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

E-Mail: gmvngstming@gmail.com

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

Ref- 112 /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, <u>New Delhi-110003</u>

Sub: Regarding Environmental Clearance for River Yamuna Lot No. 23/1 Sand, Bajri& Boulder Mining Project over an area of 30.035 ha at Village: Dumate, Tehsil: Vikasnagar& District: Dehradun, By GMVN Ltd. Uttarakhand

File No: J-11015/125/2013-IA-II (M)

Ref:

- 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 06.07.2018
- 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. 23/1 Sand, Bajri& Boulder Mining Project over an area of 30.035 ha at Village: Dumate, 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 06.07.2018, and agenda meeting held during 27-28 November 2019 for River Yamuna, Lot No. 23/1, Dehradun Uttarakhand by M/s Garhwal Mandal Vikas Nigam Ltd.

File No: J-11015/125/2013-IA-II (M) Proposal No-IA/UK/MIN/18535/2013

a) 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**

b) 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 has 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**.

c) 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 (15th June-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.**
- **d)** 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 197-201. 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.

e) 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**.

f) 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**.

g) 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: As suggested, the mining Plan has been revised based on the replenishment study. The detailed methodology has also been enclosed as Appendix -6 in the Modified Mining Plan. The same is attached as **Annexure 1**.

h) 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.

i) PP is having number of mining leases and Environment Policy needs to be revised to address various Environmental Issues. The number of manpower to be engaged for Environmental Monitoring Cell in not clear. PP should clearly mention the designation and number of person to be engaged for Environment 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: Revised Environment Policy and Environment Management Cell mentioning the designation and number of persons has been prepared and attached as **Annexure 9A & 9B**.

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

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

k) 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. 99-102 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.

1) 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**.

m) 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. 143-144 of attached **Annexure 8**.

n) 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 12.**

o) Details of the instruction of Hon'ble High Court if any for the mining close to bridge.

Reply: There is a restriction of 1 km safety barrier of upstream and downstream side from the bridge as per the High Court Order attached as **Annexure 13.** Mining is permitted only after leaving 1 km safety barrier/zone from bridges.

REVISED MININGPLEAN

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

Annexure 1

Name of the Mineral- RBM (Sand, Bajri, Boulders etc) Village- Dumate Tehsil- Vikashnagar District- Dehradun, Uttarakhand Mining Plan Period-For Five (5) Years Total Area-30.035 Hectare



A VIEW OF PROPOSED REM MINING LEASE AREA

APPLICANT

M/s GARHWAL MANDAL VIKASH NIGAM LTD (Govt. of Uttarakhand Enterprise) 45 74/1-Rajpur Road 30 Dehradun, Uttarakhand

भूतत्व एव खरिश्वामं इवाई उद्योग मिदेशालय, उत्तराख्यण

देहरादृत शर्हों के अधीन अन् Town 75 Rims.1

PREPARED BY

BHUWAN JOSHI

EMPANELLED GEOLOGIST, ROP, IBM, UK, J&K, HP Forest & Rural Development Cell (ERDC) Empanelment No. URRDA2008-09/3190 Mu.Kha./ROP/DDN/01/2016 Govt, of Utarakhand ROP, Registration No.RQP/DDN/180/2009/4 Indian Bureau of Mines Govt, of India

Progressive Geological & Geotechnical Services (PG2S) <u>REGD, OFFRCE</u> House No.-o, Kamal Bhawan Vijay Colony, Lane No.-I, Debradan Uttarakhand E-mail joshishuvaniiryahoo co.m Mo. No. 09412152105

Address-

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MINING PLAN

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

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

APPENDIX

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APPENDIX-10	LEAST AREA INCANT'S ID
APPENDIX-11	ROPCIETINICATE
	Bhuwan Joshi Empanified Geologist FRDC. Gevr. Carakhand RuP, India, Bureau Registration

PLATES

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PLATE 2	GEOREFRENCED MAP WITH CONTOUR (SCALE 1:4000)		
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PLATE-5	PIT POSITION AT THE END OF PRE-MONSOON PERIOD
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PLATE-12	PHY SECTION ALAN (PRE-MONSOON PERIOD)
PLATE-13	PIT SECTION PLAN (POST-MONSOON PERIOD)
PLATE-14	ULTIMATE GLOUSER PLAN
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MINE PLAN

CHAPTER-1

1.0 INTRODUCTORY NOTE-

The Letter of Intent (LoI) was granted/released vide letter No. 589/bhu.khani.ee./2012-13, Dated 23 January 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 Bosider (RBM), in a part of River Yamuna-Lot No. 23/1, Village- Dumate, Khasara No. 649 ka, Area- 30,035 Hectare,

Proposed SAND, BAJRI AND BOULDERS MINE/Mining, in a part of Village-Durnate, Tehsil- Vikashnagar, District- Dehradun, Uttarakhand, Applicant- Garhwal Mandal Vikash Nigam Ltd, 74/1-Rajpur Road, Dehradun, District- Dehradun, Uttarakhand is a small 'B' category mine as per explanation furnished in MCDR, 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
Dumate	Vikashnagar	Dehradun	30.035	RBM (Sand, Bajri, Boulder etc)



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CHAPTER-2

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vidress.	74/1-Rainur Road, Dehradun
vidress	74/1-Rainur Road, Dehradun
	A L LOUP CONTRACTOR
District	Dehradun
state	Uttarakhand
Sin Code	248001
hone	0135-2740896, 2746817, 2749308
tatus of the applicant	Garhwal Mandal Vikash Nigam Ltd (GMVN) is a Govt. of Uttarakhand Enterprise.
fineral(s) which the applicant itends 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.
eriod for which the mining lease is quired or granted / renewed	Letter of Intent (LoI) for the project vides letter No. 589/bhu.khani.ee./2012-13 Dated 23 January 2013,
A Contract Starts	Handred Area for Mining- 30.035 Handred as Annexure I)
ame of the RQP preparing the	Hhuwan Joshi
ddress *	Karnal Bhawan, House No. 6, Vija
	Lane No. 1, New Cantt Road,
OCATIONYE GEOLOGICAL & GEOTECHNICAL SERVICES (PG20)	
	tate in Code hone tatus of the applicant fineral(s) which the applicant tends to mine cried for which the mining lease is quired or granted / renewed me of the RQP ming plan dress

F		Dehradun (Uttarakhand) 248001
T	Phone	09412152105
F	Fax	
	Registration No.	RQP/DDN/180/2009/A-1BM 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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PROCREMENT GEOLOGICAL & GEOTECOMICAL MENTICES (9520) PROCREMENT GEOLOGICAL & GEOTECOMICAL MENTICES (9520) PROCREMENT GEOLOGICAL & GEOTECOMICAL MENTICES (9520) Ref: Stration No. ROP/DDN/1607/009/A Govi of Inc.a

CHAPTER-3

3.0 PROJECT DESCRIPTION

NEED OF THE PROJECT-

RBM i.e. Sand, Bajri and Boulder are available everywhere and is being used from 3.1 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 sustainable development. Besides above, the process of mining of minerals is a constant source of revenue generation to the Starts country State Government through Royalty.

3.1.1 Project benefits of sustainable RBM Mining-

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Physical benefits: Road Transport, Marker Whatcement of green cover & Creation of community assets.

Social benefits: Increase in Employment Potential, Increased UNcathorshited activities, Educational attainments & Strengthening of existing community Decisions etc. -rakhand

PROCREMENT GEOLOGICAL & GEOTECONICAL MENTICES (PGD) Rec: SUITADON NO ROP/DDM/180/2000// Govi of Inc.a BHUWAN JOSHI

RQP, Registration No.RQP/DDN/180/2009/A

Environmental benefits:

- · Controlling river channel.
- · Protecting of river hanks
- · 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 insitu mining activity.

3.2 PROJECT BACKGROUND

The Letter of Intent (Lol) was granted vide letter No. 589/bhu.khani.ee/2012-13, Dated 23 January 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 River Yamuna -Lot No. 23/1, village- Dumate, Khusara No. 649 ka., Area- 30.035 Hectare. Mining Plan for the project approved vide letter No. 2214/Mine Plan/u.khni/Dehradun/2013-14, dated 03 March 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/18535/2013. 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-11015/125/2013-IA-II (M) dated 6 July 2018, Annex. 1) as below-

5. N.	COMMITTEE RECOMMENDATIONS	COMPLIANCE STATUS
1-	This has reference to the EC proposal of	
	M/s Garhwal Mandal Vikas Nigam Ltd.	-
	for mining of 2.8 LTPA of Sand, Bain	STITM PAR
	and Boulders from River Yamuna Lot No.	A Jail
	23/1 having mining lease area 10015 hd	
1	located at Village-Dumet, ETehsil	
	Vikashnagar, District-Lehradun	S BECOM
1	Uttarakhand	
T	The proposal was considered by the	
	Expert Appraisal Committee, in its 33rd	
	meeting, held during June 21-22 2018	Btuwan Josh
	wherein the firm in 1.5	Empan Hert Capitorist
1	the Committee deterred the	RUP India Burand
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information-	
 a) 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 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 will come under no mining zone i.e. safety barriers from the grider bank. safety barrier at lease boundary, restrictions as per condition of LoI/Mining lease deed, restriction as Mineral Concession Rule of the concerned 	 Baseline Survey carried 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, all discussed percussions /recommendations mentioned in the text part and Plates 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: 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 The safety barrier has been proposed to more stop the top erosion phenomena. About 15% Safety barriers/left from the river bank has been proposed to more stop the top erosion phenomena.
State, restrictions as per	Bhuwan Joshi Empan ded Geolesiet
austamatic sand mining	FRDC. Gov: akhand

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RQP, Registration No.RQP/DDN/180/2009/A

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is the help of sections drawn	
with the weight of the rivers and	
across the wind of the flow of	
giong the uncertain 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.	
b) PP should suitably name each	Survey carried by IITR; based on IITR
section line. Section Plan for both	survey Geological Section, annexed as
sections drawn across the river	Mining Plate-4, pre monsoon period pit
and along the direction of the river	section plan, annexed as Mining Plate12 &
needs to be submitted. Each	post monsoon period pit section plan
section should have level on	annexed as Mining Plate 13 prepared
vertical axis and distance from the	and a state of a state
hank of river on horizontal avia	में हवाड़ उद्योग
Easthe easting along the Unit	Refu Ref
For the section along the direction	(E) (3)
of the river the levels to be shown	R
on the vertical axis and distance	
from upstream to downstream	anterward stemme
should be shown on horizontal	(* inte
axis,	Ganna
c) The PP should prepare the	On the basis of survey carried by IITR,
modified Mining plan based on	MODIFIED ET SED MENING PLAN
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 the mining plan. In the mining plan veatwise production plan hould be prepared in three plates for each year. Plate-1 show the mine working for the pre-monsoon period (1st APR-14st June), Plate-2 should show the status of the mine after the replenishment and no working should be proposed in this period (15st 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 ine. post monsoon period (2nd Oct-31st March) d) 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) or new the recent and their the monsoon, yearwise replenishment guantity all plan a sections of the replenishment study for the past five years. d) The average rise in the river bed level in the post and pre monsoon period is 0.442 m for one year cycle of 2018-19. Considering the area of present mining lot as 30.035 hectare, the average volume of material available in one year cycle of replenishment is 1.32.754 Jetuwan for the past. However this 	 the mining plan. In the mining plan vera-wise production plan sear-wise production plan should be prepared in three plates for each year. Plate-1 show the mine working for the pre-monsoon period (1" APR-14" June), Plate-2 should show the status of the mine after the replenishment and no working should be proposed in this period (15" June-1" 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 mineral and Plate-3 show the mine working after replenishment of the river bed i.e., post monsoon period (2^{ed} Oct-31" March) P P 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 (AMSI. & R1.) or river bed review of the replenishment study (all five years) shall be provided which include the level the level (AMSI. & R1.) or river bed review of the replenishment study for the past five years. Status for the replenishment study for the past five years. Status for the replenishment study for the past five years. Status for the replenishment study for the past five years. Status for the past five years. Status for the replenishment study for the past five years. The average role of creplenishment is 1.32.754.7 Cubic meters. However this value shout proto the date of material available in one year cycle of of replenishment is 1.32.754.7 Cubic meters. However this value shout proto the date of material available in one year cycle of replenishment is 1.32.754.7 Cubic meters. However this value shout proto the date of material available in one year system of material availab	i r	the above survey. The information sought above needs to be a part of	been prepared by RQP, all recommended plates been attached as- Mining Plate 5 to
 for each year. Plate 1 show the mine working for the pre-monsoon period (1st APR-14st June). Plate 2 should show the status of the mine after the replenishment and no working should be proposed in this period (15st 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 (2st Oct-31st March) d) 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) or river bed reconciler for and street the fromosoon, yearther replenishment quantity all plan is seen or of the replenishment study for the past two years. 	 for each year. Plate-1 show the mine working for the pre-monsoon period (1" APR-14" June). Plate-2 should show the status of the mine after the replenishment and no working should be proposed in this period (15th June-1" 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 mineral and Plate-3 show the mine working after replenishment of the river bed i.e. post monsoon period (2nd Oct-31st March) d) 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) or the post for replenishment quantity all plan a section of the replenishment quantity all plan a section of the replenishment quantity all plan a section of the replenishment quantity all plan a subsequent of the replenishment and mineable years. However this value should possed in the post and pre-scheme of the first the monsoon, year or the replenishment quantity all plan a section of the replenishment quantity all plan a section of the replenishment quantity all plan a section of the replenishment and mineable years. However this value should possed the taken again allow and the replenishment quantity all plan a section of the replenishment and mineable years. However this available in one year cycle of replenishment is 1,32,754,7cubic meters. However this value should possed the taken again allow and the replenishment and plane the replenishment and mineable years. However this available in one year cycle of replenishment is 1,32,754,7cubic meters. However this value should possed the taken again allow and the replenishment and the replenishment and plane the repl		the mining plan. In the mining plan year-wise production plan should be prepared in three plates	13 & extractable minable reserve been maintained in Mining chapter of the report.
 d) 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) or river bed recorded before and effer the monsoon, yearwise repletions ment quantity, all plan de sections of the replenishment study for the past five years d) PP should specifically mention in the mining plan that 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) or river bed recorded before and effect the monsoon, yearwise repletions ment quantity, all plan de sections of the replenishment study for the past five years. However this Bruwan Joshn 	d) 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) or river bed recoded before and effer the monsoon, yeargree repletionsment quantity, all plan d sections of the replenishment study for the past five years.		for each year. Plate-1 show the mine working for the pre-monsoon period (1 st APR-14 th June), Plate- 2 should show the status of the mine after the replenishment and no working should be proposed in this period (15 th June-1 st 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 (2 nd Oct-31 st March)	
Didwair obain	value shoutstripot, be taken 'agistinual average,		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	IITR, on the basis of study carried by Indian Institute of Technology Roorkee (IITR), (replenishment report submitted by IITR to GMVNL), <u>Volume of replenishment and mineable</u> <u>volume available</u> The average rise in the river bed level in the post and pre monsoon period is 0.442 m for one year cycle of 2018-19. Considering the area of present mining lot as 30.035 hectare, the average volume of material available in one year cycle of replenishment is 1,32,754,7cubic meters. However this

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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 a more viable option. The current deposition of RBM in the river for one year cycle (premonsoon to post monsoon) is about half a meter. 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 Bhuwan Joshi allowed (new be for current year only), as it at year only), as it logist FROC.Gov *khand RUP India-

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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

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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 neighboring 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 30.035 hectare area will be 4,50,525 cubic meters approximately for excavation upto 1.5 an Joshi m with respect to the present river bed level. FRDC CINO akhand RUP Indi: Bureau

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	(Ref. IITR survey report)
	Annex.
c) 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
f) 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
g) 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.
 h) 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.
 PP is having number of mining leases and Environment Policy needs to be revised to address various Environmental Management Cell is not clear. PP should clearly mention the designation and number of person to be engaged for Environmental 	Bt.uwan Joshi Emportant Bt.uwan Joshi Emportant Strand RuP Inc. Bureau Partant Strand

Monitoring Cell. The EMC will be	
set up for this mine only or for all	
the mining lease of the GMVN in	
the area.	
j) The PP should clearly bring out	Part of EM consultant, not a part of mining
aborter situation Air Quality	pian.
modeling needs to be done in	
Aermode software both for area	
and line source.	
k) The transportation route needs to	Part of EM consultant, not a part of mining
be clearly provided in the EIA	plan.
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	the second distance of the
road, amount proposed for	
maintenance of the road,	
compensation to the land owners	
effected by transportation of	
mineral etc.	and the second states
I) Detailed occupational plan needs	Part of EM consultant, not a part of mining
to be submitted with budger	plan.
allocation. The Computtee was of	(all all all all all all all all all al
the view that being handling the	1=1
large number of mines the GALYN	
should set up a dedicated cell for	ent *
the occupational health	
surveillance.	
m) The budget of EMP needs to be	Part of EM consultant, not a part of mining
revised as the Environmental	plan. Bhuwan Joshi
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Monitoring cost is not included in the EMP Budget.	
 n) 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.
 Details of the instruction of Hon'bel High Court if any for the mining close to the bridge. 	-Distance from nearest Upstream Bridge is- about 6 km (Rajbala Road Bridge), location point coordinate is- 30°31'24.81"N, 77°54'52.48"E. -Distance from nearest Downstream Bridge is- about 710 m (Vikashnagar-Barkot Road Bridge, NH-123), location point coordinate is- 30°30'34.86"N, 77°40'49 17"E

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On the basis of above MoEF recommendations for this project <u>(Letter no. J-11015/125/2013-IA-II (M)</u>, Dated 6 July 2018); mining plan is being revised here, as per Environment Clearance (EC) proposal already been submitted at MoEF level.



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)	Tchsil	Vikashnagar
(d)	Village	Dumate
(c)	Khasra No./ Plot No./ Block Range /	Khasara No. 649 ka.
(f)	Felling Series etc.	None
(g)	Area (hectares)	30.035 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 i.e. RBM
)	Geographical Pillar	Latitude- 30°30'44.99"N Longitude- 77° 50'23.60"E
	100 × 100 × 1	Latitude- 30°30'49.46'N Longitude- 77° 51'6.53"E
	* 3.	Latitude- 30°30'41.20"N Longitude- 77° 51'8.18"E
	4.	Latitude- 30 30 30 30 30 30 30 30 30 30 30 30 30
15 "	CREMINE CROCOCHIAL & GROTEL BRICAL MENVERS (PG20)	Govi ot in a ROPIDDN/180/2

4.2 GENERAL

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(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 fl.
(c)	Category of land use	Revenue land (Non forest land)
(d)	Elevation Range of River Bed	474.6 to 486.5 m

4.3 ABOUT THE DISTRICT- District Dehradun is situated in NW corner of Uttarakhand state and extends from N Latitude $29^{9}58^{\circ}$ to $31^{9}02^{\circ}30^{\circ}$ and E Longitude $77^{9}34^{\circ}45^{\circ}$ to $78^{9}18^{\circ}30^{\circ}$. It falls in Survey of India Toposheets 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 km² 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- Dumet, district- Dehradun, Uttarakhand. The village is approachable through via Vikashnagar-Barkot Route (NH-123). The proposed mine lease is connected to NH-123 through a *none-damar/none bitumen* road of about 200m. The nearest railway station is Dehradun Railway station and reapproachable at a distance of about 28 kms aerial distance.

NEAREST AVAILABLE FACILITIES

Nearest approachable NH/Sta	200m
Nearest Railway transportation facility	Dehradun, about 28 kms areal
Nearest Air facility/Helipad etc	Helipad at Dehradun & Airport at Br.uwan Joshi Jollygrant Dichradun, about \$8 kms ERDC Gov
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Nearest bank facility	Kalsi, about 500m
Nearest Public Health Centre (PHC)	Kalsi, about 500m
Nearest Community Health Centre (CHC)/Dist. Hospital	Vikashnagar, about 700 m
Nearest Primary School	Dumet, about 500 m
Nearest High School/Intermediate Collage	Vikashnagar, 700 m
Nearest Degree & Post Degree Collage	Dehradun, about 26 kms
Nearest Vocational Educational Center/ITI	Dehradun, about 26 kms
Nearest Small market	Kalsi, about 500m
Nearest Major market	Vikashnagar, about 700 m
COM SOUNDARY CONTRACTOR	

4.5 ABOUT THE PROPOSED LEASE AREA- Letter of Intent (LoI) for RBM mining was granted via letter No. 589/bhu.khani.ee./2012-13, Dated 23 January 2013, in the a part of village- Dumate, 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 about first half of the river bed 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 6 km (Rajbala Road Bridge), location point coordinate is- 30°31'24.81"N, 77°54'52.48"E.
- Distance from Downstream Bridge is- about 710 m (Vikashnagar-Barkot Road Bridge, NH-123), location point coordinate is- 30°30'34.86"N, 77°49'49.17"E.

4.6 ABOUT THE MINING PLAN

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- rence to technically & environmentally safe with reference 1. Quantity of minable mineral method of mining - Discussed at ohanter 6.
- 2. Description of DGRS coordinates of the proposed mining lease area must be given in the mining plan - survey plates 1 to 4.
- 3. DGPS Coordinates must be superintesed in Georeferenced Khasara map (Cadastral) (Annex, survey plates 1 to 4). Bhuwan Jo
- etc within the 4. Description about the government land, private lande for logist ment and copy proposed lease area shall be given & verified by theorem

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of same shall be attached with the mining plan (described/classified on joint demarcation report), as below-

Sr. No.	Khasra No,	Status of Land	Total Area (Ha.)	Area Utilized for Mining (Ha.)
1	1 649 ka.	Revenue	30.035	30.035
			30.035	30.035

- 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).
- 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. Geo referenced map, Annex. 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 associatings a physical map or raster image of a map with spatial locations. Georeferencing may be applied to any tend of object or structure that can be related to a geographical location, such as points of interest, roads, places, bridges, or buildings.

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Georeferencing is crocial to making aerial and satellite imagery, usually raster images, useful for mapping as it explained for when data, such as the above GPS points, relate to the Bruwan Joshi Emparated Goologist ERDC Govt

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- 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 combine 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. They provide a method of determining the lawsh 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 adzetteers are often produced by census agencies, national mapping organizations or postal service providers. At their simplest, these may simply comprise a list of area codes or place names and mother list of corresponding codes, names or coordinate locations. The sume and guides of the codes available guide guide guides to condinate locations. The sume and guides of the codes available guide guides to condinate locations. The sume and guides of the codes available guide guides to collapse the uk's National Statistics Postcode Directory will be shows each postcode's RuP indic. Bureau

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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.

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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 incorporate details of the resources associated with them, including the physical structures on or beneath them, their geology, soils, and vegstation 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

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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.

pifferential 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 10 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.



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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 RESERVENT

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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 Branarde & RB00 shall be loaded ERDC Govt of Uttarakhand

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into upper with help of labors and manual excavator & transport to open market & erosher as per requirement. On the feasibility study, economics viability of deposit has been 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 mincable 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 mincable 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.

Sr. No.	Mineral	Size	Percentage
1. 1	Sand Jular An	0.06-2 mm	60%
2. /13/	Bajpt	8-64 mm	15%
3. [E]	Voulder & Gravels	256 mm<	20%
4. 18	Sheelay	1-62.5 µm	5%

Table No. 1. Classification of Mineral Constituents available

Bulk density is taken its 22 for calculation (as per Go UK, Industrial Development Section Notification 1033/VH 14 2015/ 146- Kha/ 2010, dated 31st July 2015). Calculation of reserve has been done as following:

- 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).
- 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] a 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.

Cross- Section Line	Sectional Area (m²)	Strike influence (m)	Volume (m ³)	Quantity (MT)
1-1*	915	150	137250	271755
2-2'	906	200	181200	358776
3-3'	906	200	181200	358776
4-4*	900	200	180000	356400
5-5'	894	200	178800	354024
6-6'	900	हार्मी उद्योग ह	135000	267300
TOTAL	31000	Con Contraction	9,93,450	1,96,7031

able No. 2. Reserve	Estimation (Proved	Reserve)
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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)	
1-12	610	150 48212	91500	181170	
2-2*	604	200	1380Wan Joshi Empanelled Goot	239184 ogist	1
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TOTAL			6,62,300	13,11,354
-6'	600	150	.90000	178200
.5'	596	200	119200	236016
1.4'	600	200	120000	237600
3.37	604	200	120800	239184

Table No. 4. Reserve Estimation (Possible Reserve)

Cross-Section Line	Sectional Area (m²)	Strike influence (m)	Volume (m ³)	Quantity (MT)	
1-1'	305	150	45750	90585	
2-2*	302	200	60400	119592	
3-3'	302	200	60400	119592	
4-4'	300	200	60000	118800	
5-5'	298	200	59600	118008	
6-6'	300	150	45000	89100	
TOTAL	-		3,31,150	6,55,677	

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	9,93,450	1,96,7031
Probable Reserve	122	6,62,300	13,11,354
Possible Reserve	33 133	321150	6,55,677

5.3.2 Mineable Reserve: The mineable reserve is calculated as referred in Part-1, Point No. 02 of Uttarakhand Mining Paties 2011.

- Total Area= 30.035= 3.00.350 M2 TOTA
- Proposed mine working shall be coplined up to 1.5m bgl (as per IITR survey report).

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Detail about the minable reserve discussed in Mining Chapter Stat the report.

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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 the land 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 Shaira 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. 23/1 of Yamuna river section at Dumet has been given in figure 3. For better interpretability the satellite image of the concerned river section has been shown in the backgroundy land

State of the art survey equipments e.g. Exectronic Total Station and Geodetic GPS have been used for carrying our the survey Before starting the survey work, a number of ground control points have been established or 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 been connected with the Survey of India reference BM, which is available at PWD FRDC. Governmanakhand

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Since the Survey of India reference BM is at more than 1 km distance from the riversections 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 entire width of the river from left bank to right bank, since the location of mining lot can be more efficiently demarcated if the ground elevation values of entire width-points are available. In this mining lot, the reference pillar (used as survey control point) is situated on the left bank of the river on the upstream side near the spur adjoining the meeting point of Yamuna river with a small drainage coming from Katapatthar area. This reference pillar as well as few TBMs have been used as reference for this mining lot.

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 electromagnetic 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 Prismanode, 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.

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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. 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 0.048 m to 0.92 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 Dumat and Dhakrani is approx. 15 km. For Dumat portion of the Yamuna river (lot no. 23/1), the survey work has been carried out from the upstream side of the river, i.e. from the eastern edge of khasra no. 649. Near to this side a small river coming from Katapatthar area meets the Yamuna river and a large spur exists. The survey work has been carried out towards downstream direction. The reference control pillar has been constructed on this end of the mining-lot. The entire mining lot has been covered in a single khasra no. 649. A road bridge connecting the states of Uttarakhand and Himachal Pradesh exists in the downstream side of the lot no. 23/1.

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. The longitudinal and cross-sections corresponding to the pre and post monsoon period have been given in the subsequent figures:

(Ref. IITR Report Anne

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CHAPTER-6

6.1 MINING

METHOD OF WORKING- Taking into consideration the matrix of deposit in 6.1.1 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-30.035 Hectare) at a part of village- Dumate, Tehsil- Vikashnagar, 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) or above ground water level whichever is less. 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-

Proposed Area Survey- Survey work & replenishment study for the project carried by Indian Institute of Technology Roorkee (IITR) as per recommendations of MoEF (Letter No. J-11015/88/2013-JA-Harra Paured 86 July 2018). (Survey Drawing Plate. 1 to 5)

Following guidelings 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
- Bruwander Govt. of India. 3. Sustainable Sand Mining Management Guideline d Geologist FRDC, Gov देहराष

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4. Other guidelines & Circulars, related to RBM mining/ Gazettes of the Ministry of Environment & Forests.

6.2.1 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. 589/bhu.khani.ee./2012-13, Dated 23 January 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 River Yamuna-Lot No. 23/1, Village- Dumate, Khasara No. 649 ka, Area- 30.035 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 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.)
s) Sand and gravel may be extracted across	Mining is proposed wariulies Demarcated area
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the entire active channel during the dry	only
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 within 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 ensure, as per 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
i) Flood discharge capacity of the river could be maintained in areas where there are	Mining is proposed within the Demarcated area Bhuwan Joshi only Empanelled Geologist FRDG.Govt of Amarkhand
31 PROCREMENTE CEOLOGICAL & CEOTECHNICAL SERVICES (PG28)	ROP India Bureau Renistration ivo ROP/DDN/180/2009/A Govt of Inc.a BHUWAN JOSHI

significant flood hazard to existing structures 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.)
1) The Piedmont Zone (Bhabhar area)	Mining is proposed within Demarcated 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.	only, 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 8 meter or 10 percent of the river width which are 1	Mining is proposed within Demarcated area only find maximum 1.5 m depth
whichever less.	× ×
located on the river side of the proposed embankment, because they get silted up in course of time. For low embankment less than	only up to maximum 1.5 m depth
6 m in height, borrow area should not be selected within 25 m from the toe/heel of the	Bhuwan Joshi Empanulled Geologist FRDC.Govi
32 PROCRESSIVE CROLOGICAL & GROTECHNICAL SERVICES (PG35)	Govt of Inc. 2 BHUWARDOGE

embankment. In case of higher embankment 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 60 meters centre-to-centre should be left in the borrow pits.	
 o) Demarcation of mining area with pillars and geo-referencing should be done prior to start of 	Georeferencing of the proposed demarcated lease area done. Georeference Maps are attached as survey plate 1 to 4
Mining.	

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 barries felt som the river bank has been proposed to stop the toe erosion phenomena.
- . The approach read will repaired fromshine to time.

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 The proposed infinor mineral extraction area is jointly visited by various district level department officers and boundary pillars been demarcated and informed to the applicant.

