BOLAN MINING ENTERPRISES

Final Report
January 2018

Environmental Impact Assessment (EIA)

Barite-Lead-Zinc Project Development and Installation of Processing Plants at Barite-Lead Zinc Deposits Near Gunga, Khuzdar

EMC Pakistan
Private Limited

Bolan Mining Enterprises

A Joint Venture between Government of Balochistan & Pakistan Petroleum Limited (PPL)

ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

Barite-Lead-Zinc Project Development and Installation of Processing Plants at Barite-Lead Zinc Deposits Near Gunga, Khuzdar

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January 2018

Ref: EIA/03/11/17

EMC PAKISTAN PVT. LTD.

503, Anum Estate, Opp. Duty Free Shop, Main Shahrah-e-Faisal, Karachi.

Phones: 9221-34311466, 34324680, Fax: 9221-34311467.

E-mail: mail@emc.com.pk, info@emc.com.pk

Website: www.emc.com.pk

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Executive Summary

Name of Project: EIA of Barite-Lead-Zinc Project Development and Installation of Processing Plants at Barite-Lead-Zinc Deposits near Gunga, Khuzdar

Location of Project: 03 Km to the southeast of village Gunga and 16 km to the southwest of Khuzdar city, District Khuzdar, Balochistan, Pakistan.

Project Proponent	EIA Consultant
Bolan Mining Enterprises BME House, Model Town Quetta, Balochistan, Pakistan Phone: +92-81-2836169-171 & 2820617, Fax No: +92-81-2838207 Email: rm@bme.com.pk	**EMC Pakistan Private Limited** 503, Anum Estate, Shahrah-e-Faisal, Karachi, Pakistan Phone: +92-21-34311466 & 34382860, Fax No: +92 21 34311467 Email: mail@emc.com.pk

This report presents the findings of the Environmental Impact Assessment (EIA) study conducted by EMC Pakistan Pvt. Ltd for the proposed Barite-Lead-Zinc Project Development and Installation of Processing Plants at its deposits being proposed by Bolan Mining Enterprises (Project Proponent). The EIA study has been conducted in compliance with the mandatory requirements of Section 15 of Balochistan Environmental Protection Act, 2012 and the rules & regulations framed thereunder.

Balochistan Environmental Protection Act (BEPA Act) was legislated in 2012. Section 15 of BEPA Act 2012 requires that every new project has to be preceded by an Initial Environmental Examination (IEE) or Environmental Impact Assessment (EIA) depending upon the size and severity of impacts anticipated on commissioning of the project. Pakistan Environmental Protection Agency (Review of IEE and EIA) Regulations, 2000 categorize projects in two separate schedules which requires either an IEE (Schedule-I) or an EIA (Schedule-II) where provisions of Section 15 BEPA-Act shall apply. According to the Schedule-II, the proposed project falls in the Category "C" Mining and Mineral Processing, therefore it requires Environmental Impact Assessment (EIA).

Bolan Mining Enterprises (BME) is a joint venture between the Government of Balochistan (GoB) and Pakistan Petroleum Limited (PPL), each with a 50 percent working interest. BME was formed through a joint venture agreement signed on June 1, 1974 to mine, grind and market barite deposits near Khuzdar and other minerals in Balochistan. PPL was designated as operator under the agreement. The agreement was renewed in June 2004 for another 30 years, valid till 2033.

The proposed project is the extraction and beneficiation of Barite and Lead/Zinc from the Gunga through open pit mining method. The Gunga prospect area is located within the 1500 km^2 in Kuzdar reserved area. A mining lease spanning 316 acres for exploration & exploitation of barites in Gunga near Khuzdar, hosting proven reserves of 5 million tonnes and probable 50-100 million tonnes, was granted to BME by GoB. The deposit area is rugged with slopes ranging from 30º to 60º and at places steeper on escarpment sides.

The deposit consists of two layers (Upper layer or Massive Barite Layer (MBL) and lower layer or Lower Mineralized Layer (LML). The operations are based on open-pit method to extract the ore from near-surface deposits with various angles of dip. The surface mining technique will be used for the extraction of ore. The processing plant will be installed to separate the waste material from the barite – lead & zinc ore and consist of two lines for the processing of the upper and lower layer. The concentrator comprises of crushing, grinding, flotation, thickening and filtration & reagents preparation. Moreover, the site preparation works also include the tailing pond, water reservoir and designated area for dumping of overburden/waste.

The Project (Barite-Lead-Zinc) Gunga deposit area is situated 16km to the southwest of Khuzdar city and about 3 km to the southeast of village Gunga, Ferozabad town in Khuzdar tehsil and Khuzdar District, Balochistan. The distance from Khuzdar to Karachi and Khuzdar to Quetta is approximately 350 km and 270 km respectively and RCD is the main highway that connects the Khuzdar city. The coordinates of the deposit area are Latitude 27° 44' 18" N and Longitude 66° 31' 42" E. The local elevation difference is up to 200 meters.

Table.Ex 1.1: Total area for the proposed project

Sr. No.	Site	Area (Acres)
1.	Gunga Barite Mine Lease Area	316
2.	Proposed Tailing Site	346
3.	Proposed Site for Processing Plant	180
4.	Proposed Waste Dump Area	452
5.	Proposed Water Reservoir	316
	Total Area for Proposed Project	**1,610**

The type, nature (positive, negative, direct, indirect), magnitude, timing (during design, operation), duration (short term/temporary, long term/permanent) and significance of impacts will be assessed in this section. The evaluation approach implemented in this study is a **Receptor-Specific Analysis** approach addressing the various sources of impacts from the project's different implementation phases including mobilization, site preparation, commissioning, drilling/quarrying operations, and site restoration. The analysis covers all potential fields of impacts and/ potential receptors:

- Ambient Air Quality;
- Geology and Water Resources (groundwater and surface water);
- Noise and Vibration;
- Land-use
- Biodiversity (fauna and flora);
- Visual and Aesthetics;
- Socio-Economic Environment;

The general evaluation process will include the following stages:

- **Step 1:** Identification of project related activities (sources) and environmental aspects;
- **Step 2:** Identification of potential impacts to the environment (physical, biological, human and cultural);

- **Step 3:** Evaluation and assessment of the related unmitigated impact significance;
- **Step 4:** Identification of Best Practicable Environmental Options (BPEO); and
- **Step 5:** Re-evaluation and assessment of the mitigated impact significance.

The assigned impact severity assessment was first undertaken in accordance to BME currently planned project design and mitigation measures incorporated. The assessment was conducted to identify the potential unmitigated impacts and the residual impacts under current project designs and BME control measures.

Having identified and characterized the potential significant impacts during each phase using the screening procedure identified above, an Environmental Impact Severity Matrix (EISM) was developed to summarize all identified impacts during each phase of the project.

Table Ex 1.2 : Impact Assessment Management Matrix

		LIKELIHOOD RATING		
		A	B	C
CONSEQUECE RATING	1	1A	1B	1C
	2	2A	2B	2C
	3	3A	3B	3C
	4	4A	4B	4C
	5	5A	5B	5C
	6	6A	6B	6C

KEY

Consequences		Likelihood	Acceptability	
1- Negligible	4-Significant	A- Low		Minor
2- Minor	5-Catastrophic	B- Medium		Moderate
3- Moderate	6-Beneficial	C- High		Significant

The EIA process finds that the impacts of the project activities at the pre-construction, construction and operation stages have been adequately addressed and mitigation measures duly proposed wherever needed. Adoption of mitigation measures will ensure reduction of impact on the micro and macroenvironment as well as socio-economic conditions to acceptable levels.

On the basis of the findings of the EIA Study, it is possible to conclude that:

- The implementation of mitigation measures for the potential impacts during construction and operation of Barite-Lead-Zinc Project Development and Installation of Processing Plants will have no significant impact on the physical, biological as well as socio-economic composition of the microenvironment and macroenvironment of the project area in district Khuzdar.

Table Ex-1.3 : Comparison between Environmental Impact Severity Matrix – a) No Mitigation Measures Applied b) Measures in Place

ACTIVITY/ SOURCE OF THE IMPACT			a) UNMITIGATED IMPACTS		b) MITIGATED IMPACTS
Consequence			Likelihood	Acceptability	
1- Negligible			A-Low	Negligible with minor mitigation	
2- Minor			B-Medium	Minimize Impacts	
3- Moderate					
4-Significant			C-High	Significant/ Major Mitigation	
5-Catastrophic					
6-Beneficial				Beneficial	
Construction Phase					
- Air Quality (Gaseous Emissions)			3C		2A
- Air Quality (Dust Generation)			4C		2C
- Noise			4C		2B
- Impact on Soil			3C		2B
- Impact on Vegetation			3B		2A
- Impact on Water Quality			4C		3B
- Solid Waste			3B		2A
- Occupational Health and Safety			4C		3B
Mining and Processing Phase					
- Air Quality			4C		3B
- Water Use and Quality			4C		4B
- Noise and Vibration			3C		2A
- Waste Generation			4C		3B
- Land Use and Biodiversity			3B		2A
- Soil Resources			4C		3B
- Use of Hazardous Materials			4C		4B
- Energy Use			3B		2A
- Occupational Health and Safety			4C		3B
- Community health and safety			3C		2A
Mine Closure and Post Closure Phase			3B		2A
Socio-Economic impacts					6B

- The likely impact of construction & operation of the proposed project will be appropriately mitigated through proven technologies, careful planning and landscaping.

Mitigation will be assured by a program of environmental monitoring conducted to ensure that all measures are provided as intended, and to determine whether the environment is protected as envisaged. This will include observations on and off site, document checks, and interviews with workers and beneficiaries, and any requirements for remedial action will be reported to the Balochistan-EPA.

There are two essential recommendations that need to be followed to ensure that the environmental impacts of the project are successfully mitigated. The Implementing Agency (BME) shall ensure that:

- All mitigation and enhancement measures proposed in this EIA report are implemented in full, as described in the document;
- The Environmental Management and Monitoring Plan is implemented in letter and spirit.

It is envisaged that the current commitment of the proponent to maintain the quality of life in and around the project area through implementation of the environmental management plan and manpower engagement/employment plan, specifically developed for the project would mitigate the likely adverse impacts. The Project will thus respond to all aspects of sustainability: Economic, social and environmental and will thus be a sustainably viable project.

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ANNEXURES

1 Introduction

Name of Project: EIA of Barite-Lead-Zinc Project Development and Installation of Processing Plants at Barite-Lead-Zinc Deposits near Gunga, Khuzdar

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Project Proponent	EIA Consultant
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1.1. General

This report presents the findings of the Environmental Impact Assessment (EIA) study conducted by EMC Pakistan Pvt. Ltd for the proposed Barite-Lead-Zinc Project Development and Installation of Processing Plants at its deposits being proposed by Bolan Mining Enterprises (Project Proponent). The EIA study has been conducted in compliance with the mandatory requirements of Section 15 of Balochistan Environmental Protection Act, 2012 and the rules & regulations framed thereunder.

Environmental Impact Assessment is a planning tool accepted as an integral component of sound decision making. The purpose of EIA is to give environment its due place in the decision-making process by clearly evaluating the environmental consequences of the proposed activities before action is taken. Early identification and characterization of critical environmental impacts allows the public and the government to form a view about the environmental acceptability of the proposed developmental project and what conditions should apply to mitigate, reduce or compensate those risks and impacts.

Field surveys were conducted in the study area by EMC Pakistan Pvt. Limited team which included environmentalist, sociologist and ecologist. Field data collection included observational surveys; consultations and meetings for data collection with government departments, NGO's and communities; and ground verification of available secondary information. Secondary information was collected from proponent (Bolan Mining Enterprises), in-house sources, Government Departments and NGOs. Applicable international guidelines, conventions and environmental assessment procedures prepared by the Pakistan EPA have been gone through while preparing this document.

1.2. Project Overview

The proposed project is the extraction and beneficiation of Barite and Lead/Zinc from the Gunga through open pit mining method. The Gunga prospect area is located within the 1500 km² in Kuzdar reserved area. A mining lease spanning 316 acres for exploration of barites in Gunga near Khuzdar, hosting proven reserves of 5 million tonnes and probable 50-100 million tonnes, was granted to BME by GoB. The lease is valid up to 2033. The technical data and process specifications details used in this report is provided by the Bolan Mining Enterprises management.

The deposit area is rugged with slopes ranging from 30º to 60º and at places steeper on escarpment sides. The deposit consists of two layers (Upper layer or Massive Barite Layer (MBL) and lower layer or Lower Mineralized Layer (LML). The operations are based on open-pit method to extract the ore from near-surface deposits with various angles of dip. The surface mining technique will be used for the extraction of ore. The processing plant will be installed to separate the waste material from the barite and consist of two lines for the processing of the upper and lower layer. The concentrator comprises of crushing, grinding, flotation, thickening and filtration & reagents preparation. Moreover, the site preparation work also include the tailing pond, water reservoir and designated area for overburden waste. The mine design work is based on the conversion of the ultimate pit shell to practical mine designs with berms and ramps. The general design criteria used are;

- Bench Height: 10m
- Overall slope angle: 40º
- Single slope angle: 60º
- Road width (dual-lane): 30m
- Road gradient: 10%

Figure 1.1: Barite-Lead-Zinc deposits in Gunga, Khuzdar.

1.3. Project Proponent-Bolan Mining Enterprises (BME)

Bolan Mining Enterprises (BME) is a joint venture between the Government of Balochistan (GoB) and Pakistan Petroleum Limited (PPL), each with a 50 percent working interest. BME was formed through a joint venture agreement signed on June 1, 1974 to mine, grind and market barite deposits near Khuzdar and other minerals in Balochistan. PPL was designated as operator under the agreement. The agreement was renewed in June 2004 for another 30 years, valid till 2033.

Government of Balochistan (GoB) granted a mining lease spread over 316 acres for exploration of Barite in Khuzdar, hosting proven reserves of 5 million tonnes and probable 50-100 million tonnes. BME the largest Barite producer and meets 90 percent barite requirement of the oil & gas exploration companies in Pakistan.

In 2002, BME acquired a mining lease over an area of 13,660 acres in Dilband for iron ore. Dilband ML is valid for three decades. Fine iron ore from Dilband was supplied to Pakistan Steel Mills during 2003 and 2004 but supply was discontinued because the agreement was not renewed. BME is now working on exploring suitable technology for utilization of low grade Dilband Iron.

BME also holds two iron mining licenses, valid until 2026, in the northwest of Nokkundi, Balochistan. These two mining lease hold about 50 million tonnes iron. Beneficiation studies on laboratory and pilot plant scale (2006), established that concentrate of acceptable quality could be produced from Nokkundi ore. This was followed by engineering study in 2008 for setting up a beneficiation plant with processing capacity of 0.5 million tonnes run of ore annually. Later, the study was revised and updated for annual processing of 1 million tonnes instead. Mine planning, designing and detailed engineering studies have recently been initiated for mining of iron ore on scientific basis to optimize production from Nokkundi reserves. The study will be completed by the mid 2017 including 8,500 meters drilling for a bankable feasibility study.

An exploration license for Lead and Zinc, covering an area of 1,77,597 acres, in Khuzdar was granted to BME in March 2008. Drilling of 2,100 meters completed which establishes its vertical and central continuity.

Based on a positive result, a feasibility study including 10,000m drilling is carried out through an Australian Drilling Company. The drilling commenced in June 2016 and completed in September 2017. It is anticipated the feasibility study will be completed in early March 2018.

Since 2013 BME entered into Barite export business and there is a high demand for BME barite in gulf countries. BME Barite is of API-drilling grade standard and generally having Sp gravity of greater than 4.21g/cm^3. BME exported about 200,000 metric tonnes barite to Middle East and other countries.

Mission

By the virtue of Joint Venture, BME is mandated to mine, process and market the already discovered Barite Deposits near Khuzdar and operate other minerals of Balochistan. BME is committed to deliver excellence and to transform natural resources into prosperity and sustainable development.

Vision

Our vision is to become a leading natural-resource exploration and exploitation company in Balochistan. We committed to deliver excellent value to all stakeholders.

Values

- A safe working environment through accident prevention.
- Consistent execution at all levels of our organization.
- Integrity and the highest ethical standards laid down by the venture.
- Mutual respect and trust in our working relationships.
- Teamwork and meeting our commitments.
- Diversity of people, customers, and ideas.
- Facilitating customers
- Aggressively exploring domestic and global market
- Continuous improvement, development.
- Performance with recognition for results.
- Support for the communities from which we transform resources.

Goal

BME goal is to learn from our past experiences, to sustain operations and maintain profitability and to continue to develop and grow by taking advantage of the opportunities presented by prevailing economic conditions in order to be one of leading mining companies.

Quality Control

BME has own API certified quality control laboratory for testing & analysis of both barite powder and Ore, however, BME also get production analyzed from independent labs (SGS Pakistan (Pvt) Limited & Qualities laboratory Karachi) for cross confirmation of test results and Administration control. The only material that conforms to API Specs 13-A releases for sales. Buyers are also encourage to carry out analysis through their own resources

Table 1.1 Barite Specifications (BME)

Generic Name	Barite
Commercial Product Name	Bolan Bar
Chemical Name	Barium Sulfate, $BaSO_4$
Molecular Weight	233.39
EC No:	231-784-4
CAS No:	7727-43-7
HS Code	2511.1000
Availability	Powder (200 mesh), ore / lumps (0-325 mm)
Packing Material for Powder	One tonne capacity polypropylene woven jumbo bag with poly ethylene inner lining.
Ore / Lumps	In loose form, size 0-325 mm
Relative density	4.20-4.25 mg/cm^3
Barium Contents	80% to 95 %

Color/ Odour	Varies from grayish to fawn/ odourless.
Melting Point	1580 °C
Water Solubility	Slightly soluble
Partition coefficient	n-octanol/water
Drilling Applications	As weighting agent during drilling of Oil & Gas wells
Other use	In the paper and rubber industries; as a filler or extender in cloth, ink, and plastics products; in radiography ("barium milkshake"); as getter (scavenger) alloys in vacuum tubes; deoxidizer for copper; lubricant for anode rotors in X-rays tubes; spark-plug alloys. Also used to make an expensive white pigment.

