

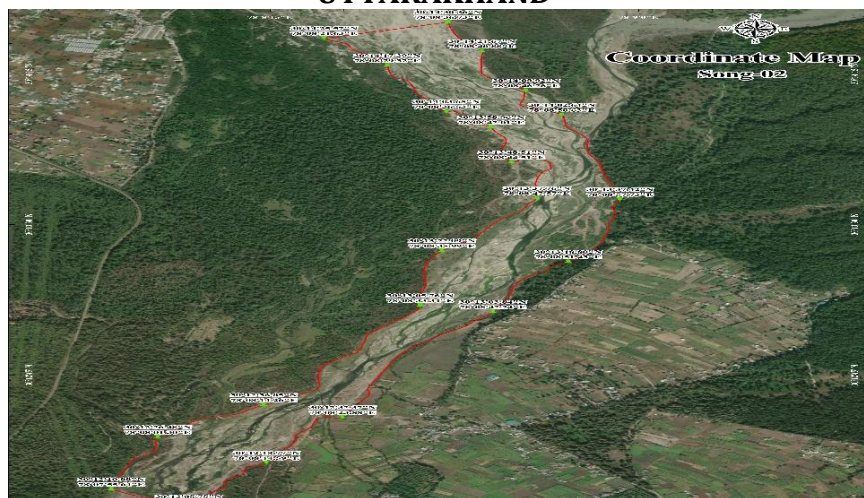
DRAFT ENVIRONMENT IMPACT ASSESSMENT REPORT
FOR
MINING OF MINOR MINERAL (SAND, BAJRI AND BOULDERS)
FROM SONG-2 RIVER BED, DEHRADUN FOREST DIVISION
DISTRICT DEHRADUN, UTTARAKHAND
(M.L. AREA OF 136.85 HA, PRODUCTION CAPACITY -4064445.00 TPA)
PRODUCTION (AS PER REPLENISHMENT STUDY REPORT 2019-20)-441904.41 TPA
SCHEDULE: 1 (a), CATEGORY: A

(AS LEASE AREA IS MORE THAN 100 HECTARES)

PROJECT PROPONENT



**UTTARAKHAND FOREST DEVELOPMENT CORPORATION, DEHRADUN,
UTTARAKHAND**



DOC. No: MCPL/EMD/MIN/2019-21/09/02 (DEIA) JULY, 2021



PREPARED BY

MANTEC CONSULTANTS PVT. LTD.



(QCI Accredited EIA Consultant at S.No. 162 as per List of Accredited Consultant Organizations/Rev. 15, OCTOBER 11, 2021)

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NABET ANNEXURE – VII



DISCLOSURE OF CONSULTANTS

Declaration by Experts contributing to the EIA for Mining of Minor Mineral (Sand, Bajri and Boulders) from the river bed of River Song-2 by M/s Uttarakhand Forest Development Corporation, located in Dehradun Forest Division. District- Dehradun, Uttarakhand.

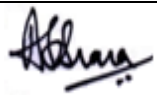
Declaration by Experts contributing to the EIA: EIA


I, hereby, certify that I was part of the EIA team in the following capacity that developed the above EIA.

EIA Coordinator:





Name	Mr. Punit Lal Mehto	Dr. B.J Prasad
Signature and Date	20.12.2019 	18.02.2020 
Period of Involvement	December 2019- January 2020	February 2020 -till date
Contact Information	9911537948	9650991514

Associate EIA Coordinator

Name	Mr. A.S. Brara
Signature and Date	
Period of Involvement	Dec 2019-till now

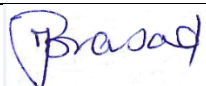


Name	Mr. Preeti
Signature and Date	
Period of Involvement	Jan 2019-till now

Functional Area Experts

S. No.	Functional Areas	Name of the Experts	Involvement (task & period)	Signature & Date
1	AP*	Mr. A.S. Brara	December 2019 - March 2020; <ul style="list-style-type: none"> • Identification of Air Quality Monitoring Network • Supervision of ambient air quality monitoring • Review of primary air quality monitoring report and analysis • Addressing air quality issues in EIA Report and suggesting mitigation measures for impacts due to air pollution and review • Review and analysis of primary meteorological data 	
		Ms. Preeti	December 2019 - March 2020; <ul style="list-style-type: none"> • Identification of Air Quality Monitoring Network • Supervision of ambient air quality monitoring • Review of primary air quality monitoring report and analysis • Addressing air quality issues in EIA Report and suggesting mitigation measures for impacts due to air pollution and review • Review and analysis of primary meteorological data 	
2	WP*	Mr. A.S. Brara	December 2019 - March 2020 <ul style="list-style-type: none"> • Identification of water sampling locations, their time and frequency pertaining to site conditions • Counter checking of analysis of data by literature study and consultation with local people and concerned departments • Identification of water quality by analysis report study and detection of potential hazards due to developmental activity • Checking of water availability by literature study and by interacting concerned Govt. Officials like GWB and irrigation dept. 	
		Ms. Preeti	December 2019 - March 2020; <ul style="list-style-type: none"> • Identification of water sampling locations, their time and frequency pertaining to site conditions • Counter checking of analysis of data 	

			<p>by literature study and consultation with local people and concerned departments</p> <ul style="list-style-type: none"> • Identification of water quality by analysis report study and detection of potential hazards due to developmental activity • Checking of water availability by literature study and by interacting concerned Govt. Officials like GWB and irrigation dept. 	
3	SHW*	Mr. R.A Wani	<p>December 2019 - March 2020;</p> <ul style="list-style-type: none"> • Estimated the waste generation quantity due to various construction activity • Devising measures to minimize wastes; recycle and disposal • Identification methods of recycling and reuse Ensured incorporation of the same into the EIA report. 	R. A. Wani
4	SE*	Mr. Anil Kumar	<p>December 2019 - March 2020;</p> <ul style="list-style-type: none"> • Design and develop format/questionnaire for baseline survey, social changes arising out of development projects and assessment of data so collected • Evaluation of socio economic status of tribal/ non- tribal areas • Assessment of social impact • Collection of secondary information Survey tool design • Reconnaissance study, transect walk • Community participation, Mitigation plan • Stakeholder consultation 	Anil Kumar
		Mr. Braj Vallabh Pandey	<p>June 2020 to Till Now;</p> <ul style="list-style-type: none"> • Design and develop format/questionnaire for baseline survey, social changes arising out of development projects and assessment of data so collected • Evaluation of socio economic status of tribal/ non- tribal areas • Assessment of social impact • Collection of secondary information Survey tool design • Reconnaissance study, transect walk • Community participation, Mitigation plan • Stakeholder consultation 	Braj Vallabh Pandey

5	EB*	Dr. Rajdeep	December 2019 - Feb 2020; <ul style="list-style-type: none"> Visited site to identify the ecological condition of project area by direct field study and identification of major floral and faunal species Identification of potential impact due to the project interventions and developing mitigation measures by direct field study and consulting the stakeholders like forest and wildlife officials, local people etc. 	Rajdeep
		Dr. B.J. Prasad	Feb 2020 -Till now; <ul style="list-style-type: none"> Visited site to identify the ecological condition of project area by direct field study and identification of major floral and faunal species Identification of potential impact due to the project interventions and developing mitigation measures by direct field study and consulting the stakeholders like forest and wildlife officials, local people etc. 	B Prasad
6	HG*	Capt. H.K. Sharma	December 2019 –March 2020; <ul style="list-style-type: none"> Identification of the water sources and drainage pattern Analyze them to identify the likely impacts Devise mitigation measures and assisted in preparation of the EIA report. 	Prasad (H.K. Sharma)
7	GEO*	Mr. B.M. Sinha	December 2019 –March 2020 <ul style="list-style-type: none"> Identification of nature of geology of the project area Identification of areas likely to be affected by soil erosion Devised protection measures for embankment slope and water bodies 	B.M. Sinha
8	SC*	Dr. Vivek Diwedi	December 2019 –Feb 2020 <ul style="list-style-type: none"> Identification of soil quality and soil type for establishing the baseline conditions Assessing the impact on soil due to various activities of the project Suggest mitigation measures to control the adverse impact Preparation of report for incorporation in the EIA 	Vivek Diwedi

		Dr. BJ Prasad	<p>Feb 2020–March 2020;</p> <ul style="list-style-type: none"> • Identification of soil quality and soil type for establishing the baseline condition • Assessing the impact on soil due to various activities of the project • Suggest mitigation measures to control the adverse impact • Preparation of report for incorporation in the EIA 	
9	AQ*	Mr. A.S. Brara	<p>December 2019 –March 2020;</p> <ul style="list-style-type: none"> • Analysis of air quality data, meteorological data, traffic data etc. as per the requirements of Pollution Dispersion model (AERMOD) • Assessment of secondary data requirements for modeling, collection of secondary data like mixing height, stability class etc. • Predict air quality using pollution dispersion model (AERMOD) • Interpretation, analysis and presentation of predicted results of pollution dispersion modeling • Review and finalization of report 	
10	NV*	Mr. A.S. Brara	<p>December 2019 –March 2020;</p> <ul style="list-style-type: none"> • Identification of Noise Quality Monitoring Network and noise sensitive location along the project stretch • Supervision of ambient noise quality monitoring • Review of noise quality monitoring report • Addressing noise related issues in EIA report and suggesting measures for impacts due to noise pollution • Analysis of noise quality data, traffic data etc. as per the requirement of mathematical model of FHWA-TNM • Interpretation, analysis and presentation of predicted results. 	

		Capt. H.K.Sharma	December 2019 –March 2020; <ul style="list-style-type: none"> • Identification of Noise Quality Monitoring Network and noise sensitive location along the project stretch • Supervision of ambient noise quality monitoring • Review of noise quality monitoring report • Addressing noise related issues in EIA report and suggesting measures for impacts due to noise pollution • Analysis of noise quality data, traffic data etc. as per the requirement of mathematical model of FHWA-TNM Interpretation, analysis and presentation of predicted results. 	<i>Received (H.K.Sharma)</i>
11	LU*	Mr. Manoj Kr. Singh	December 2019 –March 2020; <ul style="list-style-type: none"> • Identification and collection of satellite images and other associated maps for the project area • Creation of GIS data base and processing of satellite imageries • Devised measure to save sensitive and productive land uses by suggesting option of realignment, bypass and eccentric widening • Analysis of land use map and incorporation of land use details into EIA 	<i>Manoj</i>
12	RH*	Mr. R.A. Wani	December 2019 –March 2020; <ul style="list-style-type: none"> • Identification of the potentially hazardous material and events that might occur during various phases of the project • Devising contingency plan for each type of hazard • Incorporation of the same in the EIA report 	<i>R.A. Wani</i>

***One TM against each FAE may be shown.**

****Please attach additional sheet if required.**

Part B: Declaration by Head of the ACO/ authorized person

I, A. S. Brara, hereby, confirm that the above mentioned experts prepared the EIA "Mining of Minor Mineral (Sand, Bajri and Boulder) from the riverbed of river Song-2 of Village- Kaluwala, Tehsil & District-Dehradun and State-Uttarakhand and EIA Coordinator (EC) is fully aware of the content. The consultant organization shall be fully accountable for any mis-leading information. It is also certified that EIA Report has been analysed by the system for plagiarism check using Smalls tools software in accordance with good scientific practice. No unethical practices have been carried out and external data / text has not been used without proper acknowledgement, while preparing this EIA report.

Certificate of Plagiarism check	
Title of EIA Report:	Mining of Minor Mineral (Sand, Bajri and Boulder) from the riverbed of river Song-2 of Village- Kaluwala, Tehsil & District- Dehradun and State- Uttarakhand.
Name of Accredited Organisation:	M/s Mantec Consultants Pvt. Ltd., Noida
Unique Identification Number:	MCPL/EMD/MIN/2018-19/09/02/(DEIA-V01)
Name of EIA Co-ordinator:	Dr. B. J. Prasad
Name of the Software:	Smallseotools
Date of Check:	July, 8 th 2021
Time of Check:	Multiple time due to word limit

*Note – The ACO may use/take help of appropriate software to detect plagiarism issues of the EIA content.

EIA Co-ordinator:

Name : Dr. B.J. Prasad (Principal Consultant)

Signature : 

Head of ACO / authorised person:

Name : Mr. A.S. Brara (CMD)

Signature : 

Consultant Organization: M/s Mantec Consultants Pvt. Ltd., Noida

NABET Certificate no. & Issue date: NABET/EIA/2023/RA 0205 & Date of Issue 07/05/2021

Undertaking by Project Proponent

The Environmental Impact Assessment Report of "**Mining of Minor Mineral (Sand, Bajri and Boulder) from the riverbed of Song-2 of Village-Kaluwala, Tehsil & District-Dehradun and State-Uttarakhand**" prepared by Mantec Consultants Pvt. Ltd. has been reviewed thoroughly at our end before submission. I, on behalf of **M/s Uttarakhand Forest Development Corporation**, hereby undertake that the data and information provided in the report are correct to the best of our understanding, and we own responsibility for correctness of contents of the EIA report.

Authorized Signatory

Uttarakhand Forest Development Corporation
प्रभागिय लोनिंग प्रबन्धक (खनन)
उत्तराखण्ड वन विकास निगम
देहरादून

Undertaking by Accredited Consultant Organization

I, **A. S. Brara**, hereby, confirm that this EIA/ EMP Report Mining of Minor Mineral (Sand, Bajri and Boulder) from the riverbed of Song-2 of Village- Kaluwala, Tehsil and District- Dehradun, State- Uttarakhand. I also confirm that I shall be fully accountable for any misleading information mentioned in this Report.

Signature

: 

Name

: Mr. A.S. Brara

Designation

: CMD

Name of the EIA Consultant Organization: Mantec Consultants Pvt. Ltd., Noida- 201301

QCI/NABET Accredited EIA Consultant at S.No. 162 as per List of Accredited Consultant Organizations/(Alphabetically) Rev. 15, October 11, 2021 and MoEF&CC and NABL approved Laboratory.

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ABBREVIATIONS	
AAQM	Ambient Air Quality Monitoring
Avg.	Average
BOD	Biochemical Oxygen Demand
BIS	Bureau of Indian Standards
COD	Chemical Oxygen Demand
CEC	Cation Exchange Capacity
CGWA	Central Ground Water Authority
CPCB	Central Pollution Control Board
CER	Corporate Environment Responsibility
CSR	Corporate Social Responsibility
dB	Decibel
DMP	Disaster Management Plan
EHS	Environmental Health and Safety
EMP	Environmental Management Plan
Ha	Hectare
IMD	Indian Meteorological Department
IUCN	International Union for Conservation of Nature
KLD	Kilo Liter per Day
LU/LC	Land use/Land Cover
mRL	Mean Reference Level
MCDR	Mining Conservation & Development Rules
MoEF&CC	Ministry of Environment and Forest and Climate Change
MTPA	Million Tonns Per Annum
NH	National Highway
NAAQ	National Ambient Air Quality
NABET	National Accreditation Board for Education and Training
NABL	National Accreditation Board for Testing and Calibration Laboratories
NOx	Nitrogen Oxides
OH&S	Occupational Health & Safety
PM	Particulate Matter
LOS	Level of Service
PCU	Passenger Car Unit
QCI	Quality Council of India
RA	Risk Assessment
R&R	Rehabilitation & Resettlement
RDS	Respirable Dust Sampler
SEIAA	State Environment Impact Assessment Authority
SOI	Survey Of India
SPCB	State Pollution Control Board
SPM	Suspended Particulate Matter

SHW	Solid Hazardous Waste
TDS	Total Dissolve Solid
TOR	Terms of Reference
US EPA	United State Environmental Protection Agencies
w.e.f.	With Effective From
w.r.t.	With Reference To

COMPLIANCE TO TOR CONDITIONS

Point wise compliance of ToR issued by MoEF7CC, New Delhi, vide letter F.No. J-11015/85/2020-IA.II (M), New Delhi by Honorable EAC, on dated 04.03.2021 for the project Mining of Sand, Boulder and Bajri (Minor Mineral) Mine from the river bed of Song-2 River by M/s Uttarakhand Forest Development Corporation, located in Dehradun Forest Division, Uttarakhand over an area of 136.85 ha with Production Capacity of 4064445.00 TPA.

S.NO.	ToR POINT	COMPLIANCE Of ToR	Reference
	Specific TOR		
I.	The PP needs to submit the details of Scientific Replenishment Study carried out as per Enforcement and Monitoring Guidelines for Sand Mining, 2020.	Detailed Replenishment Study report is attached as Annexure-V in EIA report.	Annexure-V
II.	The PP shall ensure that the impacts on aquatic and terrestrial ecosystems due to mining activity be properly addressed in the EIA/EMP report.	Impacts on aquatic as well as on terrestrial ecosystems have been addressed in Chapter 4 of EIA Report.	Item no. 4.10 to 4.11.2, Chapter- 4, page no. 109,
III.	The PP needs to ascertain the impact of transportation and details of transportation route viz. (length of the road, type of road, passing through the village or habitation) and mitigative measures to be taken for abatement of pollution due to transportation. The budget for the same needs to be provided.	Traffic study was carried out as per IRC guideline and analyzed and it was determined that there is not much impact on local transport. The LOS value from the proposed mine may be "Good" for the road. So the additional load on the carrying capacity of the concern roads is not likely to have any significant adverse effect. The details of traffic study is given in Chapter-3	Section 3.10 of Chapter-3 on Page No.51
IV.	The PP needs to confirm that is there any other homogenous mining lease within 500 meters of this lease and forming cluster. If yes, details of the same needs to be provided.	No mining lease is present in 500m of this project lease area. Cluster Certificate for the same attached as Annexure-XIII	NA
V.	The PP needs to submit the Forest Clearance and Wildlife Clearance at the time of appraisal of EC.	The Stage-1 Forest clearance of the project vide proposal number File no. 8-62/1999FC (VOL) dated 4th February 2021 is attached as Annexure-III . The State Wildlife Board has forwarded our Wildlife Clearance Proposal to National Board of Wildlife and at present time proposal is under consideration of	Annexure-III.

		NBWL. Wildlife Clearance will be submitted to EAC at the time of appraisal of EC.	
VI.	The Project Proponent needs to submit the District Survey Report as per the Ministry's notification S.O. 3611 (E) dated 25th July, 2018.	The copy of DSR is attached as Annexure-VI	
VII.	The PP should submit the Affidavit in a Non- Judicial Stamp paper to comply with all statutory requirement & judgement of Hon'ble Supreme Court dated 2nd August 2017 in Writ Petition (Ciil) No. 114 of 2014 in the matter of Common Cause versus Union of India & Ors as applicable as per Ministry OM dated 30.05.2018.	Affidavit is attached as Annexure- VII in EIA Report.	Annexure- VII
	Additional TOR's		
I.	PP Should provide in the EIA Report details of all the statutory clearances, permissions, no objection certificates, consents etc. required for this project under various Acts, Rules and regulations and their status or estimated timeline after grant of EC.	Details of all statutory clearances have been mentioned in Chapter-I of EIA Report.	Item 1.2 of Chapter-1 on page no.2.
II.	PP should submit the revenue plan for mining lease, revenue plan should be superimposed on the satellite imagery clearly demarcate the Govt. land, private land, agricultural land, etc.	The revenue plan for mining lease is incorporated in Mine Plan	Annexure-IV
III.	PP should submit the real time aerial footage & video of the mining lease area and of transportation route. PP should submit the detailed plan in tabular format (year wise for life of mine) for afforestation and green belt development in and around the mining lease. The PP should submit the no. of saplings to be planted, area to be covered under afforestation & green belt, location of plantation, target for survival rate and budget earmarked for the afforestation & greenbelt development. In addition to this, PP should show on surface plan (5 year interval for life of mine) of suitable scale that are to be covered under afforestation & greenbelt clearly mentioning the lat and long of the area to be covered during each 5 years. The capital and recurring expenditure to be incurred needs to be submitted. Presently in India there are many agencies	Real time photographs of the project mine lease area have been incorporated in Chapter-2. The Schedule for plantation for the five years has been given in EIA/EMP report. The most suitable floral species and the capital and recurring expenditure to be incurred for green belt development and plantation activities in the project area are given in Chapter-10. The working agency for plantation work will be Divisional Forest Officer, Dehradun.	Figure 2.4, Chapter-2 on Page no.17 Section 10.5 of Chapter-10 on Page No. 136,137,138

	which are developing forest in short interval of time. Thus, for the plantation activities details of the experts/agencies to be engaged needs to be provided with budgetary provisions.		
IV	PP should submit the quantity of surface or groundwater to be used for this project. The complete water balance cycle needs to be submitted. In addition to this, PP should submit a detailed plan for rainwater harvesting measures to be taken. PP should submit the yearwise target for reduction in consumption of ground/surface water by developing alternative source of water through rain water harvesting measure. The capital and recurring expenditure to be incurred needs to be submitted.	Water requirement for dust suppression will be 14 KLD which will be fulfilled by Water Tanker Supply. The details of water requirement is given in Paragraph 2.9.2 of Chapter-2. Water balance is given in Figure 2.8. Provision of Rainwater Harvesting is incorporated in Paragraph 4.8 in Chapter-4.	Section 2.9.2 of Chapter-2 on page no 26. Figure 2.8 , page no. 26 Page No. 112
V.	PP should clearly bring out the details of the manpower to be engaged for this project with their roles/responsibilities/designations. In addition to this, PP should mention the no. and designation of person to be engaged for implementation of EMP. The capital & recurring expenditure to be incurred needs to be submitted.	Details of manpower are mentioned in Paragraph 2.9.4 of Chapter-2.	Item no. 2.9.4 on page no. 27, Table 2.4.
VI.	PP should submit the year wise activity wise and time bound budget earmarked for EMP, occupational health surveillance & CER. The capital and recurring expenditure to be incurred to be submitted.	Budget earmarked for Environment Management Plan, Occupational Health Surveillance are mentioned in Chapter-10.	Table no. 10.3 and 10.4, page no. 139 & 140
VII	PP should submit the measures/technology to be adopted for prevention of illegal mining and pilferage of mineral. PP should submit the detailed mineralogical and chemical composition of the mineral and percentage of free silica from a NABL/MoEF&CC accredited laboratory.	The measures / technology to be adopted for prevention of illegal mining and pilferage of mineral are given in Chapter-4. The mineralogical and chemical composition of the mineral is given in Chapter-2.	Section 4.8.2 of Chapter-4 on page no: 109. Section 2.13 of Chapter-2 on page no: 28.
VIII	PP should clearly show the transport route of the mineral and protection and mitigative measures to be adopted while transportation of the mineral. The impact from the centre line of the road on either side	Transport route Map is incorporated in Chapter-3. Anticipated impacts and mitigation measures are	Figure-2.3, page no.16

	should be clearly brought out supported with the line source modeling and isopleth. Further, frequency of testing of Poly Achromatic Hydrocarbon needs to be submitted alongwith budget. Based on the above study the compensation to be paid in the event of damage to the crop and land on the either side of the road needs to be mentioned. The PP should provide the source of equations used and complete calculations for computing the emission rate from the various sources.	addressed in Chapter-4. Source of equations used and complete calculations for computing the emission rate from the various sources are addressed in Chapter-4.	Isopleths- Figure 4.1 to 4.4, page no.103 to 106 Table 4.2 page 99, chapter-4
IX	PP should clearly bring out that what is the specific diesel consumption and steps to be taken for reduction of the same. Year-wise target for reduction in the specific diesel consumption needs to be submitted.	In entire process of mining, there is no requirement of diesel. Diesel consumption will be only in vehicles used in transportation of minerals. There will be no requirement of any DG SET or machinery which requires Diesel fuel as it is open cast mining.	—
X	PP should bring out the awareness campaign to be carried out on various environmental issues, practical training facility to be provided to the environmental engineer/diploma holders, mining engineer/ diploma engineers, geologists and other trades related to mining operations. Target for the same needs to be submitted.	Will be complied.	—
XI	The budget to be earmarked for the various activities shall be decided after perusal of the Standard EC Conditions if agreed PP should also submit an undertaking by the way of affidavit for Compliance of Standard EC Conditions already prescribed by the Ministry vide O.M. No. and Specific condition if prescribed by the EAC/MoEF&CC.	Will be complied.	—
XII	The PP should ensure that only NABET accredited consultant shall be engaged for the preparation of EIA/EMP Reports. PP shall ensure that accreditation of consultant shall be valid during the collection of baseline data, preparation of EIA/EMP report and during the appraisal process. The PP and consultant should submit an undertaking the information and data provided in the EIA Report and submitted to the	Nabet Accredited Consultant via certificate no. NABET/EIA/2023/RA 0205 is engaged for preparation of EIA/EMP Report. Details are: EIA Consultant- M/s Mantec Consultants Pvt. Ltd., Noida-201301 Date of Issue of Certificate- 07/05/2021 Validity- 20/04/2023 Category of Organization- “A”	

	Ministry are factually correct and PP and consultant are fully accountable for the same.	During the Baseline Data collection, preparation of EIA/EMP report and during the appraisal process the accreditation is valid.	
XIII	The PP should submit the photograph of monitoring stations & sampling locations. The photograph should bear the date, time, latitude & longitude of the monitoring station/sampling location. In addition to this PP should submit the original test reports and certificates of the labs which will analyze the samples.	Monitoring Photographs depicting date, time, latitude & longitude are incorporated in Chapter-3. Original lab reports are attached as Annexure-VIII .	Figure 3.12, Chapter-3, page no. 51 Annexure-VIII.
	Standard TOR		
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.	The year wise production details(2011-2019) has been given in Production Certificate.	Annexure-XIV
2	A copy of the document in support of the fact that the proponent is the rightful lessee of the mine should be given	Mine has been allotted in the name of M/s UKFDC vide Letter of Intent (LOI) no 1038/खनन/ आशय पत्र / व०वि०नि०/ भू० खनि० ई ०/2018-19 dated 05/11/2018 by Director of Mines & Geology Department Uttarakhand (Copy of same attached as Annexure II)	Attached as an Annexure II.
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 mining technology etc. and should be in the name of the lessee.	All the documents are compatible with one another in terms of the mine lease area, production levels, waste generation and its management and mining technology. Approved mine plan letter is attached as Annexure IV. Lessee Name- M/s Uttarakhand Forest Development Corporation	Attached as an Annexure IV.

		Mine Lease area- 136.85 ha Proposed Capacity- 4064445.00 TPA As per Replenishment Study – (200865.64 cum PA) 441904.41 TPA Waste Generation and Management- No solid Waste other than the negligible amount of clay which will be further used for the plantation. Mining Method- Open Cast Manual method.	
4	All corner coordinates of the mine lease area, superimposed on a High Resolution Imagery /Toposheet, topographic sheet, geomorphology and geology of the area should be provided. Such an Imagery of the proposed area should clearly show the land use and other ecological feature of the study area (core and buffer zone)	All of corner coordinates of the ML area are incorporated in EIA/ EMP Report. Land use maps are also incorporated in Chapter no. 3	Figure 2-2 of Chapter No. 2 page no. 14. Figure-3.2, Page No. 32, Chapter-3
5	Information should be provided in survey of India Toposheet in 1:50,000 scale indicating geological map of the area, geomorphology of land forms of the area, existing minerals and mining history of the area important water bodies, streams and rivers and soil characteristics.	All maps are provided superimposed on Toposheet of survey of India in 1:50,000 scales showing all land forms of the area given in chapter-2 of EIA/EMP report. Important water bodies, streams and rivers related information given in Chapter-1.	Figure 2.2 of Page No. 14. Section 1.4 of Table 1-1 on Page No. 3-4.
6	Details about the land proposed for mining activities should be given with information as to whether mining conforms to the land use policy of the state land diversion for mining should have approval from state land use board or the concerned authority.	The mine lease area is 136.85 ha which is a forest land. The Letter of Intent (LOI) is attached as an Annexure II . No land diversion is involved in this project.	Attached as an Annexure II .
7	It should be clearly stated whether the proponent company has 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	Environment Policy attached as Annexure-IX The administrative order of the UKFDC for dealing with environment issues and for ensuring compliance with the EC conditions is mentioned in Chapter -6	Attached as Annexure- IX Fig 6.1, Pg 122

	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 condition 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.		
8	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.	Mining will be carried out by opencast method only without blasting as per mining plan/ Scheme with Progressive Mine Closure Plan approved by Director Geology & Mining, Uttarakhand. Subsidence is not envisaged because the overburden and waste will be backfilled in the voids created in mining works. Clay mixed Over Burden which may be in very meager quantity will be used in plantation works. The average bench height is 1.5m. Bench width will be 3m. The sides of the benches will have slopes at a safe angle of 45° to the horizontal. Moreover, all Safety standards/ safeguards will be implemented as per Guidelines prescribed by Director General of Mines Safety.	
9	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.	The study area comprises of 10km zone around the mine lease periphery as shown in the study area map is given in Figure 1.1 of Chapter-1 of EIA report. No solid waste other than the clayey soil which will be further used for the plantation purposes.	Figure 1.1 of Chapter-1 of Page No.6.

10	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.	<p>A map delineating all the environmental sensitive features has been prepared and given in Figure 1.1 of Chapter 1 of EIA report.</p> <p>Land use classification of 10km radius study area around the mine site, is given in Figure 3.4 of Chapter-3 of EIA reports.</p> <p>Impact of change of land use is given in section 4.8 of Chapter-4, along with the mitigation measures.</p>	<p>Figure 1.1 of Chapter-1 of Page No. 6.</p> <p>Figure 3.2 of Chapter-3 of Page No. 32.</p> <p>Section 4.8 of Chapter-4 of Page No. 109.</p>
11	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.	As there is no cognitive outcome of Over Burden is found in mining area, no proposal for storage of overburden outside the mining lease area are proposed. R&R issue is not envisaged with this mine as no habitation fall within the mine area.	---
12	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.	The Stage-1 Forest clearance of the project vide proposal number File no. 8-62/1999FC (VOL) dated 4th February 2021 is attached as Annexure-III .	Annexure-III.
13	Status of forestry clearance for the broken up area and virgin forestland involved in the Project including deposition of net present value (NPV) and compensatory a forestation (CA) should be indicated. A copy of the forestry clearance should also be furnished.	<p>The Copy of Stage-1 Forest clearance of the project vide proposal number File no. 8-62/1999FC (VOL) dated 4th February 2021. is attached as Annexure III</p> <p>NPV is totally exempted by Hon'ble Supreme Court's order dated 28.3.2008 and order dated 9.5.2008 in IA No 826 in 566 and related IA's regarding the rate of Net Present Value (NPV) of forest land.</p>	Attached as an Annexure III.

		As it is a renewal proposal of minor mineral mining, provision of Compensatory Afforestation is not applicable here.	
14	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.	NA	—
15	The vegetation in the RF/PF areas in the study area, with necessary details, should be given.	Detailed list of vegetation is mentioned in Chapter-3	Section 3.11 on page no. 55
16	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.	Detailed Wildlife Conservation Plan is attached in Chapter-10 of EIA Report.	Item no. 10.13, chapter-10, page no.141
17	Location of National Parks, Sanctuaries, Biosphere Reserves, Wildlife Corridors, Ramsar site 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 Standing Committee of National Board of Wildlife and copy furnished.	Rajaji Tiger Reserve located at 5 kms from proposed mine site. Location map duly attested by Chief Wildlife Warden is attached as Annexure X . The State Wildlife Board has forwarded our Wildlife Clearance Proposal to National Board of Wildlife and at present time proposal is under consideration of NBWL. Wildlife Clearance will be submitted to EAC at the time of appraisal of EC.	Annexure-X
18	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, endangered, endemic and RET Species 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 along with budgetary	Detailed of Biological Study (Flora & Fauna) within 10km radius of the project site have been incorporated in section 3.11 of Chapter no-3 in the EIA report. Fauna listed in Schedule-I have been found in the study area so the necessary conservation plan is incorporated in then Chapter-10.	Section 3.11 on page no. 55 Section 10.13 of Page No. 141.

	provisions 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.		
19	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	The proposed project does not come within 10km radius of any 'critical polluted area neither it comes under Aravali range. Hence it is not applicable.	-----
20	Similarly, for coastal Projects, A CRZ 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.	NA	NA
21	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(s) located in the mine lease area will be shifted or not. The issues relating to shifting of village(s) including their R&R and socio-economic aspects should be discussed in the Report.	As per the Socio-Economic Survey, no R&R Plan is envisaged; as there is no displacement of people from their respective areas.	-----
22	One season (non-monsoon) [i.e. March-May (Summer Season); October-December (post monsoon season) ; December-February (winter season)]primary baseline data on ambient air quality as per CPCB	Primary baseline data of study area within 10 Km radius of the project site has been generated for the post monsoon season from December 2019-	Chapter-3

	Notification of 2009, 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 Down wind 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.	February 2020. The monitoring location has been identified on the basis of CPCB Notification of 2009, water quality, noise level, soil and flora and fauna the same has been given in the Chapter-3.	
23	Air quality modeling should be carried out for prediction of impact of the project on the air quality of the area. It should also take into account the impact of movement of vehicles for transportation of mineral. The details of the model used and input parameters used for modeling should be provided. The air quality contours may be shown on a location map clearly indicating the location of the site, location of sensitive receptors, if any, and the habitation. The wind roses showing pre-dominant wind direction may also be indicated on the map.	Prediction of impacts on air Environment has been carried out employing mathematical model by using AERMOD was done and mentioned in EIA report. Wind rose map showing pre-dominant wind direction has been carried out and the results are delineated in EIA report.	Sec 4.3 Pg no 98 Fig 3.5, Page no. 41
24	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.	Water is not required in entire process of mining. Water requirement for plantation, dust suppression and drinking purposes is 11.3 KLD which will be fulfilled by Water Tankers. The details of water requirement is given in Chapter-2	Section 2.9.2 of Chapter-2 on page no 26.
25	Necessary clearance from the Competent Authority for drawl of requisite quantity of water for the Project should be provided	Not Applicable, as water requirement will be fulfilled by the water tanker supply.	
26	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.	Provision of Rainwater Harvesting is incorporated in section 4.7 in Chapter-4.	Section 4.7, Page No. 107

27	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.	Impact of the proposed project on the water quality both surface and ground water is negligible and the impact, mitigation measures on the quality of water both surface and ground water is given in Chapter-4 .	Section 4.10 of page no:- 109 of Chapter-4
28	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. The Report inter-alia, shall include details of the aquifers present and impact of mining activities on these aquifers. 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.	The working will not intersect the ground water. Hence the details of Hydro Geological study is not required. The ground water table is given in Chapter-4 Water requirement will be met by tanker supply therefore permission from Central Ground Water Authority for pumping of ground water is not required.	Figure 4-5 of Chapter -4 on Page no 108.
29	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.	Proposed mining of Sand/Bajri/Boulder is to be carried out itself in Song river bed to channelize the river flow. No other stream crosses the mine site	-----
30	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.	The working depth will be restricted up to 3.0 meter from the average reserve level at 498.5m and 553.1 m bgl is the ground water table. Hence, ground water table will not be intersected. A schematic diagram is provided in the Chpater-4.	Figure 4-5 of Chapter -4 on Page no 108
31	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	As this proposal is a renewal proposal of previous sanctioned project, hence, Compensatory Aforestation is not applicable here. The Schedule for Green Belt Development plantation for the five years has been given in EIA/EMP report. The most suitable floral species for green belt development plantation activities in the project area	Section 10.5 of Chapter-10 on Page No. 136

	the species to be planted. The details of plantation already done should be given. The plant species selected for green belt should have greater ecological value and should be of good utility value to the local population with emphasis on local and native species and the species which are tolerant to pollution.	are given in Chapter-10 Details of previous plantation as compensatory afforestation is Annexed as Annexure-XI .	
32	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. Project Proponent shall conduct Impact of Transportation study as per Indian Road Congress Guidelines.	Traffic study was carried out as per IRC guideline and it was analyzed that not much impact is created on local transport. The LOS value from the proposed mine may be "Good" for road. So the additional load on the carrying capacity of the concerned road is not likely to have any significant adverse effect. The details of traffic study is given in Chapter-3.	Section 3.10 of Chapter-3 on Page No.51.
33	Details of the onsite shelter and facilities to be provided to the mine workers should be included in the EIA Report.	Site facilities which will be provided by M/s Uttarakhand Forest Development Corporation are given as. The site services include (a) mines office, (b) rest shelter, (c) first aid center, (d) store room , water tank, public convenience, water-man-shed Road	Sub Section-2.9.3 of Chapter-2 on Page No. 27.
34	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.	Excavation of mineral will be done only up to 3.0 meter depth or up to river water level whichever is less and during monsoon riverbed will be replenished naturally. However, it will be ensured that riverbed surface is uniformly extracted so that there could not be irregular water accumulation in pits. Hence, no reclamation and restoration activity has been proposed here.	----

35	Occupational Health impacts of the Project should be anticipated and the proposed preventive measures spelt out in detail. Details of pre-placement medical examination and periodical medical examination schedules should be incorporated in the EMP. The project specific occupational health mitigation measures with required facilities proposed in the mining area may be detailed.	Occupational Health and Safety details are given in Chapter-6. Its Monitoring Schedule is given in Chapter-6	Section 6.4.8 of Chapter-6 on Page No-121.
36	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.	Corporate social responsibility of the corporation is given in report, indicating public health implications of the project and related activities for the population in the impact zone will be addressed in public hearing with action plan by providing aid and employment facilities.	
37	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	Socio-economic measures, which will be provided by the corporation for the local community is given in EIA report.	Chapter-3
38	Detailed environmental management plan (EMP) 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.	Environment Management Plan is given in Chapter 10.	Chapter 10
39	Public Hearing points raised and commitment of the Project Proponent on the same along with time bound Action Plan with budgetary provisions to implement the same should be provided and also incorporated in the final EIA/EMP Report of the Project.	Public hearing will be conducted after submission of Draft EIA to Uttarakhand State Pollution Control Board. The Public Hearing outcomes will be incorporated in Final EIA report.	----
40	Details of litigation pending against the project, if any, with direction /order passed by any Court of Law	No litigation is pending against the project. There is no direction/order passed by any Court of Law against the project.	----

	against the Project should be given.		
41	The cost of the Project (capital cost and recurring cost) as well as the cost towards implementation of EMP should be clearly spelt out	The cost of project (9.878767 Crores) and EMP (65.48 Lakhs capital cost and 32.715 lakhs recurring cost) has been given in EIA report.	Table 1.1 of Chapter-1 on page no. 3.
42	A Disaster management Plan shall be prepared and included in the EIA/EMP Report.	Disaster Management Plan is given in chapter 7.	Section 7.5 of Chapter-7 on Page No. 127.
43	Benefits of the Project if the Project is implemented should be spelt out. The benefits of the Project shall clearly indicate environmental, social, economic, employment potential, etc.	Project benefits are given in chapter 8.	Chapter 8 on page no. 131.
44	Activity-wise time-bound action plan on the issues raised and commitment made during public hearing to be submitted as part of the final EMP Report in compliance of the Ministry's OM F.No.22-65/2017-II.III dated 30.09.2020.	Will be complied and submitted.	----
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.	Complied	--
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.	Complied	--
c.	Project Proponent shall enclose all the analysis/testing reports of water, air, soil, noise etc. using the MoEF&CC/NABL accredited laboratories. All the original analysis/testing reports should be available during appraisal of the Project.	Baseline Reports are attached as Annexure-VIII	Annexure-VIII.

d.	Where the documents provided are in a language other than English, an English translation should be provided.	Documents are provided in English language.	--
e.	The Questionnaire for environmental appraisal of mining projects as devised earlier by the Ministry shall also be filled and submitted.	Complied	--
f.	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 be followed.	The EIA report has been prepared by complying with the circular issued by MoEF vide O.M. No. J-11013/41/2006-IA.II (I) dated 4th August, 2009.	--
g.	Changes, if any made in the basic scope and project parameters (as submitted in Form-I and the PFR for securing the TOR) should be brought to the attention of MoEF&CC 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.	No such changes has been done.	---
h.	As per the circular no. J-11011/618/2010-IA.II(I) dated 30.5.2012, certified report of the status of compliance of the conditions stipulated in the environment clearance for the existing operations of the project, should be obtained from the Regional Office of Ministry of Environment, Forest and Climate Change, as may be applicable.	We will submit at the time of Final EC Presentation.	----
i.	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	All plans are attached as Annexure IV of Scheme of Mine. The drainage map is given EIA report.	Annexure IV of Mining Scheme. Figure 2.5 on page

	and external dumps, if any, clearly showing the land features of the adjoining area.		no.23
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CHAPTER-1 : INTRODUCTION

1.1 INTRODUCTION

Mineral resources of the nation reflect in terms of potential economic growth of the country at large. Our natural mineral wealth has been exploited considerably during the past 50 years. With increase in industrialization coupled with population growth, the demand for different minerals has increased and is likely to grow further in years to come. This has resulted in irreversible impacts on diminishing reserves, with simultaneous generation of solid wastes and effluents causing environmental degradation. It is therefore important to tackle the problem for control of pollution and mining of minerals in a cost-effective method causing least damage to the environment. In order to commence/enhance production/ renewal of any mines, it is necessary to obtain Environmental Clearance from the Ministry of Environment, Forests & Climate Change, Govt. of India as per EIA Notification 2006 and consecutive amendments.

Mining Operation Plan, Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) etc. are some of the important requisites from investor for Environmental Clearance. Hence, the lessee has to prepare an Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) report for Environmental Clearance before commencement of mining activities. To prepare an effective and sustainable EIA and EMP, it is necessary to conduct a baseline survey of the existing environmental attributes. It helps to evaluate anticipated environmental impacts to the proposed activities and in formulating a scientific Environmental Management Plan.

Irrespective of magnitude of operation, attempts have been made to maintain Environmental balance of the study area. Environmental Impact Assessment (EIA) is one of the tools available with the planners to achieve the above mentioned goal. It is desirable to ensure that the development options under consideration are sustainable. In doing so, environmental consequences must be characterized early in the project cycle and accounted for in the project design.

There are many Acts/Rules & Notifications issued by MoEF&CC, New Delhi for keeping the environment in and around project sites congenial for healthy/better standard of living. Few of them are mentioned below:

1. Environment (Protection) Act, 1986
2. Environment (Protection) Rules, 1986
3. Water (Prevention & Control of Pollution) Act, 1974
4. Air (Prevention & Control of Pollution) Act, 1981
5. Environmental Impact Assessment (EIA) Notification, dated 27th January, 1994
6. Environmental Impact Assessment (EIA) Notification, dated 14th September, 2006
7. Environmental Impact Assessment (EIA) Notification as amended on 1st December, 2009.
8. Environmental Impact Assessment (EIA) Notification as amended on 14th August, 2018.

M/s UKFDC has proposed for mining of Sand, Bajri and Boulder minor mineral in their mining lease area of 136.85 hectare in Village Kaluwala, Tehsil & District- Dehradun for production of 4064445.00 TPA. The applicant is seeking prior Environmental Clearance project as per EIA notification 2006 and its amendments. Since the mining lease area is more than 100 hectares, the project falls under "Category A" based on the Schedule Clause number 1(a) of EIA notification 2006 and subsequent amendments.

In order to assess the likely impacts arising out of the project, the Environmental Impact Assessment (EIA) study is undertaken, which will be followed by preparation of a detailed Environmental Management Plan (EMP) to minimize those adverse impacts.

1.2 PURPOSE OF REPORT

The applicant M/s Uttarakhand Forest Development Corporation, Aranya Vikas Bhawan, 73 Nehru Road, Dehradun, is seeking prior Environmental Clearance for Collection of Minor Mineral (Sand, Bajri and Boulders) from the river bed of River Song-2 over an area of 136.85 ha with Production Capacity of 4064445.00 TPA.

M/s Uttarakhand Forest Development Corporation (UKFDC) was granted earlier Environmental Clearance vide MoEF&CC letter no. J-11015/340/2009-IA.II (M) on 10.02.2011.

As the mine lease lies falls in the reserve forest so, the M/s Uttarakhand Forest Development Corporation granted the Forest clearance vide letter No. MoEF (FC division) **F.No. 8-62/99- FC** for the period of 10 years on 26.05.2009. As the Forest clearance is expired on 26.05.2019 and the Environmental Clearance is also expired so, the M/s Uttarakhand Forest Development Corporation applied for the Fresh Environmental Clearance.

The Stage I Forest Clearance is approved by Ministry of Environment, Forest and Climate Change (Forest Conservation Division) with **File no. 8-62/1999FC (VOL)** dated **4th February 2021**. The Stage-I forest Clearance letter attached as an **Annexure II**.

As per EIA Notification 2006 and subsequent amendments, the project falls in Schedule 1 (a) in Category 'A' as the mining lease area in more than 100 hectares.

In this context, Form-I and Pre-Feasibility Report has been submitted to MoEF&CC, New Delhi on date 23/12/2020 (online) and requesting for issue of "Terms of Reference" (ToR). The ToR Presentation was held on 04.02.2021 before EAC of MoEF&CC New Delhi. Subsequently, the ToR was issued on date 04.03.2021 by Honorable EAC, New Delhi vide letter no F.No. J-11015/85/2020-IA.II (M) (enclosed as **Annexure-I**). Baseline data have been collected for one season i.e. from 1st December 2019 to 29th February 2020.

Letter of Intent: The letter of intent (LoI) has been issued by the Director of Mines & Geology department, Uttarakhand vide No 1038 /खनन/ आशय पत्र / वंवि०नि०/ भू०खनि०ई०/2018-19 dated 05.11.2018 in favour of M/s Uttarakhand Forest Development Corporation, for mining of Sand, Bajri and Boulder (**Copy of LOI has been enclosed as Annexure-II**).

Lease Period: 5 Years

Mine Plan and Progressive Mine Closure Plan: The mining plan for the Song-2 river mining lease over an area of 136.50 ha was earlier approved by the Director Geology and Mining Uttarakhand vide letter No. 1135/ उ०ख०/मा प्लान/ दे० दून०2015-16 dated 10/03/2016. The present scheme of mining is approved by the Director Geology and Mining Uttarakhand for an area of 136.85 Ha vide letter No. 1993/ भू०खनि०ई०/ मा०प्लान/2020-21 dated 12.11.2020. (**Copy enclosed as Annexure-IV**).

1.3 IDENTIFICATION OF PROJECT AND PROJECT PROPONENT

Identification of the Project

Mining of Minor mineral (Sand, Bajri and Boulders) from the river Song-2 by M/s Uttarakhand Forest Development Corporation having an area of 136.85 ha with production capacity of 4064445.00 TPA & the production as per replenishment study report 2019-2020 is 441904.41 TPA. The mine is situated in Dehradun Forest Division (Village- Kaluwala), Tehsil and District-Dehradun. The mine lease area falls in the survey of India Toposheet no **53J/4**.

Project Proponent

Uttarakhand Forest Development Corporation (UKFDC) is a statutory body constituted by the State Government of Uttarakhand. The Corporation was formed for the better preservation, supervision and development of forest also for better exploitation of forest produce within the State and for matters connected there with.

The Corporation has been progressing forward not only in its financial aspect but also has taken a big leap in the direction of diversification of its activities.

The Corporation has added the collection and disposal of minor minerals from the rivers situated inside reserved forest areas, collection and marketing of medicinal plants and Eco tourism in its works apart from the removal of dead, dying and uprooted trees as allotted by the Forest department.