6.5 ABOUT THE RESERVE

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The proved ultimate mineable reserve from the demarcated area, as per Uttarakhand Minor Mineral Policy 2015, is 9, 91,155 tonnes/year (categorized as zone C). Other aspects of the proposed lease area are as discussed below-

- Total demarcated Area= 30.035 Ha = 3,00,350 M²
- Non-Mineable Area (area restricted for mining due to hazard safety) 6.353 ha.
- Mineable Area after proposing safety zone 23.682 ha.
- Deposit/material (in cum) at maximum allowable depth (as per IITR survey report) i.e. 1.5 m Depth= 4,50,525 M^a
- Total material (tonnes) available up to the maximum allowable (as per IITR survey report) depth i.e. 1.5 m from minable area= 9, 91,155 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. 7,37,740 tones/year, however considering the 10% of total minable reserve as residuals/mining waste/none economic, so net saleable mineral reserve would be 6,63,961 (~) 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-

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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)
484.5-483.5	15426	0.75	11607	25535	22981
483.5-482.5	24062	0.75	1218046	39701	35730
482.5-481.5	18925	-0.15	14193	31224	28101
Total	100 m	Turan .	1 43,846	96,460	86,812
Post- Monsooi	n Period Reser	e (Ictobe	r - March) Ta	Btuwan Jo Empanglied (blefNDC:Govt RUP, India Recistration (Scologist Geologist Bureau N. ROBIDON

Bench level (mRL)	Bench Area (m2)	Depth	Volume (cum)	Total Reserve (tonnes)	Recoverable Reserve/Saleable Production (tonnes)
484-482.5	31200	0.75	23400	51480	46332
482.5-481	28671	0.75	21503	47306	42575
481-479.5	29746	1.50	44619	98161	88344
479.5-478	58325	1.50	87487	192471	173223
478-476.5	50720	1.50	76080	167376	150638
476.5-475	25602	1.50	38403	84486	76037
Total			2,91,492	6,41,280	5,77,149

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)
484.5-483.5	15476	0.75	11607	25535	22981
483.5-482.5	24062	0.75	18046	39701	35730
482.5-481.5	18925	0.75	14193	31224	28101
Total			43,846	96,460	86,812

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)
484-482.5	31200	0.75	23400	51480	46332
482.5-481	28671	हकाई 75 होनेन	21503	47306	42575
481-479.5	29746	1.50	C- 4619	98161	88344
479.5-478	58725	1 1.50 ;	87487	192471	173223
478-476.5	50720	-150	76080	167376	150638
476.5-475	25002	1.50	TR 38403	84486	76037
Total	1	JACONOS C.	2,91,492	Brewbastosh	5,77,149
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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)
484.5-483.5	15476	0.75	11607	25535	22981
483.5-482.5	24062	0.75	18046	39701	35730
482.5-481.5	18925	0.75	14193	31224	28101
Total			43,846	96,460	86,812

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

Bench level (mRL)	Bench Area (m2)	Depth	Volume (cum)	Total Reserve (tonnes)	Recoverable Reserve/Saleable Production (tonnes)
484-482.5	31200	0.75	23400	51480	46332
482.5-481	28671	0.75	21503	47306	42575
481-479.5	29746	1.50	44619	98161	88344
479.5-478	58325	1.50	87487	192471	173223
478-476.5	50720	1.50	76080	167376	150638
476.5-475 25602	1.50	38403	84486	76037	
		Chara dens	2.98,992	6,41,280	5,77,149

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

(m2)	-	team	Reserve (tonnes)	Reserve/Saleable Production (tonnes)
15476	0.75	11607	25535 Btuwan k	22981
24062	0.75	18046	ERDC Govt	Geologist35730
and the second s	15476 24062	15476 0.75 24062 0.75	15476 0.75 11607 24062 0.75 18046	Image: Constraint of the second sec

482.5-481.5	18925	0.75	14193	31224	28101
Total			43,846	96,460	86,812

Post- Monsoon Period	Reserve (October -	March)	Table	No	13.
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Bench level (mRL)	Bench Area (m2)	Depth	Volume (cum)	Total Reserve (tonnes)	Recoverable Reserve/Saleable Production (tonnes)
484-482.5	31200	0.75	23400	51480	46332
482.5-481	28671	0.75	21503	47306	42575
481-479.5	29746	1.50	44619	98161	88344
479.5-478	58325	1.50	87487	192471	173223
478-476.5	50720	1.50	76080	167376	150638
476.5-475	25602	1.50	38403	84486	76037
Total			2,91,492	6,41,280	5,77,149

6.6.5 FIFTH YEAR

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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)
484.5-483.5	15476	0.75	11607	25535	22981
483.5-482.5	24062	0.75	18046	39701	35730
482.5-481.5	18925	0.75	14193	31224	28101
Total			43,846	96,460	86,812

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

Bench level (mRL)	Bench Ares (m2) &	Depth	Cuime	Total Reserve (tonnes)	Recoverable Reserve/Saleable Production (tonnes)
484-482.5	31200	0.75	an 23490	51480	46332
482.5-481	28671	0.75	21503	47306	42575
481-479.5	29746	1.50 500	44619	Bt.uwan Josh	88344
479.5-478	58325	1.50	87487	Empara 474 Geo	logist 173223
- Maria	and Barris	1 cont		RUP India Bu	'eau
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Total			2,91,492	6,41,280	5,77,149
476.5-475	25602	1.50	38403	84486	76037
478-476.5	50720	1.50	76080	167376	150638

6.6.6 TOTAL PRODUCTION PROPOSED (PRE & POST MONSOON) Table No. - 16

YEAR	PRE-MONSOON (TONNES)	POST-MONSOON (TONNES)	RECOVERABLE RESERVE (TONNES)
FIRST YEAR	86,812	5,77,149	6,63,961
SECOND YEAR	86,812	5,77,149	6,63,961
THIRD YEAR	86,812	5,77,149	6,63,961
FOURTH YEAR	86,812	5,77,149	6,63,961
FIFTH YEAR	86,812	5,77,149	6,63,961
TOTAL	4,34,060	28,85,745	33,19,805

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 preparationants July A
- > Erection of a temporary site office and two rest shelter.

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- Barbed wire feating 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.

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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 1.5m bgl or 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.

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 twaste material, it includes wastage during transportation and unused/ low value material like silt/clay etc which gets deposited as crust Bhuwan Joshi material on the bed profile, shall be scrapped and careful Emptoned doc drogsiting into the FRDC.Govt of the rankhand

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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).

CHAPTER-10

10.1 USE OF MINERALS-

A LEW COLOR OF THE ADDRESS OF THE AD

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 cities and towns.

CHAPTER-11

11.1 OTHERS HAULAGE AND SURFACE TRANSPORT- Mode of transportation of material 11.1 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 nick-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 5.4 KLD, it breaks up as under:-

5. NO.	EPURPOSE	WATER REQUIREMENT (KLD)
	Dust Suppression	30
	Drinking	/* 1.6
	Miscellaneous (Plantation etc)	0.8 Empanetied o

Fotal	5.4 KLD
-------	---------

11.5 EMPLOYMENT

The manpower requirement for the proposed project is given below -

NO.	CATEGORY	NUMBERS
1.	MINING COMPETENT PERSON	1
2.	ADMINISTRATIVE	.1
3,	SUPERVISOR	3
4.	UNSKILLED WORKERS	45
-	TOTAL	50

The part time services of following experts/ expert agencies optionally proposed 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 provision.

CHAPTER-12

12.0 MINERAL BENEFICIATION

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

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Bhuwan Joshi Empanetled Geologist FRDC.Govt of Untarakhand RUP Indian Bureau Recistration No. ROP/DDN/180/2009/

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 taken 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.

SOLID WASTE MANAGEMENT- As per the logical assessment of the production 13.2 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 giver bed area/lease area the plantation is not possible however in the outer bank afea & 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 wasteland & barren, scattered seasonal bushes & shrubs cover this area. There are no agricultural land most and is barren. There is no existing infrastructure, hewever during minifig Qeoporary resslighters for RUP Indian Bureau workers will be provided. Recistration No GP/DDN/180/2009/A

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RQP, Registration No.RQP/DDN/180/2009.

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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 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,

Fautal 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 (Psittaeola kranco, baya (Ploceus philippinus), peafowl (Pavo cristatus), pigeon (columba fiyia), Egretta si

13.3.2 Climatic Condition

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The study area is in Shiralik zone and is subjected to vagaries of weather. The climate of the project area is characterized by coel and dry climate. It varies according to the altitude of the place. The entire district exhibits lear broad seasobt in the yesh(1) Winter or Cold weather (mid Dec. - mid March) (2). Summer or hot weather (3) Martigistmid June); (3) OP/DDN/180/2009

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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 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 easierly Secureasterly.

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 regioBhuwan Joshi 20212020

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RAINFALL

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Empanelled Geologist FRDC.Go The annual average rainfall of Dehreuin rakhand district is 36.7 contine Bureau OP/DDN/180/2009/A

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13.3.4 Social Infrastructure-

The nearest health & education facilities are available in all nearby villages of the proposed

mining area.

13.4 EFFECT OF MINING ON ENVIRONMENT

Due to the mining activity following things are going to affected

- > Degradation of land
- > 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 effect 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.



CHAPTER-14

14.0MINE CLOSURE PLAN

14.1 INTRODUCTORY NOTE-

The Letter of Intent (LoI) was granted/released vide letter No. 589/bhu.khani.ee./2012-13, Dated 23 January 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 River Yamuna-Lot No. 23/1, Village- Dumate, Khasara No. 649 ka, Area- 30.035 Hectare.

Proposed SAND, BAJRI AND BOULDERS MINE/Mining, in a part of Village- Dumate, Tehsil- Vikashnagar, District- Dehradun, Uttarakhand, Applicant- Garhwal Mandal Vikash Nigam Ltd, 74/1-Rajpur Road, Dehradun, District- Dehradun, Uttarakhand is a small 'B1/B2' category mine as per explanation furnished in MCDR, i.e. manual opencast mine, not using explosives.

14.2	GENERAL
	and the second se

1.1	Name of the applicant	Garhwal Mandal Vikash Nigam Ltd
	1	र इक्कीई उद्योग हि
	Address 5	Rajpur Read Dehradun
	District (E	Dehradun
	State	Ortarakining *
	Pin Code	248001
	Phone	0135-2740896, 2746817, 2749308 Bt.uwan Jose
1.2	Status of the applicant	Garhwal FADC.Gov Rup Ind Rup Ind Rup Rup Ind Rup Stand
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F		(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. 589/bhu.khani.ee./2012-13, Dated 23 January 2013, Demarcated Area for Mining- 30.035 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
.6	Name of the prospecting and	The baseline data is collected from various reports, proponent, as well as detailed prospecting of the area is carried out by the ROP BLuwan Joshi
3 L.	AND USE PATTER OF THE AND	Ex:- Empandier ofogist FRDC.Gov khand RUP Indis Bureau

Sr. No.	Land Use (Ha.)	Agriculture Land (Ha.)	Forest Land (Ha.)	Waste Land (Ha.)	Grazing Land (Ha.)
1	Mining pits quarry			*	-
2	Approach Road		-		-
1	Dumps	-	-	•	-
1	Office, rest shelter etc	•	-		-
1	Balance undistributed land	•	-	30.035 Ha.	
_	Total			30.035 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 (ROP & Geological Consultant) C/o B.S. Rawat, Kanal Bhawan, House No. 6, Vijay Colony, Lane No. 1 New Cantt Road, Dehradun (Uttarakhand) 148001

14.6 MINE DESCRIPTION: - Picking /extractions of minor minerals (sand, bajari & boulders), from a part Village- Dumate, deposited by the River- Yamuna. 392159

14.7 GEOLOGY: Geologically the area falls in the Ingranuptajn Doon Valley and is underlain by recent to sub recent Doon Gravels, which the over the beper Siwalik

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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.

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 help of labors and manual excavator & transport to open market & crusher as requirement. On the feasibility study, economics viability of deposit has been 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 of feasibility study provides a preliminary assessment with a level of confidence as compared to that officusibility 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 RDM is seen in the entire stretch & thickness of RBM varies 2.5m to 3.0m. Therefore prological ax Brids Beel Considered as G-1.

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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 22.

Sr. No.	Mineral	Size	Percentage (≈±)
1.	Sand	0.06-2 mm	60%
2.	Bajri	8-64 mm	15%
3.	Boulder & Gravels	256 mm<	20%
4.	Silt/Clay	1-62.5 µm	5%

Table No. 22. Classification of Mineral Constituents available

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:

- 4. Cross sections have been prepared at intervals. Refer Plate No.4
- 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).

 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 Bit probables beserve whereas 1m

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considered as possible reserve. Out of total volume, 90% considered/assessed as the recoverable/economic RBM reserve & 2.2 bulk density.

14.8.1 G	cological	Reserves:	The summarized	category-wise	geological	reserve estimated
by is:-	10125-1					

Mineral Reserve	Code	Quantity of RBM in (m ³)	Quantity of RBM in Tons
Proved Reserve	111	9,93,450	1,96,7031
Probable Reserve	122	6,62,300	13,11,354
Possible Reserve	133	3,31,150	6,55,677

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 2 to 3 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 rides of the river/channel within nearby civil land, so proper channelization is essentially required for bazard 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 deposite would be annually replenishing as such no need to develop or plan for closure scheme but towards valley side temporarily Bruwan lost.

c) Mining:	RUP Jobe Bureau
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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	23.682 Ha.
2.	Additional Area proposed to be replenished with flood water	23.682 Ha.

d) Dump;

SL No.	Activities	Area (Ha.)
1-	Area already covered by dump	Nil
2-	Additional Area to be covered by soil stack	
3-	Additional area to be covered by interburden dump	Nil
4-	Dump area to be covered by protective measures	-

c) Plantation:

SI. No.	Activities	Area
1-	Area already covered under plantation	
2.	Area proposed to be cover under plantation & protection work	23,682 m ²
	Total	23,682 m ²

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

ill be carried out to monitor the quality and for timely Periodic air quality monitoring will be carried 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 prining lease, and about 10% of total material has been considered as waste material includes wastage during SCHARTSTER CONCOURSE & CONTRACTOR AL MERINES IN

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transportation and unused/ low value material like silt/clay etc which gets deposited as crust material on the hed 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 on only up 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, picking and 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.



ANNEXURE & PLATES



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Ministry of Environment, Forest and Climate Change IA Division

1/c mining

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

Dated 06.07.2018



M/s. Gharhwal Mandal Vikas Nigam Ltd 74/1, Rajpur Road Dehradun, Uttarakhand-248001

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Sub: Mining of 2.8 LTPA of Sand, Bajri and Boulders in River Yamuna Lot No. 23/1 by M/s Garhwal Mandal Vikas Nigam Ltd. from mining lease area 30.035 Ha located at Village-Dumet, Tehsil- Vikashnagar, Distt-Dehradun, Uttarakhand.; File No. J-11015/125/2013-IA-II IA/UK/MIN/18535/2013; (M); Proposal No: Grass Root Research 8 Creation India (P) Ltd.]-Consultant: Information/Clarification Regarding.

This has reference to the EC proposal of M/s Garhwal Mandal Vikas Nigam Ltd for mining of 2.8 LTPA of Sand, Bajri and Boulders from River Yamuna Lot No. 23/1 having mining lease area 30.035 Ha located at Village-Dumet, Tehsil- Vikashnagar, Distt-Dehradum Uttarakhand

Z The proposal was considered by the Expert Appraisal Committee, in its 33rd meeting held during June 21-22, 2018 wherein the Committee deferred the proposal and sought following requisite information:

उकाइ उद्योक a) The Proponent should collect the baseline data in respect of initial level of the mining lease. For this permanent bench mark (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 suitBhlywiantUestuids of 25 Meter * 25 Meters with the help of sections across the PRE Striver alikhanding the

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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 etc. The PP should scentarn the level of the river bed with the help of sections drawn across the with 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 PL pepth of mining in each grid, grids left under no mining zone etc.

b) 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 horzonta 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 horzontal axis.

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 that was also 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 which the should be proposed in this period (1sthJune-1st Oct) as the mining lease area needs to be left for the replenishment of the river bed mineral and plat-3 ahow the mine working after replenishment of the river bed i.e. post monsoon Period and Oct-31st March.

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s even die hing plan the mining plan that in the subsequent scheme s even die hing plan the year wise data pertaining to replenishment sie state hal be produced which include the level (AMSL & RL) of the state has been been under the monsoon, year wise replenishment a ban & cours of the replenishment study for the past five years.

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

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

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- 0 PP is having number of mining leases and Environmental Policy needs to be revised to address various Environmental Issues. The number of manpower to be engaged for Environmental Management Cell is not clear. 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.
- It The PP should clearly bring out the impact on environment due to cluster situation. Air Quality modeling needs to be done in Aermode software both for area and line source.

If 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.

Detailed occupational plan needs to be submitted with budget allocation. The Committee was of the view that being thendling the large number of mines the EMVIN should set up adedicated cell for the accupational health surveillance.

The budget of EMP Beeds to be revised as the Environmental Monitoring cost is hot included in the AMP Budget

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

 Details of the instruction of Hon'ble High Court if any for the mining close to the bridge.

3. The matter was examined in the Ministry and accordingly, the undersigned is hereby directed to request to submit the above mentioned information online to the hereby of Environment, Forest and Climate Change, Indira Paryavaran Bhawan, Vayu Ministry of Environment, Forest for further necessary action on the proposal. Wing, Jor Bagh New Delhi-110003 for further necessary action on the proposal.

Yours faithfully,

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

Copy to:-

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



भूतत्व एवं खनिकनं इकाई, चर्चाम निर्वेशालय चत्वत्तत्वाश्व भोषालयानी, देहरादूत संख्या 514 भूष्यनिवई० / 2012–13, दिनकि 23 जनवरी, 2013

कार्यालय आग

तातासभ्य श्वभिज मौति का। ते बिन्तू-2 के प्रसार-1 के बनुसार सज्य के सजस्य नदी जयवनिज क्षेत्रों में तमस्यनिव के पुनान के व्यनन पहुंदे महताल मण्डल क्षेत्र में पढ़मत मनवल विकास निगम को उत्तराखण्ड उपखणिक अरिवर किम्मलती 2001 के नियमानुसार निर्धारित प्रमंत्र एमक्स्म-1 में आवेदन करने के उग्रवन 66 वर्ष हेतु स्वीक्ष्म अरिवर किम्मलती 2001 के नियमानुसार निर्धारित प्रमंत्र एमक्स्म-1 में आवेदन करने के उग्रवन 66 वर्ष हेतु स्वीक्ष्म किंक बने क व्यक्तिन के पुलिया पढ़साल मण्डल क्षेत्र के कवल नदी उपखणिज क्षेत्रों में उपखनिज के पुन्दान का किंक बने क विकास के पुलिया पढ़साल मण्डल क्षेत्र के कवल नदी उपखनिज क्षेत्रों में उपखनिज के पुन्दान का किंक बने क विकास के पुलियान पढ़साल मण्डल क्षेत्र के कवल नदी उपखनिज क्षेत्रों में उपखनिज के पुन्दान का किंक बने के वाये के पुजाने पत्र प्रान्त निर्वेशक, गढ़साल मण्डल किंकस नियम, देहसदूत द्वारा प्रस्तुत आवेदन पत्रों के सन्वन्ध में हब आधान पत्र (Letter of Internt) के माक्सम से राज्य तरकाल जानेदक प्रस्थ निदेशक, गढ़साल बन्दन किंका नियम तिथ के पत्र में जनके द्वारा आवेदित क्षेत्रों क्या जनपदार जेनेदक क्षेत्र के क्षात्र नहराह बनवन किंका नियम तिथ के पत्र में उनके द्वारा आवेदित क्षेत्रों क्या जनपदार देहसादूत के 86 उपखनिज लॉटो त्या वनवन किंका नियम कि के पत्र में उनके द्वारा आवेदित क्षेत्रों क्या जनपदार देहसादूत के 80 उपखनिज लॉटो त्या वनवन किंका नियम कि 20 उपखनिज लॉटों में पीठी के 8 एव जनपद दिहरी पढ़वाल के 29 उपखनिज लॉटो किंका किंकम वालिक 1.2.3, च 4 में निम्वव चरिलसिय है, को में 65 (पाय) वर्ष की अर्वाध देनु उपखनिज नुवान का स्थल पहिल कीक्षा नहन वी मेगा रखती है--

जनमद देहशदून के खनन होन्न-

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22 23 24 25		4/8	17.460.
23 24 25		4/2	0.500
24. 25		4/11	5 810
25	बादल नदी	6/1	7.848
	11.51	7/1	3.123
26	सौंग नदी	7/2	156.700
27.		त्तीः देख	56.576
28		112	
29		0/1	23,030
30	नन नदी	872	16,790
31.	A	R\3	50,669 .
32		8/4	19,668
33	-	9/1	6.660
34	बिन्दाल नही	9/2	40.480
35		ii/3	5.796 ,
36		6/4	20.631
17.	बिन्दाल केन्ट		4.000
8	नागलराव नदी	10/1	27.770
<u>s</u>		10/2	3.983
0.	कालीगाढ़ नदी	11/1	3.437 .
1.	नलोटा नदी	1 1/2	6.269
2.		12/1	8.316 .
1	सुसवा नदी	12/2	262.114 .
	-	12/3	42.435
त्ययन ज	ी (रानीपोखरी क्रन्ट)	13/1	36.691
जाखन	नदी(माजरी संगट)	13/2	82 340
and a second		14/1	19 000
	-	1.4/2	21.094
	5	14/3	82 610
		14/4	35.405
		14/5	92.540
3	शसन नदी	CALS	52.210
	-	.4/0	32.709
	1 STATE	JEIDE	4 000
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1	18/ +	14/10	62 000 -
Propriet	E E	14/11	51,000

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		14/12	35.000 -
C M	T	14/13	20.667 ,
- 24		14/14	15.622
- 11		14/15	11.040
81	शीतला नदी	16/1	60.983
e	सारना नदी	17/1	51,463
61	नीम्मी नदी	18/1	8,400
2H		21/1	123.190
-		21/2	27.551
54	A more than	21/3	10,350
8.	यगुना नया	23/1	30.035
18		23/2	31.203
ŧt.		2373	14.970
78	कालीराव नदी	5/1	1 8.903
n	रात्टी नदी	15/3, 15/4	31.129
12	चन्द्रभागा तदी	ऋषिकेश	4.974
Th.	गंगा नदी	<u>ऋ</u> षिकेश	1.615
N.	अध्वाद्यी खाला	25/11	1 1.453
12	प्रान्त्रयीगांव स्वाला	2156	5.800
A	अध्याला नही	25/12	0.450
n	गणवारम् गग	20/13	2,500
		20/46	20.000
3	चारखाला	26/17	2,231
	कालागादखाला	6.2.+1	45.100
#1	दरेड नदी		10.120
-6	रागटसाला ।	24/3	1.039 .
#1	1.2.2.2.2.2.2.2.2.2.2.2.2.2.2.2.2.2.2.2	2:42	2.051
	रोग		2110.257

। <u>सनम्द हरिदात के खनन क्षेत्र-</u>

7/7/7

20H0	नदी का नाम	लॉट न0	होत्रफल (हैं0)	
11.1	गंगा नदी .	भौगपुर-6	63.140	
2	गंगा नदी	विशनपुर कुण्डी-8	137.450	
Con Land	बुचवा शहीद (विहारीगढ)	बुधवा सहीद-10	104.504	
4	बेजारावाला (विहारीगढ)	वंजारावाला-11	72.329	
1.5	गंगनहर (कडकी)	गोहम्मदण्ट बाई पास	5,776 •	
61	रगंनाली नदी (फडकी)	खारिराखोपुर	9 160 -	
1	सोगाली नदी (रुहकी)	तर्द रत्यवभास् / सोनाली	16,290	
a Li	रवगाऊ नही	काटीअरेद्रनगर	42.000	
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1 01465	नदी का नाम	सॉट न0	क्षेत्रफल (हैं0)	
1	खो नदी -	गट स्थान भुंज गडीघाट स्तनापुर, काशीरामपुर, कोटद्वार गांव	66.255 .	
7	રાસલે નની	बालभद्रपुर खुनीबर्द, सिम्बल खेरा	27.853 .	
2	नयार नदी	हुन्दुल ज्ल्खेत	19 694	
4	दयार नदी	बरखालू	5.004	
5	न्यार नदी	चमेलीसँण	5.741	
a	नयार नदी	न्युगांव	10.157.	
-	नयार मदी	कार्य प्रमो गरीख	7.028	
	हंबल नदी	Ang Julian Angeliki	20.00	
the second	कुल योग / के	12 131	125.732	
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		der.	Emple 30 Scologist FRDC.Govi Schand RuP.India, Bureau Rec.stration No KOP/DDN/	

जनार बौडी गढवाल के खनन होन्न-

1	सोनाली नदी (रूडकी)	सीसौना फ्रोम लोबा लिट	8.662 .
1	रतगाऊ नदी (रूडकी)	दाल्वाला मजमात	3.448 -
30	गंग नरी	रामपुर रायधाटी (अहतमल)	61.232
11.	गंगा नदी	जरापुर रनजीतपुर(लक्सर)	3.398
12	गंगा नदी	शयधारी मुस्तहकम	4.000
13	गंगा नदी	रायधारी मुस्तहकम	10,000
14	दाण गाँगा	निहन्दीपुर	3.410
15	ताण मंगा	रायसी (लक्सर)	21.067
15	तरण भेगः	बालवाली	31.570
17.	धीली नदी	सञ्जनपुर ,	19.000
18	रुक नदी	दादवास	13.905
79	रऊ नदी	रामः नगर	10 350 .
201	रुऊ नदी	आनकी हेतमपुर	64.892
23	रक नदी	ज्यालापुर अगवानपुर	10.892
23	ক্তে কৰী	सलीग महतुद	7.702
24	रक नदी	गढ रोजनाबाद ।	11.593 .
25	गगवानपुर शहीद वाला	भगवानपुर सिद्धवाला.	24.933 .
25	गगा नदी	ឌាំងាមខេ -	143 000 +
27	गंगा नदी	अजीलपुर i	32.208 .
28	गंगा नदी	निरुसरपुर	74 208
	कुल		1007 558 -

त्वद टिहरी घडवात के खनन क्षेत्र-

1080	रतकनन्दा नदी, देव प्रयाग	14100000	and the second se
+ 1		बगवान	5.256
12		भल्दीगांव	1.181
2		रानीहाट	10.539
3		चिल्डीयासमांव	9.281
1		- रादी	3.027
5		गियां में	9.712
6		जुमालगढ	2.213
-		1 97.45 I	10:79- 1.07
8.1	क्रोत्टी	ग्वालीझंडा	0.45*
8		किंग्रह्से ।	1.68*
8		• ग्वासीहांडा	1.442 .
11		रगेरी ।	1.550
14		दत्रही	9 105
12		तोलिय:काटल	5.239
14		भरगकाटल i	1.647
19 1 12 1		द्वत्र	0.853
17		महे-द्रपुर	2,400
18		efigt I	1.375 .
15		2214	0.723
20		मरोड .	7.773 ,
21	. 1	- नीमांव	1.800 .
12		भूटमांच आद्यात्व	51,430
3		खायसेत दवरस्यता	1,158
6			0.351
5	1	नाण्डीखण्नेताली	0.818
		भूमी झोली	0.266
1		सीनधाना	3634 .
8	रिहत्त ।	भट्टियारगांव	66.539
	धनसाली	अर्तना !	111 528
1	बूल योग		304 931

2 खोरह प्रत्य निरेष्ठङ, गढवाल मण्डून विप्रसाउतिगड़, दिए यदि उक्त तालिकांओं में उल्लेखित लांटो में अखीरह बुगान का सनन पहा लेने होती साहमत हो तो शास्त्रप्रदेश संख्या 922/VII-1/11-रिट/2012.




हतांग 26 जुलाई, 2012 में दिये भये निवैधानुसार E.I.A Notification, 2006 के अन्तर्गत प्रयोकल्पीय हे तोने 20 प्राप्त कर, पर्यावरणीय स्वीम्पृति की प्रति इस याग्यांतन को प्रस्तुत करना सुनक्षियत करें, ताकि भीकृति अन्य पहा स्वीकृति हेतु अप्रेतान कार्यवाही की जा सजे। भवदीय.

> (राजेश बगीली) 何之刘初。

कुछांकन संख्याः (१)/वद्ददिनांकितः।

पुर्धानगर इतिलिपि निग्नलिखित को सूचनार्थ एवं आवश्यक कार्यवाही छेतु देवित। 1 प्रमुख संधिव, औद्योगिक विकास विभाग, सत्तराखण्ड शासन्।

- 2 जिल्लाचिकारी, देहरादून / हरिद्वार / पैही / टिहरी गढवाल ।

व प्रत्य निरेशक, गढवाल मण्डल विकास नियम लिंग, देहराडून को इस आध्य से प्रेणिव कि E.I.A. अन्यां विरोधन 2006 के अन्यांत प्रयोधनीय प्रतिनिर्धन को इस आध्य से प्रेणिव कि E.I.A. Notification, 2006 के अन्तर्गत पर्यावरणीय स्वीय्हीं प्राप्त कर इस कार्यालय की उपलब कराना सुनिश्चित करें।

गाई फाईल।

(शलेश बगाली) निदेशक,

JEITON GERMANNA Bhuwan Joshi अतित्य एवं देवेव Empanded Contonist FRDC.Gov akhand RUP India Bureau Recistration No ROP/DDN/180/2009/A Govt of Inc.a 11357571 देहराद শৃতমতানতালতালত E.

