7.1 RISK ASSESSMENT

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 conditions should be such as not to be impair his working efficiency. This is possible only when there is adequate safety in mines.

7.2 IDENTIFICATION OF HAZARDS

There are various factors which can create unsafe working conditions in mining of minor minerals from river bed. These hazards are as follows:

a) Inundation / Flooding
b) Quick Sand/Morrum Condition
c) Drowning
d) Accident due to vehicular movement
e) Accident during sand/morrum loading, transporting and dumping

7.2.1 INUNDATION/FLOODING

a) The possibility of inundation/flooding of the mines are very high during monsoon or during heavy rains as the mine area lies in the riverbed.
b) There is danger to the trucks and other machineries due to flooding.
c) There is danger to the workers working in the mines.

Inundation or flooding is expected and beneficial for these mines as during this time only the mineral reserve gets replenished.

7.2.2 QUICK SAND CONDITION

Quick sand/ morrum is a colloidal hydrogel which consists of fine granular material (such as sand/morrum or silt) clay, and water. Quick sand/morrum condition arises in saturated loose sand/morrum when the sand/morrum is suddenly agitated. When water in the sand/morrum cannot escape, it creates liquefied soil that loses strength and cannot support weight. This condition occurs when the permeability of the strata is very high and the effective stress in the sand/morrum becomes zero due to influx of water i.e.

$i = icr = y'/yw$

where,

i = Hydraulic gradient,

icr = Critical Hydraulic gradient,

y' = submerged unit weight,

yw = unit weight of water.

This creates dangerous condition to the trucks and other machineries plying over the sand/morrum dunes on the river banks.

7.2.3 DROWNING

There are no possibilities of drowning in the river, since mining operations are carried out only in the dry seasons. All mining activities will be stopped during the monsoon season.

7.2.4 MINERAL LOADING

a) The minerals are loaded in the trucks using hand shovels. There is possibility of injury in the hands during loading with shovels.
b) There is possibility that the workers standing on the other side of loading may get injury due to over thrown sand/morrum with pebbles.
c) There is possibility of workers getting injured during opening of side covers to facilitate loading.
d) There is possibility of riverbank collapse.
e) There is a chance of falling of cattle/children into pits in river bed.

7.2.5 TRANSPORT

The minerals loaded in trucks are being sent to through public roads.

a) Possibilities of road accidents.
b) Accident may also occur during movement in the mine.
c) There are possibilities that due to overloading, pebbles or boulders may injure the passersby.

7.3 MITIGATION OF HAZARDS

7.3.1 MEASURES TO PREVENT ACCIDENTS DURING LOADING

a) The trucks will be brought to a lower level so that the loading operation suits to the ergonomic condition of the workers.
b) The loading will be done from one side of the trucks only.
c) The workers will be provided with gloves and safety shoes during loading.
d) Opening of the side covers (pattas) will be done carefully and with warning to prevent injury to the loaders.
e) Operations during daylight only.
f) It will be ensured that no foreign material will remain/spilled either in riverbed or catchment in the pits/pockets of area.
g) Stockpiling of extracted material on the river bank will be avoided.

7.3.2 MEASURES TO PREVENT ACCIDENTS DURING TRANSPORTATION

a) All transportation within the main working will be carried out directly under the supervision and control of the management.
b) The Vehicles must be maintained in good repairs and checked thoroughly at least once a week by the competent person authorized for the purpose by the Management.

c) To avoid danger while reversing the trackless vehicles especially at the embankment and tipping points, all areas for reversing of lorries will as far as possible be made man free.
d) A statutory provision of the fences, constant education, training etc. will go a long way in reducing the incidents of such accidents.
e) Overloading will strictly not be permitted.
f) The trucks will be covered and maintained to prevent any spillage.
g) The maximum permissible speed limit will be ensured.
h) The truck drivers will have proper driving license.

7.3.3 MEASURES TO PREVENT DANGEROUS INCIDENTS DUE TO INUNDATION/FLOODING

Inundation of flooding is expected and beneficial for these mines as during this time only the mineral reserve gets replenished.

a) During monsoon months and heavy rains the mining operations are ceased.
b) There will be mechanism/warning system of heavy rains and discharges from the upstream dams.
c) An excavation plan as given in pre-feasibility report will be formulated and periodic mockdrills will be carried out regularly at mine site to conquer any unavoidable circumstances.