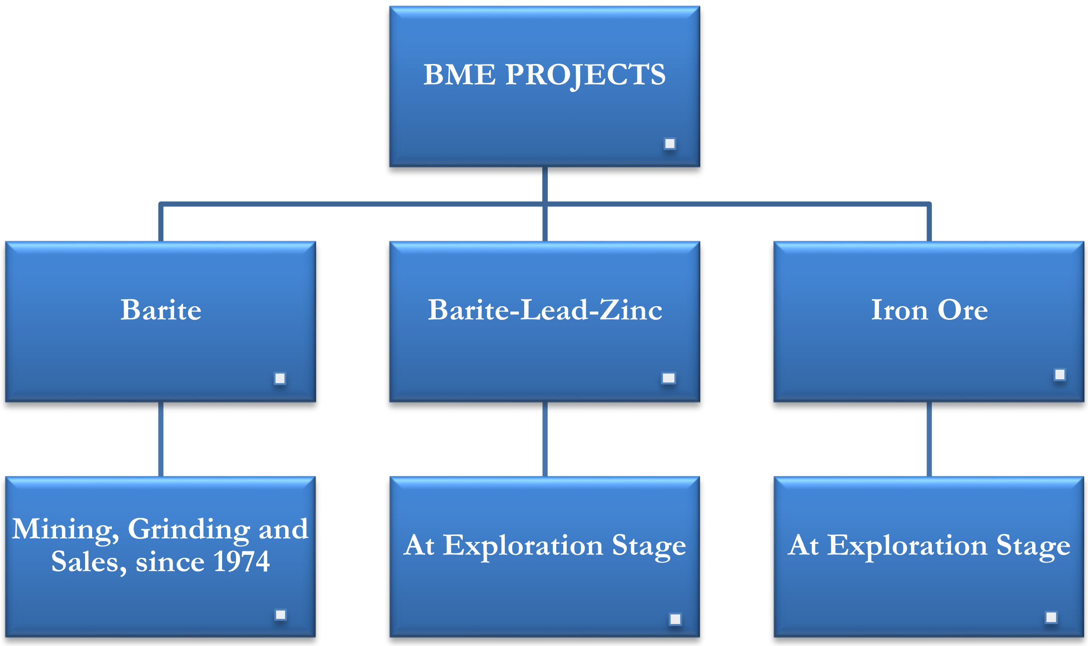


Figure 1.2 Bolan Mining Enterprises Project Organogram

1.4. Project Location

The Project Gunga deposit area is situated 16km to the southwest of Khuzdar city and about 3 km to the southeast of village Gunga, Ferozabad town in Khuzdar tehsil and Khuzdar District, Balochistan. The distance from Khuzdar to Karachi and Khuzdar to Quetta is approximately 350 km and 270 km respectively and RCD is the main highway that connects the Khuzdar city. The Gunga prospect area is located within the 1500 km² in Kuzdar reserved area. A mining lease spanning 316 acres for exploration of barytes in Gunga near Khuzdar, hosting proven reserves of 5 million tonnes and probable for 50-100 million tonnes, was granted to BME by GoB. The lease is valid up to 2033. The deposit area is rugged with slopes ranging from 30° to 60° and at places steeper on escarpment sides. The coordinates of the deposit area are Latitude 27° 44' 18" N and Longitude 66° 31' 42" E. The local elevation difference is up to 200 meters. The project area and adjoining locations are shown in figure 1.4.

Table.1.2: Total area for the proposed project		
Sr. No.	**Site**	**Area (Acres)**
1.	Gunga Barite Mine Lease Area	316
2.	Proposed Tailing Site	346
3.	Proposed Site for Processing Plant	180
4.	Proposed Waste Dump Area	452
5.	Proposed Water Reservoir	316
	Total Area for Proposed Project	**1,610**

Figure 1.2 Location of Proposed Project Site

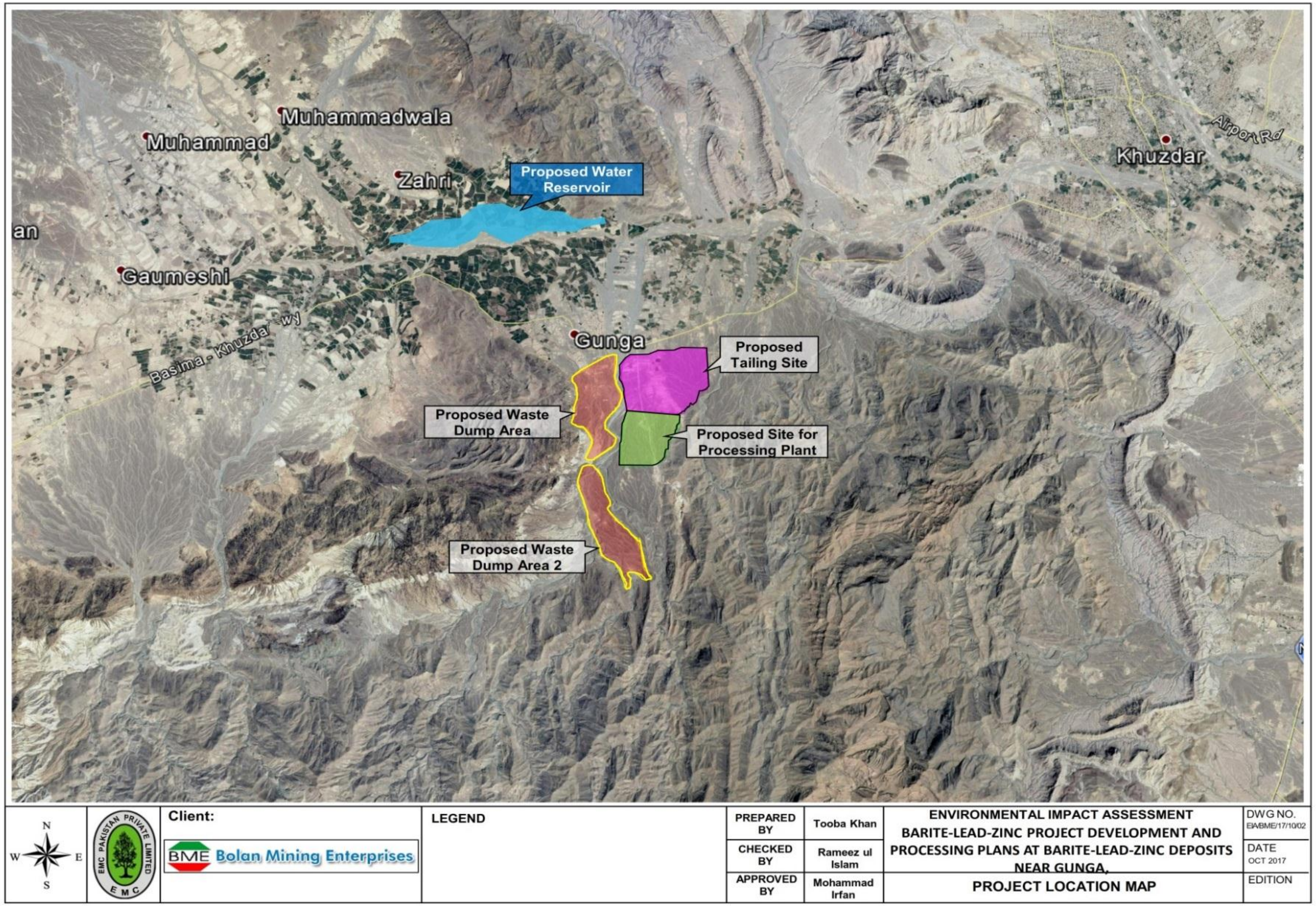


Figure 1.4 Location of Project area in Khuzdar

1.5. Project Need

Barite is an important mineral chemically it is 67.7% barium oxide and 34.3% sulphar trioxide. Its deposits in Pakistan are concentrated in Baluchistan and Khyber-Pakhtunkhwa. In 1984-85 Baluchistan produced 20699 tones and KPK 437 tones of barite[1]. About eleven million metric tones of barite deposits occur at Gunga 16 km South West of Khuzdar (Baluchistan).

Barite was first discovered in 1956 at Gunga near Khuzdar in Balochistan. Later, it was found in other places in the province and also in Haripur-Abbottabad region in Khyber Pakhtunkhwa. In fact an extensive lead-zinc-barite mineralization belt has been discovered in Lasbela, Balochistan. Significant localities are Shekran, Rang Laki, Mai Khor, Gunga, Surmai and Duddar. Minerals at Gunga, Sarmai and Duddar have been explored and evaluated for prospective deposits. The private sector has installed a few barite crushing plants in the two provinces which are in operation on a small scale.

Barite is known for its heavy specific gravity and used primarily as a weighting agent for drilling fluids; in addition, it has application as radiation-shielding material and heavy weight aggregate. Nearly 85% of the worldwide barite production is consumed in drilling of oil and gas wells. In exploration, drilling mud plays a vital role and is used as weighting agent. It is normally powder of some heavy minerals, viz. ilmenite, haematite, galena and barite, and balances high subsurface formation pressure during oil and gas well drilling. Among these, barite is widely used in the mud because of easy availability, low price, high specific gravity, low hardness and brittle nature.

Barite is mostly consumed as drilling mud additive during boring of water wells and in the petroleum drilling industry with the rest going in raw state to the pain industry in major cities of Pakistan. The AnalaR-Grade barium chemicals requirements are met through import and also products of international level in other industries like glass, paint and plastic is demand of the day.

Increase in barite production in successive years has been too slow, and remained static for many years in Pakistan. In 2003, barite production stood at 40,745 tonnes. However, since 2008 to 2012, barite production has been in the range of 52,000 to 56,500 tonnes, registering growth up to 75,000 tonnes only in 2014. Barite deposits are significant and suitably located for large-scale production. Yet barite's extraction and production is neither proportionate to its deposits nor commensurate with the varied applications in industry; the domestic demand of which is being largely met through imports.

Currently, world production is 9.6m tonnes annually, of which 90 percent is used in oil industry, 9 percent in other industries and 1 percent in construction. The US is the largest consumer of barite, with 3.4 million tonnes per year. Major consumption, besides the countries that produce barite, is recorded in the Middle East, Asia Pacific and African countries. Pakistani mineral and its derivatives have great export potential in these regions, whereas only small quantities have been exported so far.

[1] Studies o the Beneficiation of Gunga Barite with Different Concentrations of Hydrochloric Acid

Government of Balochistan (GoB) granted a mining lease for exploration of Barite in Khuzdar, hosting proven of million tones reserves. BME the largest Barite producer and meets 90 percent barite requirement of the oil & gas exploration companies in Pakistan.

Since 2013, BME entered into barite export business and there is a high demand for BME barite in gulf countries. BME barite is of API-drilling grade standard and generally having specific gravity of greater than 4.21 g/cm^3. BME exported about 200,000 metric tonnes barite to Middle East and other countries.

Mining, grinding and marketing of drilling grade barite powder and ore to mainly oil and gas drilling companies in domestic and global market and export of ore globally respectively. BME has its own storage facility at its mill premises at Khuzdar.

The low grade barites which are amenable to beneficiation are not being utilized and dumped as waster material. These waste dumps are becoming more environmental hazards. The specific gravity of low grade barite ranges from 3.5 to 4.1 with no marketability. The low grade barite needs to beneficiated to produce mud-grade concentrates to conserve valuable natural resources. There is a need to establish beneficiation plant of suitable capacity to treat low grade ore as wells as the high grade to produce super grade concentrates for oil and gas, pharmaceutical, chemical and paint industry. The proposed project would dramatically increase the export of barite and due to the commencement of project, Pakistan would likely to come under the top 10 of barite exporters countries in the world.

1.6. Objectives of EIA

The main objectives of the Environmental Impact Assessment (EIA) study are to:

- Describe key components of the microenvironment & macroenvironment of project area.
- Identify, analyze and evaluate the type and extent of likely potential environmental and social impacts with emphasis on significant beneficial/adverse effects the proposed project will cause on the existing biological, physical & socio-economic environments of the project area.
- Recommend mitigation measures and strategies to minimize or avoid adverse environmental & social impacts including monitoring plans for implementation of the mitigation measures.
- Assist planners and decision-makers in evaluating the project‘s feasibility based on its potential environmental impacts.
- Describe the project & all the activities to be carried out during the life of the project, including design, construction, operation, maintenance or any other activities relating to the project.

1.7. Project Categorization

Balochistan Environmental Protection Act (BEPA Act) was legislated in 2012. Section 15 of BEPA Act 2012 requires that every new project has to be preceded by an Initial Environmental Examination (IEE) or Environmental Impact Assessment (EIA) depending upon the size and severity of impacts anticipated on commissioning of the project. Pakistan Environmental Protection Agency (Review of IEE and EIA) Regulations, 2000 categorize projects in two separate schedules which requires either an IEE (Schedule-I) or an EIA (Schedule-II) where provisions of Section 15 BEPA-Act shall apply. According to the Schedule-II, the proposed project falls in the Category "C" Mining and Mineral Processing of coal, gold, copper, sulphur and precious stones.

1.8. Methodology of EIA

The environmental assessment (examination & evaluation) is based on comparative evaluation of the environmental quality before and after establishment of the project. For this purpose, the baseline or the profile project area was developed by collecting data, records and information on physical, ecological as well as socioeconomic environment of Khuzdar, in particular the surrounding areas in its neighbor-hood. An environmental audit of the activities so far undertaken has therefore been carried out, in addition to assessment of impact of construction activity at the different phases of the projects, i.e. pre-construction, construction, and operation/completion stages. The changes anticipated in the critical environmental aspects e.g. in the ambient environmental parameters that may be significant have been identified. This leads to identification of significant impact, for which necessary mitigation measures have been proposed. Figure 1.5 shows the step-by-step process for the completion of an EIA study.

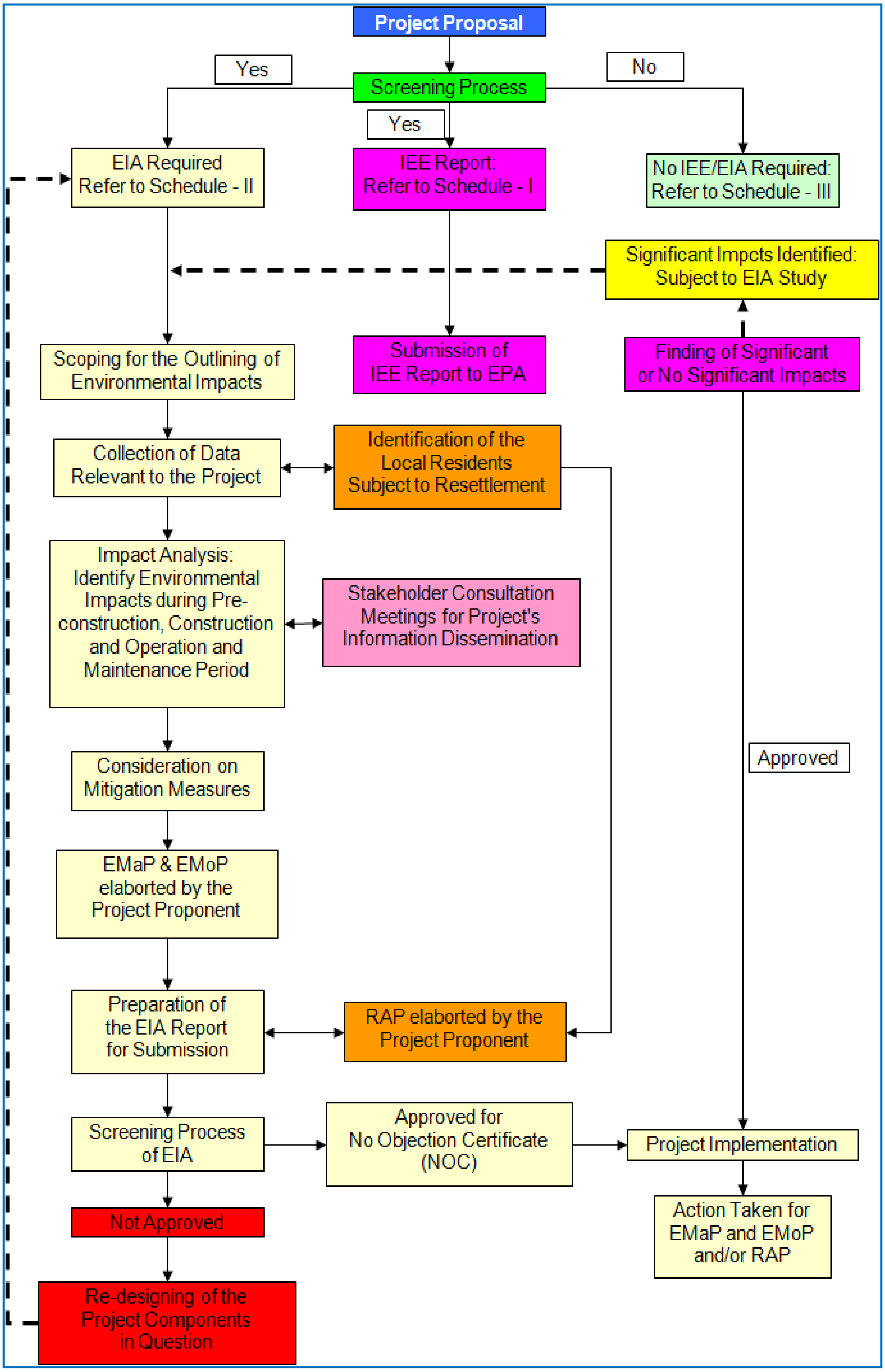


Fig 1.5: Methodology of EIA

A. Acquiring Project Specific Data

This was the very first step to embark on the study initiated through meetings held with the officials of Bolan Mining Enterprises. In the meetings, discussions were made to clarify the nature and extent of project in environmental perspectives. Basic information on the form of raw input received from the proponent was analyzed by the experts to comprehend the project & to assess its influence on the environment.