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ation of and 1.10 ्याः (नमार²⁰¹) (राखण्ड दहराद्न)

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व्यक्त

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ाजियाः विवादम्।

> 3×M दिनांक फरवरी, 2015

हरूय 2214 / गणनम / सटसमि० / देहरादूम / 2013-14

ानन / वृति/ प्रत्मार्तिकया ज्यायेगा हे

क कि यन सार

वित्र्य - प्रदीवरणग्य अनुमति प्राप्ति हेतु प्रबन्ध निदेशक, गढवाल मण्डल विकास नियम लि० 74/1 राजपुर रोड, र्पतन वे महा में जनपद देहरादून के ग्राम डूमेट, तहसील विकासनगर जनपद देहरादून क्षेत्रान्तर्गत यमुना ती ने लोखा 23 / 1 खसरा नम्बर 649क मध्य कुल रकवा 30.035 है0 राजस्व भूमि में बालू, बजरी, बोल्डर े लगा के तह को की अवधि हेतु आशय पत्र पर स्वीकृत क्षेत्र से सम्बन्धित खनून योजना के अनुमोदन के おおも 引)

ार्थ रेज्य रेज्य रेजन रेजिना दिनाक 25 नवम्बर, 2014 के द्वारा जनपद देहरादून के ग्राम इमेट. मही राज्य राज्य संग्रे के राज्य के राज कि भूतान एव खनिवन विभाग के कार्यालय झांप संख्या 589/भूठखनिवई0/2012-13 हिनाव हा न ा उस्त मंग आपके पक्ष में पर्यावरणीय अनुमति प्राप्त किये जाने हेतु अशय पर स्वीकृत किया गया का वोजना ज गरतीय खान व्यूरों द्वारा तदर्ध मान्यता प्राप्त आरठक्यू०पी० श्री हरीश कैयौला 〒 E ポレート इन्द्रवय र 1996 - 2002-A न हारा तथार की गयी है को वैज्ञानिक, तकनीकी एवं पर्यावरण सुरक्षा के राध्यां के समियालित लवालन हेतु उपयुक्त पाये जाने के दुष्टिंगत उत्तराखण्ड उपखनिज की जिल्ला का प्रयोग करते हुए प्रस्तुत खनन योजना का - अधी- किया जाता ह

्यूगेदन गणग गण दिराख के निष्यादन की तिथि से आगामी पांच वर्षों की अवधि के लिए

ानागत क्षेत्र क संग्रिका में पर्यावरण एवं वन मंत्रालय भारत सरकार से पर्यावरणीय अनुमति पर्यावरणीव अनुमति की समस्त शर्तों का अनुपालन किया जायेगा।

गाबन्धन, पिलस्<u>यन्दी अप</u>खनिज परिहार नियामवली-2001 के नियम-17 के अनुसार भृतत्व के द्वारा काइक्राई। मयोक क्रम संयुक्त रूप से किया जायेगा तथा नियम-14 के अनुसार 1 किया ना प्रमान के उपरान्त खनन क्षेत्र से A SEL

Phuwan Joshi

मगतत सहनियों से जिना बनाहित्य के प्रथम येथे दे साम्राज्य एल० 473.0 मीठ 1 Rendered 1775 Ho 180/2009/A Govi of Inc.a

मा भारती 473.0 मी० से आत्रापल0 477.5 मी० तक 280,000.00 टन एवं पंचम वर्ष में आर्यप्ल0 का खन्न किया जायेगा।

ाजन अन्य किसी अधिनियम जो कि इस खान या क्षेत्र पर लागू होते हैं या समय-समय पर जन्म नद सरकार या अन्य किसी सक्षम द्वारा प्रख्यापित किये जाते हैं, को छोड़ कर अनुमोदित

- ा योजना वन (सरक्षण) अधिनियम-1980 वन संरक्षण नियमावली 1981 और अन्य सम्बन्धित स्वाय के जीव नियमावली आदेश और दिशा निर्देश जो कि इस खनन पट्टे पर समय-समय पर दिये जाये
- र स्वर्गन केलना किसी में। प्रमावी क्षेत्रान्तर्गत माननीय न्यायालय के आदेश एवं दिशा निर्देश के लागू इस्तर नहीं करती है।
- त्रांत न किये गये खनन कार्य के निरोक्षण के उपरान्त यदि खनन योजना में संशोधन हेतु आदेश कि त्य त्राणीधित खनन योजना प्रस्तुत करने का पूर्ण उत्तरदायित्व पट्टाधारक का होगा।
- अन्यादिना अमिकों को सुरक्षात्मक उपकरण प्रदान करने तथा सुरक्षित खनन कार्य करने हेतु सभी जनवान ताक्रानियां बरतने का दायित्व पटल्यारक का होगा।
- स्वार्थ अनेन योजना की एक एक प्रमाणित प्रति सम्बन्धित जिलाधिकारी कार्यालय एवं निदेशालय के प्रमान के अभिलेखार्थ यथाशीघ प्रस्तन करने का दायित्व भी पटटाधारक का होगा।
- अन्य विजना के अनुसार, पट्टाधारक द्वारा खनन कार्य न किये जाने पर, पट्टाधारक के विरुद्ध कि जन्मधान गांगा आयंगा और तद्नुसार कार्यवाही की जायेगी।
- ्र के पट्टाधारक द्वारा अनिकों की साथ अनुमादिन की जा रही है कि पट्टाधारक द्वारा अमिकों की सुरक्षा एवं जन्म दी प्रदिन व्यवस्था की जावेगी।

रातमक- - आनुमोदित पति।

काम कर बाद ते गए के मेकर दिसास देहरादून।

भवदीय (श्रीधर बाबू अद्दोकी निदेशक

(MY)

(श्रीधर बाबू अददांकी) निदेशक



Bhuwan Joshi Emmilia Geologist FRIDG.Gui makhand



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FOR SAND, BAJRI AND BOULDERS IN RIVER YAMUNA, LOT No. 23/1 KHASRA NO. : 649a AREA: 30.035 ha.

At

VILLAGE – DUMATE, TEHSIL – VIKASNAGAR DISTRICT –DEHRADUN (UTTARAKHAND)

APPLICANT



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अभी महोदय देहरादन में। घत्र संख्या 351/खनिज-नदी तल-2012 दिलॉक 16 अगस्त. अदेश संख्या 390/खनिज/2012 दिलाक 30 अनस्त. 2012 एवं प्रसुख तचिव उत्तराखण्ड क un संख्या 2541/Vite11/146-वा/2009 दिलॉक ट." अल्टूबर, 2009 के अनुपालन जे गठित हमिति हारा जनपद वेहनावून तहसील विकासनगर थे ग्रांग इसेट दिनात यमुना नदी तल जिसवी त्रेगाएँ कटापत्यर की नीचली सीमा से कालसी पुल के अन्टर का भाग है, का संयुक्त निरोक्षण दिसॉक 14 09 2012 को किया गया। यनन पट्टे हेतु आवेदित स्थल को राज्य सरकार में प्रचलित खनिज . ११ते २०११ के अनुसार सार्वजनिक स्थल पुल, नहर, सडक इल्यादि से १००-१०० मीटर की दूरी छोडते ्य तगा नदी किनारे से नदी की चौडाई का 15% (प्रतिशत) भाग छोडकर उपखलिज खनन योग्य नवफल सम्मालित किया गया है। जो निम्न प्रकार से है:-

ह में	जनपद	तहसील	ग्राम का नाम	लदी का नाम	लाट संख्या	यासरा नम्बर	कुल क्षेत्रफल (है0 मे)	खतन योग्य होत्रफल	उपलब्ध उपखनिज
	2	3	4	5 5	6	7	8	9	10
1	दहरादून	विकासलगर	डूसेट	यमुना नदी	23/1	649क	56.135	30.035	मित्रित

उपरोक प्रस्तायित उपखनिज सिविल नदी तल क्षेत्र में प्रचुर मात्रा में उपखनिज निक्षेपित है. क्रिहे राजस्य दित में खनन/चुगान किया जाना अति आवश्यक है। मौके पर उपस्थित यन विमाग, विचर्ड विभाग, यतन विभाग तथा राजस्व विभाग (गठित समिति के सदस्य/प्रतिनिधि) की आख्या जिम्लवत हे.-

1- बन विभागा- वन विभाग के प्रतिनिधि श्री एस.एस.बिष्ट (आर.ओ.लॉघा) द्वारा अवगत कराया गया के उप बनिज बनन/चुगान हेतु प्रस्तावित क्षेत्र सिविल भूनि है तथा वृक्षविहीन है, उक्त प्रस्तावित स्मेल से बन की सीमा 100मीटर से अधिक दूरी पर स्थित है। अतः राजस्य भूमि पर उपखलिज यनन/ युगान की अनुमति दिये जाने पर विभाग को कोई आपति नहीं है।

2- रीर्चाइ विमाग:- सिर्चाई विभाग के प्रतिनिधि श्री विवेक शर्मा, अपर सहायक अभियल्ता सिर्चाई निर्माण खण्ड बालसी (मुख्यालय अम्पाडी) द्वारा अवगत कराया गया कि प्रस्तावित स्थल के एक छोर प विभाग देश निर्मित इस्सपर से सुरक्षित पूरी छोड़कर तथा पुल निर्धारित 100मीटर की दूरी खेरेल उक प्रतादित स्थल पर उपखनिज खनन/चुगान की अनुमति दिये जाने पर विभाग को कोई मार्थ्वा लिगाह

- मतत्व एवं बनिकर्म दिशागः- भूतन्व एवं मुनिकर्म विभाग के प्रतिनिधि वीरेन्द्र कुमार सिंह. झुन निर्मित देलादून दारा उक्त प्रस्तुवित स्थल पर प्रयुर भाव में उपकलिज रेत. बजरी, बोल्डर विश्वित भि में निसायन है. जो प्रतिवय येणीकाल में प्रानी के बहाय से एकवित होता रहता हैं। प्रस्तायित स्थल र मान बण्ड में हे तथा पहिंच मार्ग उपलेष्य है। अतः राजस्य हित में उपखतिज खनल/चुगाल की स्वयांत छेट वाने पर विसारा तेकी कोई आसीव सही है।

महात विमान- राजस्व विभोग के प्रदितिधि के मेवकार्स पानिया, लेखपाल विकासनगर हारा मान आया मया कि पस्ताबित स्थल गाव स्थित कि विस्ता तम्ब Brand कि कि chand RUP Prod. Bureau Rens. Tal. June Mur /DDIN: 00/2009/

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(Triad

पर प्रधुर मात्रा में उपखलिज निक्षेपित है। अतः राजस्य 'हेत में उक्त स्थल पर उपखलिज के का जान प्रतान की अनुमति दिये जाने पर कोई आपति नही है।

अ इल्लेखनीय है शासनादेश संख्या 922/VII-1/11-रिट/2012 दिनॉक 26 जुलाई, 2012 द्वारा राज्य के समस्त खनिज/उपखनिज क्षेत्रों के लिये खनन पट्टा स्वीकृत किये जाने से पूर्व पर्यावरण एवं वन श्रज्ञत्य से पर्यावरणीय अनुमति प्राप्त करना आवश्यक है।

अतः उक्त के इष्टिगत पर्यावरणीय स्वीकृति उपरान्त उक्त प्रस्तावित क्षेत्र को उपखनिज के धनन/वुगान के पट्टे पर दिये जाने हेतु संस्तुति की जाती है।

Mar (एस.एस.बिष्ट) रज अधिकारी, लॉंघा

वन विमाग

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b

(एम.एस.बिष्ट) सहायक अभियन्ता

(योरन्द्र कुमारे) सिंह खान निरीक्षक

(हर गिरी) तहसीलंदार

सिंचाई निर्माण खण्ड कालसी भूतत्व एवं खनिकर्म विभाग

देहरादून

विकासलगर

(अशोक कुंमार पण

उपजिलापिकारी

विकासनगर



मरेशक । मुरेझाल्या 1 एवं जानिकामें विभागत उलार साण्ड देहराहुन

Bhuwan Joshi Emps., deo "leologist FRDC.Guit: * "hand RUP India Bureau Reristation ... AUPIDDN/1802000 Govt of Inc.d

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GEOREFERENCE MAP OF DUMET YAMUNA RIVER LOT NO. 23/1

DGPS COORDINATES

Pillar	Latitude	Longitude
A	30°30'44.99"N	77°50'23.60"E
B	30°30'49.46"N	77°51'6.53"E
С	30°30'41.20"N	77°51'8.18"E
D	30°30'36.53"N	77°50'25.09"E

DGPS COORDINATES OF REFERENCE POINT

Pillar		Refernce_P	Latitude
	1	ROAD CHOWK	30°30'32.28"N
	2	ROAD CORNER	30°30'28.51"N

Legend

DGPS Pillar Point
 River Bank
 Mining Area
 Sajra Map

Scale- 1: 10,000

0	170	340	680	1,020	1,360
-		1			Meters

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

PROJECT: DUMET YAMUNA RIVER LOT NO. (30.035 HA



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Annexure 1A

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GARHWAL MANDAL VIKAS NIGAM LIMITED

SURVEY WORK FOR BASELINE DATA ASSESSMENT OF YAMUNA RIVER SECTION (LOT NO. 23/1) AT DUMET IN UTTARAKHAND STATE

Project Report

Dr. R.D. Garg

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

December 2018

র্রী০ আনত ভী০ गर्ग / Dr. R. D. Gorg মাহ্যাদক / Professor ভালদক প্রথিয়ায়িকী বিদান Department of Civil Engineering मारतीय प्रीचोगिकी सरकाम अञ्चयी-Indian Institute of Technology Rookae सङ्ग्रेणी / Rookee-247 667, INDIA

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 Dumet near Katapathar area for mining lot no. 23/1 having an area of 30.035 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. 2120 m length with an average slope of 0.83%. The survey work has been carried out independently from the upstream side of the river, i.e. from the eastern edge of khasra no. 649. 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 postmonsoon period has been observed in the range of 0.356 m to 0.585 m. The average rise in the river bed level in the post and pre monsoon period is 0.442 m. Considering the area of present mining lot as 30.035 hectare, the average volume of material available in one year cycle of replenishment is 1,32,754.7 cubic meters. However, 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 30,035 hectare area will be 4,50,525 cubic meters approximately for excavation upto 1.5 m with respect to the present river bed level.

6 खींव आगव थीव गर्म / Dr. R. D. Garg smanuts / Professor জাপথাৰ অনিয়াসিক্ৰী বিশাল Department of Civil Engineering भारलीय ग्रीद्योगिकी संस्थान रूपकी Indian Institute of Technology Rookee want / Roomes-247 667, INDIA

SURVEY WORK FOR BASELINE DATA ASSESSMENT OF YAMUNA RIVER SECTION (LOT NO. 23/1) AT DUMET 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:

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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-

 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
- C			20.022 1000

2. Along the river in longitudinal direction, the sections will be provided at a spacing of 25 m. In lateral/across direction also, the sections will be provided at a spacing of 25 m. The number of sections along/across the river will depend upon the length and width of river sections, as well as ground conditions. If there is water in the river, then ground survey measurements will not be possible in that portion. The survey work will be carried out provided the ground conditions are suitable and safe for surveyors. 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.

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

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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. Flowing water is present on several parts of the river sections due to the repeated rains which have occurred this year due to more than average monsoon season. The river section has approx. 2120 m length with an average slope of 0.83%. General layout of lot no. 23/1 at Dumet area has been given in Figure 1.

Figure 1: General layout of the lot no. 23/1 at Dumet area 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. 23/1 as provided by the revenue officials is shown in figure 2.

Figure 2: Shajra map of the lot no. 23/1 at Dumet 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 land 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 riversections. 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. 23/1 of Yamuna river section at Dumet has been given in figure 3. For better interpretability, the satellite image of the concerned river section has been shown in the background.

Figure 3: Georeferenced Shajra map of the lot no. 23/1 of Yamuna river section at Dumet 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 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).

The various control points and TBM established for the Durnet section of the Yamuna river (lot no. 23/1) are given in table no. 1. These control points are also marked on the ground and these may be utilized as further controls for the survey work in subsequent years. These will act as reference as well as will reduce the efforts in subsequent surveys for the same section as well as adjoining sections of Yamuna river.

Table 1: Control points and TBM for the Dumet section of the Yamuna river (lot no.

23/1)

S. No.	Easting (meters)	Northing (meters)	Elevation (meters)	Code/ ID	Remarks
1,	773953.087	3379020.911	489.592	S-3	Taken at Left bank of Yamuna River at Dumet on top of spur at Chainage - 125.0 m
2.	774056.807	3379084,427	489.884	S-4	Taken at Left bank of Yamuna River at Dumet on top of spur at Chainage - 0.0 m
3.	773775.019	3378918.985	487.700	TBM-1	Taken at Left bank of Yamuna river at Dumet on top of spur at Chainage - 325.0 m
4.	773600.822	3378815.729	486.482	TBM-2	Taken at Left bank of Yamuna river at Dumet on top of spur at Chainage - 525.0 m
5.	773425.454	3378815.151	486.045	TBM-3	Taken at Left bank of Yamuna river at Dumet on top of spur at Chainage - 685.0 m
6.	773234.474	3378801.543	485.061	TBM-4	Taken at Left bank of Yamuna River at Dumet on platform near Toilet at Chainage - 875.0 m
7.	772509.925	3378708.295	480.149	TBM-5	Taken at Left bank of Yamuna River at Dumet on top of spur at Chainage - 1600.0 m
8.	772124.862	3378748.409	476.775	TBM-6	Taken at Left bank of Yamuna River at Dumet at Chainage - 1975.0 m (near road bridge)

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 riversections as well as for river replenishment studies.

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The survey work for the river sections has been carried out for the major width of the river starting from left bank to right bank. The location of mining lot could be more efficiently demarcated by this approach. In this mining lot, the reference concrete pillar (used as survey control point) is situated on the left bank of the river on the upstream side near the spur adjoining the meeting point of a small drainage with Yamuna river near Basan, Katapatthar area. This reference pillar as well as few TBMs have been used as reference for this mining lot. 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 electromagnetic radiations and computing the horizontal and vertical distance on that basis.

For the Yamuna river sections, the survey work has been carried out independently, since the separation between the two mining-lots of Dumat and Dhakrani is approx. 15 km. For Dumat portion of the Yamuna river (lot no. 23/1), the survey work has been carried out from the upstream side of the river, i.e. from the eastern edge of khasra no. 649. Near to this side a small river coming from Katapatthar area meets the Yamuna river and a large spur exists. The survey work has been carried out towards downstream direction. The reference control pillar has been constructed on this end of the mining-lot. The entire mining lot has been covered in a single khasra no. 649. This lot has stretched to about 2120 m along the river with an average slope of 0.83%. A road bridge connecting the states of Uttarakhand and Himachal Pradesh exists in the downstream side of the lot no. 23/1.

Total Station survey for the Yamuna 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 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 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.

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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 0.356 m to 0.585 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 A and B.

S. No.	Chainage (meters)	Elevation (meters)		Difference in Elevation
		Pre-monsoon	Post-monsoon	(meters)
1.	0	485.704	486.166	0.462
2.	25	484.849	485.325	0.476
3.	50	484.737	485.213	0.476
4.	75	484.796	485.272	0.476
5.	100	485.039	485.515	0.476
6.	125	485.175	485.652	0.477
7.	150	485.643	486.116	0.473
8.	175	485.638	486.114	0.476
9.	200	485.811	486.284	0.473
10.	225	485.746	486.223	0.477
11.	250	485.661	486.139	0.478
12.	275	485,527	485.953	0,426
13.	300	484.961	485.387	0.426
14.	325	484.558	484.984	0.426
15.	350	483.893	484.319	0.426
16.	375	483.432	483.86	0.428
17.	400	483.557	483.979	0.422
18.	425	483.49	483.911	0.421
19,	450	483.473	483.862	0.389
20.	475	483.483	483.871	0.388
21.	500	483.076	483.457	0.381
22.	525	483.127	483.509	0.382
23.	550	483.054	483.436	0.382
24.	575	482.659	483.047	0.388
25.	600	482,054	482.515	0.461
26.	625	481.676	482,142	0.466
27.	650	481.113	481.58	0.467
28.	675	481.2	481.663	0.463
29.	700	480.753	481.221	0.468
30,	725	480.466	480.927	0.461
31.	750	480.017	480.485	0.468
32.	775	479.999	480.435	0.436
33.	800	479.837	480.422	0.585
34.	825	479.738	480.19	0.452
35,	850	479.532	480.001	0.469
36.	875	479.356	479.858	0.502
37.	900	479,098	479.609	0.511
38.	925	478.889	479.403	0.514
39,	950	478.552	479.063	0.511
10.	975	478.905	479.421	0.516
1.	1000	479.305	479.823	0.518
2.	1025	479.358	479.875	0.517
3.	1050	479.21	479,696	0.486

Table 2: Elevation of the river bed level in Pre and Post monsoon period for the

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44.	1075	479.108	479,567	0.459
45.	1100	478.902	479,355	0.453
46.	1125	478.633	479,025	0.392
47.	1150	478.468	478.91	0.442
48.	1175	478.136	478,595	0.459
49.	1200	477.382	477.834	0.452
50.	1225	477.237	477.691	0.454
51.	1250	476.781	477.223	0.442
52,	1275	477.049	477.461	0.412
53.	1300	477.19	477.616	0.426
54.	1325	477.223	477.647	0.424
55.	1350	477.063	477.489	0.426
56.	1375	476.789	477.215	0.426
57.	1400	476.551	476.963	0.412
58.	1425	476.412	476.808	0.396
59.	1450	476.31	476.697	0.387
60.	1475	477.097	477.485	0.388
61.	1500	477.001	477.357	0.356
62.	1525	476.88	477.266	0.386
63.	1550	476.708	477.097	0.389
64.	1575	476.526	476.908	0.382
65.	1600	476.334	476.706	0.372
66.	1625	476.072	476.453	0.381
67.	1650	474.42	474.872	0.452
68.	1675	474.273	474.739	0.466
69.	1700	474.249	474.712	0.463
70.	1725	473.669	474.106	0.437
71.	1750	473.018	473.487	0.469
72.	1775	472.786	473.25	0.464
73.	1800	472.59	473.006	0.416
74.	1825	472.606	473.022	0.416
75.	1850	471.926	472.344	0.418
76.	1875	472.268	472.687	0.419
77.	1900	471.976	472.39	0.414
78.	1925	471.768	472.17	0.402
79.	1950	471.652	472.068	0.416
80.	1975	471.431	471.817	0.386
31,	2000	471.041	471.503	0.462
\$2.	2025	471.246	471.698	0.452
33.	2050	470.744	471.212	0.468
\$4.	2075	470.102	470.554	0.452
35.	2100	470.125	470.561	0.436
36.	2116.7	470.188	470.64	0.452
			Average	0.442
		0.356		
		0.585		

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Volume of replenishment and mineable volume available

The average rise in the river bed level in the post and pre-monsoon period is 0.442 m for one year cycle of 2018-19. Considering the area of present mining lot as 30.035 hectare, the average volume of material available in one year cycle of replenishment is 1,32,754.7 cubic meters. 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 crosssection 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 crosssection 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 postmonsoon) is about half a meter. 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 breaching of the river banks eausing 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 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. 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 comparison as 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 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 30.035 hectare area will be 4,50,525 cubic meters approximately for excavation upto 1.5 m with respect to the present river bed level.

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Figure 4: River bank line (shown in yellow colour) of Yamuna river-section (lot no. 23/1) at Dumet in February 2013. Satellite image of February 2013 is shown in background.

Figure 5: River bank line (shown in green colour) of Yamuna river-section (lot no. 23/1) at Dumet in December 2018. Satellite image of December 2018 is shown in background.

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GALLERY OF PHOTOGRAPHS FOR YAMUNA RIVER-SECTION (LOT NO. 23/1)

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Photo 1: Establishing the Reference Control Point on the top of spur at left bank of Yamuna river

Photo 2: Collecting survey points through Electronic Total Station by establishing reference control point on the top of spur


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Photo 3: Taking observations through Electronic Total Station at the site



Photo 4: Observing and collecting survey points through Electronic Total Station



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Photo 5: Taking observations through Electronic Total Station at the site. The equipment is placed on the top of spur



Photo 6: Collecting survey points through Electronic Total Station for various points of the river

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Photo 7: Collecting survey points through Electronic Total Station at the site



Photo 8: Establishing the reference control point through relative point positioning (DGPS)

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Annexure 2

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3379225.0 < Y28	2-	-	-	+	+	+		-	-	-	-	+	+	+	-	+	+	
3379200.0 (Y27	> -		-	+	+	-	-	-	-	-	-		+	-	-	-	-	
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3378625.0 (Y4	> -	-	+	+	-	+	+	EL	EV.:47	6.775	m.	+	+	-	-	-	-	_
3378600.0 (Y3	> -		+	+	+	+	-		+	-		+	+	+	-	-	-	-
3378575.0 (Y2	> -		-	+	+	+	-		-		-	-	+	+	-	-	-	-
3378550.0 < Y1	, _	-	~	~	~		~	~	-	-	-	-	-	-		-	-	-
	×1×	X	ex X	X4	X	X6	X7	X8	6X	(10	XII	115	13	14	115	910	117	
	2 0	YO	× D	V O	v c	× c	Ň	Y	ž	0	~	5	0	C X	C .	× v	× v	
	771850.	71875.	71900.	71925.0	71950,0	71975.0	72000.0	72025.0	72050.0	2075.0	72100.0	2125.0	2150.0	2175.0	2200.0	2225.0	2250.0	