The applicant details are given below:-

S.No.	Name of the Mine lease area	Applicant	Proponent Name	Proponent Name
1.	Mining of Sand, Bajri and Boulder (Minor Mineral) from Song-2 Riverbed Village Kaluwala, Tehsil & District Dehradun, Uttarakhand	M/s Uttarakhand Forest Development Corporation	M/s Uttarakhand Forest Development Corporation Mob No of Authorised person for correspondence: +91-9568003225 Email id: dmlkhanand.dun@gmail.com	M/s Uttarakhand Forest Development Corporation Mob No of Authorised person for correspondence: +91-9568003225 Email id: dmlkhanand.dun@gmail.com

1.4 BRIEF DESCRIPTION OF NATURE, SIZE, LOCATION OF THE PROJECT AND ITS IMPORTANCE TO THE COUNTRY REGION

Table 1.1 Brief Description of the Project

S. No.	Particulars	Details
A.	Nature and Size of the Project	Mining of Minor Minerals (Sand, Bajri and Boulders) from the riverbed of River Song-2 by M/s Uttarakhand Forest Development Corporation, located in Dehradun Forest Division, District Dehradun, Uttarakhand over an area of 136.85 ha with Production Capacity of 4064445.00 TPA & Production capacity (as per replenishment study report 2019-20)-

		441904.41 TPA		
B.	Location			
Geographical Coordinates	Latitude and Longitude of	Pillar No.	Latitudes	Longitudes
		S. No	Latitude	Longitude
		A	30°14'30.36" N	78°08'36.73" E
		B	30°14'21.67" N	78°08'40.88" E
		C	30°14'09.92" N	78°08'46.26" E
		D	30°14'02.64" N	78°08'50.63" E
		E	30°13'37.42" N	78°08'57.73" E
		F	30°13'18.80" N	78°08'51.43" E
		G	30°13'03.84" N	78°08'42.24" E
		H	30°12'32.37" N	78°08'23.88" E
		I	30°12'18.77" N	78°08'14.59" E
		J	30°12'18.77" N	78°08'14.59" E
		K	30°12'05.75" N	78°08'05.09" E
		L	30°12'10.88" N	78°07'55.64" E
		M	30°12'26.48" N	78°08'01.30" E
		N	30°12'36.05" N	78°08'14.36" E
		O	30°13'05.76" N	78°08'33.34" E
		P	30°13'22.09" N	78°08'35.99" E
		Q	30°13'37.76" N	78°08'47.57" E
		R	30°13'48.51" N	78°08'44.05" E
		S	30°13'58.96" N	78°08'42.01" E
		T	30°14'03.65" N	78°08'36.53" E
		U	30°14'17.39" N	78°08'29.32" E
		V	30°14'25.57" N	78°08'21.63" E
		W	30°14'30.36" N	78°08'36.73" E
	Toposheet (OSM) No.	53 J/4		
C.	Lease Area Details			
	Lease Area	136.85 ha		
	Topography	Undulated (Riverbed)		
	Site Elevation Range	497.53 m amsl to 547.31 m amsl Source: Mining Plan		
D.	Cost Details			
	Cost of the project	Rs. 9.878767 Crore		
	Cost for EMP	Rs. 65.48 Lakhs/Yr (Capital Cost) Rs. 20.655 Lakhs/Yr (Recurring Cost)		
	OH&S	Rs. 1.00 Lakh/Yr (Capital Cost) Rs 5.00 Lakhs/Yr (Recurring Cost)		
	Cost For Biodiversity Conservation	Will be provided during public hearing		
E.	Environmental Settings of the area			

Ecological Sensitive Areas (National Park, Wild Life Sanctuary, Biosphere Reserve, Reserve/ Protected Forest etc.) within 10 Km radius	Rajaji Tiger Reserve~5 Km, W RF/PF: Rishikesh Range Reserve Forest ~ 2.9 km E Barkot Range Reserve Forest ~ 6.8 km SSE Thano Reserve Forest ~ 0.5 km W
Inter-state boundary within 5 Km radius	None
Nearest Town/ Major City	Dehradun~12.75 Km, NW
Nearest Railway Station	Doiwala Railway Station~3.27 km, SSW
Nearest State Highway/ National Highway	NH-7 Haridwar Dehradun Road~1.8 km, E
Nearest Airport	Jolly Grant Airport~4.87 km, ESE (aerial distance)
Nearest Post Office	Post Office near Doiwala~2.36 Km, SSW
Nearest Police Station	Jolly Grant Police Station~1.18 kms in NNW
Medical Facilities	Doon Public Hospital~6.57 Km, NW
Education Facilities	Hope way Public School~ 2.78 Km, ESE Swami Rama Himalayan University (SRHU)~2.99Km, ESE
Seismic Zone	Zone-IV (As per 1893:2002)
Water Body	Song River ~ 0.1 km ESE Jakhan River ~ 8.1 km E

(Source: Site visit /Baseline Data and Pre-feasibility Report)

All corner-coordinates of ML area are superimposed on Toposheet No. 53 J/4 **Figure 1.1**

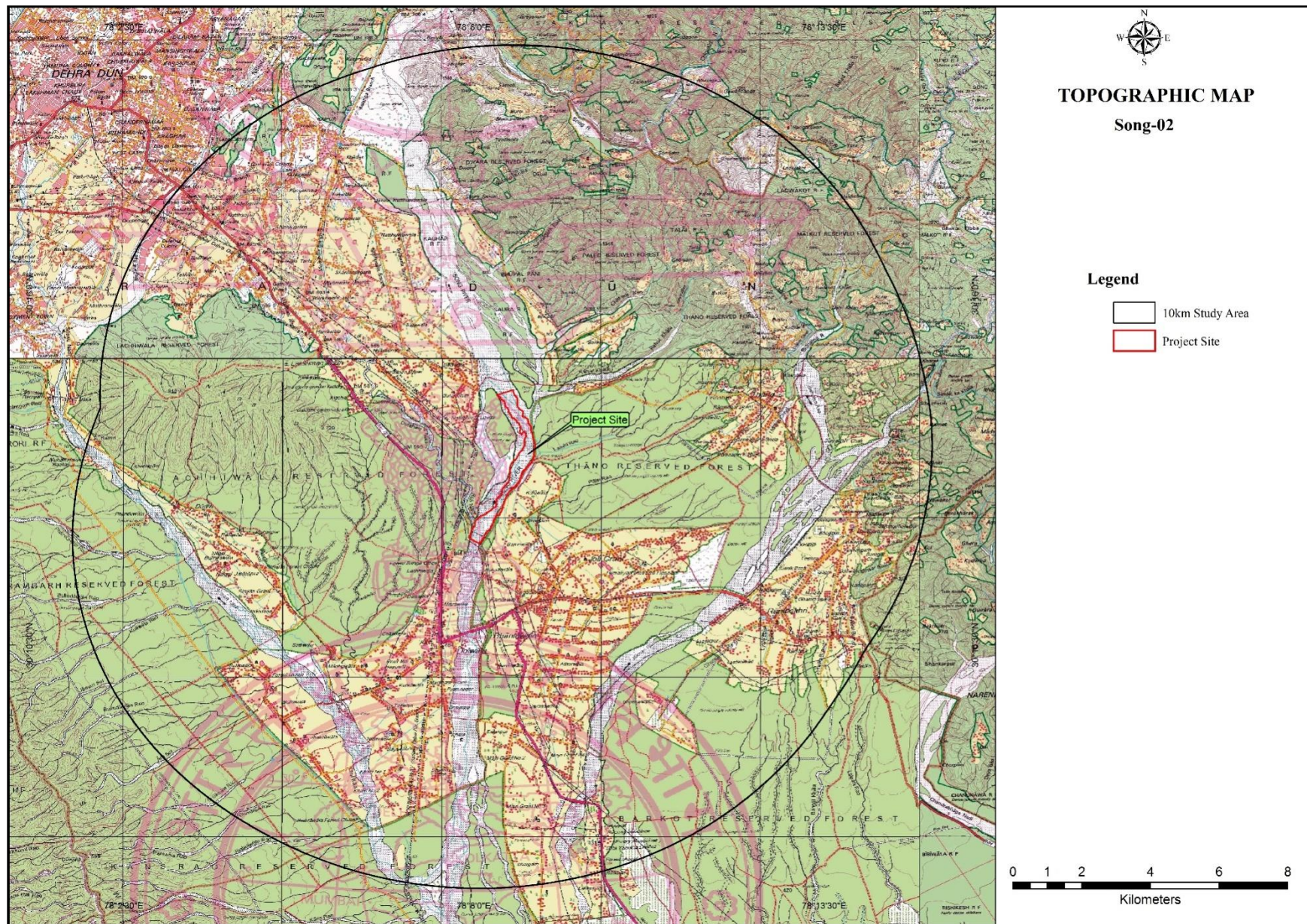


Figure 1.1 Toposheet map of 10 km study area with showing the Coordinates of Proposed Mine Lease area

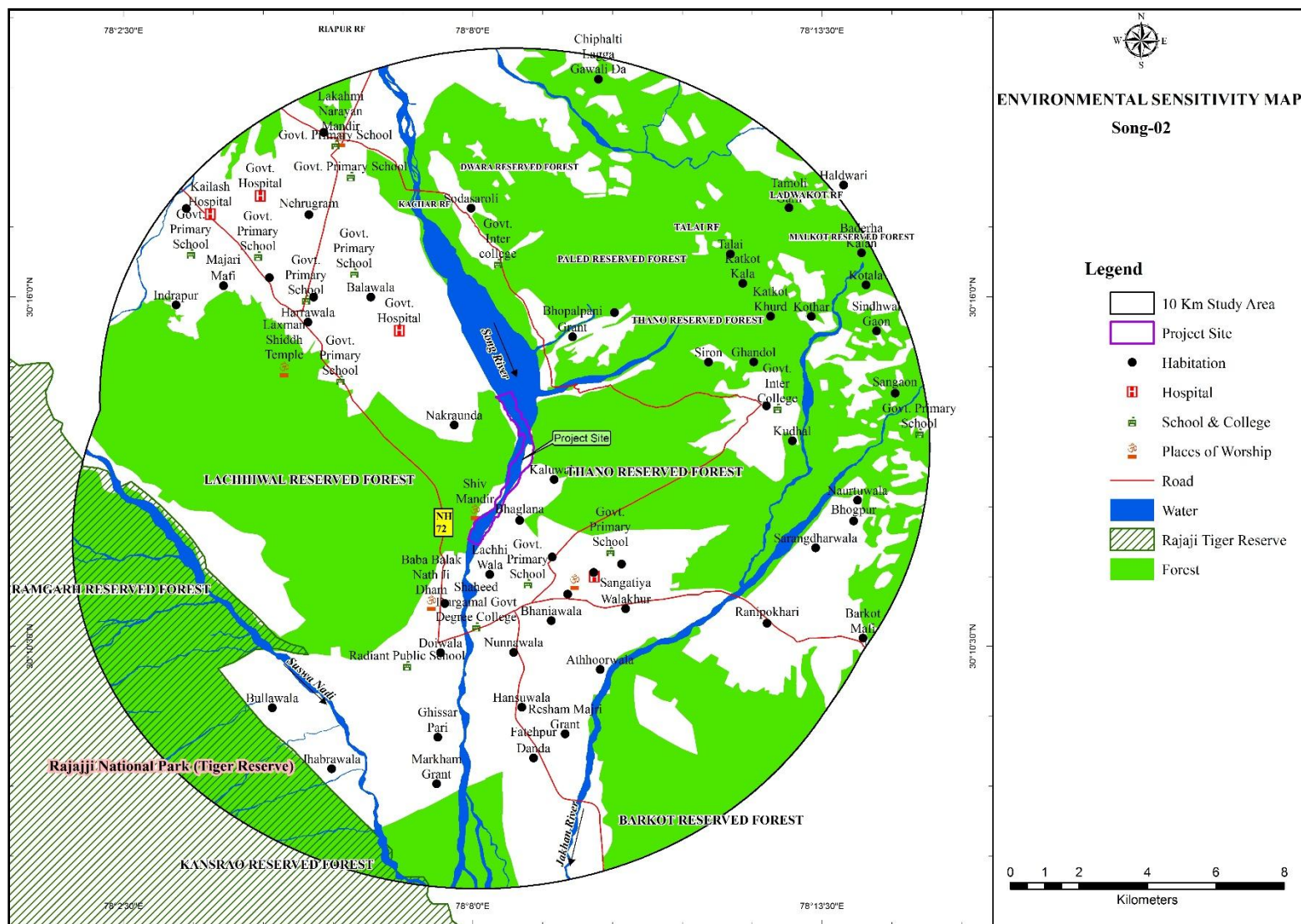


Figure 1.2 Environmental Sensitivity Map of 10 km Study Area

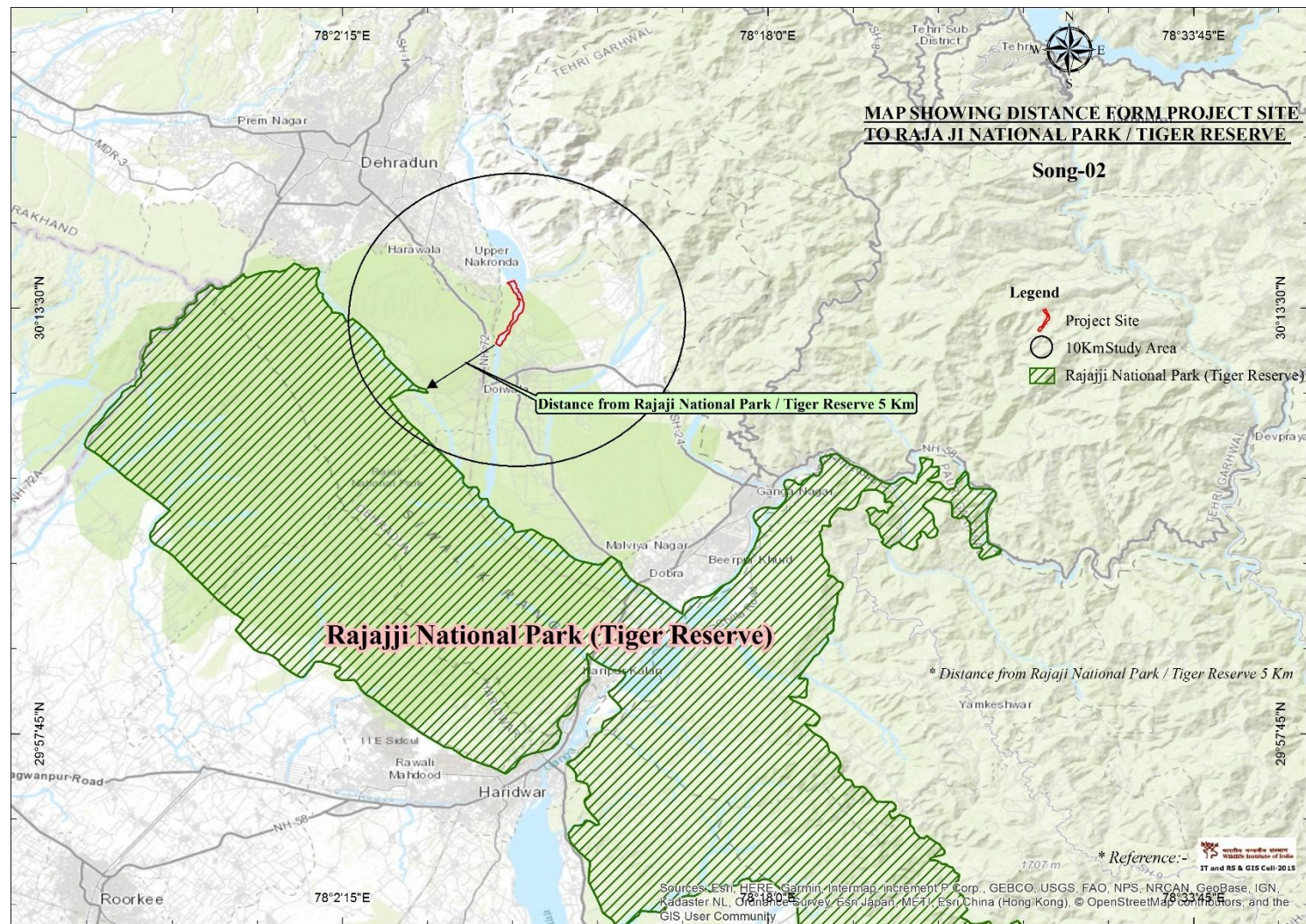


Figure 1.3 MAP SHOWING DISTANCE OF RAJAJI NATIONAL PARK FROM PROJECT SITE

1.5 IMPORTANCE OF THE PROJECT FOR COUNTRY OR REGION

Building huge infrastructure as envisaged by Government of India particularly in road and housing sector requires basic building and construction raw materials. The Sand, Bajri and Boulders are the primary building material required for the purpose. The mining activities as proposed are the backbone of all construction and infrastructure projects as the raw material for construction is made available only from such mining. The mineral to be excavated is in high demand at the local market for real estate and infrastructure industry. This project will also provide employment to local people helping them to increase their household income for the betterment of livelihood. In addition to this, it will further prevent widening of the Song-2 River bed due to the deposition of sediments which if not mined out will result in raising of the river bed causing flooding, damage to the adjoining areas, destruction of life and property. The applicant's proposed riverbed mine can get 4064445.00 TPA of Sand, Bajri and Boulder for the fulfillment of the indigenous need of market.

1.6 SCOPE OF STUDY

In line with the Terms of Reference (TOR) prescribed by MoEF&CC reference vide letter no F.No. J-11015/85/2020-IA.II(M) dated **04.03.2021**, the area comprising 10 km radius around the proposed mine lease boundary is considered as the study area. The scope of the study includes detailed characterization of the environmental attributes like Air, Water, Noise, and Land, Biological and Socio-economic aspects.

1.6.1 Preparation of EIA

The EIA includes the following details:

1. Study of the reports like Geological report, Pre-Feasibility Report (PFR) or mining plan made available by the client.
2. Present Environmental Setting
3. Identification, prediction and evaluation of Anticipated Environmental Impact due to the proposed mine and related facilities.

The environmental impacts would be anticipated in core and buffer zone on:

- Topography and drainage
- Climate
- Water quality (Surface/Ground)
- Hydro-geological Regime
- Air quality
- Noise Levels
- Soil Quality
- Flora and Fauna
- Traffic density survey
- Land-Use

- Socio-Economic Conditions
- Habitat
- Health, culture, human environment including public health, occupational health and safety
- Sensitive Places/Historical Monuments.

This EIA Report is prepared in accordance with EIA Notification, 2006 and its subsequent amendments and that has been divided into twelve chapters (in addition to Executive Summary) as briefed hereunder:

Chapter 1 – Introduction

The chapter provides description of project background, site and surroundings, objectives, scope and organization of the study and format of this report.

Chapter 2 – Project Description

This chapter provides information on project and capacity; need for the project; location; size or magnitude of operation; technology and process description; maps showing project layout, component of projects etc.

Chapter 3– Description of the Environment

This chapter deals with the methodology and findings of field studies undertaken with respect to ambient air, meteorology, water, soils, noise levels, ecology to define the various existing environmental status in the area of the project. This also deals with the infrastructural development as a part of project and sources of pollution from the proposed mining project.

Chapter 4 – Anticipated Environmental Impacts and Mitigation Measures

In this chapter, the potential impacts of the proposed mining and allied activities, which could cause significant environmental concerns, are identified and discussed. This discussion will form the basis for environmental management activities.

Chapter 5 – Analysis of Alternatives (Technology and Site)

This chapter will include a comparison of alternatives in this chapter to determine the best method of achieving the project objectives with minimum environmental impacts or indicates the most environmentally friendly and cost effective options, if any.

Chapter 6 – Environmental Monitoring Program

This chapter will include ascertaining the environmental impacts; state of pollution within the mine lease and in its vicinity; planning for predictive or corrective actions in respect of pollution to keep it within permissible limits.

Chapter 7 – Additional Studies

This chapter will include outcomes of public consultation, risk assessment, social impact assessment, R&R action plan, biodiversity conservation plan, watershed management etc.

Chapter 8 – Project Benefits

This chapter deals with improvements in the physical infrastructure, social infrastructure, employment potential and other tangible benefits due to proposed project activity.

Chapter 9 – Environmental Cost Benefit Analysis

This chapter includes environmental value enhancement (biodiversity, crop productivity, eco tourism etc.)

Chapter 10 – Environmental Management Plan

This chapter will include the description of administrative aspects of ensuring that the mitigation measures suggested are implemented and their effectiveness is monitored, after approval of the EIA.

Chapter 11 – Summary

This will constitute the summary of EIA Report.

Chapter 12 – Disclosure of Consultant

This will include the names of the consultants engaged in preparation of EIA and nature of consultancy rendered.

1.7 LAWS APPLICABLE TO THIS PROJECT

The Acts, Notifications, Rules and Amendments applicable for setting up a new mining industry or its expansion of an existing mine and for operation of a mine include the following:

- EIA Notification, 2006 under EP Act, 1986.
- Uttarakhand Mines and Mineral Concession, Stock, Transportation of Mineral and Prevention of Illegal Mining Rules, 2005.
- The Mines and Mineral (Development and Regulation) Act, 1957.
- The Mines Act, 1952.
- Mines Rules, 1955.
- Mineral Concession Rules, 1960.
- Mineral Conservation and Development Rules, 1968
- The Water (Prevention & Control of Pollution) Acts 1974/ Rules 1975
- The Air (Prevention & Control of Pollution) Acts 1981/ Rules 1982
- The Environment (Protection) Acts 1986/ Rules 1986
- Contract Labor (Regulation & Abolition) Act 1970 & Its Central Rule 1971
- The Central Motor Vehicle Rules 1989 (Under Motor Vehicle Act 1988)
- Sustainable Sand Mining Management Guideline, 2016
- Enforcement & Monitoring Guidelines for Sand Mining, 2020

CHAPTER-2 : Project Description

2.1 GENERAL

Proposed proposal pertains to riverbed sand, bajri boulder mining project by open cast manual method on allotted mine lease area at the Song-2 River near village Kaluwala of Tehsil and District - Dehradun, Uttarakhand. The total allotted Mine lease for the proposed project is 136.85 ha with their maximum annual production capacity i.e. 4064445.00 TPA & the production as per replenishment study report 2019-2020 is 441904.41 TPA. This chapter deals with the broad description of the project, location, type of mineral deposit(s), quality of reserve, Mining methodology, various site utilities and infrastructure, etc. The downstream use of sand, bajri, boulders for value addition and its importance is also described.

2.2 TYPE OF THE PROJECT

The project is proposed for mining of “Sand, Bajri and Boulder” from the allotted mine lease area on the bed of River Song-2. It is an opencast manual mining project. M/s Uttarakhand Forest Development Corporation, Dehradun Forest Division, Tehsil & District- Dehradun, is the project proponent who is seeking prior environmental clearance for the proposed project.

2.3 NEED FOR THE PROJECT

River channels and their flood plains are important sources of construction grade aggregate materials like Sand, Bajri and Boulder. The durability of river-borne coarser clastics and their sorting by fluvial action make them best suitable raw materials/ingredients for building constructions. The market demands of such construction raw materials are high throughout the country for the construction and infrastructure development projects.

The project lies on bed of Song river and also on the palaeo channels (derived from “palaeo” or “old”, and channel) of the river. Because of this, during monsoon season, the water may rise above the high flood level causing heavy and devastating floods. Such disasters may damage large tracts of land laying on both the banks of the river especially the agricultural lands. Hence, it is necessary to remove the materials so that the river gets channelized.

Apart from this the project will also serve the following:

- Generate various employment opportunities especially to the local people hosting the mining project.
- Economic development of the state by contributing to state exchequer.

2.4 DESCRIPTION OF MINE LEASE AREA

The proposed activity of Sand, Bajri and Boulder mining is located at Village Kaluwala, over an area of 136.85 Ha in Song-2 River bed in Tehsil and District -Dehradun, Uttarakhand. The lease area falls in Survey of India Toposheet (OSM) No. 53 J/4.

2.4.1 Location of Project

The proposed Sand, Bajri and Boulder (minor minerals) mining project has lease area of 136.85 ha ha is a forest land lying in the river bed of Song river:

The location and coordinate map of the mine lease area is given in **Figure 2-1** and **2-2**.

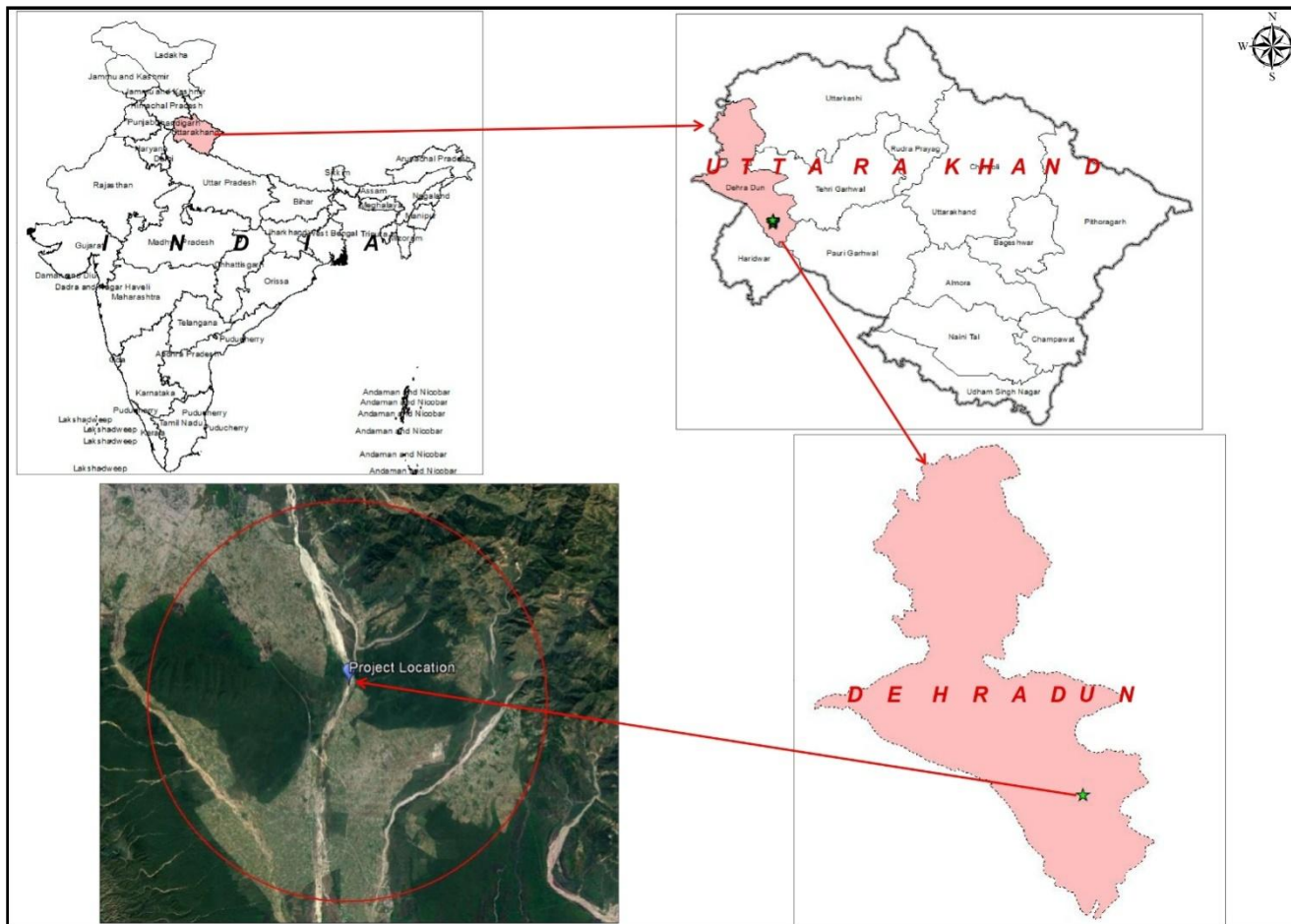


Figure 2.1: Location Map of the Project Site

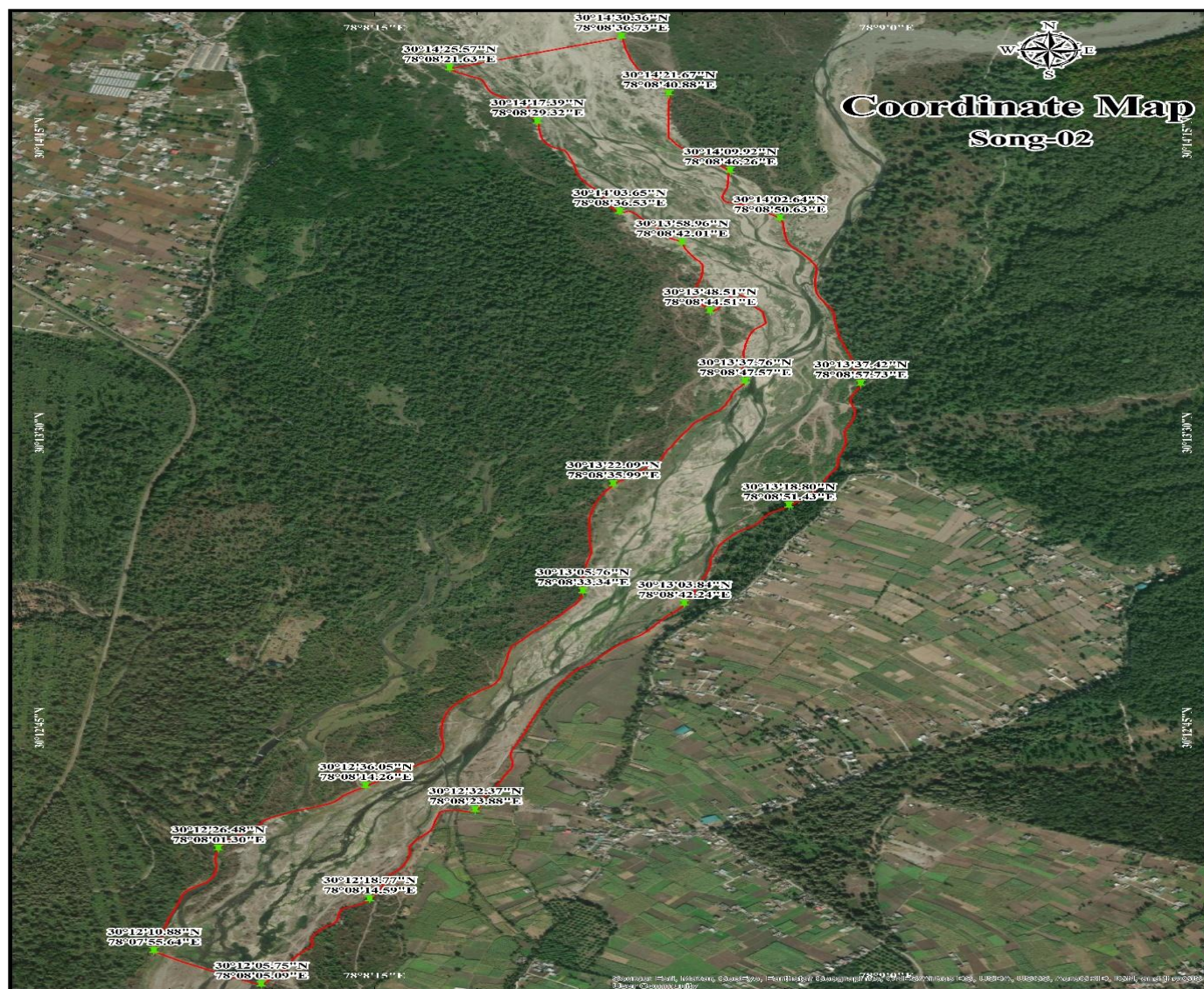


Figure 2.2: Corner Coordinate map of the Project Site

2.4.2 Site Location

Project site is located in Kaluwala Village, Tehsil & District- Dehradun (Uttarakhand). Mining site is situated 12.75 Km away from Dehradun. The Route Map is given in Fig 2.3.

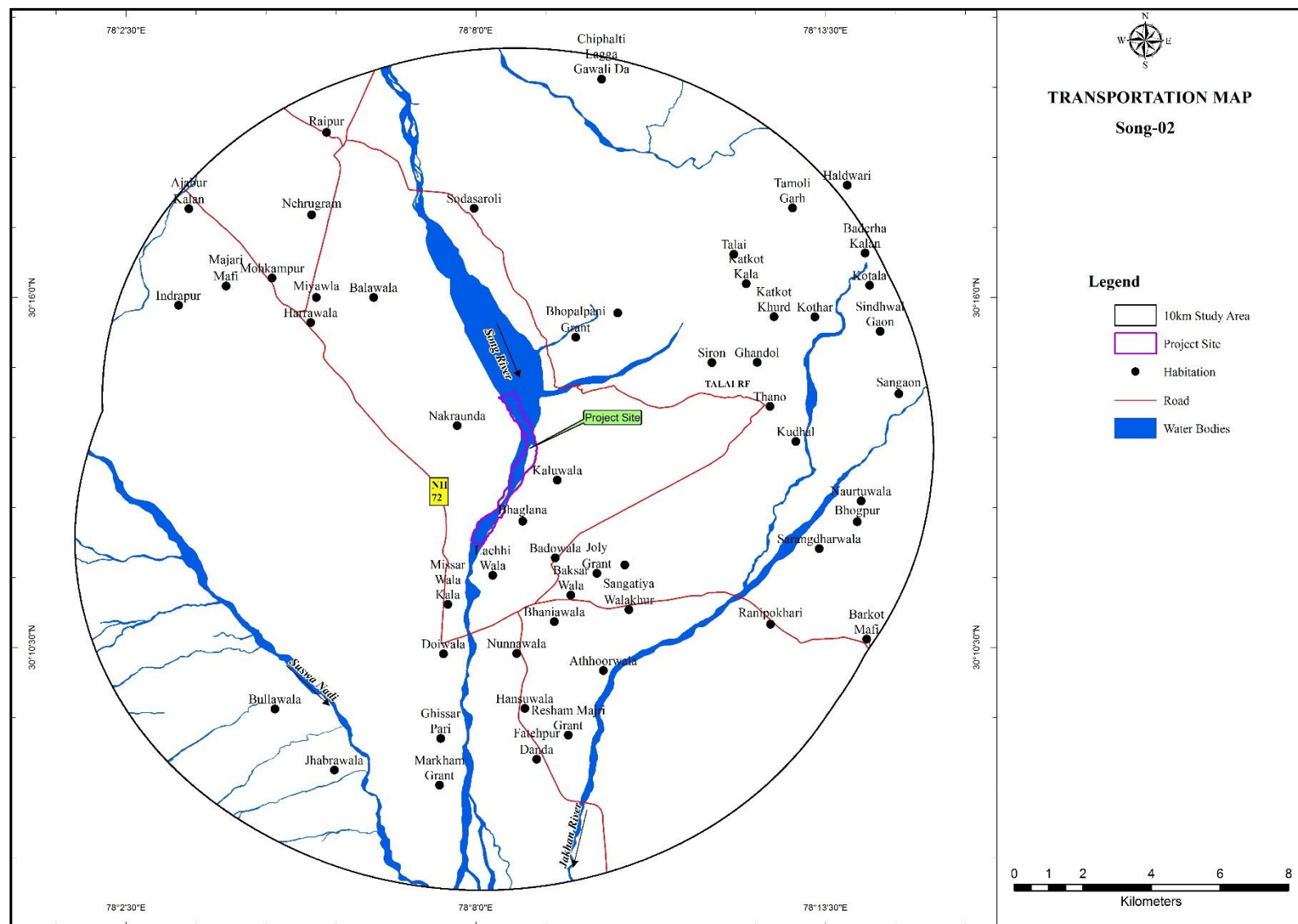


Figure 2.3: Transportation Map of proposed project site

2.4.3 Site visit Photographs:



Figure 2.4 : Site Photographs

2.5 SIZE OR MAGNITUDE OF OPERATION (Incl. Associated activities required by or for the project)

The proponent has taken an area of 136.85 Ha for mining of river bed materials as per LoI. The maximum rated capacity of the project will be 4064445.00 TPA which will be excavated out in layers upto a depth of 3m in riverbed.

Table 2.1: Details of Mining

S. No.	Particulars	Details
1.	Method of Mining	Open Cast manual
2.	Geological Reserves	5419151.10 TPA
3.	Mineable Reserves	4064445.00 TPA
4.	Proposed Production	4064445.00 TPA
5.	Elevation Range of the Mine Site	498.5m amsl to 553.10m amsl
6.	Bench Height	1.5 m in Riverbed
7.	Bench Width (Average)	3.0 m
8.	Bench Slope	45°

2.6 Topography of the Area

The mine lease lies in the river bed and is part of foothills of siwalik range region of Uttarakhand. Topography shows some depositional and erosion during past years. In fact, mining pits if any, are replenished every year during the rainy season. The lease area has gentle slope towards south & SW. Highest point is at RL 553.10m in the northwest corner of the area where as the lowest point RL is 498.5m is in the southwestern corner of the area. Scheme of mining of this area for 68.425 ha out of 136.85 ha is being prepared after leaving 25% area on the either side of the river bed from lease boundary.

2.6.1 Geology

2.6.2 Regional Geology

Studied in the annals of Garhwal Himalaya, the district of Dehradun occupies the long tectonic 'Doon valley' of the outer Himalaya. It lies within the Pre-Tertiary ranges of Lesser Himalaya to the north, and the siwalik ranges of the Outer Himalaya to the South. The siwalik rocks have been folded into an overtuned syncline, flanked by two anticlines. The syncline shape of siwaliks has controlled the geomorphological development of Doon valley.

The terrain around Dehradun comprises of minor ridges and valleys. A prominent ridge runs north-south. Western part is washed by the river Tons, Noon Nadi and Asan, tributaries of Yamuna, flowing towards southwest and the eastern segment is drained by the WNW-ESE flowing river Suswa, tributary of Ganga and Song & Jakhan are the tributaries of river Ganga.

Lithostratigraphy of the Upper Siwalik and Post-Siwalik sediment in Tons Valley is given below:

Age	Formations	Divisions	Lithology	Average Thickness
Recent (Quaternary)	Doon Gravels	Tons/Asan Alluvium	Alluvium	
Sub-Recent	Post-Siwaliks	New Terrace Sediments	Gravel and Pebble beds with brown clay bands	70m
Upper-Pleistocene-Mild Pleistocene		Old Terrace Sediments	Boulder beds, sand, yellow and maroon clay bands	44m
Unconformity				
Lower Pleistocene	Upper Siwaliks	Boulder Conglomerates	Alternating Conglomerates Sand	147m

The Upper Siwalik partly ranges into Pleistocene which is probably represented by the Boulder Conglomerate Stage here. These are overlain by Post-Siwalik sediments with a pronounced unconformity. The siwalik rocks constitute low ranges in this area, whereas the Post-Siwalik constitutes the older and newer terraces of the river Tons/Asans. The Quaternary part of the Upper Siwalik consists mainly of conglomerates contain pebble mainly of quartzite, slate, limestone, sandstone etc embedded in a sandy matrix. The old Terrace sediments contain boulder and gravel beds with smooth, but often cracked boulders mainly of quartzite, phyllite, schist, sandstone etc. embedded in coarse sandy matrix. There are some bands of yellow and maroon clay along with some sandy and sandy clay horizon. These sediments generally lie horizontally, but occasionally show gentle southerly dips. The new terrace sediments contain pebble and gravel horizons with unconsolidated material composed mainly of limestone, quartzite etc. There are some brown colored clay bends, which appear to be older Alluvium. These are usually placed horizontally, unconformably overlying the old Terrace sediments. Sometimes, these even overlap the Old Terrace, and directly overlie the Siwalik and other formation. The Post-Siwalik sediments exhibit variable thicknesses. Tube well data shows a gradual increase in their thickness from west to east. In the western part of the area the Old Terrace is 12m and New Terrace is 36m thick.

In Lesser Himalayan Zone steeply sloping northern flank of the valley comprising rock of the Lesser Himalayan Formations, such as quartzite, schist, slates, phyllite, hard, sandstone, limestone and dolomite of the Chandpur, Nagthat, Blaini, Krol and Tal Formations and having secondary porosity and permeability and are characterized by springs and seepages. Though sedimentary in nature the rocks have very low intergranular porosity and are characterized by fissures, fracture and joints. The zones of lineament, faults and the main boundary Thrust show pockets of high secondary porosity. The groundwater/sub-surface water in this zone occurs largely as disconnected local bodies in favorably perched aquifers under both confined and unconfined conditions and also in zones of jointing, fracturing and faulting. Relatively flat areas and gentle sloping grounds characterized by deep weathering, such as hill-tops, ridges, saddles, spurs and bulges of old landslide-debris, river terraces and fluvial fans from the recharge area while steeper hill-slopes, 1st

or 2nd order stream at slope breaks and scraps of fans are site of discharges. The upper portions of the catchment areas are saucer-shaped. The springs in the rocks of the secondary porosity show great variability in yield even within short distances. The limestone and dolomite of the Krol formation is characterized by cavities and solution channels oriented along WNW-ESE and NW-SE trending joints. The sand gravel deposits of fluvial and colluvial origin in the Lesser Himalayan Zone lying in the lower reaches of the stream or near the confluence of two streams in the form of fan and terraces are highly porous and permeable and therefore hold, sufficient quantities of water. The soil cover of the study area was found to be mostly yellowish grey with some soils having brownish colour. The texture of the soil in the study area was found predominantly sandy clay loam in nature.

In Synclinal central zone classified under piedmont zone occupied by the Doon gravels, having primary porosity and permeability, is forming the main aquifer in the area. The groundwater is present in aquifers under unconfined and confined conditions. The course and gravels underlain by clay beds is the main water bearing strata. The zone is characterized by high infiltration rate. The Siwalik Zone the water is present under confined conditions and the water table is relatively deep.

2.6.3 Local Geology

The Synclinal trough shaped Doon Valley bounded by the rocks of the Lesser Himalayan formations in north and Siwalik in south, forms a part of the sub-mountain region of the Garhwal Himalaya. Geologically the valley is divided into:

The Lesser Himalaya: Mussoorie mountain range in northwest and northeastern parts. It comprises rocks of the Jaunsar (Chandpur phyllite and Nagthat quartzites) and Mussoorie Group (shales, sandstone, greywacks, calcareous slates, dolomite and limestone of Blaini-Krol-Tal sequence) of Proterozoic-Cambrian age.

A synclinal structural depression: Filled with coarse elastic/River Borne Material (RBM) consisting fan deposits of late Pleistocene and Holocene age known as the Doon Gravels. The Doon Gravels have been further subdivided into oldest, Younger and Youngest Doon Gravels. The oldest Doon Gravels resting over the Upper and Middle Siwalik beds and at places directly over Chandpur phyllite are consist of poorly sorted pebbles and gravels set in sandy matrix and red clays. The oldest Doon Gravels consist partly of crushed Upper Siwaliks cobbles, angular pebbles of quartzites, slates and shales from the Nagthat, Chandpur and Tal formations and limestone pebbles from the Krol Limestone alternating with clay beds. The Younger Doon Gravels, resting unconformably over the oldest Doon Gravels in northern part, are characterized by very large boulders present in debris flow and braided river deposits. The unit consists of poorly sorted mixture of clay, sands, gravels and large boulders. The major part of the valley is occupied by Younger Doon Gravels occurring in the form of large fans, formed by reworking of Oldest Doon Gravels and are called as Principal Doon fans. The Youngest Doon Gravels are braided river deposits and sub-recent terrace deposits along Asan and Song River. A number of coalesced fan have also descend down from the Siwalik range forming "Piedmont zone", are also part of youngest Doon Gravels.

The Siwalik Range: The Siwalik range in the south comprises the middle and Upper Siwalik. The rocks of the middle Siwalik have the characteristics facies of continental deposits of large low land rivers and consist of friable medium grained grey coloured sandstone rich in micaceous minerals with mudstone. The rocks of the Upper Siwalik indicate a change in the region of the large braided

ivers and are characterized by alternate polymictic conglomerates and subordinate grey micaceous sandstone. The conglomerates consists of well rounded to subrounded clasts of white, pink and grey quartzite, granite, phyllite and rare limestone.

2.6.4 Drainage

District Dehradun is drained by Ganga, Yamuna and their tributaries. The two basins are separated by a ridge starting from Mussoorie and passing through Dehradun. The easterly flowing rivers join River Ganga and the westerly flowing rivers join River Yamuna. Ganga River enters the district near Rishikesh where Chandrabhaga River joins it. Song and Suswa are two main tributaries of the Ganges. Suswa flows SE, draining the eastern Doon along with its ephemeral tributaries like Bindal Rao, Rispana Rao etc. and joins River Song SE of Doiwala. Song River has its origin from the adjoining Tehri district. Initially it runs parallel to the Mussoorie Mountain chain in NW direction for few kilometers and then takes a sudden turn in SE direction and joins Suswa River south of Doiwala. Yamuna River emerges from Yamnotri, which falls in district Uttarkashi. It enters Dehradun district at the point called Khat Bhondar which is about 20km east of Deoban. Tons is the main tributary of Yamuna which has its emerging point in the north of Yamnotri and receives water from Supin and Rupin (tributaries of Tons). River Tons separates Uttarakhand from Himachal Pradesh. The western part of Doon Valley is drained by Asan and its tributaries; it joins Yamuna near Rampur Mandi. Yamuna River roughly divides the district in two halves, the hilly region in the north and Doon valley in the south. Drainage pattern of the mine lease area is shown in **Figure 2.5**

Table 2.2 : Details of Site Elevation

Lowest Elevation (mRL)	Highest Elevation (mRL)	Working Depth (in meters)	Ground Water Table
498.5	553.1	River Bed: upto 3.0 m bgl	Pre Monsoon Depth to water- 2.29 to 71.00 m bgl Post Monsoon Depth to water- 2.52 to >100 m bgl.

(Source: http://cgwb.gov.in/District_Profile/Uttarakhand/Dehradun.pdf)

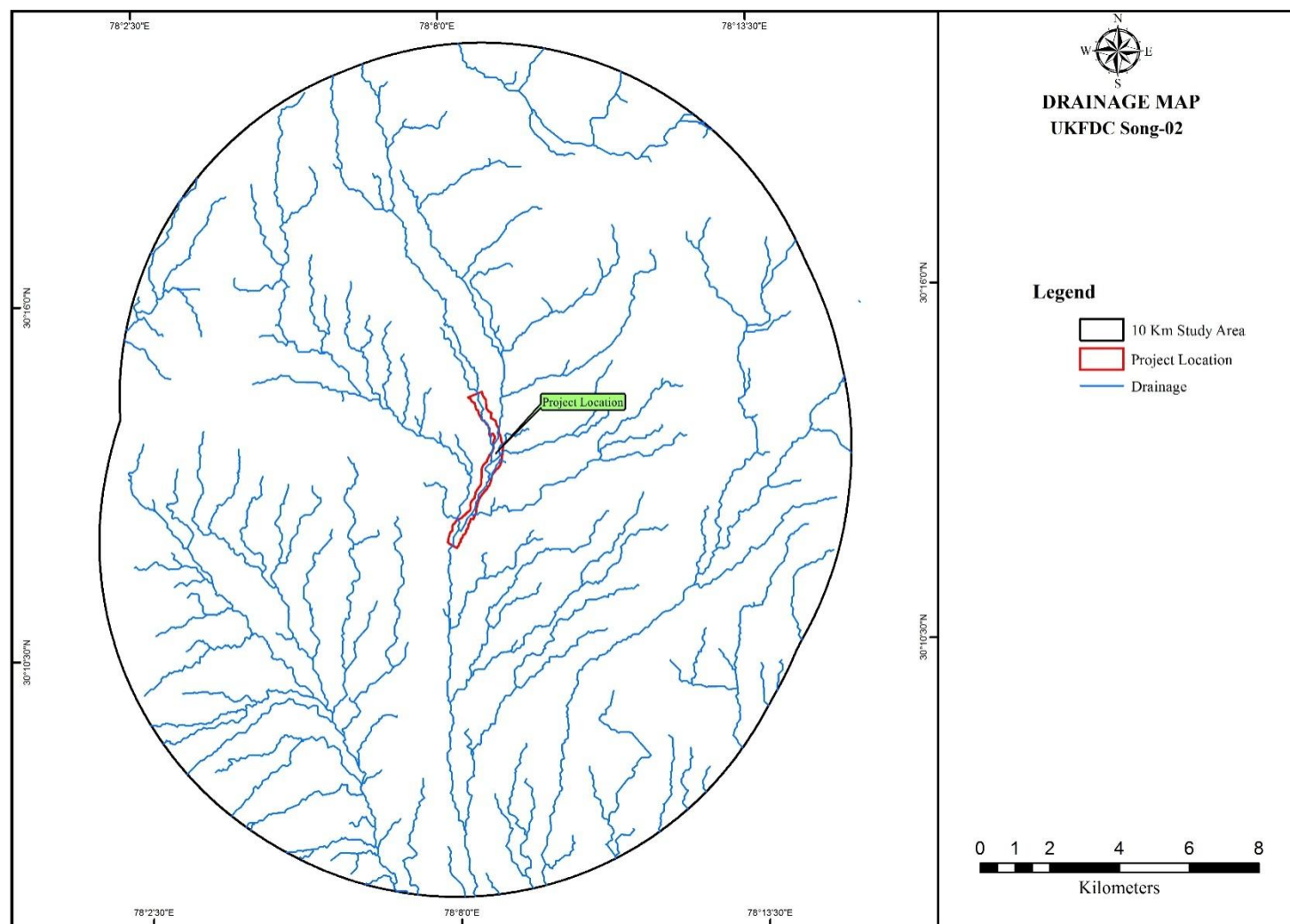


Figure 2.5 Drainage Pattern Map of the Study Area

2.6.5 Climate

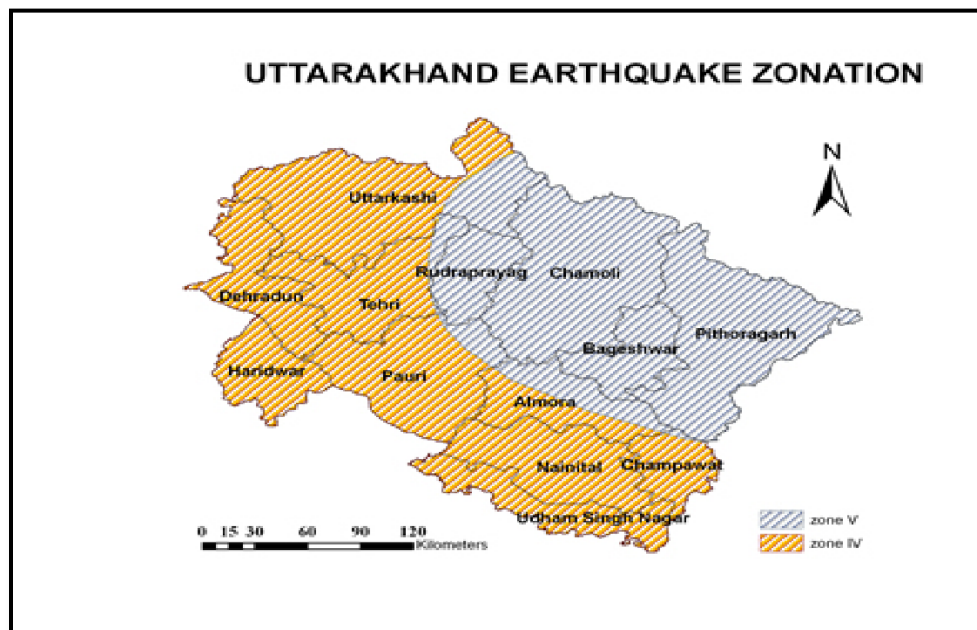
The climate of the district in general, is temperate. The temperature depends on the elevation. In the Doon Valley, the heat is often intense. The temperature drops below freezing point during the winters. The summer starts by March and lasts up to mid of June when the monsoon sets in. Generally, the month of May and early part of June is hottest. Winter starts from November and continue up to February.

2.6.6 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.

2.7 SEISMICITY OF THE AREA

Many parts of India subcontinent have historically high seismicity. Seven catastrophic earthquakes of magnitudes after greater than 8 Richter scale have occurred in the western, northern and eastern parts of India and adjacent countries in the past 100 years. By contrast, peninsular India is relatively less seismic, having suffered only infrequent earthquakes of moderate strength. The main seismogenic belts are associated with the collision plate boundary between the Indian and Eurasian plates. The project site as well as study area leis in Zone-IV of seismic Zoning Map **Figure-2-6** , and thus can be said to be located in an area of moderate seismic hazard by national standards. Hence the risk of earthquake at the site persists through there has been no incident in the near past.



(Source: Disaster Mitigation and Management Center, Government of Uttarakhand)

Figure 2.6 : Seismic Zone Map of Uttarakhand

2.8 MINERAL RESERVES

The method of cross-section has been adopting for calculating geological reserve. The intersectional volume between two section lines has been determined by the following manner:

$$V = (S1 + S2) / 2 \times L, \text{ Where,}$$

V: Volume

S1 & S2 : Section Area of mineral body

L : Strike Influence (59m to 770m)

The incidence of RBM has been taken as 90% of the total volume considering rest 10% as waste and would be used as backfilled material for reclaiming the excavated benches. The extraction/removal of the deposited minor mineral (sand, bajri and boulder) from the river will be made by leaving 25% width of the river on either side of the riverbed. While computing the geological mineral reserves the depth of mineralization is taken upto 3m in all the applied area.

There are two categories of reserve which is proved and probable reserves. The mineral present in proved category is upto 2m depth and in probable it is 1m depth.

- Proved Reserves : 5419151.10 tonnes
- Probable Reserves: 2708525.16 tonnes

Mineral Production

Mine lease area is a part of river bed and mining will be done manually by opencast method in quite systematic manner. The maximum limit of mineral extraction is about 4064445.00 TPA and from First to Fifth year maximum exploitable limit of mineral extraction will be 20322225 Tonnes. Details of yearwise exploitable minerals is summarized in **Table-2.3**.

Table 2.3 Yearwise Production

Year	Production (Tonnes)
1 st Year	4064445.00
2 nd Year	4064445.00
3 rd Year	4064445.00
4 th Year	4064445.00
5 th Year	4064445.00

2.8.1 METHOD OF MINING

As per Environmental Impact Assessment Guidance Manual for Mining of Minerals released by MoEF&CC- the project is a type of surface mining. The typical operations involved in a surface mining is shown flowchart given below as **Figure-2.7**.

The Project will be accomplished by fully manual opencast method of mining and does not involve any processes such as drilling, blasting and beneficiation.

- The mining process involves collection of material by simple hand tool such as shovel, pans, spade, pick axe and sieves.

- Hand operated tools like spade tasla will be used for collection of sand.
- This is followed by sorting and manual picking, stacking and loading into the trucks/tractor-trolley for transportation.
- The only waste is clayey sand which will be used for plantation.
- Mining Plan is being prepared after leaving safety zone i.e. 25% of each side from lease boundary.
- The river materials are getting transported through the high velocity water flow in rainy season and is deposited in downstream where the bed slope is mild.

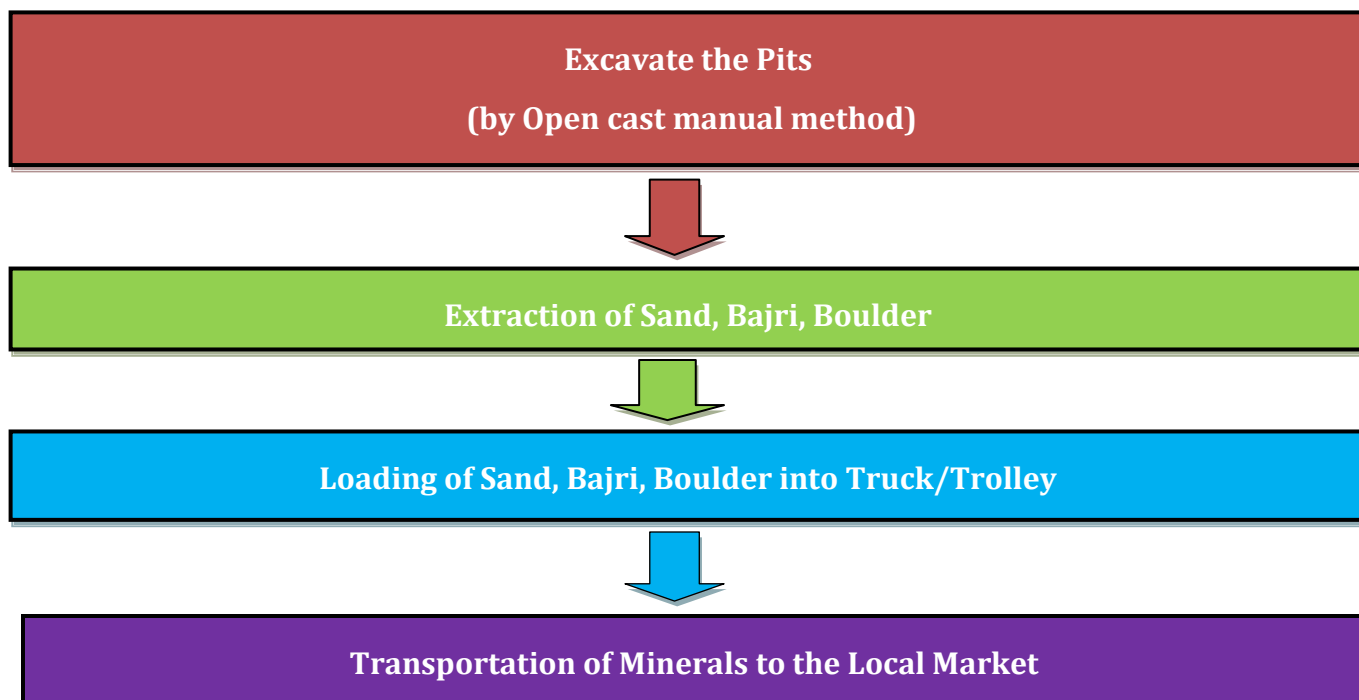


Figure 2.7: Schematic Flowchart of Sand, Bajri, Boulder Mining Process

As per Uttarakhand Minor Mineral (Sand, Bajri, Boulder) Mining Policy 2016 the pits from where the material is picked are not deeper than 1.5m each year including replenishment as allowed in mining area and shall follow the normal channel direction of the river.

