

STUDY PERIOD-DEC-2012 TO FEB-2013

NON FOREST LAND

**-ENVIRONMENTAL IMPACT ASSESSMENT  
&  
-ENVIRONMENTAL MANAGEMENT PLAN  
FOR  
RIVER BED MINING PROJECT OF MINOR MINERALS  
(SAND,BAJRI & STONE)**

**Inter state boundary of Punjab & H.P.  
falls in buffer zone(10km radius) of lease area  
NAME OF THE RIVER – KUNDLU**

**AREA–19.6 Hect. (245.15 Bighas), CATEGORY- 'A'  
Purpose- Lease Renewal /Production Enhancement,  
Production Capacity – 62600 TPA (ROM)**

**SURVEY NO.-**

**Mauza Androla Nichla : 285 Min (108.04 Bighas)**

**Mauza Androla Uparla**

**345/303 (22.00 Bighas), 321 (30.12 Bighas)**

**339/105(22.00 Bighas),341/225(20.00Bighas)**

**343/258 (42.00 Bighas), 336/1 (1.07 Bighas)**

**At:**

**MAUZA/ VILLAGE: ANDROLA NICHLA AND ANDROLA UPARLA  
Tehsil-Nalagarh, Distt. -Solan, Himachal Pradesh.**



**APPLICANT**

**SMT ROSHANI DEVI  
W/O Lt. SH. HAKAM RAM  
VILLAGE & P.O. – KHERA,  
TH.-NALAGARH, DIST. - SOLAN,-174101(H.P.).  
Mob. +91 9816038133 E mail :- [ssbist@udrminotech.com](mailto:ssbist@udrminotech.com),**

**EIA CONSULTANT**

**M/S UDAIPUR MIN-TECH PVT. LTD.  
206-APEKSHA COMPLEX, SECTOR NO.-11,  
HIRAN MAGARI, UDAIPUR-313002 (RAJ.).  
PH- +91-294-2489672 (OFF.)Mob. +91 9414167672**

**ACCREDITED BY NABET CATEGORY "A" FOR MINING PROJECT**

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QCI – NABET Scheme for Accreditation of EIA Consultant Organizations

Annexure I-A

**Name of the Consultant: Udaipur Min-Tech Pvt. Ltd.**


206, "Apeksha Complex",  
Sector 11, Hiran Magri,  
Udaipur- 313002

**Sectors Approved – 01 Nos.**

Sl. No.	Sector No.	Name of Sector	Category** A/B
1	1	Mining of minerals (Opencast only)	A

**Total = 01 Sector\***

*\*Sectors allocated to individual EIA Coordinators are mentioned in Annexure I-B*



(Vipin Sahni)  
Director

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POINTS TO BE CLARIFIED TO THE EXPERT APPRAISAL COMMITTEE, (EAC), MINISTRY OF ENVIRONMENT & FORESTS (MOEF), NEW DELHI AS PER THE APPROVED TOR FOR RIVER BED MINING OF MINOR MINERALS viz. SAND , BAJARI & STONE OF SMT ROSHNI DEVI,RIVER- KUNDLU, VILLAGE – ANDROLA NICHALA AND ANDROLA UPARLA,TALUKANALAGARH, DIST- SOLAN (HIMACHAL PRADESH), LEASE AREA –19.6 HECT.

Sl. No. as per MOEF	Description as per MOEF	Covered in EIA as per details
I	Year-wise production details since 2006 after the EIA Notification, 2006 coming into force.	Year-wise production details since 2006 after the EIA Notification, 2006 coming in to force is given in Table No.1.2 on Page No.25
II	A copy of the document in support of the fact that the proponent is the rightful lessee of the mine should be given.	Copy of lease deed in favour of proponent is enclosed as Annexure – II.
III	All documents including approved mine plan,(eco friendly mine plan), EIA report and Public hearing should be compatible with one another in terms of the mine lease area, production levels, waste generation and its management and mining Technology .	Details are given in EIA report.
IV	The terms and condition imposed, if any, by the Competent Authority in the state government while granting mining lease / permit / contract should be built into the mine plan (eco friendly mine plan), as well as the EIA report. It may inter – alia include; area of working (length and breadth of the river stretch), mode of working shift, transportation of mineral, restriction, if any imposed for working etc.	Please Refer Page No. 40 to 41 in Chapter No. II of EIA report.
V	All corner co-ordinates of the mine lease area superimposed on High Resolution Imagery/Toposheet to be provided.	No forest land is involved in the lease area. Details are given in the chapter – 4.
VI	Involvement of forest land,if any, in the project and status of forestry	

	clearance should be given	
VII	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.	Please Refer Page No. 49 in Chapter No. 3 of EIA report. Study area comprises the core zone and buffer zone which includes 10 Km zone around the ML Area. The baseline data in Ambient air quality, water quality, noise level, soil quality, biodiversity and socio economic descriptions are largely drawn and contained in EIA report.
VIII	Does the company have a well laid down Environment policy approved by its Board of directors? If so, it may be detailed in the EIA report.	Please Refer Page No. 176 in Chapter No. 9 of EIA report.  The project is based on limited mining operations in river bed resources. To have a separate staff and facilities for Environmental management cell is unfeasible. However the management is committed to provide personal attention as well as a senior employee with few assistants to look into compliance of guidelines provided in the EMP report.  Periodic monitoring for Air, Water, noise and soil will be done by consultants that have been accredited and the cost will be borne by the management.
IX	Does the Environmental policy prescribe for standard operating process/procedures to bring into focus any infringement/ deviation /violation of the environmental or forest norms/conditions? If so, it may be detailed in the EIA report.	Plz. Refer Page No. 161 to 163 in Chapter No. V of EIA report.  Standard operating procedures shall be followed during quarrying of minor minerals. Hence no impact on Land Use Pattern including change in river course is envisaged.
X	What is the hierarchical system or Administrative order of the company to deal with the environmental issues and for ensuring compliance with the EC conditions. Detailed of this system may be given.	Plz. Refer Page No. 162 in Chapter No. V of EIA report.

XI	Does the company have a 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? This reporting mechanism should be detailed in the EIA report.	Plz. Refer Page No. 162 in Chapter No. V of EIA report. The lessee is a small scale establishment, but is committed towards protection of environment and shall ensure compliances of EC conditions.
XII	A study should also be carried out to decide on the quantum of mineral which can be removed on sustainable basis taking into account the replenishment potential of the area and details furnished.	Plz. Refer Page No. 42 in Chapter No. II, Section 2.6 of EIA report. The Replenishment Potential of the river, Production plan of quarrying of minor minerals is given along with the details.
XIII	Land use of the study area delineating forest area, agricultural land, grazing land, wildlife sanctuary and national park, wildlife corridor, water bodies, human settlements & other ecological features should be indicated.	Plz. Refer Page No. 83 to 103 in Chapter No. III of EIA report. The details of Land Use of the study area are given in Chapter III of EIA report.
XIV	Land use plan of the mine lease area should be prepared to encompass pre operational, operational & post operational phases and submitted.	Plz. Refer Page No.109 in Chapter No. 3, section 3.15 of EIA report.  It is river bed mining. River bed will be excavated in slice of 1 meter thickness leaving statutory barrier. Material will be replenished every year during monsoon. So no change occurs in form of pit. ML area will change in form of plantation done during the year. Dump of silt and clay will be used in plantation or will be transported as suspended load during monsoon. So after monsoon, existing land use will be restored except change in plantation area.
XV	Impact of the project on the wildlife in the surrounding and any other protected area and accordingly detailed mitigation measures required should be worked out with cost implications.	Plz. Refer Page No. 155 in Chapter No. IV of EIA report. Core zone area of mine is sparsely vegetated land. The mining activities will be confined to core zone only, hence no adverse impact is foreseen on the wild life of the area. For more details, plz. Refer page no. 156 in Chapter IV of EIA report.
XVI	The vegetation in the RF/PF in the study area, if any, should be indicated.	Plz. Refer Page No. 92 to 101 in Chapter No. III of EIA report. Not much vegetation is observed in the

		core zone apart from some grasses and slight shrubby vegetation. The banks of river have thick vegetation in the form of lantana bushes. Some tree species are also observed along the bank of the river.
XVII	A study shall be got done to ascertain the impact of the mining project on wildlife of the area including aquatic life.	Plz. Refer Page No. 155 in Chapter No. 4 of EIA report. Core zone area of mine is unirrigated agriculture land and waste land. The mining activities will be confined to core zone only, hence no adverse impact is foreseen on the wild life of the area. For more details, plz. Refer page no. 155 in Chapter IV of EIA report. No adverse impacts is envisaged on the aquatic flora and fauna as the mine working will be confined to above water level only and at all touching / disturbing water table.
XVIII	Location of National parks, Sanctuaries, Biosphere Reserves, Wildlife corridors, Tiger/Elephant reserves (existing as well as proposed), within 10 km of the mine lease should be clearly indicated supported by a location map duly authenticated by Chief Wildlife Warden for operating the mine within 10 km of the national park/sanctuary, if any, should also be obtained and furnished.	Not required as no National parks, Sanctuaries, Biosphere Reserves, Wildlife corridors, Tiger / Elephant reserves. Protected / Reserved forest exists outside the lease area.  Details are given on page no. 107, table 3.14 in chapter III of EIA report.
XIX	A detailed biological study for the study area [core zone & buffer zone (10 km radius of the periphery of the mine lease)] shall be carried out. Details of flora & fauna, duly authenticated, separately for core and buffer zone should be furnished based on field survey clearly indicating the schedule of the fauna present. In case of any scheduled-I fauna found in the study area, the necessary plan for their conversion should be prepared in consultation with state forest and wildlife deptt. and details furnished. Necessary allocation of funds for	For detailed biological study of flora and fauna based on field survey are provided in Page No. 102 to 106 in Chapter No. III of EIA report. During faunal investigation of the area, no Schedule – I species observed in the study area.

	implementing the same should be made as part of the project cost.	
XX	Impact of the project on land use including change of river course, if any should be given.	Plz. Refer Page No. 156 to 158 in Chapter No. IV of EIA report. Standard operating procedures shall be followed during quarrying of minor minerals. Hence no impact on Land Use Pattern including change in river course is envisaged. For more details plz.
XXI	Impact on topography, drainage, agriculture fields, cattle fields, wildlife, water logging leading to water borne diseases, if any. It may also be shown whether it will lead to change of watercourse of the river. Modeling exercise should also be carried out through an expert agency to show the change in river flow dynamics, if any.	No change in watercourse of the river. No impact is envisaged on topography, drainage, agriculture fields, cattle fields, wildlife etc. as the mining is confined to core zone only and the core zone is unirrigated land and waste land. Secondly, during mining period, river remains dry. Hence no change in water course of the river is envisaged. For more details, plz. Refer page no. 157 to 158 in EIA report.
XXII	Collection of one season (non-monsoon) primary baseline data on ambient air quality (PM10, SO <sub>2</sub> and NO <sub>x</sub> ), water quality, noise level, soil and flora and fauna site specific metrological data should also be collected. The location of the monitoring stations should be justified. Date wise collected baseline AAQ data should form part of EIA and EMP report. The mineralogical composition of PM10 particularly for free silica should be given. There should be at least one monitoring station within 500 m of the mine lease in the pre-dominant downwind direction.	Plz. Refer Page No. 49 to 124 in Chapter No. III of EIA report. Primary baseline data on ambient air quality (PM10,SO <sub>2</sub> & NO <sub>2</sub> ), water quality, noise level, soil quality, flora and fauna, site specific meteorological data including monitoring stations of one season (non-monsoon i.e December 2012 to February 2013) have been collected and provided in page no. 49 to 124 of Chapter III of EIA report. The baseline data monitored are well within the standard limits.
XXIII	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 in to account the impact of movement of vehicles for transportation of mineral. The details of the model used and the input	The details of the air quality modeling are given in chapter 3.0, Pages 64-73 along with a windrose.

	parameters used for modeling should be provided. The Air quality contours may be shown on the location map clearly indicating the location of site, location of sensitive receptors, if any, and habitation. The wind roses showing pre-dominant wind direction may also be indicated on the map. The impact of stone crusher nearby should also be taken into account.	
XIV	The water requirement for the project, its availability and source to be furnished. A detailed water balance should also be provided. Fresh water requirement for the project should be indicated.	Total water requirement 4.30 KLD. The availability of water from Dug well outside mine lease area, therefore No permission is required. The mining will not intersect ground water level also.  The break-up for water usage is given in the page 47.
XXV	Necessary clearance from the Competent Authority for drawl of requisite quantity of water for the project should be provided.	Not required as water for mining purpose will be brought from well outside the lease area.
XXVI	Impact of the project on the water quality should be assessed and necessary safeguard measures, if any required, should be provided.	No impact on surface as well as ground water because no waste water will be discharged due to mining and mining will be restricted above ground water.
XXVII	Information on site elevation, working depth, groundwater table should be provided both in AMSL and bgl. A schematic diagram should also be provided for the same.	Schematic diagram is given on page no. 154 of EIA report.
XXVIII	Quantity of solid waste generation, if any, should be estimated and details for its disposal and management should be provided.	During mining of minor minerals, only clay will be generated as waste. It will be left in the pits as back fill. The clay being the lightest of the sediment load in the flowing river, water is carried downstream by even the lightest floods during the onset of monsoon. As clay donot contain any harmful constituent, therefore their carriage/movement would not create any harmful environmental impact. For more details, please, Referpage no. 42 of Chapter II of EIA report.

XXIX	Impact on local transport infrastructure due to the project. Projected increase in truck traffic as result of the project in the present road network (including those outside the project area) and whether it is capable of handling the increased load. Arrangement for improving the infrastructure, if contemplated, (including action to be taken by other agencies such as State Government) should be covered.	Not much impact on local transport as only 5 - 6 dumpers/ day will be required for transport of mineral from mine. Increase in truck traffic is negligible and capable of handling the increased load. State govt. conduct traffic census regularly and take action accordingly. However monitoring of traffic density is given in table 3.14. on Page 78.
XXX	Details of the infrastructure facilities to be provided for the mine workers should be furnished.	Office cum store exists adjoined to the lease area of the same lessee facilitated with toilet, rest shelter, first aid room, telephone & safety equipments like helmets, safety boot etc.
XXXI	Phase-wise plan of greenbelt development, plantation and compensatory afforestation clearly indicating the area to be covered under plantation and the species to be planted should be provided.	Details given on Page-172 to 173 respectively.
XXXII	Occupational health impact of the project activity should be anticipated and reported and proposed preventive measures indicated. These along with details of pre-placement medical examination and periodical medical examination schedules and medical facilities proposed to be provided should be incorporated in the EMP.	Occupational health impact of the project should be anticipated and preventive measures indicated. Details in this regard should be provided. Details of pre-placement medical examination and periodical medical examination schedules should be incorporated in the EMP. Ambient noise level measured at 5 locations around the site varies from 54.9 to 52.9 Leg dB(A) during day time and 44.7 to 43.6 Leg dB(A) during night time are well within the prescribed limits. Although the river bed mining project does not involve any major risks, though a first aid room with proper equipment
XXXIII	Measures of socio economic influence to the local community proposed to be provided by project proponent should be spelt out. As far as possible, quantitative dimensions should be	The project proponent will look after the peripheral area for development & help in providing rural employment.

	given.	
XXXIV	Detailed environmental management plan to mitigate the environmental impact. Specific safeguard measures to control PM <sub>10</sub> as well as pollution due to transportation should be given. It should also address the impact due to stone crusher nearby.	Details given on Page -168 to 175.
XXXV	Public hearing points raised and commitment of the project proponent on the same along with time bound action plan to implement the same to be provided.	Yet to be conducted.
XXXVI	Details of litigation pending against the project, if any, with direction / order passed by any court of law against the project should be given.	No litigation is pending against the project.
XXXVII	The cost of the project (capital cost and recurring cost) as well as the cost towards implementation of EMP should clearly be spelt out.	Capital cost of project – 25.30 Lacs Recurring cost of project-06.00 Lacs Capital cost of EMP – 6.50 lacs Recurring cost of EMP- 3.00 lacs

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## **CHAPTER - I INTRODUCTION**

Mining Environment and development have become complimentary to each other. As a result of developmental activities visible ill-effects of the environmental degradation are clear and give signals of the concern. Therefore a sustainable development of the area involving extraction of mineral wealth vis-à-vis protection of environment is the ultimate solution for betterment of mankind.

### **1.1 PURPOSE OF REPORT**

The Environmental Management Plan has been prepared to assess the current environmental scenario of the area and then based on the activities of mining proposed, to carry out Environmental Impact Assessment.

The plan will identify and address the impacts, where these are adverse in nature, and thereafter design mitigative measures to manage such impacts in a manner as to conserve environment and ecology of the area. The EMP has been prepared with a view to ultimately ensure that the adverse impacts are minimized if these cannot be prevented altogether.

Environmental clearance is a statutory requirement for the new and old establishment of any mining project of which EIA has to be prepared and submitted to respective agencies of state and center level in line with EIA Notification, 1994.

As per new EIA Notification Dated 14<sup>th</sup> Sept. 2006, Environmental Clearance is required at the time of renewal of mining lease and enhancement of production wherein the area is 5.00 hect & above . This

project fall under category “A”, project or activity-1 (a) 4 as it attracts the general condition {interstate boundary of Punjab – Himachal Pradesh at a distance of 5.0 km therefore this project requires Environment clearance from MOEF New Delhi.

Lessee decided to get Environmental Clearance under renewal of lease and enhancement of production both categories.The application for EC was submitted to EAC, MOEF, New Delhi. Meeting held with the EAC (mining) on dated 21<sup>st</sup> Oct., 2011 and issued TOR letter no. J-11015/194/2011-IA.II (M) Dated 9<sup>th</sup> Jan., 2012.Forpreparation of an Environment Impact Assessment (EIA) Report in respect of the project. (Refer Annexure No.1)

## 1.2. IDENTIFICATION OF PROJECT AND PROJECT PROPONENT

### 1.2.1 Identification of Project

**Name of the project:** River bed mining of sand, bajri & stone (Minormineral).

(ML area 19.6 ha.)

Renewal of leaseand production 62600 TPA (ROM).

**Location of the project:**

MAUZA/VILLAGE : Mauza Androla Nichla

285 Min (108.04 Bighas)

Mauza Androla Uprala

345/303 (22.00 Bighas), 321 (30.12 Bighas

)339/105(22.0Bighas), 341/225(20.00Bighas)

343/258 (42.00 Bighas), 336/1 (1.07 Bighas)

Tehsil - Nalagarh, Distt.- Solan, State- (H.P.)-171006.

### 1.2.2 Identification of Proponent

Applicant: Smt. Roshni Devi, W/o Lt. Sh. Hakam Ram, Village & P.O. – Khera, Tehsil- Nalagarh, District- Solan, (H.P.).

### 1.3 LEASE STATUS

Smt Roshini Devi w/o late Shri. Hakam Ram, resident of Village & P.O. Khera, Tehsil- Nalagarh, District- Solan, has been transferred a mining lease for extraction of Sand, Bajri and stones over an area of 245.15 bighas (19.6 ha). The lease was previously granted to her husband Late Mr. Hakam Ram (applicant) who was engaged in minor minerals mining profession since last 7-8 years.

The applicant has also setup a stone crusher near lease area to process the stones. After the death of Mr. Hakam Ram, the lease was transferred to Smt. Roshini Devi, as the overall business setup was transferred to her Name, being his wife.

### 1.4 BRIEF PROJECT DESCRIPTION

The mining lease for extraction of Sand, Bajri and stone has been granted for an area of 245.15 bighas (19.6 hectares).

Mauza Androla Nichla	Khasra No. 285 Min (108.04 Bighas)
Mauza Androla Uparla	Khasra No. 345/303 (22 Bighas), Khasra No. 321 (30.12 Bighas), Khasra No. 339/105 (22 Bighas), Khasra No. 341/255 (20 Bighas), 343/258 (42 Bighas) and Khasra no. 336/1 (1.07 Bighas)

Located in Tehsil – Nalagarh, District- Solan, State – Himachal Pradesh. The area was originally granted in favour of Late Mr. Hakam Ram. After the death of Mr. Hakam Ram, the lease was transferred to Smt. Roshini Devi, as the overall business setup was transferred to her Name, being his wife. The area is transferred vide order no. Udhog – Bhu (Khani-4) Laghu-352/2001/12406 Dt. 4.02.2010 for a period of five years for mining of minor minerals, to be used in manufacture of grit. The Transfer deed of the lease was registered and executed on date 26.08.2010 for remaining period up to the lease period. The stone extracted from this Quarry is used for manufacture of grit in stone crusher. The sand and bajri are directly sold.

**Table 1.1 BRIEF DESCRIPTION OF PROJECT**

S.No	Particulars	Details
1	Locations	
	A. Village	Mauza- Androla Nichla Androla Uppla
	B. Tehsil	Nalagarh,
	C. District	Solan,
	D. State	Himachal Pradesh.
2.	Longitude	76° 48' 12'' - 76° 50' 12''
3.	Latitude	31° 07' 54'' - 31° 08' 32''
4.	Elevation above sea level	330 mts to 387 mtrs ab. msl.
5.	Nearest National Highway	NH-22 Chandigarh- Panchkula-Shimla at a distance of 36 km.
6.	Nearest Railway station	Kalka on Shimla- Panchkula Railway line at a distance of 40.0 km.
7.	Nearest Airport	Chandigarh Airport at a distance 60 kms.
8.	Nearest Tourist Place	None within 10 km radius of the project site.
9.	Archeological Place	None within 10 km radius of the project site.
10.	National Park , Wild Life Sanctuary, Wild Life Corridors, Biosphere Reserves, Migratory routes for Birds, Reserved/Protected Forest	Nearest Reserve Forest is Raipur at distance of 2.0 km
11.	Nearest major city with population	Nalagarh at 13.0 KM. Solan at 75.0 KM

		Baddi at 32.0 KM
12.	Nearest Water bodies	RiverKundlu
13.	Nearest town	Town Nalagarh at a distance of 13.0 km
14.	Nearest Village of the project site	Androla within a distance of 1 Km.

### 1.5 LEGAL STATUS OF THE PROJECT

Under Section 15 of Mines & Minerals (Development & Regulations) Act 1957 all State Governments are empowered to frame the Rules, Regulations and Guidelines in respect of mining of minor minerals within the said state. Exercising its powers conferred under section 15 of Mines & Minerals (Development & Regulations) Act 1957, State Government of Himachal Pradesh framed relevant Minor minerals Mining rules referred as Himachal Pradesh Minor Minerals (Concession) Rules 1971. Himachal Pradesh Minor Minerals (Concession) Rules 1971 provides method for allotments of Minor Minerals Concessions as follows:

The mining lease for excavation of minor mineral (Sand, Bajri and stones) will be granted to the persons or parties, who will set up a industrial crusher in the state for processing of stones to grit, and this shall be committed by lease holder and will be a primary condition for grant of the lease.

In accordance of the above the lessee applied for mining lease as well as proposal for set up of stone crusher to the state Govt. The area was originally granted in favour of, Late Mr. Hakam Ram. After the death of Mr. Hakam Ram, the lease was transferred to Smt. Roshini Devi, as the overall business setup was transferred to her Name, being his wife.

The area is transferred, vide order no. Udhog – Bhu (Khani-4) Laghu-352/2001/12406 Dt. 4.02.2010 for a period of five years for mining of minor

minerals, to be used in manufacture of grit. The Transfer deed of the lease was registered and executed on date 26.08.2010 for remaining period, up to the lease period.

The area was inspected by a joint committee of revenue officials, pollution control board, and mining department and other official to verify and assess the viability of the project.

As per New EIA Notification 14<sup>th</sup> Sept. 2006, Lessee requires Environmental Clearance from MoEF, New Delhi, for expansion of Production capacity of 30640Tons/ Annum to 62600Tons/ Annum of Minor Mineral (Sand, Bajri & Stone) for a renewal lease period(5 years) and renewal of lease.The lease was registered and executed on 26.08.2010, for a period up to the lease period.

The mining method will be opencast and will be carried out manually. The targeted production of Sand, Bajri & Stone mineral will about 62600 Tones/annum. Production details from year 2006 onwards are given in Table No. 1.2.

**TABLE NO.1.2- PRODUCTION DETAILS**

<b>YEAR</b>	<b>Sand, Bajari, &amp; stone (IN MT)</b>
2006 – 07	21097
2007 – 08	30640
2008 – 09	13967
2009 – 10	11643
2010 – 11	23150

## **1.6 LOCATION AND COMMUNICATION**

### **1.6.1 Location**

The mining lease area under reference is situated in village–Mauza Androla Nichla & Androla Upmla, Tehsil- Nalagarh, District- Solan of Himachal Pradesh.

The area is approachable by Tar road to Panjaira village from Nalagarh in NNW direction. The area lies at a distance of 13.0 Km from Nalagarh Town, near Mauza Androla Nichla & Androla Uppla. The river-beds are approached by the approach road from Androla village at a distance of 1.0 Km lying in Kundlu Khad and lies in the SW direction of Panjiara village. The Nalagarh Town can be approached by Tar road from Solan (district H.Q.) at a distance of 80 kms.

The Nearest Railway station is at Kalka at a Distance 40 Km on Kalka-Delhi Broad gauge Railway Line. The Nearest National highway (NH- 22) is Simla- Chandigarh at a distance of 36 kms. The Nearest Airport is Chandigarh Airport at a Distance of 60.0 kms.

### **1.6.2 Communication**

#### **Road link**

The area lies at a distance of 13.0 Km from Nalagarh Town, near Mauza Androla Nichla & Androla Uppla. The river-beds are approached by the approach road from Androla village at a distance of 1.0 Km. lying in Kundlu Khad and lies in the SWW direction of Panjiara village. The Nalagarh can be approached by Tar road from Solan (district H.Q.) at a distance of 80 kms.

#### **Rail link**

The Nearest Railway station is at Kalka at a Distance 40.0 Km on Kalka-Delhi Broad Gauge Railway Line. The Nearest National highway is Shimla -Chandigarh at a distance of 36 kms.

### **Air link**

The Nearest Airport is Chandigarh Airport at a Distance of 60.0 kms. There is regular air service between Mumbai - Chandigarh - Jaipur - Delhi.

### **1.6.3 Basic Amenities**

#### **Power**

No electric power supply is available at mine site. In future, if electricity will be required for lighting purpose then lessee will apply and get connection.

#### **Amenities**

The nearest police station and tehsil headquarter is at Nalagarh, which is about 13Kms from mine. The Controlling office of Department of Mines & Geology is at Solan which is 80 Kms from mine. Telephone facility is available at the mine office. Drinking water facility by means of dug wells situated near village in the river beds. The analysis of the water from the dug well conforms that the water is potable in nature.

### **1.7 OBJECTIVES OF ENVIRONMENTAL MANAGEMENT PLAN**

The main objectives of this EMP are listed below:

- \* To establish the present environmental scenario.
- \* To anticipate the impacts of proposed future mining operations on the environment.
- \* To prepare a detailed action plan for implementation of mitigative measures.
- \* To suggest preventive and mitigative measures to minimize adverse impact and to maximize beneficial impacts.
- \* To prepare a compensatory afforestation scheme.

\* To suggest a monitoring program to evaluate the effectiveness of mitigative measures.

\* To suggest the formation of a core group responsible for implementation of environmental control and protective measures and monitoring of such implementation.

\* To suggest a feedback mechanism enabling to make mid-course corrections.

\* To prepare a capital cost estimate and annual recurring cost for Environmental Management Plan.