7.3.4 MEASURES TO PREVENT QUICK SAND CONDITION

a) The only way to avoid quick sand/morrum condition is by avoiding mineral lifting below water table.
b) The critical hydraulic gradient (icr) will be maintained at less than 1 to prevent high artesian pressure in a coarse sand/morrum area.
c) At least 0.5m sand/morrum bed should be left in-situ while excavating sand/morrum from riverbed.

7.3.5 MEASURE TO PREVENT DROWNING

a) The mining will be done under strict supervision and only during the dry season.
b) Deep water areas must be identified.
c) No go zones will be clearly marked and mine workers will be informed.
d) Safety mock drills will be organized for rescue operations.

7.3.6 NATURAL RESOURCE CONSERVATION

Mining at the concave side of the river channel will be avoided to prevent bank erosion.

Similarly meandering segment of a river should be selected for mining in such a way as to avoid natural eroding banks and to promote mining on naturally building (aggrading) meander components.

7.4 SEDIMENT INFLUX RATE

Sediment influx in Ephemeral streams is generally confined to the beginning of the rainy season as velocity of the water washes down medium to fine sand and silt depending on the velocity and gradient of land. Cobbles, pebbles and boulders will be transported buy only over short distance. Boulders are normally 256 mm and above are normally transported either by dragging action or by saltation.

Recharge is in two forms, one general deposition of coarse, medium and fine sand when the velocity of the river water decreases below the carrying capacity. However, flash floods due to heavy rains in the upper reaches often causes rapid transportation of boulder, sand etc., along with silt which can never deposit.

Recharge Rate: It is dependent upon the following 4 factors

1. Velocity of the water and change of velocity
2. Size of particles
3. Temporary increase in density of carrying media due to presence of silt load.
4. Artificial or natural barriers being encountered within the river course, where due to the sudden check in velocity, materials are deposited.

The numerical sedimentation rate varies from 50cm medium sand to as much as 3m of medium and fine sand where the slope of the river bed is less than 100 slope per season. For silt and clay, these only be deposited in the flood area and normally varies between 1-5m over 6 months period.

7.5 SOCIAL IMPACT ASSESSMENT, REHABILITATION & RESETTLEMENT (R & R) ACTION PLAN

There will be no resettlement or rehabilitation involved in the project being on meandering course of the river. However, a detailed Socio Economic Assessment has been performed, which is given below:

7.5.1 INTRODUCTION

In this section of the report an attempt has been made to measure Socio-economic impact of the proposed river bed mining project on river Yamuna at Gata No 553, 554 at Village – Issospur Khurgan, Tehsil- Kairana, District- Shamli, U. P. The various attributes that have been taken into account are population composition, employment generation, occupational shift, household income, consumption pattern, ethnic issue and law & order problem. The key objective of the study is to assess possible impact of the project on socio-economic life of the people in the neighborhood known as study area.

The objectives of the socio-economic impact assessment are as follows:

a) To collect baseline data of the study area.

b) To know the socio-economic status of the people living in the study area of the proposed mining project.

c) To assess the possible impact of the project on socio-economic aspects in the study area.

d) To measure the impact of the project on Quality of life of the people in the study area.

7.5.2 APPROACH & METHODOLOGY

a) A mixture of both quantitative and qualitative approach has been adopted in the current socio-economic study.

b) The study has been conducted based on primary and secondary data. While primary data has been collected through a sample survey of selected households in the study area, the secondary data has been collected from the administrative records of the Government of Uttar Pradesh, Census 2011, district hand books and from the Uttar Pradesh Government portal.

c) The details regarding population composition, number of literates, workers, etc have been collected from secondary sources and analyzed. Also village/city/town wise details regarding amenities available in the study area have been collected from secondary sources like Census 2011, and analyzed.

d) Two stage sampling design has been adopted to select the sampling units. The first stage units are census villages in the rural areas and towns/cities in urban areas. The ultimate stage units are households in the selected villages and towns/cities. Probability sampling has been adopted to select the sampling units.

e) Estimation of various parameters has been made based on sample data and bottom top approach has been adopted.

f) On the basis of a preliminary reconnaissance survey, two questionnaires were developed to make it suitable to fulfill the objectives of the study. The questionnaires contained both open ended and close ended questions

g) The data collected during the above survey was analyzed to evaluate the prevailing socio-economic profile of the area.

h) Based on the above data, impacts due to mining operation on the community have been assessed and recommendations for improvement have been made.