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in Sa	DumetLot	lo (23/1)- Minea	able Area			Dumet Lot N	o (23/1)- Minea	ble Area	A BORING		Dumet Lot N	lo (23/1)- Mine	able Area			Dumet Lot M	No (23/1)- Mine	able Area	
GRID of mincoble	GROUND LEVEL of mineable area (Pre- Manseon)	GROUND LEVEL of minsable area (Post Mension)	Difference in Elevation	Reserve per grid (Cubic Meter)	GRID of mineshie	GROUND LEVEL of minesple area (Pre- Mansoon)	GROUND LEVEL of mineable area (Post Morecool	Difference in Devation	Reserve per grid (Cultic Meter)	GRID of minerable	GROUND LEVEL of mineable area (Pro-	BROUND LEVEL of mine shire area (Post	Difference in Elevation	Reserve per grid (Cubic Meter)	GBID of mineable	GROUND LEVEL of mineable area (Pre-	GROUND LEVEL of mineable area (Post	Oifference in Elevation	Reserve pergrid (Cubic Meser)
816.4 Y IO	474.902	4/5.257	0.3547	221.70	3763 X36,V12 X36,V12	476.087	476.40	0.4093	252.05	8968 X52,Y18	478.694	479.143	0.4487	280.41	309 3 X69,V 20	481.783	Mamoon) 482.244	0.4612	268.25
×30,711 ×30,712	474,588	474,942	0.3545	221.56	X38,V14 X38,V15	477,158 477,788	477.592	0.4042	252.54	X52,Y15 X52,Y15	478.510 478.781 479.450	4/8.558	0.4485	280.30	X69,V21 X69,V22	481.584	482.146 482.154	0.4611 0.4981	288.19
X30,V13	475.404	475,759	0.3551	222.90	X38,V16 X38,V17	478.385	478,791	0.4052	253,27	X52,Y17	480.043	4/5.508	0.4499	280.85	X70,Y14	411.652 482.542	482.141 483.052	0.4891 0.4960	305.67 306.23
x30, Y15	476,365	475.545	0.3562	222.61	X18,V18	478.078	471.423	0.4050	253.11	X53,Y13	480.152	490.552	0,4500	281.25 280.88	x70,¥15 x70,¥16	483.487	483.861 483.978	0.4968	306.76 306.83
X30, Y15 X30, Y17	476.544	477,11 477	0.3561	222.56	X38,721	478.270	478.675	0.4051	3332	X53,Y25	475,638	479.727 479.087	0.4392	280.75 280.38	X70,¥17 X70,¥18	483.188 483.114	481.679 481.605	0.4906	306.64 306.60
X30,Y18 X30,Y19	476.515 476.544	476.671 477	0,3558	122.36 122.51	X38,V11	476,230	476,794	0.4035	252.30	K33, Y17	475.754 479.905	479.303 479.954	0.4487	280.41 290.88	X70,Y19 X70,Y20	482.875 481.958	481.305 482.442	0.4905 0.4854	305.44 305.96
X30,Y20 X31,Y9	476,941 474,784	477,297 475,139	0.3562	122.65 221.64	X39,V13	476.921	477,325	0.4040	152.50	X54,Y13	479.952	490.402	0.4498	281.15 281.95	X70,921 X70,922	402.090 481.901	482,596 482,407	0.5064	316.51 316.39
K31, Y30 K31, Y32	474.645	475	0.3545	221.58	X39,V15 X39,V16	477,980	476.195	0.4049	253.06	X54,Y15	479.005	479,883	0.4499	780.84 280.59	X70,971 X71,915	481,839 483,880	482.345 484,388	0.5062	316-35 317.69
K31,Y12 K31,Y13	474.543 474.844	470.897 475.199	0.3544 0.3547	221.53 221.67	X39,V17 X39,V18	477.928 478.210	476.118	0.4048	23.03	X54,717	479.220	479.669	0.4491	280.62	X71,715 X71,717	483,637 483,479	483.367	0.5080	317.53 317.43
X31,Y14 K31,Y15	477.030	477.385. 476.961	0.1563	222.69 222.49	X39,V19 X39,V21	478.178	478.578	0.4051	213.16	855,713	480,833	481,284	0.4493	280.81	X71,718 X71,719	483.307 483.351	483.815 483.859	0.5077	317.31 317.34
X31,916 X31,917	476,729 476,798	477.135 477.154	0.3563	222.57 222.58	340,910 340,911	676.572 676.862	477	0.4228	364.25	X55, Y15	470.163	479.618	0.4405	280,62	X71,Y21	482,361	483.268 483.268	0.1069	316.94 316.95
X31,718 X31,719	476.615 476.832	476.971 477.188	0.3560	222.50 222.60	X40,712 X40,713	476.935	477.318	0.4221	354.45	X55, Y17 X55, Y18	479.104	479,543	0.4586	286.65	X71,Y23	461.907	483.5 483.413	0.5062	316.97 316.38
X31, V20 X32, YF	477.095 474,787	477.452 475.142	0.3554	222.72 221.64	840,754 840,715	476.850	477.313	0.4231	264.42	X56, Y13	480.947	481.407	0.4606	287.75	371,726	482.018	402.524	0.5062	316.47
x32, Y10 x32, Y11	474,645 474,623	475 474.978	0.3545	221.58 221.57	X40,Y16	478.891	472.316	0.4249	265.53	X56, Y35	478,909	479.367	0.4585	286.53	X72,V16	463.795	454.303	0.5082	317.63
x32,Y12 x32,Y13	474.543 474.492	474,897 474,816	0.3544	221.58	X40,715	478.2%	478,715	64243	265.20	X56,Y17	470,065	479:524	0.4585	285.63	372,718	463.628	494.31	0.5062	317.64 317.52
X32, Y14 X32, Y15	476.832 476.218	477.298 476.583	0.3057	228.57	K41,710	4/6.698	477,136	0.4229	264.31	X57,Y34	479,874	480,333	0.4554	287.11	3072,1/20	483.217	483.725	0.5075	117/A1 117/25
X32, Y16 X32, Y17	476.132 476.470	476.497 476.835	0.3652	228.23	X41,712	477.159	477.502	0,4233	264.57	X57,Y16	479,887	480.356	0.4690	293.33	372,822	483,170	481.635 421.678	0.5075	\$17,20 317,22
X32,Y18 X32,Y19	475,898 476,977	477.254 477.343	0.3658	228.60	X41,Y14	476.577	4/0.33	0.4228	264,25	X57,Y18 X57,Y19	479.214	479.682	0.4683	292.72	372,824	481.968	482,474	0.5063	306,49 316,43
X32, Y20 X33, Y9	477.241 474.948	477.607	0.3660	128.76 127.66	X41,Y16	478.111	473,535	0.4242	265.10	X58, Y14 X58, Y15	480.351	490.005	0.4695	293.41	X73,715	484.000	482.033	0.5085	316.55
X33,Y30 X33,Y11	474.863 474.779	475.227	0.3642	227.62	K41,Y10 K41,Y19	478 516	478.941	0.4245	265.32	858, Y10 858, Y17	479 995 890 885	481.454	0,4693	293.19	X73,¥17	494.105	404.62	0.5279	329.95
X33,Y32 X33,Y33	474.773 475.035	475,137 475,4	0.3641	227.58	862,Y10 842,Y11	476 999	477.422	0.4292	254.48	X58, ¥18 X58, ¥19	480.087	480.556	0.4692	293.25	X73,719 X73,720	483.721	484,749	0.5275	329.85 329.70
X33,Y34 X33,Y35	476.330 476.279	475.595	0.3653	228.33	X42,Y12 X42,Y13	477.547 478.005	477.971	0.4297	264.79	K99, Y14 K99, Y15	480.860 480.104	481.31	0.4999	290.71 293.26	X73,Y21 X73,Y22	483.480	484,007	0.5273	129.54
X35, Y35 X88, Y17	477.091	477.471	0 3802	237.65	X42,Y14 X42,Y15	477.454 477.701	477.878 478.125	0.4236	264.73	X59,716 X59,717	479.901 480.242	480.378	0.4990	293.14 293.34	X73,Y23 X73,Y24	483.380	481.887	0.5271	329.46
X33, Y38 X33, Y39	477.111	477,491	0.3803	237.66	X42,Y15 X42,Y17	478.258 478.815	471.682 421.24	0.4243	255.18	K33, Y15 X53, Y19	480.484 479.289	480.954	0.0595	293.49 295.76	X74,Y15 X74,Y16	484.119	484,647	0.5280	329.97
X33,Y20 X84,Y0	477.386	477.756	0.3805	237.80	342,Y38 342,Y29	478.772 478.696	475.157 475.121	0.4247	265.47 265.42	360, Y14 360, Y15	480.738 480.677	481.213 481.152	0.4742	296,66	374,Y17 374,Y18	484,429 494,750	484,957	0.5283	330,10
K34,Y20 K34,Y21	475.027	475.406	0.3786	236.62	343,921 343,912	478.007 478.005	478.431 478.429	0.4241	265.04	360, Y15 360, Y17	479.915 480.652	480,409 481,127	0.4739	256.15 256.61	3074,Y19 3074,Y30	483.920	484.453	0.5326	332.87
K34,V12	475.551 475.551	475.000	0.3790	236,69	X43,Y13 X43,Y14	478.003 478.053	478.427 478.517	0.4241	205.04	X60, Y18 X60, Y19	480.655 479.408	483,13	0.4746	296.61 295.84	374,921 374,922	(83.64) 463.894	484,173 484,417	0.5326	232.68
K34, Y14	475.405	476.802	0.3956	247,23	X41,715 X41,716	477.849 478.406	478.273 478.83	0.4239	254.95 265.26	364, YE4 364, YE5	480.754 480.477	483.229 480.951	0,4747	296.67 296.50	X74,Y23 X74,Y24	483.816 482.194	484,348	0.5325	332.80
X34,V16	477,161	477.557	0.3962	247.45	X41,717 X41,718	478.962 479.029	479,387 479,454	0.4249	265.57	X61, V16 X61, V17	480.287 485.578	480.751 481.047	0,4342 0,4345	296.38 296.56	X75,715 X75,716	484,150	484.693 484.835	0.5329	333.03
X34,V18	477.314	477.61	0.3963	247.78	843,Y19 844,Y11	478.924 478.285	479.349 478.709	0.4249	265.55	X61,V18 X61,V19	482.750 472.571	481.225 480.345	0.4747 0.4738	294.67 296.12	X75,917 X75,918	484,747 484,437	485.02	0.5335	333.44
x34,V20	477.329	477,755 477,904	0.3964	247,71 247.81	K64,V12 X44,V13	478.203	478,707 478,705	0.4243	265.19	X61, Y20 X62, Y14	479.760 481.555	480.234 482.83	0.4737 0.4753	294.05 297.04	X75,719 X75,720	484,149 483,954	484,682 484,407	0.3328	383.03 382.89
X35,Y9 X35,Y30	475.543 475.806	475,938 476,201	0 3949	246.78 246.92	304,916 364,915	478.288 478.491	478.712 478.915	0.4243 0.4245	265.20 265.31	X62, ¥15 X62, ¥16	481.077 480.582	481, 552 461, 056	0.4750	296.87 296.96	X75,¥21 X75,¥22	483.323 484.305	403.851. 404.836	0.5319	387.48 553.13
X35,V11 X35,V12	476.069 476.246	475.450 475.541	0.3953	247.06 247.15	X64,Y16 X64,Y17	478.676 479.110	475,101 475,535	0.4247	265.41	X62, V17 X62, V18	480.667 480.844	481.142 481.319	0.4746	296.61 296.72	X75,723 X75,724	484,160 483,309	404,653 403,840	0.5309	33103 33245
X35,Y13 X35,Y14	475.393 675.604	476,789 477	0.3956 0.3957	247.23 247.34	844,918 845,911	479.285	473.71 478.991	0.4252 0.4246	265.75 265.35	362, V19 362, V20	480.336 480,244	490.61 490.718	0.4743	296.41 296.35	X75,Y25 X76,Y15	482,379 484,206	482.91 484.730	0.5312 0.5332	333.00 333.26
X35,V15 X35,V16	476.919 477.248	477.315 477.644	0.3963	247.50 247.67	X45,Y12 X45,Y13	478.538	479.003 479.006	0.434E 0.4346	265.36	363,Y14 363,V15	481.955 481.221	482,431 401,696	0.4759 0.4751	297.41 256.56	30%,Y16 30%,Y17	484.501 485.000	485.038 485.534	0.5195	333.4E 333.80
X35,Y17 X35,Y18	477.576 477.525	472.978 477.922	0.3965	247.84 247.81	X45,Y14 X45,Y15	478.575 478.684	479 479,109	0.4245	265.36	X63,V16 X63,V17	480.952 480.967	481,452 481,427	0,4604	287.78 287.78	x76,V18 326,V19	484.608 484.374	485.342 485.308	0.5337 0.5338	313.54
X35,Y19 X35,Y20	477.584 477.601	477.98 <u>1</u> 478	0.3966	247.84	X45,V36 X45,V37	475,123 475,434	479.548	0.4251 0.4253	265.66 265.83	X63,V18 X63,V19	481.037 480.716	481,407	0.4605	287.81 287.61	3076,Y20 3076,Y21	464.279 484.132	44482	0.5333	333.32
X36,79 X36,710	475.745 475.885	476.14 476.288	0.3950	246.89 251.95	X45,V18 X46,V11	479.365 478.819	479.79 479.244	0.4253	201.79 201.49	363,920 364,925	480.307	480,767 481,664	0.4508 0.4606	287.37 287.91	X76,Y22 X76,Y23	484.547 484.728	485.181 485.262	0.5338	333.56 383.62
K86,911 K86,912	475.032 475.180	476,435 476,583	0.4033	252.02	X46,Y12 X46,Y13	478.813 478.808	479.238 479.238	0.4249	205.49	X64,V16 X64,V17	481.216 480.912	481 677 451,372	0.4607 0.4604	287.91 287.71	X76,Y24 X76,Y25	483.598 482.546	484.132 483.077	0.5325	332.84
X36,V13 X36,V14	435.327 475.800	476.71 477.294	0.4035	252.18 252.48	X06,V14 X06,V15	478.575 478.699	479 479.124	0.4245	265.36 265.43	X64,Y18 X64,Y19	481.360 480.833	481.871 481,263	0.4608	288.00 287.68	X76,¥26	482:621	483.152	0.5315	382.17 115292,4401
X36,Y15 X36,Y16	477.016 477.326	477.42 477.73	0.4041	252.55 252.71	X46,Y16 X45,Y17	479.028 479.540	479,453 479,965	0.4250	265.61 265.99	X64, V20 X64, V21	480.471 480.132	480.931 480.592	0.4999	287.47 287.26					
335,717 X36,718	477.595 477.728	478 478.133	0.4045	252,85 252,92	847,Y11	479.575 478.404	480 478.828	0.4255 0.4244	265.91 265.76	X65,Y15	482,865	482.827	0.4618	288.60 288.29					
X36,Y19 X36,Y20	477.803 477.853	476.208 478.258	0.4047 0.4048	252.96 252.99	847,912	479.030 478.542	479.455 479.007	0.4250	25.61	N65, Y18	481.504	481,97 481,965	0.4609	288.06 288.08					
X37,Y10 X37,Y11	475.831 475.973	476.234 476.376	0.4081 0.4082	251.92	847,715	478.960	479.385	0.4348	265.50	X65,720	480,777	481, 093	0.4602	287.02					
X37,Y11 X37,Y13	476.121 476.444	476.524 476.848	0.4033	252.07	847,815	479,499	479.098	0.4365	255.87	X06,Y15	482,906	481,508	0.4599	287,45					
X37,Y14 X37,Y15	477.105 477.324	477.509 477.728	0.4041 0.4043	252.59 252.71	X48,Y11	475.265	478.69	0.4243	265.28	306,717	482,052	482,513	0.4615	288.41					
X37,Y16 X37,Y17	477.437 477.747	477.641. 478.152	0.4044	252.77 252.98	X46,713	425,739	476.868	0.4245	265.45	X86,Y19	481,518	481,979	0.4609	288.09					
X37,Y18 X37,Y19	477.940 478.023	478.345 478.428	0.4049	253.03 253.08	348,715	425,250	473.715	0.4252	265.75	X86,Y21	480,918	461, 378	0.4604	287.75					
X37,Y29 X37,Y21	478.038 478.249	478.443	0.4049	253.00 253.20	X48,V17	471302	479.817	04253	265.81	X67,Y15	482,218	412,68	0.4616	288.51					
X38,Y10 X38,Y11	475.825 475.947	476.228 476.35	0.4031	251.92 253.98	X49,V12 X49,V13	478.436	478.925	0.4399	274,25	X57,Y17	412.331	482,793	0.4617	288.58					
					X49,V14 X49,V15	475.085	479.525	0.4394	274,64	N67, Y29	481.845	482.307	0.4613	288.25					
					X49,Y16 X49,Y17	429.701	480.141	0.4400	274.99	X57, Y21	491.303	481,754	0.4507	287,95					
					X49,Y18 X50,Y12	479,870	480.31	0.4401	275.09	X68, Y14	482.214	483.635	0.4606	288.51					
					350,Y13 350,Y14	478,758 479,172	479.147	0.4391	274.45	X68,V16	482,830	483.202	0.4622	288.88					
					X50,V15 X50,V16	479,544	479.954	0.4358	275.16	X54, Y18 X54, Y19	482,829	483.291	0.4622	256.88					1
				-	X50,917 X50,918	480.095	480.525	0.4403	275.22	X58, Y20 X58, Y21	481.691 481.501	482.152	0.4611	268.20					
					351,712 351,713	47£375 476.727	473.814 479.160	0.4388	274.23	X58, Y22 X59, Y14	481.452 482.497	481.913	0.4609	288.05					
					X51,Y14 X51,Y15	479.173 479.293	479.613	0.4395	274.69	X093, Y15 X093, Y16	482,550 483,172	481.012	0.4615	288.71					
					X51,Y16 X51,Y17	475.819 490.189	480,360	0.4497	281.07	X090, Y17 X020, Y18	483.005 483.064	483.467 483.526	0.4634	288.98					
					X51,Y18	400.031	480,481	0.4499	281.19	X02, Y19	482.459	482.931	0.4619	288.46					





Replenisha

Replenishable Qua Replenishable Quant Partial Grid ded **Total Replenis**

Dumet Lot No (23/1)- Non Mineable Area					Dumet Lot No (23/1)- Non Mineable Area						
GRID of non mineable area	GROUND LEVEL of miles able area (Pre- Monsoon)	GROUND LEVEL of mineable Area (Post Monsoon)	Different # in Elevation	Reserve per grid (Cubic Meter)	GRID of non mineable area	GROUND LEVEL of minestile area (Pre- Monsoon)	GROLIND LEVEL of mineable area (Post Morecon)	Differenc e in Elevation	Reserve per grid (Cubic Meter)		
X44,Y19	479.198	479.551	0.358	223,70	X50, Y22	481.103	481.551	0.448	279.75		
X45,Y19	479.036	479.394	0.358	223.63	X51, Y22	481.255	481.703	0.448	279.8		
X45,Y19	479.036	479.394	0.358	223.63	X52, Y22	483.408	481.856	0.449	279.93		
X47,Y19	479.317	479.675	0.358	223,76	X53, Y22	481.561	482.009	0.448	280.00		
x48,Y19	479.599	479.957	0.358	223.89	X54, V22	481.714	482.162	0.448	290.15		
X49,Y19	479,580	480.238	0.358	224,02	X55, Y22	481.867	482.315	0.448	280.24		
X50,V19	480.068	490.427	0.359	224.11	X56, V22	482.019	482,468	0,449	280.33		
X51,119	479,936	480.794	0.358	224.05	X57,Y22	482.156	482.613	0.457	285.40		
NE3 V10	479.807	480.155	0.358	223.99	X58, Y22	461.689	482.345	0.456	285.34		
N54 V10	470.007	100.240	0.358	223.58	X59,Y22	482.097	482.554	0.457	285.42		
X55 Y10	479.473	402.340	0.359	229.07	X050, YZZ	482.533	482.99	0,457	285.68		
N56 Y19	479 504	60,214	0.358	123.81	X01,YZZ	482.196	482.653	0.457	285.48		
x38 y20	479.141	47 3 302	0.358	223.85	802,422	480.944	481.409	0.465	290.76		
X39 X30	478 105	470.490	0.357	223.21	A03,122	479.796	480.258	0.464	290.00		
K40, Y 20	478.220	478.352	0.4%	363.10	X04,122	479.789	460.253	0.464	290.06		
K41 V20	478.277	478.693	0.405	253.10	A00,122	450.122	480.585	0.464	290.26		
X42 V20	478.339	478.002	0,405	22,605	AB0,122	451.957	481.432	0.465	290.78		
X41, V20	478.390	476.130	0.405	162.27	X54,123	481.718	482.194	0.466	291.23		
X44, Y20	478,506	478.911	0.405	250.27	N50,123	481.8/1	462.337	0.466	291.32		
X45, Y20	478.418	478.823	0.405	252 20	NE7 V23	492,024	452,45	0.466	2/1.41		
X06, Y20	47R-344	478 749	0.05	252.25	Mar, 1 ca	492.177	462.043	0.460	291.51		
X47, Y20	478,574	678.979	0.405	253.37	N50,123	492.363	462,730	9/4/1	299.62		
X48, V20	478,696	479.101	0.405	252.43	X60 Y23	402.610	452,949	0.472	296.73		
X49, Y20	478,856	479.162	0.405	253.53	N51 V23	483 757	465,071	0.472	299.80		
X50, Y20	478,869	479,775	0.406	253.53	M62 V23	493 904	400.223	0.472	294.88		
X51,Y20	479,192	679 598	0.405	253.70	NE3 V 23	402.101	965,000	0.472	204.96		
X52, Y20	479,350	679.756	0.406	253.78	NEA V23	400 5 40	102,502	0.471	2294,00		
X53, Y20	479,955	490.362	0.407	254.10	NEC 973	400.107	402.02	0.400	200,00		
X54, Y20	490,560	480.967	0.407	254.42	X66 V 23	493.841	401.341	0.400	235,51		
X55, Y20	480.487	480.894	0.407	254.38	ME7 V 23	491 100	401.041	0.400			
X56, Y20	480.243	480.65	D.407	254.25	M58 V 23	481 375	491.955	0.460	200.00		
X57, Y20	479.982	480.389	0.487	254.12	N50 Y24	482.643	402.154	0.401	300,07		
X58, Y20	479.582	480.003	0.421	262.91	X61.V24	482.776	493 377	0.461	213.00		
X59, Y20	479.612	480.083	0.421	262.93	K62,Y24	482,929	483.43	0.501	313.17		
X60, Y20	479.349	479.769	0.420	262.78	X63,Y24	483.068	483 569	0.901	313.22		
X40, Y21	477.975	478.394	0.419	262.03	X64, Y24	453,205	483,706	0.501	\$13.31		
X41, Y21	477.875	478.294	0.419	261.96	X65, Y24	483.271	483,777	0.501	313.35		
3642, Y21	477.776	478.195	0.419	261.92	X96, Y24	480.781	481,289	0.508	317.76		
X43, 725	478.551	478.971	0.420	262.35	3067, Y 24	481.052	481.575	0.523	326.98		
X44, Y21	478.893	479.313	0.420	262.53	3058, Y34	481.337	481.95	0.523	327.17		
3(45, Y21	479.236	479.656	0.420	262.72	X099, Y24	481.622	482.146	0.524	327.37		
X46, Y21	479.553	479.974 -	0.421	262.90	X70, Y24	481.815	482.339	0.524	327.50		
X47, Y21	479.802	480.223	0.421	263.03	X67,Y25	483.365	483,891	0.526	328.55		
3(48, Y21	480.050	480.471	0.421	263.17	X68, Y25	481.332	481.865	0.533	333.20		
X49, Y21	480.299	480.72	0.421	263,30	X69, Y25	481.817	482.15	0.533	333.40		
X50, Y21	480.525	480.946	0.421	263.43	X70, ¥25	481.799	482.333	0.534	333.52		
X51, Y21	480.666	481,097	0.431	268.52	X71, ¥25	431,966	487.4	0.534	333.57		
X52, Y21	480,801	481.232	0,431	269.60	X72, ¥25	481.947	482.485	0.539	336,64		
X53, Y21	480.937	481,368	0.431	268.68	X73, Y25	482.071	482.615	0.544	339.75		
X54, Y21	430.790	461.221	0.435	269.59	X74, Y25	482,201	482.745	0.544	339.64		
855, 721	481.370	481.802	0.432	269.92	X73, Y26	462.239	482.783	0.544	\$39.87		
X56, Y21	481,480	481.912	0.432	269.98	X74, Y26	482.370	482.914	0.544	339.96		
X57,Y21	481.475	481.908	0.432	269.98	- 90/22211	17 COVID-	110000000000000000000000000000000000000	0.442856	32107.03313		
X58, Y21	481.533	481.965	0.432	270.01							
X58, YZ1	481.344	481,792	0.448	279.93							
XMO, YZL	481.332	481.78	0.448	279.93							
361,721	479.708	480.154	0.446	278.58							
A62, Y21	480.195	480.642	0.447	279.26							
A63, Y21	480.005	480.512	0.447	279.19							
	480.040	451.092	0.447	279.53							
847,122	200 200	494 540	10 m m m	Contract and							

able Quantity	(cubic meter)	
antity in Minable area	115292.45	
tity in Non Minable are	32107.03	
duction(110 Grids)	-15399.48	
shable Quantity	132000	

Annexure 3A

1:3000 (H) 1:300 (V)

NON MINEABLE AREA = 6.353 HA MINEABLE AREA = 23.682 HA

LEGEND

NON MINEABLE AREA MINEABLE AREA LEASE BOUNDARY 7.5M LEASE BERRIOR ZONE

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Yamuna River (23 /1) Vill.-Dumet

GRIDWISE ELEVATION & RESERVE CALCULATION

DRAWING NO.

SHEET NO. 1/1

Annexure 38

	ramuna kiver Lot No (23/1)- Wilneable Area								
GRID of mineable area	GROUND LEVEL of mineable area (Pre- Monsoon)	GROUND LEVEL of mineable area (Post Monsoon)	Difference in Elevation	Reserve per grie (Cubic Meter)					
X30,Y9	474.902	475.257	0.3547	221.70					
X30,Y10	474.858	475.213	0.3547	221.68					
X30,Y11	474.588	474.942	0.3545	221.55					
X30,Y12	474.243	474.597	0.3542	221.39					
X30,Y13	475.404	475.759	0.3551	221.93					
X30,Y14	476.589	476.945	0.3560	222.49					
X30,Y15	476.866	477.222	0.3562	222.61					
X30,Y16	476.754	477.11	0.3561	222.56					
X30,Y17	476.644	477	0.3560	222.51					
X30,Y18	476.315	476.671	0.3558	222.36					
X30,Y19	476.644	477	0.3560	222.51					
X30,Y20	476.941	477.297	0.3562	222.65					
X31.Y9	474.784	475.139	0.3546	221.64					
X31,Y10	474.645	475	0.3545	221.58					
X31,Y11	474.645	475	0.3545	221.58					
X31,Y12	474.543	474.897	0.3544	221.53					
X31,Y13	474.844	475.199	0.3547	221.67					
X31,Y14	477.030	477.386	0.3563	222.69					
X31,Y15	476.605	476.961	0.3560	222,49					
X31,Y16	476.779	477.135	0.3561	222.57					
X31,Y17	476.798	477.154	0.3561	222.58					
X31.Y18	476.615	476.971	0.3560	222.50					
X31.Y19	476.832	477.188	0.3562	222.60					
X31.Y20	477.096	477.452	0.3564	222.72					
X32,Y9	474.787	475.142	0.3546	221.64					
X32,Y10	474,645	475	0.3545	221.58					
X32.Y11	474,623	474,978	0.3545	221.57					
X32.Y12	474,543	474.897	0.3544	221.53					
X32,Y13	474,492	474.846	0.3544	221.51					
X32,Y14	476.832	477.198	0.3657	228.57					
X32,Y15	476,218	476,583	0.3652	228.27					
X32,Y16	476.132	475.497	0.3652	228.23					
X32,Y17	476.470	476.835	0.3654	228 39					
X32,Y18	476.898	477.264	0.3658	228.60					
X32,Y19	476,977	477.343	0.3658	228.64					
X32,Y20	477.241	477.607	0.3660	228.76					
X33.Y9	474.948	475.312	0.3643	227.66					
X33,Y10	474.853	475,227	0.3642	227.62					

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X33,Y11	474.779	475.143	0.3641	227.58
X33,Y12	474.773	475.137	0.3641	227.58
X33,Y13	475.036	475.4	0.3643	227.71
X33,Y14	476.330	476.695	0.3653	228.33
X33,Y15	476.279	476.644	0.3653	228.30
X33,Y16	477.091	477.471	0.3802	237.65
X33,Y17	477.222	477.602	0.3803	237.72
X33,Y18	477.111	477.491	0.3803	237.66
X33,Y19	477.148	477,528	0.3803	237.68
X33,Y20	477.386	477.766	0.3805	237.80
X34,Y9	475.103	475.482	0.3787	236.66
X34,Y10	475.027	475.406	0.3786	236.62
X34,Y11	475.290	475.669	0.3788	236.75
X34,Y12	475.553	475.932	0.3790	236.89
X34,Y13	475.816	476.195	0.3792	237.02
X34,Y14	476.406	476.802	0.3956	247.23
X34,Y15	476.832	477.228	0.3959	247.45
X34,Y16	477.161	477.557	0.3962	247.62
X34,Y17	477.414	477.81	0.3964	247.76
X34,Y18	477.314	477.71	0.3963	247.70
X34,Y19	477.359	477.755	0.3964	247.73
X34,Y20	477.527	477.924	0.3965	247.81
X35,Y9	475.543	475.938	0.3949	246.78
X35,Y10	475.806	476.201	0.3951	246.92
X35,Y11	476.069	476.464	0.3953	247.06
X35,Y12	476.246	476.641	0.3954	247.15
X35,Y13	476.393	476.789	0.3956	247.23
X35,Y14	476.604	477	0.3957	247.34
X35,Y15	476.919	477.315	0.3960	247.50
X35,Y16	477.248	477.644	0.3963	247.67
X35,Y17	477.576	477.973	0.3965	247.84
X35,Y18	477.525	477.922	0.3965	247.81
X35,Y19	477.584	477.981	0.3966	247.84
X35,Y20	477.603	478	0.3966	247.85
X36,Y9	475.745	476.14	0.3950	246.89
X36,Y10	475.885	476.288	0.4031	251.95
X36,Y11	476.032	476.435	0.4032	252.02
X36,Y12	476.180	476.583	0.4034	252.10
X36,Y13	476.327	476.73	0.4035	252.18
X36,Y14	476.890	477.294	0.4040	252.48
X36,Y15	477.016	477.42	0.4041	252.55
X36,Y16	477.326	477.73	0.4043	252.71
X36,Y17	477.595	478	0.4046	252.85
X36,Y18	477.728	478.133	0.4047	252.92

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X36,Y19	477.803	478.208	0.4047	252.96
X36,Y20	477.853	478.258	0.4048	252.99
X37,Y10	475.831	476.234	0.4031	251.92
X37,Y11	475.973	476.376	0,4032	251.99
X37,Y12	476.121	476.524	0.4033	252.07
X37,Y13	476.444	476.848	0.4036	252.24
X37,Y14	477.105	477.509	0.4041	252.59
X37,Y15	477.324	477.728	0.4043	252.71
X37,Y16	477.437	477.841	0.4044	252.77
X37,Y17	477.747	478.152	0.4047	252.93
X37,Y18	477.940	478.345	0.4049	253.03
X37,Y19	478.023	478.428	0.4049	253.08
X37,Y20	478.038	478.443	0.4049	253.09
X37,Y21	478.249	478.654	0.4051	253.20
X38,Y10	475.825	475.228	0.4031	251.92
X38,Y11	475.947	476.35	0.4032	251.98
X38,Y12	476.087	476.49	0.4033	252.05
X38,Y13	476.459	476.863	0.4036	252.25
X38,Y14	477.188	477.592	0.4042	252.64
X38,Y15	477.768	478.173	0.4047	252.94
X38,Y16	478,386	478.791	0.4052	253.27
X38,Y17	477.757	478.162	0.4047	252.94
X38,Y18	478.078	478.483	0.4050	253.11
X38,Y19	478.095	478.5	0.4050	253.12
X38,Y21	478.270	478.675	0.4051	253.21
X39,Y10	476.176	476.579	0.4034	252.10
X39,Y11	476.380	476.784	0.4035	252.21
X39,Y12	476.730	477.134	0.4038	252.39
X39,Y13	476.921	477.325	0.4040	252.50
X39,Y14	477.118	477.522	0.4042	252.60
X39,Y15	477.980	478.385	0.4049	253.06
X39,Y16	478.699	479.104	0.4055	253.44
X39,Y17	477.928	478.333	0.4048	253.03
X39,Y18	478.210	478.615	0.4051	253.18
X39,Y19	478.173	478.578	0.4051	253.16
X39,Y21	478.272	478.696	0.4243	265.19
X40,Y10	476.577	477	0.4228	264.25
X40,Y11	476.862	477.285	0.4231	264.41
X40,Y12	476.935	477.358	0.4231	264.45
X40,Y13	477.545	477.969	0.4237	264.79
X40,Y14	476.890	477.313	0.4231	264.42
X40,Y15	477.981	478.405	0.4240	265.03
X40,Y16	478.891	479.316	0.4249	265 53
V40 V17	478 296	478 72	0.4243	265.20



X40,Y18	478.291	478.715	0.4243	265.20
X40,Y19	478.232	478.656	0.4243	265.17
X41,Y10	476.693	477.116	0.4229	264.31
X41,Y11	477.219	477.642	0.4234	264.60
X41,Y12	477.159	477.582	0.4233	264.57
X41,Y13	477.906	478.33	0.4240	264.99
X41,Y14	476.577	477	0.4228	264.25
X41,Y15	478.132	478.556	0.4242	265.11
X41,Y16	478.111	478.535	0.4242	265.10
X41,Y17	478.571	478.996	0.4246	265.35
X41,Y18	478.516	478.941	0.4245	265.32
X41,Y19	478.461	478.885	0.4245	265.29
X42,Y10	476.999	477.422	0.4232	264.48
X42,Y11	477.728	478.152	0.4238	264.89
X42,Y12	477.547	477.971	0.4237	264.79
X42,Y13	478.065	478.489	0.4241	265.07
X42,Y14	477,454	477.878	0.4236	264.73
X42,Y15	477.701	478.125	0.4238	264.87
X42,Y16	478.258	478,682	0.4243	265.18
X42,Y17	478.815	479.24	0.4248	265.49
X42,Y18	478.772	479,197	0.4247	265.47
X42,Y19	478.696	479.121	0.4247	265.42
X43,Y11	478.007	478.431	0.4241	265.04
X43,Y12	478.005	478.429	0.4241	265.04
X43,Y13	478.003	478.427	0.4241	265.04
X43,Y14	478.093	478.517	0.4241	265.09
X43,Y15	477.849	478.273	0.4239	264.95
X43,Y16	478.406	478.83	0.4244	265.26
X43,Y17	478.962	479.387	0.4249	265.57
X43,Y18	479.029	479.454	0.4250	265.61
X43,Y19	478.924	479.349	0.4249	265.55
X44,Y11	478.285	478.709	0.4243	265.20
X44,Y12	478.283	478.707	0.4243	265.19
X44,Y13	478.281	478.705	0.4243	265.19
X44,Y14	478.288	478.712	0.4243	265.20
X44,Y15	478.491	478.915	0.4245	265.31
X44,Y16	478.676	479.101	0.4247	265.41
X44,Y17	479.110	479.535	0.4250	265.65
X44,Y18	479.285	479.71	0.4252	265.75
X45,Y11	478.566	478.991	0.4246	265.35
X45,Y12	478.578	479.003	0.4246	265.36
X45,Y13	478.581	479.006	0.4246	265.36
X45,Y14	478.575	479	0.4246	265.36
X45,Y15	478.684	479,109	0.4247	265.42

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X45,Y16	479.123	479.548	0.4251	265.66
X45,Y17	479.434	479.859	0.4253	265.83
X45,Y18	479.365	479.79	0.4253	265.79
X46,Y11	478.819	479.244	0.4248	265.49
X46,Y12	478.813	479.238	0.4248	265.49
X46,Y13	478.808	479.233	0.4248	265.49
X46,Y14	478.575	479	0.4246	265.36
X46,Y15	478.699	479.124	0.4247	265.43
X46,Y16	479.028	479.453	0.4250	265,61
X46,Y17	479.540	479.965	0.4254	265,89
X46,Y18	479.575	480	0.4255	265.91
X47,Y11	478.404	478.828	0.4244	265.26
X47,Y12	479.030	479,455	0.4250	265.61
X47,Y13	478.582	479.007	0.4246	265.36
X47,Y14	478.838	479.263	0.4248	265.50
X47,Y15	478.960	479.385	0.4249	265.57
X47,Y16	478.634	479.059	0.4246	265.39
X47,Y17	479.499	479.924	0.4254	265.87
X47,Y18	479.808	480.234	0.4257	266.04
X48,Y11	478.266	478.69	0.4243	265.18
X48,Y12	478.444	478.868	0.4245	265.28
X48,Y13	478.739	479.164	0.4247	265.45
X48,Y14	478.992	479.417	0.4249	265.59
X48,Y15	479.290	479.715	0.4252	265.75
X48,Y16	479.175	479.6	0.4251	265.69
X48,Y17	479.392	479.817	0.4253	265.81
X48,Y18	479.882	480.308	0.4257	266.08
X49,Y12	478.486	478.925	0.4389	274.29
X49,Y13	478.811	479.25	0.4392	274.48
X49,Y14	479.086	479.525	0.4394	274.64
X49,Y15	479.433	479.873	0.4397	274.84
X49,Y16	479.701	480.141	0.4400	274.99
X49,Y17	479.564	480.004	0.4399	274.91
X49,Y18	479.870	480.31	0.4401	275.09
X50,Y12	478.462	478.901	0.4388	274.28
X50,Y13	478.758	479.197	0.4391	274.45
X50,Y14	479.171	479.611	0.4395	274.69
X50,Y15	479.544	479.984	0.4398	274.90
X50,Y16	479.993	480.433	0.4403	275.16
X50,Y17	480.095	480.535	0.4403	275.22
X50,Y18	479.880	480.32	0.4401	275.09
X51,Y12	478.375	478.814	0.4388	274.23
X51,Y13	478.727	479.166	0.4391	274.43
X51.Y14	479.173	479.613	0.4395	274.69