## **1.8 METHODOLOGY FOR EIA**

M/s. Udaipur Min-Tech Pvt. Ltd. was assigned the job of preparation of a detailed EIA report of the proposed river bed mining project of minor minerals (sand, bajri, & stone) river –Kundlu, near Mauja / village Androla Nichla and Androla Upri belonging to Smt. Roshni Devi.

The study was conducted within 10 Km radius from the proposed mine as centre. The base line data collection involves the data's of air quality, water status, land use, socio-economic structure of the study area, existing flora, fauna, prevailing noise levels, along with the physiographical status and meteorological conditions of the area. The current report is based on the mining technique, air emissions, waste water generation and discharge, and solid waste management. It also highlights the storage and safety measures adopted for handling of explosive.

Effective plans to mitigate the adverse impacts and suggestive pollution control measures along with environmental management plan have been summarized.

## 1.9 SCOPE OF THE STUDY

The terms of reference on the basis of which the EIA has been prepared are given below:

### 1.9.1 Data generation

The data has been generated by M/s Udaipur Min-Tech Pvt. Ltd, and M/s Eco Laboratories & Consultation Pvt. Ltd. Mohali, (Punjab), in accordance with the requirement of statutory agencies. The monitoring and testing has been done as per the guidelines of MoEF and the IS standards. Monitoring has been conducted for the following parameters:

**TABLE-1.3  
DATA GENERATION**

S.No	Description	No.of locations	Total No. of samples
1.0	<b>AIR</b> Ambient air monitoring (24 hourly samples), twice a week for 3 months for one season. Parameters: PM <sub>10</sub> , SO <sub>2</sub> , NO <sub>x</sub> ,	6	144
1.1	Meteorological parameters will be measured at hourly duration simultaneously at one air monitoring station for 3 months <b>Parameters:</b> a. Wind speed, direction b. Relative humidity c. Temperature d. Cloudiness e. Rainfall	1	90 days
2.0	<b>WATER</b> Water/effluents sample to be collected from each of the various locations (surface and ground water) in core and buffer zone (10 km radius).	3	3

	Parameters: Water/effluents: tested for physical and chemical and biological parameters as well as according to applicable standards.		
3.0	SOIL	3	3
4.0	NOISE Hourly readings taken for 24 hours (Leq)	6	4 sets
5.0	TRAFFIC DENSITY	1	1 set

### 1.9.2 Data Collection

The EIA study is being done for the Mine Lease (core zone) and area within 10 km radius (buffer zone), both of which comprise the 'study area'. The following data, through field survey and other sources, has been collected by Udaipur Min-Tech Pvt. Ltd, for preparing the EIA/EMP for the proposed mining area with related facilities.

- i Details of wild fauna and flora within a distance of 10 km from the project site and information about forests, if any.
- ii. Eco-sensitive places, sanctuaries, biosphere reserves within 10 km radius.
- iii. Major industries within 10 km radius.
- iv. Religious places / historical monuments and tourist places within 10km radius.
- v. Land use pattern within core zone and buffer zone (10 km radius around the core zone) based on census and satellite image and cropping pattern.
- vi. Demography and Socio-economic based on last available Census data for entire study area.

- vii. Relevant meteorological data, for previous decades from Indian Meteorological Department (IMD)
- viii. Study of present environmental protection and mitigation measures innearby operating similar projects, if any.
- ix. Geo-hydrological aspects based on available data from various secondary sources.
- x. Identification of water bodies, hills, roads etc. within 10 km radius.

### **1.9.3 Preparation of EMP**

The EMP will include the following details:

- a. Study of the reports like Geological report, FR or mining plan made available by the client.
- b. Present Environmental Setting  
The base line data generated and collected as per para 1.9.1 and 1.9.2 will be used to establish the present environment scenario.
- c. 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
- Flora and Fauna
- Traffic density
- Land-Use
- Socio-Economic Conditions
- Habitat
- Health, culture, human environment including public health, occupational health and safety
- Sensitive Places/Historical Monuments.

The impacts would be anticipated based on experience of similar projects.

- d. Proposed Environmental Safeguards and Monitoring Mechanism. Relevant guidelines as per Environment Impact Assessment (EIA) Notification issued in January 1994 and subsequently on 14<sup>th</sup> September 2006 under the Environment (Protection) Act, 1986 will be kept in mind while spelling out mitigation measures.

The following aspects would be covered

- i. Reclamation of areas disturbed during mining but not required for any activity after exhaustion of reserves.
- ii. Measures to control the surface and ground water pollution due to various effluents to be discharged, if any.
- iii. Measures to control air pollution due to proposed activities/operation.
- iv. Green belt development plan and reclamation plan of mine.
- v. Measures to contain noise pollution & mitigate adverse impact on workers and habitat in core and buffer zone.
- vi. Pronounce the improvement in socio-economic conditions & benefits the people will get on implementation of the project.
- vii. Measures to control health hazard of workers and surrounding population.
- viii. Total and specific cost of control measures.
- ix. Environmental monitoring, implementation organization and feedback mechanism to effect mid-course corrections.
- x. Identification of flora species which can be planted in and around the project.

#### 1.10 TERMS OF REFERENCE

The term of reference have been issued by Expert Appraisal Committee (EAC) of MoEF, New Delhi and are enclosed as Annexure No.I. The response to the terms of reference has been given on page on 12-19

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## CHAPTER - II

### PROJECT DESCRIPTION

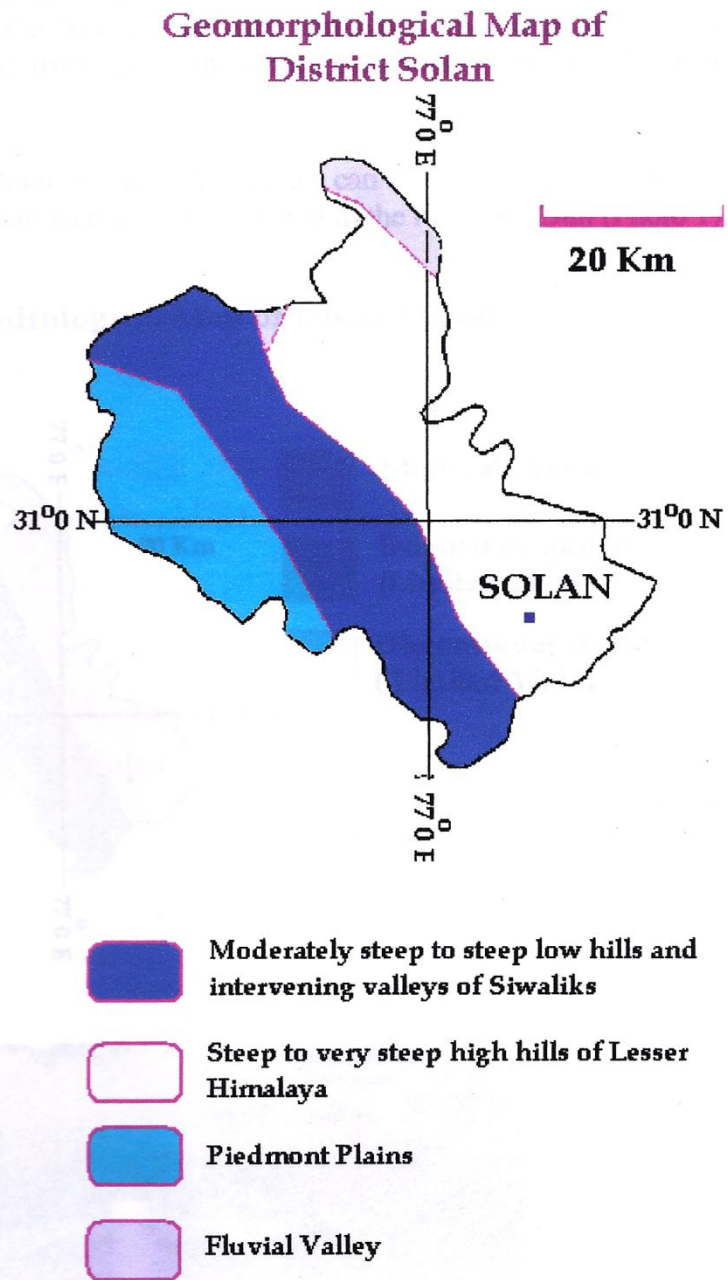
#### 2.0 PHYSIOGRAPHY

In general the area is a part of Siwalik range. The Siwalik hills are located within the political boundary of Pakistan, India, Nepal and Bhutan and ranges between 6 to 90 km in width. They gradually become steeper and narrower in relief and width respectively, from northern Pakistan to Bhutan. Ongoing erosion and tectonic activity has greatly affected the topography of the Siwaliks. Their present day morphology is comprised of hogback ridge, consequent, subsequent, obsequent river valleys of various order, gullies, choes, earth pillar, rilled earth butters of the conglomerate formation, semicircular, choe-devides, talus cones, collovial ones and choe terraces.

Intermittently located between the Siwaliks and the lesser Himalayas are duns, flat-bottomed longitudinal structural valleys with their own drainage systems. These essentially comprises several large Himalayan piedmont alluvial fans and terraces which formed as a result of tectonic episodes in the flanking Siwaliks, the duns also consist of lacustrine, fluvial, Aeolian and swamp – environment deposit and range from middle Pleistocene to Holocene in age.

#### Four broad geomorphological units have been identified:

1. Low structural hills and valleys unit of Shiwalik
2. High structure hills and Valleys of lesser Himalayan zone with Panchmunda and krol peaks.
3. Pidemont plains northwest of Nalagarh
4. Fluvial valleys



**Figure WP-2:**  
**Geomorphological**  
**division of District**  
**Solan**

The area lies in Nalagarh Dun in Sub-Himalyas. The Sub-Himalyas, the southernmost division of the Himalaya, is separated from the lesser Himalaya by the main boundary thrust in the north and the southern boundary is demarcated from the Indo-Gangetic Plain by the Himalayan frontal fault.

## **2.1 DRAINAGE:**

The Sutlej River and its tributary are the major drainage system in this Dun. The Sutlej river flows in a longitudinal course from the northwest to the southeast, whereas its tributaries originates from the higher reaches of Sub-Himalaya between Nalagarh thrust and MBT, and flow in transverse course in a south-southwestern direction. The catchment areas of these piedmont rivers (tributaries of Sutluj) are mainly comprised of lower tertiary and tertiary rocks. Mudstone and sandstone are the predominant rock types in the lower and middle Siwaliks, respectively. The important geomorphological features observed within the Dun basin are alluvial fans and river terraces.

### **2.1.1 Drainage pattern**

Drainage pattern of the area is dendritic. Drainage flows from the hill side roughly parallel to each other and meet the River Sirsa which flows towards NE to SW Sirsa river is a major tributary of river Sutlej. Sirsa river has following tributaries:

On Right Bank

1. Kiratpur nadi
2. Ramgarh nadi
3. Surajpur nadi
4. Balad nadi
5. Phula nadi
6. Khali nadi
7. Chikni nadi

8. Ratta nadi
9. Mahadev nadi

**On left Bank**

Kanhan Nadi

**2.2 THE ALTITUDE OF THE AREA**

The mining lease area is situated in KundluKi Khad which is a tributary of Sirsa khad. Sirsa khad originates from the south of kasuli ridge at a height of 1926 m above mean sea level and after travelling through small hillocks it enters in nalagarh valley near kalka it roughly flows in E-W direction then its takes a sowing towards NW where number of tributaries such on kiratpur nadi, Ram Nagar nadi, Narkanda nadi, Suragpur choe, Balad nadi and Ratta nadi joins with it. Ratta nadi originates from the Jatrog ridge at a height of 1136m above mean sea level. This nadi mostly traverse through hillocks of tertiary formation and it enters in Nalagarh valley near village Bauni when its height reduces to 510m above mean sea level. It joins with Sirsa River near village Kishanpura.

The highest point of mining lease area lies at 331mRL and lowest points lies at 312mRL.

**TABLE 2.1 Salient feature of the project**

Name of the river	Kundlu
Origin of the river/ stream/Khad	Mansarovar group of lakes in Tibet Himalayas at 4062 metres.
Drainage system	Dendritic
Width of the river	15m to 38m
Length of the river	1050
Catchment area	20,000 Sq Km in Himachal Pradesh
General slope	--
<b>Competency of the river</b>	<b>12-30cms x 10-40cms x 9-24cms</b>

Source: Cumulative Impact Assessment report (CIA), Satluj Jal Vidyut Nigam Limited (SJVNL)

### 2.3 REGIONAL GEOLOGY

Geologically, the rock formations occupying the district range in age from Pre-Cambrian to Quaternary period. The generalized geological succession in the district is given below.

**TABLE 2.2**

<i>Era</i>	<i>Period</i>	<i>Formation</i>	<i>Lithology</i>
Quaternary	Recent to Pleistocene	Alluvium /valley fills/ Older alluvium	Sand with pebble and clay, medium to coarse grained sand with pebble of sandstone and lenses of clay
Tertiary	Pliocene – M-Miocene	Siwalik Group	Sand stone, conglomerate, clay, gravel beds, shale, mudstone
L-Miocene - Oligocene		Subathu	Sand stone, shale., nodular clay, L.St.
Proterozoic	Upper-III	Krols	Sandstone, red &Carbo.shale., slate, greywacke, , dolomitic limestone.
Lower-III	Simla / Jaunsar		Siltstone, greywacke, sandstone, quartzite, conglomerate, Shale, slate, phyllite, dolomite and meta- volcanics
Proterozoic- II	Shali/ Sundernagar		Cherty dolomite, quartzite, limestone, shale, slate, phylitised/ sporadic shale, meta-volcanics etc.,

#### 2.3.1 Local Geology:

The rocks of the catchment comprises of the Siwalik group, older alluvium and Newer alluvium.

The stratigraphy of the catchment is given in table 2.4

**TABLE: 2.3 LITHO-STRATIGRAPHY OF THE SATLUJ RIVER AND SURROUNDING AREAS NEAR THE MINING LEASE AND ITS EFFECTIVE CATCHMENT**

<b>Group</b>	<b>Lithology</b>		<b>Age</b>
<i>Newer Alluvium</i>	Channel Alluvium	Grey micaceous, fine to coarse grained sand, silt and clay	Quaternary
	Terrace Alluvium	Cyclic sequence of grey micaceous sand, silt and clay	
	Fan Alluvium	Brownish grey clay, sand and gravel with boulders	

Older <i>Alluvium</i>	Dun Gravels	Multicyclic sequence of brown to grey silt, clay with kankar and reddish brown to grey micaceous sand with pebbles.	
Siwalik Group	Upper Siwalik	B	Predominantly massive conglomerate with red and orange clay as matrix and minor sandstone and earthy buff and brown clay stone
		A	Sandstone, clay and conglomerate alternation
	Middle Siwalik	B	Massive Sandstone with minor conglomerate and local variegated clay stone
		A	Predominantly medium to coarse- grained sandstone and red clay alternation, soft pebbly with subordinate claystone, locally thick prism of conglomerate
	Lower Siwalik	B	Alternation of fine to medium- grained sporadically pebbly sandstone, calcareous cement and prominent chocolate and medium maroon claystone in the middle part
	A	Red and mauve clay stone with thin intercalations of medium to fine grained sandstone	
Sirmaur Formation	Shale, sandstone, siltstone, clay, pebble beds, limestone lenses		<i>Eocene- Miocene</i>
Jaunsar Group	Cobble bed/conglomerate, siltstone, shale, sandstone, limestone		<i>Proterozoic</i>
Baliana Formation	Dolomite, Carbonaceous shale, slates & quartzites.		

### 2.3.2 Geology of the lease area

The mining lease area is situated in the river course of Kundlu khad. The stream course is occupied with river borne deposit which comprises of boulders, cobbles, pebbles, sands and silt clay deposit forming channel deposit of annual deposition.

The deposits above High Flood Level are designated as terrace deposit which comprises of boulder, Cobble, Pebble, Sand, Silt and clay. The upper surface in terrace area is covered with sandy soil where agriculture fields are developed. In the catchment area rocks of Siwalik formation are exposed which comprises of alternate sequence of sandstone and clay/silt stone. In order to demarcate different lithounits, Geological plan on 1:2000 scale with 1 meter interval is proposed.

The following table shows the rocks classification according to age

Channel deposit	Boulders, Cobbles, Pebbles, Sand silt and clay
Terrace deposit	Boulders, Cobbles, Pebbles, Sand silt and clay
-----Unconformity-----	
Siwalik formation	Sand stone, Clay/ Silt stone and Boulder Conglomerate

### 2.3.3 The Nature of Rocks and Their Attitude

The mining lease area is covered with river borne deposits which are deposited in the Kundlu ka Khad during the flood season. The Khad receives its sediment load from the disintegration/erosion of the rocks forming catchment area. The deposit contains sediment of quartzite, sandstone, with fine nature of sand, silt and clay. The color of the coarse aggregates varies from white off white to grayish in colour. The boulders are sub rounded to rounded in shape and the surface is generally smooth.

At the bank terraces deposit of recent in age and exposed outside the lease area. The deposit is comparison of boulders, cobbles and the surface.

## 2.4 MINABLE AREA AND RESERVE:

Minable area is selected as per the provision made in the Himachal Pradesh Minor Mineral Policy 1971 and guideline contained in the river stream Bed mining policy and land form studies were taken into consideration.

The following points of public utilities/features is available in and around to the mining lease area.

1. Bridge On Jamna to Reru
2. Bridge on Nalagarh- Sawarghat road

According to the river stream bed policy guideline, about 200m safe distance is left as no mining area on upstream and downstream side of the respective bridges.

After leaving the one fifth areas from the banks of the nadi according to width and surrounding public utility, the left out area is divided into two parts to carry mining operation.

## **2.5. METHOD OF RESERVE CALCULATION**

Reserve has been calculated by surface area method. Movable surface area has been multiplied with the thickness. Thickness is taken as 1m as no mining will be allowed to more than one meter as per the guideline.

Obtained volume is multiplied with Avg. Specific gravity i.e 2.25.

Final tonnage is divided among five category according to the percentage found in the exploratory Pit River bed.

### **2.5.1 Percentage of the River Bed Material in the River:**

In order to assess the mineral wise percentage, available for stone crusher and direct sale, a 1m x 1m x 1m pit was given at random in the Sirsa river bed and it was found that about 35% is small size Stone /boulder, 25% bajri, 25% sand 10% silt and 5% clay.

### **2.5.2 Mining:**

For managing gravel mining, it is necessary to estimate the annual bed load sediment supply from upstream, the "replenishment rate", and to limit annual extraction to that value or some fraction thereof, considered the "safe yield".

## **2.6 REPLENISHMENT POTENTIAL OF MINERAL**

The replenishment rate approach has the virtue of scaling extraction to the river load in a general way, but bedload transport can be notoriously variable from year to year. Thus, this approach is probably better if permitted extraction rates are based on new deposition that year rather than on long-term average bedload yields. The mined reach is the "upstream" sediment source for downstream reaches, so mining at the replenishment rate could be expected to produce hungry water conditions downstream.

Dunne et al. (1981) stressed because actual bedload transport is variable from year to year, estimated average annual bedload inflow rates may not be applicable in most years.

The mining lease area has a catchment area of 35 sq km. Recorded HFL is 400mRL. The erosion process in the catchment area and transportation of minor mineral along with strong water current during the rainy season will augment the process of replenishment in the downstream mining lease area.

During the monsoon replenishment rate due to the sudden increase in carrying capacity and competency of the river is 6 to 8 cm.

As abundant precaution, keeping in view the variation in rainfall particularly highest rainfall, which generally causes flood, the factor of 3 cm annual replenishment is taken into consideration. It is also observed in the exploratory pit that during high floods the factor of 5cm per year is achieved thus all the old pit can get filled with mineral. Hence mined out area of the pre-monsoon will be completely filled with mineral during the

monsoon. Hence it is assumed that the entire pit will be filled after monsoon. However, the gap of one year is left for rehabilitation.

## **2.7 ROTATION IN MINING AREA**

The rotational mining shall be adopted to facilitate the replenishment of the excavated pits during rainy season. Thus the mineable area has been divided in two blocks i.e the upstream block and the downstream block. The Mining of these two blocks is suggested on rotation basis in such a way that pit of previous year mining will act as depository for the post monsoon season. The workability is suggested by keeping in the mind possible effect on the meandering of Khad. The previous year pits will reduce the velocity of the flow of the khad waters and thus reducing its carrying capacity resulting in deposition of material being transported by the river waters. In totality the principal of the Placer Deposit is adopted. Hence following rotation plan is recommended:

### **Significant feature of Mining**

- The mining shall be done manually. No mining machinery shall be deployed.
- The working period for mining will be restricted to 270 days (nine months) and during three month of rainy season no mining shall be undertaken.
- The mining operations in the lease area would be confined to day light hours, from 9 A.M. to 5 P. M.
- The block being rested will remain so for nearly 15 months.
- Thus virtually each block would be rested for replenishment for two consecutive monsoons.
- The material is sorted manually at mining site and sand is separated from stone and bajri.

- The sorted stone and bajri is than loaded into trolleys by manually and transported to the crusher site.

**TABLE 2.4 PRODUCTION PLAN FOR FIVE YEARS**

Year	Block	Stone/ Boulder	River born bajri	Sand	Clay/Silt	Total
First	Block-1 upstream	22000	15500	12500	12500	62600
Second	Block-2 downstream	22000	15500	12500	12500	62600
Third	Block-1 upstream	22000	15500	12500	12500	62500
Fourth	Block-2 downstream	22000	15500	12500	12500	62500
Fifth	Block-1 upstream	22000	15500	12500	12500	62500
	TOTAL	110000	77500	62500	62500	312500

## 2.8 EMPLOYMENT GENERATION:

The mining activity in the lease area will involve contractual labor. About 12 to 14 persons will be engaged in extraction of stone, bajri and sand; loading of material into tractor trolleys and tipper trucks. The stone and bajri shall be transported to the crusher. Thus, for transportation of material about three to four drivers and equal number of helpers shall be engaged. At the crusher about 15 skilled and semiskilled workers are deployed.

## 2.9 WASTE GENERATION

During the excavation of stone, bajri and sand from the river bed silt and clay are also quarried being associated minerals. The clay which will be generated to the extent of 12000 to 13000 metric tons per year will be left in the pits as back fill. The clay being the lightest of the sediment load in the flowing river water is carried downstream by even the lightest floods

during the onset of monsoons. Clay in the river water is derived mostly from erosion of soil cover and weathered rocks and is generally suitable for agricultural field. As clay does not contain any harmful constituents, therefore their carriage/movement further downstream would not create any harmful environmental impact.

The generation of waste during five years of mining according to approved mining plan is as given in the table 2.5.

## **2.10 TRANSPORTATION**

The lease area is having gentle slope with the gradient of 2 to 3 degrees hence, tracks for the movement of tractors can be made and maintained in any part of the lease area.

The loaded tractor trolleys / tipper trucks would carry the material to the crusher site, at a distance of about 3.5 kms from the mining site. About 232 metric tons of stone and bajri would be required to be moved daily. Six trucks will be able to move this material.

## **2.11 ANTICIPATED LIFE OF MINE**

There is no specific life of the mine area as the area under reference is open and barren river bed of the river Kundlu and whatever quality of minor minerals are extracted from the said lot during one year; more than the extracted quantity of the same are automatically replenished every year by the river Kundlu itself on account of its flow and velocity.

## **2.12 USE OF MINERAL**

- Minor minerals are mainly consumed by infrastructure & housing industries and development.
- Whereas sand and bajri is directly used for all construction works.

- Boulders are consumed by stone crushers and manual crushing operations for use in roads construction etc.
- Virtually there is no construction or infrastructure building work is possible without these minor minerals, hence the same can be assumed as back bone of the infrastructural growth of India.

## 2.13 UTILITIES AND PROPOSED SITE FACILITIES

### 2.13.1

#### a. Power Supply :

The electric power supply is not yet available to the mine site, however in future the lessee may apply for a connection if required so.

#### b. Water :

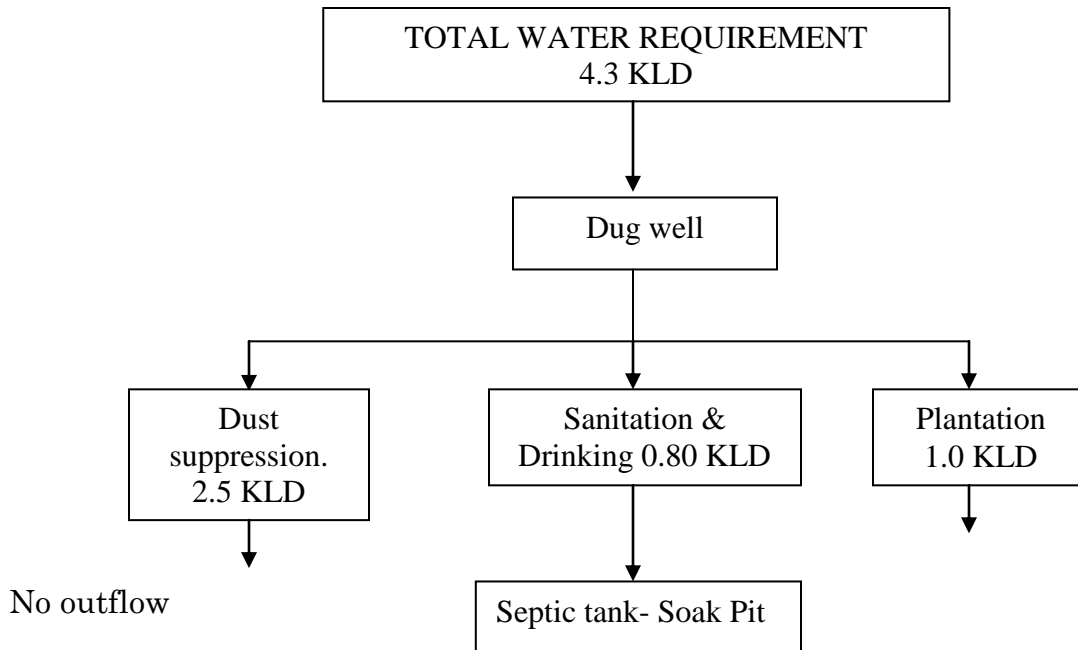
Water requirement for domestic/drinking purpose is fulfilled through the nearby villages/dug wells in river beds. Therefore there is no requirement for clearance from the Competent Authority as there will be no ground water withdrawal by the project proponent.

**TABLE 2.5**

### **PEAK WATER REQUIREMENT**

<b>Purpose</b>	<b>Requirement (KLD)</b>
Drinking	0.8
Dust Suppression	2.5
Plantation	1.0
<b>Total</b>	<b>4.3</b>

## WATER BALANCE DIAGRAM



### c) Man Power

Total manpower required for the project is approx.40-50 persons.

### 2.13.2 PROPOSED SITE FACILITIES

#### i) Office :

The owner has common office cum store available for both the lease area.

#### ii) First Aid Room :

Although the river bed mining project does not involve any major risks but a first aid room with proper equipment will be maintained as per Mines Act and Mine Rules at the mine site office. Antidotes in first aid boxes will also be maintained to counteract poison produced by certain species of small insects, if any.

**iii) Latrine and Urinal :**

Latrine and urinal will be provided separately for male and female worker as per Mine Rules.

=====\*\*\*\*\*=====

## **CHAPTER – III**

### **DESCRIPTION OF THE ENVIRONMENT**

#### **3.1 GENERAL**

##### **3.1.1 Study area**

Exploitation of mineral resources from the land through mining causes environmental and ecological instability, severe land degradation besides biological physical and socio-economic imbalance. The impact of the mining activities can be quantified through Environmental Impact Assessment Studies within the impact zone. The findings of EIA studies help in preparation of the environmental management plan for mitigating the adverse impacts.