B. Literature Review

While the project details were being acquired, desktop study was also initiated simultaneously to draft environmental baseline information of the project area. The desktop study comprised of literature review, collection of updated authenticated published/printed data on the physical ecological and social environment related to the focused area. The same was also used to delineate the scope of surveys which would then form the basis of environmental assessment.

C. Stakeholder Consultation

Stakeholder consultations were held to involve the public in the decision making process and to have a fair interaction with all community groups and assuring them that every attempt would be made to reduce the negative impacts of the project, and that adequate remedial measures would be taken to recompense the loss of the affected persons, if any.

D. Reconnaissance and Detailed Surveys

Preliminary surveys of project location were organized by EMC Pakistan Pvt. Ltd in which experts visited the area and assessed the physical scenario in order to plan various detailed studies. The relevant surveys were carried out under the supervision of environmental experts. Preliminary socio-economic evaluation was also undertaken. This was followed by detailed and comprehensive surveys which were carried out in order to investigate various domains of environment and socio-economic sector to highlight various issues, and concerns that may lead to the identification of aspects and subsequent assessment of impacts.

Detailed environmental baseline survey was conducted to collect primary data in the Project surrounding to help identify sensitive receptors. The primary data were examined and compared with secondary data available from earlier environmental studies in the region. The scope of survey included collection of information on following key aspects:

Collection of environmental & social baseline data of the project area including the following items:

- Climate and Rainfall
- Air Quality
- Noise Quality
- Land and Soil
- Soil
- Geology
- Vegetation
- Fauna
- Geomorphology
- Administrative Division

Figure 1.6: Field Activities conducted by EIA study team

E. Aspects Identification

The EIA process requires development of an inventory of all possible environmental and socio-economic aspects, which provide the basis of categorization and evaluation of impacts and their likelihood to occur due to the materialization of the project. Aspects are those which are the causes of positive and negative impacts. Those aspects are primarily associated with activities performed during construction and operation phases of the project.

F. Impact Assessment and Mitigation Measures

Based on the developed aspects inventory, experts analyzed the aspects for their logical outcome as potential impacts on the physical, ecological and social environment. These impacts have been identified, assessed and weighed for different activities during construction, commissioning and operational phases of the project. Mitigation measures were also proposed for various activities of projects in order to minimize the potential impacts during the life span of the project.

G. Environmental Management and Monitoring Plan

In the light of impacts identified and mitigations proposed an Environmental Management Plan (EMP) has been developed which has a pivotal role in assigning tasks to personnel for the environmental management and implementation of mitigation measures as well as to monitor its effectiveness throughout the life cycle of the project. It also provided monitoring plans/procedures to be followed for checking and compliance maintenance of environmental quality and legal requirements through suggested mitigation measures.

H. Documentation Review and Conclusion

This is the final step to complete the environmental assessment and compile all the work done in shape of a report. Report writing started just after the initiation of environmental assessment. The report has been written by experts of EMC and compiled by the office staff in coordination with the experts. At the end of the study, the entire report is reviewed by the team leader followed by recommendations and conclusion in the light of the assessment.

I. Report Structure

The EIA report has been structured on the standard format, prescribed by the EPA. The Report has been presented in the following sections:

Chapter 1: Provides an introduction and overview of the project

Chapter 2: Details the project description, its objective, location of the facilities and construction & operation details including analysis of alternatives along with proposed schedule for implementation

Chapter 3: Gives an overview of policy and legislation along with international guidelines relevant to the project

Chapter 4: Provides description of the microenvironment and macro environment of the project area. This chapter contains the description of the physical environment, socio-economic condition and built environment of the area.

Chapter 5: Provides details of stakeholder consultation and the issues and concerns raised by the stakeholders and interested parties.

Chapter 6: Describes the potential environmental and social impacts of the proposed Project. General and project specific guidelines were used to assess the potential environmental impacts at the various stages - designing, construction and operations of the project.

Chapter 7: Presents the Environmental Management Plan and Monitoring Program for the project

Chapter 8: Presents the Risk Assessment & Disaster Management Plan

Chapter 9: Summarizes the report and presents its conclusions.

The main text of the report is supported by a series of Annexure which provide auxiliary information including respective sections of prominent Provincial, National & International Environmental Laws and Guidelines which form part of the environmental study are provided in the Annexure.

1.9. EIA Consultant

This EIA report has been prepared by EMC Pakistan Pvt. Ltd. EMC organized the following team for conducting the environmental assessment and preparing the Report:

Table 1.2: List of EIA Study Team

S. No.	Name of Expert	Position in EIA Study Team
1	Mr. Syed Nadeem Arif	Project Director
2	Mr. Saquib Ejaz Hussain	Team Leader/ EIA Specialist
3	Dr. Kella Lekhraj	Flora Expert
4	Mr. Shamim Fakhri	Fauna Expert
3	Mr. Khurram Shams	Social Expert
5	Mr. Shahbaz Ahmed	Environmental Specialist
6	Mr. Sohaib	Environmental Engineer
7	Mr. Irfan Ali	Environmentalist
8	Mr. Waqas Khan	HSE Advisor
9	Mr. Hassan Baloch	Sociologist

2 Description of Project

2.1 Introduction

The proposed project is the extraction and beneficiation of Barite and Lead/Zinc from the Gunga open pit. The Gunga prospect area is located within the 1500 km^2 in Kuzdar reserved area. A mining lease spanning 316 acres for exploration of Barites in Gunga near Khuzdar, originally proven reserves of 5 million tonnes, and probable 50-100million tonnes was granted to BME by GoB. The lease is valid up to 2033. The technical data and process specifications details used in this report is provided by the Bolan Mining Enterprises management.

The deposit area is rugged with slopes ranging from 30º to 60º and at places steeper on escarpment sides The deposit consists of two layers (Upper layer or Massive Barite Layer (MBL) and lower layer or Lower Mineralized Layer (LML). The operations is based on open-pit method to extract the ore for near-surface deposits with various angles of dip. The processing plant will be installed to separate the waste material from the barite and consist of two lines for the processing of the upper and lower layer. The concentrator comprises the crushing, grinding, flotation, thickening and filtration & reagents preparation. The mine design work is based on the conversion of the ultimate pit shell to practical mine designs with berms and ramps. The general design criteria used are;

- Bench Height: 10m
- Overall slope angle: 40º
- Single slope angle: 60º
- Road width (dual-lane): 30m
- Road gradient: 10%

Figure 2.1: Proposed project area, near Gunga Khuzdar.

2.2 Project Location

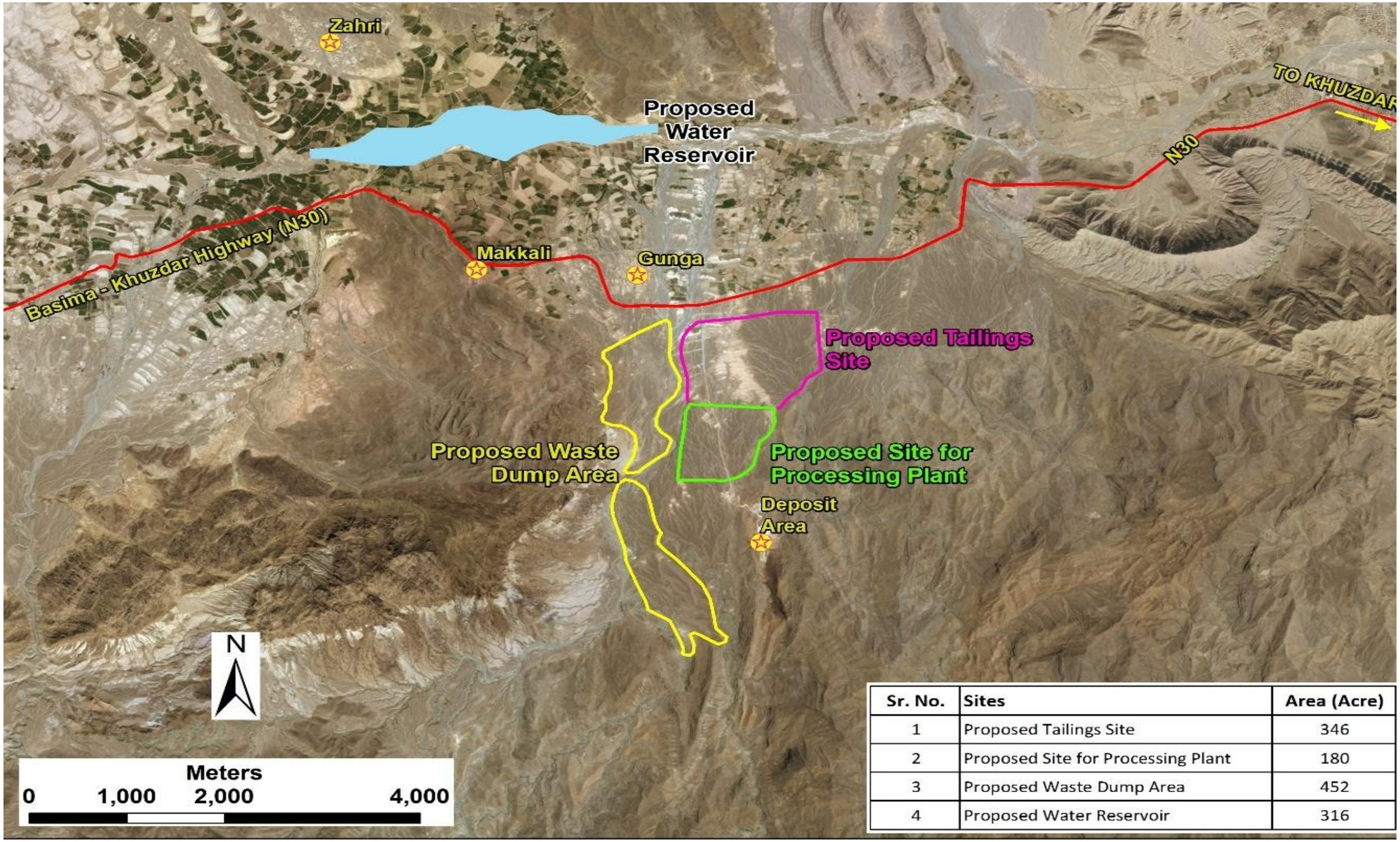
The Project Gunga deposit area is situated 16km to the southwest of Khuzdar city and about 3 km to the southeast of village Gunga, Ferozabad town in Khuzdar tehsil and Khuzdar District, Balochistan. The distance from Khuzdar to Karachi and Khuzdar to Quetta is approximately 350 km and 270 km respectively and RCD is the main highway that connects the Khuzdar city. The Gunga prospect area is located within the 1500 km² in Kuzdar reserved area. A mining lease spanning 316 acres for exploration of barytes in Gunga near Khuzdar, hosting proven reserves of 5 million tonnes and probable for 50-100 million tonnes, was granted to BME by GoB. The lease is valid up to 2033. The deposit area is rugged with slopes ranging from 30º to 60º and at places steeper on escarpment sides. The coordinates of the deposit area are Latitude 27° 44' 18" N and Longitude 66° 31' 42" E. The local elevation difference is up to 200 meters. The project area and adjoining locations are shown in figure 2.1.

Table.2.1: Total area for the proposed project

Sr. No.	Site	Area (Acres)
1.	Gunga Barite Mine Lease Area	316
2.	Proposed Tailing Site	346
3.	Proposed Site for Processing Plant	180
4.	Proposed Waste Dump Area	452
5.	Proposed Water Reservoir	316
	Total Area for Proposed Project	**1,610**

Barite-Mine Area

Proposed site for processing plant



Sr. No.	Sites	Area (Acre)
1	Proposed Tailings Site	346
2	Proposed Site for Processing Plant	180
3	Proposed Waste Dump Area	452
4	Proposed Water Reservoir	316

Figure 2.1: Location of Proposed Project

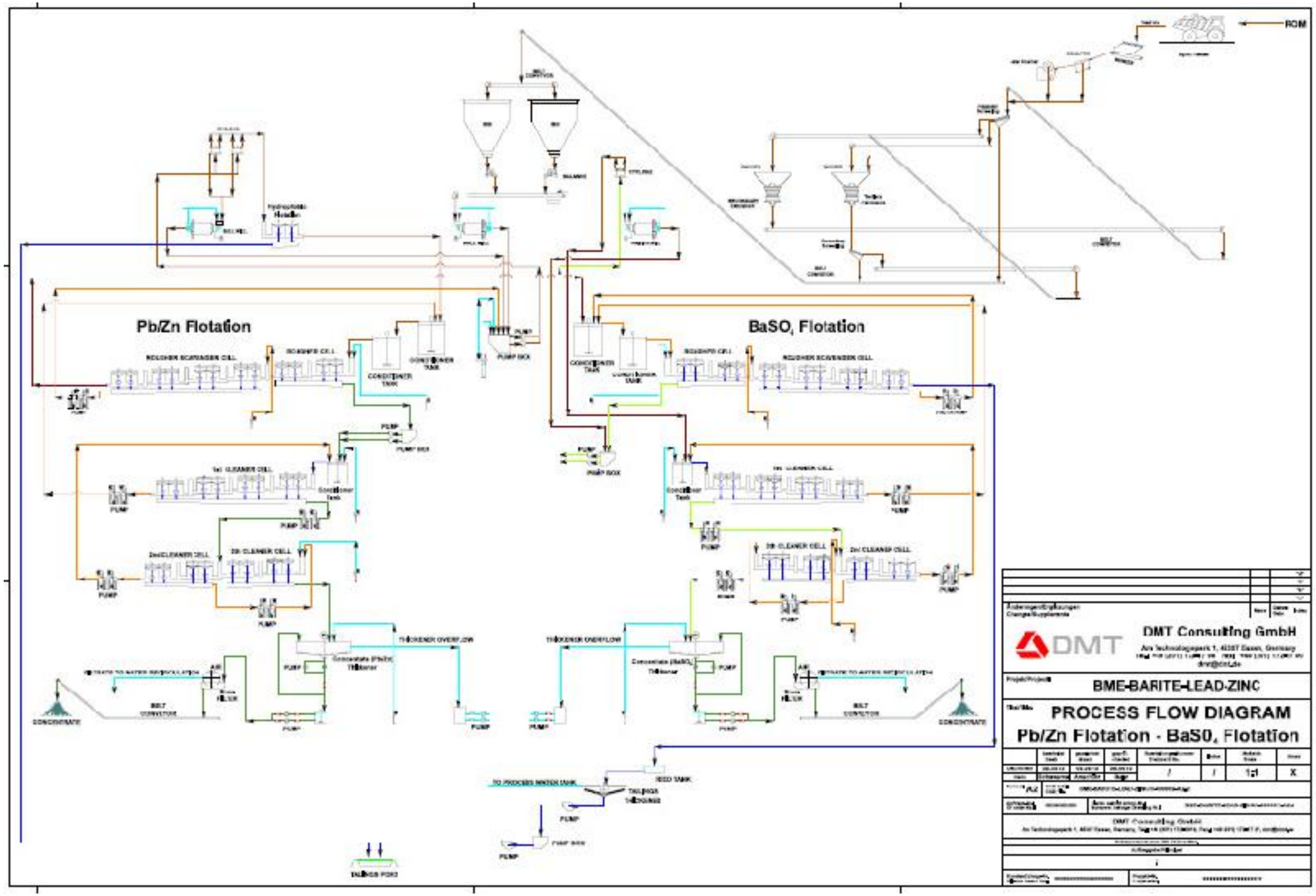


Figure 2.2: Process Flow Diagram Barite-Lead-Zinc, Bolan Mining Enterprises (BME)

2.3 Raw Material (Gunga Deposits) & Mining Activities

The barite-zinc-lead deposits of Khuzdar-Lasbela belt are most important sulfide mineral deposits in Pakistan. In Gunga about 11 million tons of barite ore with over 6% zinc and 1% lead combined have been estimated by JICA & MMAJ (1987). These barite and sulfide mineral deposits are located in the narrow metallogenic zone of Balochistan known as the Khuzdar-Lasbela belt. This belt is about 300 km long and is reported to contain several strata bound and vein type barite-zinc-lead occurrences. These deposits are widely distributed in Jurrassic sediments in Khuzdar and Lasbela districts.

In Gunga, two mineralized zones are recognized. The upper zone is mainly composed of barite, but significant concentration of sphalerite and galena are found in the lower mineralized zone (JICA and MMAJ, 1987). The model, generated by the interactive gravity modeling indicates that the Gunga mineralization has been deformed by the post tectonic activities and the complex structural set up controls the geometry of the Gunga mineralized zones.

The wall rocks have been altered in Gunga by solidification, leaching as well as by the introduction and oxidation of iron. This alteration appears to be partly related to barite deposition (Killinger and Ahmad, 1967). According to JICA and MMAJ (1987) the mode of barite mineralization in Gunga is divided into following four types-strata bound replacement associated with

- Fracture filling,
- Open space fillings in solution collapsed breccia
- Replacement in fault, and
- Veinlets associated with all these three types

The wall rocks in Gunga are hydrothermally altered. The alteration is not confined to the ore zones but is widespread (Jankovic, 1986). It appears that in Gunga like Mississippi Valley (Kaiser et al., 1987), the stratigraphic and structural control provided open space which facilitated fluid flow and mineral growth.


Barite-Zinc-Lead Deposits in Gunga, Khuzdar

The Gunga deposits consists of two layers Upper layer or Massive Barite Layer (MBL) and lower layer or Lower Mineralized Layer (LML). The surface mining technique will be used for the extraction of deposits which describe vertical levels of the material. The mine design work is based on the conversion of the ultimate pit shell to practical mine designs with berms and ramps. The general design criteria used are:

- Bench Height: 10 m
- Overall slope angle: 40°
- Single slope angle: 60°
- Road width (dual-lane) : 30 m
- Road gradient: 10%

All parameters are preliminary only and will be revised in the feasibility phase. The design of the final pit shell is displayed in Figure 2.2.