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X51,Y15	479.253	479.702	0.4492	280.74
X51,Y16	479.819	480.269	0.4497	281.07
X51,Y17	480.189	480.639	0.4501	281.28
X51,Y18	480.031	480,481	0.4499	281.19
X52,Y13	478.694	479.143	0.4487	280.41
X52,Y14	478.510	478.958	0.4485	280.30
X52,Y15	478.781	479.23	0.4487	280.46
X52,Y16	479.460	479.909	0.4494	280.86
X52,Y17	480.043	480.493	0.4499	281.20
X52,Y18	480.132	480.582	0.4500	281.25
X53,Y13	479.503	479.952	0.4494	280.88
X53,Y14	479.278	479.727	0.4492	280.75
X53,Y15	478.638	479.087	0.4486	280.38
X53,Y16	478.754	479.203	0.4487	280.44
X53,Y17	479.505	479.954	0.4494	280.88
X53,Y18	479.962	480.412	0.4498	281.15
X54,Y13	480.311	480.761	0.4502	281.36
X54,Y14	479.434	479.883	0.4493	280.84
X54,Y15	479.005	479.454	0.4489	280.59
X54,Y16	479.063	479.512	0.4490	280.62
X54,Y17	479.220	479.669	0.4491	280.72
X54,Y18	479.385	479.834	0.4493	280.81
X55,Y13	480.833	481.284	0.4507	281.66
X55,Y14	479.396	479.845	0.4493	280.82
X55,Y15	479.169	479.618	0.4491	280.69
X55,Y16	479.081	479.54	0.4586	286.64
X55,Y17	479.104	479.563	0.4586	286.65
X55,Y18	479.213	479.672	0.4587	286.71
X56,Y13	480.947	481.407	0.4604	287.75
x56,Y14	479.491	479.95	0.4590	286.88
X56,Y15	478.909	479.367	0.4585	286.53
X56,Y16	479.800	480.259	0.4593	287.07
X56,Y17	479.065	479.524	0.4586	286.63
X56,Y18	479.188	479.647	0.4587	286.70
X57,Y14	479.874	480.333	0.4594	287.11
X57,Y15	479.668	480.127	0.4592	286.99
X57,Y16	479.887	480.356	0.4690	293.13
x57,Y17	480.267	480.736	0.4694	293.36
X57,Y18	479.214	479.682	0.4683	292.72
X57,Y19	479.566	480.035	0.4687	292.93
X58,Y14	480.353	480.822	0.4695	293.41
X58,Y15	480.157	480.626	0.4693	293.29
X58,Y16	479.995	480.464	0.4691	293.19
K58,Y17	480.485	480.955	0.4696	293.49

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X58,Y18	480.087	480.556	0.4692	293.25
X58,Y19	479.239	479.707	0.4684	292.73
X59,Y14	480.840	481.31	0.4699	293.71
X59,Y15	480.104	480.573	0.4692	293.26
X59,Y16	479.909	480.378	0.4690	293.14
X59,Y17	480.242	480.711	0.4694	293.34
X59,Y18	480.484	480.954	0.4696	293.49
X59,Y19	479.289	479.762	0.4732	295.76
X60,Y14	480.738	481.213	0.4747	296.66
X60,Y15	480.677	481.152	0.4746	296.62
X60,Y16	479.935	480.409	0.4739	296.16
X60,Y17	480.652	481.127	0.4746	296.61
X60,Y18	480.655	481,13	0.4746	296.61
X60,Y19	479.408	479.881	0.4733	295.84
X61,Y14	480.754	481.229	0.4747	296.67
X61,Y15	480.477	480.951	0.4744	296.50
X61,Y16	480.287	480.761	0.4742	296.38
X61,Y17	480.573	481.047	0.4745	296.56
X61,Y18	480.750	481.225	0.4747	296.67
X61,Y19	479.871	480.345	0.4738	296.12
X61,Y20	479.760	480.234	0.4737	296.05
X62,Y14	481.355	481.83	0.4753	297.04
X62,Y15	481.077	481.552	0.4750	296.87
X62,Y16	480.582	481.056	0.4745	296.56
X62,Y17	480.667	481.142	0.4746	296.61
X62,Y18	480.844	481.319	0.4748	296.72
X62,Y19	480.336	480.81	0.4743	296.41
X62,Y20	480.244	480.718	0.4742	296.35
X63,Y14	481.955	482.431	0.4759	297.41
X63,Y15	481.221	481.696	0.4751	296.96
X63,Y16	480,992	481.452	0.4604	287.78
X63,Y17	480.967	481.427	0.4604	287.76
X63,Y18	481.037	481.497	0.4605	287.81
X63,Y19	480.716	481.176	0.4602	287.61
X63,Y20	480.307	480.767	0.4598	287.37
X64,Y15	481.203	481.664	0.4606	287.91
X64,Y16	481.216	481.677	0.4607	287.91
X64,Y17	480.912	481.372	0.4604	287.73
X64,Y18	481.360	481.821	0.4608	288.00
X64,Y19	480.833	481.293	0.4603	287.68
X64,Y20	480.471	480.931	0.4599	287.47
X64,Y21	480.132	480.592	0.4596	287.26
X65,Y15	482.365	482.827	0.4618	288.60
X65.Y16	481.850	482.311	0.4613	288.29



X65,Y17	481.459	481.92	0.4609	288.06
X65,Y18	481.504	481.965	0.4609	288.08
X65,Y19	481.232	481.693	0.4607	287.92
X65,Y20	480.777	481.237	0.4602	287.65
X65,Y21	480.438	480.898	0.4599	287.45
X66,Y15	482.906	483.368	0.4623	288.92
X66,Y16	482.497	482.959	0.4619	288.68
X66,Y17	482.052	482.513	0.4615	288.41
X66,Y18	481,667	482.128	0.4611	288.18
X66,Y19	481.518	481.979	0.4609	288.09
X66,Y20	481.081	481.542	0.4605	287.83
X66,Y21	480.918	481.378	0.4604	287.73
X67,Y14	482.320	482.782	0.4617	288.57
X67,Y15	482.218	482,68	0.4616	288.51
X67,Y16	483.060	483.522	0.4624	289.02
X67,Y17	482.331	482.793	0.4617	288.58
X67,Y18	482.453	482.915	0.4618	288.65
X67,Y19	481.846	482.307	0.4613	288.29
X67,Y20	481.359	481.82	0.4608	288.00
X67,Y21	481.303	481.764	0.4607	287.96
X67,Y22	481.212	481.673	0.4607	287.91
X68,Y14	482.214	482.676	0.4616	288.51
X68,Y15	482.211	482.673	0.4616	288.51
X68,Y16	482.830	483.292	0.4622	288.88
X68,Y17	482.726	483.188	0.4621	288.82
X68,Y18	482.829	483.291	0.4622	288.88
X68,Y19	482.157	482.619	0.4616	288,48
X68,Y20	481,691	482.152	0.4611	288.20
X68,Y21	481.543	482.004	0.4610	288.11
X68,Y22	481.452	481.913	0.4609	288.05
X69,Y14	482.497	482,959	0.4619	288.68
X69,Y15	482.550	483.012	0.4619	288.71
X69,Y16	483.172	483.635	0.4625	289.08
X69,Y17	483.005	483.467	0.4624	288.98
X69,Y18	483.064	483.526	0.4624	289.02
x69,Y19	482,469	482.931	0.4619	288.66
X69,Y20	481.783	482.244	0.4612	288.25
x69,Y21	481.684	482.145	0.4611	288.19
x69,Y22	481.665	482.154	0.4891	305.68
x69,Y23	481.652	482.141	0.4891	305.67
X70,Y14	482.542	483.032	0.4900	306.23
K70,Y15	483.370	483.861	0.4908	306.76
X70,Y16	483.487	483,978	0.4909	306,83
X70.Y17	483.188	483.679	0.4906	306.64



X70,Y18	483.114	483.605	0.4906	305,60
X70,Y19	482.875	483.365	0.4903	306.44
X70,Y20	481.953	482.442	0.4894	305.86
X70,Y21	482.090	482.596	0.5064	316.51
X70,Y22	481.901	482.407	0.5062	316.39
X70,Y23	481.839	482.345	0.5062	316.35
X71,Y15	483.880	484.388	0.5083	317.69
X71,Y16	483.637	484.145	0.5080	317.53
X71,Y17	483.479	483.987	0.5079	317.43
X71,Y18	483.307	483.815	0.5077	317.31
X71,Y19	483.351	483.859	0.5077	317.34
X71,Y20	482.581	483.088	0.5069	316.84
X71,Y21	482.761	483.268	0.5071	316.95
X71,Y22	482.793	483.3	0.5072	316.97
X71,Y23	481.907	482.413	0.5062	316.39
X71,Y24	481.900	482,406	0.5062	316.39
X71,Y26	482.018	482.524	0.5063	316.47
X72,Y15	484.038	484.546	0.5085	317.79
X72,Y16	483.795	484.303	0.5082	317.63
X72,Y17	483.802	484.31	0.5082	317.64
X72,Y18	483.628	484.136	0.5080	317.52
X72,Y19	483.454	483.962	0.5079	317.41
X72,Y20	483.217	483.725	0.5076	317.25
X72,Y21	483.130	483.638	0.5075	317.20
X72,Y22	483.170	483.678	0.5076	317.22
X72,Y23	482.060	482.566	0.5064	316.49
X72,Y24	481.968	482.474	0.5063	316.43
X72,Y26	482.147	482.653	0.5065	316.55
X73,Y15	484.091	484.6	0.5085	317.83
X73,Y16	483.934	484.462	0.5278	329.85
X73,Y17	484.105	484.633	0.5279	329.96
X73,Y18	483.931	484.459	0.5278	329.85
X73,Y19	483.721	484.249	0.5275	329.70
X73,Y20	483.409	483.936	0.5272	329.49
X73,Y21	483.480	484.007	0.5273	329.54
X73,Y22	483.521	484.048	0.5273	329.57
X73,Y23	483.360	483.887	0.5271	329.46
X73,Y24	482.016	482.542	0.5257	328 54
X74,Y15	484.119	484.647	0.5280	379 97
X74,Y16	484.107	484.635	0.5279	379.97
X74,Y17	484.429	484.957	0.5283	320.19
X74,Y18	484.250	484.783	0.5330	333.10
X74,Y19			9.2339	555.10
and the second se	483.920	484,453	0.5326	337 97



			0.4424	115292.4491
X76,Y26	482.621	483.152	0.5315	332.17
X76,Y25	482.546	483.077	0.5314	332.12
X76,Y24	483.599	484.132	0.5325	332.84
X76,Y23	484.728	485.262	0.5338	333.62
X76,Y22	484.647	485.181	0.5337	333.56
X76,Y21	484.132	484.665	0.5331	333.21
X76,Y20	484.279	484.812	0.5333	333.31
X76,Y19	484.774	485.308	0.5338	333.65
X76,Y18	484.608	485.142	0.5337	333.54
X76,Y17	485.000	485.534	0.5341	333.80
X76,Y16	484.501	485.035	0.5335	333.46
X76,Y15	484.206	484.739	0.5332	333.26
X75,Y25	482.379	482.91	0.5312	332.00
X75,Y24	483.309	483.841	0.5319	332.45
X75,Y23	484.160	484.693	0.5329	333.03
X75,Y22	484.305	484.838	0.5330	333.13
X75,Y21	483.319	483.851	0.5319	332.46
X75,Y20	483.954	484.487	0.5326	332.89
X75,Y19	484.149	484.682	0.5328	333.03
X75,Y18	484.487	485.02	0.5332	333.26
X75,Y17	484.747	485.281	0.5335	333.44
X75,Y16	484.302	484.835	0.5330	333.13
X75,Y15	484.160	484.693	0.5329	333.03
X74,Y24	482.194	482.725	0.5307	331.68
X74,Y23	483.816	484.348	0.5325	332.80
X74,Y22	483.884	484.417	0.5326	332.85
X74,Y21	483.641	484.173	0.5323	332.68

Yan	Yamuna River Lot No (23/1)- Non Mineable Area						
GRID of non mineable area	GROUND LEVEL of mineable area (Pre- Monsoon)	GROUND LEVEL of mineable area (Post Monsoon)	Difference in Elevation	Reserve per grid (Cubic Meter)			
X44,Y19	479.193	479.551	0.358	223.70			
X45,Y19	479.036	479.394	0.358	223.63			
X46,Y19	479.036	479.394	0.358	223.63			
X47,Y19	479.317	479.675	0.358	223.76			
X48,Y19	479.599	479.957	0.358	223.89			
X49,Y19	479.880	480.238	0.358	224.02			
X50,Y19	480.068	480.427	0.359	224.11			

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X51,Y19	479.936	480.294	0.358	224.05
X52,Y19	479.807	480.165	0.358	223.99
X53,Y19	479.788	480.146	0.358	223.98
X54,Y19	479.987	480.346	0.359	224.07
X55,Y19	479.422	479.78	0.358	223.81
X56,Y19	479.504	479.862	0.358	223.85
X38,Y20	478.141	478.498	0.357	223.21
X39,Y20	478.195	478.552	0.357	223.23
X40,Y20	478.220	478.625	0.405	253.18
X41,Y20	478.277	478.682	0.405	253.21
X42,Y20	478.333	478.738	0.405	253.24
X43,Y20	478.390	478.795	0.405	253.27
X44,Y20	478.506	478.911	0.405	253.33
X45,Y20	478.418	478.823	0.405	253.29
X46,Y20	478.344	478.749	0.405	253.25
X47,Y20	478.574	478.979	0.405	253.37
X48,Y20	478.696	479.101	0.405	253.43
X49,Y20	478.856	479.262	0.405	253.52
X50,Y20	478.869	479.275	0.406	253.53
X51,Y20	479.192	479.598	0.406	253.70
X52,Y20	479.350	479.756	0.406	253.78
X53,Y20	479.955	480.362	0.407	254.10
X54,Y20	480.560	480.967	0.407	254.42
X55,Y20	480.487	480.894	0.407	254.38
X56,Y20	480.243	480.65	0.407	254.25
X57,Y20	479.982	480.389	0.407	254.12
X58,Y20	479.582	480.003	0.421	262.91
X59,Y20	479.612	480.033	0.421	262.93
X60,Y20	479.349	479.769	0.420	262.78
X40,Y21	477.975	478.394	0.419	262.03
X41,Y21	477.875	478.294	0.419	261.98
X42,Y21	477.776	478.195	0.419	261.92
X43,Y21	478.551	478.971	0.420	262.35
X44,Y21	478.893	479.313	0.420	262.53
X45,Y21	479.236	479.656	0.420	262.72
X46,Y21	479.553	479.974	0.421	262.90
X47,Y21	479.802	480.223	0.421	263.03
X48,Y21	480.050	480.471	0.421	263.17
X49,Y21	480.299	480.72	0.421	263.30
X50,Y21	480.525	480.946	0.421	263.43
X51,Y21	480.666	481.097	0.431	269.52
X52,Y21	480.801	481.232	0.431	269.60
X53,Y21	480.937	481.368	0.431	269.68
X54.Y21	480.790	481,221	0.431	269.59



X55,Y21	481.370	481.802	0.432	269.92
X56,Y21	481.480	481.912	0.432	269.98
X57,Y21	481.476	481.908	0.432	269.98
X58,Y21	481.533	481.965	0.432	270.01
X59,Y21	481.344	481.792	0.448	279.93
X60,Y21	481.332	481.78	0.448	279.93
X61,Y21	479.708	480.154	0.446	278.98
X62,Y21	480.195	480.642	0.447	279.26
X63,Y21	480.065	480.512	0.447	279.19
X47,Y22	480.645	481.092	0.447	279.53
X48,Y22	480.798	481.245	0.447	279.61
X49,Y22	480.950	481.398	0.448	279.70
X50,Y22	481.103	481.551	0.448	279.79
X51,Y22	481.255	481.703	0.448	279.88
X52,Y22	481.408	481.856	0.448	279.97
X53,Y22	481.561	482.009	0.448	280.06
X54,Y22	481.714	482.162	0.448	280.15
X55,Y22	481.867	482.315	0.448	280.24
X56,Y22	482.019	482.468	0.449	280.33
X57,Y22	482.156	482.613	0.457	285.46
X58,Y22	481.889	482.345	0.456	285.30
X59,Y22	482.097	482.554	0.457	285.42
X60,Y22	482.533	482.99	0.457	285.68
X61,Y22	482.196	482.653	0.457	285.48
X62,Y22	480.944	481.409	0.465	290.76
X63,Y22	479.794	480.258	0.464	290.07
X64,Y22	479.789	480.253	0.464	290.06
X65,Y22	480.122	480.586	0.464	290.26
X66,Y22	480.967	481.432	0.465	290.78
X54,Y23	481.718	482.184	0.466	291.23
X55,Y23	481.871	482.337	0.466	291.32
X56,Y23	482,024	482.49	0.466	291.41
X57,Y23	482.177	482.643	0.466	291.51
X58,Y23	482.325	482.796	0.471	294.62
X59,Y23	482.477	482.949	0.472	294.71
X60,Y23	482.619	483.091	0.472	294.80
X61,Y23	482.757	483.229	0.472	294.88
X62,Y23	482.894	483.366	0.472	294.96
X63,Y23	482.391	482.862	0.471	294.66
X64,Y23	480.540	481.01	0.470	293.53
X65,Y23	480.182	480.651	0.469	293.31
X66,Y23	480.861	481.341	0.480	299.75
X67,Y23	481.102	481.582	0.480	299.90
X68,Y23	481.375	481.855	0.480	300.07



X60,Y24	482.643	483.124	0.481	300.86
X61,Y24	482.776	483.277	0.501	313.03
X62,Y24	482.929	483.43	0.501	313.13
X63,Y24	483.068	483.569	0.501	313.22
X64,Y24	483.205	483.706	0.501	313.31
X65,Y24	483.271	483.772	0.501	313.35
X66,Y24	480.781	481.289	0.508	317.76
X67,Y24	481.052	481.575	0.523	326.98
X68,Y24	481.337	481.86	0.523	327.17
X69,Y24	481.622	482.146	0.524	327.37
X70,Y24	481.815	482.339	0.524	327.50
X67,Y25	483.365	483.891	0.526	328.55
X68,Y25	481.332	481.865	0.533	333.20
X69,Y25	481.617	482.15	0.533	333.40
X70,Y25	481.799	482,333	0.534	333.52
X71,Y25	481.866	482.4	0.534	333.57
X72,Y25	481.947	482.486	0.539	336.64
X73,Y25	482.071	482.615	0.544	339.75
X74,Y25	482.201	482.745	0.544	339.84
X73,Y26	482.239	482.783	0.544	339.87
X74,Y26	482.370	482.914	0.544	339.96
			0.442856	32107.03313

Total Replenishment Quantity

Replenishable Quantity	Reserve (cubic meter)
Replenishable Quantity in Mineable area	115292.45
Replenishable Quantity in Non Mineable area	32107.03
Partial Grid deduction(110 Grids)	-15399.48
Total Replenishable Quantity	132000

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Chainage in mt.	0.0	25.0	50.0	75.0	100.0	125.0	150.0	175.0	200.0	225.0	250.0	275.0	300.0	325,0	350.0	375.0	400.0	
PRE MONSOON RL	+ 485,704	+ 484,849	+ 484.737	+ 484.796	+ 485.039	+ 485.175	+ 485.643	+ 485.638	+ 485,811	+ 485.746	+ 485,661	+ 485.527	+ 484.961	+ 484.558	+ 483.893	+ 483.432	+ 483.557	
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DATUM468.0		_	_	-	_					_	-			_				
470.0	1																	
474.0																		
476.0	1-																	
478.0	1-																	
480.0	1-																	
482.0)-																2 2	
484.0																20031		
496.0	-																	







		Annexure-A
Annexure 4A		
		20
	SCALE	Annexure-A
y Roorkee	1:3000 (H)	SHEET NO.
	1:300 (V)	1 of 1
		हींठ आरठ होठ गर्ग/Dr. R. D. Garg सङ्घाष्ट्रायस्थित/Associate Professor जानपद अभिवाजिमी विषाण Department of Civil Engineering भारतीय वीर्वामियी संस्थान काली

ndian Institute of Technology Roorke চরগা/Roorkee-247 667, INDIA







Annexure 4B



X-Section of the Dumet-Yamuna River (Lot No. 23/1) in Pre and Post-Monsoon Chainage from (0.0m. to 2116.74 m.)

493.07 492.0-491.0-490.0-489.0-488.0-0 487.0-496.0-485.0-484.0-483.0- \odot DATUM 482.0 0 POST RL PRE RL 125.29 B OFFSET 0 63 83 9





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0





X-Section of the Dumet-Yamuna River (Lot No. 23/1)	Civil Engineering Depa
in Pre and Post-Monsoon Chainage from	Indian Institute of Techno
(0.0m. to 2116.74 m.)	Roorkee -247667



X-Section of the Dumet-Yamuna River (Lot No. 23/1) in Pre and Post-Monsoon Chainage from

Civil Engineering Depar Indian Institute of Technol Roorkee -247667

		August 112/18 डीo आरo डीo गर्ग/Dr. R. D. Garg सह प्रायमक/Associate Professor जानपर अधियात्रिकी विषाम Department of Civil Engineering भारतीय प्रीयोगिकी संस्थान डड़की Indian Institute of Technology Roorkee उदयी/Roorkee-247 667, INDIA	
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X-Section of the Dumet-Yamuna River (Lot No. 23/1) in Pre and Post-Monsoon Chainage from (0.0m. to 2116.74 m.)

Civil Engineering Depar Indian Institute of Technol Roorkee -247667

		ही। जारव होव मर्ग/Dr. R. D. Garg मह प्राथम/Associate Professor जानपर अभिवासिकी विश्वान Department of Civil Engineering पाररीय क्रीमोनिक सरवान करनी Indian Institute of Technology Noorkee ठइकी/Roorkee-247 667, INDIA
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X-Section of the Dumet-Yamuna River (Lot No. 23/1) in Pre and Post-Monsoon Chainage from (0.0m. to 2116.74 m.)

Civil Engineering Depar Indian Institute of Technol Roorkee -247667

		ब्रीठ आरंठ डीठ गर्ग/Dr. R. D. Garg सह प्राध्यापद/Associate Professor जानपर अधिवानिकी विमाग Department of Civil Engineering गारतीय ग्रीयोगिकी संस्थान रहवी Indian Institute of Technology Roorkee हड्यपी/Roorkee-247 667, INDIA
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Roorkee -247667

		स्ति आरं हो० गर्ग/Dr. R. D. Garg सड प्राप्तागर्ग-Associate Professor जनवर अध्यापिकी निष्पा Department of Civil Engineering भारतीय ग्रीयोगिकी संस्वान उड़की Indian Institute of Technology Roorkee रुज़की/Roorkee-247 667, INDIA
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X-Section of the Dumet-Yamuna River (Lot No. 23/1) in Pre and Post-Monsoon Chainage from (0.0m. to 2116.74 m.)

Civil Engineering Depart Indian Institute of Technolo Roorkee -247667 Annexure-B8

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डो॰ आर॰ डी॰ गर्ग/Dr. R. D. Gar	g
মত সাম্মানক/Associate Professor জালগর প্রমিথ্যজিপ্ট বিশ্বাস	
Department of Civil Engineering भारतीय प्रीकोशिकी संस्थान सहावी	
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8 of 28

Annexure-B8

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X-Section of the Dumet-Yamuna River (Lot No. 23/1) in Pre and Post-Monsoon Chainage from (0.0m. to 2116.74 m.)

Civil Engineering Depar Indian Institute of Technol Roorkee -247667

		ही। असरक क्रीक गर्ग/Dr. R. D. Garg सह प्राप्यालक/Associate Professor आरायव अधिवालियी विमाग Department of Civil Engineering भारतीय क्रीयोगियी प्रस्थान स्टब्सी Indian Institute of Technology Reorkee स्टब्सी/Roorkee-247 657, INDIA
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X-Section of the Dumet-Yamuna River (Lot No. 23/1) in Pre and Post-Monsoon Chainage from (0.0m. to 2116.74 m.)

Civil Engineering Department Indian Institute of Technology Roorkee Roorkee -247667



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X-Section of the Dumet-Yamuna River (Lot No. 23/1) in Pre and Post-Monsoon Chainage from (0.0m. to 2116.74 m.)

Civil Engineering Department Indian Institute of Technology Roorkee Roorkee -247667



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X-Section of the Dumet-Yamuna River (Lot No. 23/1) in Pre and Post-Monsoon Chainage from (0.0m. to 2116.74 m.)

Civil Engineering Depar Indian Institute of Technol Roorkee -247667

		संह आराज डीठ गर्ग/Dr. R. D. Garg संह आसमपन/Associate Professor भारताय आवायको विचान Department of Civil Engineering भारतीय आवोगिको संस्थान रहन्म Indian Institute of Technology Roorkee हद्ववी/Roorkee-247 667, INDIA
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X-Section of the Dumet-Yamuna River (Lot No. 23/1) in Pre and Post-Monsoon Chainage from (0.0m. to 2116.74 m.)

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X-Section of the Dumet-Yamuna River (Lot No. 23/1) in Pre and Post-Monsoon Chainage from (0.0m. to 2116.74 m.)

Civil Engineering Departm Indian Institute of Technolog Roorkee -247667



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Annexure-B18







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X-Section of the Dumet-Yamuna River (Lot No. 23/1) in Pre and Post-Monsoon Chainage from (0.0m. to 2116.74 m.)

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Annexure-B24

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X-Section of the Dumet-Yamuna River (Lot No. 23/1) in Pre and Post-Monsoon Chainage from (0.0m. to 2116.74 m.)

Civil Engineering Indian Institute of T Roorkee -2

Annexure-B27

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DESCRIPTION	SYMBOL
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X-Section of the Dumet-Yamuna River (Lot No. 23/1) in Pre and Post-Monsoon Chainage from (0.0m. to 2116.74 m.)

Civil Engineering Department Indian Institute of Technology Roorkee Roorkee -247667

Annexure-B28

ALL JIL 19 डी॰ उगर॰ डी॰ पर्ग/Dr. R. D. Garg सह प्राप्यापत्र:Associate Professor आत्रपत अपियायिकी विश्वान Department of Civil Engineering भारतीय प्रीयोगिकी संस्थान स्टब्सी Indian Institute of Technology Roorkee स्टब्से/Roorkee-247 667, NDIA

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Annexure 6





Annexure 7

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

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

Ref. 900] 44/3 2019

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

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)

8

ENVIRONMENTAL MANAGEMENT PLAN (EMP) REPORT

OF

RIVER YAMUNA LOT NO. 23/1 SAND, BAJRI & BOULDER MINING PROJECT

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

Area: 30.035 Ha, Proposed Capacity: 2,80,000 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: APRIL 2015



Prepared By GRASS ROOTS RESEARCH & CREATION INDIA (P) LTD.

(An ISO 9001:2008 Certified Co.: Accredited by QCI / NABET: Approved by MoEF&CC, Gol) F-374-375, Sector-63, Noida, U.P. Ph.: 0120- 4044630, Telefax: 0120- 2406519 Email: eia@grc-india.com, grc.enviro@gmail.com Website: <u>http://www.grc-india.com</u>

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
СРСВ	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
На	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
MoEFCC	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 SPCB	State Highway State Pollution Control Board
ToR	Terms of Reference
ТРА	Tonnes Per Annum
USEPA	United State Environmental Protection Agency

By Speed Post

No. J-11015/125/2013-IA.II (M) Government of India Ministry of Environment & Forests

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

Τn

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

Subject: Mining of Sand, Bajri and Boulders in River Yamuna Lot No. 23/1 of M/s Garhwal Mandal Vikas Nigam Ltd. Located at Vill-Dumate, Tehsil-Vikasnagar, Distt-Dehradun, Uttarakhand (30.035 ha)- TOR regarding.

The Proposal was received in the Ministry on 26.04.2013. The Proposal is to determine the Terms of Reference for which the proponent had submitted information in the prescribed format (Form-1) along with Pre-feasibility report.

The Mine Lease area is located at Village Dumate, Tehsil Vikasnagar, 2. District Debradua, Uttarakhand. The proposed production capacity is 2.8 Lakh TPA. The lease area lies on River Yamuna. The Mine Lease area is between 30° 30'42.15'N to 77° 50'22.59'E. The Project is located in seismic zone-IV. It is 'A' category project as due to the presence of the interstate houndary between Uttarakhand and Himachal Pradesh and Doon Valley lies within 10 Km radius of the lease area. 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 sicving 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 sesson. The lease area has been decided as per the Letter of Intent 589/Bhu. Khani.E./2012-13 dated 23-1-2013. Total water (Letter No requirement will be 3.4 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, 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. 17,50,000.

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

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- 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.

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- 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.

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- 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. Phasewise 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 preplacement 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-I 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 pracedure prescribed under the EIA Notification, 2006.

(Dr. Saroj) Director

Copy to:

- (i) The Secretary, Ministry of Mines, Government of India, Shastri-Bhawan, New Delh;
- The Secretary, Department of Mines & Geology, Government of Uttarakhand, Secretariat, Dehradun.
- (iii) The Secretary, Department of Environment, Government of Uttarakhand, Secretariat, Debradum.
- (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 Minos, Indira Bhavan, Civil-Lines, Nagpur-440 001.
- (xi) The District Collector, Dehradun District, Uttarakhand.
- (xii) Guard File.

Saboil Director

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CHAPTER-I

INTRODUCTION

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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 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.

The present Environmental Impact Assessment report is prepared to comply with the Terms of Reference (TOR) received from EAC MoEF&CC, New Delhi, GOI under EIA notification of the MoEF&CC, New Delhi, dated 14th September, 2006 as amended and also the EIA Technical Manual for Mining of Minerals (Feb, 2010) of MoEF&CC, New Delhi, Govt. of India, for seeking environmental clearance for mining of sand 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. 23/1 Sand, *Bajri* & Boulder Mining Project over an area of 30.035 ha near Village: Dumate, Tehsil: VikasNagar & District: Dehradun, Uttarakhand, for the allotted lease area, decided as per the Letter of Intent vide (Letter No. 589/Bhu. Khani.E./2012-13 dated 23-1-2013 issued byGeology & 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 30.035 Ha. near village: Dumate, 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 also Doon Valley an eco-sensitive zone lies within the 10 km radius of the lease area

The project proposal was submitted to Ministry of Environment, Forest and Climate Change, New Delhi for its appraisal. Based on which, presentation for Terms of Reference (TOR) was held during June 26th-28th, 2013. Based on the data provided and presentation done, the Ministry of Environment, Forest and Climate Change, New Delhi has issued the Terms of Reference vide letter No. J-11015/125/2013-IA.II (M) dated 16th September, 2013.

There are four other leases lies within the 500m radius of the proposed Sand, Bajri and Boulder Mining Project, District Dehradun, Uttarakhand and the cumulative area of all the five mines is 38.28 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

RIVER YAMUNA LOT NO. 23/1 SAND, *BAJRI* & BOULDER MINE

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 still comes under A Category without cluster situation due to the presence of Doon Valley as all the other 4 leases awarded EC prior to 15th January, 2016.

It has been proposed to mine around 2.8 lakh Tonnes per annum of minerals. The estimated project cost for the proposed project is Rs. 17, 15, 000.