For the purpose of studying the baseline status of the environment, core zone and buffer zone are considered for Impact Assessment. The core area for the purpose comprises mining lease area of 19.6824 Hect. The buffer zone comprises a 10 km from around the core area.

This section contains a description of the existing baseline environmental status of the area surrounding Kundlu River bed mine, the data collected has been used to define the environmental scenario of the area, against which the potential impacts of the project has been assessed.

##### **3.1.2 Sources of Environmental Data**

The baseline information on micro-meteorology, ambient air quality, water quality, noise levels, soil quality and floristic descriptions are largely drawn from the data generated by M/s Udaipur Min-Tech Pvt. Ltd, M/s Eco Laboratories & Consultants Pvt. Ltd. Mohali, (Panjab), (NABL Accredited Lab). Long term meteorological data recorded

at the nearest IMD station, Chandigarh was also collected. Micro-meteorological data at site was recorded using automatic weather station.

Apart from these, secondary data have been collected from Census Handbook, Revenue Records, Statistical Department, Soil Survey and Land use Organization, District Industries Centre, Forest Department, Central Ground Water Authority, etc. The generation of primary data as well as collection of secondary data and information from the site and surroundings was carried out during December 2012 to February 2013.

### **3.1.3 Aspect Studied**

As per the gazette notification dated 14<sup>th</sup> September 2006 and guidelines of CPCB, the study area was demarked. The study was conducted within a radius of 10 km within mine as center. The study period defined is Dec. 2012, Jan. 2013, Feb. 2013. The disciplines covered by the baseline data collection programme include the following:-

- Topography,
- Physiography,
- Hydrological aspects,
- Atmospheric condition,
- Biological environment,
- Land use,
- Cropping pattern, and
- Socio-economic aspects.

### **3.1.4 Presentation**

Each of the aspects listed above considered ahead in a sequential manner. Data Collected during the baseline study period are given ahead and provides a sound knowledge of the existing environment.

### 3.2 STUDY AREA AT A GLANCE

The study area includes the villages of Nalagarh Tehsil within 10 Kms. radius from the mine as center.

#### 1. General Particulars:-

- |                                |                               |
|--------------------------------|-------------------------------|
| i) Latitude (N)                | : 31° 07' 54'' - 31° 08' 32'' |
| Longitude (E)                  | : 76° 48' 12'' - 76° 50' 12'' |
| ii) Study area (10 Km. radius) | : 38656.90 Hect.              |
| iii) Populations               | : 6282                        |
| iv) District H.Q.              | : Solan                       |

#### 2. Demography :-

- |                       |        |
|-----------------------|--------|
| i) Total Population   |        |
| a) Male               | : 3287 |
| b) Female             | : 2995 |
| ii) Literates         | : 3534 |
| iii) No. of Household | : 1095 |
| iv) No. of Villages   | : 26   |

#### 3. Land use Pattern :-

- |                      |                 |
|----------------------|-----------------|
| i) Water bodies      | : 716.70 Hect.  |
| ii) Plantation       | : 494.34 Hect.  |
| iii) Forest land     | : 2275.67Hect.  |
| iv) Crop land        | : 5735.91 Hect. |
| v) Fallow Land       | : 12353.78Hect. |
| vi) Human Settlement | : 871.31 Hect.  |
| vii) Industries      | : 116.20 Hect.  |
| viii) Dense Scrub    | : 5601.45 Hect. |

- ix) Open Scrub : 9066.04Hect.
- x) Seasonal River : 1301.76 Hect.
- xi) Open / Waste Land : 123.74 Hect.

**4. Climatology (Chandigarh IMD 2012) :-**

- i) Total Rain  
(December 2012 to February 2013) : 39.6 (mm)
- ii) Mean monthly maximum temp. : 25.83 °C
- iii) Mean monthly minimum temp. : 4.2 °C
- iv) Relative humidity : 62 % (Avg.)

**3.3 TOPOGRAPHY**

**3.3.1 Existing Conditions**

The study area shows Hilly terrain in North- East and Dun in west. Elevation of hilly area varies from 500 mRL to 1200mRL. Mid part of the study area covers the valley. Valley area drained by Sirsa khad originates from the south of kasuli ridge at a height of 1926 m above mean sea level and after travelling through small hillocks it enters in nalagarh valley near kalka it roughly flows in E-W direction then its takes a sowing towards NW where number of tributaries such on kiratpur nadi, Ram nagar nadi, Narkanda nadi, Suragpur choe, Balad nadi and Ratta nadi joins with it. Ratta nadi originates from the Jatrog ridge at a height of 1136m above mean sea level. This nadi mostly traverse through hillocks of tertiary formation and it enters in Nalagarh valley near village Bauni when its height reduces to 510m above mean sea level. It joins with Sirsa river near village Kishanpura.

Lease area is situated in Kundlu ka khad and the highest point of mining lease area lies at 374 mRL and lowest points lies at 330 mRL.

The nearest villages are Kashmirpur, Androla and Panjaira. These villages are outside of the lease area. The topography of the study area is shown in **Fig 3.1**.

### **Topographic map of the study area**

*(Please find the topographic map in the pdf format in the same folder of the given CD disc)*

### **3.4 CLIMATIC CONDITION**

The climate is moderate humid and tropical interspersed between cold weather, hot weather and southwest monsoon. The cold weather commences in November and continues till the end of February, which is characterized by cloudless days and very cold nights with much fog and dew. May and June are usually the hottest months. During monsoon period (July to September) the weather remains humid. Once the pollutants are discharged in the atmosphere, the meteorological factors play an important role in transport dispersion and diffusion with the environment. Since, these factors show wide fluctuations with time, it was felt necessary and desirable as part of this EIA study, to collect meteorological data at nearest available at Tehsil head quarter Nalagarh and is presented in Table 3.1.

The southwest monsoon sets in by the second half of the July and withdrawal takes place in October. July to September months are the main rainy months though it continues till October. Cyclones and sudden storms may occur during May-June. In the post monsoon, a few thunderstorms occur, especially in October. Thereafter, the weather clears up and pleasant weather prevails throughout the valley. Precipitation occurs for some days during December and January. Rainfall is highly variable in the region due to its rugged topography and its geographical position. The rainfall generally increases up to the valleys from southwest to northwest and decreases beyond the highest range over the northern part of the region. The percentage contribution of rainfall is less than the southern parts, perhaps due to decreasing influence of the monsoon. After April, the rainfall gradually increases till June and thereafter sharply during July and August. It decreases rapidly after the withdrawal of southwest monsoon in September. The precipitation during pre-monsoon months is mostly associated with thunderstorms and constitute

11% of the annual rainfall. Nearly 76% of the total rainfall is received during the five monsoon months from July to September. Rainfall during winter months constitutes 13% of total rainfall. The weighted annual average rainfall based on available stations in study area is 1358 mm.

The daily maximum temperature during April to June varies from 14.6 to 36.7°C and shows moderate summer in the region. The highest temperature recorded is 36.7°C in the month of June and lowest 14.6°C during April month.

The relative humidity of the area varies from 6 to 91%. The month of May is considered to be having the lowest humidity whereas the maximum humidity is observed during the month of April.

### **3.5 PHYSIOGRAPHY**

The area falls in village – Mauza Androla Nichla & Androla Uppla, Tehsil – Nalagarh, District- Solan of Himachal Pradesh is located in between latitudes 31° 07' 54'' - 31° 08' 32'' N and between longitude 76° 48' 12'' - 76° 50' 12'' E, having a temperature range of 6°-45°. The climate in the district is moderate humid and tropical with annual rainfall of app. Averaged at 910 mm. River-beds of the district are suitable for mining of minor minerals in mixed form. Solan district lies in the uppermost corner of Sirsa- Kundludoab. River Kundlu is a tributary of Sutlaj River, which lies to west of the area. The mining lease area is situated in Kundlu Ki Khad. The general flow of Sutlej River in this stretch is N to S.

Solan district lying within the lesser Himalaya and the Siwalik foothill comprises rocks ranging in age from Proterozoic to quaternary. The oldest rock of undifferentiated Proterozoic age belongs to the Jutog group

comprising Carbonaceous Phyllites, Schists, Gniesses, Quarzites and Marble.

The Alluvium may be differentiated onto Older Alluvium consisting of oxidized (Brown, yellow, and khaki color) sediments and Newer Alluvium comprising of unoxidized (grey and khaki color) sediments.

District Solan has a number of rivers passing through it. Due to this geographical advantage, District Solan is the main supplier of mixed state minerals in whole of north India including complete NCR. Current mining lot falls in the river bed of the river & completely suitable for mining of mixed state minerals as identified by the state government.

### **3.6 SEISMICITY OF AREA**

The state of Himachal Pradesh lies almost entirely in the Himalayan Mountains, and is part of the Punjab Himalayas. Due to its location it braves dozens of mild earthquakes every year. Large earthquakes have occurred in all parts of Himachal Pradesh, the biggest being the Kangra Earthquake of 1905. The Himalayan Frontal Thrust, the Main boundary Thrust, the Krol, the Giri, Jutogh and Nahan thrusts lie in this region. Besides that there are scores of smaller faults, like the Kaurik Fault which triggered the 1975 earthquake. However, it must be stated that proximity to faults does not necessarily translate into a higher hazard as compared to areas located further away, as damage from earthquakes depends on numerous factors such as subsurface geology as well as adherence to the building codes.

## SEISMIC HAZARD

Chamba, Kullu, Kangra, Una, Hamirpur, Mandi, and Bilaspur Districts lie in Zone V. The remaining districts of Lahual and Spiti, Kinnaur, Shimla, Solan and Sirmaur lie in Zone IV. Since the earthquake database in India is still incomplete, especially with regards to earthquakes prior to the historical period (before 1800 A.D.), these zones offer a rough guide of the earthquake hazard in any particular region and need to be regularly updated (Source : GSHAP Hazard Map for Himachal Pradesh).

Table 3.1 Earthquake occurred in the last 10 years in the region is as follows:

Date and Year	Place	Location		Intensity
		N	E	
<b>11 November 2004</b>	Bharmour, Kangra region	32.442 N,	76.512 E	A moderate earthquake struck the Kangra Valley and the Dhauladhar Mountains. It was felt strongly in the Kangra-Dharamsala region and event caused minor damage to buildings in the region. It had a magnitude of Mb=5.1.
<b>8 October 2005</b>	Kashmir-Kohistan, Pakistan-India border,	7.634.43 2 N	73.537 E	A major earthquake struck the India-Pakistan border on the morning of 8 October 2005. It had a magnitude of Mw=7.6 and was felt strongly in much of Pakistan, northern India and eastern

				Afghanistan..Tremors from the earthquake were felt more than a thousand kilometers away in the Indian states of Gujarat, Madhya Pradesh and Uttar Pradesh.
--	--	--	--	--

### 3.7 HUMAN SETTLEMENT

There is no human settlement within the lease area. The nearest village existing outside of the lease area is Androla which is 1.00 Km away towards SE of the lease area. Dwelling houses in the village are far away from the proposed working area. Total 26 villages with 1095 household within the study area with a population of 6282. The population density in the area is 37.01 Person / sq. Km.

### 3.8 HYDROLOGICAL ASPECTS

In order to conduct EIA Studies, baseline data pertaining to water environment of the existing project was carried out evaluating the basin characteristics, drainage pattern, hydrology. The different parameters of surface water as well as ground water also analyzed at different sites. (Refer Fig 3.2)

**DRAINAGE MAP OF THE STUDY AREA.**

*(PLEASE REFER TO THE ATTACHED PDF FILE OF THE DRAINAGE MAP IN THE SAME FOLDER IN THE GIVEN CD DISC)*

### **3.8.1 Introduction**

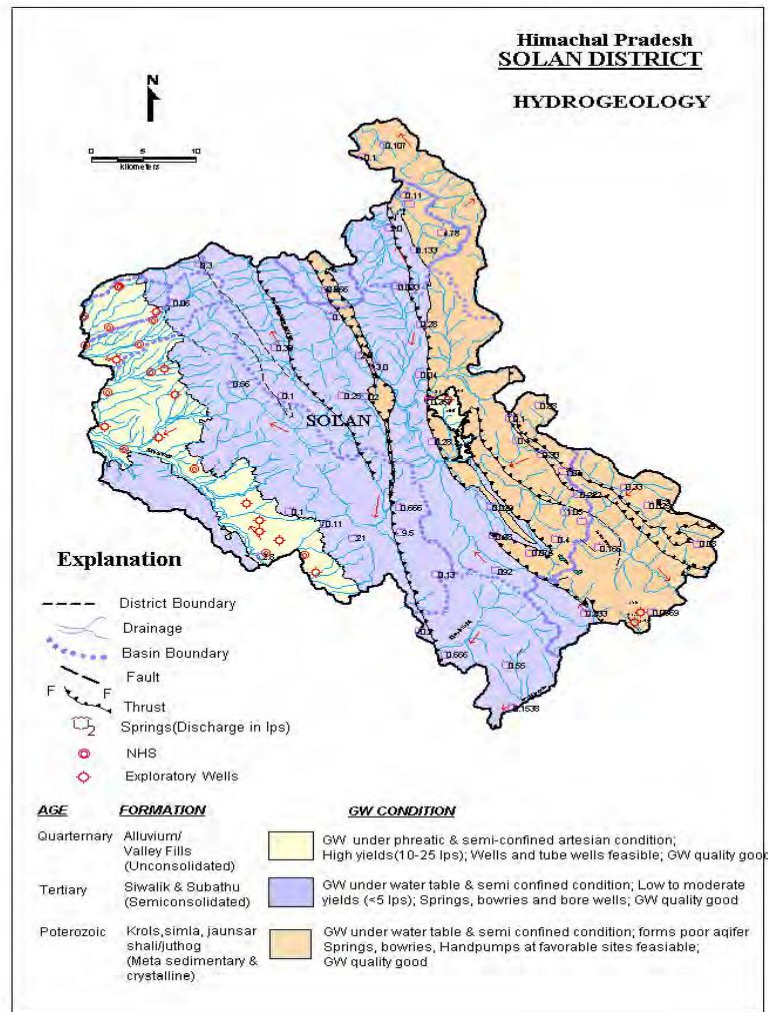
Local hydrological parameters and ground level water levels are not affected due to mining activity in the area.

### **3.8.2 Hydrogeology**

The area surrounding mining site has alluvium and underlying weathered and fractured rock form the aquifer. The area has moderate yielding tube wells.

Geologically, the area is underlain by formations ranging in age from Quaternary to Pre-Cambrian. Phyllite, slate, quartzite, limestone, schist, dolomites, granite and gneisses constitute the older (hard rocks) formations. The valley fills deposits (soft) in the district which represent the Quaternary deposits and are restricted in the western part of Bagheri – Kherachak – Baddi area.

Figure 3.2 (A) shows hydro geomorphologic characteristics of study area.



Major part of the area is covered by Siwaliks & Tertiary group of rocks. The district can be divided into porous and fissured formations. Ground water occurs under water table to semiconfined condition in porous formations with depth to water level varies from near ground level to more than 30 m bgl mainly in valley fill/ alluvial areas. In fissured formations, springs are the major source of water supply. Springs located along major thrust/ faults (structurally weak planes) are high yielding.

### **3.8.3 Ground Water Condition**

The ground water level in the valley of River Sirsa is shallow and varies on an average from 5.5 meters to 6.3 meters near the riverbed and increases towards the hills. The tributaries like Balad Nadi, Ratta Nadi remain dry except monsoon season and ground water is the only water source for domestic, agricultural and industrial use. An analysis of long-term fluctuations of the ground water levels in the study area shows a rising trend of on an average 0.11 cm/per year for the last 20 years except for some isolated patches (Central Water Commission) The ground water levels are thus showing positive trends.

In valley area of Nalagarh, the ground water occurs in porous unconsolidated alluvial formation (valley fills) comprising, sand, silt, gravel, cobbles/pebbles etc. Ground water occurs both under phreatic & confined conditions. Wells and tube wells are the main ground water abstraction structures. Ground water is being developed in the area by medium to deep tube wells, dug wells, dug cum bored wells. Depth of open dug wells and dug cum bored well in area ranges from 4.00 to 60.00 m bgl wherein depth to water level varies from near ground surface to more than 35 m bgl. Yield of shallow aquifer is moderate with well discharges up to 10 lps.

## **3.9 ATMOSPHERIC CONDITION**

Atmospheric conditions include micro meteorological condition and ambient air quality of the study area. Meteorological conditions with respect to wind velocity and direction in the study area was determined by locating a monitoring station at the mine. The monitored data is

supplemented with meteorological data collected at Chandigarh. The required data for interpretation the ambient air quality of the study area was generated by establishing a monitoring network. Regular field observations as per the norms of MoEF and CPCB were taken from the established monitoring stations.

### 3.9.1 Meteorology

#### 3.9.1.1 Introduction

Meteorology plays a vital role in affecting the dispersion of pollutants. Since meteorological factors show wide fluctuations with time, meaningful interpretation can be drawn only from long term reliable data. Such source of data is the Indian meteorological Department (IMD), which maintains a network of meteorological stations at several important locations. The nearest station (Chandigarh) to the study area is located at 60 Km. from mine site. Meteorological information available for this station is temperature, humidity, rainfall, wind speed and wind direction.

#### 3.9.1.2 Meteorological Data's from Chandigarh.

The data recorded at Chandigarh for the study period December 2012 to February 2013 are summarized in table 3.2 and table 3.3.

**TABLE – 3.2**  
**MEAN TEMPERATURE AND RELATIVE HUMIDITY RECORDS**  
**FROM THE CHANDIGARH IMD STATION**

Month	Temperature (°C)		Relative Humidity		Wind Speed (Kmph)		Rainfall (mm)	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
December 2012	28.2	3.0	92	20	008	001	5.6	0
January 2013	22.1	4.6	94	30	009	001	31.2	0
February 2013	27.2	5.0	90	16	009	002	2.8	0

### 3.9.1.3 Micro Meteorology At Site

Micro meteorology datas viz. temperature and relative humidity were recorded at site during the study period which are summarized in the table 3.3

**TABLE – 3.3  
TEMPERATURE RECORDS AND RELATIVE HUMIDITY  
AT MINE SITE**

Month	Temp.(°C)		Humidity(%)		Rainfall In Mm	Prominent wind direction /wind speed(Km./Hr.)
	Min.	Max.	Min.	Max.		
December 2012	6.5	26.8	26	81	2.0	003
January 2013	8.2	21.0	38	86	14.23	004
February 2013	5.3	26.5	23	90	1.6	002

### 3.10 AMBIENT AIR ENVIRONMENT

To establish the ambient air quality the studies were carried out during December 2012 to February 2013.

#### 3.10.1 Ambient Air Sampling

Ambient air quality sampling was carried out with the help of Respirable particulate matter Sampler “Respirable Dust Sampler” (RDS). The data generated by M/s Eco Laboratories & Consultants Pvt. Ltd. For ambient air quality status within 10 km. radius of the existing mine has been compiled along with micrometeorological conditions for particular season.

### 3.10.2. Location of Ambient Air Sampling Stations

Six sampling stations were established around the core zone within 10 km radius to study the present air quality. The locations are given in Table 3.3 and the area marked in Fig. 3.3.

**TABLE 3.4**  
**LOCATION OF AMBIENT AIR MONITORING STATIONS**

Station Code.	Station Name	Location with respect to Site	
		Distance (Km)	Direction
A0	Mine – Site	Core zone	--
A1	D/S project site @	500 M	NE
A2	Near Bhogpur Village	4.5 Km	SSE
A3	Near Nawangraon Village	1.5 Km	S
A4	Near Barun	2.0 Km	N
A5	Near Nangal Kuhl	1.70 Km	N

### 3.10.3. Sampling Schedule

Eight hourly samples were collected from each station round the clock, twice a week for continuous three month (December 2012 to February 2013).

### 3.10.4. Air quality parameter

The following parameters were analyzed for each sample.

- Particulate Matter (PM<sub>10</sub>)
- Sulphur dioxide (SO<sub>2</sub>)
- Oxides of nitrogen (NO<sub>2</sub>)
- Carbon Monoxide (CO)

**AIR QUALITY MONITORING STATIONS LOCATION MAP**

*(PLEASE REFER TO THE ATTACHED PDF OF AIR QUALITY MONITORING STATIONS LOCATION MAP IN THE SAME FOLDER IN THE GIVEN CD DISC)*

The sampling and testing of ambient air quality parameters were carried out as per relevant parts of IS 5182. The brief details of testing procedure adopted are given in Table 3.5.

**TABLE 3.5**  
**PROCEDURE FOR DETERMINING VARIOUS AIR QUALITY PARAMETERS**

Parameters	Testing Procedure
PM <sub>10</sub>	Gravimetric method using Respirable particulate matter Sampler “ Respirable Dust Sampler” (RDS) IS:5182(Part IV)1973
NO <sub>2</sub>	Absorption in dil. NaOH and then estimated calorimetrically with sulphanilamide and N(I-Nepthyle) Ethylene diamine Dihydrochloride and Hydrogen Peroxide(IS:5182 1975, Part VI)
SO <sub>2</sub>	Absorption in Sodium Tetra Chloro- Mercurate followed by Colorimetric estimation using P-Rosaniline hydrochloride and Formaldehyde(IS:5182 Part II. 1969)
CO	By Electronic CO detector

The detailed results of ambient air quality are given in table 3.5 to 3.9.

**TABLE – 3.6**  
**Ambient Air Quality**  
**(PM<sub>10</sub> 24-hr Concentration in ug/cum)**

Station ▶		Mine site	D/S project site @ 500 m	Bhogpur	Near Nawangraon	Near Barun	Near Nangal Kuhl
S. No. ▼	Result	A0	A1	A2	A3	A4	A5
December-12, January 2013 and February 2013							
1.	Minimum	65.23	70.18	66.18	60.23	69.28	62.07
2.	Maximum	85.23	88.95	85.21	87.78	83.64	90.67
3.	Average	71.79	80.83	76.46	76.25	74.74	74.90

Source : Eco Laboratories & Consultants Pvt. Ltd.

**TABLE – 3.7**

**Free silica in PM<sub>10</sub>**

S. no.	Test parameters	Units	Result						Test method
			A0	A1	A2	A3	A4	A5	
1.	Free silica in PM <sub>10</sub>	ug/cum	4.53	3.85	3.53	3.67	3.37	3.29	NIOSH 7601

Source : Eco Laboratories & Consultants Pvt. Ltd.

**TABLE – 3.7**  
**Ambient Air Quality**  
**(SO<sub>x</sub> 24-hr Concentration in ug/cum)**

Station ►		Mine site	D/S project site @ 500 m	Bhogpur	Near Nawangraon	Near Barun	Near Nangal Kuhl
S. No. ▼	Result	A0	A1	A2	A3	A4	A5
December-12, January 2013 and February 2013							
1.	Minimum	BDL	BDL	BDL	BDL	BDL	BDL
2.	Maximum	4.99	3.77	4.27	4.63	4.58	3.21
3.	Average	2.88	3.00	2.89	3.48	2.86	2.76

**BDL = Below Detectable limits**

**Source : Eco Laboratories & Consultants Pvt. Ltd.**

**TABLE – 3.8**  
**Ambient Air Quality**  
**(NO<sub>x</sub> 24-hr Concentration in ug/cum)**

Station ▶		Mine site	D/S project site @ 500 m	Bhogpur	Near Nawangraon	Near Barun	Near Nangal Kuhl
S. No. ▼	Result	A0	A1	A2	A3	A4	A5
December-12, January 2013 and February 2013							
1.	Minimum	3.03	5.33	2.46	2.64	2.79	2.50
2.	Maximum	6.60	8.85	5.56	6.15	5.43	5.13
3.	Average	4.95	7.07	3.34	4.19	3.78	3.79

**Source : Eco Laboratories & Consultants Pvt. Ltd.**

The observed range of various parameters recorded, have been compared with the National Ambient Quality Standards laid down by the Central Pollution Control Board and given be Table 3.9.

TABLE – 3.9

## (Comparison of Air Monitoring Results)

Para Meters	A0 Mine site	A1 D/S project site @ 500 m	A2 Near Bhogpur	A3 Near Nawangraon	A4 Near Barun	A5 Near Nangal Kuhl	NAAQS		
							Industrial Residential, Rural & other area	Ecologically Sensitive Area	
							PM <sub>10</sub>		
Minimum	65.23	70.18	66.18	60.23	69.28	62.07	100	100	
Maximum	85.23	88.95	85.21	87.78	83.64	90.67			
Average	71.79	80.83	76.46	76.25	74.74	74.90			
98% tile	83.53	87.17	83.51	86.02	81.98	88.86			
							So <sub>2</sub>		
Minimum	BDL	BDL	BDL	BDL	BDL	BDL	80	80	
Maximum	4.99	3.77	4.27	4.63	4.58	3.21			
Average	2.88	3.00	2.89	3.48	2.86	2.76			
98% tile	4.89	3.69	4.18	4.54	4.49	3.16			
							NO <sub>2</sub>		
Minimum	3.03	5.33	2.46	2.64	2.79	2.50	80	80	
Maximum	6.60	8.85	5.56	6.15	5.43	5.13			
Average	4.95	7.07	3.34	4.19	3.78	3.79			
98% tile	6.47	8.67	5.45	6.03	5.32	5.03			
The CO readings were less than 1 ppm for most part of the sampling period. The CO level was recorded as 1 ppm for the villages in the morning and evening hours.								5000	2000

\* NAAQS – National Ambient Air Quality Standards. 24-hr concentration in ug/m<sup>3</sup>.

A perusal of Tables 3.9 shows that PM<sub>10</sub>, NO<sub>2</sub>, SO<sub>2</sub> & CO are well within the limits prescribed for areas meant for “Industrial, Residential and Rural Use.”

### **3.10.5 Result**

It can be observed from the Ambient Air quality monitoring that the minimum & maximum concentration of PM<sub>10</sub> for all the 6AAQM station were found to be 60.23 µg/m<sup>3</sup> and 90.67 µg/m<sup>3</sup> respectively.

As far as the gaseous pollutant SO<sub>2</sub> and NO<sub>2</sub> are concerned, the prescribed CPCB limit of 80 µg/m<sup>3</sup> for residential and rural areas has never surpassed at any station. The maximum & minimum concentrations of SO<sub>2</sub> & NO<sub>2</sub> were found to be BDL µg/m<sup>3</sup> & 4.99 µg/m<sup>3</sup> and 2.46 µg/m<sup>3</sup> & 8.85 µg/m<sup>3</sup> respectively.

### **3.10.6 Mineralogical Composition of PM<sub>10</sub> in the Environment**

Main constituents of PM<sub>10</sub> are the inorganic ions, organic compounds, Carbonaceous species, elemental carbon and organic carbon. Free silica was found to be 3.29 to 4.53 µg/m<sup>3</sup>.

### **3.10 Wind Rose**

Wind speed of a site plays a vital role in predicting the extent of air pollution. It gives a clear view about the extent to which air pollutants are carried before they touch the ground.

Wind rose is diagrammatic representative of wind speed in an specified direction with its arms representing sixteen direction, each arm gives a clear frequency distribution of wind speed.

Wind roses are generated with the meteorological information's initially collected. These raw data are processed with certain interpolation and stability classes and joint frequency function are developed to eventually reach to the development of wind roses.



### 3.12 NOISE ENVIRONMENT

Noise often defined as unwanted sound, interferes with speech communication, causes annoyance, distracts from work, disturb sleep, thus deteriorating quality of human environment. Noise Pollution survey has therefore been carried out.

Noise levels were measured residential areas and other settlements located within 10 km radius around the site.

