Technology Roorkee
Roorkee -247667

SCALE	Annexure-B16
1:800 (H)	SHEET NO.
1:100 (V)	16 of 46

Annexure-B17



LEGEND :-

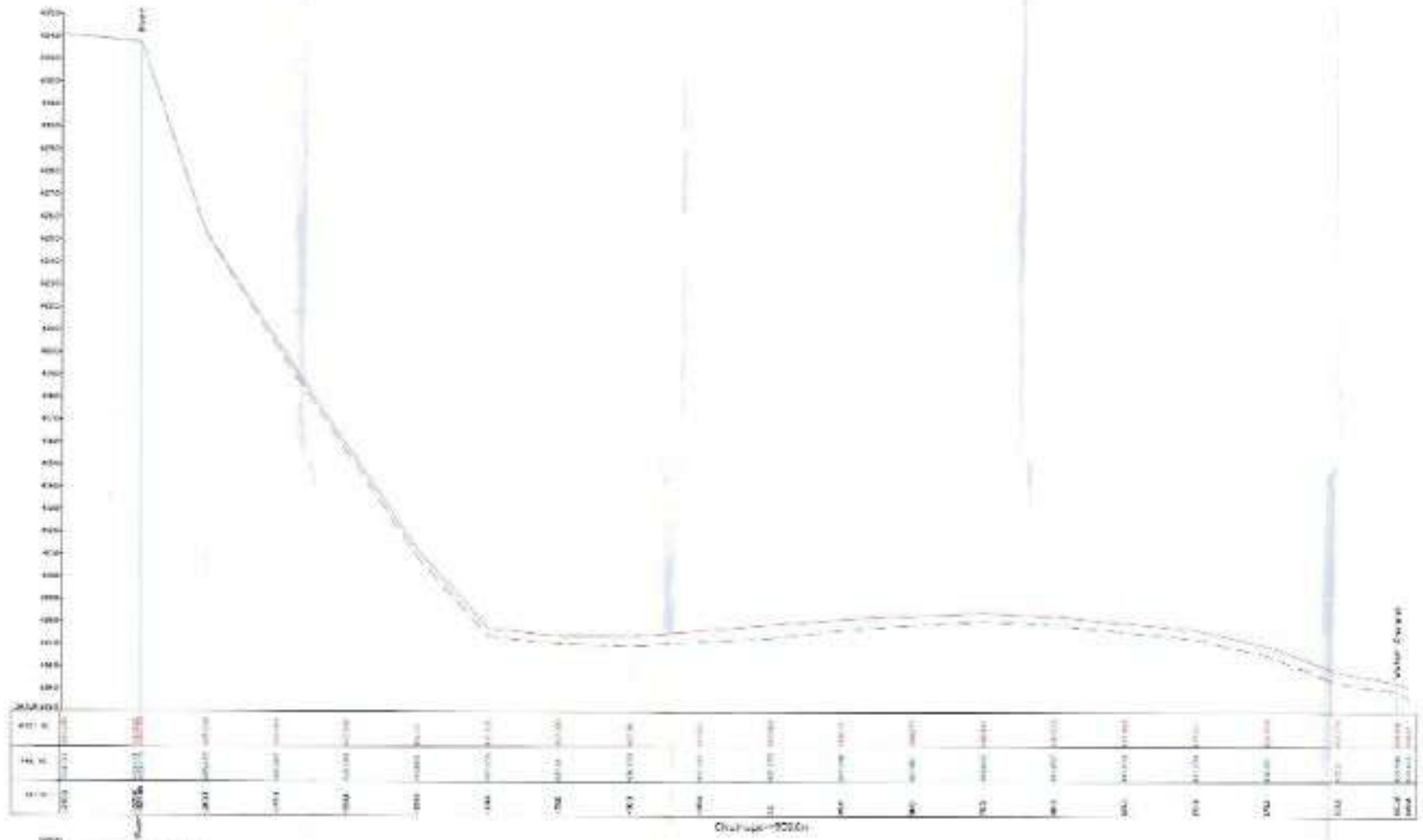
DESCRIPTION	SYMBOL
Post Monsoon	
Pre Monsoon	

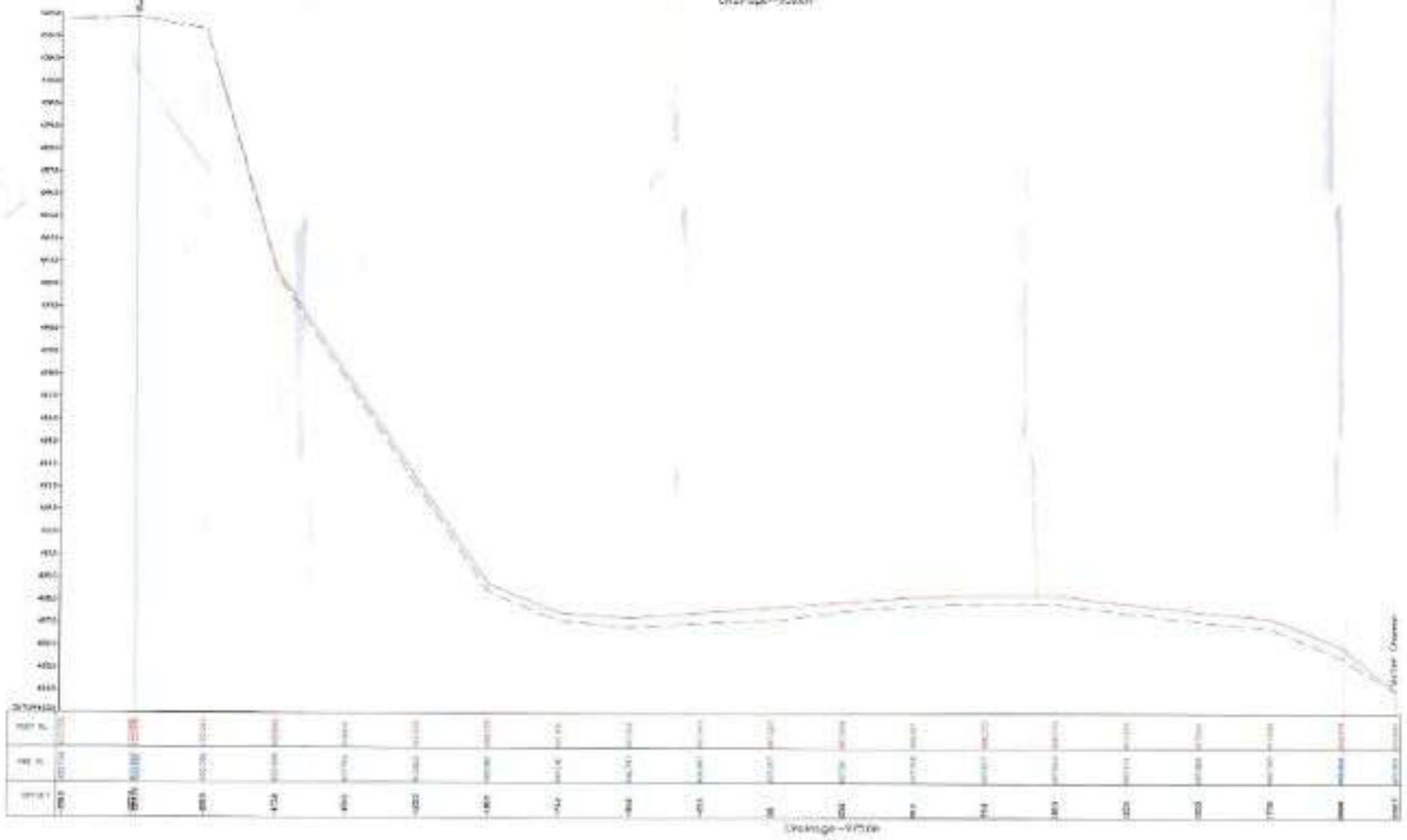
X-Section of the Dhaktani-Yamuna River (Lot no. 21/2) in Pre and Post monsoon at Chainage from (0.0 m. to 2614.64 m.)

Civil Engineering Department
Indian Institute of Technology Roorkee
Roorkee -247667

SCALE	Annexure-B17
1:800 (H) 1:100 (V)	SHEET NO.
	17 of 46

Annexure-B18





LEGEND :-

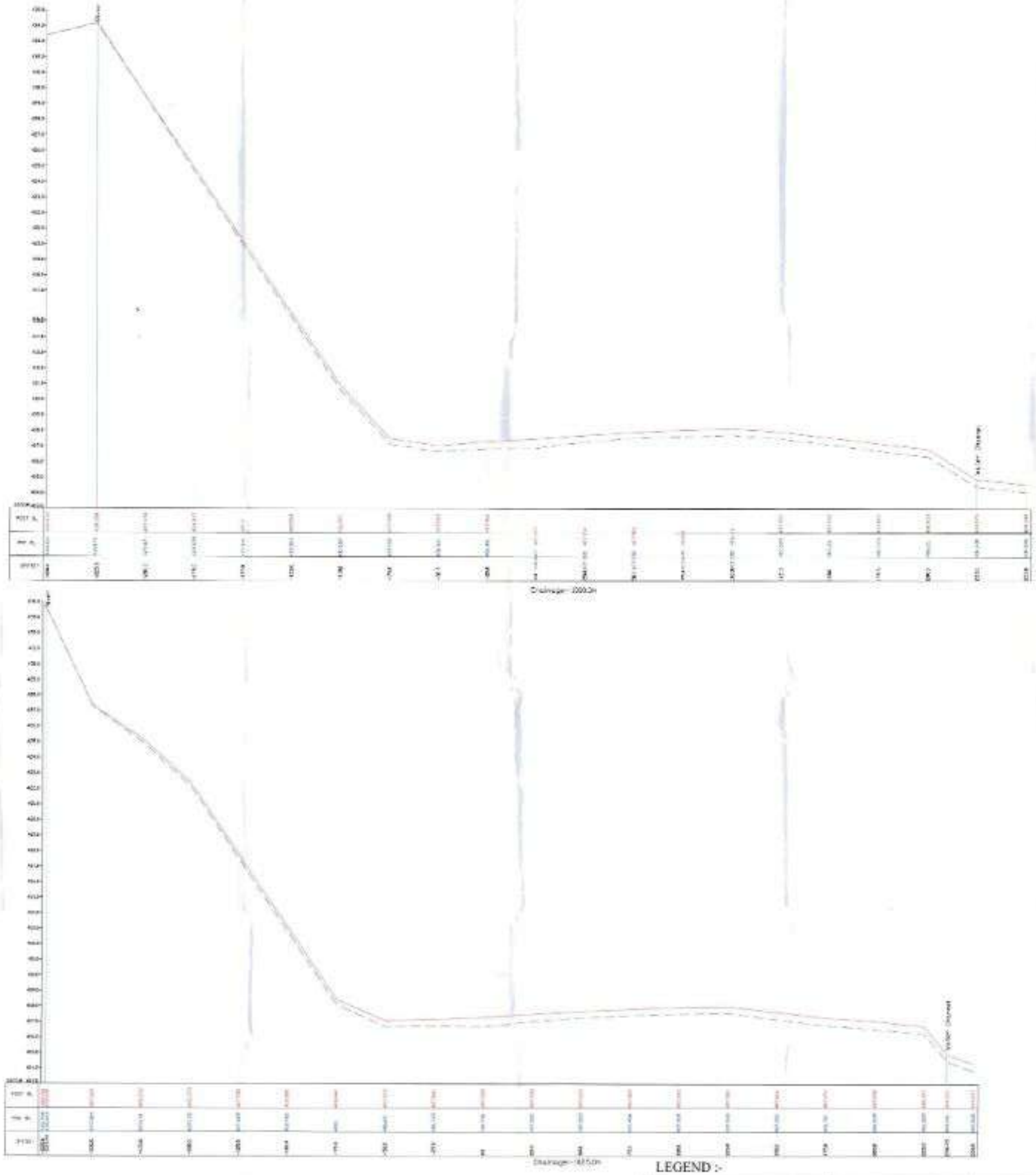
DESCRIPTION	SYMBOL
Post Monsoon	———
Pre Monsoon	- - - - - -

X-Section of the Dhakrani-Yamuna River (Lot no. 21/2) in Pre and Post monsoon at Chainage from (0.0 m. to 2614.64 m.)

Civil Engineering Department
Indian Institute of Technology Roorkee
Roorkee -247667

SCALE	Annexure-B18
1:800 (H)	SHEET NO.
1:100 (V)	18 of 46

Annexure-B19



LEGEND :-

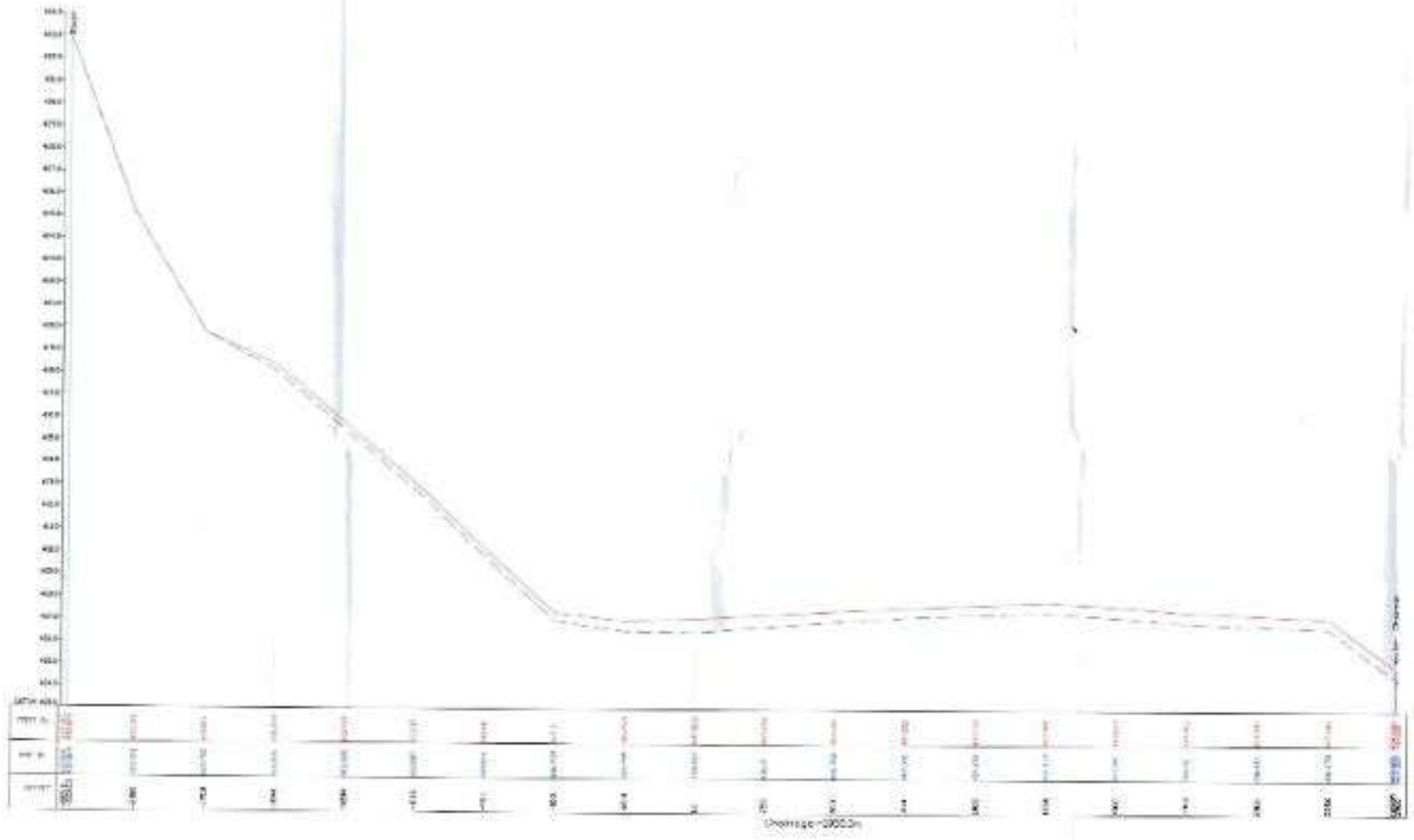
DESCRIPTION	SYMBOL
Post Monsoon	———
Pre Monsoon	- - - - - -

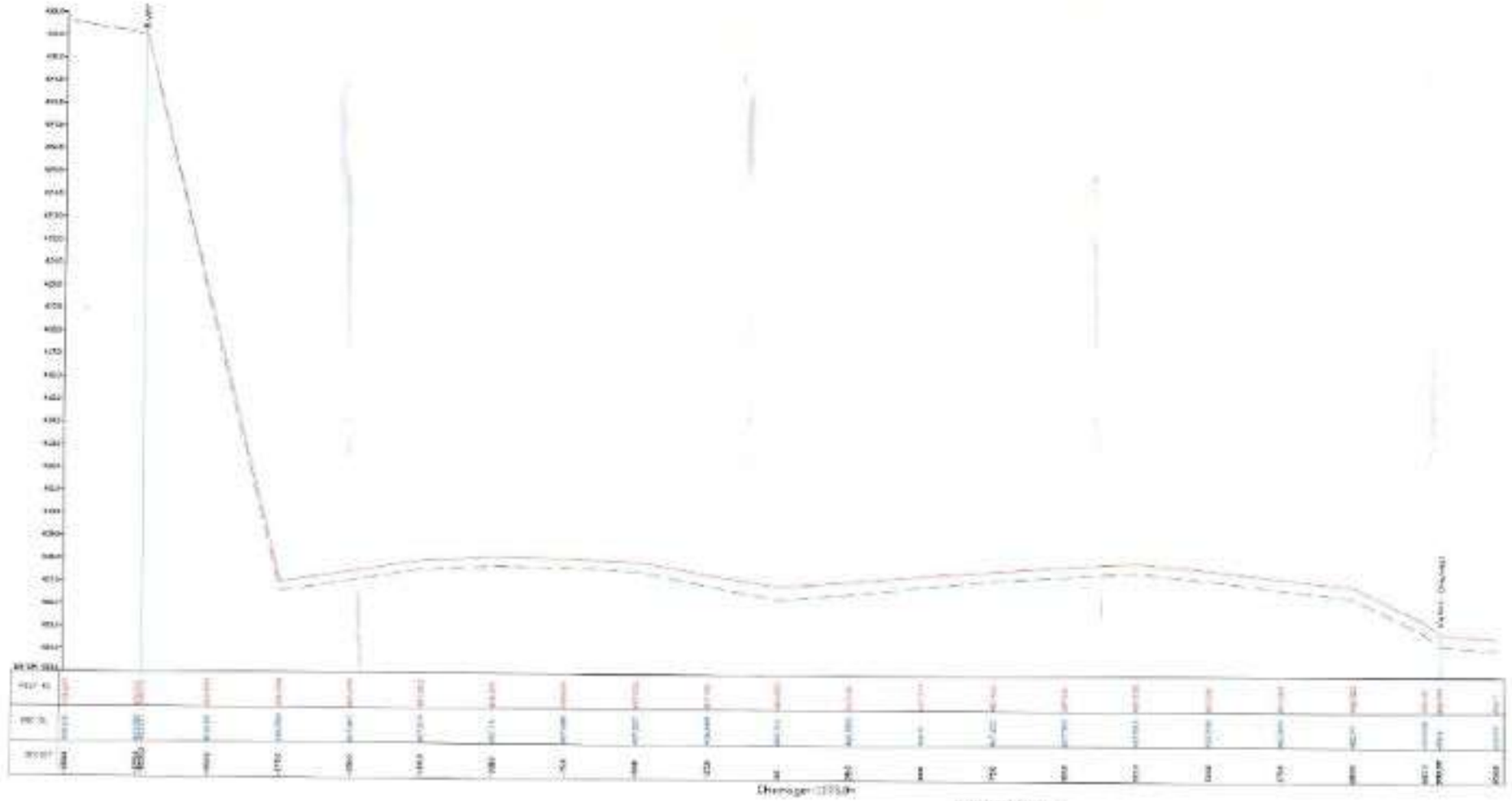
X-Section of the Dhakrani-Yamuna River (Lot no. 21/2) in Pre and Post monsoon at Chainage from (0.0 m. to 2614.64 m.)

Civil Engineering Department
Indian Institute of Technology Roorkee
Roorkee -247667

SCALE	Annexure-B19
1:800 (H)	SHEET NO.
1:100 (V)	19 of 46

Annexure-B20





LEGEND :-

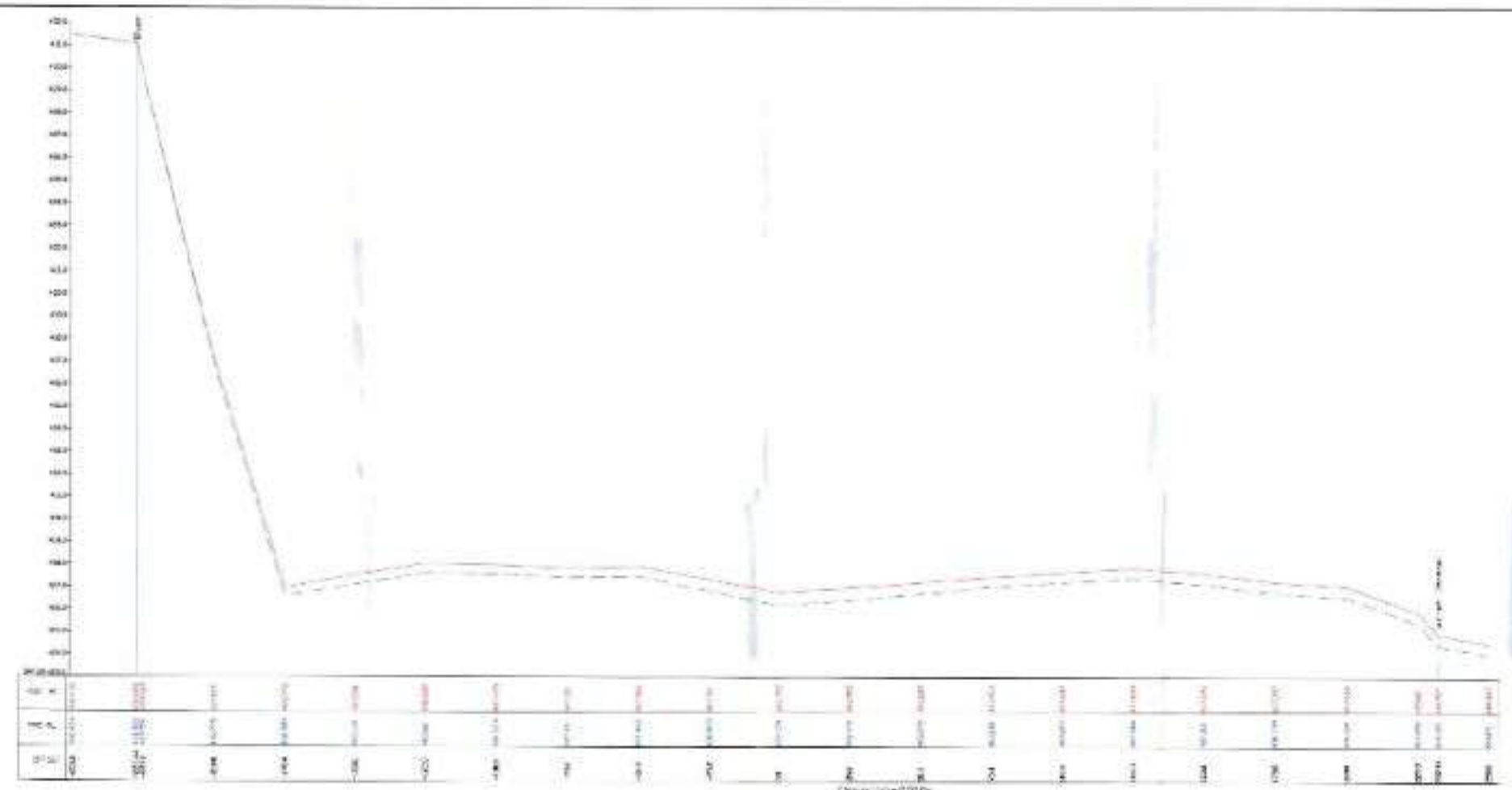
DESCRIPTION	SYMBOL
Post Monsoon	———
Pre Monsoon	- - - - -

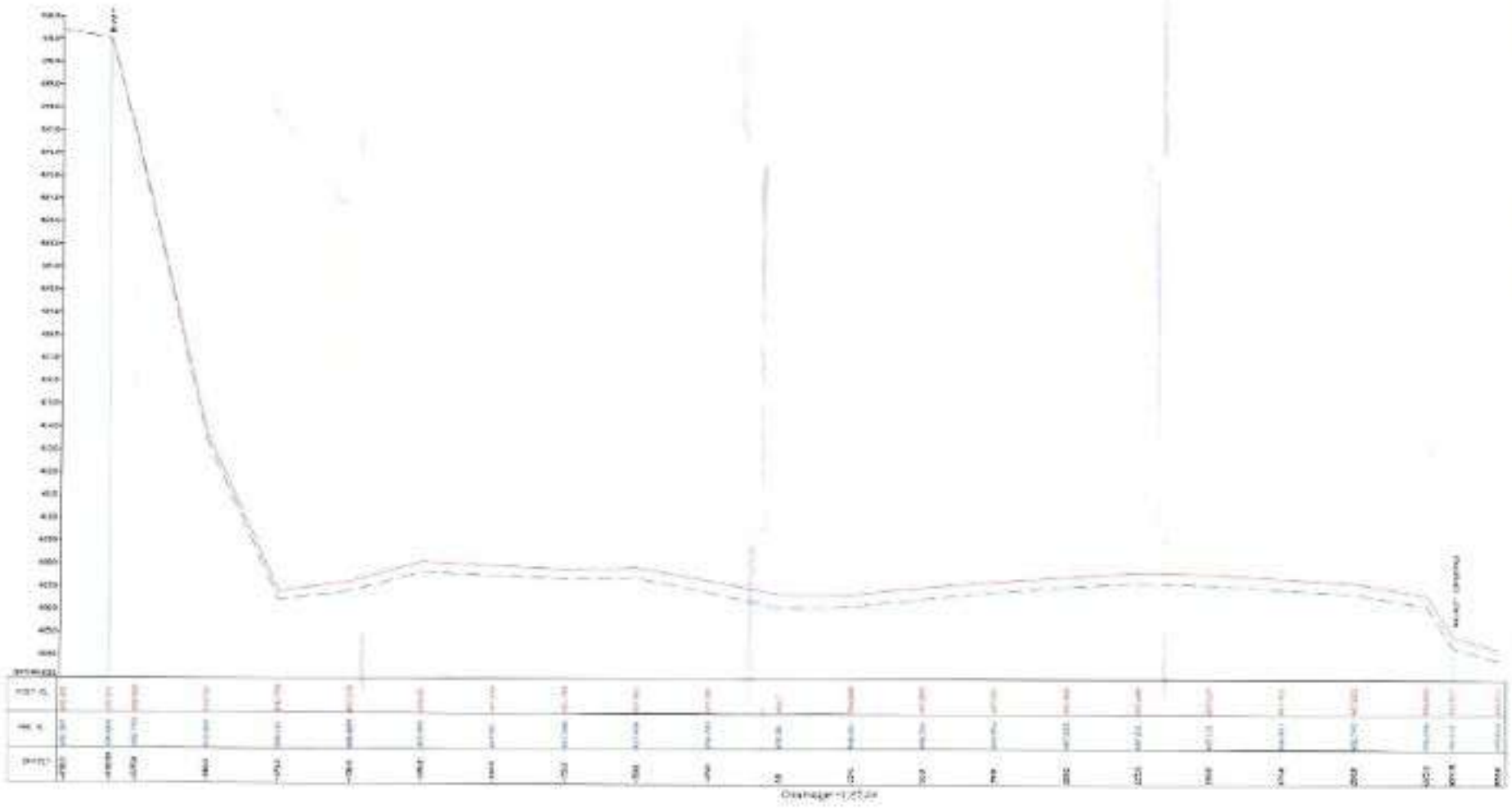
X-Section of the Dhakrani-Yamuna River (Lot no. 21/2) in Pre and Post monsoon at Chainage from (0.0 m. to 2614.64 m.)

Civil Engineering Department
Indian Institute of Technology Roorkee
Roorkee -247667

SCALE	Annexure-B20
1:800 (H) 1:100 (V)	SHEET NO.
	20 of 46

Annexure-B21





LEGEND :-

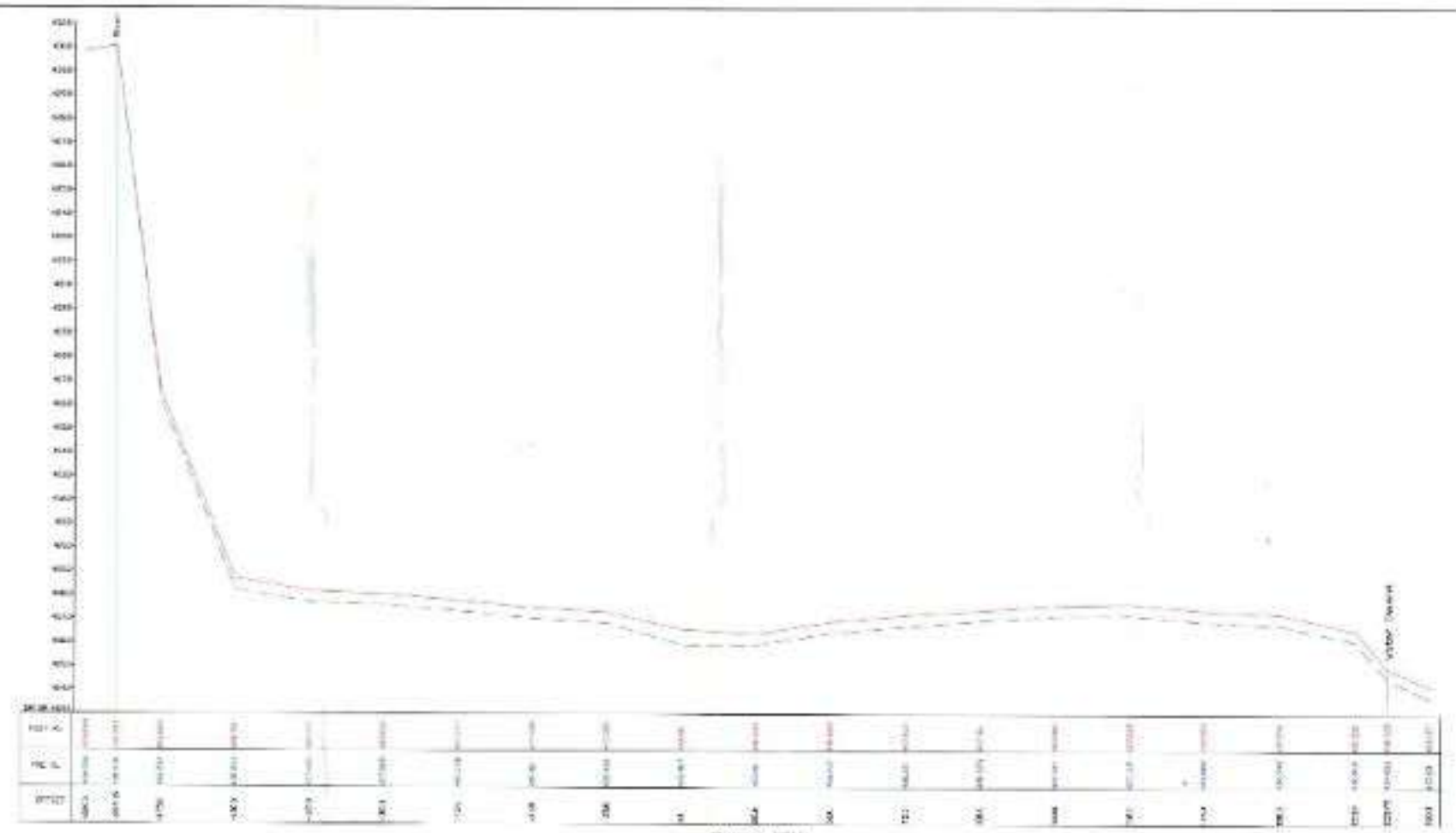
DESCRIPTION	SYMBOL
Post Monsoon	———
Pre Monsoon	- - - - - - -

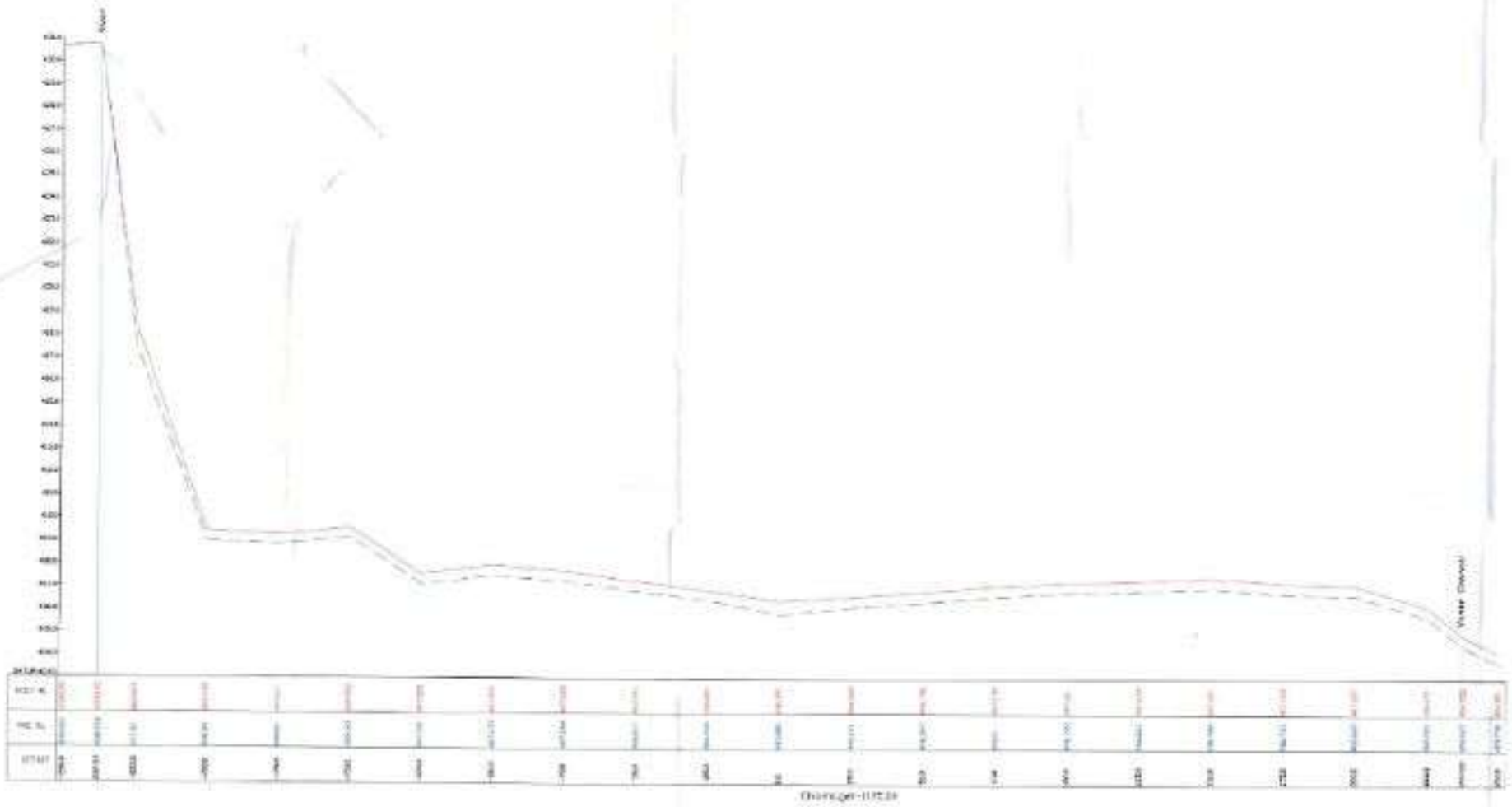
X-Section of the Dhakrani-Yamuna River (Lot no. 21/2) in Pre and Post monsoon at Chainage from (0.0 m. to 2614.64 m.)

Civil Engineering Department
Indian Institute of Technology Roorkee
Roorkee -247667

SCALE	Annexure-B21
1:800 (H) 1:100 (V)	SHEET NO.
	21 of 46

Annexure-B22





LEGEND :-

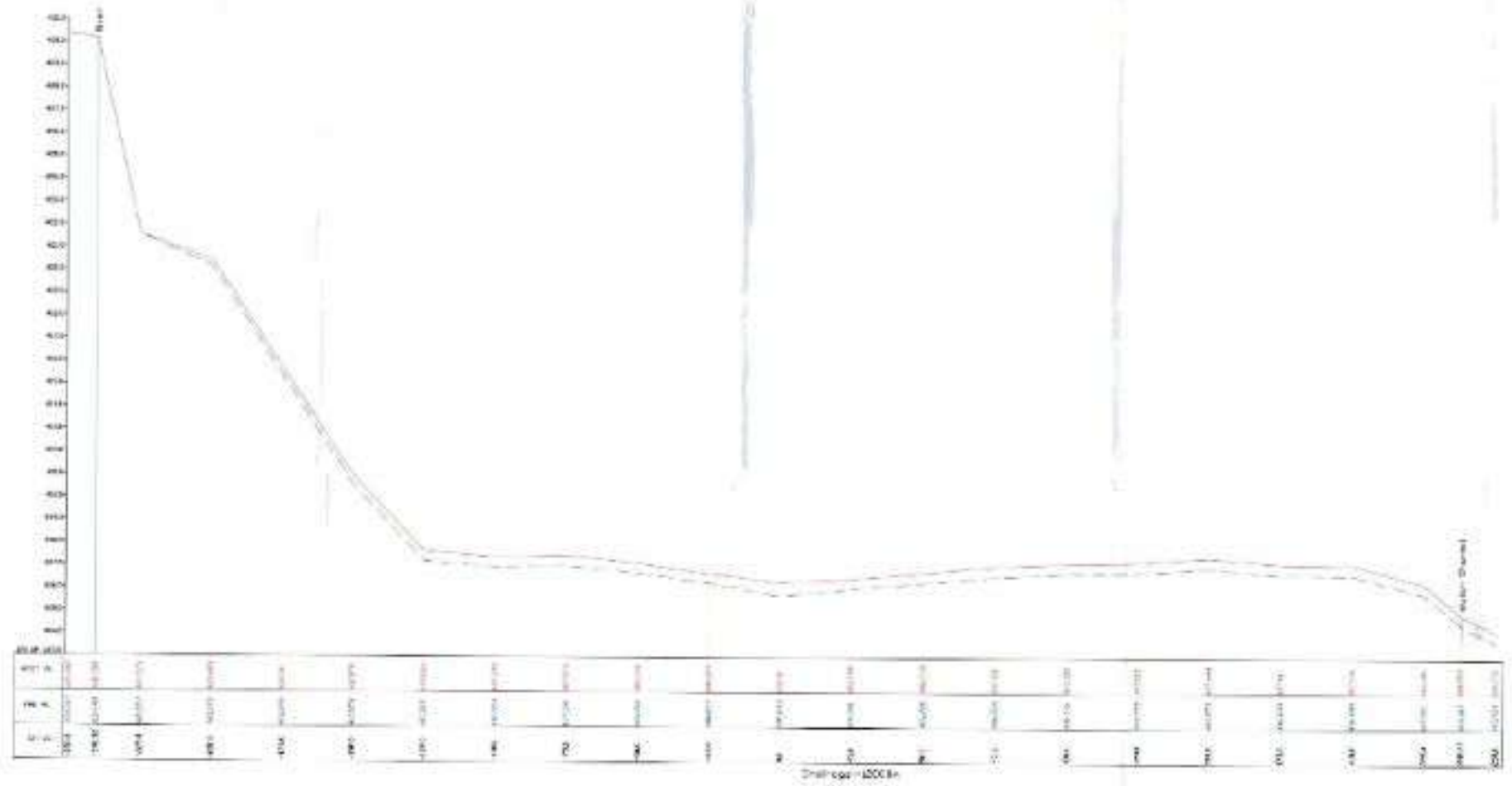
DESCRIPTION	SYMBOL
Post Monsoon	
Pre Monsoon	

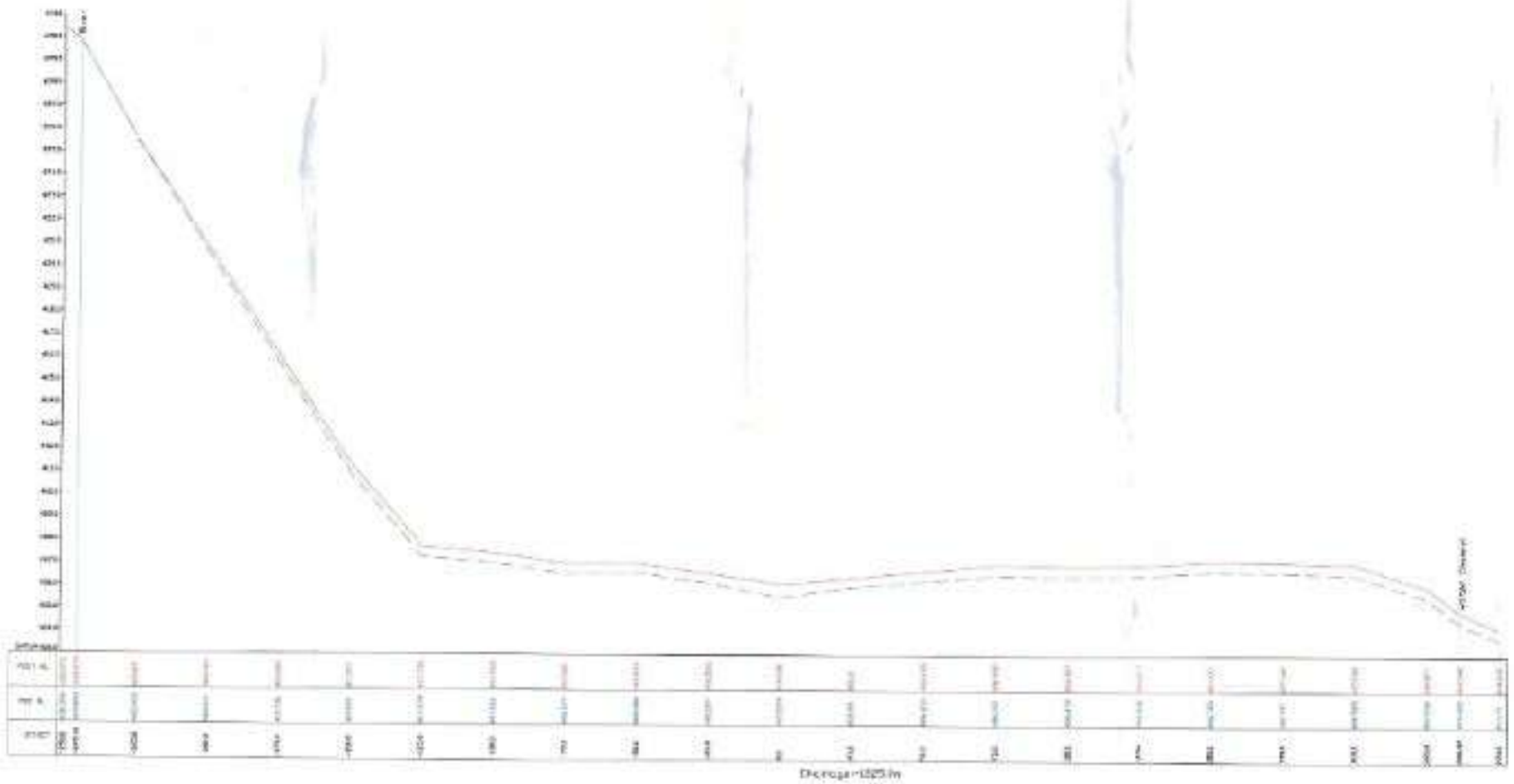
X-Section of the Dhakrani-Yamuna River (Lot no. 21/2) in Pre and Post monsoon at Chainage from (0.0 m. to 2614.64 m.)

Civil Engineering Department
Indian Institute of Technology Roorkee
Roorkee -247667

SCALE	Annexure-B22
1:800 (H) 1:100 (V)	SHEET NO.
	22 of 46

Annexure-B23





LEGEND :-

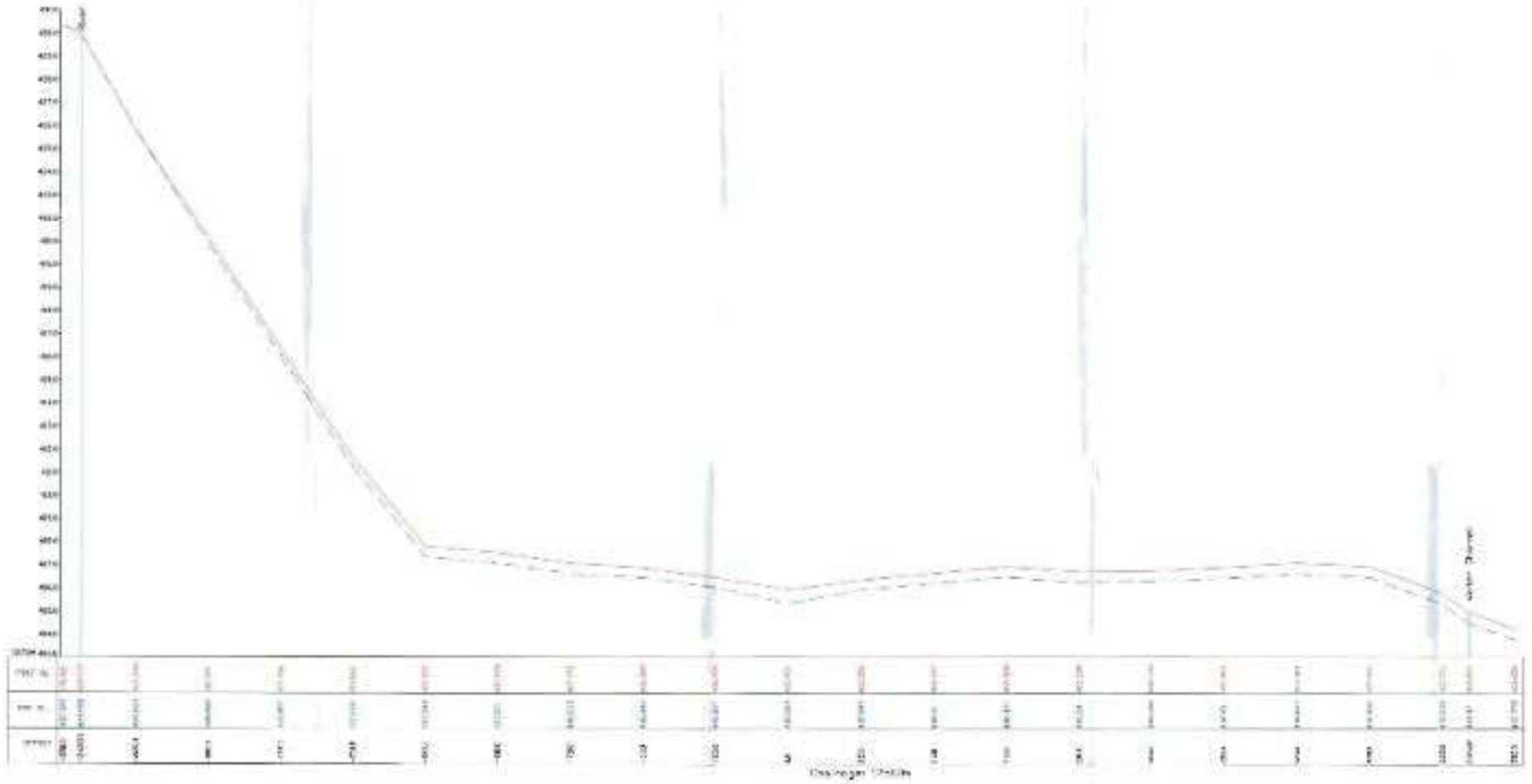
DESCRIPTION	SYMBOL
Post Monsoon	———
Pre Monsoon	- - - - - -

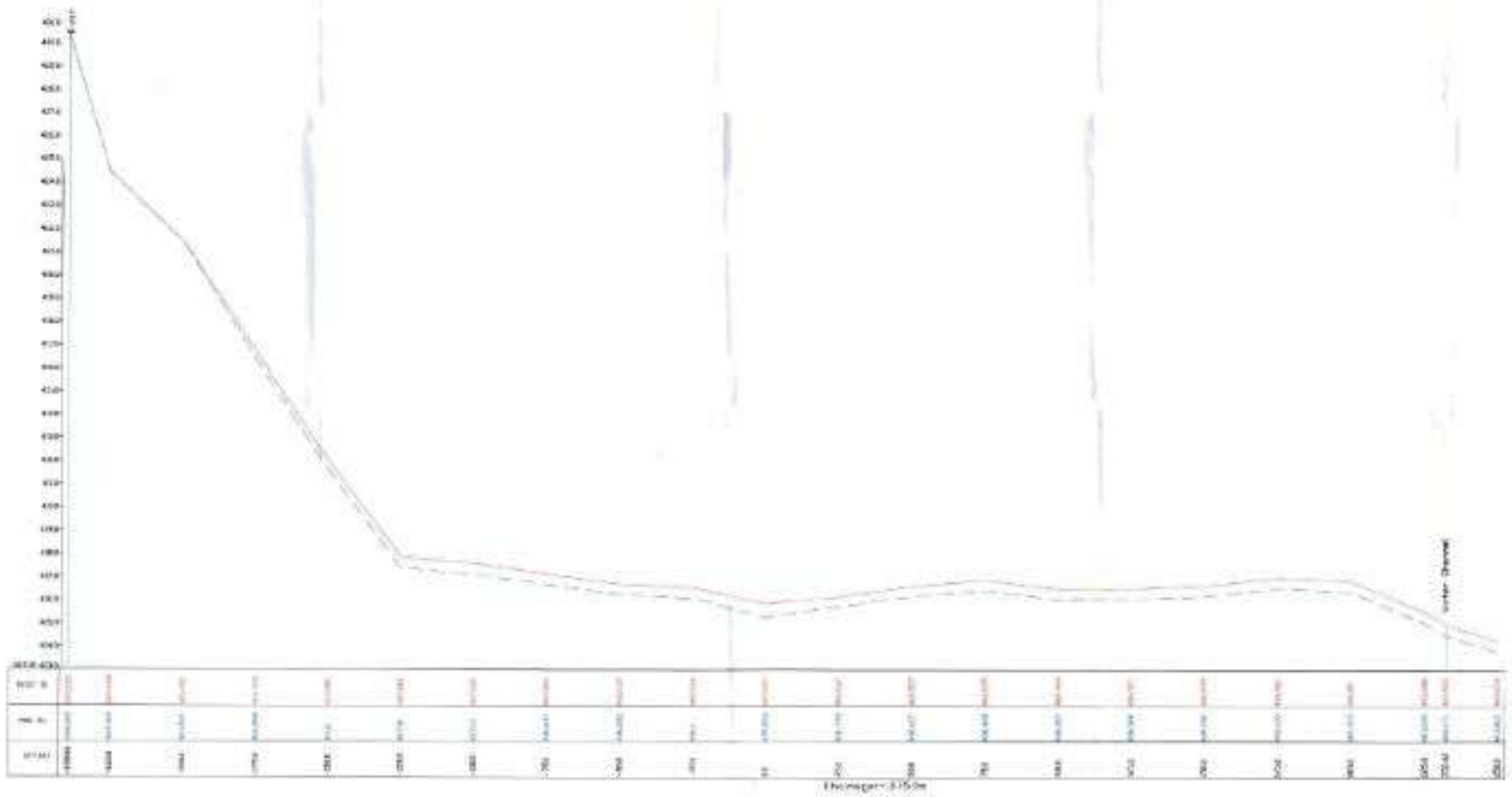
X-Section of the Dhakrani-Yamuna River (Lot no. 21/2) in Pre and Post monsoon at Chainage from (0.0 m. to 2614.64 m.)

Civil Engineering Department
Indian Institute of Technology Roorkee
Roorkee -247667

SCALE	Annexure-B23
1:800 (H)	SHEET NO.
1:100 (V)	23 of 46

Annexure-B24





LEGEND :-

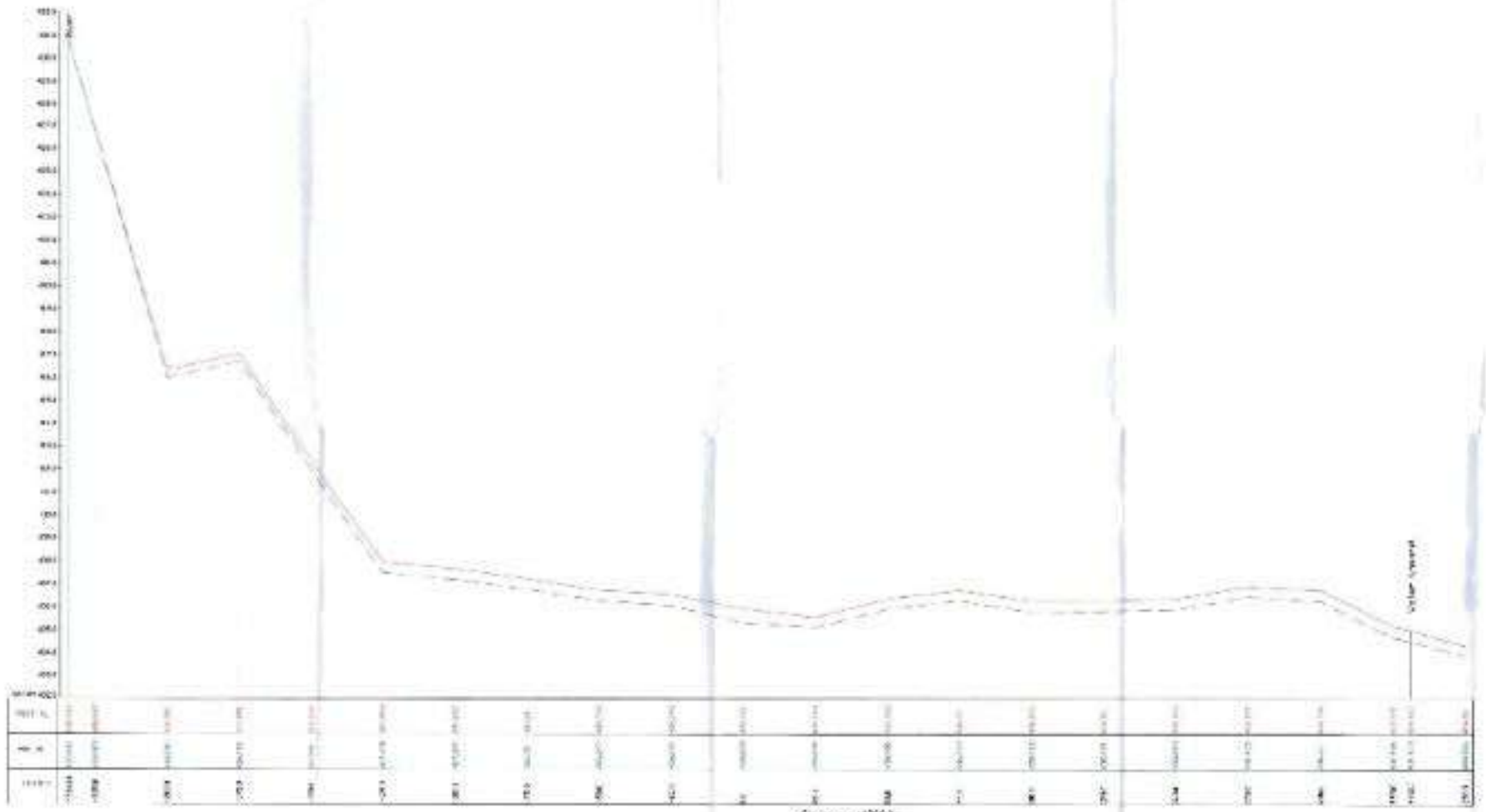
DESCRIPTION	SYMBOL
Post Monsoon	———
Pre Monsoon	- - - - -

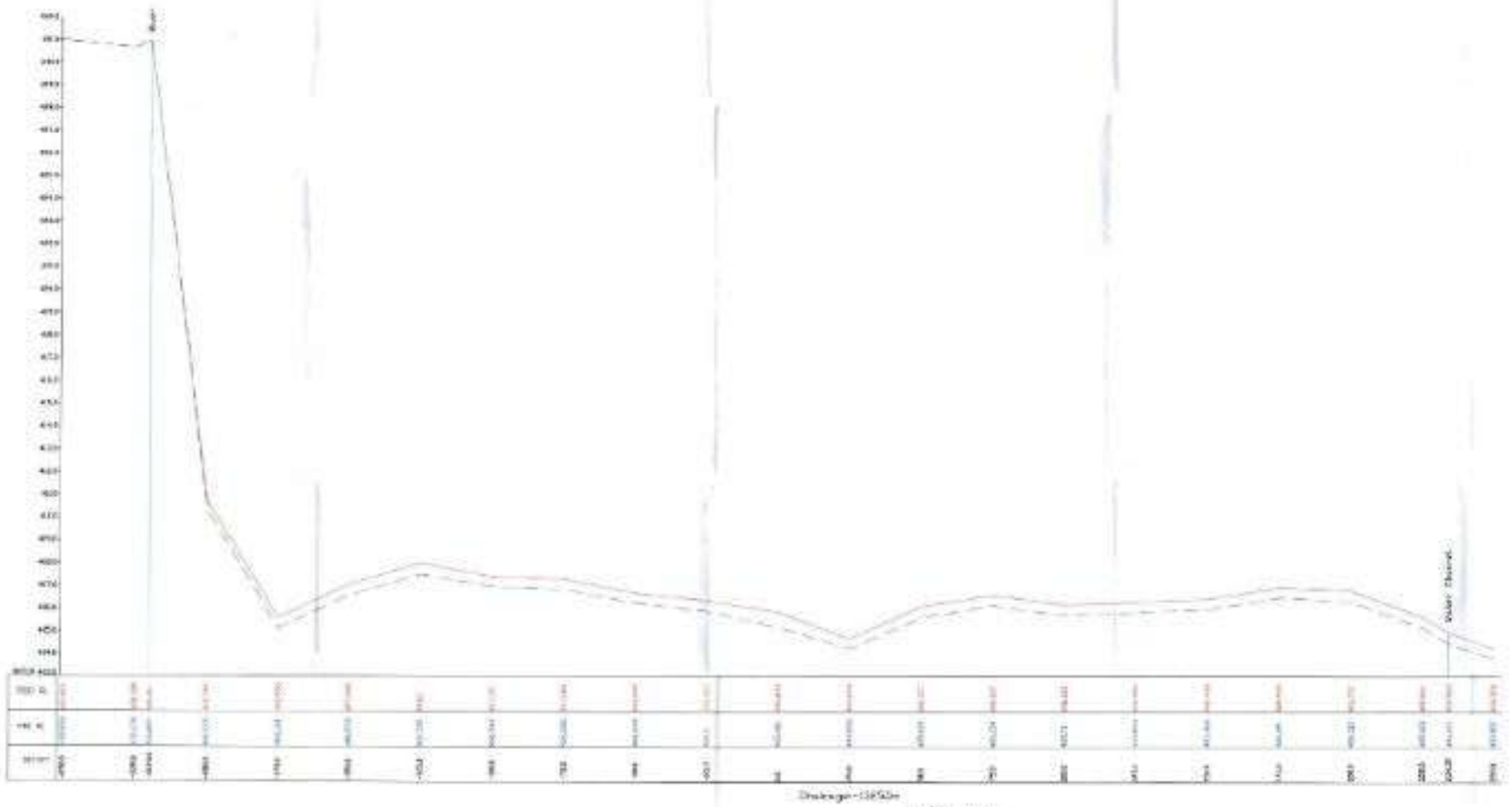
X-Section of the Dhakrani-Yamuna River (Lot no. 21/2) in Pre and Post monsoon at Chainage from (0.0 m. to 2614.64 m.)

Civil Engineering Department
Indian Institute of Technology Roorkee
Roorkee -247667

SCALE	Annexure-B24
1:800 (H) 1:100 (V)	SHEET NO.
	24 of 46

Annexure-B25





LEGEND :-

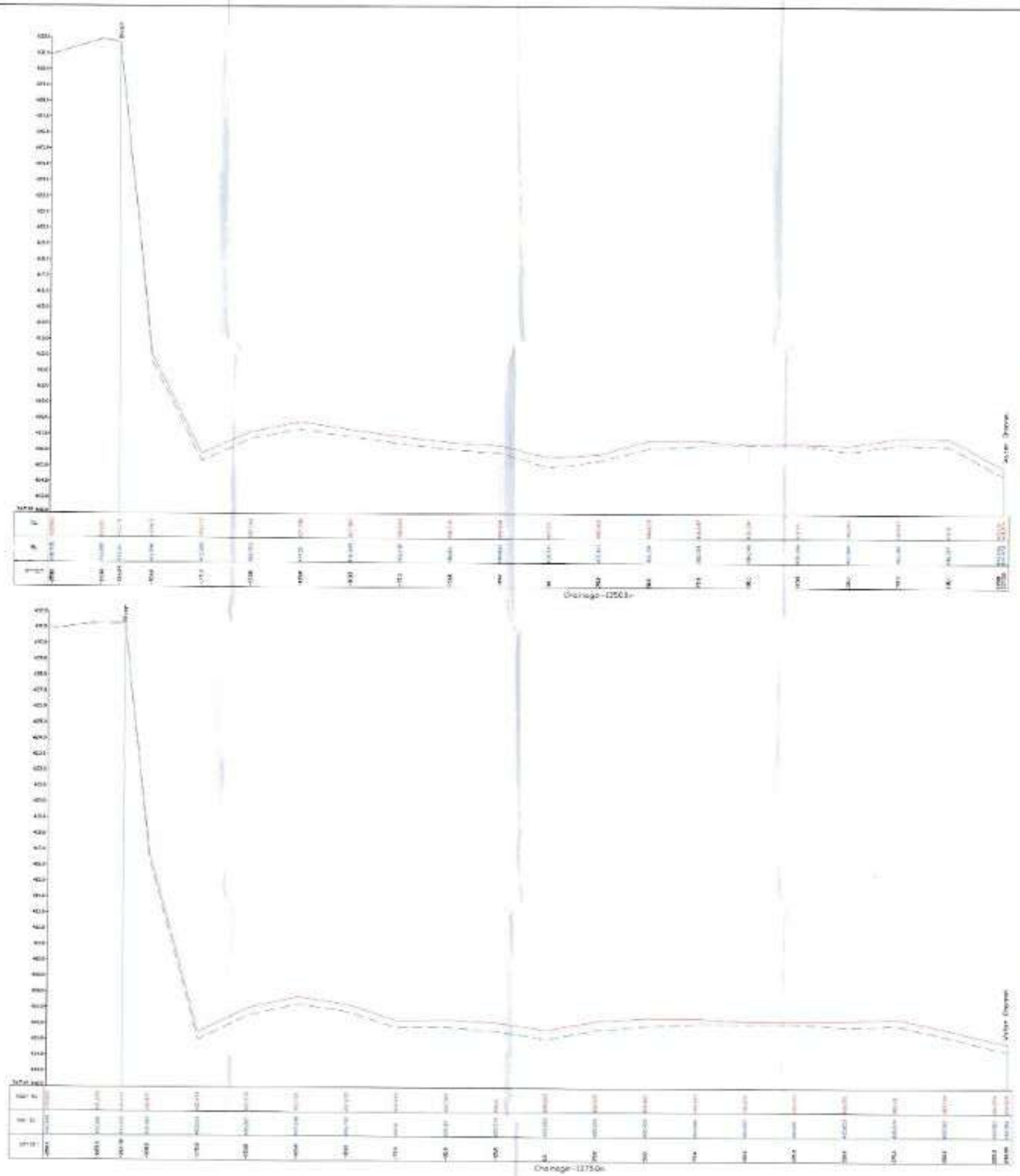
DESCRIPTION	SYMBOL
Post Monsoon	
Pre Monsoon	

X-Section of the Dhakrani-Yamuna River (Loc no. 21/2) in Pre and Post monsoon at Chainage from (0.0 m. to 2614.64 m.)

Civil Engineering Department
Indian Institute of Technology Roorkee
Roorkee -247667

SCALE	Annexure-B25
1:800 (H)	SHEET NO.
1:100 (V)	25 of 46

Annexure-B26



LEGEND :-

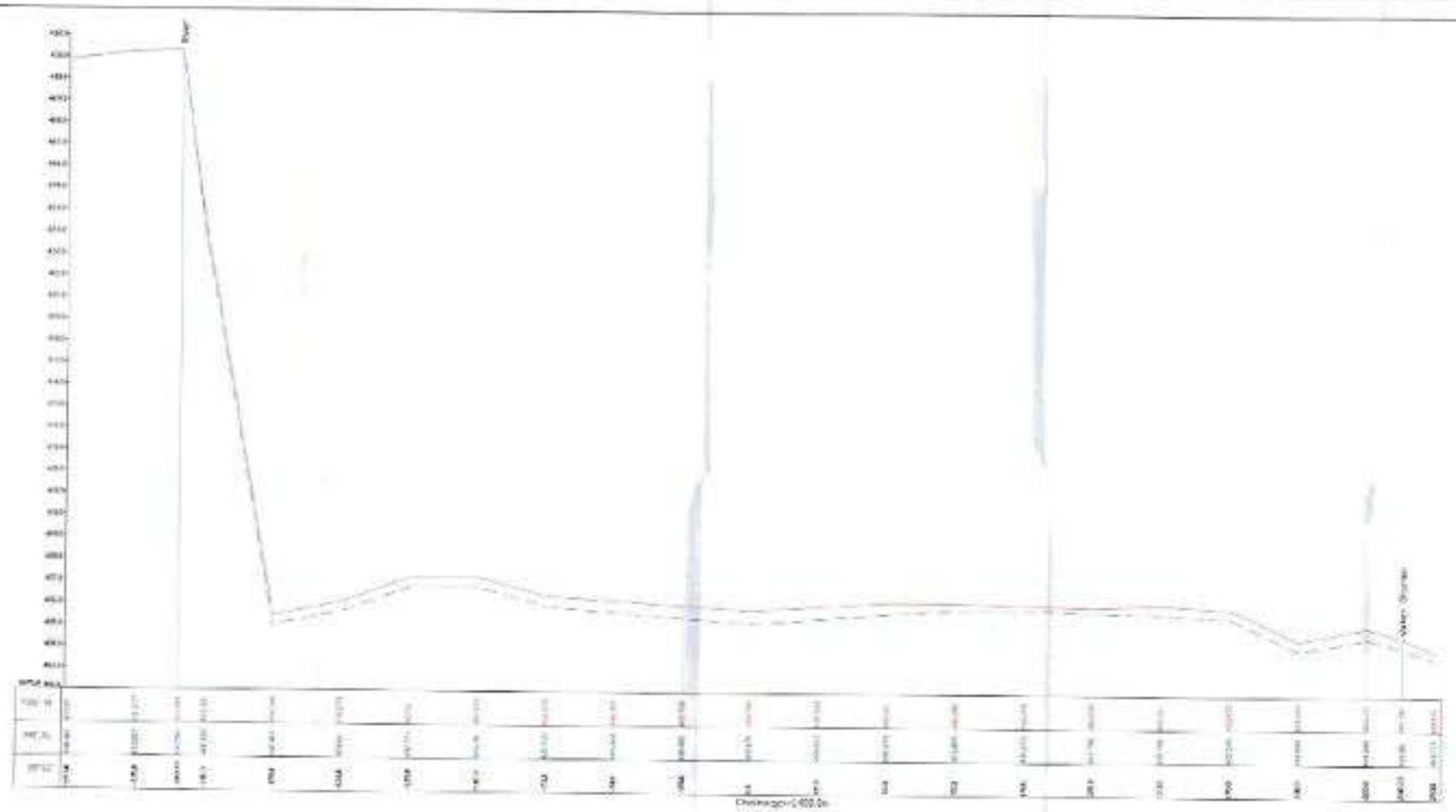
DESCRIPTION	SYMBOL
Post Monsoon	———
Pre Monsoon	- - - - - -

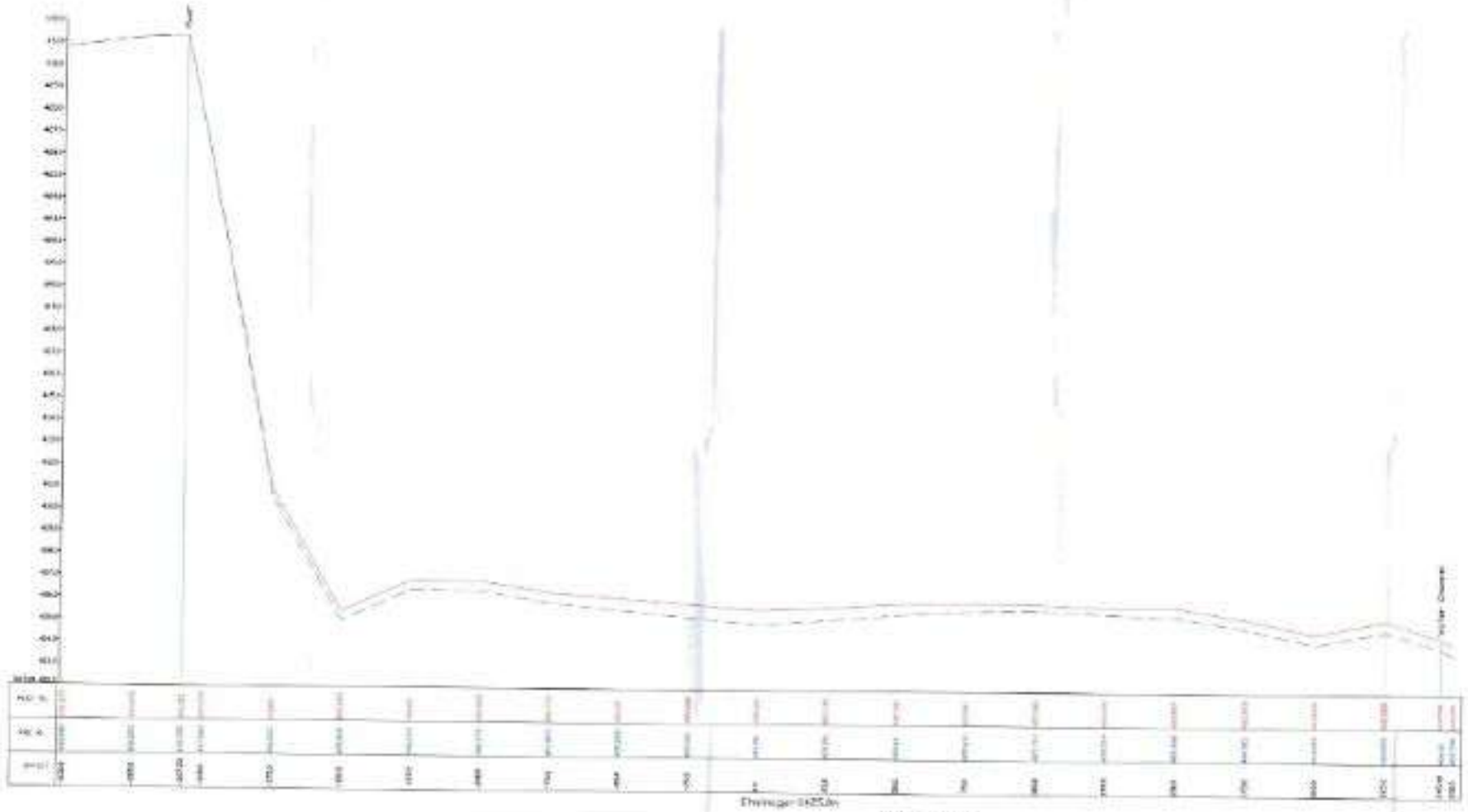
X-Section of the Dhakrani-Yamuna River (Lot no. 21/2) in Pre and Post monsoon at Chainage from (0.0 m. to 2614.64 m.)

Civil Engineering Department
Indian Institute of Technology Roorkee
Roorkee -247667

SCALE	Annexure-B26
1:800 (H) 1:100 (V)	SHEET NO.
	26 of 46

Annexure-B27





LEGEND :-

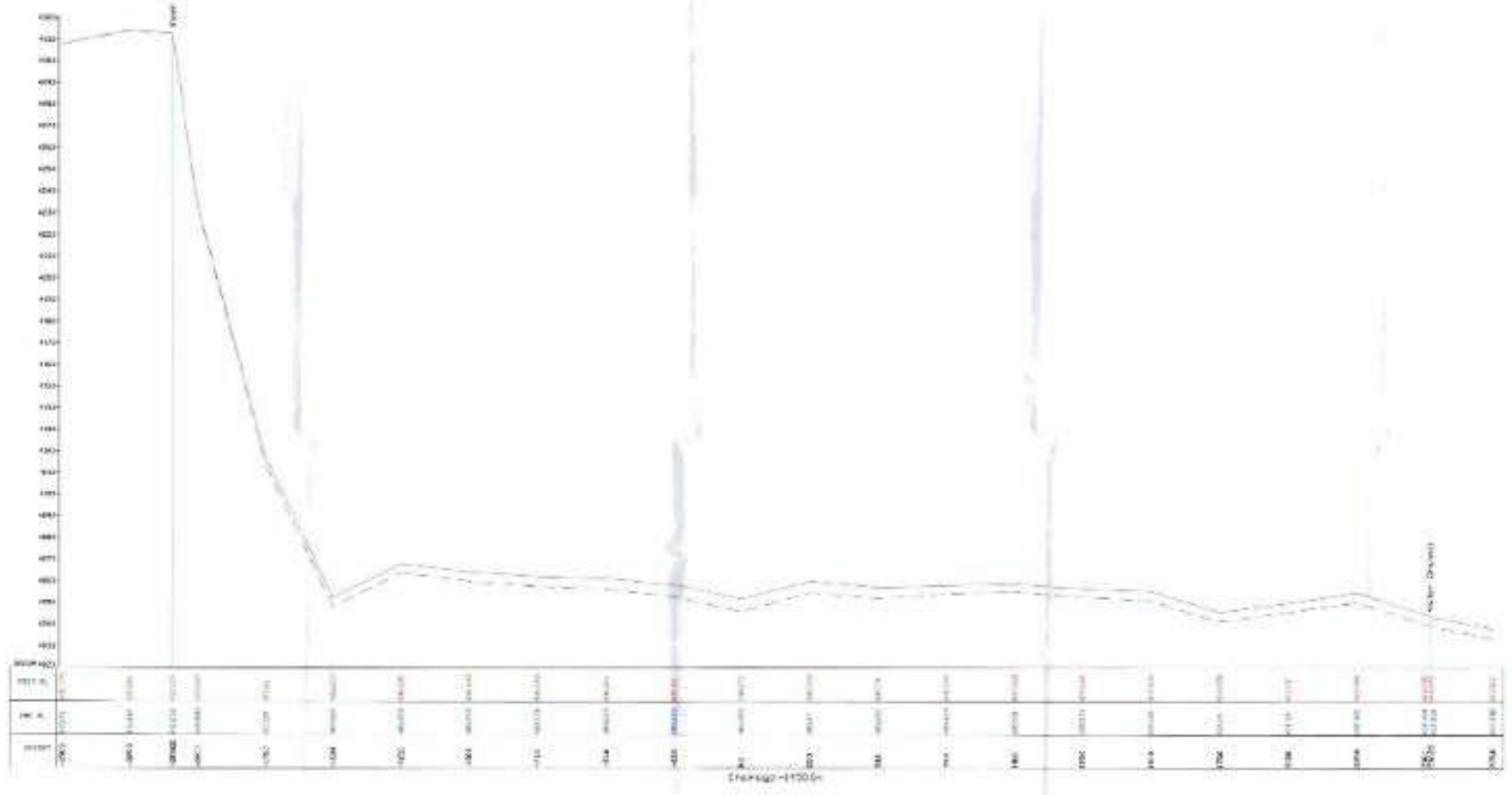
DESCRIPTION	SYMBOL
Post Monsoon	
Pre Monsoon	

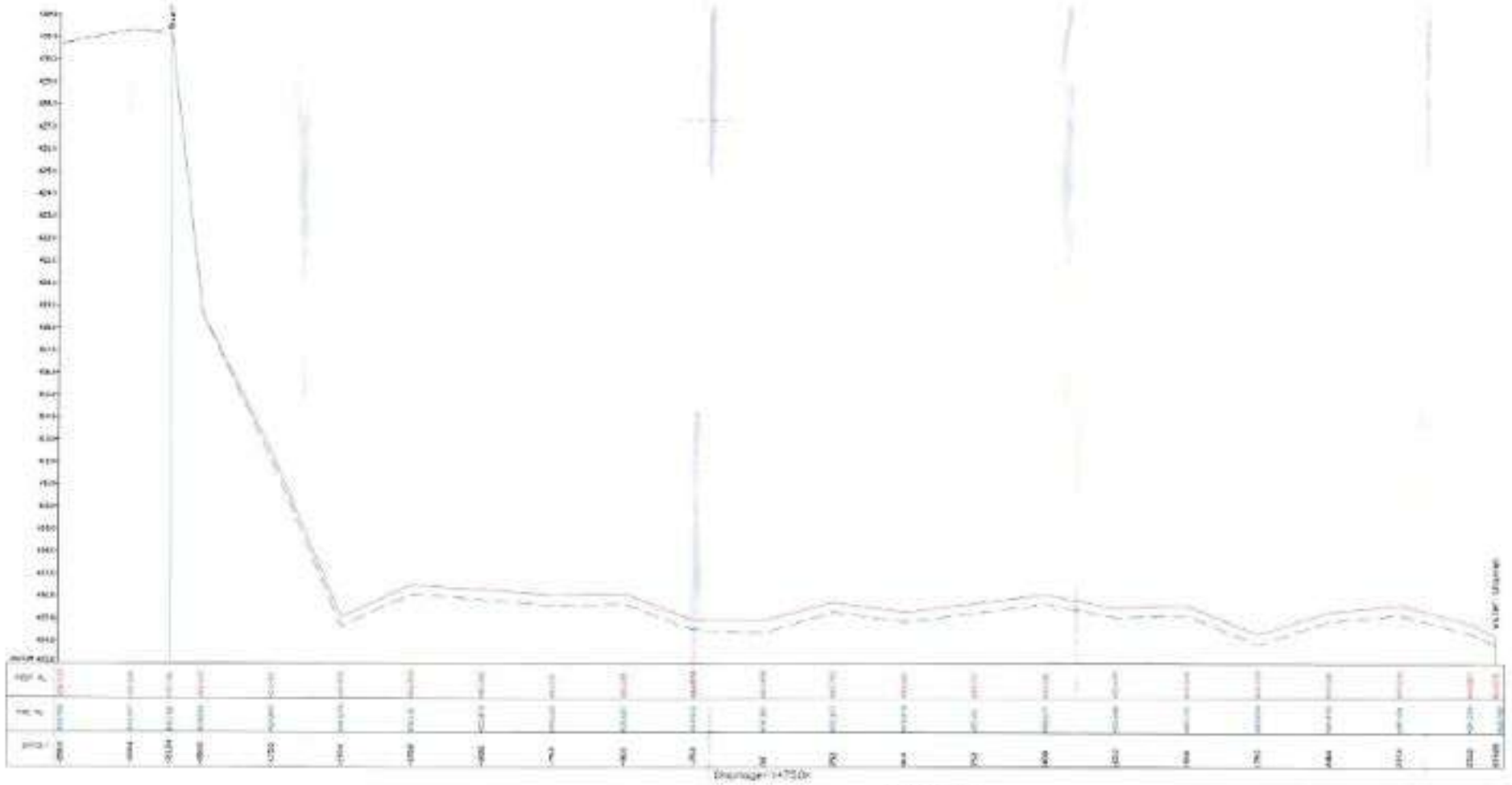
X-Section of the Dhakrani-Yamuna River (Lot no. 21/2) in Pre and Post monsoon at Chainage from (0.0 m. to 2614.64 m.)

Civil Engineering Department
Indian Institute of Technology Roorkee
Roorkee -247667

SCALE	Annexure-B27
1:800 (H) 1:100 (V)	SHEET NO.
	27 of 46

Annexure-B28





LEGEND :-

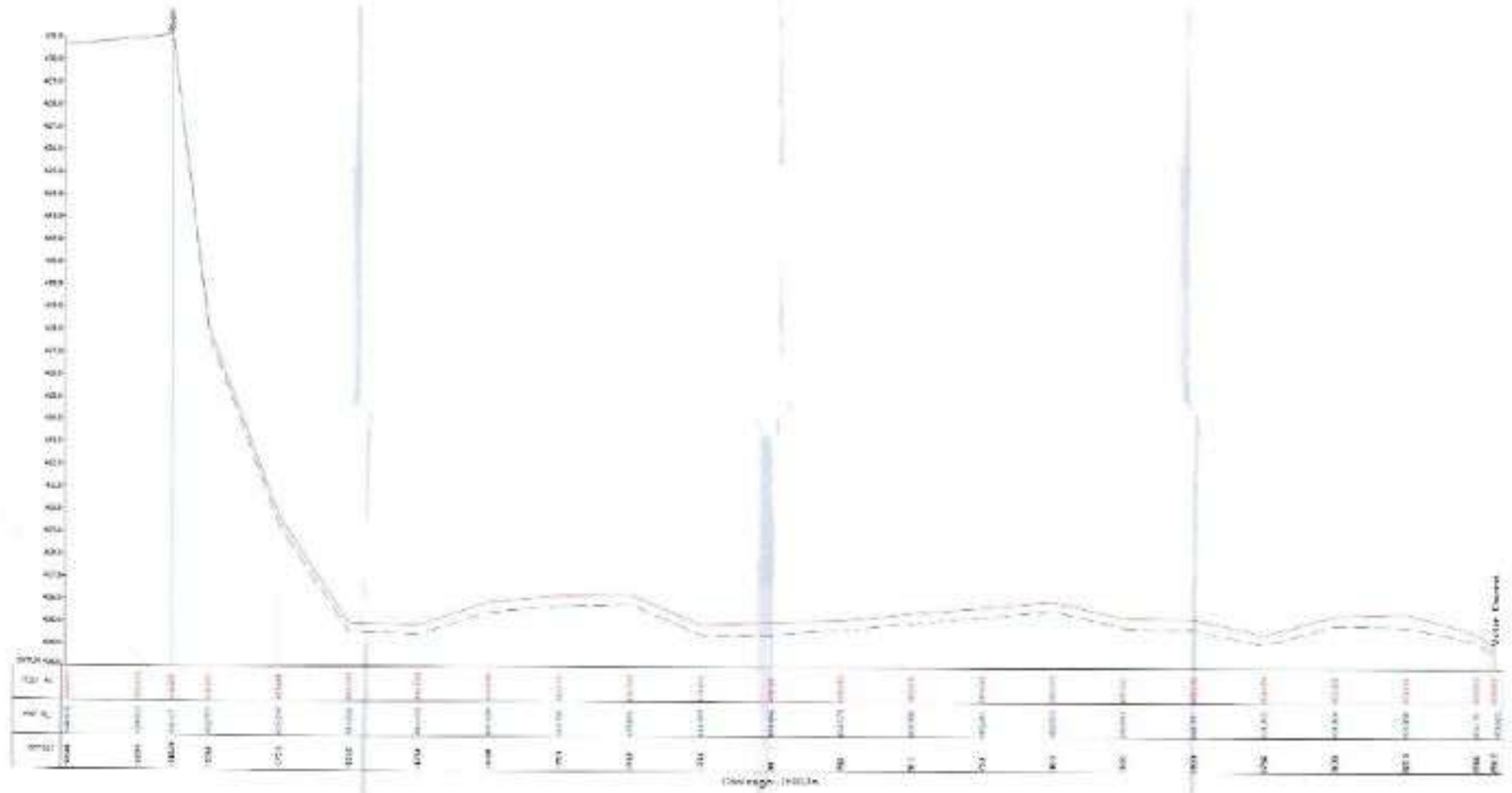
DESCRIPTION	SYMBOL
Post Monsoon	———
Pre Monsoon	- - - - -

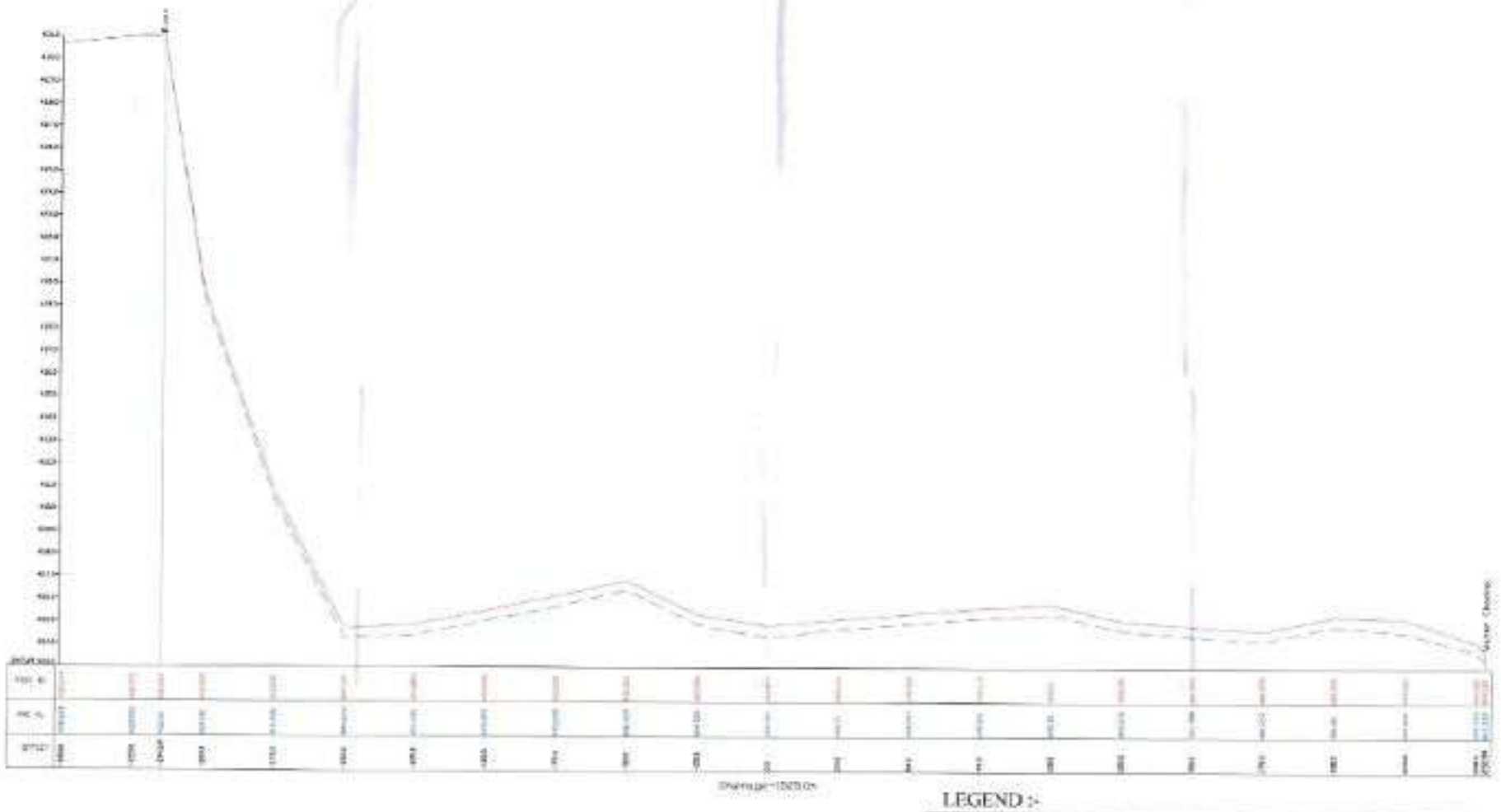
X-Section of the Dhakrani-Yamuna River (Lot no. 21/2) in Pre and Post monsoon at Chainage from (0.0 m. to 2614.64 m.)