Now the Government of Uttarakhand vide its notification no. 334/Vli-A-1/5(15)/19 dated 04 March 2020 made change in Uttarakhand Minor Mineral Concession Rule-2001 Rule no. 11 and 29 Ka sub rule-1 and in place provide that "The length of the area under a mining lease shall ordinarily not exceed four times its breadth and the maximum permissible depth for collection of minor minerals shall be fixed at 3.0 meter or up to ground water level whichever is less".

The guidelines of the Ministry of Environment & Forests and Directorate of Geology and Mining will be followed; the most important is as under: Uttarakhand Minor Mineral (Sand, Bajri, Boulder) Mining Policy 2016.

2.8.2 Production Parameters

- Dry pit mining will be followed which means mining all times will be done above the water flow level of river. Mining activity will be immediately stopped when water comes in the mining pits.

- RBM (sand, bajri & boulder) will be collected upto a depth of 3.0m from first to fifth year or river water levels whichever is less than prescribed. Bench/levels in post monsoon & pre monsoon are given according to sequence of mining from lower elevation to higher elevation.
- Stream will not be diverted to form inactive channel and mining at the concave side of the river channel will be avoided to prevent bank erosion.
- Mining will be restricted in minimum 25% from both sides of river bank to minimize effect of river bank erosion and to avoid consequent channel migration. So mining activity will be done only in 68.425 ha area, leaving a safety zone or non-mining area.
- Area of mining lease will be demarcated prior to mining and Pillars will be erected on ground
- No mining operations shall be carried out in proximity of any bridge and or embankment.
- No construction will be done at site except for construction of initial temporary shelter house and office hut.
- No water intake from river will be done. Required drinking and sprinkling water will be supplied by tankers from outside sources.
- No machineries will be used and mining will be completely stopped during monsoon season.
- Mining will be carried out only during the day time. The factors such as topography, bed gradient, soils, rainfall etc will be taken into consideration for the same. Total number of working days for operation of mine will be 245 in a year.

2.9 Basic requirements of the Project

The RBM containing sand, bajri & boulders of quartzite mineral is an important material for construction. The RBM will be used in road, bridge and building constructions.

2.9.1 Power

No electrical power shall be required for mining operations.

2.9.2 WATER REQUIREMENT

Water requirement proposed in project for domestic use, dust suppression and plantation, shall be met from the tanker supply. Total Water requirement shall be **25.3 KLD**. The breakup of water requirement shows in **figure 2-8**

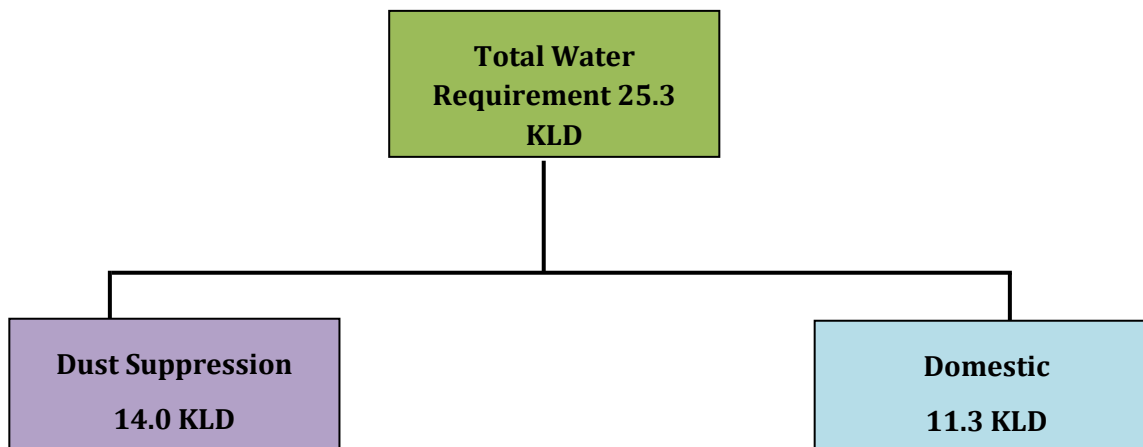


Figure 2.8 Water Balance Diagram

2.9.3 GENERAL FEATURES

Facilities which will be required at the mine site during operational phase are described below:

- **Mine Office:** Power site services such as Computer Room, Controlling Office of entry and exit of vehicles, First aid, attendance record, complaint box and telephone facility will be provided to the workers.
- **Workshop:** Temporary workshop for storage and maintenance of hand equipment will be organized.
- **Security:** Security guards will be deployed at the mine site.
- **Rest Shelter:** Rest shelter along with first-aid station complying with all the provisions of Mines Rules will be constructed temporarily in the lease area itself.
- **Sanitation Facility:** Bio-toilets will be provided to workers during operational phase of mining.
- **Drinking Water Facility:** Arrangement of water will be done separately for workers.

2.9.4 EMPLOYMENT POTENTIAL

About 345 workers including skilled, semi-skilled & unskilled labours shall be engaged through project proponent for extraction of sand, bajri, boulder (minor mineral) and loading & handling of mineral in mining area. Breakup of manpower is given in **Table-2.4**:

Table 2.4 : Manpower Requirement

S.No.	Labour Categorization	No. of Persons
Skilled		
1	Supervisor	2
2	Office Assistant/Dispatch Supervisor	4
Unskilled		
3	Safety Guard & Field Staff	9
4	Daily Wages/mining workers (120 for Truck Loading + 120 for Tractors Loading)	240
5	Vehicles Driver (30 Trucks & 60 Tractors)	90
Total Manpower		345

2.9.5 Extent of Mechanization

As the mechanism of mineral extraction is manual Open Cast Method, no mechanization is required.. Hence disposal of mining machineries are not required.

2.10 WASTE MANAGEMENT

Not applicable, as the mining activity will not be generating any overburden or waste water. There will be no OB or waste generation as the minor mineral is exposed in the river bed.

But, at the later stage, if any soil or waste will be obtained during mining, then same will be stored with proper protection and will be used for reclamation (plantation).

2.11 USE OF MINERAL

The RBM containing sand, bajri & boulders of quartzite mineral is an important material for construction. The RBM will be used in road, bridge and building constructions.

2.11.1 Infrastructure/Site Services

The site services include a) mines office b) rest shelter c) First aid centre d) store room , e) water tank f) public convenience g) water and shelter hut h) Road-for adjacent mines and factory i) drinking water facilities h) telephone lines etc.

2.12 Litigation

There is no court case against this project.

2.13 Chemical and mineralogical composition:

Rock type	Top Site	Middle Site	Lower Site	Average
Sand	17%	19%	20%	18.7%
Bajri	34%	32%	37%	34.3%
Boulder	49%	49%	43%	47%

CHAPTER-3 : DESCRIPTION OF THE ENVIRONMENT

3.1 GENERAL

The main objectives of describing the environment, which may be potentially affected, are (i) to assess present environmental quality and the environmental impacts and (ii) to identify environmentally significant factors that could preclude Mine development. This chapter discusses about the present scenario of the study area with reference to the prominent environmental attributes. The study area covers 10 Km radius of the mine lease area. Baseline data has been collected during the Winter Season 1st December to 28th February 2020 by M/s Mantec Laboratory {NABL Accredited Lab, Certificate No.TC-6440 (in lieu of 1417) (Certificate enclosed as **Annexure C**) in accordance with the Guidelines for EIA issued by the Ministry of Environment Forests and Climate Change, Government of India and CPCB, New Delhi.

The impact identification always commences with the collection of baseline data such as Ambient Air Quality, Micro-Meteorology, Ground and Surface Water Quality, Noise levels, Soil Quality, Land use pattern, Biological Environment and Socio-economic aspects, Solid and Hazardous waste, Risk Assessment, Geology and Hydrology within the study area.

The baseline information on micro-meteorology, ambient air quality, water quality, noise levels and soil quality are largely drawn from the data generated by Mantec Laboratory (NABL Accredited Lab). Long term meteorological data recorded at the nearest IMD station, Dehradun was also collected. Site specific micrometeorological data was recorded by using automatic weather station. Apart from these, secondary data have been collected from Census Handbook, Revenue Records, Statistical Department, Soil Survey and Landuse Organization, District Industries Centre, Forest Department, Central Ground Water Authority, Botanical Survey of India, Zoological Survey of India, Geological Survey of India, etc.

Following environmental attributes has been assessed during baseline study;

- Physical environment (Air, Water, Soil and Noise) baseline data.
- Relevant meteorological data, for previous decades from Indian Meteorological Department (IMD) and primary data.
- Land use pattern within core zone and buffer zone (10 Km radius around the core zone) based on Survey of India Toposheet map, ground truth and satellite image.
- Identification of water bodies, hills, roads etc. within 10 Km radius.
- Eco-sensitive places, National Parks, Sanctuaries, Biosphere Reserves within 10 Km radius.
- Religious places / historical monuments and tourist places within 10 Km radius.
- Details of fauna and flora within a distance of 10 Km from the project site and information about forests, if any.
- Demography and Socio-economic based on last available Census data for entire study area.
- Major industries within 10 Km radius.
- Study of present environmental protection and mitigation measures in nearby operating similar projects, if any

3.2 LAND ENVIRONMENT

The impacts on land environment would be in the form of permanent change in landuse pattern as well as direct and indirect impacts on surrounding land due to excavation of minerals, discharge of wastes on the land and unscientific means of disposal. Area statistics of land-use classes has been generated within 10 Km radius of mine lease area (Core zone and Buffer zone) and given in **Table**

3.2.1 Methodology for Baseline Data Generation

Land use /Land cover map preparation, Base map creation; Geometric and Radiometric correction of satellite image has been processed using ERDAS Imagine 9.2 and ArcGIS 9.3 Software. The methodology used for present LU/LC of study area is shown in Figure 3-1 and is detailed below:

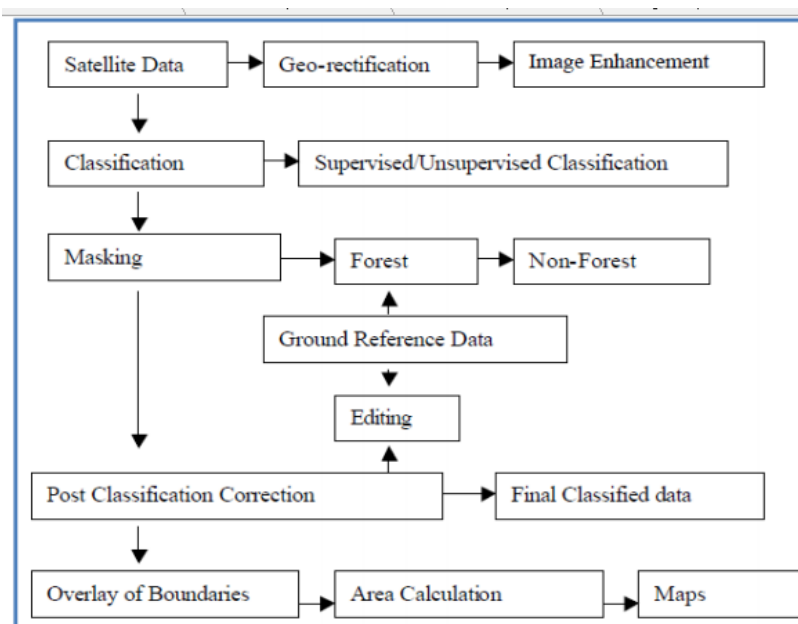


Figure 3.1 : Methodology Use for Landuse Classification & Mapping

Methodology Adopted For Thematic Data Extraction From The Satellite Imageries:

ERDAS image processing software and ArcGIS Software were used for the project. Erdas 9.2 Image Processing Software was used for digital processing of the spatial data. Digital image processing techniques were applied for the mapping of the land use/land cover classes of the provided area from the satellite data. The methodology applied comes under following steps:

Image Extraction:

Satellite imageries were obtained and a sub set for the Area of Interest was created through ERDAS image processing software.

Geo-Rectification:

Geometric correction includes correction for geometric distortions due to sensor, earth geometry variations and conversion of the data to real world coordinates (e.g. Latitude and Longitude) on the Earth's surface. The satellite imagery was geometrically rectified with reference to the geo-referenced toposheets and vector data.

Image Enhancement:

Image enhancement is one of the important image processing functions primarily done to improve the appearance of the imagery to assist in visual interpretation and analysis. Various options of image enhancement techniques were tried out to get the best image for visual interpretation. Histogram equalized stretch enhancement techniques was applied to the imagery of the study area for better interpretation of different features in the satellite imagery.

Classification:

Satellites images are composed of array of grid, each grid have a numeric value that is known as digital number. Smallest unit of this grid is known as a pixel that captures reflectance of ground features represented in terms of Digital number, which represent a specific land features. Using image classification technique, the satellite data is converted into thematic information map based on the user's knowledge about the ground area.

Hybrid technique has been used i.e. visual interpretation and digital image processing for identification of different land use and vegetation cover classes based on spectral signature of geographic feature. Spectral signature represents various land use classes. Image interpretation keys are developed based on image characteristics like color, tone, size, shape, texture, pattern, shadow, association etc. which enables interpretation of satellite images for ground feature. Training sites are then assigned based on their spectral signature and interpretation elements. Land use/Land cover Map has been broadly classified into five classes namely Agriculture, Forest Land, Built-up Area, Water Bodies and Waste Land and all other land uses have been categorized in others class. Using image classification algorithm land use map is then generated.

3.2.2 Land Use/ Land Cover Pattern of the Study Area

The existing land use pattern of the study area based on the latest satellite imagery is given in Table 3-1 as follows and is shown in Figure 3-2.

Table 3.1 : Land Use Pattern of the Study Area

S. No	Classes	Area (sq.km)	Area in %
1	Agriculture Land	102.56	24.62
2	Built-Up Area	26.06	6.25
3	Forest	197.43	47.39
4	Shrub	63.56	15.26
5	Barren Land	7.97	1.91
6	Waste Land	1.44	0.35
7	Water Bodies	17.59	4.22
Total		416.60	100.00

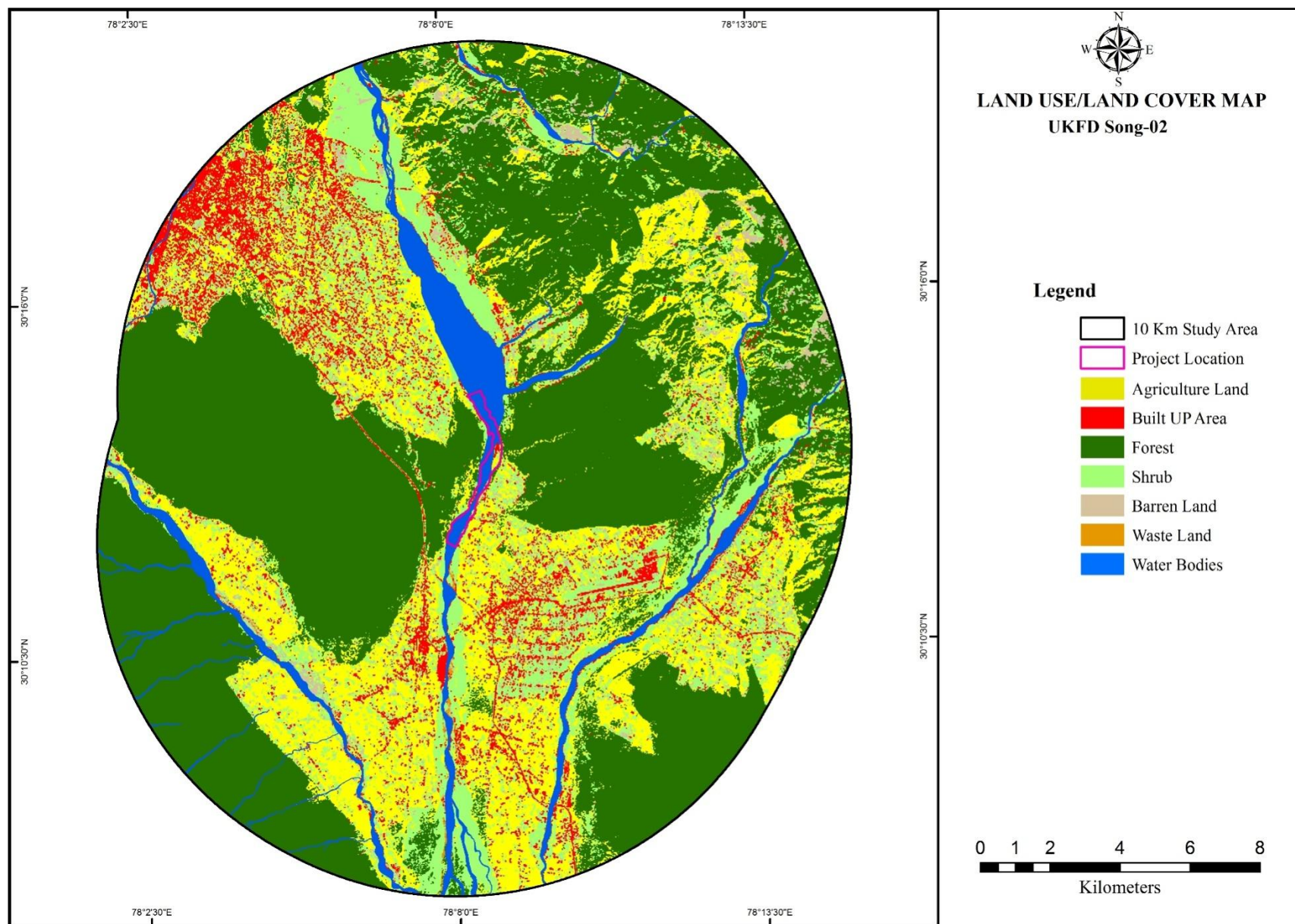


Figure 3.2: Land-Use/Land-Cover Map of the Study Area

3.2.3 Description of Land Use

The study area is prominently covered by forest land (47.39%). Agricultural land covers 24.62% of the study area. The water bodies cover 4.22% while shrubs are covering 15.26% of the study area. Waste land constitutes about 0.35 % of the study area.

3.3 SOIL ENVIRONMENT

Soil is the largest pool of terrestrial organic carbon. Soil may be defined as a thin layer of earth's crust, which serves as a natural medium for the growth of plants. It is the environmental sieve that controls the fate of contaminants, and directs water in the various pathways of the hydrologic cycle. The soil characteristics are mainly classified into three groups which include physical, chemical and electrical properties. For studying soil quality of the region 8 samples were collected to assess the existing soil conditions in and around the area. The study area has medium sandy loam.

3.3.1 Methodology of Baseline Data Generation

The soil survey was carried out to assess the soil characteristics of the area. For studying soil quality of the region, 8 samples were collected from 8 different locations in the study area (in and around the mine lease area) to assess the existing soil conditions. Distance and direction of soil sampling station from the mine site have been given below in Table 3-2.

Table 3.2: Details of Soil monitoring Locations

S. No.	Code	Location Name	Distance (kms)	Direction	Latitude	Longitude
1.	SQ1	Bhopal Pani	2.44	NE	30.26352964790	78.14781048510
2.	SQ2	Nakraunda	1.0	W	30.23669450080	78.13117018130
3.	SQ3	Balawala	4.0	NW	30.26294049780	78.10664986960
4.	SQ4	Doiwala	3.89	S	30.17648148600	78.12646219480
5.	SQ5	Ranipokhari	7.75	SE	30.17960448380	78.21307492930
6.	SQ6	Bhaniwala	2.52	SE	30.18626931570	78.15409544010
7.	SQ7	Bullawala	6.87	SW	30.16174718870	78.07880914670
8.	SQ8	Rishikesh	3.37	E	30.21675276810	78.18295338730

The samples were collected by driving an auger into the soil up to the depth of 90cm. The present study on the soil quality establishes the baseline characteristics and identifies the incremental concentrations if any, due to the proposed project. The objective of the sampling is:-

- To determine the baseline soil characteristics of the study area;
- To determine the impact of proposed activity on soil characteristics and;
- To determine the impact on soil more importantly agriculture production point of view.

The soil samples were collected from three different depths viz. 30cm, 60cm and 90cm. The samples were then packed in polythene plastic bags and sealed. The samples from three different depths are homogenized and are then analysed. Map showing monitoring locations of Soil samples for physico-chemical analysis of soil is shown below in Figure 3-3.

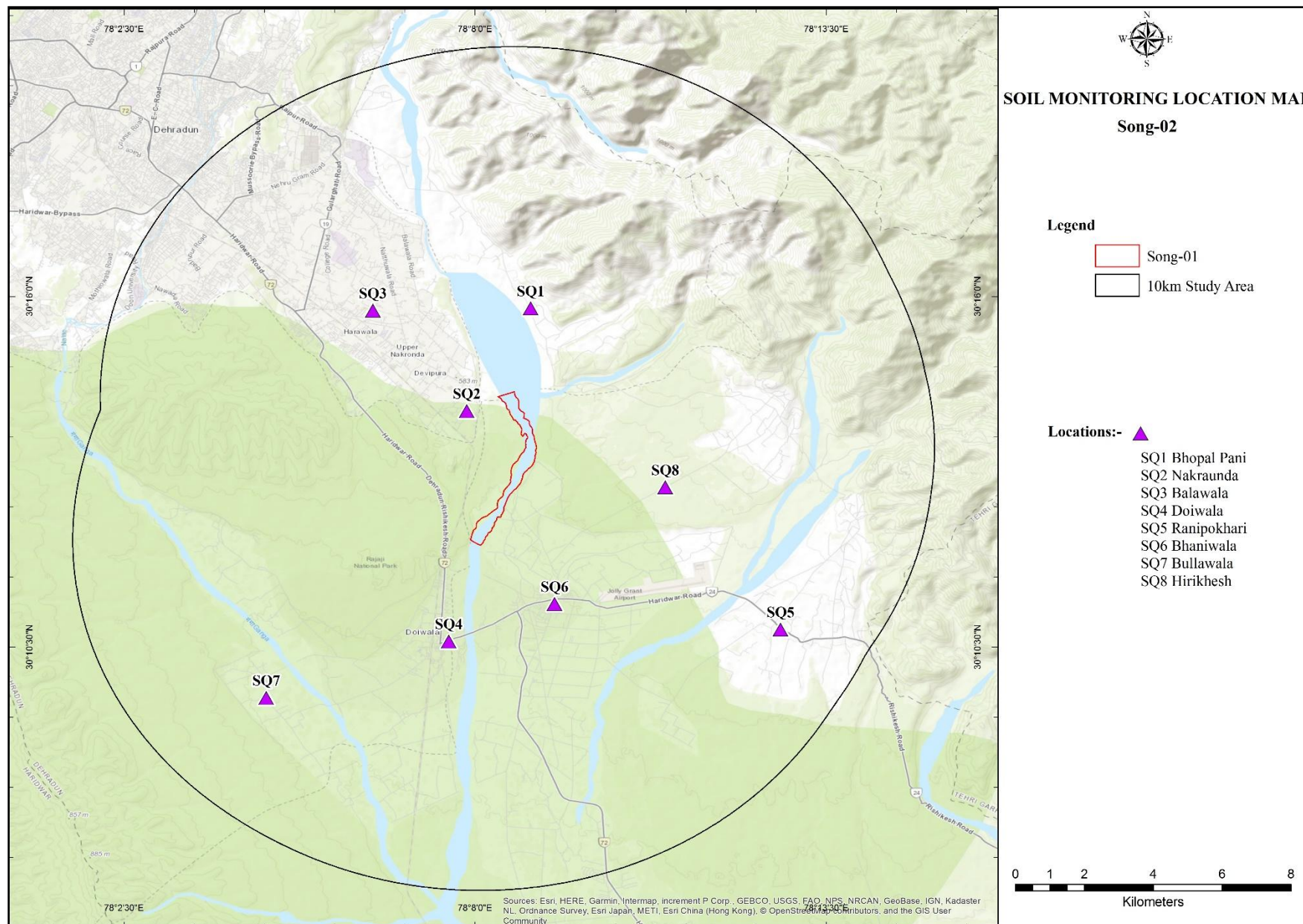


Table 3.3: Soil Quality Analysis Results

		Location	Location 1	Location 2	Location 3	Location 4	Location 5	Location 6	Location 7	Location 8
			Bhopal Pani	Nakraunda	Balawala	Doiwala	Ranipokhari	Bhaniwala	Bullawala	Hirikhesh
Sr. No.	Parameters	Units	Value	Value	Value	Value	Value	Value	Value	Value
1	pH	-	7.54	7.25	7.61	7.62	7.62	7.52	7.45	7.84
2	Bulk Density	gm/cm ³	1.48	1.25	1.62	1.65	1.62	1.75	1.28	1.67
3	Conductivity	micro mhos/cm	415	354	385	365	358	362	395	388
4	Moisture	%	6.48	7.51	7.32	7.35	7.62	6.46	7.61	7.34
5	Texture	-	Sandy Clay Loam	Sandy Clay Loam	Sandy Clay Loam	Sandy Clay Loam	Sandy Loam	Sandy Clay Loam	Sandy Clay Loam	Sandy Clay Loam
6	Sand	%	64	62	60	68	60	62	64	64
7	Clay	%	21	20	22	20	18	22	20	20
8	Silt	%	15	18	18	12	22	16	16	16
9	Sodium	mg/100gm	7	9	10	8	7.4	8	9	8
10	Potassium	mg/100gm	4	5	6	5	4.1	4	6	5
11	Nitrogen	mg/100gm	9.2	10.2	9.5	9.7	10.4	10.5	8.6	10.8
12	Phosphorous	mg/100gm	0.94	0.98	1.08	0.85	0.48	0.57	0.84	0.94
13	Organic Matter	%	1.48	1.54	1.25	1.35	1.07	1.82	1.38	1.64
14	Organic Carbon	%	0.86	0.89	0.73	0.78	0.62	1.06	0.80	0.95
15	SAR	meq /100gm	0.61	0.74	0.89	0.70	0.68	0.72	0.76	0.72
16	CEC	meq/100gm	13.46	13.08	13.50	12.7	11.14	14.64	12.76	13.28
17	Calcium	meq /100gm	5.48	6.32	5.28	5.24	4.85	5.34	5.95	5.42
18	Magnesium	meq /100gm	2.65	2.85	2.58	2.81	2.48	2.35	2.81	2.37

3.3.2 Interpretation of Results

Monitoring data shows that the texture of soil at all locations is Sandy Clay Loam except at one location (Ranipokhari) where the texture of the soil is Sandy Loam. The monitoring sites have sand ranging from 60% to 68% in soil samples. Silt content varies from 12% to 22%, while Clay content varies from 18% to 22% in the soil samples.

- The data shows that value of pH ranges from 7.25-7.84.
- Near village Bhopal Pani shows maximum conductivity of 415µmhos/cm, Nakraunda village shows minimum conductivity of 354 µmhos/cm.
- Values of CEC ranges from 11.14 meq/100g as lowest at Ranipokhari village and 14.64 meq/100g as maximum at Bhaniwala village.
- Magnesium values ranges from 2.35 meq/100g as lowest at Bhaniwala and 2.85 meq/100g as highest near Nakraunda.
- The average concentration of Nitrogen, Phosphorus and Potassium in the soil samples varies from 8.6 to 10.8 mg/100gm, 0.48 to 1.08 mg/100gm and 4 to 6 mg/100gm.

3.4 WATER ENVIRONMENT

3.4.1 Methodology Adopted for Selection of Sampling Station

The sampling was done both for surface water and underground water. The samples were taken from the identified monitoring locations within the 10 Km radius of the study area. Total of 12 samples were taken (8 for ground water and 4 for surface water). The water quality sampling locations are described in Table 3.4 and shown in Figure 3-4.

Table 3.4: Water Sampling Stations

S. No.	Code	Location	Distance (kms)	Direction	Latitude	Longitude
1.	GW1	Dehradun	9.25	NW	30.28990307570	78.06187089220
2.	GW2	Manav Vihar	4.49	NW	30.27726660480	78.11987191670
3.	GW3	Bhopalpani Grant	2.17	NE	30.26045869900	78.15042777590
4.	GW4	Doiwala	2.49	SW	30.18092871960	78.12440437210
5.	GW5	Barasi Grant	2.75	NE	30.25566943880	78.16720643720
6.	GW6	Bhaniwala	2.43	SE	30.18756006740	78.15417765450
7.	GW7	Mothrowala	9.91	NW	30.26186339920	78.03936483560
8.	GW8	Hirikhesh	3.38	E	30.21670444400	78.18294972250
9.	SW1	Mine Site	1.76	N	30.25606388890	78.13597222220
10.	SW2	Nala near Nakraunda	2.23	W	30.23226388890	78.12018333330
11.	SW3	Water Body near Barasi Grant	2.06	E	30.24534722220	78.16458333330
12.	SW4	Song River U/S	9.44	N	30.32693333330	78.14118055560

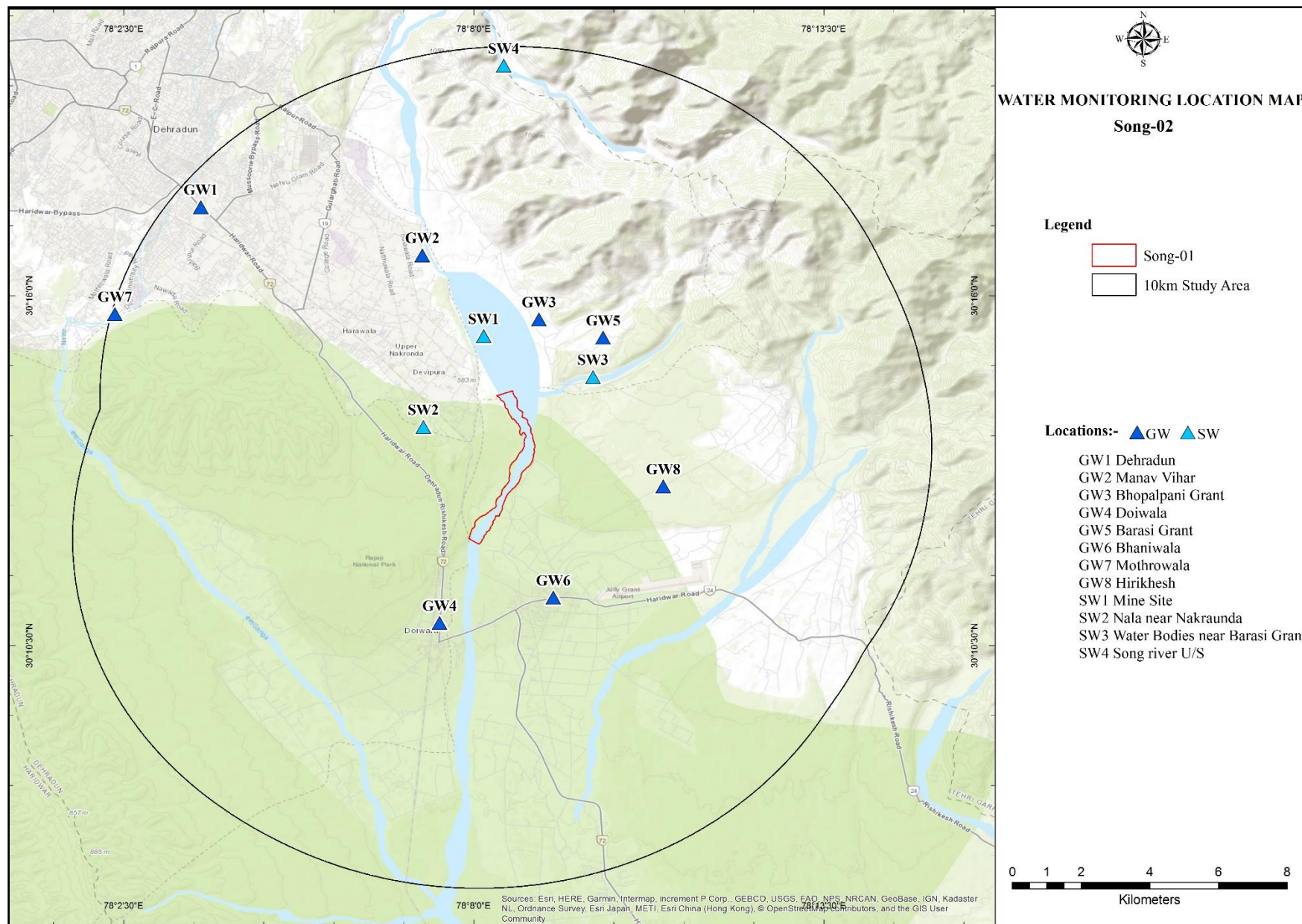


Figure 3.4: Key Plan of Water Sampling Stations

Table 3.5: Ground Water Analysis Results

	Locations		GW 01 Dehradun	GW 02 Manav Vihar	GW 03 Bhopalpa ni Grant	GW 04 Doiwala	GW 05 Barasi Grant	GW 06 Bhaniwal a	GW 07 Mothrowal a	GW 08 Hirikhesh
SL. No.	Parameters	Units of Measurements								
1	Colour	Hazen Units	<5	<5	<5	<5	<5	<5	<5	<5
2	Odour	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
3	Taste	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
4	pH	-	7.26	7.62	7.96	7.79	7.45	7.25	7.21	7.51
5	Temperature	°C	24	23	27	25	29	22	23	22
6	Turbidity	NTU	1.2	1.2	1.5	1.5	1.3	1.3	1.1	1.3
7	Conductivity	µmhos/cm	384	454	620	573	585	541	500	450
8	Alkalinity as CaCO ₃	mg/l	79	83	119	96	112	105	100	90
9	Total Dissolved Solids	mg/l	251	294	403	375	380	353	325	293
10	Total Hardness as CaCO ₃	mg/l	161	219	202	293	190	180	239	216
11	Calcium as Ca	mg/l	38.3	55.1	48.4	72.4	45.6	45.1	61.9	55.8
12	Magnesium as Mg	mg/l	15.7	19.7	19.5	27.2	18.4	16.4	20.4	18.4
13	Chloride as Cl	mg/l	56	76	105	81	99	90	86	78
14	Total Phosphorus	mg/l	0.61	0.51	0.63	0.80	0.59	0.57	0.70	0.63
15	Nitrate as NO ₃	mg/l	5.6	5.1	9.6	7.5	6.5	6.8	6.3	5.7
16	Sulphate as SO ₄	mg/l	43	55	65	67	61	56	51	46
17	Fluoride as F	mg/l	0.56	0.60	0.77	0.69	0.73	0.68	0.57	0.51
18	Arsenic as As	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
19	Lead as Pb	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
20	Zinc as Zn, Max	mg/l	0.14	0.18	0.12	0.18	0.14	0.18	0.2	0.12
21	Sodium as Na	mg/l	26	22	28	22	20	24	18	22
22	Potassium as K	mg/l	4	3	4	3	2	4	2	3
23	Total Coliform	MPN/100ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent
24	Faecal Coliform	MPN/100ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent

Table 3.6: Surface water Analysis

	Locations		SW 01 Mine Site	SW 02 Nala Near Nakraunda	SW 03 Water Body near Barasi Grant	SW 04 Song River U/S
Sl. No.	Parameters	Units of Measurements	Dec. 2019	Dec. 2019	Dec. 2019	Dec. 2019
1	Colour	Hazen Units	<5	<5	<5	<5
2	Odour	-	Agreeable	Agreeable	Agreeable	Agreeable
3	Taste	-	Not done	Not done	Not done	Not done
4	pH	-	7.54	7.34	7.81	7.45
5	Temperature	°C	28	26	28	26
6	Turbidity	NTU	2.6	3.7	2.1	1.9
7	Conductivity	µmhos/cm	387	348	382	350
8	Alkalinity as CaCO ₃	mg/l	79	89	68	63
9	Total Dissolved Solids	mg/l	253	227	250	229
10	Total Suspended Solids	mg/l	5	5	4	3
11	Total Hardness as CaCO ₃	mg/l	126	139	135	123
12	Calcium as CaCO ₃	mg/l	96	110	88	74
13	Magnesium as CaCO ₃	mg/l	30	29	47	49
14	Chloride as Cl	mg/l	60	42	64	58
15	Total Phosphorus	mg/l	0.64	0.50	0.66	0.60
16	Nitrate as NO ₃	mg/l	11.4	9.79	12.2	11.1
17	Sulphate as SO ₄	mg/l	35	27	38	35
18	Fluoride as F	mg/l	0.78	0.37	0.72	0.66
19	Arsenic as As	mg/l	<0.01	<0.01	<0.01	<0.01
20	Lead as Pb	mg/l	<0.01	<0.01	<0.01	<0.01
21	Zinc as Zn, Max	mg/l	0.12	0.18	0.14	0.16
22	Sodium as Na	mg/l	32	26	28	22
23	Potassium as K	mg/l	4	3	4	3
24	Dissolved Oxygen	mg/l	6.2	6.4	6.7	6.3
25	BOD	mg/l	6	8	8	10
26	COD	mg/l	48	64	62	76
27	Total Coliform	MPN/100ml	3541	4865	4428	5624
28	Faecal Coliform	MPN/100ml	1954	2749	2562	3157

3.4.2 INTERPRETATION

Analysis results of **Ground water** reveal the following;

- pH varies from 7.21 to 7.96
- Total Hardness varies from 161.00 to 293.00 mg/L.
- Total Dissolved Solids varies from 251.00 to 403.00 mg/L.
- Fluoride varies from 0.51 to 0.77 mg/L
- Chloride varies from 56.00 to 105.00 mg/L

Analysis results of **Surface water** reveal the following;

- pH varies from 7.34 to 7.81
- Total Hardness varies from 123.00 to 139.00 mg/L.
- Total Dissolved Solids varies from 227.00 to 253.00 mg/L.
- Fluoride varies from 0.37 to 0.78 mg/L
- Chloride varies from 42 to 64 mg/L
- COD varies from 48.00 to 76.00 mg/L
- BOD varies from 6 to 10 mg/L

A review of the above chemical analysis reveals that there is some variation in chemical composition of water tapped from different sources but the ground water from all sources remains suitable for drinking purposes as all the constituents are within the limits prescribed for drinking water standards promulgated by Indian Standards (IS: 10500).

3.5 METEOROLOGY

Meteorology plays a vital role in affecting the dispersion of pollutants, once it discharged into the atmosphere cannot be controlled. Since meteorological factors show wide fluctuations with time, meaningful interpretation can be drawn only from long-term reliable data. Such data source is the India Meteorological Department (IMD), which maintains a network of meteorological stations at several important locations. The nearest IMD station is Dehradun. The Meteorological parameters viz. temperature, humidity, rainfall, wind speed, and wind direction, etc. are obtained from the IMD Dehradun

Meteorological station was set-up at site to record surface meteorological parameter during study period; 1st December 2019 to 28th February 2020. The nearest IMD station is taken at Uttarakhand.

3.6 Climate and Rainfall

The temperatures shooting upto 36.2° C at Dehradun. The maximum temperature rises to over 42° C at Dehradun. The mean daily maximum temperature during winter is 19.1°C at Dehradun. 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. The climatic data of Doon Valley is summarized in Table 2. Monsoon starts by the mid of June and lasts upto September.

3.7 Wind Speed / Wind Rose Diagram

Wind speed and wind direction data recorded during the study period is useful in identifying the influence of meteorology on the air quality of the area. Based on the collected meteorological data, relative percentage frequencies of different wind directions are calculated and plotted as wind roses of Sixteen directions viz., N, NNE, NE, ENE, E, ESE, SE, SSE, S, SSW, SW, WSW, W, WNW, NW and NNW for 24

hours duration respectively. Maximum and minimum temperatures including percentage relative humidity were recorded simultaneously.

The average wind speed recorded was 6.1 to 7.2 km/h during Decemeber 2019 to Februaray 2020. Wind rose diagram from the monitored data shows that the predominant wind direction during the study period was mainly from west of north-west (WNW) to east of south-east (ESE). The meteorological condition of the study area has been tabulated in Table 3-5. The Wind rose diagram has been shown in **Figure 3.5**.

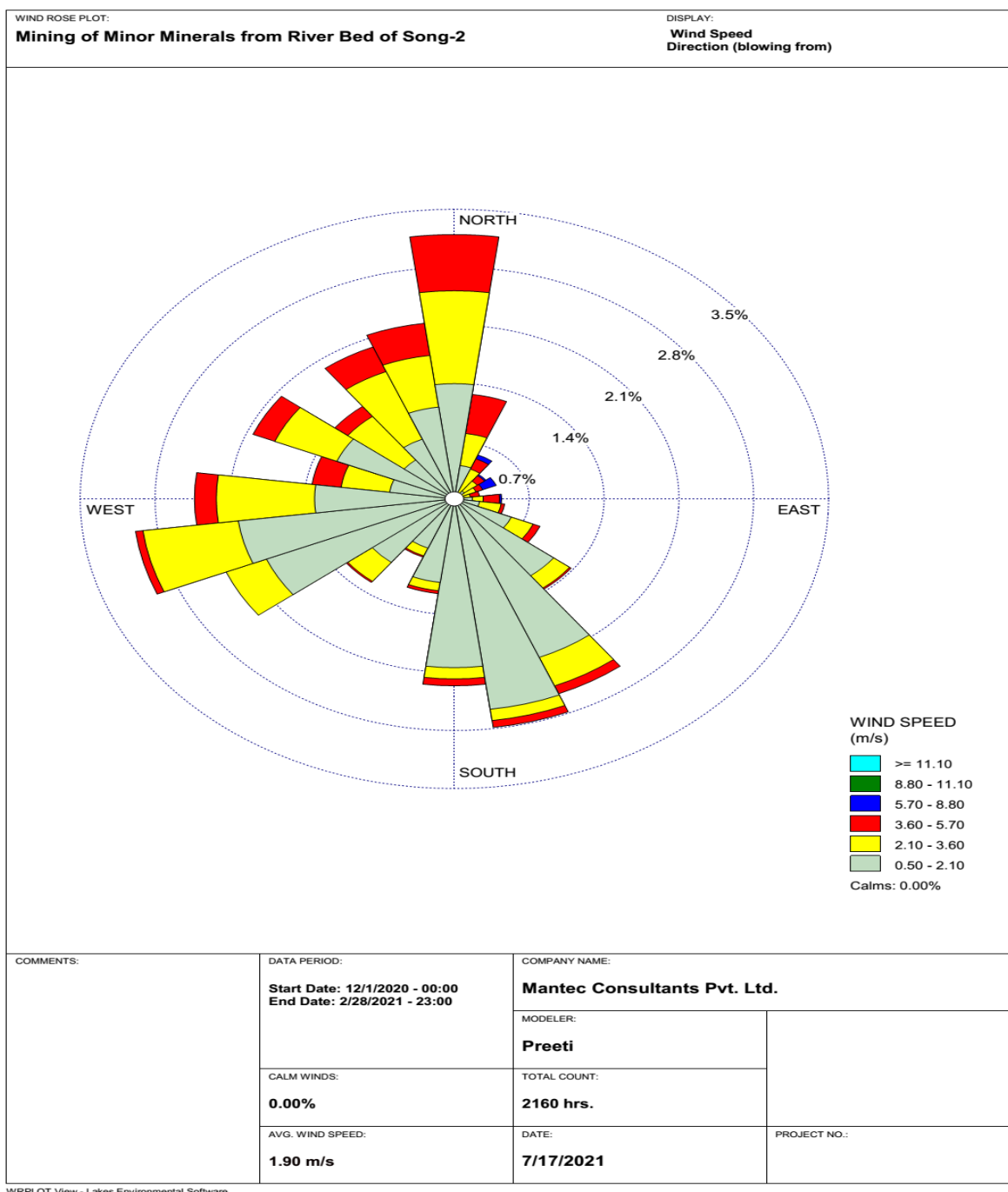


Figure 3.5: Wind Rose Diagram of Study Area

3.8 AMBIENT AIR QUALITY

The ambient air quality with respect to the study area of 10 Km radius around the lease area forms the baseline information. The various sources of air pollution in the region are dust rising from unpaved roads, domestic fuel burning, vehicular traffic, agricultural activities etc. The prime objective of baseline air quality monitoring is to assess existing air quality of the area. This will also be useful in assessing the conformity to standards of the ambient air quality during the operations.

3.8.1 Selection of Sampling Station

The baseline status of the ambient air quality has been assessed through scientifically designed Ambient Air Quality Network. The design of monitoring network in the air quality surveillance program has been based on the following considerations:

- Representation of Mine leases area.
- Representation of the down wind direction and cross-sectional distribution.
- Representation of residential areas.
- Representation of regional background levels.
- Representation of sensitive receptor.
- Meteorological conditions (predominant wind direction and wind speed.
- Topography of the study area.

Keeping in view above mentioned points, 08 nos. of Ambient Air Quality Monitoring Stations were established within the study area. The sampling locations are shown in **Table 3-7** and in Figure 3-10. Villages/locations have been selected in downwind direction as well as in the upwind direction for AAQ monitoring from the proposed activity site.

Table 3.7: Ambient Air Quality Monitoring Sampling Stations

S. No.	Code	Location	Distance (kms)	Direction	Latitude	Longitude
1.	AQ1	Bhopal Pani	2.50	NE	30.26383273450	78.14908608400
2.	AQ2	Nakraunda	1.04	W	30.23646210560	78.13087742790
3.	AQ3	Balawala	3.83	NW	30.26286666670	78.10898611110
4.	AQ4	Doiwala	3.27	SW	30.17364676630	78.12420269930
5.	AQ5	Ranipokhari	7.47	SE	30.18167501110	78.21094691050
6.	AQ6	Bhaniwala	2.65	SE	30.18366543730	78.15307713550
7.	AQ7	Bullawala	6.93	SW	30.15918333330	78.08073611110
8.	AQ8	Rishikesh	3.39	E	30.21675276810	78.18295338730

3.8.2 Baseline Data

Ambient air monitoring at 08 locations were carried out on during 1st December 2019 to 28th February 2020, in the study area to assess the ambient air quality at the source. Major air pollutants viz., Particulate Matter (PM₁₀), Sulphur Dioxide (SO₂), Nitrogen Dioxide (NO₂), representing the basic air quality in the region were identified for Ambient Air Quality Monitoring (AAQM). The ambient air quality results are given in Table 3-9 for each location.

3.8.3 Sampling process and Analytical Techniques and Instruments Used for Sampling process

The various instruments used and technique adopted for sampling is given in table below:-

Table 3.8 Testing Procedure Used for Determining Various Air Quality Parameters

Parameter	Testing procedure
PM ₁₀	Gravimetric Method by using Repairable particulate matter sampler “Repairable Dust Sampler” (RDS)
PM _{2.5}	Cyclonic Method by using Fine particulate sampler.
NO ₂	Absorption in diluted NaOH and then estimated calorimetrically with sulphanilamide and N (I-Nephthyle) Ethylene Diamine Dihydrochloride and Hydrogen Peroxide (IS: 5182 1975, Part-VI).
SO ₂	Absorption in Sodium Tetra Chloromercurate followed by Colorimetric estimation using P-Rosaniline hydrochloride and Formaldehyde (IS: 5182 Part – II, 2001).

Table 3.9: Ambient Air Quality Monitoring Results

Station	Description	PM ₁₀ (µg/m ³)	PM _{2.5} (µg/m ³)	SO ₂ (µg/m ³)	NO ₂ (µg/m ³)
AQ1	Max	58	34	13	28
	Min	42	23	6	18
	Avg	51.54	29.92	9.32	24.52
	98 percentile	58.00	34.00	12.96	28.08
AQ2	Max	62	35	12	23
	Min	45	25	5	15
	Avg	53.33	29.75	8.38	19.04
	98 percentile	61.08	34.08	11.54	23.00
AQ3	Max	57	33	14	25
	Min	41	24	6	16
	Avg	48.50	27.42	9.88	20.13
	98 percentile	56.08	32.08	13.54	24.08
AQ4	Max	59	35	14	26
	Min	43	25	6	15
	Avg	50.17	29.00	10.58	21.33
	98 percentile	56.70	33.16	13.54	26.00
AQ5	Max	58	38	15	26
	Min	44	22	6	16
	Avg	50.33	31.17	10.25	20.67
	98 percentile	58.00	38.00	15.00	26.00

AQ6	Max	62	37	14	24
	Min	53	30	6	15
	Avg	57.04	33.08	8.58	20.71
	98 percentile	62.00	36.54	12.62	24.00
AQ7	Max	60	35	13	22
	Min	48	28	6	16
	Avg	57.17	32.00	9.25	18.46
	98 percentile	60.00	34.54	12.54	21.54
AQ8	Max	64	37	15	27
	Min	47	27	6	16
	Avg	57.40	33.29	9.29	20.88
	98 percentile	64.32	37.31	14.54	26.00

3.8.4 Interpretation of Results

Ambient Air Quality Monitoring reveals that the minimum and maximum concentrations of PM₁₀ were found to be 41.0 to 64.0 Minimum and maximum concentrations of PM_{2.5} were found to be 22.0 µg/m³ and 38.0 µg/m³ respectively. The minimum and maximum concentrations of NO₂ were found to be 15.0 µg/m³ and 28.0 µg/m³ respectively. The prescribed CPCB limit of SO₂ and NO₂ is 80 µg/m³ for residential and rural areas has never surpassed at any monitoring station. The minimum & maximum concentrations of SO₂ for all the 8 AAQM stations were found to 5.0 µg/m³ and 15.0 µg/m³ respectively. From the above study and discussions, it can be concluded that air quality of the area is good as the levels are well within the prescribed limits as prescribed by CPCB.