#### 3.12.1 Noise Analysis within the study area

The noise analysis within the study area was recorded using 4-20, sound level meter. The analysis reveals that the noise's well within the permissible range. The location of Noise level monitoring is presented in Table 3.10& the levels recorded are as stated in Table 3.11.

**TABLE 3.10  
LOCATION OF NOISE MONITORING STATIONS**

Station Code.	Station Name	Location with respect to Site	
		Distance (Km)	Direction
N0	Mine – Site	Core zone	--
N1	D/S Project site	500m	
N2	Near Bhogpur Village	4.5 Km	SSE
N3	Near Nawangraon Village	1.5 Km	S
N4	Near Barun	2.0 Km	N
N5	Near Nangal kuhl	1.70 Km	N

**NOISE AND TRAFFIC MONITORING STATIONS LOCATION  
MAP**

*(PLEASE REFER TO THE ATTACHED PDF OF NOISE AND TRAFFIC  
MONITORING STATIONS LOCATION MAP IN THE SAME FOLDER IN THE  
GIVEN CD DISC.)*

TABLE 3.12  
NOISE LEVEL WITHIN THE STUDY AREA

(Unit – dBA)

S. No	Location	Result		Test	Test Method
		Day	Night		
1.	Project Boundary	54.9	44.7	1Hour Leq	IS:9989 : 1981 R -2002
2.	Near D/S project site	53.7	43.9	1Hour Leq	IS:9989 : 1981 R -2002
3.	Near Bhogpur Village	54.7	43.6	1Hour Leq	IS:9989 : 1981 R -2002
4.	Near Nawangraon Village	52.9	44.3	1Hour Leq	IS:9989 : 1981 R -2002
5.	Near Barun	53.6	43.8	1Hour Leq	IS:9989 : 1981 R -2002
6.	Near Nangal Kuhl	54.4	44.5	1Hour Leq	IS:9989 : 1981 R -2002

Source : Eco Laboratories & Consultants Pvt. Ltd.

TABLE 3.13 (A)  
CPCB NOISE STANDARDS

Category of Zones	Leq in dB (A)	
	Day	Night
Industrial	75	70
Commercial	65	55
Residential	55	45
Silence Zone	50	40

- a. Day time is from 6.00 Am to 10.00PM.
  - b. Night time is reckoned between 10.00 PM to 6.00AM
  - c. Silence zone is defined as an area up to 100m around premises of hospitals, educational institution and courts. Use of vehicle horn, loudspeaker and bursting of crackers is banned in these zones.
- Note : Mixed categories of areas be declared as one of the four above mentioned categories by the competent Authority and the corresponding standards shall apply.

### 3.12.1 Result

Ambient noise levels were measured at 6 locations around the site. Noise levels varies from 52.9 to 54.9 Leq dB(A) during day time and during night time noise levels ranges from 43.6 to 44.7 Leq dB(A). 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.

### 3.12.2 Traffic density

Traffic density measurements were performed at one location at village Gujamala,(Nalagarh–Panjaira State Highway) Location of these stations are marked on the map in **Fig.3.5**. The monitoring was performed in December, 2012.

Traffic density measurement were made 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 simultaneously at each station during each shift- one person on each of the two directions for counting the traffic. At the end of 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 the summary in Table 3.12.

**TABLE 3.14**  
**TRAFFIC DENSITY**

Traffic vehicle	No. of vehicles per day at Gujjamal on Nalagarh –Panjaira,State Highway
H.M.V.	58
L.M.V.	72
2/3 wheelers	81
Grand Total	211

### 3.13 SOIL ENVIRONMENT

The soil in the area in general is quite shallow gravelly impregnated with weathered fragments of parent rock and have developed under unique environment of natural forest vegetation. Surface layer of soil up to 15-20 cm is of reddish brown to yellowish brown color, loamy with loose and undecomposed organic matter where as depth ranging from 15-50 cm is rich in humus content. The slope soil is composed of silt and good for vegetation / cultivation. Rock has been weathering due to heavy rainfall. The clay soil is found on river terrace due to aggradations process in river bed and thus good for paddy cultivation. The soils of upper Giri Catchments in very steep mountains are either typical udorthents or Lithic udorthents and shallow coarse loamy soil deep brown to very dark grayish. The soil samples have been collected from five locations for assessment of soil quality in project area. The location of Soil samples is presented in Table 3.15 & The results of soil sample analyzed in table 3.15 (A) and depicted in **Fig 3.6**

**SOIL QUALITY SAMPLING POINTS**

*(PLEASE REFER TO THE ATTACHED PDF FILE OF SOIL QUALITY SAMPLING POINTS MAP IN THE SAME FOLDER OF THE GIVEN CD DISC)*

**TABLE – 3.15**  
**LOCATION OF SOIL QUALITY MONITORING STATIONS**

Station Code.	Station Name	Description	Location with respect to Site	
			Distance (Km)	Direction
S1	Project Site	Ag. Land	Core Zone	
S2	Barun	Ag. Land	2.00	N
S3	Bhogpur	Ag. Land	4.50	SSE

**TABLE – 3.15 (A)**  
**SOIL SAMPLE ANALYSIS**

S. No	Parameters	Unit	Project Site S1	Barun	Bhogpur	Test Method
1.	pH (1 : 2.5)	-	8.12	7.19	7.73	Soil & Solid Waste Analysis Manual- P.K.Behera
2.	Electrical Conductivity Saturation Extract (1:2)	Micro-mhos/cm	638	603	592	--
3.	Soil moisture Content	%	38.6	39.2	38.5	--
4.	Soil Texture	--	Sandy Clay loam	Sandy Clay Loam	Sandy Clay loam	--
5.	Bulk Density	gm/cc	1.63	1.59	1.71	--
6.	Organic Matter	%	1.29	1.26	1.32	--

Source: Eco Laboratories & Consultants Pvt. Ltd.

**TABLE NO.:3.15. (B)**

**STANDARD SOIL CLASSIFICATION**

S.NO.	Parameter	Classification
1.	pH	<4.5 extremely acidic 4.51-5.0 very strong acidic 5.01-5.5 strongly acidic 5.51-6.0 slightly acidic 6.51-7.3 Neutral 7.31-7.8 slightly alkaline 7.81-8.5 moderately alkaline 8.51-9.0 strongly alkaline >9.0 Very strongly alkaline
2.	Salinity Electrical conductivity (mho/cm) 1 mho/cm=640 ppm	Up to 1.0 average 1-2 harmful to germination 2-3 harmful to crops
3.	Nitrogen (Kg/ha)	Up to 50 very less 51-100 less 110-150 good 151-300 better >300 sufficient
4.	Phosphorus (kg/ha)	Up to 15 very less 15-30 less 31-50 medium 51-65 on average sufficient 66-80 sufficient >80 more than sufficient
5.	Potassium (kg/ha)	0-120 very less 120-180 less 180-240 medium 241-300 average 301-360 better >360 more than sufficient

Soil is the media for supplying the nutrients for plant growth. Nutrients are available to plants at certain pH of soils can reflect by addition of pollutants in it either by air, or by water or by solid waste or

by all of these. In order to establish the baseline status of soil characteristics, soil samples were collected at 3 sampling location.

### **3.13.1 Result**

The results of soil sample analyzed during Winter period (February 2013) are presented in Table 3.13(B) for physical and chemical parameters. The result of soil analysis shows that it is slightly acidic in nature having pH values from 7.73 to 8.12. The soil texture is sandy clay loam having predominantly Sand. The Soil density varies from 1.59 to 1.71. The micronutrients have been found in all the samples.

## **3.14 BIOLOGICAL ENVIRONMENT**

### **3.14.1 Biological Environment**

The basic purpose to exploring the biological environment under Environmental Impact Assessment (EIA) is to assist in the decision making process and to ensure that the project options under consideration are bio-environmental-friendly. EIA identifies ways of improving project environmentally by preventing, minimizing, mitigating or compensating for adverse impacts before construction and after construction phase. The present study on the floral assessment of the proposed project is based on field survey of the area supported by secondary data from various governmental and non-governmental sources.

A change in the composition of biotic communities is reflected by a change in the distribution pattern, density, diversity, frequency, dominance and abundance of natural species of flora and fauna existing in the ecosystem. These changes over a span of time can be assessed and related to the existing environmental factors. The sensitivity of animal and plant species to the changes occurring in their existing ecosystem can therefore,

be used for monitoring Environmental Impact Assessment studies of any project.

### **3.14.2 Study Area**

The entire tract of the study area is hilly, lies between altitudes of 500 m to 2000 m. The slopes vary considerably and are generally moderated to slightly steep. The climate in the study area varies from sub tropical to moist temperate. The temperature of the solan district varies in between  $-4\text{ }^{\circ}\text{C}$  ( $25\text{ }^{\circ}\text{F}$ ) to  $32\text{ }^{\circ}\text{C}$  ( $90\text{ }^{\circ}\text{F}$ ) over the course of a year. During winters Solan experiences little snowfall. Average annual rainfall in the district is 1253 mm.

The District has a number of springs and streams, which can be found in the hills, and woods of the area. Solan District is covered by catchment areas of Asni and Kiar-Ka-Nala, Gambhar, Dabar Khad, Kuthar Nadi, etc. Kaushalya Nadi is the main tributary of Ghagar. Sirsa is the main stream in Nalagarh Sub division. It has its source in the hills above Kalka and runs north-west along the base of the Shivaliks eventually joining the Sutlej at Avankot in Ropar District.

The present ecological study in the study area was undertaken with the objectives of preparing a checklist of flora, fauna and avifauna in the submergence area and in the study area, listing of rare/endangered species for flora and fauna, economically important and medicinal plant species etc. The biological survey was carried out in forested area (village forest, and community forest), and non-forested area (agricultural field, riverside, plain areas, village wasteland etc). Secondary data collected from various Government Departments and project authority to substantiate primary data.

10 km (radial distance from the proposed mining lease) study area was taken for the assessment of terrestrial ecology of flora and fauna based on

topography, land use, vegetation pattern, etc. The observations were taken in agriculture fields, hills, plain area, and village wasteland prescribed by the objectives and guidelines for Preliminary Environmental Examination. All observations were taken during the month of December 2012.

### **3.14.3 Survey Methodology**

#### **3.14.3.1 Flora**

The present study on the floral assessment for the proposed project activity is based on extensive field survey of the area. The study has been conducted in summer season. The plant species were identified with the help of taxonomists of related fields and nearby Institutions. Besides the collection of plant species, information was also collected with vernacular names of plant species made by local inhabitants. In this process the whole study area was divided into different sections to get the maximum diversity of plant species. The sampling sites were selected based on land use pattern, topography and floristic composition of the study area. The other relevant data on bio-diversity, like economically important plant species and medicinal plant, Rare and endangered species in the study area have been collected from secondary sources like forest and wild life departments.

#### **3.14.3.2 Fauna**

The study of fauna takes substantial amount of time to understand the specific faunal characteristics of the area. The assessment of fauna have been done on the bases secondary data collected from different government offices like forest department, wildlife department etc. The presence of wildlife was also confirmed from the local inhabitants depending on the animal sightings and the frequency of their visits in the project area. In addition review of secondary data was another source of

information for studying the fauna of the area. In addition the following sources were also used.

- ❖ Physical/active search, covering rocks, burrows, hollow inspection and location of nesting sites
- ❖ Habitat assessment etc.

### **3.14.3.3 Avifauna**

Avifauna species present and relative abundance of species in different habitat were surveyed by transects count. In addition to direct count, avifaunal species also identified using their call. Birds were noted, counted and identified with the help of Nikon 50 binocular and standard field identification guides. All the records were reviewed under IUCN and Wildlife (Protection) Act, 1972 for their conservation status.

### **3.14.4 Forest and forest types observed in the study area**

According to the revised classification of the forest types of India by Champion and Seth (1968) the following forest types are generally observed in the study area.

- a) Group 5- Tropical dry deciduous forest  
(Sub group 5B-Northern tropical dry deciduous forest)
- b) Group 9- Sub tropical pine forest  
(Sub group C, - Himalayan sub-tropical forest)
- c) Group 12- Himalayan moist temperature forest

These forests occur almost in the entire tracts of the study area. The forests are characterized by the presence of entirely broad leaved deciduous trees. *Anogeissus latifolia* (chal) is an important species in this type. Other dominant species found in the study area are *Acacia catechu*,

Bauhinia variegata, Bombax ceiba, Cassia fistula, Emblica officinalis, Terminalia belerica, Terminalia chebula and Terminalia tomentosa etc.

The understory consists of shrubby undergrowth with some evergreen xerophytic species. The lantana bushes found to be dominant all over the study area with other associates like Acacia pennata, Aegle marmelos, Barhinia vahlii, Caesalpinia sepiaria, Flacourtia indica, Grewia oppositifolia, Holarrhena antidysentrica, Mimosa rubicaulis and Zizyphus nummularia etc. The only Bamboo species observed in the study area is Dendrocalamus strictus. The Bamboo clumps area found in pure patches and also as mixed with deciduous species, thorny bushes and grasses. The species which found in close association with bamboo are *Anogeissus latifolia*, *Lannea grandis*, *Acacia catechu*, *Cassia fistula*, *Lantana camara*, *Adathoda vasica* etc.

### 3.14.5. Floral diversity in Study Area

#### 3.14.5.1 Core Zone

The river stretch which has been granted as the mining lease area (i.e. core zone) for the mining activity has uneven and rough terrain. There is sparse vegetation which includes some grasses and shrubs. Shrubs like lantana, Calotropis procera, Parthenium spp. are observed scattered in the river bank. Trees and bushes are found along the bank of the river. The vegetation gives a thick appearance due to the presence of Lantana bushes. Other prominent species include Dalbergia sisoo, Mangifera indica, *Anogeissus latifolia*, *Acacia catechu*, *Cassia fistula*, *Ficus benghalensis*, *Lantana camara*, *Adathoda vasica*, *Terminalia belerica*, *Calotropis procera*, *Datura stramonium*.

### 3.14.5.2 Buffer Zone

The buffer zone includes an array of terrain, prominent among which are hilly area, planes, agriculture fields, barren lands and human habitation. A gradual change in the vegetative pattern has also been observed from the hills to the planes. The hills have vegetation mostly on the top and the hill planes which include species like *Acacia catechu*, *Dalbergia sissoo*, *Aegle marmelos*, *Albizzia chinensis*, *Albizzia lebbek*, *Anogeissus latifolia*, *Bauhinia racemosa*, *Bombax ceiba*, *Dalbergia sissoo*, *Grewia oppositifolia* and *Mangifera indica* etc.

Plantations along the sides of agricultural fields and within human habitation include several species like *Eucalyptus* spp, *Azadirachta indica*, *Bauhinia purpurea*, *Butea monosperma*, *Cassia fistula*, *Dalbergia sissoo*, *Emblica officinalis*, *Eucalyptus globules*, *Ficus bengalensis*, *Ficus religiosa*, *Mangifera indica*, *Melia azadirach*, *Nerium indicum*, *Phoenix sylvestris*, *Syzygium cumini*, *Terminalia arjuna* and *Zizyphus mauritiana* etc.

Several shrubs and herbs have been observed within the planes, agricultural fields and other areas. They include *Adathoda vasica*, *Agave Americana*, *Calotropis procera*, *Cannabis sativa*, *Cassia tora*, *Datura stramonium*, *Jatropha curcas*, *Lantana camara*, *Polygonum capitatum*, *Solanum indicum*, *Vitex negundo* and *Zizyphus jujube* etc.

**The list of plant species recorded in the study area is given in Table 3.5.2.**

### 3.14.6 Medicinal plants

The common herbal medicinal flora of the study area consists of *Eucalyptus* spp, *Azadirachta indica*, *Bauhinia purpurea*, *Butea monosperma*, *Cassia fistula*, *Dalbergia sissoo*, *Emblica officinalis*, *Eucalyptus globules*, *Ficus bengalensis*, *Ficus religiosa*, *Mangifera indica*, *Melia azadirach*, *Nerium indicum*, *Syzygium cumini*, *Terminalia arjuna*,

*Adathoda vasica, Agave Americana, Calotropis procera, Cannabis sativa, Cassia tora, Datura stramonium, Jatropha curcas, Vitex negundo and Zizyphus jujube etc.*

### 3.14.7 Threatened Plant Species

#### Flora

Threatened taxa are those species (including flora and fauna), which are vulnerable to endangerment in the near future. Threatened status of any taxa is not a single category but is a group of the categories; critically endangered, endangered and vulnerable. On the application of different criteria of IUCN for the assessment of conservation status of taxa, no taxa were found threatened in the study area. The reported taxa have also not been enlisted in the Red Data Book of Indian plants.

#### Fauna

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. The animal life of an area is dependent upon the vegetation and there are countless relationships between the species composing an animal community.

During the survey the species like Neola (*Herpestes edwardsinyula*), Bandar (*Macaca mullata*) and Langur (*Presbytis entellus*) are observed in the study area. According to the information collected from different offices and local people Jungli Suar (*Sus scrofa indicus*), Geedar (*Canis areus*), Khargosh (*Lepus nigricollis*) are generally observed in the study area. **During the faunal investigation no Schedule-I species observed in the study area. The list of faunal elements found in the study area is**

**given in Table no. 3.18.** The lower reaches of study area are very warm and provide an ideal habitat for many snakes and other reptiles. Common reptiles found in the study area are house lizard and rock lizard etc.

**List of reptiles available in the study area are presented in Table 3.19 (A,B,C).**

### **Avifauna**

Plantations along the sides of agricultural fields and within human habitation are ideal habitats for some bird species like House Crow (*Corvus splendens*), Redvented bulbul (*Pycnonotus cafer*), Black Drongo (*Dicrurus adsimilis*), Crow pheasant (*Centropus sinensis*), Magpie robin (*Copsychus saularis*), Jungle Crow (*Corvus macrorhynchos*), Jungle Babbler (*Turdoides striatus*) which observed in the study area. The species which are observed near or around water bodies are White Breasted kingfisher (*Halcyon smyrnensis*), Cattle Egret (*Bubulcus ibis*), Wagtail Yellow (*Motacilla flava*), Green Bee eater (*Merops orientalis*) and Redwhiskered Bulbul (*Pycnonotus Jocosus*). Some species like House Sparrow (*Passer domcshticus*), Indian Robin (*Saxicoloides fulicata*), Rose ringed Parakeet (*Psittacula krameri*), Common Myna (*Acridotheres Grisea*) are observed near villages or near human settlements. **The list of bird species observed in the study area are presented in Table3.19**

#### **3.14.8 Endangered & Vulnerable Animals**

A comprehensive central legislation namely Wild Life (Protection) act was enforced in 1972. This law provides protection to wild animals and for matters related to their ancillary or incidental death. Not a single species were observed to be threatened in the study area.

**Table 3.16 : List of sampling locations for biological study**

Sr. No.	Villages	Direction	Distance
	Basowali	N	2.5
	Baglehr	NE	2.0
	Pater	S	2.4
	Garoti	NW	1.0
	Kalyanpur	NNE	3.5
	Nawanagar	E	5.0
	Bhangalan	S	5.5
	Jhajra	SW	2.0
	Rampur	NNW	6.5
	Bagheri	N	9.4
	Kundli	NE	7.5
	Nawan Garh	SE	9.0

**Table 3.17 : Forests in 10 km radius of the study area**

Forest name	Distance (KM)	Direction
Lahuda PF	8.0	NNE
Kala Amb PF	5.7	NE
Sihl PF	5.5	NE
Dhangoh PF	6.0	NE
Raiwaken PF	5.5	E
Ratwar PF	5.0	E
Aduwa PF	4.0	SE
Khobla PF	7.0	SE
Sobal PF	9.0	SE
Hatra PF	2.2	S
Rakh Palasi	8.0	S
Palasi PF	9.0	S
Himatpur PF	6.0	SW
Raipur PF	2.0	NW
Open Jungle	7.5	NW

**Table 3.18**  
**List of Common plant species observed in the study area**

Sr. No.	Botanical Name	Local Name	Family
<b>Trees</b>			
1.	Acacia catechu	Khair	Leguminosae
2.	Acer oblongum	Parang	Sapindaceae
3.	Aegle marmelos	Bel	Rutaceae
4.	Aesculus indica	Khanor	Urticaceae
5.	Albizzia chinensis	Siris	Leguminosae
6.	Albizzia lebbek	Siris	Leguminosae
7.	Albizzia odoratissima	Kala Siris	Leguminosae
8.	Albizzia procera	Safed Siris	Leguminosae
9.	Anogeissius latifolia	Chhal, Dhau, Bakli	Combretaceae
10.	Azadirachta indica	Neem	Meliaceae
11.	Bauhinia purpurea	Lal Karal	Leguminosae- Caesalpinieae
12.	Bauhinia racemosa	Karal	Leguminosae- Caesalpinieae
13.	Bauhinia variegate	Kachnar, Papri	Leguminosae- Caesalpinieae
14.	Boechmeria rugulosa	Shingar, Genthi	Urticaceae
15.	Bombax ceiba	Semal	Malvaceae
16.	Butea monosperma	Dhak, Palah	Leguminosae
17.	Campsis grandiflora	Delaun	Bignoniaceae
18.	Casearia elliptica	Gotlu, Chilla	Samydaceae
19.	Cassia fistula	Amaltas	Leguminosae
20.	Cedrela serrata	Dauri	Meliaceae
21.	Cedrela toona	Toon	Meliaceae
22.	Cedrus deodara	Deodar	Prinaceae

Sr. No.	Botanical Name	Local Name	Family
23.	<i>Celtis australis</i>	Khirik	Urticaceae
24.	<i>Cordial dichotoma</i>	Lasura	Boraginaceae
25.	<i>Cornus capitata</i>	Thumbi	Cornaceae
26.	<i>Cupressus torulosa</i>	Saru	Coniferae
27.	<i>Dalbergia sissoo</i>	Shisham	Leguminosae
28.	<i>Dendrocalamus strictus</i>	Bans	Graminae
29.	<i>Ehretia laevis</i>	Chamror	Boraginaceae
30.	<i>Ehretia serrata</i>	Pandayan	Boraginaceae
31.	<i>Elaeodendron glaucum</i>	Morindu, Mirgu	Celastraceae
32.	<i>Emblica officinalis</i>	Amla	Leguminosae
33.	<i>Engelhardtia colebrookiana</i>	Samma	Juglandaceae
34.	<i>Erythrina suberosa</i>	Dhaul, Padiara	Legumimosae
35.	<i>Eucalyptus globules</i>	Safeda	Myrtaceae
36.	<i>Eugenia jambolana</i> var. <i>Caryophyllifolia</i>	Kathamam	Myrtaceae
37.	<i>Ficus bengalensis</i>	Bar, Bargad	Urticaceae
38.	<i>Ficus glomerata</i>	Fagura	Urticaceae
39.	<i>Ficus palmate</i>	Dhura, Fegra	Urticaceae
40.	<i>Ficus religiosa</i>	Peepal	Urticaceae
41.	<i>Flacourtia indica</i>	Kangu	Bixaceae
42.	<i>Garuga pinnata</i>	Kharpat	Burseraceae
43.	<i>Glochidion velutinum</i>	Saman	Euphorbiaceae
44.	<i>Grewia oppositifolia</i>	Dhaman, Biul	Tiliaceae
45.	<i>Grewia populifolia</i>	-	Tiliaceae
46.	<i>Hamiltonia sauveolans</i>	-	Rubiaceae
47.	<i>Holarrhena antidysentrica</i>	Maror phalli	Apocynaceae
48.	<i>Jacaranda</i>	Jacaranda	Scrophulariaceae

Sr. No.	Botanical Name	Local Name	Family
	mimosaefolia		
49.	Juglans regia	Akhrot	Juglandaceae
50.	Kydia calycina	Pula	Malvaceae
51.	Lagerstroemia indica	Harsinghar	Lythraceae
52.	Lannea grandis	Jhingan	Anacardiaceae
53.	Limonia acidissima	Barnasi	Rutaceae
54.	Litsea glutinosa	Chandana	Lauraceae
55.	Lyonia ovalifolia	Ayar, Ailan	Ericaceae
56.	Machilus odoratissima	Bajhaul	Lauraceae
57.	Maesa indica	Burkain	Myrsinaceae
58.	Mallotus philippinensis	Kamal, Kamela	Euphorbiaceae
59.	Mangifera indica	Aam	Anacardiaceae
60.	Melia azadirach	Drek	Meliaceae
61.	Milletia auriculata	Shama	Meliaceae
62.	Mitragyna parviflora	Kaem, Phaldu	Rubiaceae
63.	Moringa oleifera	Sanjna	Moringaceae
64.	Morus alba	Shahtoot	Urticaceae
65.	Morus serrata	Toot	Urticaceae
66.	Morus nagi	Kaphal	Myricaceae
67.	Nerium indicum	Kaner	Apocynaceae
68.	Olea cuspidate	Kahu	Oleaceae
69.	Olea glandulifera	Jharinu	Oleaceae
70.	Oroxylum indicum	Tat-palanga	Bignoneaceae
71.	Ougenia oojeinensis	Sandan	Leguminosae
72.	Persea gamblei	Bhadrol	Lauraceae
73.	Phoenix sylvestris	Khajoor	Palmae
74.	Pinus roxburghii	Chil, Chir	Coniferae
75.	Pistacea integerrima	Kakkar	Anacardiaceae
76.	Populous ciliate	Poplar	Salicaceae

Sr. No.	Botanical Name	Local Name	Family
77.	Populous deltoidea	Poplar	Salicaceae
78.	Prunus armeniaca	Khumani	Rosaceae
79.	Prunus persica	Aru	Rosaceae
80.	Prunus puddum	Paja	Rosaceae
81.	Prunus granatum	Daru	Lythraceae
82.	Putranjiva roxburghii	Jaipota	Euphorbiaceae
83.	Pyrus communis	Nashpati	Rosaceae
84.	Pyrus pashia	Kainth	Rosaceae
85.	Quercus glauca	Bani	Cupuliferae
86.	Quercus leucotichophora	Ban	Cupuliferae
87.	Rhododendron arboretum	Buras, brass	Ericaceae
88.	Robinia pseudoacacia	Rubinia	Leguminosae
89.	Salix alba	Badah	Salicaceae
90.	Salix pyrina	Biuns	Salicaceae
91.	Sapinudus mukorossi	Ritha, Soap nut	Sapindaceae
92.	Sapium insigne	Baloje, Khirni	Urticaceae
93.	Stereospermum sauveolans	Padal	Bignoneaceae
94.	Schleichera oleosa	Kusum	Sapindaceae
95.	Syzygium cumini	Jamun	Myrtaceae
96.	Tecoma stans	Trumpet flower	Bignoniaceae
97.	Terminalia arjuna	Arjun	Combretaceae
98.	Terminalia belerica	Bahera	Combretaceae
99.	Terminalia chebula	Harar	Combretaceae
100.	Terminalia tomentosa	Sain	Combretaceae
101.	Trewia nudiflora	Gamhar	Euphorbiaceae
102.	Wendlandia exserta	Chila, Pansara	Rubiaceae