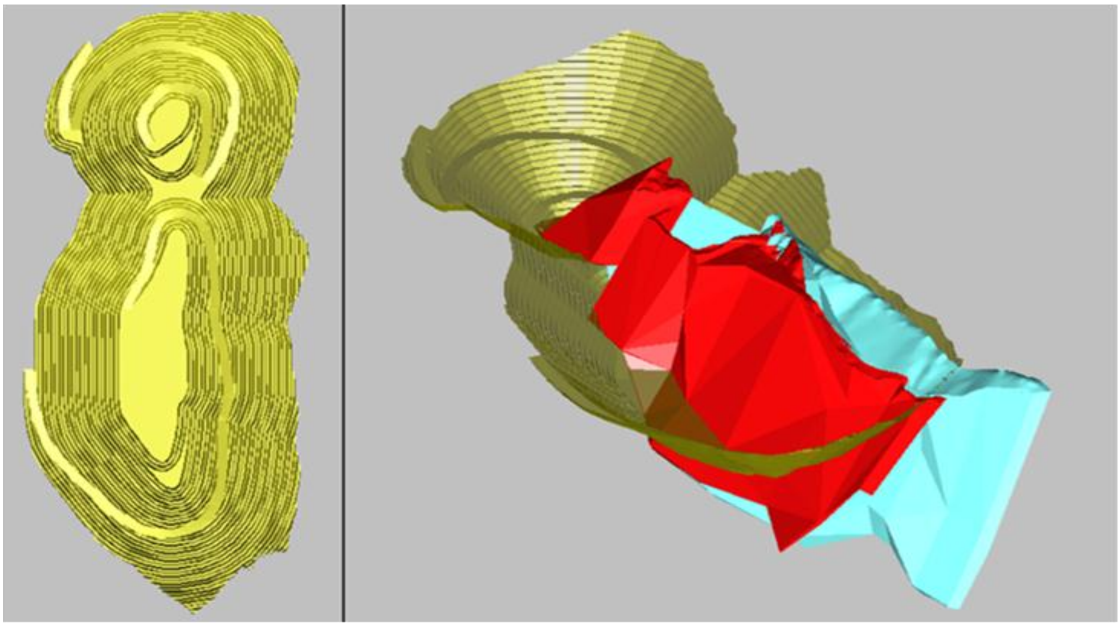


Figure 2.2: Design Ultimate Pit (Massive Barite Layer MBL in red and Lower Mineralized Layer LML in blue)

Raw Materials

On the basis of chemical analyses and content of the individual core samples in the specified zone, the average content of the main components were calculated table 2.1 & table 2.2;

- **Upper Layer**
  - Zn-1.855%, including Zn(O)-0.43%,
  - Pb-1.889%, including Pb(O)-1.109%,
  - $BaSO_4$ -44.05%,
  - Fe-3.48%
- **Lower Layer –**
  - Zn-2.573%, including Zn(O)-1.187%,
  - Pb-0.820%, including Pb(O)-0.155%,
  - $BaSO_4$ -3.40%,
  - Fe-13.57%.

Oxidation degree of the ore is very high, especially in the Upper Layer where oxidation of lead is at the level up to 60% and zinc above 23%. In the case of the Lower Layer this degree for lead is at the level of about 19% and for zinc is above 46%.

Content of $BaSO_4$ was calculated with assumption that whole Ba is contained in this mineral.

Table 2.1: The Upper Layer (after taking into account the thickness and the volume weight) (average volume weight 3.386g/cm3; degree of oxidation: Zn - 23.18%, Pb – 58.71%)

No. Drill Hole	Share [%]	Contents [%]						Separation [%]					
		Zn	Zn(O)	Pb	Pb(O)	$BaSO_4$	Fe	Zn	Zn(O)	Pb	Pb(O)	$BaSO_4$	Fe
BD 13-001	17.57	2.78	1.79	0.46	0.13	3.08	9.80	18.99	26.50	9.85	14.70	15.89	12.69
BD 13-002B	13.15	2.50	0.45	0.67	0.15	9.35	10.85	12.78	4.98	10.74	12.69	36.11	10.51
BD 13-003	9.08	4.24	0.47	4.43	0.73	9.69	10.05	14.96	3.59	49.05	42.66	25.84	6.72
BD 13-004	1.72	1.76	0.49	0.53	0.13	32.50	8.78	1.18	0.71	1.11	1.44	16.42	1.11
BD 13-005	13.30	2.58	1.82	0.49	0.10	0.99	18.33	13.34	20.39	7.95	8.56	3.87	17.96
BD 13-006	9.77	1.02	0.67	0.35	0.07	0.03	17.07	3.87	5.51	4.17	4.40	0.09	12.29
BD 13-007	14.12	3.02	1.45	0.38	<0.05	0.34	13.02	16.58	17.25	6.54	2.73	1.41	13.54
BD 13-008	7.00	2.89	1.47	0.22	0.06	0.02	15.59	7.86	8.67	1.88	2.70	0.04	8.04
BD 13-010B	14.29	1.88	1.03	0.50	0.11	0.08	16.28	10.44	12.40	8.17	10.12	0.34	17.14
$\sum$	**100.00**	**2.573**	**1.187**	**0.820**	**0.155**	**3.40**	**13.57**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**

Source: Pre feasibility study BME Management

Table 2.2: The Lower Layer (after taking into account the thickness and the volume weight) (average volume weight 2.965g/cm3; degree of oxidation: Zn - 46.13%, Pb – 18.90%)

No. Drill Hole	Share [%]	Contents [%]						Separation [%]					
		Zn	**Zn(O)**	**Pb**	**Pb(O)**	**$BaSO_4$**	**Fe**	**Zn**	**Zn(O)**	**Pb**	**Pb(O)**	**$BaSO_4$**	**Fe**
BD 13-001	17.57	2.78	1.79	0.46	0.13	3.08	9.80	18.99	26.50	9.85	14.70	15.89	12.69
BD 13-002B	13.15	2.50	0.45	0.67	0.15	9.35	10.85	12.78	4.98	10.74	12.69	36.11	10.51
BD 13-003	9.08	4.24	0.47	4.43	0.73	9.69	10.05	14.96	3.59	49.05	42.66	25.84	6.72
BD 13-004	1.72	1.76	0.49	0.53	0.13	32.50	8.78	1.18	0.71	1.11	1.44	16.42	1.11
BD 13-005	13.30	2.58	1.82	0.49	0.10	0.99	18.33	13.34	20.39	7.95	8.56	3.87	17.96
BD 13-006	9.77	1.02	0.67	0.35	0.07	0.03	17.07	3.87	5.51	4.17	4.40	0.09	12.29
BD 13-007	14.12	3.02	1.45	0.38	<0.05	0.34	13.02	16.58	17.25	6.54	2.73	1.41	13.54
BD 13-008	7.00	2.89	1.47	0.22	0.06	0.02	15.59	7.86	8.67	1.88	2.70	0.04	8.04
BD 13-010B	14.29	1.88	1.03	0.50	0.11	0.08	16.28	10.44	12.40	8.17	10.12	0.34	17.14
$\sum$	**100.00**	**2.573**	**1.187**	**0.820**	**0.155**	**3.40**	**13.57**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**

Source: Pre feasibility study BME Management

The following table lists the main mineral components occurred during the analysis of the processing sample provided in the course of the lab test work.

Table 2.3: List of the main mineral components

Mineral component	Relative proportions (mass %)	
	Upper ore	Lower ore
Illite	-	9.9
Dickite	11.7	-
Quartz	35.1	37.5
Calcite	5.0	11.9
Barite	42.7	-
Siderite	-	32
Pyrite	3.6	5.9
Galena	0.9	1
Wurtzite	1.0	1.8

Source: Pre feasibility study BME Management

Figure 2.3: Surface mining through Excavator and Jack hammer Equipment in Gunga Khuzdar

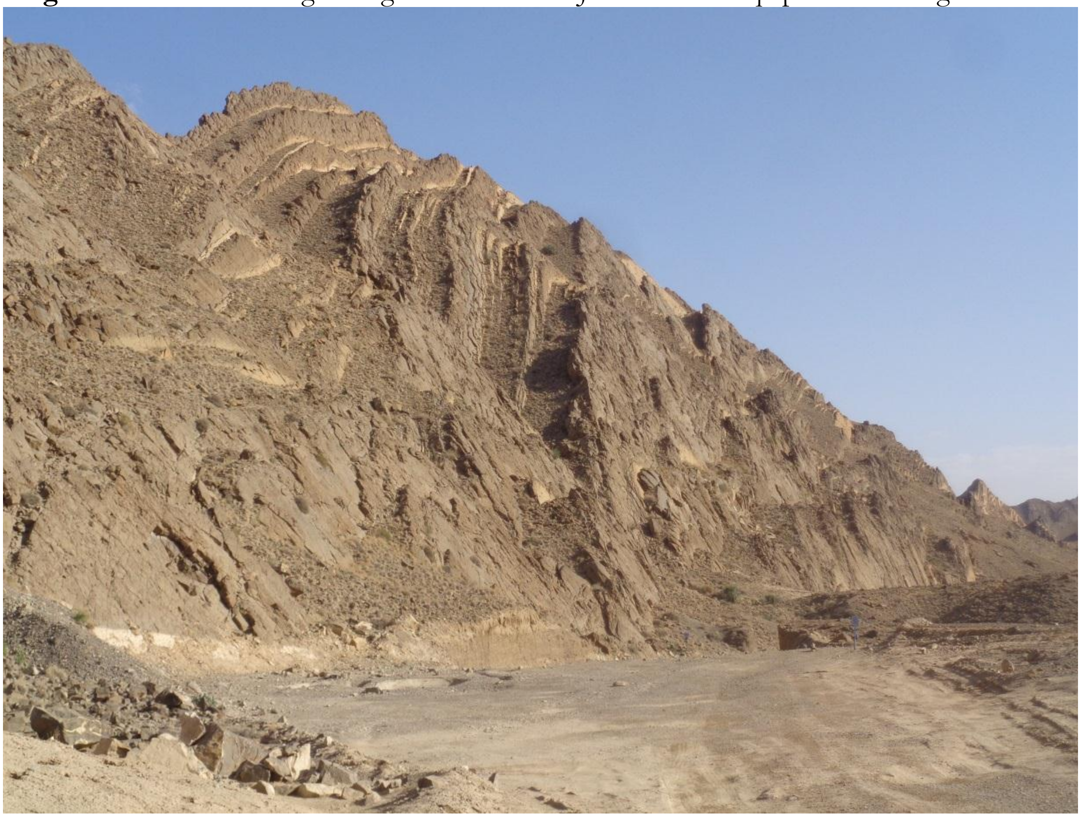


Figure 2.4: Raw Material-Barite deposit area, Gunga Kunzda

Main ore minerals as well as the ore minerals present in smaller quantities, create diverse forms of occurrence in the studied samples which are listed in the tables.

<table>
<tr><th colspan="4">Table 2.4: Main ore minerals with smaller quantities & create diverse</th></tr>
<tr><td>Mineral component</td><td>Form of occurrence</td><td>Lower ore</td><td>Upper ore</td></tr>
<tr><td rowspan="4">ZnS (wurtzite, sphalerite)</td><td>Free</td><td colspan="2">Free grains forming the intergrowths only with the gangue minerals of the ore</td></tr>
<tr><td>Intergrowths with pyrite</td><td colspan="2">grains forming the intergrowths with pyrite, in respect of quantity the zinc sulphide outnumbers the pyrite</td></tr>
<tr><td>Intergrowths with galena</td><td colspan="2">grains forming the intergrowths with galena, in respect of quantity the zinc sulphide outnumbers the pyrite</td></tr>
<tr><td>submicroscopic</td><td>Lack</td><td>submicroscopic aggregations accompanying the crystal zinc sulphide</td></tr>
<tr><td rowspan="4">galena</td><td>Free</td><td colspan="2">free grains forming the intergrowths only with the gangue minerals of the ore</td></tr>
<tr><td>Single grains without intergrowths</td><td colspan="2">grains crumbled from the ore, forming the single crystals without intergrowths with other mineral components of the ore</td></tr>
<tr><td>Intergrowths with ZnS</td><td>grains forming the intergrowths with zinc sulphide, in respect of quantity the galena outnumbers the zinc sulphide</td><td rowspan="2">lack</td></tr>
<tr><td>Intergrowths with pyrite</td><td>grains forming the intergrowths with pyrite, in respect of quantity the</td></tr>
<tr><td rowspan="3">pyrite</td><td>Free</td><td colspan="2">free grains forming the intergrowths only with the gangue minerals of the ore</td></tr>
<tr><td>Single grains without intergrowths</td><td>grains crumbled from the ore, forming the single crystals without intergrowths with other mineral components of the</td><td>lack</td></tr>
<tr><td>Framboids</td><td colspan="2">spherical framboidal aggregations forming the intergrowths only with the gangue components of the ore</td></tr>
<tr><td>goethite</td><td>Intergrowths mainly with ZnS or pyrite</td><td colspan="2">grains forming the intergrowths with zinc sulphide or pyrite</td></tr>
<tr><td colspan="4">Source: Pre feasibility study BME Management</td></tr>
</table>

Table 2.5: Forms of occurrence of the ore minerals according to the ore types

Mineral component	**Form of occurrence**	**Lower ore**	**Upper ore**
Hematite	intergrowths with the main ore minerals	Lack	grains forming the intergrowths with zinc sulphide or pyrite
Chalcopyrite	Free	free grains forming the intergrowths only with the gangue minerals of the ore	lack
Other Intergrowths	bornite-chalcocite	free grains forming the intergrowths only with the gangue minerals of the ore	
	ZnS-pyrite-galena	Lack	grains forming the intergrowths of three ore minerals: zinc sulphide, pyrite and galena

Source: Pre feasibility study BME Management

Table 2.6: List of Equipment for Mining Works

S. No.	Equipment	Unit	Specification	Units
1	Hydraulic Shovels	m^3	8	1
2	Front-end Loaders	m^3	16	2
3	Rear-dump Trucks	t	91	20
4	Rotary Drills	cm	27	3
5	Bulldozers	kW	140	5
6	Graders	kW	140	2
7	Water Tankers	L	26,000	1
8	Service/Tire Trucks	-	-	-
9	Bulk Trucks	Kg/min	450	1
10	Light Plants	kW	10	5
11	Pumps	kW	75	4
12	Pickup Trucks	Kg	900	12

Source: Pre feasibility study BME Management

2.4 Processing Plant[2]

The processing plant consists of 2 lines for the processing of the upper and lower layer which consist of crushing, grinding, flotation, thickening & filtration and regents preparations. The plant will be built over an area of 17.12 acres (210m x 330 m) and located next to the deposits as shown in the map 2.1.

2.4.1 Lower Layer

The concentrator consists of the following sections:

- Crushing
- Grinding
- Flotation
- Thickening and Filtration
- Reagents Preparation

A. Crushing section

The run of mine ore with max. 900 mm grain size is delivered by mine trucks to surface stockpiles. A front-end loader delivers the ore from the stockpiles to a feed hopper with a capacity of 45-60 m^3.

The ore from the feed hopper is discharged by variable speed apron feeder to grizzly the oversize to a jaw crusher. The undersize from the grizzly and the crushed product are transported by belt conveyors to double deck vibrating screens which separates at 14 mm and 45 mm.

The screen operated in a closed circuit with the 1st cone crusher (standard) for the fraction plus 45 mm, the crushed material is transported back to the screen. The plus 14 mm fraction is transported to two secondary. Cone crushers (granulator) operating in closed circuit with a double deck screen 15 and 10 mm. Screen oversize is transported back to the crushers.

Screen undersize is transported by belt conveyors to two 1,000 m^3 capacity fine ore bins. A vibrating feeder discharges the fine ore from the bins.

B. Grinding section

The grinding section consists of two overflow type wet mills, with 2,000 kW and 3,500 kW. The classification of the ground ore takes place in one stage hydro-cyclones. The ore minus 12 mm will be fed to the first ball mill via belt conveyors.

The first ball mill is operating in open circuit. The discharges of both mills and the scavenger concentrate of the rougher flotation are combined in a pump sump box and transferred via slurry to hydro-cyclones. The feed to the hydro-cyclones will be controlled via flow and density meters, the pressure with pressure indicator. The underflow of the cyclones is directed to the secondary ball mill. The overflow of the cyclones ($p80= 45\ \mu m$) is transferred to the Pb flotation. An automatic particle

2 *Source: BME Management*

size analyzer measures the size distribution of the product and defines the set point ossify the decontrol will be installed. Some of the collecting and depressing reagents are added to the ball mills.

C. Pb Flotation section

The overflow of the cyclone group is directed to two conditioner tanks where the slurry is mixed with collectors. Each tank has a volume of 50 m^3.

The conditioned slurry flows to the Pb rougher flotation consisting of 4 free flow type cells each of 50 m^3 volume. Further reagents will be added in the feed box of the flotation banks.

The rougher flotation is followed by rougher scavenger flotation, consisting of 8 free flow cells each of 50 m^3 volume. Additional collector and frother will be added. The concentrate of the rougher flotation will be directed to a three-stage cleaner flotation.

The 1st cleaner flotation consisting of a conditioner tank (25 m^3 volume) and 8 free flow cells each with 10 m^3 volume. The 2nd cleaner flotation consists of 4 cells each of 5 m^3 volume. The 3rd cleaner flotation consists of 4 cells each of 5 m^3 volume. While the lead final concentrate is pumped to the lead concentrate thickener, the tailings of the first cleaner will be directed back to the 1st conditioner of the rougher flotation. The tailings of the scavenger rougher lead flotation will be directed to the zinc flotation.