7.5.3 CONCEPT & DEFINITION OF TERMS USED

a) **Study Area:** The study area, also known as impact area has been defined as the sum total of core area and buffer area with a radius of 10 Kilometers from the periphery of the project site. The study area includes all the land marks both natural and manmade, falling therein.

b) **QoL:** The Quality of Life (QoL) refers to degree to which a person enjoys the important possibilities of his/her life. The 'Possibilities' result from the opportunities and limitations, each person has in his/her life and reflect the interaction of personal and environmental factors. Enjoyment has two components: the experience of satisfaction and the possession or achievement of some characteristic.

c) **Household:** A group of persons who normally live together and take their meals from a common kitchen are called a household. Persons living in a household may be related or unrelated or a mix of both. However, if a group of related or unrelated persons live in a house but do not take their meals from the common kitchen, then they are not part of a common household. Each such person is treated as a separate household. There may be one member households, two member households or multi-member households.

d) **Sex Ratio:** Sex ratio is the ratio of females to males in a given population. It is expressed as 886 per 1000 male'.

e) **Literates:** All persons aged 7 years and above who can both read and write with understanding in any language are taken as literate. It is not necessary for a person to have received any formal education or passed any minimum educational standard for being treated as literate. People who are blind but can read in Braille are also treated as literates.

f) **Literacy Rate:** Literacy rate of population is defined as the percentage of literates to the total population aged 7 years and above.

g) **Labour Force:** The labour force is the number of people employed and unemployed in a geographical entity. The size of the labour force is the sum total of persons employed and unemployed. An unemployed person is defined as a person not employed but actively seeking work. Normally, the labour force of a country consists of everyone of working age (commencing from 14 to 16 years) and below retirement (around 65 years) that are participating workers, that is people actively employed or seeking employment. People not counted under labour force are students, retired persons, stay-at home people, people in prisons, permanently disabled persons and discouraged workers.

h) **Work:** Work is defined as participation in any economically productive activity with or without compensation, wages or profit. Such participation may be physical and/or mental in nature. Work involves not only actual work but also includes effective supervision and direction of work. The work may be part time or full time or unpaid work in a farm, family enterprise or in any other economic activity.

i) **Worker:** All persons engaged in 'work' are defined as workers. Persons who are engaged in cultivation of land or milk production even solely for domestic consumption are also treated as workers.

j) **Main Workers:** Those workers who had worked for the major part of the reference period (i.e. 6 months or more in the case of a year) are termed as Main Workers.

k) **Marginal Workers:** Those workers who did not work for the major part of the reference period (i.e. less than 6 months) are termed as Marginal Workers.

l) **Work participation rate:** The work participation rate is the ratio between the labour force and the overall size of their cohort (national population of the same age range). In the present study the work participation rate is defined as the percentage of total workers (main and marginal) to total population.

7.5.4 FINDINGS OF THE STUDY

Study Area

The field investigation has revealed that the entire study area of the proposed mining project is located in Shamli district, Uttar Pradesh. The Sub-district (Tehsil) falling in the study area is Kairana.

<u>BASELINE DATA OF THE IMPACT AREA</u>

Table 7.1: Demographic Particulars of Study Area

S. No.	Description	Number	Percentage to respective totals
1	**Total Population**	107,266	**100**
	Male	57,187	53.13
	Female	50,079	39.67
2	**Sex ratio (No. of females per 1000 males)**	**876**	
3	**Total Literates**	74,886	**100**
	Male	42,555	56.82
	Female	32,331	43.18
4	**Over all Literacy Rate**		**80.32**
	Male		86.21
	Female		73.70
5	**Children (0-6)**	14,036	**100**
	Male	7,823	55.74
	Female	6,213	44.26
6	Child sex ratio	794	

Source: Census 2011

Table 7.2: Amenities Data (For Rural Area):

S. No.	Amenities	Types	Number
1	**Educational Institutions**		
		Primary School	23
		Middle school	10
		Secondary School	2
		Senior Secondary School	1
2	**Health Institutions**		
		Allopathic Hospital	2
		Homeopathic Hospital	1
		Allopathic Dispensary	1
		Ayurvedic Dispensary	1
		Homeopathic Dispensary	1
		PHC	2
		PHSC	1
3	**Drinking Water #**		
		Tap	2
		Well	12
		Tube well	3
		Hand pump	13
4	**Communication Facilities**		
		Post Office	7
		Telephone	10
5	**Transport Facilities#**		

		Bus Service	6
		Railway Service	1
6	**Banking facilities**		
		Commercial bank	4
		Cooperative bank	2
7	**Power #**		12

No. of villages provided with the facilities

Source: Census 2011

7.5.5 DEMOGRAPHIC COMPOSITION

Population

According to Census 2011, the total population of the study area is 107,266 in which 57,187 population is male & 50,079 population is female. The overall sex ratio has been worked out to 876 females per 1000 males, which is much lower than the national average of 876 females per 1000 males as per Census 2011.