Sr. No.	Botanical Name	Local Name	Family
103.	Xylosma longifolium	Chirandi	Bixaceae
104.	Zanthoxylum armatum	Trimal	Rutaceae
105.	Zizyphus mauritiana	Ber	Rhamnaceae
<b>Shrubs and Herbs</b>			
1.	Adathoda vasica	Basuti	Bcanthaceae
2.	Agave Americana	Ram Ban	Amaryllidaceae
3.	Agave cantala	-do-	Amaryllidaceae
4.	Ageratum conyzoides	Neela phulnu	Asteraceae
5.	anaphalis adnata	Bujlu	Asteraceae
6.	Anaphalis vulgaris	Charmar (Khardar)	Asteraceae
7.	Arisaema wallichianum	Cobra plant	Asteraceae
8.	Arundinaria falcate	Nar, Piuli	Gramineae
9.	Asclepias curasavica	-	Asclepiadaceae
10.	Asparagus racemosus	Sataron, Sansarmul	Liliaceae
11.	Bambusa arundinacea	Kanta bans	Gramineae
12.	Berberis aristata	Kashmal	Berberidaceae
13.	Berberis chitria	Kasmal	Berberidaceae
14.	Berberis lyceum	Kashmal	Berberidaceae
15.	Bergenia ligulata	Pathal Tor	Saxifragaceae
16.	Boenninghausenia albiflora	Pissumar buti	-
17.	Buddleia paniculata	Durpa Siaru	Loganiaceae
18.	Caesalpinia decapitata	-	Leguminosae
19.	Calotropis procera	Aak	Asclepiadaceae
20.	Cannabis sativa	Bhang, wild hemp	Urticaceae
21.	Capparis aphylla	Karir	Capparidaceae
22.	Carissa opaca	Karaunda	Apocynaceae

Sr. No.	Botanical Name	Local Name	Family
23.	Cassia tora	Ailu	Leguminosae- Caesalpinieae
24.	Chenopodium album	Bathu	Chenopodiaceae
25.	Clerodendron phlomidis	Dhak, Kari	Verbenaceae
26.	Cochlospermum gossypium	Kumb	Bixaceae
27.	Cordial vestita	Lasuri	Boraginaceae
28.	Coriaria nepalensis	Nachhar	Coriariaceae
29.	Cotoneaster bacillaris	Baint	Rosaceae
30.	Cotoneaster microphylla	Chamror	Rosaceae
31.	Crotolaria albida		Leguminosae
32.	Daphne cannabina	Satbarna	Thymelaeaceae
33.	Datura stramonium	Dhatura	Solanaceae
34.	Debregeasia hypoleuca	Siharu	Urticaceae
35.	Desmodium tiliaefolium	Matoi	Leguminosae
36.	Dodonea viscosa	Mehndar	Sapindaceae
37.	Deutzia corymbosa	Philru	Saxifragaceae
38.	Duranta plumier	-	Verbanaceae
39.	Elsholtzia fruticosa	Potha	Labiatae
40.	Euonymus pendulus	Bharmela	Celastraceae
41.	Euphorbia royaleana	Thor	Euphorbiaceae
42.	Flemingia chappar	Chhanchra	Leguminosae
43.	Fragaria indica	-	Ranunculaceae
44.	Gerardiana heterophylla	Bichhu buti	Urticaceae
45.	Glycosmis pentaphylla	Ban Nimbu	Rutaceae
46.	Hippophae rhamnoides	Gaihiu	Elaeagnaceae
47.	Llex dipyrena	Kanderu	Hicaceae

Sr. No.	Botanical Name	Local Name	Family
48.	Indigofera gerardiana	Kathi	Papilionaceae
49.	Indigofera hirsute	Kathi	Papilionaceae
50.	Indigofera pulchella	Kathi, Nil	Papilionaceae
51.	Iris nepalensis	-	Liliaceae
52.	Jasminum humile	Malti	Oleaceae
53.	Jasminum multiflorum	Ban Malti	Oleaceae
54.	Jasminum officinale	Dhur malti	Oleaceae
55.	Jatropha curcas	Jamalgota	Euphorbiaceae
56.	Lantana camara	Phul Lakri	Verbenaceae
57.	Loranthus longiflorous	Narate	Loranthaceae
58.	Menthe arvensis	Ban Pudina	Labiatae
59.	Mimosa rubicaulis	Karingan	Leguminosaceae
60.	Murraya koenigii	Gandhela	Rutaceae
61.	Myrsine Africana	Jhunjhra	Myrsinaceae
62.	Nyctanthes arbour-tristis	Harsingar, Kura	Oleaceae
63.	Opuntia dillenii	Nagphani	Cactaceae
64.	Plectranthus rugosus	Chhichari, Kathal	Labiatae
65.	Polygonum capitatum	-	Polygonaceae
66.	Prinsepia utilis	Bhekhhal	Rosaceae
67.	Randia dumetorum	Rara	Rubiaceae
68.	Randia tetrasperma	Jundru	Rubiaceae
69.	Rhamnus virgata	Thalta	Rhamnaceae
70.	Rhus cotinus	Tung	Anacardiaceae
71.	Rhus punjabensis	Tittar	Anacardiaceae
72.	Rhus semialata	Bankhor	Anacardiaceae
73.	Rosa moshata	Kuja	Rosaceae
74.	Rubus ellipticus	Heer	Rosaceae
75.	Rubus macilentus	Akha	Rosaceae

Sr. No.	Botanical Name	Local Name	Family
76.	Rumex hastatus	Chulmora	Polygonaceae
77.	Rumex nepalensis	Jungli Palak	Polygonaceae
78.	Salvia glutinosa	Makhiaar	Labiatae
79.	Sarcococca saligna	Diun	Euphorbiaceae
80.	Solanum indicum	Ban Tambaku	Solanceae
81.	Strobilanthus alatus	-	Acanthaceae
82.	Triumfetta pilosa	-	Tiliaceae
83.	Urtica dioica	Bichhu buti	Urticaceae
84.	Viburnum coriaceum	Basmol, Talanj	Caprifoliaceae
85.	Viburnum mullaha	Ire	Caprifoliaceae
86.	Viburnum punctatum	Shawange	Caprifoliaceae
87.	Vitex negundo	Bana	Verbanaceae
88.	Viola canescens	Banafsha	Violaceae
89.	Woodfordia floribunda	Dhai	Lythraceae
90.	Zizyphus jujube	Beri	Rhamnaceae
<b>Climbers</b>			
1.	Acacia pennata	Agla, Kandiali	Leguminosae
2.	Bauhinia wahlia	Taur, Maljhan	Leguminosae
3.	Caesalpinia sepiaria	Kanderi	Leguminosae
4.	Campsis grandiflora	Chinese Trumpet creeper	Bignoniaceae
5.	Clematis Montana	Garol	Ranunculaceae
6.	Clematis nutans	Chibru, Machrun	Ranunculaceae
7.	Cuscuta reflexa	Seragbali, Akashbel	Ranunculaceae
8.	Hedera helix	Mithiari, Kareni	Araliaceae
9.	Parthenocissus semicordata	Baulan, Pani bel	Vitaceae

Sr. No.	Botanical Name	Local Name	Family
10.	Rosa moschata	Kuja	Rosaceae
11.	Smilax niveus	Ushwa	Liliaceae
12.	Smilax parviflora	Jhanjhrola, Ushwa	Liliaceae
13.	Trachlopermum fragrans	-	Apocyanaceae
14.	Trachlopermum lucidum	Kali Dudhi	Apocynaceae
<b>Bamboos and Grasses</b>			
1.	Andropogon Spp.	-	Graminae
2.	Agropyron longearistatum	-	Graminae
3.	Agrostis tenuis	-	Graminae
4.	Aristida depressa	Lambi	Graminae
5.	Arundinaria falcate	Nirgaal	Graminae
6.	Arundinella nepalensis	-	Graminae
7.	Bambusa arundinacea	Kanta bans	Graminae
8.	Bothriocloa pertusa	-	Graminae
9.	Brachiaria villosa	-	Graminae
10.	Bromus Spp.	-	Graminae
11.	Chrysopogon fulvus	Dholu	Graminae
12.	Chrysopogon gryllus	Dholu	Graminae
13.	Chrysopogon montanus	Dholu	Graminae
14.	Cymbonpogon martini	Makora	Graminae
15.	Cynodon dactylon	Dub	Graminae
16.	Dendrocalamum strictus	Bans/Male Bamboo	Graminae
17.	Dendrocalamus hamiltonii	Magar bans	Graminae
18.	Dicanthium annulatum	-	Graminae
19.	Eulatiopsis binata	Bhabbar	Graminae

Sr. No.	Botanical Name	Local Name	Family
20.	Festuca Spp.	-	Graminae
21.	Hemarthria compressa	-	Graminae
22.	Heteropogon contortus	Lamb, Sariala	Graminae
23.	Pennisetum orientale	-	Graminae
24.	Phalcaris tuberosa	-	Graminae
25.	Phylostachys chinensis	Chinese bamboo	Graminae
26.	Poa pratensis	-	Graminae
27.	Saccharum Spontaneum	Kans	Graminae
28.	Sehima notata	-	Graminae
29.	Sorghum nitidum	Lungi	Graminae
30.	Themeda arudinacea	-	Graminae
31.	Themeda anathera	-	Graminae

Source: Solan Forest Department, Field Survey and Public Consultation

**Table 3.19 (A)**  
**Common Animals found in the Study Area**

Sr. No.	Common Name	Scientific Name	Family	Status in Wildlife (Protection) Act-1972	Status in IUCN Category
1.	Jungli Suar	<i>Sus scrofa indicus</i>	Suidae	Schedule III	Least Concern
2.	Bandar	<i>Macaca mullata</i>	Cercopithecidae	Schedule II	Least Concern
3.	Langur	<i>Presbytis entellus</i>	Cercopithecidae	Schedule II	Least Concern
4.	Jangli Billi	<i>Felis chaus</i>	Felidae	Schedule II	Least Concern
5.	Geedar	<i>Canis areus</i>	Canidae	Schedule II	Least Concern
6.	Lomari	<i>Vulpes bengalensis</i>	Canidae	Schedule II	Least Concern
7.	Khargosh	<i>Lepus nigricollis</i>	Leporidae	Schedule IV	Least Concern
8.	Sail	<i>Hystrix indica</i>	Hystricidae	Schedule IV	Least Concern
9.	Neola	<i>Herpestes edwardsinyula</i>	Herpestidae	Schedule II	Least Concern

Source: Solan Forest Department, Field Survey and Public Consultation

**Table 3.19 (B)**

**Common Reptiles found in the Study Area**

Sr. No.	Common Name	Scientific Name	Family	Status in Wildlife (Protection) Act-1972	Status in IUCN Category
1.	Rat Snake	<i>Ptyas mocosus</i>	Colubridae	Schedule II	Least concern
2.	Common Indian Krait	<i>Bungarus Caeruleus</i>	Elapidae	Schedule IV	Least concern
3.	Indian Cobra	<i>Naja naja</i>	Elapidae	Schedule II	Not Evaluated
4.	House Lizard	<i>Gecko hemiddactylus</i>	Gekknidae	Not evaluated	Least concern

Source: Solan Forest Department, Field Survey and Public Consultation

**Table 3.19(C)**  
**List of Avifauna observed in the Study Area**

Sr. No	Common Name	Zoological Name	Family	Status in Wildlife (Protection) Act-1972	Status in IUCN Category
1.	Jungli murga	<i>Gallus gallus</i>	Phasianidae	Schedule IV	Least Concern
2.	Mor	<i>Pavo cristatus</i>	Phasianidae	Schedule I	Least Concern
3.	Dhaura teetar	<i>Francolinus pondicerianus</i>	Phasianidae	Schedule IV	Least Concern
4.	Kala teetar	<i>Francolinus Francolinus</i>	Phasianidae	Schedule IV	Least Concern
5.	Bater	<i>Prodecula asiatica</i>	Phasianidae	Schedule IV	Least Concern
6.	Ghuggi	<i>Streptopediachinensis</i>	Columbidae	Schedule IV	Least Concern
7.	golden backed Wood pecker	<i>Dinopium benghalense</i>	Picidae	Schedule IV	Least Concern
8.	Black Winged Kite	<i>Elanus carruleus</i>	Accipitrida	Not Evaluated	Least Concern
9.	Black backed woodpecker	<i>Chrysocolaptes pondiceria</i>	Picidae	Schedule IV	Least Concern
10.	Gray partridge	<i>Francolinus pondiceria</i>	Phasianidae	Schedule IV	Least Concern
11.	Pied Bush Chat	<i>Saxicola caprata</i>	Musckapisae Turdinae	Not Evaluated	Least Concern
12.	White Breasted kingfisher	<i>Halcyon smyrnensis</i>	Alcedinidae	Schedule IV	Least Concern
13.	Pied	<i>Ceryle rudis</i>	Alcedinidae	Schedule	Least

Sr. No	Common Name	Zoological Name	Family	Status in Wildlife (Protection) Act-1972	Status in IUCN Category
	Kingfisher			IV	Concern
14.	Koel, Cuckoo	<i>Eudynamys scolopiea</i>	Cuculidae	Not Evaluated	Least Concern
15.	House Crow	<i>Corvus splendens</i>	Corvidae	Schedule V	Least Concern
16.	Grey Wagtail	<i>Motacilla caspica</i>	Motacilidae	Schedule IV	Least Concern
17.	Yellow cheeked Tit	<i>Parus zanthogenys</i>	Paridae	Not evaluated	Least Concern
18.	Redvented bulbul	<i>Pycnonotus cafer</i>	Pycnonotidae	Schedule IV	Least Concern
19.	King Crow, Black Drongo	<i>Dicrurus adsimilis</i>	Dicruridae	Schedule IV	Least Concern
20.	Indian tree pie	<i>Dendrocitta vegabanda</i>	Carvidae	Schedule IV	Least Concern
21.	Crow pheasant	<i>Centropus sinensis</i>	Cuculidae	Not Evaluated	Least Concern
22.	King Vulture	<i>Torgos calvus</i>	Accipitridae	Schedule IV	Least Concern
23.	Grey tit	<i>Parus major</i>	Paridae	Schedule IV	Least Concern
24.	Purple Sunbird	<i>Nectarinia asiatica</i>	Nectariniidae	Schedule IV	Least Concern
25.	Magpie robin	<i>Copsychus saularis</i>	Muscicapidae	Schedule IV	Least Concern
26.	Jungle Babbler	<i>Turdoides striartus</i>	Tmalinae	Schedule IV	Least Concern
27.	Cattle Egret	<i>Bubulcus ibis</i>	Ardeidae	Schedule	Least

Sr. No	Common Name	Zoological Name	Family	Status in Wildlife (Protection) Act-1972	Status in IUCN Category
				IV	Concern
28.	House Sparrow	<i>Passer domcshticus</i>	Ploceidae	Not Evaluated	Least Concern
29.	Indian Robin	<i>Saxicoloides fulicata</i>	Muscicapidae	Not Evaluated	Least Concern
30.	Common Pariah Kite	<i>Milvus migrans</i>	Accipitridae	Not Evaluated	Least Concern
31.	Common Kingfisher	<i>Alcedo atthis</i>	Alcedinidae	Schedule IV	Least Concern
32.	Jungle Crow	<i>Corvus macrorhynchos</i>	Corvidae	Schedule IV	Least Concern
33.	Rose ringed Parakeet	<i>Psittacula krameri</i>	Psittacidae	Schedule IV	Least Concern
34.	Common Myna	<i>Acridotheres Grisea</i>	Starnidae	Schedule IV	Least Concern
35.	White Wagtail	<i>Motacilla alba</i>	Motacilidae	Not Evaluated	Least Concern
36.	Wagtail Yellow	<i>Motacilla flava</i>	Motacilidae	Not Evaluated	Least Concern
37.	Indian Roller or Blue Jay	<i>Coracias benghalensi</i>	Muscicapidae	Not Evaluated	Least Concern
38.	Green Bee eater	<i>Merops orientalis</i>	Meropidae	Not Evaluated	Least Concern
39.	Red whiskered Bulbul	<i>Pycnonotus Jocosus</i>	Pycnonotidae	Not Evaluated	Least Concern

Source: Solan Forest Department, Field Survey and Public Consultation

**RESERVED FOREST/PROTECTED FOREST LOCATION  
MAP**

*(PLEASE REFER TO THE ATTACHED PDF FILE OF RESERVED  
FOREST AND PROTECTED FOREST LOCATION MAP IN THE SAME  
FOLDER OF THE GIVEN CD DISC)*

### 3.15 LAND ENVIRONMENT

#### 3.15.1 Land use of Study Area (Buffer Zone)

The total and of the study area is divided into following five categories:-

- i. Water bodies
- ii. Plantation
- iii. Forest
- iv. Crop Land
- v. Fallow Land
- vi. Human Settelement
- vii. Industries
- viii. Dense Scrub
- ix. Open Scrub
- x. Seasonal River
- xi. Open / Waste Land

##### 3.15.1.1 DATA INPUT

IRS LISS3 Multispectral digital FCC (False Color Composite) data from NRSC Bhuwan Portal has been used for preparation of Land use/ Land cover thematic map of study area. Project site mine plan map & Google maps and Toposheet has been used as a reference map for preparation of base layer map like road, rail network, project site boundary, landmarks point etc.

##### Technical Details

- |                    |                               |
|--------------------|-------------------------------|
| ➤ Satellite Image  | IRS LISS3                     |
| ➤ Band Combination | 2,3,4                         |
| ➤ DIP Software     | ERDAS Imagine 9.2 & Arc GIS 9 |

### **3.15.1.2 METHODOLOGY**

Land use / Land cover map preparation, Base map creation; and Geometric correction of satellite image has been processed using ERDAS Imagine 9.2 Software.

The methodology used for Land use pattern of study area is explained in following headings.

### **3.15.1.3 GEOREFERENCING OF TOPOMAPS**

SOI toposheet has been geo-referenced in geographic lat/long coordinate system using ERDAS Imagine Software.

### **3.15.1.4 BASE MAP LAYER CREATION**

Project site mine plan map & Google maps and geo-referenced toposheet has used as a reference map for base layer creation. In base layer linear, polygon and point feature like road, rail, canal, village location and project site have been created in vector data format. Base map layer information has been used for analysis of surrounding feature like road, rail, and village location near project site activity through superimposed on thematic map for data integration.

Finally, the area not available for cultivation includes and not covered by above eleventh categories, i.e. mostly, the area covered by hills, valleys, structures, roads etc.

The land use of study area is given as under:-

**TABLE 3.20**  
**Land Use Pattern Based on Satellite Image**

<b>S.no.</b>	<b>Class Names</b>	<b>Area (Ha.)</b>
i	Water bodies	716.70
ii	Plantation	494.34
iii	Forest	2275.67
iv	Crop Land	5735.91
v	Fallow Land	12353.78
vi	Human Settelement	871.31
vii	Industries	116.20
viii	Dense Scrub	5601.45
ix	Open Scrub	9066.04
x	Seasonal River	1301.76
xi	Open / Waste Land	123.74
	<b>Total</b>	<b>38656.90</b>

**LAND USE PATTERN MAP BASED ON SATELLITE DATA**

*(PLEASE REFER TO THE ATTACHED PDF FILE OF THE LAND USE PATTERN MAP BASED ON SATELLITE DATA IN THE SAME FOLDER IN THE GIVEN CD DISC.)*

**SATELLITE IMAGE OF THE STUDY AREA**

*(PLEASE REFER TO THE ATTACHED PDF FILE OF THE SATELLITE IMAGERY OF THE STUDY AREA IN THE SAME FOLDER IN THE GIVEN CD DISC.)*

### **3.12.1.5 INTERPRETATION OF SATELLITE IMAGE**

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 class. 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.

Ground Truth Data Collection for validation of Land Use Plan Ground truth data on geographic features of the study area has collected by site visit to the area for verification of information of the different doubtful features of the study areas, which were found to be responsible for the occurrence of specific spectral reflectance behavioral patterns. Ground truth has been carried out for verification of the ground features (esp. one in doubt) interpretation accuracy and reliability of remotely sensed data.

### **3.15.1.6 Agricultural Yield of the Study Area**

Agricultural practice is the main source of income of the study area. The major crop grown are Wheat, Maize, Ginger, Potato, sugar cane, mushroom & pulses etc. Crop wise yield grown around the study area is given in Table 3.21.

**TABLE –3.21**  
**AGRICULTURAL YIELD IN STUDY AREA**  
**(10 KM RADIUS FROM MINE SITE)**

Sl. No.	Crop	Month of Sowing	Month of Harvesting	% of Cropping Area	Yield kg per ha
1.	Maize	May-June	Sept.-Oct.	40%	1800 to 2500
2.	Mash	June-July	Sept.-Oct.	5%	800 to 1000
3.	Ginger	May-June	Dec.-Jan.	15%	10000 to 12000
4.	Calocasia	May-June	Nov.-Dec.	5%	110000 to 13000
5.	Kulth	May-July	Sept.-Oct.	2%	800 to 900
6.	Wheat	Oct.-Dec.	Apr.-May	80%	1800 to 2500

### 3.15.2 Land use of Lease area (Core Zone)

The lease area of 19.6 hect. has mountainous topography with minimum and maximum elevation of the leasehold area, above mean sea level are 374 m AMSL and 330m AMSL respectively. No Ag. field exist within the lease area. No forest land is involved in the core zone. The summarized details of the type of and covered in the lease area is indicated in Table 3.18(A).

**TABLE – 3.22**  
**LAND USE PATTERN-EXISTING**

*All figures in Hect.*

Particulars	Forest Land	Crop Land	Grazing Land	Waste Land	Total
Pit / Quarries					
River course					
Barrier zone i.e Barrier from Bridge					
Remaining land					
Total					

It is river bed mining. River bed will be excavated in slice of 1m thickness leaving statutory barrier. Material will be replenished each year during the Monsoon. So no change in form of pit will occur. Lease area will

change in form of plantation done during the year. Dump of silt and clay that dumped in the lease area will be used in plantation or will be transported as suspended load during the monsoon. So after monsoon existing land use will be restored except change in plantation area.

### **3.16 WATER ENVIRONMENT**

In order to conduct EIA Studies, baseline data pertaining to water environment of the existing project was carried out evaluating the basin characteristics, drainage pattern, and hydrology.

#### **3.16.1 Surface Water Quality**

The project itself is a part of surface water body. The lease falls in river Kundlu, near Village Androla Upparla, Tehsil Nalagarh, District Solan, State Himachal Pradesh. The water is not polluted and bears a lot of dissolved oxygen in it. The natural treatment of the water current takes places for a considerable length from the place of origin as the ultraviolet radiation due to sun is quite high in the upper reaches. In addition to this water of the river is not exposed to sewerage in general although, some sewerage during monsoon is brought by different streams passing through the inhabitation, during high flood season. The area is free of industrial pollutants as the industrial base is non existent.

##### **3.16.1.1 Ground Water Quality Assessment**

The sources of potable water are the hand pumps, tub-wells & dugwell in the area. Samples were collected from the available water resources around the mine leases area. The samples were collected & tested from different sites.

The quality of ground water was studied by collecting three water samples from representative open dug wells, tube wells & hand pumps.

The details of water quality sites are given in Table 3.23 & results in Table 3.24 (A) to 3.23(C) & location shown in Fig 3.10. The samples were collected during summer (January 2013).

**TABLE – 3.23**  
**LOCATION OF VARIOUS WATER SAMPLE STATIONS**

Station Code.	Station Name	Description	Location with respect to Site	
			Distance (Km)	Direction
W1	Project Site	water	--	--
W 2	Near Barun	water	2.0 Km	N
W 3	Near Bhogpur	water	4.5 Km	SSE

u/s – upstream      d /s – downstream

Samples from surface /ground water sources were collected by adopting grab sampling method. The sample was filled into a sampling bottle. The physico-chemical quality of water samples were characterized by adopting the relevant parts of IS:3025, “Standard Methods for Water Analysis” and the methods prescribed under IS:10500.

**WATER SAMPLING LOCATION MAP**

*(PLEASE REFER TO THE ATTACHED PDF FILE OF THE WATER SAMPLING LOCATION MAP IN THE SAME FOLDER IN THE GIVEN CD DISC.)*

**TABLE - 3.24(A)**  
**WATER QUALITY ANALYSIS**

**Name of Location:- Project Site**

S. No	Test Parameters	Units	Results	Requirements		Test Method
				Desirable Limits	In Absence of Alternate Source	
1.	Colour	--	< 5	Max 5	Max 25	IS: 3025(P-4)1983 R-2002
2.	Odour	--	Nonobjectionable	Nonobjectionable	--	IS: 3025(P-5)1983 R-2002
3.	Taste	--	Agreeable	Agreeable	--	IS: 3025(P-7/8)1984 R-2002
4.	Turbidity	NTU	< 5	Max 5	Max 10	IS: 3025 (P-10)1984 R-2002 (DL= 2 NTU)
5.	pH value	--	7.77	6.5 to 8.5	No relaxation	IS: 3025(P-11)1983 R-2002
6.	Total Hardness (as CaCO <sub>3</sub> )	mg/l	274.56	Max 300	Max 600	IS: 3025(P-521)1983R2002 Ad.1(MDL= 0.1mg/l)
7.	Calcium (as Ca)	mg/l	70.65	Max 75	Max 200	IS: 3025 (P-40):1991R 1998 (DL=1 mg/l)
8.	Magnesium (as Mg)	mg/l	23.50	Max 30	Max 100	IS3025 (P-46) 1994 R 1999 Ad.2 (DL=2 mg/l)
9.	Iron (as Fe)	mg/l	0.15	Max 0.3	Max 1.0	IS: 3025(P-53):2003 (DL=0.1 mg/l)
10.	Chlorides (as Cl)	mg/l	32.5	Max 250	Max 1000	IS: 3025 (P-32):1988R 1999 (DL=1 mg/l)
11.	Sulphate (as SO <sub>4</sub> )	mg/l	30.75	Max 200	Max 400	IS3025 (P-24)1986R 1998 (DL= 1 mg/l)
12.	Dissolved solids	mg/l	470	Max 500	Max 2000	IS: 3025 (P-16):1984R2002 Ad.1 (DL=5 mg/l)
13.	Alkalinity	mg/l	148	Max 200	Max 600	APHA 21 <sup>st</sup> ED 2005-2320 B (DL=1 mg/l)
14.	Nitrate (as NO <sub>3</sub> )	mg/l	2.58	Max 45	Max 100	IS: 3025 (P-34)1988 R 1999 (DL=0.1 mg/l)
15.	Fluoride (as F)	mg/l	0.59	Max 1.0	Max 1.5	APHA 21 <sup>st</sup> ED. 2005-4500D

						(DL=0.01 mg/l)
16.	Manganese (as Mn)	mg/l	BDL	Max 0.1	Max 0.3	IS: 3025 (part-59): 2006 (DL= 0.05 mg/l)
17.	Boron	mg/l	BDL	Max 1	Max 5	APHA 21 <sup>st</sup> ED. 2005-4500 C (DL=0.5 mg/l)
18.	Cyanide (as CN)	mg/l	BDL	Max 0.05	No relaxation	IS: 3025(Part 27): 1986 R2003 Ad.1 (DL=0.01 mg/l)
19.	Copper (as Cu)	mg/l	BDL	Max 0.05	Max 1.5	IS: 3025 (Part 42): 1992R 1998 (DL= 0.02 mg/l)
20.	Zinc (as Zn)	mg/l	BDL	Max 5	Max 15	IS 3025 (P-49) 1994 R1999 Ad.1 (DL= 0.02 mg/l)
21.	Lead (as Pb)	mg/l	BDL	Max 0.05	No relaxation	IS3025 (P-47) 1992R 1999 (DL=0.02 mg/l)
22.	Phenolic compounds (as C <sub>6</sub> H <sub>5</sub> OH)	mg/l	BDL	Max 0.001	Max 0.002	IS3025 (P-43) 1992 R 1998 Ad. 2 (DL=0.0001 mg/l)
23.	Cadmium (as Cd).	mg/l	BDL	Max 0.01	No relaxation	IS: 3025(P-41) 1992 R 1998 (DL=0.008 mg/l)
24.	Arsenic (as As)	mg/l	BDL	Max 0.05	No relaxation	IS: 3025(Part 37): 1988 R 1999 (DL=0.02 mg/l)
25.	Chromium (as Cr)	mg/l	BDL	Max 0.05	No relaxation	APHA 21 <sup>st</sup> ED. 2005-3111 B (DL=0.02 mg/l)
26.	Coliforms	MPN/100ml	4	Max 10	--	IS: 1622-1981 R 2003 (DL= 2 MPN/100ml)
27.	E.coli/100 ml	--	Absent	Absent	--	IS: 1622-1981 R 2003

Source : Eco Laboratories & Consultants Pvt. Ltd.

