EXECUTIVE SUMMARY

PROJECT PROPONENT

Uttarakhand Forest Development Corporation (UAFDC), a state owned corporation is the working agency on behalf of Uttarakhand Government engaged in removal of the minerals from the river bed. The UAFDC has got the diversion for riverbed mining of Minor minerals (RBM) like sand, boulder and bajri in the year 2002 vide letter no. 8-16/2000-FC dated 28-10-2002 for 10 yrs period. The renewal of the same is under process.

PROJECT DESCRIPTION

The proposed riverbed mining site is located in Rawasan-II (a Tributary of river Ganga and supportive river) near Rawasan and Mitiveri villages of Haridwar District, Uttarakhand state. The proposed site comes under Forest Division of Haridwar. The river carries huge quantity of sediment consisting of stones, gravel and sand during monsoon. The area earmarked for extraction in the river near Rawasan II site is 100.59 ha. However, as per the study carried out by ICAR in April, 2013 the extraction of RBM from 32.67 ha of area has been recommended. Based on this recommended area, the estimated quantity of extractable volume of RBM from this location is 316496.25 cum only.

Location of the Project

The proposed riverbed mine is located in Ganga River near Rawasan and Mitiveri villages of Haridwar District, Uttarakhand. The site is 0.2 km away from SH-49 and NH-74The nearest railhead is Haridwar located 17 km from the site. The nearest town is Haridwar which is 10 km away from the project site. The project site is at latitude 29º 48' 37.42" N to 290 49' 33.87" N and longitude 78º 14' 37.04" E to 78º 16' 31.21" E in Haridwar District, Uttarakhand. The location and key features of the project site are shown below.

KEY ENVIRONMENT FEATURES	
Project Site	Ganga River near Rawasan and Mitiveri villages
Elevation above MSL	245 to 260 m
Nearest Highway	SH-49: 200 m, NH-74: 200 m
Nearest Town/Village	Haridwar 16 Km
Nearest Railway Line	Haridwar 17 Km
Nearest Airport	Jolly Grant Airport, Dehradun – 41 km
Ecologically sensitive zones	Rajaji national Park – 5.5 km
Archaeological monuments	None within the study area
Defence Installations	None within the study area
Seismicity	Seismic Zone V
Climatology	

KEY ENVIRONMENT FEATURES

Annual IMD Roorkee	Annual Mean Max Temp: 38.5 ^{0}C (Summer) Annual Mean Min Temp : 18.8 ^{0}C (Winter) Annual Total Rainfall : 1156.4 mm
Site Data for post-monsoon Season	Mean Max Temp: 34.15^0 C Mean Min Temp : 10.6^0 C Total Rainfall : 59.2 mm

Topography: The elevation of the proposed site ranges from 245 m to 260 m MSL. In the vicinity of Siwalik Hills, the gradient is steep. Geomorphologically Haridwar district can be divided into four geomorphic units. These are flood plain, lower piedmont plain, upper piedmont plain and structural hills. Geologically the area is divided into three zones v.i.z. Siwaliks, Bhabar and Gangetic Alluvial Plains from North to South.

Geology: The northern part, paleochannels and active floodplain of rivers have soils of sandy loam; whereas remaining part of the block is covered by silty loam soils. Important soils are ultisols, which are the brown hill soil, occurring all through the northern part of the block. These are the soils with a horizon of clay accumulation and low base supply. Entisols are the soils (also called the bhabar soil) occurring all along the foothills of Siwaliks and extends up to Tarai. These soils are without Pedogenic horizons.Though these soils consist of boulders, pebbles, sand, silt and clay, they are highly fertile. Mollisols, also called the Terai soil, occur in the southern part of the Block. They consist mainly of fine-grained sand, silt and clay. These are the soils with a nearly black, organic-rich surface horizon and high base supply. These three types of soils are mineral soils with organic matter less than 25%. These are the most fertile soils of the Block.

SALIENT FEATURES

This mine falls under “A” category project as the lease area is >50 ha (as per MoEF Notification, 2006 and amended till date). The proposed project is manual extraction and collection of RBM (sand, boulder and bajri) by employing local labourers from dry river bed up to maximum depth of 1.5 meter as suggested by Central Soil & Water Conservation Research and Training Institute, Dehradun (The Indian Council of Agricultural Research). Mining will not be carried out during monsoon season. The mining process involves collection of material by simple hand tool such as shovel, pans and sieves. This is followed by sorting and manual picking, stacking and loading into trucks/ tractor–trolley for transporting. Mining will be done only along the centre of the river leaving a margin of 25% on both sides.