Literacy and Literacy rate

The total number of literates in the study area has been worked out to 74,886 which is around 80.32 % percent of the total population. The literacy rate of male has been worked out to 86.21 % percent as against 73.70 % percent for female,

7.5.6 POSSIBLE IMPACT ASSESSMENT

Impact on population composition

The impact of the proposed mining project on population composition will be marginal as only few skilled and managerial staff will be recruited from outside and the rest will be recruited locally. The impact will be significant if a large number of people from outside get employed in the proposed project. In that case not only the population of the study area will go up but also the skewed sex ratio may make permanent social effects like rise in exploitation of women, higher crime rate, increase in sexual diseases and depression among youth.

Impact on employment generation

The proposed sand mining project is expected to provide employment opportunities to the skilled workers and the unskilled workers. It is understood that all the persons to be deployed for various mining activities will be recruited locally and there is very little scope for migration of people from outside the study area. The employment potentiality of the project is expected to ameliorate the economic condition of the families of those persons who will get employed in the proposed mining project. However, the mining project will provide seasonal employment. Further, the project will provide indirect employment to about 100 people who will be involved in segregation of extracted mining materials, crushing of boulders, petty business and service oriented industries.

Impact on Health

Extraction of sand/ morrum from the river bed poses serious health risks due to dust. The effects will vary depending upon the nature of the dust particles, silica content in it and the size of the particles. Pneumoconiosis is an occupational lung disease often caused to miners, due to the inhalation of dust. Silica content in the sand may also lead to Silicosis, which is again an occupational lung disease. Miners may also suffer with occupational respiratory ailments, skin allergies etc, but the same are preventable if exposure is minimized. Further, regular health check-up of the miners is required to prevent any negative impact on their health. In the present mining project, no adverse impact on health is expected if minimum precautions are taken by the miners.

Impact on income

In India poverty is widespread. According to an estimate made by World Bank during 2005, 26 percent of the total Indian population falls below the International poverty Line of US$ 1.25 a day (PPP, in nominal terms ₹ 21.6 a day in urban areas and ₹ 14.3 in rural areas). Uttar Pradesh is one of the worst poverty ridden states in India, with per capita income of Rs. 26,051. The proposed mining project at Pateora is expected to provide casual employment to unskilled workers and skilled workers for a period of 225 days in a year. According to Department of labour, Government of Uttar Pradesh each unskilled worker is eligible to get a minimum basic wage of Rs. 100 per day. In addition they will get V.D.A amounting to Rs. 65.50 per day. Thus the total amount an unskilled worker is expected to get is Rs 165.50 per day. Further, a semi-skilled worker will get a basic wage of Rs 114 and V.D.A amounting to Rs.74.69 making the total amount of Rs. 188.69 per day. Lastly, a skilled worker can expect to get a minimum wage of Rs. 126.54 and V.D.A amounting to Rs. 82.92 making the total amount of Rs. 209.46 per day. The impact of the proposed mining activity on household income in the study area is thus positive since it will provide employment to local people, which will result to an increase in household income of those workers who will be recruited for mining operation. However, this impact will be effective for a limited period of 225 days in a year.

Impact on consumption pattern

The field survey has revealed that people in the study are poverty ridden. Increased household income may slightly change the consumption pattern of few but majority of the people will continue to be burdened with poverty.

Impact on road development

Movement of trucks and other vehicles to and fro the quarry is expected to increase substantially, when mining will start. The existing roads connecting the quarry with the national and state highways are mostly narrow mud roads. There will be mud slide and traffic bottle neck if these roads are not widened and their conditions are not improved by making them paved roads. Hence, there is ample scope for road development in and around the mining areas.

Impact on law & Order

As local people will be employed to run the quarry, no law & order problem is envisaged. It is expected that the workers will attend to their duties from their residence and return to their homes after the day's work is over. There would have been law & order problem if the workers were migrants and lived in shanties closed to the mining area. However, to meet any untoward incident one police post may be set up closed to the project area.