BDL – Below Detection Limit,MPN- Most Probable Number.

**TABLE - 3.24(B)**  
**WATER QUALITY ANALYSIS**

Name of Location:- Near Barun

S. No	Test Parameters	Units	Results	Requirements		Test Method
				Desirable Limits	In Absence of Alternate Source	
1.	Colour	--	< 5	Max 5	Max 25	IS: 3025(P-4)1983 R-2002
2.	Odour	--	Unobjectionable	Unobjectionable	--	IS: 3025(P-5)1983 R-2002
3.	Taste	--	Agreeable	Agreeable	--	IS: 3025(P- 7/8) 1984 R-2002
4.	Turbidity	NTU	< 5	Max 5	Max 10	IS: 3025 (P- 10) 1984 R-2002 (DL= 2 NTU)
5.	pH value	--	7.84	6.5 to 8.5	No relaxation	IS: 3025(P-11) 1983 R-2002
6.	Total Hardness (as CaCO <sub>3</sub> )	mg/l	282.24	Max 300	Max 600	IS: 3025(P-521) 1983R2002 Ad. 1(MDL= 0.1mg/l)
7.	Calcium (as Ca)	mg/l	70.65	Max 75	Max 200	IS: 3025 (P-40): 1991R 1998 (DL=1 mg/l)
8.	Magnesium (as Mg)	mg/l	23.96	Max 30	Max 100	IS3025 (P-46) 1994 R 1999 Ad.2 (DL=2 mg/l)
9.	Iron (as Fe)	mg/l	0.17	Max 0.3	Max 1.0	IS: 3025(P-53): 2003 (DL=0.1 mg/l)
10.	Chlorides (as Cl)	mg/l	34.49	Max 250	Max 1000	IS: 3025 (P-32): 1988R 1999 (DL=1 mg/l)
11.	Sulphate (as SO <sub>4</sub> )	mg/l	33.8	Max 200	Max 400	IS3025 (P-24)1986R 1998 (DL= 1 mg/l)
12.	Dissolved solids	mg/l	470	Max 500	Max 2000	IS: 3025 (P-16): 1984R2002 Ad.1 (DL=5 mg/l)
13.	Alkalinity	mg/l	162	Max 200	Max 600	APHA 21 <sup>st</sup> ED 2005-2320 B (DL=1 mg/l)
14.	Nitrate (as NO <sub>3</sub> )	mg/l	2.07	Max 45	Max 100	IS: 3025 (P-34)1988 R 1999 (DL=0.1 mg/l)
15.	Fluoride (as F)	mg/l	BDL	Max 1.0	Max 1.5	APHA 21 <sup>st</sup> ED. 2005-4500D (DL=0.01 mg/l)

16.	Manganese (as Mn)	mg/l	BDL	Max 0.1	Max 0.3	IS: 3025 (part-59): 2006 (DL= 0.05 mg/l)
17.	Boron	mg/l	BDL	Max 1	Max 5	APHA 21 <sup>st</sup> ED. 2005-4500 C (DL=0.5 mg/l)
18.	Cyanide (as CN)	mg/l	BDL	Max 0.05	No relaxation	IS: 3025(Part 27): 1986 R2003 Ad.1 (DL=0.01 mg/l)
19.	Copper (as Cu)	mg/l	BDL	Max 0.05	Max 1.5	IS: 3025 (Part 42): 1992R 1998 (DL= 0.02 mg/l)
20.	Zinc (as Zn)	mg/l	0.12	Max 5	Max 15	IS 3025 (P-49) 1994 R1999 Ad.1 (DL= 0.02 mg/l)
21.	Lead (as Pb)	mg/l	BDL	Max 0.05	No relaxation	IS3025 (P-47) 1992R 1999 (DL=0.02 mg/l)
22.	Phenolic compounds (as C <sub>6</sub> H <sub>5</sub> OH)	mg/l	BDL	Max 0.001	Max 0.002	IS3025 (P-43) 1992 R 1998 Ad. 2 (DL=0.0001 mg/l)
23.	Cadmium (as Cd).	mg/l	BDL	Max 0.01	No relaxation	IS: 3025(P-41) 1992 R 1998 (DL=0.008 mg/l)
24.	Arsenic (as As)	mg/l	BDL	Max 0.05	No relaxation	IS: 3025(Part 37): 1988 R 1999 (DL=0.02 mg/l)
25.	Chromium (as Cr)	mg/l	BDL	Max 0.05	No relaxation	APHA 21 <sup>st</sup> ED. 2005-3111 B (DL=0.02 mg/l)
26.	Coliforms	MPN/100 ml	6	Max 10	--	IS: 1622-1981 R 2003 (DL= 2 MPN/100ml)
27.	E.coli/100ml	--	Absent	Absent	--	IS: 1622-1981 R 2003

Source : Eco Laboratories & Consultants Pvt. Ltd.

BDL – Below Detection Limit,

MPN- Most Probable Number

**TABLE - 3.24(C)**  
**WATER QUALITY ANALYSIS**

**Name of Location:-Near Bhogpur**

S.No	Test Parameters	Units	Results	Requirements		Test Method
				Desirable Limits	In Absence of Alternate Source	
1.	Colour	--	< 5	Max 5	Max 25	IS: 3025(P-4)1983 R-2002
2.	Odour	--	Unobjectionable	Unobjectionable	--	IS: 3025(P-5)1983 R-2002
3.	Taste	--	Agreeable	Agreeable	--	IS: 3025(P-7/8) 1984 R-2002
4.	Turbidity	NTU	< 5	Max 5	Max 10	IS: 3025 (P-10) 1984 R-2002 (DL= 2 NTU)
5.	pH value	--	7.91	6.5 to 8.5	No relaxation	IS: 3025(P-11) 1983 R-2002
6.	Total Hardness (as CaCO <sub>3</sub> )	mg/l	266.88	Max 300	Max 600	IS: 3025(P-521) 1983R2002 Ad. 1(MDL= 0.1 mg/l)
7.	Calcium (as Ca)	mg/l	73.7	Max 75	Max 200	IS: 3025 (P-40): 1991R 1998 (DL=1 mg/l)
8.	Magnesium (as Mg)	mg/l	19.8	Max 30	Max 100	IS3025 (P-46) 1994 R 1999 Ad.2 (DL=2 mg/l)
9.	Iron (as Fe)	mg/l	0.21	Max 0.3	Max 1.0	IS: 3025(P-53): 2003 (DL=0.1 mg/l)
10.	Chlorides (as Cl)	mg/l	33.50	Max 250	Max 1000	IS: 3025 (P-32): 1988R 1999 (DL=1 mg/l)
11.	Sulphate (as SO <sub>4</sub> )	mg/l	32.25	Max 200	Max 400	IS3025 (P-24)1986R 1998 (DL= 1 mg/l)
12.	Dissolved solids	mg/l	480	Max 500	Max 2000	IS: 3025 (P-16): 1984R2002 Ad.1 (DL=5 mg/l)

13.	Alkalinity	mg/l	154	Max 200	Max 600	APHA 21 <sup>st</sup> ED 2005-2320 B (DL=1 mg/l)
14.	Nitrate (as NO <sub>3</sub> )	mg/l	2.12	Max 45	Max 100	IS: 3025 (P-34)1988 R 1999 (DL=0.1 mg/l)
15.	Fluoride (as F)	mg/l	0.51	Max 1.0	Max 1.5	APHA 21 <sup>ST</sup> ED. 2005-4500D (DL=0.01 mg/l)
16.	Manganese (as Mn)	mg/l	BDL	Max 0.1	Max 0.3	IS: 3025 (part-59): 2006 (DL= 0.05 mg/l)
17.	Boron	mg/l	BDL	Max 1	Max 5	APHA 21 <sup>st</sup> ED. 2005-4500 C (DL=0.5 mg/l)
18.	Cyanide (as CN)	mg/l	BDL	Max 0.05	No relaxation	IS: 3025(Part 27): 1986 R2003 Ad.1 (DL=0.01 mg/l)
19.	Copper (as Cu)	mg/l	BDL	Max 0.05	Max 1.5	IS: 3025 (Part 42): 1992R 1998 (DL= 0.02 mg/l)
20.	Zinc (as Zn)	mg/l	BDL	Max 5	Max 15	IS 3025 (P-49) 1994 R1999 Ad.1 (DL= 0.02 mg/l)
21.	Lead (as Pb)	mg/l	BDL	Max 0.05	No relaxation	IS3025 (P-47) 1992R 1999 (DL=0.02 mg/l)
22.	Phenolic compounds (as C <sub>6</sub> H <sub>5</sub> OH)	mg/l	BDL	Max 0.001	Max 0.002	IS3025 (P-43) 1992 R 1998 Ad. 2 (DL=0.0001 mg/l)
23.	Cadmium (as Cd).	mg/l	BDL	Max 0.01	No relaxation	IS: 3025(P-41) 1992 R 1998 (DL=0.008 mg/l)
24.	Arsenic (as As)	mg/l	BDL	Max 0.05	No relaxation	IS: 3025(Part 37): 1988 R 1999 (DL=0.02 mg/l)
25.	Chromium (as Cr)	mg/l	BDL	Max 0.05	No relaxation	APHA 21 <sup>st</sup> ED. 2005-3111 B (DL=0.02 mg/l)
26.	Coliforms	MPN/100ml	4	Max 10	--	IS: 1622-1981 R 2003 (DL= 2 MPN/100ml)
27.	E.coli/100ml	--	Absent	Absent	--	IS: 1622-1981 R 2003

Source : Eco Laboratories & Consultants Pvt. Ltd.

**BDL – Below Detection Limit,**

**MPN- Most Probable Number**

Following points can be generalized from the analysis results of ground water:-

- pH varies from 7.71 to 7.91
- Total Hardness varies from 266.88 to 282.24 mg/l
- Total Dissolved Solids varies from 470 to 480mg/l

A review of the above chemical analysis that there is some variation in chemical composition of water tapped from different open wells tube wells and hand pumps, 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 standard IS:10500.

### **3.17 SOCIO-ECONOMIC ENVIRONMENT**

#### **3.17.1 Baseline Status**

Baseline information is collected in order to delineate apply the socio-economic profile of the study area. The process related database thus generated includes:

- Demographic structure
- Infrastructure base in the area
- Economic structure
- Health status
- Cultural attributes
- Public awareness and their concern about the project

The primary socio economic data was collected through field survey in sample villages in study area as well as the observations by the survey team. It has been substantiated with relevant socioeconomic data from

secondary sources of various official records. viz., Census records, District statistical abstract, district health office, District industry center tourism office etc.

### **3.17.2.1 Demographic Structure**

The details concerning the demographic structure of the study were collected from Census record of Solan district. Totals Population of the study area is 6282 persons in which 3287 are males and 2995 are females out of the total population Scheduled Caste 1108 (17.63%) and Scheduled Tribe population is not available respectively. The detail about demographic structure is given in Table 3.6.1 and summary of demographic information is given in Table 3.6.2

**TABLE 3.25**

**Sampling Villages for Socio-economic Survey**

<b>Sr. No.</b>	<b>Villages</b>	<b>Direction</b>	<b>Distance</b>
1.	Basowali	N	2.5
2.	Baglehr	NE	2.0
3.	Pater	S	2.4
4.	Garoti	NW	1.0
5.	Kalyanpur	NNE	3.5
6.	Nawanagar	E	5.0
7.	Bhangalan	S	5.5
8.	Jhajra	SW	2.0
9.	Rampur	NNW	6.5
10.	Bagheri	N	9.4
11.	Kundli	NE	7.5
12.	Nawan Garh	SE	9.0

**Table 3.26**  
**Demographic Structure of the Study Area**

Sr. No	Villages	Area In Hector	No of Household	Population			SC	ST	Literate			Main Workers	Marginal Workers	Non Workers	
				TP	M	F			T L	T M	T F				
<b>TEHSIL Arki(T)</b>															
1.	Bagha (190)		31	170	94	76	13	0	117	70	47	50	47	73	
2.	Gahar (75)		6	33	15	18	0	0	22	13	9	10	1	22	
3.	Dol (321)		5	24	12	12	8	0	12	8	4	7	7	10	
4.	Rampur (369)		37	187	91	96	47	0	133	67	66	45	99	43	
Total				<b>79</b>	<b>414</b>	<b>212</b>	<b>202</b>	<b>68</b>	<b>0</b>	<b>284</b>	<b>158</b>	<b>126</b>	<b>112</b>	<b>154</b>	<b>148</b>
<b>TEHSIL Ramshahr(S.T)</b>															
5.	Dhar (273)		48	266	132	134	0	0	141	89	52	58	77	131	
6.	Dolru (62)		35	195	100	95	53	0	91	61	30	22	77	96	
7.	Bahli (58)		11	70	32	38	0	0	39	24	15	0	31	39	
Total				<b>94</b>	<b>531</b>	<b>264</b>	<b>267</b>	<b>53</b>	<b>0</b>	<b>271</b>	<b>174</b>	<b>97</b>	<b>80</b>	<b>185</b>	<b>266</b>
<b>TEHSIL Nalagarh(T)</b>															
8.	Mastanpura (22)		143	886	449	437	109	0	456	289	167	330	97	459	

9.	Khanoa (23)		57	366	184	182	0	0	188	123	65	180	64	122
10.	Gholowal (14)		53	347	182	165	107	0	214	135	79	82	121	144
11.	Kalibari (15)		52	309	167	142	1	0	194	125	69	84	84	141
12.	Kalyanpur (76)		35	183	93	90	36	0	116	67	49	69	42	72
13.	Bairchha (21)		118	639	336	303	70	0	348	216	132	184	197	258
14.	Chamba (33)		36	213	113	100	12	0	118	75	43	26	91	96
15.	Lakhanpu r (114)		40	313	170	143	185	0	141	82	59	108	5	200
16.	Chak (13)		13	77	32	45	27	0	51	25	26	41	16	20
17.	Baihli (24)		111	578	303	275	161	0	311	194	117	299	83	196
18.	Kanwan Wali (25)		47	263	146	117	84	0	185	120	65	46	96	121
19.	Nangal Kuhl (37)		25	153	82	71	0	0	102	56	46	84	1	68
20.	Nangal Dhakka (19)		120	620	343	277	118	0	322	206	116	120	148	352
21.	Badal (351)		29	152	82	70	46	0	60	41	19	72	49	31
Total			879	5099	2682	2417	956	0	2806	1754	1052	1725	1094	2280

TEHSIL Krishangarh(S.T)														
22.	Majher (244)		4	24	12	12	0	0	16	10	6	4	14	6
TEHSIL Kasauli(T)														
23.	Dib (120)		18	91	51	40	0	0	68	38	30	44	0	47
TEHSIL Solan(T)														
24.	Jehar (22)		10	53	24	29	5	0	37	19	18	13	3	37
25.	Katiara (62)		11	70	42	28	26	0	52	32	20	24	36	10
Total			21	123	66	57	31	0	89	51	38	37	39	47
26.	Grand Total		1095	6282	328	299	110	0	3534	218	134	2002	1486	2794

Source: Primary Census Abstract CD and village Directory CD 2001, Solan District, Himachal Pradesh

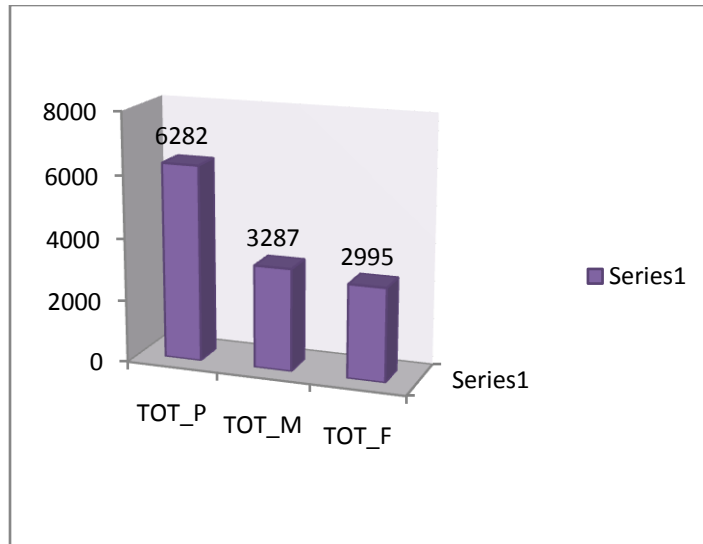
**TABLE 3.27**  
**Demographic Summary of the Study Area**

<b>Sr. No</b>	<b>Demographic Parameters</b>	<b>Details</b>
1.	No. of District	1
2.	No. of Villages	26
3.	Total No. of Households	1095
4.	Total Population	6282
5.	Density of Population (Persons Per sq.km)	37.01
6.	Sex ratio (No. of Female \1000Males	911
7.	Scheduled Castes (%)	1108 (17.63%)
8.	Scheduled Tribe (%)	NA
9.	Literate (%)	3534(56.25%)
10.	Main Workers (%)	2002 (31.86%)
11.	Marginal Workers (%)	1486(23.65%)
12.	Non- Workers (%)	2794 (44.47%)

**Source: Primary Census Abstract CD and village Directory CD 2001, Solan District, Himachal Pradesh State**

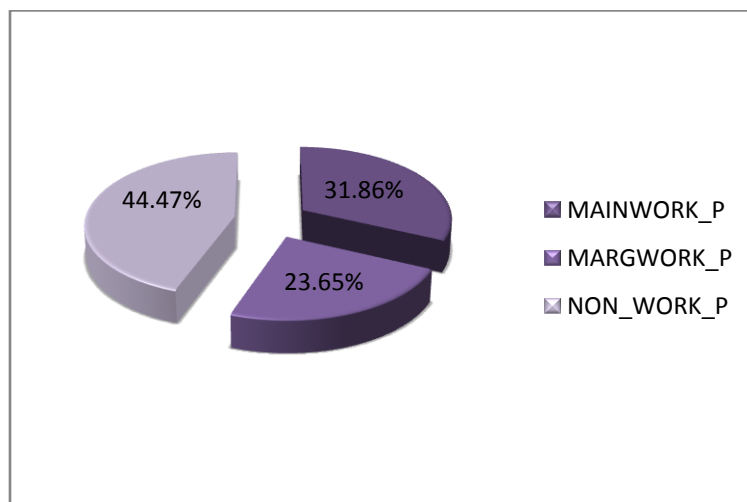
**Salient features are as follows:**

Total population of the region as per 2001 census is 6282 out of which 3287 are male and 2995 are female. Total population distribution of the study area with male female is shown in **Diagram** given below:



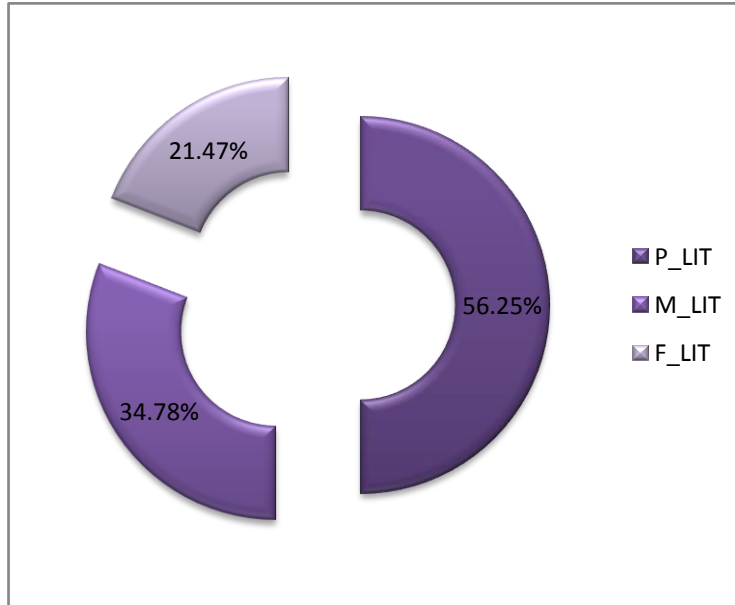
**Total Population distributed by Male Female ratio in study area**

- Out of the total population Scheduled Caste 1108 (17.63%) and Scheduled Tribe population is not available there.
- Sex ratio (number of male per thousand female) in the region is 911 this shows that male population is higher in the region as compared with the female population
- Total main worker population is 2002 (31.86%), 1486 (23.65%) come under marginal worker category and 2794 (44.47%) belong to non workers category. Employment pattern is shown **BELOW**



**Employment Pattern of working population in the study area**

- Literacy rate of the population in the study area is 3534 (56.25%). Total male literate are 2185(34.78%) and female literate are 1349 (21.47%) is shown below



**Literacy Rate of the study area with Male Female  
(Source: 2001 Census Solan District)**

### 3.28 Infrastructure Resource Base

The infrastructure resources base of the study area with reference to education, medical facility, water supply, post and telegraph, transportation and communication facility and power supply etc is presented in **Table 3.6.3** the infrastructure resources details have been abstracted from Housing, Household Amenities and Assets CD 2001 of Himachal Pradesh, Solan District are described below:

**TABLE 3.25**

**Infrastructure Resource Base of the study Area**

Sr. No	Villages	Education Institutions	Medical Facilities	Drinking Water Supply	Communication	Transportations	Approach Road	Power Supply
<b>TEHSIL Arki(T)</b>								
1.	Bagha (190)			T	PH(12)	BS	MR,FP	EA
2.	Gahar (75)			T	PH(2)	BS	PR	EA
3.	Dol (321)			T	PH		FP	ED
4.	Rampur (369)	P		T,HP,R,S	PH(13)	BS	PR,MR,FP	ED
<b>TEHSIL Ramshahr(S.T)</b>								
5.	Dhar (273)	P		T	PH(2)		FP	EA
6.	Dolru (62)			T			MR	EA
7.	Bahli (58)			T,HP		BS	MR,FP	ED
<b>TEHSIL Nalagarh(T)</b>								
8.	Mastanpura (22)	P,M		T,TK,TW,HP	PH(23)	BS	PR,MR,FP	EA,EA G,EO
9.	Khanoa (23)	P		T,W,TK,TW,	PH(4)		MR,FP	ED,EA G
10.	Gholowal	P		T,W,HP	PH(10)	BS	PR,MR,FP	EA

	(14)						P	
11.	Kalibari (15)	P	D,PHS	T,W	PO,PH(5)	BS	PR,MR,FP	EA
12.	Kalyanpur (76)			T		BS	PR,MR,FP	EA
13.	Bairchha (21)			T		BS	PR,MR,FP	EA
14.	Chamba (33)	P,M,PUC		T,S		BS	MR,FP	ED
15.	Lakhanpur (114)	P		T,W,TW,C,S	PH(5)		MR,FP	EA
16.	Chak (13)			T,W,TK,TW,HP	PH(3)		PR,MR,FP	EA
17.	Baihli (24)	P(2)	PHS	T,W,TK,TW,HP	PH(10)		MR,FP	EA
18.	Kanwan Wali (25)	P		T,W,HP	PH(7)		MR,FP	ED
19.	Nangal Kuhl (37)		RMP,SMP	T,W,TK	PH(12)	BS	PR,MR,FP	ED
20.	Nangal Dhakka (19)			T,W,TK,HP	PH(7)	BS	PR,FP	ED
21.	Badal (351)	P		T			FP	ED,EA G
<b>TEHSIL Krishangarh(S.T)</b>								
22.	Majher (244)			T,S			FP	EA
<b>TEHSIL Kasauli(T)</b>								
23.	Dib (120)			T,S	PH(6)	BS	PR,FP	ED
<b>TEHSIL Solan(T)</b>								

24.	Jehar (22)			T			FP	ED
25.	Katiara (62)		DA	T,S	PH(3)	BS	PR,MR,F P	EA

Source: Primary Census Abstract CD and village Directory CD 2001, Solan District, Himachal Pradesh State

**Education:** As per 2001 village directory record, all villages having education facility in the form of primary school. It indicates that in education field the study area having better facility.

**Water Facility:** Adequately protected and wholesome drinking water is a primary need of community. The water supply in the region is in good condition. Water system is available in the form of tap, well, hand pumps, rivers and other allied sources.

**Communication and Transportation:** After independence, considerable progress has been made in the field of transport and communication because of implementation of 5 years plan. In respect of development of road transport especially as regards passenger services, the state has made commendable progress. Communication facility is fine in this region. Near about 60% are far from any communication facility. Villages having Transportation facility is in excellent condition. The entire region is connecting with bus and navigable waterway. Road approach is in all form like mud road, footpath, navigable river, navigable waterway etc.

**Power Supply:** Electric power is one of the basic and key infrastructures in the growing economy. It occupies a distinct role in the development of industry and agriculture. It is also a key factor in the socio-economic transformation in rural areas. All villages are electrified in the region and electricity is available for all-purpose

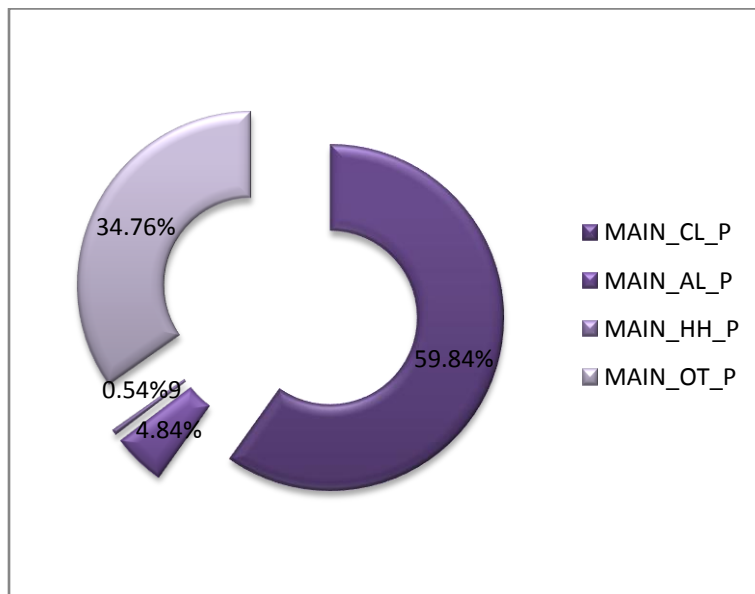
**Medical/Primary Health Care:** Medical facilities in terms of community health workers are available in some of the villages. Primary health center and primary health sub centers are adding medical facility in most of the village.

### 3.14.2.3 Economic Attributes

Economic resource base of any region mainly depends upon its economically active group i.e. the working population involved in productive work. Work- Work may be defined as participation in any economically productive activity. Such participation may be physical or mental in nature. Work involves not actual work but also effective supervision and direction of work. It also includes unpaid work on farm or in family enterprise.