The salient features of the proposed mining lease area are as given below:

Particulars	River Bed Mine
Area	100.59 ha
Mineable area	32.67 ha
Total reserves	351662.50 cum/annum
Mineable reserves	316496.25 cum/annum

Particulars	River Bed Mine
Expected life of mine, years	9 months operation for a period of 10 years
Method of mining	Opencast, manual
Maximum Depth of mine	1.5 m

Land: The mine-lease area for the project is 100.59 ha. The landuse pattern of the study area is divided into two parts v.i.z eastern and western part. The western part is dominated by agriculture activities, whereas eastern part is dominated by Forest landuse.

Water: Approximately 1500 liters of water will be consumed every day for drinking purpose. The water demand will be met from the nearby villages. However the water for sprinkling will be collected from nearby villages.

Workforce: The mining activity in the area will provide direct employment to about 262 persons engaged in manual extraction of sand, stone and bajri. Indirect employment will also be generated through allied activities such as transportation etc.

Power Requirement: There will be no power consumption as the extraction will be done manually. All work related to river bed mining will be done manually using hand tools during natural day light.

ALTERNATIVES

Site Alternatives: Mining of minerals is site specific in nature and the location of the proposed project is restricted to the geology and mineral disposition of the area. Safety, economical and technical constraints determine the mining methods to be employed. Unlike other industries, the project cannot be shifted to other sites.

Mining Technology: Mining operation will comprise of the following steps:

1. Survey and site demarcation by Forest Department
2. Site preparation
3. Surface mining by hand tools
4. Loading and transportation of minor mineral through trucks/dumpers after computerized weighment.

DESCRIPTION OF THE ENVIRONMENT

Baseline data generation forms a part of the Environmental Impact Assessment study, which helps to evaluate the predicted impacts on the various environmental attributes and helps in preparing an Environmental Management Plan (EMP) outlining the measures for improving the environmental quality and scope of future expansions for environmentally sustainable development.

Baseline data was generated for various environmental parameters including air, water (surface and ground water), land and soil, ecology and socio-economic status to determine quality of the prevailing environmental settings. The study was conducted during post-monsoon season (October to December), 2014.

Meteorological Data

The study area is part of sub-tropical to humid climate with three distinct seasons v.i.z summer followed by rainy and winter seasons. The average normal annual rainfall in the region is 1156.4 mm, out of which 84% is received during monsoon season and only 16% occurs during non-monsoon period. Temperature begins to rise from March (29.1°C) and reaches to its maximum in May (39.2°C). With the commencement of monsoon season by mid-June, the temperature begins to fall. During the winter season in the month of November to February the temperature ranges between 10.5°C and 6.1°C.The relative humidity is highest in monsoon season (85% in the morning and 79% in the evenings). The lowest humidity is observed during the month of April and May i.e. 24% (evening) and 40% in May (morning).The mean monthly wind speed is highest in the summer when it goes up to 7.4 and 7.2 km/hour in the month of May and June and the minimum wind speed is observed during winter when it is 2.6 km/hour. The potential evapo-transpiration is maximum in the month of May 198.9 mm and minimum (38.5 mm) in the month of December.

Air Environment

Fifteen Ambient Air Quality Monitoring (AAQM) Stations were selected. Criteria used for designing the network were principally governed by the wind rose pattern for post-monsoon season and the accessibility of the selected sites. Attempts were made to locate most of the AAQ stations in predominant downwind direction with respect to the project site.

It is observed that the P98 values of PM10 and PM2.5 ranges from 88.85 µg/m³ to 112.81 µg/m³ and 31.04 µg/m³ to 41.69 µg/m³. The P98 value of SO_2 and NOX varied from 12.12 µg/m³ to 23.53 µg/m³ and 18.08 µg/m³ to 36.78 µg/m³ respectively. Thus SPM, SO_2 and NOx concentrations were observed to be below the stipulated standards of CPCB for residential / rural region in all the air quality monitoring locations during the study period.

Air quality modeling was done using line source model as published by USEPA "Workbook of dispersion Modeling" by Turner, for transportation though roads and the empirical emission factor equations from USEPA.

Land-Use

The landuse pattern of the study area is divided into two parts v.i.z eastern and western part

- The western part is dominated by agriculture activities, whereas eastern part is dominated by Forest land use
- Rajaji National Park is approximately 5.5 km away from the project site.
- No Sanctuary and Bio-sphere Reserve.