D. Zn Flotation section

The zinc rougher flotation consists of two conditioner tanks where the slurry is mixed with activators and collectors. Each tank has a volume of 50m^3. The conditioned slurry flows to the zinc rougher flotation consisting of 4 free flow type cells each of 50m^3 volume. Frother reagent will be added in the feed box of the flotation banks.

The rougher flotation is followed by the rougher scavenger flotation consisting of 8 free flow cells each of 50m^3 volume. Additional collector and frother will be added. The concentrate from the scavenger flotation will be added to the zinc flotation feed. The concentrate of the rougher flotation will be directed to a two-stage cleaner flotation.

The 1st cleaner flotation consists of conditioner tank (25m^3 volume) and 8 free flow cells each with 10 m^3 volume. The 2nd cleaner flotation consists of 4 cells each of 5m^3 volume. While the zinc final concentrate is pumped to the zinc concentrate thickener, the tailings of the first cleaner will be directed back to the 1st conditioner of the rougher flotation. The tailings of the scavenger rougher zinc flotation will be directed to the tailing thickener.

E. Dewatering section

The lead concentrate will be dewatered in a two steps dewatering section, consisting of a thickening and filtering part. The lead concentrate slurry containing approximately 10% solid will be pumped to

Pb-concentrate thickener (diameter 20 m) where the concentrate will be thickened to 70% solid. Before entering the thickener the slurry will be mixed with flocculants in order to achieve better settling rates. The mixing of slurry and flocculants solution takes place in the slurry pipe short before discharge point. The thickener underflow will be discharged with 70% solids and pumped to agitated surge tank and to the filter. The concentrate slurry will be dewatered in vacuum filters to residual moisture of 10%. Whereas the filtrate water of the vacuum filter will be pumped to Pb-concentrate thickener, the overflow water of the thickener will be re-circulated to the plant.

The zinc concentrate will be dewatered in the same way with a separate Zn thickener and vacuum filter. The filtrate water of the vacuum filter will be pumped to Zn-conc. thickener, the overflow water of the thickener will be re-circulated to the plant. The tailing from the zinc flotation will be directed to the tailing thickener.

Target of the Tailing Handling Section is the recovery of the process water from the tailings and to dispose the tailings slurry to the tailing pond.

Table 2.7: List of Equipment for Lower Layer

EQUIPMENT TYPE	**Capacity**	**Specification**	**Energy (kw) Unit**	**Energy (kw) Total**	**Unit**
Crushing-Screening Unit	Max. 500 t/h				
Bunker		150 m³		0	1
Apron Feeder			18.5	18.5	1
Grizzly scalper			15	15	1
Jaw Crusher			200	200	1
Cone Crusher			315	630	2
Feeder			5	5	1
Feeder			5	5	1
Screen			44	44	1
Screen			74	74	1
Total 500 m various of sizes and dimensions conveyor belt			564	564	1
Bunker for cone crusher		100 m3		0	2
Dust collector system and piping			110	110	1
Grinding Units	Max. 200 t/h				

Various sizes and dimensions conveyor belt			118	118	1
Ball Mill			2000	2000	1
Ball Mill			3500	3500	1
Hydro cyclones					2
Flotation Units					
Auto samplers					12
Online stream analyzer					1
Pb Conditioner Tank (50 m³)			45	90	2
Rougher Cells (50 m³)			37	148	4
Rougher Scavenger Cells (50 m³)			37	296	8
Conditioner Tank (25 m³)			30	30	1
Cleaner Cell (20 m³)			22	176	8
Cleaner Cell (5 m³)			15	60	4
Cleaner Cell (5 m³)			15	60	4
Zn conditioner Tank (50 m³)			45	90	2
Rougher Cells (50 m³)			37	148	4
Rougher Scavenger Cells (50 m³)			37	296	8
Conditioner Tank (25 m³)			30	30	1
Cleaner Cell (20 m3)			22	176	8
Cleaner Cell (5 m³)			15	60	4
Compressor and Blowers					
Chemical Preparing and					

Delivery					
Concentrate Thickener and Filtering Units					
Thickener	Diameter 20m		5.5	11	2
Drum Filter			5	10	2
Thickener	Diameter 50 m		10	10	1
SLURRY PUMPS AND ITS TANK			600	600	1
Source: Pre feasibility study BME Management					

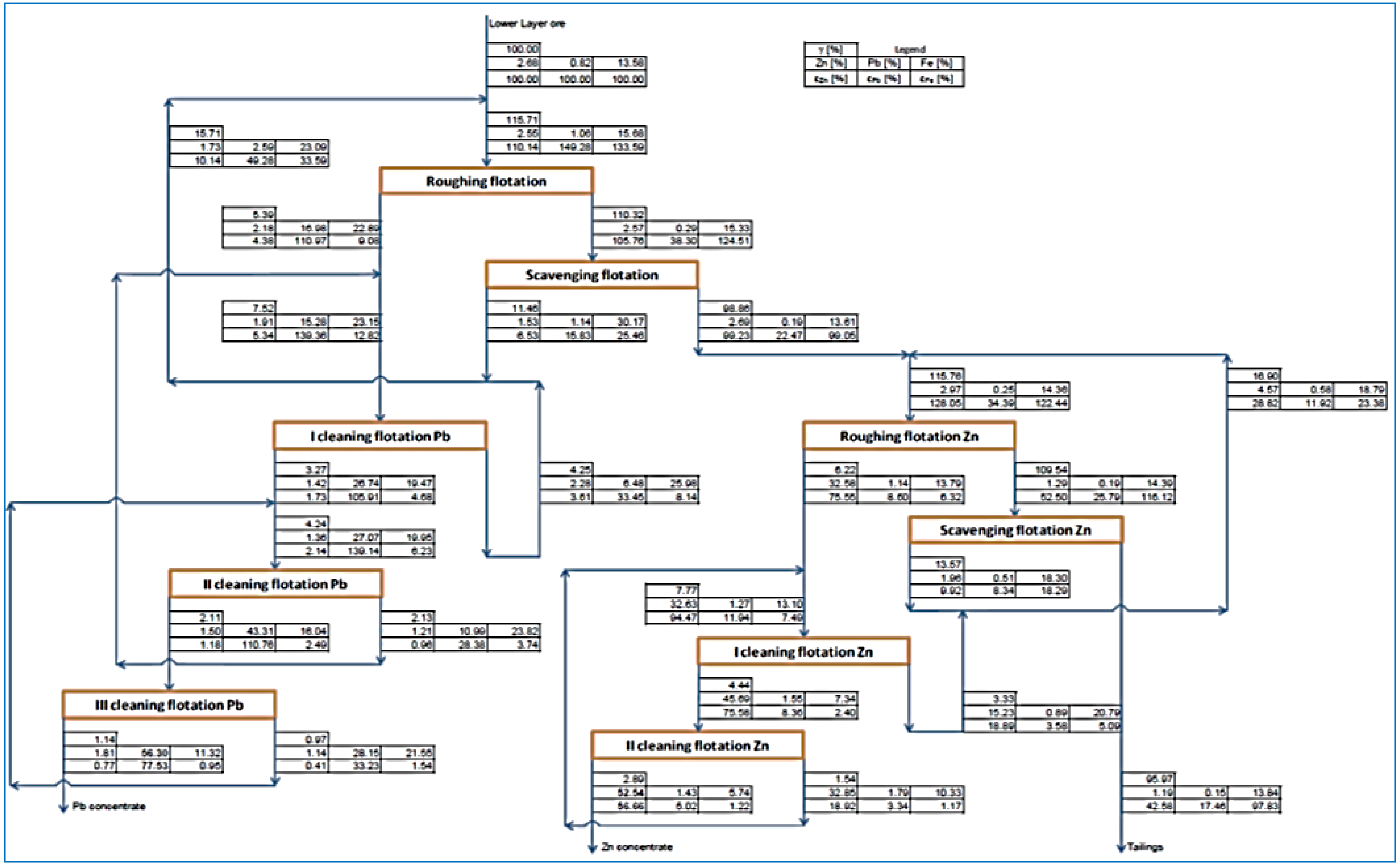


Figure 2.5: The lower layer process in proposed plant
(Source: Pre feasibility study BME Management)

2.4.2 Upper Layer

The concentrator consists of the following sections:

- Crushing
- Grinding
- Flotation
- Thickening and Filtration
- Reagents Preparation

A. Crushing section

The run of mine ore with max. 900 mm grain size is delivered by mine trucks to surface stockpiles. A front-end loader delivers the ore from the stockpiles to a feed hopper with a capacity of 45-60 m^3.

The ore from the feed hopper is discharged by variable speed apron feeder to grizzly the oversize to a jaw crusher. The undersize from the grizzly and the crushed product are transported by belt conveyors to double deck vibrating screens which separates at 14 mm and 45 mm.

The screen operated in a closed circuit with the 1st cone crusher (standard) for the fraction plus 45 mm, the crushed material is transported back to the screen. The plus 14 mm fraction is transported to two secondary. Cone crushers (granulator) operating in closed circuit with a double deck screen 15 and 10 mm. Screen oversize is transported back to the crushers.

Screen undersize is transported by belt conveyors to two 1,000 m^3 capacity fine ore bins. A vibrating feeder discharges the fine ore from the bins.

B. Grinding section

The grinding section consist of two overflow type wet mills with 1,200 kW and 1,600 kW. The classification of the ground ore takes place in one stage hydro-cyclones. The ore minus 12 mm will be fed to the first ball mill via belt conveyors.

The 1st ball mill is operated in open circuit. The discharges of both mills and the scavenger concentrate of the rougher flotation are combined in a pump sump box and transferred via slurry to hydro-cyclones. The feed to the hydro-cyclones will be controlled via flow and density meters, the pressure with pressure indicator. The underflow of the cyclones is directed to the secondary ball mill. The overflow of the cyclones ($p80= 45\ \mu m$) is transferred to the Hydrophobic flotation. A automatic particle size analyzer measures the size distribution of the product and defines the set point of the density control will be installed. Some of the collecting and depressing reagents are added to the ball mills.

C. Pb/Zn Flotation section

The tailing of the hydrophobic flotation will be directed to a two conditioner tanks where the slurry is mixed with collectors. Each tank has a volume of 50 m^3. The conditioned slurry flows to the Pb/Zn rougher flotation consisting of 4 free flow type cells each of 50 m^3 volume. Frother reagent will be added in the feed box of the flotation banks.

The rougher flotation follows the rougher scavenger flotation consisting of 8 free flow cells each of 50 m^3. Additional collector and frother will be added. The concentrate of the rougher flotation will be directed to a three-stage cleaner flotation.

The 1st cleaner flotation consisting of conditioner tank (25 m^3 volume) and 8 free flow cells each with 10 m^3 volume. The 2nd cleaner flotation consists of 4 cells each of 5 m^3 volume. The 3rd cleaner flotation consists of 4 cells each of 5 m^3 volume. While the bulk final concentrate is pumped to the bulk concentrate thickener, the tailings of the first cleaner will be directed back to the 1st conditioner of the rougher flotation. The tailings of the scavenger rougher bulk flotation will be directed to the barite flotation.

D. $BaSO_4$ Flotation section

The barite rougher flotation is consisting of two conditioner tanks where the slurry is mixed with collectors. Each tank has a volume of 50 m^3. The conditioned slurry flows to the barite rougher flotation consisting of 4 free flow type cells each of 50 m^3 volume. Frother reagent will be added in the feed box of the flotation banks.

The rougher flotation is followed by rougher scavenger flotation consisting of 8 free flow cells each of 50 m^3. Additional collector and frother will be added. The concentrate from the scavenger flotation will be added to the barite flotation feed. The concentrate of the rougher flotation will be directed to regrind mill and to three-stages cleaner flotation.

The 1st cleaner flotation consisting of conditioner tank (25 m^3 volume) and 8 free flow cells each with 10 m^3 volume. The 2nd cleaner flotation consist of 4 cells each of 5 m^3 volume and the 3th cleaner consist of 4 cells each of 5 m^3. While the barite final concentrate is pumped to the barite concentrate thickener, the tailings of the first cleaner will be directed back to the 1st conditioner of the rougher flotation. The tailings of the scavenger rougher barite flotation will be directed to the tailing thickener.

E. Dewatering section

The lead concentrate will be dewatered in a two steps dewatering section, consisting of a thickening and filtering part. The lead concentrate slurry containing approximately 10% solid will be pumped to Pb-concentrate thickener (diameter 20 m) where the concentrate will be thickened to 70% solid. Before entering the thickener the slurry will be mixed with flocculants in order to achieve better settling rates. The mixing of slurry and flocculants solution takes place in the slurry pipe short before discharge point. The thickener underflow will be discharged with 70% solids and pumped to agitated surge tank and to the filter. The concentrate slurry will be dewatered in vacuum filters to residual moisture of 10%. Whereas the filtrate water of the vacuum filter will be pumped to Pb-concentrate thickener, the overflow water of the thickener will be re-circulated to the plant.

The zinc concentrate will be dewatered in the same way with a separate Zn thickener and vacuum filter. The filtrate water of the vacuum filter will be pumped to Zn-conc. thickener, the overflow water of the thickener will be re-circulated to the plant. The tailing from the zinc flotation will be directed to the tailing thickener.

Target of the Tailing Handling Section is the recovery of the process water from the tailings and to dispose the tailings slurry to the tailing pond.

Table 2.8: List of Equipment for Upper Layer

EQUIPMENT TYPE	Capacity	Specification	Energy (kw) Unit	Energy (kw) Total	Unit
Crushing-Screening Unit	Max. 500 t/h				
Bunker		150 m^3		0	1
Apron Feeder			18.5	18.5	1
Grizzly scalper			15	15	1
Jaw Crusher			200	200	1
Cone Crusher			315	630	2
Feeder			5	5	1
Feeder			5	5	1
Screen			44	44	1
Screen			74	74	1
Total 500m various of sizes and dimensions conveyor belt			564	564	1
Bunker for cone crusher		100 m^3		0	2
Dust collector system and piping			110	110	1
Grinding Units	Max. 200 t/h				
Various sizes and dimensions conveyor belt			118	118	1
Ball Mill			1200	1200	1
Ball Mill			1600	1600	1
Hydro cyclones					2
Flotation Units					
Auto samplers					12
Online stream analyzer					1

Hydrophobic Flotation			45	90	2
pb/ Zn Conditioner Tank (50m^3)			45	90	2
Rougher cells (50m^3)			37	148	4
Rougher scavenger cells (50m^3)			37	296	8
Conditioner Tank (25 m^3)			30	30	1
Cleaner cell (20 m^3)			22	176	8
Cleaner cell (5 m^3)			15	60	4
Cleaner cell (5 m^3)			15	60	4
$BaSO_4$ Conditioner Tank (50 m^3)			45	90	2
Rougher Cells (50m^3)			37	148	4
Rougher Scavenger Cells (50m^3)			37	296	8
Conditioner Tank (25 m^3)			30	30	1
Rougher Cells (50 m^3)			37	148	4
Rougher Scavenger Cells (50 m^3)			37	296	8
Conditioner Tank (25 m^3)			30	30	1
Cleaner Cell (20 m^3)			22	176	8
Cleaner Cell (5 m^3)			15	60	4
Compressor and Blowers					
Chemical Preparing and Delivery					
Concentrate Thickener and Filtering Units					
Thickener	Diameter 20 m		5.5	11	2
Drum Filter			5	10	2
Thickener	Diameter 50m		10	10	1
SLURRY PUMPS AND ITS TANK			600	600	1

Source: Pre feasibility study BME Management

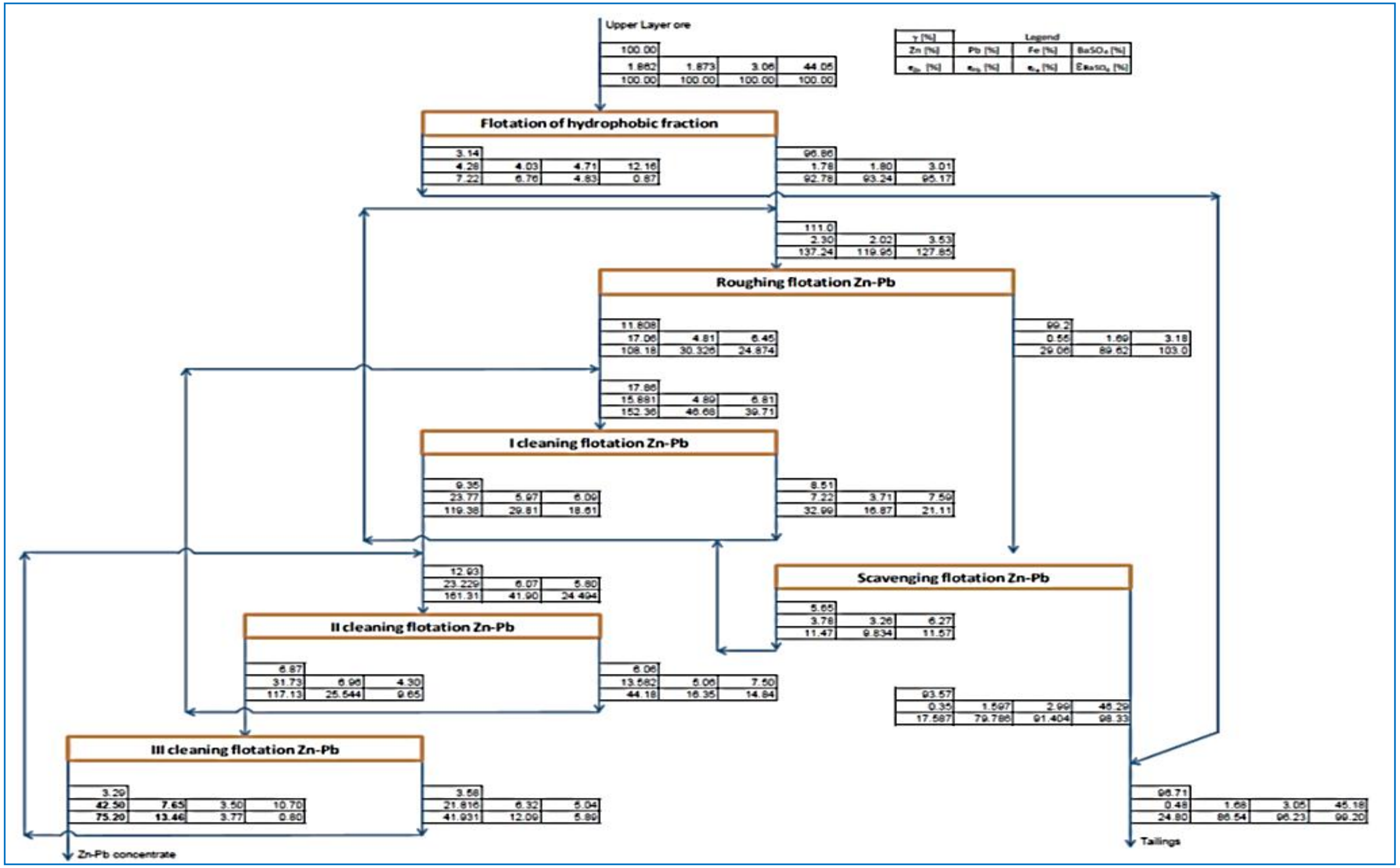


Figure 2.5: Upper Layer Qualitative-quantitative flow sheet of Zn-Pb bulk flotation after preliminary removal of hydrophobic fraction
(Source: Pre feasibility study BME Management)

2.5 Construction Phase for Proposed Project

2.5.1 Site Preparation

Construction will start from ground works followed by concrete works for installations once the sub-base of the site has been prepared and foundations laid for the process equipment and supporting infrastructure. Sealed site roads and paved areas will be constructed.