Civil Engineering Department
Indian Institute of Technology Roorkee
Roorkee -247667

SCALE	Annexure-B28
1:800 (H)	SHEET NO.
1:100 (V)	28 of 46

Annexure-B29





LEGEND :-

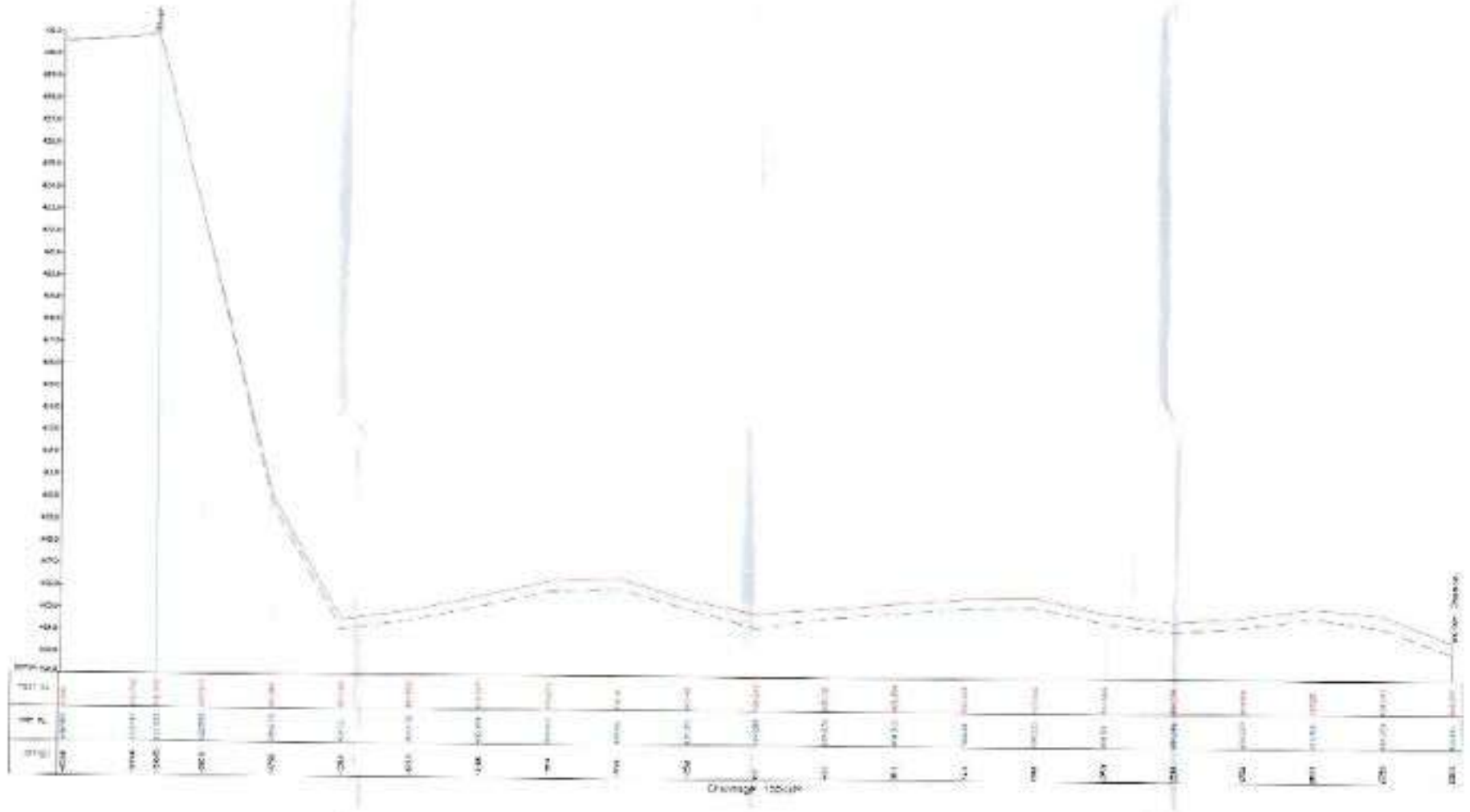
DESCRIPTION	SYMBOL
Post Monsoon	———
Pre Monsoon	- - - - - - -

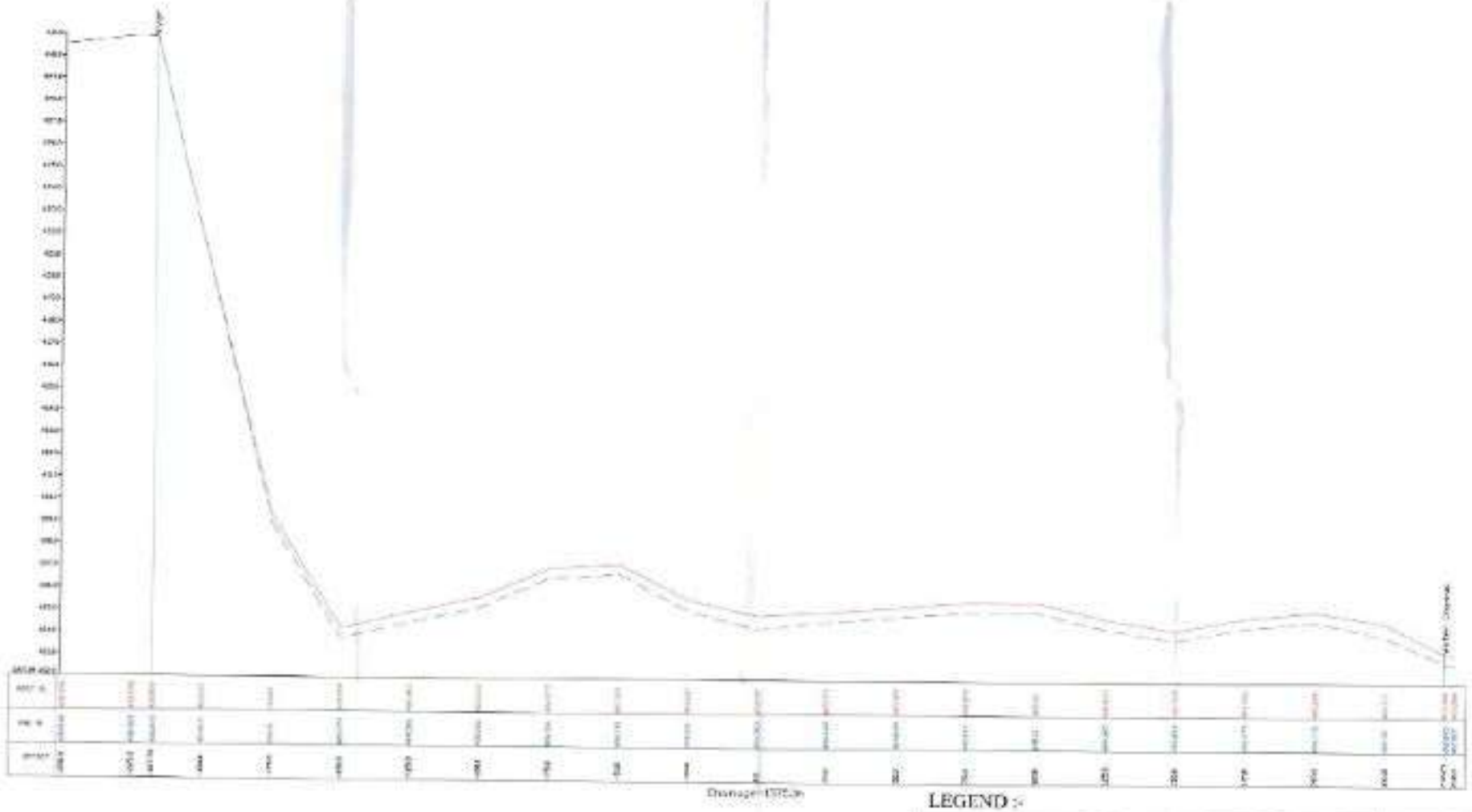
X-Section of the Dhakrani-Yamuna River (Lot no. 21/2) in Pre and Post monsoon at Chainage from (0.0 m. to 2614.64 m.)

Civil Engineering Department
Indian Institute of Technology Roorkee
Roorkee -247667

SCALE	Annexure-B29
1:800 (H)	SHEET NO.
1:100 (V)	29 of 46

Annexure-B30





LEGEND :-

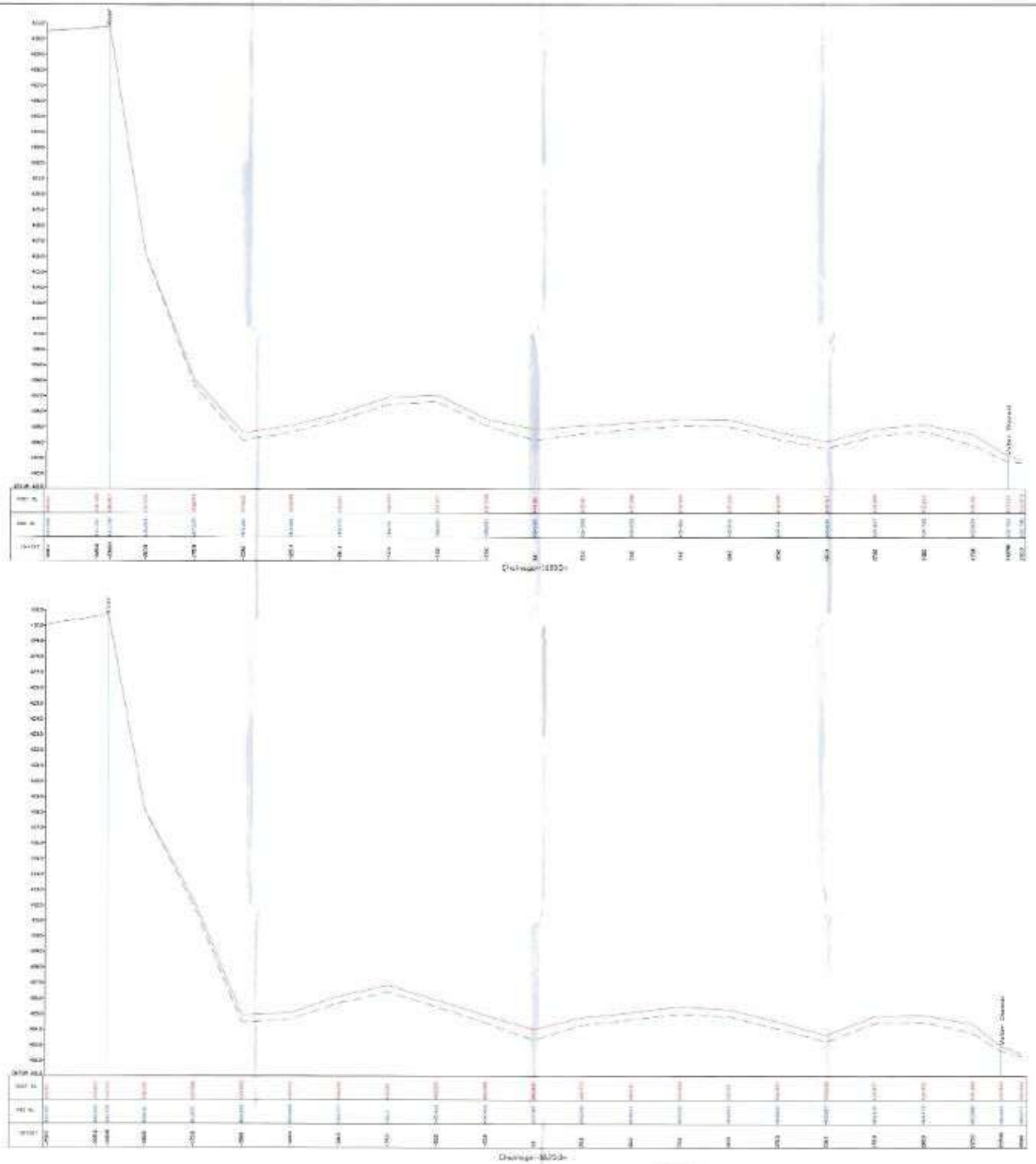
DESCRIPTION	SYMBOL
Post Monsoon	———
Pre Monsoon	- - - - - -

X-Section of the Dhakrani-Yamuna River (Lot no. 21/2) in Pre and Post monsoon at Chainage from (0.0 m. to 2614.64 m.)

Civil Engineering Department
Indian Institute of Technology Roorkee
Roorkee -247667

SCALE	Annexure-B30
1:800 (H)	SHEET NO.
1:100 (V)	30 of 46

Annexure-B31



LEGEND :-

DESCRIPTION	SYMBOL
Post Monsoon	———
Pre Monsoon	- - - - -

X-Section of the Dhakrani-Yamuna River (Lot no. 21/2) in Pre and Post monsoon at Chainage from (0.0 m. to 2614.64 m.)

Civil Engineering Department
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Roorkee -247667

SCALE	Annexure-B31
1:800 (H) 1:100 (V)	SHEET NO.
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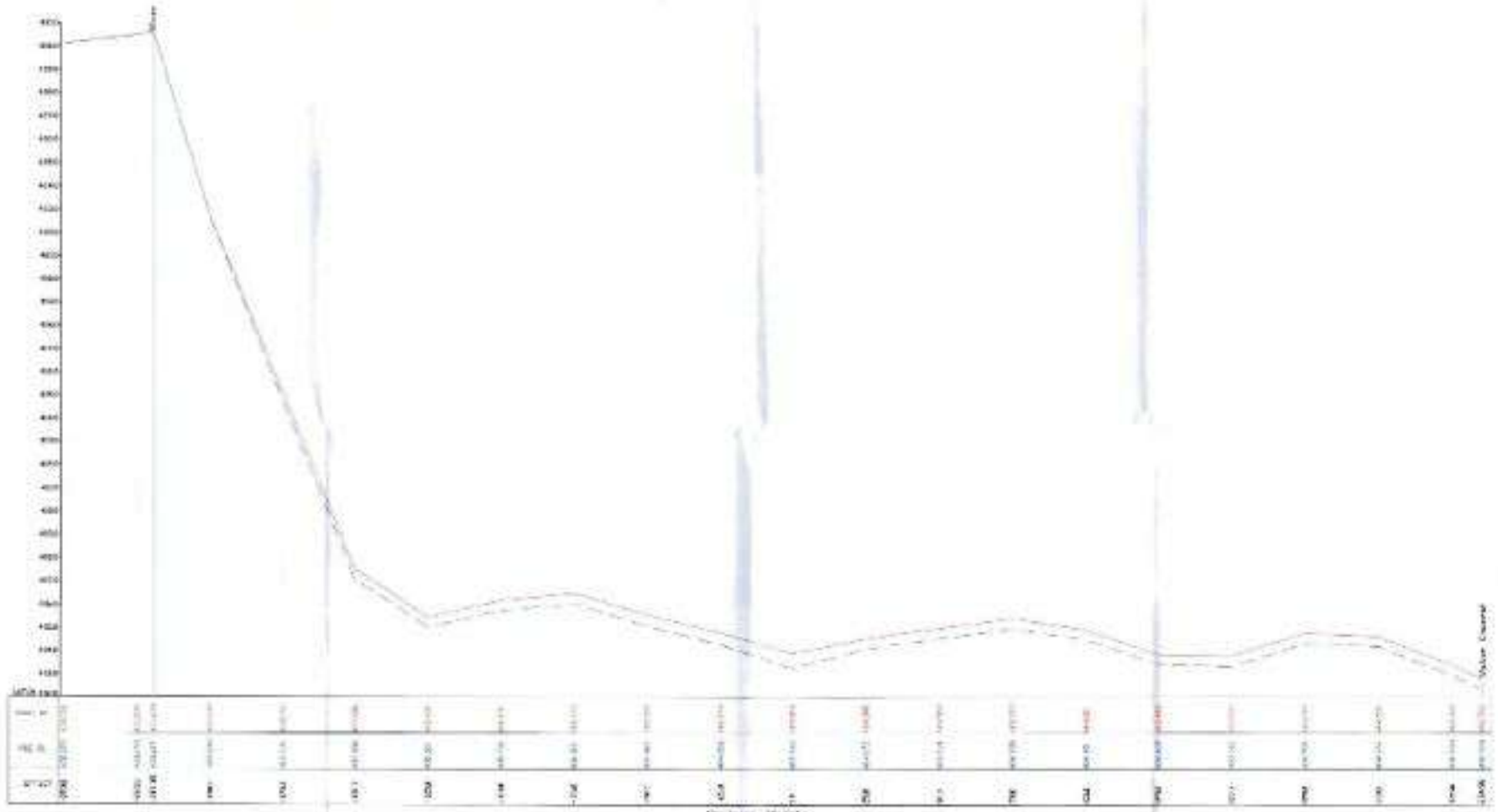
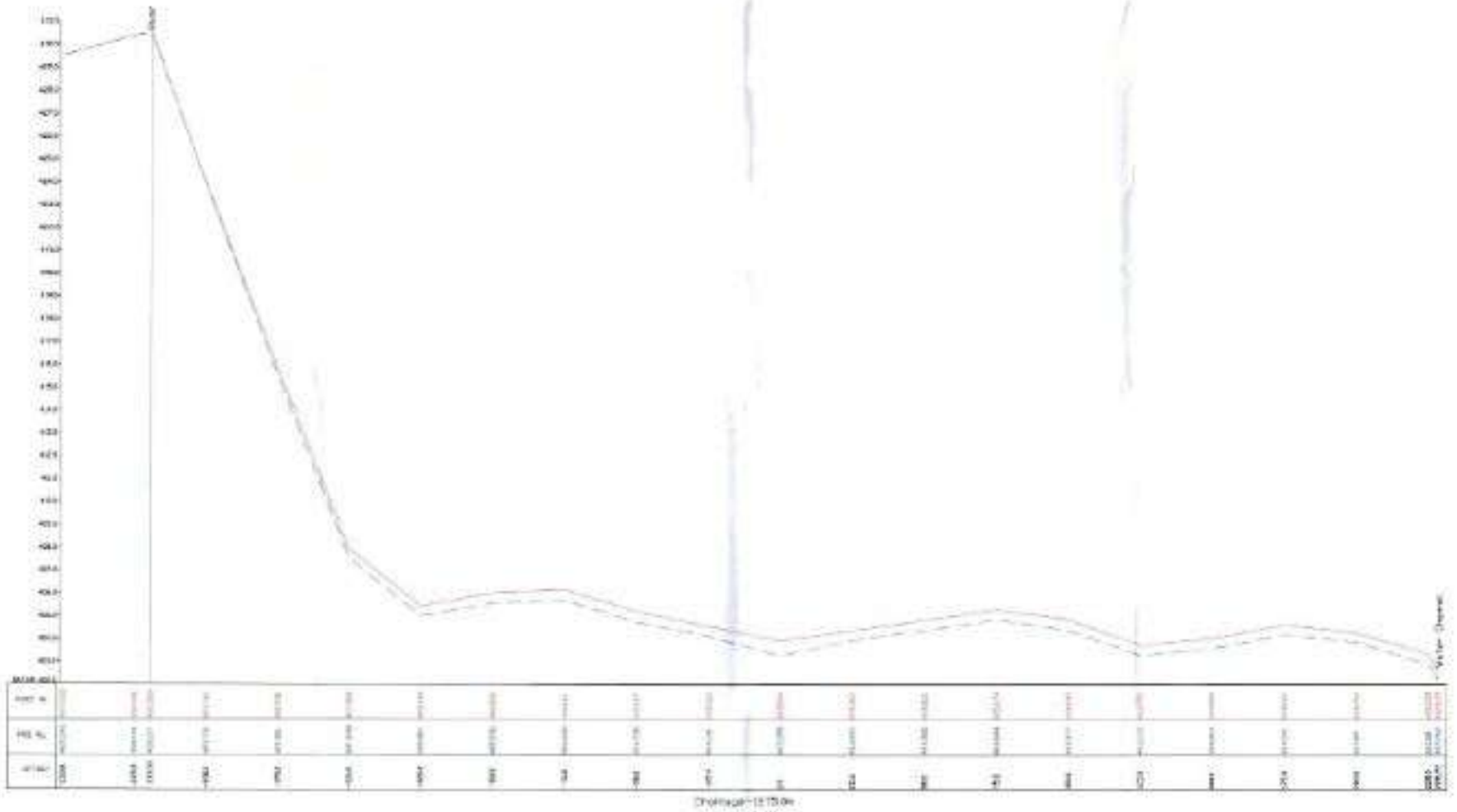
Annexure-B32





LEGEND :-

DESCRIPTION	SYMBOL
Post Monsoon	———
Pre Monsoon	- - - - - -

X-Section of the Dhakrani-Yamuna River (Lot no. 21/2) in Pre and Post monsoon at Chainage from (0.0 m. to 2614.64 m.)

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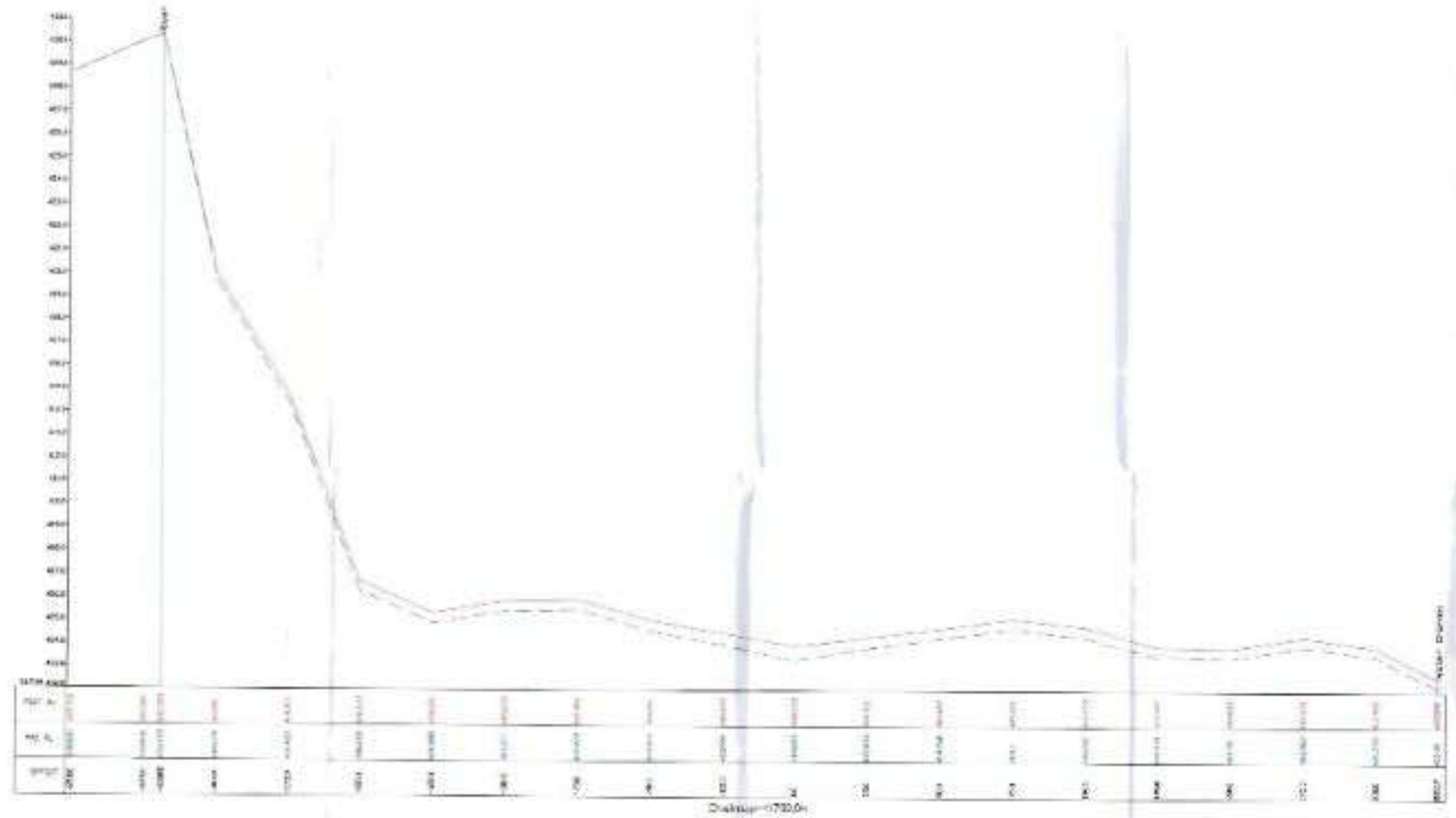
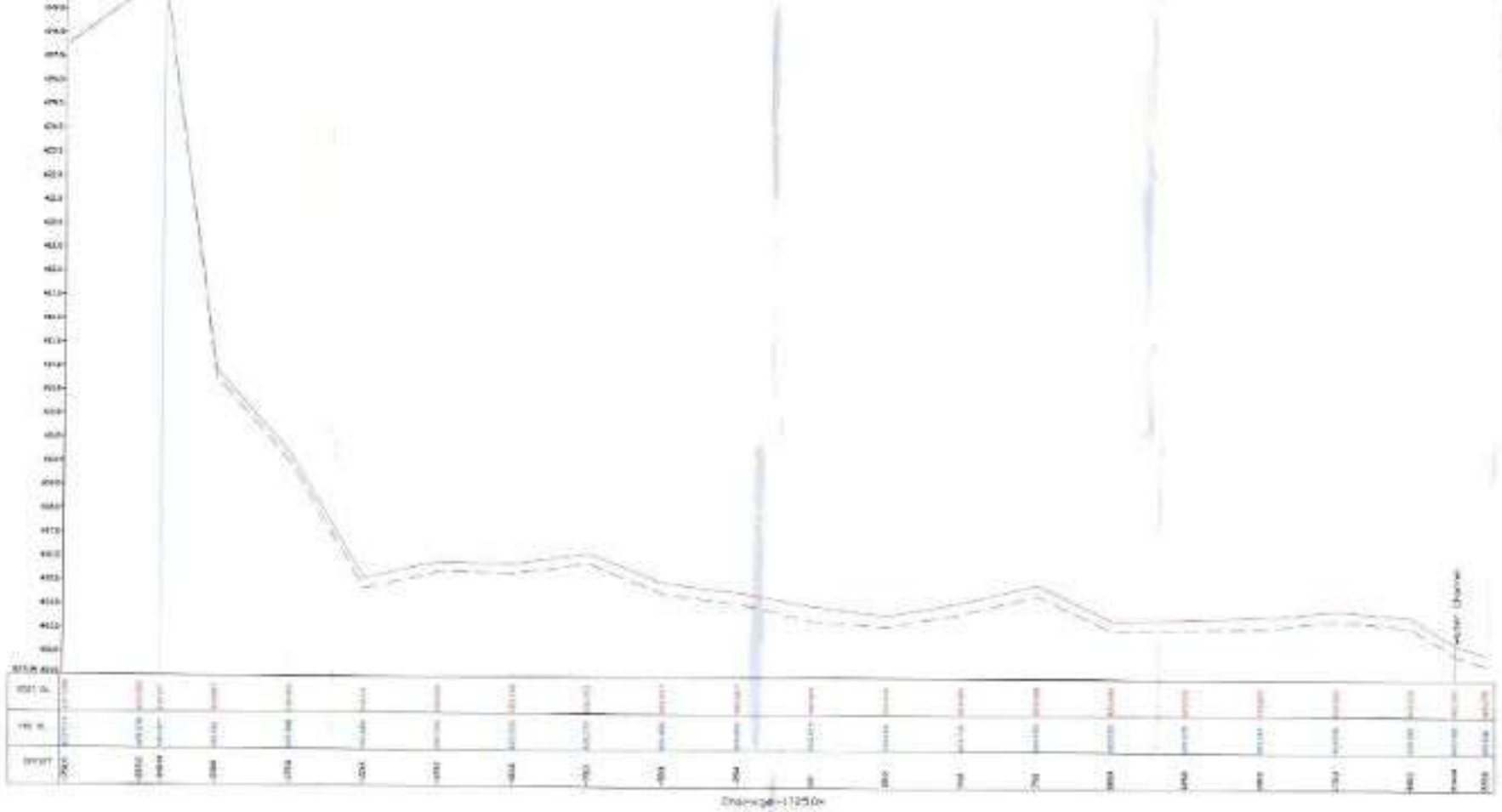
Roorkee -247667

SCALE	Annexure-B32
1:800 (H) 1:100 (V)	SHEET NO. 32 of 46

Annexure-B33





LEGEND :-

DESCRIPTION	SYMBOL
Post Monsoon	
Pre Monsoon	

X-Section of the Dhakrani-Yamuna River (Lot no. 21/2) in Pre and Post monsoon at Chainage from (0.0 m. to 2614.64 m.)

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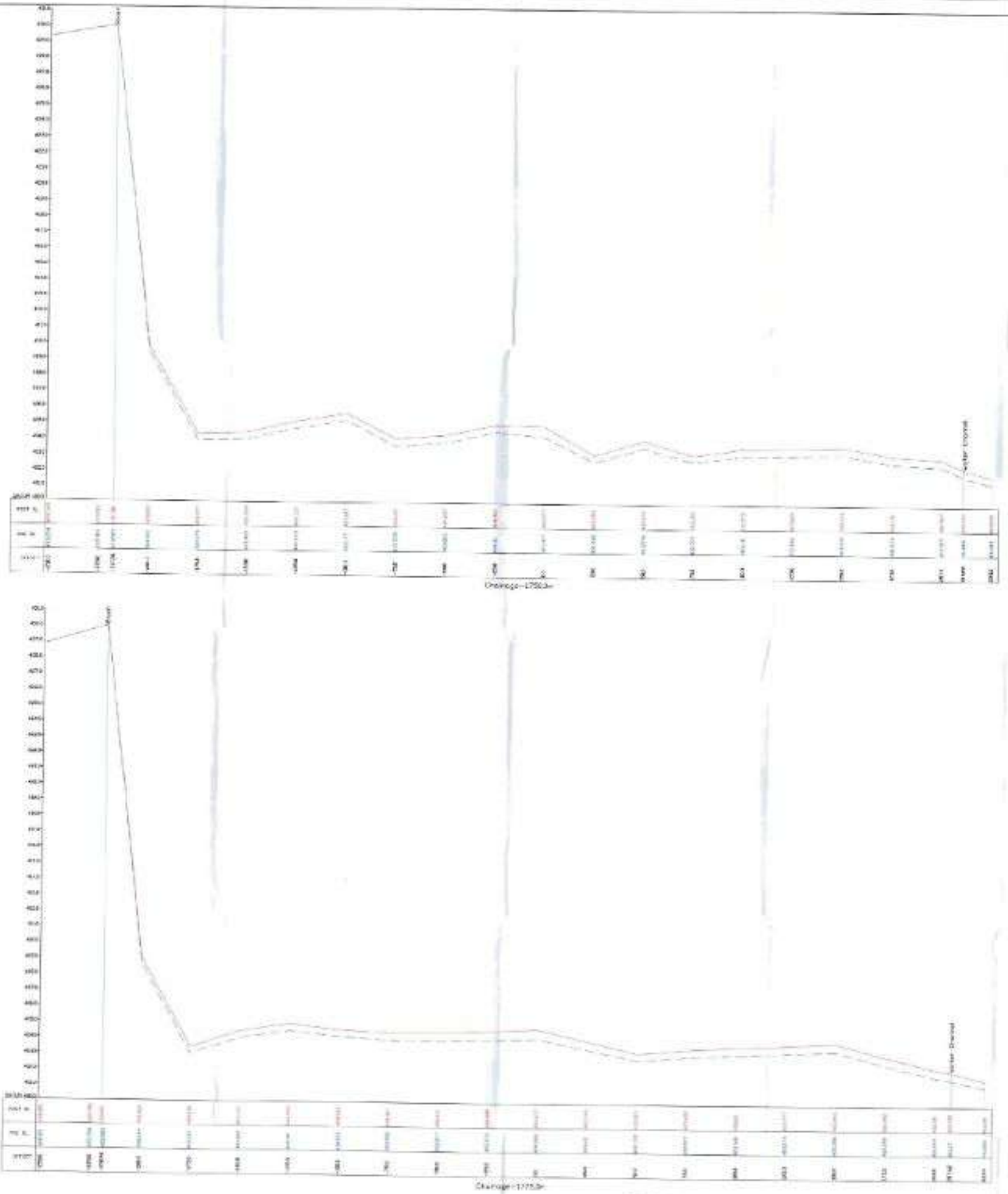
Roorkee -247667

SCALE	Annexure-B33
1:800 (H)	SHEET NO.
1:100 (V)	33 of 46

Annexure-B34



LEGEND :-

DESCRIPTION	SYMBOL
Post Monsoon	———
Pre Monsoon	- - - - -

X-Section of the Dhakrani-Yamuna River (Lot no. 21/2) in Pre and Post monsoon at Chainage from (0.0 m. to 2614.64 m.)

Civil Engineering Department
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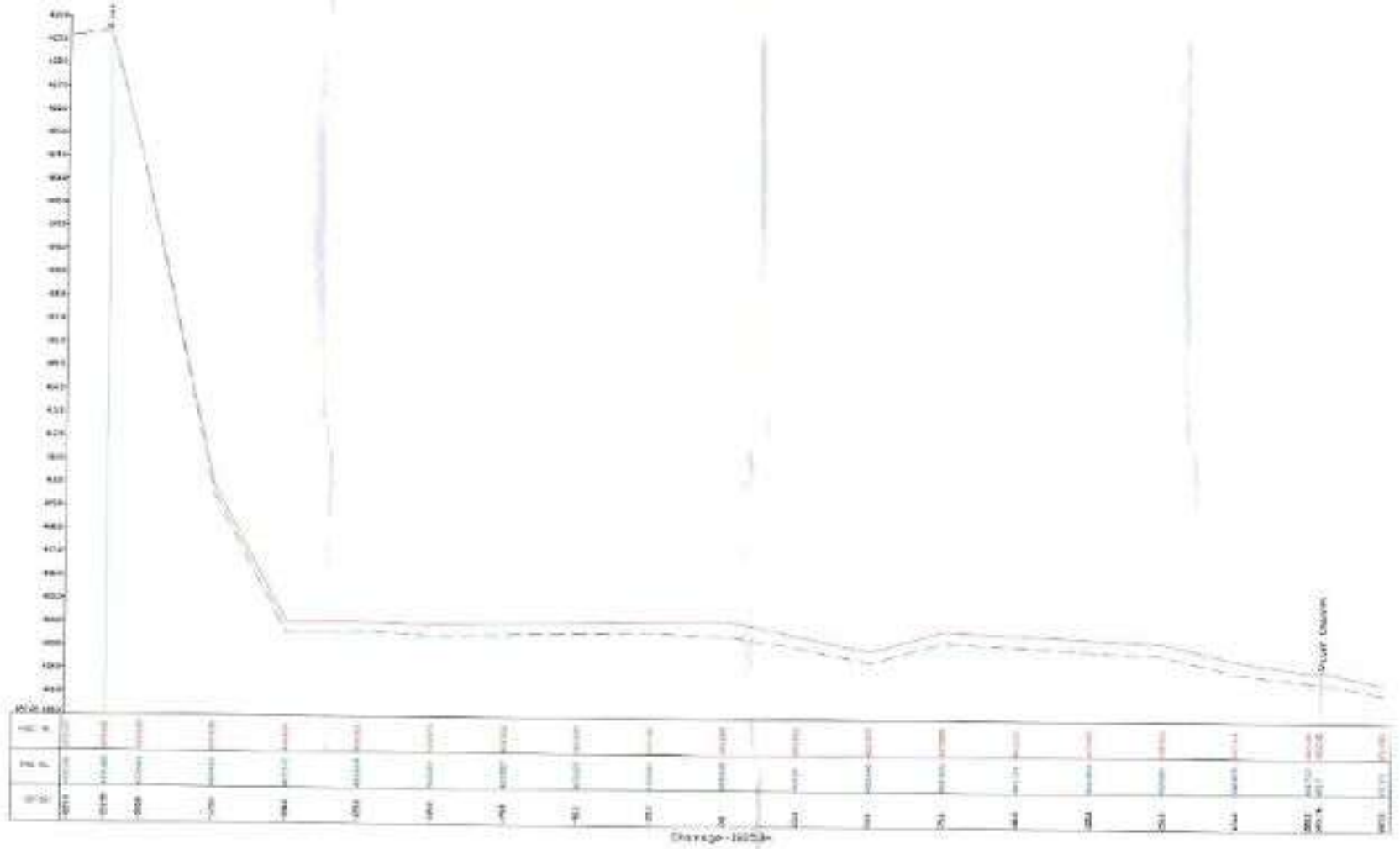
Roorkee -247667

SCALE	Annexure-B34
1:800 (H)	SHEET NO.
1:100 (V)	34 of 46

Annexure-B35



LEGEND :-

DESCRIPTION	SYMBOL
Post Monsoon	———
Pre Monsoon	- - - - -

X-Section of the Dhakrani-Yamuna River (Lot no. 21/2) in Pre and Post monsoon at Chainage from (0.0 m. to 2614.64 m.)

Civil Engineering Department
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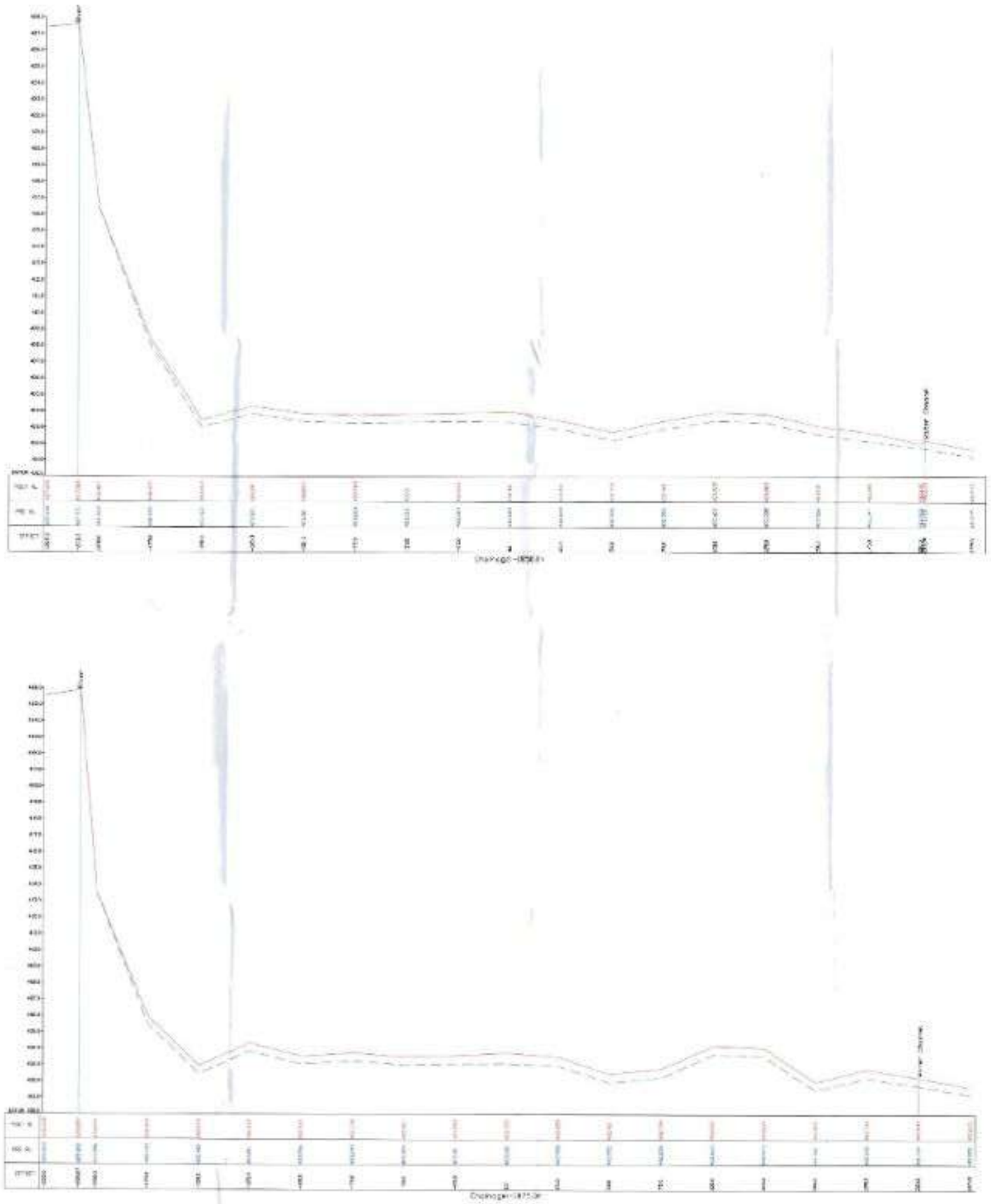
SCALE	Annexure-B35
1:800 (H)	SHEET NO.
1:100 (V)	35 of 46

Annexure-B36



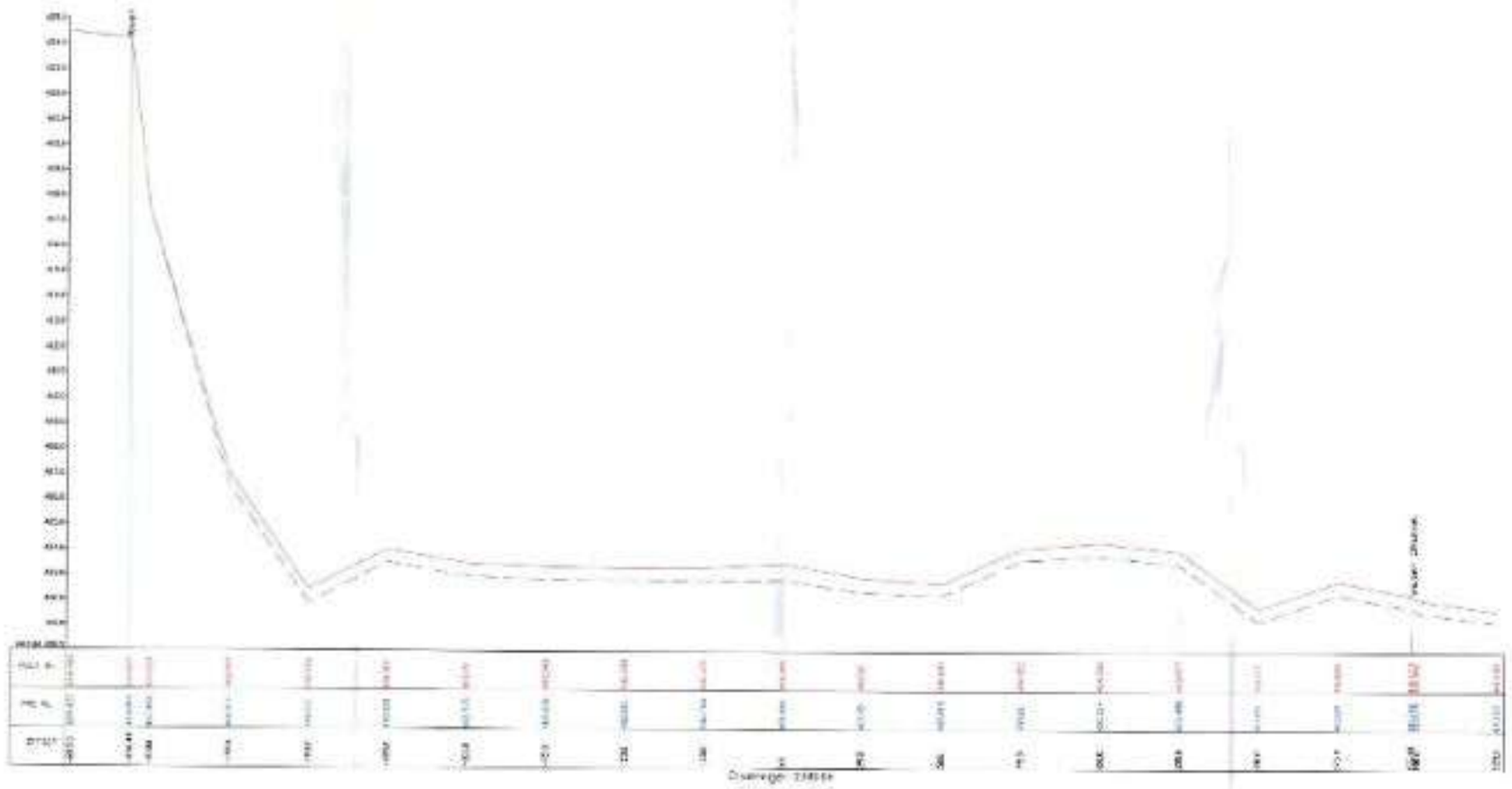
LEGEND :-

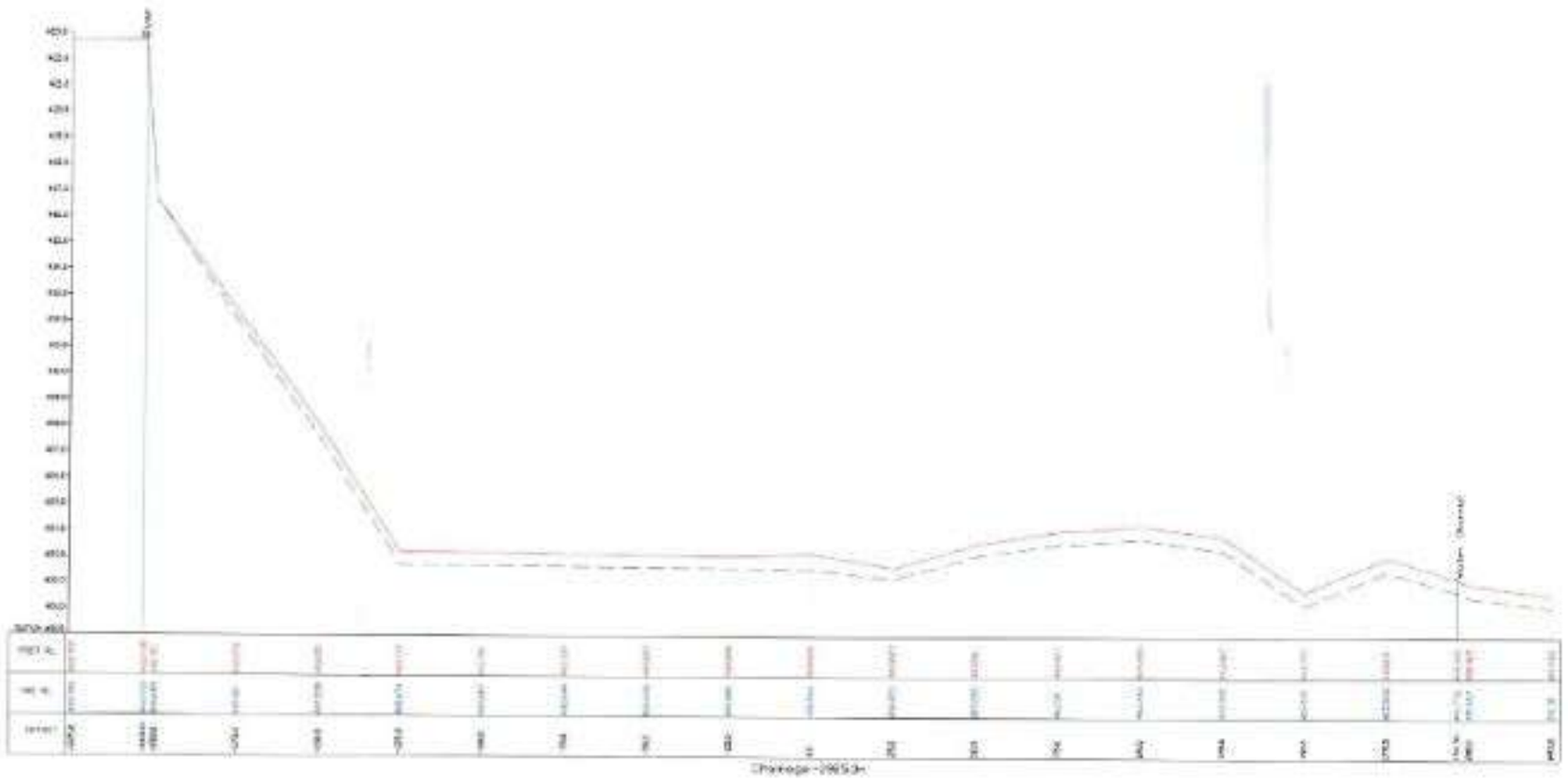
DESCRIPTION	SYMBOL
Post Monsoon	———
Pre Monsoon	- - - - - -

X-Section of the Dhakrani-Yamuna River (Lot no. 21/2) in Pre and Post monsoon at Chainage from (0.0 m. to 2614.64 m.)

Civil Engineering Department
Indian Institute of Technology Roorkee
Roorkee -247667

SCALE	Annexure-B36
1:800 (H)	SHEET NO.
1:100 (V)	36 of 46





LEGEND :-

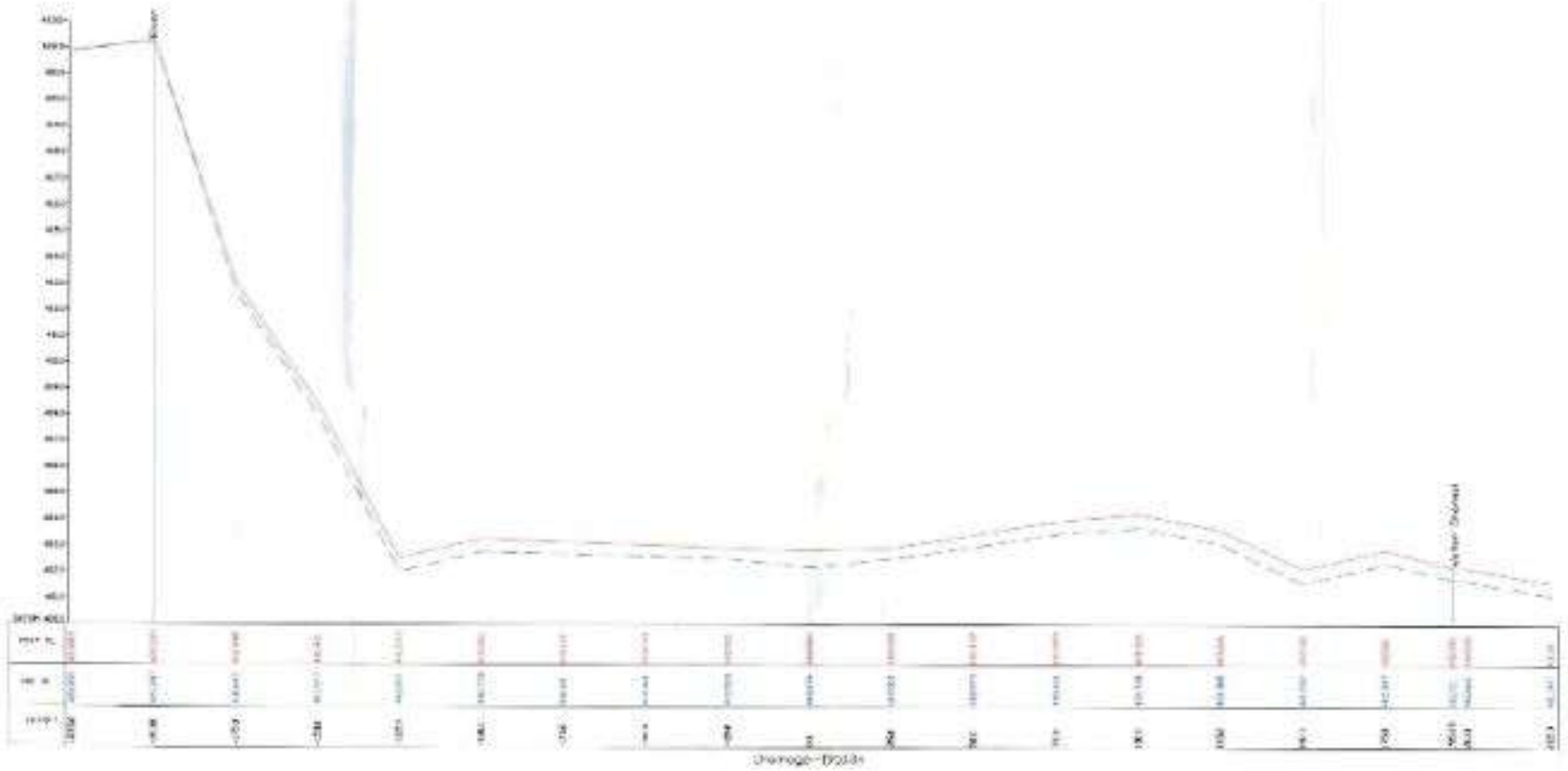
DESCRIPTION	SYMBOL
Post Monsoon	———
Pre Monsoon	- - - - - -

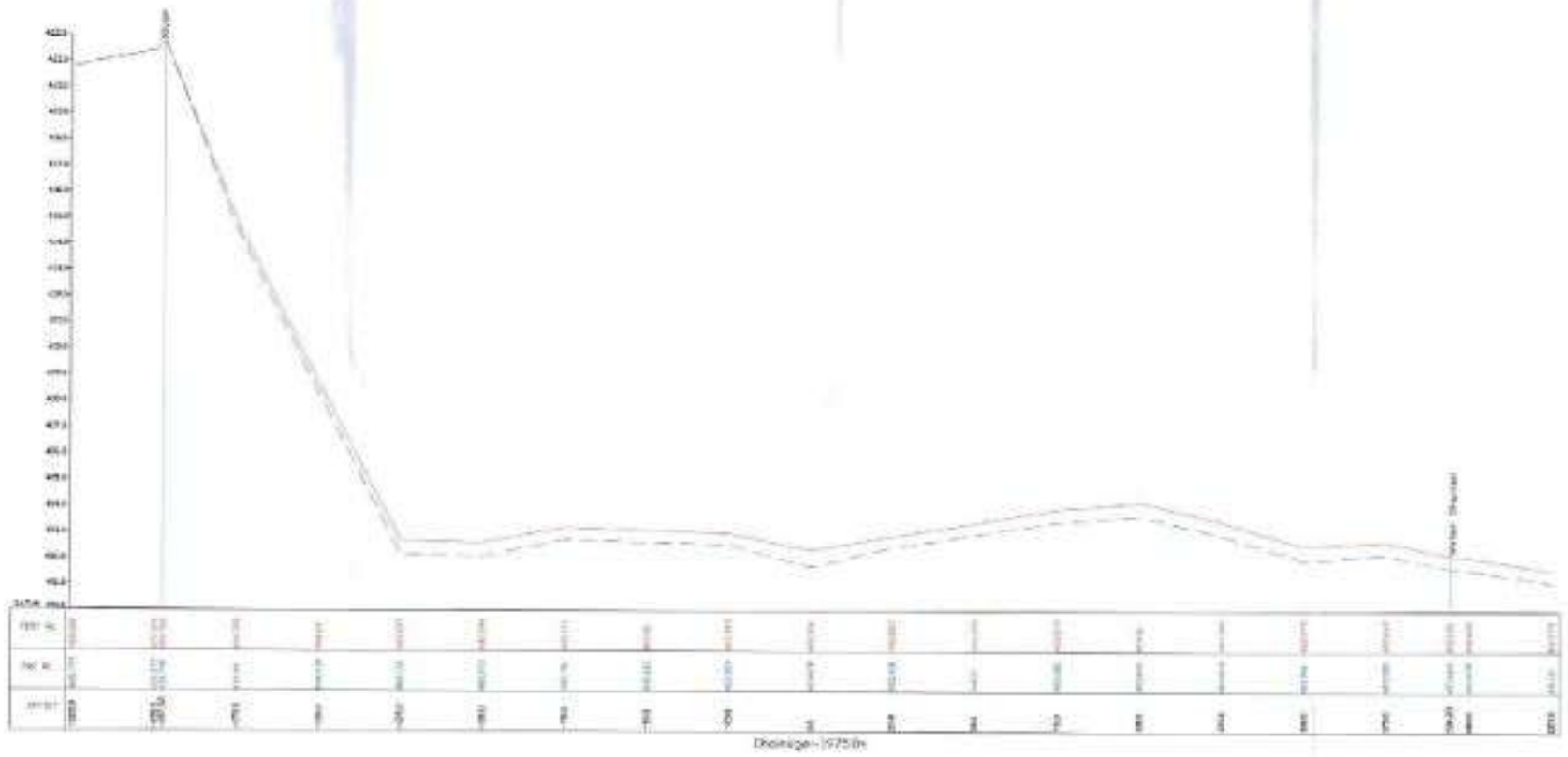
X-Section of the Dhakrani-Yamuna River (Lot no. 21/2) in Pre and Post monsoon at Chainage from (0.0 m. to 2614.64 m.)

Civil Engineering Department
Indian Institute of Technology Roorkee
Roorkee -247667

SCALE	Annexure-B37
1:800 (H)	SHEET NO.
1:100 (V)	37 of 46

Annexure-B38





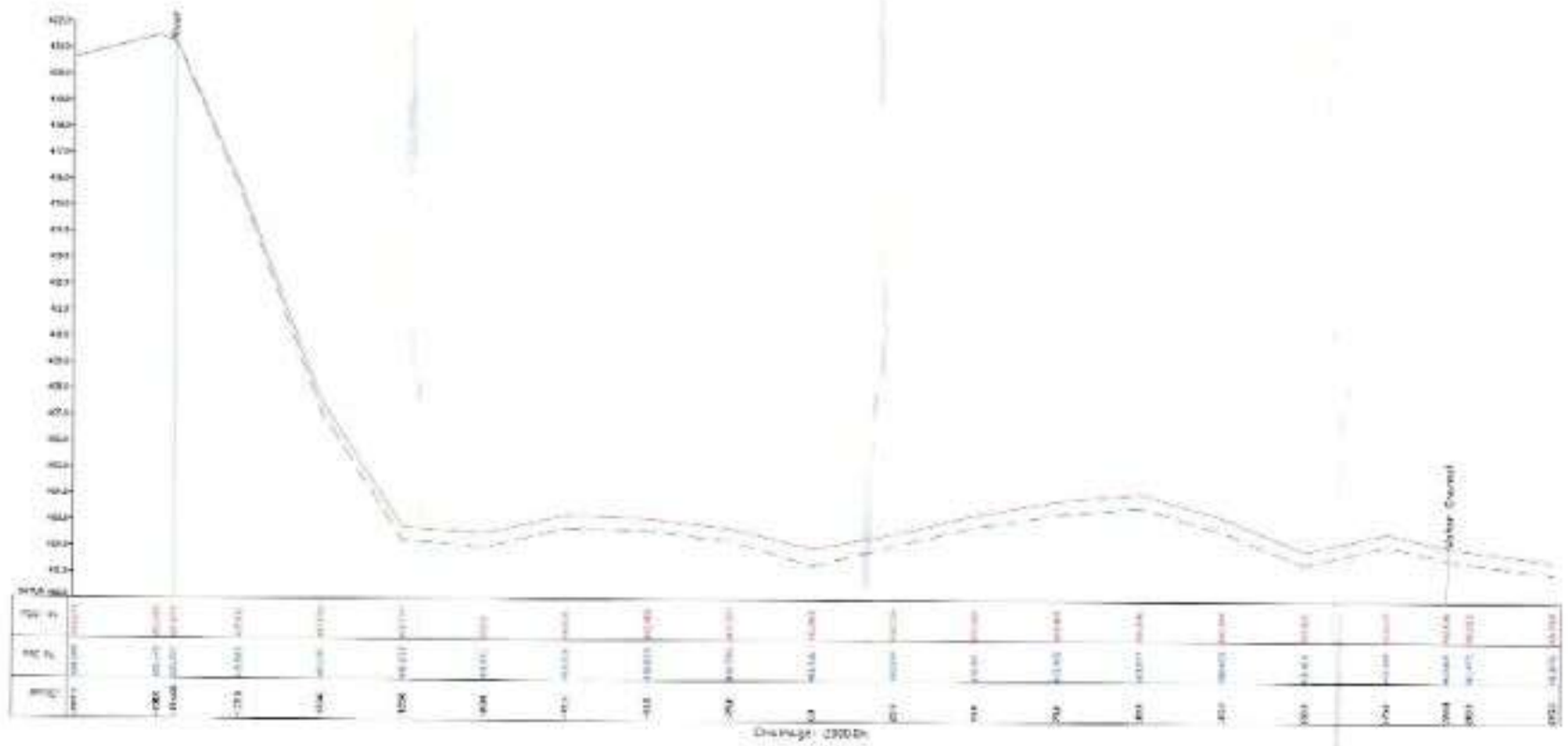
LEGEND :-

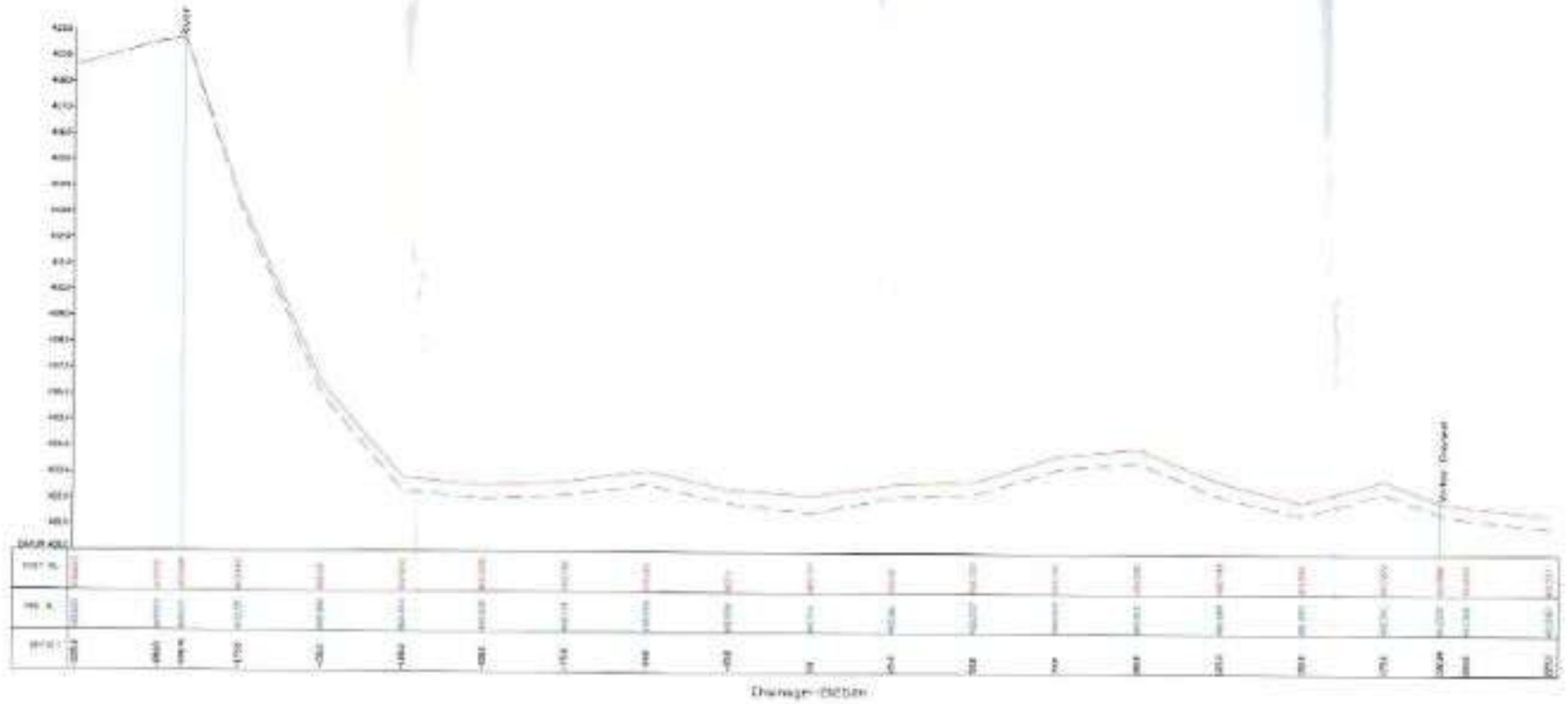
DESCRIPTION	SYMBOL
Post Monsoon	———
Pre Monsoon	- - - - - -

X-Section of the Dhakrani-Yamuna River (Lot no. 21/2) in Pre and Post monsoon at Chainage from (0.0 m. to 2614.64 m.)

Civil Engineering Department
Indian Institute of Technology Roorkee
Roorkee -247667

SCALE	Annexure-B38
1:800 (H) 1:100 (V)	SHEET NO.
	38 of 46





LEGEND :-

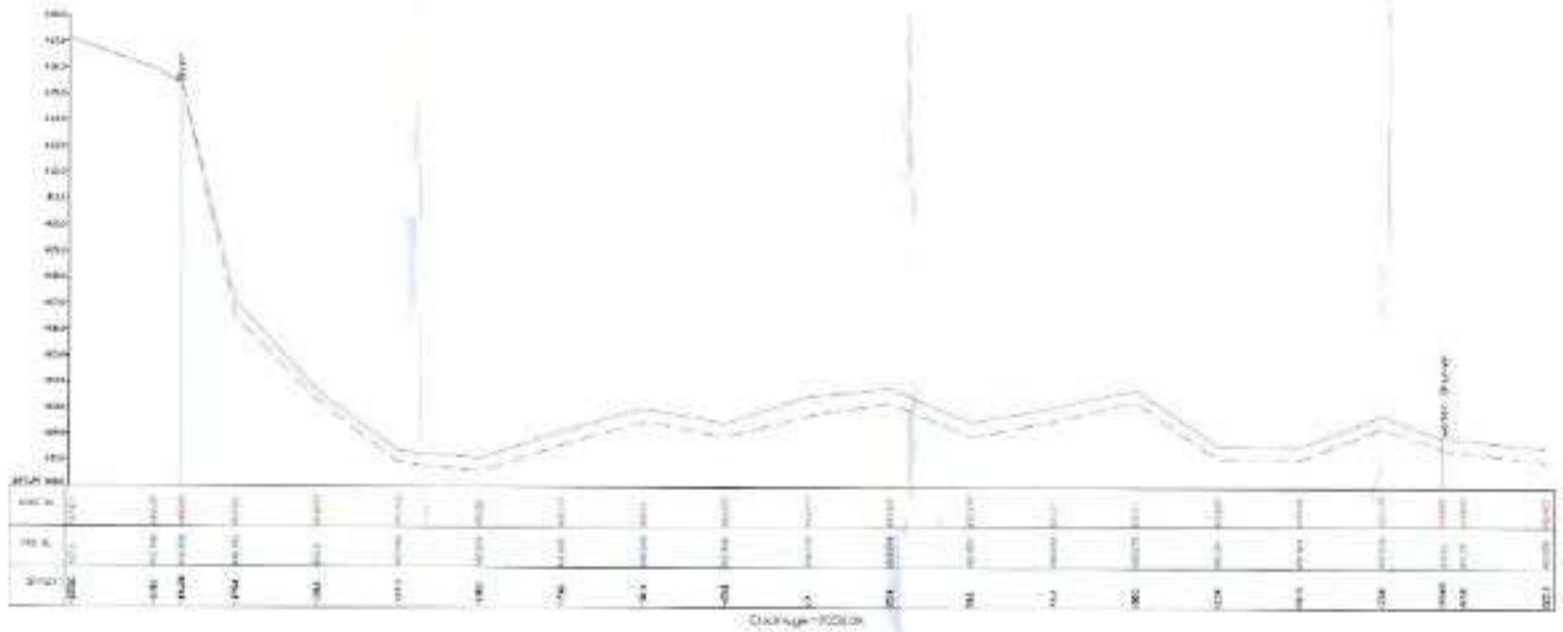
DESCRIPTION	SYMBOL
Post Monsoon	———
Pre Monsoon	- - - - - -

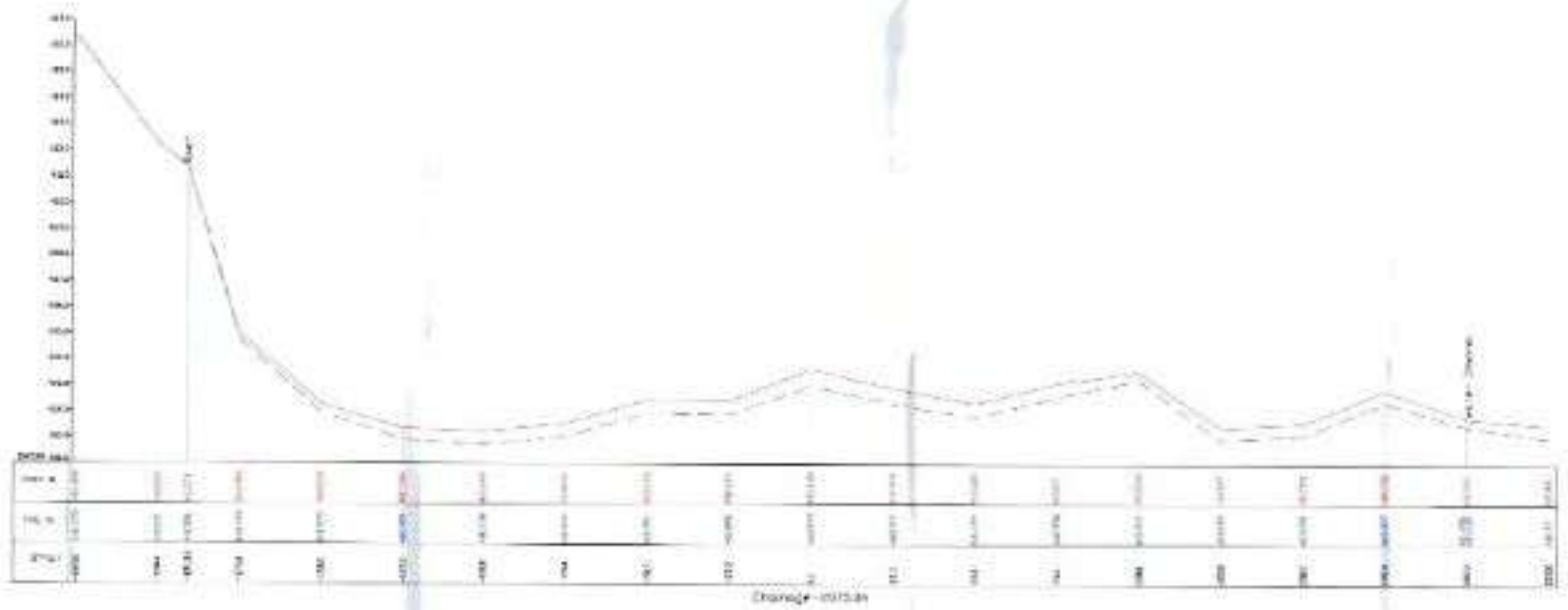
X-Section of the Dhakrani-Yamuna River (Lot no. 21/2) in Pre and Post monsoon at Chainage from (0.0 m. to 2614.64 m.)

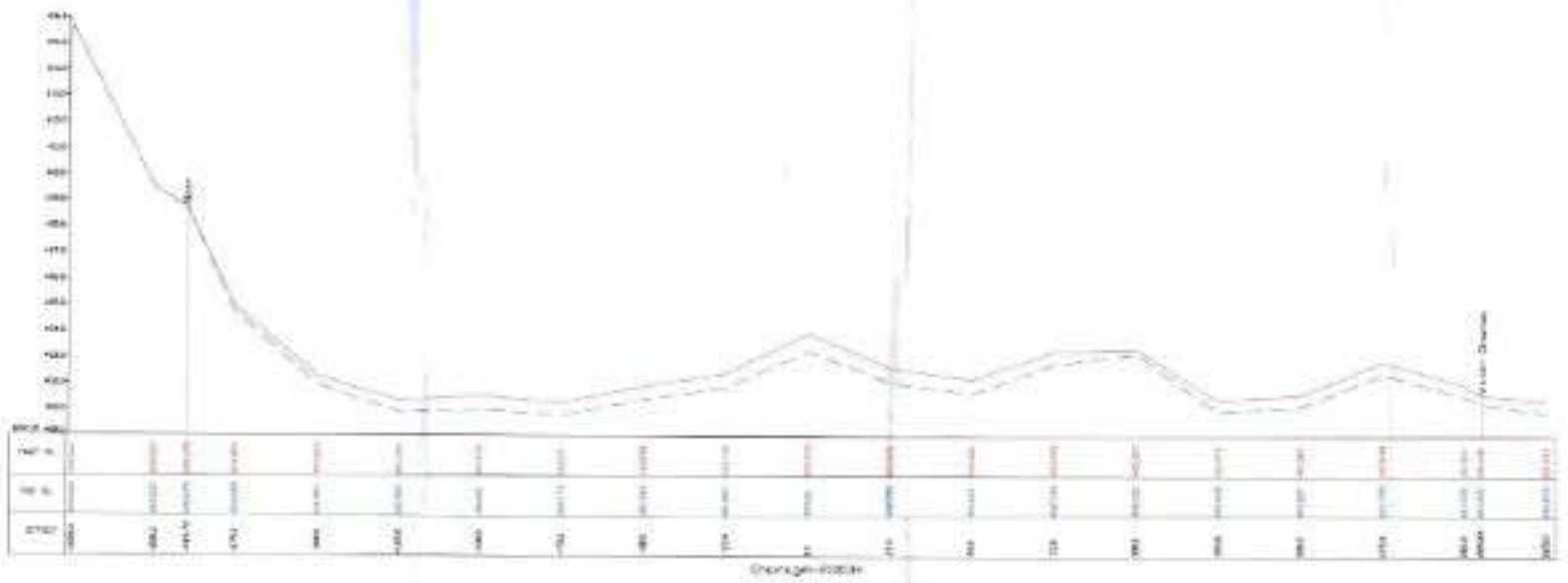
Civil Engineering Department
Indian Institute of Technology Roorkee
Roorkee -247667

SCALE	Annexure-B39
1:800 (H)	SHEET NO.
1:100 (V)	39 of 46

Annexure-B40







LEGEND :-

DESCRIPTION	SYMBOL
Post Monsoon	
Pre Monsoon	

X-Section of the Dhakrani-Yamuna River (Lot no. 21/2) in Pre and Post monsoon at Chainage from (0.0 m. to 2614.64 m.)

Civil Engineering Department
Indian Institute of Technology Roorkee
Roorkee -247667

SCALE	Annexure-B40
1:800 (H)	SHEET NO.
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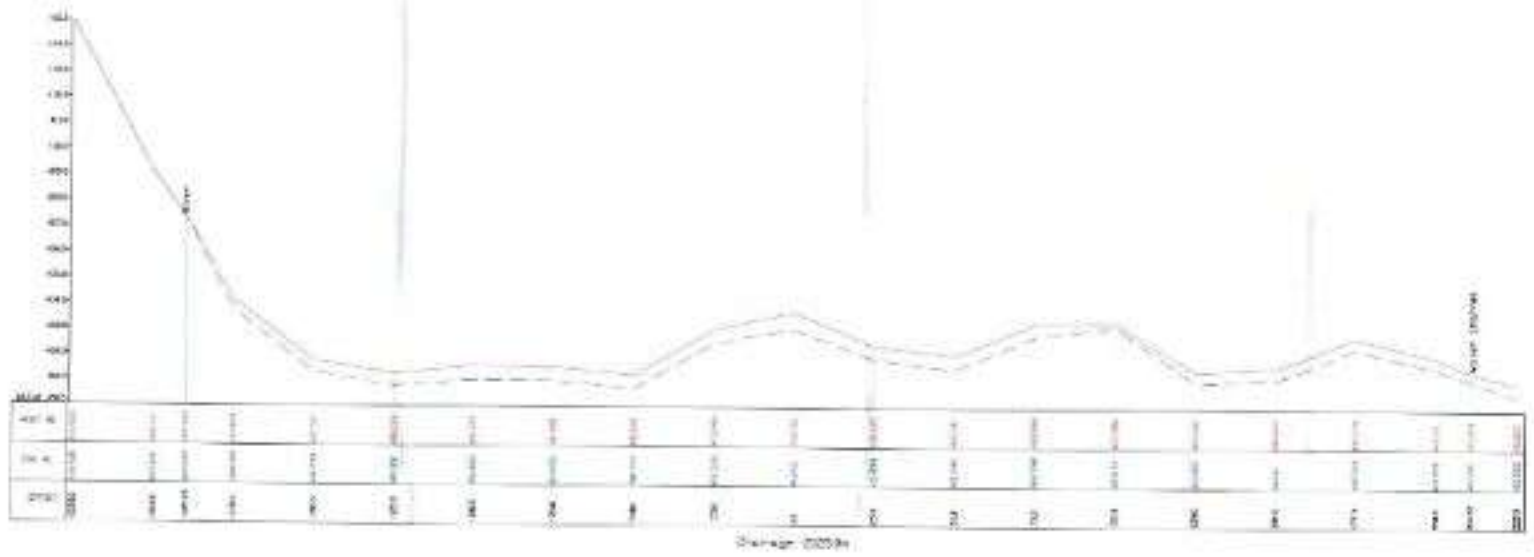
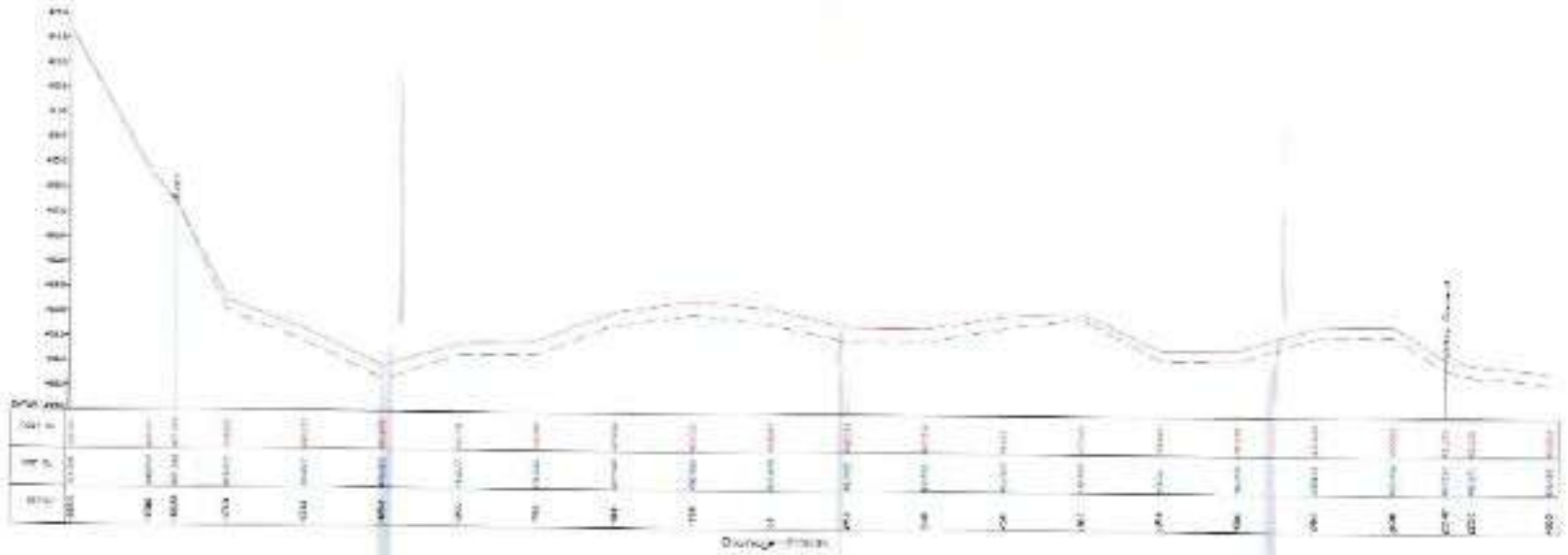
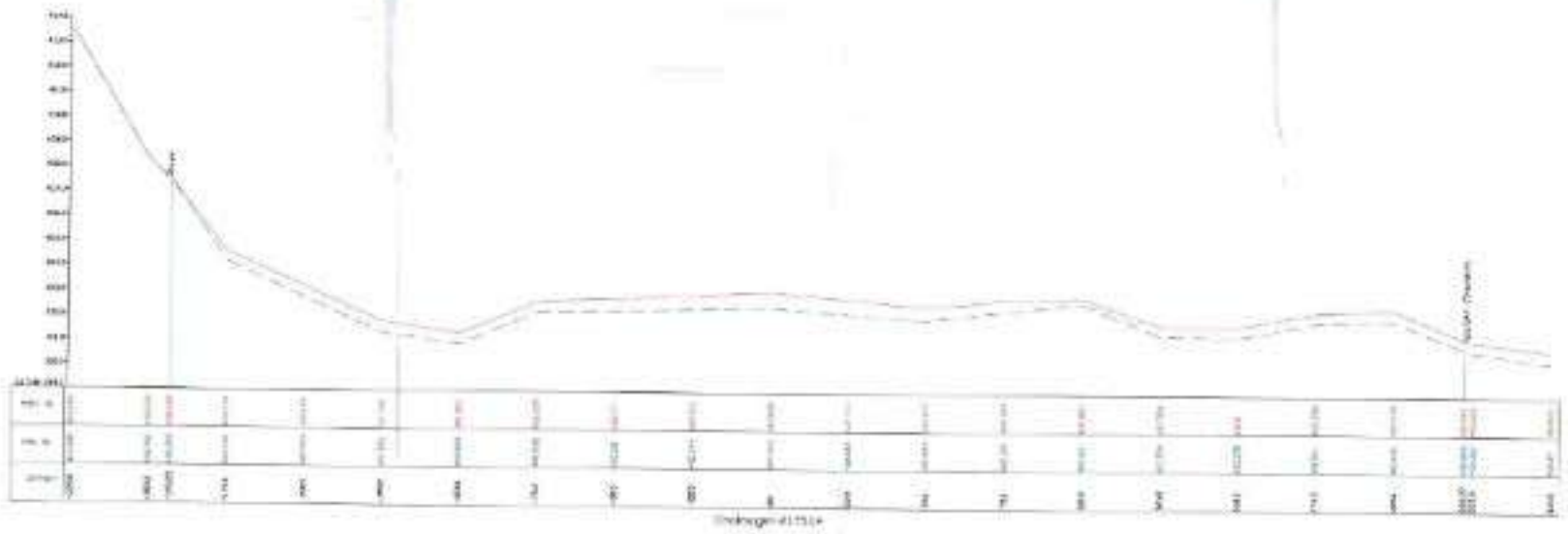
Annexure-B41







LEGEND :-

DESCRIPTION	SYMBOL
Post Monsoon	———
Pre Monsoon	- - - - -

X-Section of the Dhakrani-Yamuna River (Lot no. 21/2) in Pre and Post monsoon at Chainage from (0.0 m. to 2614.64 m.)

Civil Engineering Department
Indian Institute of Technology Roorkee
Roorkee -247667

SCALE	Annexure-B41
1:800 (H) 1:100 (V)	SHEET NO.
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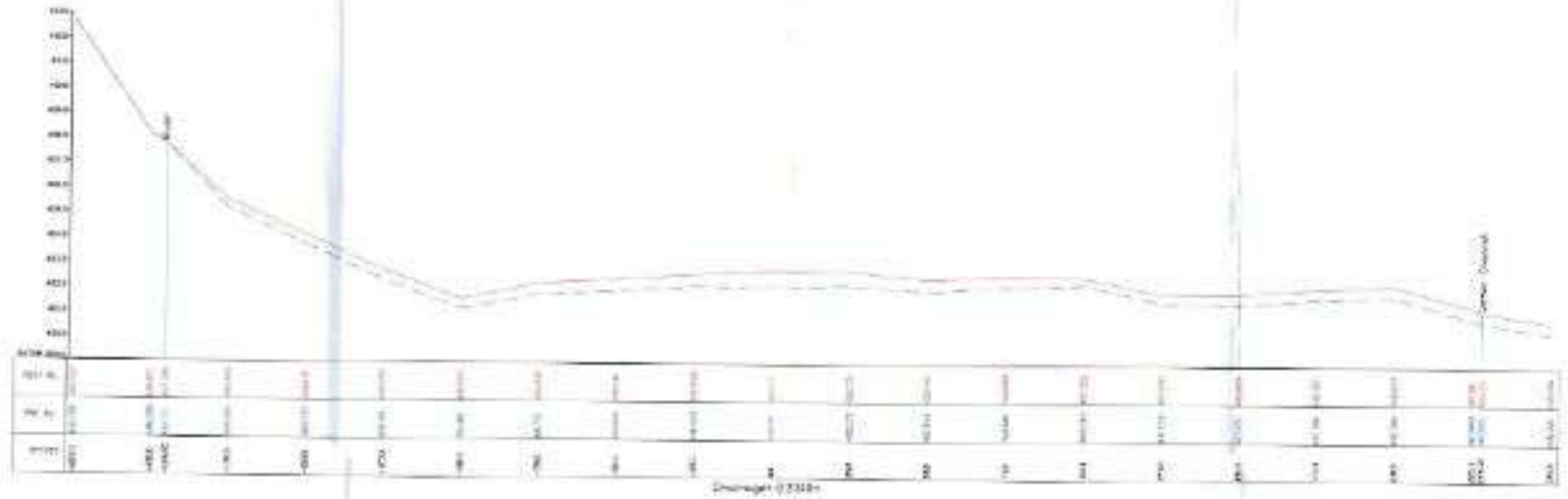
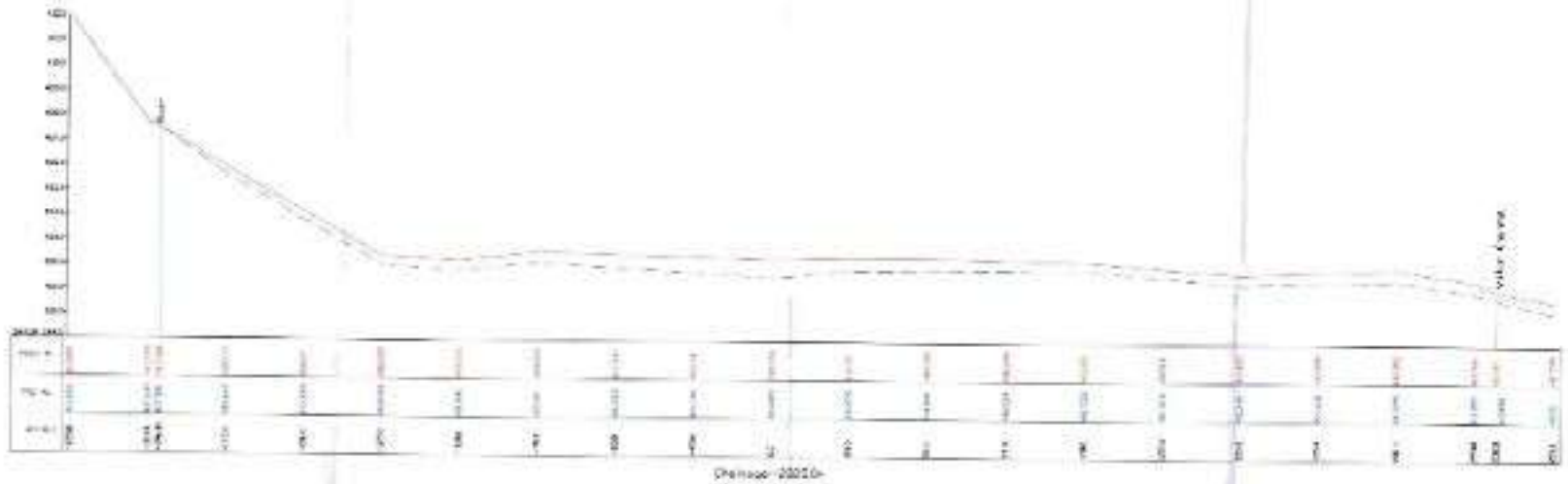
Annexure-B42





LEGEND :-

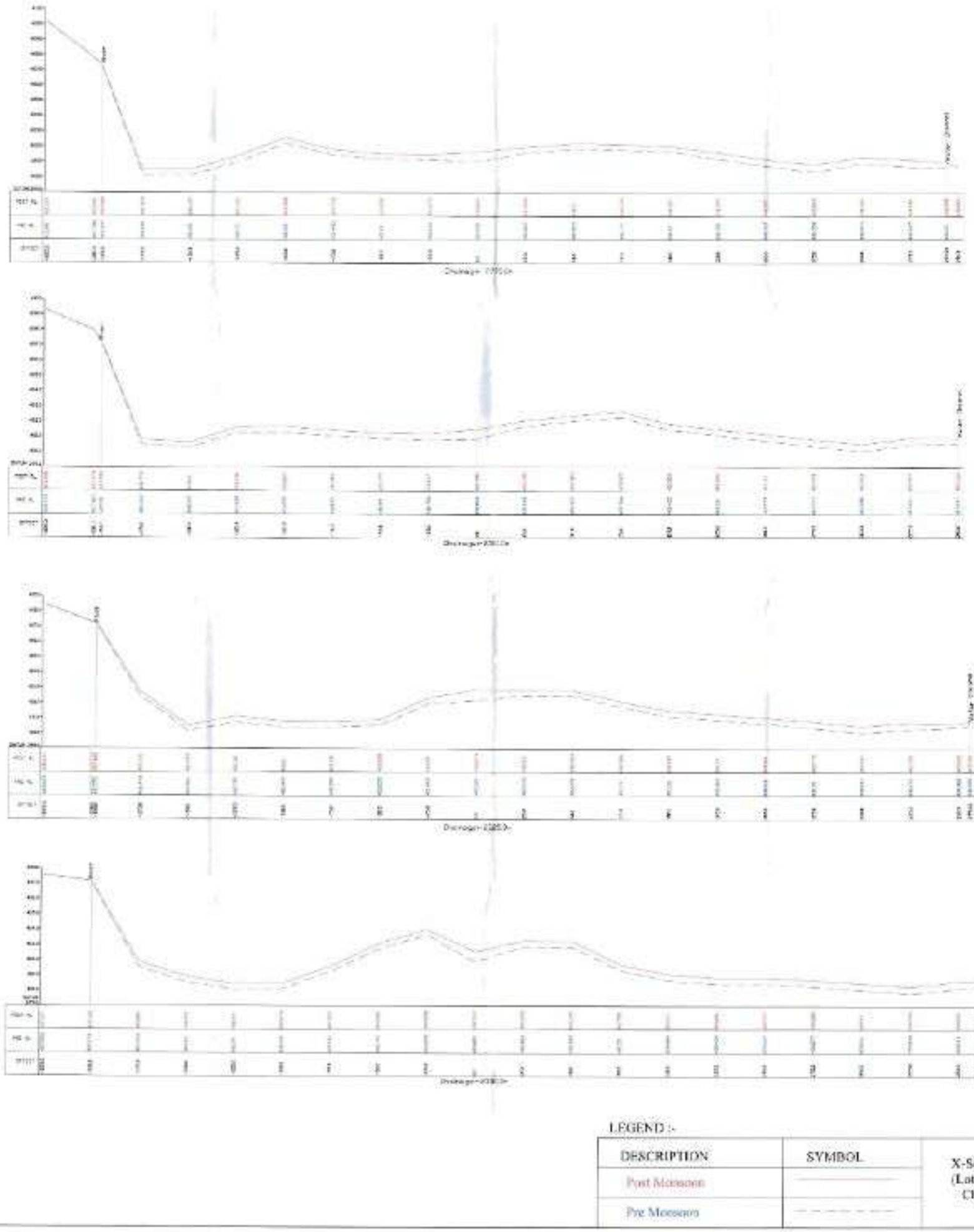
DESCRIPTION	SYMBOL
Post Monsoon	
Pre Monsoon	

X-Section of the Dhakrani-Yamuna River (Lot no. 21/2) in Pre and Post monsoon at Chainage from (0.0 m. to 2614.64 m.)