The core zone is confined within the river bed area having sand, bajri, boulders and streams of water.

Soil Environment

The texture of the soil in all the sampling locations are predominantly sandy loam and pH in the sampling locations varies from 7.60 to 7.90.

Water Environment

Ten surface water samples and seven ground water samples were collected for analyzing the water quality of the study area. All the sampling locations were taken in the villages which will be affected by the project by mining activities.

Ground water quality:

- pH: All the samples of ground water meet the desirable limit (pH ranges from 7.48 to 7.83) as per IS: 2012.
- Alkalinity: Total alkalinity in the water samples of ground water ranges from 135.3 to 188.7 mg/l. The alkalinity of the samples is within desirable limit of 200 mg/l.
- Conductivity in the sampling locations range from 512.7 µS/cm to 608.9 µS/cm.
- Total hardness in the samples range from 171.2 mg/l to 198.4 mg/l.

Surface water quality:

- The pH of the surface water samples is found normal and ranges from 7.86 to 7.98.
- Conductivity in the sampling locations range from 398.3 µS/cm to 434.7 µS/cm.
- Total hardness in the samples range from 90.7 mg/l to 114.9 mg/l.
- Total alkalinity in the water samples of ground water ranges from 116.9 mg/l to 145.4 mg/l.

Noise Environment

The noise quality of the region describes the extent of existing noise level in the area due to vehicular movement or any other activities. Fourteen noise monitoring stations were identified to assess the noise quality in the area. The noise levels recorded in the monitoring locations during daytime were found to be in the range of 47.1 to 56.3 dB (A) and during night time the Leq value was between 35.7 and 40.5 dB (A).

Ecology

Ecological Resource: The study area has ecologically sensitive receptors such as sanctuary, spots of tourist attraction and places of religious interest.

Flora: The flora of the region can be divided into Natural vegetation and Forest vegetation. The common flora found in the study area is *Shorea robusta, Adina cordifolia, Mallotus oppositifolius, Terminalia arjuna, Bridelia retusa, Dalbergia sissoo* and *Syzygium cumini*.

Fauna: The nearest national park to the area is Rajaji National which is about 10.70kmfrom the mine site. Common fauna encountered in the study area are Asian Elephant, Indian Langur, Nilgai

(Antelope), Sambhar and Rhesus Macaque. Among birds Kingfisher, Barbets, Woodpeckers, Babblers, Golden Spectacled Warbler, Slaty Headed Parakeets, Great Hornbills are observed in the study area.

Social Environment

The study area falls under:

1. Vikas Khand Dogadda, Tehsil Kotdwara and Lansdowne, District Garhwal, State Uttarakhand.
2. Vikas Khand Bahadarabad, Tehsil & District Haridwar, State Uttarakhand.
3. Vikas Khand Laksar and Khanpur, Tehsil & District Haridwar, State Uttarakhand.
4. Vikas Khand Yamkeshwar, Tehsil Kotdwara, District Garhwal, State Uttarakhand.
5. Vikas Khand Najibabad and Kiratpur, Tehsil Najibabad, District Bijnor, State Uttar Pradesh.

ANTICIPATED IMPACTS & MITIGATION MEASURES

Environmental Impact Assessment (EIA) of the proposed project has been carried out with reference to land & soil, water, noise, flora, fauna and socio economic status.

Land Environment

The landscape of this area will not be disturbed by the proposed river bed mining. Roads for transportation of mined minerals are already constructed and since existing infrastructure facilities and haul roads will be used, no further impact on land use is anticipated.

Mitigation measures: Since there is no further impact in landuse therefore no mitigation measures are required.

Air Environment

In opencast mining the different process of handling and transportation of minor minerals in the mining activities are prone to generation of high levels of fugitive dust that may increase the levels of particulate matters to high extent. Dusts are generated due to the following mining processes:

i. Generation of dust due to transportation of mined minerals.

ii. Generation of dust due to movement of heavy vehicles.

The effects of air pollutants upon receptors are influenced by concentrations of pollutants and their dispersion in the atmosphere. Air quality modeling is an important tool for prediction, planning and evaluation of air pollution control activities besides identifying the requirements for emission control to meet the regulatory standards. It was found that after mines operation the resultant Ground Level Concentration for Particulate Matters will be much below the stipulated standards. The efficient management of air quality requires the use of modeling techniques to analyze the patterns of pollutant concentrations from many individual sources of air pollutants operating simultaneously.