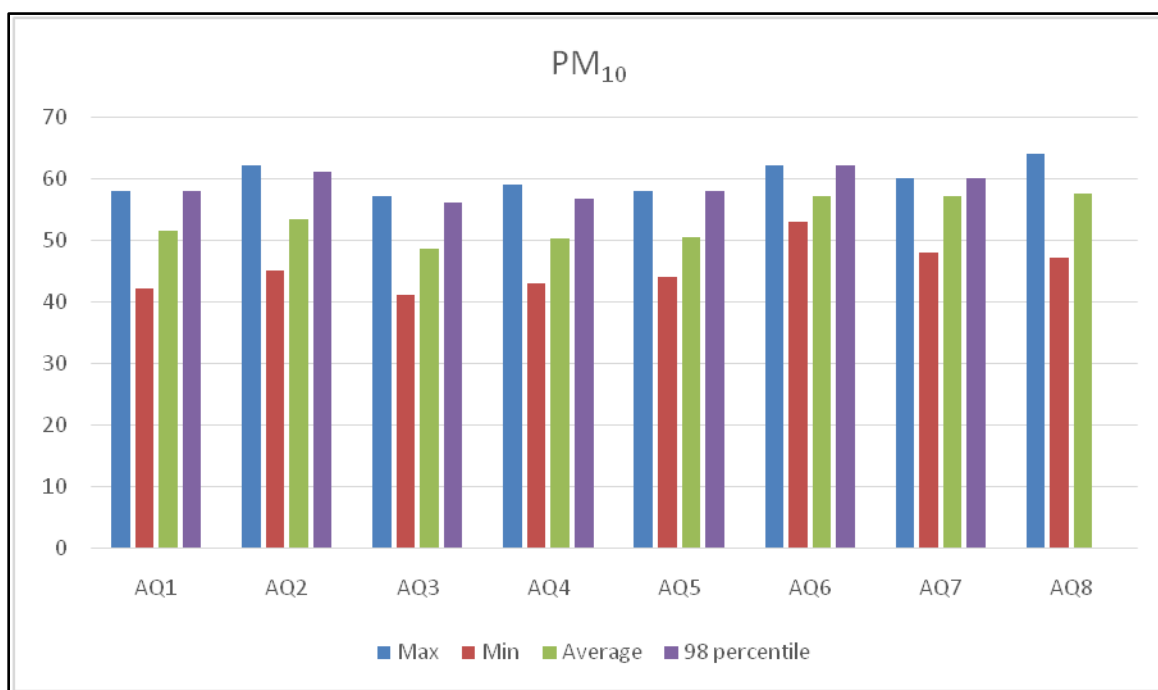


Figure 3.6: PM₁₀ Concentration in µg/m³

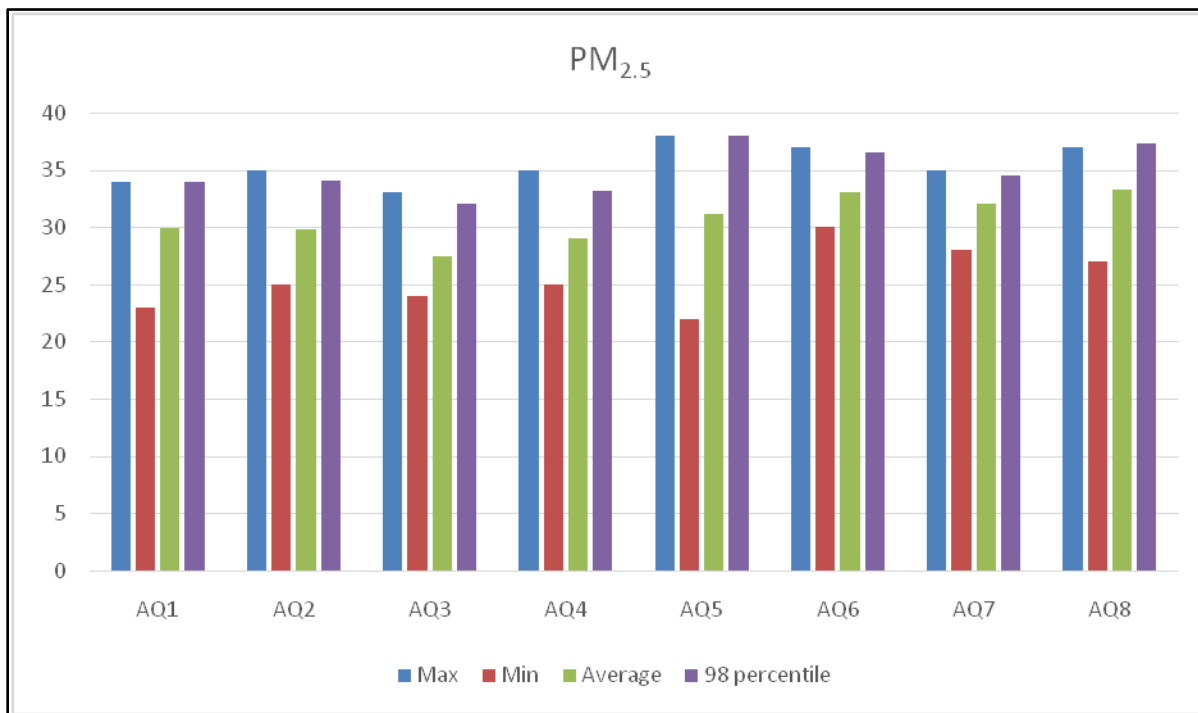


Figure 3.7: PM_{2.5} Concentration in µg/m³

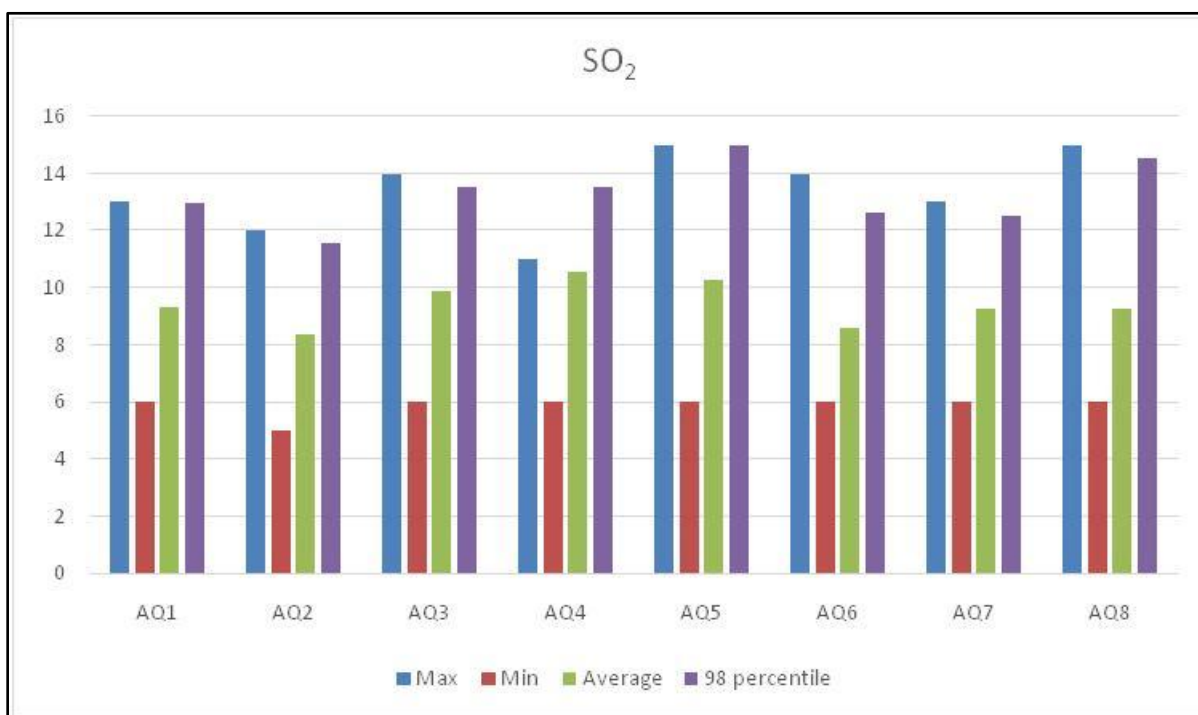


Figure 3.8: SO₂ Concentration in µg/m³

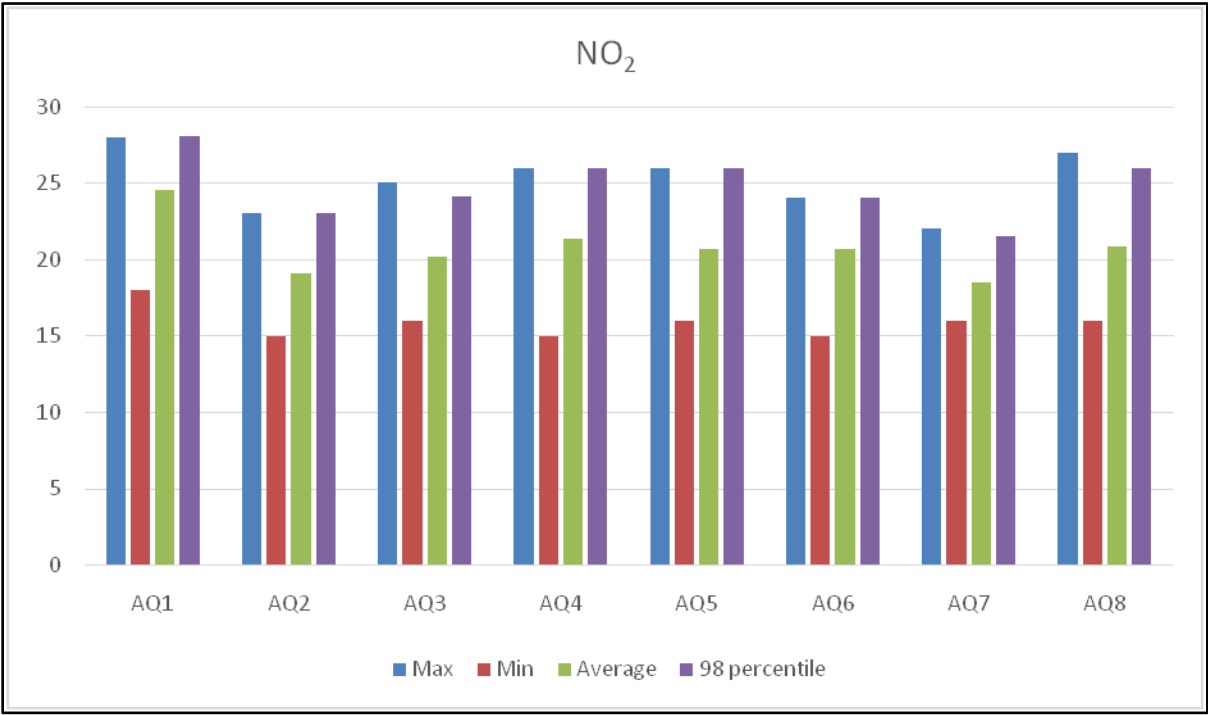


Figure 3.9: NO₂ Concentration in µg/m³

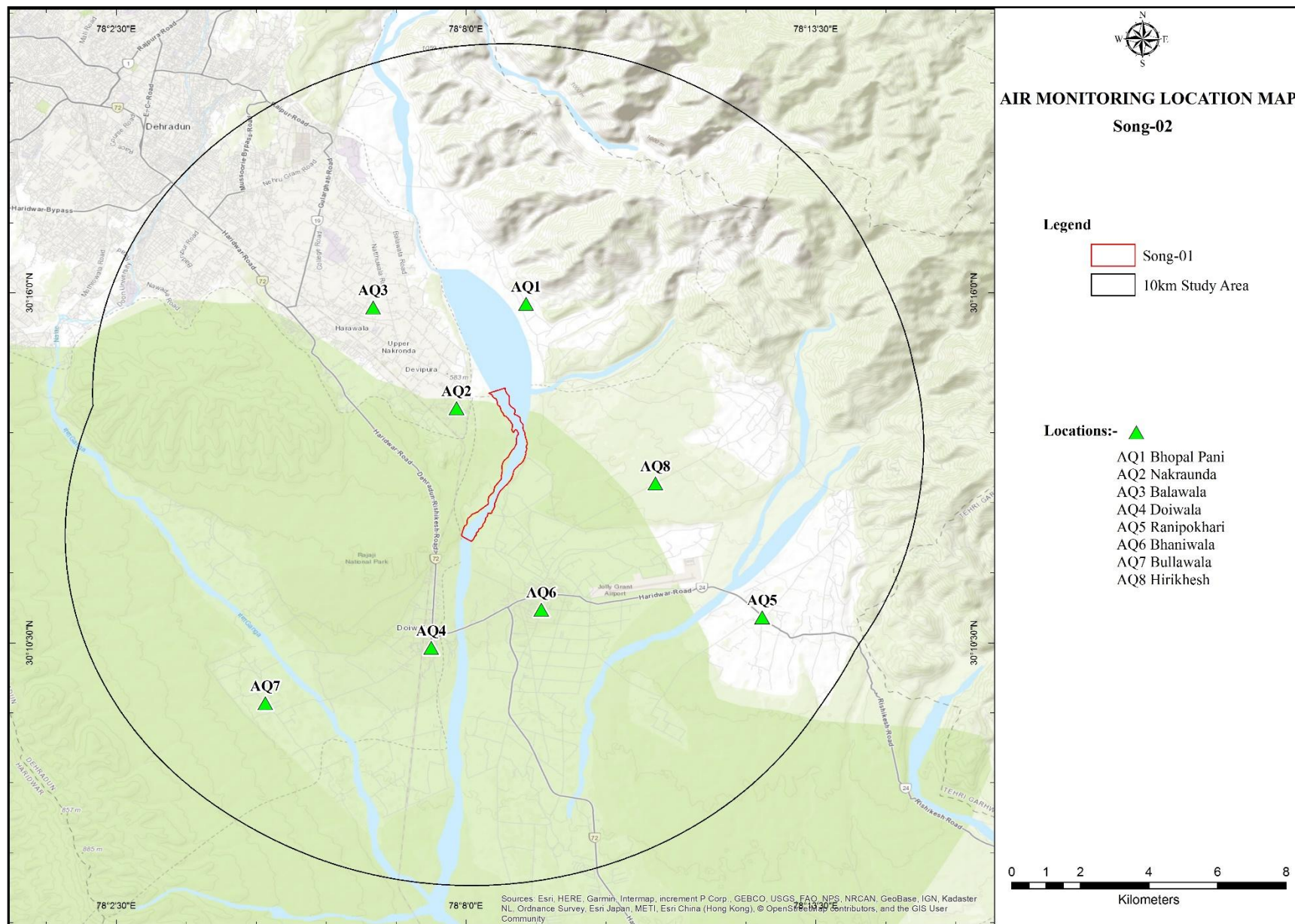


Figure 3.10: Key plan of Air Monitoring Stations

3.9 NOISE ENVIRONMENT

Noise in general we can say that the sound, which is composed of many frequency components of various loudness distributed over the audible frequency range. Various noise scales have been introduced to describe, in a single number, the response of an average human being to a complex sound made up various frequencies at different loudness levels. The most common and heavily favored of those scales is the A weighted decibel (dBA). This is more suitable for audible range of 20 to 20,000 Hertz. The scale has been designed to weigh various components of noise according to the response of a human ear. The main objective of the noise level monitoring is to assess the background noise levels in different zones viz., industrial, commercial, residential and silence zones within the study area. Noise levels were measured in residential areas, bus stands and other settlements located within 10Km radius around the site.

3.9.1 Noise Analysis within the Study Area

The noise analysis within the study area was recorded using 4012 Maxtech sound level meter. The instrument was calibrated with a Standard Acoustic calibrator before using in the field. The measurements were carried out continuously for the 24-hour period to obtain hourly equivalent sound pressure level, per hour Leq. from these values, day and night time as well as 24 hours Leq values were also calculated. The Leq value is the equivalent continuous sound level, which is equivalent to the same sound energy as the fluctuating sound measured in the same period.

3.9.2 Methodology adopted for Selection of Sampling Station

Noise levels are more annoying in the night time particularly in the residential areas. The environmental impact of noise can have several effects varying from annoyance to hearing loss depending on loudness of noise levels. The monitoring for noise levels were done in 8 locations keeping considering the population and traffic of the area. The locations are depicted in Table 3.10 and levels recorded stated in Table 3.11.

Table 3.10: Noise Monitoring Sampling Stations

S. No.	Code	Location	Distance (kms)	Direction	Longitude	Latitude
1.	NQ1	Bhopal Pani	2.42	NE	30.26330899370	78.14783238140
2.	NQ2	Nakraunda	1.0	W	30.23667475290	78.13082538010
3.	NQ3	Balawala	3.99	NW	30.26312827720	78.10704214830
4.	NQ4	Doiwala	3.0	SW	30.17577188000	78.12427800050
5.	NQ5	Ranipokhari	7.54	SE	30.18132601680	78.21153194260
6.	NQ6	Bhaniwala	2.46	SE	30.18724609460	78.15430388730
7.	NQ7	Bullawala	6.91	SW	30.16147144110	78.07857943170
8.	NQ8	Rishikesh	3.38	E	30.21675276810	78.18295338730

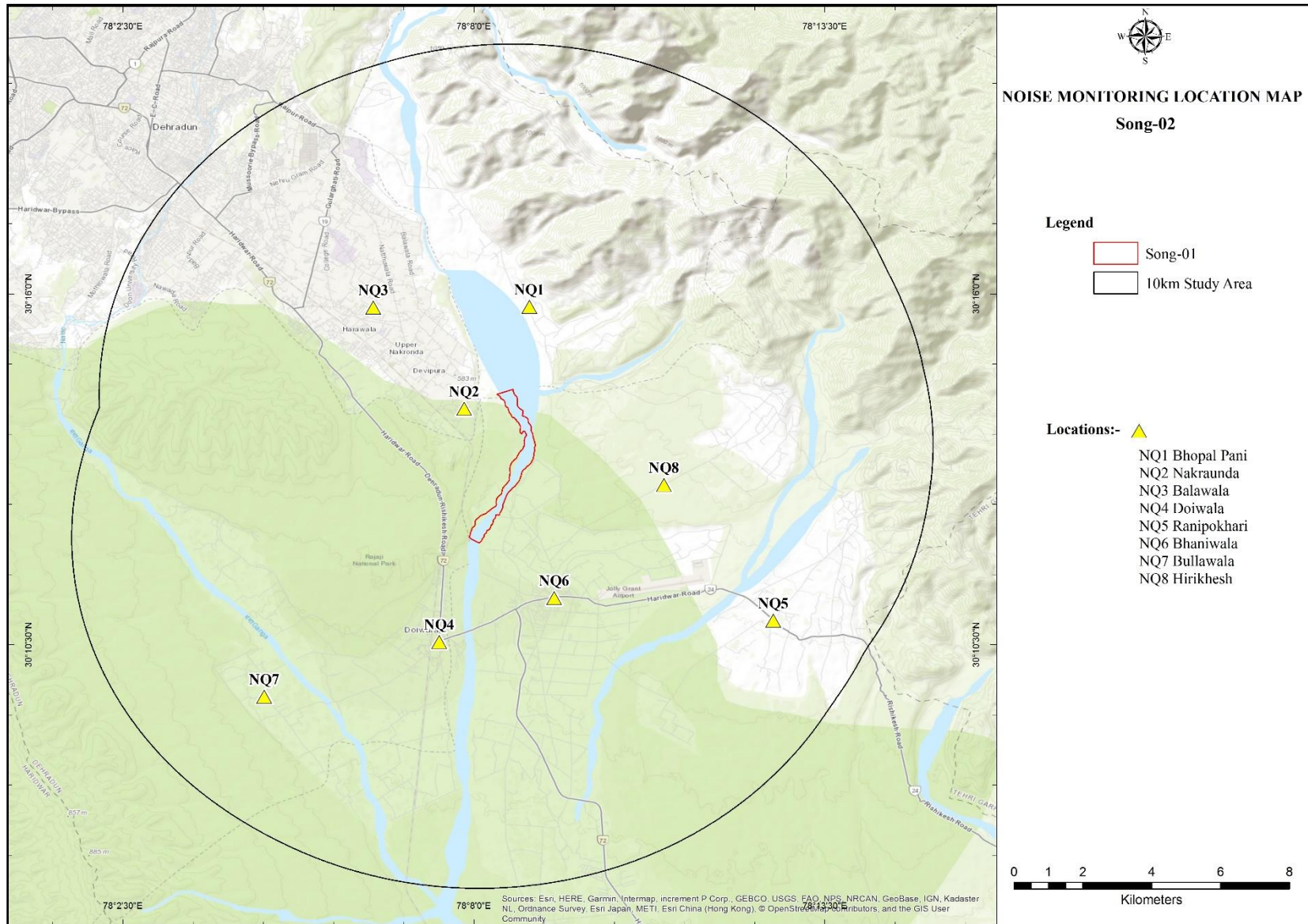


Figure 3.11: Key plan of Noise Monitoring Station

Table 3.11: Noise Levels in Study Area

Sr.No.	Noise		Standards of Noise Level			Noise Level db(A)	
	Location	D.O.S	Category of Area	Day dB (A)	Night dB (A)	Day (Ld)	Night (Ln)
1	Bhopalpani Grant	01.12.2019	Residential Area	55	45	50.7	40.8
2	Nakraunda	04.12.2019	Silent Zone	50	40	44.6	37.2
3	Balawala	08.12.2019	Residential Area	55	45	48.3	41.8
4	Doiwala	12.12.2019	Residential Area	55	45	49.3	40.6
5	Rani Pokhari	16.12.2019	Residential Area	55	45	50.6	42.5
6	Bhaniwala	18.12.2019	Residential Area	55	45	50.8	39.7
7	Bullawala	20.12.2019	Residential Area	55	45	46.7	41.2
8	Rishikesh	24.12.2019	Commercial Area	65	55	58.3	48.5

3.9.3 Result of Noise Monitoring

Ambient noise levels were measured at 8 locations around the proposed project site. The noise levels recorded during the day time were from 44.6 Leq dB to 58.3 Leq dB respectively and level of noise during night time were from 37.2 Leq dB to 48.5 Leq dB respectively. Thus noise levels at all locations were observed to be within the prescribed limits. From the above study and discussions it can be concluded that noise levels in the study area are well within the prescribed limits as prescribed by the CPCB and State Pollution Control Board.





Figure 3.12: Sampling Photographs of Air, Water, Noise and Soil

3.10 TRAFFIC STUDY

Traffic density measurements were performed at NH-72 which is connected by nearby approach road to the mine site. Traffic density were done continuously for 24 hours by visual observation and counting of vehicles under three categories, viz., heavy motor vehicles, light motor vehicles and two wheelers. Two skilled persons were deployed simultaneously at each station during each shift- one person on each hour, fresh counting and recording was undertaken. Total numbers of vehicles per hour under the three categories were determined. The results of measurements are given in below:

Table 3.12: Roads and Highways in the Study Area

TRAFFIC SCENARIO FOR NH-72				
Time (Hrs)	HMV	LMV	Two Wheeler	Total
09:00-10:00	200	40	54	294
10:00-11:00	100	32	52	184
11:00-12:00	50	33	42	125
12:00-13:00	60	32	40	132
13:00-14:00	90	32	35	157
14:00-15:00	120	30	33	183
15:00-16:00	126	30	35	191
16:00-17:00	150	30	40	220
17:00-18:00	90	28	48	166
18:00-19:00	130	32	45	207
19:00-20:00	100	25	35	160
20:00-21:00	50	20	30	100

21:00-22:00	120	25	30	175
22:00-23:00	500	20	25	545
23:00-24:00	450	10	25	485
24:00-01:00	12	10	10	32
01:00-02:00	9	15	8	32
02:00-03:00	7	8	8	23
03:00-04:00	4	8	5	17
04:00-05:00	10	10	10	30
05:00-06:00	12	10	15	37
06:00-07:00	80	13	14	107
Total	2470	493	639	3495

Calculation for PCU/hr (NH-72)

S.No	Vehicle distribution	No. of Vehicles per day on NH	Passenger Car unit	Total No. of vehicle PCU/Hr on NH
1	HMV	2470	3	7410
2	LMV	493	1	493
3	Two Wheeler	639	0.5	319.5
Total			Total	8222 /24=343

Existing traffic scenario & LOS (NH-72)

Road	V (Volume in PCU/hr)	C (Capacity in PCU/hr)	Existing V/C ratio	LOS
NH-72	343	3600	0.1	A

The existing Level

V/C	LOS	Performance
0.0-0.2	A	Excellent
0.2-0.4	B	Very Good
0.4-0.6	C	Good/Average/Fair
0.6-0.8	D	Poor
0.8-1.0	E	Very Poor

Extraction During Mine Operation: 4064445 Tonnes

Total Capacity of Mine per day: 4064445/245 = 16590 TPD

Number of Shifts: 4

Effective Working Hours: 8

Output per hour = 2074 TPH

By trucks (10T)= 1037 TPH

By tractors (5T)= 1037 TPH

No. of Tippers required @ 10T (Trucks): 103 * 2= 206(NH72-134, Thano Road-72)

No. of Tippers required @ 5T (Tractors): 207*2= 414(NH72-269, Thano Road-145)

Increase in PCU/Hr for NH 72 - 1209

Increase in PCU/Hr for Thano Road- 651

Increase in PCU/Hr for NH 72-

S.No	Vehicle distribution	No. of Vehicles per day on NH	Passenger Car unit	Total No. of vehicle PCU/Hr on NH
1	HMV	2470	3	$7410/24=309+1209=1518$
2	LMV	493	1	$493/24=20$
3	Two Wheeler	639	0.5	$639/24=26$
Total			Total	1564

Modified Traffic Scenario & LOS For NH-72

Road	V (Volume in PCU/hr)	C (Capacity in PCU/hr)	Existing V/C ratio	LOS
NH-72	1564	3600	0.43	C

TRAFFIC SCENARIO FOR THANO ROAD

TRAFFIC SCENARIO FOR THANO ROAD				
Locations	Thano Road			
Time (Hrs)	HMV	LMV	Two Wheeler	Total
09:00-10:00	3	5	8	16
10:00-11:00	2	5	8	15
11:00-12:00	2	4	10	16
12:00-13:00	3	4	11	18
13:00-14:00	1	4	5	10
14:00-15:00	2	1	8	11
15:00-16:00	2	1	7	10
16:00-17:00	1	2	11	14
17:00-18:00	2	3	10	15
18:00-19:00	1	2	11	14
19:00-20:00	1	3	6	10
20:00-21:00	1	1	4	6
21:00-22:00	2	0	5	7
22:00-23:00	0	4	4	8
23:00-24:00	0	3	3	6
24:00-01:00	0	0	0	0
01:00-02:00	0	0	0	0
02:00-03:00	0	0	0	0
03:00-04:00	0	1	0	1
04:00-05:00	0	1	0	1

05:00-06:00	0	3	4	7
06:00-07:00	1	4	6	11
Total	24	51	121	193

Traffic data was collected continuously for 24 hours by visual observation and counting of vehicles under three categories viz., heavy motor vehicles, light motor vehicles and two/three wheelers. As traffic densities on the roads are high, two skilled persons were deployed for counting the traffic. At the end of each hour, fresh counting and recording was undertaken.

Calculation for PCU/hr (Thano Road)

Sl.No	Vehicle distribution	No. of Vehicles per day on Village road	Passenger Car unit	Total No. of vehicle PCU/Hr on Village road
1	HMV	24	3	72
2	LMV	51	1	51
3	Two Wheeler	121	0.5	60.5
Total		3.10.1	Total	183.5/24=7

Existing traffic scenario & LOS (Thano Road)

Road	V (Volume in PCU/hr)	C (Capacity in PCU/hr)	Existing V/C ratio	LOS
Thano Road	7	900	0.007	A

Details of Vehicle PCU/Hr. on Thano Road

Sl. No	Vehicle distribution	No. of Vehicles per day on Village road	Passenger Car unit	Total No. of vehicle PCU/Hr on Thano Road
1	HMV	24	3	72/24=3+ 651 =654
2	LMV	51	1	51/24=2
3	Two-Wheeler	121	0.5	60.5/24=3
Total			Total	659

Modified Traffic Scenario & LOS For Thano Road

Road	V (Volume in PCU/hr)	C (Capacity in PCU/hr)	Existing V/C ratio	LOS
Thano Road	659	900	0.7	D

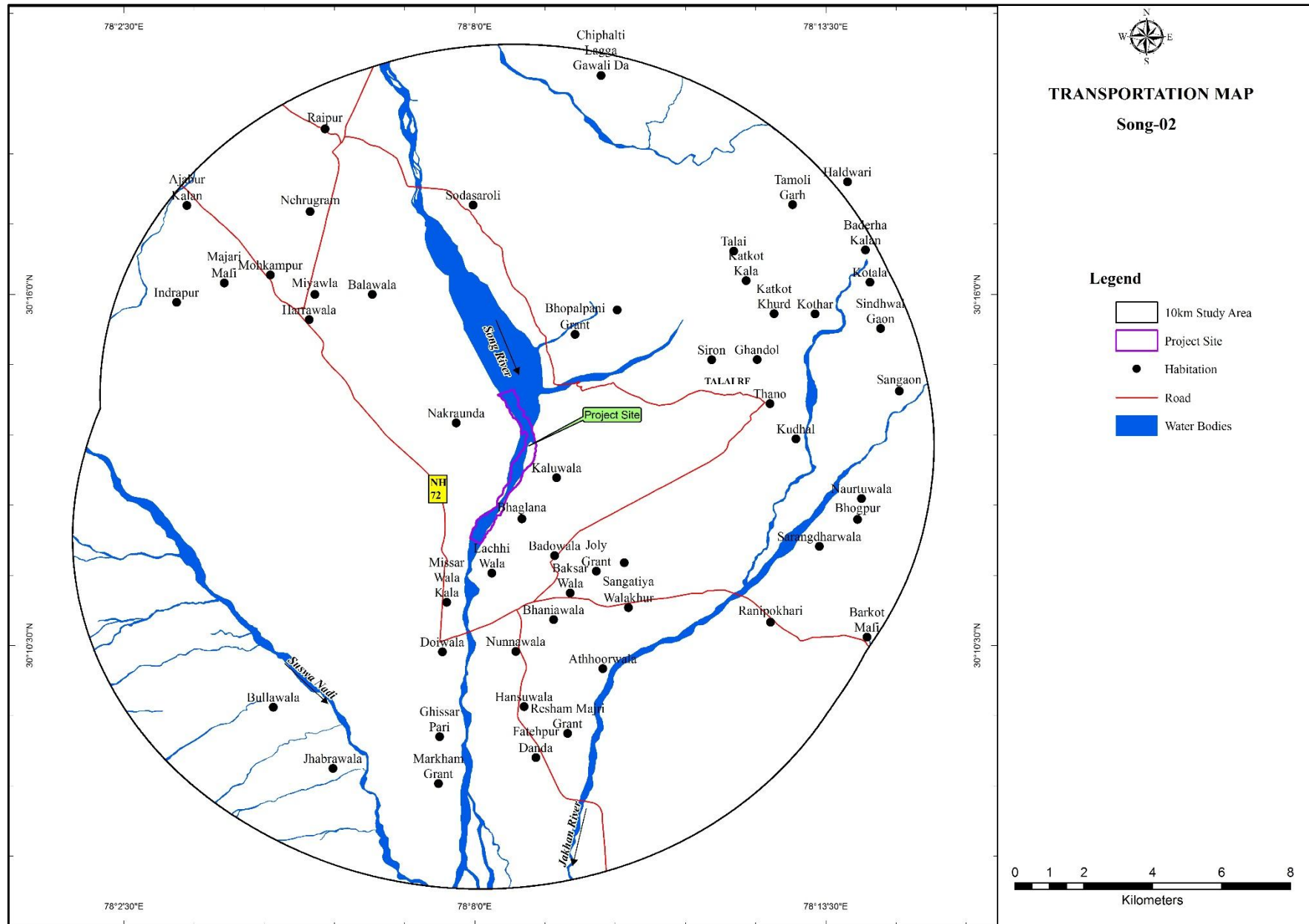


Figure 3.13: Transportation Map

3.11 BIOLOGICAL ENVIRONMENT

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

Before starting any Environmental Impact Assessment study, it is necessary to identify the baseline of relevant environmental parameters which are likely to be affected as a result of construction and 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 of project site in the study area.

3.11.1 OBJECTIVES OF BIOLOGICAL STUDIES

The objectives of biological study are outlined as follows:

- To characterize the flora and fauna to assess present bio-diversity
- To conduct detailed studies for floral and faunal composition and collect Baseline data of the existing terrestrial and aquatic ecosystems in the study area of project site.
- Identification of rare and endangered species of plants and animals and their status under The Wildlife (Protection) Act, 1972 and to define ecological/conservation status of species as per IUCN categories (Red Data List).
- Identification of ecologically sensitive areas within the study area.
- Assessment of migratory route of wildlife (if any).

3.11.2 Study Area

The proposed mine site is located near Kaluwala village in Doiwala Block Dehradun District of Uttarakhand State, India. It is located at a distance of about 21 km towards East from District head quarters Dehradun and 4 km from Doiwala.

The mine site Song-II falls in the both side of the forests area i.e., Thano RF, Dwara RF, Riapur RF, Lachhiwala RF, Ramgarh RF and Barkot RF. Along the river side sparse vegetation such as *Dalbergia sisoo* and *Acacia catechu* with thorny shrubs like *Opuntia* and *Urtica dioica* were found. Presence of the common herbs is also very sparse in the pebbles and sands uploaded by the river in the rainy season up to a good distance at both sides.

As per the Bio-geographical provinces, the project site falls under the category 2B- West Himalayan. The study area is located in the lower Himalayan region of the Indian Bio-geographical Zones (Rodger, Panwar and Mathur, 2000).

3.11.3 Methodology of Assessment of the Biological Environment

The primary baseline survey was conducted to assess the nature of the existing habitat and species composition. Ecology and Biodiversity study was carried out during Dec. 2019 to Feb. 2020 in 10 km radius of the mine site. The plant species were identified with the help of plant taxonomy manual, published literatures and reports and Websites (BSI, ZSI and State/District

Forest Departments). In addition, information was also collected with vernacular names of plant species from local inhabitants.

The Phyto-sociology study was carried out using square quadrats technique through random sampling procedure. All the plots sampled were representative of most common types of forest area.

Quadrats of 10m x 10m for tree species, 5m x 5m for shrub species and 1m x 1m for herb species were used for sampling purpose. Following parameters were recorded:

- Name of the species.
- Number of the occurrence of each species in each quadrat.
- Diameter (DBH) of species.

Different sampling techniques were employed for documenting different faunal groups. For herpetofauna (Amphibians and Reptiles), visual encounter survey; for birds, point count and transect methods and for mammals direct, indirect sightings (signs like tracks, pellets and pugmarks) were adopted. The water bodies in the area were also assessed for the status of the aquatic life and fishes.

During field survey, discussions with the forest officers and local people were also carried-out to collect information related to local biodiversity in and around the study area.

The Sampling location are presented in Table 3.13 and depicted in Figure 3.14.

Table 3.13: EB Sampling location in 10 km radius study area

S.No .	Sampling Code	Direction	Distance (Km)	Environment Sensitive Type	Coordinates	
					Latitude	Longitude
1	S1	-	0.0 Km	Thano RF Project site	30.22644	78.14906
2	S2	NW	7.45 Km	Dwara RF	30.30567	78.12052
3	S3	NW	9.13 km	Riapur RF	30.31447	78.09755
4	S4	W	0.61 Km	Lachhiwala RF	30.20398	78.12584
5	S5	SW	6.55 Km	Ramgarh RF	30.17282	78.07356
6	S6	SE	6.63 Km	Barkot RF	30.16170	78.18606

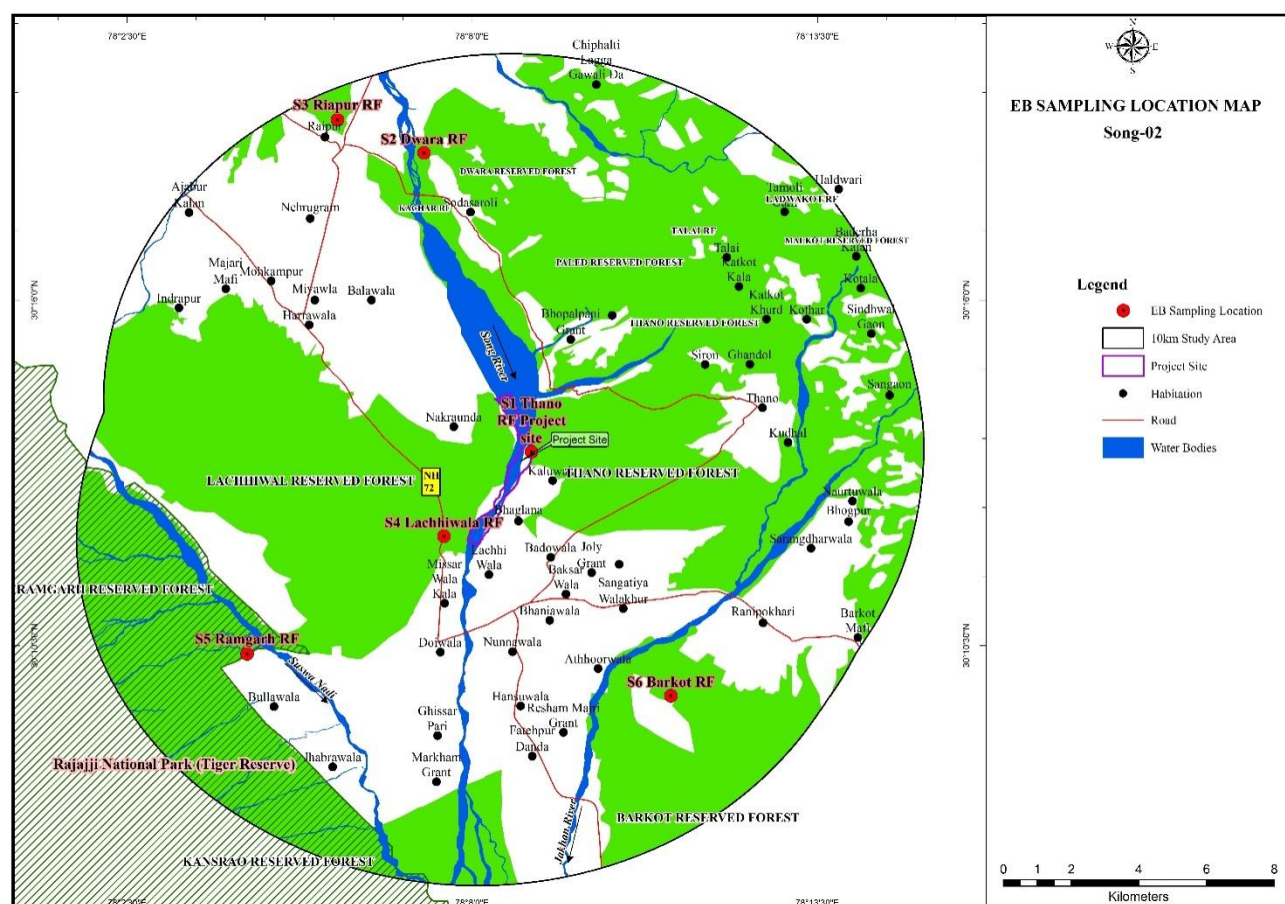


Figure 3.14: EB Sampling locations in 10 km radius study area

Ecological sensitivity along with critical habitats (National Park, Wildlife Sanctuary, Ecological Sensitive Area, Migratory Corridor, habitat of endangered and vulnerable and rare species, etc) in the study area has also been worked out.

Identification and classification of species recognized as critically endangered, endangered, threatened etc has also been carried out as per IUCN Red List and Scheduled Species as per WPA (1972). Moreover, authentic secondary sources of the information i.e., Govt. publications and published research papers and web search have also been referred which are given below in the Table 3.14.

Table 3.14 Authentic Secondary Sources Consulted for Biodiversity Study

- BSI (2016). State wise Distribution of Endemic and Threatened plant taxa of India. http://www.bsienviis.nic.in/Database/E_3942.aspx.
- ENVISThreatenedFauna; http://wiienviis.nic.in/Database/ScheduleSpeciesDatabase_7969.aspx
- http://gbpihedenviis.nic.in/ENVIS%20Bullitin/ENVIS%20Bulletin,%20Vol.%2026,%202018/Forests_Uttarakhand_V.P._Sati.pdf
- <https://bsi.gov.in/page/en/flora>.
- <http://cpcbenviis.nic.in/scanned%20reports/PROBES-75%20Guidelines%20For%20Developing%20Greenbelts.pdf>
- <http://utrenviis.nic.in/data/medicinal%20plant%20abstract.pdf>

- <http://faunaofindia.nic.in/PDFVolumes/hpg/052a/index.pdf>
- Champion, H.G. and Seth (1968). A revised survey of the forest types of India. Govt. of India Press, Nasik, India.
- <http://www.utrenvis.nic.in/data/flora%20and%20fauna%20oct%202013.pdf>
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- Mishra, R. (1968). Ecology Workbook. Oxford and IBH Publishing Inc., Calcutta, India.
- Philips, E.A. (1959). Methods of Vegetation Study. Henry Holt Co. Inc., New York, USA., Pages: 107.
- <https://fsi.nic.in/isfr19/vol2/isfr-2019-vol-ii-uttarakhand.pdf>
- <https://www.prepdata.org/dashboards/uttarakhand-agriculture-dashboard-d7603478-1c73-40f5-a87f-68f11aed3c7d>
- http://www.frienvvis.nic.in/Database/District-Wise-Forest-Cover-of-Uttarakhand_2476.aspx
- <http://faunaofindia.nic.in/PDFVolumes/sfs/062/index.pdf>
- <http://faunaofindia.nic.in/PDFVolumes/hpg/039/index.pdf>
- DistrictWiseForestCoverofUttarakhand(2017)http://www.frienvvis.nic.in/Database/District-Wise-Forest-Cover-of-Uttarakhand_2476.aspx.
- SFRI (2015). State Forest Report of India, Ministry of Environment & Forest, Dehradun.
- Champion HG, Seth SK (1968). A revised survey of the forest types of India, Government of India Publications, New Delhi.
- <https://forest.uk.gov.in/pages/display/99-medicinal-aromatic-plants>
- Kumar A, Ram J (2005). Anthropogenic disturbances and plant biodiversity in forests of Uttaranchal, Central Himalaya. Biodiversity Conservation, 14(1): 309-331.
- http://www.frienvvis.nic.in/Database/Medicinal-Plants-Uttarakhand_2150.aspx
- <http://www.utrenvis.nic.in/data/flora%20and%20fauna%20oct%202013.pdf>
- <https://forest.uk.gov.in/pages/view/19/40-protected-area-network>
- <http://cpcbenvvis.nic.in/scanned%20reports/PROBES-75%20Guidelines%20For%20Developing%20Greenbelts.pdf>

3.11.4 Eco-Sensitive zone in the Study Area

The major environment sensitive areas have been studied in 10 km radius of the mine site using Google earth images. The study area fall in Thano Reserve Forest, Dwara Reserve Forest, Riapur Reserve Forest, Lachhiwala Reserve Forest, Ramgarh Reserve Forest and Barkot Reserve Forest and Rajaji Tiger Reserve. The Rajaji Tiger Reserve is situated at a distance of 5km in SW direction from project site. The riverbed project area itself falls in the forest area.

The Environmental sensitivity map has been shown as Figure No. 3.14.

3.11.5 Forest types and natural vegetation at regional level and in the study area

The state of Uttarakhand is renowned for its unique bio-diversity. Due to geographic and climatic diversity in different areas of the state, different forest types are found spanning from the Himalayas to the plains of the Terai. Due to biodiversity present in the state, 12 percent of total geographical area is protected areas which includes 6 National Parks, 7 Wildlife Sanctuary, 4 Conservation Reserves and 1 Biosphere Reserve. Rajaji National Park/Tiger Reserve is

present at a distance of approx. 5 km from project site which is an eco-sensitive zone area of Rajaji Tiger Reserves. (Figure 3.15).

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

1. Moist Siwalik Sal Forest (3C/C2a)
2. Northern Dry Mixed Deciduous Forest (5B/C2)
3. Dry Deciduous Scrub (5/DS1)
4. Subtropical Euphorbia Scrub (9/C1/DS2)
5. Moru Oak Forest (12/C1b)
6. Moist Deodar Forest (12/C1c)
7. Western Mixed Coniferous Forest (Spruce, Blue Pine, Silver Fir)
(12/C1d)
8. Himalayan Temperate Secondary Scrub (12/C1/DS2)
9. Low Level Blue Pine Forest (12/2S1)
10. Khair-Sissu Forest (5/1S2)

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

Forests present in Study area are as follows:

1. Thano Reserve Forest
2. Dwara Reserve Forest
3. Riapur Range Reserve Forest
4. Lachhiwala Reserve Forest
5. Ramgarh Reserve Forest
6. Barkot Reserve Forest

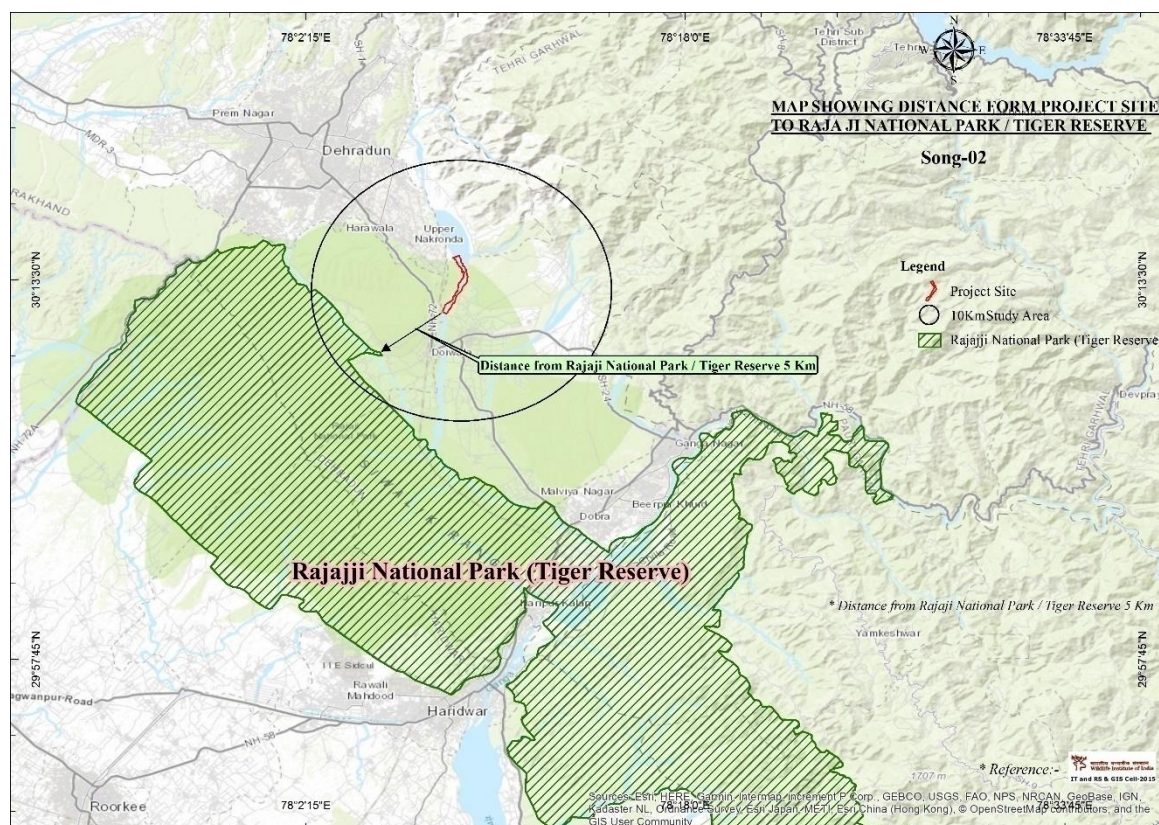


Figure 3.15 Map Showing Distance from Project site to Rajaji Tiger Reserve

Rajaji National Park (Tiger Reserve)

Rajaji National Park is located in the Shivalik range near the foothills of the Himalayas. The National Park has recently been notified as Rajaji Tiger Reserve. It is spread over in an area of 820 km² in three districts of Uttarakhand i.e. Haridwar, Dehradun and Pauri Garhwal. In 1983, three wildlife sanctuaries in the area namely, Chilla, Motichur and Rajaji sanctuaries were merged into one.

Rajaji National park is predominantly covered by the Sal Forest and a number of other forest types which include the Western Gangetic Moist and Northern dry Deciduous and Khair-Sissoo forests. Low Alluvial Savannah Woodlands cover the drier southern margins of the park, in contrast to the Shiwalik Chir-Pine on the high reaches of the hills. Broad leaved deciduous forests, riverine vegetation, scrub land, grass lands and pine forests form the range of flora in this park.

It is the second tiger reserve in the state after the Corbett Tiger Reserve and 48th Tiger Reserve of India. As per directions of the Tiger Conservative Authority of India, the Rajaji National Park is the core area of the Rajaji Tiger Reserve, while about 300 km² of Shyampur range of the Haridwar forest division and parts of Kotdwar and Laldhang forest division, which function as a buffer zone, is also be included in the Tiger Project, augmenting the total area to 1150 km².

3.11.6 Floral composition of the study area based on Field Observation

Uttarakhand is bestowed with rich and diversified forest resource with their high economic viability, in spite of being economically viable and a substantial option of livelihoods of the rural people. The region is immensely rich in floral species. The Based upon primary observation, the project study area fall in forest land i.e Thano range RF and Barkot range RF.

Most dominant species observed during site survey of the study area are *Shorea robusta* (Sal), *Lannea coromandelica* (Indian Ash Tree), *Azadirachta indica* (Neem), *Dalbergia sisso* (Shisham), *Acacia catechu* (Khair), *Adina cordifolia* (Haldu), *Syzygium cumini* (Jamun), *Mallotus philippensis* (Rohini), *Mitragyna parvifolia* (Kadamb), *Populus sp.* (Poplar), *Terminalia sp.*, *Ficus spp.*, *Euclyptus sp.*, *Macaranga pustulata* (Blistery Macaranga), *Schleichera oleosa* (Kusum,Gum lac Tree) and *Anogeissus latifolia* (Axle Wood Tree) etc. The shrubby vegetation is represented by *Opuntia sp.*, *Carissa opaca*, *Clerodendrum viscosum*, *Jasminum multiflorum*, *Solanum sp.*, *Phlogacanthus thyrsoformis*, *Jatropha curcas*, *Rhus parviflora* and *Lantana camara* etc.

A list of floral species has been prepared based on primary survey (site observations) and discussion with local people. The total number of different plant life forms under trees, shrubs, herbs and climbers is shown in Table 3.16 and their % distribution is shown in Figure 3.16.