Civil Engineering Department
Indian Institute of Technology Roorkee
Roorkee -247667

SCALE	Annexure-B42
1:800 (H)	SHEET NO.
1:100 (V)	42 of 46

Annexure-B43



LEGEND :-

DESCRIPTION	SYMBOL
Post Monsoon	———
Pre Monsoon	- - - - -

X-Section of the Dhakrani-Yamuna River (Lot no. 21/2) in Pre and Post monsoon at Chainage from (0.0 m. to 2614.64 m.)

Civil Engineering Department
Indian Institute of Technology Roorkee
Roorkee -247667

SCALE	Annexure-B43
1:800 (H)	SHEET NO.
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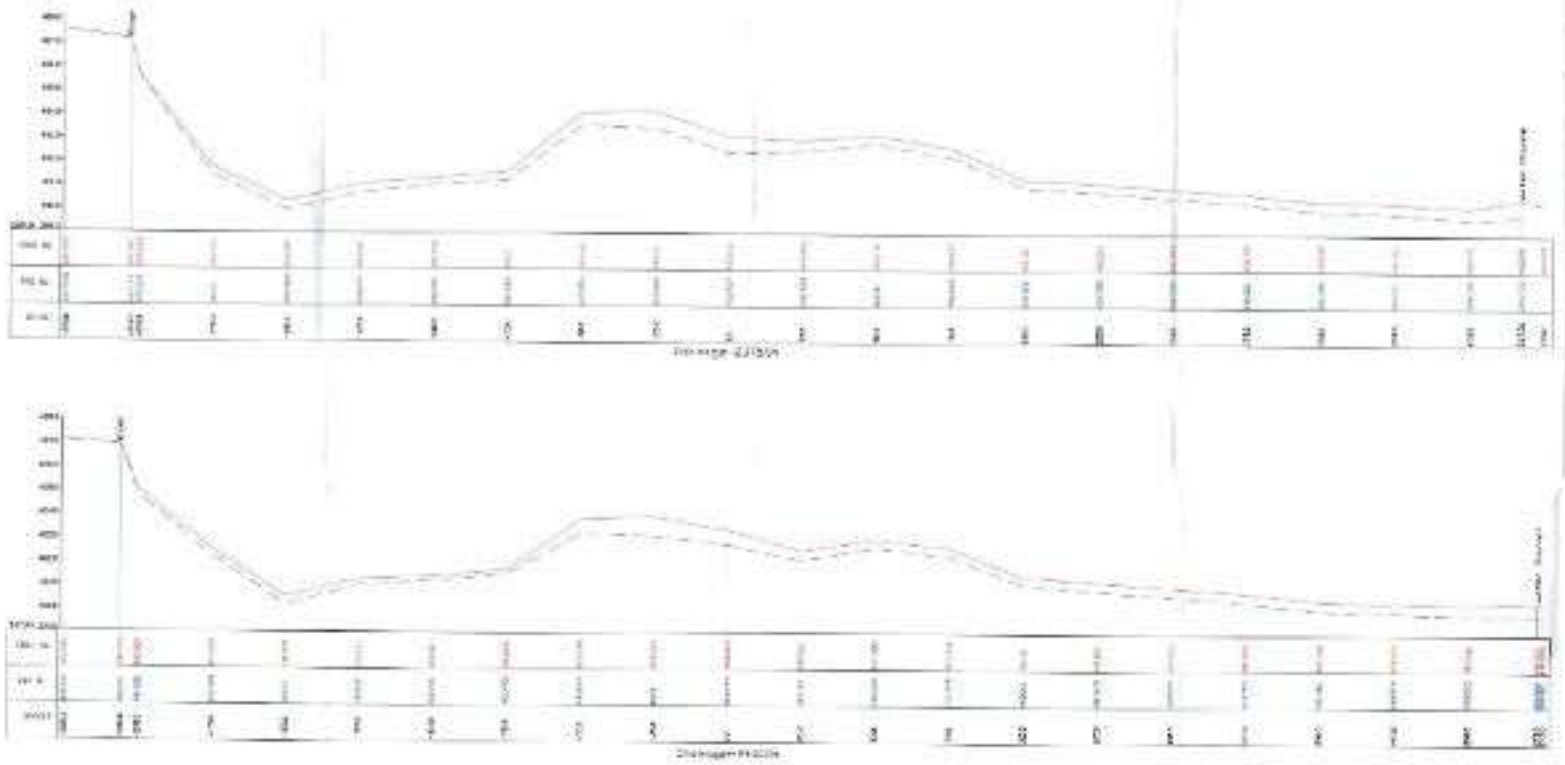
Annexure-B44



LEGEND :-

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Pre Monsoon	

X-Section of the Dhakrani-Yamuna River (Lot no. 2/2) in Pre and Post monsoon at Chainage from (0.0 m. to 2614.64 m.)

Civil Engineering Department
Indian Institute of Technology Roorkee
Roorkee -247667

SCALE	Annexure-B44
1:800 (H)	SHEET NO.
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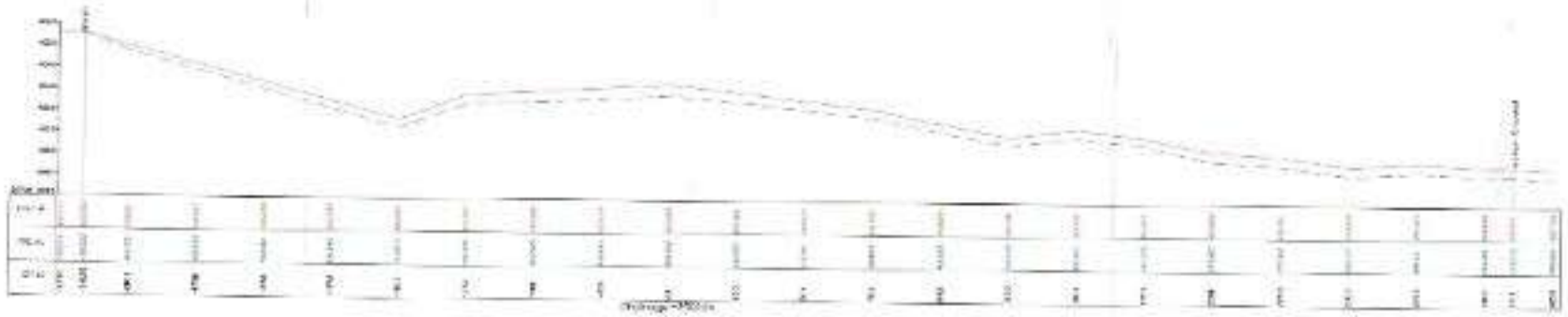
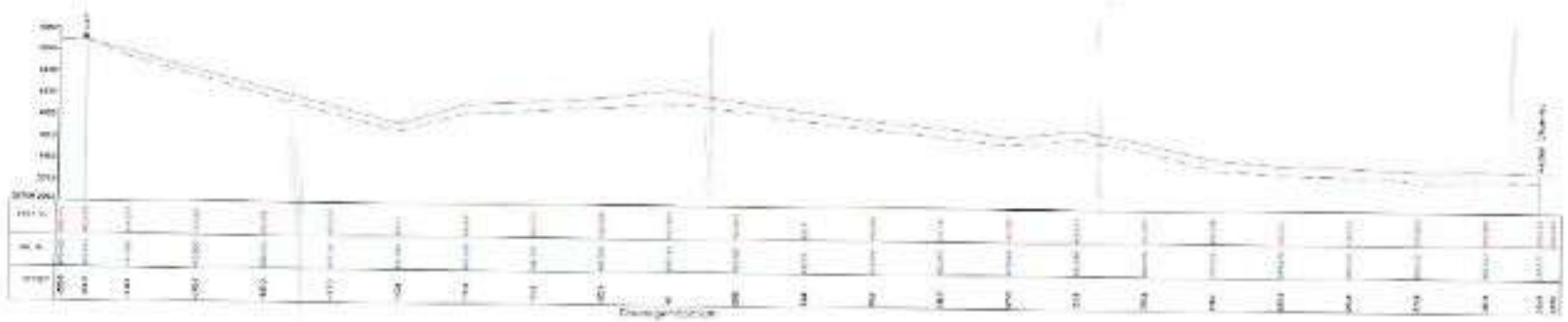
Annexure-B45





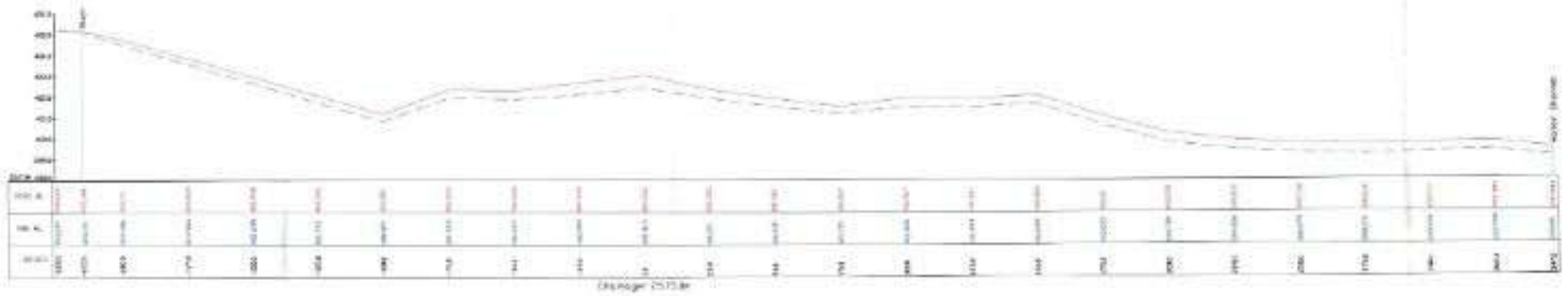
LEGEND :-

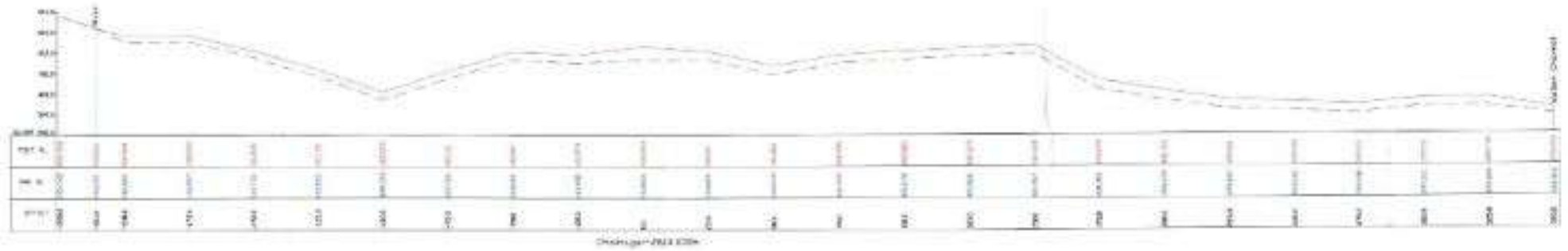
DESCRIPTION	SYMBOL
Post Monsoon	———
Pre Monsoon	- - - - - -

X-Section of the Dhaknni-Yamuna River (Lot no. 21/2) in Pre and Post monsoon at Chainage from (0.0 m. to 2614.64 m.)

Civil Engineering Department
Indian Institute of Technology Roorkee
Roorkee -247667

SCALE	Annexure-B45
1:800 (H)	SHEET NO.
1:160 (V)	45 of 46





LEGEND :-

DESCRIPTION	SYMBOL
Post Monsoon	
Pre Monsoon	

X-Section of the Dhakrani-Yamuna River (Lot no. 21/2) in Pre and Post monsoon at Chainage from (0.0 m. to 2614.64 m.)

Civil Engineering Department
Indian Institute of Technology Roorkee
Roorkee -247667

SCALE	Annexure-B46
1:800 (H)	SHEET NO.
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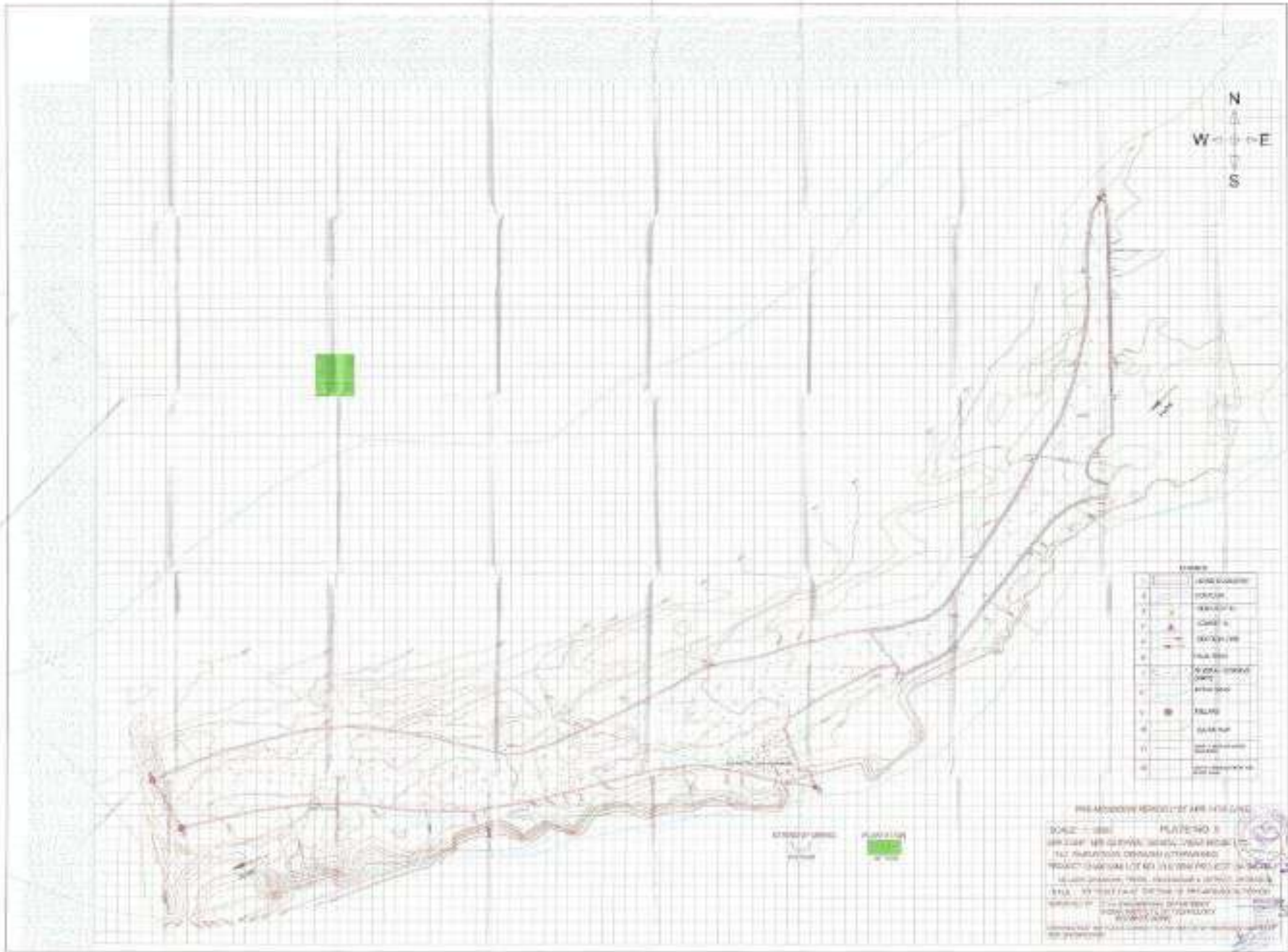
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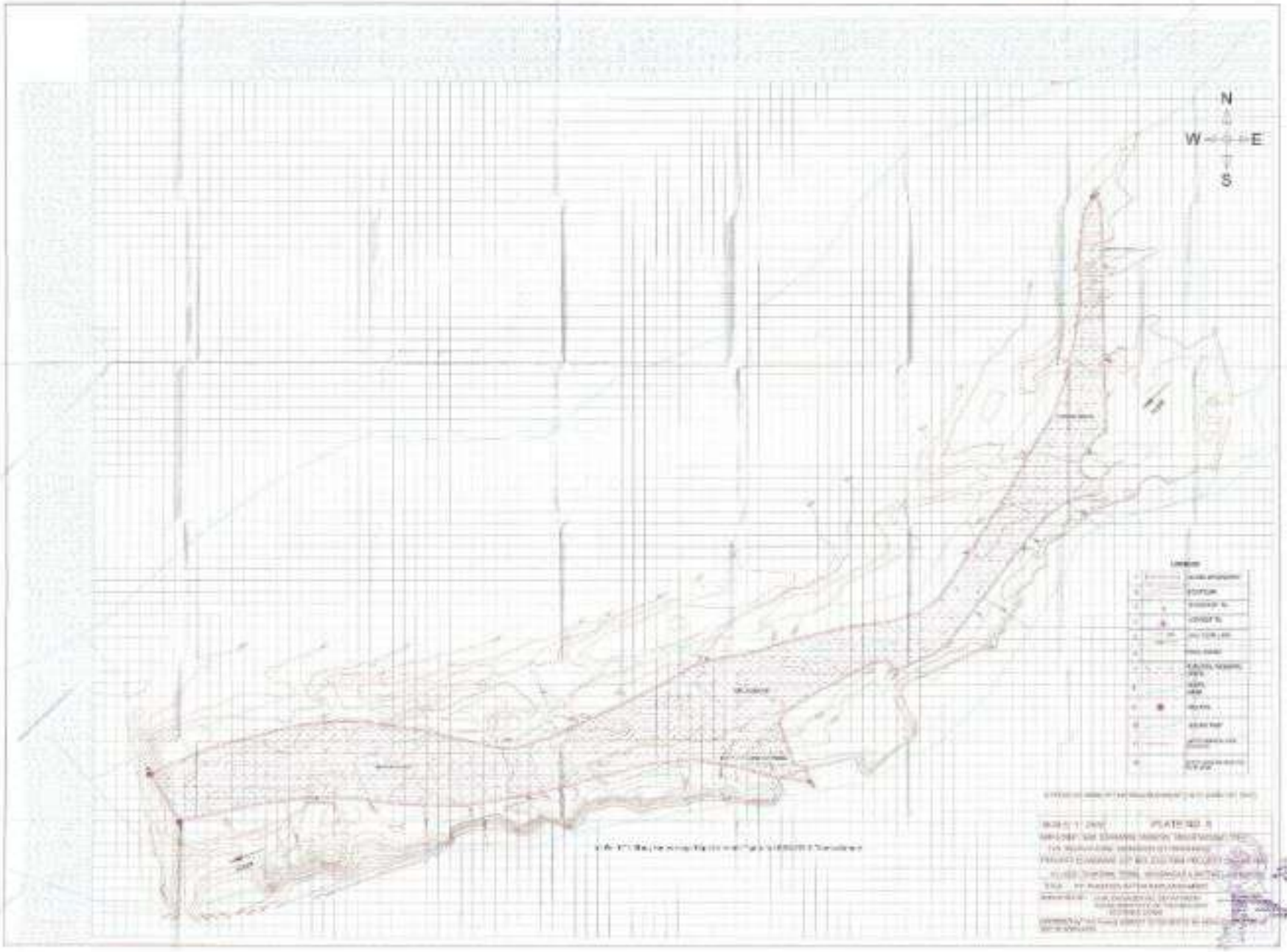
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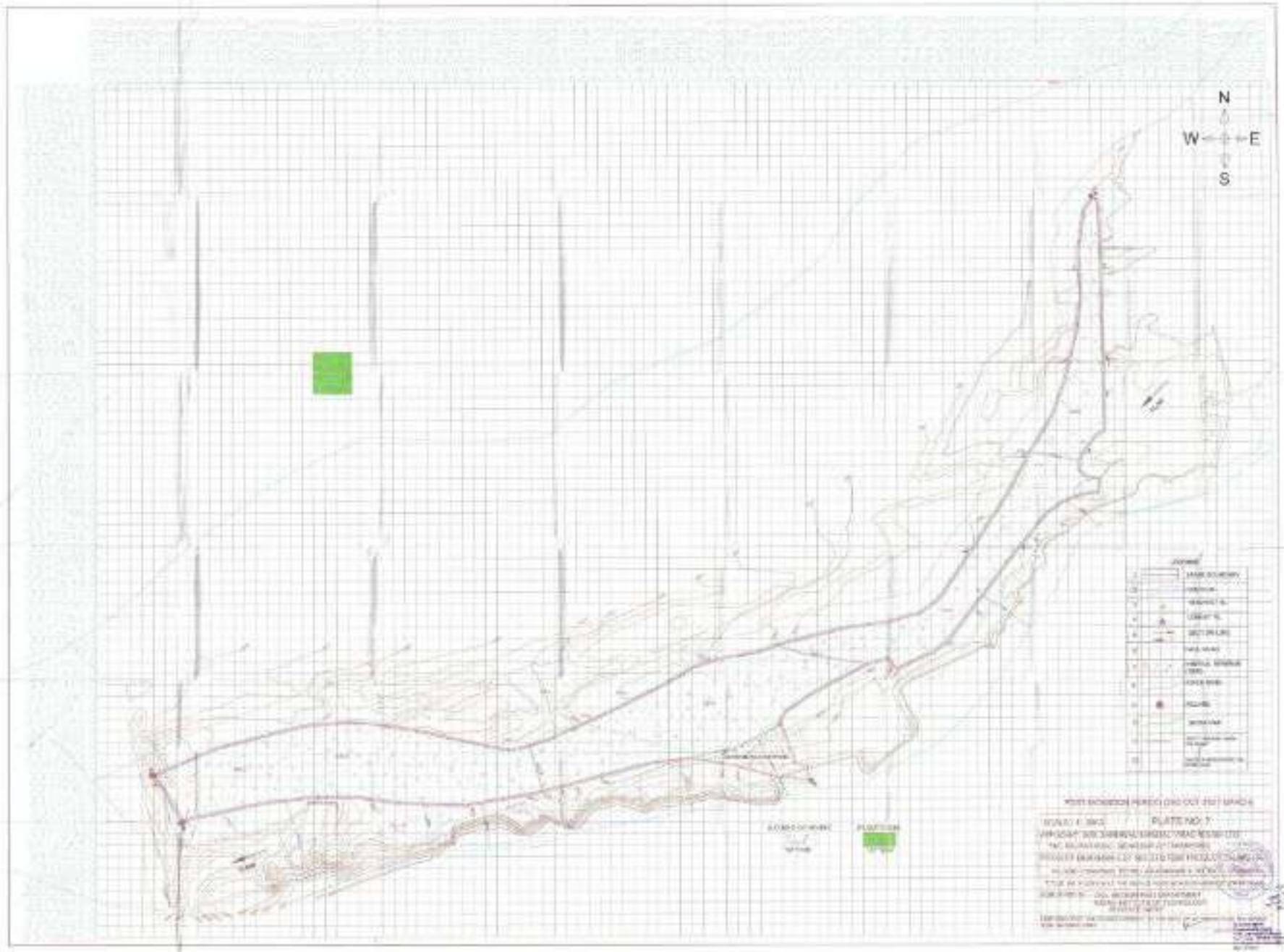
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Annexure 6

KML GRID PLAN OF RIVER YAMUNA, LOT NO. 21/2

21by2 GRID 25 Meters Interval.kml

Annexure 7

GARHWAL MANDAL VIKAS NIGAM LTD.
74/1 RAJPUR ROAD, DEHRADUN

E-Mail: gmvnl@gmvnl.com
gmvn@sancharnet.in

Ph :- 0135-2746817,2749308
Fax :- 2746847

Ref.....गमवि/खस/5/2019

Date.....30-1-2019.

Undertaking

We, M/s Garhwal Mandal Vikas Nigam Limited, having registered office at 74/1, Rajpur Road, Dehradun-248001, do hereby undertake that,

- Each year after the replenishment study, the plan & section shall be submitted to concerned Department of Mining & Geology of the State for verification and official record.

For. Garhwal Mandal Vikas Nigam Limited

B. S. Danu
(Incharge – Mining)

ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

&

ENVIRONMENTAL MANAGEMENT PLAN (EMP) REPORT

OF

RIVER YAMUNA LOT NO. 21/2 SAND, *BAJRI* & BOULDER MINING PROJECT

Village: Dhakrani, Tehsil: Vikasnagar,
District: Dehradun, State: Uttarakhand

Area: 34.940 Ha, Proposed Capacity: 3, 30,000 TPA

Category – 'A', Sector and Schedule – Mining of Minerals 1(a)

APPLICANT

GARHWAL MANDAL VIKAS NIGAM LTD.
74/1 RAJPUR ROAD, DEHRADUN

STUDY PERIOD – OCTOBER TO DECEMBER, 2013

SUBMISSION DATE: JUNE 2015

Prepared By

GRASS ROOTS RESEARCH & CREATION INDIA (P) LTD.
(An ISO 9001:2008 Certified Co.: Accredited by QCI / NABET: Approved by MoEF&CC, GoI)
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Website: http://www.grc-india.com

GRC INDIA TRAINING & ANALYTICAL LABORATORY
(NABL Accredited & Recognized by MoEF&CC, GoI)
A unit of GRC India

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ABBREVIATIONS

AMSL	Above Mean Sea Level
AAQ	Ambient Air Quality
bgl	Below Ground Level
BOD	Biochemical Oxygen Demand
COD	Chemical Oxygen Demand
CPCB	Central Pollution Control Board
CSR	Corporate Social Responsibility
dB	Decibel
DO	Dissolved Oxygen
EAC	Expert Appraisal Committee
EIA	Environmental Impact Assessment
EMC	Environmental Management Cell
EMP	Environment Management Plan
EPA	The Environment Protection Act
GLC	Ground Level Concentration
Ha	Hectare
HFL	High Flood Level
JIR	Joint Inspection Report
KLD	Kilo litre Per Day
Km	Kilo Meter
Leq	Equivalent Noise Level
LFL	Low Flood Level
LOS	Level of Service
LoI	Letter of Intent
MoEF&CC	Ministry of Environment, Forest & Climate Change
NABET	National Accreditation Board for Education and Training
NH	National Highway
NOC	No Objection Certificate
OSHA	Occupational Safety and Health Administration
PCU	Passenger Car Unit
PFR	Pre- feasibility Report
PM	Particulate Matter
PUC	Pollution Under Control
QCI	Quality Council of India
RBM	River Bed Material
RL	Reduced Level
SH	State Highway
SPCB	State Pollution Control Board
ToR	Terms of Reference
TPA	Tonnes Per Annum
USEPA	United State Environmental Protection Agency

By Speed Post

No. J-11015/137/2013-IA.II (M)
Government of India
Ministry of Environment & Forests

Paryavaran Bhawan,
C.G.O. Complex, Lodi Road,
New Delhi-110 003
Dated the 16th September, 2013

To

M/s Garhwal Mandal Vikas Nigam Ltd
74/1, Rajpur Road
Dehradun, Uttarakhand 248001

Subject: Mining of Sand, Bajri and Boulders in River Yamuna Lot No. 21/2 of M/s Garhwal Mandal Vikas Nigam Ltd. Located at Vill-Dhakrani, Tehsil-Vikasnagar, Distt-Dehradun, Uttarakhand. (34.940 ha) – TOR regarding.

The Proposal was received in the Ministry on 08.05.2013. The Proposal is to determine the Terms of Reference for which the proponent had submitted information in the prescribed format (Form-I) along with Pre-feasibility report.

2. The Mine Lease area is located at Village Dhakrani, Tehsil Vikasnagar, District Dehradun, Uttarakhand. The proposed production capacity is 3.3 Lakh TPA. The lease area lies on River Yamuna. The Mine Lease area is between 30°28'3.21"N to 77°42'59.22"E. The Project is located in seismic zone-IV. It is 'A' category project as due to the presence of Doon Valley (lies next to the Lease area in S direction), Aasan Conservation Reserve (3 Km in SW direction.) & Sinhedhara Wildlife Sanctuary (9 Km in W direction) within 10 Km radius of the lease area. Interstate boundaries between Uttarakhand and Himachal Pradesh (next to mine site in W direction) and Interstate Boundary between Uttarakhand and Uttar Pradesh (8 km in SW direction) also lies within 10 km radius of the site. The proposed project is an open-cast mining project, confined to extraction of sand, bajri and boulder from the proposed site. The operation will be manual with use of hand tools like shovel, pan, sieves, etc. Sand will be separated from bajri and boulders by sieving process. Excavation will be carried out up to a maximum depth of 1.5 meter. Extraction of sand, bajri and boulder material will be done only during the day time and completely stopped during the monsoon season. The lease area has been decided as per the Letter of Intent (Letter No. 40/Bhu. Khani.E./2012-13 dated 18-4-2013. Total water requirement will be 5.0 KLD. This water will be supplied from the bore well from nearby villages through tankers as well as from surface water sources for dust suppression. Additional water will also be required for plantation purpose. Silt/Clay (6-12% of sand excavated) will be generated as waste, to be disposed off as filling in low-lying area, for plantation & as spreading in agricultural fields. The total cost of project would be around Rs. 18,50,000.

3. The proposal was placed before Expert Appraisal Committee in its meeting held during June 26th-28th, 2013, the Committee prescribed the following TORs for undertaking detailed EIA study:

1. Year-wise production details since 1994 should be given, clearly stating the highest production achieved in any one year prior to 1994. It may also be categorically informed whether there had been any increase in production after the EIA Notification, 1994 came into force w.r.t. the highest production achieved prior to 1994.
2. A copy of the document in support of the fact that the Proponent is the rightful lessee of the mine should be given.
3. All documents including approved mine plan, EIA and public hearing should be compatible with one another in terms of the mine lease area, production levels, waste generation and its management and mining technology and should be in the name of the lessee.
4. All corner coordinates of the mine lease area, superimposed on a High Resolution Imagery/toposheet should be provided. Such an Imagery of the proposed area should clearly show the land use and other ecological features of the study area (core and buffer zone).
5. Does the company have a well laid down Environment Policy approved by its Board of Directors? If so, it may be spelt out in the EIA report with description of the prescribed operating process/procedures to bring into focus any infringement/deviation/violation of the environmental or forest norms/ conditions? The hierarchical system or administrative order of the Company to deal with the environmental issues and for ensuring compliance with the EC conditions may also be given. The system of reporting of non-compliances / violations of environmental norms to the Board of Directors of the Company and/or shareholders or stakeholders at large may also be detailed in the EIA report.
6. Issues relating to Mine Safety, including subsidence study in case of underground mining and slope study in case of open cast mining, blasting study etc. should be detailed. The proposed safeguard measures in each case should also be provided.
7. The study area will comprise of 10 km zone around the mine lease from lease periphery and the data contained in the EIA such as waste generation etc should be for the life of the mine / lease period.
8. Land use of the study area delineating forest area, agricultural land, grazing land, wildlife sanctuary, national park, migratory routes of fauna, water bodies, human settlements and other ecological features should be indicated. Land use plan of the mine lease area should be prepared to encompass preoperational, operational and post operational phases and submitted. Impact, if any, of change of land use should be given.
9. Details of the land for any Over Burden Dumps outside the mine lease, such as extent of land area, distance from mine lease, its land use, R&R issues, if any, should be given.
10. A Certificate from the Competent Authority in the State Forest Department should be provided, confirming the involvement of forest land, if any, in the project area. In the event of any contrary claim by the Project Proponent regarding the status of forests, the site may be inspected by the State Forest Department along with the Regional Office of the Ministry to ascertain the status of forests, based on which, the Certificate in this regard as mentioned above be issued. In all such

cases, it would be desirable for representative of the State Forest Department to assist the Expert Appraisal Committees.

11. Status of forestry clearance for the broken up area and virgin forestland involved in the Project including deposition of net present value (NPV) and compensatory afforestation (CA) should be indicated. A copy of the forestry clearance should also be furnished.
12. Implementation status of recognition of forest rights under the Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 should be indicated.
13. The vegetation in the RF / PF areas in the study area, with necessary details, should be given.
14. A study shall be got done to ascertain the impact of the Mining Project on wildlife of the study area and details furnished. Impact of the project on the wildlife in the surrounding and any other protected area and accordingly detailed mitigative measures required, should be worked out with cost implications and submitted.
15. Location of National Parks, Sanctuaries, Biosphere Reserves, Wildlife Corridors, Tiger/Elephant Reserves/(existing as well as proposed), if any, within 10 km of the mine lease should be clearly indicated, supported by a location map duly authenticated by Chief Wildlife Warden. Necessary clearance, as may be applicable to such projects due to proximity of the ecologically sensitive areas as mentioned above, should be obtained from the State Wildlife Department/Chief Wildlife Warden under the Wildlife (Protection) Act, 1972 and copy furnished.
16. A detailed biological study of the study area [core zone and buffer zone (10 km radius of the periphery of the mine lease)] shall be carried out. Details of flora and fauna, duly authenticated, separately for core and buffer zone should be furnished based on such primary field survey, clearly indicating the Schedule of the fauna present. In case of any scheduled-I fauna found in the study area, the necessary plan for their conservation should be prepared in consultation with State Forest and Wildlife Department and details furnished. Necessary allocation of funds for implementing the same should be made as part of the project cost.
17. Proximity to Areas declared as 'Critically Polluted' or the Project areas likely to come under the 'Aravali Range', (attracting court restrictions for mining operations), should also be indicated and where so required, clearance certifications from the prescribed Authorities, such as the SPCB or State Mining Dept. Should be secured and furnished to the effect that the proposed mining activities could be considered.
18. Similarly, for coastal Projects, A CRZ map duly authenticated by one of the authorized agencies demarcating LTL, HTL, CRZ area, location of the mine lease w.r.t CRZ, coastal features such as mangroves, if any, should be furnished. (Note: The Mining Projects falling under CRZ would also need to obtain approval of the concerned Coastal Zone Management Authority).
19. R&R Plan/compensation details for the Project Affected People (PAP) should be furnished. While preparing the R&R Plan, the relevant State/National Rehabilitation & Resettlement Policy should be kept in view. In respect of SCs /STs and other weaker sections of the society in the study area, a need based sample survey, family-wise, should be

undertaken to assess their requirements, and action programmes prepared and submitted accordingly, integrating the sectoral programmes of line departments of the State Government. It may be clearly brought out whether the village located in the mine lease area will be shifted or not. The issues relating to shifting of Village including their R&R and socio-economic aspects should be discussed in the report.

20. One season (non-monsoon) primary baseline data on ambient air quality (PM10, SO2 and NOx), water quality, noise level, soil and flora and fauna shall be collected and the AAQ and other data so compiled presented date-wise in the EIA and EMP Report. Site-specific meteorological data should also be collected. The location of the monitoring stations should be such as to represent whole of the study area and justified keeping in view the pre-dominant downwind direction and location of sensitive receptors. There should be at least one monitoring station within 500 m of the mine lease in the pre-dominant downwind direction. The mineralogical composition of PM10, particularly for free silica, should be given.
21. Air quality modelling should be carried out for prediction of impact of the project on the air quality of the area. It should also take into account the impact of movement of vehicles for transportation of mineral. The details of the model used and input parameters used for modelling should be provided. The air quality contours may be shown on a location map clearly indicating the location of the site, location of sensitive receptors, if any, and the habitation. The wind roses showing pre-dominant wind direction may also be indicated on the map.
22. The water requirement for the Project, its availability and source should be furnished. A detailed water balance should also be provided. Fresh water requirement for the Project should be indicated.
23. Necessary clearance from the Competent Authority for drawl of requisite quantity of water for the Project should be provided.
24. Description of water conservation measures proposed to be adopted in the Project should be given. Details of rainwater harvesting proposed in the Project, if any, should be provided.
25. Impact of the project on the water quality, both surface and groundwater should be assessed and necessary safeguard measures, if any required, should be provided.
26. Based on actual monitored data, it may clearly be shown whether working will intersect groundwater. Necessary data and documentation in this regard may be provided. In case the working will intersect groundwater table, a detailed Hydro Geological Study should be undertaken and Report furnished. Necessary permission from Central Ground Water Authority for working below ground water and for pumping of ground water should also be obtained and copy furnished.
27. Details of any stream, seasonal or otherwise, passing through the lease area and modification / diversion proposed, if any, and the impact of the same on the hydrology should be brought out.
28. Information on site elevation, working depth, groundwater table etc. Should be provided both in AMSL and bgl. A schematic diagram may also be provided for the same.

29. A time bound Progressive Greenbelt Development Plan shall be prepared in a tabular form (indicating the linear and quantitative coverage, plant species and time frame) and submitted, keeping in mind, the same will have to be executed up front on commencement of the project.
30. Impact on local transport infrastructure due to the Project should be indicated. Projected increase in truck traffic as a result of the Project in the present road network (including those outside the Project area) should be worked out, indicating whether it is capable of handling the incremental load. Arrangement for improving the infrastructure, if contemplated (including action to be taken by other agencies such as State Government) should be covered.
31. Details of the onsite shelter and facilities to be provided to the mine workers should be included in the EIA report.
32. Conceptual post mining land use and Reclamation and Restoration of mined out areas (with plans and with adequate number of sections) should be given in the EIA report.
33. A time bound Progressive Greenbelt Development Plan shall be prepared in a tabular form (indicating the linear and quantitative coverage, plant species and time frame) and submitted, keeping in mind, the same will have to be executed up front on commencement of the project. Phase-wise plan of plantation and compensatory afforestation should be charted clearly indicating the area to be covered under plantation and the species to be planted. The details of plantation already done should be given.
34. Occupational Health impacts of the Project should be anticipated and the proposed preventive measures spelt out in detail. Details of pre-placement medical examination and periodical medical examination schedules should be incorporated in the EMP.
35. Public health implications of the Project and related activities for the population in the impact zone should be systematically evaluated and the proposed remedial measures should be detailed along with budgetary allocations.
36. Measures of socio economic significance and influence to the local community proposed to be provided by the Project Proponent should be indicated. As far as possible, quantitative dimensions may be given with time frames for implementation.
37. Detailed environmental management plan to mitigate the environmental impacts which, should inter-alia include the impacts of change of land use, loss of agricultural and grazing land, if any, occupational health impacts besides other impacts specific to the proposed Project.
38. Public hearing points raised and commitment of the project proponent on the same along with time bound action plan to implement the same should be provided and also incorporated in the final EIA/EMP Report of the Project.
39. Details of litigation pending against the project, if any, with direction /order passed by any Court of Law against the project should be given.
40. The cost of the project (capital cost and recurring cost) as well as the cost towards implementation of EMP should clearly be spelt out.
41. Details of replenishment studies.

42. Details of Transportation of mined materials as per the Indian Road Congress for both the ways with loaded as well as unloaded traffic load and its impact on Environment.
43. Cumulative impact due to sand mining.
44. Proper conservation plan for Scheduled –I and II species.
45. Impact of mining on plankton.
46. Cluster approach for collection of baseline data shall be followed.
47. Appropriate Disaster Management safeguards in view of the high seismicity of the area.
48. NBWL clearance should be obtained.

4. Besides the above, the below mentioned general points are also to be followed:-

a) All documents to be properly referenced with index and continuous page numbering.
b) Where data are presented in the report especially in tables, the period in which the data were collected and the sources should be indicated.
c) Where the documents provided are in a language other than English, an English translation should be provided.
d) The Questionnaire for environmental appraisal of industrial projects as devised earlier by the Ministry shall also be filled and submitted.
e) While preparing the EIA report, the instructions for the proponents and instructions for the consultants issued by MoEF vide O.M. No. J 11013/41/2006-IA.II(I) dated 4th August, 2009, which are available on the website of this Ministry, should also be followed.
f) Changes, if any made in the basic scope and project parameters (as submitted in Form-1 and the F.R for securing the TOR) should be brought to the attention of MoEF with reasons for such changes and permission should be sought, as the TOR may also have to be altered. Post Public Hearing changes in structure and content of the draft EIA/EMP (other than modifications arising out of the P.H. process) will entail conducting the PH again with the revised documentation.
g) As per the circular no. J-11011/618/2010-IA.II(I) dated 30.5.2012, you are requested to submit certified report of the status of compliance of the conditions stipulated in the environment clearance for the existing operations of the project by the Regional Office of Ministry of Environment & Forests, if applicable.
h) For the baseline study for contiguous lease areas of similar nature 'Cluster Approach' may be adopted for collection of baseline data, which shall adequately cover every single lease area under consideration for EC.

5. The EIA report should also include (i) surface plan of the area indicating contours of main topographic features, drainage and mining area, (ii) geological maps and sections and (iii) sections of the mine pit and external dumps, if any, clearly showing the land features of the adjoining area.

6. After preparing the draft EIA (as per the generic structure prescribed in Appendix-III of the EIA Notification, 2006) covering the above mentioned issues, the proponent will get the public hearing conducted and take further necessary

action for obtaining environmental clearance in accordance with the procedure prescribed under the EIA Notification, 2006.

(Dr. Saroj)
Director

Copy to:

(i) The Secretary, Ministry of Mines, Government of India, Shastri Bhawan, New Delhi
(ii) The Secretary, Department of Mines & Geology, Government of Uttarakhand, Secretariat, Dehradun.
(iii) The Secretary, Department of Environment, Government of Uttarakhand, Secretariat, Dehradun.
(iv) Chief Wildlife Warden, Government of Uttrakhand, Secretariat, Dehradun.
(v) Secretary, SCMC, Dehradun.
(vi) The Chief Conservator of Forests, Central Region, Ministry of Environment and Forests, B-1/72, Sector-A, Aliganj, Lucknow-226020.
(vii) The Chairman, Central Pollution Control Board, Parivesh Bhavan, CBD-cum-Office complex, East Arjun Nagar, New Delhi-1100032.
(viii) The Member Secretary, Central Ground Water Authority, A-2, W3, Curzon Road Barracks, K.G. Marg, New Delhi-110001.
(ix) The Chairman, Uttrakhand Environment Protection & Pollution Control Board, E-115, Nehru Colony, Hardwar Road, Dehradun, Uttarakhand.
(x) The Controller General, Indian Bureau of Mines, Indira Bhavan, Civil Lines, Nagpur-440 001.
(xi) The District Collector, Dehradun District, Uttarakhand.
(xii) Guard File.

(Dr. Saroj)
Director

CHAPTER-I

INTRODUCTION

INDEX

1.0 PURPOSE OF THE REPORT

Environmental Impact Assessment (EIA) is one of the proven management tools for integrating environmental concerns in development process and for improved decision making as there is a need to harmonize the developmental activities with the environmental concerns into the larger interest of the society. The growing awareness, over the years, on environmental protection and sustainable development, has given further emphasis to the implementation of sound environmental management practices for mitigating adverse impacts from developmental activities. EIA study plays a vital role in sustainable development of a country. Recognizing its importance, the Ministry of Environment, Forest and Climate Change, Government of India had formulated policies and procedures governing the industrial and other developmental activities to prevent indiscriminate exploitation of natural resources and to promote integration of environmental concern in project development.

Environmental Impact Assessment report is prepared to comply with the Terms of Reference (TOR) received from Ministry of Environment, Forest And Climate Change dated 16th Sept'13 under EIA notification of the MoEF&CC dated 14th September, 2006 as amended on 1st December 2009, 4th April, 2011, 13th December, 2012, 13th March 2013, and 9th September 2013 and also the EIA Guidance Manual for Mining of Minerals (Feb, 2010) of MoEF&CC, Govt. of India, for seeking environmental clearance for mining of Sand, *Bajri* & Boulder in the applied mining lease area.

1.1 IDENTIFICATION OF PROJECT & PROJECT PROPONENT

The project is being proposed by Garhwal Mandal Vikas Nigam (GMVN) Limited.

The address of the proponent is given below:

Garhwal Mandal Vikas Nigam Limited,
74/1 Rajpur Road, Dehradun
Uttarakhand
Ph: - 0135-2746817, 2749308
gmvnl@gmvnl.com

The proponent has applied for environmental clearance in the name of River Yamuna Lot No. 21/2 Sand, *Bajri* & Boulder Mining Project over an area of 34.940 ha at Village: Dhakrani, Tehsil: Vikasnagar & District: Dehradun, Uttarakhand, for the allotted lease area, decided as per the Letter of Intent vide (Letter No. 40/Bhu. Khani.E./2012-13 dated 18-04-2013 issued by Geology & Mining Unit, Directorate of Industries, Govt. of Uttarakhand. The LOI is attached as **Annexure I(A).**

1.2 BRIEF DESCRIPTION OF PROJECT

The proposed project is to mine sand, *bajri* & boulder from bed of river Yamuna, over an area of 34.940 ha at Village: Dhakrani, Tehsil: Vikasnagar & District: Dehradun, Uttarakhand.

As per MoEF&CC, New Delhi Gazette dated 14th September 2006 and amended thereof, the proposed mining project was categorized as **Category 'A'** project due to the presence of Interstate Boundary between Uttarakhand and Himachal Pradesh and Uttarakhand and Uttar Pradesh, also Aasan Conservation Reserve, and Doon valley lies within the 10 km radius of the lease area.

The project proposal was submitted to Expert Appraisal Committee for its appraisal. Based on which, presentation for Terms of Reference (TOR) was held on 28th June, 2013. Based on the data provided and presentation done, the Expert Appraisal Committee has issued the Terms of Reference vide

letter No. J-11015/137/2013-IA.II (M) dated 16th September, 2013

Now as per the amended EIA Notification dated 15th January, 2016, 1st July, 2016 and 14th August, 2018 the category of the project has still comes under Category A as general condition of Doon Valley is applicable.
There are three other leases lies within the 500m radius of the proposed Sand, Bajri and Boulder Mining Project, District Dehradun, Uttarakhand and the cumulative area of the all four mines is 107.7473 ha.

As per the EIA Notification dated 1st July, 2016, a cluster shall be formed when the distance between the peripheries of one lease is less than 500 meters from the periphery of other lease in a homogeneous mineral area which shall be applicable to the mine leases or quarry licenses granted on and after 9th September, 2013. (Ref: Clause (B) (i), Page No-4 in EIA Notification dated 1st July, 2016) or The leases not operative for three years or more and leases which have got environmental clearance as on 15th January, 2016 shall not be counted for calculating the area of cluster but shall be included in the Environment Management Plan and the Regional Environmental Management Plan." (Ref: Note 5, Page No-5 in EIA Notification dated 1st July, 2016)

Therefore as per the EIA Notification dated 15th January, 2016, 1st July, 2016 and 14th August, 2018, the project comes under "A" Category without cluster situation due to general condition of Doon Valley as two private mines already granted EC before 15.01.2016 and one other mine of GMVN which already granted EC is not operational till date.

It has been proposed to mine around 3.3 lakh Tonnes per annum of minerals. The estimated project cost for the proposed project is Rs. 18.5 lacs. The proposed mining lease area falls in Survey of India Toposheet 53F11. The mine lease co-ordinates and connectivity details are listed below:

Latitude	30°28'3.21"N to 30°27'16.24"N
Longitude	77°42'59.22"E to 77°42'4.73"E

Connectivity Details given below:

Connectivity Details		**Aerial Distance**
Nearest Railway Station	Dehradun Railway Station in SE direction.	Approx 35 km
Nearest Airport	Jolly Grant Airport in SE direction.	Approx 52 km
Nearest Highway	NH-72 in S direction	Approx. 1 Km

Project's importance to the country and the region

The project involves collection of Sand, *Bajri*, & Boulder, thus the proposed mining project would improve the supply of construction materials like stone, making a positive impact on the infrastructural projects like construction of roads, buildings, bridges etc in the state.

Since the quarries will be leased out to successful allottees, mining operation in the state will get legalized and it will fetch income to the state exchequer by the way of royalty.

This project operation will provide direct and indirect employment to the people residing in nearby villages improving their social/economical status.

1.3 SCOPE OF THE STUDY

The project proposal was submitted to Expert Appraisal Committee for its appraisal. Based on which, presentation for Terms of Reference (TOR) was held on 28th June, 2013. Based on the data provided and presentation done, the Expert Appraisal Committee has issued the Terms of Reference vide letter No. J-11015/137/2013-IA.II (M) dated 16th September, 2013

The points given by the EAC in the TOR has been considered and their compliances are as under:-

Point Wise Compliance for TOR

S. No.	Tor	Compliance
1.	Year-wise production details since 1994 should be given, clearly stating the highest production achieved in any one year prior to 1994.It may also be categorically informed whether there had been any increase in production after the EIA Notification,1994 came into force w.r.t. the highest production achieved prior to 1994.	It is a greenfield project for which LoI has been issued by Geology and Mining Unit, Uttarakhand vides Letter No. 589/Bhu. Khani.E./2012-13 dated 23-01-2013. No mining activity has been carried out prior to and or after 1994 till date.
2.	A copy of the document in support of the fact that the proponent is the rightful lessee of the mine should be given	A copy of LOI in support of the fact that the proponent will be the rightful lessee of the mine is attached **as Annexure I (A).**
3.	All documents including approved mine plan, EIA and public hearing should be compatible with one another in terms of the mine lease area, production levels, waste generation and its management and mining technology and should be in the name of lessee.	Approved Mine Plan is compatible with the EIA/EMP report in terms of the mine lease area, production levels, waste generation and its management and mining technology. The approved Mine Plan is attached as **Annexure XIII** As the Public hearing was held prior to the approval of Mine Plan, A letter from Geology & Mining Unit, DoI, Dehradun, has been attached as **Annexure XIV**, stating that the mining characteristics remains same in both Draft & Final Report.
4.	All corner coordinates of the mine lease area superimposed on High Resolution Imagery/topo sheet should be provided. Such an imagery of the proposed area should clearly show the landuse	Corner coordinates of the mine lease area superimposed on high resolution toposheet has been incorporated in **Chapter II (Page no.27)**. Landuse map is attached as **Map No. 2.**

	and other ecological features of the study area (core and buffer zone).	
5.	Does the company have a well laid down Environment Policy approved by its Board of Directors? If so, it may be detailed in the EIA report with description of the prescribed operating process/procedures to bring into focus any infringement/deviation/violation of the environmental or forest norms/conditions? The hierarchical system or administrative order of the company to deal with the environmental issues and for ensuring compliance with EC conditions may also be given. The system of reporting of non-compliances/violations of environmental norms to the Board of Directors of the company and/or shareholders or stakeholders at large may also be detailed in the EIA report.	Yes, there is well laid Environmental Policy for the proposed project attached as a **Annexure-VI**. The project is being proposed by Garhwal Mandal Vikas Nigam Ltd., Government of Uttarakhand undertaking. Hence the policy i.e. Uttarakhand Mining Policy, 2011 will be followed. The Environmental Management Cell (EMC) has been formulated to deal with environmental issues and to ensure compliance with EC conditions. Structure of EMC is attached as **Annexure-XXIX.** The EMC will be made in charge for reporting non compliances to the Owner. The hierarchical system or administrative order of the company to deal with the environmental issues is given in EIA Report at **Page No-151.**
6.	Issues relating to Mine Safety, including subsidence study in case of underground mining and slope study in case of open cast mining, blasting study etc. should be detailed. The proposed safeguard measures in each case should also be provided.	Mines safety for workers working at the site has been taken care of. Safety measures related to risks during mining activity, natural disasters, etc has been proposed Details about the same are given in **Chapter VII** (Page no.132-133). The proposed project is a river bed mining project. It is not an underground mining project and

<table>
<tr><td></td><td></td><td>therefore no subsidence and blasting study is proposed.</td></tr>
<tr><td>7.</td><td>The study area will comprise of 10 km zone around the mine lease from lease periphery and the data contained in the EIA such as waste generation etc should be for the life of the mine / lease period.</td><td>The 10 km zone from periphery of the lease has been considered as the study area. The Buffer map of the study area is given as Map No. 1 in Chapter II. All the details in the EIA report are for the life of the lease period.

Total waste generated during the five years would be approx. 4,12,500 tonne.

The details of mining & production have been given in Chapter II (Page no.36-41).</td></tr>
<tr><td>8.</td><td>Land use of the study area should be described delineating forest area, agricultural land, grazing land, wildlife sanctuary and national park, migratory routes of fauna, water bodies, human settlements and other ecological features should be indicated. Land use plan of the mine lease area should be prepared to encompass preoperational, operational and post operational phases and submitted. Impact, if, any, of change of land use should be given.</td><td>Land use pattern of 10 km from the periphery of the lease area has been prepared and incorporated as Map No.2, Chapter III. Aasan Conservation Reserve lies at a distance of 2.4 km from project site.
Pre- operational Land use cover of 10 km radius:
<table>
<tr><th>S. No</th><th>Description</th><th>Area in Hectares</th><th>Percentage share in total area</th></tr>
<tr><td>1</td><td>Open/ waste land</td><td>1511.10</td><td>4.13</td></tr>
<tr><td>2</td><td>River</td><td>366.30</td><td>1.00</td></tr>
<tr><td>3</td><td>Agricultural land</td><td>9532.45</td><td>26.14</td></tr>
<tr><td>4</td><td>Agricultural Fallow Land</td><td>4262.04</td><td>11.68</td></tr>
<tr><td>5</td><td>Settlement</td><td>1097.61</td><td>3.00</td></tr>
<tr><td>6</td><td>Vegetation</td><td>429.11</td><td>1.18</td></tr>
<tr><td>7</td><td>Forest</td><td>16967.85</td><td>46.44</td></tr>
</table></td></tr>
</table>

		<table><tr><td>8</td><td>River With Dry Channel</td><td>2347.65</td><td>6.43</td></tr><tr><td colspan="2">Total</td><td>36534.10</td><td>100</td></tr></table> The lease area is part of river bed. Mining will be done only in dry part of the river bed. There will be no change in land use during pre and post operational phase as the site is devoid of any vegetation, structure, human settlement, etc. The mineral removed from the riverbed during operational phase will be gradually replenished during monsoon season.
9.	Details of the land for any Over Burden Dumps outside the mine lease, such extent of land area, distance from mine area, its land use R&R issues, if any, should be given.	The proposed project is a River Bed Mining Project, therefore there will be no Over Burden & hence no dumps are proposed in the lease area. There will be no change in Landuse and no R&R issues are involved.
10.	A certificate from competent Authority in the State Forest Department should be provided, confirming the involvement of forest land, if any, in the project area. In the event of any contrary claim by the project proponent regarding the status of forests, the site may be inspected by the state Forest Department along with the Regional Office of the Ministry to ascertain the status of forests, based on which, the Certificate in this regard as mentioned above be issued. In all such cases, it would	There is no forest land within the lease area. Inspection report confirming the same with report from forest department has been attached as **Annexure I (B).**

	be desirable for representative of the State Forest Department to assist the Expert Appraisal Committees.	
11.	Status of forestry clearance for the broken up area and virgin forestland involved in the Project including deposition of net present value (NPV) and compensatory a forestation (CA) should be indicated. A copy of the forestry clearance should be furnished.	No forest land is involved in the lease area, therefore, deposition of net present value (NPV) and compensated Afforestation is not indicated. Report from forest department has been attached as **Annexure I (B).**
12.	Implementation status of recognition of forest rights under the Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 should be indicated.	There is no involvement of forest land in the project area.
13.	The vegetation in the RF / PF in the study area, with necessary details, should be given.	There are 19 RF in the study area, which have been listed in **Chapter III** (Page no.67). The vegetation details of the same are incorporated in Chapter III (Page no.68-69) of the report.
14.	A study shall be got done to ascertain the impact of the Mining Project on the wildlife in the surrounding and any other protected area and accordingly detailed mitigative measures required, should be worked out with cost implications and submitted.	There is Aasan Conservation Reserve falls at a distance of 2.4 km from the project site. Distance certificate from Forest Department w.r.t. Aasan Conservation Reserve, Approved Conservation Plan from Chief Wildlife Warden and NBWL from Wildlife Department MoEP&CC has already been obtained and are attached as Annexure- XXV, XI and XXV respectively. Details of mitigative measures are given in **Chapter III** and the site is also near to the

		Doon valley which is an eco-sensitive zone. Details of impacts & mitigation measures are given in **Chapter IV** (Page no.101-103) of report.
15.	Location of National Parks, Sanctuaries, Biosphere Reserves, Wildlife Corridors, Tiger/Elephant Reserves (existing as well as proposed) if any, within 10 km of the mine lease, should be clearly indicated, supported by a location map duly authenticated by Chief Wildlife Warden. Necessary clearance, as may be applicable to such projects due to proximity of the ecologically sensitive areas as mentioned above, should be obtained from the State Wildlife Department/Chief Wildlife Warden under Wildlife (Protection) Act, 1972 and copy furnished.	Though there is no National Parks, Sanctuaries, within 10 km of the mine lease area. However, Aasan Conservation Reserve lies at a distance of 2.4 km from the lease area. Distance certificate has been obtained from Forest Department regarding the same. Copy is attached as **Annexure- XV)** Buffer Map showing the location of the Reserve is attached as **Annexure VIII.** We are in the process of getting the distance map authenticated by Chief Wildlife Warden and will submit a copy to MoEFCC soon. An undertaking in this regard is enclosed as **Annexure XXVI.** NBWL Clearance has been obtained for the project. Copy of permission enclosed as **Annexure XXV.**
16.	A detailed biological study for the study area [core zone and buffer zone (10 km radius of the periphery of the mine lease)] shall be carried out. Details of flora and fauna, duly authenticated, separately for core and buffer	Detailed biological study of core zone and buffer zone within 10 km radius of the periphery of the mine lease has been carried out for the project. The same has been incorporated in **Chapter III** (Page no. 65-88) of the report.

	zones should be furnished based on primary field survey, clearly indicating the Schedule of the fauna present. In case of any scheduled-I fauna found in the study area, the necessary plan for their conservation should be prepared in consultation with State Forest and Wildlife Department and details furnished. Necessary allocation of funds for implementing the same should be made as part of the project cost.	There is no Schedule-I species in the study area as per the authenticated list of Flora and Fauna provided by DFO, Dehradun. The same is attached as **Annexure IX.** However, conservation plan for Schedule I & II species with allocated funds has been prepared and approved by Forest Department. The same is attached as **Annexure-XI.**
17.	Proximity to Areas declared as 'Critically Polluted 'or the Project areas likely to come under the 'Aravali Range'(attracting court restrictions for mining operations),should also be indicated and where so required; clearance certifications from the prescribed Authorities, such as the SPCB or State Mining Dept. should be secured and furnished to the effect that the proposed mining activities could be considered.	There is no area declared as 'Critically Polluted and also no area of the project come under the 'Aravali Range' within 10 km radius of the project site.
18.	Similarly, for coastal Projects, A CRZ map duly authenticated by one of authorized agencies demarcating LTL, HTL, CRZ area, location of the mine lease w.r.t. CRZ, coastal features such as mangroves ,if ,any, should be furnished.(Note: The Mining Projects falling under CRZ would also need to obtain approval of the concerned Coastal Zone Management Authority).	The proposed project is not a coastal project. Hence no approval of the concerned Coastal Zone Management Authority is required.

19.	R & R compensation details for the Project Affected People (PAP) should be furnished. While preparing the R&R Plan, the relevant State/National Rehabilitation & Resettlement Policy should be kept in view. In respect of SCs /STs and other weaker sections of the society in the study area, a need based sample survey, family-wise, should be undertaken to assess their requirements, and action programmes prepared and submitted accordingly, integrating the sectoral programmes of line departments of the State Government. It may be clearly brought out whether the village located in the mine lease area will be shifted or not. The issues relating to shifting of Village including their R&R and socio-economic aspects should be discussed in the report.	There are no inhabited areas in the allotted mine area which lies on the river bed, therefore no R&R Plan is proposed. However compensation will be paid to the land owner in case of private land (if any) in line with govt. scheme.
20.	One season (non-monsoon) primary baseline data on ambient air quality (PM_{10}, SO_2 and NOx), water quality, noise level, soil and flora and fauna shall be collected and the AAQ and other data so compiled presented date- wise in the EIA and EMP Report. Site-specific metcorological data should also be collected. The location of the monitoring stations should be such as to represent whole of the study area and justified keeping in view the pre-	Base line study was carried out for one (non-monsoon) season from Oct'13 to Dec'13. Details are provided in **Chapter III** (Page no.44-64) of this EIA/EMP Report. The locations of the monitoring stations were decided on the basis of prevailing micro - meteorological conditions (Wind direction & wind speed) of the study area. The windrose has been given in **Chapter III** (Page no.46) of EIA/EMP Report. One location has been selected in downwind

	dominant downwind direction and location of sensitive receptors. There should be at least one monitoring station within 500m of the mine lease in the pre-dominant downwind direction. The mineralogical composition of PM_{10}, particularly for free silica, should be given.	direction within 500m from the lease boundary. Date wise collected baseline AAQ data is attached as **Annexure III.** The location of the monitoring sites has been shown in **Map No 4 in Chapter III.**
21.	Air quality for modeling should be carried out for prediction of impact of the project on the air quality of the area. It should also take into account the impact of movement of vehicles for transportation of mineral. The details of the model used and input parameters used for modeling should be provided. The air quality Contours may be shown on a location map clearly indicating the location of the site, location of sensitive receptors, if any, and the habitation. The wind roses showing pre-dominant wind direction may also be indicated on the map.	Air quality modeling has been carried out for prediction of impact of the project on air quality. Aermod has been used taking into account impact of movement of vehicles which is incorporated and results are attached as **Annexure XXIII.** The windrose diagram showing pre dominant wind direction has been indicated in **Chapter III** (Page no.46) of the EIA/EMP Report.
22.	The water requirement for the project, its availability and source should be furnished. A detailed water balance should also be provided. Fresh water requirement for the Project should be indicated.	The total water requirement for the project will around 5.0 KLD. The break-up for water is given in **Chapter II** (Page no.41) of the EIA/EMP Report. Water will be taken from nearby village. NoC for the same has been obtained and attached as **Annexure-X.**
23.	Necessary clearance from the Competent Authority for drawl of requisite quantity of water for the Project should be provided.	The nearby water source comes under the jurisdiction of Gram Pradhan. The nearby villages through their Gram Pradhan are

		agreed to provide the required amount of water. Necessary approvals from Gram Pradhan have been obtained and attached as **Annexure-X**.
24.	Description of water conservation measures proposed to be adopted in the Project should be given. Details of rainwater harvesting proposed in the Project, if any, should be provided.	The project do not consume any process water except for drinking, dust suppression & plantation. Plantation is proposed, which will increase the water holding capacity & help in recharging of ground water. No artificial rainwater harvesting is proposed for the present project.
25.	Impact of the project on the water quality, both surface and groundwater should be assessed and necessary safeguard measures, if any required, should be provided.	There will be no impact of the project on the ground water quality as the mining will be carried out up to a depth of 1.5 meter bgl or above ground water table whichever comes first. No mining will be done in monsoon affecting surface water. The mining project will also be done in dry area of river bed; hence there will be no impact on the surface water as well.
26.	Based on actual monitored data, it may clearly be shown whether working will intersect groundwater. Necessary data and documentation in this regard may be provided. In case the working will intersect groundwater table, a detailed Hydro Geological Study should be undertaken and Report furnished. Necessary permission from Central Ground Water Authority for working below ground water and for pumping of	Mining will be done from the top surface to about 1.5 m below ground level or above ground water level; whichever comes first. As studied the ground water level in pre-monsoon is 2.52 m bgl in and in post monsoon season is 2.29 m bgl. So there will be no intersection with groundwater.

<table>
<tr><td></td><td>ground water should also be obtained and copy furnished.</td><td></td></tr>
<tr><td>27.</td><td>Details of any stream, seasonal or otherwise, passing through the lease area and modification/ diversion proposed, if any, and the impact of the same on the hydrology should be brought out.</td><td>The lease area lies on the bed of Yamuna River. During mining, river stream will not pass through lease area.
Moreover no modification/ diversion of the river is proposed, hence there will be no impact on the hydrology as such.</td></tr>
<tr><td>28.</td><td>Information on site elevation, working depth, groundwater table etc. should be provided both in AMSL and bgl. A schematic diagram may also be provided for the same.</td><td><table><tr><td>Site elevation</td><td>Highest:420 m AMSL
Lowest: 414 m AMSL</td></tr><tr><td>Working depth</td><td>1.5 m bgl or above ground water level, whichever comes first.</td></tr><tr><td colspan="2">Groundwater depth</td></tr><tr><td>Pre-monsoon</td><td>2.52 m bgl</td></tr><tr><td>Post-monsoon</td><td>2.29 m bgl</td></tr></table>Schematic diagram for the same is incorporated in Chapter II (Page no.37).
Surface plan with cross sections of the lease area has been attached has Annexure II (A) and II (B) respectively.</td></tr>
<tr><td>29.</td><td>A time bound Progressive Greenbelt Development Plan shall be prepared in a tabular form (indicating the linear and quantitative coverage, plant species and time frame) and submitted, keeping in mind, the same will have to be executed up front on commencement of the project.</td><td>Plantation will be carried along the river banks and road sides or near the civic amenities in consultation with local authority or govt. body as it is not feasible to develop green belt around the lease area which lies on the river bed.
The fund will be deposited with mining trust according to Mines and Mineral (Development and</td></tr>
</table>

		Regulation) Act 1957 dated 28th Dec, 1957 and Uttarakhand District Mineral Foundation Trust, 2017 dated 17th November, 2017. Plantation will be done by the trust and will be decided by the concerning DFO. Copy of the Act is enclosed as **Annexure XXXIII.** List of species to be planted is attached as **Annexure XIX.**
30.	Impact on local transport infrastructure due to the Project should be indicated. Projected increase in truck traffic as a result of the Project in the present road network (including those outside the Project area) should be worked out, indicating whether it is capable of handling the incremental load. Arrangement for improving the infrastructure, if contemplated (including action to be taken by other agencies such as State Government) should be covered.	There will be an increase of 147 trucks carrying the minerals per day. The impact due to this on local transport infrastructure has been detailed in **Chapter IV** (Page no. 103-106) of the EIA/EMP Report. Effective mitigation measures will be adopted to minimize the impacts from transportation & handling of mineral: • The haul road will be kept wide, leveled, compacted and water will be sprayed regularly to suppress fugitive dust. • Transportation route will be repaired & maintained regularly. • Utmost care will be taken to prevent spillage of mineral from the trucks by covering it with tarpaulin sheet. • Transportation will be done through having a valid PUC certificate. The budget for environment

		management during Mineral transportation and handling is given in **Chapter X (Page No-156-157)**
31.	Details of the onsite shelter and facilities to be provided to the mine workers should be included in the EIA report.	A temporary rest shelter will be provided for the workers near to the site with provisions of water, first aid facility, protective equipments, etc. Details are given in **Chapter II** (Page no.41-42) of the EIA/EMP Report.
32.	Conceptual post mining land use and Reclamation and Restoration of mined out areas (with plans and with adequate number of sections) should be given in the EIA report.	As the mine area lies on the river bed, the area will be reclaimed naturally with sediments, gradually during monsoon seasons. There will be construction of ramps, temporary rest shelters during operational phase; However these will be removed and the banks will be restored at the time of mine closure. Approved Mine Plan with plans and sections is attached as **Annexure-XIII.**
33.	A time bound Greenbelt Development, plantation and compensatory afforestation should be charted clearly indicating the area to be covered under plantation and the species to be planted. The details of plantation already done should be given.	As the proposed project lies on the riverbed and being a new project, no plantation has been done earlier. Plantation will be carried along the river banks and road sides or near the civic amenities in consultation with local authority or govt. body. Time bound Progressive Greenbelt Development Plan along with list of species to be planted is attached as **Annexure XXXII.**
34.	Occupational Health impacts of the Project should be anticipated and the proposed preventive measures spelt out in detail.	Occupational health impact mainly is expected due air pollution due to fugitive dust emission because of movement of vehicles. However

	Details of pre-placement medical examination and periodical medical examination schedules should be incorporated in the EMP.	appropriate mitigation measures for air pollution control have been proposed as given in **Chapter VII** (Page no. 132-133) of the report. The fund for occupational health issues will be deposited with mining trust according to Mines and Mineral (Development and Regulation) Act 1957 dated 28th Dec, 1957 and Uttarakhand District Mineral Foundation Trust, 2017 dated 17th November, 2017. Each labour will undergo pre-placement medical examination. Thereafter periodical heath check up will be arranged as stated in the **Chapter VII** (Page no.132-133) of the report. Occupational Health Plan with budgetary provision has been attached as **Annexure XXX.**
35.	Public health implications of the Project and related activities for the population in the impact zone should be systematically evaluated and the proposed remedial measures should be detailed along with budgetary allocations.	The proposed project being a small scale manual mining projects, there will be hardly any process related health implication on the population of the nearby villages except fugitive dust emissions due to transportation of trucks. However health camps & awareness programs will be arranged for them. Details are given in **Chapter VIII** (Page no. 132-133) of the report.
36.	Measures of socio economic significance and influence to the local community proposed to be provided by the Project Proponent should be indicated. As far as possible, quantitative dimensions	Socio-economic significance provided to the local community i.e. to the nearby villagers is given in **Chapter VII** (Page no.130) of the EIA/EMP Report. Maximum socio economic

	may be given with time frames for implementation.	measured would be covered through the amount deposited with District Administration as provided under the Mines and Mineral (Development and Regulation) Act 1957 dated 28th Dec, 1957 and Uttarakhand District Mineral Foundation Trust, 2017 dated 17th November, 2017. As the Project Proponent is regularly paying the certain amount to the District Administration as per the provisions.
37.	Detailed environmental management plan to mitigate the environmental impacts which, should inter-alia include the impacts of change of land use, loss of agricultural and grazing land, if any, occupational health impacts besides other impacts specific to the proposed Project.	The detailed environmental management plan to mitigate the environmental impacts has been mentioned in **Chapter X** (Page no.152-157) of the EIA/EMP Report. There will be no change in land use as the project lies on dry part of riverbed and also there will be no loss of agriculture and grazing land. Detailed occupational health plan is attached as **Annexure XXX.**
38.	Public hearing points raised and commitment of the project proponent on the same along with time bound action plan to Implement the same should be provided and also incorporated In the final EIA/EMP Report of the Project.	Details of public hearing are given in **Chapter VII** (Page no.119). Public hearing proceedings of the project along with action plan & budget allocation has been attached as **Annexure-XII A & XII B**.
39.	Details of litigation pending against the project, if any, with direction /order passed by any Court of Law against the project should be given.	There is no litigation pending against the project. The LoI has been issued from Dept. of Geology & Mining Unit, Govt. of Uttarakhand to carry out mining

		operation in the proposed area.
40.	The cost of the project (capital cost and recurring cost) as well as the cost towards implementation of EMP should clearly be spelt out.	The capital cost of the project is 18.5 Lakhs. The costs like for project monitoring & EMP has been given in **Chapter VI** (Page no.116) & **X** (Page no.156-157) respectively.
41.	Details of replenishment studies.	The extractable quantum of mineral in the first year would be limited to the available quantum. The extractable amount for further years will vary depending on amount/rate of natural replenishment which will be monitored by expert agencies every year hired by the project proponent. The replenishment study has been carried out through IIT, Roorkee by considering sections and elevations at various points within the lease area to monitor the actual replenished quantity. Modified Mining Plan incorporated the details of Replenishment is attached as **Annexure XIII.**
42.	Details of Transportation of mined materials as per Indian Road Congress for both the ways with loaded as well unloaded traffic load and its impact on Environment.	The details of transportation for loaded as well as unloaded trucks with anticipated impacts due to transportation & its mitigation measures are given in **Chapter IV** (Page no. 103-106) of the EIA/EMP Report.
43.	Cumulative impact due to sand mining.	Cumulative impacts due to sand mining has been evaluated and incorporated in the EIA report as **Annexure-XVIII.**

44.	Proper Conservation Plan for Schedule-I and Schedule-II fauna.	The details of biological environment (flora & fauna for core and buffer zone) are given in **Chapter III** (Page no. 65-88). There is no Schedule-I species found in the study area. However, Conservation Plan for Schedule I & II species has been prepared and approved by Forest Department is attached as **Annexure XI.**
45.	Impact on mining on plankton.	As the mining will be carried out on the dry part of the allotted area, as such there will be no impact on the planktons. The list of species of planktons (phytoplankton & zooplanktons) is given in **Chapter III** (Page no.85-86).
46.	Cluster approach for collection of baseline data shall be followed.	Cluster approach has been followed for collection of baseline data.
47.	Appropriate Disaster Management safeguards in view of the seismicity of the area.	The project area lies in Seismic Zone IV, which implies that this is highly prone to earth quakes. However there are no built in structures or permanent constructional activity for the project which would get affected. Apart from this Uttarakhand State has a devised State Disaster Management Action Plan (SDMP) prepared by Disaster Mitigation & Management Centre, Uttarakhand Secretariat which has been considered for disaster management for the proposed project. The Disaster Management Plan is attached as **Annexure XVI.**

48.	NBWL clearance should be obtained.	Aasan Wetland Conservation Reserve lies at a distance of 2.4 Km from project site for which NBWL Clearance is already been obtained. Approval of the same is attached as **Annexure XXV.**

General Points to be followed as per ToR:

1.	All documents may be properly referenced with index, page numbers and continuous page numbering	Complied.
2.	Where data are presented in the report especially in tables, the period in which the data were collected and the sources should be indicated	Relevant details i.e. the period & sources of data have been mentioned in Final EIA/EMP Report.
3.	Where the documents provided are in a language other than English, an English translation should be provided	Yes, the same has been provided, in case of documents are in a language other than English.
4.	The Questionnaire for environmental appraisal of mining projects as prescribed by the ministry shall also be filled and submitted	The questionnaire for environmental appraisal of the project is attached in the report as **Annexure-IV**
5.	While preparing the EIA report, the instructions for the proponents and instructions for the consultants issued by MoEF vide O.M No. J-11013/41/2006-IA.II(I) dated 4th August, 2009 should be followed	Instructions for the proponents and consultants issued by MoEF&CC from time to time have been taken into consideration while preparing the EIA report.

6.	Changes, if made any in the basic scope and project parameters as submitted in Form 1 and PFR for securing TOR should be brought to the attention with reasons for such changes and permission should be sought out, as TOR may also have to be altered. Post public hearing changes in structure and content of the draft EIA/EMP (other than modifications arising out of P.H process) will be entail conducting the PH again with revised documentation.	No changes have been done in the basic scope and project parameters as submitted in Form 1 and PFR.
7.	As per the circular no. J-11011/618/2010-IA.II(I) dated 30.2.2012, you are requested to submit certified report of the status of compliance of the conditions stipulated in the environmental clearance for the existing operations of the project by the Regional Office of Ministry of Environment & Forests, if applicable.	Not applicable as this is a new mine for which Environmental clearance is yet to be received.
8.	For the baseline study for contiguous lease areas of similar nature "Cluster approach" may be adopted for collection for baseline data, which shall adequately cover every single lease area under consideration for EC.	Cumulative Baseline study has been carried out for the mine leases. The overlaid map of sampling location of all the mine leases is attached as **Annexure XXIV.**

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10 KM BUFFER MAP OF THE STUDY AREA

LEGEND

Project Site

10 KM Buffer Boundary

Inter State Boundary

Asan (Ramsar Site)

Dehradun

Kalsar Sanctuary

Toposheet No:
53 F/1(SW)

SHIVALIK LIMITED
Project Site Dehradun, Uttarakhand

Fig No: 1

Source: SOI Toposheet

CHAPTER-II

PROJECT DESCRIPTION

INDEX

2.0 TYPE OF PROJECT

The project is proposed for the excavation of Sand, *Bajri* & Boulder from the bed of River Yamuna. It is an opencast mining project where the entire activity will be done manually.

2.1 NEED FOR THE PROJECT

The project site lies on river Yamuna, which gets recharged by the rain water and carries with it huge quantity of sediment consisting of sand, *bajri*, silt, clay, etc. during every monsoon season, generally. This monsoon, i.e. in 2013, the state has received > 400% rainfall, which resulted into the swelling of rivers. As a result, there is unprecedented sediment deposition in the rivers. Under such circumstances the risk of the disaster (huge flooding) may increase manifold as the river beds are already filled with sediments, if not excavated prior to the next monsoon. Hence it is quite necessary to clear the excessive sediment load from the rivers at the earliest, which otherwise will damage large tracts of land lying on both the banks of the river due to heavy and devastating floods. Hence the mining activity will channelize the river which is need of the hour.

2.2 LOCATION DETAILS

The River Yamuna Lot No. 21/2 Sand, *Bajri* & Boulder Mining Project is located at Village: Dhakrani, Tehsil: Vikas Nagar & District: Dehradun, Uttarakhand. The lease area falls in Survey of India Toposheet 53F11.The lease co-ordinates and connectivity details are listed below:

Latitude	30°28'3.21"N to 30°27'16.24"N
Longitude	77°42'59.22"E to 77°42'4.73"E

The lease area is connected to NH-72 by a metalled road followed by a *kaccha* road via village Dhakrani which is approx. 410 m.

2.2.1 Lease Hold Area:

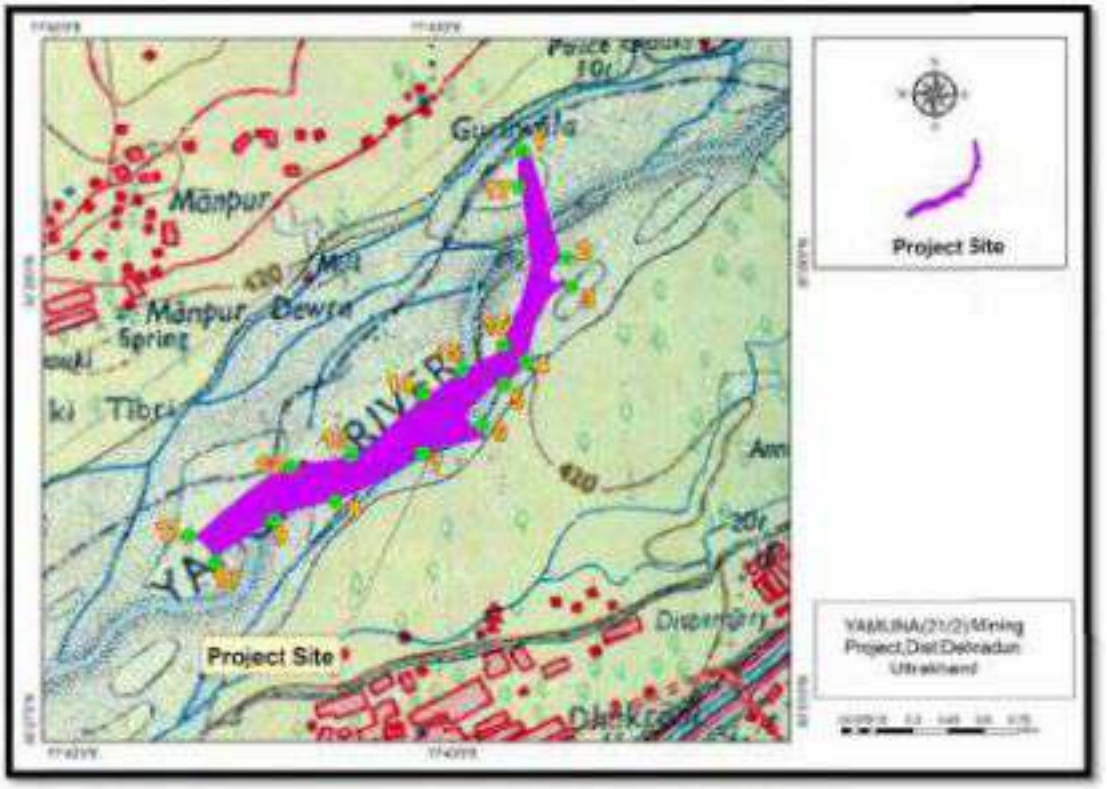
The lease hold area of 34.940 ha lies in the bed of River Yamuna, decided as per the Letter of Intent vide Letter No. 40/Bhu. Khani.E./2012-13 dated 18-04-2013 issued by Geology & Mining Unit, Directorate of Industries, Govt. of Uttarakhand.

The site has been inspected jointly by various departments and has been recommended for mining. The Joint Inspection Letter has been attached as **Annexure I (B).**

Table 2.1: Details of the Lease Hold Area

Lot No.	Khasra No.	River	Village	Area in Hectares
21/2	971,969,970,936 मि0	Yamuna	Dhakrani	34.940

The general location & Project site layout with pillar coordinates are shown below:



S.No.	Latitude	Longitude
1	30°28'4.28"N	77°42'59.02"E
2	30°27'49.38"N	77°43'3.46"E
3	30°27'45.72"N	77°43'4.15"E
4	30°27'35.01"N	77°42'55.36"E
5	30°27'33.37"N	77°42'52.69"E
6	30°27'27.62"N	77°42'48.49"E
7	30°27'25.18"N	77°42'37.74"E
8	30°27'20.13"N	77°42'24.41"E
9	30°27'18.77"N	77°42'14.08"E
10	30°27'14.72"N	77°42'4.71"E
11	30°27'17.61"N	77°42'1.70"E
12	30°27'25.66"N	77°42'17.92"E
13	30°27'26.90"N	77°42'28.82"E
14	30°27'33.47"N	77°42'39.73"E
15	30°27'36.05"N	77°42'46.25"E
16	30°27'38.32"N	77°42'52.61"E
17	30°27'50.15"N	77°42'58.61"E

Fig: 2.1: Pillar Coordinates of the lease area.

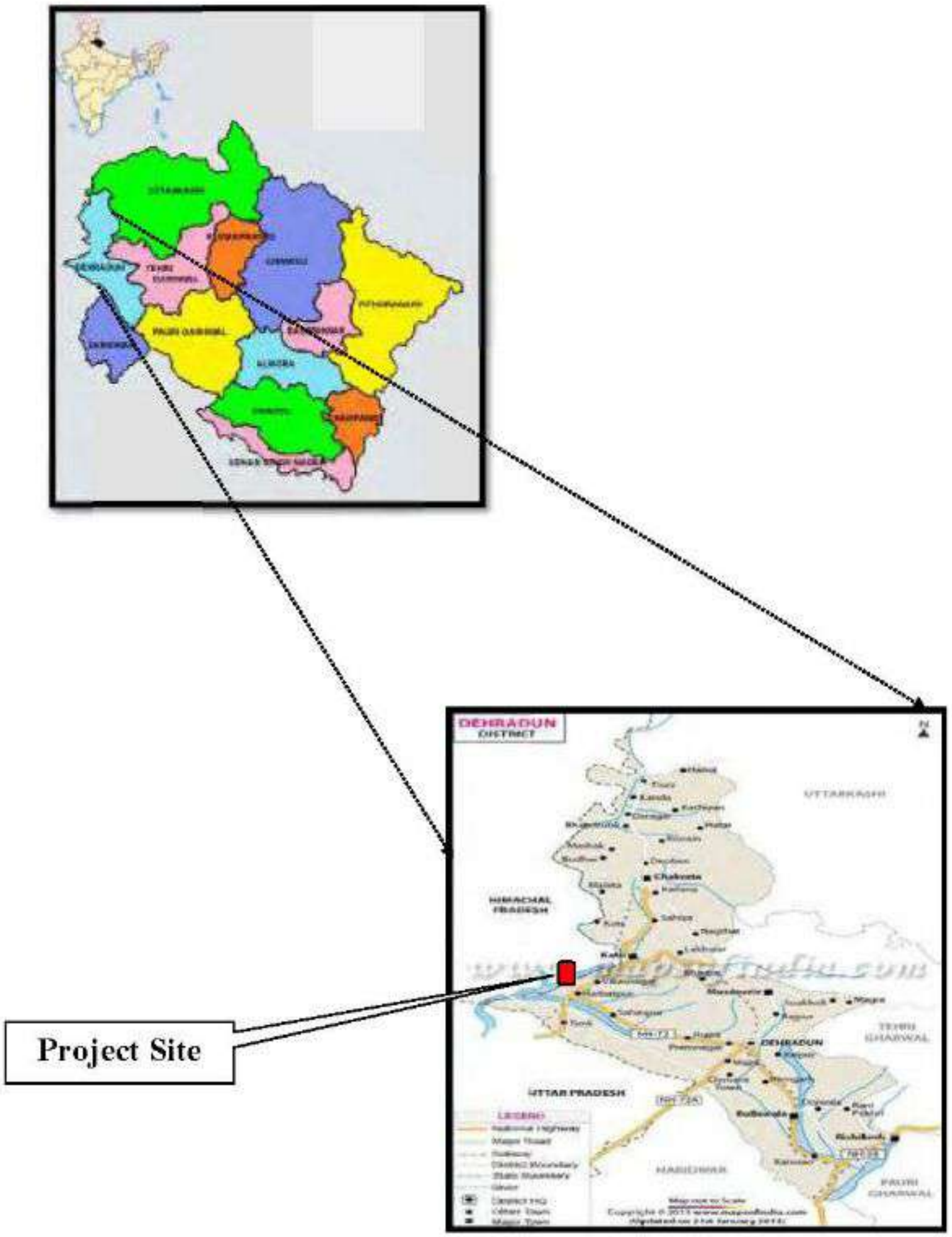


Fig 2.2: Location Map of the lease area

2.2.2 TOPOGRAPHY & GEOLOGY

Topography

Dehradun can be divided into two distinct tracts i.e. the montane tract and the sub-montane tract. The Montane Tract consists entirely of a succession of mountains and gorges. Below the Montane Tract follows the Sub-Montane Tract, which is the famous Doon valley bounded by Shiwalik hills in the south and outer scarp of the Himalayas in the north. The sub-montane tract which consists of two parallel running tracts, i.e. (a) Bhangar; and (b) Terai.

The Sub-Montane Tract is situated in foothills of Himalayas. The Sub-Montane exhibits a general fall of slope from the foothills region. The slope gradually decreases and becomes almost flat at the Doon area, where the site lies.