Mitigation Measures:

- The dust suppression measures like water spraying will be done on the roads.
- Only PUC certified vehicles will be deployed for transportation.
- Care will be taken to prevent spillage from the trucks.
- Trucks will be covered with tarpaulin to prevent fugitive dust.

UAFDC will undertake afforestation in lieu of the mining area in Uttarakhand.

Water Environment

River bed mining causes lowering of river bed level as well as lowering of ground water table due to excessive extraction and draining out of ground water from the adjacent areas, if the general water table is higher than the river bed level. In case the general ground water table is lower than river bed water level, then it will have positive impact as ground water table will be recharged vertically as well as laterally.

Mitigation measures: The deposits occur in the middle/bottom of the river. During the lease period, the deposit will be worked from the top surface to 1.5 m bgl or above the ground water table whichever comes first. Thus no ground water pollution is expected, as mining will not intersect ground water. It is not proposed to divert or truncate any part of the stream and at no point of time mining will be done from the stream.

Noise Environment

The area in general represents calm surroundings. There is no heavy traffic, industries or noisy habitation in the area. With increase in the scale of mining operations, the vehicular movement and the presence of mining workers may lead to increase in noise level. However, this increase in noise level will be insignificant.

Mitigation Measures:

- The vehicles will be maintained in good running condition so that noise will be reduced to minimum possible level.
- Trucks drivers will be instructed to make minimum use of horns at the village area.
- Plantation of trees along the banks and approach roads will be done to dampen the noise, if possible.

Ecological

No major impact is foreseen on the flora and fauna of the study area as the mining operation is restricted to manual mining of river bed.

The most important effect of sand mining on aquatic habitats are bed degradation and sedimentation, which can have substantial negative effects on aquatic life attached to stream bed deposits.

Mitigation Measures:

- Noise produced due to vehicular movement for carrying sand materials will be within permissible noise limit. Higher noise level in the area may lead to restlessness and failure in detection of calls of mates and young ones.
- The riparian ecosystem or the wetlands will not be destroyed by the mine owners/workers. Mining will be carried out on the dry river bed area and the river water channel will not be disturbed at all.
- Labourers will not be allowed to discard food, polythene waste etc., which can attract animals/birds near the core site.

Socio-Economic Environment

Establishment of the mines will generally contribute positively to the socio-economic status of the study area in terms of employment (direct & indirect). With the continuation of mining operations, employment opportunities, communication and connectivity will be improved. Thus this project will, in general have a positive impact.

Mitigation Measures:

- **Occupational Health & Safety:** The workers working in sand mining and its loading, unloading and transportation operation will be given safety training. All the workers will be provided with dust masks and protective clothing. Periodic health check-ups as per the mine safety rule will be undertaken. First-aid box will be provided at site. The drop height of material will be kept minimum and water sprinkling on haul roads will be done periodically to suppress the fugitive dust emission. The mining operation will be carried out during day time and hence no significant health impact is anticipated on the workers as well as on the people residing nearby.
- **R&R Plan/Compensation Details:** Since it is a river bed mining project and so no settlements are involved and therefore no R&R issue arises from proposed mining.

ENVIRONMENT MONITORING PLAN

Success of any Environment Management Plan depends upon the efficiency of the organizational set-up responsible for the implementation of the programme. Regular monitoring of the various environmental parameters is also necessary to evaluate the effectiveness of the management programme so that necessary corrective measures are taken to resolve them. Since environmental quality parameters at work zone are important for maintaining safety, the monitoring work forms part of the safety measures also.

Proposed Management Setup

Environment management will be executed by a team headed by a senior executive reporting to the managing director. The team should be responsible for planning, execution and monitoring of all aspects of the environment, during the mining operation.

A well-defined environmental monitoring program would be emphasized with trained and qualified staff that would monitor the ambient air to ensure that the pollutants level is maintained always within the permissible levels. The locations will be finalized in consultation with SPCB.

RISK ASSESSMENT

The possible risks in case of river bed mining project are bank erosion, floods and accidents during transportation. The mining is restricted to non-monsoon seasons thus no flash flood damages are anticipated.

The other hazards are road accidents, slipping, minor cuts etc. A worker in the mine should be able to work under adequately safe and healthy condition. Since mining of minor minerals is an essential aspect, safety of the mine and the employees should be taken care of by the Mining Rules & Regulations which are well defined with laid down procedure for safety.