Table 3.15: Number of floral life forms in the Study Area

S. No.	Plant Life Form	Number of Species
1	Trees	50
2	Shrubs	18
3	Herbs	28
4	Climbers	8
Total No. of Species		104

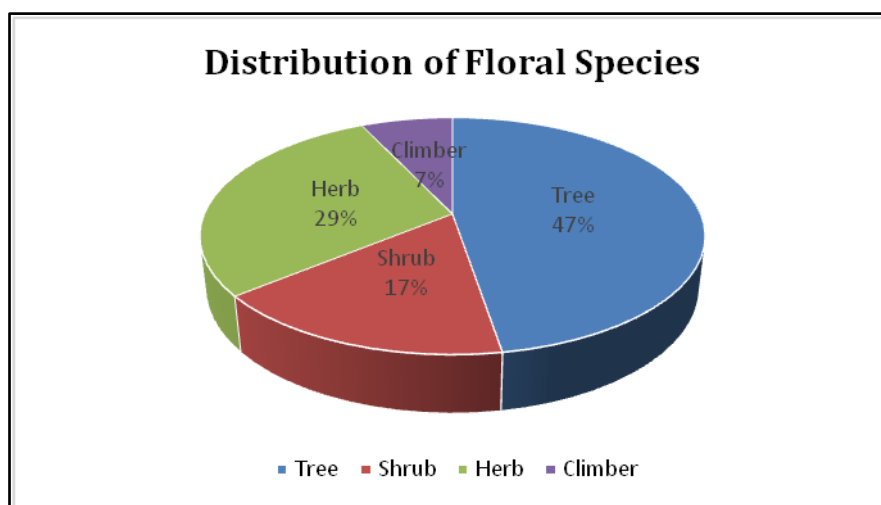


Figure 3.16: Pie diagram showing % distribution of floral life forms

The floral composition along with common name, family, life form and IUCN status of the study area is listed below in Table: 3.16

Table 3.16 List of Floral species observed during primary survey

S.No.	Scientific Name	Common /Local name	Family	IUCN Status
Trees				
1.	<i>Albizia procera</i>	Safed Siris	Mimosaceae	-
2.	<i>Acacia catechu</i>	Khair	Mimosaceae	-
3.	<i>Anogeissus latifolia</i>	Axle Wood Tree	Combretaceae	-
4.	<i>Aegle marmelos</i>	Bel	Rutaceae	-
5.	<i>Adina cordifolia</i>	Haldu	Rubiaceae	-
6.	<i>Azadirachta indica</i>	Neem	Meliaceae	-
7.	<i>Bauhinia variegata</i>	Kachnar	Caesalpiniaceae	-
8.	<i>Bauhinia purpurea</i>	Kaniar	Caesalpiniaceae	-
9.	<i>Bombax ceiba</i>	Semal/ Silk Cotton Tree	Malvaceae	-
10.	<i>Butea monosperma</i>	Palash	Fabaceae	-
11.	<i>Cedrela toona</i>	Toon	Meliaceae	LC
12.	<i>Cassia fistula</i>	Amaltas	Caesalpiniaceae	-
13.	<i>Cordia dichotoma</i>	Lasora	Boraginaceae	-
14.	<i>Casearia tomentosa</i>	Chilla	Salicaceae	-
15.	<i>Dalbergia sissoo</i>	Shisham	Fabacea	-
16.	<i>Eucalyptus sp.</i>	Blue Gum	Myrtaceae	-
17.	<i>Ehretia acuminata</i>	Bakli	Boraginaceae	-
18.	<i>Ehretia laevis</i>	Datranga	Boraginaceae	-
19.	<i>Ficus benghalensis</i>	Banyan Tree	Moraceae	-
20.	<i>Ficus racemosa</i>	Goolar	Moraceae	-
21.	<i>Helicteres integrifolia</i>	Chilbil	Ulmaceae	-
22.	<i>Helicteres isora</i>	Marorphali	Sterculiaceae	-
23.	<i>Ilex dipyrena</i>	Himalayan Holly	Aquifoliaceae	-
24.	<i>Lannea coromandelica</i>	Mohin	Anacardiaceae	-

25.	<i>Lagerstroemia parviflora</i>	Dhaura	Lythraceae	-
26.	<i>Murraya paniculata</i>	Kamini	Rutaceae	-
27.	<i>Mallotus philippensis</i>	Rohani	Euphorbiaceae	-
28.	<i>Melia azedarach</i>	Chinaberry Tree	Meliaceae	-
29.	<i>Milusa velutina</i>	Dom-Sal	Annonaceae	-
30.	<i>Mangifera indica</i>	Mango	Anacardiaceae	-
31.	<i>Mitragyna parvifolia</i>	Kadamb	Rubiaceae	-
32.	<i>Ougeinia oojeinensis</i>	Sandan	Fabaceae	-
33.	<i>Polyalthia longifolia</i>	False Ashok	Annonaceae	-
34.	<i>Phyllanthus emblica</i>	Amla	Phyllanthaceae	-
35.	<i>Pithecellobium dulce</i>	Jangal Jalebi	Mimosaceae	LC
36.	<i>Populus sp.</i>	Himalayan Poplar	Salicaceae	-
37.	<i>Ricinus communis</i>	Castor Bean	Euphorbiaceae	-
38.	<i>Syzygium cumini</i>	Jamun	Myrtaceae	-
39.	<i>Shorea robusta</i>	Sal	Dipterocarpaceae	-
40.	<i>Salix tetrasperma</i>	Indian Willow	Salicaceae	-
41.	<i>Terminalia alata</i>	Asan	Combretaceae	-
42.	<i>Trewia nudiflora</i>	Pindalu	Euphorbiaceae	-
43.	<i>Tamarindus indica</i>	Tamarind	Caesalpiniaceae	-
44.	<i>Tectona grandis</i>	Teak	Verbenaceae	-
45.	<i>Terminalia bellirica</i>	Bahera	Combretaceae	-
46.	<i>Terminalia arjuna</i>	Arjun	Combretaceae	-
47.	<i>Toona ciliata</i>	Toon/Indian Mahogany	Meliaceae	-
48.	<i>Ziziphus mauritiana</i>	Indian Plum	Rhamnaceae	-
Shrubs				
1.	<i>Ardisia solanacea</i>	Dhan-Priya	Myrsinaceae	-
2.	<i>Adhatoda vasica</i>	White vasa	Acanthaceae	-
3.	<i>Boehmeria macrophylla</i>	Bara-siauru	Urticaceae	-
4.	<i>Cassia tora</i>	Chakunda	Caesalpiniaceae	-

5.	<i>Carissa carandas</i>	Karonda	Apocynaceae	-
6.	<i>Calotropis procera</i>	Aak	Apocynaceae	-
7.	<i>Callicarpa macrophylla</i>	Bastara	Verbenaceae	-
8.	<i>Clerodendrum infortunatum</i>	Hill Glory Bower	Verbenaceae	-
9.	<i>Colebrookea oppositifolia</i>	Binda	Lamiaceae	-
10.	<i>Ipomoea carnea</i>	Behaya	Convolvulaceae	LC
11.	<i>Jasminum officinale</i>	Chameli	Oleaceae	-
12.	<i>Lantana camara</i>	Raimuniya	Verbenaceae	-
13.	<i>Opuntia stricta</i>	Erect Prickly Pear	Cactaceae	-
14.	<i>Opuntia dillenii</i>	Nagphana	Cactaceae	-
15.	<i>Parthenium hysterophorus</i>	Carrot Grass	Asteraceae	-
16.	<i>Rauwolfia sp.</i>	Sarpagandha	Apocynaceae	-
17.	<i>Solanum torvum</i>	Bhurat	Solanaceae	-
18.	<i>Urena lobata</i>	Bachita	Malvaceae	-
Herbs				
1.	<i>Achyranthes aspera</i>	Aghara	Amaranthaceae	-
2.	<i>Aeschynomene indica</i>	Didhen	Amaranthaceae	-
3.	<i>Anisomeles indica</i>	Kala Bhangra	Lamiaceae	-
4.	<i>Argemone mexicana</i>	Mexican Poppy	Papaveraceae	-
5.	<i>Ageratum conyzoides</i>	Jangli Pudina	Asteraceae	-
6.	<i>Adiantum sp.</i>	-	Pteridaceae	-
7.	<i>Bidens biternata</i>	Chirchitta	Asteraceae	-
8.	<i>Cassia occidentalis</i>	Kasunda	Caesalpiniaceae	-
9.	<i>Cannabis sativa</i>	Bhang/Ganja	Cannabaceae	-
10.	<i>Cyperus rotundus</i>	Motha	Cyperaceae	-
11.	<i>Cynodon dactylon</i>	Doob	Poaceae	-
12.	<i>Cenchrus ciliaris</i>	Anjan	Poaceae	-
13.	<i>Chrysopogon zizanioides</i>	Khas	Poaceae	-

14.	<i>Digitaria sanguinalis</i>	Crabgrass	Poaceae	-
15.	<i>Eclipta prostrata</i>	Bhringaraj	Asteraceae	-
16.	<i>Eleusine indica</i>	Malankuri	Poaceae	-
17.	<i>Euphorbia hirta</i>	Bara Dudhi	Euphorbiaceae	-
18.	<i>Heteropogon contortus</i>	Black Speargrass	Poaceae	-
19.	<i>Indigofera sp.</i>	Creeping Indigo	Fabaceae	-
20.	<i>Justicia adhatoda</i>	Arusa	Acanthaceae	-
21.	<i>Jasminum multiflorum</i>	Balini	Oleaceae	-
22.	<i>Ludwigia sp.</i>	Paddy Clove	Onagraceae	LC
23.	<i>Mimosa pudica</i>	Lajwanti	Mimosaceae	LC
24.	<i>Oxalis corniculata</i>	Amrul	Oxalidaceae	-
25.	<i>Pupalia lappacea</i>	Chirchitta	Amaranthaceae	-
26.	<i>Sida cordifolia</i>	Kharinta	Malvaceae	-
27.	<i>Sida rhombifolia</i>	Atibala	Malvaceae	-
28.	<i>Solanum virginianum</i>	Thorny Nightshade	Solanaceae	-
29.	<i>Xanthium strumarium</i>	Ghaghra	Asteraceae	-
Climbers				
1.	<i>Asparagus racemosus</i>	Satawari	Asparagaceae	-
2.	<i>Clematis montana</i>	Garol	Ranunculaceae	-
3.	<i>Cuscuta reflexa</i>	Amar Bel	Convolvulaceae	-
4.	<i>Dioscorea deltoidea</i>	Shingli-Mingli	Dioscoreaceae	-
5.	<i>Ichnocarpus frutescens</i>	Black creeper (Dirgha-Mula)	Apocynaceae	-
6.	<i>Smilax aspera</i>	Salsa	Smilacaceae	-
7.	<i>Tinospora cordifolia</i>	Giloy	Menispermaceae	-
8.	<i>Vallisneria spiralis</i>	Ramsur	Apocynaceae	-
Source: Mantec Consultants Pvt Ltd, Ecology and Biodiversity team				

3.11.7 Phytosociological Aspects of the Floral species in the Study Area

Phyto-sociological analysis of the vegetation helps in determining the relative importance of each species in the study area and to establish if any valuable species is threatened.

The phyto-sociological parameters such as density, frequency, basal area and importance value index of individual species were determined through random sampling using quadrats of different sizes in the study area. Relative frequency, density and Relative dominance were calculated and the sum of these represented Importance Value Index (IVI) for various tree species. For shrubs and herbs, the IVI was calculated by summing up relative frequency, relative density and relative abundance.

Sample plots were selected in such a way to get maximum representation of different types of vegetation and plots were laid out in different part of the study area of 10 km radius. Phyto-sociological analysis of tree species is shown in Table 3.17

Table 3.17 Frequency, Density, Relative frequency, Relative Density and Importance Value Index of trees species

S.No	Scientific name	Family	Density (D/m ²)	Frequency %	RF	RD	IVI
1	<i>Adina cordifolia</i>	Rubiaceae	0.80	40.00	1.83	1.36	7.26
2	<i>Aegle marmelos</i>	Rutaceae	0.70	50.00	2.29	1.19	5.45
3	<i>Anogeissus latifolia</i>	Combretaceae	1.40	70.00	3.21	2.38	9.04
4	<i>Azadirachta indica</i>	Meliaceae	1.00	60.00	2.75	1.70	6.91
5	<i>Bauhinia variegata</i>	Fabaceae	0.50	50.00	2.29	0.85	4.13
6	<i>Bauhinia purpurea</i>	Fabaceae	1.10	40.00	1.83	1.87	5.43
7	<i>Cordia dichotoma</i>	Boraginaceae	1.80	60.00	2.75	3.06	8.02
8	<i>Casearia tomentosa</i>	Salicaceae	0.90	70.00	3.21	1.53	5.97
9	<i>Cedrela toona</i>	Meliaceae	1.60	50.00	2.29	2.72	6.12
10	<i>Cassia fistula</i>	Fabaceae	1.50	60.00	2.75	2.55	6.78
11	<i>Dalbergia sissoo</i>	Fabaceae	3.20	80.00	3.67	5.43	12.92
12	<i>Eucalyptus spp.</i>	Myrtaceae	2.10	60.00	2.75	3.57	12.23
13	<i>Ehretia laevis</i>	Boraginaceae	1.30	60.00	2.75	2.21	5.94
14	<i>Ficus benghalensis</i>	Moraceae	0.40	20.00	0.92	0.68	9.73
15	<i>Flacourtia indica</i>	Salicaceae	0.80	30.00	1.38	1.36	3.60
16	<i>Grewia asiatica</i>	Tiliaceae	0.70	50.00	2.29	1.19	3.97
17	<i>Holoptelea integrifolia</i>	Ulmaceae	3.40	90.00	4.13	5.77	14.58
18	<i>Helicteres isora</i>	Sterculiaceae	0.60	40.00	1.83	1.02	3.96
19	<i>Litsea glutinosa</i>	Lauraceae	0.50	30.00	1.38	0.85	3.83
20	<i>Lannea coromandelica</i>	Anacardiaceae	0.80	50.00	2.29	1.36	6.85
21	<i>Lagerstroemia</i>	Lythraceae	0.40	40.00	1.83	0.68	4.24

	<i>parviflora</i>						
22	<i>Mallotus philippensis</i>	Euphorbiaceae	3.30	80.00	3.67	5.60	13.21
23	<i>Mitragyna parvifolia</i>	Rubiaceae	0.10	10.00	0.46	0.17	6.67
24	<i>Milusa velutina</i>	Annonaceae	0.90	40.00	1.83	1.53	4.22
25	<i>Oroxylum sp.</i>	Bignoniaceae	1.20	60.00	2.75	2.04	6.02
26	<i>Ougeinia oojeinensis</i>	Fabaceae	2.00	60.00	2.75	3.40	8.12
27	<i>Phyllanthus emblica</i>	Phyllanthaceae	0.60	40.00	1.83	1.02	7.29
28	<i>Schleichera oleosa</i>	Sapindaceae	2.20	70.00	3.21	3.74	10.64
29	<i>Syzygium cumini</i>	Myrtaceae	1.20	60.00	2.75	2.04	6.76
30	<i>Shorea robusta</i>	Dipterocarpaceae	3.90	90.00	4.13	6.62	17.40
31	<i>Terminalia alata</i>	Combretaceae	1.40	60.00	2.75	2.38	9.93
32	<i>Terminalia bellirica</i>	Combretaceae	1.60	70.00	3.21	2.72	9.50
33	<i>Tectona grandis</i>	Lamiaceae	3.20	80.00	3.67	5.43	11.20
34	<i>Senegalia catechu</i>	Fabaceae	1.60	60.00	2.75	2.72	6.58
	Total		48.9		87.56	83.08	269.67
Shannon's-Wiener's Diversity Index (H) = 2.556							

Table 3.18 Frequency, Density, Relative frequency, Relative Density and Importance Value Index of Shrubs and herbs species

S.No	Scientific name	Family	Density(D/ m2)	Frequency %	RF	RD	IVI
1	<i>Aerva sanguinolenta</i>	Amaranthaceae	0.71	57.14	2.53	0.65	3.60
2	<i>Adhatoda vasica</i>	Acanthaceae	3.29	71.43	3.16	3.01	12.37
3	<i>Abutilon indicum</i>	Malvaceae	1.71	57.14	2.53	1.57	6.17
4	<i>Asparagus racemosus</i>	Asparagaceae	1.29	42.86	1.90	1.18	4.11
5	<i>Ageratum conyzoides</i>	Asteraceae	1.71	57.14	2.53	1.57	4.12
6	<i>Adiantum sp.</i>	Pteridaceae	3.14	71.43	3.16	2.88	7.07
7	<i>Achyranthes aspera</i>	Amaranthaceae	4.00	57.14	2.53	3.66	6.61
8	<i>Ambrosia artemisiifolia</i>	Asteraceae	1.86	71.43	3.16	1.70	6.93
9	<i>Cannabis spp.</i>	Cannabaceae	4.57	85.71	3.80	4.18	10.05

Draft EIA/EMP Report for Mining of Minor Mineral (Sand, Bajri and Boulders) from the river bed of River Song-2 by M/s Uttarakhand Forest Development Corporation, located in Dehradun Forest Division, District Dehradun, Uttarakhand over an area of 136.85 Ha

10	<i>Bauhinia vahlii</i>	Fabaceae	1.71	71.43	3.16	1.57	10.94
11	<i>Boerhavia diffusa</i>	Nyctaginaceae	0.43	28.57	1.27	0.39	3.73
12	<i>Cheilanthes sp.</i>	Pteridaceae	0.29	14.29	0.63	0.26	2.96
13	<i>Cassia occidentalis</i>	Fabaceae	2.14	57.14	2.53	1.96	7.59
14	<i>Calotropis procera</i>	Apocynaceae	2.29	71.43	3.16	2.09	11.46
15	<i>Clerodendrum infortunatum</i>	Lamiaceae	3.71	85.71	3.80	3.40	13.40
16	<i>Centella sp.</i>	Apiaceae	2.00	28.57	1.27	1.83	11.37
17	<i>Colebrookea oppositifolia</i>	Lamiaceae	2.57	85.71	3.80	2.35	6.19
18	<i>Cayratia trifolia</i>	Vitaceae	0.29	57.14	2.53	0.26	9.00
19	<i>Cynodon dactylon</i>	Poaceae	8.86	57.14	2.53	8.10	10.84
20	<i>Cissampelos pareira</i>	Menispermaceae	1.71	42.86	1.90	1.57	3.49
21	<i>Cyperus rotundus</i>	Cyperaceae	6.57	42.86	1.90	6.01	8.12
22	<i>Commelina benghalensis</i>	Commelinaceae	4.57	28.57	1.27	4.18	5.47
23	<i>Euphorbia hirta</i>	Euphorbiaceae	1.71	42.86	1.90	1.57	4.09
24	<i>Evolvulus nummularius</i>	Convolvulaceae	1.14	14.29	0.63	1.05	1.70
25	<i>Helicteres isora</i>	Malvaceae	1.86	42.86	1.90	1.70	4.63
26	<i>Ichnocarpus frutescens</i>	Apocynaceae	2.00	28.57	1.27	1.83	3.30
27	<i>Indigofera sp.</i>	Fabaceae	4.71	42.86	1.90	4.31	6.63
28	<i>Lactuca serriola</i>	Asteraceae	0.57	14.29	0.63	0.52	1.36
29	<i>Lantana camara</i>	Verbenaceae	2.29	71.43	3.16	2.09	9.39
30	<i>Mucuna pruriens</i>	Fabaceae	0.43	28.57	1.27	0.39	1.86
31	<i>Oplismenus burmannii</i>	Poaceae	1.14	14.29	0.63	1.05	1.70
32	<i>Oxalis corniculata</i>	Oxalidaceae	8.86	85.71	3.80	8.10	12.11
33	<i>Parthenium hysterophorus</i>	Asteraceae	4.57	85.71	3.80	4.18	10.05
34	<i>Phyllanthus niruri</i>	Phyllanthaceae	1.71	71.43	3.16	1.57	6.39
35	<i>Pteris sp.</i>	Pteridaceae	3.00	71.43	3.16	2.75	7.36
36	<i>Perilla frutescens</i>	Lamiaceae	0.29	14.29	0.63	0.26	1.51
37	<i>Pogostemon benghalensis</i>	Lamiaceae	1.14	42.86	1.90	1.05	5.01
38	<i>Ricinus communis</i>	Euphorbiaceae	1.71	57.14	2.53	1.57	10.30
39	<i>Solanum sp.</i>	Solanaceae	0.71	42.86	1.90	0.65	5.65
40	<i>Sida rhombifolia</i>	Malvaceae	0.71	42.86	1.90	0.65	4.62

41	<i>Opuntia sp.</i>	Cactaceae	4.43	71.43	3.16	4.05	15.49
42	<i>Vitis latifolia</i>	Vitaceae	0.29	14.29	0.63	0.26	1.93
43	<i>Xanthium strumarium</i>	Asteraceae	4.14	85.71	3.80	3.79	11.72
	Total		109.26		99.98	99.00	300.01
Shannon's-Wiener's Diversity Index (H) =2.453							

Important Value Index is a measure to indicate dominance of a species in a given ecosystem area. From the above Quadrat study, it is observed that some species like *Shorea robusta*, *Tectona grandis*, *Mallotus philippensis*, *Schleichera oleosa*, *Dalbergia sissoo*, *Terminalia alata*, *Adhatoda vadica*, *Cannabis spp.*, *Adiantum sp.*, *Clerodendrum infortunatum*, *Opuntia sp.* *Bauhinia vahlii* and *Lantana camara* have high Importance Value Index and these are dominant in the project area.

3.11.8 Rare or endangered or threatened flora

There are no rare or endangered or threatened plant species in the study area as per IUCN category. The floral species found in the study area are common and have wide spread occurrence.

3.11.9 Medicinally important Floral Species

Ayurveda says "There is no plant on the earth, which does not possess medicinal property", this means that each plant is equally important for its biological activities, ecology and environment. The conservation of medicinal plants means every species of plants in its natural habitat should be protected and preserved. Conservation of invaluable biodiversity is a national and international agenda. Because of continuous exploitation of medicinal plants from their natural habitats, it is required to replant and regenerate them in other areas having similar habitat or environment. Due to over exploitation of natural resources many plant species have become extinct from the world.

Uttarakhand is a storehouse of a rich variety herbs and medicinal and aromatic plant species. The medicinal plants present in the study area with their common names and family are given in the Table 3.19.

Table 3.19 Medicinally important floral species

S.No	Scientific Name	Common Name	Family	Parts Use
1.	<i>Aegle marmelos</i>	Bel	Rutaceae	Fruit
2.	<i>Adenostemma lavenia</i>	Jangli-jira	Asteraceae	Leaf
3.	<i>Acacia nilotica</i>	Gum Arabic	Mimosaceae	Stem
4.	<i>Andrographis paniculata</i>	Hara Chirayata,	Acanthaceae	Stem
5.	<i>Aloe vera</i>	Gheekumari	Asphodelaceae	Leaf

6.	<i>Azadirachta indica</i>	Neem	Meliaceae	Whole plant
7.	<i>Boerhavia diffusa</i>	Satha	Nyctaginaceae	Leaf
8.	<i>Berberis aristata</i>	Indian Barberry	Berberidaceae	Root & stem
9.	<i>Boswellia serrata</i>	Shallaki	Burseraceae	Whole plant
10.	<i>Carissa spinarum</i>	Wild Karanda	Apocynaceae	Fruit
11.	<i>Cardamine impatiens</i>	Ban Laiyya	Brassicaceae	Leaf
12.	<i>Commiphora wightii</i>	Guggal	Brassicaceae	Whole plant
13.	<i>Calotropis gigantea</i>	Crown Flower	Apocynaceae	Root/Leaf
14.	<i>Cassia fistula</i>	Amaltas	Caesalpiniaceae	Whole plant
15.	<i>Cassia tora</i>	Chakvat	Caesalpiniaceae	Root/Leaf/Seed
16.	<i>Ficus benghalensis</i>	Banyan Tree	Moraceae	Whole plant
17.	<i>Holarrhena antidysenterica</i>	Kutj	Apocynaceae	Root & Stem
18.	<i>Mentha arvensis</i>	Ban pudina	Lamiaceae	Whole plant
19.	<i>Ocimum sanctum</i>	Holy Basil/Tulsi	Lamiaceae	Whole Plant
20.	<i>Nyctanthes arbor-tristis</i>	Coral Jasmine/Harisingar	Oleaceae	Leaf
21.	<i>Phyllanthus emblica</i>	Aonla	Phyllanthaceae	Fruit
22.	<i>Rhamnus virgata</i>	Chentuli	Rhamnaceae	Fruit
23.	<i>Rauvolfia serpentina</i>	Sarpagandha	Rhamnaceae	Whole plant
24.	<i>Tribulus terrestris</i>	Gokhuru	Zygophyllaceae	Seed
25.	<i>Tamarindus indica</i>	Tamarind	Caesalpiniaceae	Fruit
26.	<i>Viola biflora</i>	Yellow Wood Violet	Violaceae	Flower
27.	<i>Ziziphus mauritiana</i>	Ber/Indian Plum	Rhamnaceae	Whole plant
Source: Secondary data				

3.12 Agricultural Crops (Species of Economic Importance)

Agriculture is the backbone of Uttarakhand and is practiced by many people especially those living in the hilly areas of Uttarakhand. Many hilly people of Uttarakhand have taken agriculture

as their main occupation as it gives them bread and butter. Major crops grown in the state are rice, wheat, sugarcane, maize, soybean, pulses, oilseeds and a number of fruits and vegetables.

3.13 Faunal description based on Field Survey:

Faunal assessment provides a basis for determining relative abundance and rarity of each species which is important for assessing the diversity of fauna of a particular area. Since animals are capable of movements from one place to another, this makes their study entirely different. Different animals prefer different types of habitat for food and shelter. During survey species like Rhesus Macaque (*Macaca mulatta*), Spotted Deer (*Axis axis*), Common Langur (*Presbytis entellus*), Wild Boar (*Sus scrofa*), Five Striped Palm Squirrel (*Funambulus pennanti*) and Mongoose (*Herpestes edwardsi*) were observed in the study area.

During discussion with local people it was informed that some reptiles and amphibians like Asian Common Toad (*Duttaphrynus melanostictus*), Green Whip Snake (*Hierophis viridiflavus*), Indian Cobra (*Naja naja*) and Russell's Viper (*Vipera russelli*) are also observed in the study area.

The study area is dominated by Forest land which support higher vegetation of Faunal species. During discussion with forest officers and local people it was documented that Six Scheduled-I species are listed as per Indian Wildlife Protection Act, 1972, i.e., Asian Elephant (*Elephas maximus*), Leopard Cat (*Prionailurus bengalensis*), Bengal tiger (*Panthera tigris tigris*), Leopard (*Panthera pardus*), Indian Pangolin (*Manis crassicaudata*) and Indian peafowl (*Pavo cristatus*).

The list of faunal species i.e. (Mammals, Birds, Amphibians, Reptilians and Butterflies) reported in the study area (Core and Buffer Zone) is given in Table 3.20. The conservation status of listed species as per IUCN Red Data Book and Indian Wildlife Protection Act, 1972 has also been mentioned in the Table below.

Table 3.20: Faunal Species reported from the Study Area

S. No.	Scientific Name	Common Name	Family	WPA/IUCN status	Core Zone	Buffer Zone
1.	<i>Axis axis</i>	Spotted Deer	Cervidae	III/LC	✓	✓
2.	<i>Boselaphus tragocamelus</i>	Nilgai	Bovidae	III/LC	-	✓
3.	<i>Cervus unicolor</i>	Sambar	Cervidae	III/VU	✓	✓
4.	<i>Elephas maximus</i>	Elephant	Elephantidae	I/EN	✓	✓
5.	<i>Felis chaus</i>	Jungle Cat	Felidae	II/LC	-	✓
6.	<i>Funambulus palmarum</i>	Three Striped Palm Squirrel	Sciuridae	LC	-	✓
7.	<i>Funambulus pennanti</i>	Northern Palm Squirrel	Sciuridae	IV/LC	✓	✓

8.	<i>Herpestes auropunctatus</i>	Javan Mongoose	Herpestidae	LC	-	✓
9.	<i>Herpestes edwardsii</i>	Common Mongoose	Herpestidae	II/LC	✓	✓
10.	<i>Hystrix indica</i>	Indian Porcupine	Hystriidae	IV/LC	-	✓
11.	<i>Lepus nigricollis</i>	Indian Hare	Leporidae	IV/LC	-	✓
12.	<i>Macaca mulatta</i>	Rhesus Macaque	Cercopithecidae	II/LC	✓	✓
13.	<i>Mus booduga</i>	Indian Field Mouse	Muridae	IV/LC	✓	✓
14.	<i>Mus musculus</i>	House Mouse	Muridae	IV/LC	-	✓
15.	<i>Manis crassicaudata</i>	Indian Pangolin	Manidae	I/EN	-	✓
16.	<i>Panthera pardus</i>	Leopard	Felidae	I/VU	-	✓
17.	<i>Presbytis entellus</i>	Grey Langur	Cercopithecidae	-	✓	✓
18.	<i>Panthera tigris</i>	Bengal tiger	Felidae	I/EN	-	✓
19.	<i>Pteropus giganteus</i>	Flying Fox	Pteropodidae	IV/LC		✓
20.	<i>Prionailurus bengalensis</i>	Leopard Cat	Felidae	I/LC	-	✓
21.	<i>Rattus rattus</i>	Black Rat	Muridae	LC	-	✓
22.	<i>Rousettus leschenaulti</i>	Fruit Bat	Pteropodidae	IV/LC	-	✓
23.	<i>Suncus murinus</i>	The Grey Musk Shrew	Soricidae	LC	-	✓
24.	<i>Sus scrofa</i>	Wild Boar	Suidae	III/LC	✓	✓
25.	<i>Vulpes bengalensis</i>	Indian Fox	Canidae	II/LC	-	✓
26.	<i>Viverricula indica</i>	Small Indian Civet	Viverridae	II/LC	-	✓
Birds						
27.	<i>Aegithalos concinnus</i>	Black-throated Bushtit	Aegithalidae	LC	-	✓

28.	<i>Alcedo atthis</i>	Common Kingfisher	Alcedinidae	LC	-	✓
29.	<i>Ardea alba</i>	Great White Egret	Ardeidae	LC	✓	✓
30.	<i>Ardeola grayii</i>	Indian Pond Heron	Ardeidae	LC	-	✓
31.	<i>Acridotheres fuscus</i>	Jungle Myna	Sturnidae	LC	✓	✓
32.	<i>Amandava amandava</i>	Red Munia	Estrildidae	LC	-	✓
33.	<i>Amaurornis phoenicurus</i>	White-Breasted Waterhen	Rallidae	LC	-	✓
34.	<i>Acridotheres tristis</i>	Indian Myna	Sturnidae	LC	-	✓
35.	<i>Bubulcus ibis</i>	Cattle Egret	Ardeidae	LC	✓	✓
36.	<i>Copsychus saularis</i>	Oriental Magpie-Robin	Muscicapidae	LC	-	✓
37.	<i>Chloris spinoides</i>	Yellow-Breasted Greenfinch	Fringillidae	LC	-	✓
38.	<i>Corvus macrorhynchos</i>	Large-Billed Crow	Corvidae	LC	✓	✓
39.	<i>Columba livia</i>	Rock Dove	Columbidae	IV/LC	✓	✓
40.	<i>Corvus splendens</i>	House Crow	Corvidae	LC	✓	✓
41.	<i>Dendrocitta vagabunda</i>	Rufous Treepie	Corvidae	LC	✓	✓
42.	<i>Dendrocitta formosae</i>	Grey Treepie	Corvidae	LC	✓	✓
43.	<i>Dicrurus macrocercus</i>	Black Drongo	Dicruridae	LC	-	✓
44.	<i>Halcyon smyrnensis</i>	White-Throated Kingfisher	Alcedinidae	LC	-	✓
45.	<i>Hirundo concolor</i>	Dusky Crag Martin	Hirundinidae	LC	-	✓
46.	<i>Lonchura</i>	Spotted Munia	Estrildidae	LC	-	✓

	<i>punctulata</i>					
47.	<i>Lanius schach</i>	Long-Tailed Shrike	Laniidae	LC	-	✓
48.	<i>Lanius vittatus</i>	Bay-Backed Shrike	Laniidae	LC	-	✓
49.	<i>Merops orientalis</i>	Green Bee-Eater	Meropidae	LC	-	✓
50.	<i>Motacilla cinerea</i>	Grey Wagtail	Motacillidae	LC	-	✓
51.	<i>Motacilla alba</i>	Pied Wagtail	Motacillidae	LC	-	✓
52.	<i>Nectarinia asiatica</i>	Purple Sunbird	Nectariniidae	LC	-	✓
53.	<i>Orthotomus sutorius</i>	Common Tailorbird	Cisticolidae	LC	-	✓
54.	<i>Ocyrceros birostris</i>	Indian Grey Hornbill	Bucerotidae	LC	-	✓
55.	<i>Pavo cristatus</i>	Indian Peafowl	Phasianidae	I/LC	-	✓
56.	<i>Prinia sylvatica</i>	Jungle prinia	Cisticolidae	LC	✓	✓
57.	<i>Prinia hodgsonii</i>	Grey-Breasted Prinia	Cisticolidae	LC	✓	✓
58.	<i>Prinia inornata</i>	Plain Prinia	Cisticolidae	LC	-	✓
59.	<i>Parus major</i>	Great Tit	Paridae	LC	-	✓
60.	<i>Psittacula krameri</i>	Rose-Ringed Parakeet	Psittaculidae	LC	✓	✓
61.	<i>Psittacula cyanocephala</i>	Plum-Headed Parakeet	Psittaculidae	LC	-	✓
62.	<i>Pycnonotus cafer</i>	Red-Vented Bulbul	Pycnonotidae	LC	✓	✓
63.	<i>Pericrocotus flammeus</i>	Orange Minivet	Campephagidae	LC	-	✓
64.	<i>Pycnonotus cafer</i>	Red-vented Bulbul	Pycnonotidae	LC	✓	✓
65.	<i>Passer domesticus</i>	House Sparrow	Passeridae	LC	✓	✓
66.	<i>Sturnus contra</i>	Pied Myna	Sturnidae	LC	-	✓
67.	<i>Streptopelia chinensis</i>	Spotted Dove	Columbidae	LC	✓	✓

68.	<i>Streptopelia senegalensis</i>	Laughing Dove	Columbidae	LC	✓	✓
69.	<i>Seicercus xanthoschistos</i>	Grey-Hooded Warbler	Phylloscopidae	LC	-	✓
70.	<i>Saxicola sp.</i>	Grey Bush Chat	Muscicapidae	LC	-	✓
71.	<i>Saxicoloides fulicata</i>	Indian Robin	Muscicapidae	LC	✓	✓
72.	<i>Saxicola caprata</i>	Pied Bush Chat	Muscicapidae	LC	-	✓
73.	<i>Turdoides striatus</i>	Jungle Babbler	Leiothrichidae	LC	✓	✓
74.	<i>Urocissa erythrorhyncha</i>	Red-Billed Blue Magpie	Corvidae	LC	-	✓
75.	<i>Upupa epops</i>	Hoopoes	Upupidae	LC	-	✓
76.	<i>Vanellus indicus</i>	Red-Wattled Lapwing	Charadriidae	LC	-	✓
77.	<i>Zosterops palpebrosus</i>	Oriental White-Eye	Zosteropidae	LC	-	✓
Reptilians						
78.	<i>Ancistrodon himalayanus</i>	Himalayan Pit Viper	Viperidae	-	-	✓
79.	<i>Bungarus caeruleus</i>	Common Krait	Elapidae	-	-	✓
80.	<i>Bungarus fasciatus</i>	Banded Krait	Elapidae	LC	-	✓
81.	<i>Calotes versicolor</i>	Common Garden Lizard	Agamidae	-	-	✓
82.	<i>Eryx johnii</i>	Red Sand Boa	Boidae	NT	✓	✓
83.	<i>Hierophis viridiflavus</i>	Green Whip Snake	Colubridae	LC	✓	✓
84.	<i>Naja naja</i>	Indian Cobra	Elapidae	II	✓	✓
85.	<i>Ophiophagus hannah</i>	King Cobra	Elapidae	II/VU	-	✓
86.	<i>Ptyas mucosa</i>	Rat Snake	Colubridae	II	✓	✓
87.	<i>Vipera russelli</i>	Russell's Viper	Viperidae	-	✓	✓
Amphibians						

88.	<i>Acris crepitans</i>	Northern Cricket Frog	Hylidae	LC	-	✓
89.	<i>Bufo bufo</i>	Toad	Bufonidae	LC	-	✓
90.	<i>Bufo stomaticus</i>	Indian Marbled Toad	Bufonidae	LC	-	✓
91.	<i>Duttaphrynus melanostictus</i>	Asian Common Toad	Bufonidae	LC	✓	✓
92.	<i>Duttaphrynus himalayanus</i>	Himalaya Toad	Bufonidae	LC	-	✓
93.	<i>Fejervarya limnocharis</i>	Rice Field Frog	Dicroglossidae	LC	-	✓
94.	<i>Fejervarya syhadrensis</i>	Cricket Frog	Dicroglossidae	LC	-	✓
95.	<i>Hoplobatrachus tigerinus</i>	Indus Valley Bullfrog	Dicroglossidae	IV/LC	-	✓
96.	<i>Rana cascadae</i>	Cascades Frog	Ranidae	LC	✓	✓
Butterflies						
97.	<i>Catopsilia pyranthe</i>	Mottled Emigrant	Pieridae	-	-	✓
98.	<i>Danaus chrysippus</i>	Plain Tiger	Nymphalidae	-	✓	✓
99.	<i>Junonia lemonias</i>	Lemon Pansy	Nymphalidae	-	✓	✓
100.	<i>Ixias pyrene</i>	Yellow Orange Tip	Lycaenidae	-	-	✓
101.	<i>Leptosia nina</i>	Psyche	Pieridae	-	-	✓
102.	<i>Pachliopta aristolochiae</i>	Common Rose	Papilionidae	-	-	✓
103.	<i>Papilio polyctor</i>	Common Peacock	Papilionidae	-	-	✓
104.	<i>Papilio demoleus</i>	Lime Butterfly	Papilionidae	-		✓
105.	<i>Parantica aglea</i>	Glassy Tiger	Nymphalidae	-	✓	✓
106.	<i>Peacock pansy</i>	Junonia Almanac	Nymphalidae	-	-	✓
Abbreviations: LC= Least Concerned, CR= Critically Endangered, VU= Vulnerable, DD= Data Deficient, NT= Near Threatened, EN= Endangered.						
Source: Primary survey, secondary sources and discussion with Forest officers						

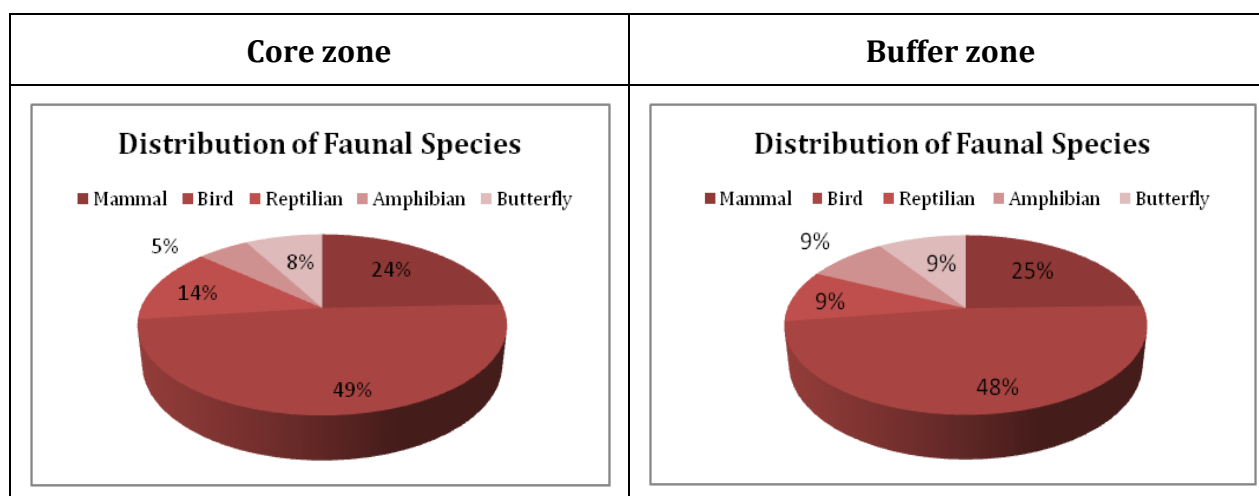
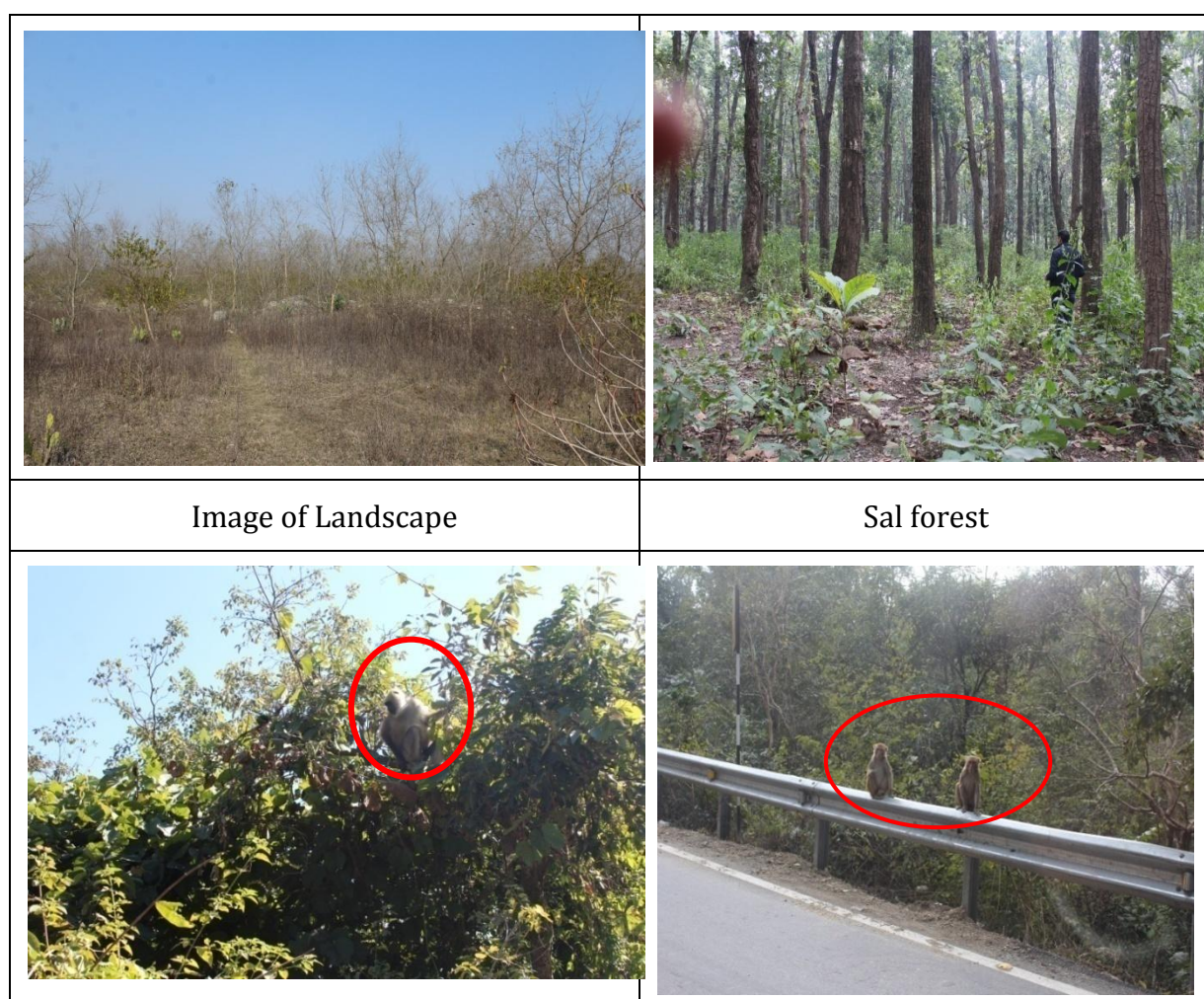












Figure 3.17: Pie diagram showing % distribution of faunal life forms

The visuals of the landscape and terrestrial ecosystem of the study area are depicted in the following Photographs.



<i>Presbytis entellus</i>	<i>Macaca mulatta</i>
	
<i>Psittacula sp.</i>	<i>Streptolia sp.</i>
	
<i>Clerodendrum sp.</i>	<i>Dalbergia sissoo</i>
	
<i>Mallotus sp.</i>	<i>Tamarindus indica</i>

	
<i>Tectona grandis</i>	<i>Albizia sp.</i>
	
Image of Landscape	<i>Ziziphus sp.</i>
	
<i>Latana camara</i>	<i>Bambusa sp.</i>

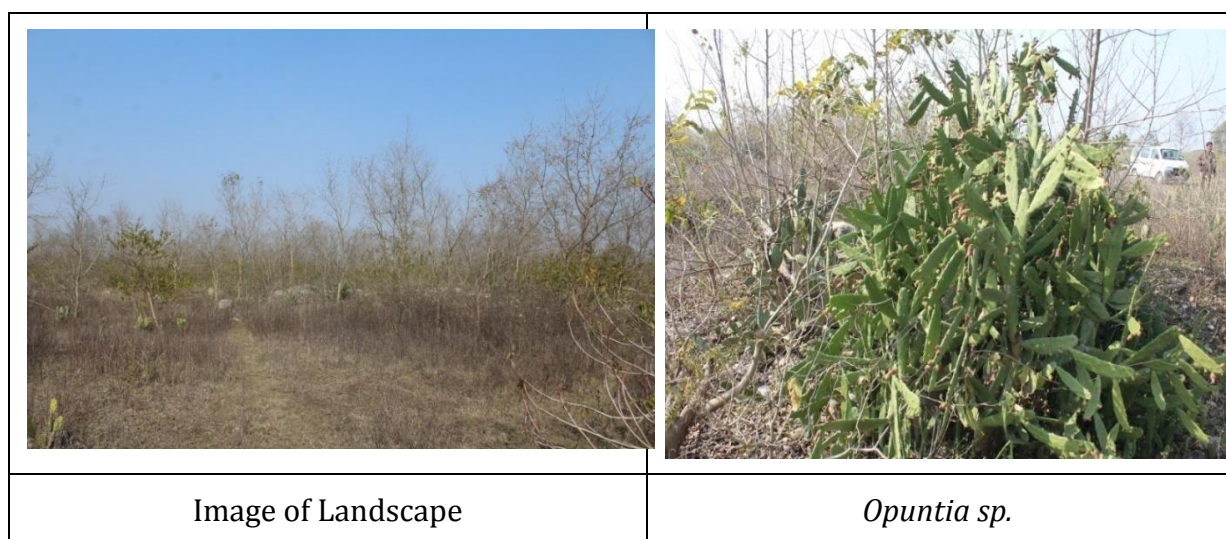


Figure 3.18: Photographs of Flora of the study area

3.14 Aquatic Life

Aquatic flora normally includes phytoplankton and macro-phytes (Plants that have adapted to living in aquatic environment such as River, Lakes, Ponds, Canal). Some aquatic plants which may be observed at random locations in submerged conditions in river or streams are *Typha elephanta*, *Photamogeton pectinatus*, *Ceratophyllum demersum* and *Eichhornia crassipes*. Phytoplankton and Macrophytic vegetation, collected from different rivers and streams present in the buffer area, are given in Table 3.21.

Aquatic fauna comprises of mostly Avifauna, Amphibians; and Fishes which cannot survive without aquatic ecosystem.

Zooplankton is commonly found in all types of aquatic habitats. These are recognized as secondary producers. The list of plankton species recorded from water bodies present in the buffer zone is given in the Table 3.23 below:

Table 3.21 Phytoplanktons in the Buffer zone

Class	S.No	Genera
Bacillariophyceae	1	<i>Amphora sp.</i>
	2	<i>Cyclotella sp.</i>
	3	<i>Nitzschia sp.</i>
Cyanophyceae	4	<i>Chroococcus sp.</i>
	5	<i>Anabaena sp.</i>
	6	<i>Gloeocapsa sp.</i>
	7	<i>Nostoc sp.</i>
	8	<i>Lyngbya sp.</i>
	9	<i>Merismopedia sp.</i>
	10	<i>Oscillatoria sp.</i>
Chlorophyceae	11	<i>Ankistrodesmus sp.</i>
	12	<i>Coelastrum sp.</i>
	13	<i>Scenedesmus sp.</i>

	14	<i>Tetraedron sp.</i>
	15	<i>Westella sp.</i>
Chlamydomonadales	16	<i>Volvox sp.</i>
Trebouxiophyceae	17	<i>Oocystis sp.</i>
Zygnematophyceae	18	<i>Cosmarium sp.</i>
	19	<i>Spirogyra sp.</i>

Table 3.22 Aquatic vegetation in the Buffer zone

S.No	Species	Family	IUCN Status
1	<i>Azolla pinnata</i>	Salviniaceae	-
2	<i>Typha elephantina</i>	Typhaceae	-
3	<i>Cryptocoryne sp.</i>	Araceae	-
4	<i>Eichhornia crassipes</i>	Pontederiaceae	-
5	<i>Potamogeton pectinatus</i>	Potamogetonaceae	-
6	<i>Hydrilla sp.</i>	Hydrocharitaceae	LC
7	<i>Ceratophyllum demersum</i>	Ceratophyllaceae	-
8	<i>Ipomoea aquatica</i>	Convolvulaceae	LC
9	<i>Typha angustifolia</i>	Typhaceae	-

Table 3.23 Zooplankton Species in the Buffer zone

Class	S.No	Genera
Centropxyidae	1	<i>Centropxyxis sp.</i>
Colpodea	2	<i>Bursaria sp.</i>
Brachionidae	3	<i>Brachionus sp.</i>
Cyclopidae	4	<i>Cyclops sp.</i>
	5	<i>Mesocyclops sp.</i>
	6	<i>Thermocyclops sp.</i>
Diaptomidae	7	<i>Diaptomus sp.</i>
Oligohymenophorea	8	<i>Vorticella sp.</i>
	9	<i>Paramoecium sp.</i>
Tubulinea	10	<i>Arcella sp.</i>
	11	<i>Diffugia sp.</i>

3.14.1 Fish Fauna

The Song River is mainly rain-fed aquatic body system. A very lean water current flow in the non-rainy season and most of its width remains dry. No major fish stock is found in these streams but only a few small fish species are found i.e *Barilius barna*, *Barilius bendelisis* (Angura), *Barilius tileo* (Tileo Baril), *Chagunius chagunio* (Chaguni), *Garra gotyla* (Pathorchata). There are some fish pockets where fish maintains their survival and breeding. The fish species which are commonly found in the nearby aquatic habitats of the study area are listed in the Table 3.24 below:

Table 3.24: Fish Species reported in the Buffer zone

S. No.	Scientific Name	Common Name	Family	WPA/IUCN Status
1	<i>Bagarius bagarius</i>	Gangetic Goonch	Sisoridae	NT
2	<i>Barilius bendelisis</i>	Angura	Cyprinidae	LC
3	<i>Barilius tileo</i>	Tileo Baril	Cyprinidae	LC
4	<i>Catla catla</i>	Catla	Cyprinidae	LC
5	<i>Chagunius chagunio</i>	Chaguni	Cyprinidae	-
6	<i>Cirrhinus mrigala</i>	Mrigal	Cyprinidae	LC
7	<i>Garra gotyla</i>	Pathorchata	Cyprinidae	LC
8	<i>Heteropneustes fossilis</i>	Stinging Catfish	Heteropneustidae	LC
9	<i>Labeo rohita</i>	Rohu	Cyprinidae	LC
10	<i>Labeo calbasu</i>	Orange-fin Labeo	Cyprinidae	LC
11	<i>Mystus seenghala</i>	Kavasi	Bagridae	LC
12	<i>Mystus tengara</i>	Tengara Catfish	Bagridae	LC
13	<i>Opsarius barna</i>	Barna Baril	Cyprinidae	LC
Abbreviations: LC= Least Concerned, CR= Critically Endangered, VU= Vulnerable, DD= Data Deficient, NT= Near Threatened, EN= Endangered.				

Conclusion:

The study area of the project is dominated by Reserve forests and natural vegetation. The vegetation of the study area is dominated by Sal forest and Khair-Sissoo etc. The species observed in the study area are generally found in abundance. Among faunal species, six species are falling under Schedule-I of Wildlife (Protection) Act, 1972; i.e. *Elephas maximus* (Asian Elephant), *Panthera tigris tigris* (Bengal Tiger), *Manis crassicaudata* (Indian Pangolin), *Prionailurus bengalensis* (Leopard Cat), *Panthera pardus* (Leopard) and *Pavo cristatus* (Indian Peafowl).

3.15 SOCIO-ECONOMIC ENVIRONMENT

3.15.1 Introduction: Socio-Economic Impact Assessment

Socio-Economic Impact Assessment (SEIA) refers to systematic analysis of various social and economic characteristics of human being living in a given geographical area (study area/impact area). The prime objective of SEIA is to identify and evaluate potential socio-economic and cultural impacts of a proposed development project on the lives & conditions of people, their families and communities. If the potential impacts are significant and adverse, SEIA assist the developers and other stakeholders to reduce, remove or prevent these impacts from happening. Also, it examined how a development project changes the lives of local residents. The outcome of the study relies on both quantitative and qualitative measure of impacts. The impacts are evaluated in terms of changes in community demographics, housing, employment, market effects, public services, retail business, standard of life of the community. Further, assessing proposed developments in socio-economic context help the community leaders and local people identify potential social issues, evaluate the adequacy of social services and determine whether the project has adverse effects on overall social well-being or not.

SEIA also provides a forum for planning how to maximize the beneficial impacts of a proposed development. Beneficial impacts can include a better standard of living due to increased access to employment, business opportunities, training, education and health.

3.15.2 Objectives of the Study

The objectives of Socio-Economic Impact Assessment of the project are as follows:

- a) To comprehend socio-economic status of the people living there in.
- b) To assess probable impact of the project on social and economic aspects.
- c) To measure the impact of the project on the standard of life of the people.
- d) To ensure sustainability of positive impacts.
- e) To suggest mitigation measures and agency responsible for taking action in case of adverse impact.

3.15.3 Steps taken to prepare the SEIA Report

- ☞ Literature review.
- ☞ Identification of the study area and important landmarks therein.
- ☞ Preparation of list of habitations located in the study area.
- ☞ Firming up of approach and methodology.
- ☞ Collection of secondary data from census report, district profile, published, administrative records etc.
- ☞ Data entry and data validation.
- ☞ Generation of tables.
- ☞ Data analysis and preparation of report.

3.15.4 Methodology

For Socioeconomic Impact Assessment of the proposed project we recourse to systematic analysis by Geoinformatics application of village level dynamic studies in various socioeconomic characteristics, both in terms of quality and quantity. Accordingly, both qualitative and quantitative data of the study area was collected through various sources.

For collection of information, we approached Census of India for published data/information, visited state & district portals and referred to administrative records of the state & district administration.

3.15.5 Study Area

The study area defines 10 km circle radius around the mining site at Kaluwala village in sub district Rishikesh, district Dehradun of Uttarakhand state. The study area habitations are spread over the sub districts Dehradun and Rishikesh of Dehradun district and sub districts Dhanaulti and Narendranagar of Tehri Garhwal district of Uttarakhand state. The nearest railway station and airport to the project site is Doiwala Railway Station 3.27 km in south south west (SSW) direction and Jolly Grant Airport, 4.87 km east south east (ESE) of the mining site respectively.