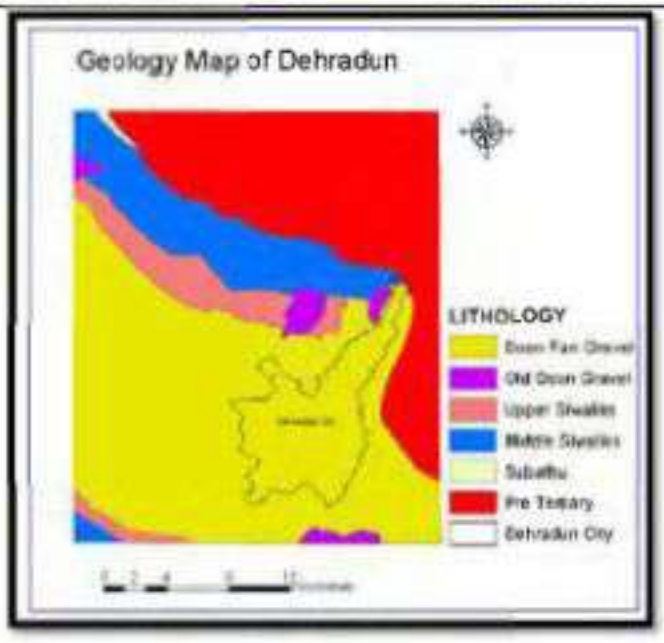
Geology

Dehradun valley was formed as an inter montane valley between lesser Himalaya in the north and the Siwaliks in the south. The present Doon valley is developed in two phases. In the first phase, around 18 million years ago there was an upliftment in the Himalaya around the Main Boundary Thrust (MBT) that raised the Mussoorie Range and the Lower Himalaya. It resulted in the formation of a synclinal depression known as Doon Syncline, in which the eroded sediments of the up-lifted part were deposited and this continued for the long period. In the second phase, around 0.5 million years ago another tectonic event uplifted the Siwalik Range strata along the Himalayan Frontal Thrust (HFT) and the Doon valley came into existence (Thakur, 1995)

Age	Geological units/ Formations	Lithology
Recent	River Alluvium	Loose unconsolidated materials of sand, silt and clay derived from Upper Siwalik and Lesser Himalaya

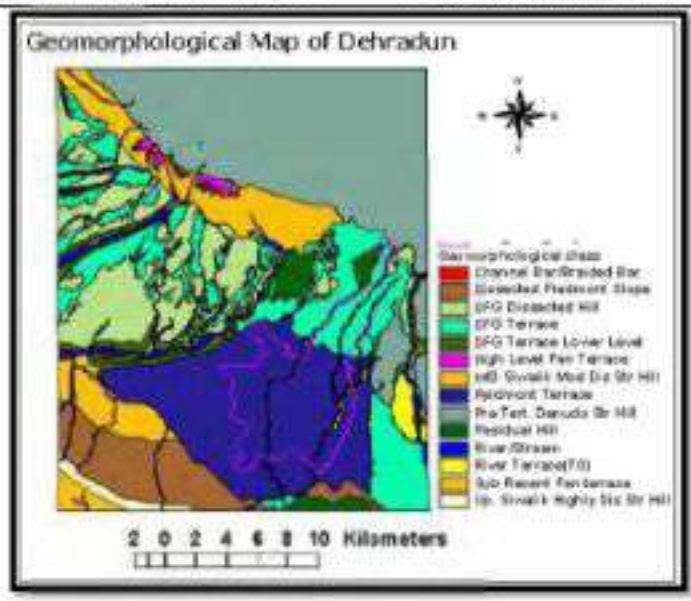
Sub Recent to Late Pleistocene	Young Doon Gravel	Sub rounded boulders and gravels of sandstone and quartzite derived from Siwalik and Lesser Himalaya
	Old Doon Gravel	Big angularand sub-rounded boulders of quartzite and sand-stones embedded in clay.
Unconformity		
Late Pliocene To Middle Miocene	Upper Siwalik	Coarse boulders,conglomerates and clay
	Middle Siwalik	Hard and soft sand stone and clay intercalation in pockets
	Lower Siwalik	Hard sandstone, interbeded with stone
Main Boundary Thrust		
Palaeoceneto Early Eocene	Subathu Formation	Red shale and lenticular bands of sandstone
Krol Thrust		
Pre-Tertiary	Tal	Quartzites
	Krol	Dolomitic limestone, cherty red shale, sandstone, black shale.
	Blaini / Infra Krol	Boulder beds, slate, dark shale, pink dolomite, violate quartzite and shale
	Nagthat	Quartzite and slate
	Chandpur	Phyllite, slate and limestone
	Damta	Grey slate, quartzite and turbidites

(Source: Seismic response analysis of Dehradun_pdf)



Geomorphology

Doon valley is the largest intermontane synclinal longitudinal valley in the sub Himalayan region. Many rivers such as Ganga, Yamuna, Sheetla Rao, Jakhan Rao, Suswa and Asan contributed in the formation of local landforms of the valley. For different type of formations there is change in drainage pattern, as in the pre tertiary formations drainage pattern is dendritic and trellis, in the Siwaliks it is sub-parallel and dendritic whereas in the recent formations it is parallel and sinuous (Patel and Kumar, 2003). Geomorphologically the landforms in the area are formed due to erosion, deposition and tectonic activity. Nossin (1971) concluded that the valley has been uplifted by 315 to 420 meter due to differential movement along the MBT and Krol thrust. He recognized different level of fans in the valley that consist of Doon Gravel of Pleistocene to recent age. Nakata (1972) suggested that the valley was formed by an intricate superimposition of alternate depositional and erosional phases caused by the climatic changes and crustal movement. *(Source: Seismic response analysis of Dehradun_pdf)*



2.2.3 CLIMATE & RAINFAL: The district has within its limits lofty peaks of the Outer Himalayas as well as the Dun Valley with climatic conditions nearly similar to those in the plains. The temperature depends on the elevation. The climate of the district, in general, is temperate. In the hilly regions, the summer is pleasant but in the Doon Valley, the heat is often intense. The temperature drops below freezing point not only at high altitudes but also even at places like Dehradun during the winters, when the higher peaks are under snow. The summer starts by March and lasts up to mid of June when the monsoon sets in. Generally, the month of May and early part of June is hottest with mean temperatures shooting upto 36.20c at Dehradun and 24.80C at Mussoorie. The maximum temperature rises to over 420C at Dehradun while at Mussoorie it doesn't exceed 320C. Winter starts from November and continue upto February. The highest maximum temperature recorded at Dehradun was 43.90C on June 4, 1902 and that at Mussoorie was 34.40C, on May 24th 1949. The mean daily maximum temperature during winter is 19.10C at Dehradun and 10.20C at Mussoorie. The mean daily minimum temperature in January is 6.10C at Dehradun and 2.50C at Mussoorie. In Mussoorie the temperature drops to about -60C to -70C when snow fall occurs. The

lowest minimum temperature at Dehradun during winter was - 1.10C, on February 1st, 1905 and January 1945 while at Mussoorie it was -6.70C, on February 10th.

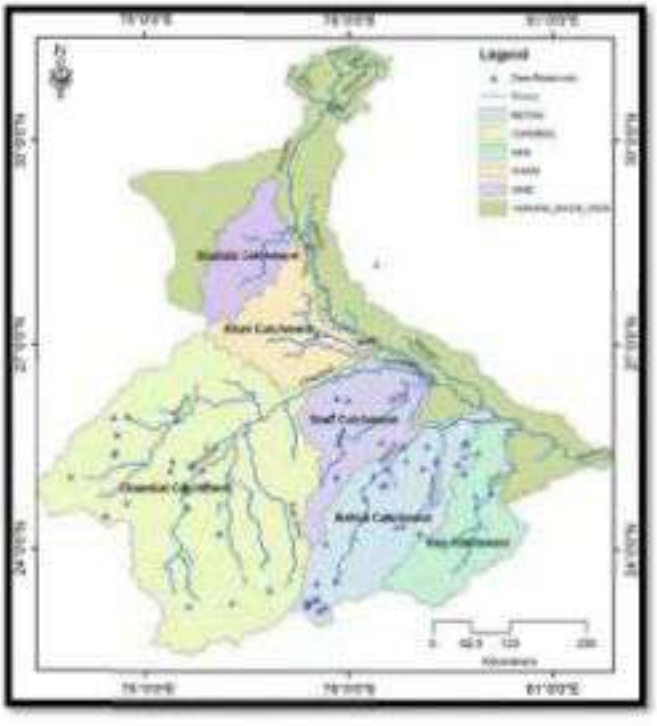
RAINFALL: The district receives an average annual rainfall of 2073.3 mm. Most of the rainfall is received during the period from June to September, July and August being the wettest months. The region around Raipur gets the maximum rainfall, while the southern part receives the least rainfall in the district. About 87% of the annual rainfall is received during the period June to September. *(Source: CGWB Dehradun.pdf)*

FLOW: The river has extremes of dry as well as flood conditions during a year. Due to high population density of the catchment, the river remains almost in dry state during January to June in many parts of its stretch and under flooded conditions during July-September. Figure 2 shows the annual flow condition of river Yamuna. During the non-monsoon period (October to June), the river flow reduced significantly and some rivers stretches become totally dry, whereas, during monsoon period (July-September), the rivers receives significant amount of water, which is beyond its conveyance capacity resulting in flood (CPCB, 2006). The river is dissected at 5 barrages during its course i.e. at Dak Patthar (about 160 km from origin in Uttaranchal); at Hathnikund (172 km distance from origin, just at foothills in Haryana); at Wazirabad (in NCT Delhi, 396km distance from origin); at Okhla (in NCT – Delhi, 418 km distance from origin); and at Mathura (Near Gokul village in U.P. about 570 km distance from origin). *(Source: Current condition of the Yamuna River-Deepshikha Sharma and Arun Kansal, TERI University)*

2.2.4 SURFACE DRAINAGE PATTERN:

The project site lies on the bed of River Yamuna originating from the Yamunotri glacier near Bandar Punch (38 59' N 78 27' E) in the Mussourie range of the lower Himalayas at an elevation of about 6320 meter above mean sea level in the district Uttarkashi (Uttranchal). The catchment (table 1&2) of the Yamuna river system covers parts of the states of Uttaranchal, Uttar Pradesh (U.P.), Himachal Pradesh, Haryana, Rajasthan, Madhya Pradesh and the entire state of Delhi. The river Yamuna traverses a distance of about 1370 km in the plain from Saharanpur district of Uttar Pradesh to the confluence with river Ganga at Allahabad. The major tributaries of the river are Tons, Betwa, Chambal, Ken and Sindh and these together contribute 70.9% of the catchment area and balance 29.1% is the direct drainage of main River and smaller tributaries. On the basis of area, the catchment basin of Yamuna amounts to 40.2% of the Ganga Basin and 10.7% of the country.

Fig 2.3: Map showing Catchment of Yamuna River along with its tributaries



Surface Drainage Map is also attached as **Map No. 2**

In the upper stretch, upto a distance of 200 Km, it draws water from several streams. The combined stream flows through the Shivalik range of Himachal Pradesh and Uttaranchal and enters into plains at the point called as Dak Pathar, located in Uttaranchal.From this point onwards, the river water is regulated through weir and diverted into canal for power generation. From Dak Pathar it flows to the Poanta Sahib (a famous Sikh religious place). On the right side of the Yamuna basin is the hill station of Mussourie.

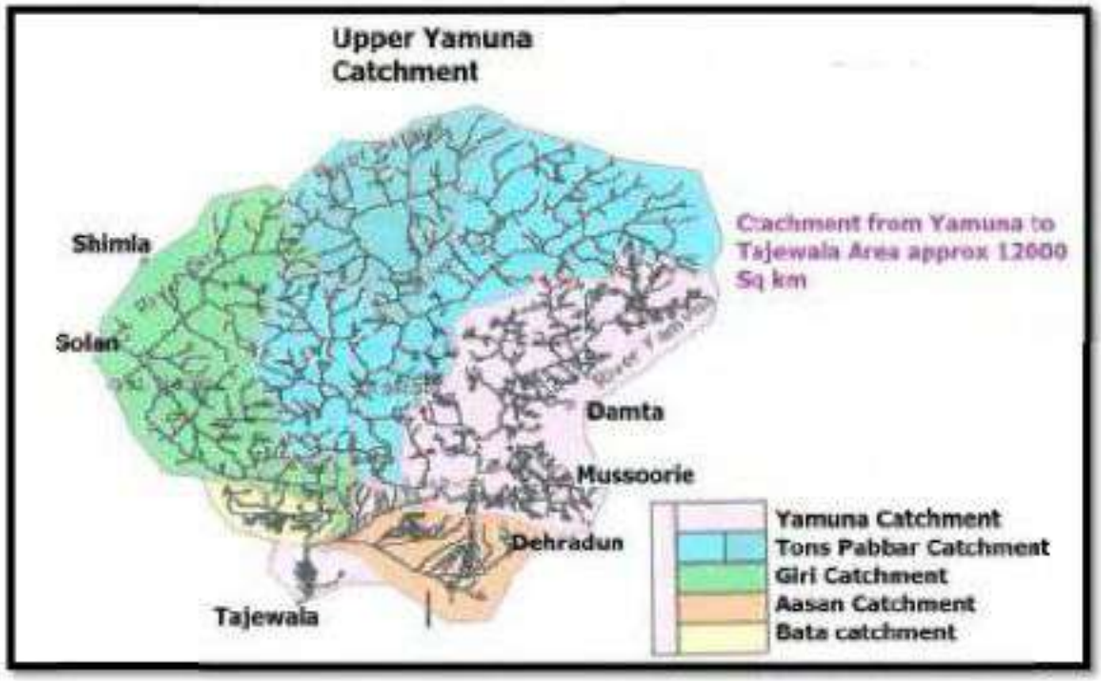


Fig 2.4 Upper Yamuna Catchment

2.2.5 WATERSHEDS

Table 2.2: Details of Catchments, Watersheds, Sub-Watersheds & MWS in Uttarakhand

Catchment	Watershed	No. of Sub Watersheds	No. of Micro Water Sheds	Total Area (Ha.)
Yamuna	**Aglar**	2	7	25,698
	Asan	3	18	82,088
	Lower Tons	3	19	45,265
	Tons	4	36	1,67,926
	Yamuna	7	80	2,29,185
Total		19	160	5,50,162

Source: Uttarakhand State Perspective and Strategic Plan 2009-2027)

Table 2.3: Number of Micro-watersheds in Dehradun.

District	No. of MWS	Area (ha)
Dehradun	95	3,05,043

(*Source: Uttarakhand State Perspective and Strategic Plan 2009-2027*)

2.3 MINING

Mining will be done as per the guidelines of Uttarakhand Mineral Policy, 2011 and guidelines of Uttarakhand Minor Mineral Concession Rules, 2001.

- This is an open-cast mining project. The operation will be entirely manual with use of hand tools like shovel, pan, sieves, pick axes, etc. The minerals will be collected in its existing form and the sand will be separated from *bajri* and boulders by sieving process.
- Mining will be done leaving a safety distance from the banks 15% of the width of the river will be left for bank stability from both the banks.
- The deposit will be worked from the surface of the bed upto 1.5 m bgl or above ground water level, whichever comes first. Hence, at no point of time mining will intersect with ground water table.

- Mining will be done only during the day time and completely stopped during the monsoon season.

SCHEMATIC REPRESENTATION OF SITE ELEVATION, WORKING DEPTH & GROUND WATER

RESERVE (AVAILABLE QUANTUM) AND PRODUCTION (EXTRACTABLE QUANTUM)

The sediments proposed to be extracted are sand, *bajri* & boulder which are generally found in the river bed in the lease area. The sediments like sand/*bajri* along with silt & clay are brought into the bed through transport from the catchment area, are referred as "Wash Load". And the sediments which are in continuous contact with bed, carried forward by rolling/sliding are referred to as "Bed Load".

Reserve (Available Quantum):

The already existing quantity at the river bed in the lease area due to fresh depositions has been considered to be the quantum of mineral available (**Reserve**) which may be mined out. In order to calculate this quantity, the lease area has been considered with an ultimate depth of 1.5 meter from the surface (excluding the boulder available on the surface). For the reserve tonnage estimation, the reserve quantity is

multiplied with the bulk density of 2 tonnes per cum (for mixed sand and *bajri*).

The reserve for the site has been estimated to 7,45,958.4 tonnes

Production (Extractable Quantum):

However considering the factors such as geological disturbances, volume that cannot be mined due to flow of water and also considering the safety factor, approximately 3.3 lakh tonnes has been considered to as production or the extractable quantity from the mineable area for grant of Environmental Clearance. The amount of sand & *bajri* in the total extractable quantum is assumed to be around 80%, which is likely to be replenished due to sediment inflow, gradually during the monsoon seasons.

- Of the quantum of minerals which will be excavated, only sand & *bajri* is replenishable. Boulders which may roll or come into the lease area during high flow velocity of water or during floods.
- The quantum of replenishable amount for the purpose of EIA i.e. the wash load will be obtained by a reputed expert agency.
- Thus the extractable quantum in the first year would be limited to the available quantum. The extractable amount for the further years may vary depending on amount/rate of actual replenishment which is to be monitored by expert agencies every year.

Process:

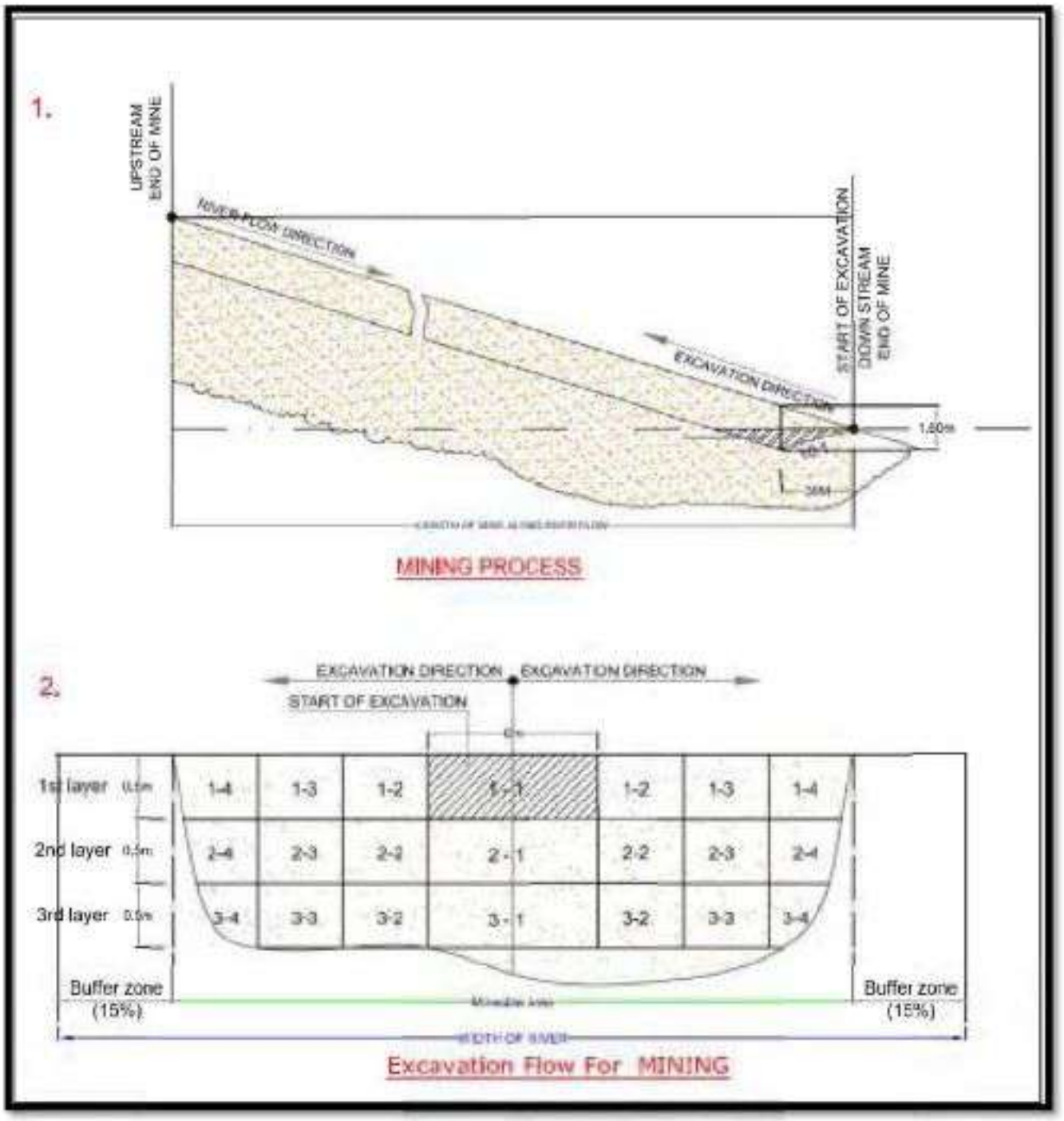
The mineable area will be demarcated with pillars after leaving the safety zone for bank stability.

1. Mining will be carried out only up to a depth of 1.5m, using hand tools like shovel, pan, sieve etc. only during the day time.
2. Mining operations will be carried in non monsoon season only, so that the excavation carried out in an area in the particular year gets replenished during the subsequent year.
3. The mining in the either area will be started from the downstream end from the middle of the cross-section towards the upstream side.

4. After the first layer is excavated, the process will be repeated for the next layers.

For the 2nd year, the mining again will be continued in a similar way starting from the downstream end moving upwards of the second part.

Fig 2.5: The schematic diagram showing the mining process is given below:



Man Power Requirement:

The manpower requirement for the proposed project is given below along with the breakup, who will be utilized for excavation & loading of minerals into trucks or tractor-trolleys.

Table 2.4: Manpower requirement breakup

S. No.	Category	Numbers
1.	Administrator	1
2.	Supervisor	2
3.	Mining workers	180
4.	Additional workers*	2
TOTAL		**185**

*Additional workers include workers for dust suppression purpose, providing water for drinking & domestic purpose, for maintenance of roads, etc.

Waste –Disposal Arrangement

In this project, silt & clay is also a constituent of the River-Bed Material. The silt/clay generated have no market value, thus this material will be either used in plantation or filling low lying areas or as a spread in agricultural field. Total waste generated during the lease period of five year would be approx. 4,12,500 Tonnes from the mining activity.

Restriction on mining:

- As per Joint inspection Report, No mining operation shall be carried out within 75 m of railway line & bridge, 60 m from NH, 50 m of reservoir, canal, tank or road, horizontally from the outer toe of the bank or the outer edge of the cutting as the case may be.
- The mining will not be allowed below the water table.
- The contractors will abide by Uttarakhand Minor Mineral Concession Rules, 2001 and guidelines contained in the

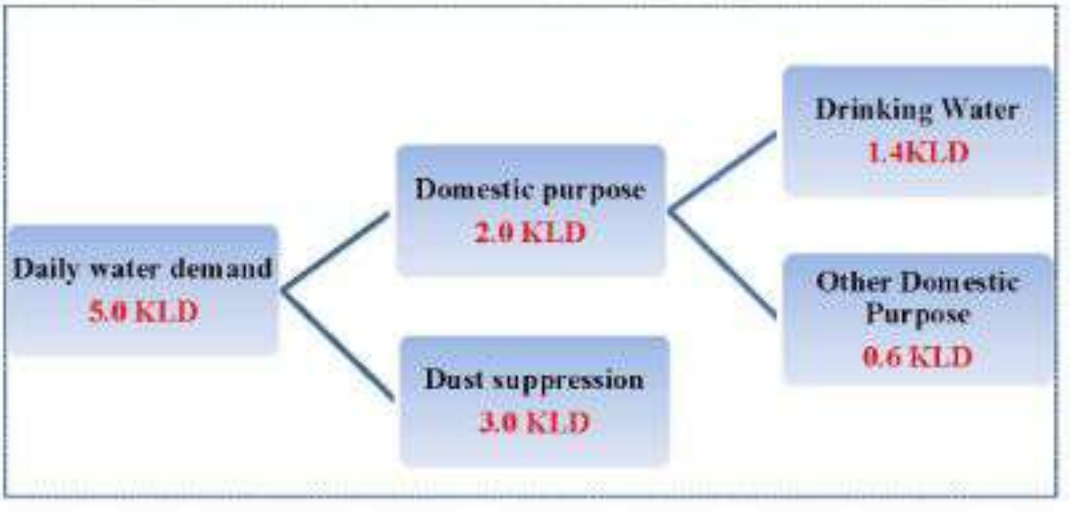
River/Stream Bed Mining Policy and Land forms studies were taken into consideration.

- The contractors will abide at the time of mining with the term and condition as laid down under Mines Act, 1952 and Mines & Minerals (Regulation and Development) Act, 1957, Forest (Conservation) Act, 1980and the stipulations of the EIA/EMP.
- The contractor will abide by provision of Mines Act, 1952, Interstate Migrant Work Man Act, the contractor with the satisfaction of competent authority will provide drinking water, rest shelter, first aid box, welfare facilities as Central and State Govt. labor laws.

2.4 SITE FACILITIES AND UTILITIES

Water Supply

Water requirement for the proposed project will be provided for the workers for drinking & domestic purpose. Water will also be provided for dust suppression. Fresh water will be only used for drinking purpose. The break up for water requirement is given below:



The water will be supplied from available sources from nearby village.

Temporary Rest Shelter:

A temporary rest shelter will be provided for the workers near to the site for rest.

Provisions will also be made for following in the rest shelter:

- First aid box along with anti-venoms to counteract poison produced by certain species of small insects, if any.
- Sanitation facility i.e. septic tank or community toilet facility will be provided for the workers.

2.5 STATUTORY REQUIREMENTS

It is accepted that effective resource management cannot be done in isolation. The proponent therefore vigorously pursues approaches towards coordination and integration where possible, so as to lead to coordinated regulatory systems.

Various acts dealing with matters relating to the conservation and protection of the environment and which a holder of a mining authorization must also take cognizance of, include inter alia, the following:

- Uttarakhand Mineral Policy, 2011
- Uttarakhand Minor Mineral Concession Rules, 2001
- The Mines Act, 1952
- The Mines and Mineral (Development and Regulation) Act, 1957
- Mines Rules, 1955
- Mineral Concession Rules, 1960
- Mineral Conservation and Development Rules, 1988
- The Water (Prevention and Control of Pollution) Act, 1974
- The Air (Prevention and Control of Pollution) Act, 1981
- The Environment (Protection) Act, 1986
- The Forest (Conservation) Act, 1980

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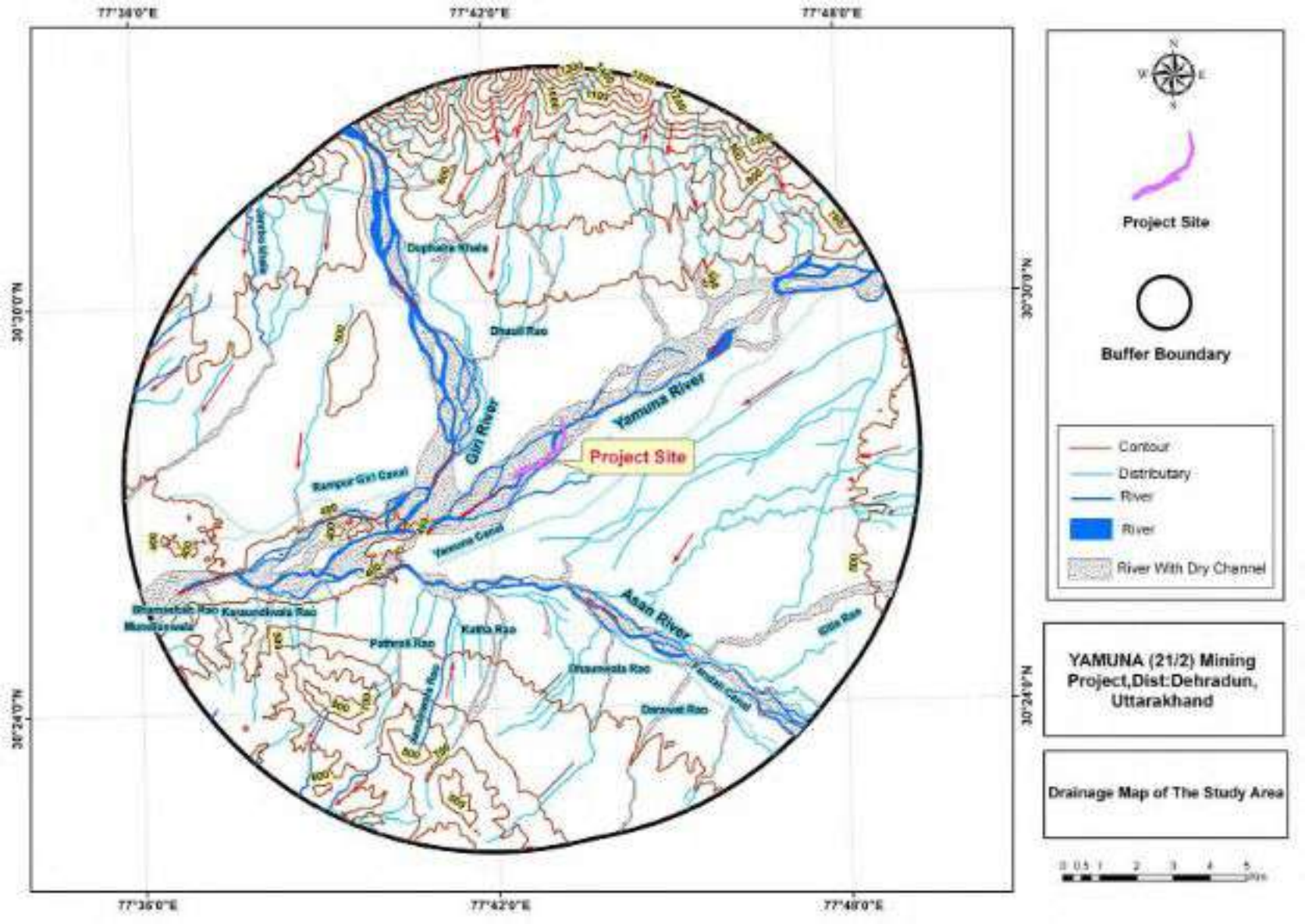

77°36'0"E
77°42'0"E
77°48'0"E
30°30'0"N
30°24'0"N
Project Site
Buffer Boundary
Contour
Distributary
River
River
River With Dry Channel
Yamuna River
Giri River
Asan River
Project Site
YAMUNA (21/2) Mining Project,Dist:Dehradun, Uttarakhand
Drainage Map of The Study Area

CHAPTER-III

DESCRIPTION OF ENVIRONMENT

INDEX

3.0 INTRODUCTION

This section contains the description of baseline studies of the 10 km radius of the area surrounding River Yamuna Lot No. 21/2 Sand, *Bajri* & Boulder Mining Project. The data collected has been used to understand the existing environment scenario around the proposed mining project against which the potential impacts of the project can be assessed.

3.1BASELINE DATA

3.1.1 LAND ENVIRONMENT

Land-Use/ land cover pattern of the study area delineating all the features has been studied through satellite imagery. The entire land use of the proposed area is a river bed which lies on Yamuna River.

The land use of the study area is tabulated below and land use map is attached as **Map no.3**

Table 3.1: Land Use cover of the project study area

S.No.	Description	Area in Hectares	Percentage share in total area
1	Open/ waste land	1511.10	4.13
2	River	366.30	1.00
3	Agricultural land	9552.45	26.14
4	Agricultural Fallow Land	4262.04	11.68
5	Settlement	1097.61	3.00
6	Vegetation	429.11	1.18
7	Forest	16967.85	46.44
8	River With Dry Channel	2347.65	6.43
Total		**36534.10**	**100**

As the lease area lies in the river bed there will be no change in the land use plan of the mine lease area in pre-operational, operational and post-operational phases. Only the sediments will be removed from the surface of riverbed which will be gradually replenished during monsoon season. There will be no diversion or modification of any land use due to the mining activity.

3.1.2 AIR ENVIRONMENT

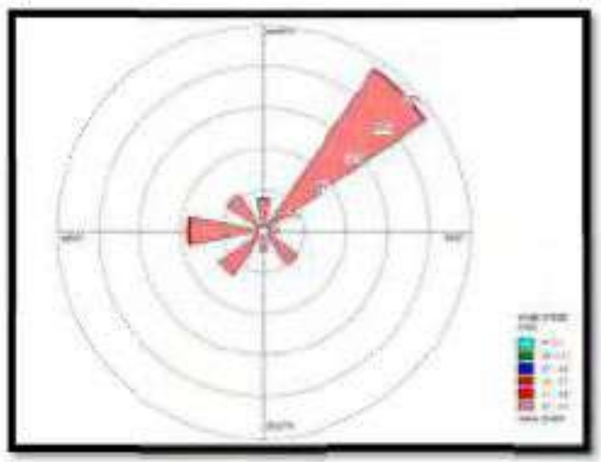
Ambient air quality monitoring stations were selected primarily on the basis of surface influence, demographic influence and meteorological influence. 24 hourly monitoring was carried out for SO_2, NO_2, & PM_{10} twice a week at each station. This study was done during post-monsoon season for a period of 3 months (October'13 to December'13).

a. **Site-specific meteorological data**

Month (2013)	Wind Speed (kmph)			Temperature (°C)			Relative Humidity (%)			Rain Fall * (mm)			Cloud Cover** (Octas of sky)
	Mean	Max	% of calm	Mean (Dry Bulb)	Highest	Lowest	Mean	Highest	Lowest	Total	24-hours Highest	No. of rainy days	Mean
October	2.4	8.6	29	17.3	29.2	7.2	56.9	95.5	22.0	21.5	2.5	9	5
November	2.0	6.3	27	16.0	27.3	6.0	56.6	95.7	21.8	0.2	0.1	2	3
December	1.7	7.7	28	14.6	23.9	5.2	56.2	95.2	21.3	0.9	0. 3	3	2

Fig. 3.1:Wind Rose Diagram

Observation: The prominent seasonal wind direction is from NE contributing approximately 18% of the total.



b. Method of monitoring

The Central Pollution Control Board (CPCB) has published comprehensive document on emission testing regulations ("Emission Regulations Part-3, 1985"). Those procedures relevant to the particulate monitoring are summarized below:

Table 3.2: Methods adopted for PM_{10}, $PM_{2.5}$, SO_2 and NO_2

Parameters	Technique	Technical Protocol	Minimum Detectable Limit
$PM_{2.5}$	Gravimetric method	**CPCB Guideline Vol. I May' 2011**	**5 (µg/m³)**
PM_{10}	Gravimetric method	**IS 5182 (Part-XXIII)**	**5 (µg/m³)**
Sulphur Dioxide	Improved West and Gaeke	**IS-5182 (Part-II)**	**5 (µg/m³)**
Nitrogen Dioxide	Modified Jacob & Hochheiser	**IS-5182 (Part-VI)**	**6 (µg/m³)**

i. Particulate Matter (PM):-

The CPCB method and IS 5182 (Part-XXIII) adopt a very similar approach to particulate sampling. There are some differences in the expressions used, but they are generally of no practical significance. It is recommended that CPCB method is adapted.

ii. Equipment Calibration:

For accurate testing of emission sources, the components of the sampling train is calibrated by outsource and supplier (Master Calibrator) standards and solutions are used, calibrated under certified reference material. The Ambient air quality monitoring locations are marked in **Map No. 4.**

The ambient air quality data were collected to find the existing GLC. The data is given in Table No. 3.3 (ii).

Table 3.3(i) Ambient air quality monitoring stations

S. No.	Location	Station name	Distance (approx.) and direction from the lease area (km)		Zone (Core/ Buffer)
1.	**AQ1**	Kharowala	2.0	NNW	Buffer zone
2.	**AQ2**	Vikasnagar	6.0	E	Buffer zone
3.	**AQ3**	Bharotiwala	5.0	W	Buffer zone
4.	**AQ4**	Kunja Grant	5.0	SW	Buffer zone
5.	**AQ5**	Project Site	-	-	Core Zone

Table 3.3 (ii): Ambient Air Quality Status

Site	Particulars	$PM_{2.5}$ (µg/m³)	PM_{10} (µg/m³)	SO_2 (µg/m³)	NO_2 (µg/m³)
AQ1 (24 Observations)	Minimum	27.2	56.9	BDL	18.2
	Maximum	37.5	70.2	6.1	23.1
	Average	30.1	61.5	5.3	19.9
	98th Percentile*	36.4	69.1	5.9	22.3
AQ2 (24 Observations)	Minimum	35.6	74.3	5.0	16.1
	Maximum	43.7	86.2	6.1	20.9
	Average	38.3	79.2	5.3	17.4
	98th Percentile*	42.1	85.2	6.0	19.9
AQ3 (24 Observations)	Minimum	30.5	61.1	BDL	14.9
	Maximum	38.1	74.8	6.2	19.4
	Average	34.7	68.1	5.3	16.7
	98th Percentile*	37.5	73.7	6.0	18.7
AQ4 (24 Observations)	Minimum	32.8	64.3	BDL	16.2
	Maximum	40.6	75.0	6.1	21.5
	Average	35.6	69.1	5.3	17.5
	98th Percentile*	39.2	74.5	6.0	20.4
AQ5 (24 Observations)	Minimum	28.7	53.7	BDL	10.3
	Maximum	38.7	71.2	6.1	21.0
	Average	31.6	60.5	5.7	15.1
	98th Percentile*	37.6	70.6	6.1	20.7
CPCB Standards (µg/m³)		60	100	80	80

* **Note:** The 98th percentile is calculated statistically only to compare with NAAQ standards of short terms values.

Observations:

Ambient Air Quality Monitoring reveals that the minimum & maximum concentrations of PM_{10} amongst all the 5 AQ monitoring stations were found to be 53.7µg/m³ at AQ5 and 86.2µg/m³ at AQ2, respectively. As far as the gaseous pollutants SO_2 and NO_2 are concerned, the prescribed CPCB limit of 80µg/m³ for residential and rural areas has never surpassed at any station. The minimum & maximum concentrations of SO_2 were found to be 5.0µg/m³ at AQ2 and 6.2µg/m³ at AQ3, respectively. The minimum & maximum concentrations of NO_2 were found to be 10.3µg/m³ at AQ5 and 23.1µg/m³ at AQ1 respectively. The air environment around this area is also affected by agriculture activities in the area.

Fig 3.2: Air monitoring photograph at village Vikasnagar

Table 3.3 (iii): Free SiO_2 (µg/m³)

S.No	AQ1	AQ2	AQ3	AQ4	AQ5
Maximum	1.40	1.72	1.49	1.50	1.42
Minimum	1.13	1.48	1.22	1.28	1.07

The standard for Respirable dust is 3mg/m³ for 8 hour of working period where Free silica content should not exceed 5% as prescribed by Directorate General of Mines Safety.

Observations:

The minimum & maximum concentrations of SiO_2 were found to be 1.07µg/m³ at AQ5 & 1.72µg/m³ at AQ2 respectively.

3.1.3 WATER ENVIRONMENT

a) Ground water

Block wise net available groundwater, stage of groundwater development and category (as on 2007)

Block	Type Area	Net available ground water reserve (ham)	Current draft for all uses (ham)	Stage Groundwater Development (%)	Category
Vikasnagar	Command	1780.61	1780.61	53.78	Safe
	Non-command	19824.35	19824.35	51.23	Safe

Net annual groundwater resources availability for various uses in Dehradun district.

Block	Command/Non. Command/ Total	Net Ground water Availability (ham)	Existing Ground water Draft for domestic and industrial supply (ham)	Allocation for domestic and industrial water supply up to 2025 (ham)
Vikasnagar	Command	1780.61	45.60	312.12
	Non-command	19824.35	483.62	2878.27

Ground water resources availability, utilization stage of development is summarized as under:-

Three water samples were collected from the study area. The physico-chemical analysis of the water samples is given in the Table 3.3 (v).

The Ground water sampling locations are marked in **Map No. 5**

Table 3.3 (iv)

Ground water sampling locations

Station No.	Location	Approx. Distance (km)	Direction	/ buffer zone
GW1	Dhakrani	-	-	Core zone
GW2	Bharotiwala	2.5	W	Buffer zone
GW3	Vikas Nagar	7	NE	Buffer zone

Table 3.3 (v) Physico-chemical properties of ground water near project site (Dhakrani), 2013)

S. No	Parameter	Limit (IS-10500:2012)		Unit	Oct	Nov	Dec
		Desirable Limit	Permissible Limit		Dhakrani		
1	Colour	5	15	Hazen	<5	<5	<5
2	Odour	Agreeable	Agreeable	-	Agreeable	Agreeable	Agreeable
3	Taste	Agreeable	Agreeable	-	Agreeable	Agreeable	Agreeable
4	Turbidity	1	5	NTU	<1	<1	<1
5	pH	6.5-8.5	No Relaxation	-	7.38	7.42	7.51
6	Total Hardness (as CaCO3)	200	600	mg/l	208	196	189
7	Iron (as Fe)	0.3	No Relaxation	mg/l	0.04	0.05	0.03
8	Chlorides (as Cl)	250	1000	mg/l	21	18	14
9	Fluoride (as F)	1	1.5	mg/l	0.4	0.3	0.5
10	TDS	500	2000	mg/l	285	293	275
11	Calcium(as Ca2+)	75	200	mg/l	50	47	45
12	Magnesium (as Mg2+)	30	100	mg/l	20	19	18
13	Copper (as Cu)	0.05	1.5	mg/l	<0.01	<0.01	<0.01
14	Manganese(as Mn)	0.1	0.3	mg/l	0.03	0.04	0.02
15	Sulphate (as SO4)	200	400	mg/l	14	17	20
16	Nitrate(as NO3)	45	No Relaxation	mg/l	3	3	4
17	Phenolic Compounds (as C6H5OH)	0.001	0.002	mg/l	<0.001	<0.001	<0.001
18	Mercury (as Hg)	0.001	No Relaxation	mg/l	<0.001	<0.001	<0.001
19	Cadmium (as Cd)	0.003	No Relaxation	mg/l	<0.01	<0.01	<0.01
20	Selenium (as Se)	0.01	No Relaxation	mg/l	<0.01	<0.01	<0.01
21	Arsenic (as As)	0.01	0.05	mg/l	<0.01	<0.01	<0.01
22	Cyanide (as CN)	0.05	No Relaxation	mg/l	<0.01	<0.01	<0.01
23	Lead (as Pb)	0.01	No Relaxation	mg/l	<0.01	<0.01	<0.01
24	Zinc (as Zn)	5	15	mg/l	0.05	0.09	0.07
25	Anionic Detergent (as MBAS)	0.2	1	mg/l	<0.01	<0.01	<0.01
26	Chromium (as Cr(6+)	0.05	No Relaxation	mg/l	<0.01	<0.01	<0.01
27	Mineral oil	0.5	No Relaxation	mg/l	<0.01	<0.01	<0.01
28	Alkalinity (as CaCO3)	200	600	mg/l	194	201	187
29	Aluminum (as Al)	0.03	0.2	mg/l	<0.01	<0.01	<0.01
30	Boron (as B)	0.5	1	mg/l	0.1	0.2	0.1
Bacteriological Parameter							
1	Total Coliform	Shall not be detectable		MPN/100ml	ND (<2)	ND (<2)	ND (<2)
2	E.coli	Shall not be detectable		E.coli /100ml	Absent	Absent	Absent

Table 3.3 (vi) Physico-chemical properties of ground water near village Bharotiwala, 2013)

S.No.	Parameter	Limit (IS-10500:2012)		Unit	(Oct)	(Nov)	(Dec)
		Desirable Limit	Permissible Limit		Bharotiwala		
1	Colour	5	15	Hazen	<5	<5	<5
2	Odour	Agreeable	Agreeable	-	Agreeable	Agreeable	Agreeable
3	Taste	Agreeable	Agreeable	-	Agreeable	Agreeable	Agreeable
4	Turbidity	1	5	NTU	<1	<1	<1
5	pH	6.5-8.5	No Relaxation	-	7.56	7.48	7.38
6	Total Hardness (as CaCO3)	200	600	mg/l	256	248	253
7	Iron (as Fe)	0.3	No Relaxation	mg/l	0.08	0.07	0.05
8	Chlorides (as Cl)	250	1000	mg/l	42	36	37
9	Fluoride (as F)	1	1.5	mg/l	0.7	0.4	0.6
10	TDS	500	2000	mg/l	375	351	360
11	Calcium(as Ca2+)	75	200	mg/l	61	59	62
12	Magnesium (as Mg2+)	30	100	mg/l	25	24	23
13	Copper (as Cu)	0.05	1.5	mg/l	<0.01	<0.01	<0.01
14	Manganese(as Mn)	0.1	0.3	mg/l	0.04	0.03	0.04
15	Sulphate (as SO4)	200	400	mg/l	18	15	16
16	Nitrate(as NO3)	45	No Relaxation	mg/l	3	2	4
17	Phenolic Compounds (as C6H5OH)	0.001	0.002	mg/l	<0.001	<0.001	<0.001
18	Mercury (as Hg)	0.001	No Relaxation	mg/l	<0.001	<0.001	<0.001
19	Cadmium (as Cd)	0.003	No Relaxation	mg/l	<0.01	<0.01	<0.01
20	Selenium (as Se)	0.01	No Relaxation	mg/l	<0.01	<0.01	<0.01
21	Arsenic (as As)	0.01	0.05	mg/l	<0.01	<0.01	<0.01
22	Cyanide (as CN)	0.05	No Relaxation	mg/l	<0.01	<0.01	<0.01
23	Lead (as Pb)	0.01	No Relaxation	mg/l	<0.01	<0.01	<0.01
24	Zinc (as Zn)	5	15	mg/l	0.13	0.09	0.11
25	Anionic Detergent (as MBAS)	0.2	1	mg/l	<0.01	<0.01	<0.01
26	Chromium (as Cr6+)	0.05	No Relaxation	mg/l	<0.01	<0.01	<0.01
27	Mineral oil	0.5	No Relaxation	mg/l	<0.01	<0.01	<0.01
28	Alkalinity (as CaCO3)	200	600	mg/l	231	227	237
29	Aluminum (as Al)	0.03	0.2	mg/l	<0.01	<0.01	<0.01
30	Boron (as B)	0.5	1	mg/l	0.1	0.1	0.2
Bacteriological Parameter							
1	Total Coliform	Shall not be detectable		MPN/100 ml	ND (<2)	ND (<2)	ND (<2)
2	E coli	Shall not be detectable		E coli /100ml	Absent	Absent	Absent

Note: ND: Not detectable

Table 3.3 (vii) Physico-chemical properties of ground water near village Vikasnagar, 2013)

S.No	Parameter	Limit (IS-10500:2012)		Unit	(Oct)	(Nov.)	(Dec.)
		Desirable Limit	Permissible Limit		Vikasnagar		
1	Colour	5	15	Hazen	<5	<5	<5
2	Odour	Agreeable	Agreeable	-	Agreeable	Agreeable	Agreeable
3	Taste	Agreeable	Agreeable	-	Agreeable	Agreeable	Agreeable
4	Turbidity	1	5	NTU	<1	<1	<1
5	pH	6.5-8.5	No Relaxation	-	7.23	7.34	7.42
6	Total Hardness (as CaCO3)	200	600	mg/l	138	146	127
7	Iron (as Fe)	0.3	No Relaxation	mg/l	0.21	0.11	0.19
8	Chlorides (as Cl)	250	1000	mg/l	21	27	18
9	Fluoride (as F)	1	1.5	mg/l	0.5	0.6	0.4
10	TDS	500	2000	mg/l	210	237	196
11	Calcium(as Ca2+)	75	200	mg/l	33	35	30
12	Magnesium (as Mg2+)	30	100	mg/l	13	14	12
13	Copper (as Cu)	0.05	1.5	mg/l	<0.01	<0.01	<0.01
14	Manganese(as Mn)	0.1	0.3	mg/l	0.03	0.05	0.04
15	Sulphate (as SO4)	200	400	mg/l	16	22	14
16	Nitrate(as NO3)	45	No Relaxation	mg/l	3	3	3
17	Phenolic Compounds (as C6H5OH)	0.001	0.002	mg/l	<0.001	<0.001	<0.001
18	Mercury (as Hg)	0.001	No Relaxation	mg/l	<0.001	<0.001	<0.001
19	Cadmium (as Cd)	0.003	No Relaxation	mg/l	<0.01	<0.01	<0.01
20	Selenium (as Se)	0.01	No Relaxation	mg/l	<0.01	<0.01	<0.01
21	Arsenic (as As)	0.01	0.05	mg/l	<0.01	<0.01	<0.01
22	Cyanide (as CN)	0.05	No Relaxation	mg/l	<0.01	<0.01	<0.01
23	Lead (as Pb)	0.01	No Relaxation	mg/l	<0.01	<0.01	<0.01
24	Zinc (as Zn)	5	15	mg/l	0.11	0.08	0.07
25	Anionic Detergent (as MBAS)	0.2	1	mg/l	<0.01	<0.01	<0.01
25	Chromium (as Cr6+)	0.05	No Relaxation	mg/l	<0.01	<0.01	<0.01
27	Mineral oil	0.5	No Relaxation	mg/l	<0.01	<0.01	<0.01
28	Alkalinity (as CaCO3)	200	600	mg/l	125	130	119
29	Aluminium (as Al)	0.03	0.2	mg/l	<0.01	<0.01	<0.01
30	Boron (as B)	0.5	1	mg/l	0.1	0.2	0.1
Bacteriological Parameter							
1	Total Coliform	Shall not be detectable		MPN/ 100ml	ND (<2)	ND (<2)	ND (<2)
2	E coli	Shall not be detectable		E coli /100ml	Absent	Absent	Absent

Observation:

Analysis results of ground water in the study area reveal the following: -

- pH varies from 7.23 to 7.56.
- Total hardness varies from 127 mg/l to 256 mg/l.
- Total dissolved solids vary from 196 mg/l to 375 mg/l.

The ground water from all sources remains suitable for drinking purposes as all the constituents are within the limits prescribed by drinking water standards promulgated by Indian Standards IS: 10500.

Fluorides and nitrates are within the permissible limits. Most of the parameters in ground water sources are well within the permissible limits as per IS: 10500-1991, Drinking Water Standards.

Fig.3.3: Ground water monitoring photograph at village Bharotiwala

b) Surface water

Three water samples were collected from the study area. The Surface water sampling locations are marked in **Map No. 4.** The physico-chemical analysis of the water samples is given in the Table 3.3 (vi).

Table 3.3 (viii)
Surface water sampling locations

Station No.	Location	Direction	Distance (Km)	Core Zone/Buffer Zone
SW1	Project Site	Centre	-	Core Zone
SW2	Upstream (Adan)	NE	7 Km	Buffer Zone
SW3	Downstream (Paonta Sahib)	SW	7 Km	Buffer Zone

Table 3.3 (ix)
Physico-chemical properties of surface water (October, 2013)

S.No.	Parameter	Unit	S.W. 1 (Project Site)	S.W. 2 (Upstream)	S.W. 3 (Downstream)
1	pH	-	7.56	7.79	7.78
2	Dissolved Oxygen	mg/l	8.5	8.7	8.9
3	BOD (3 Days at 27 °C)	mg/l	1.2	2.7	2.6
4	Free Ammonia (as N)	mg/l	<0.1	<0.1	<0.1
5	Sodium Adsorption Ratio	-	0.32	0.20	0.20
6	Boron	mg/l	0.1	0.2	0.2
7	Conductivity	µmhos/cm	342	376	386
8	Temperature	(°C)	20	20	20
9	Turbidity	NTU	4	6	7
10	Magnesium hardness (as CaCO3)	mg/l	53	61	62
11	Total Alkalinity (as CaCO3)	mg/l	132	141	143
12	Chloride (as Cl)	mg/l	16	20	20
13	sulphate (as SO4)	mg/l	9	10	12
14	Nitrate (as NO3)	mg/l	0.5	0.7	0.9
15	Fluoride (as F)	mg/l	0.3	0.3	0.3
16	Sodium (as Na)	mg/l	9	6	6
17	Potassium (as K)	mg/l	1.3	1.6	1.8
18	TKN (as N)	mg/l	0.3	0.4	0.3
19	Total Phosphorous (as P)	mg/l	<0.01	<0.01	<0.01
20	COD	mg/l	7	10	8
21	Phenolic compounds (as C6H5OH)	mg/l	<0.001	<0.001	<0.001
22	Lead (as Pb)	mg/l	<0.01	<0.01	<0.01
23	Iron (as Fe)	mg/l	0.05	0.06	0.07
24	Cadmium (as Cd)	mg/l	<0.01	<0.01	<0.01
25	Zinc (as Zn)	mg/l	0.03	0.07	0.06
26	Arsenic (as As)	mg/l	<0.01	<0.01	<0.01
27	Mercury (as Hg)	mg/l	<0.001	<0.001	<0.001
28	Chromium (as Cr)	mg/l	<0.01	<0.01	<0.01
29	Nickel (as Ni)	mg/l	<0.01	<0.01	<0.01
30	TDS	mg/l	207	228	232
	Microbiological Parameters				
1	Total Coliform	MPN/100ml	270	240	220
2	Fecesl Coliform	MPN/100ml	70	80	90

Table 3.3 (x)
Physico-chemical properties of surface water (Nov, 2013)

S.No.	Parameter	Unit	S.W. 1 (Project Site)	S.W. 2 (Upstream)	S.W. 3 (Downstream)
1	pH	-	7.34	7.75	7.68
2	Dissolved Oxygen	mg/l	8.7	8.9	8.9
3	BOD (3 Days at 27 °C)	mg/l	1.3	2.3	2.0
4	Free Ammonia (as N)	mg/l	<0.1	<0.1	<0.1
5	Sodium Adsorption Ratio	-	0.25	0.32	0.43
6	Boron	mg/l	0.1	0.2	0.1
7	Conductivity	µmhos/cm	336	374	362
8	Temperature	(°C)	19	19	18
9	Turbidity	NTU	5	5	6
10	Magnesium hardness (as CaCO3)	mg/l	54	59	54
11	Total Alkalinity (as CaCO3)	mg/l	132	145	142
12	Chloride (as Cl)	mg/l	15	18	15
13	sulphate (as SO4)	mg/l	8	9	10
14	Nitrate (as NO3)	mg/l	0.6	0.6	0.5
15	Fluoride (as F)	mg/l	0.4	0.4	0.4
16	Sodium (as Na)	mg/l	7	9	12
17	Potassium (as K)	mg/l	1.4	1.6	1.5
18	TKN (as N)	mg/l	0.4	0.3	0.3
19	Total Phosphorous (as P)	mg/l	<0.01	<0.01	<0.01
20	COD	mg/l	8	9	11
21	Phenolic compounds (as C6H5OH)	mg/l	<0.001	<0.001	<0.001
22	Lead (as Pb)	mg/l	<0.01	<0.01	<0.01
23	Iron (as Fe)	mg/l	0.04	0.05	0.05
24	Cadmium (as Cd)	mg/l	<0.01	<0.01	<0.01
25	Zinc (as Zn)	mg/l	0.04	0.06	0.05
26	Arsenic (as As)	mg/l	<0.01	<0.01	<0.01
27	Mercury (as Hg)	mg/l	<0.001	<0.001	<0.001
28	Chromium (as Cr)	mg/l	<0.01	<0.01	<0.01
29	Nickel (as Ni)	mg/l	<0.01	<0.01	<0.01
30	TDS	mg/l	201	225	220
	Microbiological Parameters				
1	Total Coliform	MPN/100ml	280	220	320
2	Faecal Coliform	MPN/100ml	80	90	140

Table 3.3 (xi)
Physico-chemical properties of surface water (Dec, 2013)

S.No.	Parameter	Unit	S.W. 1 (Project Site)	S.W. 2 (Upstream)	S.W. 3 (Downstream)
1	pH	-	7.65	7.85	7.72
2	Dissolved Oxygen	mg/l	8.3	8.7	8.5
3	BOD (3 Days at 27 °C)	mg/l	1.8	2.1	2.2
4	Free Ammonia (as N)	mg/l	<0.1	<0.1	<0.1
5	Sodium Adsorption Ratio	-	0.53	0.38	0.66
6	Boron	mg/l	0.1	0.2	0.1
7	Conductivity	umhos/cm	344	387	374
8	Temperature	(°C)	18	18	19
9	Turbidity	NTU	4	4	6
10	Magnesium hardness (as CaCO3)	mg/l	49	59	51
11	Total Alkalinity (as CaCO3)	mg/l	136	150	145
12	Chloride (as Cl)	mg/l	15	18	17
13	sulphate (as SO4)	mg/l	8	10	10
14	Nitrate (as NO3)	mg/l	0.7	0.8	1.1
15	Fluoride (as F)	mg/l	0.4	0.6	0.6
16	Sodium (as Na)	mg/l	14	11	18
17	Potassium (as K)	mg/l	1.6	1.5	1.9
18	TKN (as N)	mg/l	0.5	0.6	0.6
19	Total Phosphorous (as P)	mg/l	<0.01	<0.01	<0.01
20	COD	mg/l	9	11	12
21	Phenolic compounds (as C6H5OH)	mg/l	<0.001	<0.001	<0.001
22	Lead (as Pb)	mg/l	<0.01	<0.01	<0.01
23	Iron (as Fe)	mg/l	0.05	0.07	0.07
24	Cadmium (as Cd)	mg/l	<0.01	<0.01	<0.01
25	Zinc (as Zn)	mg/l	0.03	0.07	0.06
26	Arsenic (as As)	mg/l	<0.01	<0.01	<0.01
27	Mercury (as Hg)	mg/l	<0.001	<0.001	<0.001
28	Chromium (as Cr)	mg/l	<0.01	<0.01	<0.01
29	Nickel (as Ni)	mg/l	<0.01	<0.01	<0.01
30	TDS	mg/l	208	235	225
	Microbiological Parameters				
1	Total Coliform	MPN/100ml	220	210	270
2	Faecal Coliform	MPN/100ml	70	70	90

Observation:

The analysis results indicate that the pH ranges between 7.54 and 7.85.

Dissolved Oxygen (DO) was observed in the range of 8.5 to 8.9 mg/l against the minimum requirement of 4 mg/l. BOD values were observed to be in the range of 1-3 mg/l.

The chlorides and Sulphates were found to be in the range of 15-20 mg/l and 8-12 mg/l respectively.

Bacteriological examination of surface water samples revealed the presence of total coliform in range of 210 MPN/100 ml to 320 MPN/100 ml against the limit of 5000 MPN/100 ml.

Based on the results it is evident that most of the parameters of the samples comply with 'Category B' standards of CPCB, indicating it as organized outdoor bathing.

3.1.4 SOIL ENVIRONMENT

Soil may be defined as a thin layer of earth's crust, a medium for the growth of plants. The soil characteristics include both physical and chemical properties. The soil survey and soil sample were carried out / collected to assess the soil characteristics of the study area. Soil samples were collected from 3 and analyzed as per CPCB norms. The soil sampling locations are marked in **Map No. 4.** The physico-chemical characteristic of these soil samples is given in Table No. 3.3 (viii).

Table No. 3.3 (xii) Description of soil sampling locations

Station No.	Location	Direction	Approx. Distance (km)	Core Zone / Buffer Zone
SQ1	Dhakrani (P.S)	-	-	Core Zone
SQ 2	Kharowala	N	4	Buffer Zone
SQ 3	Kunja Grant	S	3	Buffer Zone

Fig.3.4: Soil sampling photograph at village Kharowala

Table 3.3 (xiii) Physico-chemical properties of soil

Soil Quality Data ,Oct-2013					
S.No	**Parameter**	**Unit**	**Kharowala**	**Dhakrani (near P.S)**	**Kunja Grant**
1	Texture	-	Clay Loam	Sandy Loam	Sandy Loam
	Sand	%	42.6	78.9	70.1
	Silt	%	24.8	9.9	15.0
	Clay	%	32.6	11.2	14.9
2	Ph (1:2)	-	7.56	7.16	6.75
3	Electrical Conductivity (1:2)	µmhos/cm	259	146	171
4	Cation exchange capacity	meq/100 gm	12.9	9.3	10.7
5	Exchangeable Potassium	mg/kg	91	45	62
6	Exchangeable Sodium	mg/kg	106	59	91
7	Exchangeable Calcium	mg/kg	1842	1423	1697
8	Exchangeable Magnesium	mg/kg	365	216	203
9	Sodium Absorption Ratio	-	0.59	0.38	0.55
10	Water Holding Capacity	%	29.8	23.9	23.9
11	Porosity	%	31.4	41.2	41.8

Observations:

Samples collected from identified locations indicate the soil is sandy loamy type. The pH value ranging from 6.75 to 7.56, which shows that the soil is alkaline in nature. The water holding capacity is found in between 23.9% to 29.8%.

3.1.5 NOISE ENVIRONNENT

The noise levels within the study area were recorded using Sound Level Meter and noise monitoring results were compared with the Ambient Noise Quality Standard notified under Environment Protection Act, 1986. The levels recorded are as stated in Table 3.3 (x). The noise level monitoring locations are marked in **Map No. 4.**

Table 3.3 (xiv): Noise quality monitoring stations

S. No.	Location	Station Name	Approx. Distance (km)	Direction	Zone (Core / Buffer)
1.	NQ1	Project Site	-	-	Core zone
2.	NQ2	Vikas Nagar	7 km	NE	Buffer Zone
3.	NQ3	Kunja Grant	3 Km	S	Buffer Zone
4.	NQ4	Kharowala	4km	N	Buffer Zone

Table No. 3.3 (xv): Noise level status

S. No.	Location	Zone	Leq LIMIT (as per CPCB Guidelines), in		Leq Value monitored, in dB(A)	
			DAY*	NIGHT*	DAY*	NIGHT*
1	NQ1	Industrial Zone	75	70	51.8	40.6
2	NQ2	Silence Zone	50	40	48.7	39.3
3	NQ3	Residential Zone	55	45	50.8	39.2
4	NQ4	Residential Zone	55	45	52.3	39.6

* Day Time Leq in dB(A) (6.00AM TO 10.00PM)
Night Time Leq in dB(A) (10.00PM TO 6.00AM)

Results

Noise monitoring reveals that the maximum & minimum noise levels at day time were recorded as 52.3 dB (A) at NQ-4 & 48.7 dB (A) at NQ2

respectively. The maximum & minimum noise levels at night time were found to be 40.6 dB(A) at NQ1 & 39.2 dB(A) at NQ3 respectively.

There are several sources in the 10 km radius of study area, which contributes to the local noise level of the area. On the commencement of the project, the sound from traffic activities will add to the ambient noise level of the area. This will be kept under check by taking proper suggestive measures

3.1.6 BIOLOGICAL ENVIRONMENT

Biological diversity comprises the variability of species, genus and ecosystems and is very crucial for maintaining the basic processes on which the life depends. Broadly it can be divided in to two types i.e. the floral diversity and faunal diversity. Conservation of the biodiversity is essential for the sustainable development as it not only provides the food, fodder and medicine but also contribute in improvement of essential environmental attributes like air, water, soil, etc.

Before starting any Environmental Impact Assessment study, it is necessary to identify the baseline of relevant environmental parameters which are likely to be affected as a result of operation of the proposed project. A similar approach has been adopted for conducting the study on Biological Environment for this Project. Both terrestrial and aquatic ecosystems have been studied to understand the biological environment.

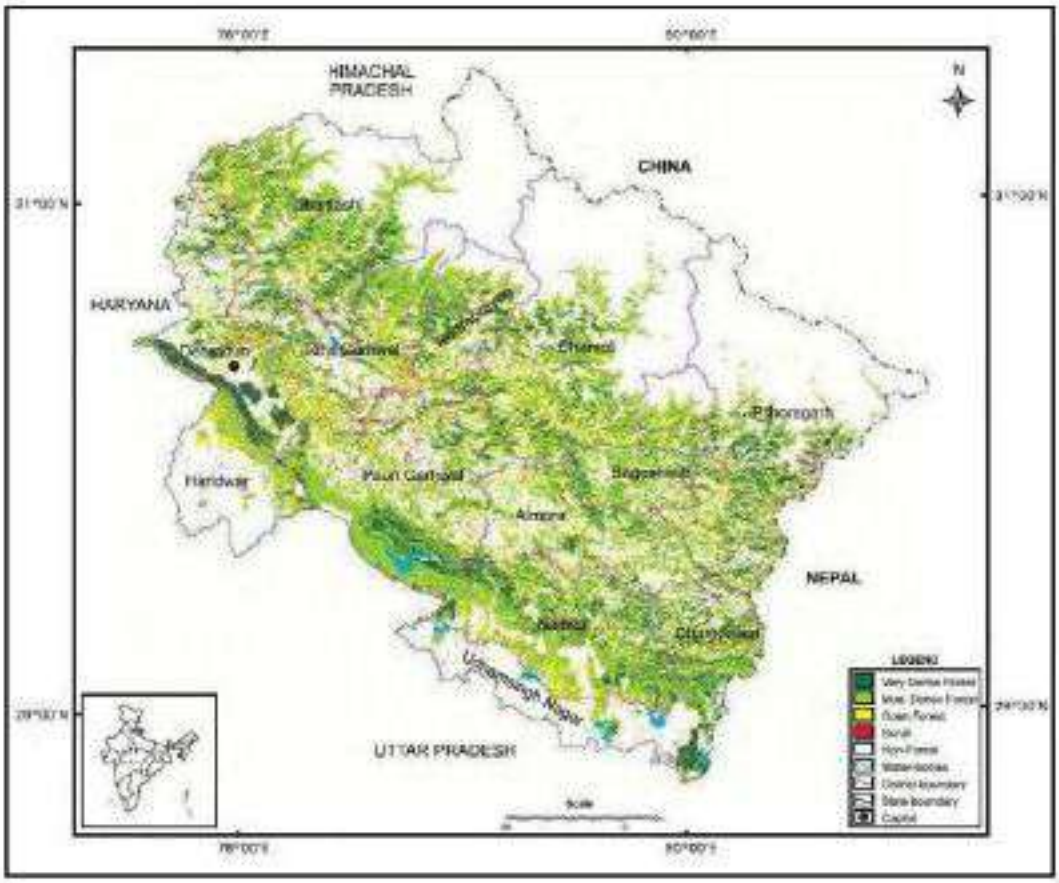
Forests cover in Dehradun District:

The forest cover in the Uttarakhand state, based on interpretation of satellite data of October-November 2008 mentioned in the India State of Forest Report 2011, is 24,496 km², which is 43.80 % of the state's geographical area. In terms of forest canopy density classes, the state has 4762 km² area under very dense forest, 14167 km² area under moderately dense forest and 5567 km² area under open forest. Out of 3088km² total area of Dehradun

district, 584 km² area is under very dense forest, 695 km² fall under moderately dense forest and 328 km² area is open forest.

Source: India State of Forest Report; FSI 2011,

Major forest types occurring in the state are Tropical Moist Deciduous, Tropical Dry Deciduous, Sub Tropical Pine, Himalayan Moist Temperate, Sub Alpine and Alpine Forests. Forests are largely distributed throughout the state with conifers and Sal being major forest formation. Following ten forest sub-types are present in Dehradun district as per Champion and Seth 1968.



1. Moist Siwalik Sal Forest (3C/C2a)
2. Northern Dry Mixed Deciduous Forest (5B/C2)
3. Dry Deciduous Scrub (5/DS1)

4. Subtropical Euphorbia Scrub (9/C1/DS2)
5. Mohru Oak Forest (12/C1b)
6. Moist Deodar Forest (12/C1c)
7. Western Mixed Coniferous Forest (Spruce, Blue Pine, Silver Fir) (12/C1d)
8. Himalayan Temperate Secondary Scrub (12/C1/DS2)
9. Low Level Blue Pine Forest (12/2S1)
10. Khair-Sissu Forest (5/152)

Major part of study area falls under Northern Dry Mixed Deckluous Forest (5B/C2) forest subtype.

The state has six National Parks, six Wildlife Sanctuaries and two Conservation Reserves covering cumulative area of 7376 km² which constitutes 13.79% of its geographical area. Nearest protected area is Asan conservation reserve and is situated at a distance of 2 km from proposed project.

Forests in the study area:

About 46.44 percent of the study area is covered with dense forest. There are many reserve forest namely Kandela RF, Danda Ambora RF, West Yamuna RF, Mehruwala RF, Gojar RF, Nigali RF, Salahat RF, Kalsi RF, Rudarpur RF, Darawat RF, Dharmawala RF, Aduwala RF, Kulhal RF, Barkala RF, Dhaula RF, Garib Nath RF, Jamunwala RF, Jamotya RF, Gorakhpur RF.

Study period and methodology

Detailed survey was conducted to evaluate floral and faunal composition of the study area. Primary data on floral and faunal composition was recorded during site visit and secondary data was collected from the Forest department and published relevant literature. Inventory of flora and fauna has been prepared on the basis of collected data.

Field study period: The ecological survey has been conducted for one season. All data were collected in post-monsoon period in order to reduce metrological biasness.

Methodology:

Table 3.4(i): Mode of data collection & parameters considered during the survey

Aspect	Data	Mode of data collection	Parameters monitored
Terrestrial Ecology	Primary data collection	By conducting field survey	Floral and Faunal diversity
	Secondary data collection	From authentic sources like Forests Department of Dehradun and Forest Department of Dehradun and available published literatures	Floral and Faunal diversity and study of vegetation, forest type, importance etc.
Aquatic Ecology	Primary data collection	By conducting field survey	Floral and Faunal diversity
	Secondary data collection	From authentic sources like Forests Department of Dehradun and Forest Department of Dehradun and available published literatures	Floral and Faunal diversity and study of vegetation, forest type, importance etc.

General Vegetation in the Study area:

Area supports moderately healthy vegetation, the main forest species are along the Shivalik foothills. These area supports species of Sal (*Sorea robusta*), Haldu (*Adina cordfolia*), Palash, Sisam (*Dalbergia sissoo*), Kanji (*Holoptelia integrifolia*), Khair (*Acacia catechu*), Sagoon (*Tectona grandis*), Harad (*Temininalia chebula*), Bahera (*Terminalia belerica*), Amla (*Enbelica officinalis*), Semal (*Bombax ceiba*), Rohini (*Mallotus philippensis*). Sainjna (*Moringa oliofera*), Kusum, Mango (*Mangifera indica*), Poplar, Ficus spp., Jamun (*Syzygium cumini*), Eucalyptus, Toon (*Toona ciiata*), Bamboo spp. etc.

Ground vegetation mainly consists of grasses and small shrubs. Useful fodder grasses, Cynodon dactylon, Eleusine indica, Eulaliopsis binata, Trifolium alexandrinum, etc. can be seen growing in the area. The large weeds which infest uncultivated tracts are Aak (*Calotropis procera*), castor (*Ricinus communis*), Dhatura (*Datura metel*) and thorn (*Opuntia stricta*). Other noxious weeds and those which appear in crops are Pohli or Thistle (*Carthamus oxyacantha*), Shial Kanta (*Argemone mexicana*), kandyari (Solanum xanthocarpum), Lantana, Epitorium, Parthenium hysterophorus and Bhang (Cannabis sativa).

Flora of the Core zone

The core zone comprises of Yamuna river bed, where mining operation is proposed. This area consists of riparian vegetation in which aquatic and marshland plants are the main component. Most among them are weeds. No ecologically sensitive plant species has been reported from this area. Riparian vegetation is found along the river side.

Fig.3.5: Flora of the Core Zone

Flora of the Buffer zone: Buffer zone of the proposed project is Doon Valley and foothills of Shivalik. Many tree species are planted in the area because of their usefulness, economic and aesthetic values. The tree species observed in the area are, Aam (*Mangifera indica*), Jamun (*Syzygium cumini*), Bail (*Aegle marmelos*), Bakain (*Melia azedarach*), Bargad (*Ficus bengalensis*), Neem (*Azadirachta indica*), Peepal (*Ficus religiosa*), Popular (*Populas dealtoides*), Safeda (*Eucalyptus umbelatus*), Sisam (*Dalbergia sissoo*), etc.

In agricultural waste land and along the road side, growth of weeds like *Argemone mexicana, Cannabis sativa, Cenchrus ciliaris, Heteropogon contortus, Lantana camara, Parthenium hysterosporus*, etc. are very common. These weeds are affecting the agricultural productivity of the region due to fast growth, short life cycle and enormous production of seeds.

Fig.3.6: Flora of the Buffer Zone

Vegetation in and around human settlement:

Vegetation pattern in villages and surrounding areas are slightly different from the rest of the areas. The common species grown near villages are mostly edible or useful plants. The diversity of vegetation in Yamuna River and its adjacent areas was assessed in terms of the physiognomy of its floral

elements. A list of some common valuable and edible plant species recorded nearby the human settlement is given Table 3.4(ii).

Table 3.4(ii): Plant Species Present nearby Human Settlement

Sl. No.	Name of species	Local Name
1	*Albizzia lebbek*	Siris
2	*Alnus nepalensis*	Utis
3	*Bauhinia variegata*	Kachnar
4	*Bombax ceiba*	Semal
5	*Cedrus deodara*	Deodar
6	*Cinnamomum tamala*	Tejpat
7	*Celtis australis*	Kharik
8	*Dalbergia sissoo*	Shisham
9	*Mallotus philippinensis*	Ruin
10	*Morus alba*	Tut
11	*Pinus roxburghii*	Chir
12	*Populus ciliata*	Poplar
13	*Pyrus pashia*	Mehal
14	*Quercus incana*	Ban oak
15	*Rhododendron arboretum*	Burans
16	*Cedrela toona*	Tun
Source: GRC Survey Data and information of Department of Forest, Uttarakhand		

A list of flora of the study area is enclosed

Table: 3.4(iii): Flora of the Core zone

S.No.	Species	Family	Habit
1	*Ageratum conyzoides*	Asteraceae	Herb
2	*Amaranthus spinosus*	Amaranthaceae	Herb
3	*Calotropis procera*	Asclepiadaceae	Shrub
4	*Cannabis sativa*	Canabaceae	Herb
5	*Chenopodium album*	Chenopodiaceae	Herb
6	*Datura innoxia*	Solanaceae	Shrub

7	*Hydrolea zeylanica*	Hydrophylaceae	Herb
8	*Ipomoea carnea*	Convolvulaceae	Shrub

Table: 3.4(iv): Flora of the Buffer zone

S.No.	Species	Family	Habit
1	*Alternanthera paronychioides*	Amaranthaceae	Herb
2	*Alternanthera paronychioides*	Amaranthaceae	Herb
3	*Amaranthus spinosus*	Amaranthaceae	Herb
4	*Colocasia esculenta*	Araceae	Herb
5	*Ageratum conyzoides*	Asteraceae	Herb
6	*Grangea maderaspatana*	Asteraceae	Herb
7	*Parthenium hysterophorus*	Asteraceae	Herb
8	*Cassia tora*	Fabaceae	Herb
9	*Cannabis sativa*	Cannabaceae	Herb
10	*Chenopodium album*	Chenopodiaceae	Herb
11	*Argemone mexicana*	Papaveraceae	Herb
12	*Brachiaria ramosa*	Poaceae	Herb
13	*Cynodon dactylon*	Poaceae	Herb
14	*Eleusine indica*	Poaceae	Herb
15	*Eragrostis tenella*	Poaceae	Herb
16	*Imperata cylindrica*	Poaceae	Herb
17	*Saccharum spontaneum*	Poaceae	Herb
18	*Physalis minima*	Solanaceae	Herb
19	*Adina cordifolia*	Rubiaceae	Tree
20	*Aegle marmelos*	Rutaceae	Tree
21	*Albizia lebbeck*	Fabaceae	Tree
22	*Anogeissus latifolia*	Combretaceae	Tree
23	*Artocarpus integrifolia*	Moraceae	Tree

S.No.	Species	Family	Habit
24	*Azadirachta indica*	Meliaceae	Tree
25	*Bauhinia acuminata*	Fabaceae	Tree
26	*Bauhinia variegata*	Fabaceae	Tree
27	*Bombax ceiba*	Malvaceae	Tree
28	*Butea monosperma*	Fabaceae	Tree
29	*Cassia fistula*	Fabaceae	Tree
30	*Celtis australis*	Cannabaceae	Tree
31	*Dalbergia sissoo*	Fabaceae	Tree
32	*Delonix regia*	Fabaceae	Tree
33	*Emblica officinalis*	Phyllanthaceae	Tree
34	*Ficus racemosa*	Moraceae	Tree
35	*Ficus religiosa*	Moraceae	Tree
36	*Ficus tomentosa*	Moraceae	Tree
37	*Garuga pinnata*	Burseraceae	Tree
38	*Grewia optiva*	Tiliaceae	Tree
39	*Holoptelea integrifolia*	Ulmaceae	Tree
40	*Indigofera gerardiana*	Fabaceae	Tree
41	*Litchi chinensis*	Sapindaceae	Tree
42	*Luecena leucocephala*	Fabaceae	Tree
43	*Mangifera indica*	Anacardiaceae	Tree
44	*Melia azedarach*	Meliaceae	Tree
45	*Morus alba*	Moraceae	Tree
46	*Nyctanthes arbor*	Oleaceae	Tree
47	*Ougeinia oojeinensis*	Fabaceae	Tree
48	*Polyalthia longifolia*	Annonaceae	Tree
49	*Ricinus communis*	Euphorbiaceae	Tree
50	*Shorea robusta*	Dipterocarpaceae	Tree
51	*Tectona grandis*	Lamiaceae	Tree

S.No.	Species	Family	Habit
52	*Terminalia bellerica*	Combretaceae	Tree
53	*Terminalia chebula*	Combretaceae	Tree
54	*Toona ciliata*	Meliaceae	Tree
55	*Adina cordifolia*	Rubiaceae	Tree
56	*Aegle marmelos*	Rutaceae	Tree
57	*Albizia lebbeck*	Fabaceae	Tree
58	*Anogeissus latifolia*	Combretaceae	Tree
59	*Artocarpus integrifolia*	Moraceae	Tree
60	*Azadirachta indica*	Meliaceae	Tree
61	*Bauhinia acuminata*	Fabaceae	Tree
62	*Bauhinia variegata*	Fabaceae	Tree
63	*Bombax ceiba*	Malvaceae	Tree
64	*Butea monosperma*	Fabaceae	Tree

3.4.1.4. Aquatic Flora of the Buffer Zone

Aquatic flora referred to as phytoplankton and macrophytes (Plants that have adapted to living in aquatic environment such as River, lakes, Ponds, dams). During the present investigation, some Phytoplankton and Macrophytic vegetation were collected from and different Yamuna River and Asan Wetland along with some others streams present in the buffer area is given in Table 3.4(v) and 3.4(vi).

Table 3.4(v): Phytoplankton Present recorded from River Yamuna River

Sl. No.	Name of the Individuals		
	Chlorophyceae		**Cyanophyceae**
1	*Ankistrodesmus* sp.	1	*Anacystis*sp.
2	*Ankistrodesmus falcatus*	2	*Aphanocapsa montana*
3	*Cosmarium* sp.	3	*Aphanothece* sp.
4	*Coelastrum* sp.	4	*Arthrospira massartiia*
5	*Oocystis* sp.	5	*Chroococcus* sp.
6	*Scenedesmus* sp.	6	*Gloeocapsa*sp.

7	*Scenedesmus dimorphos*	7	*Lyngbya*sp.
8	*Scenedesmus armatus*	8	*Merismopedia* sp.
9	*Spirogyra* sp.	9	*Microcystis flos-aquae*
10	*Tetraedron* sp.	10	*Nostoc*sp.
11	*Westella* sp.	11	*Oscillatoria* sp.
	Bacillariophyceae	12	*Spirulina* sp.
1	*Achnanthes* sp.		**Euglenophyceae**
2	*Amphora ovalis*	1	*Euglena* sp.
3	*Ceratonies arcus*	2	*Euglena acus*
4	*Cyclotella* sp.	3	*Trachelomonas* sp.
5	*Cymbellatumida*		**Dinophyceae**
6	*Fragillaria sp.*	1	*Ceratium*sp.
7	*Melosira granulata*		**Xanthophyceae**
8	*Navicula grimmii*	1	*Tribonema*sp.
Source: GRC Survey Data			

Table 3.4(vi): Aquatic Macrophytes Present in the River Yamuna River

S. No.	Name of the Plants
1	*Alternanthera philoxeroides*
2	*Azolla pinnata,*
3	*Ceratophyllum demersum*
4	*Eichhornia crassipes*
5	*Hydrilla verticillata*
6	*Lemna perpusilla*
7	*Najas graminea*
8	*Nymphaeanouchali*
9	*Nymphoides indica*
10	*Potamogeton crispus*
11	*Potamogeton pectinatus*
12	*Spirodela polyrhiza*
13	*Utricularia* sp.
14	*Vallisneria sp.*

Wild life and avifauna of the study area:

Buffer zone of project area comprises of Aasan Conservation Reserve, and supports healthy aquatic bird population. But area does not support any significant wild mammalian species. No wild mammalian species

encountered during the field visit to study area, while livestock of local people are significantly using the area.

There are many river channels present in the buffer zone of study area which are the major attraction sites for avifauna. Asan barrage is famous for winter migratory birds, almost 140 bird species were identified during the field work, majority of these are migratory aquatic birds. As far as the reptile community was concerned, rat snake and house lizard are reported from the study area. Area does not support any healthy wild mammalian species and after a potential search, neither any direct sighting nor the indirect evidences were found in whole study area. A list of wild fauna of the study area has been prepared on the basis of local inquiry from the village people and from the available published literatures. The conservation value at regional level of identified fauna was gathered from the Wildlife protection Act, 1972 moreover, global conservation status of species was estimated from Red data book of IUCN was used. No established habitats of any mammals or birds are noticed in river bed and along the banks.

The fauna of study area can be grouped in to aquatic and terrestrial as the core area mostly comprises of aquatic fauna and the buffer area provides shelter to the terrestrial animals.

Aquatic fauna:

Aquatic fauna mostly comprises of Avifauna, Amphibians & Fish which cannot survive without water. Detail list of aquatic birds is shown in tabular form.

Terrestrial fauna:

Mammals: Area is not rich in wild mammal population due high anthropogenic pressure. There is continuous series of human settlements from Dehradun city to project site which restricted any significant wildlife in area. However, beyond the 15 km periphery from project site there are areas with high wildlife biodiversity, such as Rajaji National Park and Mussoorie Wildlife Sanctuary. Common grazing livestock like buffalo, cow, goat etc. can be noticed in open grass fields. Small mammals like Indian palm squirrel

(*Funambulus palmarum*) and field mouse (*Apodemus sylvaticus*) are noticed in vicinity of village. Inquiry from village people regarding wild animals reveals that Rhesus macaque (*Macaca mulatta*), Indian hare (*Lepus nigricollis*), fruits bat (*Pteropus conspicillatus*), Nilgai (*Boselaphus tragocamelus*), etc. are often seen in the area. Nilgai has become a menace to the farmers in the district due to their rising numbers and damage to agriculture crops.

Avifauna: Water birds like White-breasted Waterhen, Northern Pintail, Northern Shoveler, Common Teal, Falcated Duck, Eurasian Wigeon, Mallard, Spot-billed Duck, Gadwall, Cormorant and Bar Headed Goose are of common occurrence in Asan Conservation Reserve. Terrestial birds like Red-vented Bulbul, Magpie Robin, Jungle Babblers, White Wagtail, House Sparrow, House Crow, Wablers and Tits can be easily observed in study area.

Reptiles: The reptilians species commonly reported are Agama (*Laudakia tuberculata*) in settlement area, Garden lizard (*Calotes versicolor*) and Eutropis macularia along shady places in agricultural field or where growth of bushes is noticed. Among non poisonous snakes rat snakes (*Ptyas mucosus*) are commonly noticed in field, followed by poisonous snakes like King Cobra (*Naja naja*) and Banded krait (*Bungarus multicinctus*) are reported to be seen by farmers.

Amphibian: Amphibians are commonly found at the places along the margin of aquatic and terrestrial systems. Due to presence of water bodies like river, nalas, etc. the study area is providing shelter to many amphibian species. Some of the commonly reported species are *Bufo melanostictus* (common Indian toad), *Euphlyctis cyanophlyctis* (Indian skipper frog), *Hoplobatrachus tigerinus* (Indian bull frog) etc.

Fish: The fish species which are commonly found in the proposed site are *Labeo bata* (Bhangan or Bata), *Gudusia chapara* (Chappera or Palla), *Labeo*

rohita (Dumra or Dhambra), *Notopterus notopterus* (Pari or Battu), *Catla catla* (Thcila), *Clarius batrachus* (mangur), etc

A list of Fauna of the study area is presented in Table 3.4(vii) and Table 3.4(viii).

Table: 3.4(vii): Fauna of the Core zone

Sr. No.	Common Name	Scientific Name	Wildlife schedule	IUCN Red List Status
AVIFAUNA				
1	Common Myna	*Acridotheres tristis*	IV	LC
2	Indian Cormorant	*Phalacrocorax fuscicollis*	IV	VU
3	House Crow	*Corvus splendens*	V	LC
4	Ashy Drongo	*Dicrurus leucophaeus*	IV	LC
5	Kocl	*Eudynamys scolopacea*	IV	NA
6	Sparrow	*Passer domesticus*	IV	LC
MAMMALS				
1	Squirrel	*Funambulus pennant*	IV	DD
2	Rat	*Rattus rattus*	V	LC
AMPHIBIANS				
1	Common Indian toad	*Duttaphrynus melanostictus*	IV	NA
2	Indian skipper frog	*Euphlyctis cyanophlyctis*	IV	NA
3	Indian bull frog	*Hoplobatrachus tigerinus*	IV	NA

LC: Least Concern, VU: Vulnerable, NA: Not Assessed, DD: Data deficient.

Table: 3.4 (viii) Fauna of the Buffer zone

S.No.	Common Name	Scientific name	IWPA	IUCN
MAMMALS				
1	Squirrel	*Funambulus pennant*	IV	DD
2	Rat	*Rattus rattus*	V	LC
3	Wild pig	*Sus scrofa*	III	LC
4	Goral	*Naemorhedus goral*	III	LC
5	Nilgai	*Boselaphus tragocamelus*	III	LC
6	Spotted Deer	*Axis axis*	II	LC
7	Rhesus Macaque	*Macaca mulatta*	II	LC
8	Indian Grey Mongoose	*Herpestes edwardsii*	IV	LC
REPTILES & AMPHIBIANS				
1	Common Toad	*Duttaphrynus melanostictus*	IV	NA
2	India bull frog	*Rana tigrina*	IV	DD
3	Indian tree frog	*Polypedates maculatus*	IV	NA
4	Skipping frog	*Bufo stomaticus*	IV	NA
5	Garden lizard	*Calotes versicolor*		NA
6	House lizard	*Hemidactylus sp*	IV	NA
7	Rat snakes	*Ptyas mucosa*	II	NA
AVIFAUNA				
S.No.	Common Name	Scientific name	IWPA	IUCN

S.No.	Common Name	Scientific name	IWPA	IUCN
1	Jungle Myna	*Acridotheres fuscus*	IV	LC
2	Bank Myna	*Acridotheres ginginianus*	IV	LC
3	Common Myna	*Acridotheres tristis*	IV	LC
4	Blyth's Reed Warbler	*Acrocephalus dumetorum*	IV	LC
5	Clamorous Reed Warbler	*Acrocephalus stentoreus*	IV	LC
6	Common Sandpiper	*Actitis hypoleucos*	IV	LC
7	Common lora	*Aegithina tiphia*	IV	LC
8	Crimson Sunbird	*Aethopyga siparaja*	IV	LC
9	Common Kingfisher	*Alcedo atthis*	IV	LC
10	Water Pipit	*Anthus spinoletta*	IV	LC
11	Tree Pipit	*Anthus trivialis*	IV	LC
12	House Swift	*Apus affinis*	IV	LC
13	Common Swift	*Apus apus*	IV	LC
14	Cattle Egret	*Bubulcus ibis*	IV	LC
15	Yellow-breasted Greenfinch	*Carduelis spinoides*	IV	LC
16	Common Rosefinch	*Carpodacus erythrinus*	IV	LC
17	Greater Coucal	*Centropus sinensis*	IV	LC
18	Pied Kingfisher	*Ceryle rudis*	IV	LC
19	White-capped Water Redstart	*Chaimarrornis leucocephalus*	IV	LC
20	Rock pigeon	*Columba livia*	IV	LC

S.No.	Common Name	Scientific name	IWPA	IUCN
21	Oriental Magpie Robin	*Copsychus saularis*	IV	LC
22	Indian Roller	*Coracias benghalensis*	IV	LC
23	House Crow	*Corvus splendens*	IV	LC
24	Northern House Martin	*Delichon urbica*	IV	LC
25	Rufous Treepie	*Dendrocitta vagabunda*	IV	LC
26	Ashy Drongo	*Dicrurus leucophaeus*	IV	LC
27	Black Drongo	*Dicrurus macrocercus*	IV	LC
28	Black-rumped Flameback	*Dinopium benghalense*	IV	LC
29	Little Egret	*Egretta garzetta*	IV	LC
30	Great Thick-knee	*Esacus recurvirostris*	IV	LC
31	Asian Koel	*Eudynamys scolopacea*	IV	LC
32	Verditer Flycatcher	*Eumyias thalassina*	IV	LC
33	White-throated Kingfisher	*Halcyon smyrnensis*	IV	LC
34	Common Hawk Cuckoo	*Hierococcyx varius*	IV	LC
35	Black-winged Stilt	*Himantopus himantopus*	IV	LC
36	Red-rumped Swallow	*Hirundo daurica*	IV	LC
37	Streak-throated Swallow	*Hirundo fluvicola*	IV	LC
38	Pheasant-tailed Jacana	*Hydrophasianus chirurgus*	IV	LC
39	Scaly-breasted Munia	*Lonchura punctulata*	IV	LC
40	Marbled Duck	*Marmaronetta angustirostris*	IV	LC

S.No.	Common Name	Scientific name	IWPA	IUCN
41	Crested Kingfisher	*Megaceryle lugubris*	IV	LC
42	Coppersmith Barbet	*Megalaima haemacephala*	IV	LC
43	Lineated Barbet	*Megalaima lineata*	IV	LC
44	Brown-headed Barbet	*Megalaima zeylanica*	IV	LC
45	Crested Bunting	*Melophus lathami*	IV	LC
46	Green Bee-eater	*Merops orientalis*	IV	LC
47	Blue-tailed Bee-eater	*Merops philippinus*	IV	LC
48	Black Kite	*Milnus migrans*	IV	LC
49	Blue-capped Rock Thrush	*Monticola cinclorhynchus*	IV	LC
50	Blue Rock Thrush	*Monticola solitarius*	IV	LC
51	White Wagtail	*Motacilla alba*	IV	LC
52	Grey Wagtail	*Motacilla cinerea*	IV	LC
53	Purple Sunbird	*Nectarinia asiatica*	IV	LC
54	House Sparrow	*Passer domesticus*	IV	LC
55	Scarlet Minivet	*Pericrocotus flammeus*	IV	LC
56	Indian Cormorant	*Phalacrocorax fuscicollis*	IV	LC
57	Little Cormorant	*Phalacrocorax niger*	IV	LC
58	Tickell's Leaf Warbler	*Phylloscopus affinis*	IV	LC
59	Lemon-rumped Warbler	*Phylloscopus chloronotus*	IV	LC
60	Hume's Warbler	*Phylloscopus humei*	IV	LC

S.No.	Common Name	Scientific name	IWPA	IUCN
61	Greenish Warbler	*Phylloscopus trochiloides*	IV	LC
62	Grey-headed Woodpecker	*Picus canus*	IV	LC
63	Baya Weaver	*Ploceus philippinus*	IV	LC
64	Plain Prinia	*Prinia inornata*	IV	LC
65	Black Ibis	*Pseudibis papillosa*	IV	LC
66	Plum-headed Parakeet	*Psittacula cyanocephala*	IV	LC
67	Alexandrine Parakeet	*Psittacula eupatria*	IV	LC
68	Rose-ringed Parakeet	*Psittacula krameri*	IV	LC
69	Red-vented Bulbul	*Pycnonotus cafer*	IV	LC
70	Himalayan Bulbul	*Pycnonotus leucogenys*	IV	LC
71	Pied Avocet	*Recurvirostra avosetta*	IV	LC
72	Plumbeous Water Redstart	*Rhyacornis fuliginosus*	IV	LC
73	Plain Martin	*Riparia paludicola*	IV	LC
74	Sand Martin	*Riparia riparia*	IV	LC
75	Grey Bushchat	*Saxicola ferrea*	IV	LC
76	Common Stonechat	*Saxicola torquata*	IV	LC
77	River Tern	*Sterna aurantia*	IV	LC
78	Spotted Dove	*Streptopelia chinensis*	IV	LC
79	Asian Pied Starling	*Sturnus contra*	IV	LC
80	Brahminy Starling	*Sturnus pagodarum*	IV	LC

S.No.	Common Name	Scientific name	IWPA	IUCN
81	Common Wood shrike	*Tephrodornis pondicerianus*	IV	LC
82	Asian Paradise-flycatcher	*Terpsiphone paradisi*	IV	LC
83	Spotted Redshank	*Tringa erythropus*	IV	LC
84	Marsh Sandpiper	*Tringa stagnatilis*	IV	LC
85	Common Redshank	*Tringa totanus*	IV	LC
86	Common Babbler	*Turdoides caudatus*	IV	LC
87	Jungle Babbler	*Turdoides striatus*	IV	LC
88	Common Hoopoe	*Upupa epops*	IV	LC
89	River Lapwing	*Vanellus duvaucelii*	IV	LC
90	Red-wattled Lapwing	*Vanellus indicus*	IV	LC
91	Oriental White-eye	*Zosterops palpebrosus*	IV	LC

LC: 136Least Concern, NA: Not Assessed, DD: Data deficient.