The proposed mining lease area falls in Survey of India Toposheet 53F14. The mine lease co-ordinates and connectivity details are listed below:

	Latitude:	30°30'42.15"N to	30°30'40.55"N
Coordinates			
	Longitude :	77°50'22.59"E to	77°51'10.91"E

Connectivity Details given below:

С	Aerial Distance	
Nearest Railway Station	Dehradun Railway Station in SE direction.	Approx 28 km
Nearest Airport	Jolly Grant Airport in SE direction.	Approx 48 km
Nearest Highway	NH-123 in W direction	Approx. 0.7 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 Ministry of Environment, Forest and Climate Change, New Delhi for its appraisal. Based on which, presentation for Terms of Reference (TOR) was held during June 26th-28th, 2013. Based on the data provided and presentation done, the Ministry of Environment, Forest and Climate Change, New Delhi has issued the Terms of Reference vide letter No. J-11015/125/2013-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:-

S.No	ToR	Compliance
•		
1.	Year-wise production details since	It is a greenfield project for which LoI
	1994 should be given, clearly stating	has been issued by Geology and
	the highest production achieved in	Mining Unit, Uttarakhand vide Letter
	any one year prior to 1994.It may	No. 589/Bhu. Khani.E./2012-13
	also be categorically informed	dated 23-01-2013.
	whether there had been any	
	increase in production after the	No mining activity has been carried
	EIA Notification, 1994 came into	out prior to and or after 1994 till
	force w.r.t. the highest production	date.
	achieved prior to 1994.	
2.	A copy of the document in support of	A copy of LOI in support of the fact
	the fact that the proponent is the	that the proponent will be the
	rightful lessee of the mine should be	rightful lessee of the mine is
	given.	attached as Annexure I (A).
3.	All documents including approved	Approved Mine Plan is compatible
	mine plan, EIA and public hearing	with the EIA/EMP report in terms
	should be compatible with one	of the mine lease area, production
	another in terms of the mine lease	levels, waste generation and its
	area, production levels, waste	management and mining
	generation and its management	technology. The approved Mine
	and mining technology and	Plan is attached as Annexure XII .
	should be in the name of lessee.	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 XIII, stating that the
		mining characteristics remains
		same in both Draft & Final Report.

4.	All corner coordinates of the mine	Corner coordinates of the mine
	lease area superimposed on High	lease area superimposed on high
	Resolution Imagery/ toposheet	resolution toposheet has been
	Should be provided. Such an imagery	incorporated in Chapter II (Page
	of the proposed area should clearly	no.29-30). Landuse map is attached
	show the landuse and other	as Map No. 2.
	ecological features of the study	
	area (core and buffer zone).	
5.	Does the company have a well laid	Yes, there is well laid
	down Environment Policy approved	Environmental Policy for the
	by its Board of Directors? If so, it	proposed project attached as
	may be detailed in the EIA report	Annexure-VI.
	with description of the prescribed	
	operating process/procedures to	The project is being proposed by
	bring into focus any	Garhwal Mandal Vikas Nigam Ltd.,
	infringement/deviation/violation of	Government of Uttarakhand
	the environmental or forest	undertaking. Hence the policy i.e.
	norms/conditions? The hierarchical	Uttarakhand Mining Policy, 2011
	system or administrative order of	will be followed.
	the company to deal with the	
	environmental issues and for	The Environmental Management
	ensuring compliance with EC	Cell (EMC) has been formulated to
	conditions may also be given. The	deal with environmental issues
	system of reporting of non-	and to ensure compliance with EC
	compliances/violations of	conditions. Structure of EMC is
	environmental norms to the Board	attached as Annexure-XXVIII.
	of Directors of the company and/or	
	shareholders or stakeholders at	The EMC will be made in charge
	large may also be detailed in the	for reporting non compliances to
	EIA report.	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-138.

6.	Issues relating to Mine Safety,	Mines safety for workers working at
	including subsidence study in	the site has been taken care of
	case of underground mining and	Safety measures related to risks
	slope study in case of open cast	during mining activity, natural
	mining, blasting study etc. should be	disasters, etc. has been proposed
	detailed. The proposed	Details about the same are given in
	safeguard measures in each case	Chapter VII (Page no.128-129).
	should also be provided.	The proposed project is a river bed
	-	mining project. It is not an
		underground mining project and
		therefore no subsidence and
		blasting study is proposed.
7.	The study area will comprise of 10 km	The 10 km zone from periphery of
	zone around the mine lease from	the lease has been considered as
	lease periphery and the data	the study area. The Buffer map of
	contained in the EIA such as	the study area is given as Map No.
	waste generation etc. should be for	1 in Chapter II. All the details in
	the life of the mine / lease period.	the EIA report are for the life of the
	, 1	lease period.
		-
		Total waste generated during the five
		year would be approx. 3, 50,000
		tonne.
		The details of mining & production
		have been given in Chapter II (Page
		no.38-41).

8.	Land use of the study area should be	Land use pattern of 10 km from
	described delineating forest area,	the periphery of the lease area has
	agricultural land, grazing land,	been prepared and incorporated as
	wildlife sanctuary and national	Map No.2, Chapter III.
	park, migratory routes of fauna,	
	water bodies, human	There are no National Park or
	settlements and other ecological	Wildlife Sanctuary or Migratory
	features should be indicated.	routes of fauna within the 10 km
	Land use plan of the mine lease	radius of study area.
	area should be prepared to	Pre- operational Land use cover of
	encompass preoperational	10 km radius:
	operational and post operational	S.N Descrip Area in %
	phases and submitted Impact if	1 Open land 1546.4 4.47
	phases and submitted. Impact, in	2 River 254.3 0.70
	any, of change of faild use should be	3 Agricultural 4687.8 12.6
		4 Agricultural 1242.6 3.60
		5 Settlement 511.57 1.45
		6 Vegetation 178.7 5.33
		7 Forest 25184. 70.1
		8 River with Dry 759.66 2.20
		9 Water Bodies 04.97 0.18
		10tai 34430. 100
		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	The proposed project is a River Bed
	Burden Dumps outside the mine	Mining Project, therefore there will
	lease, such extent of land area,	be no Over Burden & hence no
	distance from mine area, its land use	dumps are proposed in the lease
	R&R issues, if any, should be given.	area. There will be no change in
		Landuse and no R&R issues are
		involved.

10.	A certificate from competent	There is no forest land within the
	Authority in the State Forest	lease area.
	Department should be provided,	
	confirming the involvement of	Inspection report confirming the
	forest land, if any, in the project	same with report from forest
	area. In the event of any contrary	department has been attached as
	claim by the project proponent	Annexure I (B).
	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	No forest land is involved in the
	the broken up area and virgin	lease area, therefore, deposition of
	forestland involved in the Project	net present value (NPV) and
	including deposition of net	compensated Afforestation is not
	present value (NPV) and	indicated.
	compensatory a forestation (CA)	Report from forest department has
	should be indicated. A copy of the	been attached as Annexure I (B).
	forestry clearance should be	
	furnished.	
12.	Implementation status of	There is no involvement of forest
	recognition of forest rights under the	land in the project area.
	Scheduled Tribes and other	
	Traditional Forest Dwellers	
	(Recognition of Forest Rights) Act,	
	2006 should be indicated.	
13.	The vegetation in the RF / PF in	There are 8 Reserved Forests in
	the study area, with necessary	the study area, which have been
	details, should be given.	Detailed in Chapter III (Page
		no.o/). However, No protected
		forests are found in the study area.
		The vegetation details of the same
		are incorporated in Chapter III
		(Page no.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.	The site is adjacent to Doon Valley which is an eco-sensitive zone. Details of impacts & mitigation measures are given in Chapter IV (Page no.97-99) 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.	There is no National Parks, Sanctuaries, within 10 km of the mine lease area. Distance certificate has been obtained from Forest Department regarding the same. Copy attached as Annexure- XX . Buffer Map showing the location of the Reserve is attached as Map No 1 . 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 XXIV . No clearance is required from State Wildlife Department/Chief Wildlife
		Warden under Wildlife (Protection) Act, 1972.

16.	A detailed biological study for the	Detailed biological study of core
	study area [core zone and buffer zone	zone and buffer zone within 10 km
	(10 km radius of the periphery of the	radius of the periphery of the mine
	mine lease)] shall be carried out.	lease has been carried out for the
	Details of flora and fauna, duly	project. The same has been
	authenticated, separately for core and	incorporated in Chapter III (Page
	buffer zones should be furnished	no.65-85) of the report.
	based on primary field survey, clearly	
	indicating the Schedule of the fauna	There is no schedule-I species in
	present. In case of any scheduled-I	the study area as per the
	fauna found in the study area, the	authenticated list of Flora and
	necessary plan for their conservation	Fauna duly authenticated by DFO
	should be prepared in consultation	Dehradun. The same is attached
	with State Forest and Wildlife	as Annexure XIX.
	Department and details furnished.	However, conservation plan for
	Necessary allocation of funds for	Schedule I & II species with
	implementing the same should be	allocated funds has been prepared
	made as part of the project cost.	and approved by Forest
		Department. The same is attached
		as Annexure-X.
17.	Proximity to Areas declared as	There is no area declared as
	"Critically Polluted "or the Project	"Critically Polluted and also no area
	areas likely to come under the	of the project come under the
	"Aravali Range"(attracting court	"Aravali Range within 10 km radius
	restrictions for mining	of the project site.
	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 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 in line with govt. scheme.

20.	One season (non-monsoon) primary	Base line study was carried out for
	baseline data on ambient air quality	one (non-monsoon) season from
	(PM10, SO2 and NOx), water	Oct"13 to Dec"13.Details are
	quality, noise level, soil and flora	provided in Chapter III (Page
	and fauna shall be collected and the	no.46-65) of this EIA/EMP Report.
	AAQ and other data so compiled	
	presented date- wise in the EIA and	The locations of the monitoring
	EMP Report. Site- specific	stations were decided on the basis
	meteorological data should also be	of prevailing micro meteorological
	collected. The location of the	conditions (Wind direction & wind
	monitoring stations should be such	speed) of the study area. The
	as to represent whole of the study	windrose has been given in
	area and justified keeping in view	Chapter III (Page no.48) of
	the pre- dominant downwind	EIA/EMP Report. One Location
	direction and location of sensitive	has been selected in downwind
	receptors.	direction within 500 m from the
	There should be at least one	lease boundary.
	monitoring station within 500 m of	Date wise collected baseline AAQ
	the mine lease in the pre- dominant	data is attached as Annexure III.
	downwind direction. The	
	mineralogical composition of PM1O,	The location of the monitoring
	particularly for free silica, should be	sites has been shown in Map No 4
	particularly for free silica, should be given.	sites has been shown in Map No 4 in Chapter III.
- 01	particularly for free silica, should be given.	sites has been shown in Map No 4 in Chapter III.
21.	particularly for free silica, should be given. Air quality for modeling should be	sites has been shown in Map No 4 in Chapter III. Air quality modeling has been
21.	particularly for free silica, should be given. Air quality for modeling should be carried out for prediction of	sites has been shown in Map No 4 in Chapter III. Air quality modeling has been carried out for prediction of impact
21.	particularly for free silica, should be given. 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	sites has been shown in Map No 4 in Chapter III. Air quality modeling has been carried out for prediction of impact of the project on air quality.
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	sites has been shown in Map No 4 in Chapter III. Air quality modeling has been carried out for prediction of impact of the project on air quality. Aermod has been used taking into
21.	particularly for free silica, should be given. 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	sites has been shown in Map No 4 in Chapter III. 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 webicles which is incorporated and
21.	particularly for free silica, should be given. 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	sites has been shown in Map No 4 in Chapter III. 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 Anneyure
21.	particularly for free silica, should be given. 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	sites has been shown in Map No 4 in Chapter III. 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 XXV .
21.	particularly for free silica, should be given. 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	sites has been shown in Map No 4 in Chapter III. 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 XXV. The windrose showing pre-
21.	particularly for free silica, should be given. 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	sites has been shown in Map No 4 in Chapter III. 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 XXV. The windrose showing pre- dominant wind direction has been
21.	particularly for free silica, should be given. 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	sites has been shown in Map No 4 in Chapter III. 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 XXV. The windrose showing pre- dominant wind direction has been indicated in Chapter III (Page
21.	particularly for free silica, should be given. 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	sites has been shown in Map No 4 in Chapter III. 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 XXV. The windrose showing pre- dominant wind direction has been indicated in Chapter III (Page no.48) of the EIA/EMP Report.
21.	particularly for free silica, should be given. 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.	sites has been shown in Map No 4 in Chapter III. 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 XXV. The windrose showing pre- dominant wind direction has been indicated in Chapter III (Page no.48) of the EIA/EMP Report.
21.	particularly for free silica, should be given. 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	sites has been shown in Map No 4 in Chapter III. 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 XXV. The windrose showing pre- dominant wind direction has been indicated in Chapter III (Page no.48) of the EIA/EMP Report.
21.	particularly for free silica, should be given. 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	sites has been shown in Map No 4 in Chapter III. 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 XXV. The windrose showing pre- dominant wind direction has been indicated in Chapter III (Page no.48) of the EIA/EMP Report.
21.	particularly for free silica, should be given. 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	sites has been shown in Map No 4 in Chapter III. 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 XXV. The windrose showing pre- dominant wind direction has been indicated in Chapter III (Page no.48) of the EIA/EMP Report.
21.	particularly for free silica, should be given. 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	sites has been shown in Map No 4 in Chapter III. 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 XXV. The windrose showing pre- dominant wind direction has been indicated in Chapter III (Page no.48) of the EIA/EMP Report.

22.	The water requirement for the	The total water requirement for the
	project, its availability and source	project will around 3.4 KLD. The
	should be furnished. A detailed	break-up for water is given in
	water balance should also be	Chapter II (Page no.43) of the
	provided. Fresh water requirement	EIA/EMP Report. Water will be
	for the Project should be indicated.	taken from nearby village. NoC for
		the same has been obtained and
		attached as Annexure-IX.
23	Necessary clearance from the	The nearby water source comes
20.	Competent Authority for drawl of	under the jurisdiction of Gram
	requisite quantity of water for the	Pradhan The nearby villages
	Project should be provided	through their Grom Drodhon are
	Froject should be provided.	arread to provide the required
		agreed to provide the required
		annount of water. Necessary
		approvals from Grain Plaunan have
		been obtained and attached as
04	Description	Annexure-IX.
24.	Description of water conservation	The project do not consume any
	measures proposed to be adopted in	process water except for drinking,
	the Project should be given. Details of	dust suppression & plantation.
	rainwater harvesting proposed in the	Plantation is proposed, which will
	Project, if any, should be provided.	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	There will be no impact of the
	quality, both surface and	project on the ground water
	groundwater should be assessed	quality as the mining will be
	and necessary safeguard measures,	carried out up to a depth of 1.5
	if any required, should be provided.	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 ground water should also be obtained and copy furnished.	Mining will surface to ground leve water level; w As studied t in pre-mons and in pos 2.43 m bgl. intersection	be done from the top about 1.5 m below el or above ground whichever comes first. the ground water level soon is 2.76 m bgl in st-monsoon season is . So there will be no with groundwater.
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.	The lease area lies on the bed of River Yamuna. During mining, it will be ensured that excavation will be done away from the stream flow. Moreover no modification/ diversion of the river is proposed, hence there will be no impact on the hydrology as such	
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.	Site elevation Working depth Groundwater Pre- monsoon Post- monsoon Schematic d incorporated no.39). Surface plar the lease ar as Annexure (B).	Highest:479 m AMSL Lowest: 473 m AMSL 1.5 m bgl or above ground water level, whichever comes first. r depth 2.76 m bgl 2.43 m bgl iagram for the same is i in Chapter II (Page n with cross-section of rea has been attached e II (A) & Annexure II

29.	A time bound Progressive	Plantation will be carried along the
	Greenbelt Development Plan shall	river banks and road sides or near
	be prepared in a tabular form	the civic amenities in consultation
	(indicating the linear and	with local authority or govt. body as
	quantitative coverage, plant species	it is not feasible to develop green
	and time frame) and submitted,	belt around the lease area which lies
	keeping in mind, the same will have	on the river bed.
	to be executed up front on	The fund will be deposited with
	commencement of the project.	mining trust according to Mines and
		Mineral (Development and
		Regulation) Act 1957 dated 28th Dec,
		1957 and Uttarakhand District
		Mineral Foundation Trust, 2017
		dated 17 th 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 XXIX.
		List of species to be planted is
		attached as Annexure XVIII .

30.	Impact on local transport	There will be an increase of 125
	infrastructure due to the Project	trucks carrying the minerals per
	should be indicated. Projected	day. The impact due to this on local
	increase in truck traffic as a result	transport infrastructure has been
	of the Project in the present road	detailed in Chapter IV (Page no. 99-
	network (including those outside	102) of the EIA/EMP Report.
	the Project area) should be worked	
	out, indicating whether it is capable	Effective mitigation measures will be
	of handling the incremental load.	adopted to minimize the impacts
	Arrangement for improving the	from transportation & handling of
	infrastructure, if contemplated	mineral:
	(including action to be taken by	
	other agencies such as State	• The haul road will be kept wide,
	Government) should be covered.	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-143-144)
31.	Details of the onsite shelter and	A temporary rest shelter will be
	facilities to be provided to the	provided for the workers near to
	mine workers should be included in	the site with provisions of water,
	the EIA report.	first aid facility, protective
		equipments, etc. Details are given
		in Chapter II (Page no.43) 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
		Approved Mine Plan with plans and
		sections is attached as Annexure-
		XII.
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.	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 or along the 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 XVIII.

34.	Occupational Health impacts of the	Occupational health impact mainly
	Project should be anticipated and	is expected due air pollution due
	the proposed preventive	to fugitive dust emission because
	measures spelt out in detail.	of movement of vehicles. However
	Details of pre-placement medical	appropriate mitigation measures
	examination and periodical	for air pollution control have been
	medical examination schedules	proposed as given in Chapter VII
	should be incorporated in the	(Page no. 128-129) of the report.
	EMP.	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 17 th November, 2017.
		Each labour will undergo pre-
		placement medical examination.
		Thereafter periodical heath
		checkup will be arranged as stated
		in the Chapter VIII (Page no.128-
		129) of the report.
		Occupational Health Plan with
		budgetary provision has been
		attached as Annexure XXX.
35.	Public health implications of the	The proposed project being a small
	Project and related activities for the	scale manual mining project, there
	population in the impact zone	will be hardly any process related
	should be systematically evaluated	to health implication on the
	and the proposed remedial	population of the nearby villages
	measures should be detailed along	except fugitive dust emissions due
	with budgetary allocations.	to transportation of minerals by
		trucks. However health camps &
		awareness programs will be
		arranged for them. Details are
		given in Chapter VIII (Page
		no.131-132) of the report.

36. Measures of socio economic Socio-economic	significance
significance and influence to the provided to the local	community
local community proposed to be i.e. to the nearby villag	ers is given
provided by the Project Proponent in Chapter VIII (Pa	ge no.131-
should be indicated. As far as 133) of the EIA/EMP	Report.
possible, quantitative dimensions Maximum socio economi	ic measured
may be given with time frames for would be covered the	nrough the
implementation. amount deposited wi	th District
Administration as prov	rided under
the Mines and Mineral (I	Development
and Regulation) Act 195	7 dated 28 th
Dec, 1957 and Uttarakh	and District
Mineral Foundation T	rust, 2017
dated 17 th November, 2	017. As the
Project Proponent is regu	larly paying
the certain amount to	the District
Administration as	per the
provisions.	
37. Detailed environmental management The detailed en	vironmental
plan to mitigate the Management plan to r	nitigate the
environmental impacts which, should environmental impacts	has been
inter-alia include the impacts of mentioned in Chapte	r X (Page
change of land use, loss of no.138-144) of the EIA/B	EMP Report.
agricultural and grazing land, if any, There will be no change	in land use
occupational health impacts besides as the project lies on	dry part of
other impacts specific to the riverbed and also there	will be no
proposed Project. loss of agriculture and g	razing land.
Detailed occupational he	ealth plan is
attached as Annexure X	XX.
38. Public hearing points raised and Details of public hearing	are given in
commitment of the project Chapter VII (Page r	10.115-116).
proponent on the same along with Public hearing proceed	ings of the
Implement the same should be budget allocation has be	on ottochod
provided and also incorrected in the los Approvided and also incorrected in the	
final FIA (FMP Report of the Project	D .
39 Details of litigation pending There is no litigation pend	ling against
against the project if any with the project The Lol	has been
direction /order passed by any issued by the Dept of	Geology &
Court of Law against the project Mining Unit Govt of L	
	ttarakhand
should be given.	ttarakhand

40.	The cost of the project (capital	The capital cost of the project is
	cost and recurring cost) as well as	17.15 Lakhs. The costs like for
	the cost towards implementation of	project monitoring & EMP have
	EMP should clearly be spelt out.	been given in Chapter VI (Page
		no.112) & X (Page no.143-144)
		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 XII.
42.	Details of Transportation of mined	The details of transportation for
	materials as per Indian Road	loaded as well as unloaded trucks
	Congress for both the ways with	with anticipated impacts due to
	loaded as well unloaded traffic load	transportation & its mitigation
	and its impact on Environment.	measures are given in Chapter IV
		(Page no.99-102) of the EIA/EMP
		Report
43.	Cumulative impact due to sand	Cumulative impacts due to sand
	mining.	mining has been evaluated and
		incorporated in the EIA report as
		Annexure XVII.

44.	ProperConservation Plan for	The details of biological environment
	Schedule-I and Schedule-II species.	(flora & fauna for core and buffer
		zone) are given in Chapter III (Page
		no. 65-85). There is no schedule-I
		species found in the study. 3
		Schedule II species has been found
		in the buffer zone.
		However Conservation Plan for
		Schedule I & II species has been
		prepared and approved by Forest
		Department is attached as
		Annexure X.
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 Planktons
		(Phytoplankton & Zooplanktons) is
		given in Chapter III (Page no. 74 &
		83).
46.	Cluster approach for collection of	Cluster approach has been followed
	baseline data shall be followed.	for collection of baseline data.
47.	Appropriate Disaster Management	The project area lies in Seismic Zone
	safeguards in view of the seismicity of	IV, which implies that this is highly
	the area.	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 XV .

48.	NBWLclearance should be obtained.	As there is no protected area (under
		Wildlife Protection Act, 1972) within
		10 km of the lease area, clearance
		from NBWL is not required.
		-

General Points to be followed as per ToR:

1.	All documents may be properly	Complied.
	referenced with index, page numbers	
	and continuous page numbering	
2.	Where data are presented in the report especially in tables the period	Relevant details i.e. the period &
	in which the data were collected and the sources should be indicated	Mentioned in EIA/EMP
3	Where the documents provided are	Ves the same has been provided
0.	in a language other than English, an	in case of documents are in a
	English translation should be	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 4 th 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.

DRAFT EIA/EMP SECTION . I: INTRODUCTION

6.	Changes, if made any in the basic	No changes have been done in the
	scope and project parameters as	basic scope and project parameters
	submitted in Form I and PFR for	as submitted in Form I and PFR.
	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.	
7.	As per the circular no. J-	Not applicable as this is a new
	1101 1/618/2010-IA.II(I) dated	mine for which Environmental
	30.2.2012, you are requested to	clearance is yet to be received.
	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.	
8.	For the Base line study for contiguous	Cumulative Baseline study has
	Lease areas of similar nature, the	been carried out for the mine
	Cluster approach to be adopted for	leases.
	collection of baseline data, which shall	The overlaid map of sampling
	be adequately cover every single lease	location of all the mine leases is
	area under consideration for EC.	attached as Annexure XXVI











CHAPTER-II PROJECT DESCRIPTION INDEX

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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. 23/1 Sand, *Bajri* & Boulder Mining Project is located near Village: Dumate, Tehsil: Vikasnagar & District: Dehradun, Uttarakhand. The lease area falls in Survey of India Toposheet 53F14. The lease co-ordinates details are listed below:

	Latitude:	30°30'42.15"N to	30°30'40.55"N
Coordinates			
	Longitude :	77°50'22.59"E to	77°51'10.91"E

2.2.1 Lease Hold Area

The lease hold area of 30.035 ha lies in the bed of River Yamuna, decided as per the Letter of Intent vide Letter No. 589/Bhu. Khani.E./2012-13 dated 23-1-2013 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)**.

Lot No.	Khasra No.	River	Village	Area in Ha.
23/1	649 क	Yamuna	Dumate	30.035

Table 2.1: Details of the Lease Hold Area

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



Si.No.	Latitude	Longitude
1	30° 30' 42.15" N	77° 50' 22.59" E
2	30° 30' 47.89" N	77° 51' 09.05" E
3	30° 30' 40.55" N	77° 51' 10.91" E
4	30° 30' 34.42" N	77° 50' 23.90" 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 intermontane 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 Hima- laya

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 withd stone		
Main Boundary Thrust				
Palaeoceneto Early Eocene	Subathu Formation	Red shale and lenticular bands of sandstone		
	Krol	Thrust		
	Tal	Quartzites		
Pre-Tertiary	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, Sitla 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 recognised different level of fans in the valley that consist of Doon Gravel of pliestocene 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: The district has within its limits lofty peaks of the Outer Himalayas as well as the Doon 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 36.2°C at Dehradun and 24.8°C at Mussoorie. The maximum temperature rises to over 42°C at Dehradun while at Mussoorie it doesn't exceed 32°C. Winter starts from November and continue upto February. The highest maximum temperature recorded at Dehradun was 43.9°C on June 4, 1902 and that at Mussoorie was 34.4°C, on May 24th 1949. The mean daily maximum temperature during winter is 19.1°C at Dehradun and 10.2°C at

Mussoorie. The mean daily minimum temperature in January is 6.1°C at Dehradun and 2.5°C at Mussoorie. In Mussoorie the temperature drops to about -6°C to -7°C when snow fall occurs. The lowest minimum temperature at Dehradun during winter was - 1.1°C, on February 1st, 1905 and January 1945 while at Mussoorie it was -6.7°C, on February 10th.

(Source: CGWB Dehradun_pdf).

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 2.4: 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 2.3 Upper Yamuna Catchment

2.2.5 WATERSHEDS

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

Catchment	Watershed	No. of Sub	No. of Micro	Total Area			
		Watersheds	Water Sheds	(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			
		1					

Uttarakhand

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".

<u>Reserve (Available Quantum):</u>

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 5,40,778.48 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 2, 80,000 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 excavated 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 2.4: 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.

S. No.	Category	Numbers
1.	Administrator	1
2.	Supervisor	2
3.	Mining workers	153
4.	Additional workers*	2
	TOTAL	158

 Table 2.4: Manpower requirement breakup

*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. 3, 50,000 from the mining activity.

Restriction on mining:

- As per Joint inspection Report, No mining operation shall be carried out within 100m of railway line & bridge, NH, 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, 1980 and 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



CHAPTER-III

DESCRIPTION OF ENVIRONMENT

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3.0 INTRODUCTION

This section contains the description of baseline studies of the 10 km radius of the area surrounding River Yamuna Lot No. 23/1 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.

3.1 BASELINE 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**

S.No.	Description	Area in Ha	% share in total area
1	Open land	1546.45	4.47
2	River	254.31	0.70
3	Agricultural land	4687.85	12.60
4	Agricultural Fallow Land	1242.62	3.60
5	Settlement	511.57	1.45
6	Vegetation	178.71	5.33
7	Forest	25184.54	70.10
8	River with Dry Channel	759.66	2.20
9	Water Bodies	64.97	0.18
	Total	34430.73	100

Table 3.1: Land Use cover of the project study area

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 postoperational 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 SO₂, NO₂, & PM₁₀

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).

Month	Wind Speed (kmph)		Temperature (°C)		Relative Humidity (%)		Rain Fall * (mm)		Cloud Cover** (Octas of sky)				
(2013)	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

a Site-specific meteorological data

b. Wind Rose Diagram

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



c. 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:

Parameters	Technique	Technical Protocol	Minimum Detectable Limit
PM2.5	Gravimetric method	CPCB Guideline Vol. I May' 2011	5 (µg/m³)
PM10	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)

Table 3.2: Methods adopted for PM10, PM2.5, SO2 and NO2

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.

S.No.	Location	Station name	Distance(approx.) and direction from the lease area (km)		Zone (Core/ Buffer)
1.	AQ1	Project Site (near Baruwala)	-	-	Core Zone
2.	AQ2	Dakhpathar	5	WSW	Buffer zone
3.	AQ3	Katapathar	2	E	Buffer zone
4.	AQ4	Near Kalsi	2	Ν	Buffer zone
5.	AQ5	Kedarwala	8	S	Buffer zone

Table 3.3 (i) Ambient air quality monitoring stations

EIA/EMP CHAPTER - III DESCRIPTION OF ENVIRONMENT

Site	Particulars	PM2.5 (μg/m ³)	PM 10(μg/m ³)	SO ₂ (µg/m ³)	NO ₂ (μg/m ³)
	Minimum	27.1	67.8	BDL	15.1
AQ1	Maximum	33.5	76.4	5.8	19.4
(24 Observations)	Average	29.6	70.4	5.3	16.7
	98 th Percentile*	32.5	75.1	5.7	18.9
	Minimum	34.3	75.3	BDL	17.7
AQ2	Maximum	41.3	85.8	5.6	21.2
(24 Observations)	Average	37.1	79.2	5.3	18.8
	98 th Percentile*	40.5	84.4	5.5	20.7
	Minimum	28.0	59.9	BDL	9.6
AQ3	Maximum	35.0	74.9	6.0	18.5
(24 Observations)	Average	30.9	66.8	5.7	13.8
	98th Percentile*	34.0	73.2	6.0	17.8
	Minimum	37.5	76.8	BDL	16.2
AQ4	Maximum	44.4	87.6	5.9	19.6
(24 Observations)	Average	40.6	81.1	5.3	17.5
	98 th Percentile*	43.8	86.4	5.8	19.3
	Minimum	27.6	61.7	BDL	13.1
AQ5	Maximum	35.5	70.5	5.6	17.3
(24 Observations)	Average	31.1	64.9	5.3	14.4
	98 th Percentile*	34.8	69.5	5.5	16.6
CPCB Stands	ards ($\mu g/m^3$)	60	100	80	80

Table 3.3 (ii): Ambient Air Quality Status

* 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 PM₁₀ amongst all the 5 AQ monitoring stations were found to be $59.9\mu g/m^3$ at AQ3 and $87.6\mu g/m^3$ at AQ4, respectively.

As far as the gaseous pollutants SO₂ and NO₂ are concerned, the prescribed CPCB limit of $80\mu g/m^3$ for residential and rural areas has never surpassed at any station. The minimum concentrations of SO₂ were found to be Below detectable limit & maximum concentrations of SO₂ were found to be $6.0\mu g/m^3$ at AQ3. The minimum & maximum concentrations of NO₂ were found to be $9.6\mu g/m^3$ at AQ3 and $21.2\mu g/m^3$ at AQ2 respectively.



Fig3.2: Air monitoring photograph near village Dakhpathar

Free SiO _{2 (μg/m³)}						
S.No AQ1 AQ2 AQ3 AQ4 AQ5						
Maximum	1.35	1.50	1.19	1.53	1.23	
Minimum	1.52	1.71	1.49	1.75	1.41	

The standard for Respirable dust is $3mg/m^3$ 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 SiO₂ were found to be 1.19μ g/m³ at AQ3 & 1.75μ g/m³ at AQ4 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/No n. 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)
Vikasnag	Command	1780.61	45.60	312.12
ar	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 physicochemical analysis of the water samples is given in the Table below.