The study area comprises of a total of 115 identified habitations out of which there are 112 villages and 3 are urban areas. There is 1 uninhabited village in the study area habitations. The habitations have been shown in the map and the table below:

Habitations in the study area

Sl. No.	Village	Sl. No.	Village
1	Bharwa Katal	47	Nahi Kalan
2	Mahendra Pur	48	Jakar
3	Dubri	49	Farti
4	Dubara	50	Sangaon
5	Kokliyal Gaon	51	Sindhwal Gaon
6	Daur Mai Kanda	52	Kotala
7	Kol	53	Nahikhurd
8	Chiphalti Lagga Gawali Danda	54	Baderha Kalan
9	Jaintwari	55	Baderna Khurd
10	Jhoti Urph Koti Lagga Jaintwar	56	Tamoli Garh
11	Toliya Katal	57	Talai
12	Saudan Lagga Gawali Dand	58	Dharkot
13	Ghursal Gaon	59	Simiyanah
14	Sunderwala	60	Baderana Majhala
15	Dwara	61	Kuthar
16	Akhandwali Bhilang	62	Katkot Khurd
17	Sodasaroli	63	Katkot Kalan
18	Kalimati	64	Siron
19	Barasi Grant	65	Ghandol
20	Bhopalpani Grant	66	Chauki
21	Paw Wala Soda	67	Kaknawamaychak Talai
22	Motharo Wala	68	Kotimay Chak
23	Badripur	69	Ramnagar Danda
24	Haripur	70	Kandogal

25	Nawada	71	Kudhal
26	Chaktonwala Grant	72	Gadool
27	Balawala	73	Pali
28	Miyanwala	74	Khaldhar
29	Mohkam Pur Kala	75	Bagi
30	Mohkam Pur Khurd	76	Bangai
31	Majari Mafi	77	Naurtuwala
32	Harrawala	78	Rakhwal Gaon
33	Nakraunda	79	Govind Wala
34	Kuwan Wala	80	Bishan Garh
35	Nagal Jwalapur	81	Bairagada
36	Simlas Grant	82	Sarangdharwala
37	Lachhi Wala	83	Bhogpur
38	Missar Wala Kala	84	Chakbarkot
39	Missar Wala Khurd	85	Barkot Mafi
40	Markham Grant	86	Rani Pokhari Grant
41	Ghissar Pari	87	Mauja Rani Pokhari
42	Doiwala	88	Listrabad
43	Hansuwala	89	Kaluwala
44	Lachhiwala Range	90	Sangatiya Walakala
45	Landwakot	91	Bhaglana
46	Haldwari	92	Badowala
Sl. No.	Village	Sl. No.	Village
93	Baruwala Grant	105	Ashkrodi Range
94	Jauligrant	106	Kaudasi
95	Sangatiya Walakhurd	107	Fagsi

96	Baksar Wala	108	Badogal
97	Kanhar Wala	109	Falsuwa
98	Athhoorwala	110	Rainapur Grant
99	Bhaniya Wala	111	Mazri Grant
100	Jeevan Wala	112	Kasron Range
101	Fatehpur Danda		Urban Area
102	Sahab Nagar	113	Dehradun
103	Barkot Range	114	Natthuwa Wala (CT)
104	Thano Range	115	Natthan Pur (CT)

Baseline Data

The baseline data with respect to population and amenities available in the study area has been worked out as under:

I. Demographic particulars/population details

S. No.	Description	Number	Percentage to Respective Total
1	Total Population	205061	100
	Male	106255	51.8
	Female	98806	48.2
	Sex Ratio		929
2	Population (0-6) Age Group	24094	100
	Male	12802	53.1
	Female	11292	46.9
	Sex Ratio		882
3	Population- Scheduled Caste	23844	100
	Male	12524	52.5
	Female	11320	47.5
	Sex Ratio		903
4	Population- Scheduled Tribe	1349	100
	Male	731	54.2
	Female	618	45.8
	Sex Ratio		845
5	Total Literates	155473	100
	Male	85934	55.3
	Female	69539	44.7

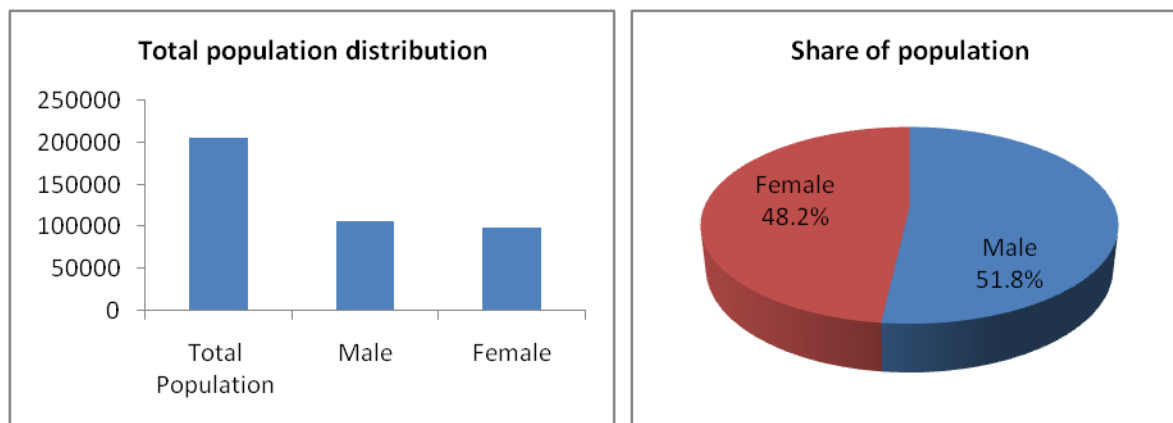
	Gender Gap in Literates	10.6	
6	Overall Literacy Rate	85.9	
	Male	91.9	
	Female	79.5	
	Gender Gap in Literacy Rate	12.4	
7	Total Workers	71487	100
	Male	53634	75.0
	Female	17853	25.0
	Gender Gap in Work Participation	50.0	
8	Main Workers	55442	100
	Male	44121	79.6
	Female	11321	20.4
	Gender Gap in Work Participation	59.2	
9	Marginal Workers	16045	100
	Male	9513	59.3
	Female	6532	40.7
	Gender Gap in Work Participation	18.6	
10	Household Industrial Workers	2218	100
	Male	1572	70.9
	Female	646	29.1
11	Total Agricultural Workers	10904	100
	Male	7878	72.2
	Female	3026	27.8
12	Cultivators	7871	100
	Male	5328	67.7
	Female	2543	32.3
13	Agricultural Labour	3033	100
	Male	2550	84.1
	Female	483	15.9
14	Other Workers	42320	100
	Male	34671	81.9
	Female	7649	18.1

Source: Primary Census Abstract, 2011

3.15.6 Population Composition

According to Census 2011, total population of the study area has been worked out to be 205061 in which 106255 (51.8 per cent) are males and remaining 98806 (48.2 per cent) are females. The overall sex ratio in the study area has been worked out to be 929 females per 1,000 males.

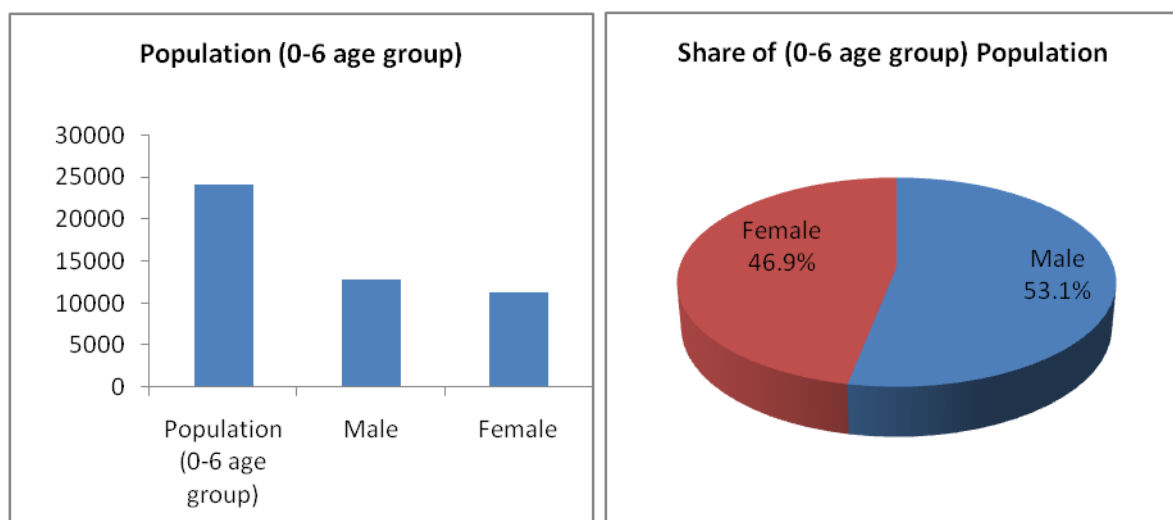
Total Population Details



Child Population Distribution

In the study area, the total population of age group of 0-6 year has been worked out to be 24094 which constitute about 11.7 per cent of the total population. Of the total (0-6) age group population, 53.1 per cent are boys and remaining 46.9 per cent are girls. In absolute terms, the number of males in the age group (0-6) population is 12802 whereas the number of females in this age group is 11292. The sex ratio of population in this age group (0-6 years) is 882 girls per 1,000 boys.

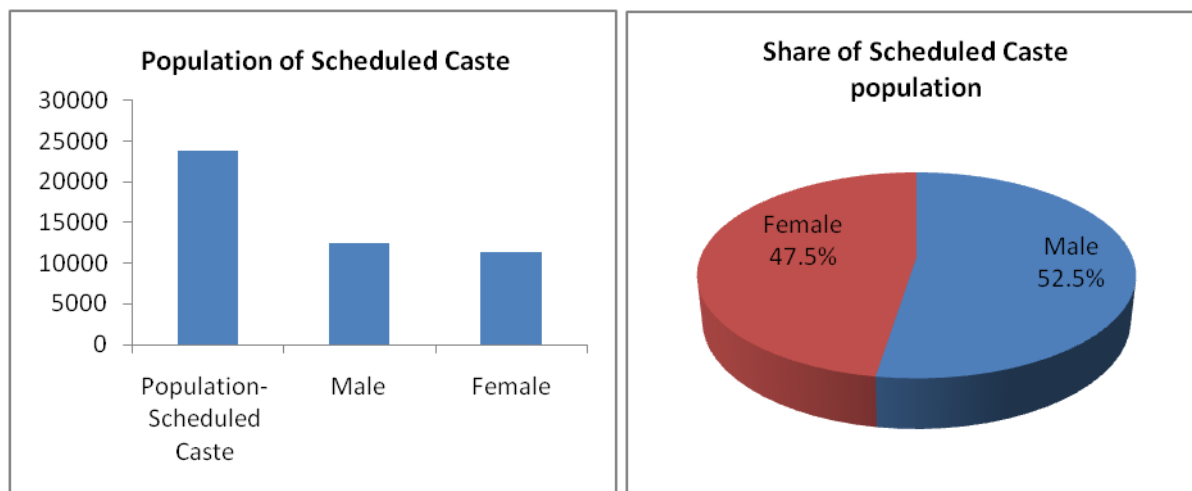
Age Group 0-6 Population Distribution



Social Group Population Distribution

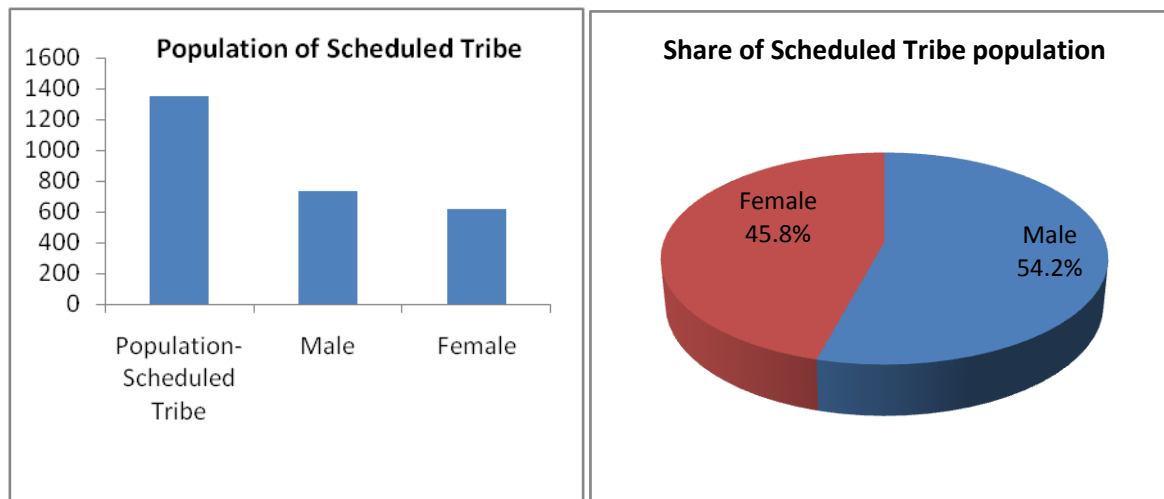
In the study area, Scheduled Caste population is 23844 which constitute 11.6 per cent of the total population of the study area. In the total Scheduled Caste population, 52.5 per cent is male and the remaining 47.5 per cent is female. In absolute terms, the number of Scheduled Caste males is 12524 whereas the number of Scheduled Caste females is 11320. The sex ratio among Scheduled Caste population has been worked out to be 903 females per 1,000 males.

Scheduled Caste Population Distribution



In the study area, Scheduled Tribe population is 1349 which constitute 0.7 per cent of the total population of the study area. Of the total Scheduled Tribe population, 54.2 per cent is male and the remaining 45.8 per cent is female. In absolute terms, the number of the Scheduled Tribe males is 731 whereas the number of Scheduled Tribe females is 618. The sex ratio among Scheduled Tribe population has been worked out to be 845 females per 1,000 males.

Scheduled Tribe Population Distribution



Household and Household Size

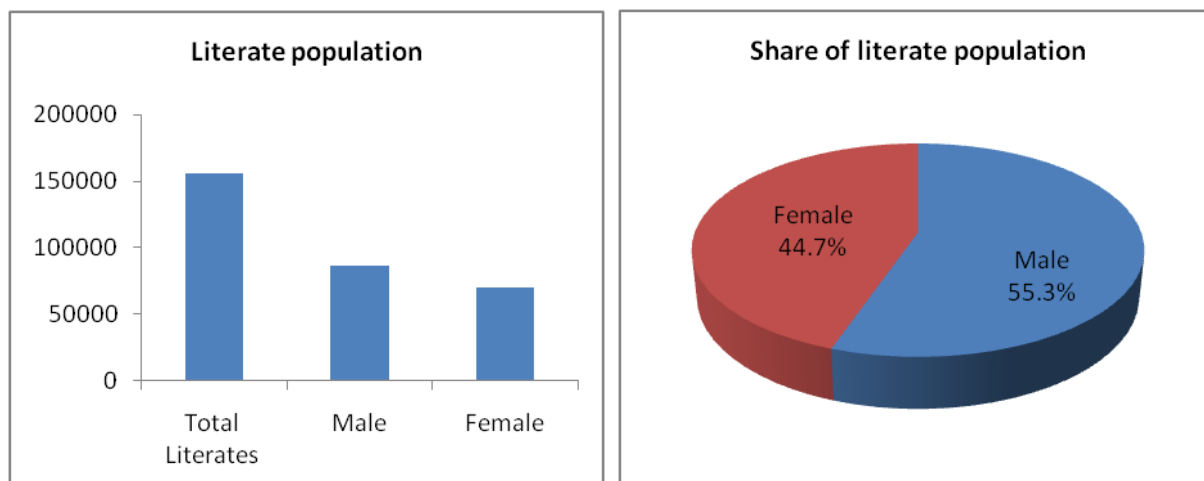
The entire population of the study area is distributed into 43647 households and the average household size has been worked out to be 5.

Literates, Literacy Rate and Gender Gap in Literacy Rate

In the study area, 75.8 per cent of the total population is literate. The total number of the literate population is 155473 in which the number of male literates is 85934 and the number of female literates

is 69539. The male literates are 55.3 per cent and the female literates are 44.7 per cent. The gender gap among the literate population is 10.6 per cent. The overall literacy rate has been worked out to be 85.9 per cent. The literacy rate of the male is 91.9 per cent and the literacy rate of the female is 79.5 per cent which creates a gender gap in the literacy rate of 12.4 per cent.

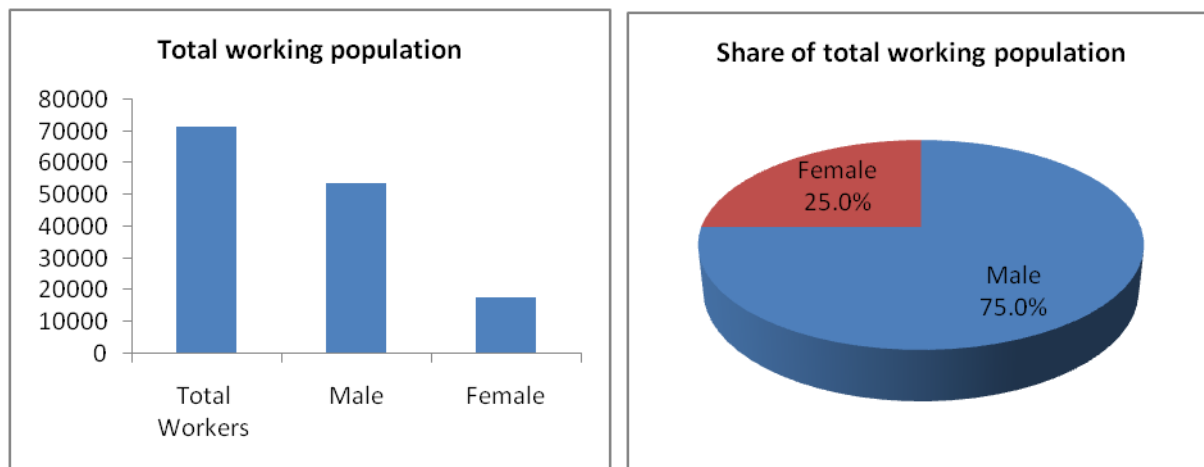
Literates Population Distribution



Working Population Details

Based on Census 2011, total number of workers in the study area has been worked out to be 71487 which constitute 34.9 per cent of the total population. Of the total workers, 75.0 per cent are males and the remaining 25.0 per cent are females. In absolute term, the total number of male workers is 53634 and the total number of female workers is 17853. In the total working population there is a large gender gap of 50.0 per cent.

Working Population Distribution

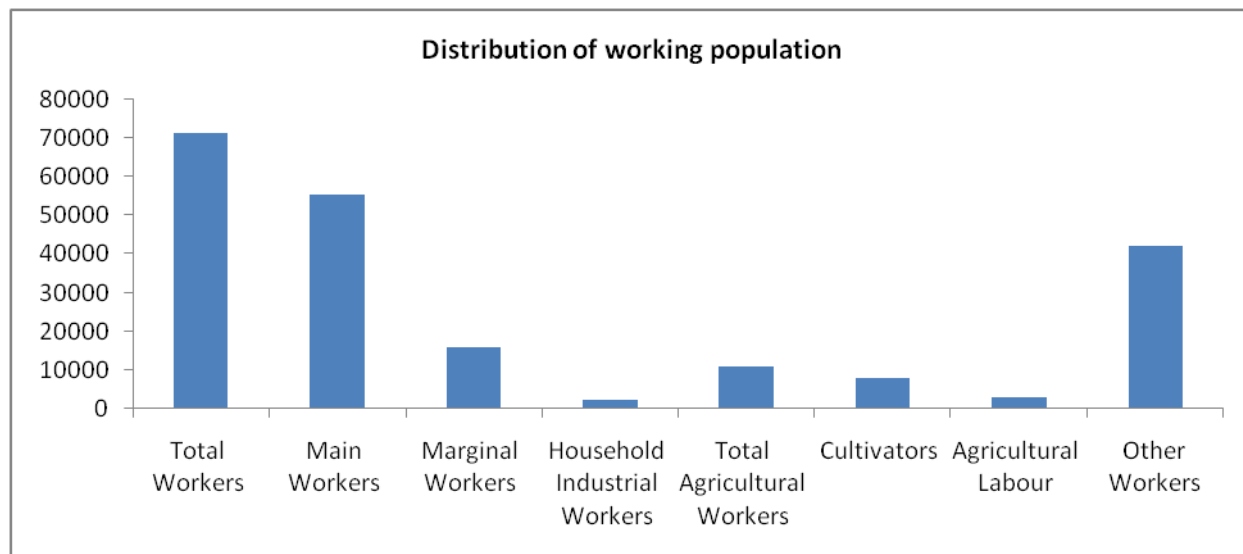


Details of the Working Population

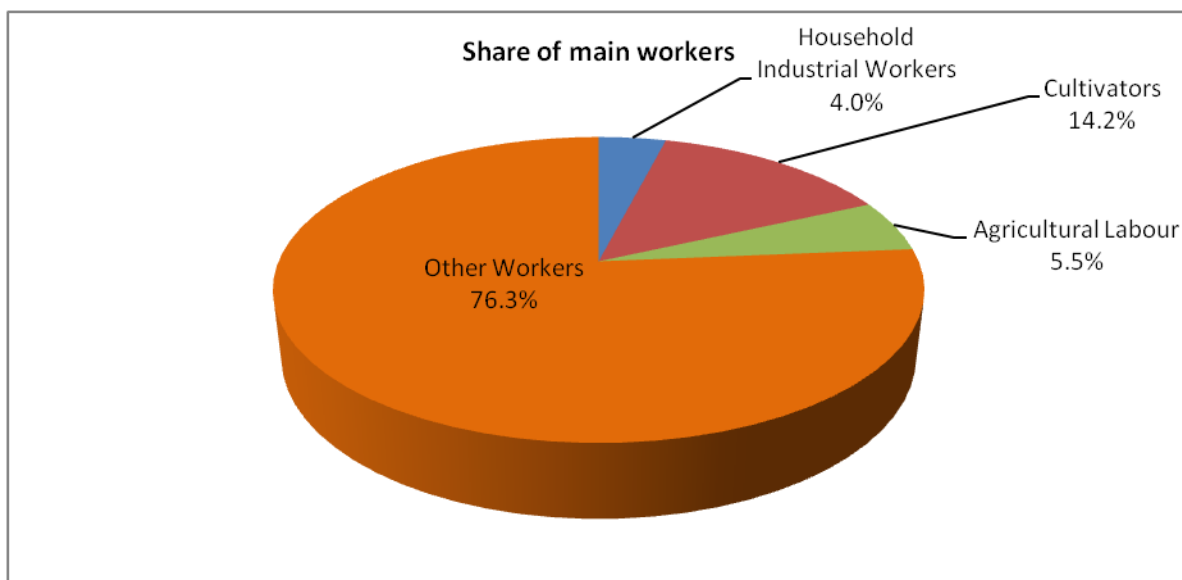
In the total working population of the study area habitations is 77.6 per cent is main workers and the remaining 22.4 per cent is marginal workers. Of the total main workers 79.6 per cent are males and

remaining 20.4 per cent are females which create a large gender gap in work participation of 59.2 per cent. In case of marginal workers, 59.3 per cent are males and 40.7 per cent are females that create a gender gap of 18.6 per cent in this segment of work participation. The main workers are further divided into cultivators, agricultural laborers, household industrial workers and other workers. The sum total of the cultivators and agricultural laborers has been termed as total agricultural workers.

Distribution of Working Population



Distribution of main workers



Of the main working population, 14.2 per cent are cultivators and 5.5 per cent are agricultural laborers. The population that belongs to the other workers category is 76.3 per cent while 4.0 per cent of the main workers belong to industrial household workers category. From the above distribution of workers it is

clear that the economy of the study area is mainly dependent on other workers category and next on those involved in agricultural sector either as cultivators or agricultural laborers.

II. BASIC AMENITIES:

Basic Amenities Available in the Study Area		
EDUCATION		
Educational Institutions	Type of Educational Facilities	Number
	Pre Primary School (Pvt.)/ Primary School (Govt. & Pvt.)/ Middle School (Govt. & Pvt.)/ Secondary School (Govt. & Pvt.)/ Senior Secondary School (Govt. & Pvt.)/Degree College-Art Only (Govt.)/ Degree College-Science Only (Govt.)/ Degree College-Commerce Only (Govt.)/ Degree College-Art and Science Only (Govt.)/ Degree College-Art and Commerce Only (Govt.)/ Degree College-Art, Science and Commerce (Govt.)	291
HEALTH		
Health Facilities	Type of Facilities	Number
	Community Health Centre/ Primary Health Centre/ Primary Health Sub Centre/ Maternity And Child Welfare Centre/ Hospital Allopathic/ Dispensary/ Mobile Health Clinic/ Family Welfare Centre/ Non Government Medical Facilities In And Out Patient	77
WATER		
Drinking Water	Means of Drinking Water	No. of Habitations
	Tap Water Treated	109
	Tap Water Untreated	50
	Covered Well	04
	Uncovered Well	11
	Hand Pump	45
	Tube Wells/Borehole	18
	Spring	06
	River/Canal	40
	Tank/Pond/Lake	11
ELECTRICITY		
Power Supply	Power Supply For Domestic Use	114
	Power Supply For Agriculture Use	49
	Power Supply For Commercial Use	39
ROAD		
Approach Road	Black Topped (pucca) Road	73
	Gravel (kuchha) Roads	81
	All Weather Road	08
	Foot Path	114

	Major District Road	49
TRANSPORTATION		
Road Transportation	Public Bus Service	32
	Private Bus Service	40
	Auto/Modified Autos	23
DRAINAGE		
Drainage Facility	Closed Drainage	29
	Open Drainage	56
	Open Kuccha Drainage	76
OTHER AMENITIES		
Other Amenities	Post Office	13
	Sub Post Office	25
	Public Distribution System (PDS) Shop	19
	Nutritional Centres-Anganwadi Centre	33
	ASHA	35
	Birth and Death Registration Office	40

(Source: Desk Research & Census of India, 2011)

Corporate Environmental Responsibility (CER)

As per the Office Memorandum **F.No. 22-65/2017-IA.III dated 30.09.2020** of the Ministry of Environment, Forest and Climate Change regarding “Corporate Environment Responsibility” (CER), the project proponents are required to allocate funds towards environment development activities as proposed by the project proponent or prescribed by EAC or SEAC, as the case may be, shall be a part of EMP and the commitments made by project proponent to address the concerns raised during Public consultation.

Conclusion

By following the environmental guidelines related to the project, this project would be beneficial for the people by generating employment opportunities. This project would lead to employment generation and improve the socio-economic status of the household in the study area habitations. The Corporate Environment Responsibility will prove beneficial for the study area habitants and will lead to improvement in their health and living conditions.

CHAPTER-4 : ANTICIPATED ENVIRONMENTAL IMPACT AND ITS MITIGATION MEASURES

4.1 INTRODUCTION

The environmental parameters likely to be affected by mining are related to many factors, *i.e.* physical, social, economic, agriculture and aesthetic. The excavated minerals will be transported via trucks to outsiders. The operations may disturb environment of the area in various ways, such as removal of mass, change of landscape, flora and fauna of the area, surface drainage, and change in air, water and soil quality. While for the purpose of development and economic up-liftment of people, there is need for establishment of mining industries, but these should be environment friendly. Therefore, it is essential to assess the impacts of mining on different environmental parameters, before starting the mining operations, so that abatement measures could be planned in advance for eco-friendly mining in the area.

4.2 ENVIRONMENTAL IMPACT ASSESSMENT

Environment and development should be considered as mutually complementary, interdependent, and an instrument of reinforcing the quality of life. Environmental Impact Assessment (EIA) is the important aspect of overall environmental management strategy and an important tool for sustainable development. It identifies major impacts of mining and associated activities on environment and provides guideline to prepare the necessary control measure termed as Environmental Management Plan (EMP).

Alteration or modification of the above attributes may cause hazardous impact on ecological equilibrium of site. Besides this there will be some other reasons which will affect the environment viz. traffic network, and other vehicular movements, impacts on flora and fauna of that area, surface drainage, and change in air, water and soil quality. While for purpose of development and economic up-liftment of people, there is need for establishment of industries and mining, but these have to be environmental friendly. Therefore, it is essential to assess the impacts of mining on different environmental parameters, before starting the mining operations, so that abatement measures could be planned in advance for eco-friendly mining in the area. The increasing awareness among the people about ecological imbalance and environmental degradation has raised many apprehensions.

Table 4.1: Impact Identification Matrix

Aspects Impacted Attributes	Mining, Storage and handling and allied activity					
	Open Cast-Operation	Mineral Transportation	Mining Mineral Storage /stacking	Maintenance Workshop	Greenbelt Development	Employment
Ambient Air	•	•	•		*	
Water Resource	•					
Water Quality	•		•			
Ambient Noise	•	•		•	*	
Vibration	•					
Flora and Fauna	•	•	•		*	
Soil and Land-use	•		•		*	
Infrastructure	•	*		*		
Traffic		•				
Health & Safety	•		•			
Socio-economic	•	•	•	•	•	*

The impacts on different environmental parameters due to this mining project are discussed below:

4.2.1 CONSTRUCTION PHASE

This is a sand, bajri and boulder mining project in riverbed. There will be no impacts as no construction stage is envisaged in this project.

4.2.2 OPERATION PHASE

Some of the impacts identified in various phases of operation are insignificant and do not warrant much attention whereas some others are important especially with respect to the present context. Therefore objective is to identify those impacts, which are significant and require a detailed analysis for decision making or formulating adequate management measures. This section deals with an assessment of impact of various mining activities on the existing environmental conditions. The methodology of assessment is based upon identification and description of the existing project activities as well as environmental components followed by evaluating the impact of mining and associated activities on the environment. The environmental components that are likely to be influenced or modified by the continuation of project activities are:

- Air Environment,
- Noise and Vibration Environment,
- Water Environment,
- Land use
- Soil Environment
- Hydrology
- Geology
- Biological Environment,
- Socio-economic status of the area,
- Solid Waste/overburden

4.3 AIR ENVIRONMENT

The air quality in the mining area depends upon the nature and concentration of emissions and meteorological conditions.

4.3.1 Anticipated Impact

Mining Operation carried out by opencast manual method generate dust particles due to various activities like Loading & Unloading of sand, and Transportation. The impact on ambient air quality in the area surrounding the mining area depends upon the pollutant emission rate and prevailing meteorological conditions. As it is an open cast manual mine, particulate Matter (Dust) of various sizes is the only pollutant of any significance.

4.3.2 Impact through mathematical modelling for mining projects

Mining Operation will be carried out by opencast manual method. The impact on ambient air quality in the surrounding area of the mine lease depends upon the pollutant emission rate and prevailing meteorological conditions. The major sources of air pollution in the proposed mine is dust generation due to extraction, loading and haulage of mineral (sand/bajri/boulder) and 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. The operations considered for determining source strength for dispersion modeling are as follows:

- Excavation,
- Loading, and
- Haulage

4.4 Air Pollution Modeling

Impact assessment is an important part of Environmental Impact Assessment Study. There are various techniques available to predict the impacts. Mathematical modeling is an established and accepted technique to predict the impacts. The open cast mines are potential sources of air pollution.

4.5 Mining Data for 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 general equation for emissions estimation is:

$$E = A \times EF \times (1-ER/100)$$

Where: E = emissions; A = activity rate; EF = emission factor, and ER = overall emission reduction efficiency in %

The proposed mining activity includes various activities like excavation, handling and transport of RBM.

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 4.2

Table 4.2 : Estimated Emission rate of PM₁₀, PM_{2.5}, SO₂, NO₂

Emission source	Details
Mineral excavation	
1. Production capacity of the mine, TPA	4064445
2. Operational days	245
3. Activity rate, TPD	16589.57143
4. Activity rate (A), T/second	0.192008929
5. Emission factor (EF), kg/MT	0.94021669
6. Emission rate (A*EF*1000), g/second	180.5299993
7. Area of activity, m ²	6.84E+05
8. Uncontrolled emission rate, g/m ²	2.64E-04
9. Controlled emission rate, g/m ²	2.64E-05
Mineral Loading	
1. US EPA emission factor, kg/MT	0.00434373
2. Emission rate, g/s	0.834034943
3. Area of activity, m ²	6.84E+05
4. Uncontrolled emission rate, g/m ²	1.22E-06
5. Controlled emission rate, g/m ²	1.22E-07
Haulage emission	
1. Truck capacity, MT	10
2. No. of truck trips	3318

3. Road length travelled, km	3.5
4. Emission factor, g/VkmT	0.0097
5. Emission rate, g/s	13.03740625
6. Activity area of haulage, m ²	21000
5. UnControlled emission rate, g/m ²	0.000620829
6. Controlled emission rate, g/m ²	6.20829E-05
Emission rate of haulage emission PM2.5	3.72497E-05
Mineral excavation and loading emission rate PM10, g/m²	2.65E-05
Mineral excavation and loading emission rate PM2.5, g/m²	1.59045E-05

SO2 emission calculation	
Diesel consumption, lpd	1228
Diesel consumption, kg/d (@0.82kg/l)	1006.96
Sulphur content in HSD, %	0.05
Sulphur contained in HSD used, kg/d	0.50348
Sulphur dioxide emission, kg/day	1.00696
Sulphur dioxide emission, g/sec	0.01165463
Activity area, m ²	6.84E+05
Emission rate, g/sec.m ²	1.7034E-08
NOx emission calculation	
NOx emission for HSD combustion, g/kg	16
Total HSD combustion, kg/day	1068
NOx emission rate, g/day	17088
NOx emission rate, g/sec	0.197777778
Activity area, m ²	6.84E+05
Emission rate, g/sec.m ²	2.89064E-07

4.5.1 Modeling Procedure

Prediction of Ground Level Concentrations (GLC's) due to proposed mines has been made by Industrial Source Complex, Short Term (ISCST3) as per CPCB guidelines. ISCST3 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.

4.5.2 Model Options Used For Computations

- Plume rise has not been considered;
- Calms processing routine is used by default;
- 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.

4.5.3 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 Industrial Source Complex model to establish the worst case scenario.

4.5.4 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.

4.5.5 Presentation of Results

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 GLC for PM₁₀, due to mining is found to be 10.33 µg/m³ respectively, within the mine lease area. The maximum incremental GLCs are superimposed on the maximum baseline PM₁₀ concentrations recorded during monitoring period i.e. Post monsoon season 2019 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 4.3 to 4.7.

Table 4.3: Incremental Concentration of PM₁₀ in the Study Area

S.No	Site Name	PM ₁₀ concentration (µg/m ³)		
		Baseline	Incremental	Cumulative
AQ1	Bhopal Pani	58	5	63
AQ2	Nakraunda	62	3	65
AQ3	Balawala	57	7	64
AQ4	Doiwala	59	5	64
AQ5	Ranipokhari	58	5	63
AQ6	Bhaniwala	62	3	65
AQ7	Bullawala	60	3	63
AQ8	Hirikhesh	64	3	67

Table 4.4: Incremental Concentration of PM_{2.5} in the Study Area

S.No	Site Name	PM _{2.5} concentration (µg/m ³)		
		Baseline	Incremental	Cumulative
AQ1	Bhopal Pani	34	2	36
AQ2	Nakraunda	35	3	38
AQ3	Balawala	33	5	38
AQ4	Doiwala	35	3	38
AQ5	Ranipokhari	38	3	41
AQ6	Bhaniwala	37	3	40
AQ7	Bullawala	35	2	37
AQ8	Hirikhesh	37	3	40

Table 4.5: Incremental Concentration of SO₂ in the Study Area

S.No	Site Name	SO ₂ concentration (µg/m ³)		
		Baseline	Incremental	Cumulative
AQ1	Bhopal Pani	13	0.003	13.003
AQ2	Nakraunda	12	0.002	12.002
AQ3	Balawala	14	0.003	14.003
AQ4	Doiwala	14	0.002	14.002
AQ5	Ranipokhari	15	0.003	15.003
AQ6	Bhaniwala	14	0.003	14.003
AQ7	Bullawala	13	0.001	13.001
AQ8	Hirikhesh	15	0.002	15.002

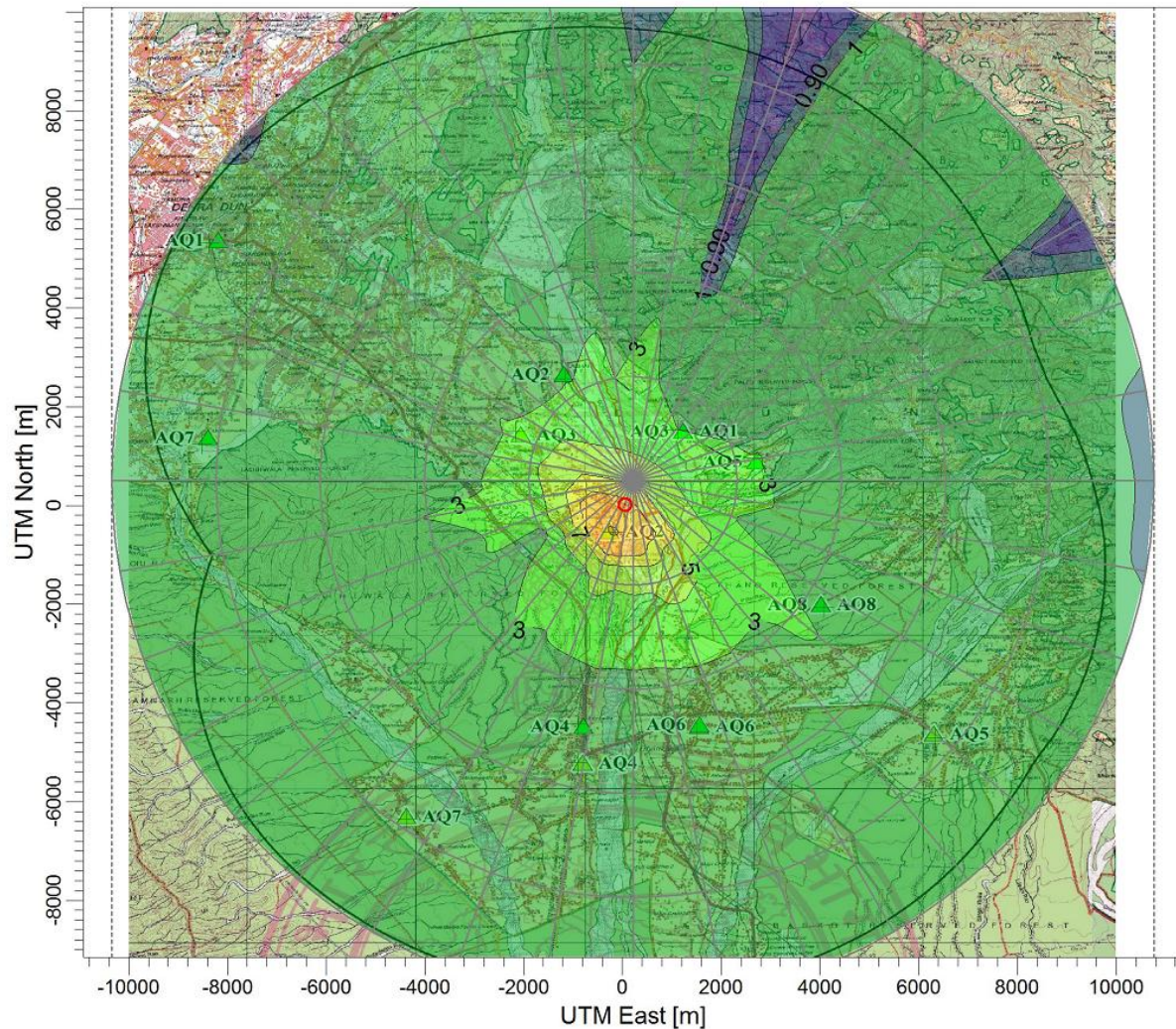
Table 4.6: Incremental Concentration of NO₂ in the Study Area

S.No	Site Name	NO ₂ concentration (µg/m ³)		
		Baseline	Incremental	Cumulative
AQ1	Bhopal Pani	28	0.03	28.03
AQ2	Nakraunda	23	0.09	23.09
AQ3	Balawala	25	0.06	25.06
AQ4	Doiwala	26	0.03	26.03
AQ5	Ranipokhari	26	0.05	26.05
AQ6	Bhaniwala	24	0.03	24.03
AQ7	Bullawala	22	0.01	22.01
AQ8	Hirikhesh	27	0.01	27.01

The resultant concentrations of PM₁₀, PM_{2.5}, SO₂, NO₂ at all locations are well within the NAAQS standard limits. Isopleths were drawn for the pollutant distribution in the area and are shown in Figure 4.1 – 4.4.

PROJECT TITLE:

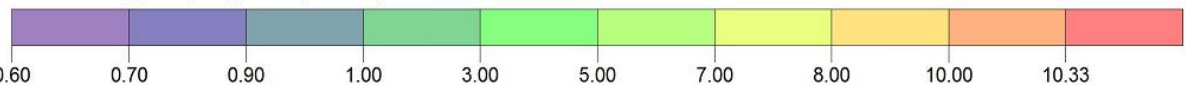
**Mining of Minor Mineral from of Song-1 and Song-2 River bed
GLC for PM10**




PLOT FILE OF HIGH 1ST HIGH 1-HR VALUES FOR SOURCE GROUP: ALL

ug/m³

Max: 10.33 [ug/m³] at (-196.29, -535.34)



COMMENTS:	SOURCES:	COMPANY NAME:	
	2	Mantec Consultants Pvt. Ltd.	
	RECEPTORS:	MODELER:	
	193	Preeti	
	OUTPUT TYPE:	SCALE:	1:140,000
	Concentration	0  5 km	
	MAX:	DATE:	PROJECT NO.:
	10.33 ug/m³	7/6/2021	

AERMOD View - Lakes Environmental Software

C:\Users\Preeti\Desktop\Jakan -1 modelling\Song-1\song-1\song-1.isc

Figure 4.1: Isopleths for PM₁₀ Concentration of Project site

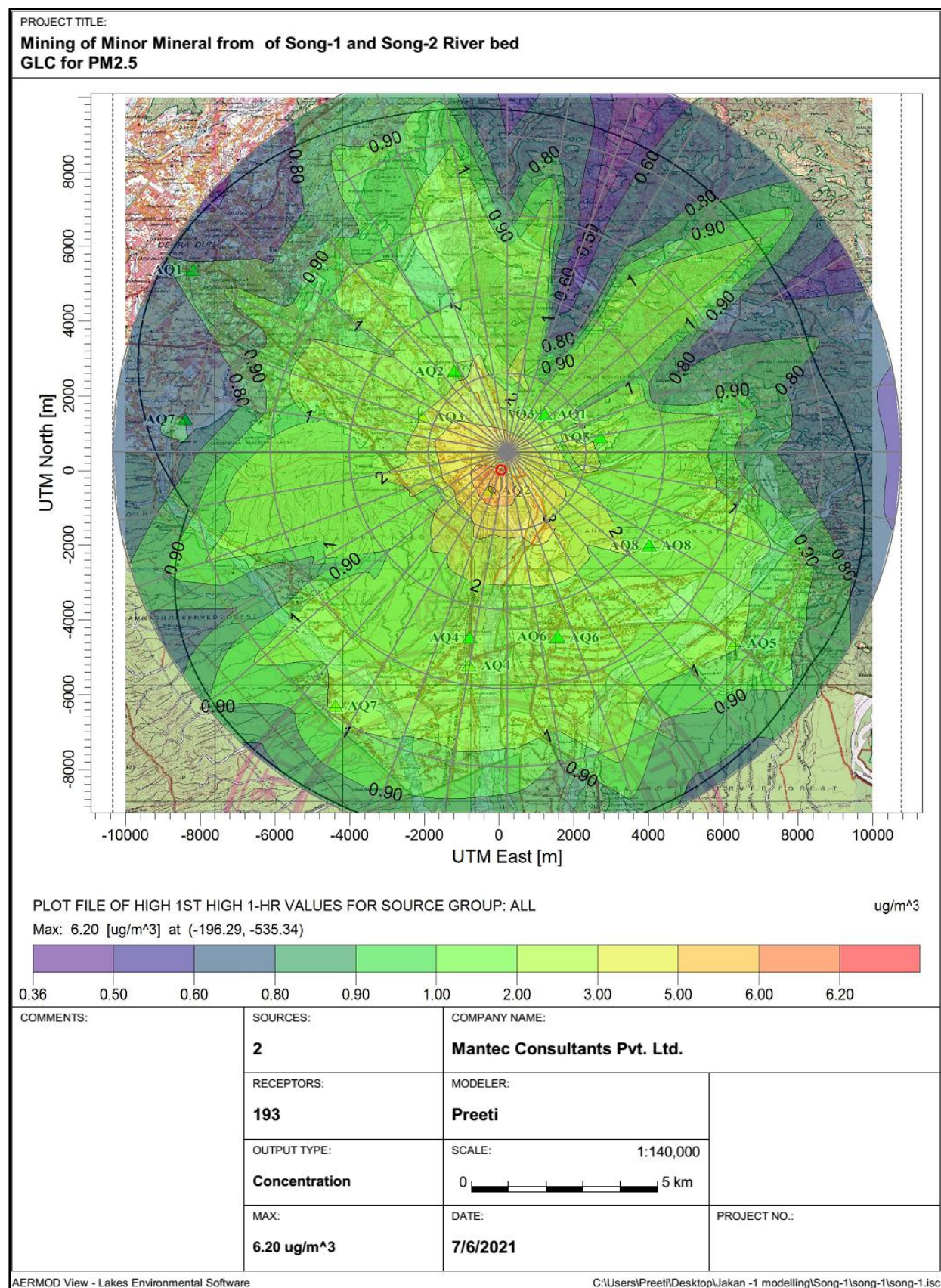


Figure 4.2: Isopleths for PM_{2.5} Concentration of Project site

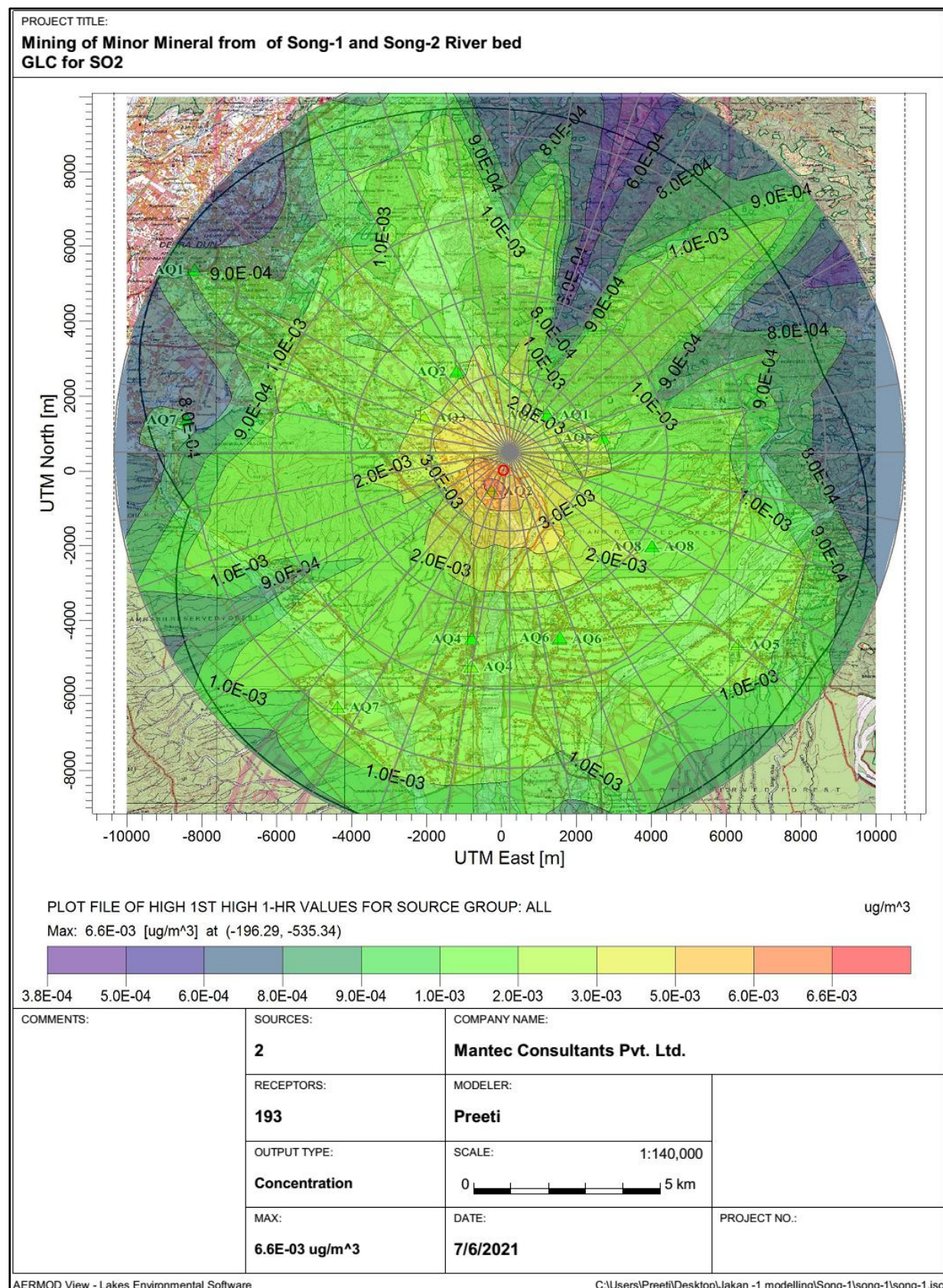


Figure 4.3: Isopleths for SO₂ Concentration of Project site

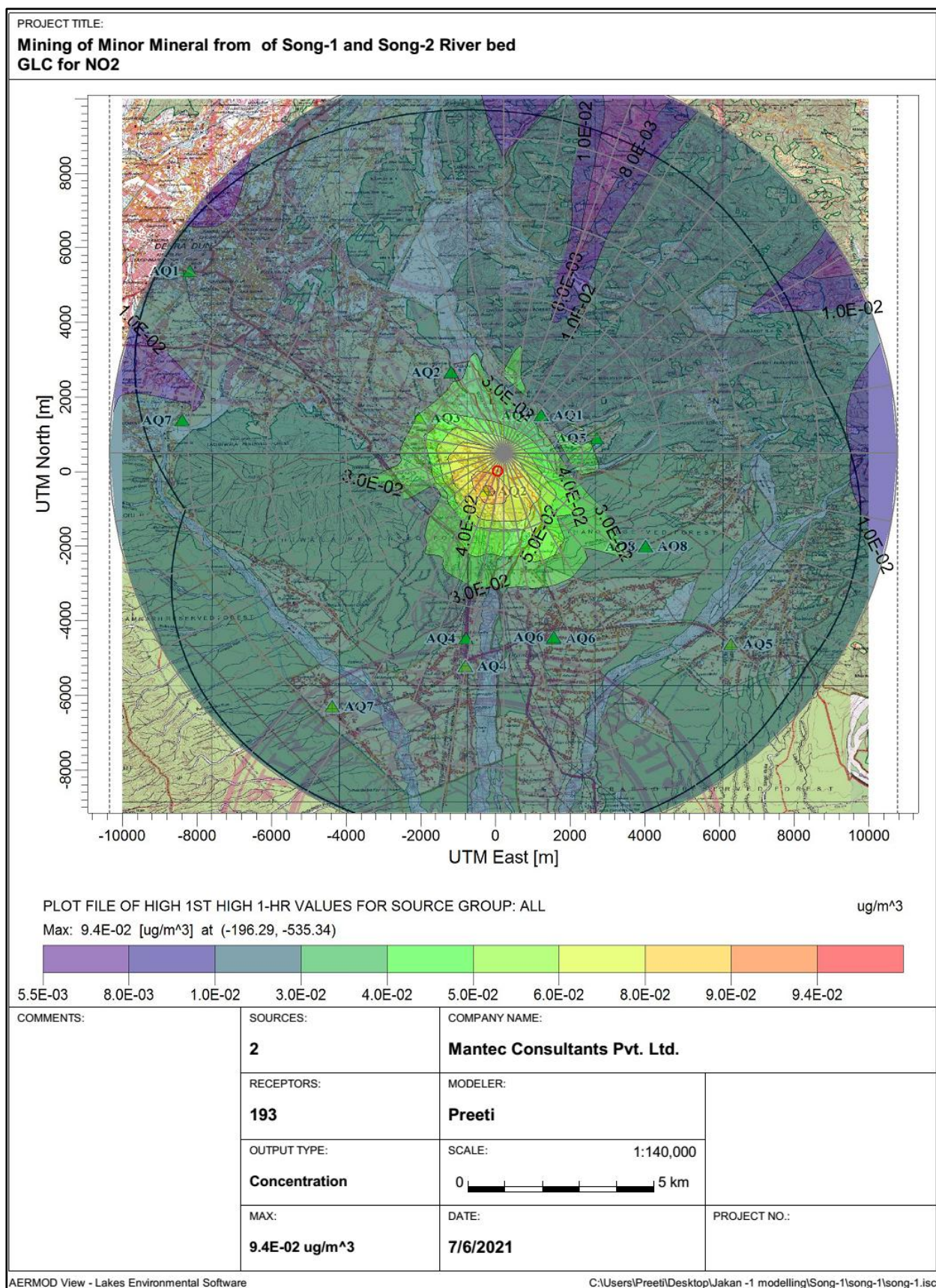


Figure 4.4: Isopleths for NO₂ Concentration of Project site

4.5.6 MITIGATION MEASURES

- Only EUC certified vehicles will be engaged for transportation of minerals.
- The speed of trucks on haul road will be controlled as increased speed increases dust emissions. Overloading of transport vehicles will be avoided.
- Proper mitigation measures like water sprinkling will be adopted to control dust emissions.
- Masks will be provided to workers.
- To control the emissions regular preventive maintenance of equipment will be carried out on contractual basis.
- Green belt of adequate width will be developed.
- Transportation of minerals will be done by covered vehicles only.

4.6 IMPACTS OF NOISE/VIBRATIONS AND MITIGATION MEASURES

The area in general represents calm surroundings. There is no heavy traffic, industry or noisy habitation in the area except the existing mine. As the project is proposed for open cast manual mining method there will be no blasting or drilling activities.