3.4.2.4. Aquatic Fauna

I. Zooplankton

Zooplankton is commonly found in all types of aquatic habitats. These are recognized as secondary producers and considered as one of the best tools for environmental monitoring programme. During the present survey zooplankton diversity of Yamuna River was assessed. List of zooplankton species recorded from selected water bodies present in the buffer zone present mining project is given in Table 3.4(ix).

Table 3.4(ix): Zooplankton Species Recorded from Yamuna River

Name of the Groups	Name of the Taxa
Protozoa	*Arcella* sp.
	Centropyxis sp.
	Difflugia sp.
	Paramoecium sp.
Rotifera	*Asplanchna brightwelli*
	Brachionus angularis
	Brachionus calciflorus
	Brachionus falcatus
	Brachionus sp.
	Cephlodella gibba
	Filinia longiseta
	Keratella cochlearis
	Keratella tropica
	Lecane closterocera
	Lecane luna
Copepoda	*Cyclops* sp.
	Mesocyclops sp.
	Thermocylops sp.
	Diaptomus sp.
	Nauplius larvae
Cladocera	*Alona intermediate*
	Bosmina sp.
	Bosmina longirostris
	Chydorus sp.

	Daphnia sp.
	Daphnia pulex
	Diaphanosoma excisum
Ostracoda	*Cypris* sp.
	Stenocypris sp.
Source: GRC Survey Data	

II. Macro-invertebrates

Macro-invertebrates are commonly found in all types of aquatic habitats such as streams, rivers, wetlands, lakes and ponds. The term macro-invertebrate used for those animals that have no backbone and can be seen with the naked eye. These animals generally include insects, crustaceans, molluscs and annelids. They are significant within the food chain as larger animals such as fish and birds rely on them as a food source. Various macro-invertebrate species were collected and identified from Yamuna River of the buffer zone of present mining project is given in Table 3.4(x).

Table 3.4(x): Macro-invertebrates recorded from Yamuna River

Name of the Groups	Name of the Taxa
Mollusca	*Corbicula* sp.
	Corbicula striata
	Gyraulus sp.
	Lamellidens sp.
	Melanoides scabra
	Thira tuberculata
Diptera	*Chironomus* sp.
	Chironomus plumosus
	Tendipes kiefferulus
Oligochaete	*Dero dagitata*
	Pheretima sp.
	Tubifex tubifex
Crustacea	*Gammarus pulex*
	Palemone sp.
Trichoptera	*Glossosoma* sp.
	Hydropsyche sp.
Ephemeroptera	*Baetis nymph*
	Caenis rundorum
Source: GRC Survey Data	

IV. Fishes

Present mining area is proposed on the dry riverbed. Fish species present in the buffer area of present mining project are listed in Table 3.4(xi).

Table 3.4(xi): Fish species found in Yamuna River of Buffer Zone

Family	Scientific Name	IUCN status
Order- Beloniformes		
Family: Belonidae	*Xenentodon cancila*	LC
Order- Cyprinidontiforms		
Family: Aplocheilidae	*Aplocheilus panchax*	LC
Family: Cyprinidae	*Amblypharyngodon mola*	LC
	Puntius conchonius	VU
	Labeo calbasu	LC
	Labeo dero	LC
	Labeo bata	LC
	Labeo dyocheilus	LC
Order- Clupeiformes		
Family: Clupeidae	*Gudusia chapra*	LC
Order- Perciformes		
Family: Nandidae	*Nandus nandus*	LC
Order- Siluriformes		
Family: Pangasidae	*Pangasius pangasius*	LC
Family: Sisoridae	*Bagarius bagarius*	VU
Family: Siluridae	*Heteropneustes fossilis*	LC
Family: Mastacembelidae	*Macrognathus pancalus*	NT
Order- Tetraodontiformes		
Family: Tetraodontidae	*Tetraodon fluviatilis*	NE

Source : GRC data supported by Department of Fisheries, Uttarakhand
IUCN Status=LC: Least Concern, **EN:** Endangered, **NT:** Near Threatened,
VU: Vulnerable.

3.7. Occurrence of Schedule-I and Rare, Endangered and Threatened Species (RET)

Overall studies reveal that plant species come under the category of RET and Schedule-I species have not been observed from the buffer zone of Yamuna River (LoL 21/2) Sand, Bajri and Boulder Mining Project area. So, there is no need of conservation plan. However, all care will be taken for protection of others flora & fauna also, if any in the lease hold area.

3.1.7 SOCIO ECONOMIC & ITS BASELINE DATA:

The socio economic and its baseline data has been collected to comprehend socio-economic status of the people living in the study area and also to assess the impact of the project on it.

METHODOLOGY

For Socio-Economic Impact assessment of the proposed Sand, *Bajri* & Boulder mining project on River Yamuna, Village Dhakrani, Tehsil Vikasnagar, District Dehradun, Uttarakhand GRC India recourse to systematic analysis of various Socio-Economic characteristics, both in terms of quality and quantity. Accordingly, both qualitative and quantitative data was collected from secondary sources. For collection of secondary data GRC approached the Census Authority in the state for published data/information, visited state and district portal and referred to administrative records of the state and district administration. The qualitative data deals with description; they can be observed but not measured. Hence, codes were extensively used during collection of qualitative data. They were decoded after data processing to facilitate data analysis and report writing.

STUDY AREA

The study area consists of lease area and buffer area. There is no vegetation in the leased out area excepting few small bushes. There are 48 villages and three towns in the study area. All the habitations are located in Uttarakhand. The district and sub-district wise distribution of villages is presented in the table below:

Table: 3.5 (i) Sub-district wise distribution of villages and towns in the Study

S. No	Name of the Sub-district	Number of Villages	Number of Towns
District: Dehradun, Uttarakhand			
1	Vikasnagar	21	3
2	Dehradun	01	-
Total		22	3
District: Sirmaur, Himachal Pradesh			
1	Paonta Sahib	26	-
Total		26	-
Grand Total		**48**	**3**

BASELINE DATA

Baseline data refers to basic information collected before a project/scheme is implemented. It is used later to provide a comparison for assessing actual impact of the project. The present report is provided with the following base line data for the study area as a whole.

Table: 3.5 (ii) Demographic Particulars of the Study Area of Sand, *Bajri* & Boulder Mining Project on River Yamuna

S.N.	Description	Number	Percentage to Respective total
1	**Gender wise total Population of the Study area**	**128036**	**100**
	Male	66822	52.2
	Female	61214	47.8
	Sex Ratio (No. of females per 1000 males)	916	
2	**Gender wise total Population (0-6 age group)**	**17467**	**100**
	Male	9113	52.2
	Female	8354	47.8
	Sex Ratio of 0-6 age group population (No. of females per 1000 males)	916	
3	**Number of Households and household size**	**24843**	
	Average House Hold size for the study area as a whole	6	
	Highest Household size in the study area	9	
	Lowest Household size in the study area	4	
4	**Total Population of Schedule Caste Community in the study area**	**14229**	**100**
	Male	7440	52.3
	Female	6789	47.7
	Sex Ratio (No. of females per 1000 males)	912	
5	**Total Population of Schedule Tribe Community**	**12732**	**100**
	Male	6735	52.9

	Female	5997	47.1
	Sex Ratio (No. of females per 1000 males	890	
6	**Total population of General Community (including OBC)**	**101075**	**100**
	Male	52647	52.1
	Female	48428	47.9
	Sex Ratio of General Community population (including OBC) (No. of females per 1000 males	920	
7	**Total Literates in the study area**	**85007**	**100**
	Male	48192	56.7
	Female	36815	43.3
	Over all literacy rate in the study area	**76.9**	
	Male	83.5	
	Female	69.6	
	Gender gap in literacy rate	13.9	
8	**Total Workers in the study area**	**37875**	**100**
	Male	31543	83.3
	Female	6332	16.7
	Overall Gender Gap in work participation rate	66.6	
	Overall Dependency Rate of Non-workers over workers	116.8	
9	**Total Main Workers in the study area**	**19589**	**100**
	Male	16796	85.7
	Female	2793	14.3
	Over all gender gap in work participation rate of main workers	71.4	

10	**Total Marginal Workers in the study area**	**5658**	**100**
	Male	3221	56.9
	Female	2437	43.1
	Over all gender gap in work participation rate of Marginal workers	13.8	
11	**Total Household Industrial Workers in the Study Area**	**14813**	**100**
	Male	12594	85
	Female	2219	15
12	**Total Agricultural Workers in the study Area**	**10541**	**100**
	Male	7734	73.4
	Female	2807	26.6
13	**Total Cultivators in the Study Area**	**6061**	**100**
	Male	4287	70.7
	Female	1774	29.3
14	**Total Agricultural Labour in the Study Area**	**4480**	**100**
	Male	3447	76.9
	Female	1033	23.1
15	**Total Others Worker in the Study Area**	**59462**	**100**
	Male	30224	50.8
	Female	29238	49.2

Source: Census 2011

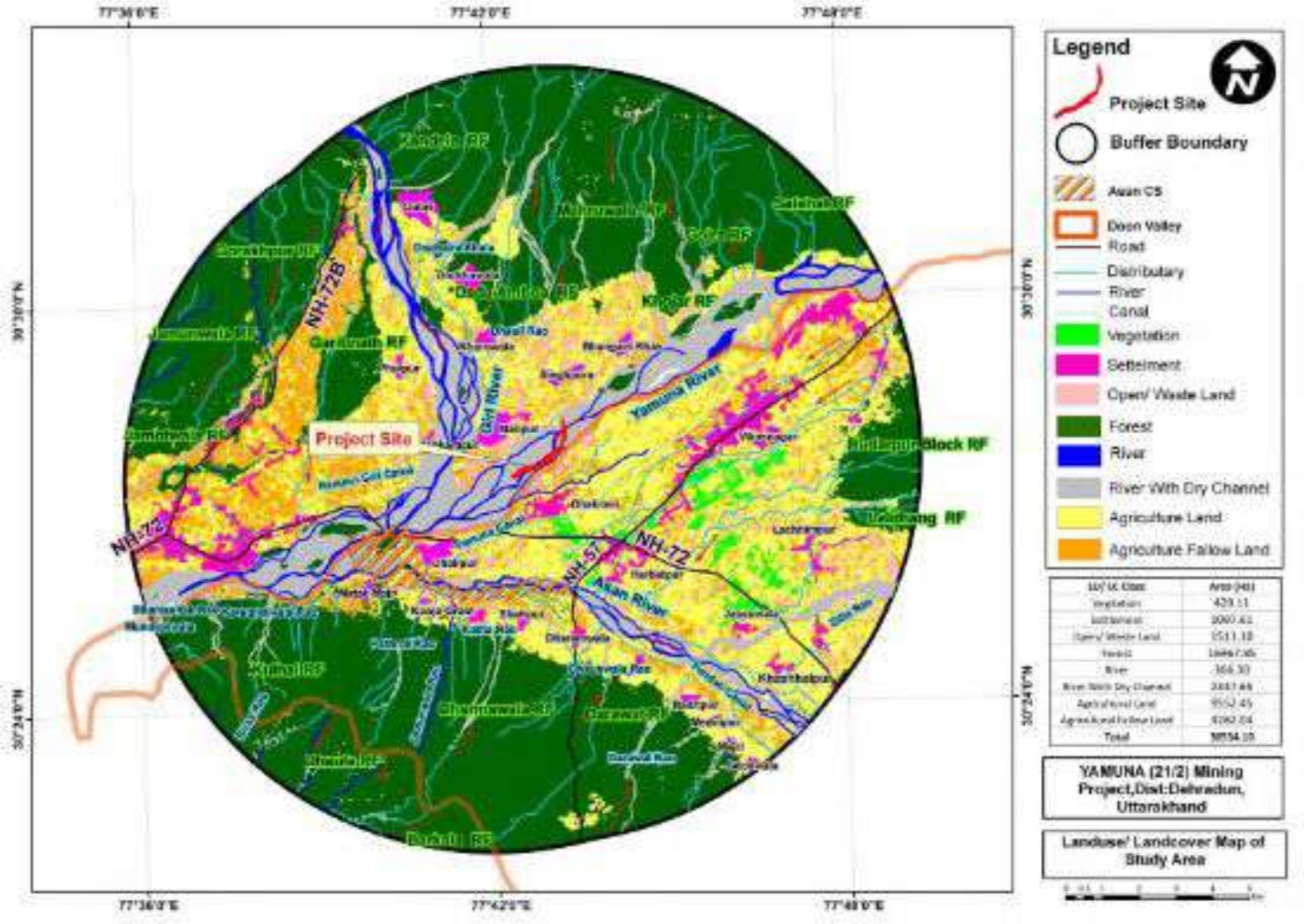
Various amenities available in the study area are given in the table below:

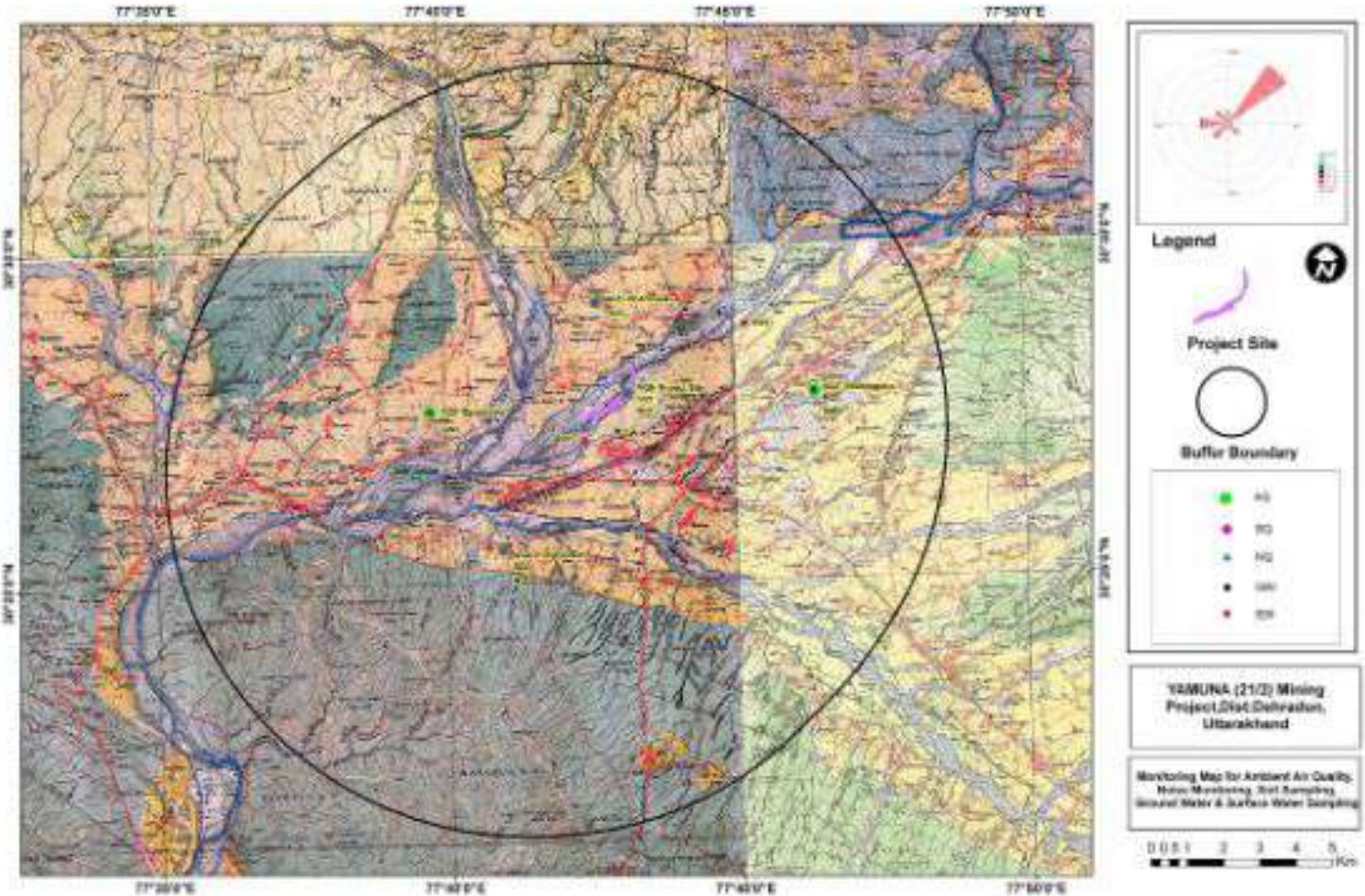
Table: 3.5 (iii) List of amenities available in the study area

Sl. No	Amenities	Type	No. of villages	Number of institution	No. of Towns	Number of institution
1	Educational Institutions	Primary School	40	40	3	5
		Middle school	22	24	2	3
		Secondary School	9	11	1	1
		Senior Secondary	3	4	-	-
		Adult Literacy	15	22	-	-
		Other School	3	3	-	-
2	Health facilities	Allopathic Hospital	3	3	1	1
		Allopathic Dispensary	2	2	-	-
		Unani Hospital	-	-	1	1
		Ayurvadic Hospital	-	-	1	1
		Ayurvadic Dispensary	2	2	-	-
		Maternity & Child Welfare Center	5	5	1	1
		Maternity Home	-	-	1	1
		Primary Health Sub-Centre	9	9	-	-
		Family Welfare	1	1	-	-
		Child Welfare	4	4	1	2
		Registered Medical Practicenors	8	25	3	45
		Community Health Workers	8	11	1	2
3	Drinking Water	Well	19	19	1	-
		Hand pump	28	28	-	-
		Tub well	16	16	1	-
		Tap	47	47	2	-
4	Electricity	Power for domestic uses	19	-	2	400 Connectio
		Power for Agriculture uses	10	-	1	100 Connectio
		All purpose	28	-	2	-

5	Approach Road	Only Paved Roads	25	-	3	-
		Only Mud Roads	3	-	1	-
		Both paved and Mud Roads	6	-	-	-
		Paved, Mud and Foot Road	7	-	-	-
7	Banks & Credit Societies	Commercial bank	3	3	1	15
		Cooperative bank			1	1
		Agriculture Credit Societies			1	2
8	Communication Facilities	Bus Services	33	-	2	-
		Railway Facilities	-	-	1	-

The impact assessment based on this data collected has been discussed in **Chapter VI** (Page no.128-133).


77°36'0"E
77°42'0"E
77°48'0"E
30°36'0"N
30°30'0"N
30°24'0"N
Project Site
NH-72B
NH-72
NH-51
Yamuna River
Asan River
Tons River
Song River
Kedarkot RF
Kalsi RF
Chamasari RF
Ganeshpur RF
Kanasar RF
Kharkhaloun
Legend
Project Site
Buffer Boundary
Asan CS
Doon Valley
Road
Distributary
River
Canal
Vegetation
Settelment
Open/ Waste Land
Forest
River
River With Dry Channel
Agriculture Land
Agriculture Fallow Land
YAMUNA (21/2) Mining Project,Dist:Dehradun, Uttarakhand
Landuse/ Landcover Map of Study Area


77°35'0"E
77°40'0"E
77°45'0"E
77°50'0"E
Legend
Project Site
Buffer Boundary
YAMUNA (21/2) Mining Project,Dist.Dehradun, Uttarakhand
0 0.5 1 2 3 4 5 Km

CHAPTER -IV

ANTICIPATED ENVIRONMENTAL IMPACT AND MITIGATION MEASURES

INDEX

4.0 GENERAL

All industrial and/or development projects are likely to have an impact on the natural set up of the environment. This impact may be beneficial or adverse, depending on the improvement or the deterioration it brings, about change in the status of air, water, land, ecology, natural systems, socio-cultural life styles and economics of the population. Depending on the nature of activities and baseline environment status, the impacts are assessed for their importance. On the basis of the impact analysis, the mitigating action and future monitoring requirement are paid attention to in the Environmental Management Plan for countering or minimizing the impacts.

Keeping in mind, the environmental baseline scenario as detailed in **Chapter III** (Page no.42-91) and the proposed mining activity described in **Chapter II** (Page no.34-39), it is attempted to assess the likely impact and its extent on various environmental parameters and likely mitigation measures to be adopted.

4.1 LAND ENVIRONMENT

The proposed extraction of streambed materials, mining below the existing streambed, and alteration of channel-bed form and shape may lead to several impacts such as erosion of channel bed and banks, increase in channel slope, and change in channel morphology if, the operations are not carried out systematically.

The mining and allied activities involved in river bed mining result in creation of temporary haul roads and formation of mined pits inside river, etc. affecting the landuse pattern. In this project, silt and clay are also produced as a constituent of the River-Bed Material, which are considered to be waste.

Anticipated Impacts:

- Undercutting and collapse of river banks.

- Excessive and unscientific riverbed material mining is a threat to bridges, dams and nearby structures.
- River bank cutting and erosion.
- Upstream erosion as a result of an increase in channel slope and changes in flow velocity.
- Downstream erosion due to increased carrying capacity of the stream
- Downstream changes in patterns of deposition.
- Changes in channel bed and habitat type.

Mitigation measures:

- Since the project is mainly for sand, *bajri* and boulder excavation (soil deficient), no loss of top soil is involved.
- The silt and clay generated as waste will be used for plantation or filling up low lying area elsewhere.
- No mining is proposed in the vicinity of important structure like bridges/ dams.
- Mining will be done leaving a safety distance of 15% of the width of the river from the bank inwards for bank protection.
- In this activity, the work is proposed to be done manually which will avoid adverse effects associated with heavy machinery and their functioning.
- The mining is planned in non monsoon seasons only, so that the excavated area gets replenished during the monsoon each year.
- Grasses and bushes which have fibrous roots at the first instance are proposed to grown along the banks which enhances the binding properties of the soil. Hence protecting the banks.
- The systematic and scientific removal of sand, *bajri* and boulder will not cause bed degradation.
- Restoration of bank will be ensured at the end of mine closure every year.

4.2 WATER ENVIRONMENT

Anticipated Impacts:

Mining of sand from within or near a river bed has a direct impact on the physico-chemical habitat characteristics. These characteristics include in stream roughness elements, depth, velocity, turbidity, sediment transport and stream discharge. Altering these habitat characteristics can have deleterious impacts on both in-stream biota and associated riparian habitat.

The detrimental effects, if any, to biota resulting from bed material mining are caused by following:

i. alteration of flow patterns resulting from modification of the river bed
ii. an excess of suspended sediment
iii. Damage to riparian vegetation and in-stream habitat

The disturbance activities can also disrupt the ecological diversity in many ways.

Mitigation measures

Project activity will be carried out only in the dry part of the river bed. Hence, none of the project activities affect the water environment directly. In the project, it is not proposed to divert or truncate any stream. No proposal is envisaged for pumping of water either from the river or tapping the ground water.

In the lean months, the proposed sand mining will not expose the base flow of the river and hence, there will not be any adverse impact on surface hydrology.

The deposit will be worked from the top surface up to a maximum depth of 1.5m below ground level or above the ground water table whichever comes first. Hence mining will not affect the ground water regime as well.
Further mining will be completely stopped during the monsoon seasons to allow the excavated area to regain its natural profile.

4.3 AIR ENVIRONMENT

Anticipated Impacts:

Emission of fugitive dust is envisaged due to:

i. Mining Activities includes excavation and lifting of minerals. The whole process will be done manually. Therefore the dust generated is likely to be insignificant as compared to mining processes involving drilling, blasting, mechanized loading etc.

ii. Transportation of minerals will be done by road using trucks. Fugitive dust emission is expected from the transportation of trucks on the haul roads. Evaluation of fugitive dust emission has been done by using line source model as given below:

Air Modeling

A detailed study on emission sources and quantification of pollutant concentration by means of dispersion modeling is required to access the environmental impact of a mine. On the basis of the predicted increments to air pollutant concentrations, an effective mitigation and environmental plan can be devised for sensitive areas. In case of river bed sand, stone & *bajri* mining, as there is no blasting and drilling activities, the impacts may only be caused by material handling and transportation activities. The material is mostly wet, and therefore effect is minimal.

However detailed Air quality modelling has been done through Aermod and is attached as **Annexure XXIII.**

4.4 NOISE ENVIRONMENT

The proposed mining activity is manual in nature. No drilling & blasting is envisaged for the mining activity. Hence the only impact is anticipated is due to movement of vehicles deployed for transportation of minerals.

Anticipated Impacts:

- Mental disturbance, stress & impaired hearing.
- Decrease in speech reception & communication.
- Distraction and diminished concentration affecting job performance efficiency

The noise level in the working environment are compared with the standards prescribed by Occupational Safety and Health Administration (OSHA-USA) which has been adopted and enforced by the Govt. of India through model rules framed under Factories Act, 1980 and CPCB 2000 norms. The summary of the permissible exposures in cases of continuous noise as per above rules is given below:

Damage Risk Criteria for Hearing Loss OSHA Regulations

Maximum allowable duration per day in hour	Sound pressure dB(A)	Remarks
(1)	(2)	(3)
8.0	90	1. For any period of exposure falling in between any figure and lower figure as indicated in column (1), the permissible sound is to be determined by extrapolation or proportionate scale. 2. No exposure in excess of 115 dB(A) is permissible.
6.0	92	
4.0	95	
3.0	97	
2.0	100	
1 ½	102	
1	105	
¾	107	
½	110	
¼	115	

Noise at lower levels (sound pressure) is quite acceptable and does not have any bad effect on human beings, but when it is abnormally high- it incurs some maleficent effects.

a. Mitigation measures

The following measures have been envisaged to reduce the impact from the transportation of minerals:

i. The vehicles will be maintained in good running condition so that noise will be reduced to minimum possible level.
ii. In addition, truck drivers will be instructed to make minimum use of horns in the village area and sensitive zones.
iii. No such machinery is used for mining which will create noise to have ill effects.
iv. Awareness will be imparted to the workers about the permissible noise levels & maximum exposure to those levels

4.5 BIOLOGICAL ENVIRONMENT

Mining which leads to the removal of channel substrate, re-suspension of streambed sediment and stockpiling on the streambed, will have ecological impacts. These impacts may have an effect on the direct loss of stream reserve habitat, disturbances of species attached to streambed deposits, reduced light penetration, reduced primary production, and reduced feeding opportunities.

Sand mining generates additional traffic, which negatively impairs the environment.

Anticipated Impacts:

- Excessive and unscientific riverbed sand mining results in the destruction of aquatic and riparian habitat through large changes in the channel morphology.

- Access roads crossing the riparian areas will have impact on the species disturbing the ecosystem.
- Mining may drive away the wild life from their habitat, and significantly affect wildlife and nearby residents.
- Diminution of the quality and quantity of habitat essential for aquatic and riparian species.
- Reduction in the yield of agriculture due to deposition of dust on the leaves, etc. of the crops.
- Fragmentation of wildlife habitat and blocking of migratory paths. Isolation may lead to local decline of species, or genetic.
- Mining on the streambed, braided flow or subsurface inter-sand flow may hinder the movement of fishes between pools.

Animals are sensitive to noise and avoid human territory. The project stretch of the river is not an identified drinking water point for the animals. However, any animal desirous of accessing the river can continue to do so upstream or downstream of the stretch during the mining activities, as there will not be any damming or diverting of water. Hence, no significant impact is anticipated from the proposed project.

Mitigation measures

As the proposed mining will be carried out in a scientific manner, not much significant impact is anticipated, however, the following mitigation measures will be taken to further minimize it:

1. No mining will be carried out during the monsoon season to minimize impact on aquatic life which is mainly breeding season for many of the species.
2. As the mining site has no vegetation, no clearance of vegetation will be done.
3. Prior to closure of mining operations / during the rainy season the eroded bank will be restored / reclaimed to minimize negative impacts on aquatic habitats.

4. Haul roads will be sprinkled with water which would reduce the dust emission, thus avoiding damage to the crops.
5. Mining will be carried out on the dry part of the lease area to avoid disturbance to the aquatic habitat and movement of fish species.
6. No discard of food, polythene waste etc. will be allowed in the lease area which would distract/attract the wildlife.
7. No night time mining will be allowed which may catch the attention of wild life.
8. If wildlife are noticed crossing the area, they will not be disturbed at all.
9. Workers will be made aware of the importance of the wildlife and signage will be displayed at the sensitive areas to caution the workers & other passerby.
10. Access roads will not encroach into the riparian zones and if any riparian vegetation cleared off for the mining activity will be restored at the end of closure of mine.

Although, the project will not lead to any tree cutting, plantation activities shall be undertaken to improve the vegetation cover of the area. To avoid dust emissions, the mined materials will be covered with tarpaulin during transportation.

4.6 TRAFFIC ANALYSIS

Transportation Route:

The sand, *bajri* & boulder excavated from the lease area will be loaded directly into trucks and transported to the concerned market via village Dhakrani by an unmetalled road of about 410m and finally meets national Highway 72 by a metalled road having length of 1.68 Km and width of 8m. The evacuation route is shown in the map as given below

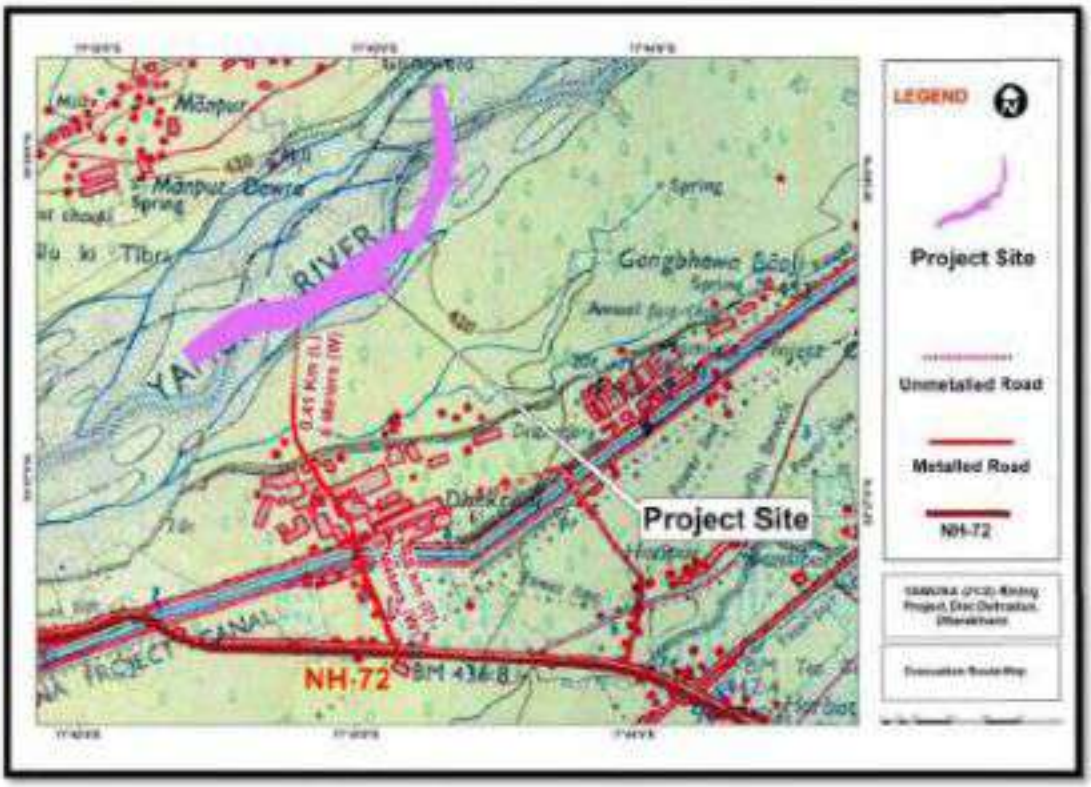


Fig. 4.2: Map Showing Evacuation Route

Traffic analysis is carried out by understanding the existing carrying capacity of the roads near to the project site and the connecting main roads in the area. Then depending on the capacity of the mine, the number of trucks that will be added to the present scenario will be compared to the carrying capacity.

Table 4.4 (i): Existing Traffic Scenario & LOS

Road	V	C	Existing V/C Ratio	LOS
Near Village Dhakrani	625	6000	0.10	A
NH-72 Intersection	2000	15,000	0.13	A

Source: Capacity as per IRC: 64-1990

V= Volume of Vehicles in PCU's/day & C= Capacity of Road in PCU's/day

The existing Level of Service (LOS) is "A" i.e. excellent.

V/C	LOS	Performance
0.0 - 0.2	A	Excellent
0.2 - 0.4	B	Very Good
0.4 - 0.6	C	Good / Average / Fair
0.6 - 0.8	D	Poor
0.8 - 1.0	E	Very Poor

Reference: ENVIS Technical Report, IISc, Bangalore.

During Mine operation

Proposed Capacity of mine/annum : 3,30,000 TPA

No. of working days : 225 days

Proposed Capacity of mine/day : 1467 TPD

Truck Capacity : 10 tonnes

No. of trucks deployed/day : 147

Increase in PCU/ day : 441

Considering both loaded & empty trucks

Increase in PCU/hr will be 882 PCUs

Table 4.4 (ii): Modified Traffic Scenario & LOS

Road	V	C	Modified V/C Ratio	LOS
Near village Dhakrani	1507	6000	0.25	B
NH-72 Intersection	2882	15,000	0.19	A

Results

From the traffic study it is observed that due to the additional traffic load on the existing roads and highways the LOS of the village roads gets modified to B

i.e. "Very Good" & the LOS of the highway remains same i.e. A. Therefore, to avoid the adverse effect on the concerned roads due to additional load, traffic management has been proposed as given below.

Impacts

- Congestion on road will be increased as the LOS will be increased.
- Air Quality will be affected due to dust emission on haul road.
- Increase in percentage of air quality parameters will get affected.
- Chance of accident will increase.
- Haul Road will get damaged.

Traffic Management:

1. Roads will be repaired regularly every year before start of mining and maintained in good conditions. Budget for maintenance of road is given in Chapter 10 (Page No- 156-157) in the EIA report.
2. A supervisor will be appointed to regulate the traffic movement near the site.
3. Speed breakers will be constructed accident prone areas to calm the traffic and its speed.
4. Signage will be erected at the sensitive & precarious places to caution or provide information to road users.
5. Passways will be made to ensure easy movements of trucks on the narrow roads.
6. Water sprinkling on haul road will be done to reduce dust emission from vehicle movement and to reduce the impact on vegetation along both the road side.
7. Overloading will not be permitted and trucks will be covered with tarpaulin.
8. A committee has been formed for study of traffic headed by chairman is attached as an **Annexure XVII**.

CHAPTER-V

ANALYSIS OF ALTERNATIVES

(TECHNOLOGY & SITE)

5.0 INTRODUCTION

Consideration of alternatives to a project proposal is a requirement of EIA process. During the scoping process, alternatives to a proposal can be considered or refined, either directly or by reference to the key issues identified. A comparison of alternatives help to determine the best method of achieving the project objectives with minimum environmental impacts or indicates the most environmentally friendly and cost effective options.

5.1 ALTERNATIVE FOR MINE LEASE

During monsoon season, when rivers reach high stage, Yamuna River also bears significant catchment area and it transports river bed material (sand, bajri and boulder) which gets accumulated at such stretch which widens river width and concave banks. Thus, it is evident that the proposed site will be mined for the purpose of preventing land cutting during heavy rainfall and floods.

Sand, Bajri and Boulder (minor mineral) deposits are site specific. It is present in Yamuna river bed (34.94 Ha.). The mining of the material will be done by opencast manual method in riverbed. No new technology is involved. The mining shall be done as per laid down procedures by IBM. Solid Waste generated during mining will consist of silt mixed soil which will be backfilled in the excavated pits. The mined out area will get replenished annually after monsoon.

5.2 ALTERNATIVE FOR TECHNOLOGY AND OTHER PARAMETERS

Some alternatives considered during EIA study are discussed below:

S. No.	Particular	Alternative Option 1	Alternative Option 2	Remarks
1	Technology	Open-cast Manual mining	Open-cast Mechanical	Open-cast Manual Mining is preferred.

			mining	**Benefits** • No electrical power requirement Minimal noise will be generated • Minimal air pollution will be generated • Overburden will not be generated
2	Employment	Local Employment	Outsource Employment	Local Employment is preferred. **Benefits** • Provides employment to local people along with Financial Benefits • No residential building /housing is required
3	Laborer Transportation	Public Transport	Private Transport	Local labour will be deployed so they will either reach mine site by bicycle or by foot. **Benefits** • Cost of transportation of men will be negligible
4	Material Transportation	Public Transport	Private Transport	Material will be transported through truck/trolley on the contract basis **Benefits** • It will give indirect employment
5	Water Requirement	Tanker Supply	Groundwater/ Surface water supply	Tanker supply will be preferred **Benefits** • No change in the surface water or ground water quality It will provide indirect employment
6	Road	Haul Road	Metallic Road	Haul road will be considered for linking mine site from metallic road for transportation purpose. Minimum distance will be measured along with less

				number of trees for considering optimum haul road route. **Benefits** • Less distance; less fuel used Minimum or negligible number of trees will be cut in best opted haul road route.

5.3 SUMMARY

We have analyzed all the option for alternatives of the proposed mine site. This project is sand, bajri and boulder specific project and existing land use of mine lease classified as River Body which will continue to be so even after the current mining project is over, hence no alternate site is suggested for this project.

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CHAPTER-VI

ENVIRONMENTAL MONITORING PROGRAMME

INDEX

6.0 INTRODUCTION

Regular monitoring of the various environmental parameters is necessary to evaluate the effectiveness of the management programme so that the necessary corrective measures can be taken in case there are some drawbacks in the proposed programme. Since environmental quality parameters at work zone and surrounding areas are important for maintaining sound operating practices of the project in conformity with environmental regulations, the post project monitoring work forms part of Environmental Monitoring Program.

Environmental Monitoring Program will be implemented once the project activity commences. Environmental monitoring program includes (i) environmental surveillance, (ii) analysis & interpretation of data, (iii) preparation of reports to support environmental management system and (iv) organizational set up responsible for the implementation of the programme.

6.1 ENVIRONMENTAL MONITORING AND REPORTING PROCEDURE

Monitoring shall confirm that commitments are being met. This may take the form of direct measurement and recording of quantitative information, such as amounts and concentrations of discharges and wastes, for measurement against corporate or statutory standards, consent limits or targets. It may also require measurement of ambient environmental quality in the vicinity of a site using ecological/biological, physical and chemical indicators. Monitoring may include socio-economic interaction, through local liaison activities or even assessment of complaints.

The preventive approach to environment management may also require monitoring of process inputs, for example, type and method used, resource consumption, equipment and pollution control performance etc.

The key aims of environment monitoring are:

1. To ensure that results/conditions are as forecast during the planning stage, and where they are not, to pinpoint the cause and implement action to remedy the situation.
2. To verify the evaluations made during the planning process, in particular with risk and impact assessments and standard & target setting and to measure operational and process efficiency.
3. Monitoring will also be required to meet compliance with statutory and corporate requirements.
4. Finally, monitoring results provide the basis for auditing i.e. to identify unexpected changes.

6.2 MONITORING METHODOLOGIES AND PARAMETERS

Air Quality Monitoring

Air Quality monitoring is essential for evaluation of the effectiveness of abatement programmes and to develop appropriate control measures. Suspended Particulate Matter (SPM), Sulphur Dioxide (SO_2) and Nitrogen Dioxide (NO_2) will be monitored at the workplace i.e. core zone. The methodology proposed for is shown below:

Parameters	Technique	Technical Protocol	Minimum Detectable Limit
$PM_{2.5}$	Gravimetric method	**CPCB Guideline Vol. I May' 2011**	**5 (µg/m³)**
PM_{10}	Gravimetric method	**IS 5182 (Part-XXIII)**	**5 (µg/m³)**
Sulphur Dioxide	Improved West and Gaeke	**IS-5182 (Part-II)**	**5 (µg/m³)**
Nitrogen Dioxide	Modified Jacob & Hochheiser	**IS-5182 (Part-VI)**	**6 (µg/m³)**

Water Quality monitoring

Water quality monitoring involves periodical assessment of quality of surface water and the ground water near the mining project.

- Surface water samples will be analyzed for all the parameters as per EPA, 1986
- Ground water samples will be analyzed for all the parameters as per IS-10500.

Soil Quality monitoring

The soil quality monitoring is carried out to assess the soil characteristic. The soil quality will be analyzed as per CPCB norms.

Noise Level Monitoring

Noise level monitoring will be done for achieving the following objectives:

a) To compare sound levels with the values specified in noise regulations
b) To determine the need and extent of noise control of various noise generating sources

Noise level monitoring will be done at the work zone to assess the occupational noise exposure levels. Noise levels will also be monitored at the noise generating sources like mineral handling arrangements, vehicle movements and also at the nearest village for studying the impact due to higher noise levels for taking necessary control measures at the source.

Socio-economic Survey

Socio economic condition will be monitored to assess the demographic particulars of the area including the impacts on the social & economical condition on the residents nearby.

Plantation monitoring programme

Plantation monitoring will be done to ensure survival & growth rate of plantations.

6.3 MONITORING SCHEDULE

The schedule has been shown below for the parameters proposed for monitoring.

S.No.	Description of Parameters	Schedule of Monitoring
1	Air Quality	24 hourly samples twice a week in each season except monsoon
2	Water Quality (Surface & Groundwater)	Once a season for 4 seasons in a year
3	Soil Quality	Once in a year in project area
4	Noise Level	Twice a year for first two years & then once a year
5	Socio-economic Condition	Once in 3 years
6	Plantation monitoring	Once in a season

6.4 MONITORING SCHEDULE - IMPLEMENTATION

An implementation programme has been prepared as it serves no purpose if it is not implemented in letter and spirit.

The major attributes of environment are not confined to the mining site alone. Implementation of proposed control measures and monitoring programme has an implication on the surrounding area as well as for the region. Therefore, mine management should strengthen the existing control measures as elaborated earlier in this report and monitor the efficacy of the control measures implemented within the mining area relating to the following specific areas:

a) Collection of air and water samples at strategic locations with frequency suggested and by analyzing thereof. If the parameters exceed the permissible tolerance limits, corrective regulation measure will be taken.

b) Collection of soil samples at strategic locations once every two years and analysis thereof with regard to deleterious constituents, if any.

c) Measurement of water level fluctuations in the nearby ponds, dug wells and bore wells and to assess if mining has got any impact on it or not.

d) Measurement of noise levels at mine site, stationary and mobile sources, and adjacent villages will be done twice a year for first two years and thereafter once a year.

e) Post plantation, the area will be regularly monitored in every season for evaluation of success rate. For selection of plant species local people should also be involved.

An Environmental Management Cell (EMC) is envisaged which will be responsible for monitoring EMP and its implementation. EMC members should meet periodically to assess the progress and analyze the data collected during the month.

6.5 BUDGET ALLOCATION FOR MONITORING

The EMC will be responsible to carry on the monitoring. Budget allotment has also been proposed for the same:

S. No.	Description	Cost to be incurred (in lakhs/annum)
1	Air Quality	0.5
2	Water Quality (Surface & Groundwater)	0.5
3	Soil Quality	0.3
4	Noise Level	0.3
TOTAL		1.6

6.6 REPORTING SCHEDULES OF THE MONITORING DATA

It is proposed that voluntary reporting of environmental performance with reference to the EMP should be undertaken. The environmental monitoring cell shall co-ordinate all monitoring programmes at site to furnish the data to the State regulatory agencies regularly in respect of the stipulated prior environmental clearance terms and conditions.

The proponent shall prominently advertise in the newspapers indicating that the project has been accorded environmental clearance and also the details of website where it is displayed.

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CHAPTER-VII

ADDITIONAL STUDIES

INDEX

7.0 PUBLIC CONSULTATION

The public consultation for this project was held on 08/07/2014. The Public hearing Notice is shown below which was published on 08-06-2014 in the regional news papers, Times of India.

मुख्यालय, उत्तराखण्ड पर्यावरण संरक्षण एवं प्रदूषण नियंत्रण बोर्ड
29/20 नेहरू रोड, सहस्रधारा, देहरादून (उत्तराखण्ड)
Phone: 0135-2658086, Fax: 0135-2716092 Web : ueppcb.uk.gov.in

संशोधित ड्राफ्ट

सर्वसाधारण को सूचित किया जाता है कि गढ़वाल मण्डल विकास निगम देहरादून द्वारा विभिन्न नदियों के नीचे दिये गये लाटो में उपखनिज खनन हेतु लोक सुनवाई की विज्ञप्ति प्रकाशित की गई थी। उक्त लोक सुनवाई की प्रस्तावित तिथियों में निम्न संशोधन किया जाता है।

क्र० सं०	नदी का नाम एवं लाट संख्या	पूर्व में प्रकाशित समाचार पत्र तथा तिथि	पूर्व में प्रस्तावित तिथि	संशोधित तिथि
1	यमुना नदी लाट 23/1, 23/2	अमर उजाला/हिन्दुस्तान टाईम्स 14.05.2014	16.06.2014	07.07.2014
2	यमुना नदी लाट 21/2, 21/3	अमर उजाला/हिन्दुस्तान टाईम्स 14.05.2014	17.06.2014	08.07.2014
3	यमुना नदी लाट 21/1, 23/3	अमर उजाला/हिन्दुस्तान टाईम्स 14.05.2014	18.06.2014	10.07.2014

पूर्व में प्रकाशित लोक सुनवाई स्थल एवं समय यथावत रहेगा।

पत्रांक – यूईपीसीबी/एफसी/Gen-345/1775-451 दिनांक 07.06.2014 सदस्य सचिव

HINDUSTAN TIMES 8.06.14

IRRIGATION & WATER

Photograph of Public Hearing are given below:

The records of the proceedings are attached at **Annexure XII (A)** and the action plan along with budget allocation is attached as **Annexure XII (B)**.

7.1 HAZARD IDENTIFICATION AND RISK ASSESSMENT METHODOLOGY

RISK is to expose someone or something to danger, harm or loss. The different steps of risk assessment procedure are as given below:

Step I: Hazard Identification

The purpose of hazard identification is to identify and develop a list of hazards for each job in the organization that are reasonably likely to expose people to injury, illness or disease if not effectively controlled. Workers can then be informed of these hazards and controls put in place to protect workers prior to them being exposed to the actual hazard.

Step II: Risk Assessment

Risk assessment is the process used to determine the likelihood that people exposed to injury, illness or disease in the workplace arising from any situation identified during the hazard identification process prior to consideration or implementation of control measures.

Risk occurs when a person is exposed to a hazard. Risk is the likelihood that exposure to a hazard will lead to injury or health issues. It is a measure of probability and potential severity of harm or loss.

Step III: Risk Control

Risk control is the process used to identify, develop, implement and continually review all practicable measures for eliminating or reducing the likelihood of an injury, illness or diseases in the workplace.

Step IV: Implementation of risk controls

All hazards that have been assessed should be dealt in order of priority in one or more of the following hierarchy of controls

The most effective methods of control are:

i. Elimination of hazards

ii. Substitute something safer

iii. Use engineering/design controls

iv. Use administrative controls such as safe work procedures

v. Protect the workers i.e. by ensuring competence through supervision and training, etc.

Each measure must have a designated person assigned for the implementation of controls. This ensures that all required safety measures will be completed.

Step V: Monitor and Review

Hazard identification, risk assessment and control are an on-going process. Therefore regularly review the effectiveness of your hazard assessment and control measures. Make sure that you undertake a hazard and risk assessment when there is change to the workplace including when work systems, tools, machinery or equipment changes. Provide additional supervision when the new employees with reduced skill levels or knowledge are introduced to the workplace.

A) RISK ANALYSIS

The risk assessment portion of the process involves three levels of site evaluation:

a) Initial Site Evaluation,

b) Detailed Site Evaluation,

c) Priority Site Investigations and Recommendations.

The risk assessment criteria used for all levels of site evaluation take into account two basic factors:

- The existing site conditions
- The level of the travelling public's exposure to those conditions.

The Initial Site Evaluation and Detailed Site Evaluation both apply weighted criteria to the existing information and information obtained from one site visit. The Initial Site Evaluation subdivides the initial inventory listing of sites into 5 risk assessment site groups. The Detailed Site Evaluation risk assessment is then performed on each of the three highest risk site groups in order of the group priority level of risk. The result of the Detailed Site Evaluation process is a prioritized listing of the sites

within each of the three highest risk site groups.

Risk analysis is done for:

- Forecasting any unwanted situation
- Estimating damage potential of such situation
- Decision making to control such situation
- Evaluating effectiveness of control measures

Table 7.1 (i) Risk Likelihood Table for Guidance

Step 1: Assess the Likelihood				**Step 2: Assess the Consequences**		
L1	Happens every time we operate	Almost Certain	Common or repeating occurrence	**C1**	Fatality	Catastrophic
L2	Happens regularly (often)	Likely	Known to have occurred "has happened"	**C2**	Permanent disability	Major
L3	Has happened (occasionally)	Possible	Could occur or "heard of it happening"	**C3**	Medical/hospital or lost time	Moderate
L4	Happens irregularly (almost never)	Unlikely	Not likely to occur	**C4**	First aid or no lost time	Minor
L5	Improbable (never)	Rare	Practically impossible	**C5**	No injury	Insignificant

A logical systematic process is usually followed during a qualitative risk assessment to identify the key risk events and to assess the consequences of the events occurring and the likelihood of their occurrence [Table 6.1(ii)]

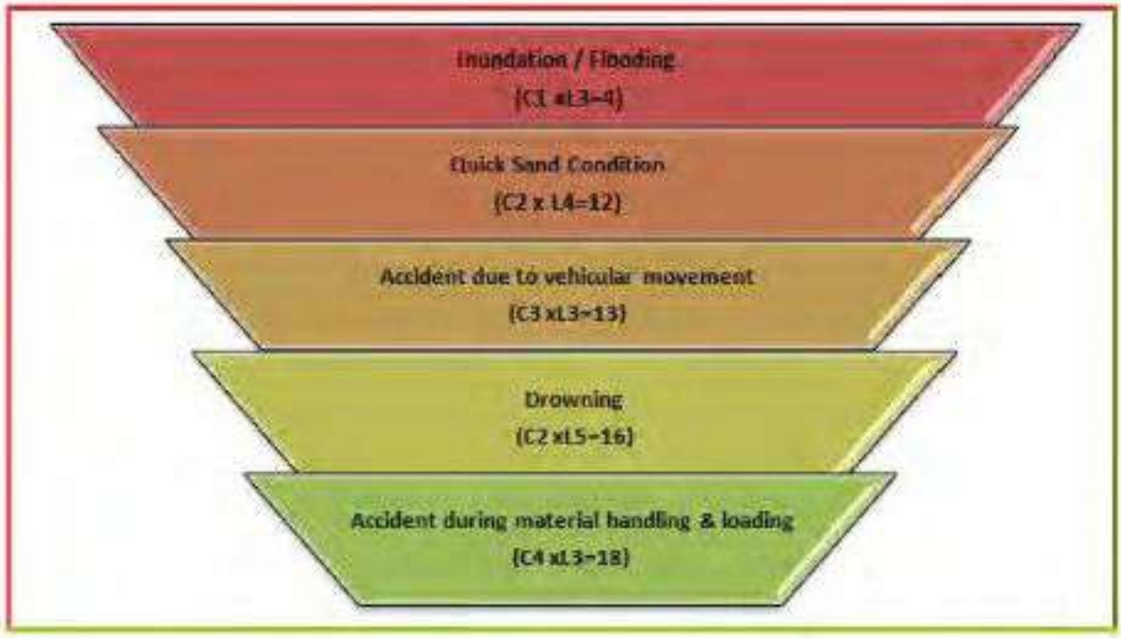
Table7.1 (ii) Qualitative Risk Assessment

Risk Rank LikelihoodxConsequence	L1 Almost certain	L2 Likely	L3 Possible	L4 Unlikely	L5 Rare
C1 Catastrophic	1	2	4	7	11
C2 Major	3	5	8	12	16
C3 Moderate	6	9	13	17	20
C4 Minor	10	14	18	21	23
C5 Insignificant	15	19	22	24	25

RISK RATING:

HIGH RISK 1-6	MEDIUM RISK 7-15	LOW RISK 16-25

7.2 RISK ASSESSMENT



There are various factors, which can create unsafe working conditions/hazards in mining of minor minerals from river bed.

The key risk (hazard x probability) event **rating** associated with sand bed mining and to assess its consequences of such events occurring and the likelihood based on above Table-2 are as:-

The Risk rating of such hazards is as follows:

7.2.1 INUNDATION/FLOODING

The risk rating assigned to this activity is assigned as '4' i.e., it is possible and will have catastrophic with major consequences, if work started without assessment of the river bed condition especially during monsoon season.

Inundation or flooding is expected and beneficial for these mines as during this time only the mineral reserve gets replenished.

Measures to prevent consequences of Inundation/Flooding

Inundation of flooding is expected and beneficial for these mines as during this time only the mineral reserve gets replenished.

1. During monsoon months and heavy rains the mining operations are ceased.
2. There should be mechanism/warning system of heavy rains and discharges from the upstream dams.

7.2.2 Quick Sand Condition

The risk rating assigned to this activity is assigned as '12' i.e., it is an unlikely event with major consequences as frequency of this risk is less likely to occur.

Two things may create the conditions to form quicksand. Underground water may seep-up and saturate the sand, thereby reducing the friction between the sand grains and giving the sand a liquid nature. Or, sand or another soil may be sifted by the force of an earthquake so that friction is lessened and the earth becomes unsteady.

This creates danger condition to the trucks plying near the river bed and banks for transportation of minerals.

Measures to Prevent Quick Sand Condition

1. The only way to avoid quick sand condition is by avoiding mineral lifting below water table.
2. Mining will be done in layers rather than going for maximum depth at one time.

7.2.3 ACCIDENT DUE TO VEHICULAR MOVEMENT

The risk rating assigned to this activity is assigned as '13' i.e., it is possible event with moderate consequences as frequency of this operation is more but the predicted/assumed intensity is less like minor cuts, bodily injury. The possibilities of road accidents are due to reckless or untrained driver or overloading of trucks or in case pathway is not compacted suitably, etc.

Measures to Prevent Accidents during Transportation

1. All transportation within the main working should be carried out directly under the supervision and control of the management.
2. The Vehicles will be maintained/repaired and checked thoroughly by the competent person.
3. A statutory provision of constant education, training etc. will go a long way in reducing the incidents of such accidents.
4. Overloading will not be permitted and will be covered with tarpaulin.
5. The maximum permissible speed limit will be ensured.
6. The truck drivers will have valid driving license.

7.2.4 DROWNING

The risk rating assigned to this activity is assigned as '16' i.e., it is a rare accident but will have major consequences, if occurred. This may occur due to flash floods etc. due to which the workers at the site may get seriously injured or drowned.

Measure to Prevent Drowning

1. The mining will be done under strict supervision and only in the dry part of the river.
2. Mining will be completely stopped in monsoon season to avoid such accidents.
3. Deep water areas will be identified and 'No Go Zones' will be clearly marked and made aware to the mine workers.

7.2.5 ACCIDENT DURING MATERIAL HANDLING & LOADING

The risk rating assigned to this activity is assigned as '18' i.e. it is possible event with minor consequences", as frequency of this operation is more but the predicted/assumed intensity is less like minor cuts, abrasion, etc. may be due to river bank collapse, over thrown boulders/pebbles, injuries due to carelessness use of hand tools, etc.

Measures to Prevent Accidents during material handling & loading

1. The truck should be brought to a lower level so that the loading operation suits to the ergonomic condition of the workers.
2. The loading should be done from one side of the truck only to avoid over throw of materials.
3. The workers should be provided with gloves and safety shoes during loading.

All the activities will be done under strict supervision/control to avoid anticipated accidents so that the risk is reduced to a level considered **As Low As Reasonably Practicable (ALARP)** conditions which are adequately safe and healthy.

7.3 DISASTERS & ITS MANAGEMENT

7.3.1 Anticipated Disasters

1. **Floods**: The area is not highly prone to floods but however cloudbursts may cause floods & flashflood near the proposed site. Precautionary measures will be taken and in disaster management,

it will be considered to avoid the impending effects on the workers at the site if the disaster happens to occur.

2. **Earth Quake:** The lease area falls in seismic zone IV which is prone to earthquakes.

3. **Land slide:**

The area lies in moderate to low landslide zone as per the mapping shown here. This poses risk while mining & transportation. Hence retention walls will be made strong enough at place to hold the land slide.

7.3.2 Disaster Management

At present Disaster Mitigation & Management Centre is working as autonomous institute under aegis of Department of Disaster Management Government of Uttarakhand and Disaster Mitigation and Management Centre(DMMC)is the apex center in the field of Disaster Mitigation & Management in Uttarakhand, to protection of the community and the environment from the over whelming obliterstion caused by disasters. (source: dmmc.uk.giv.in)

- ✓ District Level Cell and State Level Cell are to take timely precautionary measures to avoid effects of impending disasters.
- ✓ The State Level Cell will be in continuous touch with State Govt. to pass on message like heavy rainfall etc. as received from IMD and take precautionary action to prevent any consequential disaster.
- ✓ A Nodal Officer at State Level Cell will be made in charge for the timely dissemination of the information & monitoring to the District Level Cells.
- ✓ "Disaster Warning System" as developed will be strictly implemented.
- ✓ Identification of nearby hospitals with route & contact number for emergency assistance.
- ✓ Evacuation plan for the workers at site including contract labours will be developed in nearby shelters.
- ✓ "Emergency Helpline Number" will be displayed at all levels.
- ✓ Disaster Management Plan prepared by The State Disaster Management Authority Uttarakhand will be followed and the contact numbers of the person responsible who will execute the work during disaster is attached as **Annexure XVI**.

7.4 SOCIO-ECONOMIC IMPACT OF THE PROJECT & SAFETY MEASURES

There will be no resettlement or rehabilitation involved in the proposed project as there is no habitations involved in the allotted lease area which lies on the river-bed. However, a detailed Socio Economic Assessment has been performed, which is given below:

INTRODUCTION

Socio-Economic Impact Assessment (SEIA) refers to systematic analysis of various social and economic characteristics of human being living in a given geographical area during a given period. The geographical area is often called Study Area or Impact Area. SEIA is carried out separately but concurrently with Environment Impact (EI). The study area consists of core area where the project is located and a buffer area encircling the project area with a radius of 10 kilometers from the periphery of the core area. For every new project or existing project under expansion or tied for modernization or change in product mix, Socio-economic Impact Assessment is mandatory. The Socio-economic impact assessment focuses the effect of the project on social and economic well-being of the community. The impact may be direct or indirect. Further, the impact may be positive or negative.

OBJECTIVES OF SEIA

The prime objective of the current study is to assess the impact of the proposed Sand, *Bajri* & Boulder mining Project on socio-economic characteristics of people living in the neighborhoods. Further, it is to be established whether the impending impact would be direct or indirect. Furthermore, it is to be examined whether the said impact would be positive or negative. Lastly, it is to be comprehended if the impact is positive how long it would sustain or if it is negative how soon the same could be eased.

SCOPE

The Scope of the study is as follows:

a) To collect baseline data of the study area
b) To comprehend socio-economic status of the people living in the study area.
c) To assess probable impact of the project on social and economic aspects in the study area.

d) To measure the impact of the project on Quality of life of the people living in the study area.

e) To ensure sustainability of positive impact.

f) To suggest mitigation measures and agency responsible for taking action in case of adverse impact.

SOCIO-ECONOMIC IMPACT OF THE PROJECT

Impact on Demographic Composition

The proposed *Project* will hardly make any difference in the demographic composition of the study area as the additional employment it envisages to create will be met locally to the maximum extent. Hence, the chances of in-migration of people from outside the study area are remote. Accordingly, there will be no variation in the total population of the study area including that of sex ratio, when the mine starts operating.

Employment Opportunities

The proposed *Project* will provide employment to local people. The number of workers to be deployed in the mining project will depend upon the quantity of minerals to be extracted from the mine by the lease holder. Both the miners and the unskilled workers will be recruited locally. It has estimated that 185 people will get direct employment in this mining project for a period of nine months in a year. Besides the above the project is expected to generate indirect employment to the extent of 50 persons in the informal sector. It is a positive impact of the project since it is providing employment opportunities to the local people. The project will not affect the vulnerable groups of people.

Increased Supply of minerals in the market

Sand and *bajri* has many uses. Mixed with cement and lime it is used in masonry construction. It is a critical component of concrete mixture. Both Government departments and private developers have taken up construction of roads, bridges and buildings in a big way. Hence, the demand for sand, *bajri* and boulder after crushing is ever increasing with

the growth of the infrastructure development in our country. The requirement for the building materials is always high and there is already an acute shortage of sand in the market and the construction industry is the main sufferer. With the commencement of the proposed mining project the supply of minerals will increase and the gap between demand and supply will decrease to some extent, if not fully.

Impact on Agriculture

The entire mining area is part of river bed and the entire land is Government Revenue Land. It is non-forest land and the proposed activity is to take place in the bed of the River Yamuna. There will be no negative impact on agriculture as no cultivation is taking place on the proposed mining area. Since, scientific mining will be adopted in the proposed mining project the area will not face flood due to mining, which destroy standing crops and land & property. Removal of obstruction to river flow by mining will also channelize the river away from banks and flood intensity will be reduced. This is a positive impact of the proposed mining project.

Impact on Road Development

Movement of trucks and other vehicles to and fro the mining site is expected to increase, when mining will start. The existing roads connecting the quarry with the national highways are connected by metalled and unmetalled roads. Hence, there is need for road maintenance and repairing regularly in the mining area. Further, there are risks of accidents during loading of extracted minerals into trucks and transportation to markets for sells. However, accidents can be avoided by taking due care and precautions.

Income to Government

The proposed mining activity will benefit the State in the form of royalty, dead rent, fees and earnings from taxes.

Impact on Law & Order

As most of the workers to be employed in the proposed mining project are local residents no law & order problem is envisaged. It is expected that the workers will attend to their duties from their residence and return to their homes after the day's work. There would have been law & order problem if the workers were migrants and lived in shanties closed to the mining area. However, to meet any untoward incident one police post shall be set up close to the mining site.

Impact on Health

There are no chances of occurring diseases, due to manual mining of sand, *bajri* and boulder. Sand is non-toxic. However, sand mining activities require precautions since it create respiratory problems among mine workers. Excessive inhalation of sand is a serious health concern. To avoid respiratory problem from sand necessary protection shall be taken.

Few safety measures are outlined below:

a) ***Safe Working Environment***: The project proponent shall ensure health and safety of all the employees at work. Efforts will be made to provide and maintain a safe work environment and ensure that the machinery and equipment in use is safe for employees. Further, it will be ensured that working arrangements are not hazardous to employees.

b) ***Provision of First Aid***: The first aid treatment reflects the hazards associated with the mining of *Sand, Bajri & Boulder*. The first-aiders will be well trained in handling patients working in the above Mining Project.

c) ***Regular Health Examination:*** For all mine workers regular health examination will be made compulsory. It will cover treatment of serious back injury; existing asthma or respiratory diseases, existing skin diseases, lung function test (pre and post ventolin), Audiograms, Chest X- ray etc.

d) ***No work for Temporal Disabilities:*** The workers having temporary disability will be asked to stop doing the job till he/she recovers from disabilities.

e) ***Health Education:*** Adequate health education and information related to the job will be provided to the workers. Baseline health information will be recorded for future references.

f) ***Tie-up with the Nearest Hospital for Medical Assistance:*** To meet the medical needs of the mine workers tie-up with nearest hospitals will be made. Efforts will be made to reserve few beds in the above hospitals for the workers of the mining project. This will ensure timely medical aid to the affected persons.

g) ***Supply of Mask and Gloves:*** The workers in the *Sand, Bajri & Boulder* mining project are subject to respiratory diseases. For protection from dust it will be made compulsory for all workers to wear masks and gloves, while working in the mine.

h) ***Administration of Anti-venom Injections:*** Provision of Anti-venom therapy will be made available for administration to the workers in case of snake, spider and insect bites, while working in the mine.

i) ***Special Telephone Number:*** A special telephone number will be made available to the workers in case of emergency so that they can dial the same for-medical assistances. Further, efforts will be made to provide vehicles to the patients in short duration for shifting to a hospital.

j) ***Special Group Insurance Scheme:*** All the mine workers will be covered under a Group Insurance Scheme of LIC or any other Insurance company.

CONCLUSION

The commissioning of Sand, *Bajri* & Boulder Mining Project on River Yamuna Lot No. 21/2 at Dhakrani, Tehsil: VikasNagar & District: Dehradun will provide employment to local people who are in search of the same. The granting of environment clearance to M/S Garhwal Mandal Vikas Nigam Ltd will make mining of Sand, *Bajri* & Boulder legally valid and it will generate revenue for the state. With the implementation of the Sand, *Bajri* & Boulder Mining Project the occupational pattern of the people in the area will change making more people engaged in mining, industrial and business activities rather in agriculture only. It is expected that mineral resource, employment and other community facilities will improve to a great extent with the opening of the Sand, *Bajri* & Boulder Mining Project and associated industrial and business activities.

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CHAPTER-VIII

PROJECT BENEFITS

INDEX

8.0 GENERAL

The execution of the project, bring overall improvement in the locality, neighborhood and the State by bringing industry, roads, employment and hence improving living standard and economic growth.

8.1 PHYSICAL BENIFITS

The opening of the proposed project will enhance the following physical infrastructure facilities in the adjoining areas.

a. **Road Transport:** There will be improved road communication due to the proposed project and maintenance will also be done time to time.

b. **Market:** Generating useful economic resource for construction. Excavated mineral will provide a good market opportunity.

c. **Enhancement of green cover:** As a part of reclamation plan, plantation will be carried along the river banks or along the road sides or near the civic amenities.

a. **Creation of community assets** (infrastructure) like provision for drinking water, construction of school buildings, village roads/ linked roads, dispensary & health centre, community centre, market place etc, as a part of corporate social responsibility.

8.2 SOCIAL BENEFITS

a) **Increase in Employment** Potential due to the project activity. Employment opportunities will increase both directly as well indirectly.

b) **Contribution to the Exchequer** as the saleable minerals will be given royalty. Since the quarries will be leased out to successful allottees, mining operation in the state will get legalized and it will fetch income to the state exchequer.

c) **Increased Health related activities**. Healthcare promotional activities will be undertaken. Pre-placement & and Periodic medical checkups will be done, which will lift the general health status of the residents of the area. Health camps, medical aids, family welfare programs, immunization camp sports will be arranged.

S. No.	Activities recommended for communities level services	Tentative cost (Lakh Rs)
1	Assistance to set up a temporary health center during the lease tenure.	**0.60**
2	Provide free health checkups & medicines to the nearby villagers of the project site.	**0.20**
3	Awareness campaigns regarding health issues in the nearby villages.	**0.50**
4	Health checkups & medicines to workers	**3.80**
Total		**5.10**

d) **Educational attainments**: Educational activities will be promoted by the lessee. Awareness program will be arranged covering basic issues related to primary level education, environment, health and hygiene etc.

e) **Strengthening of existing community** facilities through the Community Development Programme.

8.3 ENVIRONMENTAL BENEFITS

a. Controlling river channel
b. Protecting of river banks
c. Reducing submergence of adjoining agricultural lands due to flooding.
d. Reducing aggradation of river level.
e. Protection of crops being cultivated along the river bank.
f. A check on illegal mining activity.

8.4 CORPORATE SOCIAL RESPONSIBILITY

About Rs. 1.5 Lakhs will be allotted for the Corporate Social Responsibility. The following has been proposed considering the needs & demand of the people:

Education	Social Cause	Health care & Family welfare	Environment
Distribution of school bags, books and uniform to the children in nearby villages	Common vocational training centre shall be set up.	Free medical camps for the villagers	Awareness programs for the workers to sensitize them about the importance of biological environment
Free computer education to the students	Distribution of blankets to the needy people	Awareness programs will be arranged for healthcare	Distribution of free saplings to encourage villagers for plantation
Rs 50,000	Rs 40,000	Rs 30,000	Rs 30,000

In addition to this, 25% of the royalty will be deposited to District Mineral Foundation Trust Uttarakhand which will be used for upliftment of the nearby areas.

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CHAPTER-IX

ENVIRONMENTAL COST BENEFIT ANALYSIS

INDEX

9.0 PROJECT COST

After making exhaustive study, it is considered desirable that the mining project may be implemented. Project cost for the proposed Sand, Bajri and Boulder mining namely Lot No. 21/2 over an area of 34.94 Ha. falling in Village-Dhakrani, Tehsil- Vikasnagar, District-Dehradun (Uttarakhand) is Rs. 18,50,000.

Table 9.1: Project Cost and Benefit

Major Heads	**Total**
Production Capacity	3,30,000 Tonne Per Annum
Production Cost of Mineral	Rs 195/- Per Ton
Sale Value of Mineral	Rs 202/- Per Ton
Profit	Rs.7.00 per Ton
Estimated Profit per Annum	23,10,000/- Per Annum approx.

9.1 ENVIRONMENT COST ANALYSIS AND PROJECT IMPLEMENTATION

The Environment cost for this proposed mining includes Environmental Management Plan, Environmental and Social Responsibility, Occupational Health and Safety which is likely to come Rs. 13.75 Lakhs per annum. The detailed cost for Environmental Expenses is given below in the Table.

Table 9.2: Project Cost and Benefit

S. No.	**Major Heads**	**Expenses per annum(Lakhs)**
1	Environmental Management Plan	7.15
2	Environmental and Social Responsibility	1.50
3	Occupational Health and Safety	5.10
	Total	13.75

The estimated capital cost and financial viability of the present scheme has been worked out on the assumption that the above scheme shall be completed after five years i.e. end of lease period.

From the above financial analysis, it is clear that this stone mining project is financial and technically viable. The estimated profit will be 23, 10,000 - 13, 75,000 = 9,35,000 per annum.

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CHAPTER-X

ENVIRONMENTAL MANAGEMENT PLAN

INDEX

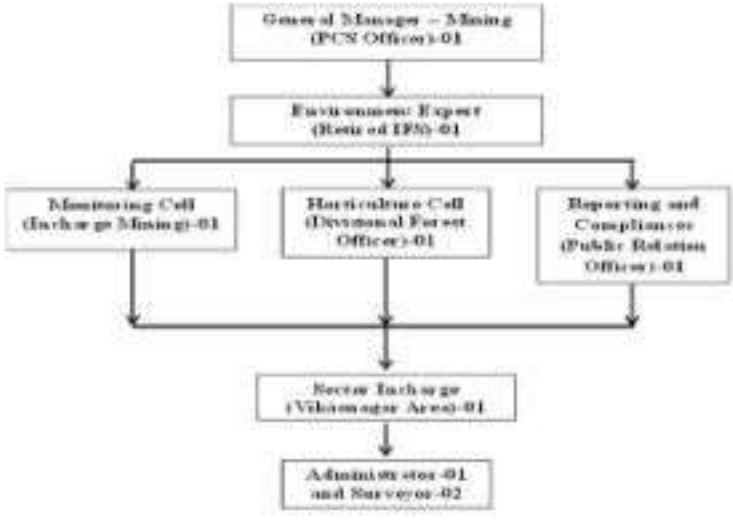
10.0 INTRODUCTION

To mitigate the adverse impact which is likely to be caused due to the mining operation and overall scientific development of local habitat, Environmental Management Plan (EMP) has been formulated and integrated with the mine planning. The details of the anticipated impacts and mitigative measures have been discussed in **Chapter IV** (Page no.96-106) of this report, based on the results of present environmental conditions and environmental impact assessment. The EMP has therefore been made considering implementation and monitoring of environmental protection measures during and after mining operations.

The mitigation measures which reduce the impact have already been identified earlier in this report in **Chapter IV** (Page no.96-106). To minimize the adverse impact, certain additional EMP measures are enumerated below for implementation.

10.1 ENVIRONMENTAL MANAGEMENT CELL (EMC)

It is imperative to establish an effective organization to implement, maintain, monitor and control the environmental management system. A separate Environmental Management Cell (EMC) will be formed to look after the environment related matter of the mine. The structure of EMC is as follows:



The EMC will perform the following activities:

- EMC will oversee that environmental control measures are implemented as per the plan.
- EMC will ensure ambient Field monitoring like air monitoring, meteorological monitoring and noise monitoring in coordination with outside agencies.
- Coordinating the environment related activities within the organization as well as with outside agencies.
- Reporting the status report to the statutory authorities.
- Systematically document and record keeping w.r.t. environmental issues.
- Plantation and their maintenance
- Collection statistics of health of workers and population of surrounding villages.
- Environmental compliance to the regulatory authorities.
- Communication with the concerned department on the environmental issue.
- Monitoring the progress of implementation of environmental management programme.

10.2 ENVIRONMENTAL MANAGEMENT PLAN (EMP) AND IMPLEMEMNTATION

Environmental Management Plan involves functions that determines the objectives, adoption of appropriate mitigation measures, protection of ecosystems, enhancement of the quality of life for those affected, and minimization of environmental costs (Barrow, 1999).

Environmental Management Plan (EMP) has been formulated with an objective to mitigate the adverse impacts of any proposed project. This includes an environmental policy on protection of environment and public safety.

1. Extraction will be done from the river bed leaving safety zone from bank & stream:

- Mining will be done in scientific and systematic manner.
- Mineral will be mined out leaving sufficient safety barrier of 15 % of the width of the river for bank stability.
- A maximum of 10m from the stream will also be left to avoid interface of mining activity with surface water.

2. The maximum working depth will remain above ground water table of the area:

Excavation above the water table will be done i.e. up to a maximum depth of 1.5m from the surface, which will provide a depression that would get filled in with sediments gradually in the monsoons. Further it will not disturb the ground water quality of the area as there will be no intersection with the water table.

3. Provide health facilities to the workers & surrounding people in the impact area to reduce the health impacts:

- Provision of dust filters / mask to workers working at dust prone and affected areas.
- Conducting periodical medical checkup of all workers for occupation related health problems.
- Awareness program for workers to make them aware of way of working and various precautions to be taken while at work.

4. Ensuring wildlife protection & arranging awareness campaigns for the same.

- No wildlife will be disturbed or chased away
- To avoid disturbance of the movement of the wild animals through the forests near the project area, sign boards will be placed detailing the dangers caused and the way towards corridors.

5. Minimize activities that release fine sediment to the river:

No washing, crushing, screening, stockpiling, or plant operations will be done at or near the streams. These and similar activities have the potential to release fine sediments into the stream, making habitat conditions harmful to local aquatic species.

6. Check on traffic load due to transportation & maintenance of evacuation route:

- Evacuation route will not be through residential areas so as to reduce the effect of dust emission from vehicular movement.
- Alternate evacuation route will be proposed to avoid traffic congestion.
- A monitoring Committee including Local Panchayat may be established to check on traffic due to transportation.

7. Effective mitigation measures will be adopted to minimize disturbance during transportation & handling of minerals:

- The haul road will be kept wide, leveled, compacted and water will be sprayed regularly to suppress fugitive dust.
- Evacuation routes will be repaired & maintained regularly.
- Utmost care will be taken to prevent spillage of minerals from the trucks by covering it by tarpaulin sheets
- It will be ensured that all transportation vehicles will carry a valid PUC certificate.

8. Establishment of reclamation program with plantation of local/native & fast growing species:

- Plantation will be done along the road sides / near civic amenities in consultation with the local authority/ Govt. bodies.

- It has also been proposed to plant along the river banks with plant species which will hold the soil and check on erosion of the banks. For eg. *Vetiveria zizanioides, Saccharum spontaneum, Pannisetum pupureum, etc.*
- For plantation purpose native/local plant species is proposed along the road sides/civic amenities.

9. *Establishment of restoration plan during the closure of mine at the onset of monsoon season:*

- Restoration of banks will be done.
- Ramps & temporary rest shelters will be removed prior to the closure of mine.
- Restructuring/reconstruction of the natural bunds if damaged, so that over flow of water can be controlled and flooding can be avoided
- Maintenance of check dams & retention walls which will prevent erosion of banks during monsoon.

10. Establishment of effective Disaster Management Plan to take timely precautionary measures to avoid effects of impending disasters:

Being a project on the river bed and though mining will not be done during monsoon, yet disaster may be caused due to earth quake, release of water from upstream dams or dam burst.

- District Level Cell and State Level Cell along with a nodal officer will be set up. The State Level Cell will be in continuous touch with State Govt. to pass on message so as to take precautionary action to prevent any consequential disaster.
- "Disaster Warning System" as developed will be strictly implemented.
- Identification of nearby hospitals with route & contact number for emergency assistance.

- Evacuation plan for the workers at site including contract labours will be developed in nearby shelters.
- "Emergency Helpline Number" will be displayed at all levels.

11. *Establishment of effective Monitoring Program monitored by Environment Management Cell:*

A monitoring program will be provided illustrating any impacts to river stability, riparian vegetation, ground & surface water, air, noise, soil quality. Monitoring schedule and budget allocation has been detailed **Chapter-VI** (Page no.115-117).

The monitoring program will also assess & scrutinize the EMP proposed & its implementation by the Environmental Management Cell (EMC).

Other precautionary measures like no cooking, no uprooting or chopping of plants/trees, no throwing of wastes into the stream will also be checked upon by the EMC.

10.3 BUDGET ALLOCATION FOR EMP IMPLEMENTATION

Annual budget for EMC is very essential for successful implementation of EMP. Costs will be both Capital and Recurring cost as given below. The fund allocated will not be diverted for any other purposes and the top management will be responsible for this.

Table 10.1 Cost of EMP

Sl. No	Description	Measures	Capital Cost (Rs. In lakhs)	Recurring Cost(in lakhs/annum)
1	Health Facilities	Medical Camps and Awareness program	2.5	5.10

2	Wildlife Protection	• Importance of Wildlife(Awareness) • Sign boards, information boards	- 0.5	0.05 0.1
3	Mineral transportation and Handling	• Repairing and maintenance of Roads • Water Sprinkling	1.0 -	2.0 1.2
4	Restoration and Reclamation	• Plantation • Maintenance of Check dams and Retention wall • Restoration of banks	5.0 - -	1.7 0.3 0.2
5	Pollution Monitoring	• Air pollution • Water pollution • Soil Pollution • Noise Pollution	- - - -	0.5 0.5 0.3 0.3
Total			**9.0**	**12.25**

Total expenditure during five years would be

Capital Cost = 9.0 Lakhs

Recurring Cost 12.25 x 5 = 61.25 Lakhs

Total = 9.0 + 61.25 = 70.25 Lakhs during 5 years.

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CHAPTER-XI

EXECUTIVE SUMMARY

INDEX

11.0 INTRODUCTION

As per MoEF, New Delhi Gazette dated 14th September 2006 and amended thereof, the proposed mining project is categorized as **category 'A'** project, due to the presence of Interstate Boundary between Uttarakhand and Himachal Pradesh, Uttarakhand and Uttar Pradesh, Aasan Conservation Reserve, and Doon valley within the 10 km radius of the lease area.

As per MoEF&CC, New Delhi Gazette dated 14th September 2006 and amended thereof, the proposed mining project was categorized as **Category 'A'** project due to the presence of Interstate Boundary between Uttarakhand and Himachal Pradesh and Uttarakhand and Uttar Pradesh, also Aasan Conservation Reserve, and Doon valley lies within the 10 km radius of the lease area.

The project proposal was submitted to Expert Appraisal Committee for its appraisal. Based on which, presentation for Terms of Reference (TOR) was held on 28th June, 2013. Based on the data provided and presentation done, the Expert Appraisal Committee has issued the Terms of Reference vide letter No. J-11015/137/2013-IA.II (M) dated 16th September, 2013

Now as per the amended EIA Notification dated 15th January, 2016 and 1st July, 2016, the category of the project has still comes under Category A.
There is three other lease lies within the 500m radius of the proposed Sand, Bajri and Boulder Mining Project, District Dehradun, Uttarakhand and the cumulative area of the two mines is 107.7473 ha.

As per the EIA Notification dated 1st July, 2016, a cluster shall be formed when the distance between the peripheries of one lease is less than 500 meters from the periphery of other lease in a homogeneous mineral area which shall be applicable to the mine leases or quarry licenses granted on and after 9th September, 2013. (Ref: Clause (8) (i), Page No-4 in EIA Notification dated 1st July, 2016) or The leases not operative for three years or more and leases

which have got environmental clearance as on 15th January, 2016 shall not be counted for calculating the area of cluster but shall be included in the Environment Management Plan and the Regional Environmental Management Plan." (Ref: Note 5, Page No-5 in EIA Notification dated 1st July, 2016)

Therefore as per the EIA Notification dated 15th January, 2016, 1st July, 2016 and 14th August, 2018, the project comes under "A" Category without cluster situation due to general condition of Doon Valley as two private mines already granted EC before 15.01.2016 and one other mine of GMVN which already granted EC is not operational till date.

The project is being proposed by Garhwal Mandal Vikas Nigam (GMVN) Limited. The proponent has applied for environmental clearance in the name of River Yamuna Lot No. 21/2 Sand, *Bajri* & Boulder Mining Project from the bed of River Yamuna over an area of 34.940 ha.
It has been proposed to mine around 3, 30,000 Tonnes per annum of minerals.
The estimated project cost for the proposed project is Rs.18.5 Lakhs.

11.1 LOCATION

The proposed mining lease area falls in Survey of India Toposheet 53F11.
The lease area is located in Village: Dhakrani, Tehsil: Vikasnagar & District: Dehradun, Uttarakhand
The mine lease co-ordinates are listed below:

Latitude	30°28'3.21"N to 30°27'16.24"N
Longitude	77°42'59.22"E to 77°42'4.73"E

11.2 MINING

This is an open-cast mining project. The operation will be entirely manual with use of hand tools like shovel, pan, sieves, pick axes, etc.
Mining will be done in layers, leaving a safety distance from the banks i.e. 15% of the width of the river will be left for bank stability from both the banks.

The deposit will be worked from the surface of the bed upto 1.5 m bgl or above ground water level, whichever comes first. Hence, at no point of time mining will intersect with ground water table.

Mining will be done only during the day time and completely stopped during the monsoon season.

11.3 RESERVE & PRODUCTION

Reserve : The already existing quantity at the river bed in the lease area due to fresh depositions has been considered to be the quantum of mineral available (**Reserve**) which may be mined out. In order to calculate this quantity, the lease area has been considered with an ultimate depth of 1.5 meter from the surface (excluding the boulder available on the surface). For the reserve tonnage estimation, the reserve quantity is multiplied with the bulk density of 2 tonnes per cum (for mixed sand and *bajri*).

The reserve for the site has been estimated to 7,45,958.4 tonnes.

Production: Approx 3.3 lakh tonnes will be excavated annually. The amount of sand & *bajri* in the total extractable quantum is assumed to be around 80%, which is likely to be replenished due to sediment inflow, gradually during the monsoon seasons.

11.4 SITE FACILITIES AND UTILITIES

Water Supply

Water will be provided to workers for drinking & domestic purpose. Water will also be required for dust suppression. A total of 5 KLD water will be required for the proposed project.

Temporary Rest Shelter:

A temporary rest shelter will be provided for the workers near to the site for rest. In addition, First aid box along with anti-venoms to counteract poison produced by certain species of small insects, if any and Sanitation facility i.e. septic tank or community toilet facility will be provided for the workers.

11.5 BASE LINE DATA

Environmental data has been collected in relation to proposed mining for Air, Noise, Water, Soil, Ecology and Biodiversity.

Table 11.1 Baseline Environmental Status

Attribute	Baseline status
Ambient Air Quality	Ambient Air Quality Monitoring reveals that the minimum & maximum concentrations of PM_{10} amongst all the 5 AQ monitoring stations were found to be 53.7µg/m^3 at AQ5 and 86.2µg/m^3 at AQ2, respectively. As far as the gaseous pollutants SO_2 and NO_2 are concerned, the prescribed CPCB limit of 80 µg/m^3 for residential and rural areas has never been surpassed at any station.
Noise Levels	The results of the monitoring program indicated that both the daytime and night time levels of noise were well within the prescribed limits of NAAQS, at all the four locations monitored.
Water Quality	The ground water from all sources remains suitable for drinking purposes as all the constituents are within the limits prescribed by drinking water standards promulgated by IS: 10500. From surface water analysis results it is evident that most of the parameters of the samples comply with 'Category B' standards of CPCB, indicating their suitability for outdoor bathing.
Soil Quality	Samples collected from identified locations indicate the soil is sandy loamy type and the pH value ranging from 6.75 to 7.56, which shows that the soil is slightly alkaline in nature.
Ecology and Biodiversity	10 km buffer of lease area comprises of Aasan Conservation Reserve, Doon Valley and some Reserve and protected forests.

11.6 ENVIRONMENTAL MANAGEMENT PLAN (EMP) & ITS IMPLEMENTATION

- Extraction will be done from the river bed leaving safety zone from bank & stream.
- The maximum working depth will remain above ground water table of the area.
- Provide health facilities to the workers & surrounding people in the impact area to reduce the health impacts.
- Ensuring wildlife protection & arranging awareness campaigns for the same.
- Minimize activities that release fine sediment to the river.
- Check on traffic load due to transportation & maintenance of evacuation route.
- Effective mitigation measures will be adopted to minimize disturbance during transportation & handling of minerals:
- Establishment of reclamation program with plantation of local/native & fast growing species
- Establishment of restoration plan during the closure of mine at the onset of monsoon season.
- Establishment of effective Disaster Management Plan to take timely precautionary measures to avoid effects of impending disasters.
- Establishment of effective Monitoring Program monitored by Environment Management Cell.

11.7 BUDGET ALLOCATION FOR EMP IMPLEMENTATION

Table for Cost of EMP

Sl. No	Description	Measures	Capital Cost (Rs. In lakhs)	Recurring Cost(in lakhs/annum)
1	Health Facilitics	Medical Camps and Awarencss program	2.5	5.10
2	Wildlife Protection	• Importance of Wildlife(Awarencss) • Sign boards, information boards	- 0.5	0.05 0.1
3	Mineral transportation and Handling	• Repairing and maintenance of Roads • Water Sprinkling	1.0 -	2.0 1.2
4	Restoration and Reclamation	• Plantation • Maintenance of Check dams and Retention wall • Restoration of banks	5.0 - -	1.7 0.3 0.2
5	Pollution Monitoring	• Air pollution • Water pollution • Soil Pollution • Noise Pollution	- - - -	0.5 0.5 0.3 0.3
Total			**9.0**	**12.25**

Total expenditure during five years would be

Capital Cost = 9.0 Lakhs

Recurring Cost 12.25 x 5 = 61.25 Lakhs

Total = 9.0 + 61.25 = 70.25 Lakhs during five years

11.8 BENEFITS OF MINING

PHYSICAL BENEFITS: Road Transport, Market, Enhancement of green cover & Creation of community assets.