Topsoil will be removed and stored and not disposed off separately. Typical activities that will be conducted during civil construction are:

- Excavation for foundations
- Laying of foundations
- Masonry work
- Concrete work
- Asphalt work (pavement, roads etc.)
- Finishing (plastering, painting etc.)

Civil work comprises of construction of all manufacturing units and utilities areas, besides site leveling, roads, drainage, sewerage and all other infrastructure within the project site boundary. The general specifications/details in respect of type of structures, grade of concrete, materials, etc. for all major units have been assumed to confirm the standard practice of civil works.

Steel structures will comprise column structures, plated girders, rolled floor beams, floor plates, chequered plates, hand railings, stairs and ladders for machine platforms, operating platforms, control pulpits.

Figure: 2.6: Main Equipment used in the civil work

Steel structures will include column bracings, rafters, roof trusses, purloins, side runners, roof bracings, stairs, ladders, handrails, columns, floor beams (both rolled and built-up plated sections), chequered plate flooring, GCS sheets for side cladding and roof cladding. Main equipment to be used in the civil works is given in Table 2.9.

The major foundations of the proposed structure will be of concrete on bearing soil or underlying rock. Piling or equivalent soil improvement could be used in filled areas if required. Bearing capacity, settlement, static and dynamic loading conditions will be considered during design stage. Seismic conditions according to seismic zoning of Khuzdar area will be taken into account. Wind and all environmental conditions will be duly considered in the design. Color and finishing will be chosen with the aim of enhancing the visual aesthetics.

Table 2.9: List of Equipment / Machinery for Civil Works

S. No.	**Equipment**
1.	Graders/ Levels
2.	Excavators
3.	Pneumatic chiesels / Hammers
4.	Scaffolding Pipes and Fittings
5.	Concrete mixers or Readymade mixed concrete trucks
6.	Vibrators and grouting pressure pumps
7.	Survey equipment like theodolite, leveling instruments and compass
8.	Dumpers
9.	Steel Shuttering
10.	Compactors
11.	Road Rollers
12.	Mobile Cranes
13.	Concrete Lifters
14.	Tractors with trolleys
15.	Welding sets including auto / MIG welders
16.	Air Compressors
17.	Gas cutting sets

2.5.2 Site Restoration

On completion of the construction phase, the temporary infrastructure will be decommissioned and relevant sites restored. This will involve;

- Removal of the temporary construction camp;
- Reinstating the pipeline route back to the original condition;
- Closing all the temporary waste pits;
- Leveling and restoration of areas;
- Restoration of vegetation and topography.

2.5.3 Infrastructure Facilities

Following are the details regarding infrastructure and utilities requirements which will be developed on finalization of feasibility and starts of EPCC.

A. Tailings Management Facility (TMF)

A conventional impoundment is a surface retaining structure designed to store both tailings and mine water, with the aim of reclaiming the water for use in the processing plant as required.

B. Security & Safety Complex

The security and safety department is located in a 1,125 m² bone-story building comprising the alert center of the operations. The alert center is permanently manned with security and rescue personnel. The security force is supported by military personnel.

The equipment comprises off-road rescue and firefighting trucks. The building contains adequate rooms for the demonstration of safety procedures and equipment and the necessary safety training facilities.

A single-story gate house in both locations is provided at the main entrance of the mine.

C. Fencing

The mine sites are surrounded and protected by a 2.5-m high steel fence system

D. Workshop and Warehouse

The central maintenance and repair workshop and the warehouse of the mine are located in the proposed area for the processing plant.

E. Fuel and Grease Station

Oils, lubricants and coolants for the maintenance facility are stored in bulk tanks in a tank farm

Oils, lubricants and coolants for the maintenance facility are stored in bulk tanks in a tank farm situated adjacent to the shop and warehouse building. Transfer and distribution pumps are provided at each tank, with distribution lines to the maintenance facility.

F. Administration Complex

The administration complex should accommodate the offices of the General Manager, the Mine Manager, the Beneficiation Plant Manager, the Engineering Department and the Business Department. The building contains a reception area, the central switchboard, the necessary conference and storage rooms, respectively, small kitchens and the obligatory sanitary installations.

G. Housing

It has been estimated that about 400 staff of various categories shall be involved during the Construction and Operation phase of the BLZ Project. The Project colony is envisaged to be planned to accommodate about 300 staff i.e.75 % of the total staff since it is assumed that about 25 % of the staff shall be from adjacent villages and Khuzdar and would stay at their own places. The Project Colony should preferably be developed at a distance of about 2-3 Km from the Mine/Processing Plant site. The total area over which the Project colony has been planned and designed is about sixty (60) acres. The area for the Project Colony shall have to be acquired at appropriate location.

For the preparation of the master plan of the Project colony, planning standards of Pakistan for the residential colony have been followed. Therefore, in addition to the actual residential areas, requisite facilities such as infrastructure, community center, mosque, commercial area, medical center, offices, parks/play grounds etc. have also been provided.

The Project colony planning has been done in such a way that it can be extended without replication of the existing road network. The main entrance to the Colony has been provided such that the roads radiating from this center approach the residential plots. In addition two side entry gates have also been provided. The residential plots have been planned according to the various categories of the staff and their sizes vary accordingly.

Spaces have also been provided for the following facilities in the Project colony:

- Offices (Maintenance and Security
- Community Centre/Club
- Mosque
- Medical Centre
- Commercial Area
- Rest House
- Parks / Play Areas

The Facility Department is in charge of the camp management including the routine maintenance and repair and the housekeeping of the entire office complex and camp facilities. The tasks of the facility department include the operation of the canteen and of the hospital.

H. Military Barracks

The mining operation is most probably protected by one platoon of soldiers. The accommodation of the platoon should be in a separate building (1,290 m²) containing lounges for officers and soldiers, respectively, kitchen, sanitary installations and a prayer room. Such military barracks have been considered cost wise but not in a drawing.

I. Supply and Storage of Explosives and Detonators

A 900m² area is provided for the explosives storage facility to provide one-month storage of all explosives at both mines.

Caps are stored in a single-story building with slab-on-grade foundation, masonry construction, and a galvanized roof. The floor and walls are lined with wood to prevent sparks. The building is well ventilated and equipped with lightning conductors. Dynamite, prime cord and boosters are stored in an identical building. Both buildings are separated by a blast wall.

Bagged ammonium nitrate will be stored in another building with slab-on-grade foundation, masonry construction, and galvanized roof. No special provisions are required to prevent sparking.

J. Water Storage and Distribution

Water for domestic use and fire protection is trucked to the mine from the nearest water source or provided by wells depending on the quality. Domestic water is treated at packaged treatment plants and pumped to elevated storage tanks for distribution by gravity throughout the facilities. Water for drinking purposes is sealed bottled water.

K. Sewage Treatment and Disposal

A packaged treatment plant is provided to collect, treat, and dispose of sewage from the mine. Sewer pipes feed these plants by gravity.

L. Truck Weighing Station

The truck weighing station is able to handle 50-tonne on-highway ore trucks. It is operated on 3 shifts/day and manned by one (1) operator.

M. Yard Lighting

The mine sites are lit by streetlamps of 1,000 W.

Equipment	Unit	Specification	Units
Hydraulic Shovels	m3	8	1
Front-end Loaders	m3	16	2
Rear-dump Trucks	t	91	20
Rotary Drills	cm	27	3
Bulldozers	kW	140	5
Graders	kW	140	2
Water Tankers	I	26,000	1
Service/ Tire Truck			8
Bulk Truck	Kg/min	450	1
Light Plants	kW	10	5
Pumps	kW	75	4

Pickup Trucks	kg	900	12
Source: BME Management			

2.5.4 Power Supply[3]

The electric power for the proposed facilities to be established in the vicinity of mining site near Gunga shall be required as follow:

- Processing Plant
- Administration Block
- Workshop , Laboratory , Warehouse and other allied facilities
- Colony/Camp

It has been estimated that there will be a total power load demand ranging between 25-30 MW. This power demand is proposed to be met through a 132kV transmission line from the existing 220/132kV Khuzdar Substation located adjacent to N25 Highway approximately six (06) km south of Khuzdar City.

A. Power Supply from Wapda Network

It has been estimated that there will be a total power load demand ranging between 25-30 MW. This power demand is proposed to be met through a 132kV transmission line from the existing 220/132kV Khuzdar Substation located adjacent to N25 Highway approximately six (06) km south of Khuzdar City.

Figure 2.6: 220/132 KV Khuzdar Substation

The Khuzdar substation is fed by the following:

[3] *Source: BME Management*

- From Quetta via Kalat by 132kV overhead Double Circuit Transmission Line ; and
- From Dadu by newly constructed 220kV overhead Double Circuit Transmission Line.

The existing and proposed Electrical Network of the area under Quetta Electric Supply Company (QESCO) is shown in Figure 2.5,

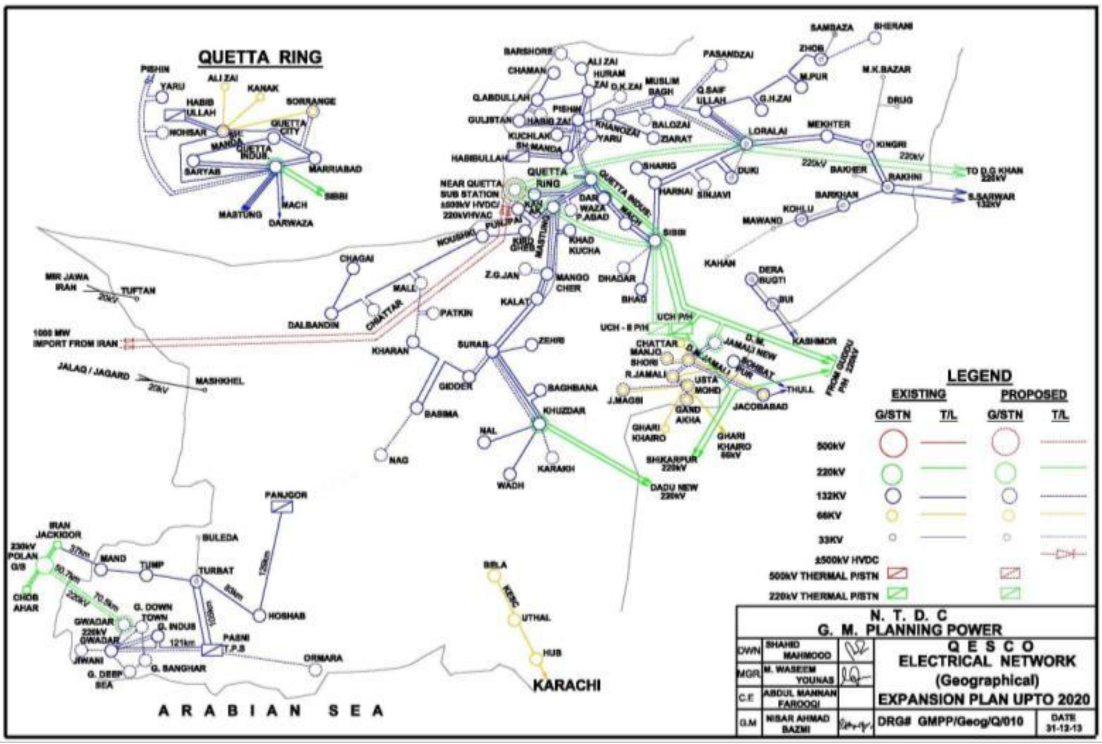


Figure 2.7: Electrical Network of the area under QESCO

The Khuzdar substation feeds Nal by a single circuit 132kV Transmission Line strung on one side of the double circuit 132kV towers. The power to the BLZ Project near Gunga can be supplied by utilizing and stringing the second circuit of existing 132kV Transmission Line Towers feeding Nal and erecting new towers in the off-shoot section leading to the proposed Plant area near the deposit.

Figure 2.8: Proposed Transmission Line Scheme

The estimated scope of work includes:

- 132kV Line Bay at Khuzdar Substation (Availability to be Verified by QESCO)
- Transformer Bay at Plant Substation with 132/11kV 40MVA Power Transformer
- 132kV Transmission Line approximately 14km (To be Verified by QESCO)

B. Power Supply by Generators

Continuous power supply is still a problem in Pakistan especially in remote areas like Gunga. It is assumed that WAPDA cannot provide sufficient electricity to assure the operation in the processing plant and associated supporting operations. This is the reason why as an option diesel based generator sets will be installed in the range of 2,500 kVA installed capacity.

- 6 generator sets for the operation of the processing plant
- 2 generator sets for the camp site
- 2 generator sets for any other necessary support

2.5.5 Water Supply[4]

Bore water is mainly used for plant process with other usages like gardening, fire hydrants and toilets and is supplied from tube-wells at around 300ft depth. The proposed water reservoir will be constructed over an area 316 acres in the north of the project site and having a capacity of around 100 million gallon (MG). Beside that water bowsers will also be utilized for fulfilling the requirement.

[4] *Source: BME Management*

Water requirement for the project is mainly for beneficiation process, maintaining the green belt and also for sprinkling to mitigate dust emissions. Water used for beneficiation process is recycled, and the makeup water is in the order. Water for domestic use and fire protection is trucked to the mine from the reservoir. Domestic water is treated at packaged treatment plants and pumped to elevated storage tanks for distribution by gravity throughout the facilities.

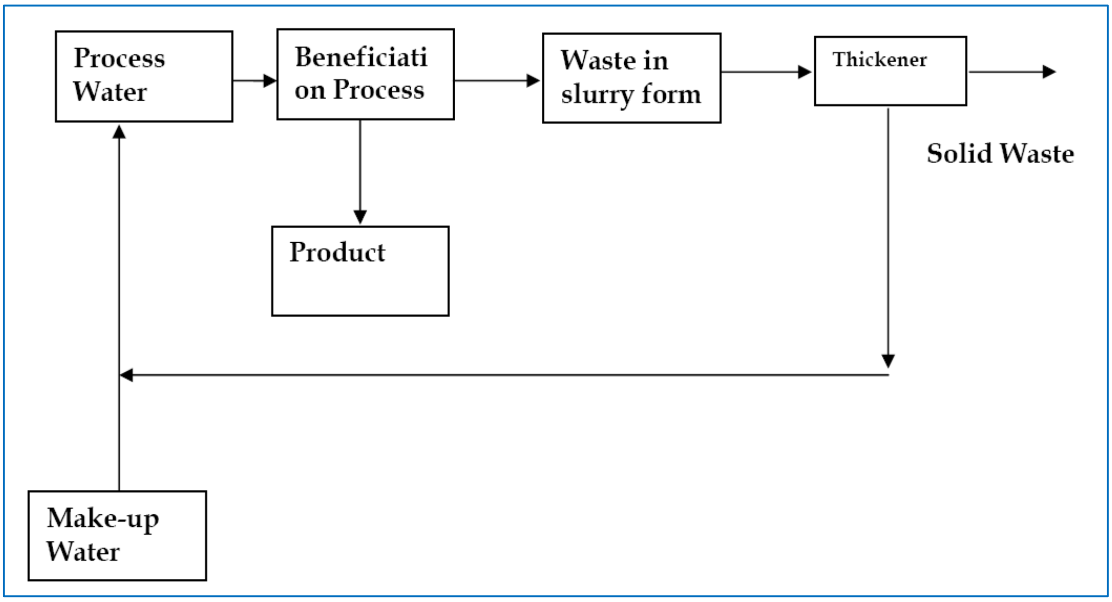


Figure 2.9 Water Recycling System for proposed project

2.5.6 Fuels

The low sulfur heavy fuel will be used for the backup generators, construction equipment such as graders, excavators, dumpers, tractors & mobile cranes. Electricity is the main source of energy for the process plant which is detailed discussed in earlier section.

2.6 Project Implementation Schedule

- Estimated date for the beginning of construction: January, 2018
- Estimated date for the beginning of operation: January, 2021
- Estimated date for the end of the project or decommissioning: December, 2047

2.7 Manpower for the Proposed Plant

Skilled manpower comprising of engineers, foremen, supervisors, technicians, welders and plant operators etc. will be recruited during the execution of the project so that the newly appointed staff is fully conversant with the installed equipment and actively participates in the commissioning process. Manpower require during the construction phase of the project is around 200-250 and it is estimated that manpower require for operation and maintenance of the new plant will be around 350.