7.6 SUGGESTIONS

Provision of First Aid at mining site

Extraction of sand/morrum from the river bed poses serious health risks due to dust, quarrying. The effects vary depending on the nature of the dust particles, silica content in it and the size of the particle. To meet any emergency during extraction of the minerals from the river bed and subsequent loading in the transport vehicles, provision for First Aid should be made by the project proponent. Before the affected person is removed to a doctor or health institution for necessary medical aid, the miner should be provided with First Aid.

Tie up with the nearest PHC for medical help

To meet the medical needs of the mine workers it is suggested that tie-ups with nearest hospital or Primary Health Center (PHC) may be made. Few beds may be exclusively reserved for the mine workers in the above health institutions. This will ensure timely medical aid to the affected persons.

Supply of Mask, Gloves

The mine workers are subject to respiratory diseases, muscular-skeletal and gastro-intestinal disorders and skin diseases. For protection from dust it may be made compulsory for all mine workers to wear masks and gloves while working in the mines.

Regular health checkups

The miners may be encouraged to undergo health checkups at regular intervals in order to protect themselves from various diseases. The health Department of Uttar Pradesh Government must Organize Health Camps at regular intervals preferably in every quarter. Further, free medical facilities may be made available to the workers and their family members.

Administration of Anti-venom injections

Provision of Anti-venom therapy must be made available at the near health institution. Anti-venom injections may be administrated to the mine workers in case of snake, spider and insect bites, while working in the mines.

Special telephone number

A special telephone number may be made available to the mine workers. In case of emergency the miners can dial the above number for medical assistance. Vehicle may be provided to the patients in short duration for shifting to the health institution.

Distribution of Blankets and Quilts

During winter season the mine workers may be distributed blankets and quilts free of cost.

7.7 Corporate Environmental Responsibility

As per the primary analysis and secondary data available the mine site is located in a remote location with scanty of available social infrastructure available. UKFDC will make best of its efforts to provide:

- Medical Camps will be organized in the interval of 3 months for the employees of the project and for the people in the nearby area of mine lease area. It will be done with coordination of the Government Hospital in the nearby area whose equipment facilities can be used for this purpose. Medicines will be provided free of cost.
- First aid training will be regularly imparted to trainees from the neighboring villages.
- The Company also distributes saplings to the local villagers as a part of social forestry.
- Give financial assistance for construction work in schools, for community Centre etc. through gram panchayat.
- Give financial assistance to Government Hospitals for their modernization and purchase of required equipment.
- Total project cost: 50.0 lacs/annum
- CER : 1.0 lacs/annum

Table 7.3: CER details with Allocation of funds

S. No.	Activity	Numbers	Unit Cost (Rs)	Total Cost (Rs.)
1	Drinking water (Handpump)	1	61,000	61,000.00
2	Electrification including Solar power (Solar Lantern)	52	@750/pc	39,000.00
	Total (Rs.)			**1.0 Lacs**

7.8 CONCLUSION

The implementation of Gata No 553, 554 at Village – Issospur Khurgan, Tehsil- Kairana, District- Shamli, U. P. sand/moram mining project on river Yamuna in district Hamirpur will throw opportunities to local people for both direct and indirect employment. Since the quarries will be leased out to successful allottees, sand/moram mining operation in the state will get legalized and it will fetch income to the state exchequer. It will also reduce flooding of river banks, destruction of standing crops, land and property to a great extent. The project will also provide employment to the nearby villagers. It is likely the intending entrepreneurs will venture to set up micro and small scale units in the near future making the area a mixed society, dependent on industry, trade and business. At present agriculture is the main occupation of the people as 79 percent of the population depends on it. With the implementation of the proposed mining project the occupational pattern of the people in the area will change making more people engaged in industrial and business activities rather in agriculture. Thus there will be a gradual shifting of population from agriculture to mining and industry. Further, the mining and industrial activities in the area may lead to rapid increase in population and thereby urbanization. Due to urbanization of the area, employment opportunities will further increase.

The study area is still lacking in education, health, housing, water, electricity etc. It is expected that same will improve to a great extent due to proposed mining project and associated industrial and business activities. It is therefore suggested that extraction of minerals should be taken up on regular basis during the post monsoon period. This will dredge the river bed on regular basis, regulate the course of the river and check flooding of the catchment area.

Proposed activities and expenses on Corporate Environmental Responsibility will be as per CER Mandate of the Government.

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