The employment pattern of worker and Main worker the study area is described below and presented in **Table 3.6.4**

- Main worker population in the study area is 2002(31.86%)
- There are 11(0.54) workers as and house hold worker
- Total marginal worker in the study area are 1486(23.65%)
- Unemployment level is high in the region as non-worker population shares more than half of the total population in the region i.e. 2794 (44.47%) Non-worker population includes student, household duties, dependent, pensioner, beggar and others. Main worker employment Pattern is shown BELOW



**Fig 3.6.4: Main worker employment Pattern of working population in the study area**

**TABLE 3.29**

**Main Worker Employment Pattern**

Sr. No	Villages	MAIN_CL_P	MAIN_AL_P	MAIN_HH_P	MAIN_OT_P
<b>TEHSIL Arki(T)</b>					
1.	Bagha (190)	9	0	0	41
2.	Gahar (75)	8	0	0	2
3.	Dol (321)	6	0	0	1
4.	Rampur (369)	18	0	0	27
<b>Total</b>		<b>41</b>	<b>0</b>	<b>0</b>	<b>71</b>
<b>TEHSIL Ramshahr(S.T)</b>					
5.	Dhar (273)	48	0	2	8
6.	Dolru (62)	0	0	0	22
7.	Bahli (58)	0	0	0	0
<b>Total</b>		<b>48</b>	<b>0</b>	<b>2</b>	<b>30</b>
<b>TEHSIL Nalagarh(T)</b>					
8.	Mastanpura (22)	156	86	4	84
9.	Khanoa (23)	146	0	0	34
10.	Gholowal (14)	33	0	0	49
11.	Kalibari (15)	41	0	0	43
12.	Kalyanpur (76)	42	0	0	27
13.	Bairchha (21)	118	4	1	61
14.	Chamba (33)	0	0	0	26
15.	Lakhanpur (114)	74	0	0	34
16.	Chak (13)	37	0	0	4
17.	Baihli (24)	220	0	0	79
18.	Kanwan Wali (25)	3	0	0	43
19.	Nangal Kuhl (37)	57	3	2	22
20.	Nangal Dhakka (19)	97	0	0	23
21.	Badal (351)	68	1	1	2
<b>Total</b>		<b>1092</b>	<b>94</b>	<b>8</b>	<b>531</b>
<b>TEHSIL Krishangarh(S.T)</b>					

22.	Majher (244)	2	0	0	2
<b>TEHSIL Kasauli(T)</b>					
23.	Dib (120)	0	0	0	44
<b>TEHSIL Solan(T)</b>					
24.	Jehar (22)	1	0	0	12
25.	Katiara (62)	14	3	1	6
Total		15	3	1	18
26.	<b>Grand Total</b>	<b>1198</b>	<b>97</b>	<b>11</b>	<b>696</b>

Unemployment level is high in the region as non-worker population shares more than half of the total population in the region i.e. 10189 (49.75%) Non-worker population includes student, household duties, dependent, pensioner, beggar and others. Main worker employment Pattern is shown in **Fig 3.15**.

#### **3.17.2.4 Health Status**

Health of the people is not only a desirable goal, but it is also an essential investment in human resources. As per the National Health Policy (1983), Primary Health Care has been accepted as main instrument for achieving this goal of development and strengthening rural health infrastructure through a three-tier system, viz., Primary Health Center (PHCs), Sub Centers and Community Health Center, which have been established.

Lack of building, shortage of manpower and inadequate provision of drug supplies are hampering the operationalization of these units. The standards to be met according to National Health Policy are given below:

**Table 3.30 Rural Health Care System in India**

<b>Population</b>	<b>Infrastructur e</b>	<b>Personnel</b>
3,000 – 5,000	1 Sub centre	1 ANM
25,000 – 30,000	1 PHC, 6 beds	2 Medical officers
1,00,000	Rural	Medical superintendent

**Source: National Health Policy, Year 2005-06**

### **3.17.2.5 Cultural and Aesthetic Attributes**

No such place of Historical or Archaeological importance exists near lease area or within buffer zone.

### **3.17.3 Socio-economic Survey**

#### **3.6.3.1 Sampling Method**

A judgmental and purposive sampling method was used for choosing respondents of various sections of the society i.e. Sarpanch, adult males and females, teachers, medical practitioners, businessmen, agriculture laborers, fishermen, unemployed group etc. Judgmental and purposive sampling method includes the right cases from the total population that helps to fulfill the purpose of research needs.

### **Data Collection Method**

In order to assess and evaluate the likely impacts arising out of any developmental projects on socio-economic environment, it is necessary to gauge the apprehensions of the people in the project area. For the process of data collection through primary and secondary sources certain methods are used among that are:

### **Field Survey and Observations**

Field Survey and Observations is made at each sampling village and the quality of life of that region is studied. Visits are made at hospitals, primary health centers and sub-centers to know the health status of the region. Various governmental organizations such as statistical department, department of census operations are visited to collect the population details of that region.

### **Interview Method**

Structured interview method is used to collect data regarding the awareness and opinion from the sample selected of the various socio-economic sections of the community. Structured interviews involve the use of a set of predetermined questions that includes fixed and alternative questions. The questionnaire mainly highlights the parameters such as income, employment and working conditions, housing, food, clothing, water supply, sanitation, health, energy, transportation and communication, education, environment and pollution to assess the quality of life of that particular region and general awareness and opinion of the respondents about the project.

The interview method has the advantage that almost all perfect sample of the general population can be reached and respond to the approach. Interview method helps to collect more correct and accurate information as the interviewer is present during the field survey.

Socio-economic survey was conducted with the help of predesigned tool to measure the socio-economic status of the people in the study area. In all, there are 26 villages located in all directions with reference to project site. On the basis of purposive sampling, adult male/female from these 12 villages was selected to collect the information related to socio-economic status. Care was taken to have interview of Sarpanch/ Mukhia of each village. In addition to individual interviews with the adult male/female,

common meetings were conducted in which heads of the villages, panchayat representatives, and other stakeholders like, school teacher, anganwadi sevika, PHC incharge, gramsewak etc were present.

The salient socio-economic features observed under the study are:

- Most of the people in study area use firewood and Kerosene as the main source of fuel for cooking purpose. Average literacy level among the people is about 56.25%. Among women in the study area, literacy level is less, as the educational facilities available in the study area.

- Road conditions are good. There is bus facility available in the interior villages.
- Medical facilities available in the area. Lack of drainage and control of mosquitoes nuisance, have resulted in higher prevalence of malaria in the area, especially during rainy season.
- Most of the villages Borewell, Hand pump, Tank facilities available in study area.
- Electricity facility is available in few villages but mostly villages are not electrified. Frequently people in the region are facing power cut problem.
- Mostly, people in the region are having the kaccha and mud houses

#### **Awareness and opinion of the people about the project**

For the assessment of awareness about the project activities and opinion about it, following salient observations were recorded:

- During survey it was observed that only near by villagers are aware and other villagers are not aware about the proposed project
- People in the region expect job opportunities and improvement in educational, transportation and sanitation facility from project authority

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## CHAPTER – IV

### ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

#### 4.0 INTRODUCTION

Any human activity in any environment produces impact, modifying it to a status which is considered adverse or beneficial according to the damage or improvement it brings about in physical, chemical and biological status of air, water, land including biota and in socio-cultural life styles and economy of the populace it affects. Depending on the nature of activities and existing status, the impacts are assessed for their importance. On the basis of the impact analysis, the mitigating action and future monitoring requirement are focused in the Environmental Management Plan for counting or minimizing adverse impacts.

Effects of this mining project on each of the environmental parameters are detailed below in accordance with the parameter of environment likely to be affected.

- Climate
- Air environment
- Land environment
- Ecology
- Water environment
- Noise levels
- Soil
- Socio-economic environment
- Cultural and Heritage environment

Generally, the environmental impacts can be categorized as either primary or secondary. Primary impacts are those which can be attributed directly to the project. On the indirect or induced and typically

include the associated investments and change patterns of social and economic by the proposed actions.

#### **4.1 CONSTRUCTION PHASE**

There will be no impacts as no construction stage is involved in this project.

#### **4.2 OPERATION PHASE**

##### **4.2.1 IMPACT ON TOPOGRAPHY& DRAINAGE**

- The mine working will remain confined to river bed lot only and in no case disturbing any surface area outside which may affect topography or drainage.
- Mining pits will impact river bed topography by formation of excavation voids. This will be temporary and in first monsoon itself will be temporary and in first monsoon itself will be restored to original.

#### **MITIGATION MEASURES**

- Mining will be done in a planned way i.e. collection of minerals/working shall be started from the centre dip to rise and then laterally in 1 meter slice so that the river course will not get affected.
- Unwanted material including mineral or spillage (if any) will not be stacked on the bank side as it will hinder the flow of water in monsoon season.
- The mining from river bed will not have any impact on natural drainage of surrounding area as the excavated sand from river bed is filled with first heavy flow in river during monsoon season.

## **4.3 IMPACTS ON CLIMATE**

### **4.3.1 TEMPERATURE**

The temperature pattern is a regional behavior and is not likely to be affected by the river bed mining activity over a small area. Some local effect may be perceived due to mining, afforestation and creation of voids in the lease area.

### **4.3.2 RAINFALL**

The trend of rainfall, as studied and discussed in last chapter, forms part of a regional pattern, not dependent on the relatively small area of river bed mining activity. The mining operation, therefore, is not likely to have any adverse impact on rainfall pattern.

### **4.3.3 WIND SPEED**

The wind speed in any area is dependent upon local topography and generation of elevation and depression of pressure changes in the region. The controlling factors for the pressure changes lie much beyond the control of small area under mining operations. Thus, no adverse impact on the regional wind speed is anticipated due to the mining operations. However, some local ground level changes may take place due to the buildings, green belt developed around the mine, etc.

### **4.3.4 HUMIDITY**

The pattern of relative humidity depends mainly on the rainfall, wind, temperature and other weather phenomenon that regional in behavior. The mining operation is not likely to have any impact on the relative humidity in the surrounding.

## **4.4 IMPACT OF AIR POLLUTION**

#### 4.4.1 Impact through Mathematical Modeling for Sand Mining Project

As explained in the previous chapter, the ambient air quality monitoring results show that all the parameters such as PM<sub>10</sub>, SO<sub>2</sub>, NO<sub>x</sub> and CO are within the limits prescribed by CPCB for “Industrial and Mixed use” areas as well as areas meant for “Residential and Rural” areas. This scenario is with the expansion already in place.

The major contribution of air pollution is by river bed mining, such as excavation, loading, transportation, hauling operation and handling of mineral viz. Sand, Bajri & Boulders. This will lead to momentary rise in the particulate matter (PM<sub>10</sub>). The dust liberated in mining and other related operations is injurious to health if inhaled in sufficient quantity. As such there will be no noticeable impact on air quality.

#### 4.4.2 Air Pollution Modeling

The impact of the expansion on the air quality has been predicated using Fugitive Dust Model (FDM), which is a computerized air quality model specifically designed for computing concentration and deposition impacts from fugitive dust sources. The sources may be point, line or area sources. The model has not been designed to compute the impacts of buoyant point sources, thus it contains no plume rise algorithm. The model is generally based on the well known Gaussian Plume formulation for computing concentrations, but the model has been specifically adapted to incorporate an improved gradient transfer deposition algorithm. Emissions for each source are apportioned by the user into a series of particle size classes. A gravitational settling velocity and a deposition velocity are calculated by FDM for each class.

#### **4.4.3 Pollutants / Model Options Considered for Computations**

The model simulations deal with major Pollution Particulate Matter (PM<sub>10</sub>) and gaseous emissions viz. SO<sub>2</sub> & NO<sub>2</sub>.

#### **4.4.5 Meteorological Data**

Data recorded by continuous weather monitoring station on wind speed, direction, and temperature at one hour interval for the monitoring period was used as meteorological input.

#### **4.4.6 Presentation of result**

In the present case model simulations have been carried using the hourly triple joint frequency data. Short – term simulations were carried to estimate concentration at the receptors to obtain an optimum description of variations in concentrations over the site in 10-km radius covering 16 directions.

The incremental concentration is estimated for the monitoring period. For each time scale, i.e. for 24 hr. the model computes the highest concentration observed during the period over all the measurement points.

The maximum incremental GLCs due to the river bed mining project for PM<sub>10</sub>, SO<sub>2</sub> and NO<sub>2</sub> are superimposed on the maximum baseline PM<sub>10</sub>, SO<sub>2</sub> and NO<sub>2</sub> concentration recorded at the monitoring location during the field monitoring period. The cumulative concentration (baseline + incremental) after implementation of the project are tabulated below in table-4.3. The maximum GLCs after implementation of the project are likely to be not in the prescribed NAAQ standards.

**TABLE: 4.1**  
**Cumulative Concentration of PM<sub>10</sub>(Baseline + Incremental)**

Sampling Location	Monitoring Maximum concentration in $\mu\text{g}/\text{m}^3$	Predicted incremental Maximum concentration in $\mu\text{g}/\text{m}^3$	Resultant Maximum concentration in $\mu\text{g}/\text{m}^3$
Mine site	90.67	3.03	93.70

**Suspended Particulate Matter & Gaseous Pollution:**

The Particulate Matter during the study period i.e December 2012 to February 2013 is well within the standard norms. The major source of generation of dust will be from transportation of mineral viz. sand, bajri & boulders. This will increase the level of particulate matter in the environment i.e. PM<sub>10</sub> (3.03  $\mu\text{g}/\text{m}^3$ ) at a distance of 500 meters near Kaccha Road. It is anticipated that the Particulate Matter during mining of minor minerals shall remain within the standard norms.

**MITIGATION MEASURES**

- To control the emissions regular preventive maintenance of equipment will be carried out on contractual basis.
- Proper mitigation measures like water sprinkling will be adopted to control dust emissions.
- Plantation will be carried out on approach roads & nearby vicinity of river bank.
- It is being ensured that all transportation vehicles will carry a valid PUC certificate.

- There is no toxic element present in the mineral which may contaminate the soil.

#### 4.5 IMPACT OF NOISE POLLUTION

The exposures to excessive noise levels can lead to:

- Prevention of sleep, insomnia and fatigue.
- Decrease in speech reception, communication, distraction and diminished concentration thus adversely affecting job performance efficiency.
- Chronic psychological disturbance including impaired hearing.
- Irreparable cardiovascular, respiratory and neuralgic damages in certain extreme cases.

The area is general represents calm surroundings. There is no heavy traffic, industry or noisy habitation in the area except the existing mine. The other major industry like minerals grinding and crusher plants is far away. With the increase in scale of mining operations, deployment of machinery and vehicles operation and men and noise levels are expected to increase. The noise levels for different equipment in this mine are given in Table 4.2.

**TABLE 4.2**  
**Noise Generated by Different Machinery**

S. No.	Equipment	Noise Level dBA
1.	Tractor compressor	85-95
2.	Dump Trucks	90-100

The impact of noise intensities at varying distances, derived mathematically by Spherical Propagation modeling for free attenuation due to distance only, are given in Table 4.3

**TABLE 4.3**  
**Free Noise Attenuation with Distance**

Noise Level at Source dBA	Distance in m	Noise Level at Receptor dBA
95	100	47
95	200	41
95	300	37
95	400	35
90	100	42
90	200	36
90	300	32
90	400	30

From the above we find that if there noise source of 95,95 and 90 dBA, each at 400m from a receptor, converge at the receptor, their components would be 35,35 and 30 dBA respectively.

With the resultant value being less than the ambient noise levels, there is no likelihood of excess addition of noise, from the mine operation, on the surrounding background noise level.

As derived above and due to the fact that there are no human settlement within 400m, no impact of noise on habitation is likely. The same is brought out by the noise measurements carried out which indicate that the noise levels in the vicinity are within limits.

Through the source would likely cause noise pollution, but since it is continuous the considerable impact will be in. However the noise levels in the working environment are compared with standards prescribed by occupational safety and health administration (OSHA-USA)& CPCB-NEW DELHI, the acceptable limits are presented in table 4.4 & 4.4.1.

**TABLE - 4.4**  
**PERMISSIBLE EXPOSURE IN CASES OF CONTINUOUS NOISE (GOD)**

S.No	Total time of Exposure (Continuous or a number of short term exposures) per day in Hours.	Sound Pressure (dBA)	Remarks
1	8	90	1. No. exposure in excess of 115 dBA is to be permitted.  2. For any period of exposure falling in between any figure as indicated in column 1, the permissible sound pressure level is to be determined by extrapolation on a proportionate scale.
2	6	92	
3	4	95	
4	3	97	
5	2	100	
6	1½	102	
7	1	105	
8	¾	107	
9	½	110	
10	¼	115	

**TABLE – 4.4.1**  
**AMBIENT AIR QUALITY STANDARD IN RESPECT OF NOISE**

Area Code	Category of Area	Limits in dB(A) Leq	
		Day time	Night time
(A)	Industrial area	75	70
(B)	Commercial area	65	55
(C)	Residential area	55	45
(D)	Silence zone	50	40

In this mine no person is exposed to very high noise levels of noise continuously during works. Those working close to noise generating equipment have been provided with earplugs.

## **MITIGATION MEASURES**

- Periodical monitoring of noise will be done.
- No other equipments, except the transportation vehicles and Excavator for loading will be allowed.
- Noise generated by these equipments by these equipments shall be intermittent and does not cause much adverse impact.
- Proper maintenance of all equipments/ machines will be carried out which help in reducing noise during operations.
- Plantation will be taken up along the approach roads and vicinity of river bank. The plantation minimizes propagation of noise and also arrests dust.

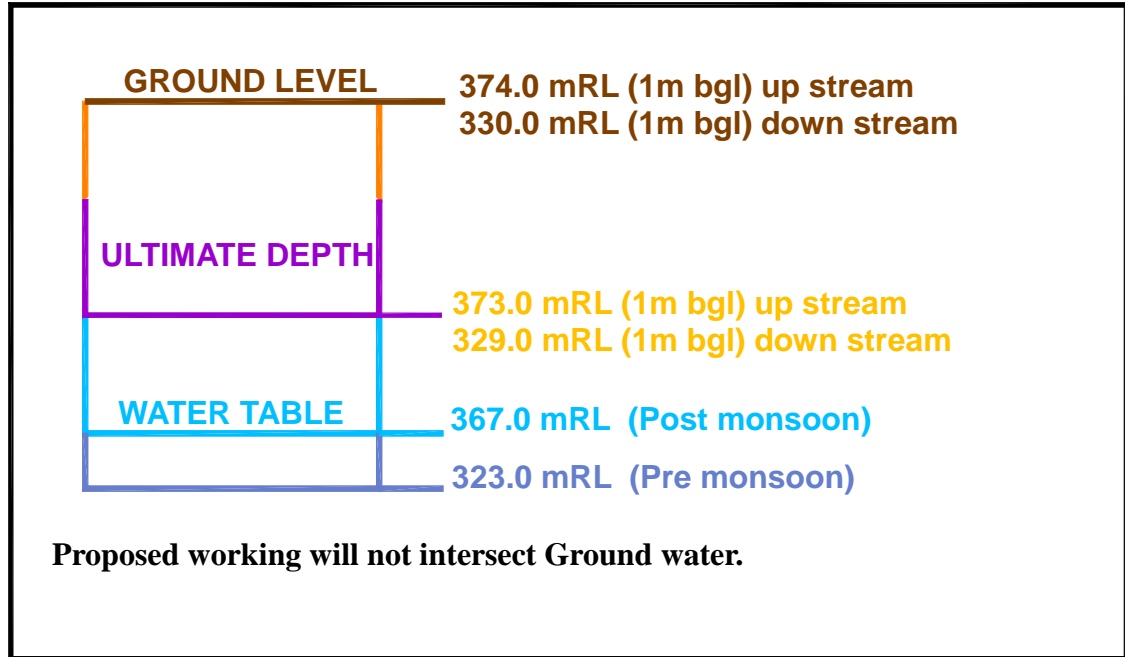
### **4.6 IMPACT ON HYDROLOGICAL CONDITIONS**

The study area itself being part of River Kundlu course carries surface as well as ground water (under current). The flow of surface/ground water (sub surface flow) is following the trend of topography, which is in the East to West direction.

The area is part of dry river bed for more than nine months in a year except for the rainy season. The sand and stone mining up to the depth of 1mt will have insignificant impact on water regime.

The ground water table which will be about 5.5m metres below the surface of river bed in the mining area during the dry seasons will not be disturbed as ultimate working depth will be 321 mRL from upstream level and 281 mRL in the downstream boundary. Thus the mine operation will not affect the hydrological conditions of the area. At the end of mining operations every yearly season, the flood waters would replenish the mined material, thus it will be positive impact on the ground water scenario in the subsequent mining period.

### SCHEMATIC REPRESENTATION OF SITE ELEVATION, WORKING DEPTH & GROUND WATER



#### 4.7 IMPACT ON WATER QUALITY

Mining causes lowering of riverbed level as well as river bed water level resulting in lowering of groundwater table due to excessive extraction and draining out of groundwater from the adjacent areas, if general ground water table is higher than riverbed level. In case the general ground water level is lower than riverbed water level, then it will have positive impact as ground water table will be recharged vertically as well as laterally. The former case may cause shortage of water for the vegetation and human settlement in the vicinity, but in later case it will help improve situation.

River is recharging the ground water, excessive mining will reduce the thickness of the natural filter materials (sediments), infiltration through

which the ground water is recharged, so restriction in depth becomes necessity.

## **MITIGATION MEASURES**

Mining in the area will be done well above the water table as well as river bed water level therefore; much impact on water regime is not anticipated. The water table is at 3-6 m below river bed level while the workings in the area are proposed up to a max. depth of 1m from river bed level 0.5m slice working is proposed, so that water level is not touched.

No waste water will be generated from the mining activity of minor minerals as the project only involves lifting of sand, Bajri & boulders from river bed.

## **4.8 IMPACT ON FLORA**

### **4.8.1 FLORA IN BUFFER ZONE**

As the mining activities will be confined to core zone only, no adverse impact is foreseen on the flora of the forest area.

### **4.8.2 FLORA IN CORE ZONE**

Excavation in the mining area and construction of roads, offices etc. does not affect the flora in the area where these operations are carried out.

Plantation will be carried out on approach roads and nearby vicinity at river banks areas will, over a period of time, upgrade the flora.

## **4.9 IMPACT ON FAUNA**

The adverse impacts on fauna are mainly dueto:

- Human Activity
- Noise
- Land Degradation

- Deforestation

The impact on the fauna of the buffer zone due to the mining activity will be marginal. As there are very few trees / shrubs in the area, deforestation will not be significant factor in impact on fauna.

Fauna in the core zone is minimal, as most of the area is either unirrigated agricultural land or waste land. Even so, by restricting mining at any time to small areas, impact on fauna will be kept to the minimum. Moreover, due to small activity of the past two decades with machinery has already pushed out whatever minor fauna was available in this desolate land. However, progressive plantation activity being undertaken will over a period of time create conditions favorable for fauna.

#### **4.10 IMPACT ON LAND ENVIRONMENT**

##### **4.10.1 LAND USE IN BUFFER ZONE**

No adverse impact is anticipated on land use of buffer zone due to the present mining operations, as all the related activities are confined to the core zone.

##### **4.10.2 IMPACT ON LAND USE PATTERN INCLUDING CHANGE OF RIVER COURSE (Refer Plate No.3 & 4)**

- If the mining is not carried out in a systematic manner by leaving sufficient safety barriers from bank then it may disturb the river flow/course.
- Stacking of unwanted material including mineral or spillage (if any) on the bank side of the river will hinder the flow of water in monsoon season, raise water level upstream, which may lead to bank cutting or flouting.

- Deviation from planned mining procedures can lead to river channel shifting as well as degradation of surrounding land, causing loss of properties and degradation of landscape.
- Mining within a river bed may have some impact on the stream's physical characteristics, such as channel geometry, bed elevation in stream roughness of the bed, flow velocity, discharge capacity, sediment transportation capacity etc.
- Alteration or modification of the above attributes may cause noticeable hazardous impact on ecological equilibrium of riverine regime.

#### **MITIGATION MEASURES**

- Mineral will be mined out in central position of stream and sufficient safety barrier say 10% of width will be left towards bank side. So that the river flow/course will not get disturbed.
- Mining of minerals will be started from dip side towards rise at the centre and also laterally in 1 meter slice so that the river course will not get affected. Unwanted material or spillage (if any) will not be stacked by the side of the excavation voids created. This is to be done so, because it will otherwise hinder the flow of water in monsoon season.
- Mining is to be done leaving safety barrier on both sides and maximum barrier should be on concave side of river preferably the flow channel (excavation void created) should be kept straight so as to help avoid erosion as side cutting.

#### **4.11 IMPACT ON SOIL**

No major impact on soil of the study area is envisaged due to mining activities as there is no stack emission and fugitive emission shall remain confined locally within working area and

emission at haul road will be controlled by water sprinkling and plantation.

#### **4.12 IMPACT ON SOCIO-ECONOMIC ENVIRONMENT**

##### **4.12.1 HUMAN SETTLEMENT**

The villages and their inhabitants in the buffer zone will not be disturbed from their settlements due to the mining operations.

There is no inhabitation within the lease area. Therefore neither villages nor any part of village or any hamlet will be disturbed during the entire life of the mine. As the mining operations will not disturb or relocate any village or settlement, no adverse impact is anticipated on any human settlement.

##### **4.12.2 EMPLOYMENT**

The area is considered as industrially backward. The population in general do not have opportunities of earning from employment. The only employment to depend on is agriculture, which is seasonal. In the absence of any high employment potential activities, the people are economically backward. The mining operations are providing employment to around 60 - 70 people.

The various indirect employment opportunities have also been generated. Several persons of the neighboring villages have been benefited with contract works, employment through contractors, running of jeeps, trucks, tractors and buses on hire, different kind of shops and transport related business avenues.

#### **4.12.3 ECONOMIC STATUS**

There are some people who are engaged in trading of sand, stone and Bajri. Therefore due to mining of sand, stone, and Bajri, the per capita income of local people have been improved.

The local people have been provided with either direct employments or indirect employment such as business, contract works and development work like roads, etc. and other welfare amenities such as medical facilities, conveyance, free education, drinking water supply etc.

The job/ business opportunities has improved the economic condition of the persons. They are in a position to utilize this money for purchase of tractors, trucks, jeeps, etc. which may be put into use for business purposes. Part of money has also been utilized in starting of some business as per person's skills.

#### **4.12.4 AGRICULTURE**

The agricultural activities are seen in the areas where there is sufficient soil cover. The buffer zone will remain undisturbed and no adverse impact is envisaged.

#### **4.12.5 SENSITIVE TARGETS**

There are no places of Tourist, religious & Historical importance in core as well as buffer zone of 10-km radius. Therefore, no adverse impacts are anticipated.

#### 4.13STRUCTURED ENVIRONMENT MANAGEMENT& ACTION PLAN

The Lessee has endeavored the mitigation measures of potential impact and aspects of operation.

**TABLE – 4.5  
ENVIRONMENT MANAGEMENT MATRIX**

Environmental Setting & baseline	Aspect of Operation	Potential impacts	Mitigation measures	Monitoring programmed
1. Air	1. Ore handling	Fugitive Emissions & Noise	Effective water sprinklers	AAQM
	2.Transportation	Fugitive Emissions & Noise	Effective water sprinklers	AAQM
The Regional emissions well within norms	--	--	--	--
2. Water	1. Ore excavation	1. Contamination	Provision of reducing turbidity & SS	Water testing
Existing water quality is potable		2. Altered hydrologic regime	Provision of rain water harvesting	

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## **CHAPTER – V**

### **ENVIRONMENTAL MONITORING PROGRAMME**

#### **5.1 INTRODUCTION**

Success of any environmental management programme depends upon the efficiency of the organizational set up responsible for Implementation of the programme. Post project monitoring is an essential part to check the impact of any project activity. Hence monitoring of various environmental parameters will be carried out at regular basis to ascertain the following:

- To assess 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.
- Examine the efficiency of pollution control system adopted at the site.