2.8 Alternatives Analysis

The screening of alternatives is a part of the EIA process to select the best among all possible options. The alternatives of a project are defined as the options that can help to meet the objectives of a project by different means including an alternative project site, technology or material, design or inputs. The key criteria when identifying alternatives is that they be feasible and reasonable.

2.8.1 No Project Alternative

Barite-Lead-Zinc mining activity and the commencement of its processing plant will increase the barite production at global level. If the said project is not materialized then it will create the gap between the demand and supply of barite requirement. The proposed project will bring the Pakistan in Top 10 barite exporters in the world. This project will contribute to the job creation for the surrounding communities, the people of Khuzdar in particular and people of Balochistan in general in skilled, technical and administrative categories during construction and operation. These opportunities would contribute towards improving the economic conditions of the communities.

Therefore, unless economically, socioeconomically and environmentally more viable option can be found, the 'no project' option will not be considered as beneficial for the development project.

2.8.2 Site Selection

Barite mining activity is site specific. As per established geological reserves and proposed production the mine lease have sufficient reserves. The best possible location for siting up the proposed facility and other infrastructure by considering the raw material availability, barren land for processing plant, tailing pond, dumping waste area.

2.8.3 Technology Alternative

2.8.3.1 Crushers

Mobile track-mounted crushers or stationary crushers are used in the crushing process. Crushers may operate by compression or by impact.

a. Jaw Crusher

There are several different kinds of crushers. A jaw crusher is used at the beginning of the process, i.e. in the primary crushing phase to crush the largest boulders. Jaw crushers can crush all types of rock, including the hardest granite, brick, concrete and asphalt.

In a jaw crusher, a moving jaw attached to an eccentric shaft compresses the rock against a stationary jaw and the pressure crushes the rock. The grain size achieved with a jaw crusher depends on the distance, or setting, of the lower part of the jaws.

Jaw crusher will be used in the proposed project to grizzly the oversize material by feed hopper.

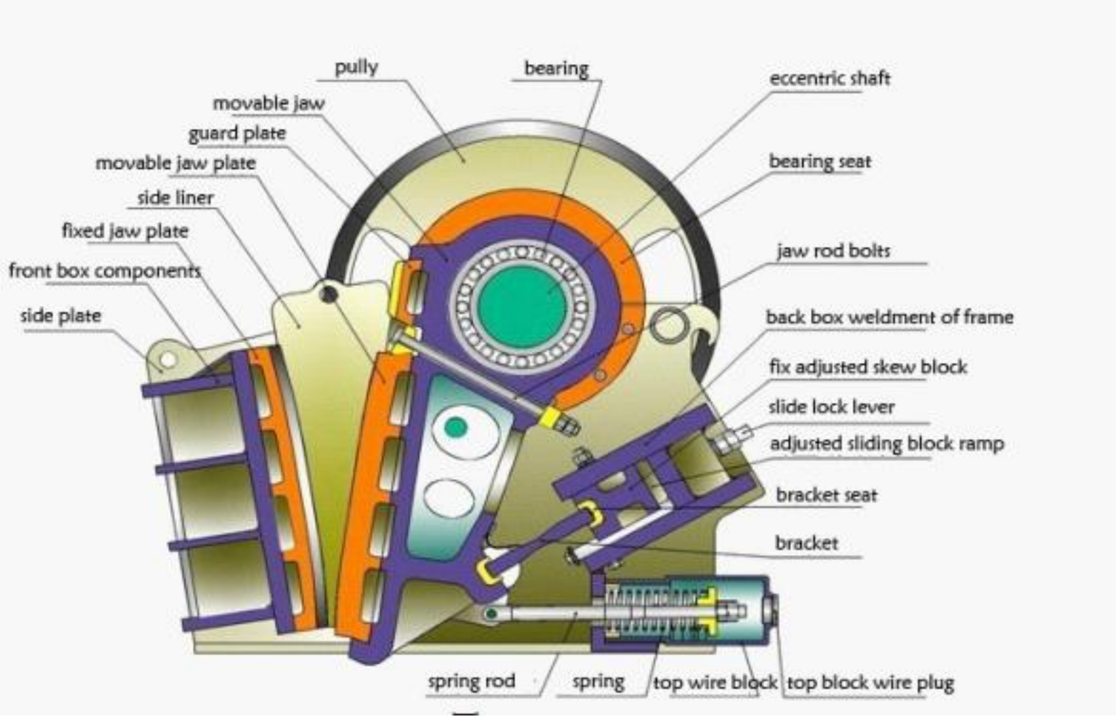


Figure: 2.10 Jaw Crusher

b. Hammer Crusher

Hammer crushers (single or double horizontal shaft) operate by material falling into the circle of the rotating hammers and being impacted by the hammers and the breaker plate. The feeder elevation and, therefore the velocity with which the material enters the circle is critical; if too low, the material bounces on top of the hammers and if too high, it penetrates through the circle and can damage the rotor discs. The discharge is partially or wholly screened by grates against which secondary reduction by attrition takes place. The grate slot size governs discharge top size but this configuration requires relatively dry material to avoid plugging.

c. Impact Crusher

Impact crushers are similar in operation to hammer crushers. Some units involve attrition but relatively wet materials can be handled. Impact crushers are used to crush medium- hard rock and softer rock materials like limestone. Impact crushers can be used also to process all recycling materials.

d. Roller Crusher

Roller crushers are used mainly for crushing easily fractured materials such as soft lime- stone, chalk, and clay. Roller crushers are employed for primary and secondary crushing. Depending on the hardness of the material concerned, lumps are reduced to between a third and a fifth of their original size. Size reduction is effected by tearing and crushing the material between rollers. The machinery is overload-protected by a plate punching device connected to the bearing of the adjustable roller, combined with a motor safety switch. If an extremely hard object is jammed between the rollers, the punching device is activated and the crusher and feed are stopped. The motor power is transmitted through a gear-drive and two cardan shafts to permit the adjustment of the space between the rollers. The frame structure of the roller crusher comprises welded and cast steel parts which are bolted together. The rollers are provided with grease-lubricated roller bearings. The toothed wheels on the gear-drive are oil-immersed with grease lubricated shaft bearings.

2.8.3.2 Mill (Grinding)

A mill is a device that breaks solid materials into smaller pieces by grinding, crushing, or cutting. In materials processing a grinder is a machine for producing fine particle size reduction through attrition and compressive forces at the grain size level.

a. Ball Mill

A typical type of fine grinder is the ball mill. A slightly inclined or horizontal rotating cylinder is partially filled with balls, usually stone or metal, which grind material to the necessary fineness by friction and impact with the tumbling balls. Ball mills normally operate with an approximate ball charge of 30%. Ball mills are characterized by their smaller (comparatively) diameter and longer length, and often have a length 1.5 to 2.5 times the diameter. The feed is at one end of the cylinder and the discharge is at the other. Industrial ball mills can be as large as 8.5 m (28 ft) in diameter with a 22 MW motor.

Ball mill is used in the BME operation for the grinding purpose.

b. Rod Mill

A rotating drum causes friction and attrition between steel rods and ore particles. But note that the term 'rod mill' is also used as a synonym for a slitting mill, which makes rods of iron or other metal. Rod mills are less common than ball mills for grinding minerals.

The rods used in the mill, usually a high-carbon steel, can vary in both the length and the diameter. However, the smaller the rods, the larger is the total surface area and hence, the greater the grinding efficiency

c. Autogenous mill

Autogenous or autogenic mills are so-called due to the self-grinding of the ore: a rotating drum throws larger rocks of ore in a cascading motion which causes impact breakage of larger rocks and compressive grinding of finer particles. It is similar in operation to a SAG mill as described below but does not use steel balls in the mill. Also known as ROM or "Run Of Mine" grinding.

d. SAG mill

SAG is an acronym for Semi-Autogenous Grinding. SAG mills are autogenous mills but use grinding balls like a ball mill. A SAG mill is usually a primary or first stage grinder. SAG mills use a ball charge of 8 to 21%. The largest SAG mill is 42' (12.8m) in diameter, powered by a 28 MW (38,000 HP) motor. A SAG mill with a 44' (13.4m) diameter and a power of 35 MW (47,000 HP) has been designed.

Attrition between grinding balls and ore particles causes grinding of finer particles. SAG mills are characterized by their large diameter and short length as compared to ball mills. The inside of the mill is lined with lifting plates to lift the material inside the mill, where it then falls off the plates onto the rest of the ore charge. SAG mills are primarily used at gold, copper and platinum mines with applications also in the lead, zinc, silver, alumina and nickel industries

e. Pebble mill

A rotating drum causes friction and attrition between rock pebbles and ore particles. May be used where product contamination by iron from steel balls must be avoided. Quartz or silica is commonly used because it is inexpensive to obtain.

f. Tower mill

Tower mills, often called vertical mills, stirred mills or regrind mills, are a more efficient means of grinding material at smaller particle sizes, and can be used after ball mills in a grinding process. Like ball mills, grinding (steel) balls or pebbles are often added to stirred mills to help grind ore, however these mills contain a large screw mounted vertically to lift and grind material. In tower mills, there is no cascading action as in standard grinding mills. Stirred mills are also common for mixing quicklime (CaO) into a lime slurry. There are several advantages to the tower mill: low noise, efficient energy usage, and low operating costs.

3 Policy, Legal & Regulatory Framework

Presented in this section are the Policy, Legal and Administrative Framework of Project in the context of sustainable development. All legal provisions relevant to environmental protection applicable to the planning, construction and operation were identified under the scope of the EIA. The proponent has to be well aware of these requirements and comply with the provisions as applicable and necessary.

3.1 Administrative Framework

Before the 18th amendment in the Constitution of Pakistan, the environmental issues were governed by three levels of the government viz. Federal, Provincial and Local Government. As a result of the 18th Amendment this subject is now in the exclusive domain of the provincial government. The Ministry of Environment at the federal level was abolished. Its functions related to national environmental management were transferred to the provinces. To manage the international obligations in the context of environment, a new ministry - the Ministry of Climate Change – was created at the federal level. As of now, Punjab, Sindh, KPK and Balochistan have enacted their own environmental protection laws.

In Balochistan at Provincial level, the Environmental Protection Council (EPC) was to be formed consisting of Chief Minister as Chairperson with Minister for Environment at Vice chairperson. Members include Chief Secretary Balochistan, Secretary Environment, Secretary Finance, Secretary Industries, Secretary Agriculture, Secretary Forest, Secretary P&D, Secretary S&GAD and Director General EPA. Other members are from Balochistan Chamber of Commerce and Industries, Balochistan Chamber of Agriculture. Environmental experts/Scientists, educationist and a member from NGO are also to be in EPC.

The EPC is policy-making body under the provincial environmental legislation scheme. The functions and powers of EPC include coordination & supervision of provisions of Act, approving provincial environmental & sustainable development policies & NEQS, provide guidance for protection & conservation and deal with provincial issues.

Balochistan Environmental Protection Agency (BEPA) is an administrative, implementation and enforcement body. The BEPA is headed by a Director General (DG) with the aim to exercise the powers and perform the functions assigned to it under the provisions of the Balochistan Environmental Protection Act 2012 and Pakistan EPA IEE /EIA regulations 2000. The BEPA has technical and legal staff and may form advisory committees. It also prepares environmental policies, takes measures for implementation of environmental policies & prepares Balochistan Environment Report.

BEPA shall also establish systems and procedures for surveys, surveillance, monitoring, measurement, examination, investigation research, inspection and audit to prevent and control pollution and to estimate the costs of cleaning up pollution and rehabilitating the environment and sustainable development. BEPA would also take measures for protection of environment such as to promote research; issues licenses for dealing with hazardous substances, certify laboratories, identify need for or initiate legislation, specify safeguards etc. BEPA would also encourage public awareness and education regarding environmental issues.

BEPA has powers to enter or inspect under a search warrant issued by Environmental Protection Tribunal or a Court search at any time, any land or building etc. where there are reasonable grounds to believe that an offence under the Act has been or is being or likely to be committed. BEPA may also take samples, arrange for testing or confiscate any article in discharge of their duties. The Act is annexed in this EIA report.

3.2 Statutory Framework

The development of statutory environmental framework has progressively gained priority in Pakistan since the late 1970s. The Pakistan Environmental Protection Ordinance 1983 was the first codifying legislation on the issue of environmental protection. This was indeed a consolidated enactment to plug the gaps and remove defects / deficiencies in the legislation. The promulgation of this ordinance was followed, in 1984, by the establishment of the Pakistan Environmental Protection Agency, the primary government institution dealing with environmental issues. Significant work on developing environmental policy was carried out in the late 1980s, which concluded in the drafting of the Pakistan National Conservation Strategy. Provincial environmental protection agencies were also established at about the same time. The NEQS were established in 1993 and were amended in 1995 and 2000. The Pakistan Environmental Protection Act (PEPA) 1997 was enacted to replace the 1983 Ordinance. PEPA conferred broad-based enforcement powers to the environmental protection agencies. Penalties were prescribed for those contravening the provisions of the Act. The powers of the federal and provincial Environmental Protection Agencies (EPAs) were also considerably enhanced under this legislation and these Agencies have been given the power to conduct inquiries into possible breaches of environmental law either of their own accord, or upon registration of a complaint. This was followed by the publication of the Pakistan Environmental Protection Agency Review of IEE-EIA Regulations 2000 which provided the necessary details on the preparation, submission, and review of IEE and EIA.

3.3 Constitutional Provision

Prior to the 18th Amendment to the Constitution of Pakistan in 2010, the legislative powers were distributed between the federal and provincial governments through two 'lists' attached to the Constitution as fourth Schedule. The Federal list covered the subjects over which the federal government had exclusive legislative power, while the 'Concurrent List' contained subjects regarding which both the federal and provincial governments could enact laws. The subject of 'environmental pollution and ecology' was included in the Concurrent List and hence allowed both the national and provincial governments to enact laws on the subject. However, as a result of the 18th Amendment concurrent list has been omitted and this subject is now in the exclusive domain of the provincial government.

- The Ministry of Environment at the federal level was abolished. Its functions related to national environmental management were transferred to the provinces. To manage the international obligations in the context of environment, a new ministry - the Ministry of Climate Change – was created at the federal level.

- After the enactment of provincial legislation, the PEPA 1997 is technically no longer applicable to the provinces. The provinces are required to enact their own legislation for environmental protection.

As of now, Punjab, Sindh, KPK and Balochistan have enacted their own environmental protection laws. These provincial laws are largely based on PEPA 1997 and, hence, provide the same level of environmental protection as the PEPA 1997. Between 1993 and 2010, the Pak-EPA promulgated several rules, regulations, standards, and guidelines to implement the provisions of the PEPA 1997. The provincial governments have yet to draft their own instruments; therefore, rules, regulations, standards, and guidelines made under PEPA 1997 can still be benefited from where these are not made under the provincial law.

Balochistan EPA has, however taken lead in finalizing and notifying the Balochistan Provincial rules, regulations and standards. The discussion on regulatory requirements applicable to this Project is, therefore, based on the Balochistan law, the Balochistan Environmental Protection Act 2012, the Regulations; and, the rules, regulations, standards, and guidelines developed under the PEPA IEE and EIA Regulations 2000.

3.4 Balochistan Environmental Protection Act, 2012

As a result of the 18th amendment to constitution of Pakistan, the Balochistan Environmental Protection Act, 2012 (amended) is now the principal provincial legislation in Balochistan for the:

1. Protection, conservation, rehabilitation and improvement of the environment,

2. Prevention and control of pollution, and

3. Sustainable development.

Balochistan Environmental Protection Act, 2012 is (currently) the basic legislative tool empowering the Government of Balochistan to frame regulations for protection of the environment in the province of Balochistan.

The Act is broadly applicable to air, water, soil, marine and noise pollution, as well as the handling of hazardous waste. Penalties have been prescribed for those who contravene the provisions of the Act. Powers of the Balochistan Environmental Protection Agency (BEPA) have been considerably enhanced under this legislation and they have been given the power to conduct inquiries into possible breaches of environmental laws either of their own accord, or upon registration of a complaint.

Under Section 15 of Act, "No proponent of a project of public and private sector shall commence construction or operation unless he has filed an Initial Environmental Examination with the Government Agency designated by Balochistan Environmental Protection Agency, as the case may be, or, where the project is likely to cause an adverse environmental effects an environmental impact assessment, and has obtained from the Government Agency approval in respect thereof".

The Act is attached in **Annex-I** in this report.

3.5 Pakistan EPA (Review of IEE and EIA) Regulations 2000

Pakistan Environmental Protection Agency (Review of IEE/EIA) Regulations, 2000 made in exercise of powers conferred under section 33 of the Pakistan Environmental Protection Act 1997. The PEPA 2000 Regulations categorize projects in three categories provided in Schedule I, II and III of the 2000 Regulations. The regulations are attached as **Annex-II** of the report.

The Mining and Mineral Processing falls in Category C of the Schedule II (List of Projects requiring EIA) of the PEPA 2000 Regulations, which provides:

B. Mining and Mineral Processing

1. Mining and processing of coal, gold, copper, sulphur and precious stones
2. Mining and processing of major non-ferrous metals, iron and steel rolling
3. Smelting plants with total cost of Rs.50 million and above

The submission and approval procedure for the EIA under the PEPA IEE and EIA regulations is summarized below:

- The EIA report shall be submitted, together with a review fee and form included as Schedule-III of the PEPA 2000 Regulations.
- Within 10 working days of filing of the IEE or EIA, the Federal Agency shall – confirm that the IEE or EIA is complete for purposes of initiation of the review process; or require the proponent to submit such additional information as may be specified; or return the IEE or EIA to the proponent for revision, clearly listing the points requiring further study and discussion
- The Federal agency is required to make every effort to complete the EIA review process within ninety days the issue of confirmation of completeness.
- In case of EIA submission, the federal agency shall call for a Public Hearing for the project to invite all the concerned persons to raise concerns on the project.
- Following the Public Hearing, Federal agency shall constitute a Committee of Experts to assist the agency in review of the EIA.
- The approval granted at the end of the review process is valid for three years for start of construction.
- Once project construction has been completed, the proponent is required to submit a request to the federal agency for confirmation of compliance. An environmental management plan for the operation phase is to accompany the request.
- The federal agency is required to communicate its decision within four months of receipt of the request. The project can commence operation only after it has received approval from the agency.