The Ground water sampling locations are marked in Map No. 4

Table 3.3 (iii)

Ground water sampling locations

Station No.	Location	Approx. Distance (km)	Direction	Buffer zone/ Core zone
GW1	Baruwala	0.2	S	Core zone
GW2	Dakhpathar	5	WSW	Buffer zone
GW3	Near Kalsi	2	Ν	Buffer zone

S.No	Parameter	Limit (IS-	10500:2012)	Unit	Oct	Nov	Dec
		Desirable Limit	Permissible Limit			Baruwala	
1	Colour	5	15	Hazen	<5	<5	<5
2	Odour	Agreeable	Agreeable	-	Agreeable	Agreeabl	Agreeabl
3	Taste	Agreeable	Agreeable	-	Agreeable	Agreeabl	Agreeabl
4	Turbidity	1	5	NTU	<1	<1	<1
5	рН	6.5-8.5	No Relaxation	-	7.82	7.42	7.56
6	Total Hardness (as CaCO3)	200	600	mg/l	320	309	305
7	Iron (as Fe)	0.3	No Relaxation	mg/l	0.11	0.08	0.12
8	Chlorides (as Cl)	250	1000	mg/l	26	21	24
9	Fluoride (as F)	1	1.5	mg/l	0.5	0.4	0.4
10	TDS	500	2000	mg/l	411	392	387
11	Calcium(as Ca2+)	75	200	mg/l	77	75	73
12	Magnesium (as Mg2+)	30	100	mg/l	31	30	29
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	0.05	0.06	0.04
15	Sulphate (as SO4)	200	400	mg/l	16	14	13
16	Nitrate(as NO3)	45	No Relaxation	mg/l	4	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	0.12	0.09	0.06
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	292	286	280
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	0.2	0.2	0.1
Microb	oiological Parameter						
1	Total Coliform	Shall not	t be detectable	MPN/1 00ml	ND (<2)	ND (<2)	ND (<2)
2	E.coli	Shall not	t be detectable	E.coli /100ml	Absent	Absent	Absent

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

Note: ND: Not detectable

S.N		Limit (IS-	10500:2012)		•		, í
о.	Parameter			Unit	Oct	Nov	Dec
		Desirable Limit	Permissible Limit		г	Dakpatha	r
1	Colour	5	15	Hazen	<5	<5	<5
					Agreea	Agreea	Agreea
2	Odour	Agreeable	Agreeable	-	ble	ble	ble
					Agreea	Agreea	Agreea
3	Taste	Agreeable	Agreeable	-	ble	ble	ble
4	Turbidity	1	5	NTU	<1	<1	<1
5	pН	6.5-8.5	No Relaxation	-	7.81	7.68	7.57
6	Total Hardness (as CaCO3)	200	600	mg/l	146	156	138
7	Iron (as Fe)	0.3	No Relaxation	mg/l	0.14	0.12	0.13
8	Chlorides (as Cl)	250	1000	mg/l	15	20	17
9	Fluoride (as F)	1	1.5	mg/l	0.6	0.7	0.5
10	TDS	500	2000	mg/l	197	215	203
11	Calcium(as Ca2+)	75	200	mg/l	35	37	33
12	Magnesium (as Mg2+)	30	100	mg/l	14	15	13
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	0.06	0.05	0.07
15	Sulphate (as SO4)	200	400	mg/l	11	14	16
16	Nitrate(as NO3)	45	No Relaxation	mg/l	2	3	4
	Phenolic Compounds (as				<0.001	<0.001	<0.001
17	С6Н5ОН)	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	0.09	0.08	0.06
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	130	134	126
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	0.2	0.2	0.1
Micro	obiological Parameter					I	
1	Total Coliform	Shall not l	be detectable	MPN/100 ml	ND (<2)	ND (<2)	ND (<2)
2	E.coli	Shall not l	be detectable	E.coli /100ml	Absent	Absent	Absent

Table 3.3 (v) Physico-chemical properties of ground water near Dakpathar, 2013)

Note: ND: Not detectable

S.No	Parameter	Limit (IS-10500:2012)		Unit	Oct	Nov	Dec
		Desirable Permissible					
1	0.1	Limit	Limit			Near Kalsi	
1	Colour	5	15	Hazen	<5	<5	<5
2	Odour	Agreeable	Agreeable	-	Agreeabl	Agreeabl	Agreeabl
3	Taste	Agreeable	Agreeable	-	Agreeabl	Agreeabl	Agreeabl
4	Turbidity	1	5	NTU	<1	<1	<1
5	pН	6.5-8.5	No Relaxation	-	7.12	7.42	7.31
6	Total Hardness (as	200	600	mg/1	132	144	140
7	Iron (as Fe)	0.3	No Relaxation	mg/l	0.05	0.05	0.03
8	Chlorides (as Cl)	250	1000	mg/l	18	24	21
9	Fluoride (as F)	1	1.5	mg/1	0.3	0.3	0.2
10	TDS	500	2000	mg/1	176	203	209
11	Calcium(as Ca2+)	75	200	mg/l	32	35	33
12	Magnesium (as Mg2+)	30	100	mg/l	12	13	14
13	Copper (as Cu)	0.05	1.5		< 0.01	< 0.01	< 0.01
14	Manganese(as Mn)	0.1	0.3	mg/l	0.02	0.03	0.05
15	Sulphate (as SO4)	200	400	mg/l	8	11	14
16	Nitrate(as NO3)	45	No Relaxation	mg/l	2	3	4
17	Phenolic Compounds (as C6H5OH)	0.001	0.002	mg/l	<0.001	< 0.001	< 0.001
18	Mercury (as Hg)	0.00 1	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	0.03	0.03	0.06
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	113	122	128
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
Microl	oiological Parameter						
1	Total Coliform	Shall not	be detectable	MPN/1 00ml	ND (<2)	ND (<2)	ND (<2)
2	E.coli	Shall not be detectable		E.coli			

/100m

1

Absent

Absent

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

Note: ND: Not detectable

Absent

Observation:

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

- pH varies from 7.12 to 7.82.
- Total hardness varies from 132 mg/l to 320 mg/l.
- Total dissolved solids vary from 176 mg/l to 411 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: 10500-199 1, Drinking Water Standards.



Fig3.3: Ground water monitoring photograph at village Dakhpathar

b) Surface water

Three water samples were collected from the study area from River Yamuna. 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 (vii).

Station No.	Location	Direction	Distance (Km)	Core Zone/Buffer Zone
SW1	Project Site	Centre	-	Core Zone
SW2	Upstream	NE	4Km	Buffer Zone
SW3	Downstream	SW	5 Km	Buffer Zone

Table 3.3 (vii)Surface water sampling locations

Physico-chemical properties of surface water (October, 2013)							
S.No.	Parameter	Unit	S.W 1	S.W 2	S.W. 3		
1	рН	-	7.78	7.65	7.79		
2	Dissolved Oxygen	mg/l	8.9	9.3	8.7		
3	BOD (3 Days at 27 °C)	mg/l	2.6	2.7	2.7		
4	Free Ammonia (as N)	mg/l	< 0.1	< 0.1	< 0.1		
5	Sodium Adsorption Ratio	-	0.20	0.27	0.20		
6	Boron	mg/l	0.2	0.2	0.2		
7	Conductivity	µmhos/cm	386	368	376		
8	Temperature	(°C)	20	20	20		
9	Turbidity	NTU	7	6	6		
10	Magnesium hardness (as CaCO3)	mg/l	62	58	61		
11	Total Alkalinity (as CaCO3)	mg/l	143	142	141		
12	Chloride (as Cl)	mg/l	20	17	20		
13	sulphate (as SO4)	mg/l	12	10	10		
14	Nitrate (as NO3)	mg/l	0.9	0.7	0.7		
15	Fluoride (as F)	mg/l	0.5	0.4	0.5		
16	Sodium (as Na)	mg/l	6	8	6		
17	Potassium (as K)	mg/l	1.8	1.6	1.6		
18	TKN (as N)	mg/l	0.5	0.4	0.4		
19	Total Phosphorous (as P)	mg/l	< 0.01	< 0.01	< 0.01		
20	COD	mg/l	8	10	10		
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	0.07	0.07	0.06		
24	Cadmium (as Cd)	mg/l	< 0.01	< 0.01	< 0.01		
25	Zinc (as Zn)	mg/l	0.06	0.05	0.07		
26	Arsenic (as As)	mg/l	< 0.01	< 0.01	< 0.01		
27	Mercury (as Hg)	mg/l	<0.00 1	< 0.00 1	< 0.00 1		
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	232	223	228		
	Microbiological Parameters						
1	Total Coliform	MPN/100ml	220	270	240		
2	Faecal Coliform	MPN/100ml	90	110	80		

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

rnysico-cnemical properties of surface water (Nov, 2013)							
S.No.	Parameter	Unit	S.W. 1	S.W. 2	S.W. 3		
1	рН	-	7.75	7.61	7.75		
2	Dissolved Oxygen	mg/l	9.1	9.4	8.9		
3	BOD (3 Days at 27 °C)	mg/l	2.2	2.5	2.3		
4	Free Ammonia (as N)	mg/l	<0.1	< 0.1	< 0.1		
5	Sodium Adsorption Ratio	-	0.20	0.24	0.32		
6	Boron	mg/l	0.1	0.2	0.2		
7	Conductivity	µmhos/cm	369	354	374		
8	Temperature	(°C)	19	20	19		
9	Turbidity	NTU	6	5	5		
10	Magnesium hardness (as CaCO3)	mg/l	60	56	59		
11	Total Alkalinity (as CaCO3)	mg/l	141	138	145		
12	Chloride (as Cl)	mg/l	18	16	18		
13	sulphate (as SO4)	mg/l	10	9	9		
14	Nitrate (as NO3)	mg/l	0.8	0.6	0.6		
15	Fluoride (as F)	mg/l	0.4	0.3	0.4		
16	Sodium (as Na)	mg/l	6	7	9		
17	Potassium (as K)	mg/l	1.6	1.4	1.6		
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	6	8	9		
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	0.06	0.06	0.05		
24	Cadmium (as Cd)	mg/l	< 0.01	< 0.01	< 0.01		
25	Zinc (as Zn)	mg/l	0.05	0.04	0.06		
26	Arsenic (as As)	mg/l	< 0.01	< 0.01	< 0.01		
27	Mercury (as Hg)	mg/l	<0.00 1	< 0.00 1	< 0.00 1		
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	223	212	225		
	Microbiological Parameters						
1	Total Coliform	MPN/100ml	230	280	220		
2	Faecal Coliform	MPN/100ml	80	110	90		

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

Physico-chemical properties of surface water (Dec, 2013)							
S.No.	Parameter	Unit	S.W . 1	S.W 2	S.W. 3		
1	рН	-	7.79	7.86	7.85		
2	Dissolved Oxygen	mg/l	8.7	9.1	8.7		
3	BOD (3 Days at 27 °C)	mg/l	1.8	2.1	2.1		
4	Free Ammonia (as N)	mg/l	< 0.1	<0.1	<0.1		
5	Sodium Adsorption Ratio	-	0.38	0.46	0.38		
6	Boron	mg/l	0.2	0.1	0.2		
7	Conductivity	µmhos/cm	380	361	387		
8	Temperature	(°C)	18	19	18		
9	Turbidity	NTU	5	4	4		
10	Magnesium hardness (as CaCO3)	mg/l	58	53	59		
11	Total Alkalinity (as CaCO3)	mg/l	145	140	150		
12	Chloride (as Cl)	mg/l	18	16	18		
13	sulphate (as SO4)	mg/l	11	10	10		
14	Nitrate (as NO3)	mg/l	0.9	0.7	0.8		
15	Fluoride (as F)	mg/l	0.6	0.5	0.6		
16	Sodium (as Na)	mg/l	11	13	11		
17	Potassium (as K)	mg/l	1.4	1.7	1.5		
18	TKN (as N)	mg/l	0.4	0.5	0.6		
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	0.06	0.05	0.07		
24	Cadmium (as Cd)	mg/l	< 0.01	< 0.01	< 0.01		
25	Zinc (as Zn)	mg/l	0.04	0.04	0.07		
26	Arsenic (as As)	mg/l	< 0.01	< 0.01	< 0.01		
27	Mercury (as Hg)	mg/l	< 0.00 1	<0.00 1	< 0.00 1		
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	230	218	235		
	Microbiological Parameters						
1	Total Coliform	MPN/100ml	200	220	210		
2	Faecal Coliform	MPN/100ml	80	80	70		

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

Observation:

The analysis results indicate that the pH ranges between 7.61 and 7.86. Dissolved Oxygen (DO) was observed in the range of 8.7 to 9.4 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 16-20 mg/l and 9-12 mg/l respectively.

Bacteriological examination of surface water samples revealed the presence of total coliform in range of 200 MPN/ 100 ml to 280 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 locations 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 (xi).

Station No.	Location	Direction	Approx. Distance (km)	Core Zone/Buffer Zone
SQ1	Baruwala (P.S)	-	-	Core Zone
SQ2	Dakhpathar	WSW	5	Buffer Zone
SQ3	Near Kalsi	Ν	2	Buffer Zone

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



Fig3.4: Soil sampling photograph at village Baruwala

S.N	Parameter	Unit	Baruwala (near P.S)	Near Kalsi	Dakpathar				
1			Sandy	Clay	Sandy clay				
	Texture	-	Loam	Loam	loam				
	Sand	%	62.3	40.8	60.1				
	Silt	%	19.5	30.1	11.7				
	Clay	%	18.2	29.1	28.2				
2	Ph (1:2)	-	7.78	7.34	7.14				
3	Electrical Conductivity (1:2)	µmhos/c m	284	466	408				
4	Cation exchange capacity	meq/ 100 gm	16.4	14.7	17.1				
5	Exchangeable Potassium	mg/kg	113	62.0	187				
6	Exchangeable Sodium	mg/kg	123	99.0	156				
7	Exchangeable Calcium	mg/kg	2518	2236.0	2555				
8	Exchangeable Magnesium	mg/kg	361	356.0	384				
9	Sodium Absorption Ratio	-	0.61	0.51	0.76				
10	Water Holding Capacity	%	25.9	31.2	26.3				
11	Porosity	%	38.6	32.8	38.4				

Observations:

Samples collected from identified locations indicate the soil is Sandy loamy type which has low water retention potential .The pH value ranging from 7.14 to 7.78, which shows that the soil is alkaline in nature. The water holding capacity is found in between 25.9% to 31.2%.

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 noise level monitoring locations are marked in **Map No. 4**.

S.	Location	Station	Approx.	Direction	Zone (Core/
No.		Name	Distance(km)		Buffer)
1.	NQ1	Baruwala(P.S)	-	-	Core zone
2.	NQ2	Dakhpathar	5	WSW	Buffer Zone
3.	NQ3	Katapathar	2	E	Buffer Zone
4.	NQ4	Near Kalsi	2	Ν	Buffer Zone
5.	NQ5	Vikasnagar	8	S	Buffer Zone

 Table 3.3 (xiii): Noise quality monitoring stations

S. No.	Location	Zone	Leq LIMIT CPCB Guio in dB	` (as per delines), 6(A)	Leq Value monitored, in dB(A)		
			DAY*	NIGHT*	DAY*	NIGHT*	
1	NQ 1	Industrial Zone	75	70	50.4	39.8	
2	NQ2	Residential Zone	55	45	53.4	41.7	
3	NQ3	Residential Zone	50	40	48.6	37.9	
4	NQ4	Residential Zone	55	45	53.1	41.5	
5.	NQ5	Silence Zone	55	45	48.7	39.3	

Table No. 3.3 (xiv): Noise level status

* Day Time Night Time Leq in dB(A) (6.00AM TO 10.00PM) 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 53.4 dB(A) at NQ-2 & 48.6 dB(A) at NQ3 respectively. The maximum & minimum noise levels at night time were found to be 41.7 dB (A) at NQ2 & 37.9 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

Biodiversity reflects the potential of a regional ecosystem. Biota of a particular area is considered as indicators of the environment as they quickly respond not only to one environmental factor but also an interactive group of factors. These communities influence and react sensitively to changes in the balance of environmental stresses.

Biological diversity comprises the variability of genus, species and ecosystems and is very crucial for maintaining the basic processes on which the life depends. On the basis of biological physiology biodiversity broadly can be divided into two category 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 contributes to 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 the 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 nearby the project site.

The study was conducted in the project area to assess all possible consequences on the biological environment. Flora and fauna surveys and data collection conducted for assessing the biological diversity and its status over a period of time that forms an integral part of Impact Assessment Techniques. The present study is highlighting the various issues pertaining to floristic diversity and the faunal wealth in the core area *i.e.* Yamuna River (Lot. 23/1) Sand, *Bajri* & Boulder Mining Project, District Dehradun (Uttarakhand) and buffer zone *i.e.* area within 10 km radius.

3.1.6.1. Description of Study Area

Yamuna River (Lot. 23/1) Sand, *Bajri* & Boulder Mining Project, District Dehradun (Uttarakhand) is executed over an area of 30.035 ha on dry river bed of Yamuna River between 30°30'42.15"N to 30°30'40.55"N and 77°50'22.59"E to 77°51'10.91"Eunder the Seismic Zone-IV as per IS-1893 (part-1)-2002.Present mine is located near the interstate boundary of Himachal Pradesh and Uttarakhand.

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. Dehradun district fall under the sub-tropical climatic condition and situated between 29.45°N to 30.15°E. The geographical coverage of Dehradun district is about 3088 sq. km. Dehradun is famous for its picturesque landscape and pleasant climate and provides a gateway to the surrounding region. It is well connected and in proximity to popular Himalayan tourist destinations.

There is no any forest area present in Core zone as mining activates have been proposed on the dry river bed in Yamuna River systems. Also, due to the location of mining site on river bed, agriculture and fishing activities will not be performed by local inhabitants at the mining site. The drainage pattern of the district is dendritic. Location of present project in the buffer zone and land use pattern along with the drainage is shown in Fig. 3.5.



Fig.3.5: Location of Yamuna River (Lot. 23/1) Sand, *Bajri* and Boulder mining project

There is no any Eco-sensitive zone, National parks and Wildlife Sanctuary present within the buffer zone as per "Wildlife Protection Act (1972)". On the other hand, several reserved forest are present in the buffer area which are listed in Table 3.4(i).

Tioject						
S. No.	Name of the Forest	Distance and Direction				
1	Ambari Reserved	About 1 km in S				
T	Forest	direction.				
0	Dumate Block	About 2 km in S				
4	Reserved Forest	direction.				
2	Salahat Reserved	About 2 km in NW				
5	Forest	direction.				
1	Kalsi Reserved Forest	About 3 km in N				
4	Kaisi Keseived Folest	direction.				
5	Nigoli Deserved Forest	About 2 km in WNW				
5	Nigali Reserved Forest	direction.				
6	Coier Peserved Forest	About 6 km in W				
0	Gojai Reserved Forest	direction.				
7	East Yamuna Reserved	About 7 km in WSW				
	Forest	direction.				
8	Ambari Reserved	About 1 km in SSE				
0	Forest	direction.				

Table	3.4(i):	Details	of Forest	present in	the	buffer	zone	of	present	miniı	ng
				Project	t						

3.1.6.2. Climate

The climate of Dehradun is very cold in winter and pleasant in summer. In rainy season the climate is very cool & full of greenness. The climate is sub-tropical interspersed between cold weather, hot weather and southwest monsoon. The cold weather commences in November and continues till the end of February, which is characterized by cloudless days and very cold nights with much fog and dew. Summers are too hot and winters are too cold and foggy in Terai region. In summers, Pauri district is pleasant. The temperature varies from 1 degree Celsius in the year to 40° C. Summer months are May, June and July whereas Dec. and Jan. are very cold.

3.1.6.3. Soil

Soil in the Dehradun district sandy loam. The soil survey was carried out to assess the soil characteristics of the area. For studying soil quality of the region, various samples were collected to assess the existing soil conditions in and around the area. Soil monitoring data of Pauri district shows that the texture of soil at all locations is Sandy Loam. The monitoring sites have sand ranging from 90% to 79% in soil samples. Silt content varies from 5% to 16%, while Clay content varies from 5% to 15% in the soil samples.

3.1.6.4. Drainage

The Dehradun district of Uttarakhand falls directly into the Ganga river basin and mainly consists of mountain ranges, large valleys, uneven landscapes, breaked cliffs, rivers and rivulets. The important rivers are Aasan, Yamuna, Tons, Sheetla, Swarna, Suddhowala, Song and Rispana River etc. On the other hand, present mining site is located in the riverbed of Yamuna River which is major tributary of Yamuna River. The river Yamuna flows from North to South in the buffer area.

3.2. Methodology 3.2.1. Period of Sampling

The ecological survey has been conducted during Post monsoon season for the collection of primary data of flora-fauna, vegetation, soil and other environmental observations. The details are given as below:

Post-monsoon: October to December Core zone : At the project site Buffer zone : Around 10 km radius of the project site

3.2.2. Mode of Data Collection

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. The mode of data and parameters considered during field investigations is given in Table 3.4(ii).

Aspect	Data	Mode of data collection	Parameters		
			monitored		
	Primary data collection	By conducting field survey	Floral and Faunal diversity		
Terrestrial Ecology	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.		
	Primary data collection	By conducting field survey	Floral and Faunal diversity		
Aquatic Ecology	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.		

Table 3.4(ii): Mode of Data Collection & Parameters Considered During the Survey

General Vegetation Study of the area:

Area supports moderately healthy vegetation, the main forest species are along the Shivalik foothills. These areas 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 cilata), 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.

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 cilitaris*, *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.
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).

S1. 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: Forest, Utta	Source: GRC Survey Data and information of Department of Forest, Uttarakhand				

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

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
24	Azadirachta indica	Meliaceae	Tree
25	Bauhinia acuminata	Fabaceae	Tree

S.No.	Species	Family	Habit
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
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

S.No.	Species	Family	Habit
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):	Phyto	plankton	Present	recorded	from	River	Yamuna	River
14510 011	··/·		Pranticon	11000110	10001404				

S1. No.	Name of the Individuals					
	Chlorophyceae		Cyanophyceae			
1	Ankistrodesmus sp.	1	Anacystissp.			
2	Ankistrodesmus falcatus	2	Aphanocapsa montana			
3	Cosmarium sp.	3	Aphanothece sp.			
4	Coelastrum sp.	4	Arthrospira massartiia			
5	<i>Oocystis</i> sp.	5	Chroococcus sp.			
6	Scenedesmus sp.	6	<i>Gloeocapsa</i> sp.			
7	Scenedesmus dimorphos	7	<i>Lyngbya</i> sp.			
8	Scenedesmus armatus	8	Merismopedia sp.			
9	Spirogyra sp.	9	Microcystis flos- aquae			
10	Tetraedron sp.	10	Nostocsp.			
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	Ceratiumsp.		
7	Melosira granulata		Xanthophyceae		
8	Navicula grimmii	1	Tribonemasp.		
Source:	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 Asan 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* (Theila), *Clarius batrachus* (mangur), etc

A list of Fauna of the study area is presented in Table 3.4(vii) and Table 3.4(viii).

Sr.			Wildlife	IUCN Red			
No.	Common Name	Scientific Name	schedule	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	Koel	Eudynamys scolopacea	IV	NA			
6	Sparrow	Passer domesticus	IV	LC			
	1	MAMMALS	1				
1	Squirrel	Funambulus pennant	IV	DD			
2	Rat	Rattus rattus	V	LC			
		AMPHIBIANS					
1	Common Indian toad	Duttaphrynus	IV	NA			
		melanostictus					
2	Indian skipper frog	Euphlyctis cyanophlyctis	IV	NA			
3	Indian bull frog	Hoplobatrachus tigerinus	IV	NA			

Table: 3.4(vii): Fauna of the Core zone

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	
б	Spotted Deer	Axis axis	II	LC	
7	Rhesus Macaque	Macaca mulatta	II	LC	
8	Indian Grey Mongoose	Herpestes edwardsii	IV	LC	
	REPTII	LES & AMPHIBIANS			
1	Common Toad	Duttaphrynus	IV	NA	
		melanostictus			
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	
1	Jungle Myna	Acridotheres fuscus	IV	LC	
2	Bank Myna	Acridotheres ginginianus	IV	LC	

S.No.	Common Name	Scientific name	IWPA	IUCN
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 Iora	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
	White-capped Water	Chaimarrornis		
19	Redstart	leucocephalus	IV	LC
20	Rock pigeon	Columba livia	IV	LC
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

S.No.	Common Name	Scientific name	IWPA	IUCN
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
		Marmaronetta		
40	Marbled Duck	angustirostris	IV	LC
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	Milvus migrans	IV	LC

S.No.	Common Name	Scientific name	IWPA	IUCN
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
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

S.No.	Common Name	Scientific name	IWPA	IUCN
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
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).

Name of the Groups Name of the Taxa		
	Arcella sp.	
Drotozoo	Centropyxis sp.	
Protozoa	<i>Difflugia</i> sp.	
	Paramoecium sp.	
	Asplanchna brightwelli	
	Brachionus angularis	
	Brachionus calciflorus	
	Brachionus falcatus	
	Brachionus sp.	
Rotifera	Cephlodella gibba	
	Filinia longiseta	
	Keratella cochlearis	
	Keratella tropica	
	Lecane closterocera	
	Lecane luna	
	Cyclops sp.	
	Mesocyclops sp.	
Copepoda	Thermocylops sp.	
	Diaptomus sp.	
	Nauplius larvae	
	Alona intermediate	
	Bosmina sp.	
	Bosmina longirostris	
Cladocera	Chydorus sp.	
	Daphnia sp.	
	Daphnia pulex	
	Diaphanosoma excisum	
Ostracoda	<i>Cypris</i> sp.	
Ostracoua	Stenocypris sp.	
Source: GRC Survey Data		

Table 3.4(ix): Zooplankton Species Recorded from Yamuna River

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).

Name of the Groups	Name of the Taxa		
	Corbicula sp.		
	Corbicula striata		
Mallusaa	<i>Gyraulus</i> sp.		
Monusca	Lamellidens sp.		
	Melanoides scabra		
	Thira tuberculata		
	Chironomus sp.		
Diptera	Chironomus plumosus		
	Tendipes kiefferulus		
	Dero dagitata		
Oligochaete	Pheretima sp.		
_	Tubifex tubifex		
Crustana	Gammarus pulex		
Crustacea	Palemone sp.		
Trichenters	Glossosoma sp.		
Гпспорсега	<i>Hydropsyche</i> sp.		
Enhomorontoro	Baetis nymph		
Ephemeroptera	Caenis runlorum		
Source: GRC Survey Data			

Table 3.4(x): Macro-invertebrates recorded from Yamuna River

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

F	amily	Scientific Name	IUCN statu s
Order- Ost	eoglossiformes		
Family: Not	topteridae	Notopterus notopterus	LC
Order- Cyp	rinidontiforms		
Family:	Cyprinidae	Catla Catla	LC
		Amblypharyngodon mola	LC
	y: Cyprinidae	Puntius conchonius	VU
Family: Cy		Labeo calbasu	LC
		Labeo rohita	LC
		Labeo bata	LC
		Labeo dyocheilus	LC

Order- Clupeiformes				
Family: Clupeidae	Gudusia chapra	LC		
Order- Perciformes				
Family: Nandidae	Nandus nandus	LC		
Order- Siluriformes				
Family: Clariidae	Clarias batrachus	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 (Lot.23/1) 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, Villages Dumate, Tehsil Vikasnagar, District Dehradun, Uttarakhand, systematic analysis of various Socio-Economic characteristics, both in terms of quality and quantity has been done. 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 74 villages and two 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	Table 3.5(i): Sub-district wise distribution of villages and towns in the			
S. No	Name of the Sub-district	Number of	Number of	
Distric	t: Dehradun, Uttarakhand	Villages	100115	
1	Chakrata	1	-	
2	Kalsi	41	-	
4	Vikasnagar	27	2	
5	Rishikesh	1	-	
	Total	70	2	
District: Sirmaur, Himachal Pradesh				
1	Paonta Sahib	4	-	
	Total	4		
	Grand Total	74	2	

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.

S.N.	Description	Number	Percentage to
			Respective total
1	Gender wise total Population of the	148911	100
	Study area		
	Male	77771	52.2
	Female	71140	47.8
	Sex Ratio (No. of females per 1000		014 7
	males)		914.7
2	Gender wise total Population (0-6	20169	100
	age group)		
	Male	10400	51.6
	Female	9769	48.4
	Sex Ratio of 0-6 age group population		939.3
	(No. of females per 1000 males)		
3	Number of Households and	25294	
	household size		
	Average House Hold size for the study		6
	area as a whole		
	Highest Household size in the study		11
	area		
	Lowest Household size in the study		1
	area		
4	Total Population of Schedule Caste	34286	100
	Community in the study area		
	Male	18041	52.6
	Female	16245	47.4
	Sex Ratio (No. of females per 1000		900.4
	males)		
5	Total Population of Schedule Tribe	43608	100
	Community		
	Male	22801	52.3
	Female	20807	47.7
	Sex Ratio (No. of females per 1000		912.5
	males		

Table 3.5(ii): Particulars of the Study Area

6	Total population of General	71017	100
	Male	36929	52.0
	Female	34088	48.0
	Sex Ratio of General Community	01000	923.1
	population (including OBC) (No. of		
	females per 1000 males		
7	Total Literates in the study area	97018	100
	Male	55754	57.5
	Female	41264	42.5
	Over all literacy rate in the study		75.4
	area		
	Male		82.8
	Female		62.7
	Gender gap in literacy rate		20.1
8	Total Workers in the study area	58725	100
	Male	41034	69.9
	Female	17691	30.1
	Overall Gender Gap in work	39.8	
	participation rate	150.6	
	Overall Dependency Rate of Non-		153.6
0	workers over workers	46100	100
9	area	46188	100
	Male	34022	73.7
	Female	12166	26.3
	Over all gender gap in work		47.4
	participation rate of main workers		
10	Total Marginal Workers in the study	12537	100
	area		
	Male	7012	56.0
	Female	5525	44.0
	Over all gender gap in work		12
1 1	participation rate of Marginal workers	1506	100
11	in the Study Area	1536	100
	Male	1034	67.3
	Female	502	32.7
12	Total Agricultural Workers in the	32852	100
	study Area		
	Male	19832	60.4
	Female	13020	39.6
13	Total Cultivators in the Study Area	26753	100
	Male	15280	57.1
	Female	11473	42.9
14	Total Agricultural Labour in the Study Area	6099	100

	Male	4552	74.6
	Female	1547	25.4
15	Total Others Worker in the Study	24337	100
	Area		
	Male	20168	82.9
	Female	4169	17.1

Source: Census 2011

Various amenities available in the study area are tabulated below:

	Table 3	3.5(iii): List of ame	nities ava	ilable in the	study ar	ea
SI.No	Amenities	Туре	No. of villages	Number of institutions	No. of Towns	Number of institutions
1	Educational	Primary School	58	88	1	4
	Institutions	Middle school	24	27	1	1
		Secondary School	7	9	1	1
		Senior Secondary School	7	8	2	2
		Adult Literacy	18	30	-	-
		Center Other School	5	7	-	_
2	Health	Allopathic Hospital	7	11	-	-
	facilities	Allopathic	7	7	-	-
		Risponder Mospital	2	2	-	-
		Ayurvadic	1	1	-	-
		Maternity & Child Welfare Center	14	18	-	-
		Primary Health Sub-Centre	6	6	2	2
		Family Welfare	2	2	-	-
		Center Child Welfare	8	10	1	2
		Cnter H e alth Center	4	6	-	-
		Registered Medical Practicenors	7	15	2	10
		Community Health Workers	16	19	-	-
3	Drinking	Well	3	-	-	-
	Water	Hand pump	8	-	-	-
		Tub well	4	-	1	-
		Тар	68	-	2	-
4	Electricity	Power for domestic	47	-	2	200
		uses				connection
		Power for	5	5	1	100
		riginculture uses				Connection

		All purpose	14	14	1	400
		r ··· r ····				connection
5	Approach	Only Paved Roads	11	-	1	350 Km.
	Road	Only Mud Roads	8	-	-	-
		Both paved and Mud Roads	6	-	1	200 Km.
		Paved, Mud and Foot Road	6	-	-	-
7	Banks & Credit	Commercal bank (Pagdand i)	7	7	1	15
	Societies	Cooperative bank	4	4	-	-
		Agriculture Credit Societies	4	4	-	-
8	Communicati on Facilities	Bus Services	28	-	1	-

The impact assessment based on this data collected has been discussed in **Chapter VII** (Page no.124-129).