4.6.1 Anticipated Impact

- The source of Noise pollution will be the vehicular movements.
- Noise generated by manual extraction of river bed material, using shovels, crowbars etc., will be negligible.

4.6.2 Mitigation Measures

- Proper maintenance of all transportation vehicles will be carried out which help in reducing noise during operations. No other equipment except the transportation vehicles will be allowed.
- Noise generated by hand equipment will be negligible and will not cause detectable adverse impact.
- Awareness will be imparted to the workers about the permissible noise levels and maximum exposure to those levels.

4.7 IMPACTS OF WATER POLLUTION AND ITS MITIGATION MEASURES

The impact of mining project on groundwater hydrology and surface water regime are site specific and depends upon the characteristics of the mineral, hydrogeology and requirement of groundwater for other uses.

4.7.1 Anticipated Impacts

- The Mining in the riverbed area may cause the groundwater contamination due to the intersection of the water table.
- Waste water disposed from the mining activity may contaminate the surface water.
- River recharges the ground water; excessive mining may reduce the thickness of natural filter materials (Sediments), through which the ground water is recharged.

4.7.2 Mitigation Measures

- Mining will be done above the water table as well as river bed water level therefore much impact on water regime is not accepted.

- Proper analysis/Monitoring will be done to check the ground water
- No waste water will be generated

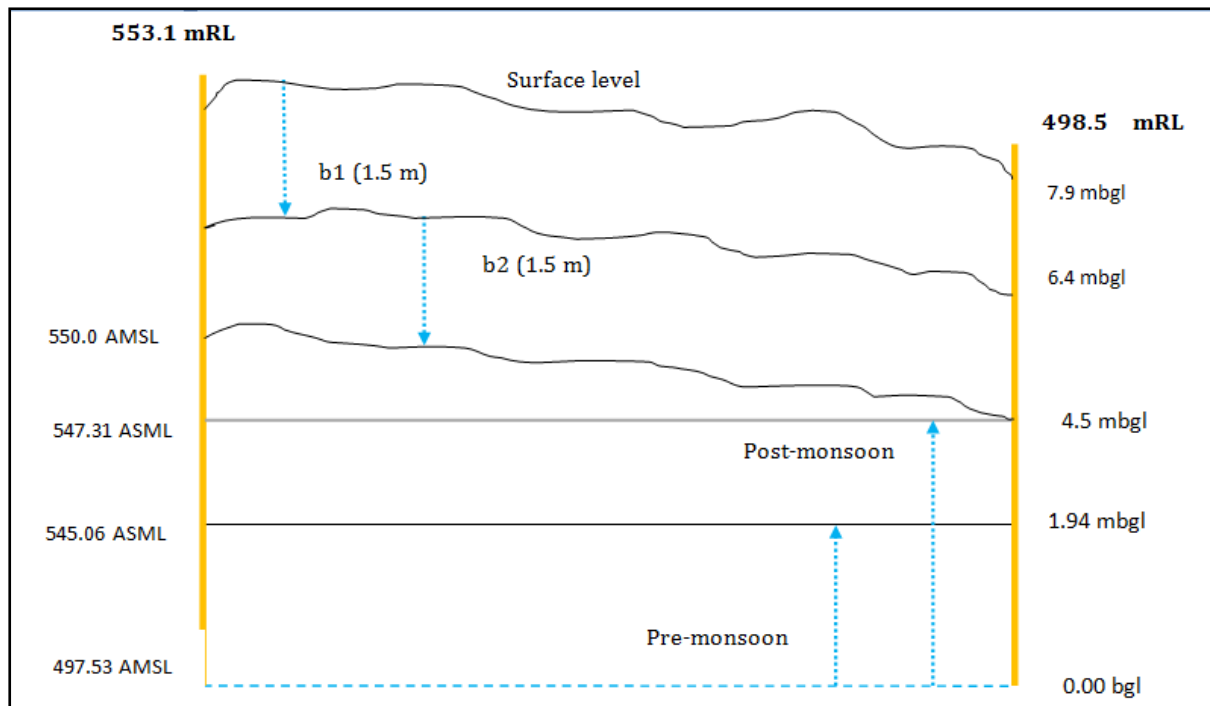


Figure 4.5: Schematic Diagram Indicating Ground Water Table

4.7.3 Introduction:

Rainwater harvesting is a technique of collection and storage of rainwater into natural reservoirs or tanks, or the infiltration of surface water into subsurface aquifers (before it is lost as surface runoff). Due to rapid urbanization, infiltration of rainwater into the sub-soil has decreased drastically and recharging of ground water has diminished.

4.7.4 Artificial Recharge to Ground Water:

Artificial recharge to ground water is process by which the ground water reservoir is augmented at a rate exceeding that obtaining under natural conditions or replacement. Any man-made scheme of facility that adds water to an aquifer may be considered to be an artificial recharge system.

4.7.5 Benefits of Artificial Recharge in Urban Areas:

- Improvement in infiltration and reduction in run-off.
- Improvement in ground water levels and yields.
- Improvement in ground water quality.

4.7.6 Rain water Harnessing Life:

- Recharge of groundwater through storm run groundwater recharge, in a major way need to be launched with concerted efforts by various Governmental and Non-Governmental Agencies and Public at large to build up the water table and make the groundwater resource, a reliable and sustainable source for supplementing water supply.

4.8 IMPACTS ON LAND USE AND MITIGATION MEASURES

Mining is being carried out by opencast manual method, it is expected to affect the land environment essentially. Impact assessment study on land environment can be done by considering land use pattern/land cover, topography, drainage pattern and geological features of the mine site as well as the study area.

4.8.1 Anticipated Impact

- Mining activity will impact river bed topography by formation of excavation voids.
- River bed mining may bring in some change in topography at the nearby area of the mine lease
- Stacks of solid waste generated from mining activity may hinder the flow of water in monsoon season.
- Undercutting and collapse of river banks.

4.8.2 Mitigation Measures

Adopting suitable, site specific mitigation measures can reduce the degree of impact of mining on land. Some of the land-related mitigation measures are as follows:-

- Depth of excavated voids will not exceed more than 3 metre depth or the level of under ground water flow whichever is less.
- Excavated pits will get replenished annually in monsoon itself & will be restored to original.
- Mineral will be mined after leaving the 25% width as a safety zone on both sides of the riverbed.
- Water flow of river will be channelized in the centre of river bed so the bank erosion could be prevented.
- Mining work will be done by open cast manual method only. No machinery or blasting will be used.

4.9 IMPACTS ON SOIL ENVIRONMENT AND MITIGATION MEASURES

4.9.1 Anticipated Impact

- Mining in the riverbed may change complete land use pattern including channel geometry, bed elevation, sediment transportation capacity which can reduce flow of the river and downstream erosion.
- Mining activity may increase the soil erosion and soil degradation which have adverse impact on soil fertility.

4.9.2 Mitigation Measures

- The mining is planned in non monsoon seasons only so that the excavated area will be replenished naturally during the subsequent rainy season for the river bed mining block.
- Mine lease area has been proposed a safety distance of 25% of each side from lease boundary which will protect the banks so channel geometry will not be disturbed.

4.10 IMPACTS ON HYDROLOGY AND MITIGATION MEASURES

4.10.1 Anticipated Impact

- The mining in the riverbed area may cause the ground water contamination due to intersection of the water table.
- Change in topography will divert the river flow.

4.10.2 Mitigation Measures

- The water table will not be intersected during mining in the riverbed as the depth of mining voids will be restricted above the ground water level.
- There is no proposal of any stream modification/diversion due to this mining activity hence there will be no any impact on flow of the river.
- Mining work will be carried out only during dry season in dry river bed.
- In entire process of mining extraction of underground water is not needed.
- Diversion of river course will be strictly restricted in order to maintain the river morphology
- Need of water for drinking and sprinkling purposes along with plantation will be met by tanker supply only.

4.11 IMPACTS ON ECOLOGY & BIODIVERSITY AND ITS MITIGATION MEASURES

4.11.1 Impacts on the Biological Environment

The Song-II mining project location is falling in the reserve forest areas. As per authenticated map provided by DFO, Dehradun, the project site is 5 km from Rajaji Tiger Reserve. Hence, it is essential that certain strict restrictions are followed during operation of the project. The trespassing of the labour, cutting of trees, chance of fire setting, disturbance to the fauna, accidents and human- animal conflicts are some major issues which require proper management and mitigations. Impact on air, water and soil pollution may occur due to the trucks and other vehicles movement. The noise generated due to movement of the trucks may disturb the wild fauna. However, these impacts would be of lower magnitude which will be further minimized through careful mitigation measures.

The movement of birds and animals on the water stream in the mining area will be disturbed. However, the mining activities to excavate the RBM will be carried out only in the dry river beds.

4.11.2 Impacts on Aquatic Ecology

The river Song is a monsoon fed seasonal river which remains dry in most part of year. Hence, it does not harbor any significant aquatic life. More over, the mining activity will remain confined during non-monsoon season in the dry part of the river bed. Therefore, the project is not likely to affect the aquatic ecology.

4.11.3 Impacts on Bird Fauna

The project does not involve any tree felling or removal of vegetation. Therefore, there may not be loss of nesting and roosting habitat of avian fauna. Plantation activities by the UKFDC will add to the shelter places to the birds. Further, the implementation of mitigation measures would reduce the impact on birds, if any.

4.11.4 Impacts on wildlife

Wildlife species live in communities that depend on each other. Survival of these species can depend on soil conditions, local climate, altitude, and other features of the local habitat. Many wildlife species are highly dependent on vegetation growing in natural drainages. This vegetation provides essential food, nesting sites, and cover for escape from predators. Any activity that destroys vegetation near water bodies reduces the quality and quantity of habitat essential for waterfowl, shore birds, and many terrestrial species. The habitat requirements of many animal species do not permit them to adjust to changes created by land disturbance. These changes reduce living space.

The most direct effect on wildlife is destruction or displacement of species in areas of excavation and mining. Mobile wildlife species, like game animals, birds, and predators, leave these areas. More sedentary animals, like invertebrates, many reptiles, burrowing rodents, and small mammals, may be more severely affected.

However, since this mining project does not involve any tree felling and ground vegetation clearance and the mining work will be carried out during dry season only, hence there may not be habitat loss of faunal species due to mining activity. The plantation activities to be undertaken by UKFDC would add to the green cover around project side and improve the habitat of fauna of area.

4.11.5 Habitat loss

Wildlife species live in communities that depend on each other. Survival of these species can depend on soil conditions, local climate, altitude, and other features of the local habitat. Mining causes direct and indirect damage to wildlife. The impacts stem primarily from disturbing, removing, and redistributing the land surface. Some impacts are short-term and confined to the mine site; others may have far-reaching, long-term effects.

The most direct effect on wildlife is destruction of wildlife habitat or displacement of species in areas of excavation and piling of mine wastes which will create obstacles to wildlife corridor. Mobile wildlife species, like game animals, birds, and predators, leave these areas. More sedentary animals, like invertebrates, many reptiles, burrowing rodents, and small mammals, may be more severely affected.

Many wildlife species are highly dependent on vegetation growing in natural drainages. This vegetation provides essential food, nesting sites, breeding sites and cover for escape from predators. Any activity that destroys vegetation near water bodies reduces the quality and quantity of habitat essential for waterfowl, shore birds, and many terrestrial species.

The habitat requirements of many animal species do not permit them to adjust to changes created by land disturbance. These changes reduce living space. The degree to which animals tolerate human competition for space varies. Some species tolerate very little disturbance. In instances where a particularly critical habitat is restricted, such as a lake, pond, or primary breeding area, a species could be eliminated.

However, in the proposed mining project; there may not be loss of habitat due to mining work, as the entire project site is a unvegetated dry river bed. The plantation activities to be undertaken by UKFDC would add to the green cover around project side.

4.11.6 Mitigation of Impacts on Biological Environment

The project may not directly affect any natural habitat, flora and fauna when a careful mining activity is carried out with all necessary control measures to minimize the air, water, noise and soil related impacts as recommended in the relevant sections. However, following mitigation measures should be adopted to further minimize the impact on biological environment:

- The mining activities should be carried out as per approved mining plan with hand tools only in order to lower the impact on river bed environment. No machinery should be used for mining purposes.
- Dry pit mining will be followed which means mining at all times will be above the water flow level of river. Mining activity will be immediately stopped when water comes in the mining pits.
- Mining will be carried out during dry season only when the project site remains completely dry. Hence, there will be no disturbance to the aquatic habitat.
- 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.
- Mining will be restricted in the 25% from both sides of the river bank to avoid river bank erosion and consequent channel migration.
- Stream will not be diverted to form inactive channel.
- Mining at the concave side of the river channel will be avoided to prevent bank erosion.
- Mining will be done during day-time only; i.e. between sunrise to sunset only.
- The conservation plan prepared for the Schedule-I species should be implemented by the UKFDC.
- UKFDC shall ensure that their workers and other staff during operation phase shall not be involved in poaching and hunting activities of any wildlife around the project site.
- No resources from adjoining forests shall be extracted (i.e. fuel wood, soil, etc.) by workers.
- The suggested air and water pollution control measures should be implemented to minimize impact on surrounding vegetation, forest area and downstream aquatic life.
- Dust is mainly generated due to unpaved roads. To mitigate the impact, regular water sprinkling should be carried out on unpaved roads.
- The speed limit for the trucks must be set with restriction on blowing horn to reduce noise due to vehicular movement. This will mitigate impact on wild fauna.
- Use of plastic bags shall be strictly prohibited in the project area.
- Awareness programme among the staff and labour must be propagated for conservation of the biodiversity.
- If wildlife are noticed crossing the area, they will not be disturbed at all.
- The project will support Forest department in raising awareness and anti-poaching law enforcement activities in the surrounding of project site.
- The UKFDC should ensure no tree felling or any other disturbance is caused to the biological environment of the study area due to the project activity.
- The UKFDC should undertake plantation in maximum available area.

4.12 SOCIO ECONOMIC IMPACT OF THE PROJECT AND SAFETY MEASURES

4.12.1 Impact on the Demographic Composition

Resulting of the proposed project, there will be no substantial increase in inclusive population. of the study area as preferably inhabitant people will be engaged for employment. Hence, the chances of in-migration of people from outside the study area are the least. Accordingly, there will be no variation in the total population of the study area including that of sex ratio, when the mine starts operating. Since there will be no significant change in population, the overall sex ratio will remain more or less same.

- **Impact on Employment Opportunities**

The project will generate 415 employment opportunities for the local people in the mining project. Indirect employment is also expected due to the associated mining activities. It is a positive impact of the project since it will be providing employment opportunities to the local people. The benefits of employment to the job seekers are expected to include, at a household and individual level, with increase in socio-economic and health status, improvement in their standard of living condition, and the benefits from increase in household expenditure on education & healthcare resources.

- **Impact on Law and Order**

No major law and order problem is envisaged due to the proposed project. It is expected that the workers will attend to their duties and return to their homes after the day's work.

4.12.2 Demand & Supply of Sand, Bajri and Boulder in the Market

With the commencement of the proposed mining project the supply of sand, bajri and boulder will increase and the gap between demand and supply will decrease to some extent. In construction activities and expansion of highways (State/National) of the area raw materials like sand bajri and boulder can be accomplished from the proposed project. Therefore, there will be a good demand of the minerals in the domestic market and the proposed project will positively fulfill this demand and reduce the gap.

4.12.3 Impact on Agriculture

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 is likely to be free from annual floods, which destroy standing crops land and property.

4.12.4 Impact on Industrial Activities

Owing to the mining activities, the study area may witness industrial rise in the area. It is expected that few crushing unit may come up in the area to convert the boulders into smaller particles viz. bajri and sand.

4.12.5 Impact on Road Development

Movement of tractors-trolleys and other vehicles to and fro the mining site is expected to increase substantially, when mining will start. Hence, there is a scope for road development in the mining area. Further, there are risks of accidents during loading of minerals into tractors-trolleys and transportation to market. However, possible accidents can be avoided by taking due care & precautions and proper maintenance of the road.

4.12.6 Impact on Health

There are no chances of occurring diseases, due to the mining of sand, bajri & boulder. To avoid respiratory problem during extraction, loading and unloading of sand, bajri and boulder, necessary protection shall be taken.

Few safety measures are outlined below:

- a) **Safe Working Environment:** The project proponent may ensure health & safety of all the employees at work. All efforts can 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 can be ensured that working arrangements are not hazardous to employees.
- b) **Provision of First Aid:** In case of any accidents arising out of the proposed mining operations, timely and prompt first aid treatment is, often, the most important tool. Suitable first aid arrangements can be made at the site for rendering immediate first aid in case of any injury.
- c) **Medical Examination:** For all mine workers, medical examination can be organized on periodical basis.
- d) **Health Education:** Adequate health education and information related to the job can be provided to the workers so that their health & safety can be ensured.
- e) **Tie-up with the Nearest Hospital for Medical Assistance:** To meet the medical needs of the mine workers in case of accidents, tie-up with nearest hospitals can be made. Efforts can be made to reserve a few beds in the nearest hospitals for the workers of the mining project to meet any emergency. This can ensure timely medical aid to the affected persons.
- f) **Supply of Mask and Gloves:** The workers exposed to dust can provide with dust masks to prevent them from getting affected by respiratory diseases. Gloves can be provided to workers working with hand tools, to ensure safety of their hands.
- g) **Administration of Anti-venom Injections:** Provision of Anti-venom therapy can be made available for administration to the workers in case of snake, spider and insect bites, while working in the mine. Some persons in the mine can be given necessary training for the purpose.
- h) **Special Telephone Number:** A special telephone number can be made available to the workers in case of emergency so that they can dial the same in case of any accident.

4.13 CORPORATE SOCIAL RESPONSIBILITY

As per the Office Memorandum F.No. 22-65/2017-IA.III dated 30.09.2020 of the Ministry of Environment, Forest and Climate Change regarding "Corporate Environment Responsibility" (CER), the project proponents are required to allocate funds towards environment development activities as proposed by the project proponent or prescribed by EAC or SEAC, as the case may be, shall be a part of EMP and the commitments made by project proponent to address the concerns raised during Public consultation. So, CER cost & activities will be proposed after public hearing.

4.14 IMPACTS DUE TO SOLID WASTE/OVERBURDEN AND MITIGATION MEASURES

4.14.1 Anticipated Impact

- As there is practically no soil cover observed in the river bed, this RBM project does not involve any waste generation. Thus, no waste dump sites are needed for the project. However, there will be 415 workers on site.
- No municipal waste other than domestic sewage shall be generated.
- Some food wastes can be expected to be generated which if not disposed properly will render the site dirty.

4.14.2 Mitigation Measures

- Only clayey soil generated during mining process, will be used in plantation works.
- Domestic sewage will be disposed off into septic tanks followed by soak pits
- Solid wastes generated from the personal habits of people such as used bidis, waste paper, food remains etc. cannot be ruled out. Dustbins shall be provided at the rest places.
- Sufficient number of bio- toilets will be provided to workers at safe places of mining site.

4.15 TRAFFIC ENVIRONMENT

4.15.1 Anticipated Impact

- The increase in traffic density will lead to the air pollution and it cause the effect on human health like damage to lung tissue, cancer, asthma etc.
- The movement of vehicles cause the noise pollution.
- Accidents may be occurring due to fast movement of vehicles.

4.15.2 Mitigation Measures

- Vehicles with PUC certificate will be hired. Regular maintenance of vehicles will be done to ensure smooth running of vehicles.
- Face masks will be provided to all workers involved in mining work.
- Regular health checkups camps will be organised for the safety purpose of the workers.
- Unnecessary blowing of horn will be avoided.
- To avoid accidents the speed of vehicles will be kept slow in mining area and near habitation areas.

4.16 IMPACTS ON GEOLOGY AND MITIGATION

4.16.1 Anticipated Impact

- Mining work can change the slope of mining area which will create soil erosion and divert rain water runoff channel.

4.16.2 Mitigation Measure

- The depth of the mining in the river bed will not exceed the limit of 3.0 meters which will get replenished every year during monsoon season.
- To protect the banks from erosion, mine lease area has been proposed leaving a safety zone of 25 % of each side from lease boundary.
- Plantation will be done along the mine lease area.
- Water will be proposed for sprinkling on unpaved roads to avoid soil weathering.

4.17 MINE CLOSURE PLAN

4.17.1 General

Mine closure plan is one of the most important requirements in the environment management of mining projects. The closure operation is a continuous series of activities right from the commencement to decommissioning of the project. Therefore, progressive mine closure plan is specifically included in the mining plan, which is to be reviewed every five years in the scheme of mining. The primary aim is to ensure that the following broad objectives along with the abandonment of the mine can be successfully achieved:

- Protection of public health and safety of the surrounding habitation.
- Minimization of environmental damage.
- Conservation of valuable attributes and aesthetics.
- Counter balancing the adverse socio-economic impacts.

4.17.2 Reason for Closure

The progressive mine closure plan has been prepared in compliance of Uttarakhand Minor Mineral Concession Rules 2001 under MMCR 1960. No immediate closure is planned as sufficient reserves are available to carry on the activities. There is market potential in domestic demands.

4.17.3 Statutory Obligations

- The mining contractor is bound to submit the Progressive mine closure plan either with Mining plan or Scheme of Mining.
- Mining contractor is bound to follow the terms and conditions as will be stipulated in the mining contract.
- In addition to it the rules pertaining to the Protection of Environment *i.e.* Environment Act, Environment Rules and other associated rules for the protection of environment will have to be followed.
- During the course of mining the rules stipulated in Mines Act, Mines rules Metalliferous Mines Regulation 1960 and UMMCR, 2001 will be followed.
- All other rules pertaining to the mining existing at that time will be followed during the course of mining activities.

4.17.4 Disposal of Mining Machinery

The sand, bajri and boulders mine is manual open cast. Hence disposal of mining Machineries are not required.

4.17.5 Infrastructure

In River Bed RBM (Sand, Bajri & Boulder) is excavated by manual open cast mining method. No mechanization is required. The tracks having width of 3.0 m and gradient 1:20 to 1:50 will be made for advancement of mining faces and for the transportation of RBM and waste material. There will not be any change in existing infrastructure.

4.17.6 Safety and security

Each worker employed in the mine will be provided helmets, gloves and shoes will be used for working in the benches. Protective works like parapet walls, garland drains shall be provided before the mine/pit is abandoned. A worker in a mine should be able to work under adequately

safe and healthy condition. Safety of the mine and the employees is taken care of by the Mining rules and regulations. The minerals will be mined out in a uniform wash so that the river flow/course shall not get disturbed. Mining is to be done leaving safety barrier on both sides and maximum barrier should be on the concave side of the river, preferably the flow channel (excavation void) created should be kept straight so as to help avoid erosion. River banks will not be excavated to form access ramps. Only excavated river gravel should be used to deposit against the river bank to form access ramps.

4.17.6 Waste Management

The RBM containing sandy soil will be stacked separately and these dumps are temporary in nature. The dumping will be undertaken manually. The toe wall having width 1.5m and height 1.0m will be made along the side and slope of the soil and width and height 1.5m each retaining wall for protecting RBM dump to avoid the wash off material during intermittent rains.

4.17.7 Air Quality Management

The lease area is situated in the river bed. The manual mining without drilling and blasting has been proposed. Therefore the impact on air environment will be negligible. Mining and allied activities are going on a comparatively small scale; the existing air is absolutely clean.

4.17.8 Mined Out Land

Plantation is proposed along the slope on both bank of the river. The mining will commence from the lower levels and will advance towards the higher levels.

CHAPTER-5 : Analysis of Alternatives (Technology & Sites)

5.1 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.

5.2 ALTERNATIVE FOR MINE LEASE

- During monsoon season, when rivers reach high stage, Song River also bears significant catchment area and it transports river bed material 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 Song river bed (136.85 Ha.). The mining of the material will be done by opencast manual method in riverbed. The mining will be done as per laid down procedures Uttarakhand Minor Mineral Concession, Stocking, Transportation of Minerals and Prevention of Illegal Mining Rules, 2005. The mined out area in river bed block will get replenished annually after monsoon. Therefore, no alternate site is suggested as existing land use of mine lease classified as "River Body" and will continue to be so even after the current mining project is over.

5.3 ALTERNATIVE FOR TECHNOLOGY AND OTHER PARAMETERS

Some alternatives considered during EIA study are discussed below:

S.No.	Particular	Alternative Option 1	Alternative Option 2	Remarks
1	Technology	Opencast manual	Opencast semi mechanized mining	Opencast manual for riverbed is preferred. Benefits: No electric power requirement Minimal noise will be generated Minimal air pollution will be generated Overburden will not be generated
2	Employment	Local employment	Outsource employment	Local employment is preferred. Benefits: Provides employment to local people along with financial benefits. No residential building/housing is required

3	Laborer transportation	Public transport	Private transport	Local labors will be deployed so they will either reach mine site by bicycle or by foot. Benefits: Cost of transportation of men will be negligible.
4	Material transportation	Private transport	Private transport	Material will be transported by local trucks/trolleys on the contract basis Benefits: It will give indirect employment to local people.
5	Water requirement	Tanker supplier	Ground water/surface water supply	Tanker supply will be preferred. Benefits: No change in the surface water or ground water quality
6	Road	Haul road	Metallic road	Only old Haul road will be used for transportation of minerals which will require only simple repairing. Cutting of trees will not require in repairing work. Benefits: Less distance, less fuel consumption, no tree felling required in repairing of old haul road.

5.4 Summary

We have analyzed all the options 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-6 : ENVIRONMENTAL MONITORING PROGRAM

6.1 INTRODUCTION

Regular monitoring of environmental parameters of immense importance to assess the status of environment during project operation. With the knowledge of baseline conditions, the monitoring programme will serve as an indicator for any deterioration in environmental conditions due to operations of the project, which will enable to take suitable mitigation steps in time to safeguard the environment.

Monitoring is important to measure the efficiency of control measures. An environmental impact assessment study is carried over for a specific period of time and the data generated for that specific period cannot bring out all variations induced by the natural or human activities. Therefore, regular monitoring programme of the environmental parameters is essential to take into account changes in the environmental quality. The objectives of monitoring are to:-

- Verify effectiveness of planning decisions;
- Measure effectiveness of operational procedures
- Confirm statutory and corporate compliance; and
- Identify Unexpected changes

6.2 Identify Unexpected Changes, Environmental Monitoring and Reporting Procedures

Monitoring will confirm that emissions are within prescribed limits. This will take the form of direct measurement and recording of quantitative information, such as quantity and concentrations of discharges, emissions and wastes for measurement against corporate or statutory standards, consent limits or targets. It may also require measurements of ambient environmental quality in the vicinity of a site using ecological/biological, physical and chemical indicators. Monitoring may include socioeconomic interaction, through local liaison activities or even assessment of complaints.

The preventive approach by management may also require monitoring of process inputs, for example, type and method used, resource consumption, equipment and pollution control performance etc. Monitoring will also be required to meet compliance with statutory and corporate requirements. Finally monitoring results will provide the basis for auditing.

6.3 Environment Monitoring Schedule

Post project monitoring will be carried out as per conditions stipulated in Environmental Clearance Letter issued by MoEF&CC, Consent issued by SPCB as well as according to CPCB guidelines. Details of the proposed environmental monitoring schedule, which will be undertaken for various environmental components, are detailed below in **Table 6.1**

Table 6.1: Monitoring Schedule

S.NO	Activity	Schedule
Air Pollution Monitoring		
1.	Ambient air monitoring of parameters specified by CPCB in their air consents from time to time within the mining lease	Twice in a year except monsoon.

2.	Ambient air monitoring of parameters specified by CPCB in their air consents from time to time at stations outside the mining lease	Twice in a year except monsoon.
Water Quality Monitoring		
3.	Monitoring of Ground Water sample as per IS: 10500	Twice in a year except monsoon season
4.	Monitoring of Sur face Water sample as per IS: 2296	Twice in a year except monsoon season
Noise Quality Monitoring		
5.	Noise in the ambient atmosphere near the mine lease area	Twice in a year except monsoon season
Greenbelt Maintenance		
6.	Monitor schedule for Greenbelt development as per approved mining plan	Once in a year
Soil Quality Monitoring		
7.	Soil quality analysis from the samples collected from the mine site and nearby areas	Twice in a year except monsoon season
Occupational Health and Safety Monitoring		
8.	Occupational health and safety monitoring	Once in a year

6.4 MONITORING OF VARIOUS PARAMETERS

6.4.1 Monitoring Methods

The mine site is considered as core zone and the area lying within 10km radius from the mine site is considered as buffer zone.

6.4.2 Drainage

Local workers will be deployed for the project. Therefore no concrete based sewerage system will be constructed. Domestic sewage generated shall be disposed into the septic tanks followed by soak pits. No domestic water will be disposed off in to the river body or near area. Regular checking will be carried out to find any blockage due to silting or accumulation of loose material. The drain will also be checked for any damage in lining/stone pitching etc.

6.4.3 Slop Failure

The proposed mining for sand, bajri and boulder from the river bed of Song river will be done by opencast manual method up to a depth of 3.0 meter from the ground level. There will be no slope formation as excavated pits will be backfilled by the solid wastes (Clayey soil) generated during the mining of sand, bajri and boulder and it will get replenished during monsoon. Hence there will be no slope failure.

6.4.4 Blasting Effects

The proposed project is for extraction of sand bajri and boulder and there is open cast manual method of mining. Hence Blasting is not required.

6.4.5 Air Quality Monitoring

Ambient air quality monitoring will be done in both upwind and downwind directions along with the adequate meteorological measurements for proper interpretation of data, PM_{2.5}, PM₁₀, SO₂, and NO₂. The number of monitoring stations, air pollutants and frequency of monitoring will be decided as per the CPCB guidelines in 2009. Meteorological stations will be monitored for wind directions and speed, rainfall, temperature, humidity and evaporation.

6.4.6 Water Quality Monitoring

Monitoring of surface run-off and ground infiltration will be done once in every season except monsoon. Quality of groundwater and surface water samples will be analyzed for all the parameters as per IS-10500 and IS-2296 respectively.

6.4.7 Noise Quality Monitoring

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 nearby villages for studying the impact due to higher noise levels for taking necessary control measures at the source.

6.4.8 Occupational Health and Safety

Health check-up for the workers will be conducted at regular intervals of two months in a year. The health camps status will be monitored and the information will be furnished to the approving authority. Environment Management Cell will also coordinate with general public, regulatory authorities, local administration to appraise environmental performance of the mine.

6.5 REPORTING SCHEDULE AND MONITORING DATA

The frequency of reporting of monitored data will be on six monthly bases to the State PCB and to Regional Office of MoEF&CC, New Delhi. Compliance report will be submitted twice in a year for 6 months interval. The Environmental statement will be prepared for the entire year of operations and will be regularly submitted to regulatory authorities.

6.6 Hierarchy

UKFDC shall conduct all its operations in a manner that is protective of the environment and health and safety of employees, customers and the community. In fulfillment of this commitment, they shall maintain continuing efforts to:

- Comply with all applicable safety, health and environmental laws and regulations.
- Enhance Safety, Health and Environment (SHE) awareness among employees and associated stakeholders through effective communication and training.

Environmental Policy of UKFDC is attached as **Annexure -IX**

The hierarchy of Environment Monitoring cell is given below:

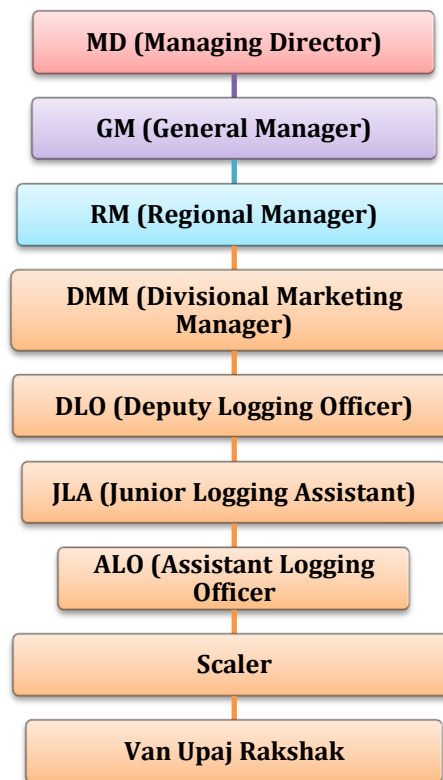


Figure 6.1: Environment Monitoring Cell

6.7 Responsibilities for Environmental Management Cell (EMC)

The responsibilities of the EMC include the following:

- Environmental Monitoring of the surrounding area
- Developing the green belt/Plantation
- Ensuring minimal use of water
- Proper implementation of pollution control measures
- Access the risk area
- Implementation of QMS
- Conducting Internal Audits
- Closing of NCs and conduction Management Review Meetings.

6.8 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 sit using ecological/biological, physical and chemical indicators. Monitoring may include socio-economic interaction, through local liaison activities or even assessment of complaints.

The key aims of environmental monitoring are:

- 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.

- To verify the evaluations made during the planning process, in particular with risk and impact assessments and standards and target setting and to measure operational and process efficiency.
- Monitoring will also be required to meet compliance with statutory and corporate requirements.
- Finally, monitoring results provide the basis for auditing, *i.e.* to identify unexpected changes.

6.9 LOCATIONS OF MONITORING STATIONS

The location of the monitoring stations was selected on the basis of prevailing micro meteorological conditions of the area like; wind direction and wind speed, relative humidity, temperature. Locations for the post project monitoring shall be as under.

Table 6.2: Locations of Monitoring Stations

S. No.	Description	Location
1.	Ambient Air Quality	Lease area, Villages in down-wind direction from the Lease Boundary
2.	Noise Level Monitoring	Lease Boundary, High noise generating areas
3.	Water Level and Quality	Nearby Surface and Ground water sources
4.	Soil Quality	Lease area and Villages within study area.

6.9.1 Reporting Schedule during Operation of Mine

After completion of analysis, copies of all the analysis reports will be sent to SEIAA Regional Office and SPCB. Copies of the reports will be maintained in the office and will be made available to the concerned inspecting authorities.

CHAPTER-7 : ADDITIONAL STUDIES

7.1 General

Mining are associated with several hazards that pose impacts on employees & surrounding area necessitating adequate implementation of Safety and health measures. Hence, mine safety is one of the most essential aspects of any working mine. It is necessary to consider specific issues as applicable to the individual projects to take precautions against these issues. A worker in a mine should be able to work under condition, which are adequately safe and healthy.

7.2 PUBLIC CONSULTATION

Public hearing is very significant part of the process of public participation envisaged under the guidelines issued by SEIAA, Government of India. It facilitates involvement of all the stake holders of the project which is essential for ensuring smooth running of project and benefitting all sections of society in the process of economic development of the region. The Final EIA/EMP will include all the public issues after conducting the public hearing.

7.3 REPLENISHMENT STUDY

A study was undertaken by ICAR-Indian Institute of Soil and Water Conservation, Dehradun (Uttarakhand) under a consultancy project sponsored by Divisional Logging Manager (Khanan), Uttarakhand Forest Development Corporation, Dehradun (Uttarakhand) on 'Assessment of extractable river bed material from river Song I, II & III and Jakhan I & II at Dehradun for the year of 2019-2020" in the defined reach of the river.

Based on the survey, assessment of the sediment deposits, it is assessed that the safe limit for extraction/removal of deposited river material from Song in 2019-2020 during premonsoon season is 176663.34×2.2) 388659.348 TPA & during post monsoon season is $(200865.64 \text{ cum} \times 2.2)$ 441904.408 TPA & This quantity has been arrived upon considering that hydrological profile of the river flow is guided to the centre of the river so as to minimize risk of steam bank erosion.

The following recommendations for future are also made for the assessment of permissible quantity of RBM to be made from the river and the methodology of extraction to be followed so as to maintain the hydrological profile of the river along with the extraction of the RBM.

- As the method and depth of extraction of RBM to be made will depend upon the pattern and quantity of RBM deposited during the monsoon, , hence the quantity of RBM extraction is to be estimated by surveying the river preferably before the monsoon (after excavation of RBM is over i.e. in the month of June) and after the monsoon is over (before the excavation of RBM starts i.e. in the month of October/November)
- The extraction of RBM from the seasonal river Song-2 may be kept from January to May.
- The very big boulders in the river should not be removed from the junction of the hilly area and plain area as these big boulders serve for dissipating the energy of the flowing water.
- The extraction may be carried out as per the methodology explained in the report and the concerned authorities responsible for extraction may please be accordingly.
- As explained to the staff present during survey, permanent pillars on both sides of the river at every one kilometre of length may be erected as permanent bench post. Further the pillars constructed to demarcate width of extraction leaving 25% of river width from the

bank may be erected with a depth of 1.5m below the ground and 1.2 m above the ground. Probably this may not be carried over by river during monsoon and hence reduce the periodical construction of pillars every year. However this year only 5-6 such pillars may be erected to observe its stability. While erecting the pillar, the corner of the pillar may face upstream.

- The four pillars are to be constructed to help in confining the extraction of RBM may please be marked from the right hand side of the river to the left hand side of the river as 1/1, 1/2, 1/3 and 1/4 starting from zero length of the river and then at the interval of about 1 km distance in the river length till the last of the river reach up to which the extraction of RBM is made. These will serve as the permanent bench mark for the survey of the cross section.

7.4 HAZARD IDENTIFICATION AND RISK ASSESSMENT METHODOLOGY

Risk analysis is the systematic study of uncertainties and risk encountered in various areas in the proposed project. Risk analysis identifies the risks involved in the mining operations and related activities. River bed mines also have the risks which need to be addressed for which a disaster management plan has been formulated with an aim of taking precautionary steps to avert disasters. In this chapter the types of risk involved, risk potential and impact on environment, lives and property will be discussed.

Risk assessments will help mine operators to identify high, medium and low risk levels. This is a requirement of the Occupational Health and Safety Act 2000. Risk assessments will help to prioritize the risks and provide information on the need to safely control the risks. In this way, mine owners and operators will be able to implement safety improvements. The possible risks in the case of riverbed mining project during the mining operation are given below:-

1. Accident due to Vehicular movement
2. Possibility of Earthquake as mine lease area falls in Seismic Zone-IV
3. Inundation of the mine lease if excessive rainfall takes place
4. Accident due to Failure of Pit Slope
5. Uneven/ Irregular mining of sand, bajri and boulder.
6. Damage to River bank due to access of Ramps.
7. Sand, bajri and boulder storage stacks stability Failure.
8. Fires on large surface

- **Mitigation measures for Accident due to Vehicular movement**

- The movement of vehicles within the mine lease area should be carried out directly under the supervision and control of the management.
- The vehicles will be maintained in a good condition and checked thoroughly at least once in a month by the competent person authorized for the purpose by the management.
- Road Signs will be provided at each and every turning point up to the main road.
- Regular training will be provided to the operators by the company or the contractors.
- A statutory provisions of the fences, constant education, training etc will go a long way in reducing the incidents of such accidents.

- **Mitigation Measures for Earthquake as mine lease area falls in Seismic Zone-IV**

Proper training will be provided to the labours for earthquake and the area will be evacuated as soon as there is any news or signal for earthquake.

- **Mitigation Measures for Inundation**

Mining will be done during the non-monsoon periods so there shall be no problem of inundation is likely to happen.

- **Possible Risks Due to Failure of Pit Slope & Its Control**

At present the mining is proposed in a mild sloping forest land in river bed. Pits will be created of limited depth of 3.0 m only, thus the chance of failure of pit slope does not exist.

- **Possible Risks Due to Uneven/ Irregular mining of sand, bajri and boulder**

Due to uneven/irregular thickness of the minerals, river bed mining may result in ponds to develop. Proper management of even excavation can overcome this. Mining will be done for ½ meter thick strip at a time in the direction of river, to avoid ponding effect and maintaining the uniform surface.

- **Possible Risks Due to Failure of waste Dump & Its Control**

No waste dump is created therefore the question of failure of waste dump does not exist.

- **Possible Risks Due to Fire & Its Control**

- The operation does not anticipate any fire disaster.

7.4.1 Measures to Prevent Accidents Due to Trucks and Dumpers

- All transportation within the main working should be carried out directly under the supervision and control of the management.
- High speed driving of Trucks, Dumpers and Tractors will not be permissible inside the mine area or near habitation.
- The vehicles will be maintained in good condition and checked thoroughly at least once a month by the competent person authorized for the purpose by the management.
- Road signs will be provided at each and every turning point up to the main road (wherever required).
- To avoid danger while reversing the vehicles, especially at the embankment and tipping points, all areas for reversing of trucks/ tippers should as far as possible be made man free.
- A statutory provision of the fences, constant education, training, etc. will go a long way in reducing the incidents of such accidents.
- Haul trucks should be oriented essentially perpendicular to the berm, while unloading.

7.5 Disaster Management Plan:

The possible risks in the case of river bed mining project are bank erosion, floods, accidents due to transportation etc. At present the mining is proposed in a mild sloping forest land in riverbed. Pits will be created of limited depth of 3.0m from first to fifth year or river water levels whichever less, thus the chances of failure of pit slopes are negligible, so benches should be made with the aspect of angles of response in the light of cohesion and angle of friction.

When the mining will reach up to the optimum economical depth then backfilling will commence by action of replenishment to restore the topography of the area. The mining faces shall be dressed properly because any hanging boulders/loose material may create fatal accidents to the labourers while working in the pit. The mine shall be critically examined for its

prone to any natural hazard and assessment regarding danger of hazard and precautions to be taken and should be reviewed so that chances of slope failure will be minimized.

7.5.1 Other Possible Measures to be taken to control Disaster Due to River Bed Mining

- Identification & determination of safe clearances by the height of river bed & thickness of sand, bajri and boulder to be extracted from the close vicinity of the bank.
- Collection of minerals/working shall be started from the center towards the bank periphery in ½ meter slice so that the river course could not get affected.
- The minerals will be mined out in a uniform way so that the river flow/course shall not get disturbed in its uniformity.
- River bank areas, under operation will be protected by avoiding unauthorized RBM excavation along rivers as that may cause instability to the river bank.
- River banks will not be excavated to form access ramps.
- Only excavated river gravel should be used to deposit against the river bank to form access ramps.

7.6 Natural Hazards in the Dehradun District

The following are the hazards that have a probability of occurrence in Dehradun, based on the history of their occurrence in the district and their probability:

1. Earthquake
2. Flood
3. Fire/Forest Fire
4. Landslide
5. Accidents
6. Industrial/Chemical Hazard
7. Lightening & Cloud Burst

7.7 Occupational Health and Safety in River Bed Mining

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. *DGFASLI* working under the Ministry of Labor provides assistance to the State enforcing agencies, training and educating them in the field of occupational health and safety in the industries.

A. Occupational Health

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
- ECG
- Spirometer
- Audiometry Color Vision
- Health Review System
- 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 three Years
- For Technical and non-Technical=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

D. Anticipated Occupational & Safety Hazards

- Musculoskeletal disorder
- Noise Induced Hearing Losses
- The Health impact due to diesel particulates from emission of diesel operated vehicles and equipment
- Physical Activity
- Silicosis due to sand/Bajri mining
- Dehydration
- Skin Disorder
- Dust Exposure

7.7.1 The Occupational Health Surveillance Program:

A team of qualified doctors and nurses will visit periodically for health check up of all the workers, team and its record will be maintained properly.

7.7.2 Impact on Human Health

This project will have an impact on the human health due to Sand, Bajri and Boulder increased dust, creation of breeding grounds for disease vectors, population influx 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.

7.7.3 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:

- Safety clauses in contract order
- Dedicated safety team
- Inspection and maintenance of equipment's 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.

7.8 CORPORATE SOCIAL RESPONSIBILITY

As per the Office Memorandum **F.No. 22-65/2017-IA.III** dated **30.09.2020** of the Ministry of Environment, Forest and Climate Change regarding “Corporate Environment Responsibility” (CER), the project proponents are required to allocate funds towards environment development activities as proposed by the project proponent or prescribed by EAC or SEAC, as the case may be, shall be a part of EMP and the commitments made by project proponent to address the concerns raised during Public consultation

Each activity & fund allocation will be done after public hearing. Yearwise CER activities that has been done by UKFDC are as follows: .

Table 7.1 Year wise CSR Activities which had already done by UKFDC.

Year wise payment details of financial assistance in citizen's welfare under Uttarakhand Forest Development Corporation		
Year	Particulars	Amount (In Lakhs)
2015-16	Mahila Mangal Dal, Uttarkashi	85.00
	Mahila Mangal Dal, Rudraprayag	100.00
	Mahila Mangal Dal, Chamoli	100.00
	Mahila Mangal Dal, Pithoragarh	85.00
	Mahila Mangal Dal, Bageshwar	100.00
	Total	470.00
	For other work	42.25
	Grand Total	512.25
2016-17	For various public welfare	68.50
2017-18		54.20
2018-19		20.00
2019-20		23.33
2020-21		14.47
	Grand Total	692.75

7.9 Rehabilitation & resettlement

The existing mine lease area is designated as river body and has no human settlements in the mine lease area. Hence, no Rehabilitation and Resettlement (R&R) is envisaged.

CHAPTER-8 : PROJECT BENEFITS

8.1 GENERAL

The proposed project brings overall improvement in the locality, neighbourhood and the state by bringing employment generation at local level and revenue to state government. Hence it will be helpful for the economic growth and support to enhance quality of life through employment.

8.2 PHYSICAL BENEFITS

8.3 The project will work for different aspect to improve physical infrastructure as following:

- There will be improved road communication due to the proposed project and maintenance as per EMP provisions.
- Generating useful economic resource for construction. Extracted mineral will provide a good market opportunity.
- Project will fulfil the demand of sand, bajri and boulders for infrastructure development.
- This project will enhance the opportunities of employment for the local villagers near the lease area due to which their economic status become better.
- Project Proponent will develop green belt nearby project site.

8.4 SOCIAL BENEFITS

The mining in the area will create rural employment. It has been observed that conditions of the villages around the mining areas are better than that of distant villages. The mining activity in the region will have positive impact on social economic conditions of the area by way of providing employment to the local inhabitants; wages paid to them will increase the per capita income.

The salient features of the programme are as follows:-

- Social welfare programme like provisions of medical facilities educational facilities, water supply for the employees.
- A well laid plan for employment of local people has been prepared by giving priority to local people.
- Development of facilities within villages like roads etc.

A budgetary provision is proposed for corporate Environmental Responsibilities (CER) as per rule which will be helpful to improve the social and environmental condition.

8.5 ECOLOGICAL BENEFITS

A green belt will be developed along the boundary of the mining lease area. The area for green belt plantation consists of undisturbed soil; hence plantation could be made as in any forest land/Van Panchayat Land or Civil Land or road side plantation. Green belt is erected not from biodiversity conservation point of view but is basically developed as a screen to check the spread of dust pollution. It is proposed to plant approx. 67740 Nos. of native species in 5 consecutive years along with some fruit bearing and medicinal trees during the plan period and a budget of Rs 81.57 lakhs for plantation are given in EMP. Green belt plantation will be

started with the beginning of the mining and will be completed within five years from the beginning.

8.6 IMPROVEMENTS IN THE SOCIAL INFRASTRUCTURE

The mining in the area will create rural employment. It has been observed that conditions of the villages around mining areas are better than that of distant villages. The mining activity in the region will have positive impact on the social economic condition of the area by way of providing employment to the local in-habitants; wages paid to them will increase the per capita income, housing, education, medical and transportation facilities, economic status, health and agriculture.

A detailed program for socio economic development of the area has been framed. The salient features of the programme are as follows:

- a. Social welfare program like provision of medical facilities educational facilities, water supply for the employees as well as for nearby villagers will be taken.
- b. A well laid plan for employment of the local people has been prepared by giving priority to local people.
- c. Supplementing Govt. efforts in health monitoring camps, social welfare and various awareness programs among the rural population.
- d. Assisting social forestry program.

8.7 SUMMARY

The management will engage the semi-skilled and unskilled workers from the nearby villages. The project activity and the management will definitely support the local Panchayat and provide other form of assistance for the development of public amenities in this region. The company management will contribute to the local schools, dispensaries for the welfare of the villagers. A suitable combination of trees that can grow fast and also have good leaf cover will be adopted to develop the green belt. It is proposed to plant approx. 68,000 no's of native species in 5 consecutive years along with some fruit bearing and medicinal trees during the mining plan period.

CHAPTER-9 : ENVIRONMENTAL COST BENEFIT ANALYSIS

9.1 PROJECT COST

After making exhaustive study, it is considered desirable that the mining project may be implemented. Project cost for the collection of Minor Mineral (Sand, Bajri and Boulders) from the river bed of River Song-2 by M/s Uttarakhand Forest Development Corporation, located in Dehradun Forest Division, District Dehradun, Uttarakhand is Rs. **9.878767 Crores**.

9.2 ENVIRONMENT COST ANALYSIS AND PROJECT IMPLEMENTATION

The Environment cost for this proposed mining includes Environmental Management Plan and Occupational Health and Safety which is likely to come 98.195 Lakhs. The detailed cost for Environmental Expenses is given below in the Table.

Table 9.1: Environmental Cost Analysis

S. No.	Major Heads	Expenses per annum (Lakhs)
1.	Environmental Management Plan along with Occupational Health and Safety	Rs. 98.195 Lakhs
Total		Rs. 98.195 Lakhs

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 by the end of lease period. From the above financial analysis, it is clear that this sand, bajri & boulder mining project is financial and technically viable.

CHAPTER-10 : ENVIRONMENTAL MANAGEMENT PLAN

10.1 INTRODUCTION

Environment Management Plan must be integrated into the process of mine planning so that ecological balance of the area is maintained and adverse effects are minimized. The Environmental Management Plan (EMP) consists of a set of monitoring programme, mitigation measures, and management control strategies to minimize adverse environmental impacts.

In order to minimize impacts of mining on different environmental parameters and to keep air and water quality within prescribed limits of CPCB, an EMP has been prepared which is to be implemented in the project and covers the following phases of the project.

- Air Environment
- Water Environment
- Noise Environment
- Biological Environment
- Land Use Planning and mine closure
- Occupational Safety and Health
- Socio-economic and Cultural Environment
- EMP budget

The mining in the area has been proposed with time bound Management Plan so that impacts on different environmental parameters are least at every stage of mining. Environment Policy approved by Board of Director of M/s Uttarakhand Forest Development Corporation has been proposed which will deal for the Environment Management cell under the supervision of Manager of Environment Health System.

UKFDC shall conduct all its operations in a manner that is protective of the environment and health and safety of employees, customers and the community. In fulfillment of this commitment, they shall maintain continuing efforts to:

- Comply with all applicable safety, health and environmental laws and regulations.
- Enhance Safety, Health and Environment (SHE) awareness among employees and associated stakeholders through effective communication and training.

Environmental Policy of UKFDC is attached as **Annexure -IX**

The hierarchy of Environment Monitoring cell is as follows:

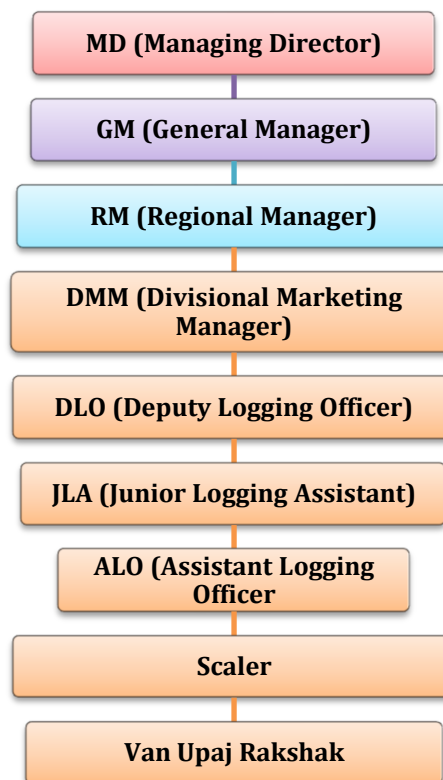


Figure 10.1 : Environment Monitoring Cell

10.2 AIR ENVIRONMENT

During the course of Sand, Bajri, Boulder mining, no toxic substances are released into the atmosphere, so there seems to be no potential threat to health of human beings. In riverbed mining activities, dust will be generated during mining, loading and transportation. The only source of fugitive gaseous emission during mining is vehicles which will be used for transportation. The environmental management for air pollution control includes:-

- The un-metalled haul roads should be adequately compacted before being put into use.
- Water should be sprinkled on the roads periodically every day (twice in a day), to wet the surface.
- Over loading of transport equipment should be avoided to prevent spillage.
- Transportation of sand should be in covered vehicles to prevent fugitive dust emission.
- Regular checking and maintenance of vehicles should be conducted once in every two months and pollution under control certificate be obtained.
- It will be ensured that all transportation vehicles carry a valid PUC certificate.
- Masks will be provided to workers daily during working hours of the mine.
- Plantation will be taken up along the approach roads and vicinity of river bank.