SOCIAL BENEFITS: Increase in Employment Potential, Contribution to the Exchequer, Increased Health related activities, Educational attainments & Strengthening of existing community facilities.

ENVIRONMENTAL BENEFITS:

a. Controlling river channel
b. Protecting of river banks
c. Reducing submergence of adjoining agricultural lands due to flooding.
d. Reducing aggradation of river level.
e. Protection of crops being cultivated along the river bank.
f. A check on illegal mining activity.

CORPORATE SOCIAL RESPONSIBILITY

About Rs. 1.5 Lakhs will be allotted for the Corporate Social Responsibility for activities related to education, social causes, healthcare & environmental.

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CHAPTER-XII

DISCLOSURE OF CONSULTANT ENGAGED

The EIA/EMP Report for **River Yamuna Lot No. 21/2 Sand, Bajri & Boulder Mining Project** has been prepared by Grass Roots Research & Creation India (P) Ltd.

Name of the Consultant	**Grass Roots Research & Creation India (P) Ltd.**	**ISO 9001: 2008 (QMS), 14001:2004 (EMS) & OHSAS 18001: 2007 Certified Co. Accredited by QCI/NABET.**
Address	**F:374- 375, Sector: 63, Noida, India**	

Name of the Laboratory	**GRC India Training and Analytical Laboratory**	**NABL Accredited Laboratory, Recognized by MoEF&CC under Environment (Protection) Act, 1986. A unit of GRC India (P) Ltd.**
Address	**F- 375, Sector: 63, Noida, India**	

The EIA/EMP report has been prepared under the guidance of the following Coordinator & Functional Area Experts:

EIA Coordinator	**Mr. K D Choudhury**
FAE- AP	Mr. K D Choudhury
FAE- NV	Mr. K D Choudhury
FAE- EB	Dr. P R Chaudhari
FAE- WP	Dr. P R Chaudhari
FAE- SE	Mr. Vineet Pandey
FAE- Soil	Dr. S. R. Maley
FAE- Geology	Dr. Tapan Mazumder
FAE- Hydrology	Dr. Tapan Mazumder
FAE- RH	Dr. Ravindra Kode
FAE- Land Use	Mr. P Radhakrishnamoorthy
FAE- SHW	Mr. Dhiraj Kr. Singh
FAE- AQM	Prof. B Padmanabha Murty

The following team was involved under the guidance of experts for preparation of the report:

Personnel involved in Preparation of EIA/EMP report as Team Member	Mr. Shahbaz Malik (Project Associate)
	Mr. B.K. Jha

Accreditation from Quality Council of India, QCI NABET

Grass Roots Research & Creation India (P) Ltd. has got the Initial accreditation from QCI NABET and has undergone Surveillance Assessment as well. The result of continued accreditation is published on the QCI website as SAAC 69th and subsequent Minutes of Meeting in the year 2013-14.

As per the recently published QCI NABET 'List of Accredited Consultant Organizations/Rev. 36/November 05, 2015', listed in as accredited consultant, Category 'A' Sl. No. 76. The list of accredited consultants is published on QCI NABET and MoEF&CC websites as well.

For reference, a snapshots of the list where GRC India's name is listed is pasted below:

National Accreditation Board for Education and Training

NABET

NABET/EIA/RA083/070 Jan.18, 2016

Grass Roots Research and Creation India (P) Ltd
F: 374-375,
Sector-63,
Noida - 201301. (UP)
(Kind Attention: **Dr. Dhiraj Kr. Singh**)

Dear Sir,

Sub: Re-Accreditation

This has reference to your application to QCI-NABET for re-accreditation (RA) as EIA Consultant Organization and the assessment carried for same in your organization from **Feb. 11 -14, 2015.**

We are pleased to inform you that based on the document and office assessments during RA, the Accreditation Committee has approved renewal of accreditation given to your organization for a period of three years from **Feb. 14, 2015 to Feb. 13, 2018** subject to coverage of balance functional areas and specific response to NCs/Obs./Alerts issued, if applicable (Refer Annexure III) with the following details:

1. Annexure I - Scope of accreditation
2. Annexure II - List of experts with approved sectors/ functional areas
3. Annexure III - Non-Conformances/ Observations/ Alerts (NCs/ Obs./ Alerts)
4. Annexure IV - Observations on Quality Management System (QMS)
5. Annexure V - Terms and conditions of accreditation
6. Annexure VI - Result of assessment
7. Annexure VII - Guidelines for addressing Major Non-Conformances/ Observations/ Alerts
8. Annexure VIII - Format to be followed for mentioning the names of the experts involved in EIA reports prepared by **Grass Roots Research and Creation India (P) Ltd.**

Result of RA for approved candidates are already posted on QCI/NABET website vide minutes of the Accreditation Committee meeting dated Sep. 30, 2015. Detail including those not approved and NCs/ Obs./ Alerts as applicable are given in Annexure III. You are requested to take necessary actions to close the NCs/ Obs. as per guidelines and timeframe mentioned in Annexure VII of this letter. You are also advised to visit QCI website to understand Version 3 of the Scheme effective from Sep. 1, 2015 for necessary actions at your end.

You are required to make all payments to NABET as applicable, within one month from the date of invoice sent to you. Continuation of this accreditation of your organization is subject to the clearance of all dues by your organization, satisfactory compliance to Annexure III and V.
With best regards,

Yours sincerely,

(A K Jha)
Senior Director

6th Floor, ITPI Building, 4-A, Ring Road, I.P Estate, New Delhi - 110 002, India
Tel. : +91-11-2332 3416 / 17 / 18 / 19 / 20 Fax : +91-11-2332 3416
e-mail : nabet@qcin.org Website : www.qcin.org

Scheme for Accreditation of EIA Consultant Organizations

Scope of Accreditation

Annexure I

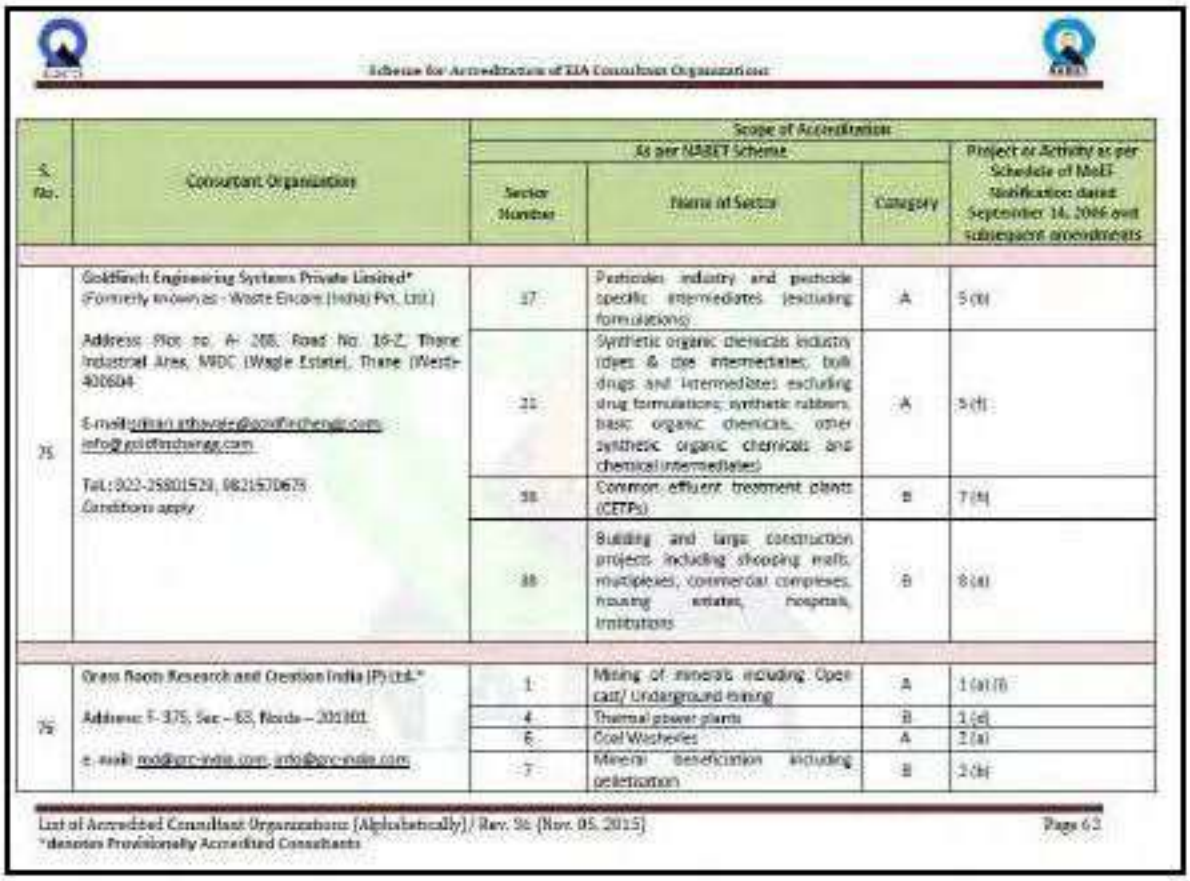
NAME OF THE CONSULTANT ORGANIZATION: **Grass Roots Research and Creation India (P) Ltd**
F: 374-375,
Sector-63,
Noida - 201301. (UP)

Sl. No.	Sector number		Name of Sector	Category A/B
	As per MoEF Notification	As per NABET Scheme		
1.	1 (a) (i)	1	Mining of Minerals	A
2.	1 (d)	4	Thermal power plants	B
3.	2 (a)	6	Coal washeries	A
4.	2 (b)	7	Mineral beneficiation including pelletisation	B
5.	3 (a)	8	Metallurgical industries(ferrous & non-ferrous)- both primary and secondary	A
6.	7 (c)	31	Industrial estates/ parks/ complexes/areas, export processing Zones(EPZs), Special Economic Zones(SEZs), Biotech Parks, Leather Complexes	A
7.	8 (a)	38	Building and large construtinn projects	B
8.	8 (b)	39	Townships and Area development projects	B
Total = 08 Sectors *Individual EIA Coordinators approved for different sectors are mentioned in Annexure II*				

The ACO has overall obtained more than 60 % marks and therefore qualifies for Cat. A.

18/01/16

(A K Jha)
Senior Director



Scheme for Accreditation of EIA Consultant Organizations

S. No.	Consultant Organization	Scope of Accreditation			
		As per NABET Scheme			Project or Activity as per Schedule of MoEF Notification dated September 14, 2006 and subsequent amendments
		Sector Number	Name of Sector	Category	
75	Goldfinch Engineering Systems Private Limited* (Formerly known as - Waste Encare (India) Pvt. Ltd.) Address: Plot no. A- 208, Road No. 16-Z, Thane Industrial Area, MIDC (Wagle Estate), Thane (West)-400604 E-mail: pritam.athavale@goldfinchengg.com; info@goldfinchengg.com Tel.: 022-25801529, 9821670675 Conditions apply	17	Pesticides industry and pesticide specific intermediates (excluding formulations)	A	5 (b)
		21	Synthetic organic chemicals industry (dyes & dye intermediates; bulk drugs and intermediates excluding drug formulations; synthetic rubbers; basic organic chemicals, other synthetic organic chemicals and chemical intermediates)	A	5 (f)
		38	Common effluent treatment plants (CETPs)	B	7 (ii)
		39	Building and large construction projects including shopping malls, multiplexes, commercial complexes, housing estates, hospitals, institutions	B	8 (a)
76	Green Room Research and Creation India (P) Ltd.* Address: F-375, Sec – 63, Noida – 201301 e. mail: mail@grc-india.com; info@grc-india.com	1	Mining of minerals including Open cast/ Underground mining	A	1 (a) (i)
		4	Thermal power plants	B	1 (d)
		6	Coal Washeries	A	2 (a)
		7	Mineral beneficiation including pelletization	B	2 (b)

*denotes Provisionally Accredited Consultants

Scheme for Accreditation of EIA Consultant Organizations

S. No.	Consultant Organization	Scope of Accreditation			
		As per NABET Scheme			Project or Activity as per Schedule of MoEF Notification dated September 14, 2006 and subsequent amendments
		Sector Number	Name of Sector	Category	
	Tel.: 0120 – 4044650, 4044660 09811554051, 09818184005 *Conditions apply*	5	Metallurgical industries(ferrous and non-ferrous) - both primary & secondary	A	3 (a)
		31	Industrial estates/parks/ complexes/ Area, export processing Zones(EPZs), Special economic zones(SEZs), Biotech Parks, Leather Complexes	A	7 (c)
		38	Building and large construction projects including shopping malls, multiplexes, commercial complexes, housing estates, hospitals, institutions	B	8 (a)
		39	Townships and Area development projects	B	8 (b)
77	Green Chem Solutions Pvt. Ltd.* Address: Plot No 803, 11th Street, Syndicate Bank Colony, Anna Nagar West Extension, Chennai 600 101. E-mail: greenchemsolutions@gmail.com Tel.: 044 – 42612108, 09790945811 *The organization as a whole was accredited for Cat. B.*	35	Common effluent treatment plants (CETPs)	B	7 (h)
		37	Common municipal solid waste management facility (CMSWMF)	B	7 (i)
		38	Building and large construction projects including shopping malls, multiplexes, commercial complexes, housing estates, hospitals, institutions	B	8 (a)
		39	Townships and Area development projects	B	8 (b)

List of Accredited Consultant Organizations (Alphabetically) / Rev. 36 (Nov. 05, 2015) Page 63

* denotes Provisionally Accredited Consultants

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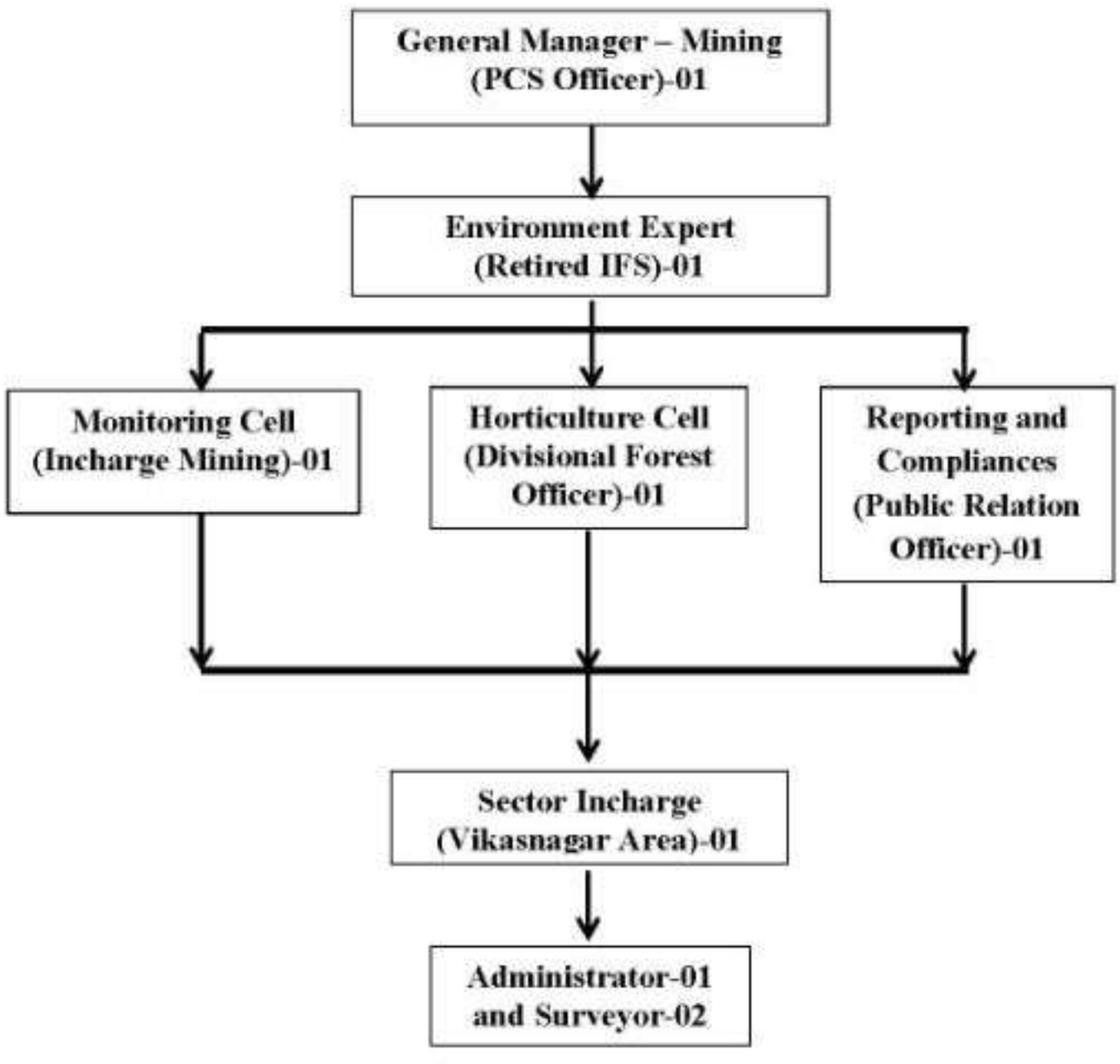
Environment Management Cell (EMC)

The EMC has been setup for all the Riverbed Mining projects of GMVN Ltd. as Higher Management (i.e. GM Mining, Evn. Expert, Mining Incharge, DFO and PRO) of the EMC will remain same for all the mining leases of GMVN Ltd. However, Sector In-charge, Administrator and Surveyor will be changed according to the location of Project Site/Lease Area.

Lower Management (i.e. Sector Incharge, Administrator and Surveyor) will be appointed for the entire Tehsil/Sector and they will be responsible to look after the all the mining leases falls under that Tehsil/Sector.



IMPACT OF PROPOSED MINOR MINERAL PROJECT ON AMBIENT AIR QUALITY AT THE RIVER YAMUNA, LOT NO. 21/2, AT VILLAGE: DHAKRANI, TEHSIL: VIKASNAGAR & DISTRICT: DEHRADUN, UTTARAKHAND.

1.1 Air Environment

Mining Operation carried out by opencast manual method generate dust particles due to various activities like Loading & Unloading of Sand, Bajri and Transportation. The air quality in the mining area depends upon the nature and concentration of emissions and meteorological conditions. Though it is an open cast manual mine with all possible air quality controlling measures but the major air pollutants from mining include:

- Particulate Matter (Dust) of various sizes.
- Dust is the single air pollutant observed in the open cast mines. Dust can be of significant nuisance to surrounding land users and potential health risk in some circumstances.

1.1.1 Anticipated Impact

The major sources of air pollution in the proposed mine is dust generation due to loading and transportation of mineral & wind erosion of exposed material. In this present study, United States Environmental Protection Agency (USEPA–42 series) approved mathematical equations have been used to predict concentrations for different operations in mining including the mineral transportation.

1.1.2 Air Pollution Modeling

Air quality models are the primary tools for relating emissions to air quality impacts. Models, in turn, require acceptable input data for emissions, surface topography, meteorological parameters, receptor configurations, baseline air quality, and initial and boundary conditions for each modeling scenario. Since the quality and reliability of model outputs can never be any better than the inputs, quality control of the input data is important.

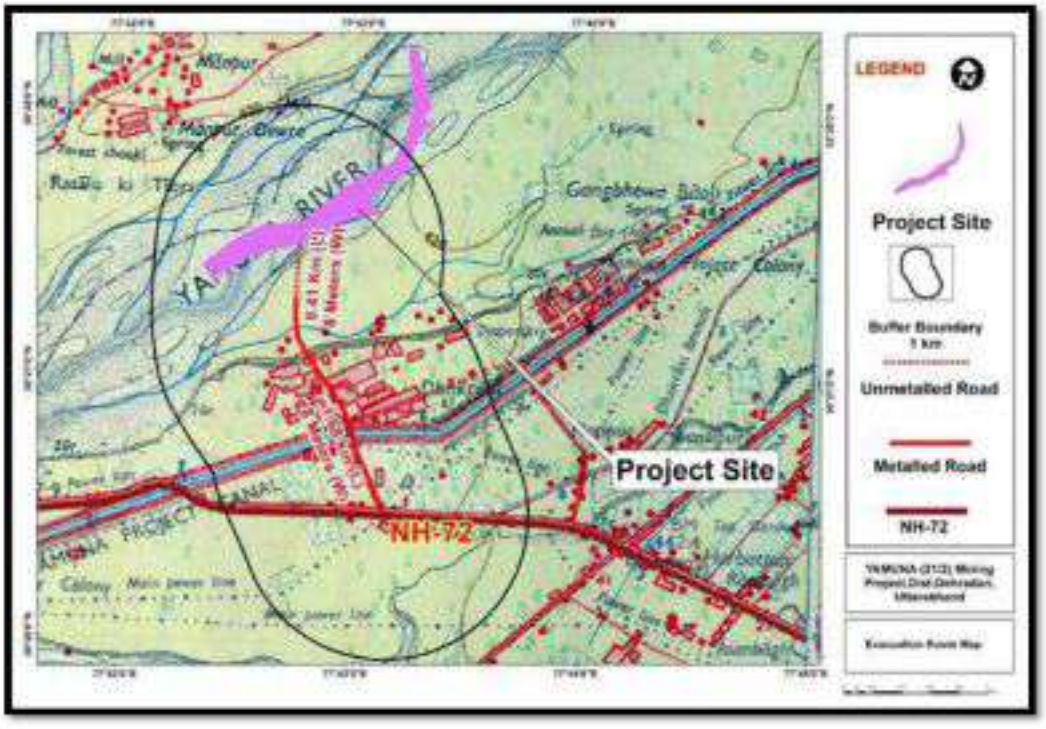
Prediction of impacts on air environment has been carried out employing mathematical model based on a steady state Gaussian plume dispersion model designed for area sources for short term. In the present case, Aermod View dispersion model based on steady state Gaussian plume dispersion, designed for area sources for short term and developed by United States Environmental Protection Agency [USEPA] has been used for simulations from point sources.

1.1.2.1 POLLUTANTS CONSIDERED FOR COMPUTATION

The model simulations deal with the major pollutants viz., Particulate Matters ($PM_{2.5}$, PM_{10}) emitted from the mining activity and SO2, CO & NOx etc. emitted from vehicular movement.

1.1.2.2 SOURCE STRENGTH ESTIMATION:

An emissions factor is a representative value that attempts to relate the quantity of a pollutant released to the atmosphere with an activity associated with the release of that pollutant.



The proposed mining activity includes various activities like ground preparation, excavation, handling and transport of ore.

These activities have been analyzed systematically basing on USEPA-Emission Estimation Technique Manual, for Mining AP-42, to arrive at possible emissions to the atmosphere and estimated emissions are given in **Table.**

Table: Estimated Emission Rates from Different Sources

Name of Mine	Quantity (MTPA)	Parameters for calculation of Emission Rates							
		Mining activity	Vehicular Movement						
		PM_{10}	Truck			PM	NOx	SO_2	CO
			Capacity (MT)	No. of Trips/ Hr	Road Length (km)				
River Yamuna 21/2	330000	0.5430	10	18	2.09	4.4E-04	3.6E-02	3.8E-04	9.8E-02

1.1.3 Modeling Procedure

Prediction of Ground Level Concentrations (GLC's) due to proposed mines has been made by Aermod View as per CPCB guidelines. Aermod View is US-EPA approved model to predict the air quality. The model uses rural dispersion and regulatory defaults options as per guidelines on air quality models (PROBES/70/1997-1998). The model assumes receptors on flat terrain.

1.1.3.1 Model Options Used For Computations

- The plume rise is estimated by Briggs formulae, but the final rise is always limited to that of the mixing layer;
- Buoyancy Induced Dispersion is used to describe the increase in plume dispersion during the ascension phase;
- Calms processing routine is used by default;
- Wind profile exponents is used by default, 'Irwin';
- Flat terrain is used for computations;
- It is assumed that the pollutants do not undergo any physico-chemical transformation and that there is no pollutant removal by dry deposition;
- Washout by rain is not considered
- Meteorological inputs required are hourly wind speed and direction, ambient temperature, stability class, and mixing height.

1.1.3.2 Mixing Height

As site specific mixing heights were not available, mixing heights based on IMD publication, "Atlas of Hourly Mixing Height and Assimilative Capacity of Atmosphere in India", has been considered for Aermod View model to establish the worst case scenario.

1.1.3.3 METEOROLOGICAL DATA

Data recorded at the continuous weather monitoring station on wind speed, direction, and temperature at one hour interval for the monitoring period was used as meteorological input.

1.1.3.4 GROUND LEVEL CONCENTRATION

The Maximum incremental concentrations for all the pollutants are given below:

S. No.	Pollutant	Maximum incremental Concentration (µg/m³)
Mining activity-Area source		
1.	PM	0.5430
Vehicular Movement-Line source		
2.	PM_{10}	4.4E-04
3.	SO_2	3.8E-04
4.	NOx	3.6E-02
5.	CO	9.8E-02

Isopleths showing incremental concentrations of all the pollutants viz. PM_{10}, SO2, NOx and CO were drawn for the distribution in the study area and is given in Figure below-

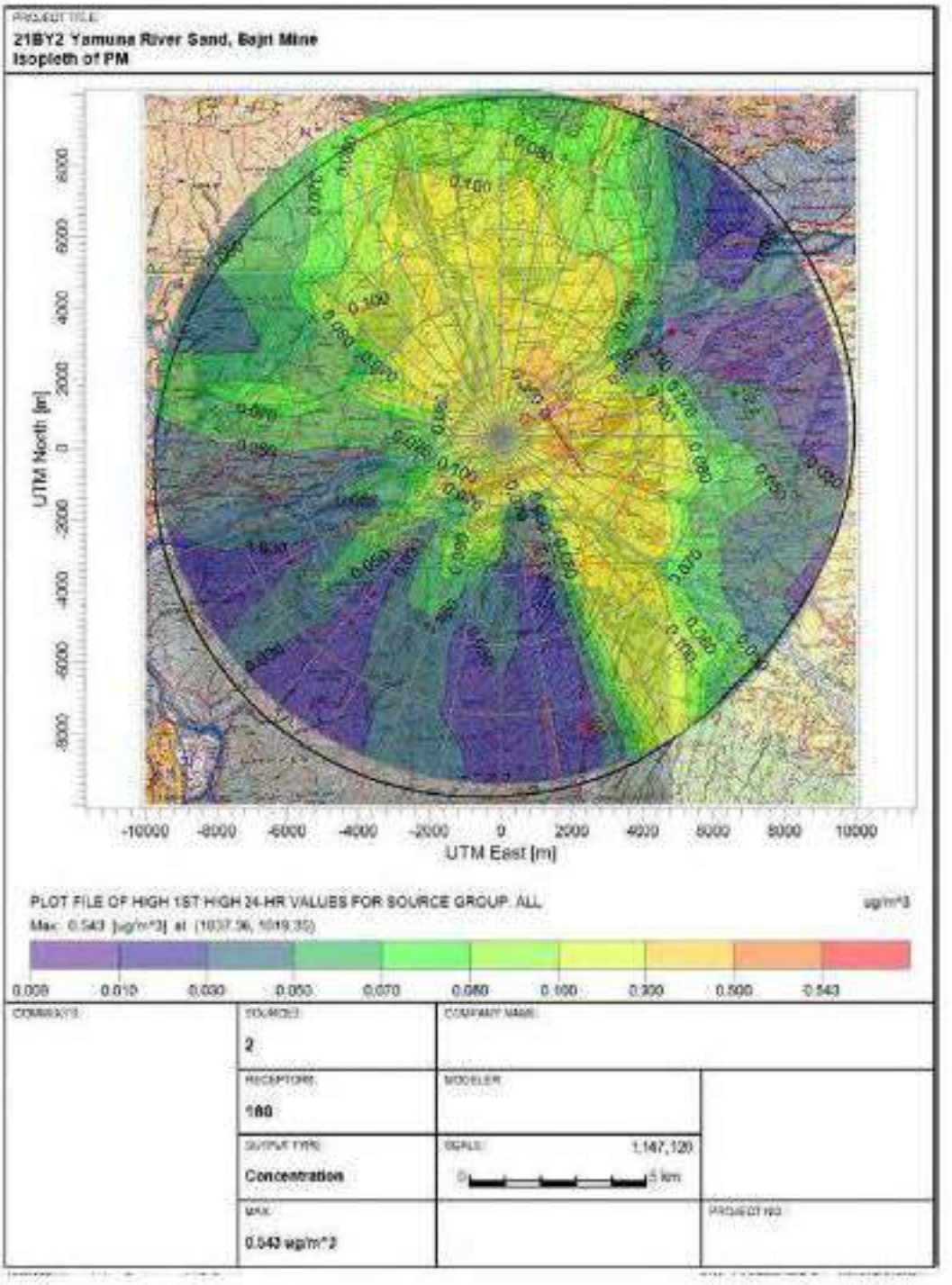


Figure: Isopleth showing cumulative incremental concentration of PM_{10} from mining activity in study area.

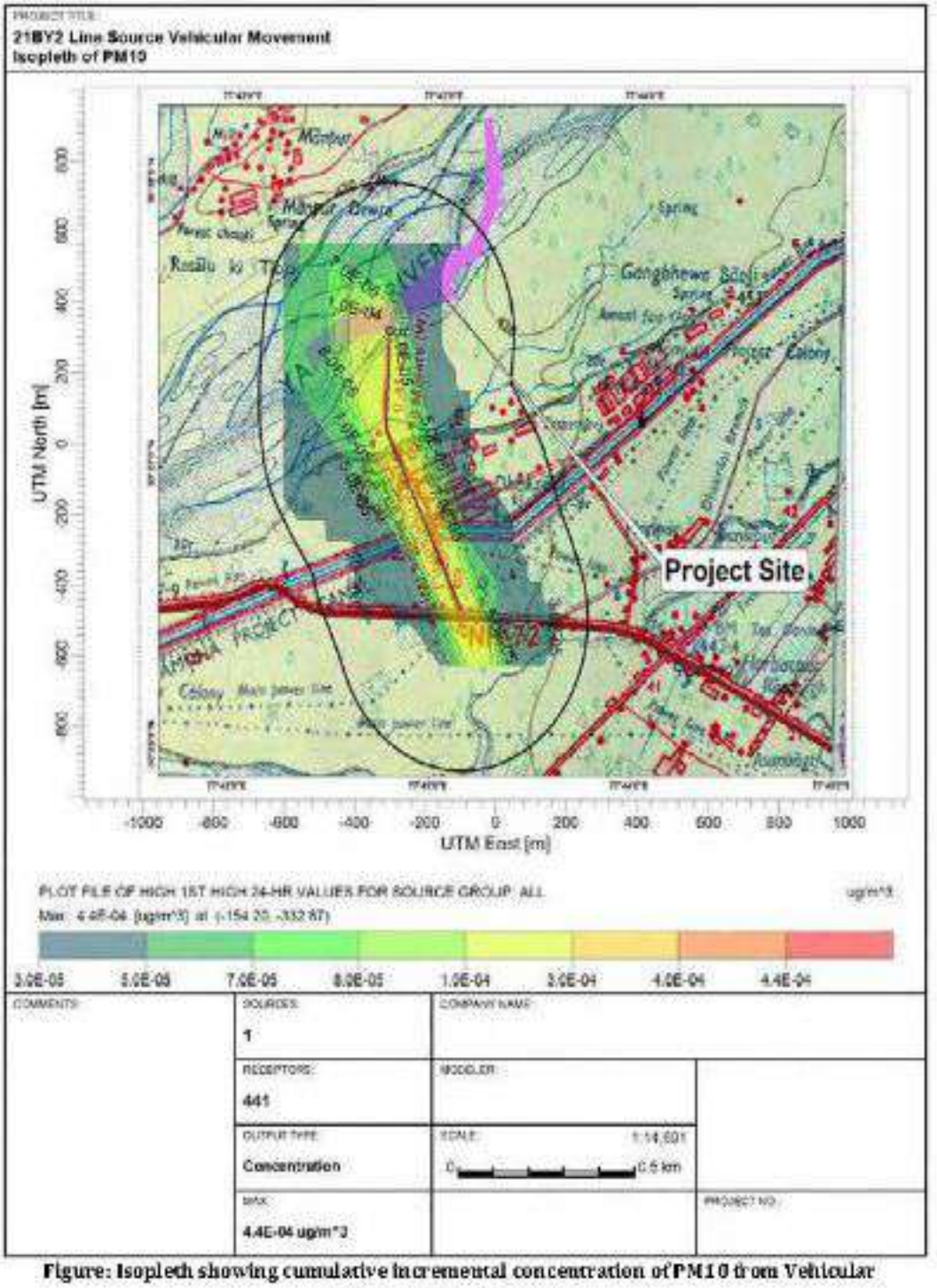


Figure: Isopleth showing cumulative incremental concentration of PM10 from Vehicular Movement in study area.

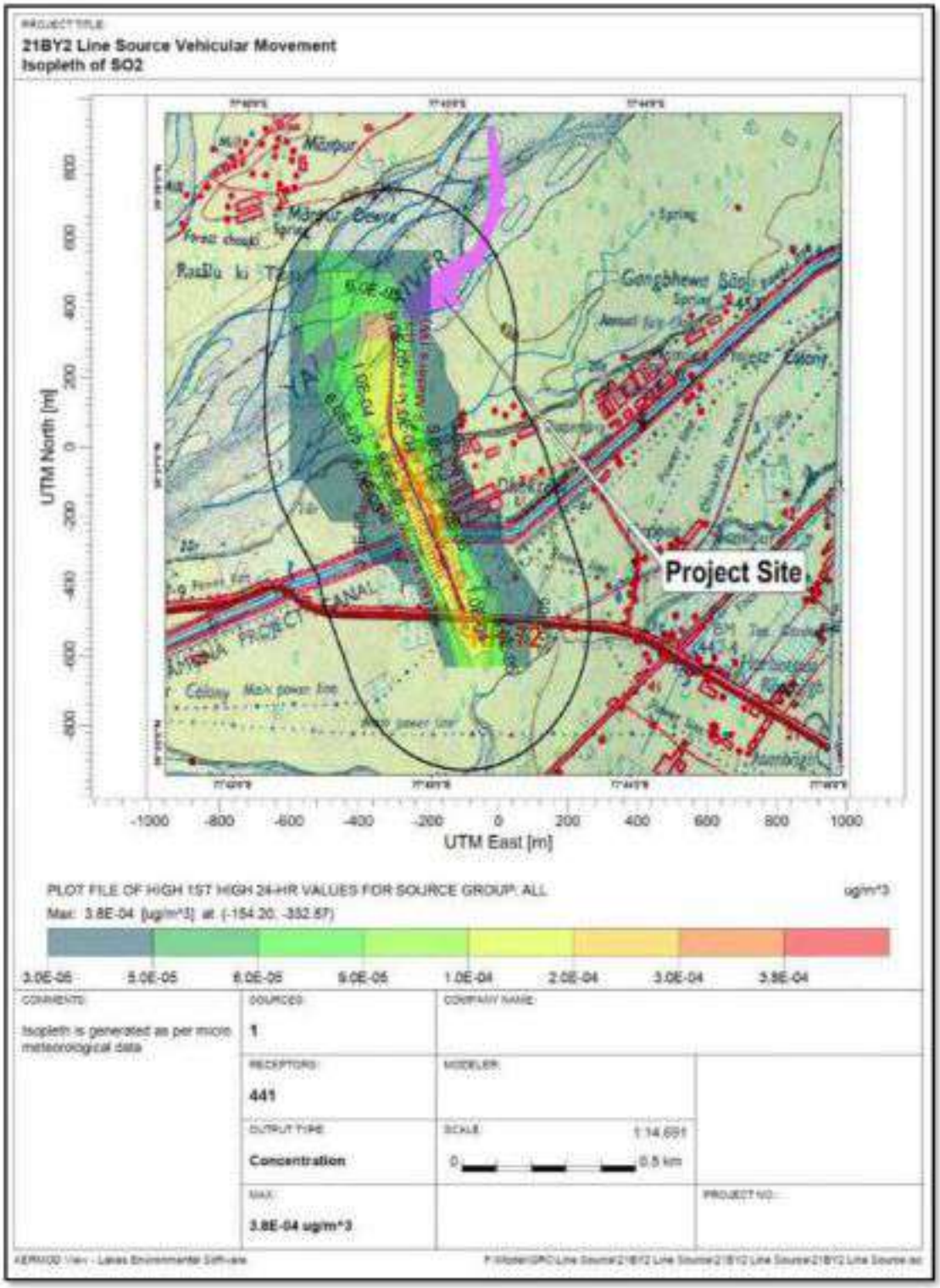


Figure: Isopleth showing cumulative incremental concentration of SO2 from Vehicular Movement in study area

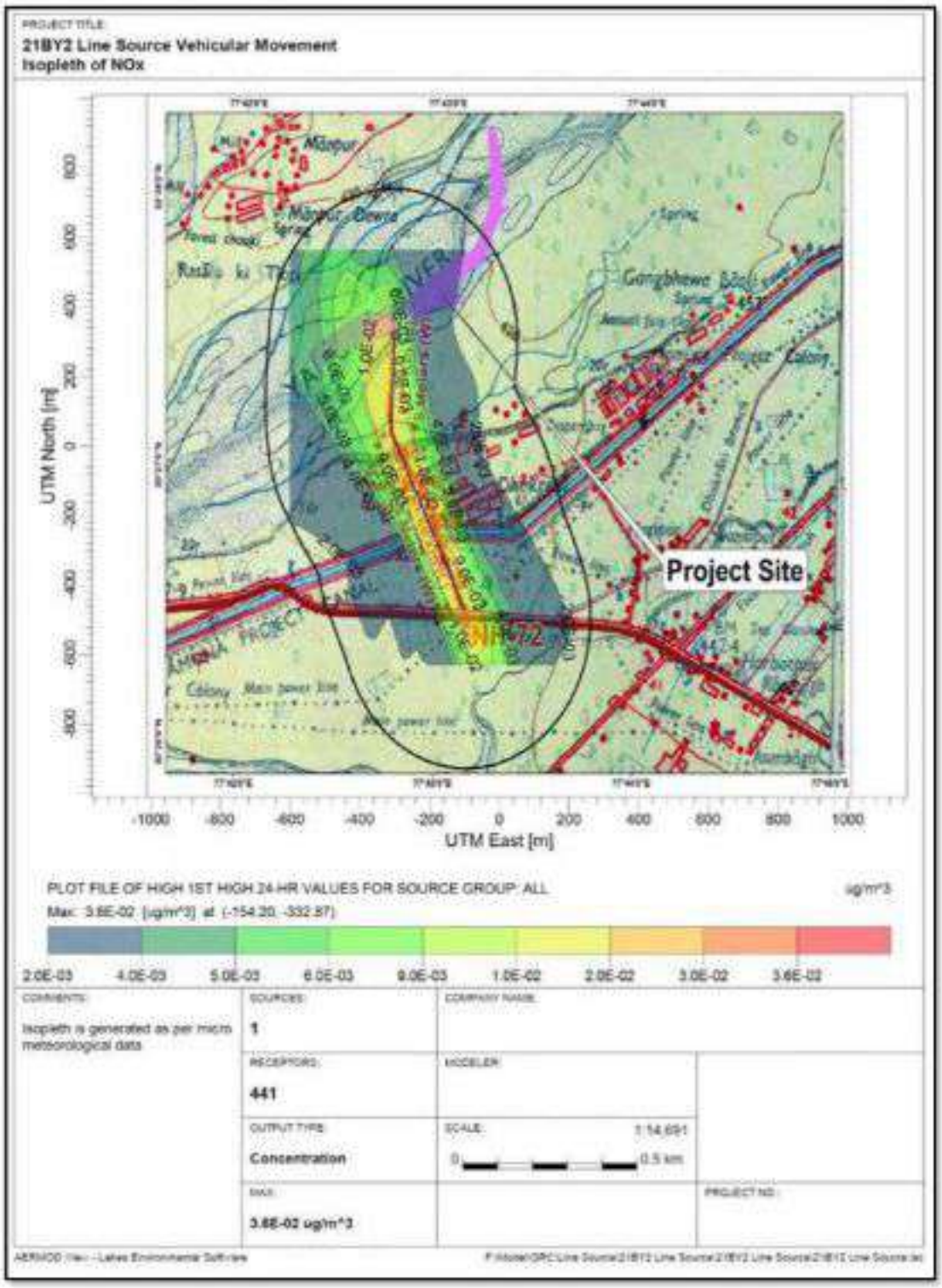


Figure: Isopleth showing cumulative incremental concentration of NOx from Vehicular Movement in study area.

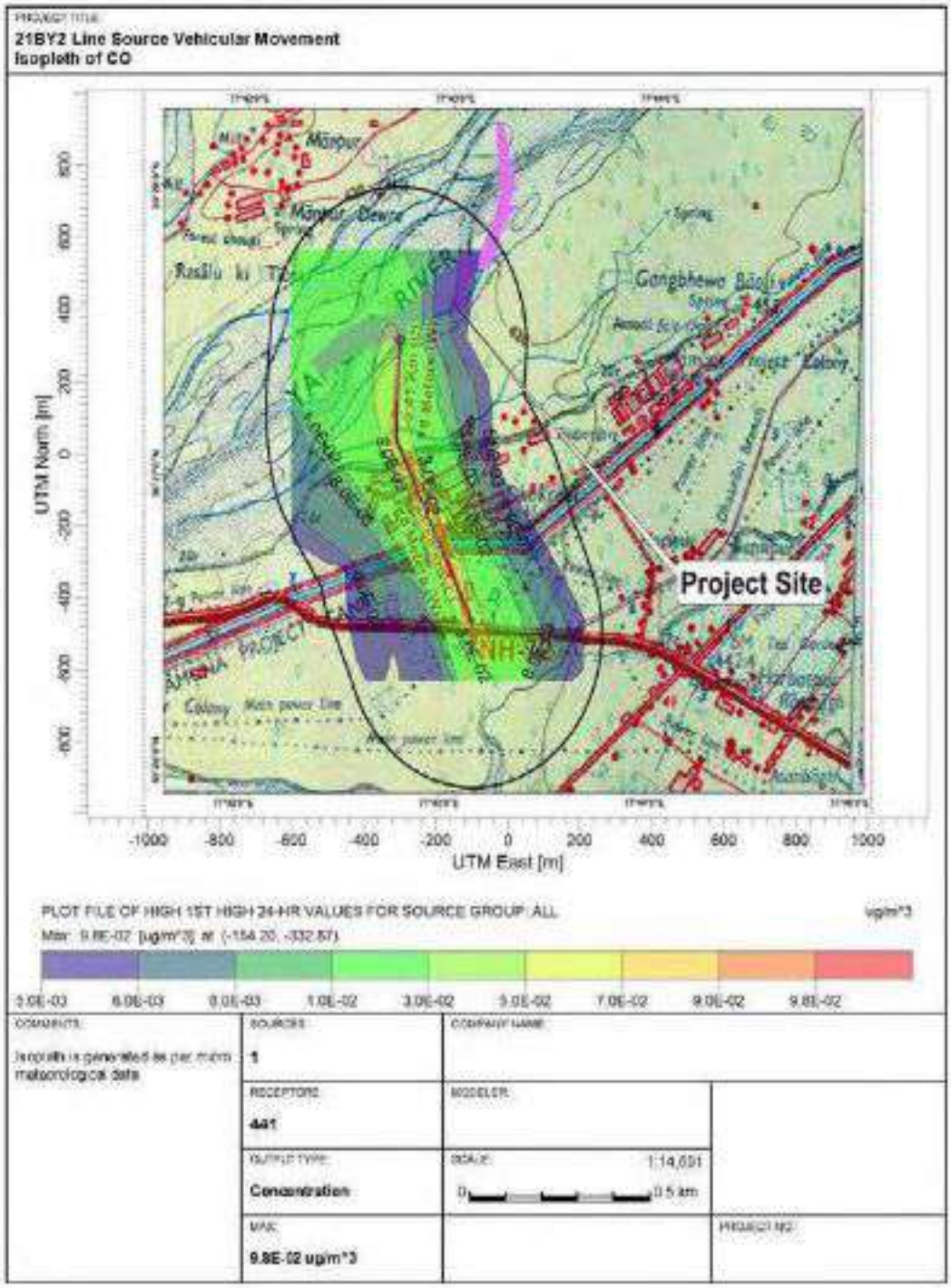


Figure: Isopleth showing cumulative incremental concentration of CO from Vehicular Movement in study area.

1.1.4 Presentation of results

1.1.4.1 Resultant Concentrations after Commencement of Mining Operations

Model simulations have been carried out using the hourly Triple Joint Frequency data viz., stability, wind speed, mixing height and temperature. Short-term simulations were carried to estimate concentrations at the receptors to obtain an optimum description of variations in concentrations over the site in 10-km radius covering 16 directions.

The maximum incremental GLCs for **PM_{10}** due to mining are found to be **0.5430µg/m³**, **$PM_{2.5}$** due to vehicular movement are found to be **4.4E-04 µg/m³**, **SO_2** due to vehicular movement are found to be **3.8E-04 µg/m³**, **NOx** vehicular movement are found to be **3.6E-02µg/m³** and **CO** vehicular movement are found to be **9.8E-02µg/m³**within the mine lease area. The maximum incremental GLCs are superimposed on the maximum baseline PM_{10} SO2, NOx, CO concentrations recorded during monitoring period i.e. post monsoon season 2013 to arrive at the likely resultant concentrations after implementation of the proposed mining. The cumulative concentrations (baseline + incremental) after implementation of the project are tabulated below in **Table**.

Table: Predicted Incremental Concentrations of PM, SO2, NOx and CO in Study Area

Site Code	Site Name	PM_{10} concentration (µg/m³)			NO_2 concentration (µg/m³)			SO_2 concentration (µg/m³)		
		Baseline	Incremental	Cumulative	Baseline	Incremental	Cumulative	Baseline	Incremental	Cumulative
A1	Kharowala	70.2	4.4	74.6	23.1	3.6	26.7	6.1	3.8	9.9
A2	Vikasnagar	86.2	4.4	90.6	20.9	3.6	24.5	6.1	3.8	9.9
A3	Bharotiwala	74.8	4.4	79.2	19.4	3.6	23.0	6.2	3.8	10.0
A4	Kunja Enam	75.0	4.4	79.4	21.5	3.6	25.1	6.1	3.8	9.9
A5	Project Site	71.2	4.4	75.6	21.0	3.6	24.6	6.1	3.8	9.9
	Maximum	**86.2**	**4.4**	**90.6**	**23.1**	**3.6**	**26.7**	**6.2**	**3.8**	**10.0**

The resultant concentrations of all the parameters viz. PM_{10}, SO_2, NOx, CO at all locations are well within the NAAQS standard limits.

Isopleths were drawn for the pollutant distribution in the area and are shown in

From the above, it could be clearly seen that due to effective implementation of various control measures, there will not be any significant impact on the ambient air quality in the region.

1.1.5 Mitigation Measures

A. **Haul Road:** -The long life WBM (Water Bound Macadam) haul roads will be constructed and maintained for traffic movement.

B. **Transport:** - The speed of dumpers/ trucks on haul road will be controlled as increased speed increases dust emissions. Overloading of transport vehicles will be avoided. The trucks/tippers will have sufficient free board. Spillage of ore on public roads will be cleared immediately and vehicles will play in safe speed.

C. **Green Belt:** - Planting of trees all along main mine haul road and regular grading of haul roads will be practiced to prevent the generation of dust due to movement of dumpers/trucks. Green belt of adequate width will be developed around the lease area. Plantation will also be done in dumping area, mineral stockyard.

Occupational Health and Safety in River Bed Mining: There is no environmental pollution due to the proposed mining as it is proposed to be manual extraction of Sand/Bajri on the banks of River. Hence there will be no major occupational health hazards. Occupational health and safety (OHS) is a cross-disciplinary area concerned with protecting the safety, health and welfare of people engaged in work or employment.

Occupational Health:

A. Pre Placement and Periodical Health Status

Pre /post-employment checkup will be carried out and following test will be conducted

- Hematological Test
- Biochemical Test
- Urine
- E C G
- Spirometer
- Audiometry
- Color Vision
- Medical Fitness from FMO
- Medical Record of Each Employee will be maintained and updated with finding

B. Frequency of Medical Examination

- For Mines Employee = Once in two Years
- For Skilled and Un-Skilled workers = Once in 6 Months

C. Personal Protective Devices and Measures

Mask for prevention of dust

- Ear Muff
- Safety Helmets
- Safety Belts
- Leather Hand Gloves
- Safety Shoes/Gum boots

Anticipated Occupational & Safety Hazards

- Musculo-skeletal disorder
- Noise Induced Hearing Losses
- Health impact due to diesel particulates from emission of diesel operated vehicles.
- Physical Activity
- Silicosis due to Sand/Bajri mining
- Dehydration
- Skin Disorder
- Dust Exposure

The Occupational Health Surveillance Program:
A team of qualified doctors and nurses will visit the site periodically for health checkup of all the workers, team and its record will be maintained properly.

Impact on Human Health
This project will have an impact on the human health due to sand, increased dust, creation of breeding grounds for disease vectors which might introduce new diseases in the area, and inadequate sanitation facilities may result in severe health Impact. Following measures can be taken to eradicate Impact of the project

Implementation of Occupational Health and Safety Measures
Occupational Health & Safety measures result in improving the conditions under which workers are employed and work. It improves not only their physical efficiency, but also provides protection to their life and limb. Management will consider the following safety measures:

- Predominantly mining activities will be opencast, manual mining to avoid accidental hazards.
- Dedicated safety team
- Inspection and maintenance of equipments and accessories
- Pre placement and periodic health check up
- Removal of unsafe conditions and prevention of unsafe acts
- Detailed analysis of each and every incident
- To provide standard PPEs and ensure its uses for mining safety
- Periodic inspection by internal and external safety experts
- Celebrations of various safety events for awareness
- Medical facilities & first aid boxes will be established in the mine premises.
- Pits, Sumps, openings in floor etc. which may be a source of danger, will be either securely covered or securely fenced. Securely fencing a pit means covering or fencing it in such a way that it ceases to be a source of danger.
- Health Awareness Programs and camps will be organized
- Under initial vocational training, the workers will be given training related to all safety and health aspects
- Special emphasis to the women health regarding the pre-natal and post-natal care will be looked into which is very much neglected in the rural areas.
- Awareness on safety and ensure using of personal protective equipments (PPE) by workers. The mine workers will be provided all necessary PPE, especially dust masks for their safe guard from dust, Ear Plugs/Ear Muffs for noise, boots etc. and measures for other hazards.

Budget for Occupational Health and Safety:

S. No.	Activities recommended for communities level services	Tentative cost (Lakh Rs)
1	Assistance to set up a temporary health center during the lease tenure.	**0.60**
2	Provide free health checkups & medicines to the nearby villagers of the project site.	**0.20**
3	Awareness campaigns regarding health issues in the nearby villages.	**0.50**
4	Health checkups & medicines to workers.	**3.80**
Total		**5.10**

The money for occupational health issues will be deposited with mining trust according to Mines and Mineral (Development and Regulation) Act 1957 dated 28th Dec, 1957 and Uttarakhand District Mineral Foundation Trust, 2017 dated 17th November, 2017.

Conclusion

River Bed Mining does not involve hazardous process with no risk related to Fire and Explosion. Hazard Identification and Risk Analysis (HIRA) shows no major Impact and can be mitigated with proper maintenance and use of PPE to avoid likely accidental scenario.

Annexure 12A

GARHWAL MANDAL VIKAS NIGAM LTD.
74/1 RAJPUR ROAD, DEHRADUN

E-Mail: gmvnl@gmvnl.com
gmvn@sancharnet.in
Ph :- 0135-2746817,2749308
Fax :- 2746847

Ref... 431 /2049 **Date:** 11-9-2014

To,

The Chief Wildlife Warden,
Government of Uttarakhand,
Wild life Institute 5, Chandrabhani,
Mohsbewala, Dehradun-248001

Subject: Authentication of the data for proposed sites- River Yamuna Lot no. 21/1, 21/2 and 21/3 at District: Dehradun, State: Uttarakhand by Garhwal Mandal Vikas Nigam for river bed mining in the allotted area.

This is for your kind information that the above mentioned project for mining of Sand, *Bajri* and Boulder lies in **Dehradun** district, State **Uttarakhand** has been applied for Environmental Clearance, for which relevant information of the study area is required to be authenticated:

- ✓ Asaan Conservation Reserve within 10km of the study area of the project site. The details are given as below:

S.No	Project Site	Distance (in km)	Direction
1	River Yamuna Lot No.-21/1	4.5 km	SW
2	River Yamuna Lot No.-21/2	3 km	SW
3	River Yamuna Lot No.- 21/3	2 km	W

- ✓ List of Flora & Fauna present in the study area (Enclosed).

Kindly authenticate the above information at your earliest for the finalization and submission of EIA/EMP report to the regulatory bodies for obtaining Environmental Clearance.

Thanking you.

Yours truly,

Managing Director

6

Phone & Fax no. 01360275052
e-mail : dfo_kalsi@rediffmail.com

कार्यालय–प्रभागीय वनाधिकारी, कालसी भूमि संरक्षण वन प्रभाग, कालसी।

पत्रांक–2465/9–2 दिनांक, कालसी, 20/4/ 2015.

सेवा में,

अपर प्रमुख वन संरक्षक /
मुख्य वन्य जीव प्रतिपालक,
उत्तराखण्ड, देहरादून।

विषय : Authentication of the data for proposed District, Dehradun State Uttarakhand by Garhwal Mandal Vikas Nigam for River bed mining in the allotted area.

संदर्भ : आपका पत्रांक 2801 / 12–1, दिनांक 17.04.2015

महोदय,

उपरोक्त संदर्भित पत्र द्वारा खनन लौटों की प्रतिलिपियाँ मूल में मय संलग्नकों सहित प्राप्त हुई हैं। गढ़वाल मण्डल विकास निगम द्वारा प्रस्तावित 10 किमी० की परिधि में अवस्थित खनन लौटों के सापेक्ष Flora & Fauna से सम्बन्धित अध्ययन रिपोर्ट (Study Report) को प्रमाणित (authenticate) कर सलग्न कर सेवा में प्रेषित किया जा रहा है।

संलग्नक : यथोपरि।

भवदीय,

(राम गोपाल)
प्रभागीय वनाधिकारी,
कालसी भू०सं० वन प्रभाग,
कालसी।

प्रतिलिपि प्रबन्ध निदेशक, गढ़वाल मण्डल विकास निगम, 74 / 1, राजपुर रोड, देहरादून को सूचनार्थ एवं आवश्यक कार्यवाही हेतु प्रेषित।

(राम गोपाल)
प्रभागीय वनाधिकारी,
कालसी भू०सं० वन प्रभाग,
कालसी।

List of Flora & Fauna for projects on River Yamuna

The following projects lies on **River Yamuna, District Dehradun, State Uttarakhand** at a stretch of approx 15 kms.

- **River Yamuna Lot no. 21/1**
- **River Yamuna Lot no. 21/2**
- **River Yamuna Lot no. 21/3**

The district supports moderately healthy vegetation, the main forest species are along the Shivalik foothills. The Buffer zone of the proposed project sites is drained with three main rivers, Yamuna on which the project located Aasan River flows from Dehradun and the Tons River which flows from north to south and borders Uttarakhand from Himachal.

D. F. O

General Vegetation Study of the area:

Area supports moderately healthy vegetation, the main forest species are along the Shivalik foothills. These area supports species of Sal *(Shorea robusta)*, Kachnar *(Bauhinia variegata)*, Haldu *(Adina cordifolia)*, Palash, Sisam *(Dalbergia sissoo)*, Kanji *(Holoptelia integrifolia)*, Khair *(Acacia catechu)*, Sagoon *(Tectona grandis)*, Harad *(Terminalia chebula)*, Bahera *(Terminalia belerica)*, Amla *(Embelica officinalis)*, Semal (Bombax ceiba), Rohini *(Mallotus philippensis)*, Sainjna *(Moringa oliofera)*, Kusum, Mango *(Mangifera indica)*, Poplar, Ficus spp., Jamun *(Syzygium cumini)*, Eucalyptus, Toon *(Toona ciliata)*, Bamboo spp. etc.

Ground vegetation mainly consists of grasses and small shrubs. Useful fodder grasses, Cynodon dactylon, Eleusine indica, Eulaliopsis binata, Trifolium alexandrinum, etc. can be seen growing in the area. The large weeds which infest uncultivated tracts are Aak (*Calotropis procera*), castor (*Ricinus communis*), Dhatura *(Datura metel)* and thorn *(Opuntia stricta)*. Other noxious weeds and those which appear in crops are Pohli or Thistle (*Carthamus oxyacantha*), ShialKanta *(Argemone mexicana)*, kandyari *(Solanum xanthocarpum)*, Lantana, Epitorium, Parthenium hysterophorus and Bhang (Cannabis sativa).

A list of flora of the study area is enclosed

Table: Flora of the Core zone

Sl.No.	Scientific Name	Family	Habit
1	*Ageratum conyzoides*	Asteraceae	Herb
2	*Amaranthus spinosus*	Amaranthaceae	Herb
3	*Calotropis procera*	Asclepiadaceae	Shrub
4	*Cannabis sativa*	Canabaceae	Herb
7	*Chenopodium album*	Chenopodiaceae	Herb
8	*Datura innoxia*	Solanaceae	Shrub
9	*Hydrolea zeylanica*	Hydrophylaceae	Herb
10	*Ipomoea carnea*	Convolvulaceae	Shrub

Table: Flora of the Buffer zone

Sl.No.	Species	Family	Hab
1	*Alternantheraparonychioides*	Amaranthaceae	Herb
2	*Alternantherapungens*	Amaranthaceae	Herb
3	*Amaranthus spinosus*	Amaranthaceae	Herb
4	*Colocasiaesculenta*	Araceae	Herb
5	*Ageratum conyzoides*	Asteraceae	Herb
6	*Grangea maderaspatana*	Asteraceae	Herb
7	*Parthenium hysterophorus*	Asteraceae	Herb
8	*Cassia tora*	Fabaceae	Herb
9	*Cannabis sativa*	Cannabaceae	Herb
10	*Chenopodium album*	Chenopodiaceae	Herb
11	*Argemone mexicana*	Papaveraceae	Herb
12	*Brachiaria ramosa*	Poaceae	Herb
13	*Cynodon dactylon*	Poaceae	Herb
14	*Eleusine indica*	Poaceae	Herb
15	*Eragrostistenella*	Poaceae	Herb
16	*Imperata cylindrica*	Poaceae	Herb
17	*Saccharum spontaneum*	Poaceae	Herb
18	*Physalis minima*	Solanaceae	Herb
19	*Adina cordifolia*	Rubiaceae	Tree
20	*Aegle marmelos*	Rutaceae	Tree
21	*Albizia lebbeck*	Fabaceae	Tree
22	*Anogeissus latifolia*	Combretaceae	Tree
23	*Artocarpus integrifolia*	Moraceae	Tree
24	*Azadirachta indica*	Meliaceae	Tree
25	*Bauhinia acuminata*	Fabaceae	Tree
26	*Bauhinia variegata*	Fabaceae	Tree
27	*Bombax ceiba*	Malvaceae	Tree
28	*Butea monosperma*	Fabaceae	Tree
29	*Cassia fistula*	Fabaceae	Tree

Sl.No.	Species	Family	Habit
30	*Celtis australis*	Cannabaceae	Tree
31	*Dalbergia sissoo*	Fabaceae	Tree
32	*Delonix regia*	Fabaceae	Tree
33	*Emblica officinalis*	Phyllanthaceae	Tree
34	*Ficus racemosa*	Moraceae	Tree
35	*Ficus religiosa*	Moraceae	Tree
36	*Ficus tomentosa*	Moraceae	Tree
37	*Garuga pinnata*	Burseraceae	Tree
38	*Grewia optiva*	Tiliaceae	Tree
39	*Holoptalia integrifolia*	Ulmaceae	Tree
40	*Indigofera gerardiana*	Fabaceae	Tree
41	*Litchi chinensis*	Sapindaceae	Tree
42	*Leucaena leucocephala*	Fabaceae	Tree
43	*Mangifera indica*	Anacardiaceae	Tree
44	*Melia azedarach*	Meliaceae	Tree
45	*Morus alba*	Moraceae	Tree
46	*Nyctanthes arbor*	Oleaceae	Tree
47	*Ougeinia oojeinensis*	Fabaceae	Tree
48	*Polyalthia longifolia*	Annonaceae	Tree
49	*Ricinus communis*	Euphorbiaceae	Tree
50	*Shorea robusta*	Dipterocarpaceae	Tree
51	*Tectona grandis*	Lamiaceae	Tree
52	*Terminalia belerica*	Combretaceae	Tree
53	*Terminalia chebula*	Combretaceae	Tree
54	*Toona ciliata*	Meliaceae	Tree
55	*Adina cordifolia*	Rubiaceae	Tree
56	*Aegle marmelos*	Rutaceae	Tree
57	*Albizia lebbeck*	Fabaceae	Tree
58	*Anogeissus latifolia*	Combretaceae	Tree
59	*Artocarpus integrifolia*	Moraceae	Tree

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Sl.No.	Species	Family	Habit
60	*Azadirachta indica*	Meliaceae	Tree
61	*Bauhunia acuminata*	Fabaceae	Tree
62	*Bauhinia variegata*	Fabaceae	Tree
63	*Bombax ceiba*	Malvaceae	Tree
64	*Butea monosperma*	Fabaceae	Tree

Wild life of the study area:

There are many river channels present in the buffer zone of study area which are the major attraction sites for avifauna. Buffer zone of project area comprises of **Aasan Conservation Reserve**, and supports healthy aquatic bird population. It is famous for winter migratory birds, almost 140 bird species were identified during the field work, majority of these are migratory aquatic birds. No wild mammalian species encountered during the field visit to study area, while livestock of local people are significantly using the area.

A list of Fauna of the study area is presented in Tables below:

Table: Fauna of the Core zone

Sr. No.	Common Name	Scientific Name	Wildlife schedule	IUCN Red List Status
		AVIFAUNA		
1	Common Myna	*Acridotheres tristis*	IV	LC
2	Indian Cormorant	*Phalacrocorax fusicollis*	IV	VU
3	House Crow	*Corvus splendens*	V	LC
4	Ashy Drongo	*Dicrurus leucophaeus*	IV	LC
5	Koel	*Eudynamys scolopacea*	IV	NA
6	Sparrow	*Passer domesticus*	IV	LC
		MAMMALS		
1	Squirrel	*Funambulus pennant*	IV	DD
2	Rat	*Rattus rattus*	V	LC
		AMPHIBIANS		
1	Common Indian toad	*Duttaphrynus melanostictus*	IV	NA
2	Indian skipper frog	*Euphlyctis cyanophlyctis*	IV	NA

3	Indian bull frog	*Haplobatrachus tigerinus*	IV	NA

LC: Least Concern, VU: Vulnerable, NA: Not Assessed, DD: Data deficient.

Table: Fauna of the Buffer zone

S.No.	Common Name	Scientific name	IWPA	IUCN
		MAMMALS		
1	Squirrel	*Funambulus pennant*	IV	DD
2	Rat	*Rattus rattus*	V	LC
3	Wild pig	*Sus scrofa*	III	LC
4	Goral	*Naemorhedus goral*	III	LC
5	Nilgai	*Boselaphus tragocamelus*	III	LC
6	Spotted Deer	*Axis axis*	II	LC
7	Rhesus Macaque	*Macaca mulatta*	II	LC
8	Indian Grey Mongoose	*Herpestes edwardsii*	IV	LC
		REPTILES & AMPHIBIANS		
1	Common Toad	*Duttaphrynus melanostictus*	IV	NA
2	India bull frog	*Ranatigrina*	IV	DD
3	Indian tree frog	*Polypedatesmaculatus*	IV	NA
4	Skipping frog	*Bufo stomaticus*	IV	NA
5	Garden lizard	*Calotes versicolor*		NA
6	House lizard	*Hemidactylussp*	IV	NA
7	Rat snakes	*Ptyas mucosa*	II	NA
		FISHES		
1	Bhangan or Bata	*Labeo bata*		
2	Chappera or Palla	*Gudusia chapara*		
3	Dumra or Dhambra	*Labeo rohita*		
4	Pari or Battu	*Notopterus notopterus*		
5	Thcila	*Catla catla*		
6	Mangur	*Clarius batrachus*		
		AVIFAUNA		
S.No.	Common Name	Scientific name	IWPA	IUCN
1	Jungle Myna	*Acridotheres fuscus*	IV	LC
2	Bank Myna	*Acridotheres ginginianus*	IV	LC
3	Common Myna	*Acridotheres tristis*	IV	LC
4	Blyth's Reed Warbler	*Acrocephalusdumetorum*	IV	LC

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S.No.	Common Name	Scientific name	IWPA	IUCN
5	Clamorous Reed Warbler	*Acrocephalusstentoreus*	IV	LC
6	Common Sandpiper	*Actitishypoleucos*	IV	LC
7	Common Iora	*Aegithinatiphia*	IV	LC
8	Crimson Sunbird	*Aethopygasiparaja*	IV	LC
9	Common Kingfisher	*Alcedoatthis*	IV	LC
10	Red Avadavat	*Amandavaamandava*	IV	LC
11	White-breasted Waterhen	*Amaurornisphoenicurus*	IV	LC
12	Northern Pintail	*Anas acuta*	IV	LC
13	Northern Shoveler	*Anasclypeata*	IV	LC
14	CommonTeal	*Anascrecca*	IV	LC
15	Falcated Duck	*Anasfalcata*	IV	LC
16	Eurasian Wigeon	*Anaspenelope*	IV	LC
17	Mallard	*Anasplatyrhynchos*	IV	LC
18	Spot-billed Duck	*Anaspoecilorhyncha*	IV	LC
19	Gadwall	*Anasstrepera*	IV	LC
20	Darter	*Anhinga melanogaster*	IV	LC
21	Greater White-fronted Goose	*Anseralbifrons*	IV	LC
22	Greylag Goose	*Anseranser*	IV	LC
23	Lesser White-fronted Goose	*Ansererythropus*	IV	LC
24	Bar-headed Goose	*Anserindicus*	IV	LC
25	Rosy Pipit	*Anthusroseatus*	IV	LC
26	Water Pipit	*Anthusspinoletta*	IV	LC
27	Tree Pipit	*Anthustrivialis*	IV	LC
28	House Swift	*Apusaffinis*	IV	LC
29	Common Swift	*Apusapus*	IV	LC
30	Grey Heron	*Ardeacinerea*	IV	LC
31	Purple Heron	*Ardea purpurea*	IV	LC
32	Indian Pond Heron	*Ardeola grayii*	IV	LC
33	Spotted Owlet	*Athenebrama*	IV	LC
34	Baer's Pochard	*Aythyabaeri*	IV	LC
35	Common Pochard	*Aythyaferina*	IV	LC
36	Tufted Duck	*Aythyafuligula*	IV	LC

S.No.	Common Name	Scientific name	IWPA	IUCN
37	Ferruginous Pochard	*Aythyanyroca*	IV	LC
38	Cattle Egret	*Bubulcus ibis*	IV	LC
39	Yellow-breasted Greenfinch	*Carduelisspinoides*	IV	LC
40	Common Rosefinch	*Carpodacuserythrinus*	IV	LC
41	Greater Coucal	*Centropussinensis*	IV	LC
42	Pied Kingfisher	*Ceryle rudis*	IV	LC
43	White-capped Water Redstart	*Chaimarromisleucocephalus*	IV	LC
44	Long-tailed Duck	*Clangulahyemalis*	IV	LC
45	Rock pigeon	*Columba livia*	IV	LC
46	Oriental Magpie Robin	*Copsychussaularis*	IV	LC
47	Indian Roller	*Coracias benghalensis*	IV	LC
48	HouseCrow	*Corvus splendens*	IV	LC
49	Northern House Martin	*Delichonurbica*	IV	LC
50	RufousTreepie	*Dendrocittavagabunda*	IV	LC
51	Yellow-crowned Woodpecker	*Dendrocoposmahrattensis*	IV	LC
52	Lesser Whistling Duck	*Dendrocygna javanica*	IV	LC
53	Ashy Drongo	*Dicrurus leucophaeus*	IV	LC
54	Black Drongo	*Dicrurus macrocercus*	IV	LC
55	Black-rumped Flameback	*Dinopiumbenghalense*	IV	LC
56	Little Egret	*Egrettagarzetta*	IV	LC
57	Great Thick-knee	*Esacusrecurvirostris*	IV	LC
58	Asian Koel	*Eudynamys scolopacea*	IV	LC
59	Verditer Flycatcher	*Eumyiasthalassina*	IV	LC
60	Common Coot	*Fulicaatra*	IV	LC
61	Common Moorhen	*Gallinulachloropus*	IV	LC
62	Jungle Owlet	*Glaucidiumradiatum*	IV	LC
63	White-throated Kingfisher	*Halcyon smyrnensis*	IV	LC
64	Common Hawk Cuckoo	*Hierococcyxvarius*	IV	LC
65	Black-winged Stilt	*Himantopushimantopus*	IV	LC
66	Red-rumped Swallow	*Hirundo daurica*	IV	LC
67	Streak-throated Swallow	*Hirundofluvicola*	IV	LC
68	Pheasant-tailed Jacana	*Hydrophasianuschirurgus*	IV	LC
69	Brown-headed Gull	*Larusbrunnicephalus*	IV	LC

प्रस्तावित

S.No.	Common Name	Scientific name	IWPA	IUCN
70	Pallas's Gull	*Larusichthyaetus*	IV	LC
71	Black-headed Gull	*Larusridibundus*	IV	LC
72	Black-tailed Godwit	*Limosalimosa*	IV	LC
73	Indian Silverbill	*Lonchuramalabarica*	IV	LC
74	Scaly-breasted Munia	*Lonchurapunctulata*	IV	LC
75	Marbled Duck	*Marmaronettaangustirostris*	IV	LC
76	Crested Kingfisher	*Megaceryleleugubris*	IV	LC
77	Coppersmith Barbet	*Megalaimahaemacephala*	IV	LC
78	Lineated Barbet	*Megalaimalineata*	IV	LC
79	Brown-headed Barbet	*Megalaima zeylanica*	IV	LC
80	Crested Bunting	*Melophuslathami*	IV	LC
81	Green Bee-eater	*Merops orientalis*	IV	LC
82	Blue-tailed Bee-eater	*Merops philippinus*	IV	LC
83	Black Kite	*Milvusmigrans*	IV	LC
84	Blue-capped Rock Thrush	*Monticolacinclorhynchus*	IV	LC
85	Blue Rock Thrush	*Monticolasolitarius*	IV	LC
86	White Wagtail	*Motacilla alba*	IV	LC
87	Grey Wagtail	*Motacillacinerea*	IV	LC
88	Painted Stork	*Mycteria leucocephala*	IV	LC
89	Purple Sunbird	*Nectariniaasiatica*	IV	LC
90	Red-crested Pochard	*Nettarufina*	IV	LC
91	Cotton Pygmy-goose	*Nettapuscoromandelianus*	IV	LC
92	Eurasian Curlew	*Numeniusarquata*	IV	LC
93	House Sparrow	*Passer domesticus*	IV	LC
94	Scarlet Minivet	*Pericrocotusflammeus*	IV	LC
95	Great Cormorant	*Phalacrocorax carbo*	IV	LC
96	Indian Cormorant	*Phalacrocorax fuscicollis*	IV	LC
97	Little Cormorant	*Phalacrocorax niger*	IV	LC
98	Tickell's Leaf Warbler	*Phylloscopusaffinis*	IV	LC
99	Lemon-rumped Warbler	*Phylloscopuschloronotus*	IV	LC
100	Hume's Warbler	*Phylloscopushumei*	IV	LC
101	Greenish Warbler	*Phylloscopustrochiloides*	IV	LC
102	Grey-headed Woodpecker	*Picuscanus*	IV	LC

S.No.	Common Name	Scientific name	IWPA	IUCN
103	Baya Weaver	*Ploceusphilippinus*	IV	LC
104	Plain Prinia	*Prinianamata*	IV	LC
105	Black Ibis	*Pseudibispapillosa*	IV	LC
106	Plum-headed Parakeet	*Psittacula cyanocephala*	IV	LC
107	Alexandrine Parakeet	*Psittacula eupatria*	IV	LC
108	Rose-ringed Parakeet	*Psittacula krameri*	IV	LC
109	Red-vented Bulbul	*Pycnonotuscafer*	IV	LC
110	Himalayan Bulbul	*Pycnonotusleucogenys*	IV	LC
111	Pied Avocet	*Recurvirostraavosetta*	IV	LC
112	Plumbeous Water Redstart	*Rhyacornisfuliginosus*	IV	LC
113	Plain Martin	*Ripariapaludicola*	IV	LC
114	Sand Martin	*Ripariariparia*	IV	LC
115	Grey Bushchat	*Saxicolaferrea*	IV	LC
116	Common Stonechat	*Saxicolatorquata*	IV	LC
117	River Tern	*Sterna aurantia*	IV	LC
118	Spotted Dove	*Streptopelia chinensis*	IV	LC
119	Asian Pied Starling	*Sturnus contra*	IV	LC
120	Brahminy Starling	*Sturnus pagodarum*	IV	LC
121	Little Grebe	*Tachybaptusruficollis*	IV	LC
122	Ruddy Shelduck	*Tadorna ferruginea*	IV	LC
123	Common Shelduck	*Tadornatadorna*	IV	LC
124	Common Wood shrike	*Tephrodornispondicerianus*	IV	LC
125	Asian Paradise-flycatcher	*Terpsiphoneparadisi*	IV	LC
126	Spotted Redshank	*Tringaerythropus*	IV	LC
127	Marsh Sandpiper	*Tringastagnatilis*	IV	LC
128	Common Redshank	*Tringatotanus*	IV	LC
129	Common Babbler	*Turdoidescaudatus*	IV	LC
130	Jungle Babbler	*Turdoidesstriatus*	IV	LC
131	Barred Buttonquail	*Turnixsuscitator*	IV	LC
132	Common Hoopoe	*Upupa epops*	IV	LC
133	River Lapwing	*Vanellusduvaucelii*	IV	LC
134	Red-wattled Lapwing	*Vanellusindicus*	IV	LC
135	Oriental White-eye	*Zosteropspalpebrosus*	IV	LC

LC: 136Least Concern, NA: Not Assessed, DD: Data deficient

D.F.O

Annexure 12B

कार्यालय प्रमुख वन संरक्षक (वन्यजीव)/मुख्य वन्यजीव प्रतिपालक, उत्तराखण्ड
86–रायपुर रोड, देहरादून (उत्तराखण्ड), फोन नं0–0135–2742604 फैक्स–2745601 ई–मेल– cwlwua@yahoo.co.in

संख्या 2349 /12-1 देहरादून दिनांक 18 दिसम्बर 2018 पत्रांक

सेवा में,

महाप्रबन्धक,खनन
गढ़वाल मण्डल विकास निगम लि0
उत्तराखण्ड,देहरादून

विषयः– गढ़वाल मण्डल विकास निगम लि0 को वन प्रभाग, कालसी जनपद देहरादून के क्षेत्रान्तर्गत आवंटित राजस्व लॉटों के कंजरवेसन प्लान को प्रमाणित करने के सम्बन्ध में।

सन्दर्भः– आपका पत्रांक 614/दस/पांच–01(2018–19)दिनांक 17/10/2018

महोदय,

उपरोक्त संदर्भित पत्र के क्रम में राजस्व चुगान लॉटों **क्रमशः 34.940 व 30.035** हेतु प्राप्त कंजरवेसन प्लान का परीक्षण कर प्रभागीय वनाधिकारी,भूमि संरक्षण वन प्रभाग,कालसी द्वारा अपने कार्यालय के पत्रांक 1565/12–1 दिनांक 04/02/2019 से इस कार्यालय को उपलब्ध कराये गये हैं, जिन्हें हस्ताक्षरित कर इस पत्र के साथ संलग्न कर मूल में आपको अग्रेत्तर कार्यवाही हेतु प्रेषित किये जाते हैं।

संलग्नः– यथोपरि (दो मूल में)

भवदीय,

18.02.2019.

(मोनिष मल्लिक)
प्रमुख वन संरक्षक (वन्य जीव)/मुख्य वन्य जीव प्रतिपालक, उत्तराखण्ड

15/2/19

संख्या 2349 (1)/12-1 दिनांकित।

प्रतिलिपि प्रभागीय वनाधिकारी,भूमि संरक्षण वन प्रभाग, कालसी को उपरोक्त प्लान की एक–एक प्रति मूल में हस्ताक्षरित कर अग्रेत्तर कार्यवाही हेतु प्रेषित।

यथोपरिः– (दो मूल में)

18.02.2019.

(मोनिष मल्लिक)
प्रमुख वन संरक्षक (वन्य जीव)/मुख्य वन्य जीव प्रतिपालक, उत्तराखण्ड।

15/2/19

OK

Phone & Fax no. 01360275052
e-mail : dfoscalsi-forest-uk@nic.in

कार्यालय–प्रभागीय वनाधिकारी, कालसी–भूमि संरक्षण वन प्रभाग, कालसी।

पत्रांक– 1598/12-1 , दिनांक, कालसी, 04-02-2019.

सेवा में,

प्रमुख वन संरक्षक (वन्यजीव)/
मुख्य वन्यजीव प्रतिपालक,
उत्तराखण्ड, देहरादून।

विषय : गढ़वाल मण्डल विकास निगम लि० को वन प्रभाग कालसी, जनपद–देहरादून क्षेत्रान्तर्गत आवंटित राजस्व लॉटों के कन्जरवेशन प्लॉन को प्रमाणित/स्वीकृत करने विषयक।

सन्दर्भ : आपका पत्रांक–1198/12–1, दिनांक 30.10.2018.

महोदय,

उपरोक्त विषयक सन्दर्भित पत्र के क्रम में अवगत कराना है कि गढ़वाल मण्डल विकास निगम लि० के राजस्व उपखनिज लॉट संख्या–21/2 (ढकरानी) एवं लॉट संख्या–23/1 (डुमेट) के अन्तर्गत शैड्यूल I व II के उक्त पत्र के माध्यम से प्राप्त प्राणियों व पादपों के संरक्षण की योजना का परीक्षणोपरान्त पाई गई कमियों का निराकरण करते हुए उक्त प्लान को स्वीकृत/प्रमाणित कर इस पत्र के साथ संलग्न कर प्रेषित किया जा रहा है। पूर्व प्रेषित प्लॉन की प्रतियां भी सुलभ सन्दर्भ हेतु संलग्न हैं।

कन्जरवेशन प्लान में उल्लिखित भौतिक कार्यों का सम्पादन उत्तराखण्ड डिस्ट्रिक्ट मिनरल फाउण्डेशन ट्रस्ट–2017 दिनांक नवम्बर 2017 में जमा रॉयल्टी में से किया जाना है। उत्तराखण्ड डिस्ट्रिक्ट मिनरल फाउण्डेशन ट्रस्ट 2017 में उपखनिज रॉयल्टी का 25 प्रतिशत भाग खनन कार्य से उत्पन्न विपरीत प्रभाव की रोकथाम के लिए व्यय किया जाएगा, जिसमें वृक्षारोपण व वन्यजीव सुरक्षा महत्वपूर्ण घटक हैं।

कन्जर्वेशन प्लान में दर्शाय भौतिक कार्य पर्यावरणीय स्वीकृति प्राप्त होने पर खनन कार्य प्रारम्भ होने के उपरान्त किया जाएगा। उल्लेखनीय है कि कन्जर्वेशन प्लान प्रस्तुत करने के उपरान्त ही पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय के समक्ष पर्यावरणीय स्वीकृति निर्गत की जा सकेगी।

संलग्नक : यथोपरि।

श्री पवन जोशी
कृपया अनुश्रवण करें।
6/2

भवदीय,

प्रभागीय वनाधिकारी,
कालसी भू०सं० वन प्रभाग,
कालसी।

प्रतिलिपि : महाप्रबन्धक, खनन, 74/1, राजपुर रोड, गढ़वाल मण्डल विकास निगम लि०, देहरादून को सूचनार्थ प्रेषित।

प्रभागीय वनाधिकारी,
कालसी भू०सं० वन प्रभाग,
कालसी।

Revenue New1546
- Raja

CONSERVATION PLAN OF SCHEDULE- II SPECIES

FOR

RIVERBED MINING PROJECT OF RIVER YAMUNA, LOT NO. 21/2, SAND, BAJRI AND BOULDER MINING PROJECT (AREA 34.940 Ha)

LOCATED IN VILLAGE: DHAKRANI, TEHSIL: VIKSNAGAR & DEHRADUN, DISTRICT: DEHRADUN, UTTARAKHAND.

KALSI FOREST DIVISION,

DISTRICT DEHRADUN UTTARAKHAND, INDIA

(Present Conservation Plan has been prepared with respect to
Over-load Mining in [illegible] Land)

Prepared by

GRASS ROOTS RESEARCH & CREATION INDIA (P) LTD.

(An ISO 9001:2008 Certified Co.: Accredited by QCI / NABET: Approved by MoEF&CC, GoI)

&

GRC INDIA TRAINING & ANALYTICAL LABORATORY

[Accredited by NABL, Recognized by MoEF&CC, GoI]

A unit of GRC India

2018

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Biodiversity conservation plan is developed with the aim to reduce adverse impact on the natural habitat of various wild animals. Day by day issues related to the threats to natural terrestrial and aquatic ecosystems arises due to high anthropogenic activities and loss of natural habitat due to climate change.

Today, when wildlife habitats are under severe pressure and a large number of species of wild fauna have become endangered, the effective conservation of wild animals is of great significance. Because every one of us depends on plants and animals for all vital components of our welfare. Presence or absence of an animal or plant in a region is determined by ecological and historical factors. Animals and plants are living indicators of the characteristics of their environment, their ranges mark the places where environmental conditions are the same or similar. To interpret the range of a species properly, it is necessary to know, in detail, the conditions required for the species to live and thrive (Hundal, 2004).

Conservation is the practice of protecting wild plant and animal species and their habitats. The goal of wildlife conservation is to ensure that nature will be enjoyed for future generations to enjoy and also to recognize the importance of wildlife and wilderness for humans and other species alike (CARE, 2012).

A conservation plan is needed for the conservation of critical habitats of wildlife and endangered and Schedule II species along with their scientific management strategy. During the mining and construction activities, natural resources (Land, Biodiversity, Forest, animals and Humans) are likely to exert tremendous pressure due to various activities in the respective region while the present management plan will ensure mitigation of such impacts.

1.1. History of Wildlife Conservation in Uttarakhand

Uttarakhand state is situated at30°15' N and 79°15' E in the northern part of India. It has eminent history in wildlife conservation as the first national park in India was declared in 1935 which is famous as Jim Corbett National Park and situated in Uttarakhand. The park is declared protected to conserve wildlife and nature. Since Independence, there has been a steady rise in the number of National Parks and Wildlife Sanctuaries, especially after the enactment of the Wildlife Protection Act in 1972. There are currently about 7-Wildlife Sanctuary and 7-National parks have been declared in Uttarakhand (WII).

The Northwestern Himalayan region forms an important zoogeographical region in the Himalayas. Uttarakhand is also a part of the northwestern Himalaya segment which is the home of a variety of plant species and wildlife taxa, including two endangered species of big cats-Snow Leopard (*Panthera uncia*) in its great or higher Himalayan landscapes, Bengal Tiger (*Panthera tigris tigris*) of

Rajaji and Corbett National Parks in its outer or sub-Himalayan foot hill habitat; one endangered deer species- Himalayan musk deer (*Moschus chrysogaster*) and two high altitude pheasant species - Himalayan monal (*Lophophorous impejanus*), Western tragopan(*Tragopan melanocephalus*) in the sub alpine western Himalayan forests (Sahoo, 2007).

1.2. Brief Description of the Study Area

Dehradun is the capital city of the State of Uttarakhand in northern India. Dehradun is located in the Doon Valley in the foothills of the Himalayas nestled between two of India's mightiest rivers - the Ganges on the east and the Yamuna on the west. The Dehradun district has various types of physical geography from Himalayan mountains to Plains. The district contains Rajaji National Park which is home to several elephants. The Doon valley has the Terai and Bhabar forests within it as well as the Shiwalik hills and Lesser Himalayan Range containing hill stations such as Mussoorie and Chakrata. The district is bordered by the Himalayas in the north, the Sivalik Hills to the south, the river Ganges to the east, and the Yamuna River to the west.

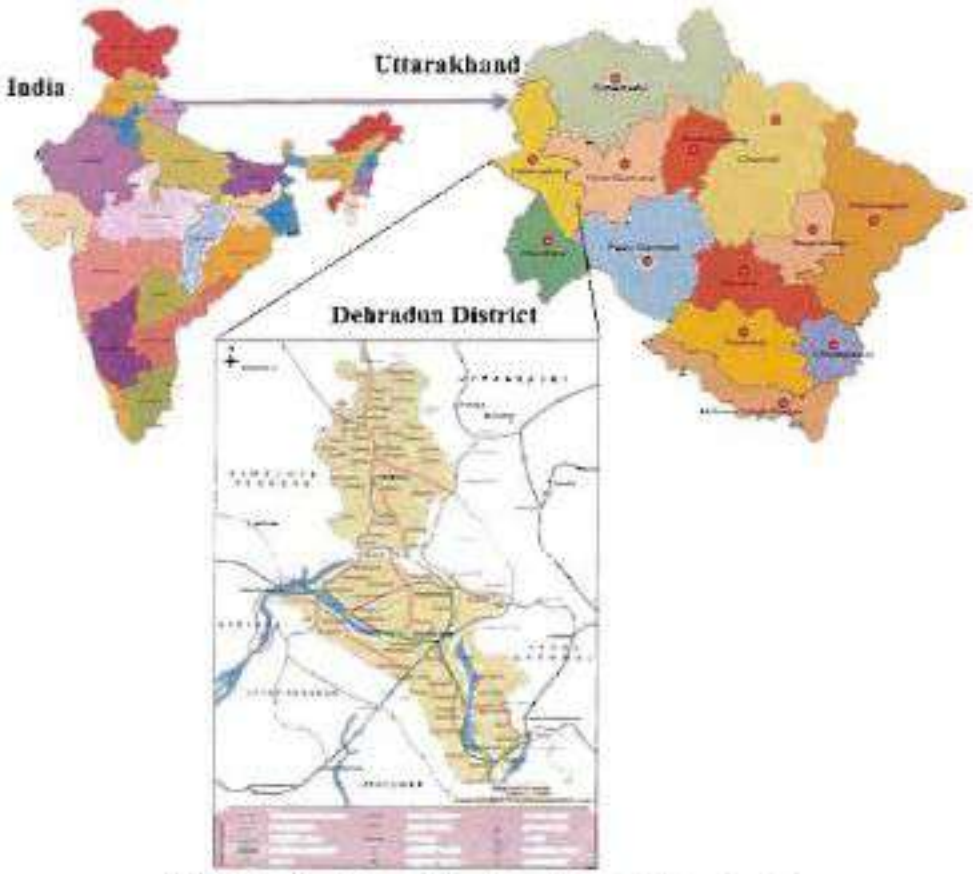

Fig. 1: Location Map of Dehradun district of Uttarakhand

Present conservation plan has been prepared with reference to the river bed mining. Proposed mining project Yamuna River Lot No 2(2) Sand, Bajri and Boulder Mining Project located in Village: Dhakrani, Tehsil: Vikasnagar & Dehradun, District: Dehradun, Uttarakhand. Location of proposed project in the river system is shown in **Fig. 2**

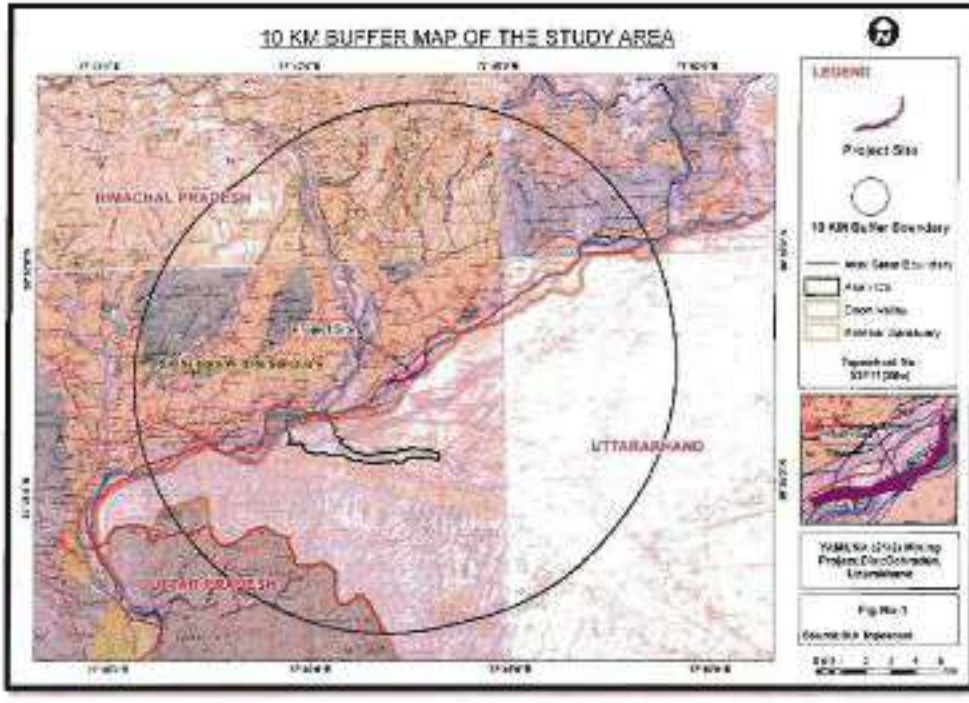

Fig. 2: Location of the proposed project in the river system in Dehradun district

The river wise list of riverbed mining projects proposed by GMVN Ltd. which falls under the **Kalsi Forest Division** for which conservation plan has been prepared see as follows:

S. No.	Project Name	Site Coordinates	Nearby Village	Area in Ha.	Area for Plantation
1	Yamuna 2(2), Sand, Bajri and Boulder Mining Project	Latitude: 30°28'3.21"N to 30°27'15.24"N Longitude: 77°42'59.22" E to 77°42'4.73"E	Dhakrani	34.94	Along the Road Side- 0.6 ha

The area for plantation along the approach roads will be 0.6 ha. However, 500 no's of plants will be distributed to the local villagers for plantation at their home which will cover approx. 2.5 ha. area. So the total area for the plantation will be 3.1 ha.