CHAPTER-IV

ANTICIPATED ENVIRONMENTAL IMPACT AND MITIGATION MEASURES

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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.46-90) and the proposed mining activity described in **Chapter II** (Page no.38-43), 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 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 XXV**.

4.4 NOISE

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:

Maximum allowable	Sound pressure	Remarks
duration	dB(A)	
per day in hour		
(1)	(2)	(3)
8.0	90	1. For any period of
6.0	92	exposure falling in
4.0	95	and lower figure as
3.0	97	indicated in column
2.0	100	(1), the permissible
1 1/2	102	determined by
1	105	extrapolation or
3/4	107	proportionate scale. 2. No exposure
1/2	110	excess of 115 dB(A)
1/4	115	is permissible.

Damage Risk Criteria for Hearing Loss OSHA Regulations

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 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 o 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 near village Dumet by an unmetalled road of about 320m and finally meets National Highway 123 by a metalled road having length of 1.55 Km and width of 8m. The evacuation route is shown in the map as given below



The evacuation route map depicting the routes is shown below

Fig. 4.1: 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.

During Mine operation

Proposed Capacity of mine/annum	: 2,80,000 TPA
No. of working days	: 225 days
Proposed Capacity of mine/day	: 1244 TPD
Truck Capacity	: 10 tonnes
No. of trucks deployed/day	: 125
Increase in PCU/ day	: 375

Considering both loaded & empty trucks

Increase in PCU/day will be 750 PCU's

Road	v	С	Existing V/C Ratio	LOS
Near Village Dumet	60	2000	0.06	А
NH-123Intersection	1400	15,000	0.09	А

Table 4.4 (i): Existing Traffic Scenario & LOS

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	А	Excellent
0.2 - 0.4	В	Very Good
0.4 - 0.6	С	Good / Average / Fair
0.6 - 0.8	D	Poor
0.8 - 1.0	E	Very Poor

Reference: ENVIS Technical Report, IISc, Bangalore.

Table 4.4 ((ii): Modified	Traffic Scena	ario & LOS
-------------	----------------	----------------------	------------

Road	v	С	Modified V/C Ratio	LOS
Near Village Dumet	810	2000	0.40	В
NH-123 Intersection	2150	15,000	0.14	А

Source: Capacity as per IRC: 64-1990

Results

From the traffic study it is observed that the level of services will go down from "A" that is Excellent to "B" which is Very Good in case of village intersection due to additional traffic load on the evacuation route where as it will remain same i.e. "A" in case of NH intersection.

Therefore, the additional load on the carrying capacity of the concerned roads is likely to have some affects, for which traffic management have been proposed and 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:

- 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 X (Page No- 143-144) 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 –XVI**.

CHAPTER-V

ANALYSIS OF ALTERNATIVES

(TECHNOLOGY & SITE)

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5.1	ALTERNATIVE FOR MINE LEASE	104
5.2	ALTERNATIVE FOR TECHNOLOGY AND OTHER PARAMETERS	104-106
5.3	SUMMARY	106

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 (30.035 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

S. No.	Particular	Alternative Option 1	Alternative Option 2	Remarks			
1	Technology	Open-cast	Open-cast	Open-cast	Manual	Mining	is
		Manual mining	Mechanical	preferred.			

Some alternatives considered during EIA study are discussed below:
			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 Transportati on	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 Transportati on	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.

CHAPTER-VI

ENVIRONMENTAL MONITORING PROGRAMME

INDEX

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6.3	MONITORING SCHEDULE	111
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6.6	REPORTING SCHEDULE OF THE MONITORING DATA	112-113

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 (SO₂) and Nitrogen Dioxide (NO₂) will be monitored at the workplace i.e. core zone. The methodology proposed for is shown below:

Parameters	Technique	Technical Protocol	Minimum Detectable Limit
	Gravimetric	CPCB Guideline	5 (μg/m³)
PM2.5	method	Vol. I May' 2011	
PM10	Gravimetric	IS 5182 (Part-	5 (μg/m³)
	method	XXIII)	
Sulphur	Improved West	IS-5182 (Part-II)	5 (μg/m³)
Dioxide	and Gaeke		
Nitrogen	Modified Jacob &	IS-5182 (Part-VI)	6 (μg/m³)
Dioxide	Hochheiser		

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.

CHAPTER-VII

ADDITIONAL STUDIES

INDEX

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7.0 PUBLIC CONSULTATION

The public consultation for this project was held on 10th September, 2014. The Public hearing Notice is shown below which was published on 14-05-2014 in the regional newspapers, Sahara & Hindustan Times.

The records of the proceedings are attached at **Annexure XI (A)** and the action plan along with budget allocation is attached as **Annexure XI (B)**.

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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

	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/hospi tal 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

Table 7.1 (i) Risk Likelihood Table for Guidance

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 7.1 (ii)]

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

Table7. 1 (ii) Qualitative Risk Assessment

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 $,12^{\circ}$ 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 low landslide zone as per the mapping shown here.



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 obliteration caused by disasters. (source: <u>dmmc.uk.giv.in</u>)

- ✓ 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. v' 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 XV**.

7.4 SOCIO-ECONOMIC IMPACT OF THE PROJECT & SAFETY MEASURES

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 158 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 40 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 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 highway 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 formedical 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. 23/1 near village Dumate, 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.

CHAPTER-VIII

PROJECT BENEFITS

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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.	0.40
3	Awareness campaigns regarding health issues in the nearby villages.	0.50
4	Health checkups & medicines to workers	3.16
	Total	4.66

- **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 of the project cost 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 &	Environment
		Family welfare	
Distribution of	Common	Free medical	Awareness programs
school bags, books	vocational	camps for the	for the workers to
and uniform to the	training centre	villagers	sensitize them about
children in nearby	shall be set		the importance of
villages	up.		biological
			environment
Scholarship for girl	Distribution of	Awareness	Distribution of free
candidates	blankets to	programs will	saplings to
	the needy	be arranged for	encourage villagers
	people	healthcare	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.

CHAPTER-IX

ENVIRONMENTAL COST BENEFIT ANALYSIS INDEX

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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. 23/1 over an area of 30.035 Ha. falling in Village-Dumate, Tehsil-Vikasnagar, District-Dehradun (Uttarakhand) is Rs. 17,15,000.

Major Heads	Total
Production Capacity	2,80,000 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	19,60,000/- Per Annum approx.

 Table 9.1: Project Cost and Benefit

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. 12.96 Lakhs per annum. The detailed cost for Environmental Expenses is given below in the Table.

S. No.	Major Heads	Expenses per
		annum(Lakhs)
1	Environmental Management Plan	7.0
2	Environmental and Social Responsibility	1.50
3	Occupational Health and Safety	4.46
	Total	12.96

Table 9.2: Project Cost and Benefit

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 19,60,000 - 12, 96,000 = 6,64,000 per annum.

CHAPTER-X

ENVIRONMENTAL MANAGEMENT PLAN INDEX

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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.84-96) 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.84-96). 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 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 percent of 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 to the movement of the wild animals through the transport route near the project area, sign boards will be placed detailing the dangers caused and the location of 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 aquatic habitat conditions harmful to local aquatic species.

6. Check on traffic load due to transportation & maintenance of evacuation route:

- To the extent possible, evacuation route will not be through residential areas so as to reduce the effect of dust emission and noise pollution from vehicular movement.
- Alternate evacuation route by using the existing roads will be proposed to avoid traffic congestion.
- A Monitoring Committee including Local Panchayat member may be established to control traffic on evacuation route.

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 checking overloading and 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. Eg. *Vetiveria zizanioides, Saccharum spontaneum, Pennisetum pupureum, etc.*

• For plantation purpose, native/local plant species are 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 and post project sedimentation studies by expert bodies. Monitoring schedule and budget allocation has been detailed **Chapter-VI** (Page no.108-112).

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.

10.4 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.

S1. No	Description	Measures	Capital Cost (Rs. In lakhs)	Recurring Cost(in lakhs/annum)
1	Health Facilities	Medical Camps and Awareness program	2.0	4.46
2	Wildlife Protection	Importance of Wildlife(Awareness) • Sign boards, information boards	- 0.5	0.05 0.1

Table 10.1 Cost of EMP

	Mineral	• Repairing and	1.0	2.0
3	transportation	maintenance of Roads		
	and Handling	• Water Sprinkling	-	1.2
	Destantion	Plantation	4.0	1.25
4	Restoration	Maintenance of Check doma (Botantian wall	-	0.5
т	Reclamation	 Restoration of banks 	-	0.3
	Pollution	• Air pollution	-	0.5
5	Monitoring	 Water pollution 	-	0.5
Ũ		 Soil Pollution 	-	0.3
		 Noise Pollution 	-	0.3
		Total	7.5	11.46

Total expenditure during five years would be

Capital Cost = 7.5 Lakhs

Recurring Cost 11.46 x 5 = 57.30 Lakhs

Total = 7.5 + 57.30 = 64.80 Lakhs

CHAPTER-XI

EXECUTIVE SUMMARY

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11.0 INTRODUCTION

The proposed project is to mine Sand, *Bajri* & Boulder from bed of river Yamuna, over an area of 30.035 Ha. near village: Dumate, 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 also Doon Valley an eco-sensitive zone lies within the 10 km radius of the lease area

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. 23/1 Sand, Bajri & Boulder Mining Project from the bed of River Yamuna over an area of 30.035 ha.

The project proposal was submitted to Ministry of Environment, Forest and Climate Change, New Delhi for its appraisal. Based on which, presentation for Terms of Reference (TOR) was held during June 26th-28th, 2013. Based on the data provided and presentation done, the Ministry of Environment, Forest and Climate Change, New Delhi has issued the Terms of Reference vide letter No. J-11015/125/2013-IA.II (M) dated 16th September, 2013.

There are four other leases lies within the 500m radius of the proposed Sand, Bajri and Boulder Mining Project, District Dehradun, Uttarakhand and the cumulative area of all the five mines is 38.28 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 still comes under A Category without cluster situation due to the presence of Doon Valley as all the other 4 leases awarded EC prior to 15th January, 2016.

It has been proposed to mine around 2.80 lakh Tonnes per annum of minerals. The estimated project cost for the proposed project is Rs. 17.15 Lakhs.

The public hearing for the proposed project was done on 10.09.2014. The details of proceedings are attached **Annexure-XI-A & B**.

11.1 LOCATION

The proposed mining lease area falls in Survey of India Toposheet 53F14.

The lease area is located near village: Dumate, Tehsil: Vikasnagar & District: Dehradun, Uttarakhand.

The mine lease co-ordinates are listed below:

	Latitude:	30°30'42.15"N to	30°30'40.55"N
Coordinates			
	Longitude :	77°50'22.59"E to	77°51'10.91"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 (AVAILABLE QUANTUM) AND PRODUCTION (EXTRACTABLE 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 5, 40,778.48 tonnes.

Production: Approx. 2.8 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 3.4 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.

Attribute	Baseline status
Ambient Air Quality	Ambient Air Quality Monitoring reveals that the minimum & maximum concentrations of PM10 amongst
0	all the 5 AQ monitoring stations were found to be 59.9
	μ g/m ³ at AQ3 and 87.6 μ g/m ³ at AQ4, respectively.
	As far as the gaseous pollutants SO ₂ and NO ₂ are concerned, the prescribed CPCB limit of 80 μ g/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 Five
	locations monitored.
Water Quality	The ground water from all sources remains suitable for
	drinking purposes as all the constituents are within the
	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 batning.
Soil Quality	Samples collected from identified locations indicate the
	soil is Sandy loamy type which has low water retention
	potential .The pH value ranging from 7.14 to 7.78, which
	snows that the son is alkaline in nature.
Ecology and	10 km buffer of lease area comprises of Doon Valley and
Biodiversity	some Reserve forests.

Table 11.1 Baseline Environmental Status

11.6 <u>ENVIRONMENTAL MANAGEMENT PLAN (EMP) & ITS</u> 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

S1.			Capital	Recurring
No		Measures	Cost	Cost(in
	Description		(Rs. In	lakhs/annum)
			lakhs)	
1	Health Facilities	Medical Camps and Awareness program	2.0	4.46
2	Wildlife	• Importance of Wildlife(Awareness)	-	0.05
2	Protection	• Sign boards, information boards	0.5	0.1
	Mineral	• Repairing and	1.0	2.0
3	transportation and Handling	maintenance of RoadsWater Sprinkling	-	1.2
		Plantation	4.0	1.25
	Restoration	Maintenance of Check	-	0.5
4	and Reclamation	 dams / Retention wall Restoration of banks 	-	0.3
	Pollution	Air pollution Water pollution	-	0.5
5	Monitoring	Soil PollutionNoise Pollution	-	0.3 0.3
	1	rotal	7.5	11.46

Total expenditure during five years would be

Capital Cost = 7.5 Lakhs

Recurring Cost 11.46 x 5 = 57.30 Lakhs

Total = 7.5 + 57.3 = 64.80 Lakhs

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 of the project cost will be allotted for the Corporate Social Responsibility for activities related to education, social causes, healthcare & environmental.

CHAPTER-XII

DISCLOSURE OF CONSULTANT ENGAGED

The EIA/EMP Report for **Mauza River Yamuna Lot No. 23/1 Sand,** *Bajri &* **Boulder Mining Project** has been prepared by Grass Roots Research & Creation India (P) Ltd.

Name of the	Grass Roots	ISO 9001: 2008
Consultant	Research & Creation	(QMS),
	India (P) Ltd.	14001:2004 (EMS) &
		OHSAS 18001: 2007
Address	F:374- 375, Sector:	Certified Co.
	63, Noida, India	Accredited by
		QCI/NABET.
Name of the	GRC India Training	NABL Accredited
Laboratory	and Analytical	Laboratory,
	Laboratory	Recognized by
		MoEF&CC under
Address	F- 375, Sector: 63,	MoEF&CC under Environment
Address	F- 375, Sector: 63, Noida, India	MoEF&CC under Environment (Protection) Act,
Address	F- 375, Sector: 63, Noida, India	MoEF&CC under Environment (Protection) Act, 1986.
Address	F- 375, Sector: 63, Noida, India	MoEF&CC under Environment (Protection) Act, 1986. A unit of GRC 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	l in	Mr. Shahbaz Malik (Project Associate)
Preparation	of	
EIA/EMP report	as	Mr. B.K. Jha
Team Member		

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. 35/ Oct. 08, 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 snapshot of the list where GRC India's name is listed is pasted below:

	National Accreditation Board for Education and Training
NABET	
NABET/EIA/RA083/076 Grass Roots Research and Creation Ind	ia (P) Ltd Jan.18, 2016
F: 374-375,	
Sector-63,	
(Kind Attention: Dr. Dhiraj Kr. Singh)	
Dear Sir,	Sub: Re-Accreditation
	Sub. Ne Accountedon
This has reference to your application to and the assessment carried for same in	9 QCI-NABET for re-accreditation (RA) as EIA Consultant Organization your organization from Feb. 11 -14, 2015.
We are pleased to inform you that Accreditation Committee has approved three years from Feb. 14, 2015 to Feb. 1 response to NCs/Obs./Alerts issued, if a 1. Annexure I - Scope o	based on the document and office assessments during RA, the renewal of accreditation given to your organization for a period of I3, 2018 subject to coverage of balance Functional areas and specific aplicable (Refer Annexure III) with the following details: f accreditation
2. Annexure II - List of e	xperts with approved sectors/ functional areas
 Annexure III - Non-Co 	nformances/ Observations/ Alerts (NCs/ Obs./ Alerts)
4. Annexure IV - Observa	tions on Quality Management System (QMS)
5. Annexure V - Terms a	nd conditions of accreditation
 Annexure VI - Result of 	fassessment
7. Annexure VII - Guidelin	es for addressing Major Non-Conformances/ Observations/ Alerts
8. Annexure VIII - Format EIA reports prepared by Grass Roots Res	to be followed for mentioning the names of the experts involved in earch 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. Details including those not approved and NCs/ Obs./
Alerts as applicable are given in Annexu	re III. You are requested to take necessary actions to close the NCs/
Obs. as per guidelines and timeframe m	entioned in Annexure VII of this letter. You are also advised to visit
end.	he Scheme effective from Sep. 1, 2015 for necessary actions at your
You are required to make all payments	to NABET as applicable, within one month from the date of imprice
sent to you. Continuation of this accredit	tation of your organization is subject to the clearance of all dues by
your organization, satisfactory complianc With best regards,	e to Annexure III and V.
Yours sincerely,	
(AKJAa) BOILL	
Senior Director	

Scope (of Accreditatic	m		Annexure
NAME	OF THE CONSU	JLTANT ORG	ANIZATION: Grass Roots Research and Creation India (P) Lt F: 374-375, Sector-63, Noida - 201301. (UP)	d
<u>SI.</u> <u>No.</u>	Sector number	As per NABET	Name of Sector	Categ ory A/B
-	Notification	Scheme		-
1.	1 (a) (i)	1	Mining of Minerals	Α
2.	1(0)	4	Thermal power plants	B
3.	2 (a)	6	Coar wasneries	A
4.	2 (D) 3 (a)	/	Metallurgical industries/fermine & non-fermuch hath	B
5.	5 (4)	8	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 construction projects	8
8.	8 (b)	39	Townships and Area development projects	8
gan	W Jon 16		ABL	
Senior D	irector			

	List of Accredited EIA Co	nsultant O	rganizations - 170(as en Oct.)	08, 2015)
			Scope of Accredite	tion	I manhood and data of the
5. NO.	Consultant Organization	Sector Number	Name of Sector	Category	Schedule of MoEF Notification dated September 14, 2006 an uniscensest amendment
1	Aarvee AssociatesAnthitetts Engineers & Consultants Por. tail." Addiness: 8-2-5. Rusula Residence Sninagar Colony, Hydensbad E-mail: sances@sances.nst. isonsaid@sances.nst. water@sances.nst Tel: Did-23737433 Conditions apply	я	Hgrways, Raiways, transport terminals, misz nepid transport system	*	718
		1	Mining of minerals (Openciast on h)	A	3 (a) (i)
	ABC Technie Labs Tedla Privato Dimited/Cornerly	1	Scienting Coper Centerie United Protection	- D	1041
	Service of the service of the second second second	1	The trul Power Start	4	340
2	Address No. 2, 2 rd Street, Thingam Colony, Area Napar West, Chennel - 600040	1.1	Metallurgical industries (sec. ferrous only)	8	3 (8)
		0	Eement Plants	A	3년회
	E-maRiabe@abstichmalab.com	10	Fetisleurs refining industry	A	4(a)
	Infail shows house com	15	Leather, skin, hide processing industry	A	4代
	Tel: 044-25355123/24/25/26	-18	Charried Perchans	A	5 (a)

		Scope of Accorditation						
S. No			Aa per HADET Schume		Project or Activity to per			
	Consultavé Degaritation	Sector Number	Sector Name of Sector		Schedule of MoEF NotTheatlos dated September 14, 2006 and subsequent amendment			
	Address: Pict vs. A. 200, Road No. 15-2, These industrial Area, NICC Invade Estatel, There InVesti- 400604 E-mail:schart.athuraie@sphiftinberga.com into@spliftinberga.com	п	Synthetic organic chemicals industry drags & dvp intermediates built drugs and minimidates excluding drug formulations; synthetic rubbers; basic inganic chemicals, other synthetic organic chemicals and chemical intermediates)	A	510			
	Tel : 022-25801529, 9821570678 Conditions apply	36	Common effuent treatment plants	8	7(6)			
		38	Building and large construction projects including shapping multi, multiplexes, commercial complexes, necting estates, nospitals, institution	B	# (a)			
			READ AND ADDING THE EXAMINE					
	Grass Roots Research and Creatise India (P) Ltd.	1	cast/ Underground miting	. 4	2 (#13			
	Address: F- 175, Sec - 63, No.da - 201301	3	Alver velley, hydel, Dreinage and Impetion projects		510			
76	e mai: migure-inflatom megger-inflatom	- 4	Thermal power plants	A	2141			
	*/. mat	1	Cest Warherits	A	5341			
	00011554031_09813154005	τ.	net formul both primary & secondary		3 (2)			
	Conditions apply	31	industrial estates/parks/ complement	8	740			

Environment Management Cell (EMC)

A centralized Environmental Monitoring Cell will be established for monitoring of important and crucial environmental parameters which are of immense importance to assess the status of environment during mine operation. With the knowledge of initial parameters, deviations in environmental conditions due to operation of the mine will be assessed and mitigation steps will be taken to safeguard the environment. The routine monitoring program will be implemented under the project monitoring as per CPCB & MoEF&CC guidelines. Officer not below the rank of General Manager will be responsible of Environmental Management Cell and execution of Environmental Monitoring Program.

Hierarchy of Environmental Management Cell in order to maintain the environmental quality within the stipulated standard, regular monitoring of various environmental parameters will be necessary.

Environmental Management Cell under Senior Officer (not below the rank of General Manager) will be constituted for regular monitoring, compliances, supervision and hearing of complain and reporting.

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.



The core responsibilities or the Environmental Monitoring Cell will be:-

- The organization and interpretation of the environmental monitoring data to establish a record of change associated with the implementation of a project or the operation of an organization.
- The process of verification that all or selected parameters measured by Environmental Monitoring Program are in compliance with regulatory requirements, internal policies and standards, and established environmental quality performance limits.
- Assessment of the effective environmental management system, practices and procedures.
- The environmental monitoring and audit work will be carried out by qualified personnel.
- A summary of non-compliance of the environmental quality performance limits.
- To implement and monitor the control and protective measures based on the EMP.
- Ensuring that employees get requisite PPE whenever required.
- To coordinate the environment related activities to the top management within as well as with outside concerned agencies.
- To provide of health checkup of workers and the people living in nearby villages.
- To develop greenbelt in the nearby villages, schools, Govt. offices and transportation routes.
- Coordination with regulatory agencies, external consultants, monitoring laboratories.
- Maintenance of log of public complaints and the action taken.

Annexure 9B

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 362/2018-19)

Date 25 JUN 2018

Environmental Policy

We, Garhwal Mandal Vikas Nigam Ltd. (GMVN), Dehradun, applicant of the proposed project, reaffirm my commitment to contributing towards a clean and sustainable environment and continually enhancing our environmental performance as an integral part of our business philosophy and values.

Towards this commitment, I shall:

- Abide to compliance to Air (Prevention and Control of Pollution) Act, 1981, Water (Prevention and Control of Pollution) Act, 1974 and Indian Wildlife (Protection) Act, 1972 and Environment (Protection) Act, 1986 in compliance of Environmental issues.
- Abide to the Uttarakhand Mineral Policy, 2011 and its amendment thereof and comply with all the conditions and stipulations.
- Ensure knowledge and consciousness about environmental issues among all employees in order to continually improve environmental impact and prevent pollution at source.
- Encourage, develop and apply the best available practicable technical solution.
- Communicate meaningfully with governments, civic leaders and other stakeholders, to develop a mutual understanding of environmental management issues and performance.
- Ensure that environmental management plans are integrated with day-to-day activities and safe work practices.
- Establish accountabilities for environmental protection accompanied by measurable objectives, targets and performance indicators.
- Plant trees & promote lush green surroundings in harmony with nature.
- Enhance environmental awareness amongst employees working and the general populace around working areas and mines.

- Report on our environmental management performance and progress regularly and appropriately to the concern authority.
- · Involve the public in decision making and make this policy available to them.

WORKERS RESPONSIBILITY

All workers and contractors will be made to comply with and support the Environment Policy and to ensure that they:

- · Follow established operational procedures, guidelines and instructions.
- · Report and respond to environmental incidents and hazards in a timely fashion.
- · Abide by the applicable laws and regulations of the mineral policy.
- Evaluate and respond to risks to the mining activity which could adversely impact people or the environment.
- Ask questions of their supervisor when unsure about environmental issues to comply/ ensure them.

For Garhwal Mandal Vikas Nigam Limited

Braup

B.S. Danu (Incharge – Mining)

IMPACT OF PROPOSED MINOR MINERAL PROJECT ON AMBIENT AIR QUALITY AT THE RIVER YAMUNA, LOT NO. 23/1, AT VILLAGE: DUMATE, 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**.

		Parameters for calculation of Emission Rates									
Name of	Quantity (MTPA)	Mining activity	Vehicular Movement								
Mine		PM ₁₀		Truck			NOx	SO ₂	CO		
			Capacit y (MT)	No. of Trips/ Hr	Road Length (km)	РМ					
River Yamuna 23/1	280000	0.3060	10	16	1.87	2.0E-04	1.7E-02	1.7E-04	4.5E-02		

Table: Estimated Emission Rates from Different Sources

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/m ³)					
Mining activity-Area source							
1.	РМ	0.3060					
Vehicular Movement-Line source							
2.	PM ₁₀	2.0E-04					
3.	SO ₂	1.7E-04					
4.	NOx	1.7E-02					
5.	CO	4.5E-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 PM₁₀ 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 $0.3060\mu g/m^3$, PM_{10} due to vehicular movement are found to be $2.0E-04 \ \mu g/m^3$, SO_2 due to vehicular movement are found to be $1.7E-04 \ \mu g/m^3$, NOx vehicular movement are found to be $1.7E-02\mu g/m^3$ and CO vehicular movement are found to be $4.5E-02\mu g/m^3$ 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.

	Site Name	PM ₁₀ concentration			NO _x concentration			SO ₂ concentration		
Site		(µg/m³)			(µg/m³)			(µg/m³)		
Code		Basel	Increm	Cumul	Basel	Increm	Cumul	Basel	Increm	Cumul
		ine	ental	ative	ine	ental	ative	ine	ental	ative
A1	Project Site									
	(near	76.4	2.0	78.4	19.4	1.7	21.1	5.8	1.7	7.5
	Baruwala)									
A2	Dalzhpathar	05.0	2.0	07.0	21.2	17	22.0	56	17	72
	Dakiipatilai	03.0	2.0	07.0	21.2	1.7	22.9	5.0	1./	7.5
A3	Katanathar	74.9	2.0	76.9	185	17	20.2	6.0	17	77
	Ratapathai	74.7	2.0	70.7	10.5	1.7	20.2	0.0	1.7	/./
A4	Noar Kalci	976	2.0	90.6	10.6	17	21.2	50	17	76
	Neal Kaisi	07.0	2.0	09.0	19.0	1.7	21.5	3.9	1./	7.0
A5	Kodarwala	70 F	2.0	72 F	172	17	10.0	E 6	17	70
	Reual wala	70.5	2.0	72.5	17.5	1./	19.0	5.0	1./	7.5
	Maximum	87.6	2.0	89.6	21.2	1.7	22.9	6.0	1.7	7.7

 Table: Predicted Incremental Concentrations of PM, SO2, NOx and CO in Study Area

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 PLAN

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.

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.	3.16
	Total	4.66

Budget for Occupational Health and Safety:

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.
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 1550m length will be covered along the road side = $3 \times 1550 \times 2$ (both the road side) = 9300 sqm or 0.93Ha.

No. of Plants to be planted @9sqm/Plant = 1033 Plants

Along the river banks

Area of 10m width and 4450m length will be covered along both the sides of river banks = $10 \times 2430 = 24300$ sqm or 2.43 Ha. No. of Plants to be planted @25sqm/Plant = 972 Plants

Distribution of Fruit Plants to Villager, Govt. School, College Campus and Panchayat area - 500 plants

Total no's of sapling to be planted = 1033+972+500 = 2505 or say 2500

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.

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	Populas 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

												1
S. No.	Proposed Plantation Activity	Annual Cost (Amount in Rs. lakhs)								Grand		
		1 st Year		2 nd }	2 nd Year		3 rd Year		4 th Year		5 th Year	
		Physi cal	Capi tal Cost	Physi cal	Recur ring	Physi cal	Recur ring	Physi cal	Recur ring	Physi cal	Recur ring	
1	Plantation Activity in the area (Total 2500 trees for 5 years), (Cost of Sapling Rs.100/Sapling)	2500 No's	Rs. 4.0 Lakhs	Maint enance	Rs. 1.25 Lakhs	Maint enance	Rs. 1.25 Lakhs	Maint enance	Rs. 1.25 Lakhs	Maint enance	Rs. 1.25 Lakhs	9.0

 Table 2: Expenditure for Plantation in Five Years (Amount in Rs. lakhs)

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.

VIPPIL No. 68 of 2016 Hon'ble Rajiv Sharms, .V. Hon'ble Alok Singh, J.

Mr. Rajesh Pandey, Advocate for the petitioner.

Ms: Pooja Banga, Brief Holder for the State/respondent nos. 1, 3 and 4.

Mr. Shiv Pande, Advocate holding brief of Mr. Aman Rab, Advocate for respondent no.2.

A question of great public importance has been raised in the present writ petition.

According to the petitioner, the and Mafias have encroached upon the river beds by raising construction, the details of specific khata Numbers and Khasra Numbers, have also been mentioned in the writ petition upon which the encroachment has be in carried but.

Accordingly the District Magistrate, Naintal Leteby directed to evict the unautions a occupants from the river beds within a period of seven days positively. The Senior Superintendent of Police, Nainital is also directed to provide all necessary assistance to the District Magistrate for evicting the persons who have encroached upon the river beds.

District Magistrate, Nainital is hereby directed to ensure that beneciorth, no encroachment is made on the niver beds. Constructions raised on the river beds impede the flow of water. It also affects riparian rights of the persons as well. The Court can take judicial notice of the fact that the mining activities have also been carried out in close proximity of the bridges throughout the State of Uttarakhand. The mining activities carried out near the bridges also damage the foundation of the bridges.

Hence, there shall be a further direction to all the District Magistrates to ensure that no mining activity takes place one kilometre upstream or downstream of the bridges throughout the State of Uttarakhand.

In view of the above, the writ petition stands disposed of.

(Alok Singh, J.) (Rajiv Sharma, J.) 17.10.2016 Compared by A PHOTOSTAT TRUE COPY