10.3 WATER ENVIRONMENT

During the operational phase of mine no waste water or industrial effluent will be generated. The environmental management for water pollution control includes:

- Water requirements for drinking, plantation and dust suppression will be met by tanker supply on the daily basis.
- Local people will be employed and no permanent housing will be done so no permanent drainage pattern for sewerage system is required as domestic sewage shall be disposed off into septic tank followed by soak pits.

10.4 NOISE ENVIRONMENT

No drilling or blasting will be done in the proposed project of sand, bajri and boulder mining. Minimal noise will be generated during the operational phase of mine due to transportation and hand equipments to be used for mining purpose. The environmental management for noise pollution control includes:-

- Mining and mineral transportation works will be done only after sunrise and before sunset. So the noise produced by above activities could not disturb local people as well as wildlife in night time.
- Proper maintenance of hand equipments will be carried out every month, which will be helpful in reducing generation of noise during operation.
- Regular checking and maintenance of vehicles should be conducted once in every two month to avoid noise pollution.
- Ear plugs will be provided to workers during the operational hours of time.
- Periodical monitoring of noise will be done to adopt corrective actions wherever needed.
- Plantation will be taken up along the approach roads. The plantation minimize propagation of noise and also arrests dust.

10.5 BIOLOGICAL ENVIRONMENT

Although, there are no significant adverse impacts from the project, the following measures are proposed to minimize anticipated impacts:

Greenbelt Development Plan

Greenbelt means planting of special type of plants suitable for a particular agro-climate zone and soil characteristics in a place which will make the area cooler, reduce air pollution, prevent soil erosion and further improve the soil fertility status. A green belt around the periphery of project side and road side will be created to avoid erosion of soil, prevention of landslides, minimize the air pollution and noise pollution in the project area. The green plants are capable of absorbing air pollutants and forming sinks for pollutants. Leaves with their vast area in a tree crown, absorb pollutants on their surface, effectively reducing their concentration and noise level in the ambient.

According to the CPCB guide line there are 15 Agro-climatic regions, each of these region is further divided in to 68 sub zones based on annual rain fall, Climatic condition and soil types. The species recommended for the Greenbelt are quite adopted to such Climatic condition and grow well in the soil types of that zone.

Selection of Plant Species for Green Belt Development:

The selection of plant species for the green belt development depends on various factors such as climate, elevation aspect and soil of plantation area. The plants would exhibit the following desirable characteristics in order to be selected for plantation.

- ❖ The species should be fast growing and providing optimum penetrability.
- ❖ The species should be wind-firm and deep rooted.
- ❖ The species should form a dense canopy.
- ❖ As far as possible, the species should be indigenous and locally available.
- ❖ Species tolerance to air pollution like SO₂ and NO₂ should be preferred.
- ❖ The species should be permeable to help create air turbulence and mixing within the belt.
- ❖ There should be no large gaps for the air to spill through.
- ❖ Trees with high foliage density, leaves with larger leaf area and hairy on both the surfaces.
- ❖ Ability to withstand conditions like inundation and drought.
- ❖ Soil improving plants (Nitrogen fixing rapidly decomposable leaf litter).
- ❖ Attractive appearance with good flowering and fruit bearing.
- ❖ Bird and insect attracting tree species.
- ❖ Sustainable green cover with minimal maintenance.

Following tree species are recommended for plantation. However, UKFDC should take view of their internal expert in forestry during plantation.

S.No	Scientific Name	Common Name	Family	Abatement Property
Trees				
1	<i>Albizia lebbeck</i>	Siris Tree	Mimosaceae	NO _x , Dust, Sox
2	<i>Ailanthus excelsa</i>	Mahanimb	Simaroubaceae	Dust
3	<i>Acacia catechu</i>	Khair	Mimosaceae	Dust
4	<i>Azadirachta indica</i>	Neem	Meliaceae	Dust, NO _x , Sox
5	<i>Anogeissus latifolia</i>	Dhau	Combretaceae	-
6	<i>Aegle marmelos</i>	Bel	Rutaceae	Noise
7	<i>Anthocephalus cadamba</i>	Kadam	Rubiaceae	Dust
8	<i>Adina cordifolia</i>	Haldu	Rubiaceae	-
9	<i>Bauhinia purpurea</i>	Kaniar	Caesalpiniaceae	Dust
10	<i>Bambusa sp.</i>	Bamboo	Poaceae	-
11	<i>Cassia fistula</i>	Amaltas	Caesalpiniaceae	Dust
12	<i>Delonix regia</i>	Gulmohar/Flame Tree	Caesalpiniaceae	Dust
13	<i>Dalbergia sissoo</i>	Shisham	Fabaceae	Noise
14	<i>Mangifera indica</i>	Aam	Anacardiaceae	SO _x , Dust
15	<i>Nerium indicum</i>	Kaner	Apocynaceae	SO _x , Dust
16	<i>Phoenix sylvestris</i>	Sendhi	Arecaceae	Dust
17	<i>Polyalthia longifolia</i>	Ashok	Annonaceae	SO _x , Noise, Dust
18	<i>Pongamia pinnata</i>	Karanj	Fabaceae	Noise, Dust
19	<i>Schleichera oleosa</i>	Kusum	Sapindaceae	-
20	<i>Syzygium cumini</i>	Jamun	Myrtaceae	Dust
21	<i>Tamarindus indica</i>	Imli	Caesalpiniaceae	Noise
22	<i>Terminalia arjuna</i>	Arjun	Combretaceae	Dust
23	<i>Zizyphus mauritiana</i>	Ber	Rhamnaceae	Dust

Table 10.1: Proposed Green Belt Plantation

Mine Lease Area (Ha.)	136.85
33% Plantation area (Ha.)	45.16 Ha.
Life of Mine (Yrs.)	Replenish every year
Total no of plants to planted @ 1500/ha	67740 saplings
Plantation on other sides i.e. Village Panchayat, Government Schools and Community centre	

Table 10.2: Budgetary outlets of greenbelt development for five years

Area Proposed in Ha.	No. of Plants to be planted	Capital Cost			Recurring Cost		
		Year	Rate in Rs. per Ha.	Cost in Lacs.	Year	Rate in Rs. per Ha.	Cost in Lacs.
45.16 Ha.	67740	1 st year	92625	41.83	3 rd year	17580	7.94
		2 nd Year	47940	21.65	4 nd Year	13080	5.90
					5 nd Year	9420	4.25
Total Budget :-				63.48			18.09

**Note- Above rates are derived from PCCF (HoFF) Uttarakhand's Schedule of Rates calculated on 1600 plants/Ha*

Total budget for the project= 81.57 lakhs for 5 year

10.6 LAND USE PATTERN

River bed mining can lead to river bank erosion and sedimentation arising from changes in hydrology due to alteration in water depths and river bed morphology. Sand, Bajri and Boulder in lowland river landforms are biologically important and an economic asset. Keeping this in mind, the following management plans are suggested:

- The area under mining at a given time will be kept minimum and the area will be reclaimed by top soil.
- There will be no mining near the banks. This is to protect the bank erosion and river migration.
- Proper wide benches in the mining area will be created to prevent any erosion.
- Slopes of the sides in mine will be at least 45° to prevent any erosion.
- Grass/plants will be planted on the slopes and benches to prevent soil erosion.

10.7 OCCUPATIONAL HEALTH AND SAFETY

Occupational Health and Safety professionals develop and coordinate safety and health systems and strategies within organizations. They identify workplace hazards, assess risks to employee health and safety, and recommend solutions. Increasingly, Health and Safety Professionals are also responsible for many of the environmental aspects of their workplace. As this profession

matures there is an increased emphasis on risk management strategy and on the development of workplace culture.

Occupational Health and Safety professionals in the minerals industry may perform the following tasks:

- The collection of minor minerals from the mine does not cause any occupational ill effects.
- Except fugitive dust generation there is no source which can show a probability for health related diseases and proper dust suppression will control dust generation and dispersion.
- Dust masks will be provided to the workers working in the dust prone areas as additional personal protective equipment.
- Awareness program will be conducted about likely occupational health hazards so as to have preventive action in place.
- Any workers health related problem will be properly addressed.
- Periodical medical checkup will be conducted.
- Promote occupational health and safety within their organization and develop safer and healthier ways of working;
- Develop and implement training sessions for management, supervisors and workers on health and safety practices and legislation;

Project Proponent shall appoint an Occupational Health Specialist for Regular and Periodical medical examination of the workers engaged in the Project and records maintained for silicosis and other occupational diseases.

Table 10.3: Budget for Occupational Health and Safety of the workers (Lakhs)

Sl. No.	Items	Capital Cost	Recurring cost
1.	PPE and first aid kit to the worker	0	0.50
2.	Awareness camp	1.00	1.50
3.	Medical Examination camp	0.00	3.00
Total		1.00	5.00

10.8 SOCIO-ECONOMIC ENVIRONMENT

10.8.1 Management Plan for Socio-Economic Environment

- In general, socio-economic environment will have positive impact due to the mining project in the area.
- The deployed laborers will be from nearby villages only as these people are mainly dependent upon such mining activities.
- In order to further improve the socio-economic conditions of the area, the management will contribute for development works in consultation with local bodies.

10.9 SOLID WASTE MANAGEMENT

The RBM contain the negligible amount of clayey soil which will be used for the plantation purpose. Waste management is an important facet of environment management. Thus, solid waste management is important from both aesthetics and environment view points. There are no toxic elements present in the mineral which may contaminate the soil or river water.

10.10 ENVIRONMENT MANAGEMENT SYSTEM

UKFDC shall conduct all its operations in a manner that is protective of the environment and health & safety of employees, customers and the community in fulfillment of this commitment, they shall maintain continuing efforts to:

- Comply with all applicable safety, health and environment laws and regulations.
- Enhance Safety, Health and Environment (SHE) awareness among employees and associated stakeholders through effective communication and training.
- Investigate all workplace incidents and illness in order to promptly correct any unsafe conditions or practices.
- Integrate SHE considerations into business planning and decision making.
- SHE responsibility among our employees in their practices, and promote and value their involvement in achieving the goals of this policy.

10.11 COST OF EMP MEASURES

Following provisions are proposed to be taken for improving, control and monitoring of environment protection measures.

Table 10.4: Budget for EMP

Sl.No.	Item	Capital Cost	Recurring Cost
1.	Environmental Training/awareness campaign	1.00	2.00
2.	Pollution abatement-Water sprinkling	0	6.125
3.	Green belt development & Others	63.48	6.03
4.	Environmental Monitoring cost	0	1.50
5.	Occupational Health and safety	1.00	5.00
Total		65.48	20.655

10.12 REHABILITATION AND RESETTLEMENT (R &R)

As the mining area is barren river bed area and replacement and relocation of people is not involved, hence Rehabilitation and Resettlement (RR) works are not applicable. However Social development of village will be considered as per social activities.

10.13 Wildlife Conservation Plan

Wildlife Conservation plan for Schedule-1 species will be provided in Final EIA report.

CHAPTER-11 : SUMMARY & CONCLUSION

11.1 GENERAL

The chapter discusses about the summary of whole EIA/EMP report along with recommendation and conclusion. The proposed mining lease area falls in Survey of India Toposheet (OSM) No. 53J/4. The lease area is located in Village- Kaluwala, Tehsil & District- Dehradun, State- Uttarakhand.

Table 11.1 Details of the Project

S. No.	Particulars	Details																																																																											
A.	Nature and Size of the Project	Mining of Minor Minerals (Sand, Bajri and Boulders) from the riverbed of River Song-2 by M/s Uttarakhand Forest Development Corporation, located in Dehradun Forest Division, District Dehradun, Uttarakhand over an area of 136.85 ha with Production Capacity of 4064445.00 TPA & the production as per replenishment study report 2019-2020 is 441904.41 TPA																																																																											
B.	Location																																																																												
Geographical Coordinates	Latitude and Longitude of	<table> <tr> <th>Pillar No.</th><th>Latitudes</th><th>Longitudes</th></tr> <tr> <th>S. No</th><th>Latitude</th><th>Longitude</th></tr> <tr><td>A</td><td>30°14'30.36" N</td><td>78°08'36.73" E</td></tr> <tr><td>B</td><td>30°14'21.67" N</td><td>78°08'40.88" E</td></tr> <tr><td>C</td><td>30°14'09.92" N</td><td>78°08'46.26" E</td></tr> <tr><td>D</td><td>30°14'02.64" N</td><td>78°08'50.63" E</td></tr> <tr><td>E</td><td>30°13'37.42" N</td><td>78°08'57.73" E</td></tr> <tr><td>F</td><td>30°13'18.80" N</td><td>78°08'51.43" E</td></tr> <tr><td>G</td><td>30°13'03.84" N</td><td>78°08'42.24" E</td></tr> <tr><td>H</td><td>30°12'32.37" N</td><td>78°08'23.88" E</td></tr> <tr><td>I</td><td>30°12'18.77" N</td><td>78°08'14.59" E</td></tr> <tr><td>J</td><td>30°12'18.77" N</td><td>78°08'14.59" E</td></tr> <tr><td>K</td><td>30°12'05.75" N</td><td>78°08'05.09" E</td></tr> <tr><td>L</td><td>30°12'10.88" N</td><td>78°07'55.64" E</td></tr> <tr><td>M</td><td>30°12'26.48" N</td><td>78°08'01.30" E</td></tr> <tr><td>N</td><td>30°12'36.05" N</td><td>78°08'14.36" E</td></tr> <tr><td>O</td><td>30°13'05.76" N</td><td>78°08'33.34" E</td></tr> <tr><td>P</td><td>30°13'22.09" N</td><td>78°08'35.99" E</td></tr> <tr><td>Q</td><td>30°13'37.76" N</td><td>78°08'47.57" E</td></tr> <tr><td>R</td><td>30°13'48.51" N</td><td>78°08'44.05" E</td></tr> <tr><td>S</td><td>30°13'58.96" N</td><td>78°08'42.01" E</td></tr> <tr><td>T</td><td>30°14'03.65" N</td><td>78°08'36.53" E</td></tr> <tr><td>U</td><td>30°14'17.39" N</td><td>78°08'29.32" E</td></tr> <tr><td>V</td><td>30°14'25.57" N</td><td>78°08'21.63" E</td></tr> <tr><td>W</td><td>30°14'30.36" N</td><td>78°08'36.73" E</td></tr> </table>	Pillar No.	Latitudes	Longitudes	S. No	Latitude	Longitude	A	30°14'30.36" N	78°08'36.73" E	B	30°14'21.67" N	78°08'40.88" E	C	30°14'09.92" N	78°08'46.26" E	D	30°14'02.64" N	78°08'50.63" E	E	30°13'37.42" N	78°08'57.73" E	F	30°13'18.80" N	78°08'51.43" E	G	30°13'03.84" N	78°08'42.24" E	H	30°12'32.37" N	78°08'23.88" E	I	30°12'18.77" N	78°08'14.59" E	J	30°12'18.77" N	78°08'14.59" E	K	30°12'05.75" N	78°08'05.09" E	L	30°12'10.88" N	78°07'55.64" E	M	30°12'26.48" N	78°08'01.30" E	N	30°12'36.05" N	78°08'14.36" E	O	30°13'05.76" N	78°08'33.34" E	P	30°13'22.09" N	78°08'35.99" E	Q	30°13'37.76" N	78°08'47.57" E	R	30°13'48.51" N	78°08'44.05" E	S	30°13'58.96" N	78°08'42.01" E	T	30°14'03.65" N	78°08'36.53" E	U	30°14'17.39" N	78°08'29.32" E	V	30°14'25.57" N	78°08'21.63" E	W	30°14'30.36" N	78°08'36.73" E
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C.	Lease Area Details																																																																												

	Lease Area	136.85 ha
	Topography	Undulated (Riverbed)
	Site Elevation Range	497.53 m amsl to 547.31 m amsl <i>Source: Mining Plan</i>
D.	Cost Details	
	Cost of the project	Rs. 9.88 Crore
	Cost for EMP	Rs. 65.48 Lakhs/Yr (Capital Cost) Rs. 20.655 Lakhs/Yr (Recurring Cost)
	OH&S	Rs. 1.00 Lakh/Yr (Capital Cost) Rs 5.00 Lakhs/Yr (Recurring Cost)
E.	Environmental Settings of the area	
	Ecological Sensitive Areas (National Park, Wild Life Sanctuary, Biosphere Reserve, Reserve/ Protected Forest etc.) within 10 Km radius	Rajaji Tiger Reserve~5 Km, W RF/PF: Rishikesh Range Reserve Forest ~ 2.9 km E Barkot Range Reserve Forest ~ 6.8 km SSE Thano Reserve Forest ~ 0.5 km W
	Inter-state boundary within 5 Km radius	None
	Nearest Town/ Major City	Dehradun~12.75 Km, NW
	Nearest Railway Station	Doiwala Railway Station~3.27 km, SSW
	Nearest State Highway/ National Highway	NH-7 Haridwar Dehradun Road~1.8 km, E
	Nearest Airport	Jolly Grant Airport~4.87 km, ESE (aerial distance)
	Nearest Post Office	Post Office near Doiwala~2.36 Km, SSW
	Nearest Police Station	Jolly Grant Police Station~1.18 kms in NNW
	Medical Facilities	Doon Public Hospital~6.57 Km, NW
	Education Facilities	Hope way Public School~ 2.78 Km, ESE Swami Rama Himalayan University (SRHU)~2.99Km, ESE
	Seismic Zone	Zone-IV (As per 1893:2002)
	Water Body	Song River ~ 0.1 km ESE Jakhan River ~ 8.1 km E

11.2 INTRODUCTION

As per MoEF, New Delhi Gazette dated 14th September 2006 and amended thereof, the proposed mining project is categorized as category 'A' as the mining lease area is more than 100 hectares. The project involves extraction of Sand, Bajri and Boulder from River Bed of Song-2 river in Village- Kaluwala, Tehsil & District-Dehradun, State-Uttarakhand. The letter of intent (LoI) has been issued by the Director of Mines & Geology department, Uttarakhand vide No 1038/खनन/ आशय पत्र / व०वि०नि०/ भू० खनि० ई०/2018-19 dated 05/11/2018 in favour of M/s Uttarakhand Forest Development Corporation, for mining of Sand, Bajri and Boulder (**Copy of LOI has been enclosed as Annexure-II**).

11.3 PROJECT DESCRIPTION

The proposed project is for mining of Sand, Bajri and Boulder (Minor Mineral) by open manual method in riverbed over an area of 136.85 Ha. with proposed production capacity of 4064445 TPA & the production as per replenishment study report 2019-2020 is 441904.41 TPA. The total geological reserve is 8127676.26 TPA and total mineable reserve is 4516050 TPA. Ultimate depth of a bench will be 3.0 m. Riverbed block will be further replenished during rainy season. Minerals will be transported by trucks. It is widely used in construction, buildings, bridges and other infrastructure. It is free from clay and non-sticky in nature. Total water requirement for the project is 25.3 KLD. Total man power requirement for the project is 345 numbers. The site facilities like canteen, rest-shelter, first aid facility, water and electricity supply etc. will be provided as per requirement. There is no litigation pending against this project.

11.4 DESCRIPTION OF THE ENVIRONMENT

Environmental data has been collected in relation to proposed mining for Air, Noise, Water, Soil, Ecology and Biodiversity. The generation of primary data as well as collection of secondary data and information from the site and surroundings was carried out during post monsoon season i.e. **December 2019 to February 2020.**

The EIA study is being done for the Mine Lease (core zone) and area within 10 Km distance from mine lease boundary (buffer zone), both of which together comprise the study area.

Table 11.2: Baseline Status

Attribute	Baseline Status
1. Ambient Air Quality	<p>Ambient Air quality Monitoring was carried out in total 8 locations and the maximum value for PM₁₀ is observed as 64 µg/m³ and minimum value of 41 µg/m³ is observed.</p> <p>Ambient Air Quality Monitoring was carried out in total 8 locations and the maximum value for PM_{2.5} is observed as 38 µg/m³ and minimum value of 22 µg/m³ is observed.</p> <p>Ambient Air Quality Monitoring was carried out in total 8 locations and the maximum value for SO₂ is observed as 15 µg/m³ and minimum value 5 µg/m³ is observed.</p> <p>Ambient Air Quality Monitoring was carried out in total 8 locations and the maximum value for NO₂ is observed as 28 µg/m³ and the minimum value of 15 µg/m³ is observed.</p>
2. Noise Levels	<p>Noise Monitoring was carried out in total 8 locations and the noise levels recorded during the day time were from 44.6 Leq dB to 58.3 Leq dB respectively and level of noise during night time were from 37.2 Leq dB to 48.5 Leq dB respectively.</p>
3. Water Quality	<p>Analyses of Ground water and Surface water was taken in the Post Monsoon Season December 2019 to February 2020.</p> <p>Ground Water-Ground water monitoring was carried out in total 8 locations.</p> <ul style="list-style-type: none"> The value of pH varies from to 7.11 to 7.56

	<ul style="list-style-type: none"> • Total Hardness varies from 167 to 282 mg/L. • Total Dissolved Solids varies from 261 to 375 mg/L. • Fluoride varies from 0.56 to 0.72 mg/L • Chloride varies from 58.0 to 96.0 mg/L <p>Surface Water - Surface Monitoring was carried out in 2 locations.</p> <ul style="list-style-type: none"> • pH varies from to 7.33 to 7.48 • Total Hardness varies from 102 to 118 mg/L. • Total Dissolved Solids varies from 192.0 to 212.0 mg/L. • Fluoride varies from 0.31 to 0.63 mg/L • Chloride varies from 36.0 to 54.0 mg/L • COD varies from 18.0 to 54 mg/L • BOD varies from <4.0 to 8 mg/L
4. Soil Quality	<p>Soil Monitoring was carried out in total 8 locations.</p> <ul style="list-style-type: none"> • The value of pH ranges from 7.14-7.63. • Chidderwala village shows maximum conductivity of 384 µmhos/cm, Thanu village shows minimum conductivity of 315 µmhos/cm. • Magnesium values ranges from 2.48 meq/100g as lowest at Anthoorwala and Narendra Nagar and 3.41 meq/100g as highest at Mine Site. • The average concentration of Nitrogen, Phosphorus and Potassium in the soil samples varies from 9.4 to 11.3 mg/100gm, 0.41 to 0.72 mg/100gm and 4.2 to 5.2 mg/100gm

11.4.1 Socio Economic Environment

Socio-Economic Impact Assessment (SEIA) refers to systematic analysis of various social and economic characteristics of human being living in a given geographical area (study area/impact area). The prime objective of SEIA is to identify and evaluate potential socio-economic and cultural impacts of a proposed development project on the lives & conditions of people, their families and communities.

The demographic profile of the study area is given below:-

S. No.	Description	Number	Percentage to Respective Total
1	Total Population	205061	100
	Male	106255	51.8
	Female	98806	48.2
	Sex Ratio	929	
2	Population (0-6) Age Group	24094	100
	Male	12802	53.1
	Female	11292	46.9
	Sex Ratio	882	
3	Population- Scheduled Caste	23844	100

	Male	12524	52.5
	Female	11320	47.5
	Sex Ratio	903	
4	Population- Scheduled Tribe	1349	100
	Male	731	54.2
	Female	618	45.8
	Sex Ratio	845	
5	Total Literates	155473	100
	Male	85934	55.3
	Female	69539	44.7
	Gender Gap in Literates	10.6	
6	Overall Literacy Rate	85.9	
	Male	91.9	
	Female	79.5	
	Gender Gap in Literacy Rate	12.4	
7	Total Workers	71487	100
	Male	53634	75.0
	Female	17853	25.0
	Gender Gap in Work Participation	50.0	
8	Main Workers	55442	100
	Male	44121	79.6
	Female	11321	20.4
	Gender Gap in Work Participation	59.2	
9	Marginal Workers	16045	100
	Male	9513	59.3
	Female	6532	40.7
	Gender Gap in Work Participation	18.6	
10	Household Industrial Workers	2218	100
	Male	1572	70.9
	Female	646	29.1
11	Total Agricultural Workers	10904	100
	Male	7878	72.2
	Female	3026	27.8
12	Cultivators	7871	100
	Male	5328	67.7
	Female	2543	32.3
13	Agricultural Labour	3033	100
	Male	2550	84.1
	Female	483	15.9
14	Other Workers	42320	100
	Male	34671	81.9
	Female	7649	18.1

11.4.2 Biological Environment

The study area falls in the Forest land. The list of total number of different plant species (trees, shrubs, herbs and climbers) has been prepared based on the site observations and along with consultation with local peoples. The most common floral species are *Bombax ceiba*, *Lannea coromandelica*, *Mallotus philippensis*, *Dalbergia sissoo*, *Aegle marmelos*, *Melia azadirachta*, *Tectona grandis*, *Shorea robusta*, *Trewia nudiflora*, *Adhatoda vasica*, *Boehmeria macrophylla*, *Callicarpa macrophylla*, *Carissa carandas*, *Cassia occidentalis*, *Commelina benghalensis*, *Jasminum pubescens*, *Lantana camara*, *Solanum torvum*, *Urtica dioica* etc. Whereas common herbs are *Achyranthes aspera*, *Ageratum conyzoides*, *Artemisia nilagirica*, *Chenopodium album*, *Euphorbia hirta*, *Justicia procumbens*, *Oxalis corniculata*, *Rauvolfia* sp. *Sida cordifolia*, and *Xanthium strumarium* etc.

There are no Rare or Critically Endangered and Threatened plant species in the study area as per IUCN category. The floral species found in the study area are common and wide spread occurrence.

Various kinds of birds are found flying across the project area. There are no species- specific major nesting sites near the project site. The site is also not known for any migratory bird halt. Snakes such as **Cobra** (*Naja naja*) and Common **green whip snakes** (*Hierophis viridiflavus*) have been spotted in the study area.

Amphibians such as **Cascades frog** (*Rana cascadae*), **Common Asian Toad** (*Duttaphrynus melanostictus*) are more frequent along the river during the peak season. Small fish species are found in the river.

Around 102 faunal species are reported from this area (24 mammals, 51 birds, 9 reptilians, 8 amphibians and 10 butterflies species). The major animals reported from surrounding forest areas include Elephant (*Elephas maximus*), **Leopard** (*Panthera pardus*), **Leopard Cat** (*Prionailurus bengalensis*), Bengal Tiger (*Panthera tigris tigris*), **Indian Pangolin** (*Manis crassicaudata*) and **Indian Peafowl** (*Pavo critatus*) all are endangered and accorded protection under the Wildlife Protection Act, 1972. All the listed species were compared with IUCN Red Data Book and Indian Wildlife Protection Act, 1972.

11.5 ANTICIPATED ENVIRONMENT IMPACT AND MITIGATION MEASURES

11.5.1 AIR ENVIRONMENT

The air quality in the mining area depends upon the nature and concentration of emissions and meteorological conditions.

11.5.2 Anticipated Impact

- Mining Operation carried out by opencast manual method generate dust particles due to various activities like Loading & Unloading of sand, and Transportation.
- The impact on ambient air quality in the area surrounding the mining area depends upon the pollutant emission rate and prevailing meteorological conditions. As it is an open cast semi mechanized mine, particulate Matter (Dust) of various sizes is the only pollutant of any significance.

11.5.3 Mitigation measures

- The speed of trucks on haul road will be controlled as increased speed increases dust emissions. Overloading of transport vehicles will be avoided.

- Transportation of minerals will be done by covered vehicles.
- Proper mitigation measures like water sprinkling will be adopted to control dust emissions.
- Masks will be provided to workers.
- To control the emissions regular preventive maintenance of equipment will be carried out on contractual basis.
- Green belt of adequate width will be developed.

11.6 NOISE ENVIRONMENT

The area in general represents calm surroundings. There is no heavy traffic, industry or noisy habitation in the area except the existing mine. As the project is proposed for open cast manual mining method there will be no blasting or drilling activities.

11.6.1 Anticipated Impact

- The source of Noise pollution will be the vehicular movements.
- Noise generated by manual extraction of river bed material, using shovels, crowbars etc., will be negligible.

11.6.2 Mitigation Measures

- Proper maintenance of all transportation vehicles will be carried out which help in reducing noise during operations. No other equipment except the transportation vehicles will be allowed.
- Noise generated by hand equipment will be negligible and will not cause detectable adverse impact.
- Awareness will be imparted to the workers about the permissible noise levels and maximum exposure to those levels.

11.7 WATER ENVIRONMENT

The impact of mining project on groundwater hydrology and surface water regime are site specific and depends upon the characteristics of the mineral, hydrogeology and requirement of groundwater for other uses.

11.7.1 Anticipated Impacts

- The Mining in the riverbed area may cause the groundwater contamination due to the intersection of the water table.
- Waste water disposed from the mining activity may contaminate the surface water.
- River recharges the ground water; excessive mining may reduce the thickness of natural filter materials (Sediments), through which the ground water is recharged.

11.7.2 Mitigation Measures

- Mining will be done above the water table as well as river bed water level therefore much impact on water regime is not accepted.
- Proper analysis/Monitoring will be done to check the ground water

11.8 LAND ENVIRONMENT

Impact assessment study on land environment can be done by considering land use pattern/land cover, topography, drainage pattern and geological features of the mine site as well as the study area.

11.8.1 Anticipated Impact

- Mining activity will impact river bed topography by formation of excavation voids.
- River bed mining may bring in some change in topography at the nearby area of the mine lease
- Stacks of solid waste generated from mining activity may hinder the flow of water in monsoon season.

11.8.2 Mitigation Measures

Adopting suitable, site specific mitigation measures can reduce the degree of impact of mining on land. Some of the land-related mitigation measures are as follows:-

- Excavated pits will get replenished annually in monsoon itself & will be restored to original
- Mining work will be executed only by manual open cast method and the depth of pits will be restricted up to 3.00 meter or the river water level whichever is less.
- Mineral will be mined after leaving the 25% width as a safety zone on both sides of the riverbed.

11.9 SOCIO ECONOMIC

11.9.1 Anticipated Impact

- Impact on the Demographic Composition
- Impact on Employment Opportunities

11.10 Solid Waste

11.10.1 Anticipated Impact

- As there is practically no soil cover observed in the river bed, this RBM project does not involve any waste generation. Thus, no waste dump sites are needed for the project. However, there will be 345 workers on site.
- No municipal waste other than domestic sewage shall be generated.

11.10.2 Mitigation Measures

- Only clayey soil generated during mining process which will be used for the plantation.
- Domestic sewage will be disposed off into septic tanks followed by soak pits

11.11 TRAFFIC ENVIRONMENT

11.11.1 Anticipated Impact

- The increase in traffic density will lead to the air pollution and it cause the effect on human health like damage to lung tissue, cancer, asthma etc.
- The movement of vehicles cause the noise pollution

11.11.2 Mitigation Measures

- Vehicles with PUC certificate will be hired. Regular maintenance of vehicles will be compelled to ensure smooth running of vehicles.
- Regular health checkups camps will be organised for the safety purpose of the workers.
- Unnecessary blowing of horn will be avoided.

11.12 Analysis of alternatives

No alternative site had been considered since proposed Capacity Enhancement is in existing sand, bajri and boulder mine and hence it is site specific.

11.13 ENVIRONMENT MONITORING PROGRAMME

UKFDC has formulated well laid-out Environmental Policy, wherein preservation of environment has been accorded a most strategic and prime position. The various protocol procedures in connection with communication channels upwards and downwards, for dealing with violations or departures in environmental standards involvement of Board of Directors as well as shareholders about such incidences, etc, have been described in detail in chapter VI.

Regular monitoring of environmental parameters of immense importance to assess the status of environment during project operation. With the knowledge of baseline conditions, the monitoring programme will serve as an indicator for any deterioration in environmental conditions due to operations of the project, which will enable to take suitable mitigation steps in time to safeguard the environment.

11.14 ADDITIONAL STUDIES

The possible risks in the case of river bed mining project are bank erosions, floods, accidents due to the transport etc. At present the mining is proposed in a mild sloping forest land in river beds. Pits will be created of limited depth 3.0 m from first to fifth year or river water levels whichever less, thus the chance of failure of pit slope not seems to be appeared,

11.15 PROJECT BENEFIT

The proposed project brings overall improvement in the locality, neighbourhood and the state by bringing employment generation at local level and revenue to state government. Hence it will be helpful for the economic growth and support to enhance quality of life through employment

11.16 ENVIRONMENTAL COST BENEFIT ANALYSIS

It is considered desirable that the mining project may be implemented. Project cost for the proposed Mining project having area of 136.85 Ha. falling in Village-Kaluwala, Tehsil & District-Dehradun, Uttarakhand is Rs. 9.878767 Crore.

11.17 ENVIRONMENTAL MANAGEMENT PLAN

As per above discussion, there is no major impact on the environment due to mining except fugitive emission in the form of dust generated during handling of mineral. The adequate preventive measures will be adopted to contain the various pollutants within permissible limits. Plantation development will be carried out along the approach roads, around Govt. buildings etc. It will prove an effective pollution mitigation technique and help avoid soil erosion during monsoon season. Employment opportunities will be provided to the locals only as providing extraction of minerals from the mine site is the only prevailing occupation for them for their livelihood. A budget of Rs. 1.00 Lakhs (Capital Cost) & Rs. .00 Lakhs (Recurring Cost) for Occupational Health and Safety and budget of Rs. 65.48 Lakhs (Capital Cost) & Rs. 20.655 Lakh (Recurring Cost) under EMP head are incurred by Project Proponent.

11.18 CONCLUSION

The proposed project will provide the employment to local people in different activities such as mining, transportation and plantation activities. The project activity will not have any major impact on the environment. At post mining stage of proposed project, the existing land use will remain same i.e. riverbed, and it will get replenished yearly during monsoon season. Also the extracted sand, Bajri and Boulder will be used in construction activities like building, infrastructure facilities. The Corporate Social Responsibility initiatives will have a positive impact on socio economic environment of the region.

CHAPTER-12 : DISCLOSURE OF CONSULTANT ENGAGED

12.1 INTRODUCTION OF ORGANIZATION

Mantec Consultants Pvt. Ltd., established in 1979, is a multi-disciplinary consulting firm offering infrastructural, environmental, management, technical and IT services.

Our team consists of technical and management experts coming from the top echelons of various professional services. The in-house capabilities are augmented and strengthened by our panel of associates who are well known experts in their respective fields.

We provide a complete range of environmental and social impact assessment services with an expert In-house team of professionals and associates. Mantec is an ISO 9001:2015 & OHSAS certified company, having a full-fledged Environmental Laboratory duly recognized by the Ministry of Environment Forest & Climate Change (MoEF&CC) and accredited by NABL (National Accreditation Board for Testing Calibration Laboratory). We are accredited by NABET/QCI for conducting the EIA studies.

Commitment to excellence has been the company's credo since the day of its inception and forms the central emphasis in all our operations.

12.2 SERVICES OFFERED

We Mantec is providing various environmental services in more than 15 industries/sectors including infrastructure, mining, irrigation, river valley projects, power plants, refineries, ports, airports, highways, residential colonies, hazardous waste sites, forestry and rural development projects etc.

1. Environmental Impact Assessment Studies
2. Environment Management Plans
3. Social Impact Assessment Studies
4. Rehabilitation and Resettlement Studies and Resettlement Action Plans
5. Safety Audits & Environmental Audits
6. Risk Analysis and Disaster Management Plans
7. Environmental Monitoring of Air, Water, Noise, Soil, Solid and Wastes
8. Environmental Monitoring of Industrial emissions, industrial effluents, ambient air etc.
9. Waste Water Management Both domestic (sewage) and industrial
10. Ground & Surface Water Treatment and Supply
11. Design and implementation of Wastewater Treatment Plants as well as Common Effluent Treatment Plants
12. Studies on River, Lake and Forest ecosystems
13. Watershed and Waste land management
14. Solid Waste Management including Hazardous and Biomedical Waste Management
15. Oil Spill Response
16. Rehabilitation of Mines
17. Remote sensing and GIS survey

12.3 LABORATORY FACILITIES AND EQUIPMENTS

Mantec Environmental Laboratory (Recognized by MoEF&CC and Accredited by NABL)

Monitoring & Analytical Capabilities for;

- Ambient Air
- Stack Gas emissions
- Process and work zone
- Indoor Air
- Volatile organic compounds (VOC's)
- PAH's in Ambient Air
- Hydrocarbon in Ambient Air and Stack
- Heavy metals in Ambient Air, water, Soil
- Ultimate and proximate analysis. (C.H.N.S.O)
- Air Modeling
- Drinking Water, Raw Water and Process Water Analysis
- ETP and STP Water Analysis
- Soil, Sludge and Hazardous Waste Analysis

Lab Equipments

- Dust Samplers and PM_{2.5} Sampler
- Stack Monitoring Kit
- Organic Vapor Sampler
- Non Dispersive Infrared Spectrophotometer (NDIR)
- Atomic Absorption Spectrophotometer
- Gas Chromatograph
- UV Spectrophotometer
- Flame Photometer
- Mercury Analyser
- COD Digester
- Micro meteorological Station
- ICP OES
- ORSAT
- CO Analyzer
- Bacteriological Chamber
- Digital Ultrasonic
- Multigas Analyzer

12.4 ADDRESS & CONTACTS

Head Office

805 Vishal Bhawan, 95 Nehru Place, New Delhi, 110019.

Phone: 91-11-26429293/4/5 Fax: 91-11-26842531

E-Mail: envmantec@yahoo.co.in

Environment Division,

D-36, Sector-VI, Noida- 210 301

Email: mantec@vsnl.com,

Ph: 0120 – 4215804, 4215000, Fax: 0120 – 4215809


12.5 ESTEEMED CLIENTELE

- | | |
|--|--|
| 1. BHARAT HEAVY ELECTRICALS LIMITED | 5. INDIAN OIL CORPORATION LIMITED |
| 2. BHARAT ELECTRONICS LIMITED | 6. NTPC LIMITED |
| 3. FCI ARAVALI GYPSUM AND MINERALS INDIA LIMITED | 7. NATIONAL HYDROELECTRIC POWER CORPORATION |
| 4. HINDUSTAN PETROLEUM CORPORATION LIMITED | 8. INDIAN COUNCIL OF FORESTRY RESEARCH AND EDUCATION |
| | 9. ISHIKA FERTILIZER LIMITED |

- | | |
|---|--|
| 10. JAI PRAKASH ASSOCIATES | 44. KARNATAKA VETERINARY ANIMAL AND FISHERIES SCIENCES UNIVERSITY |
| 11. JUBILANT AGRI AND CONSUMERS PVT. LTD. | 45. ESSAR STEEL INDIA LTD. |
| 12. TATA CHEMICALS LIMITED | 46. WELCOME FOOTWEAR |
| 13. NATIONAL HIGHWAY AUTHORITY OF INDIA | 47. COIM INDIA PVT. LTD. |
| 14. NATIONAL FERTILIZERS LIMITED | 48. HARYANA STATE ROADS AND BRIDGES DEVELOPMENT CORPORATION LIMITED |
| 15. PUNJAB ALKALIES AND CHEMICALS LTD. | 49. ULTRATECH CEMENT LTD. |
| 16. RAJASTHAN STATE MINES AND MINERALS INDIA LIMITED | 50. AXISCADES ENGINEERING TECHNOLOGIES LTD. |
| 17. MYSORE MINERALS LIMITED | 51. INVESTIGATION DESIGN & RESEARCH BOARD (IDRB), KERALA |
| 18. KANDLA PORT TRUST | 52. WATER RESOURCE DEPARTMENT, RAJASTHAN |
| 19. KARNATAKA POWER CORPORATION LIMITED | 53. BHARAT PETROLEUM CORPORATION LIMITED |
| 20. KUMAON MANDAL VIKAS NIGAM LIMITED | 54. ADOR FONTECH LTD. |
| 21. SAURASHTRA CHEMICALS LIMITED, GUJARAT | 55. PUBLIC WORKS DEPARTMENT DELHI |
| 22. UTTARAKHAND FOREST DEVELOPMENT CORPORATION | 56. THE INDIAN EXPRESS |
| 23. SUMAN ENTERPRISES | 57. WATER RESOURCES DEPARTMENT, GOVT. OF JHARKHAND |
| 24. JAI YAMUNA JI DEVELOPERS | 58. SUN PETRO CHEMICALS PVT.LTD. |
| 25. MARKANDESHWAR CONSTRUCTION COMPANY | 59. TANCEM |
| 26. M.P. STATE MINING CORPORATION LTD. | 60. FCI ARAVALI |
| 27. JINDAL MEC TEC PVT. LTD. | 61. SATLUJ JAL VIDYUT NIGAM (SJVN) |
| 28. HARYANA MINING CO. | |
| 29. ELDECO INFRASTRUCTURE | |
| 30. ANSAL PROPERTY & INFRASTRUCTURE | |
| 31. DELHI STATE INDUSTRIAL AND INFRASTRUCTURE DEVELOPMENT CORPORATION (DSIIDC) | |
| 32. EXOTICA HOUSING LTD. | |
| 33. LOUIS BERGER GROUP | |
| 34. AMBUJA CEMENT | |
| 35. WAPCOS LTD. | |
| 36. INDIAN COUNCIL OF FORESTRY RESEARCH AND EDUCATION | |
| 37. IL&FS TRANSPORTATION NETWORK LTD. | |
| 38. THDC INDIA LTD. | |
| 39. MADHYA PRADESH ROAD DEVELOPMENT CORPORATION | |
| 40. VEDANTA RESOURCES | |
| 41. RAVI TAWI IRRIGATION COMPLEX, GOVT. OF J&K | |
| 42. INSTITUTE OF CHEMICAL TECHNOLOGY | |
| 43. JHARKHAND ISPAT PVT LTD | |

12.6 OUR CREDENTIALS

ANNEXURE-A



Quality Council of India
National Accreditation Board for
Education & Training

CERTIFICATE OF ACCREDITATION

Mantec Consultants Pvt. Ltd.
D-36, Sector-6, Noida, Uttar Pradesh-201301

Accredited as Category - A organization under the QCI-NABET Scheme for Accreditation of EIA Consultant Organizations: Version 3 for preparing EIA/EMP reports in the following sectors:

Sl. No	Sector Description	Sector (as per)		Cat.
		NABET	MoEFCC	
1.	Mining of minerals – opencast only	1	1 (a) (i)	A
2.	Offshore and onshore oil and gas exploration, development & Production	2	1 (b)	A
3.	River valley projects	3	1 (c)	A
4.	Thermal power plants	4	1 (d)	A
5.	Petroleum refining industry	10	4 (a)	A
6.	Chlor-alkali industry	13	4 (d)	A
7.	Chemical fertilizers	16	5 (a)	A
8.	Petrochemical based processing (processes other than cracking & reformation and not covered under the complexes)	20	5 (e)	A
9.	Synthetic organic chemicals industry	21	5 (f)	A
10.	Oil & gas transportation pipeline (crude and refinery/petrochemical products), passing through national parks/sanctuaries/coral reefs/ecologically sensitive areas including LNG terminal	27	6 (a)	A
11.	Isolated storage & handling of Hazardous chemicals (As per threshold planning quantity indicated in column 3 of schedule 2 & 3 of MSHC Rules 1989 amended 2000)	28	6 (b)	B
12.	Ports, harbours, break waters and dredging	33	7 (e)	A
13.	Highways,	34	7 (f)	A
14.	Building and construction projects	38	8 (a)	B
15.	Townships and Area development projects	39	8 (b)	B

Note: Names of approved EIA Coordinators and Functional Area Experts are mentioned in SA AC Minutes dated February 8, 2019 and Supplementary AC Minutes dated October 11, 2023, posted on QCI-NABET website.

The Accreditation shall remain in force subject to continued compliance to the terms and conditions mentioned in NABET's letter of accreditation bearing no. QCI/NABET/ENV/ACD/19/0931 dated March 1, 2019. The accreditation needs to be renewed before the expiry date by Mantec Consultants Pvt. Ltd., Noida following due process of assessment.


Sr. Director, NABET
Dated: November 14, 2019

Certificate No.
NABET/EIA/1615/SA 083/Rev.011
Valid till
April 18, 2020

For the updated list of Accredited EIA Consultant Organizations with approved Sectors please refer to QCI-NABET website.

रजिस्ट्री सं० डी० एल०-33004/99

REGD. NO. D. L.-33004/99



भारत का राजपत्र

The Gazette of India

असाधारण
EXTRAORDINARY
भाग II—खण्ड 3—उप-खण्ड (ii)
PART II—Section 3—Sub-section (ii)
प्राधिकार से प्रकाशित
PUBLISHED BY AUTHORITY

सं. 758] नई दिल्ली, बुधवार, कारकी 28, 2018/फाल्गुन 9, 1939
No. 758] NEW DELHI, WEDNESDAY, FEBRUARY 28, 2018/PHALGUNA 9, 1939

पर्यावरण, वन और जलवायु परिवर्तन मंत्रालय
अधिसूचना
नई दिल्ली, 26 फरवरी, 2018

का.आ. 857(अ).—केन्द्रीय सरकार, पर्यावरण (संरक्षण) नियम, 1986 के नियम 10 के माब पठित, पर्यावरण (संरक्षण) अधिनियम, 1986 (1986 का 29) की धारा 12 की उपधारा (1) के खंड (ख) और धारा 13 द्वारा प्रदत्त शक्तियों का प्रयोग करते हुए भारत सरकार के तत्कालीन पर्यावरण और वन मंत्रालय की अधिसूचना सं. का.आ. 1174 (अ), तारीख 18 जुलाई, 2007 में निम्नलिखित और संशोधन करती है, अर्थात् :-

2. उक्त अधिसूचना में संलग्न सारणी में,

(i) क्रम संख्यांक 1, 17, 24, 26, 30, 39, 41, 45, 81, 86, 87, 93, 94, 95, 96 और 100 उसमें संबंधित प्रविष्टियों के स्थान पर निम्नलिखित क्रम संख्यांक और प्रविष्टियां रखी जाएंगी, अर्थात् :-

क्र.सं.	प्रयोगशाला का नाम	सरकार विज्ञापनकर्ता का नाम	तारीख और कब तक माय्य
(1)	(2)	(3)	(4)
*1	मैसर्स एटिक कंसल्टेंट्स प्राइवेट लिमिटेड, ए-36, सेक्टर -6, एंग्ला-201301, उत्तर प्रदेश	(i) श्री राजा नंद मलिक (ii) का.पिबेक द्विवेदी (iii) श्री सुमित वर्मा	26.02.2018 मे 25.02.2023
17	मैसर्स इंदमा लैबोरेटरीज लिमिटेड, 391, इंडस्ट्रियल एरिया, फेज -1, पंचकुला-160019, हरियाणा	(i) श्री अंजुल अग्रवाल (ii) श्री. निरेजन देव बहल (iii) डा. राजेंद्र कुमार जैन	26.02.2018 मे 25.02.2023

1132 GI/2018 (1)




Quality Council of India

National Accreditation Board for Education & Training

Certificate of Accreditation

Mantec Consultants Pvt Ltd.,
 Environment Management Division, D-36, Sector 06, Noida-201301

The organization is accredited as **Category-A** under the QCI-NABET Scheme for Accreditation of EIA Consultant Organization, Version 3: for preparing EIA-EMP reports in the following Sectors –

Sl.No	Sector Description	Sector (as per)		Cat.
		NABET	MoEFCC	
1	Mining of minerals including opencast only	1	1 (a) (i)	A
2	Offshore and onshore oil and gas exploration, development & productions	2	1 (b)	A
3	River valley projects	3	1 (c)	A
4	Thermal power plants	4	1 (d)	A
5	Petroleum refining industry	10	4 (a)	A
6	Chlor-alkali industry	13	4 (d)	A
7	Chemical Fertilizers	16	5 (a)	A
8	Petrochemical based processing	20	5 (e)	A
9	Synthetic organic chemicals industry	21	5 (f)	A
10	Oil & gas transportation pipeline (crude and refinery/ petrochemical products), passing through national parks/ sanctuaries/coral reefs / ecologically sensitive areas including LNG terminal	27	6 (a)	A
11	Isolated storage & handling of Hazardous chemicals	28	-	B
12	Ports, harbours, break waters and dredging	33	7 (e)	A
13	Highways	34	7 (f)	B
14	Building and construction projects	38	8 (a)	B

Note: Names of approved EIA Coordinators and Functional Area Experts are mentioned in RA AC minutes dated Jan. 15, 2021 and supplementary minutes dated Apr. 09, 2021 posted on QCI-NABET website.

The Accreditation shall remain in force subject to continued compliance to the terms and conditions mentioned in QCI-NABET's letter of accreditation bearing no. QCI/NABET/ENV/ACO/21/1727 dated May 07, 2021. The accreditation needs to be renewed before the expiry date by Mantec Consultants Pvt. Ltd., Noida following due process of assessment.


Sr. Director, NABET
 Dated: May 07, 2021

Certificate No.
 NABET/EIA/2023/RA 0205

Valid up to
 20-04-2023

For the updated List of Accredited EIA Consultant Organizations with approved Sectors please refer to QCI-NABET website.



<div><h2>CERTIFICATE</h2><p><i>This is to Certify that the Occupational Health & Safety Management System of</i></p><p>M/s Mantec Consultants Pvt. Ltd. (Environmental Division)</p><p>D-36, Sector-VI, Noida-201301, U.P., India</p><p>has been independently assessed and is compliant with the requirements of</p><p>OHSAS 18001:2007</p><p>This Certificate is applicable to the following product or service ranges:</p><p>Environmental Consultancy & Monitoring Services</p><p><i>:: Certificate No :: IN105707C</i></p><table><tr><td>Date of initial registration</td><td>07 July 2016</td></tr><tr><td>Date of this Certificate</td><td>08 August 2019</td></tr><tr><td>Surveillance audit on or before</td><td>06 July 2020</td></tr><tr><td>Recertification Due / Certificate expiry</td><td>06 July 2022</td></tr></table><p><small>This Certificate is property of LMS Certifications and remains valid subject to satisfactory surveillance audits.</small></p><div></div><p><i>Director</i></p><p><small>For verification and updated information concerning the present certificate visit to www.lmsassessments.com This Certificate is the property of LMS Certifications Private Limited and shall be returned immediately when demanded.</small></p><div></div><p><small>LMS Certifications Private Limited 1, Ananddham, Opp. Kukrail Picnic Spot Gate, Fazd Nagar, Lucknow - 226015, U.P. (INDIA) Phone : +91-5224464664 Email : info@lmsassessments.com www.lmsassessments.com</small></p><p><small>LMSDACP109CH11REV02</small></p></div> <td><div><p>National Accreditation Board for Testing and Calibration Laboratories</p><h3>CERTIFICATE OF ACCREDITATION</h3><p>MANTEC ENVIRONMENTAL LABORATORY</p><p>has been assessed and accredited in accordance with the standard</p><p>ISO/IEC 17025:2017</p><p>"General Requirements for the Competence of Testing & Calibration Laboratories"</p><p>for its facilities at</p><p>D-36, SECTOR- 06, NOIDA, GAUTAM BUDDHA NAGAR, UTTAR PRADESH, INDIA</p><p>in the field of</p><p>TESTING</p><p>Certificate Number: TC-6440</p><p>Issue Date: 26/12/2019 Valid Until: 25/12/2021</p><p>This certificate remains valid for the Scope of Accreditation as specified in the annexure subject to continued satisfactory compliance to the above standard & the relevant requirements of NABL. (To see the scope of accreditation of this laboratory, you may also visit NABL website www.nabl-india.org)</p><p>Signed for and on behalf of NABL</p><div></div><p>N. Venkateswaran Chief Executive Officer</p></div></td>	Date of initial registration	07 July 2016	Date of this Certificate	08 August 2019	Surveillance audit on or before	06 July 2020	Recertification Due / Certificate expiry	06 July 2022	<div><p>National Accreditation Board for Testing and Calibration Laboratories</p><h3>CERTIFICATE OF ACCREDITATION</h3><p>MANTEC ENVIRONMENTAL LABORATORY</p><p>has been assessed and accredited in accordance with the standard</p><p>ISO/IEC 17025:2017</p><p>"General Requirements for the Competence of Testing & Calibration Laboratories"</p><p>for its facilities at</p><p>D-36, SECTOR- 06, NOIDA, GAUTAM BUDDHA NAGAR, UTTAR PRADESH, INDIA</p><p>in the field of</p><p>TESTING</p><p>Certificate Number: TC-6440</p><p>Issue Date: 26/12/2019 Valid Until: 25/12/2021</p><p>This certificate remains valid for the Scope of Accreditation as specified in the annexure subject to continued satisfactory compliance to the above standard & the relevant requirements of NABL. (To see the scope of accreditation of this laboratory, you may also visit NABL website www.nabl-india.org)</p><p>Signed for and on behalf of NABL</p><div></div><p>N. Venkateswaran Chief Executive Officer</p></div>
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