1.3. Drainage

Dehradun district of Uttarakhand drained into the River Ganga, through River Yamuna and its tributaries. Yamuna River entersinto the Dehradun district at the point called Khat Bhondar which is about 20km east of Deoban. The western part of Doon Valley is drained by Asan and its tributaries; itjoins Yamuna near Rampur Mandi. Yamuna River roughly divides the district in two halves, thehilly region in the north and Doon valley in the south.

Dehradun district of Uttarakhand has rich in terms of flowing rivers and streams where several sand, bajri& boulder mining projects are executed and proposed on dry bed of different river systems.

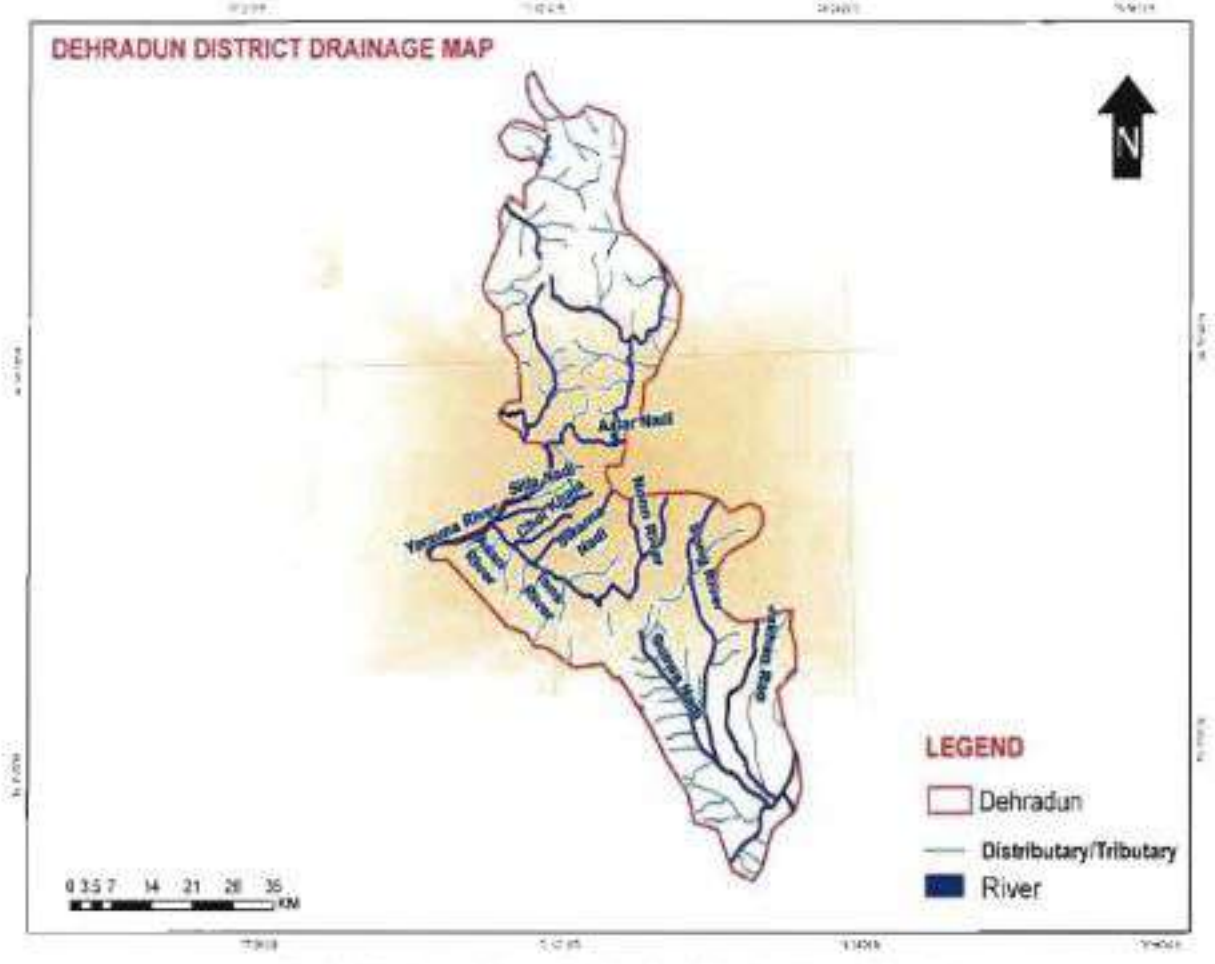

Fig. 3: Drainage Map of Dehradun district, Uttarakhand

1.4. Climate and Temperature

The Climate of the district is generally temperate. It varies greatly from tropical to severe cold depending upon the altitude of the area. The district being hilly, temperature variations due to difference in elevation are considerable. In the hilly regions, the summer is pleasant, but in the Doon, the heat

is often intense, although not to such degree as in the plains of the adjoining district. The temperature drops below freezing point not only at high altitude but even at places like Dehradun during the winters, when the higher peaks are also under snow.

Temperature plays an important role to separate Uttarakhand as well as Dehradun district from rest part of the country. During the summers, the temperature ranges between 16°C to 36°C whereas in winters temperature varies between 4°C to 24°C in Dehradun district.

1.5. Rainfall

The Dehradun district receives an average annual rainfall between 1950 to 2072 mm. Most of the annual rainfall in the district is received during the months from June to September (July and August being rainiest).

2. Ecological Profile of the Study Area

The district Dehradun falls under the temperate climatic condition. The district has maximum tree covered hilly terrain followed by forest and agricultural land out of its total geographical area. The major crops of the area are Rice, Wheat, Barley, Corn, Mandua, Hangora etc. The climatic and soil conditions allow growing sub-tropical and temperate fruits, vegetables and ornamentals. The various fruits grown in the state include mango, citrus, litchi, guava and jackfruit etc.

Dehradun is distinguished from most other district in the state by the existence of very large forests chiefly stocked with Sal. Forest products play an important role in the economy of the district. Besides, supplying fuel, fodder, bamboos and medicinal herbs, they also yield a variety of products like honey, lac, gum, resin, catechu, wax, horns and hides. Different types of forests and varying species of shrubs, climbing plants and grasses, depending upon the aspect, altitude and soil condition are found in the district. Sal forest and coniferous forests are predominant in the western part of tehsil Dehradun. A mixture of miscellaneous species is found in the lower parts. Sal is the predominant species mixed with other associates viz. bakli, sain, haldu, jhingan etc. Besides the above many other types of forests occur in small belts in the plain of the district.

2.1. Flora of the Study Area

The forest of Dehradun district is comprises of sub-tropical deciduous vegetation due to medium & high temperature, and humidity. Forests of Dehradun district are enriched with different kinds of vegetation (Grasses, Herbs, Shrubs and Trees). Some common vegetation found in the study area is listed in the **Table 1.**

Table 1: Common Vegetation found in study areas at DehradunDistrict

TREES

S. No.	Scientific Name	Common Name	Family
1	*Acacia catechu* (L.f.)Wild.	Khair	Mimoseae
2	*Acacia nilotica* (L.)Willd. *spp. indica* (Benth.) Brenan	Babool	Mimoseae
3	*Aegle marmelos* (L.) Corr.	Bel	Rutaceae
4	*Ailanthus excelsa Roxb.*	Ailanthus	Simaroubaceae
5	*Alangium salvifolium* (Lamarkii Thw.) (L.f) Wang	Ankom	Cornaceae
6	*Albizia lebbek* (L.) Benth	Kala Siris	Mimoseae
7	*Albizia procera Benth.*	Safed Siris	Mimoseae
8	*Anogeissus latifolia* (Roxb.) Wall. ex Bedd.	Bakli	Combretaceae
9	*Bauhinia racemosa* Lam.	Mahooli	Caesalpiniaceae
10	*Bauhinia retusa* Ham.	Semla	Caesalpiniaceae
11	*Bauhinia semla* Wund	Semala	Caesalpiniaceae
12	*Bauhinia variegata* L.	Kachnar	Caesalpiniaceae
13	*Bochmeria rugulosa* Wedd.	Genthi	Urticaceae
14	*Bombax ceiba* Linn.	Semal	Malvaceae
15	*Bridelia retusa* (L.) Spr.	Ekdana	Euphorbiaceae
16	*Broussonetia papyrifera* Vent.	Tutri	Urticaceae
17	*Buchnania lanzan* Spreng.	Chironji	Anacardiaceae
18	*Butea monosperma* (Lamk.) Taub.	Dhak	Fabaceae
19	*Careya arborea* Roxb.	Kumbhi	Myrtaceae
20	*Casearia elliptica* Willd.	Chila	Samydaceae
21	*Casearia graveolens* Dalz.	Narm, Chilla	Samydaceae
22	*Cassia fistula* L.	Amaltas	Caesalpiniaceae
23	*Cassine glauca* (Rottb.)Kuntze.	Dhalin, Jangee	Caesalpiniaceae
24	*Cocculus laurifolius* DC	Tilphara	Menispermaceae
25	*Cordia obliqua* Willd. (= C. dichotoma Forster f.)	Lissora	Cordiaceae
26	*Cordia vestita* Hook.f & Thom.		Cordiaceae
27	*Dalbergia sissoo* Roxb.	Shisham, Sissoo	Fabaceae
28	*Diospyros malabrica* (Desr.) Kostel.	Kala Tendu	Ebenaceae
29	*Emblica officinalis* Gaertn	Amla	Euphorbiaceae
30	*Ehretia laevis* Roxb.	Chamror	Boragilaceae
31	*Erythrina stlherosa* Roxb.	Dhaul Dhak	Leglliminosae-Papilioneae
32	*Eucalyptus globulus* Labillardiere	Safeda	Myrtaceae
33	*Ficus auriculata* Lour.	Timla	Moraceae
34	*Ficus benghalensis* L.	Bar, Bargat	Moraceae
35	*Ficus glomerata* Roxb.	Gular	Moraceae

36	*Ficus hispida* L.f.	Kakoa, Chegcha, Gobha	Moraceae
37	*Ficus lnectoria* Roxb.	Khabar	Moraceae
38	*Ficus palmata* Forsk.	Anjir, Baru	Moraceae
39	*Ficus racemosa* L.	Gular	Moraceae
40	*Ficus religiosa* L.	Pipal	Moraceae
41	*Ficus rumphii* Bl.	Pilkhan	Moraceae
42	*Flacourtia cataphracta* Roxb.	Talisha	Flacourtiaceae
43	*Flacourtia indica* (Burm.f) Merr	Kandai	Flacourtiaceae
44	*Gardenia turgida* Roxb.	Dhaneha	Rubiaceae
45	*Garuga pinnata* Roxb.	Kharpat, Titmira	Burseraceae
46	*Grewia elastica* Royle	Dhaman	Tiliaceae
47	*Grewia optiva* Drumm. ex Burret	Bhimal	Tiliaceae
48	*Haldina cordifolia* (Roxb.) Ridsdale	Haldu	Rubiaceae
49	*Holarrhena pubescens* (Buch.-Ham.) Wall.ex Don	Dudhi, Kura	Holarrhena
50	*Holoptelia integrifolia* Planch.	Kanji, Papri	Ulmaceae
51	*Hymenodictyon excelsum* Wall. (=H orixense (Roxb.)Mabberley)	Baurang	Rubiaceae
52	*Lagerstroemia parviflora* Roxb.	Dhauri	Lythraceae
53	*Lannea coromandelica (Houtt.)* Merr.	Jhingan	Anacardiaceae
54	*Mallotus philippensis* (Lamk.) Muell. -Arg.	Rohini	Euphorbiaceae
55	*Mangifera indica* L.	Aam	Anacardiaceae
56	*Miliusa velutina* Hook.f. & Thom.	Dodsal	Annonaceae
57	*Moringa oliefera* Lamk.	Sainjna	Moringaceae
58	*Nyctanthus arbortristis* L.	Harsingar, Kuri	Oleaceae
59	*Ougeinia oojeinensis* (Roxb) Hochr	Sandan	Leguminosae-Papilionese
60	*Persea gamblei* (King ex Hook.f.) Kost.	Ongiar	Lauraceae
61	*Phoenix loureiri* Kunth	Khajur, Khajur	Palmae
62	*Ziziphus xylopyra* (Retz.) Willd.	Kathber	Rhamnaceae
63	*Pithecolobium dulce* Lamk	Jangle jalebi	Rosaceae
64	*Pongamia pinnata* (L.) Pierre	Kanji, Papri	Fabaceae
65	*Premna latifolia* Roxb.	Bakar	Verbenaceae
66	*Psidium guajava* L.	Guajava	Myrtaceae
67	*Pterospermum acerifolium* Willd.	Kanakchampa	Sterculiaceae
68	*Schleichera oleosa* (Lour.) Oken.	Kusum	Sapindaceae
69	*Shorea robusta* Gaertn.	Sal	Dipterocarpaceae
70	*Syzygium cumini* (L.) Skeels	Jamun	Myrtaceae
71	*Tectona grandis* L. f.	Sagaun	Verbenaceae
72	*Terminalia alata* Heyne ex Roth	Sain, Asna	Combretaceae
73	*Terminalia belerica* (Gaertn.) Roxb	Bahera	Combretaceae
74	*Terminalia chebula* Retz.	Har, Harra, Haira, Harer	Combretaceae
75	*Toona ciliata* Roem.	Tun	Meliaceae

76	*Trewia nudiflora* L.	Gutel	Euphorbiaceae
77	*Wrightia arborea* R. Br.	Dudhi	Apocynaceae
78	*Ziziphus mauritiana* Lamk.	Ber	Rhamnaceae

SHRUBS

S.No.	Scientific Name	Common Name	Family
1	*Acacia caesia* W. & A.	Aila	Leguminos-Mimoseae
2	*Adhatoda zeylanica* Medic	Barpia, Basinga	Verbenaceae
3	*Aerva sanguinolenta* (L.f.)Blume	Mada, Pahari-puee	Amaranthaceae
4	*Antidesma acidum*Retz. 1,2,4 S	Amli	Euphorbiaceae
5	*Ardisia solanacea* Roxb.	Bhanmal	Myrsinaceae
6	*Asparagus adscendens* Roxb.	Hazar-Muli	Liliaceae
7	*Asparagus racemosus* Willd.	Dewdrni,Satawar, Satmul	Liliaceae
8	*Baliospermum montanum*(Willd.) Muell. Arg.	Dandi, Bambhati	Euphorbiaceae
9	*Berberis aristata* Roxb. ex. DC	Kingora, Kilmora	Berberidaceae
10	*Berberis lycium*Royle	Kingora, Chitroi	Berberidaceae
11	*Boehmeria macrophylla* D. Don	Bara Siaru	Urticaceae
12	*Boehmeria platyphylla* D. Don	Samrali	Urticaceae
13	*Buddleia neemda* Broch. -Ham ex. Roxb.	Agya-chita	Loganiaceae
14	*Callicarpa macrophylla* Vahl	Daia, Daya	Verbenaceae
15	*Cannabis sativa* L.	Bhang	Urticaceae
16	*Carissa spinarum L.*	Karaunda	Apocynaceae
17	*Caryopteris wallichiana* Sch.	Chingari, Karui	Verbenaceae
18	*Cassia glauca* Lamk.		Leguminosae-Caesalpinieae
19	*Cassia occidentalis* L.	Ban-jhan, Chakunda	Leguminosae-Caesalpinieae
20	*Catunaregam spinosa* (Thunb.) Tirvengadum	Mindhal, Moina, Phetra	Rubiaceae
21	*Catunaregam uliginosa* (Retz.) Sivarajan	Dambaru, Pradaro	Lauraceae
22	*Cinnamomum tamala* Fr. Nees.	Dalchini	Lauraceae
23	*Clematis montana* Ham.	Kauria- Bali	Ranunculaceae
24	*Clerodendrum viscosum*Vent.	Bhant, Addhasaju	Verbenaceae
25	*Coffea bengalensis* Roxb.	Mirhemi, Akathfages-zip	Rubiaceae
26	*Colebrookia oppositifolia* Smith.	Bindu	Lamiaceae
27	*Coriaria nepalensis* Wall.	Rikhoca	Coriariaceae
28	*Cotoneaster bacillaris* Wall.		Rosaceae
29	*Crotalaria tetragona* Roxb.		Fabiaceae
30	*Cyperus brevifolius (Rottl.)* Hasek.		Cyperaceae
31	*Cyperus kyllingia* Endl.		Cyperaceae
32	*Debregeasia longifolia* (Burm.f.) Wedd.	Tusari,Kapasi	Urticaceae

33	*Deerangia celosioides* R. Br. (= D.amaranthoides (Lam.) Merrill)	Chundri,	Amaranthaceae
34	*Euphorbia royleana* Boiss	Sinij, Sarij, Thar	Euphorbiaceae
35	*Ficus heterophylla* L. f.	Kevvu-juvi	Moraceae
36	*Fimbristylis dichotoma* (L.) Vahl.		Cyperaceae
37	*Flacourtia indica* (Burm.f.) Merr.	Kandia, Kandei, Kangu	Flacourtiaceae
38	*Glycosmis arborea* (Roxb.) DC	Barbinisa, Pilu, Potla	Rutaceae
39	*Hamiltonia suaveolens* Roxb		
40	*Helicteres isora* L.	Kapasi, Morarphal	Sterculiaceae
41	*Holmskioldia sanguinea* Retz.		Verbenaceae
42	*Inula cappa* DC	Dkchha	Asteraceae
43	*Jatropha curcas* L.	Ratanjot	Euphorbiaceae
44	*Leucomeris spectabilis* Don		
45	*Mussaenda pubescens* W.&A.		
46	*Mimosa himalayana* Gamble	Ail, Alay, Khinkari	Mimosaceae
47	*Murraya koenigii* (L.) Spreng.	Gandhela, curry leaves	Rutaceae
48	*Murraya paniculata* (Linn.) Jack	Kamini,Nyibumtenum	Rutaceae
49	*Opuntia dillenii* Haw.	Nagphani	Cactaceae
50	*Osyris arborea* Wall.		
51	*Phlogacanthus thyrsiflorus* Nees	Jasuit, Titaphul	Acanthaceae
52	*Phoenix humilis* Royle	Kajji, Soh-kwai	Arecaceae
53	*Physalis maxima / micrantha* Link.	Kaskuti, Kupanti	Solanaceae
54	*Piper longum* L.	Pipali, Rali	Piperaceae
55	*Pistacia khinjuk* Stocks	Kakra	Pistaciaceae
56	*Pogostemon benghalensis* (Burm.f.) Kuntz	Ban-tulsi,Gandhairi	Lamiaceae
57	*Pyracantha crenulata* (D.Don)M.Roemer	Ghingaru	Rosaceae
58	*Rauvolfia serpentina* Benth ex DC	Sarpgandha	Apocynaceae
59	*Reinwardtia indica* Dumr	Basanti	Linaceae
60	*Rhamnus virgatus* Roxb.	Ciaonla	Rhamnaceae
61	*Rhus parviflora* Roxb.	Tangla	Anacardiaceae
62	*Ricinus communis* L.	Arandi	Euphorbiaceae
63	*Rosa brunonii* Lindl.		Rosaceae
64	*Rubus ellipticus* Sm.	Aisele	Rosaceae
65	*Sageretia parviflora* (R. & S.) G.Don	Aamli,	Rhamnaceae
66	*Securinega virosa* (Roxb. ex Willd.) Baill ex	Kodansi	Euphorbiaceae
67	*Sida acuta* Burm.	Bala,Bregham	Malvaceae
68	*Sida rhombifolia* L.	Bagalia, Bariara	Malvaceae
69	*Smilax lanceata*	Ramdantani	Smilacaceae
70	*Solanum surattense* Burill. f.	Bhakatnaiya	Solanaceae
71	*Solanum torvum* Sw.	pathera	Solanaceae
72	*Spermadictyon suaveolens* Roxb.	Sarka-pied	Rubiaceae
73	*Spiraea bella* Sims.		
74	*Stephania glabra* (Roxb.) Miers	Garjaree, Kani-kanjo	Menispermaceae

75	*Tephrosia candida* DC	Bega, Lashta	Fabaceae
76	*Trichodesma indicum*R. Br.	Aundhi, Ondhelu	Boraginaceae
77	*Urena lobata L.*	Ungoo	Malvaceae
78	*Urtica dioica* L.	Bichhubooti	Urticaceae
79	*Urtica parvifiora* Roxb.		Urticaceae
80	*Vitex negundo* Linn.	Shimalu, Semalu, Chatima[,Wishivel	Verbenaceae
81	*Woodfordia fruticosa* (Linn.) Kurz.	Dhaula	Lythraceae
82	*Xanthium strumarium*L.	Latakai	Asteraceae
83	*Ziziphus mauritiana* Lamk. var.*fruticosa Haines*	*Jangli ber*	*Rhmanaceae*
84	*Ziziphus oxyphylla* Edgew.		Rhamnaceae

CLIMBERS

S. No.	Scientific Name	Common Name	Family
1	*Abrus precatorius* L.	Ratti, Gunchc	Leguminosae-Papilionese
2	*Abrus pulchellus* Wall ex Thw.	Gurj	Leguminosae- Papilionese
3	*Acacia concinna* DC	Allah	Mimoseae
4	*Acacia pennata* Willd.	Agla or alay	Mimoseae
5	*Ampelocissus latifolia* (Roxb.) Planch.	Pan:bel	Vitaceae
6	*Argyreia roxburghii* Choisy.	Bidhara	Convolvulaceae
7	*Aspidopterys wallichii* Hook.f.	Jugrer	Rutaceae
8	*Bauhinia vahlii* W. & A.	Maljhan	Leguminosae-Caesalpinieae
9	*Calamus lenuis* Roxb.	Bent	Palmae
10	*Capparis sepiaria* L.	Karunjuran	Capparidaceae
11	*Celastrus paniculata* Willd.	Malkangine	Celastraceae
12	*Cissampelos pareira* L.	Parbe or harijori	Rutaceae
13	*Clematis gouriana* Roxb	Bel, Kean, Giel, Kurgu	Ranunculaceae
14	*Clematis nutans* Royle(=C. roylei Rehder)		Ranunculaceae
15	*Combretum roxburghii* Spreng.	Roel	Combretaceae
16	*Cryptolepis buchanani* Roem & Sch.	Karanta	Asclepiadaceae
17	*Cuscuta reflexa* Roxb.	Akas bel	Convolvulaceae
18	*Cuscuta europaea* L.	Amarbel	Cuscutaceae
19	*Dioscorea belophylla* Voigt ex Haine	Turar	Dioscoreaceae
20	*Dioscorea bulbifera* L.	Tarar-ki-bel	Dioscoreaceae
21	*Embelia robusta* Roxb.	Gaia	Myrsinaceae
22	*Ficus hederacea* Roxb.		Urticaceae
23	*Gouania lilacefolia* Lamk.	Rakta-Rohidan	Rhallnaceae
24	*Hiptage bengalensis* (L.) Kurz.	Anetn, Madhanalti	Malpighiaceae

25	*Ichnocarpus frutescens* Br.	Bel, Kamu, Kali Dudhi	Apocynaceae
26	*Ipomoea beclaraces* Jacq.	Kaladana	Convolvulaceae
27	*Jasminum arborescens* Roxb.	Chameli	Oleaceae
28	*Jasminum pubescens Willd. (=J multiflorum* (Burm.f.) Andrews)	Chameli.	Oleaceae
29	*Lawsonia inermis* (L.) Rids	Konwai, Kawao, Khar	Lecaceae
30	*Maclura cochinchinensis* (Lour) Corner	Dammar, Manda	Uricaceae
31	*Marsdenia tenacissima* W. & A.	Marua-bel	Asclepiadaceae
32	*Millettia auriculata* Baker	Gaj	Leguminosae-Papilionese
33	*Porana paniculata* Roxb.	Safed Bel	Convolvulaceae
34	*Pueraria tuberosa* DC	Surul, Seralo	Leguminosae-Papilionese
35	*Rhynchosia minima* (L.) DC	Dariavel	Leguminosae-Papilionese
36	*Rubia cordifolia* Linn.	dammar, Manda	Rubiaceae
37	*Rubus niveus* Wall.	Boora	Rosaceae
38	*Scindapsus officinalis* (Roxb.) Schott.	Paria-bel	Araceae
39	*Smilax wightii* DC	Ram-catuan	Liliaceae
40	*Smilax zeylanica* L.	Kakadari, Ramdatum	Liliaceae
41	*Spatholobus roxburghii* Benth	Maha-bel	Leguminosae Papilionese
42	*Tinospora cordifolia* (Willd.) Hook. f. & Thomson	Atherve/Giloe, Gudilehi	Menispermaceae
43	*Vallaris solanacea* (Roth) O.Kize	Dudhi Bel	Apocynaceae
44	*Ventilago calyculata* Tapik	Kali-bel	Rhamnaceae
45	*Vitis rependa W. & A. (=Cissus rependra* Vahl)	Gandal, Mot thor	Vitaceae
46	*Wattakaka volubilis* (L. f.) Stapf.	Mund bel	Asclepiadaceae

HERBS

S. No	Scientific Name	Common Name	Family
1	*Achyranthus aspera*	Latjira,Chirchit	Amaranthaceae
2	*Adiantum caudatum* L.	Chirchit	Adiantaceae
3	*Adiantum edgeworthii* Hook.f.		Adiantaceae
4	*Ageratum conyzoides* L.	Ajgandha,Gandeia	Asteraceae
5	*Ajuga bracteosa* Wall.	Neel-Kanthi	Lamiaceae
6	*Ajuga parviflora* Benth.	Namdanghor	Lamiaceae
7	*Alternanthera sessilis* (L.) DC	Gaitwar	Amaranthaceae
8	*Alysicarpus vaginalis* (L.) DC	Dawai	Fibaceae
9	*Argemone ochroleuca* Sweet	Satyanashi	Papaveraceae
10	*Arthraxon* spp.		Poaceae
11	*Artimetia roxburghiana* Wallich ex Benser	Kunaja	Asteraceae
12	*Arundinella tenella* Nees ex Steudel		Poaceae

13	*Anisomeles indica* (L.) Kuntz.	Narutami ,Ramdadi	Lamiaceae
14	*Artemisia dilogrica* L.	Kunza,Nagadoni	Compositae
15	*Bergenia ciliata* (Haworth) Sternb.	Silparo	Saxifragaceae
16	*Bidens pilosa* L.	Kuro	Asteraceae
17	*Blumea lacera* DC.	Nirmundi	Asteraceae
18	*Boenninghausenia albiflora* (Hook.) Reichb. Ex Meisn.	Yinari	Rutaceae
19	*Boerhavia diffusa* Linn.	Punarnava	Nyctaginaceae
20	*Bupleurum falcatum* L.		Apiaceae
21	*Rularia crispata* L.	Morani, Mukaro	Acanthaceae
22	*Capsella bursa pastoris* Moen.		Brassicaceae
23	*Cassia mimosoides* L.		Caesalpiniaceae
24	*Cassia tora* Linn	Chakunda, Panwar	Caesalpiniaceae
25	*Celosia argentea* Linn.	Kombada,	Amaranthaceae
26	*Centella asiatica* (L.) Urb.	Brahmi	Apiaceae
27	*Chrysopogon fulvus* (Spreng.) Chiov.&		Poaceae
28	*Cirsium arvense* (L.) Scop.	Chest-kanta	Asteraceae
29	*Commelina benghalensis* L.	Buchna	Commelinaceae
30	*Commelina diffusa* Burm.f.	Kanjura	Commelinaceae
31	*Corchorus aestuans* L.	Pat	Tiliaceae
32	*Corchorus olitorius* L.	Banpat	Tiliaceae
33	*Costus speciosus* (Koen. Ex Retz) J.E.	Keokand	Costaceae
34	*Crotalaria albida* Heyne	Banmethi	Fabaceae
35	*Curculigo orchioides* Gaertner	Kali musli	Hypoxidaceae
36	*Cyathula spp*		Amaranthaceae
37	*Cynoglossum lanceolatum* Forsk.	Balraj	Boraginaceae
38	*Cyanotis cristata* (L.) D.Don		Commelinaceae
39	*Cyanotis fasciculata* Schult.		Commelinaceae
40	*Crotalaria retusa* Retz.	Sakesing, Xar-shunkia	Fabiaceae
41	*Desmodium heterocarpon* (L.) DC	Sarivan	Fabaceae
42	*Desmodium laxiflorum*DC	Kadukaccu	Fabaceae
43	*Dicliptera bupleuroides* Nees (= *Dicliptera roxburghiana* Nees)	Kathmul	Acanthaceae
44	*Dicliptera roxburghiana* Nees		Acanthaceae
45	*Diplazium esculentum*	Necha	Athyriaceae
46	*Drymaria cordata* (L.) Willd. ex Roem.	Abijalo	Caryophyllaceae
47	*Datura fastuosa* L.	Datura	Solanaceae
48	*Datura metel* L.	Datura	Solanaceae
49	*Desmodium gangeticum*DC	Salpani, Shalpani	Fabiaceae
50	*Desmodium parviflorum*DC		Fabiaceae
51	*Desmostachya bipinnata* Stapf.	Dab, Kus	Fabaceae
52	*Elephantopus scaber* L.	Ben-maurase	Asteraceae
53	*Elsholtzia ciliata* (Thumb.) Hyland	Chhali	Lamiaceae
54	*Equisetum ramosissimum* Desf.	Dmbro	Equisetaceae
55	*Eragrostis tenella* (L.)P. Beauv. ex Roemer & Schultes	Bhurbhusi-ghas	Poaceae
56	*Eulaliopsis binata* (Retz.) Hubard		Poaceae
57	*Eupatorium odoratophorum* Spreng.		Poaceae

58	*Euphorbia hirta* L.	Dudhi	Euphorbiaceae
59	*Euphorbia hypericifolia* L.		Euphorbiaceae
60	*Euphorbia prostrata* Ortega		Euphorbiaceae
61	*Evolvulus alsinoides* (L.) L.	Hirankhuri	Convolvulaceae
62	*Evolvulus nummularius* L.	Chinipata	Convolvulaceae
63	*Flemingia bracteata* Wight		Fabiaceae
64	*Flemingia chappar* Ham.	Rusia-gach	Fabiaceae
65	*Flemingia congesta* Roxb.		Fabiaceae
66	*Flemingia semialata* Roxb.		Fabiaceae
67	*Flemingia stricta* Roxb.		Fabiaceae
68	*Gerbera flossypiloda* (Royle) G. Beauv.	Kapasi	Asteraceae
69	*Justicia procumbens* L. var. simplex (D. Don)	Kalomai	Acanthaceae
70	*Lepidagathis incurva* Buch.-Ham ex D. Don	Chavamomorkha	Acanthaceae
71	*Mimosa pudica* L.	Chhuimui	Mimosaceae
72	*Murdannia nudiflora* (L.) Brenan	Musli-siyah	Commelinaceae
73	*Nervilia aragoana* Gaud.		Orchidaceae
74	*Oldenlandia corymbosa* Hook.f.	Khet-papra	Rubiaceae
75	*Ophioglossum spp.*		Ophioglossaceae
76	*Oxalis corniculata* Linn.	Khatta-mitha	Oxalidaceae
77	*Parthenium hysterophorus* L.	Gajar ghass	Asteraceae
78	*Peperomia pellucida* (L.) Kunth	Luchipata	Peperomiaceae
79	*Perilla frutescens* (L.) Britt.	Jangle bhangir	Lamiaceae
80	*Phyla nodiflora* (L.) Green.	Jal-buti	Verbenaceae
81	*Phyllanthus urinaria* L.	Bhui-amla	Euphorbiaceae
82	*Physalis divaricata* D.Don	Phutkanya	Solanaceae
83	*Pimpenella diversifolia* DC		Apiaceae
84	*Polygala arvensis* Willd.	Nilkanta, Rai i	Polygalaceae
85	*Polygonum plebejum* R. Br.	Chulbhaji	Polygonaceae
86	*Portulaca oleracea* Linn.	Kulfa	Portulaceae
87	*Perilla frutescens* (L.) Britton	Jangle bhangir	Lamiaceae
88	*Primulla umbellata* (Lour) Bunh.		Primulaceae
89	*Peristrophe paniculata* (Forsk.) Brumit.	Chirchiri, Atrilal	Acanthaceae
90	*Plectranthus japonicus* (Burm.f.) Koidz		Lamiaceae
91	*Plumbago zeylanica* L.	Sitapan, Chitrak	Plumbaginaceae
92	*Rumex hastatus* D.Don	Bhilmora	Rosaceae
93	*Rungia pectinata* (L.) Nees	Dabari	Acanthaceae
94	*Salvia plebeia* R. Br.	Kakrondha	Lamiaceae
95	*Scleria* (Sage)		Cyperaceae
96	*Scutellaria spp.*		Lamiaceae
97	*Senecio laetus* Edgew.	Zer-gan	Asteraceae
98	*Siegesbeckia orientalis* L.	Kanzamuchi	Asteraceae
99	*Sida cordata* (Burm. f.) Borss	Bariyara	Malvaceae
100	*Solanum nigrum* L.	Makoi	Solanaceae
101	*Sida cordifolia* L.	Bala, Kungi	Malvaceae
102	*Thalictrium foliolosum* DC	Mamiri	Ranunculaceae
103	*Tridax procumbens* L.	Patharchatti	Asteraceae

104	*Trianthella rhamboidea* Jacq.	Nichardi	Tiliaceae
105	*Urginea indica* Kunth (= *Drimia indica* (Roxb.)Jessop)	Ban-piaj	Liliaceae
106	*Vernonia cinerea* (L.) Less.	Sahadevi	Asteraceae
107	*Veronica anagallis aquatica* L.		Schlophulariaceae
108	*Veronica persica* Poir		Schlophulariaceae
109	*Viola pilosa* Blume	Banapsha	Violaceae
110	*Vernonia anthelmintica* Willd.	Kalijiri	Asteraceae
111	*Youngiajaponica* (L.) DC	Rumdum	Asteraceae
112	*Zeuxine seidenfadenii* Deva & Naithani		Orchidaceae
113	*Zingiber roseum* Rose	Jangli-adrak	Zingiberaceae
114	*Dermostachya bipinnata* Stapf.	Dab, Kus	Fabaceae

GRASSES

S.No.	Scientific Name	Common Name	Family
1	*Alopecurus nepalensis* Trin.		Poaceae
2	*Aplada mutica* L.		Poaceae
3	*Arthraxon lancifolius* (Trin) Hoc.		Poaceae
4	*Arundinella nepalensis* Trin.	Bichhla, Bichhara	Poaceae
5	*A. pronodes* (Steud.) Dandy		Poaceae
6	*A. bengalensis* (Spreng.) Druce. G O		Poaceae
7	*A. setosa* G O		Poaceae
8	*Arundo donax* L.G O		Poaceae
9	*Axonopus compressus* (Sw.) P.Beauv. G O		Poaceae
10	*Bothriochloa intermedia* (R. Br.) A. Camus	Surdhaai	Poaceae
11	*Brachiaria racemosa* (L.) Stapf		Poaceae
12	*B.pernata* (L.) A.Camus. G O		Poaceae
13	*Capillipedium assimile* (Steud.) A. Camus		Poaceae
14	*Capparis sepiaria* L.		Capparidaceae
15	*Chloris dolichostachya* Lag.	Panini	Poaceae
16	*Cynodon dactylon* (L.) Pers.	Dub	Poaceae
17	*Cyperus brevifolius* (Rottb.) Hassk.		Cyperaceae
18	*Cyperus kyllingia* End.		Cyperaceae
19	*Coix lacryma-jobi* L. G C		Poaceae
20	*Cymbopogon martinii (Roxb)* Wats. G C		Poaceae
21	*Cyrtococcum accrescens* (Trin) Stapf. G C		Poaceae
22	*Dactyloctenium aegyptiacum* (L.) Willd.		Poaceae
23	*Dendrocalamus spa*		Graminese
24	*Dicanthium annulatum* (Forsk) Stapf.	Nalli, Jarevar	Poaceae
25	*Digitaria sanguinalis (L.)* Scop		Poaceae
26	*Echinochloa colonum* L.		Poaceae
27	*Eragrostis unioloides* Nees		Poaceae
28	*Eulalia leschenaultiana* (Decne) Ohwi		Poaceae
29	*Eleusine Indica* Gaertn. G C		Poaceae
30	*E. viscosa* Trin. G C		Poaceae

31	*Fimbristylis dichotoma* (L.) Vaal		Poaceae
32	*Heteropogon contortus* Linn.	Kumaria, Sirwaia	Poaceae
33	*Hackelochloa granularis* (L.) O. Kize. G C		Poaceae
34	*Hemarthria compressa* Kunth. G C		Poaceae
35	*Imperata cylendrica* (L.) Beauv	Sirhi, Siru pula	Poaceae
36	*Lolium temulentum* L. G O		Poaceae
37	*Microstegium ciliatum* (Trin.)A.Camus G O		Poaceae
38	*Narenga porphyracoma* (Hans. ex Trim.) Bor. G O		Poaceae
39	*Neyraudia arundinacea* (L.) Hen. G C		Poaceae
40	*Oplismens burmanni* Beauv		Poaceae
41	*Oplismenus compositus* Beauv	Dum dogra, Kukaria	Poaceae
42	*Oryza sativa* L. G O		Poaceae
43	*Panicum miliare* Lamk. G C		Poaceae
44	*Panicum paludosum* Roxb. G O		Poaceae
45	*Paspalidium flavidum* (Retz) A. Camus. G C		Poaceae
46	*Paspalum distichum* L. G C		Poaceae
47	*P. scorbiculatum* L. G C		Poaceae
48	*P. vaginatum* Sw. G O		Poaceae
49	*Perotis indica* Retz. G C		Poaceae
50	*Phragmites karka* Trin. G C		Poaceae
51	*Poa annua* L. G C		Poaceae
52	*Pogonatherum crinitum* Trin. G G		Poaceae
53	*Polypogonfugax* Nees ex steud. G C		Poaceae
54	*Pseudo sorghum fasciculare* (Roxb)A Camus G O		Poaceae
55	*Rottboellia exaltata* L.f. G C		Poaceae
56	*Saccharum bengalense* Retz. G O		Poaceae
57	*Saccharum spontaneum*Linn	Kans	Poaceae
58	*Setaria glauca* (L.) P. Beauv	Ballu	Poaceae
59	*Saporobolus diander* Beauv		Poaceae
60	*Setaria glauca* Beauv G C		Poaceae
61	*Setaria palmifolia* (Koenig) Stapf. G O		Poaceae
62	*Setaria verticilata* (L.)P.Beauv. G O		Poaceae
63	*Sporobolus diander* Beauv G C		Poaceae
64	*Sorghum halepense* (L.) Pers. G C		Poaceae
65	*Themeda gigantea* (Cav) Hack.		Poaceae
66	*Thysanolaena maxima* Kize.	Birlu	Poaceae
67	*Themeda arundinacea* (Roxb.) Ridley GO		Poaceae
68	*Vetiveria zizanioides* (L.) Nash.	Garara Khas	Poaceae
69	*Zoysia tenuifolia* Trin		Poaceae

BAMBOOS

S. No.	Local Name	Botanical Name
1	Chay Bans	*Bambusa nutans*
2	Ghad ringal	*Derpanostachyum falcatum*
3	Kanta Bans	*Bambusa bambos* (L.) Voss. (*B.arundinacea* (Retz.)Widl.
4	Kanko Bans	*Dendrocalamus hamiltonii*
5	Lathi Bans	*Dendrocalamus strictus* (Roxb.)

PARASITS

S. No.	Local Name	Botanical Name
1	Banda	*Dendrophthoefalcata* (Linn.f.) Etling. *(Loranthus longiflorus Desr.)*
2	Banda	*Scurrula cordifolia* (Wal.)GDon *(Loranthus cordifolius Wall.)*
3	Banda	*Scurrulapulverulenta* (Wall.)G.Don *(Loranthlls pulveru lenta Wall.)*
4	Pand	*Viscumnepalense Spr. (V articulatum Blrm.) Cuscuta reflexa Roxb.*

2.2. Fauna of the Study Area

Well known famous ***Rajaji National Park*** is one of the major habitations of the flora and fauna in the Dehradun. The Royal Bengal Tigers and Elephants are also found here. Besides these, ***Asan Conservation*** also situated in the district which supports variety of animals.The wildlife fauna mainly found in the open forests, Wildlife Sanctuary and National Parks situated within Dehradun, district is given in Table 3.

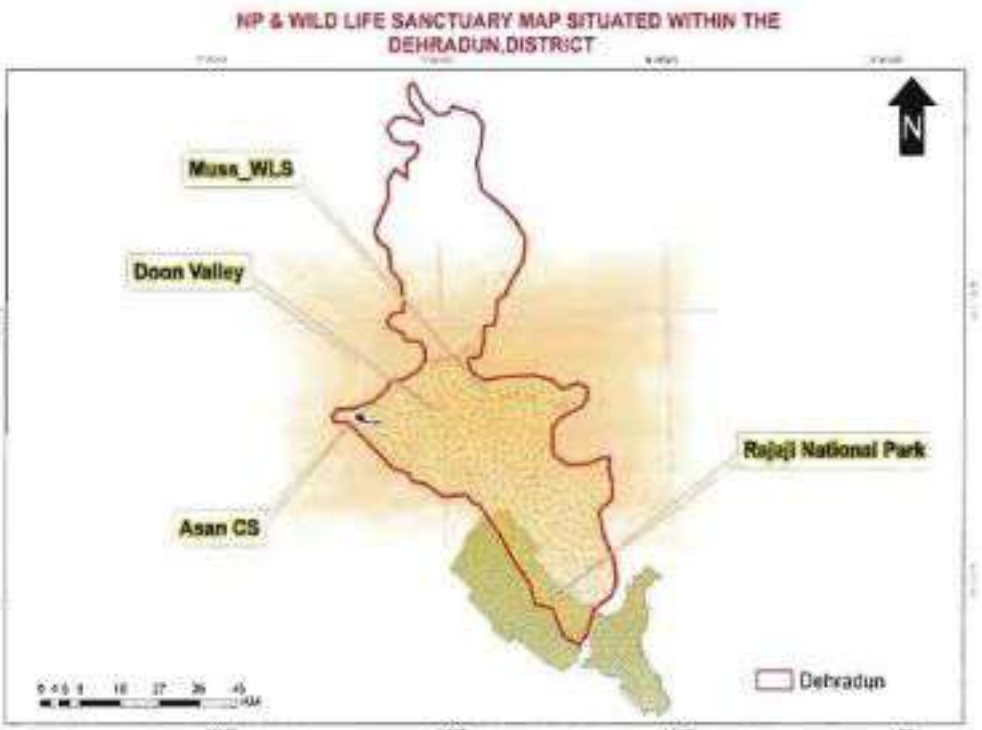

Fig. 4: Eco-sensitive Zone in Dehradun district of Uttarakhand

Table 2: Fauna commonly found in the study area at DehradunDistrict, Uttarakhand

Sl. No	English Name	Scientific Name	Schedule Status (WPA-1972)	IUCN Status
Mammal				
1	Barking deer	*Muntiacus muntjac*	III	LC
2	Common Mongoose	*Herpestes edwardsi*	II	NA
3	Fulvous Fruit Bat	*Rousettus leschenaulti*	V	LC
4	Jackal/Gidar/Siar	*Canis aureus*	II	LC
5	Grey Musk Shrew	*Suncus murinus*	-	LC
6	The Common Mongoose	*Herpestes edwardsii*	II	LC
7	Indian Hare	*Lepus nigricollis*	IV	LC
8	Indian langur	*Semnopithecus*	-	-
9	**Indian Leopard**	***Panthera pardus fusca***	**I**	**NT**
10	Spotted Deer	*Axis axis*	II	LC
11	Indian porcupine	*Hystrix indica*	IV	LC
12	Indian Wild Boar	*Sus scrofa*	III	LC
13	Jungle cat	*Felischaus*	II	LC
14	Red Faced Monkey	*Macaca mulatta*	II	LC
15	Sambar	*Cervus unicolor*	III	VU
16	Common Langoor	*Presbytis entellus*	II	
17	**Sloth Bear (Bhalu)**	***Melursus ursinus (Shaw)***	**I**	**VU**
Reptiles (Snakes) and Lizards				
1	Common Krait	*Bungarus caeruleus*	IV	NA
2	House Lizard	*Hemidactylusmabouia Moreau*	IV	LC
4	Indian Cobra	*Naljanaja*	II	LC
5	**Indian Python**	***Python molurus***	**I**	**NT**
6	Rat Snake	*Ptyar mucosa*	II	NA
7	Rock Lizard	*Agama tuberculatus*	-	DD
8	Indian House Gecko	*Hemidactylus brooki*	-	DD
9	**Monitor Lizard**	***Varanus bengalensis***	**I**	**LC**
Avian Fauna				
1	Black Drongo	*Dicrurus macrocercus*	IV	LC
2	Crimson Sunbird	*Aethopyga siparaja*	IV	LC
3	Great Barbet	*Megalaima virens*	IV	LC
4	Common Kingfisher	*Alcedo athis*	IV	LC
5	Common Myna	*Acridotheres tristis*	IV	LC
6	House Crow	*Corvus splendens*	IV	LC

7	House Sparrow	*Passer domesticus*	IV	LC
8	House Swift	*Apus nipalensis*	IV	LC
9	Indian Cuckoo	*Cuculus micropterus*	IV	LC
10	**Indian Peafowl**	***Pavo Cristatus***	**I**	**LC**
11	**Indian Grey Horubill**	***Ocyceros birostris***	**I**	**LC**
12	Jungle Crow	*Corvus macrorhynchos*	IV	LC
13	Jungle Myna	*Acridotheres fuscus*	IV	LC
14	Plum-headed Parakeet	*Psittacula cyanocephala*	IV	LC
15	Red Jungle fowl	*Gallus gallus*	IV	LC
16	Red-vented Bulbul	*Pycnonotus cafer*	IV	LC
17	Rock Pigeon	*Columba liva*	IV	LC
18	White Wagtail	*Motacilla alba*	IV	LC
Source: GRC Survey Data and Data of Department of Forest, Uttarakhand				
LC: Least Concern; **NE:** Not Evaluated; **EN:** Endangered; **NT:** Near Threatened; and **VU:** Vulnerable.				

3. Conservation Plan of Schedule I & II Species

Biological profile of Dehradun district of Uttarakhand revealed the presence of 11 schedules-I and 12 schedules II species which are listed in **Table 3.**

Table 3: List of Schedule- I & II Species Present in Buffer Zone

Sl. No	English Name	Scientific Name	Schedule Status (WPA-1972)	IUCN Status
Mammal				
1	**Leopard**	***Panthera pardus***	I	NT
2	**Leopard or Bagh/billi**	***Felis bengalensis***	I	LC
3	**Bhaddbillk/Mach billi/ Fishing Cat**	***Felis viverrina***	I	VU
4	Common Mongoose	*Herpestes edwardsi*	II	NA
5	Golden Jackal	*Canis aureus*	II	LC
6	Red Fox/Lomri	*Vulpes vulpes montana*	II	LC
7	Jungle cat	*Felis chaus*	II	LC
8	Red Faced Monkey	*Macaca mulatta*	II	LC
9	Spotted Deer	*Axis axis*	II	LC
10	Common Langoor	*Presbytis entellus*	II	LC
11	Otter/Ood/ Udbilao	*Lutra lutra*	II	NT
12	Chitrola	*Martes flaviguia*	II	LC
13	**Sloth Bear (Bhalu)**	***Melursus ursinus (Shaw)***	I	VU

Reptiles (Snakes) and Lizards				
14	**Indian Rock Python**	***Python molurus***	**I**	**NT**
15	Common pond snake	*Xenochroptus piscator*	II	NE
16	Rat Snake/Oriental Rat Snake	*Ptyas mucosus*	II	-
17	**Monitor Lizard**	***Varanus monitor***	**I**	**LC**
18	Indian Cobra	*Naja naja*	II	LC
Avian Fauna				
19	**Common Peafowl**	***Pavo Cristatus***	**I**	**LC**
20	**Common Grey Hornbill**	***Ocyceros bivostris***	**I**	**LC**
21	**Gidh**	***Gyps hilmalayanesis, ,***	**I**	**NT**
22	**Gidh**	***Gyps bengalensis***	**I**	**CR**
23	**Gidh**	***Gyps indicus***	**I**	**EN**
Source: GRC Survey Data and Data of Department of Forest, Uttarakhand				
LC: Least Concern; **NE:** Not Evaluated; **EN:** Endangered; **NT:** Near Threatened; and **VU:** Vulnerable.				

Biological importance of all these species along with their conservation and management plan and environmental mitigation are as follows:

O CONSERVATION PLAN OF MAMMALS

3.1. *Melursus ursinus* (Indian Black Bear/ Sloth bear)

Photo Source: http://www.rajasthanitigers.in/photo.html

Classification

Kingdom : Animalia
Phylum : Chordata
Class : Mammalia
Order : Carnivora
Family : Ursidae
Genus : *Melursus*
Species : *M. ursinus*

i. Conservation Status

The sloth bear classified as vulnerable on the IUCN red list of threatened species and mentioned under the Schedule-I of Wildlife Protection Act (1972). Bears are endangered by hunting for their gall bladder and bile to which medicinal properties are attributed.

ii. Habitat

Sloth bears live in a variety of dry and wet forests, and also in some grassland, where boulders and scattered shrubs and trees provide shelter.

iii. Food and Feeding Habits

The dentition indicates that bears are more herbivores and there is a departure from carnivores. In fact, they are omnivorous. Their diet includes largely insects and grubs which can be dug out from the ground or from the underneath of bark of standing trees or fallen logs. They eat termite and bee nests by suction and creating a vacuum in the nest by keeping snout close to the mound. Also, they prefer to eat leaves, root, honey, flowers (Mahua & Semal) and fruits (Ber, Tendu, Jamun, Baheda and Amla etc.) in the season. Bears sometimes raid sugarcane and maize crop incase their habitats have food shortage.

5. Threats and Conservation Plan for Sloth Bear

❖ Direct Population Threats

Direct population threats include all reasons and actions which directly reduce the number of bears in wild other than the natural death of the animal. In India, poaching for the medicinal market and use as 'Dancing' bears reduces numbers in the wild.

❖ Conservation Plan

The Wild Life Protection Act (1972) provides us with the statutory framework for wildlife conservation, and Poaching is a deadly crime against wildlife. Few poachers are caught and punished in Jharkhand whereas; poaching of black bears has not been evidenced.

❖ Poaching

At present time, Sloth bears populations in India appear to be significantly threatened by poaching. Body parts of bears are less important in local areas; hence poached bears are typically exported. News of poaching of bears species is common in Jharkhand and Odisha. Many times Government successfully rescues and release trapped sloth bears into wild. Poaching of Sloth bears in Uttarakhand is strictly prohibited.

• Conservation Plan

During formal interview and discussion with locals it was noted that study area is not prone to poaching or any violence related to sloth bears. If any kind of poaching or other offense is noticed; it will be immediately clued up to the concern Forest and Wildlife Officials. Moreover, workers will be trained and educated about the importance of Sloth bear for ecology and ultimately for humans; an internal attraction towards the species will be tried to develop.

❖ **Habitat Threats**

Loss of forested areas outside parks and reserves poses a major threat to the sloth bears because it causes population fragmentation, thereby leaving small, nonviable populations within the parks. Furthermore, habitat degradation outside the parks, caused by overgrazing, overharvest of forest products and expansion of agricultural areas possess threats to the habitat of species.

- **Conservation Plan**

Sloth bears live in a variety of dry and wet forests, and also in some grassland, where boulders and scattered shrubs and trees provide shelter. Sloth bears are considered vulnerable animals and they are threatened by habitat loss. Habitat of the species will be improved by planting suitable species in surrounding areas. The water bodies in and around the forest areas will be maintained in good condition for use by wildlife.

Other than plant products, diet of Sloth bear chiefly includes termites, insects and honey. It will be instructed to workers as well as local residents not to destroy or damage termite structure and also extract honey in optimal quantity. Honey is the favorite of sloth bear. **Sloth Bear-Human Conflicts**

Sloth bears are known for their aggressiveness, both towards humans and towards other large mammals. They seem to avoid human contact, when possible, but may encounter humans when they are entering into croplands or when people enter the forest. Sloth bears seem to have a low tolerance toward people when they inadvertently meet. There are lots of described incidents of mauling of humans by sloth bears.

- **Conservation Plan to Mitigate the Conflicts**

Conflict arises mainly due to scarcity of food for sloth bear in the forest and it enters residential area in search of food resulting in animal-human conflicts. This may be reduced by (1) Planting suitable food trees and (2) Public awareness of importance of animal in the local ecology.

3.2. *Panthera pardus* (Leopard or Panther)

Photo Source: http://img.allposterslmages.com

i. Classification

Kingdom	Animalia
Phylum	Chordata
Class	Mammalia

Order	Carnivora
Family	Felidae
Genus	*Panthera*
Species	*P. pardus*

ii. Conservation Status

The Leopard is classified as Near Threatened as per the IUCN red list of threatened species and species is mentioned under the Schedule-I of Wildlife Protection Act, (1972). *Panthera pardus* is listed in CITES Appendix I.

iii. Habitat

On the Indian subcontinent, topographical barriers to the dispersal of this subspecies are the Indus River in the west, and the Himalayas in the north. In the east, the lower course of the Brahmaputra and the Ganges Delta form natural barriers to the distribution of the Indo-chinese leopard. Indian leopards are distributed all over India, in Nepal, Bhutan, Bangladesh and parts of Pakistan. They inhabit tropical rain forests, dry deciduous forests, temperate forests and northern coniferous forests but do not occur in the mangrove forests of the Sundarbans. In Uttarakhand, Leopard is mainly found in Jim Corbet National Park and Rajaji National Park.

iv. Food and Feeding

The diet of the Leopard is highly varied, including both large and small prey. It often consists mainly of small and medium-sized mammals (5 to 45 kg), but may range from large beetles to ungulates (hoofed mammals) several times their size. Leopards are probably the most accomplished stalkers and climbers of the big cats. Their varied diet includes wildebeest, impalas, reed-bucks, Thomson's gazelles, jackals, baboons and storks. They routinely drag carcasses bigger than themselves into trees to avoid losing prey to other carnivores. Mostly they prefer hunting at night. Like other felids (i.e., members of the cat family), Leopards commonly kill their prey with a bite to the throat, although smaller prey may be dispatched with a bite to the nape or back of the head.

v. Ecological Threats and Conservation Plan

❖ **Direct Population Threats**

Direct population threats include all reasons and actions which directly reduce the numbers of Leopard in wild other than the natural death of the animal. This is mainly due to reduction in their habitat range, forest degradation, scarcity of food and water in their habitat etc. In India, leopards are feared for their attacks on people.

• Conservation Plan

The Wild Life Protection Act (1972) provides us with the statutory framework for wildlife conservation, and declared that hunting is a deadly crime against wildlife while, forestation will be done surrounding the mine area for enhancement of habitat, protecting the loss of Leopard diversity due to habitat loss.

❖ Conflicts with Human/Farmers

Leopard-human conflict is a serious problem in India and the subcontinent and is another cause of significant mortality of Leopards. India's Forest Department is entitled to set up traps only in cases of a leopard having attacked humans.

• Conservation Measures

Biological fences will be used to protect the livestock from the leopard attack. The awareness among the farmers will be generated through the formal educational programmes.

❖ Poaching

A significant immediate threat to wild leopard populations is the illegal trade in poached skins and body parts between India, Nepal and China. Illegal trade in Leopard body parts (skin, bones, and claws) continues to threaten the survival of the species in the wild. Buyers choose the skins from dealers or tanneries and smuggle them through a complex interlinking network to markets outside India, mainly in China.

• Conservation Measures

The Wild Life Protection Act (1972) provides us with the statutory framework for wildlife conservation, and Poaching is a deadly crime against wildlife. Few poachers are caught or punished. One solution that would fit just about any circumstance though, would be to administer stiffer laws and harsher sentences for those caught poaching.

During formal interview and discussion with local it was noted that study area is not prone to poaching or any other wildlife violence related to leopard or any other species. But, precaution will be always taken while dealing with wildlife. If any kind of poaching or other offense is noticed, it will be immediately clued up to the concern Forest and Wildlife Officials.

❖ Habitat Threats

Loss of forestaress outside parks and reserves poses a major threat to leopard because it causes population fragmentation, thereby leaving small, nonviable populations within the parks or their movements in human territories which raise conflicts. Furthermore, habitat degradation outside the parks, caused by overgrazing, overharvest of forest products, expansion of agricultural areas, and mining of minerals also possess threats to the habitat of species.

• **Habitat improvement**

Leopard lives in a variety of dry and wet forests, and also in some grassland, where boulders and scattered shrubs and trees provide shelter. The leopard has the widest habitat tolerance of any big cat in India. Habitat of the species will be improved by planting suitable species in surrounding areas. For habitat improvement, the degraded forest areas selected by forest department will be supported giving funds for plantation and water harvesting nearby the mine will be improved by afforestation with large trees and suitable forage plants.Similarly the ponds or water holes in the forest will be maintained in good condition along with grasslands near the ponds.

3.3. *Felis Bengalensis* (Leopard Cat or Bagh Billi)

Source: https://www.alamy.com/stock-photo-felis-bengalensis-leopard-cat

i. Classification

Kingdom	:	Animalia
Phylum	:	Chordata
Class	:	Mammalia
Order	:	Carnivora
Family	:	Felidae
Genus	:	*Felis*
Species	:	***F. bengalensis***

ii. Conservation Status

The Leopard Cat is classified as Least Concern as per the IUCN red list of threatened species and species is mentioned under the Schedule-I of Wildlife Protection Act, (1972).

iii. Habitat

Felis bengalensis is found in tropical and temperate forests, coniferous forests, shrub land habitat, and grasslands. Its distribution is limited to areas with less than 10 cm of snow annually, and it is not found in steppe or arid climates.Felisbengalensis has a fairly diverse diet and is able to find food in most habitats. It seems relatively impervious to human disturbance as populations in secondary growth and disturbed areas are stable and it is often found near agricultural fields and rural settlements.

iv. Food and Feeding

Leopard cats are carnivorous, feeding on a variety of small prey including mammals, lizards, amphibians, birds and insects. In most parts of their range, small rodents such as rats and mice form the major part of their diet, which is often supplemented with grass, eggs, poultry, and aquatic prey. They are active hunters, dispatching their prey with a rapid pounce and bite. Unlike many other small cats, they do not "play" with their food, maintaining a tight grip with their claws until the animal is dead. This may be related to the relatively high proportion of birds in their diet, which are more likely to escape when released than are rodents.

v.Ecological Threats and Conservation Plan

❖ **Direct Population Threats**

Direct population threats include all reasons and actions which directly reduce the numbers of Leopard Cat in wild other than the natural death of the animal. This is mainly due to reduction in their habitat range, forest degradation, scarcity of food and water in their habitat etc.

• **Conservation Plan**

The Wild Life Protection Act (1972) provides us with the statutory framework for wildlife conservation, and declared that hunting is a crime against wildlife while, forestation will be done surrounding the mine area for enhancement of habitat, protecting the loss of Leopard Cat diversity due to habitat loss.

❖ **Conflicts with Human**

Expansion of agriculturally used land, encroachment of humans and their livestock into protected areas are main factors contributing to habitat loss and decrease of wild prey. As a result, leopard cat approach human settlements for food. They rarely harm to human beings.

• **Conservation Measures**

The prey species preferred by Leopard Cat will be conserved to insure sufficient prey availability, which will also reduce the conflict with humans. Biological fences will be used to protect the livestock from the leopard cat.

❖ **Poaching**

A significant immediate threat to wild Leopard Cat populations is the illegal trade in poached skins and body parts between India. Illegal trade in Leopard Cat body parts continues to threaten the survival of the species in the wild. Buyers choose the skins from dealers or tanneries and smuggle them through a complex interlinking network to markets outside India.

• Conservation Measures

The Wild Life Protection Act (1972) provides us with the statutory framework for wildlife conservation, and Poaching is a crime against wildlife. One solution that would fit just about any circumstance though, would be to administer stiffer laws and harsher sentences for those caught poaching.

During formal interview and discussion with local it was noted that study area is not prone to poaching or any other wildlife violence related to leopard cat or any other species. But, precaution will be always taken while dealing with wildlife. If any kind of poaching or other offense is noticed; it will be immediately clued-up to the concern Forest and Wildlife Officials.

❖ **Habitat Threats**

Loss of forest areas outside parks and reserves poses a major threat to leopard cats because it causes population fragmentation, thereby leaving small, nonviable populations within the parks or their movements in human territories which raise conflicts.

• Habitat improvement

vi. Leopard cats lives in a variety of dry and wet forests, and also in some grassland, where boulders and scattered shrubs and trees provide shelter. Habitat of the species will be improved by planting suitable species in surrounding areas.

3.4. *Felis viverrina* (Fishing Cat)

Source: https://www.britannica.com/animal/fishing-cat

i. Classification

Kingdom	:	Animalia
Phylum	:	Chordata
Class	:	Mammalia
Order	:	Carnivora
Family	:	Felidae

Genus : *Felis*
Species : *F. viverrinus*

ii. Conservation Status

The Fishing Cat is classified as Vulnerable as per the IUCN red list of threatened species and species is mentioned under the Schedule-I of Wildlife Protection Act, (1972).

iii. Habitat

In India, fishing cats are recorded discontinuously from the Himalayan foothills of the Terai region (North India).Fishing cats live primarily in wetland areas, both marshes and swamps. These cats can be found in heavily forested regions adjacent to rivers or near jungles. They can also be found in scrub areas, reed beds, and tidal creek areas. Fishing cats have been reported in Himalayan forests at an elevation of 1525 m. (~5000 ft.), they have also been found at elevations as high as 7000 ft. (~ 2100 m.) in the mountainous areas of India.

iv. Food and Feeding

Fishing cats are best described as piscivores. Earliest records indicate that fishing cats predominantly feed on fish and shellfish. These early records also state that fishing cats have been known to eat dogs, sheep, and calves. At that time fishing cats were known to have taken human infants. In 1987 a fishing cat was observed eating a dead cow, so it is believed that they eat carrion. A study examining the food habits of F. viverrinus revealed that that they primarily feed on fish.

v. Ecological Threats and Conservation Plan

❖ **Direct Population Threats**

The major threat to fishing cats is the destruction of their habitat, primarily wetlands. For example, in India it has been documented that a variety of factors are responsible for the loss of habitat, including land reclamation, dumping, clearing of the natural vegetation, and pollution.

In addition to the loss of habitat the population of the fishing cat is in danger due to destructive fishing practices that greatly reduce the fish stock. The fishing cat is also a victim of poaching. They are often hunted for various body parts.

• **Conservation Plan**

The Wild Life Protection Act (1972) provides us with the statutory framework for wildlife conservation, and declared that hunting is a crime against wildlife while, forestation will be done surrounding the mine area for enhancement of habitat, protecting the loss of Fishing Cat diversity due to habitat loss.

❖ **Conflicts with Human/Farmers**

The fishing cat (Felis viverrinus) is one among several smaller wild cat species prowling the Indian subcontinent. It is a nocturnal, medium-sized cat usually found near swamps, marshlands, oxbow lakes, tidal creeks and mangroves. Extensive habitat loss and a rise in retaliatory killings due to increased conflict with humans have caused an estimated 30 percent decline in the global population of these felids within the last 15 years. Studies have indicated a 44 percent decline in habitat and a concomitant increase in conflict with humans.

• **Conservation Measures**

The prey species preferred by Fishing Cat will be conserved to insure sufficient prey availability, which will also reduce the conflict with humans. Biological fences will be used to protect the livestock from the Fishing Cat. The awareness among the farmers will be generated through the formal educational programmes.

❖ **Poaching**

Fishing cats are also targeted by hunters and poachers for their skin and meat.Five fishing cats were also killed by hunters in the Howrah district in 2015, which has previously reported fishing cat deaths due to hunting and poaching.

• **Conservation Measures**

The Wild Life Protection Act (1972) provides us with the statutory framework for wildlife conservation, and Poaching is a deadly crime against wildlife. One solution that would fit just about any circumstance though, would be to administer stiffer laws and harsher sentences for those caught poaching.

During formal interview and discussion with local it was noted that study area is not prone to poaching or any other wildlife violence related to Fishing Cat or any other species. But, precaution will be always taken while dealing with wildlife. If any kind of poaching or other offense is noticed; it will be immediately clued-up to the concern Forest and Wildlife Officials.

❖ **Habitat Threats**

Loss of wetland, forest areas outside parks and reserves poses a major threat to Fishing Cats because it causes population fragmentation, thereby leaving small, nonviable populations within the parks or their movements in human territories which raise conflicts.

• **Habitat Improvement**

Fishing cats live primarily in wetland areas, both marshes and swamps. These cats can be found in heavily forested regions adjacent to rivers or near jungles. They can also be found in scrub areas,

reed beds, and tidal creek areas. Habitat of the species will be improved by conserving the wetlands, planting suitable species in surrounding areas.

3.5. *Herpestes edwardsi* (Common Mongoose)

Photo Source:https://en.wikipedia.org

i. Classification

Kingdom	Animalia
Phylum	Chordata
Class	Mammalia
Order	Carnivora
Family	Herpestidae
Genus	*Herpestes*
Species	*H. edwardsii*

ii. Conservation Status

Common Mongoose are widely distributed in the wild across India and protected in many areas and by law in India. Indian Common Mongoose is mentioned in **Schedule-II** of Wildlife Protection Act (1972), indicates its conservation values. Illegal poaching for meat however continues and declines have been noted in different parts of India.

iii. Habitat

The Indian mongoose (*Herpestes edwardsii*) population use variety of habitat for their survival. In Indian, they are found generally in open forest along with grass glades and grassland. In Uttarakhand, they are commonly found along with in Rajaji National Park, Jim Corbett National Park and other forest areas. Generally, it is found in human-dominated landscapes.

iv. Food and Feeding

The Indian grey mongoose is mainly active during the day, feeding on a variety of prey, including insects, spiders, scorpions and other invertebrates, as well as frogs, lizards, rodents and snakes. It may also take vegetable matter such as fruit, and feeds on refuse and carrion. This species often kills and eats venomous snakes, being agile and quick enough to avoid being bitten. A small number of mongoose species, including the Indian grey mongoose, may be introduced to new areas in order to kill rats and snakes.

v. Major Threats

Although, this species as a whole is not thought to face any major threats, it may experience some localized ones. In some areas, the Indian grey mongoose is captured and sold as a pet or for its

skin, and all mongoose species are in demand for the wildlife trade. The meat is eaten by some tribes, and the hair used to make brushes and good luck charms.

- **Conservation of Mongoose**

The Indian grey mongoose is listed on Appendix III of the Convention on International Trade in Endangered Species (CITES), meaning that there is some regulation of international trade in this species. This mongoose is legally protected in India, and in central India it is considered a sacred species and is not killed. The Indian grey mongoose also occurs in many protected areas. However, the IUCN recommend that further field surveys, ecological studies, habitat protection and monitoring of threats are needed in order to ensure that populations of this small carnivore remain secure. On the other hand some conservation measures will be follows:

- The natural habitat will be preserved and habitat improved works will be carried out by planting bushes and shrubs.
- The existing natural habitat in the area will be preserved.
- The people living in the surrounding area and employee of the company would be motivated towards the protection of the animal. Motivation will lead to timely information to the concerned authorities about any threat to wild life or any cases of poaching/hunting.

3.6. *Canis aureus* (Golden Jackal)

Source:https://commons.wikimedia.org/wiki/File:A_Golden_Jackal-Pawalgarh,Uttarakhand,India.jpg

i. Classification

Kingdom	:	Animalia
Phylum	:	Chordata
Class	:	Mammalia
Order	:	Carnivora
Family	:	Canidae
Genus	:	Canis
Species	:	*C. aureus*

ii. Conservation Status

Canis aureus is evaluated by IUCN and mentioned as least concern whereas; it is mentioned under the Schedule-II of Wildlife Protection Act (1972) in India.

iii. Habitat

The Golden jackal is the most northerly of jackal species, and also the most widely distributed. Golden jackals prefer dry open country, arid short grasslands and steppe landscapes. In Uttarakhand,

they are commonly found along with in Rajaji National Park, Jim Corbett National Park and other forest areas.

iv. Food and Feeding

Golden jackals consume 54% animal food and 46% plant food. They are opportunistic foragers with a very varied diet, which consists of young gazelles, rodents, (especially during winter), hares, ground birds and their eggs, reptiles, frogs, fish, insects and fruit. They take carrion on occasion.

i. Ecological Threats and Conservation Plan

- **Direct Population Threats**

Loss of forest areas along with the reduction of different small size animals due to climate change and deforestation are a major threat to Golden jackals in India.

• Conservation Plan

The Wild Life Protection Act (1972) provides us with the statutory framework for wildlife conservation, and declared that hunting of Golden jackals is a deadly crime against wildlife. While greenbelt and grassland development will be done in the degraded forest land for enhancement of habitat and protecting the loss of Golden jackals diversity.

- **Conflicts with Human/Farmer**

In India, several Golden jackals are killed due to ignorance or out of fear when they enter habitation and capture goats or poultry. They raids crops such as corn, sugarcane and watermelon. Individuals have also attacked Caracul sheep with such frequency that sheep-herders have had to make their pastures jackal-proof by enclosing them.

• Conservation Plan

The workers are more prone to encounter the Jackals in study area. For maintaining the ecological integrity of forests and other habitats of Golden jackals, local villagers, farmers and workers will be educated through the awareness programme to play ecologically significant role conservation and protection of Golden jackals. Also, workers will be educated and facilitate to avoid the any encounter with the Jackals.

- **Poaching**

It has recently been hunted for its distinctive blood markings in the production of handbags. The jackals are rarely hunted by human while some tribal population poaches it for meat.

• Conservation Plan

During formal interview and discussion with locals it was noted that study area is not prone to poaching or any other wildlife violence. But, precaution will be always taken while dealing with wildlife. If any kind of poaching or other offense is noticed; it will be immediately clued-up to the concern Forest and Wildlife Officials.

• Habitat threats/Loss

Rapid degradation of forest areas, due to climate change degradation of grassland, swamps and marshes is a major threat to Jackals because it causes population fragmentation. Furthermore, habitat degradation caused by overgrazing, overharvest of forest products, expansion of agricultural areas, and use huge amounts of pesticides agricultural areas also poses threats to the habitat of Jackals as well as their prey material.

• Conservation Action

For habitat improvement for Jackals, all possible activities will be carried out in the study area of respective projects. Their habitat will be improved in the study area by planting suitable species along with the development of grasslands in the respective area. Study area will be protected with the involvement of workers as well as local people.

3.7. *Vulpes Vulpes* (Red Fox/Lomri)

Source: https://en.wikipedia.org/wiki/Red_fox

vi. Classification

Kingdom	:	Animalia
Phylum	:	Chordata
Class	:	Mammalia
Order	:	Carnivora
Family	:	Felidae
Genus	:	*Prionailurus*
Species	:	***F. bengalensis***

vii. Conservation Status

The Red Fox is classified as Least Concern as per the IUCN red list of threatened species and species is mentioned under the Schedule-II of Wildlife Protection Act, (1972).

viii. Habitat

Natural habitat is dry, mixed landscape, with abundant "edge" of scrub and woodland. They are also abundant on moorlands, mountains (even above the treeline, known to cross alpine passes), sand dunes and farmland from sea level to 4,500 m. Red Foxes flourish particularly well in urban areas. They are most common in residential suburbs consisting of privately owned, low-density housing and

are less common where industry, commerce or council rented housing predominates. In many habitats, foxes appear to be closely associated with people, even thriving in intensive agricultural areas.

ix. Food and Feeding

Red foxes are omnivores with a highly varied diet.They primarily feed on small rodents like voles, mice, ground squirrels, hamsters, gerbils, woodchucks, pocket gophers and deer mice. Secondary prey species include birds, leporids, porcupines, raccoons, opossums, reptiles, insects, other invertebrates and flotsam. On very rare occasions, foxes may attack young or small ungulates.They typically target mammals up to about 3.5 kg (7.7 lb) in weight, and they require 500 grams (18 oz) of food daily. Red foxes readily eat plant material, and in some areas fruit can amount to 100% of their diet in autumn. Commonly consumed fruits include blueberries, blackberries, raspberries, cherries, persimmons, mulberries, apples, plums, grapes, and acorns. Other plant material includes grasses, sedges and tubers.

x. Ecological Threats and Conservation Plan

❖ Direct Population Threats

Threats to this species are highly localized and include habitat degradation, loss, and fragmentation, and exploitation, and direct and indirect persecution.

• Conservation Plan

The Wild Life Protection Act (1972) provides us with the statutory framework for wildlife conservation, and declared that hunting is a deadly crime against wildlife while, forestation will be done surrounding the mine area for enhancement of habitat, protecting the loss of Red foxdiversity due to habitat loss.

❖ Conflicts with Human/Farmers

Red fox conflicts with human are common in India as they live in close proximity to humans. The vast majority of conflicts between foxes and humans can easily be avoided and humane methods of conflict prevention and resolutionare available for the occasions when real problems do occur.

• Conservation Measures

Biological fences will be used to protect the livestock from the attack. People seem to think that just seeing a fox in their neighborhood is indicative of a problem, when in fact that may not be the case.The awareness among the villagers will be generated through the formal educational programmes.

❖ Poaching

A significant immediate threat to wild Red Fox populations is the illegal trade in poached skins and body parts between India, Nepal and China. Illegal trade in Red Fox body parts (skin, bones, and claws) continues to threaten the survival of the species in the wild. Buyers choose the skins from

dealers or tanneries and smuggle them through a complex interlinking network to markets outside India.

• **Conservation Measures**

The Wild Life Protection Act (1972) provides us with the statutory framework for wildlife conservation, and Poaching is a deadly crime against wildlife. One solution that would fit just about any circumstance though, would be to administer stiffer laws and harsher sentences for those caught poaching.

During formal interview and discussion with local it was noted that study area is not prone to poaching or any other wildlife violence related to Red Fox or any other species. But, precaution will be always taken while dealing with wildlife. If any kind of poaching or other offense is noticed; it will be immediately clued-up to the concern Forest and Wildlife Officials.

❖ **Habitat Threats**

Loss of forest areas outside parks and reserves poses a major threat to Red Fox because it causes population fragmentation, thereby leaving small, nonviable populations within the parks or their movements in human territories which raise conflicts. Furthermore, habitat degradation outside the parks, caused by overgrazing, overharvest of forest products, expansion of agricultural areas, and mining of minerals also possess threats to the habitat of species.

• **Habitat improvement**

Red Fox lives in a variety of dry and wet forests, and also in some grassland, where boulders and scattered shrubs and trees provide shelter. Habitat of the species will be improved by planting suitable species in surrounding degraded forest areas.

3.8. *Felis chaus* (Jungle cat)

Photo Source:https://farm9.staticflickr.com

i. Classification

Kingdom: Animalia
Phylum : Chordata
Class : Mammalia
Order : Carnivora
Family : Felidae

Genus : Felis
Species : *F. chaus*

ii. Conservation Status

Jungle cat (*Felis chaus*) is nocturnal, rare and elusive cat, which is mentioned as least concern on IUCN Red List (2010). In India, it is accorded the highest protection by being placed in Schedule II of the Indian Wildlife Protection Act (1972). Hunting Jungle cat is prohibited Uttarakhand as well as whole in India.

iii. Habitat

Jungle cats prefer habitats near water with dense vegetative cover but can be found in a variety of habitats including deserts (where they are found near oases or along riverbeds), grasslands, scrubby woodlands and dry deciduous forests, as well as cleared areas in moist forests. They are commonly found in tall grass, thick brush, riverside swamps, and reed beds. They also adapt well to cultivated land and can be found in many different types of agriculture and forest plantations.

iv. Food and Feeding

Jungle cats primarily prey on animals that weigh less than 1 kg and commonly consume rodents, lizards, snakes, frogs, birds, hare, fish, insects, livestock, and even fruit during the winter. Rodents are its primary prey item, however, which provides up to 70% of its daily energy intake.

v. Ecological Threats and Conservation Plan

- **Direct Population Threats**

Direct population threats include all reasons and actions which directly reduce the numbers of Jungle Cat in wild other than the natural death of the animal. This is mainly due to reduction in their habitat range, Wetland degradation, scarcity of food and water in their habitat etc.

However, Jungle Cat is often found in areas where they share their habitats with larger carnivorous mammals such as tigers and bears which could be of threat to them. Jungle Cat hunted mainly for their fur and skins for commercial purposes. Although commercial trade is much reduced, the species continues to be hunted throughout most of its range for fur, for food, and as pets. They are also widely viewed as poultry pests and killed in retribution.

• Conservation Plan

The Wild Life Protection Act (1972) provides us with the statutory framework for wildlife conservation, and declared that hunting is a deadly crime against wildlife. While, some pond will be created surrounding the mine area for enhancement of habitat, protecting the loss of Jungle cat diversity due to habitat loss.

- **Conflicts with Human**

People are the biggest threat to the Jungle Cat as they have not only destroyed much of their unique wetland homes with increasing levels of industrial and commercial activity but they have also been known to hunt them over the years for their meat and fur. Sometimes, cats approach villages and other human settlement for food and got hurt by peoples.

• Conservation Plan

The Wild Life Protection Act (1972) provides us with the statutory framework for wildlife conservation, and declared that hunting is a deadly crime against wildlife. Hunting is prohibited in India. While awareness programmes will be conducted in surrounding areas regarding to the ecology and the importance of wildlife.

- **Poaching**

Despite now being a protected animal species, large seizures of Jungle Cat skins at local markets still occur which indicates that poachers are still decimating populations, particularly in certain areas. The poaching of fishing cat by people for their meat, skin and fur has obliterated populations in many areas, but poaching activities in present mine area have not been observed.

• Conservation Plan

The Wild Life Protection Act (1972) provides us with the statutory framework for wildlife conservation, and Poaching is a deadly crime against wildlife. During formal interview and discussion with local it was noted that study area is not prone to poaching or any other wildlife violence related to Jungle cat or any other species. If any kind of poaching or other offense is noticed; it will be immediately clued-up to the concern Forest and Wildlife Officials.

- **Habitat Threats/ Loss**

The main problem facing Jungle cats in the wild is the destruction of wetlands. A recent survey found that over 50% of Asian wetlands faced threat of draining, pollution, and human encroachment.

• Habitat Improvement

A Jungle cat lives mostly near by the aquatic habitats and wet forests. They also prefer to live in some grassland, where boulders and scattered shrubs. Habitat of the species will be improved by digging some ponds and some fish species will be explored into it. Plantation of suitable species in surrounding the ponds and other areas will be done.

3.9. *Macaca mulatta* (Rhesus Macaque)

Photo Source: http://thumbs.dreamstime.com

i. Classification

Kingdom	: Animalia
Phylum	: Chordata
Class	: Mammalia
Order	: Primates
Family	: Cercopithecidae
Genus	: *Macaca*
Species	: ***M. mulatta***

ii. Conservation Status

The rhesus macaque (Macaca mulatta), is one of the best-known species of Old World monkeys. In India, it is placed in Schedule II of the Indian Wildlife Protection Act (1972). It is listed as Least Concern in the IUCN Red List of Threatened Species.

iii. Habitat

Rhesus macaques inhabit arid, open areas and also found in grasslands, woodlands and in mountainous regions up to 2,500 m (8,200 ft) in elevation. Rhesus macaques are noted for their tendency to move from rural to urban areas, coming to rely on handouts or refuse from humans.

iv. Food and Feeding

They have also been observed eating termites, grasshoppers, ants and beetles. When food is abundant, they are distributed in patches and forage throughout the day in their home ranges. They drink water when foraging and gather around streams and rivers. Rhesus macaques have specialized pouch-like cheeks, allowing them to temporarily hoard their food.

v. Ecological Threats and Conservation Plan

- **Direct Population Treats**

Loss of forest areas is a major threat to Rhesus macaques in India. Furthermore, habitat degradation outside the parks, caused by overgrazing, overharvest of forest products and mining of minerals also possesses threats to the habitat of species.

• Conservation Plan

The Wild Life Protection Act (1972) provides us with the statutory framework for wildlife conservation, and declared that hunting Rhesus macaques is a deadly crime against wildlife. Whileplantation will be done in the degraded forest area for enhancement of the habitat.

• Conflicts of Tigers with Human & Farmers

The intensity of Rhesus macaques and human conflicts has significantly increased. Rhesus macaques are known for their aggressiveness sometimes. They seem to avoid human contact, when possible, but may encounter humans when they are enticed into croplands or when people enter the forest. On the other hand, it was also found that group of Macaques spoiled more crops than they actually eat; juveniles and infants in particular brought about damage during play on the agricultural ground.

• Conservation Plan

Conflict arises mainly due to scarcity of habitat and food for Rhesus macaques in the forest and it enters residential area in search of food resulting in animal-human conflicts. This may be reduced by (1) Plantation to enhance the habitat, (2) Public awareness of importance of animal in the local ecology.

• Poaching

Rhesus macaques were once seriously threatened by the rate of capture and export for use in biomedical research. In the 1960s, often 50,000 juvenile rhesus macaques were trapped and shipped from India per year, crippling the population growth of rhesus in India. There are still some rhesus macaques trapped and used for research within India, but the effect of the population is negligible compared to previous levels of usage.

• Conservation Plan

The Wild Life Protection Act (1972) provides us with the statutory framework for wildlife conservation, and poaching of Rhesus macaques is a deadly crime against wildlife.

During formal interview and discussion with local it was noted that study area is not prone to poaching or any other wildlife violence related to Rhesus macaques or any other species. If any kind of poaching or other offense is noticed; it will be immediately sliced-up to the concern Forest and Wildlife Officials. Moreover, workers will make aware of wildlife crime and also subsequent penalties and punishment.

• Habitat Threats / Loss

Loss of suitable habitat like forests and lack of water resource in respective area are a major cause of the declining the population density of Rhesus macaques in India. Due to the continuous decaling of forest results lack of fruits and food materials on which Rhesus macaques feeds.

• **Habitat Improvement Plan**

Rhesus macaques live in a variety of dry and wet forests, and also in some grassland. Habitat of the species will be improved by planting suitable species in surrounding areas. The plant species preferred for shelter and food will be conserved to insure sufficient habitat and food availability, which will also reduce the conflict with humans.

3.10. *Axis axis* (Spotted Deer)

Photo Source: http://rajajinationalpark.co.in

i. Classification

Kingdom	Animalia
Phylum	Chordata
Class	Mammalia
Order	Artiodactyla
Family	Cervidae
Genus	Axis
Species	*A. axis*

ii. Conservation Status

The Spotted deer (Chital) is classified as Least Concern as per the IUCN red list of threatened species and also mentioned under the Schedule-I) of Wildlife Protection Act, (1972) in India.

iii. Food and Feeding

Spotted deer (Chital) eats a wide variety of plants: about 160–190 have been recorded from across the species' range. It is predominantly a grazer but consumes more fallen leaves, flowers and fruits in winter/dry season. In addition to plant soft matter, crabs, mushrooms and rarely, bark (are eaten.

iv. Habitat

Spotted deer (Chital) populations use variety of habitat for their survival. In Indian, they are found generally in open forest along with grass glades. Chital is particularly frequent in grassland–forest interface, edge, and other ecotones. In Uttarakhand, they are found in Rajaji National Park and Jim Corbett National Park.

v. Ecological Threats and Conservation Plan

• **Direct Population Threats**

There are presently no major threats to Spotted deer, although densities are widely below ecological carrying capacity, through hunting and competition with domestic livestock. Many protected areas are well enough secured that the species has thrived well and, is now locally abundant and in such areas poaching of Chital is a more serious conservation problem for the large predators than it is for Chital itself. However, Spotted deer is often found in areas where they share their habitats with larger carnivorous mammals such as Tigers, Leopards, Dogs and Bears which could be of threat to them.

- **Conservation Plan**

The Wild Life Protection Act (1972) provides us with the statutory framework for wildlife conservation, and declared that hunting of spotted deer is a crime against wildlife. While, forestation and grassland development will be done surrounding the area for enhancement of habitat, protecting the loss of spotted deer diversity due to habitat loss.

- **Poaching**

Poaching of Spotted deer for their meat and horns has declined their population in many parts of India. Whereas, spotted deer is often hunted illegally by many communities for sale in local markets. On the other hand, poaching case of spotted deer has not been observed in and around the Dehradun and other district.

- **Conservation Plan**

The Wild Life Protection Act (1972) provides us with the statutory framework for wildlife conservation, and poaching of Spotted deer is a crime against wildlife. During formal interview and discussion with local people living in the study area, it was observed that study area is not prone to poaching or any other wildlife violence related to Spotted deer and other species. In present study area, public awareness programme will be conducted regarding the facts and laws of protection and conservation of Spotted deer. Any kind of illegal poaching and collection of horns noted in study area will be immediately informed to concern authority.

- **Conflicts with Human/Farmers**

Chital easily habituates to human presence, and herds often congregate in open areas near habitation or forest camps to spend the night, possibly due to greater safety from predators and poachers that shy away from these areas.

- **Conservation Plan**

The role of spotted deer in cropland ecosystem is not very crucial. The awareness among the peoples and farmers will be generated through the formal educational programmes. On the other hand, in buffer zone of present mining area, public awareness programme will be conducted regarding the facts and laws of protection and conservation of Spotted deer.

- **Habitat Threats/Loss**

Rapid habitat destruction and scarcity of suitable food are the major cause of the declining the numbers of Spotted deer in India. These animals are threatened mainly due to deforestation, the conversion of their habitat to agricultural land; and the burning of grassland. Due to shrinking habitat, they shared their habitat with several carnivores animals, which is a major cause to reduce their numbers frequently.

- **Habitat Improvement**

Spotted deer is capable of surviving both in natural habitat as well as artificial manmade ecosystems like croplands, grassland, community forests and Parks. The plantation of suitable species will be done in the buffer zone to modify their habitat. The species planted as part of greenbelt will be also selected as per the feeding habits of Spotted deer and will be included in plan. The grass species preferred by them will be conserved to insure sufficient food availability, which will also reduce the conflict with humans.

3.11. *Presbytis entellus schistaceus* (Common Langoor)

Photo Source: http://www.inaturalist.org

iv. Classification

Kingdom	: Animalia
Phylum	: Chordata
Class	: Mammalia
Order	: Primates
Family	: Cercopithecidae
Genus	: *Semnopithecus*
Species	: *Simia entellus*

v. Conservation Status

The Common Langoor (Presbytis entellus schistaceus), is one of the best-known species of Old World monkeys. In India, it is placed in Schedule II of the Indian Wildlife Protection Act (1972). It is listed as Least Concern in the IUCN Red List of Threatened Species.

vi. Habitat

CoecionLangoors can adapt to a variety of habitats. They inhabit arid habitats like deserts, tropical habitats like tropical rainforests and temperate habitats like coniferous forests, deciduous habitats and mountains habitats. They are found at sea level to altitudes up to 4,800 m (13,000 ft). They can adapt well to human settlements, and are found in villages, towns and areas with housing or agriculture. They live in densely populated cities, which has a population numbering up to a million.

v. Food and Feeding

Common langoors are primarily herbivores. However, unlike some other colobines they do not depend on leaves and leaf buds of herbs, but will also eat coniferous needles and cones, fruits and fruit buds, evergreen petioles, shoots and roots, seeds, grass, bamboo, fern rhizomes, mosses, and lichens. Leaves of trees and shrubs rank at the top of preferred food, followed by herbs and grasses. Non-plant materials consumed include spider webs, termite mounds and insect larvae. They forage on agricultural crops and other human foods, and even accept handouts. Although they occasionally drink, langoors get most of their water from the moisture in their food.

vi. Ecological Threats and Conservation Plan

- **Direct Population Threats**

Loss of forest areas a major threat to Common Langoor in India. Furthermore, habitat degradation outside the parks caused by overgrazing, overharvest of forest products and mining of minerals also possesses threats to the habitat of species.