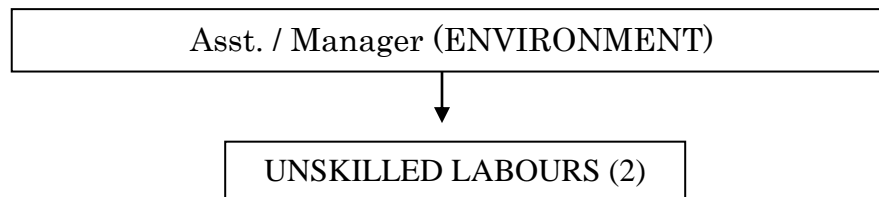
Monitoring will be carried out at site as per the statutory requirements.

Environmental monitoring will be taken up for various environmental components as per conditions stipulated in Environmental Clearance Letter issued by MOEF & Consent to operate issued by the State Pollution Control Board. Compliance of same will be submitted to respective authorities on regular basis.

#### **5.2 ENVIRONMENTAL MANAGEMENT**

In order to maintain the environmental quality within the stipulated standard, regular monitoring of various environmental component is necessary which will be complied as per condition for this an Environmental Management Cell be constituted.

**ENVIRONMENTAL MANAGEMENT TEAM  
ORGANISATIONAL CHART**



**5.3 ROLE OF ENVIRONMENTAL MANAGEMENT TEAM**

Given the size of operation of this river bed mining project, formation of an Environmental Management Cell is beyond the scope budgetary provision, however the management shall either look into it personally or shall provide a Manager level employee with 2-3 labours to look after the provisions given in this environmental management plan. The management will seek consultation of accredited consultants for monitoring on regular basis and remediation strategy.

The said team is responsible for:

1. Implementing the control and protective measures.
2. Coordinating the environment related activities within the project as well as with agencies that provide guidelines for
3. Green belt development etc., watering the plants, taking care of wilted plants and replacing them when required.
4. Ensuring that employees get requisite PPE whenever required
5. Monitoring and evaluating the progress of implementation of environmental management programme.

**5.4 MONITORING SCHEDULE AND PARAMETERS**

To evaluate the effectiveness of environmental management programme, regular monitoring of the important environment parameters will be

taken up. The schedule, duration and parameters to be monitored are shown in table:

**TABLE-5.1  
MONITORING SCHEDULE AND PARAMETERS**

Particulars	Monitoring Frequencies	Duration of Station	Important Monitoring Parameters
Surface water / Tube well	Once in a year	Grab	pH, SS, TDS, Iron, Hardness, Alkalinity Chlorides, Nitrates Sulphate & Flourides
Ambient air monitoring	Once in a Quarter.	24 hr.	PM <sub>10</sub> , SO <sub>2</sub> and NO <sub>2</sub> and CO
Noise Pollution	Once in a quarter	8 hr.	Level in dB(A) and dB(C)
Soil Sampling	Once in a year	Grab	PH, Conductivity, Sulphate, Nitrate, Phosphates, Alkalinity & texture.

#### 5.5 BUDGETARY PROVISION FOR ENVIRONMENTAL MANAGEMENT

Table 5.2 gives an overall investment on the environmental safeguards and recurring expenditure for successful monitoring and implementation of control measures.

**TABLE – 5.2  
COST OF ENVIRONMENTAL PROTECTION MEASURES  
(Investment and recurring cost Rs. Lakh)**

Sl. No	Particulars	Capital cost	Recurring cost / annum
1.	Pollution control	2.50	0.50
2.	Pollution monitoring	2.50	1.80
3.	Green belt on virgin area	1.00	0.30
4.	Occupational health	1.00	0.20
5.	Miscellaneous	0.50	0.20
	TOTAL	7.5	3.00

Total investment on environmental improvement works existing and envisaged Rs. 7.50 lakhs and recurring expenditure during the stage of production is Rs. 3.00 lakhs per year.

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## **CHAPTER – VI**

### **ADDITIONAL STUDIES: DISASTER MANAGEMENT**

#### **6.1 INTRODUCTION**

All types of industries face certain types of hazards which can disrupt normal activities abruptly and to disaster like fires, inundation, failure of machinery, explosion, to name a few. Similarly River Bed Mining also have impending dangers or risk which need be addressed for which a disaster management plan has been formulated with an aim of taking precautionary steps to avert disasters and also to take such action after the disaster which limits the damage to the minimum.

Nevertheless, the following natural/industrial problems may be encountered during the mining operation.

1. Inundation- filling of the mine pit due to excessive rains.
2. Slope failures at the mine faces or stacks.
3. Accident due to storage of explosive and blasting.
4. Accident due to fire.

As per proposal made under the mining plan, during proposed working the area will be developed by means of manual opencast mining method. Exploitation and transportation of minerals are to be carried out by manual means. Water table will not be touched during processed working. No high risk accidents like landslides, subsidence flood etc. have been apprehended.

But possibility of accidental disaster is also not ruled out. Therefore, all the statutory precautions should be taken for quick evacuation as per the Mines Act 1952, the Mines Rules 1955, MMR-1961 and MCDR-1988.

#### **6.2 RISK ASSESSMENT AND DISASTER MANAGEMENT PLAN**

The possible risks in the case of river bed mining project are bank erosion, floods, accidents due to transportation etc.

Mining and allied activities are associated with several potential hazards to both the employees and the public at large. A worker in a mine should be able to work under conditions, which are adequately safe and healthy. At the same time the environmental should be such as not to impair his working efficiency. This is possible only when there is adequate safety in mines. Hence, mine is one of the most essential aspects of any working mine. safety of the mine and the employees is taken care of by the mining rules & regulations, which are well defined with laid down procedure for safety, which when scrupulously followed safety is ensured not only to manpower but also to machines & working environment.

#### **6.2.1 Possible Risks Due To Inundation & Its Control**

Mining will be done during the non monsoon periods; therefore problem of inundation is not likely to happen.

#### **6.2.2 Dewatering**

Depth of mine is limited to 2m depth only from the river bed level whereas the ground water flows at 3m to 6m below the bed level. Hence no dewatering is required.

#### **6.2.3 Possible Risks Due To Failure of Pit Slope & Its Control**

Pit will be created of limited depth only i.e. 2m thus the chance of failure of pit slope does not exist.

#### **6.2.4 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.

#### **6.2.5 Possible Risks Due To Fire & Its Control**

The operation does not anticipate any fire disaster.

### **6.2.6 Measures to Prevent Accidents Due to Trucks and Dumpers**

- All transportation within mining lease working should be carried out directly under the supervision and control of the management.
- 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 equipments/ vehicles especially at the working place / loading points, stopper should be posted to properly guide reversing/ spotting operating, otherwise no person should be there within 10 km radius of machine.
- A statutory provision of the fences, constant education, training etc. will go a long way in reducing the incidents of such accidents.

### **6.2.7 Other Possible Measures to Avoid Risks/ Disaster Due to River Bed Mining.**

- Unwanted material including mineral or spillage (if any) should not be stacked on the banks as it will hinder the flow of water in monsoon season.
- Mining of minerals / working shall be started from the centre from dip to rise and then laterally 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.
- 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.

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## **CHAPTER-VII**

### **PROJECT BENEFITS**

#### **7.1 INTRODUCTION**

The project proponent is keen to co-operate with the proposed CSR activities. The management will help in overall socio economic development of the area.

#### **7.2 PROMOTION OF SOCIAL & ECONOMIC STATUS**

- Smt. Roshni Devi has contributed to the economy and social development of the area. It will provide direct employment to about 40 - 50 people and indirect employment to many more.
- The company believes in the philosophy to provide better health and medical facilities not only to their families but also to villagers.

#### **7.3 CONCLUSION**

The management will recruit the semi-skilled & unskilled workers from the nearby villagers.

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.

Green belt development / Plantation will be taken up in the vicinity of river banks, along the approach roads, around Govt. building, schools.

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## **CHAPTER-VIII**

### **ENVIRONMENT MANAGEMENT PLAN**

#### **8.0 INTRODUCTION**

The environmental impact assessment presented in previous chapter is based on the control measures. It is concluded that the mining activities having substantial, but reversible impact on environment and the suggestive measures should be taken so as to minimize the impacts.

Environmental management plan details the environmental quality control measures which are proposed for this project to achieve the production of 62600 TPA of sand, bajri & stone (Minor Minerals) by complying with the stipulated standard limit specified by state pollution control board and CPCB. The environment for the mined out river bed area.

Environment Management Plan, which is to be implemented in the project has detailed under the following heads:

- Land use pattern and river course environment
- Air Environment
- Water Environment
- Noise Environment
- Solid waste Management
- Biological Environment including Plantation Development
- Implementation of EMP and monitoring Programme

## **8.1 LAND USE PATTERN AND RIVER COURSE ENVIRONMENT**

Deviation from planned mining procedure can lead to bank erosion/cutting and thereby river channel shifting degradation of land, causing loss of properties and degradation surrounding of landscape. Thus for environment friendly river bed mining the following control/abatement measures will be followed:

- Mineral will be mined out in central position of stream and sufficient safety barrier say 10% of width will be left towards bank side. So that the river flow / course will not get disturbed.
- Mining of minerals will be started from dip side towards rise at the centre and also laterally in 1 meter slice so that the river course will not get affected. Unwanted material including mineral or spillage (if any) will not be stacked by the side of the excavation area. If need be done then it should be dozed afterwards in excavation voids created. This is to be done so, because it will otherwise hinder the flow of water in monsoon season.
- Mining is to done leaving safety barrier on both sides and maximum barrier should be on concave side of river preferably the flow channel (excavation void created) should be kept straight so as to help avoid erosion as side cutting.

## **8.2 AIR ENVIRONMENT**

In order to minimize impacts of mining on air and to maintain it within the prescribed limits of CPCB/SPCB, an Environment Management Plan (EMP) has been prepared. This will help in resolving all environmental and ecological issues likely to cause due to mining in the area.

During the course of mining no toxic substances are released into the atmosphere as such there seems to be no potential threat to health of human beings.

In river bed mining activities, the only source of gaseous emission is from the engines of vehicles. The reasons may be quality of fuel, improper operation of the engine, etc. proper maintenance of engines will improve combustion process and brings reduction in pollution.

The fugitive dust generation during mining and transportation requires some mitigation.

### **8.2.1 Prevention and Control of Air Pollution**

- Proper mitigation measures like water sprinkling on haul roads will be adopted to control fugitive dust emission.
- Plantation will be carried out on approach roads & nearby vicinity of river bank.
- To control the emissions regular preventive maintenances of equipments will be done to adopt corrective actions wherever needed.
- It is being ensured that all transportation vehicles will carry a valid PUC certificate.

## **8.3 NOISE ENVIRONMENT**

### **8.3.1 Noise Abatement and Control**

- Proper maintenance of all machines is being carried out, which help in reducing generation of noise during operations.
- Cushioned pad at foundation helps reduction in noise generation.
- No other equipments except the transportation vehicles and excavator & Loaders (as & when required) for loading is allowed.
- Noise generated by these equipments is intermittent and does not cause much adverse impact.

- Periodical monitoring of noise will be done to adopt corrective actions wherever needed.
- Plantation will be taken up along the approach roads and on river bank. The plantation minimizes propagation of noise and also arrests dust.

## **8.4 WATER MANAGEMENT**

### **8.4.1 Surface & Ground Water Management**

- Mining in the area will be done well above the water table as well as river bed water level therefore impact on water regime is not anticipated. The ground water level of lease area is 5.5m to 6.3m from the bgl. River bed mining will be one up to depth of 1m from the surface.
- Mining will not intersect the river bed water level or ground water table of the area. So not at all disturbing water environment.
- The mining from river bed does not have any impact on topography and natural drainage of surrounding area as no part of land outside river bed is disturbed and the void formed dust excavated sand, Bajri & Boulders (Minerals) from river bed is filled bank generally during monsoon season, more or less restoring to original position thus not affecting normal drainage in the river channel also.

### **8.4.2 Waste Water Management**

No waste water is generated from the mining activity of minor minerals as the project only involves lifting of sand, bajri & Boulders from river bed in dry state.

## **8.5 SOLID WASTE MANAGEMENT**

- No solid waste is generated from the said mining operations.

- Unwanted material including mineral or spillage(if any) will not be stacked on the banks sides as it will hinder the flow of water in monsoon season. The same is backfilled in the mined out area.
- There is no toxic element present in the mineral which may contaminate the soil.

## **8.6 BIOLOGICAL ENVIRONMENT**

### **8.6.1 Floral and Faunal Environment of the Study Area**

- The project is only of extraction of minor minerals viz. Sand, Bajri, & Boulders from the river bed.
- There will be no significant impact of the river bed mining project on the biological diversity found in the 10km. radius of the site.
- The mining lease area is in non-forest land where presence of fauna is very rare. No endangered species of fauna is found in and around lease area. As such, there will be no adverse impact of the mining activity on fauna around the mining lease area.
- No adverse impacts will be envisaged on the existing aquatic flora & fauna if any on downstream side (away from site) as the mine workings confined to above water level only and at all touching/disturbing water table.
- No adverse impacts will be envisaged on the terrestrial flora and fauna as the working are restricted to river bed only.
- To study the floral and faunal diversity of the 10km radius a detailed biological study has been carried out and suggested mitigation measures are proposed there in so that there will be no impact on the biological diversity of the forests falling in the proximity of the site.

## **8.6.2 Plantation Development**

- Plantation is an important sink of air pollutants including noise. Green cover in mining area not only helps in reducing pollution level, but also improves the aesthetic and beneficially influence the microclimate of the surrounding.
- It also attracts the animals to re-colonize the area when the mine is abandoned. However green belt may be developed with plant species suitable to the area.
- The species, selected for plantation should have rapid growth, evergreen, large crown volume and small/pendulous leave with smooth surface. In this river bed mining project plantation will be developed along the approach roads and sides of river bank. Thick plantation will work as a pollutant arrestor, reduces floods as well as avoids the situation of erosion of soil during monsoon season.

### **8.6.2.1 General Guidelines for Plantation Development**

- Trees growing upto 5m or more in height will be planted around the vicinity of river bank.
- Trees will be planted along roadsides, to arrest auto – exhaust and noise pollution, and in such a way that there is no direct line of sight to the working site when viewed from a point outside the foliage perimeter.
- Since tree trunks are normally devoid of foliage(upto 3mt.), it will be appropriate to have shrubbery in form of such trees to give coverage to trunk portion of these trees.
- Fast growing trees with thick perennial foliage will be grown, as it will take many years for other trees to grow to their full height.

In order to facilitate the proper growth of vegetation, limited measures involving preparation of seedbed with suitable amount of fertilizers and treatment with mulches will be taken.

Vegetation cover generally helps in:

- Stabilizing erodible slopes to minimize pollution.
- Control of dust.
- Enhancement of aesthetic value.
- Maximizing evpo-transpiration, which helps minimizing run off.
- Reducing noise.

For revegetation, the plants and saplings suitable for the existing soils and site condition may consider. It is recommended to plant fast growing local plant species, which can adapt to the local climate.

This has to be done in consultation with local government horticulturist.

## **8.7 SOCIO – ECONOMIC ENVIRONMENT**

### **8.7.1 Management Plan for Socio-Economic Environment**

The environmental management plan has been developed with a view to bring down the levels of impacts as discussed in the last chapter within limits. In each of the areas of impact, measures have to be taken to reduce potentially significant adverse impacts and where these are beneficial in nature, such impacts are to be enhanced/augmented so that the overall adverse impacts are reduced to as low level as possible.

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## **CHAPTER – IX**

### **CONCLUSION**

#### **9.0 INTRODUCTION**

Success of any environmental management programme 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 can be taken in case there are some drawback in the proposed programme. Since environmental quality parameters at work zone are important for maintaining safety the monitoring work forms part of safety measures also.

#### **9.1 AVAILABILITY OF FUNDS FOR ENVIRONMENT PROTECTION MEASURES**

##### **9.1.1 Funds for Green Belt Protection**

The management of Smt. Roshni Devi's river bed mine is very conscious to minimize the existing pollution load in the lease area. A thick canopy cover of green belt is being developed as discussed in the earlier chapters. Over 200 numbers of trees/year will be invested for environmental protection measures. A recurring amount of Rs. 30,000 will be spent every year.

##### **9.1.2 Funds for Dust Suppression**

Water is spread around the mining area through pipes laid down on tankers to control the dust suppression. An amount of Rs. 50,000 is spent every year on dust suppression measures.

## 9.2 IMPLEMENTATION SCHEDULE

The implementation of these mitigation measures, it is important to monitor various environmental parameters so as to ensure proper working of all the environmental control measures. This section presents the monitoring schedule and infrastructural requirement for environmental protection in Table no. 9.1, as given below:

### MONITORING SCHEDULE FOR ENVIRONMENTAL PARAMETERS

TABLE NO. 9.1

Particulars	Monitoring Frequencies	Duration of Station	Important Monitoring Parameters
Surface water / Tube well	Once in a Year	Grab	pH, SS, TDS, Iron, Hardness, Alkalinity Chlorides, Nitrates Sulphate & Flourides
Ambient air monitoring	Once in a Quarter.	24 hr.	PM <sub>10</sub> , SO <sub>x</sub> and NO <sub>x</sub>
Noise Pollution	Once in a Quarter.	-	Level in dB(A) and dB(C)
Working environment	Once in a Quarter.	-	PH, Conductivity, Sulphate, Nitrate, Phosphates, Alkalinity & texture.

## 9.3 BUDGETARY PROVISION FOR ENVIRONMENTAL MANAGEMENT

The Table 9.2 give overall investment on the environmental safeguards and recurring expenditure for successful monitoring and implementation of control measures.

TABLE- 9.2

### COST OF ENVIRONMENTAL PROTECTION MEASURES (Investment and recurring cost Rs. in Lakh)

Sl. No	Particulars	Capital cost	Recurring cost / annum
1.	Pollution control	2.50	0.50
2.	Pollution monitoring	2.50	1.80
3.	Green belt on virgin area	1.00	0.30
4.	Occupational health	1.00	0.20
5.	Miscellaneous	0.50	0.20
	TOTAL	7.50	3.00

Total investment on environmental improvement works existing and envisaged is Rs. 7.50 lakhs and recurring expenditure during the stage of production is Rs. 3.00 lakhs per year.

#### **9.4 RECOMMENDATION**

M/s Udaipur Min –Tech Pvt. Ltd. survey reveals that the management is providing continual improvement of Environment. The air environment and other emissions are regularly sprinkled with water. The management has provided ear muffs and helmets to the workers in the mine and stress on its utilization.

The regular medical check-up of workers is to be carried out. Green belt development is to be stressed and workers must be motivated for plantation care.

The general environmental awareness is given to the local workers. Regular maintenance of vehicle is carried out. Slogans of Environment, health & safety are recommended for display.

The verbal interactions with neighboring villagers reveals that due to river bed mining no impact on water level. Hence significantly no impact is there due to mining activity. However, the mine is operative since few years, but no significant problems are reported by the villagers. Conservation of soil and water must be emphasized not only at works but also at their own place. With implementation of Environment management plan and providing continual improvement the mine may be accorded environmental clearance.

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**CHAPTER - XI**  
**CONSULTANTS ENGAGED**  
**(RQP/UDP/354/2009/B)**

The consultant engaged for the preparation of the EIA/EMP of the project are M/s Udaipur Min-Tech Pvt. Ltd.. The information about the company with address are follows:

**INTRODUCTION:**

Realizing the need for multi disciplinary and pragmatic approach to mine development and mine environment management, a few dedicated Mining engineers & Geo-scientists with decades of practical experience started M/s Udaipur Min-Tech Pvt. Ltd. company as a consultancy organization in 1994 registered as company with the Registrar of Companies, Rajasthan and got recognized (RQP/UDP/354/2009/B) from Indian Bureau of Mines, Ministry of Mines, Govt. of India and ISO 9001 Company and accreditation by NABET "A" category for open cast mines. Today it has grown not only to handle anything in mining of non-fuel minerals but ready to face any challenging environmental assignment in the field of mining industry and modification of varied industries and environmental clearance of diverse industries.

M/s Udaipur Min-Tech Pvt. Ltd. provides services in the field of environmental impact assessment and management for all types of industries( Chemical, Power Stations, Infrastructure projects, Soda ash, Cement & Mines), risk analysis, disaster management, environmental health and safety, socio-economic studies and mine planning.

**OUR SERVICES :**

We provide wide range of services. These include :-

**At Mining Services :-**

- Evolution of Mineral property and feasibility studies.
- Preparation of Mining Plan , Scheme of Mining with Mine Closure Plan (Progressive & Final) as per MCR 60, MCDR 88 & GCDR 1999.
- Up gradation & Processing of Non Metallic Minerals.
- EIA / EMP report

**At Environmental Services :**

- Monitoring of ambient air quality, Stack emissions, Work zone air quality, Source monitoring and Control.
- Monitoring of water, Waste water, Pollution source identification and control process.
- Monitoring of Soil quality, Noise level, Solid waste or Sludge quality.
- Environmental audit, Industrial risk assessment and risk management and hazardous waste management.

**ACHIEVEMENTS :-**

Udaipur Min-Tech Pvt. Ltd.(UMT) in a short period after its inception has prepared more than 750 Mining Plan and Scheme of mining with Progressive Mine Closure/Final Mine Closure Plan of various minerals in Rajasthan, Gujarat, Himachal Pradesh, Assam & M.P. and more than 750 of them have already approved from IBM-Udaipur/Dehradun/Ajmer/Nagpur, Deptt. Of Mines & Geology-Rajasthan, Deptt.Of Geology & Mining –Gandhinagar (Gujarat).

UMT has conducted Mine Surveys, Mine Planning, EIA/EMP for Limestone area for Cement & Soda Ash industry, Laterite, Iron ore, Marble, Granite, Soapstone, Mica, Quartz & Feldspar, Asbestos, Wollastonite, Calcite, China Clay, Red Ochre etc. in states of Rajasthan, Gujarat, Himachal Pradesh, Assam, Goa& M.P.

UMT has prepared during year 2000-01 to 2010-11, more than 150 EIA/EMP report of mineral Soapstone, China Clay, Red ochre, Laterite, Silica Sand, Quartz& Feldspar, Dolomite, Limestone(Cement as well as Soda Ash) & Granite for Ministry of Environmental & Forestry and 100 of them have already secured approval & Environmental clearance.

**THE CORE TEAM :**

The key persons of team are

**1) Mr. S. S. BIST**

M.Sc. (Geology), M.Tech. (Applied Geology) &PG Diploma in Environment & Ecology, RQP(IBM), MMGI, FGSI etc. having 19 years professional experience of survey and geological mapping, prospecting & mine planning for various non-metallic/metallic minerals, preparation of pre-feasibility& feasibility report,

preparation of Mining plan/Scheme of Mining with PMCP/FMCP, Preparation of EIA/EMP report and mining of Granite, Marbles etc.

**2) Mr. B. L. MOD**

Diploma in Mining and AMIE(Mining) with First Class Mine Manager Certificate of competency (Unrestricted), Certified Mine Surveyor's Certificate of competency (Unrestricted), RQP(IBM), MMGI, C.Engg. MIE, MMEA, having 43 years working experience in field of mining viz underground as well as opencast mine of various metallic and non-metallic mineral in India as well as abroad. Preparation of Mining plan/Scheme of Mining with PMCP/FMCP, preparation of EIA/EMP report.

**3) Dr. H.S. YADAV**

M.Sc. (Geology), Ph.D, IBM(RQP)& having more than 21 years of professional experience in Mining of various industrial as well as building stones.

**4) Mr. S. K. MOHTA**

Diploma in Mining with First Class Mine Manager Certificate having 43 years working experience in field of mining viz underground as well as opencast mine of various metallic and non-Metallic mineral in India as well as abroad.

**5) Mr. A.K. YADAV**

AMIE (Mining) with 1<sup>st</sup> Class Mine Manager Certificate, Certified Mine surveyor(Coal & Metal), RQP(IBM) having 16 years working experience in field of mining and consultancy for open cast metallic & non-metallic minerals.

**6) Mr. J.S. AGARWAL**

M.Sc. (In-Organic Chemistry), PG Diploma in Material management-1992, Lead auditor certificate of EMS, having 36 years in fertilizer industries. Retd. as Chief Manager, (E&P Control) from IFFCO.

**7) Mr. S. N. SHARMA**

B.E in Mining with First Class Mine Manager Certificate, PG Diploma in Marketing Management, RQP(IBM) Nagpur, Maharashtra having 31 years working experience in field of mining viz. underground as well as open cast mine of various metallic and non metallic mineral in India. Preparation of Mining Plan/ Scheme of Mining with PMCP/FMCP, Preparation of EIA/EMP report of Industrial, Mining and Infrastructure project.

**8) Mr. U. C. SHARMA**

M.E in Environmental Engineering, B.E in Civil Engineering, MBA in H.R, having 20 years experience in field of Civil Environment Engineer. Preparation of EIA/EMP report of infrastructure Project.

**9) Mr. N. S. NARUKA**

M. Phil. (Environment Management), M.Sc. (Environment Science), Lead Auditor for (ISO14001:2004) EMS, and Diploma in Industrial Safety, having over 9 years of work experience in the Environmental Impact Assessment & Analysis with report writing. Evaluation and preparation of EIA's of Industrial, Mining, and Infrastructure project for environmental clearance.

**10) Dr. SHALINI GUPTA**

M.Sc.(Ecology and Environment Science), Ph.D. (Chemistry), Diploma in Industrial Safety. MoEF & NABL approved Environment Chemist, Approved FAE in AP,WP, SHW & AQ, Trained Internal Auditor as per ISO/IEC-17025-2006 & Train QMS Auditor having over 17 years of work experience in the Environment field.

Besides, our team of Professionals is given below :

1	Ashok Kumar Pardesi	Diploma in Mining & Certified Surveyor.
2	Neelima Sharma	M.Sc.(Botany), M.Sc. (Geo.), M.Tech. (Applied Geo.)
3	Parul Gupta	M.Sc. (Environment Science)
4	Rashmi Shrimali	M. Sc.(Chemistry)
5	Jitendra Singh Sankhala	B.E (Mining)
6	Anjani Kumar	M. Sc. Tech (Environmental Science & Technology)
7	Rajveer Singh	M.Sc.(Remote Sensing & GIS)
8	Kamlesh Kumar	M.Sc. (Environment Science)
9	Rahul Deshmukh	MSW & BSW(Social Works)
10	Sameer Deshpande	M.Sc.(Botany),
11	Mahesh Kumar	M.Sc. (Geology)
12	Tara Ram	M.Sc.(Geology) & M.Sc.(Environment Science)
13	Rahul Salvi	M. Sc.(Geology)
14	Surendra Kumar Gehlot	M.Sc.(Geology)
15	Lakshmi Lal Meghwal	Diploma in Draftsman & Certified Surveyor.
16	Harish Kumar Pardesi	Drafts man & AutoCAD Master.
17	Praveen Koted	Computer Operator & AutoCAD Master.
18	Deepak Bhavsar	Computer Operator & AutoCAD Master.
19	Anil Damor	Computer Operator & AutoCAD Master.
20	Bhupendra Jalora	Computer Operator & AutoCAD Master.
21	Shyam Lal Menaria	Matric

**CONTACT PERSON - S. S. BIST**  
**206 "APEKSHA COMPLEX"**  
**HIRAN MAGRI, SECTOR-11**  
**UDAIPUR - 313002(RAJ.)- INDIA**  
**PHONE - +91-294-2489672(OFF), MOBILE - +9194141 67672**

e mail : [ssbist@udrmintech.com](mailto:ssbist@udrmintech.com)

visit us at : [www.udrmintech.com](http://www.udrmintech.com)