- **Conservation Plan**

The Wild Life Protection Act (1972) provides us with the statutory framework for wildlife conservation, and declared that hunting Common Langoor is a crime against wildlife. While, plantation will be done surrounding the mine lease area for enhancement of the habitat.

- **Conflicts with Human & Farmers**

The intensity of Common Langoor and human conflicts has significantly increased. Common Langoor are known for their aggressiveness sometimes. They seem to avoid human contact, when possible, but may encounter humans when they are enticed into croplands or when people enter the forest. Most of the populations occupy human-dominated landscapes, with very few actually occurring in forested areas. Conflict with humans is a major cause of concern and predicted declines are based on this.

- **Conservation Plan**

Conflict arises mainly due to scarcity of habitat and food for Common Langoor in the forest and it enters residential area in search of food resulting in animal-human conflicts. This may be reduced by (1) Plantation to enhance the habitat, (2) Public awareness of importance of animal in the local ecology.

- **Poaching**

India has laws prohibiting the capturing or killing of langurs, but they are still hunted in some parts of the country. Enforcement of these laws have proven to be difficult and it seems most people are unaware of their protection. Populations are also threatened by forest fires and deforestation for wood.

• Conservation Plan

The Wild Life Protection Act (1972) provides us with the statutory framework for wildlife conservation, and poaching of Common Langoor is a crime against wildlife.

During formal interview and discussion with local it was noted that study area is not prone to poaching or any other wildlife violence related to Common Langooror any other species. If any kind of poaching or other offense is noticed; it will be immediately clued-up to the concern Forest and Wildlife Officials. Moreover, workers will make aware of wildlife crime and also subsequent penalties and punishment.

- **Habitat Threats / Loss**

Loss of suitable habitat, like forests and lack of water resource in respective area is a major cause of the declining the population density of Common Langoor in India. Due to the continuous decaling of forest results lack of fruits and food materials on which Common Langoor feeds.

• Habitat Improvement Plan

Common Langoor live in a variety of dry and wet forests, and also in some grassland. Habitat of the species will be improved by planting suitable species in surrounding areas. The plant species preferred for shelter and food will be conserved to insure sufficient habitat and food availability, which will also reduce the conflict with humans.

3.12. *Lutra Lutra* (Otter/Udbilao)

Source: https://en.wikipedia.org/wiki/Eurasian_otter

xi. Classification

Kingdom	:	Animalia
Phylum	:	Chordata
Class	:	Mammalia
Order	:	Carnivora

Family : Mustelidae
Genus : *Lutra*
Species : *L. lutra*

xii. Conservation Status

The Otter is classified as Near Threatened as per the IUCN red list of threatened species and species is mentioned under the Schedule-II of Wildlife Protection Act, (1972). *LutraLutra* is listed in CITES Appendix I.

xiii. Habitat

In India, the species is distributed in the Himalayan foothills, southern Western Ghats and the central Indian landscape. In the Indian sub-continent, Eurasian Otters occur in cold hill and mountain streams. During summer (April - June) in the Himalayas they may ascend up to 3,660 m. These upward movements probably coincide with the upward migration of the carp and other fish for spawning. With the advent of winter the otters come down to lower altitudes.In general, their varied and adaptable diets mean they may inhabit any unpolluted body of fresh water, including lakes, streams, rivers, and ponds, as long as the food supply is adequate.

xiv. Food and Feeding

The otter's diet mainly consists of fish. Fish is their most preferred choice of food in Mediterranean and temperate freshwater habitats. During the winter and in colder environments, though, fish consumption is significantly lower, and the otters use other sources of food, including amphibians,crustaceans, insects, birds and sometimes small mammals, including young beavers.

xv. Ecological Threats and Conservation Plan

❖ **Direct Population Threats**

Direct population threats include all reasons and actions which directly reduce the numbers of Otter in wild other than the natural death of the animal. This is mainly due to reduction in their habitat range, forest degradation, scarcity of food and water in their habitat etc.

• **Conservation Plan**

The Wild Life Protection Act (1972) provides us with the statutory framework for wildlife conservation, and declared that hunting is a crime against wildlife while, forestation will be done surrounding the mine area for enhancement of habitat, protecting the loss of Otter diversity due to habitat loss.

❖ **Conflicts with Human/Farmers**

Otters are seen as pests and competitors by fishermen and aquaculturists. Otters eat fish from the fishing zones or fisheries, thus they are perceived as a threat to the income of fishermen and

aquaculturists. Even though otters are protected by national law in several countries, certain local authorities encourage the culling of otters, in the interests of the fishermen and aquaculturists. Furthermore, otters which are accidentally entangled in fishing nets would drown overnight.

• Conservation Measures

The prey species preferred by Otter will be conserved to insure sufficient prey availability, which will also reduce the conflict with humans. Biological fences will be used to protect the livestock from the Otter. The awareness among the villagers will be generated through the formal educational programmes.

❖ Poaching

Otters are hunted for their pelts, meat, fat and other body parts. All the three Indian species viz. Eurasian otterLutralutra, Smooth-coated otter L. perspicillata and Oriental small-clawed otter Aonyxcinereus have been recorded in trade. Otters are mainly trapped for their pelts in many parts of the country, especially central India, Guwahati and south India. Seizure figures of wildlife offences in the country reveal that 20-30% of the fur trade is in otter skins. The main markets are Kanpur, Lucknow, Kota, Calcutta, Bangalore and Delhi. The otter fur trade, which is practiced in many parts of the world, routes out via Nepal and Bangladesh, to importing countries.

• Conservation Measures

The Wild Life Protection Act (1972) provides us with the statutory framework for wildlife conservation, and Poaching is a crime against wildlife. Few poachers are caught or punished. One solution that would fit just about any circumstance though, would be to administer stiffer laws and harsher sentences for those caught poaching.

During formal interview and discussion with local it was noted that study area is not prone to poaching or any other wildlife violence related to Otter or any other species. But, precaution will be always taken while dealing with wildlife. If any kind of poaching or other offense is noticed; it will be immediately clued-up to the concern Forest and Wildlife Officials.

❖ Habitat Threats

The aquatic habitats of otters are extremely vulnerable to man-made changes. Canalization of rivers, removal of bank side vegetation, dam construction, draining of wetlands, aquaculture activities and associated man-made impacts on aquatic systems are all unfavorable to otter populations. In India, the decrease in prey species from wetlands and water ways had reduced the population to an unsustainable threshold leading to local extinctions.

• **Habitat improvement**

The otters showed preference for sandy stretches in all the seasons, as these stretches provide sites for dens and grooming which is almost inaccessible to humans and thus less disturbed. This ability of the species to adapt to diverse aquatic habitats accounts for its broad geographic distribution.

Otter occurrence was associated with shallow and calmer regions (with low water velocity) along the Ganga River Basin, as these conditions increase the rate of prey capture per efforts. Ease in capturing prey was interpreted to be the most important factor in selecting the habitat by the species, as also suggested by other studies.

3.13. *Martes flavigula* (Chitrola)

Source: https://en.wikipedia.org/wiki/Yellow-throated_marten

i. Classification

Kingdom	:	Animalia
Phylum	:	Chordata
Class	:	Mammalia
Order	:	Carnivora
Family	:	Mustelidae
Genus	:	*Martes*
Species	:	***M. flavigula***

ii. Conservation Status

The Martesflavigulais classified as Least Concern as per the IUCN red list of threatened species and species is mentioned under the Schedule-II of Wildlife Protection Act, (1972).

iii. Habitat

In India, the species is distributed in northeastern India, mainly Arunachal Pradesh, Manipur, Himalayan West Bengal, Uttarakhand and Assam. With its huge range from boreal to equatorial areas and sea-level to over 4,000 amsl., Yellow-throated Marten occupies a concomitantly wide range of habitats.It occurs in areas even with deep prolonged winter snow-cover and is active right through the winter.

iv. Food and Feeding

The common food items include squirrels, birds, snakes, and lizards, although its wide diet includes also insects, eggs, frogs, kitchen waste, fruit, and nectar.

v. Ecological Threats and Conservation Plan

❖ **Direct Population Threats**

Yellow-throated Marten seems to be tied to forest areas Uttarakhand. Therefore, forest conversion there over the last few decades will have resulted in some overall population reduction. However, for a species that is common in hill evergreen forest and tolerant of degradation, very large areas remain and are likely to do so for the foreseeable future. These declines thus do not constitute a threat to the species. Moreover, the species is surviving well within remaining forests (including secondary stands), for two likely reasons: (i) it is little sought as food or for any other reason by most residents, and (ii) its scansorial nature reduces its exposure to snares and other traps, as well as allowing easy escape from domestic and feral dogs.

• **Conservation Plan**

The Wild Life Protection Act (1972) provides us with the statutory framework for wildlife conservation, and declared that hunting is a crime against wildlife while, forestation will be done surrounding the mine area for enhancement of habitat, protecting the loss of Yellow-throated Marten diversity due to habitat loss.

❖ **Conflicts with Human/Farmers**

In its native range, the Yellow-throated Marten is known for predation on the domestic animals voraciously. Prater (1971) described this animal as "a real menace to all the small creatures living in their neighborhood."

Human-marten conflict was reported from the enclave and fringe villages of remote mountainous areas causing depredation on the domestic animals. A number of village poultry farms were ravaged by the straying martens. Sometimes Martesflavigula were found as pest animal for poultry farm and kids of goat. The marten was found killing domestic chickens and occasionally feeding on cultivated fruit trees. Their increasing straying tendencies reveal a growing uneasiness, which is forcing them to move out of their traditional habitat.

• **Conservation Measures**

Biological fences will be used to protect the livestock from the Martesflavigula attack. The awareness among the farmers and villagers will be generated through the formal educational programmes.

❖ **Poaching**

Yellow-throated Marten is also threatened by poaching for its beautiful pelt, butdue to the nasty aroma of its meat, it is not hunted for food. Although poachingincidents are not common in the study area, hunting outside the PAs is not currentlyregulated effectively, especially in the fringe areas. It is also persecuted as a potentialpredator of livestock.

• **Conservation Measures**

The Wild Life Protection Act (1972) provides us with the statutory framework for wildlife conservation, and Poaching is a crime against wildlife.

During formal interview and discussion with local it was noted that study area is not prone to poaching or any other wildlife violence related to Martesflavigulaor any other species. But, precaution will be always taken while dealing with wildlife. If any kind of poaching or other offense is noticed, it will be immediately clued-up to the concern Forest and Wildlife Officials.

❖ **Habitat Threats**

Martes flavigula -human conflict is a problem in hilly regions of India. Over the twentieth century, the increase in human population has put severe pressure on the natural resources in northern India. Their increased consumption has resulted in severe threats to the survival of the wildlife including the predator and prey species. One of the main threats is habitat destruction and fragmentation through deforestation, conversion of forest land for the agriculture, livestock grazing, collection of firewood and fodder etc.

• **Habitat Improvement**

Yellow-throated Marten is listed as Least Concern because of its wide geographic and habitat distribution, evidently large population, occurrence in many protected areas, presence in many heavily degraded areas and, the lack of identified major threats. Habitat of the species will be improved by planting suitable species in surrounding areas.

O CONSERVATION REPTILES AND LIZARDS

3.14. *Python molurus* (Indian Python)

Photo source: http://upload.wikimedia.org

2.1. Classification

Kingdom : Animalia

Phylum	:	Chordata
Class	:	Reptilia
Order	:	Squamata
Family	:	Pythonidae
Genus	:	*Python*
Species	:	*P. molurus*

2.2. Conservation Status

The Indian Python is classified as Near Threatened on the IUCN Red List of Threatened Species; moreover this species is mentioned under the Schedule-I of Wildlife Protection Act (1972). This listing indicates that it may become threatened with extinction and is in need of frequent reassessment.

2.4.2. Habitat

Indian Python occurs in a wide range of habitats, including grasslands, swamps, marshes, rocky foothills and woodlands. They depend on a permanent source of water. Sometimes they can be found in abandoned mammal burrows, hollow trees, dense water reeds and mangrove thickets.

2.4.4. Food and Feeding

Indian Python mainly are carnivore animals and feed on mammals, birds and reptiles indiscriminately, but seem to prefer mammals. Live prey is constricted and killed by Python. After a heavy meal, an individual may fast for weeks. The python can swallow prey bigger than its diameter because the jaw bones are not connected. Moreover, prey cannot escape from its mouth because of the arrangement of the teeth (which are reversing saw-like).

2.5. Ecological Threats and Conservation Plan

2.5.1. Direct Population Threats

Direct population threats include all reasons and actions which directly reduce the number of Indian Python in their respective habitats other than the natural death. Loss of forest areas along with the reduction of different small size animals due to climate change and deforestation are a major threat to Indian Python in India.

• Conservation Plan

The Wild Life Protection Act (1972) provides us with the statutory framework for wildlife conservation, and declared that hunting of Pythons is a deadly crime against wildlife. For improvement of habitats, forestation and grassland development will be done surrounding the respective project area to ensure the enhancement of habitat and protecting the loss of Pythondiversity.

2.5.2. Conflicts with Human/Farmer

Several Indian Python are killed due to ignorance or out of fear when they enter habitation and capture goats or poultry. For some strange reasons, snakes have always been associated with fear in the minds of most people. The inborn fear regarding their toxic venom plays a key role in killing most

snakes, irrespective of whether they are harmful or not. While humans on encountering any Python tried to kill the snake in dread of any damage to them.

• Conservation Plan

The workers are more prone to encounter the Python in study area. The most basic requirements are willingness and inclination to learn and differentiate the poisonous and the no venemous snakes. The minute the farmers or the workers, spot a snake; they should be in a position to distinguish between a triangular and a round headed snake and the patterns associated with the snake. Both local villagers and workers will be educated facilitate to avoid the any snake bite. Following precautionary measures will be taken:

- Adequate lighting in and around the living quarters.
- Fire wood stocks to be set up far away from the house.
- Workers need to be protected with footwear.
- Workers need to be provided with adequate lighting (torch lights) during night times.

2.5.3. Poaching

The beautiful and shiny skin of the Indian Python makes them target species for poachers. In some area the meat is eaten by locals as the fat is purported to have medicinal value. Also, Pythons are hunted extensively for their patterned skin, which is made into leather. The skin of Indian Python has high value in international market as used to manufacture leather goods, including boots and shoes.

• Conservation Plan

During formal interview and discussion with locals it was noted that study area is not prone to poaching or any other wildlife violence related of Indian Python. But, precaution will be always taken while dealing with wildlife. If any kind of poaching or other offense is noticed; it will be immediately clued-up to the concern Forest and Wildlife Officials.

2.5.4. Habitat threats/Loss

Rapid degradation of forest areas, due to climate change degradation of grassland, swamps and marshes is a major threat to Indian Python because it causes population fragmentation. Furthermore, habitat degradation caused by overgrazing, overharvest of forest products, expansion of agricultural areas, and use huge amounts of pesticides agricultural areas also poses threats to the habitat of Indian Python as well as their prey material.

• Habitat Improvement

For habitat improvement of Indian Python all possible activities will be carried out in the study area. Their habitat will be artificially improved in the study area by planting suitable species along with the development of grasslands in the respective area. Any existing pond will be preserved and no discharge of any harmful effluent will be drained. If needed artificial wetlands will be created to

improve the micro-habitat of species If any Python is spotted within or nearby the lease area, it will be immediately informed to concern authority and suitable rescue plan will be adopted.

3.15. *Xenochrophis piscator* (Common Pond Snake or Checkered Keelback)

Source: https://en.wikipedia.org/wiki/Checkered_keelback

i. Classification

Kingdom	:	Animalia
Phylum	:	Chordata
Class	:	Reptilia
Order	:	Squamata
Family	:	Colubridae
Genus	:	*Xenochrophis*
Species	:	*X. piscator*

ii. Conservation Status

The Checkered Keelbackis classified as Not Evaluated as per the IUCN red list of threatened species and species is mentioned under the Schedule-II of Wildlife Protection Act, (1972).

iii. Habitat

Xenochrophis piscator is the most widespread Xenochrophis species also the most widespread fresh water snake. This is also the most common snake in and around human habitat including exclusive urban areas having no natural surrounding suitable for other snakes. Seens most the year but frequency of sighting increases remarkably during monsoon. Morphologically it is variable in colors and somewhat in patterns also. Overall it can be identified by carefully blackish patched dorsal surface on brown, greenish or yellow ground color. This snake is found in or near freshwater lakes or rivers.

iv. Food and Feeding

Feed mainly on fishes, frogs and toads. Also feeds on rodents, other snakes, rejected meat pieces etc. Juveniles feed on tadpoles also. Majorly fish feeder (77%). X. piscator showed significantly higher feeding frequencies in males and less in females than expected.

v.Ecological Threats and Conservation Plan

❖ **Direct Population Threats**

Major threats are road kills and intentional killing by people because of its wide range of colors and patterns which makes its identification tough sometimes. Due to its aggressive behavior it can be

confused with Cobra. As it is well settled in urban areas, habitat destruction doesn't seem to be a serious threat for this species. In many parts of its range it is consumed by few communities.

- **Conservation Plan**

The Wild Life Protection Act (1972) provides us with the statutory framework for wildlife conservation, while ponding will be done around the mine area for enhancement of habitat, protecting the loss of Xenochrophis piscator diversity due to habitat loss.

❖ **Conflicts with Human/Farmers**

Xenochrophis piscator species of snakes in and around human habitation which initiates human - snake conflict quite often.Xenochrophis piscator is one of the most common snakes in India and it was also found to be the most relatively abundant snake. In most cases, non - venomous snakes were found to be the victims in the human - snake conflict, as most of the people not able to distinguish between venomous and non - venomous snakes. Lack of awareness was the main reason for the killing of snakes.

- **Conservation Measures**

Awareness programs are needed to be conducted in order to make people acquainted with herpetofauna and their importance for a balanced eco – system.

❖ **Poaching**

In most cases, non - venomous snakes were found to be the victims in the human - snake conflict, as most of the people not able to distinguish between venomous and non - venomous snakes. Lack of awareness was the main reason for the killing of snakes.

- **Conservation Measures**

The Wild Life Protection Act (1972) provides us with the statutory framework for wildlife conservation and Poaching is a crime against wildlife.

During formal interview and discussion with local it was noted that study area is not prone to poaching or any other wildlife violence related to Xenochrophis piscatoror any other species. But, precaution will be always taken while dealing with wildlife. If any kind of poaching or other offense is noticed; it will be immediately clued-up to the concern Forest and Wildlife Officials.

❖ **Habitat Threats**

There is no such habitat threat to Xenochrophis piscator. Human conflict may be a problem due to lack of awareness. However, over the twentieth century, the increase in human population has put

severe pressure on the natural resources. Their increased consumption has resulted in severe threats to the survival of the wildlife including the predator and prey species. One of the main threats is habitat destruction and fragmentation through deforestation, conversion of forest land, lakes, river and ponds for the agriculture, commercial and residential, livestock grazing, collection of firewood and fodder etc.

• Habitat improvement

Xenochrophis piscator is listed as Not Evaluated because of its wide geographic and habitat distribution, evidently large population, occurrence in many protected areas, presence in many heavily degraded areas and, the lack of identified major threats. Habitat of the species will be improved by planting suitable species in surrounding areas, conserving the ponds etc.

3.16. *Ptyas mucosus* (Rat Snake/Oriental Rat Snake)

Photo source : http://www.indiansnakes.org

i. Classification

Kingdom	:	Animalia
Phylum	:	Chordata
Class	:	Reptilia
Order	:	Squamata
Family	:	**Colubridae**
Genus	:	**Ptyas**
Species	:	***P. mucosa***

ii. Conservation Status

The Ptyas mucosa is not evaluated by IUCN, whereas, it is mentioned under the Schedule-II of Wildlife Protection Act (1972) in India. It has recently been hunted for its distinctive hood markings in the production of handbags. It is listed under the CITES treaty because it closely resembles other species that are threatened and in need of protection.

iii. Habitat

Remain hidden in dark and silent places like rat holes, termite mounds, wood caves, under rocks or any narrow and dark place. Distributed in variety of forests including rainforest, scrub lands, semi-desert, dry, moist and mixed deciduous forests, grasslands, mangroves, wetlands etc. Lives in almost all kinds of habitat due to its tendency to survive in tough conditions, this includes urban areas, dense &

open forest, hills & plains, agricultural lands etc. Prefers wet surroundings during summer (shows semi aquatic behavior few times), while dry during monsoon.

iv. Food and Feeding

Ptyas mucosa feeds on a variety of prey mostly on rodents and toads; also feeds upon birds, small mammals, other snakes, all kind of lizards and their eggs etc.

v. Ecological Threats and Conservation Plan

- **Direct Population Threats**

Direct population threats include all reasons and actions which directly reduce the number of Ptyas mucosa in their respective habitats other than the natural death. Loss of forest areas along with the reduction of different small size animals due to climate change and deforestation are a major threat to Ptyas mucosa in India.

- **Conservation Plan**

Wild Life Protection Act (1972) provides us with the statutory framework for wildlife conservation, and declared that hunting of Ptyas mucosa is a deadly crime against wildlife.

- **Conflicts with Human/Farmer**

In India, several Ptyas mucosa are killed due to ignorance or out of fear when they enter habitation and capture goats or poultry. For some strange reasons, snakes have always been associated with fear in the minds of most people. The inborn fear regarding their toxic venom plays a key role in killing most snakes, irrespective of whether they are harmful or not.

- **Conservation Plan**

The workers are more prone to encounter the Ptyas mucosa in study area. The most basic requirements are willingness and inclination to learn and differentiate the poisonous and the no venomous snakes. Both, local villagers and workers will be educated regarding while conducting the awareness programme to play ecologically significant role in maintaining the ecological integrity of forests and other habitats of Ptyas mucosa.

- **Poaching**

The beautiful and shiny skin of the Ptyas mucosa makes them target species for poachers. In some area the meat is eaten by locals as the fat is purported to have medicinal value. Also, Ptyas mucosa is hunted extensively for their patterned skin, which is made into leather. The skin of Ptyas mucosa has high value in international market as used to manufacture leather goods, including boots and shoes.

- **Conservation Plan**

During formal interview and discussion with locals it was noted that study area is not prone to poaching or any other wildlife violence related of Ptyas mucosa. But, precaution will be always taken

while dealing with wildlife. If any kind of poaching or other offense is noticed; it will be immediately clued-up to the concern Forest and Wildlife Officials. More importantly, worker will be made aware of wildlife crime and also subsequent penalties and punishment.

- **Habitat threats/Loss**

Rapid degradation of forest areas, due to climate change degradation of grassland, swamps and marshes is a major threat to Ptyas mucosa because it causes population fragmentation. Furthermore, habitat degradation caused by overgrazing, overharvest of forest products, expansion of agricultural areas, and use huge amounts of pesticides agricultural areas also poses threats to the habitat of Ptyas mucosa as well as their prey material.

- **Conservation Action**

Their habitat will be artificially improved in the study area by planting suitable species along with the development of grasslands in the respective area. Any existing pond will be preserved. If needed artificial wetlands will be created to improve the micro-habitat of species. In order to maintain sufficient prey or food availability for the Ptyas mucosa, present in the study area will be protected with the involvement of workers as well as local people. Workers will be instructed not to disturb or damage any kind of wildlife.

3.17. *Varanus bengalensis* (Monitor Lizard)

Source: http://www.natureswindow.dk

i. Classification

Kingdom	:	Animalia
Phylum	:	Chordata
Class	:	Reptilia
Order	:	Squamata
Family	:	Varanidae
Genus	:	Varanus
Species	:	*V. bengalensis*

ii. Conservation Status

Varanus bengalensis is classified as least concern on the IUCN Red List of Threatened Species; moreover this species is mentioned under the Schedule-I of Wildlife Protection Act (1972). This listing indicates that it may become threatened with extinction and is in need of frequent reassessment.

iii. Habitat

The *Varanus bengalensis* is found mainly in the lower elevations, dry semi arid desert habitats, moist forest and the river valleys. They are found in a wide range of habitats, viz. river banks, by the side of canals, scrubby lands and agricultural land. They occupy burrows, dense vegetation, hollows of trees, rock cracks and crevices. In Uttarakhand, *Varanus bengalensis* and *other monitor lizards* are mainly found in Jim Corbet National Park and Rajaji National Park along with open forests.

iv. Food and Feeding

Varanus bengalensis mainly feed on beetles, grubs, scorpions, snails, crabs, ants and other invertebrates. Vertebrate prey is comparatively rare, and includes frogs, fish, lizards, snakes and rodents. They sometimes feed on dead animals.

v. Ecological Threats and Conservation Plan

- **Direct Population Threats**

Direct population threats include all reasons and actions which directly reduce the number of *Varanus bengalensis* in their respective habitats other than the natural death. Loss of forest areas along with the reduction of different small size animals due to climate change and deforestation are a major threat to *Varanus bengalensis* India.

- **Conservation Plan**

The Wild Life Protection Act (1972) provides us with the statutory framework for wildlife conservation, and declared that hunting of *Varanus bengalensis* is a deadly crime against wildlife. While, forestation and grassland development will be done in the study area and surrounding the mining lease area for enhancement of habitat to protect loss animal diversity.

- **Conflicts with Human/Farmer**

Due to the loss of habitat they move towards agriculture land. Sometimes due to the lack of awareness farmer kill them that also a responsible factor for declining the monitor species.

- **Conservation Plan**

For the protection of *Varanus bengalensis*, awareness programme for workers and farmers in the buffer zone will be conducted. Beside these, respective habitats will be improved.

- **Poaching**

Poaching is major threats of monitor lizards. Generally, they are hunted for skin and their body fat. The eggs of monitor lizards are considered a delicacy and the entire animal is also eaten. Body parts are also used for medicine to cure numerous ailments.

- **Conservation Plan**

According to the Wild Life Protection Act (1972) hunting and poaching of *Varanus bengalensis* is a deadly crime against wildlife. While forestation and grassland development will be done in the degraded forest land for enhancement of habitat and protecting the loss of their diversity.

- **Habitat threats/Loss**

On account of rapid large-scale deforestation, urbanization, dams and hydroelectric projects, habitats of *Varanus bengalensis* declining day by day along with their population density. Other factors such as impact of climate changes and some biotic factors are also responsible for the population decline of the *Varanus bengalensis* species.

- **Habitat Improvement**

The *Varanus bengalensis* lives mostly in burrows in the ground which they dig themselves.For habitat improvement, afforestation will be done with suitable forage plants. Similarly the ponds, canals or water holes in the forest will be maintained in good condition along with grasslands near the ponds. The species planted as part of greenbelt will be also selected as per requirement of *Varanus bengalensis* and will be included in plan. The prey species preferred by *Varanus bengalensis* will be conserved to insure sufficient prey availability, which will also reduce the conflict with humans.

3.18. *Naja naja* (Indian Cobra)

Photo source : http://atozwallpaper.com

i. Classification

Kingdom	:	Animalia
Phylum	:	Chordata
Class	:	Reptilia
Order	:	Squamata
Family	:	Elapidae
Genus	:	*Naja*
Species	:	*N. naja*

ii. Conservation Status

This species is mentioned under the Schedule-II of Wildlife Protection Act (1972) in India. It is listed under the CITES treaty because it closely resembles other species that are threatened and in need of protection.

iii.Habitat

Indian Cobra's occurs in a wide range of habitats, including grasslands, rocky foothills and in wild forest and in cultivated areas. They depend on a permanent source of water. Sometimes they can be found in abandoned mammal burrows, hollow trees, dense water reeds and mangrove thickets.

iv. Food and Feeding

The Indian cobra feeds on rodents, lizards and frogs. It bites quickly, and then waits while its venom damages the nervous system of the prey, paralyzing and often killing it. Like all snakes, Indian Cobra swallows its prey whole. This species sometimes enters buildings in search of rodent prey.

v. Ecological Threats and Conservation Plan

- **Direct Population Threats**

Direct population threats include all reasons and actions which directly reduce the number of Indian Cobra in their respective habitats other than the natural death. Loss of forest areas along with the reduction of different small size animals due to climate change and deforestation are a major threat to Indian Cobra's in India.

- **Conservation Plan**

The Wild Life Protection Act (1972) provides us with the statutory framework for wildlife conservation, and declared that hunting of Indian Cobra is a deadly crime against wildlife. Forestation and grassland development will be done in the study area for enhancement of habitat and protecting the loss of Cobra's diversity.

- **Conflicts with Human/Farmer**

Several Indian Cobra's are killed due to ignorance or out of fear when they enter habitation and capture goats or poultry. For some strange reasons, snakes have always been associated with fear in the minds of most people. The inborn fear regarding their toxic venom plays a key role in killing most snakes, irrespective of whether they are harmful or not.

- **Conservation Plan**

The workers are more prone to encounter the Indian Cobra in study area. The most basic requirements are willingness and inclination to learn and differentiate the poisonous and the non-venomous snakes. Both, local villagers and workers will be educated regarding while conducting the awareness programme to play ecologically significant role in maintaining the ecological integrity of forests and other habitats of Indian Cobra. Following precautionary measures will be taken:

- Adequate lighting in and around the living quarters.
- Fire wood stacks to be set up far away from the house.
- Workers need to be protected with footwear.

- Workers need to be provided with adequate lighting (torch lights) during night times.

- **Poaching**

The beautiful and shiny skin of the Indian Cobra makes them target species for poachers. In some area the meat is eaten by locals as the fat is purported to have medicinal value. Also, Indian Cobra's are hunted extensively for their patterned skin, which is made into leather. The skin of Indian Cobra has high value in international market as used to manufacture leather goods, including boots and shoes.

- **Conservation Plan**

During formal interview and discussion with locals it was noted that study area is not prone to poaching or any other wildlife violence related of Indian Cobra. But, precaution will be always taken while dealing with wildlife. And, workers will be trained and educated about the importance of Indian Cobra for ecology and ultimately for humans; an internal attraction towards the species will be tried to develop. More importantly, worker will be made aware of wildlife crime and also subsequent penalties and punishment.

- **Habitat threats/Loss**

Rapid degradation of forest areas, due to climate change degradation of grassland, swamps and marshes is a major threat to Indian Cobra because it causes population fragmentation. Furthermore, habitat degradation caused by overgrazing, overharvest of forest products, expansion of agricultural areas, and use huge amounts of pesticides agricultural areas also poses threats to the habitat of Indian Cobra as well as their prey material.

- **Conservation Action**

For habitat improvement of the Indian Cobra, all possible activities will be carried out in the present study area. Their habitat will be artificially improved in the study area by planting suitable species along with the development of grasslands in the respective area. If needed artificial wetlands will be created to improve the micro-habitat of species.

O CONSERVATION AVIAN FAUNA

3.19. *Pavo Cristatus* (Indian Peafowl)

Source: http://www.sanctuaryindia.com

i. Classification

Kingdom	:	Animalia
Phylum	:	Chordata
Class	:	Mammalia
Order	:	Aves
Family	:	Phasianidae
Genus	:	*Pavo*
Species	:	*P. cristatus*

ii. Conservation Status

Indian Peafowl are widely distributed in the wild across India and protected both culturally in many areas and by law in India. Indian peafowl is mentioned in Schedule-I of Wildlife Protection Act (1972), indicates the high conservation value of species.

iii. Habitat

The Indian Peafowl is found mainly on the ground in open forest or on land under cultivation where they forage for berries, grains but will also prey on snakes, lizards, and small rodents. They forage on the ground in small groups and will usually try to escape on foot through undergrowth and avoid flying, though they will fly into tall trees to roost.

iv. Food and Feeding

Indian Peafowl are omnivores and they eat plants, berries, seeds, spiders, insects, small reptiles and amphibians. They are very clean eaters and will generally eat everything you put out for them, provided they like it. While domestic peafowl consumes commercial feeds designed for their dietary needs also. Cabbage heads are a good choice, as they can keep the chicks occupied for quite some time.

v. Ecological Threats and Conservation Plan

- **Direct Population Threats**

Peafowl reduction is mainly due to reduction in their habitat range (Forest and Grassland), scarcity of food and water in their habitat etc. However, Peafowl is often found in areas where they share their habitats with larger carnivorous mammals such as Tigers, Leopards, Dogs and Bears which could be of threat to them. Indian Peafowl living near human habitations are sometimes hunted by domestic dogs.

- **Conservation Plan**

The Wild Life Protection Act (1972) provides us with the statutory framework for wildlife conservation, and declared that hunting of Peafowl is a deadly crime against wildlife. While, forestation and grassland will be develop surrounding the mining area for enhancement of habitat, protecting the loss of Peafowl diversity due to habitat loss.

- **Poaching**

Poaching of peacocks for their meat and feathers has declined their population in many parts of India. Intensive poaching Peafowl by local communities for meat and folk remedies involving the use of "peacock oil" is also emerging as a serious threat in different parts of the country. Mostly people poach Peafowl for having them as pets. On the other hand, poaching case of Peafowl has not been observed in present study area.

• Conservation Plan

According to Wild Life Protection Act (1972), poaching of Peafowl is a deadly crime against wildlife in India. Indian law allows only the collection of feathers that have been shed, to ensure the legal collection certain methods have been developed to identify if feathers have been plucked or have been shed naturally.

During formal interview and discussion with local people, it was observed that study area is not prone to poaching or any other wildlife violence related to Peafowl and any other species.

- **Conflicts with Human/Farmers**

During the cropping season in different parts of India, the Peafowl can be a nuisance to agriculture as they damage crops. Peafowl are omnivorous and their diet includes seeds, fruits, flower buds, shoots, invertebrates, and small vertebrates. Vertebrates make up a large component of peafowl diet; crops may be damaged and seeds and seedlings dug up as peafowl scratch through soil and litter to find invertebrates. To counter crop damage by Peafowl many time farmers used to poison the bird, as they treat bird as big threat to their crop. Its adverse effects on crops, however, seem to be offset by the beneficial role it plays by consuming prodigious quantities of pests such as grasshoppers.

• Conservation Plan

The role of Peafowl in cropland ecosystem is very crucial, and the damage done by the bird is negotiable in terms of direct benefits and environmental services. The awareness among the farmers will be generated through the formal educational programmes.

- **Habitat Threats/Loss**

Rapid habitat destruction and scarcity of suitable food are the major cause of the declining the numbers of Peafowl in India. These animals are threatened mainly due to deforestation, the conversion of their habitat to agricultural land, and the burning of grassland.

• Habitat Improvement

Indian Peafowl is a bird of scrub-jungles and forest edges, showing affinity to moist and deciduous and semiarid biomes. It is also successfully adopts to the agriculture fields, along streams with good vegetation and close to human habitations in a semi-feral condition. It generally prefers a

habitat mosaic of scrub and open areas. The plantation of suitable species (preferred by them) will be done in the buffer zone to modify their habitat to ensure food availability.

3.20. *Ocyceros birostris* (Indian Grey Hornbill)

Source: https://funbirdingmarielounc.files.wordpress.com

i. Classification

Kingdom	:	Animalia
Phylum	:	Chordata
Class	:	Aves
Order	:	Bucerotiformes
Family	:	Bucerotidae
Genus	:	*Ocyceros*
Species	:	***O. birostris***

ii. Conservation Status

Indian grey hornbill is protected by law in India. Indian Pied Hornbillis classified as Least Concern on the IUCN Red List of Threatened Species; moreover this species is mentioned under the Schedule-I of Wildlife Protection Act (1972). This listing indicates that it may become threatened with extinction and is in need of frequent reassessment.

iii. Habitat

Indian grey hornbill likes deciduous forest, parkland and open thorn-forest with fig trees. Also found around rural cultivation and in gardens. They likes deciduous forest, parkland and open thorn-forest with fig trees. Also, found even in cities that have old avenue trees. In Uttarakhand, Indian grey hornbill it is mainly found in Jim Corbet National Park and Rajaji National Park along with northern part of Uttarakhand. Indian grey hornbills usually nest in tree hollows on tall trees. It is found mainly on the plains up to about 1400.

iv. Food and Feeding

Indian grey hornbill feed on fruits, nuts, seeds, small insects, lizards, small fish and small snakes. The Great Pied Hornbill is omnivorous, taking fruit and fish. Common figs are an important part of their diet.

v. Ecological Threats and Conservation Plan

- **Direct Population Threats**

Direct population threats include all reasons and actions which directly reduce the number of Indian grey hornbill in their respective habitats other than the natural death. Deforestation of forest areas along with the reduction of different small size animals due to climate change are a major threat to Indian grey hornbill in India.

- **Conservation Plan**

The Wild Life Protection Act (1972) provides us with the statutory framework for wildlife conservation, and declared that hunting of Indian grey hornbill is a deadly crime against wildlife. Plantation (forestation) will be done in the study area for enhancement of habitat and protecting loss of Indian grey hornbilldiversity due to habitat loss.

- **Conflicts with Human/Farmer**

Three is no conflict of Indian grey hornbill with human except habitat degradation. On the other hand, some peoples believed that hanging a skull of the hornbill brought wealth. So, they kill captured and kill them from nearby settlements.

- **Conservation Plan**

The awareness among workers/ local people and farmers will be generated through the formal educational/ awareness programmesto make them aware that hanging a skull of the hornbill does not brought wealth.

- **Poaching**

Intensive poaching of Indian grey hornbill by tribal/local communities for meat and skull is emerging as a serious threat in different parts of the country, but not in Uttarakhand. On the other hand, poaching case of Indian grey hornbill has not been observed in the study area.

- **Conservation Plan**

The Wild Life Protection Act (1972) provides us with the statutory framework for wildlife conservation, and poaching of Indian grey hornbillis a deadly crime against wildlife. Present study area is not prone to poaching or any other wildlife violence related to Indian grey hornbill and any other species. Any kind of illegal collection of meat or poaching noted in study area will be immediately informed to concern authority. The contact information of concern wildlife and forest department will be provided to every worker or at the field office.

- **Habitat threats/Loss**

Rapid degradation of forest and water resources is a major threat to Indian grey hornbill because it causes population fragmentation. Furthermore, habitat degradation caused by rapid urbanization and impact of climate change also poses threats to their habitat as well as prey material.

• Habitat Improvement

Deforestation and urbanization has led to habitat shrinkage and fragmentation of Indian grey hornbill. For habitat improvement of Indian grey hornbill all possible activities will be carried out in the buffer area of present mine. Their habitat will be artificially improved in the study area by planting suitable species for their habitat and food. Also, workers will be educated and make aware of the conservation value of Indian grey hornbill.

3.21. *Gyps himalayensis* (Gidh)

Source: https://en.wikipedia.org/wiki/Himalayan_vulture

i. Classification

Kingdom	:	Animalia
Phylum	:	Chordata
Class	:	Aves
Order	:	Accipitriformes
Family	:	Accipitridae
Genus	:	*Gyps*
Species	:	***G. himalayensis***

ii. Conservation Status

The Gyps himalayensisis classified as Near Threatened as per the IUCN red list of threatened species and species is mentioned under the Schedule-I of Wildlife Protection Act, (1972).

iii. Habitat

The species is found mainly in the higher regions of the Himalayas. This species inhabits mountainous areas, mostly at 1,200-5,500 m, but has been recorded up to 6,000 m. In winter it moves lower down, with juveniles wandering into the plains.

iv. Food and Feeding

The Himalayan vulture perches on crags, favourite sites showing white marks from regular defecation. They soar in thermals and are not capable of sustained flapping flight. Flocks may follow grazers up the mountains in their search for dead animals. This vulture makes a rattling sound when descending on a carcass and can grunt or hiss at roosts or when feeding on carrion.They have been recorded eating carrion exclusively, some which is fed on even when putrid. They feed on old carcasses

sometimes waiting a couple of days near a dead animal. Historically, Himalayan vultures regularly fed on human corpses left out on Celestial burial grounds. This species is fairly contentious around other scavengers and typically dominates other meat-eaters at carrion, though is subservient to Gray Wolves, snow leopards and cinereous vultures at carcasses.In a large party, these vultures can reportedly strip a human or sheep carcass of all meat in 30 minutes and do the same to a yak carcass in roughly 120 minutes. Himalayan vultures have been observed feeding on pine needles, an unexplained behavior that cannot be for obtaining nutrition.

v.Ecological Threats and Conservation Plan

❖ **Direct Population Threats**

Himalayan vultures are susceptible to toxicity induced by diclofenac, a drug whose residues in domestic animal carcasses has led to rapid declines in populations of other Gyps vultures across Asia. The Himalayan griffon vulture populations have however not shown signs of rapid decline although reductions in nesting birds have been noted in some parts. Other potential threats include habitat degradation and a shortage of suitable nesting sites, as well as the ingestion of herbicides, insecticides and fungicides

• **Conservation Plan**

The Wild Life Protection Act (1972) provides us with the statutory framework for wildlife conservation, and declared that hunting is a deadly crime against wildlife while, forestation will be done surrounding the mine area for enhancement of habitat, protecting the loss of Himalayan vultures diversity due to habitat loss.

❖ **Conflicts with Human/Farmers**

Himalayan vultures chose to stay away from high density human settlement and remained in higher altitude locations with low temperatures which reduce the human conflict with Himalayan vultures

• **Conservation Measures**

The prey species preferred by Himalayan vultures will be conserved to insure sufficient prey availability, which will also reduce the conflict with humans. The awareness among the farmers and villagers will be generated through the formal educational programmes.

❖ **Poaching**

In the Himalayas generally,the impact of subsistence hunting of Himalayan vultures is stillpoorly known. The poaching cases in the Himalaya region are very less.

• **Conservation Measures**

The Wild Life Protection Act (1972) provides us with the statutory framework for wildlife conservation, and Poaching is a crime against wildlife.

During formal interview and discussion with local it was noted that study area is not prone to poaching or any other wildlife violence related to Himalayan vultures or any other species. But, precaution will be always taken while dealing with wildlife. If any kind of poaching or other offense is noticed; it will be immediately clued-up to the concern Forest and Wildlife Officials.

❖ **Habitat Threats**

The most serious potential threat to this species is thought to be mortality caused through ingestion ofdiclofenac and other vulture-toxic non-steroidal anti-inflammatory drugs (NSAIDs) widely used in livestock. Diclofenac has caused drastic declines in three other Gyps species, owing to kidney failure following ingestion, with clinical signs of extensive visceral gout and renal failure, and the drug also appears to be fatal in G. himalayensis.

• **Habitat improvement**

Himalayan Vulture is listed as Near Threatened because of its low geographic and habitat distribution, evidently low population. Conservation programmes should be initiated urgently along with immediate dialogue for phasing out the veterinary use of the Diclofenac.

India also moved a IUCN motion in 2004 for vulture conservation, which was accepted in the form of the IUCN resolution which "called upon Gyps vulture Range countries to begin action to prevent all uses of diclofenac in veterinary applications that allow diclofenac to be present in carcasses of domestic livestock available as food for vultures.

3.22. *Gyps bengalensis* (Gidh)

Source: https://en.wikipedia.org/wiki/Himalayan_vulture

i. **Classification**

Kingdom : Animalia
Phylum : Chordata
Class : Aves

Order	:	Accipitriformes
Family	:	Accipitridae
Genus	:	*Gyps*
Species	:	*G. bengalensis*

ii. Conservation Status

The Gyps bengalensisis classified as Critically Endangered as per the IUCN red list of threatened species and species is mentioned under the Schedule-I of Wildlife Protection Act, (1972). *Gyps bengalensis*is listed in CITES Appendix II.

iii. Habitat

Gyps bengalensis are often found in cities, towns and villages, near human habitation. They occur in temperate areas, mostly in plains and occasionally in hilly regions. Gyps bengalensis is generally found in open areas and fields enclosing scattered trees. Gyps bengalensis feed mostly on the ground, but roost and nest in trees and cliffs, and spend much of their time soaring on wind currents searching for carrion. Nests are typically 2 to 18 meters above the ground.

iv. Food and Feeding

Gyps bengalensis feed mostly on the ground, but roost and nest in trees and cliffs, and spend much of their time soaring on wind currents searching for carrion and remains of dead animals, regardless of whether it is fresh or putrid. Many populations of G. bengalensis forage through dumpsters for food. Those that live by slaughter houses obtain food from dumpsters as well. Gyps bengalensis vultures also feed on fish from lakes that have dried out. In India these vultures eat mainly cattle and human remains. When these vultures feed, they tear open the flesh with their beaks and start feeding from the supple flesh near the tail. They fight over the food between themselves, kicking and flapping their wings to drive other vultures away. White-rumped vultures will gorge themselves with carrion if given the chance, leaving them unable to fly because of the amount of food they have eaten. This species doesn't usually capture prey as a means for survival. Generally, it feeds on carcasses. However, occasionally vultures will kill animals for food.

v.Ecological Threats and Conservation Plan

❖ **Direct Population Threats**

Formerly described as possibly the most abundant large bird of prey in the world, this species global population almost certainly numbered several million individuals. However, following dramatic declines through the 1990s across its range its global population is now estimated to fall within the band 2,500-9,999 mature individuals. This equates to 3,750-14,999 individuals, rounded here to 3,500-15,000 individuals

• **Conservation Plan**

The Wild Life Protection Act (1972) provides us with the statutory framework for wildlife conservation, and declared that hunting is a deadly crime against wildlife while, forestation will be

done surrounding the mine area for enhancement of habitat, protecting the loss of Gyps bengalensis diversity due to habitat loss.

❖ **Conflicts with Human/Farmers**

Gyps bengalensis chose to stay close to densely human settlement. Gyps bengalensis vultures have adapted well to living near humans. Occasionally, they can come into conflict with the human population in close proximity to them.

• **Conservation Measures**

The prey species preferred by Gyps bengalensis will be conserved to insure sufficient prey availability, which will also reduce the conflict with humans. The awareness among the farmers and villagers will be generated through the formal educational programmes.

❖ **Poaching**

In India generally, the impact of subsistence hunting of Gyps bengalensisis still poorly known. The poaching cases of Gyps bengalensis are less reported in India.

• **Conservation Measures**

The Wild Life Protection Act (1972) provides us with the statutory framework for wildlife conservation, and Poaching is a deadliest crime against wildlife.

During formal interview and discussion with local it was noted that study area is not prone to poaching or any other wildlife violence related to Gyps bengalensisor any other species. But, precaution will be always taken while dealing with wildlife. If any kind of poaching or other offense is noticed, it will be immediately clued-up to the concern Forest and Wildlife Officials.

❖ **Habitat Threats**

The most serious potential threat to this species is thought to be mortality caused through ingestion ofdiclofenac and other vulture-toxic non-steroidal anti-inflammatory drugs (NSAIDs) widely used in livestock. Diclofenac has caused drastic declines in three other Gyps species, owing to kidney failure following ingestion, with clinical signs of extensive visceral gout and renal failure, and the drug also appears to be fatal in Gyps bengalensis.

• **Habitat improvement**

Gyps bengalensisis listed as Critically Endangered because of its low geographic and habitat distribution, evidently low population. Conservation programmes should be initiated urgently along with immediate dialogue for phasing out the veterinary use of the Diclofenac.

India also moved a IUCN motion in 2004 for vulture conservation, which was accepted in the form of the IUCN resolution which "called upon Gyps vulture Range countries to

begin action to prevent all uses of diclofenac in veterinary applications that allow diclofenac to be present incarcasses of domestic livestock available as food for vultures.

3.23. *Gyps indicus* (Gidh)

Source: https://en.wikipedia.org/wiki/Indian_vulture

i. Classification

Kingdom	:	Animalia
Phylum	:	Chordata
Class	:	Aves
Order	:	Accipitriformes
Family	:	Accipitridae
Genus	:	*Gyps*
Species	:	***G. indicus***

ii. Conservation Status

The Gyps indicusis classified as Critically Endangered as per the IUCN red list of threatened species and species is mentioned under the Schedule-I of Wildlife Protection Act, (1972). *Gyps indicus*is listed in CITES Appendix II.

iii. Habitat

It is found in cities, towns and villages near cultivated areas, and in open and wooded areas. This species feeds almost entirely on carrion, and often associates with White-rumped Vulture G. bengalensis when scavenging at carcass dumps and slaughter houses. It nests almost exclusively in colonies on cliffs and ruins, although in one area, where cliffs are absent, it has been reported nesting in trees. Vultures also play a key role in the wider landscape as providers of ecosystem services, and were previously heavily relied upon to help dispose of animal and human remains in India; which in turn reduces the amount of food available for potentially problematic species, such as feral dogs

iv. Food and Feeding

Gyps indicus feed mostly on the ground, but roost and nest in trees and cliffs, and spend much of their time soaring on wind currents searching for carrion and remains of dead animals, regardless of whether it is fresh or putrid. Many populations of Gyps indicus forage through dumpsters for food.

These that live by slaughter houses obtain food from dumpsters as well. Gyps indicus also feed on fish from lakes that have dried out. In India these vultures eat mainly cattle and human remains. Generally, it feeds on carcasses. However, occasionally vultures will kill animals for food.

v.Ecological Threats and Conservation Plan

❖ **Direct Population Threats**

A population estimate of 45,000 individuals has been extrapolated from 2007 survey results published by Prakash et al. (2007), who recorded 337 individuals along 18,000 km of road transects. This very roughly equates to 30,000 mature individuals.Survey results indicate that declines through out the Indian Subcontinent probably began in the 1990s and were extremely rapid, resulting in an overall population decline of greater than 97% over a 10-15 year period.

• Conservation Plan

The Wild Life Protection Act (1972) provides us with the statutory framework for wildlife conservation, and declared that hunting is a deadly crime against wildlife while, forestation will be done surrounding the mine area for enhancement of habitat, protecting the loss of Gyps indicus diversity due to habitat loss.

❖ **Conflicts with Human/Farmers**

It is a scavenger, feeding mostly from carcasses of dead animals which it finds by soaring over savannah and around human habitation. They often move in flocks. Gyps indicus chose to stay nearby human settlement.Gyps indicus vultures have adapted well to living near humans. Occasionally, they can come into conflict with the human population in close proximity to them.

• Conservation Measures

The prey species preferred by Gyps indicuswill be conserved to insure sufficient prey availability, which will also reduce the conflict with humans. The awareness among the farmers and villagers will be generated through the formal educational programmes.

❖ **Poaching**

In India generally, the impact of subsistence hunting of Gyps indicusis still poorly known. The poaching cases of Gyps indicus are less reported in India.

• Conservation Measures

The Wild Life Protection Act (1972) provides us with the statutory framework for wildlife conservation, and Poaching is a deadliest crime against wildlife.

During formal interview and discussion with local it was noted that study area is not prone to poaching or any other wildlife violence related to Gyps indicus or any other species. But, precaution

will be always taken while dealing with wildlife. If any kind of poaching or other offense is noticed; it will be immediately clued-up to the concern Forest and Wildlife Officials.

❖ **Habitat Threats**

The most serious potential threat to this species is thought to be mortality caused through ingestion of diclofenac and other vulture-toxic non-steroidal anti-inflammatory drugs (NSAIDs) widely used in livestock. Diclofenac has caused drastic declines in three other Gyps species, owing to kidney failure following ingestion, with clinical signs of extensive visceral gout and renal failure, and the drug also appears to be fatal in Gyps indicus.

• **Habitat improvement**

Gyps indicusis listed as Critically Endangered because of its low geographic and habitat distribution, evidently low population. Conservation programmes should be initiated urgently along with immediate dialogue for phasing out the veterinary use of the Diclofenac.

It has been reported from many protected areas across its range. The Indian government has now passed a bill banning the manufacture of the veterinary drug diclofenac that has caused the rapid population decline across the Indian subcontinent; their aim was to phase out its use by late 2005 although its sale has not been banned and it is likely to remain in widespread use for several years.

4. Greenbelt Development and Habitat Improvement Plan

For the improvement of habitat for different wildlife fauna, grassland and forestation will be done in the study area to ensure to availability of preferred prey and food source. The trees and grass species preferred by them in the study area will also be conserved to reduce the conflict with humans.

Green belt plantation will be started with the beginning of the mining and will be completed within five years from the beginning. To raise seedlings for plantation in the green belt a nursery will be developed. Seedlings of only local species, suitable for green belt plantation will be raised in this nursery. Together with the trees, greenbelt plantation will include shrubs, climbers and some herbaceous species also. Green belt will help in reducing the spread of fugitive dust and noise from the mining area.

Plantation will be done in the area in following manners

- Road Side Plantation – 330 trees/km
- Fruit Plants to villager – 500 plants (i.e. 1 plant/house)
- For fauna in the study area – 2000 plants/hectare

- **Criteria for plants/treesspecies selection for Ggreenbeltdevelopment :**

1. Having tolerance to dust pollution.
2. Should maintain leaves for as longer a time as possible.
3. Combination of plants should be such so that almost a screen of plants is formed tocheck the dustfrom escaping the area. Thus the green belt plants will consist ofmainly the trees and shrubs withsome herbs also.
4. The trees should provide shade.
5. Plants possessing economic and/or aesthetic value should be given preference.
6. Trees less affected due to pruning should be given preference because pruning willyield fuel wood.
7. Every plant species to be planted in the green belt should have some basis for itsselection to beplanted in the green belt.
8. Only local species will be taken for plantation.

- **Saplings:-**

Saplings for planting will be procured form the nurseries of the State Forest Department. Saplings will be planted after the commencement of the monsoons. Saplings will be planted in pits at specific distance/intervals. The pits will be filled with a mixture of good quality soil and organic manure (cattle dung, agricultural waste, kitchen waste). The saplings will be planted just after the commencement of the monsoons to ensure maximum survival. The species selected for plantation must be locally growing varieties with fast growth rate and ability to flourish even in thin, dry soils.

- **Post Plantation Management**

Watering will be done immediately after plantation. Further watering will depend on the rain while during dry seasons watering will be regularly done at least twice a week. Saplings will be regularly monitored and remedial actions will be undertaken as required. During this four year period, casualties will be replaced at the beginning of each monsoon.

Table 4: List of Vegetation for Habitat Improvement

S.No.	Scientific Name	Local name	Family
Trees			
1	*Astragalus sinicus*	Chinese milk vetch	Leguminosae
2	*Bauhinia variegata*	Kachnar	Leguminosae
3	*Bombax ceiba*	Silk-cotton tree	Bombaceae
4	*Brassica campestris*	Rape	Cruciferae
5	*Castanea pubinervis*	Sweet chestnut	Fagaceae
6	*Citrus limon*	Nimu	Rutaceae
7	*Emblica officinalis*	Amla	Euphorbiaceae

8	*Eupatorium odoratum*	Snakeroot	Compositae
9	*Euphoria longan*	Longan, Lamyai	Sapindaceae
10	*Ficus bengalensis*	Bargad	Moraceae
11	*Ficus palmata*	Bedu	Moraceae
12	*Ficus religiosa*	Pipal	Moraceae
13	*Mangifera indica*	Aam	Anacardiaceae
14	*Melia azedarach*	Dhenk	Meliaceae
15	*Musa paradisiacal*	Kela	Musaceae
16	*Punica granatum*	Anar	Punicaceae
17	*Pyrus pyrifolia*	Pear	Rosaceae
18	*Syzygium cumini*	Jamun	Myrtaceae
19	*Toona serrata*	Kakuru	Meliaceae
20	*Trifolium pretense*	Red clover	Leguminosae
Shrubs			
1	*Adhatoda vasica*	Basinga	Acanthaceae
2	*Berberis aristata*	Karmshal	Berberidaceae
3	*Carlaria nepalensis*	Makhoi	Coriariaceae
4	*Debregeasia hypoleuca*	Sihanru	Urticaceae
5	*Ziziphus mauritiana*	Ber	Rhamnaceae
6	*Plectranthu scoeste*	Chichiri	Lamiaceae
7	*Rosa brunonii*	Kunja	Rosaceae
8	*Urtica parviflora*	Kandali	Urticaceae
9	*Zanthoxylum alatum*	Timbur	Rutaceae
Herbs			
1	*Artemisia capillaries*	Pati	Asteraceae
2	*Bidensbipinnata*	Kuru	Asteraceae
3	*Euphorbia hirta*	Dudhi	Euphorbiaceae
4	*Galinsoguparviflora*	Marchya	Asteraceae
5	*Hedychium spicatum*	Bankakdu	Zingiberaceae
6	*Sonchus asper*	Dudhi	Asteraceae
7	*Thalictrum foliolosum*	Mamiri	Ranunculaceae
8	*Tridex procumbens*	Ground weed	Amaranthaceae
Grasses			
1	*Aphida mutica*	Tachula	Graminese
2	*Cynodon dactylon*	Dhub	Gramineae
3	*Chrysopogon fulvus*	Gadia	Graminese

5. Common Public Awareness Programmefor Wildlife Protection and Conservation

Among all the threats of biodiversity, lack of awareness is the major cause for their loss. Hence, public awareness programmes will be conducted regarding the issues, conflicts and facts of wildlife,

especially for the entire schedule-I & II species present in the study area and buffer zone of respective mining project situated in different river.

Conservation education and public awareness are useful tools in changing the behavior of people. Illegal entry into the Wildlife Sanctuary/National Park and forest for collection of forest products should be stopped. Awareness programmes about various wildlife species, their ecology, habitat, food & feeding and behavior will be conducted in the study area. Programmes will target to make aware of all groups (Community Forest User Group, Women's groups, Villagers of the Buffer Zone, School Teachers and Students). Recommendations against walking inside or at the edge of the forest during nighthours, and at dawn or dusk should also be avoided to reduce human and animal encounters.

Involvement of local people in conservation activities will be ensured by organizing meetings and Seminars/Workshop from village to village on regular basis to carry the people along with implementation. It will include the formal training on the importance of biodiversity and also to make available the information of the flora and fauna of high conservation value present in the surrounding areas. Functions like Van Mahotsav, Wildlife Week, World Forestry Day, and World Environment Day will be organized with the help of Gram Panchayat and regional NGO's. Information on Wildlife policies and Government regulation and penalties will be provided to workers.

Proposed Conservation Plan:

The following activities have been proposed for conservation of species.

Creation of New Water Holes:

Total 5 No's of New Water holes will be created during the five years and existing water holes will be maintained through proper ways. Water tankers at regular interval will be provided to maintain the water in the holes.

Plantaion:

Plantaion of 2500 Sapling will be completed in First year and will be maintained in subsequent years till five years. Wire crated fencing will be done around the plantation area to protect the plants from any kind of damages. A full time gardener will be appointed to take care of the planted area.

Protection of habitat area:

Habitat area will be protected through proper fencing and by planting of shrubs around the animal habitats and along with lease area on both the sides of river banks.

Public Awareness Program:

Regular public awareness programs will be conducted in the nearby villages regarding the local ecology and its importance.

Signages:

Sign boards will be provided around the project area to aware the public regarding environmental and ecological importance.

6. Tentative Plan for Conservation Plan of Schedule I & II Species

Table 5: Expenditure for Conservation Plan in Five Years (Amount in Rs. lakhs)

Sl. N.	Proposed Conservation Activity	Annual Cost (Amount in Rs. lakhs)										Grand Total (Rs. Lakhs)
		Ist Year		IInd Year		IIIrd Year		IVth		Vth Year		
		Physical	Financial	Physical	Financial	Physical	Financial	Physical	Financial	Physical	Financial	
1	Creation of water holes and Maintenance	2 No's	Rs 2.00 Lakhs	2 No's	Rs. 2.20 Lakhs (Creation + Maintenance)	1 No.	Rs. 1.40 Lakhs (Creation + Maintenance)	Maintenance	Rs. 0.50 Lakhs	Maintenance	Rs. 0.50 Lakhs	6.60
2	Plantation Activities in nearby areas (Total 2500 trees for 5 years), (Cost of Plant Rs.100/Sapling)	2500 No's	Rs. 5.00 Lakhs	Maintenance	Rs. 1.00 Lakhs	Maintenance	Rs. 1.10 Lakhs	Maintenance	Rs. 1.20 Lakhs	Maintenance	Rs. 1.30 Lakhs	9.60
3	Public Awareness Programmes	LS	Rs. 0.50 Lakhs	LS	Rs. 0.50 Lakhs	LS	Rs. 0.50 Lakhs	LS	Rs. 0.50 Lakhs	LS	Rs. 0.50 Lakhs	2.50
4	Signages (5 No's)	2 No's	Rs. 0.30 Lakhs	1 No.	Rs. 0.20 Lakhs (Creation + Maintenance)	2 No's	Rs. 0.35 Lakhs (Creation + Maintenance)	Maintenance	0.25	Maintenance	0.25	1.35
5	Protection of Habitat by Shrub Plantation of 10m width along both the river banks	5.0 Ha.	Rs. 2.5 Lakhs	Maintenance	Rs. 1.00 Lakhs	Maintenance	Rs. 1.10 Lakhs	Maintenance	Rs. 1.20 Lakhs	Maintenance	Rs. 1.30 Lakhs	7.10
	Total	-	**10.30**	-	**4.90**	-	**4.45**	-	**3.65**	-	**3.85**	**27.15**

The money for plantation will be deposited with mining trust according to Uttarakhand District Mineral Foundation Trust, 2017 dated 17th November, 2017 and plantation will be done by the trust and will be checked by the concerning DFO.

7. REFERENCES

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प्रभागीय वनाधिकारी
भूमि संरक्षण वन प्रभाग
कालसी (देहरादून)

प्रमुख वन संरक्षक (वन्य जीव)
मुख्य वन्य जीव प्रतिपालक
उत्तराखण्ड

Annexure 13

GARHWAL MANDAL VIKAS NIGAM LTD.
74/1 RAJPUR ROAD, DEHRADUN

E-Mail: gmvnl@gmvnl.com
gmvn@sancharnet.in

Ph :- 0135-2746817,2749308
Fax :- 2746847

Ref---378/MM@

Date 31/3/15

To

The Director (IA-II),
Ministry of Environment, Forest & Climate Change,
Indira Paryavaran Bhawan,
Lodhi Road, Jor Bagh,
New Delhi-110003

Sub: Regarding Environmental Clearance for River Yamuna Lot No. 21/2 Sand, *Bajri* & Boulder Mining Project (Area: 34.940 ha.) at village: Dhakrani, Tehsil: Vikasnagar & District: Dehradun, Uttarakhand.

Dear Sir,

I am herewith submitting the Final EIA/EMP Report along with public hearing proceedings, in hard copy as well as soft copy (in single PDF format) of the above mentioned project for your kind perusal.

Kindly issue the Environmental clearance at your earliest.

Thanking you.

Yours truly,

Managing Director
GMVN Ltd.

Encl: As above

Greenbelt Development Plan

Mine lease area of the proposed project is located in the dry river bed near the shore of the Yamuna River. Hence, the plantation will be done along the roads/river banks/any Govt. School/ College Campus and Panchayat area of any nearest village.

Green belt plantation will be started with the beginning of the mining and will be completed within five years from the beginning. Green belt will help in reducing the spread of fugitive dust and noise from the mining area.

Plantation will be done in the area in following manners

Road Side Plantation

Area of 3m width and 1680m length will be covered along the road side = 3 x 1680 x 2(both the road side) = 10080 sqm or 1.008 Ha.

No. of Plants to be planted @9sqm/Plant = 1120 Plants

Along the river banks

Area of 10m width and 4450m length will be covered along both the sides of river banks = 10 x 4450 = 44500 sqm or 4.45 Ha.

No. of Plants to be planted @25sqm/Plant = 1780 Plants

Distribution of Fruit Plants to Villager, Govt. School, College Campus and Panchayat area = 500 plants

Total no's of sapling to be planted = 1120+1780+500 = 3400

Criteria for plants/trees species selection for Green belt development:

1. Having tolerance to dust pollution.
2. Should maintain leaves for as longer a time as possible.
3. Combination of plants should be such so that almost a screen of plants is formed to check the dust from escaping the area. Thus the green belt plants will consist of mainly the trees and shrubs also.
4. The trees should provide shade.
5. Plants possessing economic and/or aesthetic value should be given preference.
6. Only local species will be taken for plantation.

Saplings

Saplings for planting will be procured form the nurseries of the State Forest Department. Saplings will be planted after the commencement of the monsoons. Saplings will be planted at specific distance/intervals. The pits will be filled with a mixture of good quality soil and organic manure (cattle dung, agricultural waste). The saplings will be planted just after the commencement of the monsoons to ensure maximum survival. The species selected for plantation must be locally growing varieties with fast growth rate and ability to flourish even in thin, dry soils.

Post Plantation Management

Watering will be done immediately after plantation. Further watering will depend on the rain while during dry seasons. Watering will be regularly done at least thrice a week. Saplings will be regularly monitored and remedial actions will be undertaken as required. During this five years period, casualties will be replaced at the beginning of each monsoon.

Table 1: List of Vegetation for Habitat Improvement

S. No.	Botanical name	Common Name	Uses
1	*Mangifera indica*	Aam	Fruit Edible, Timber, Fodder
2	*Syzygium cumini*	Jamun	Fruit Edible, Timber, Fodder
3	*Azadirachta indica*	Neem	Timber; Fodder, Medicinal
4	*Populus dealtoides*	Popular	Timber, Fuel
5	*Dalbergia sissoo*	Sisam	Timber, Fuel
6	*Albizia lebbeck*	Siris	Timber, Medicinal
7	*Delonix regia*	Gulmohar	Flower Edible, Medicinal
8	*Tamarindus indica*	Imli	Fruit Edible, Timber, Fodder
9	*Litchi chinensis*	Lichi	Fruit Edible, Medicinal, Fodder
10	*Aegle Marmelos*	Bael	Fruit Edible, Fodder, Medicinal
11	*Ziziphus mauritiana*	Ber	Timber, Fruit Edible, Fodder
12	*Emblica officinalis*	Amla	Flower bud edible, fodder

Tentative Budget for Greenbelt

Table 2: Expenditure for Plantation in Five Years (Amount in Rs. lakhs)

S. No.	Proposed Plantation Activity	Annual Cost (Amount in Rs. lakhs)										Grand Total (Rs. Lakhs)
		1st Year		2nd Year		3rd Year		4th Year		5th Year		
		Physical	Capital Cost	Physical	Recurring	Physical	Recurring	Physical	Recurring	Physical	Recurring	
1	Plantation Activity in the area (Total 3400 trees for 5 years), (Cost of Sapling Rs.100/Sapling)	3400 No's	Rs. 5.0 Lakhs	Maintenance	Rs. 1.70 Lakhs	Maintenance	Rs. 1.70 Lakhs	Maintenance	Rs. 1.70 Lakhs	Maintenance	Rs. 1.70 Lakhs	11.80

The money for plantation will be deposited with mining trust according to Uttarakhand District Mineral Foundation Trust, 2017 dated 17th November, 2017 and plantation will be done by the trust and will be decided by the concerning DFO.

Annexure 15

कार्यालय प्रमुख वन संरक्षक (वन्यजीव)/मुख्य वन्यजीव प्रतिपालक, उत्तराखण्ड

85 राजपुर रोड, देहरादून, फोन नं० 0135–2742884 फैक्स नं० 0135–2745691 ईमेल–cwlwua@yahoo.co.in

पत्रांक 363/IR-1/37-1 देहरादून दिनांक 05 अगस्त 2017

सेवा में,

1. प्रभागीय वनाधिकारी, चकराता वन प्रभाग, चकराता।
2. गढ़वाल मण्डल विकास निगम लि० का० 74/1 राजपुर रोड, देहरादून।

विषयः– राष्ट्रीय वन्यजीव बोर्ड की 43 वी बैठक दिनांक 27.06.2017 का कार्यवृत्त।

संदर्भः– वैज्ञानिक सी/उपनिदेशक(वन्यजीव) वन एवं पर्यावरण जलवायु परिवर्तन मंत्रालय भारत सरकार का पत्रांक एफ० नं० 6–119/2017 डब्लु० एल० (43वी बैठक) दिनांक 26.07.2017

महोदय,

सदर्भ में अंकित पत्र की प्रतिलिपि आपके सूचनार्थ एवं आवश्यक कार्यवाही हेतु संलग्न कर भेजी जा रही है। भारत सरकार द्वारा दिये गये निर्देशानुसार प्रकरण पर यथोचित कार्यवाही करने का कष्ट करें।

संलग्नक–उपरोक्तानुसार।

भवदीय

05/8/17

(डी०वी०एस० खाती)
प्रमुख वन संरक्षक (वन्यजीव)/
मुख्य वन्यजीव प्रतिपालक,
उत्तराखण्ड

पत्रांक 363 / तद्दिनांकित।

प्रतिलिपिः– वैज्ञानिक सी/उपनिदेशक(वन्यजीव) वन एवं पर्यावरण जलवायु परिवर्तन मंत्रालय भारत सरकार नई दिल्ली को उनके संदर्भित पत्र के क्रम में सूचनार्थ प्रेषित।

05/8/17

(डी०वी०एस० खाती)
प्रमुख वन संरक्षक (वन्यजीव)/
मुख्य वन्यजीव प्रतिपालक,
उत्तराखण्ड

Government of India
Ministry of Environment, Forest and Climate Change
(Wildlife Division)

6th Floor, Vayu Wing
Indira Paryavaran Bhawan
Jor Bag Road
New Delhi 110 003

F. No. 6-119/2017 WL

Date: 26th July 2017

To
The Principal Secretary
Department of Environment and Forests
Government of Uttarakhand
87, Rajpur Road
Dehradun-248001

Sub: Minutes of the 43rd Meeting of Standing Committee of NBWL- reg.

Sir,

The 43rd meeting of the Standing Committee of National Board for Wildlife was held on 27th June 2017 under the chairmanship of Hon'ble Minister for Environment, Forest and Climate Change. The following proposals pertaining to your State were considered:

(1) **Construction of Singoli-Bhatwari Hydroelectric Project 99 MW by M/s L&T Uttaranchal Hydropower Limited. The proposed site falls within 10 km from the boundary of Kedarnath Wildlife Sanctuary**
(2) **Construction of 171 MW Lata Tapovan Hydro Power Project of NTPC Ltd, Uttarakhand**
(3) **Construction of 520 MW (4 X 130) Tapovan Vishnugad Hydroelectric Project of NTPC Ltd., Uttarakhand. The proposed site falls outside Nanda Devi National Park at a distance of 7.5 km**

The IGF(WL) briefed the Committee on the above proposals and mentioned that the proposals were considered by the SC-NBWL in its 39th meeting held on 23rd August 2016. During the said meeting, it was decided by the Standing Committee to seek the comments of Ministry of Water Resources, River Development & Ganga Rejuvenation (MoWRD&GR) on the proposed projects. A letter was sent to Ministry of Water Resources on 23rd September 2016 for seeking its comments. Reminder letters were sent to Ministry of Water Resources on 31.03.2017 and 05.05.2017 respectively. However, no comments have been received from Ministry of Water Resources, River Development & Ganga Rejuvenation. He also mentioned that in the 42nd meeting of SC-NBWL, the Chair suggested to the Chief Wildlife Warden to ask the State Government to take up the matter with the Ministry of Water Resources, River Development & Ganga Rejuvenation.

(10) Obtain NOC for Sand, Bajri & Boulder mining (60.983 ha) on Sheetla River bed at Village Charwa Kedarwala and Jassowala, District Dehradun, Uttarakhand 56/

The IGF(WL) briefed the Committee on the proposal and stated that the proposal is for the collection of river bed materials from Asan Wetland Conservation Reserve. He added that the CWLW has recommended the proposal subject to the following conditions specified by the Divisional Forest Officer of Chakrata Forest Division:

The project is essential to prevent widening of the river bed due to deposition of sediments which if not mined out will cause flooding, damage to the adjoining areas, destruction of life and property. This will also enhance revenue and greater employment opportunities for the local people. Moreover there is no adverse impact on the flora and fauna. The proposed project has public interest.

After discussions, the Standing Committee decided to recommend the proposal along with the mitigation measures prescribed by the State Chief Wildlife Warden.

(11) Obtain NOC for Sand, Bajri & Boulder mining (34.94 ha) on Yamuna River bed at Village Dhakrani, District Dehradun, Uttarakhand 24/12 21/2

The IGF(WL) briefed the Committee on the proposal and stated that the proposal is for the collection of river bed materials from Asan Wetland Conservation Reserve. He added that the CWLW has recommended the proposal subject to the following conditions specified by the Divisional Forest Officer of Chakrata Forest Division:

The project is essential to prevent widening of the river bed due to deposition of sediments which if not mined out will cause flooding, damage to the adjoining areas, destruction of life and property. This will also enhance revenue and greater employment opportunities for the local people. Moreover there is no adverse impact on the flora and fauna. The proposed project has public interest.

After discussions, the Standing Committee decided to recommend the proposal along with the mitigation measures prescribed by the State Chief Wildlife Warden.

(12) Obtain NOC for Sand, Bajri & Boulder mining (69.785 ha) on Baldi River bed at Villages Mirota, Mandawali, Pustadi, Kulhaan, Mansingh, Kheri Mansingh, Resiwala, Dist. Dehradun, Uttarakhand 15/2, 17/4

The IGF(WL) briefed the Committee on the proposal and stated that the proposal is for the collection of river bed materials from Mussoorie Wildlife Sanctuary. He added that the CWLW has recommended the proposal subject to the following conditions:

1. No mining activity in the night.
2. Speed breakers should be made on the road to avoid high speed of vehicles involved in mining for protection of wildlife.

After discussions, the Standing Committee decided to recommend the proposal along with the mitigation measures prescribed by the State Chief Wildlife Warden.

Annexure 16

कार्यालय जिला खान अधिकारी
भूतत्व एवं खनिकर्म इकाई, उद्योग निदेशालय उत्तराखण्ड,
गोपालपानी, कक्ष संख्या 11, देहरादून

सेवा में

मुख्यप्रबन्धक,
गढ़वाल मण्डल विकास निगम लि0,
देहरादून।

संख्या- [illegible] /गढ0म0वि0नि0/खा0लॉट/भू0खनि0ई0/2017-18. दिनांक 27 फरवरी, 2018

विषय: गढ़वाल मण्डल विकास निगम लि0 को जनपद देहरादून, हरिद्वार, टिहरी गढ़वाल एवं पौड़ी गढ़वाल के क्षेत्रान्तर्गत आवंटित चुगान लॉटों का 500 मी0 की परिधि में विद्यमान के सम्बन्ध में।

महोदय,

उपरोक्त विषयक अपर निदेशक, भूतत्व एवं खनिकर्म इकाई, उद्योग निदेशालय उत्तराखण्ड, देहरादून के पत्र संख्या 349/खान/देहरादून/भू0खनि0ई0/2017-18, दिनांक 29 अगस्त, 2017 की इस कार्यालय को सम्बोधित एवं आपको पृष्ठांकित है, कि संदर्भ दर्शाए जाने का कष्ट करें, जिसके माध्यम से आपके पत्र संख्या 236/खनन, दिनांक 28 जुलाई, 2017 की प्रति सलग्न कर प्रेषित करते हुए अवगत कराया गया है कि उक्त संदर्भ स्पष्ट किये जाने सम्बन्धी पत्र पर्यावरण एवं जलवायु परिवर्तन मंत्रालय, भारत सरकार एवं सूचना उपलब्ध कराया गया था। मंत्रालय द्वारा प्रस्तुत रिपोर्ट /सूचनाओं को संज्ञान में लेते हुए उक्त सूचना संलग्न प्रारूपों में उपलब्ध कराते हुए रेवेन्यू किये जाने हेतु निर्देशित किया गया है, के क्रम में निगम को जनपद देहरादून में आवंटित विभिन्न राजस्व लॉटों के 500 मीटर की परिधि में स्थित किसी भी अन्य लीज (गढ़वाल मण्डल विकास निगम, निजी व्यवसायी, एवं विकास निगम) की रिक्ति लॉट के नाम, स्वीकृत क्षेत्रफल व चौहद्दी की दैनांक इत्यादि सहित उल्लेखित करते हुए सूचना निर्धारित प्रारूप पर उपलब्ध कराये जाने का अनुरोध किया गया है। तत्पश्चात से निगम द्वारा निर्धारित प्रारूप पर सूचना उपलब्ध कराने हेतु निर्देशित किया गया है.

उक्त के क्रम में जनपद देहरादून में निगम को आवंटित विभिन्न राजस्व लॉटों से 500 मीटर की परिधि में स्थित अन्य लीज (गढ़वाल मण्डल विकास निगम, निजी व्यवसायी, एवं विकास निगम) की रिक्ति लॉट के नाम, स्वीकृत क्षेत्रफल व चौहद्दी की दिनांक इत्यादि से सम्बन्धित सूचना तैयार कर निगम द्वारा निर्धारित प्रारूप पर आवश्यक कार्यवाही हेतु संलग्न कर प्रेषित की जा रही है।

संलग्नक : यथोक्त।

भवदीय,

(सुनील पंवार)
जिला खान अधिकारी।

पृष्ठांकन संख्या /गढ0म0वि0नि0/खा0लॉट/भू0खनि0ई0/2017-18, तद्दिनांकित।

प्रतिलिपि : अपर निदेशक, भूतत्व एवं खनिकर्म इकाई, उद्योग निदेशालय उत्तराखण्ड देहरादून को उनके पत्र संख्या 349/खान/देहरादून/भू0खनि0ई0/2017-18, दिनांक 29 अगस्त, 2017 के क्रम में सूचनार्थ एवं आवश्यक कार्यवाही हेतु प्रेषित।

(सुनील पंवार)
जिला खान अधिकारी।

जनपद देहरादून अन्तर्गत स्थित गढ़वाल मण्डल विकास निगम को आवंटित राजस्व उपखनिज खनन लॉटो की 500 मी0 की परिधि मे स्थित अन्य उपखनिज खनन लॉटो का विवरण

क्र0 सं0	लॉट का नाम /संख्या	अक्षांश / देशान्तर	क्षेत्रफल (है0)	500 मी0 परिधि मे स्थित गढ़वाल मण्डल विकास निगम को आवंटित लॉट का नाम /संख्या	500 मी0 परिधि मे किसी अन्य पट्टा/लॉट की विद्यमानता			
					पट्टाधारक का नाम	स्वीकृत क्षेत्रफल	पर्यावरणीय स्वीकृति की दिनांक	पट्टा स्वीकृति की दिनांक
1	टौंस 3/6 ग्राम रैमपुर माफी, कोलागढ, बिलासपुर कांडली, बजावाला, देहरादून	30°21'6.84"N to 30°21'28.56"N 77°59'18.13"E to 78°0'34.80"E	कुल क्षे0 10.523 है0 ख0स0 1, 1, 361 व 1	नून 8/4, कुल क्षे0 21.668 है0, ग्राम गुजराडा करनपुर, गुजराडा फुलसानी व बिलासपुर कांडली, देहरादून ख0स0 476, 475, 278, 418, 400 व 1				
				टौंस 3/8, कुल क्षे0 15.363 है0, ग्राम रौंगड़वाला, शाहपुर खैरी, कोटला खैरी, देहरादून, ख0स0 1, 2, 388 व 389				
2	टौंस 3/12 ग्राम शाहरा व ईस्ट होप टाउन, देहरादून	ब्लॉक 2 30°20'20.26"N to 30°20'16.24"N 77°55'13.07"E to 77°53'52.33"E ब्लॉक 3 30°20'25.45"N to 30°20'25.35"N	कुल क्षे0 46.931 है0 ख0स0 1166मी0, 1156मी0, 1160मी0, 1161मी0, 1162मी0, 1163मी0, 1164मी0	टौंस 3/13 कुल क्षे0 5.6 है0, ग्राम बंजीवाला, देहरादून ख0स0 239मी0				

		77°53'59.61"E to 77°55'7.05"E						
3	टौंस 3/13 ग्राम बंशीवाला, देहरादून	30°20'29.19"N to 30°20'20.58"N 77°53'33.35"E to 77°53'49.23"E	कुल क्षे0 6.0 है0 ख0स0 289मी0	टौंस 3/12 कुल क्षे0, 46.931 है0, ग्राम शाकरा व ईस्ट होप टाउन, देहरादून, ख0स0 1166मी0, 1158मी0, 1160मी0, 1161मी0, 1162मी0, 1163मी0, 1164मी0				
				टौंस 3/14, कुल क्षे0, 6.7 है0, ग्राम मटरका गाँव व शीशमबाड़ा, देहरादून, ख0स0 668मी0, 466मी0				
4	सौंन 7/2 ग्राम डोईवाला, मिस्सरवाला खुर्द, देसवाला, पित्तरपड़ी, फतेहपुर टाक, मारखम ग्रांट, देहरादून	30°8'22.11"N to 30°10'40.76"N 78°7'48.27"E to 78°7'58.37"E	कुल क्षे0 135.856 है0 ख0स0 264, 242, 243, 455, 226, 228, 229, 215/1, 226/1, 227/1, 243/2, 245, 247,248/2, 368, 1794, 1795, 1796, 1797, 1798	...	1. सौंन 3, उत्तराखण्ड इको विकास निगम लि0, अरण्य विकास भवन, 73 नेहरु रोड, देहरादून	ग्राम मारखम ग्रांट तह0 ऋषिकेश कुल क्षे0 270 है0	पत्र सं0 : J-11015/341/2009-IA.II(M) दिनांक 15.04.2011	490/VII-I/2012/123-ख/2011 उ0वि0 अनु0 2016 दिनांक 03.04.2012
5	सून 8/1 ग्राम मल्लजताड़ी,	30°24'5.19"N to 30°23'47.22"N 78° 0'51.96"E to 78° 1'35.89"E	कुल क्षे0 7.5 है0 ख0स0 78 मेध्य	सून 8/2, कुल क्षे0, 7.6 है0, ग्राम बौलास व हरिनावाला, देहरादून,				

	सलियावाला, देहरादून			1084 मध्य, 1 79 मध्य				
6	नून 8/3 ग्राम धौलास व हरियावाला, देहरादून	30°23'33.50"N to 30°23'01.17"N 78° 01'34.45"E to 78° 01'09.64"E	कुल क्षे0 7.6 है0 ख0स0 1084 मध्य, 1 78 मध्य	नून 8/1, कुल क्षे0, 7.5 है0, ग्राम गल्लवाली, सलियावाला, देहरादून, ख0स0 78 मध्य				
7	खुसवा 12/2 ग्राम सलियावाला, कुडकावाला, धैलीवाला व खंडी, देहरादून	30°9'52.02"N to 30°8'56.97"N 78°5'22.62"E to 78°6'15.42"E	कुल क्षे0 55.51 है0 ख0स0 2576	...				
8	आसन 14/4 ग्राम रामपुर व कल्याणपुर, देहरादून	ब्लॉक 5 30°22'1.77"N to 30°21'23.91"N 77°49'0.60"E to 77°49'48.14"E ब्लॉक 4 30°21'33.83"N to 30°21'25.18"N 77°49'17.99"E to 77°49'39.04"E	कुल क्षे0 35.405 है0 ख0स0 1175म, 139, 140	आसन 14/6, कुल क्षे0 32.709 है0, ग्राम सगावाला, इन्दीपुर, लक्ष्मीपुर व साहसपुर, देहरादून, ख0स0 2मी0, 1मी0, 585मी0, 593मी0, 594मी0	1. श्री अजय डबराल पुत्र श्री क्षी0 एल0 डबराल निवासी ग्राम सुन्दरवाला रायपुर तहसील विकासनगर जिला देहरादून	ग्राम रामपुर कला तo विकासनगर ख0स0 1175ठ, कुल क्षे0 2.334है0	पत्र सं0 : 657--1(651)/2014 दिनांक 04. 01.2015	41/VII-1/06-स/2015 दिनांक 16.01. 2015
9	आसन 14/5 ग्राम सहसपुर, देहरादून	30°22'55.11"N to 30°23'40.97"N 77°47'49.88"E to 77°47'8.66"E	कुल क्षे0 32.218 है0 ख0स0 240क 410क	आसन 14/6, कुल क्षे0 32.709 है0, ग्राम सगावाला, इन्दीपुर, लक्ष्मीपुर व साहसपुर, देहरादून, ख0स0 2मी0, 1मी0, 585मी0, 593मी0, 594मी0				

					आसन 14/7, कुल क्षे0 4.0 है0, ग्राम धमोलो, देहरादून, ख0स0 244ज
10	आसन 14/6 ग्राम सगदाला, इन्द्रौपुर, लखीमपुर व सहसपुर, देहरादून	30°22'55.45"N to 30°22'3.32"N 77°47'57.12"E to 77°48'58.89"E	कुल क्षे0 32.709 है0 ख0स0 2मी0, 1मी0, 585मी0, 593मी0, 594मी0	आसन 14/4, कुल क्षे0 35.405 है0, ग्राम रानपुर व कल्याणपुर, देहरादून, ख0स0 1175ग, 139, 140 आसन 14/5, कुल क्षे0 32.210 है0, ग्राम सहसपुर, देहरादून, ख0स0 240क, 410क
11	निम्मी 18/1 ग्राम कोटड़ा सतौर व कोल्हूपानी, देहरादून	30°20'37.94"N to 30°21'29.83"N 77°57'52.21"E to 77°58'32.67"E	कुल क्षे0 8.4 है0 ख0स0 319, 1, 208	टौंस 3/8, कुल क्षे0 15.363 है0, ग्राम रांगड़वाला, शाहपुर संतौर, कोटड़ा संतौर, देहरादून, ख0स0 1, 2, 388 व 389 टौंस 3/9, कुल क्षे0 3.963 है0, ग्राम जाकेड़िया ग्रांट, नीटी तेरी, कोल्हूपानी, देहरादून, ख0स0 31 मी0, 1/1, 447
12	चौरखला 20/16 ग्राम शंकरपुर, देहरादून	30°23'44.77"N 77°50'44.27"E 30°23'23.22"N 77°49'44.76"E	कुल क्षे0 20.0 है0 ख0स0 1210च	...	

13	यमुना 21/2 ग्राम ढकरानी, देहरादून	30°28'3.21"N to 30°27'16.24"N 77°42'59.22"E to 77°42'4.73"E	कुल क्षे0 54.94 है0 ख0स0 971, 969, 970, 936नी0	यमुना 21/3, कुल क्षे0 68.364 है0, ग्राम ढकरानी व रायपेदा, देहरादून, ख0स0 1 मध्य, 2क, 618	1.	श्री मौसम सिंह पुत्र श्री पृथ्वी सिंह निवासी ग्राम ढकरानी तहसील विकासनगर जिला देहरादून	ग्राम ढकरानी तह विकासनगर ख0स0 936ट, 935नी0, 936प, 936ब, कुल क्षे0 1.854है0	पत्र सं0 429–1(480)/2014 दिनांक 28.03.2014	1561/VII-I/118-ख/2014 दिनांक 10.11.2014
					2.	मैसर्स शिवा ट्रेडर्स, ग्राम रोहालकी रुड़कीपुर, पो0 ऑ0 भगवानपुर, निवासी रुड़की हरिद्वार	ग्राम ढकरानी तह विकासनगर ख0स0 961क, 953क, 955क, 955ख, 955घ, 951ड, 955ग, 953ख, 954, 948ग, 951च, 953ग, 949ग, 955ड, 955छ, 956, 955च, 955, 952, 951ग, 634क, 936ट नी0, 935नी0, 936ट, 956क, 959, 960क, 951, 962क, कुल क्षे0 2.5883है0	पत्र सं0 419–1(469)/2014 दिनांक 29.03.2014	885/VII-I/79-ख/2014 दिनांक 27.05.2014
14	यमुना 23/1 ग्राम डुंगेड़ा, देहरादून	30°30'42.15"N to 30°30'40.55"N 77°50'22.59"E to 77°51'10.91"E	कुल क्षे0 30.035 है0 ख0स0 849क	अमलावा 22/2, कुल क्षे0 3.258 है0, ग्राम व्यास नदी, देहरादून, ख0स0 888, 889	1.	श्री मुकेश अरोड़ा पुत्र श्री सागर चन्द अरोड़ा निवासी 13/3 बल्लूपुर रोड, जिला देहरादून	ग्राम व्यास नदी तह कालसी ख0स0 474, 463, 486, 477 व 456 कुल क्षे0 1.292है0	पत्र सं0 421–1(483)/2014 दिनांक 29.03.2014	893/VII-I/94-ख/2014 दिनांक 27.05.2014

					2. बागोदेवी, ग्राम व्यास नहरी तहसील कालसी जिला देहरादून	ग्राम व्यास नहरी ता0 कालसी कुल क्षे0 1.429है0	पत्र सं0 : 8–1(5)/2013 दिनांक 01.06.2013	1192/VII-1/42–ख/2013, दिनांक 13.06.2013
					3. गम्भीर सिंह, निवासी ग्राम बसान, तहसील कालसी, जिला देहरादून	ग्राम बसान खसरा सं0 158 कुल क्षे0 2.266 है0	पत्र सं0 : 657–1(658)/2015, दिनांक 15.02.2015	1399/VII-1/83–ख/2006, दिनांक 15.12.2016
15	यमुना 23/2 ग्राम डुमेट, देहरादून	30°30'41.09"N to 30°30'20.50"N 77°49'45.65"E to 77°49'15.53"E	कुल क्षे0 31.203 है0 ख0स0 1घ, 2क	...	1. श्रम संविदा समिति, तहसील विकासनगर, जिला देहरादून	ग्राम हरिपुर कलां, ता0 विकासनगर ख0स0 2 कुल क्षे0 10.11है0	पत्र सं0 : I-1101/30/2010-LA.II(M) दिनांक 08.06.2012	1520/VII-1-12/06–रिट/2003, दिनांक 20.11.2012

जिला खान अधिकारी,
देहरादून