3.6 Guidelines for Public Consultation

Public consultation is mandated under PEPA IEE and EIA Regulations 2000. Regulations provides the general requirements whereas the sectoral guidelines indicating specific assessment requirements are provided in the Guidelines for Public Consultation 1997 (the 'Guidelines'). These are summarized below:

Objectives of Public Involvement: 'To inform stakeholders about the proposed project, to provide an opportunity for those otherwise unrepresented to present their views and values, providing better transparency and accountability in decision making, creating a sense of ownership with the stakeholders';

Stakeholders: 'People who may be directly or indirectly affected by a proposal will clearly be the focus of public involvement. Those who are directly affected may be project beneficiaries, those likely to be adversely affected, or other stakeholders. The identification of those indirectly affected is more difficult, and to some extent it will be a subjective judgment. For this reason, it is good practice to have a very wide definition of who should be involved and to include any person or group who thinks that they have an interest. Sometimes it may be necessary to consult with a representative from a particular interest group. In such cases the choice of representative should be left to the group itself. Consultation should include not only those likely to be affected, positively or negatively, by the outcome of a proposal, but should also include those who can affect the outcome of a proposal';

Mechanism of consultations: 'Provide sufficient relevant information in a form that is easily understood by non-experts (without being simplistic or insulting), allow sufficient time for stakeholders to read, discuss, consider the information and its implications and to present their views, responses should be provided to issues and problems raised or comments made by stakeholders, selection of venues and timings of events should encourage maximum attendance';

Timing and Frequency: Planning for the public consultation program needs to begin at a very early stage; ideally it should commence at the screening stage of the proposal and continue throughout the EIA process;

Consultation Tools: Some specific consultation tools that can be used for conducting consultations include; focus group meetings, needs assessment, semi-structured interviews; village meetings and workshops;

Other Important Considerations: 'The development of a public involvement program would typically involve consideration of the following issues; objectives of the proposal and the study; identification of stakeholders; identification of appropriate techniques to consult with the stakeholders; identification of approaches to ensure feedback to involved stakeholders; and mechanisms to ensure stakeholders' consideration are taken into account'.

As above, the Guidelines for Public Consultation introduce effective ways to inform the contents of the project to the general public during the planning stage and that eventually consensus building toward the implementation of project is reached. However, there are instances where in middle of a project on direction of tribunal or court environmental assessment carried out with public consultation.

Incorporating public involvement into the stages of environmental assessment is explained in the guidelines that public consultation meeting has to be carried out after the works on "developing options, and assessing and mitigating impacts" for comments and assessment.

3.7 National Environmental Quality Standards (NEQS)

The NEQS were first promulgated in 1993 and were last revised in 2000 and in 2010. They comprise the basic guidelines for liquid effluent and gaseous emissions of municipal and industrial origin to comply with. These standards present the maximum allowable concentration for liquid effluent before its discharge into sea, inland water & sewage (total 32 parameters to comply with) and gaseous emissions in the ambient air from industrial sources (total 16 parameters to comply with).

During the construction and operation phase of the project NEQS will apply to all effluents and emissions. NEQS for municipal and industrial effluents, selected gaseous pollutants from industrial sources, motor vehicle exhaust and noise, ambient air quality & ambient noise and drinking water quality have been provided in the report as **Annex-III**.

A chronology of NEQS is given below:

Table 3.1: Chronology of national environmental quality standards

Year Published	**S.R.O. Number**	**Scope**
1993	742 (I)/1993	Liquid Industrial Effluent Industrial Gaseous Emission Vehicle Exhaust and Noise
1995	1023 (I)/1995	Industrial Gaseous Emission from Power Plants operating on coal and oil (added)
2000	549 (I)/2000	Liquid Industrial Effluents (amended); Industrial Gaseous Emission (amended)
2010	1062 (I)/2010	Ambient Air
2010	1063 (I)/2010	Drinking Water Quality
2010	1064 (I)/2010	Noise

In 2000, Pakistan EPA revised the national standards for liquid effluents and gaseous emissions with full consultation of the private sector, industrialists, trade and business associations and NGOs.

1. NEQS for Liquid Industrial Effluents

The municipal and liquid industrial effluent standards cover 32 parameters. The standards cover discharges limits of effluents into inland water, sewage treatment plant and the sea. The NEQS are primarily concentration based.

Table 3.2: National environmental quality standards for Municipal and liquid industrial effluents SRO 549(I)2000 (mg/I, Unless otherwise defined)

S. No	Parameter	Existing Standards	Revised Standards Into Inland Waters	Into Sewage Treatment (5)	Into Sea
1	Temperature or Temperature Increase	40 °C	< 3 °C	< 3 °C	< 3 °C
2	*pH value (H^+)	6-10	6-9	6-9	6-9
3	Biochemical Oxygen Demand $(BOD)_5$ at 20 °C (1)	80	80	250	80**
4	Chemical Oxygen Demand (COD) (1)	150	150	400	400
5	Total Suspended Solids (TSS)	150	200	400	200
6	Total Dissolved Solids (TDS)	3500	3500	3500	3500
7	Oil and Grease	10	10	10	10
8	Phenolic compounds (as phenol)	0.1	0.1	0.3	0.3
9	Chloride (as Cl^-)	1000	1000	1000	SC***
10	Fluoride (as F^-)	20	10	10	10
11	Cyanide (as CN) total	2	1.0	1.0	1.0
12	An-ionic detergents (as MBAS) (2)	20	20	20	20
13	Sulphate (SO_4^{2-})	600	600	1000	SC***
14	Sulphide (S^{2-})	1.0	1.0	1.0	1.0
15	Ammonia (NH_3)	40	40	40	40
16	Pesticides (3)	0.15	0.15	0.15	0.15
17	Cadmium (4)	0.1	0.1	0.1	0.1
18	Chromium (trivalent and hexavalent (4)	1.0	1.0	1.0	1.0
19	Copper (4)	1.0	1.0	1.0	1.0
20	Lead (4)	0.5	0.5	0.5	0.5
21	Mercury (4)	0.01	0.01	0.01	0.01
22	Selenium (4)	0.5	0.5	0.5	0.5
23	Nickel (4)	1.0	1.0	1.0	1.0
24	Silver (4)	1.0	1.0	1.0	1.0
25	Total toxic metals	2.0	2.0	2.0	2.0
26	Zinc	5.0	5.0	5.0	5.0
27	Arsenic (4)	1.0	1.0	1.0	1.0
28	Barium (4)	1.5	1.5	1.5	1.5
29	Iron	2.0	8.0	8.0	8.0
30	Manganese	1.5	1.5	1.5	1.5
31	Boron (4)	6.0	6.0	6.0	6.0
32	Chlorine	1.0	1.0	1.0	1.0

1. *Assuming minimum dilution 1:10 on discharge, lower ratio would attract progressively stringent standards to be determined by the Federal Environmental Protection Agency. By 1:10 dilution means, for example that for each one cubic meter of treated effluent, the recipient water body should have 10 cubic meter of water for dilution of this effluent*
2. *Methylene Blue Active Substances; assuming surfactant as biodegradable*
3. *Pesticides include herbicides, fungicides, and insecticides*
4. *Subject to total toxic metals discharge should not exceed level given at S. N. 25*
5. *Applicable only when and where sewage treatment is operational and BOD_5=80mg/I is achieved by the sewage treatment system*
6. *Provided discharge is not at shore and not within 10 miles of mangrove or other important estuaries.*

** The effluent should not result in temperature increase of more than 30C at the edge of the zone where initial mixing and dilution take place in the receiving body. In case zone is not defined, use 100 meters from the point of discharge*

***The value for industry is 200 mg/I*

****Discharge concentration at or below sea concentration (SC)*

Note:

1: Dilution of liquid effluents to bring them to the NEQS limiting values is not permissible through fresh water mixing with the effluent before discharging into the environment.

2: The concentration of pollutants in water being used will be subtracted from the effluent for calculating the NEQS limits"

2. NEQS for Gaseous Industrial Emissions

For industrial gaseous emissions, 16 parameters have been defined.

Table 3.3: National environmental quality standards for industrial gaseous emissions SRO 549(I)2000

Concentrations in mg/Nm³ unless otherwise defined

S. No.	Parameter	Source of Emission	Existing Standards	Revised Standards
1.	Smoke		Smoke opacity not to exceed 40% or 2 Ringlemann Scale	40% or 2 Ringlemann Scale or equivalent smoke number
2.	Particulate matter (1)	(a) Boilers and Furnaces (i) Oil fired (ii) Coal fired (iii) Cement Kilns	 300 500 200	 300 500 300
		(b) Grinding, crushing, Clinker coolers and Related processes, Metallurgical Processes, converter, blast furnaces and cupolas.	500	500
3.	Hydrogen Chloride	Any	400	400
4.	Chlorine	Any	150	150
5.	Hydrogen Fluoride	Any	150	150
6.	Hydrogen Sulphide	Any	10	10
7.	Sulphur Oxides (2)(3)	Sulfuric acid/Sulphonic acid plants		
		Other plants except power Plants operating on oil and coal	400	1700
8.	Carbon	Any	800	800

	Monoxide			
9.	Lead	Any	50	50
10.	Mercury	Any	10	10
11.	Cadmium	Any	20	20
12.	Arsenic	Any	20	20
13.	Copper	Any	50	50
14.	Antimony	Any	20	20
15.	Zinc	Any	200	200
16.	Oxides of Nitrogen (3)	Nitric acid manufacturing unit.	400	3000
		Other plants except power plants operating on oil or coal:		
		Gas fired Oil fired Coal fired	400 - -	400 600 1200

Explanations: -
1. Based on the assumption that the size of the particulate is 10 micron or more.
2. Based on 1 percent Sulphur content in fuel oil. Higher content of Sulphur will case standards to be pro-rated.
3. In respect of emissions of Sulphur dioxide and Nitrogen oxides, the power plants operating on oil and coal as fuel shall in addition to National Environmental Quality Standards (NEQS) specified above, comply with the following standards: -

A. Sulphur Dioxide

Sulphur Dioxide Background levels Micro-gram per cubic meter (µg/m³) Standards.

Background Air Quality (SO_2 Basis)	**Annual Average**	**Max. 24-hours Interval**	**Criterion I Max. SO_2 Emission (Tons/Day /Plant)**	**Criterion II Max. Allowable ground level increment to ambient (µg/m³) (One year avg)**
Unpolluted	<50	<200	500	50
Moderately Polluted*				
Low	50	200	500	50
High	100	400	100	10
Very Polluted**	>100	>400	100	10

** For intermediate values between 50 and 100 µg/m3 linear interpolations should be used*
*** No projects dioxide emissions will be recommended*

B. Nitrogen Oxide

Ambient air concentrations of Nitrogen oxides, expressed as NO_x should not be exceed the following:
Annual Arithmetic Mean: 100 µg/m³ (0.05 ppm)
Emissions level for stationary source discharge before missing with the atmosphere, should be maintained as follows:
For fuel fired steam generators as Nanogram (10^{-9}-gram) per joule of heat input:

Liquid fossil fuel	...	..	..	130
Solid fossil fuel	.	..		300
Lignite fossil fuel	...	..	..	260

Note:- Dilution of gaseous emissions to bring them to the NEQS limiting value is not permissible through excess air mixing blowing before emitting into the environment.

3. NEQS for Noise

In 2010, Pak EPA established the National Environmental Quality Standards for noise [S.R.O. 1064(I)/2010]. The standards define noise levels based on four different spatial zones and two temporal settings.

Table 3.4: National Environmental Quality Standards for Noise 2010

S. No.	Category of Area / Zone	Effective from 1st July, 2010		Effective from 1st July, 2012	
		Limits it in dB (A) Leq*			
		Day Time	Night Time	Day Time	Night Time
1	Residential area (A)	65	50	55	45
2	Commercial area (B)	70	60	65	55
3	Industrial area (C)	80	75	75	65
4	Silence Zone (D)	55	45	50	45

Notes
1: Day time hours: 6:00 am to 10:00 pm
2: Night time hours: 10:00 pm to 6:00 am
3: Silence zone; Zones which are declared as such by a competent authority. An area comprising not less than 100 meters around hospitals, educational institutions and courts.
4: Mixed categories of areas may be declared as one of the four above-mentioned categories by the competent authority.
**dB (A) Leq: Time weighted average of the level of sound in decibels on scale A which is relatable to human hearing.*

4. NEQS for Ambient Air

The Ministry of Environment, Government of Pakistan in 2010, under S.R.O. 1062 (1)/2010 established standards which provide the maximum allowable limits, in the ambient air, of Sulphur Dioxide (SO2), Oxides of Nitrogen as (NOx) and as (NO), Suspended Particulate Matter–(SPM), Reparable Particulate Matter–PM10, Repairable Particulate Matter–PM2.5, Lead and Carbon Monoxide (CO).

Table 3.5. National Ambient Air Quality Standards (2010)

Pollutants	Time–Weighted Average	Concentration in Ambient Air: Effective from 1st July 2010	Concentration in Ambient Air: Effective from 1st January 2013	Method of Measurement
Sulfur Dioxide (SO_2)	Annual Average*	80 µg/m³	80 µg/m³	Ultraviolet Fluorescence
	24 hours**	120 µg/m³	120 µg/m³	
Oxides of Nitrogen as (NO)	Annual Average*	40 µg/m³	40 µg/m³	Gas Phase Chemiluminescence
	24 hours**	40 µg/m³	40 µg/m³	
Oxides of Nitrogen as (NO_2)	Annual Average*	40 µg/m³	40 µg/m³	Gas Phase Chemiluminescence
	24 hours**	80 µg/m³	80 µg/m³	
Ozone (O_3)	1 hour	180 µg/m³	130 µg/m³	Non dispersive UV absorption
Suspended Particulate Matter (SPM)	Annual Average*	400 µg/m³	360 µg/m³	High Volume Sampling, (Average flow rate not less than 1.1m3/minute).
	24 hours**	550 µg/m³	500 µg/m³	
Reparable Particulate Matter.PM_{10}	Annual Average*	200 µg/m³	120 µg/m³	βRay absorption
	24 hours**	250 µg/m³	150 µg/m³	
Reparable Particulate	Annual Average*	25 µg/m³	15 µg/m³	βRay absorption

Matter.$PM_{2.5}$	24 hours**	40 μg/m³	35 μg/m³	
		25 μg/m³	15 μg/m³	
Lead (Pb)	Annual Average*	1.5 μg/m³	1.0 μg/m³	ASS Method after sampling using EPM 2000 or equivalent Filter paper
	24 hours**	2.0 μg/m³	1.5 μg/m³	
Carbon Monoxide(CO)	8 hour	5 μg/m³	5 μg/m³	Non Dispersive Infra-Red (NDIR)
	1 hour	10 μg/m³	10 μg/m³	
Annual arithmetic mean of minimum 104 measurements in a year taken twice a week 24 hourly at uniform interval. **24 hourly /8 hourly values should be met 98% of the in a year. 2% of the time, it may exceed but not on two consecutive days.				

3.8 National Acts and Guidelines

3.8.1 Pakistan Penal Code, 1860[5]

Section XIV of PPC deals with the offences affecting the public health, safety, convenience, decency and morals. Person may be guilty of public nuisance if his act or omission causes common injury, danger or annoyance to the public or results in spread of infection of diseases dangerous to life. The section also deals with environmental pollution.

Provisions under this Act relating to environment are no longer being enforced after promulgation of the Pakistan Environmental Protection Act, 1997. However, pollution offences can still be tried under the Pakistan Penal Code, 1860.

3.8.2 Antiquities Act, 1975[6]

The Antiquities Act of 1975 ensures the protection of cultural resources in Pakistan. The Act is designed to protect antiquities from destruction, theft, negligence, unlawful excavation, trade, and export. Antiquities have been defined in the Act as ancient products of human activity, historical sites, or sites of anthropological or cultural interest and national monuments etc. The law prohibits new construction in the proximity of a protected antiquity and empowers the Government of Pakistan to prohibit excavation in any area that may contain such articles of archaeological significance. There are no structures of historical significance within or immediately neighboring the project site.

3.8.3 Land Acquisition Act, 1894[7]

This Act provides law for the acquisition of land needed for public purposes and for companies and for determining the amount of compensation to be made on account of such acquisitions. The law provides details of various peculiarities involved in acquisition of land such as preliminary investigation, objection to acquisition, declaration of intended acquisition, enquiry into measurements, value & claims, taking possession, reference to court and procedure thereon, apportionment of compensation, payment, temporary occupation of land, acquisition of land for companies, disputes resolutions,

5 *Pakistan Penal Code(XLV of1860)6th October 1860*
6 *Act VII of 1976(Gazette of Pakistan, Extraordinary, Part 1, 14th January, 1976*
7 The Land Acquisition Act 1894 (Act of 1894)

penalties and exemptions etc. This Act has 55 sections addressing different areas. Such as section 4(2) mentions that it shall be lawful for any official authorized by the Collector to enter upon and survey, to dig or to do all other acts necessary to ascertain that whether the land is adapted for such purpose. The project land has been leased by the proponent.

3.8.4 The Forest Act, 1927[8]

The Act contains procedures for constituting and managing various types of forests, such as reserved forests, village forests and protected forests. The Act empowers the provincial forest departments to declare any forest area as reserved or protected. It also defines the duties of forest related public servants, and prescribes penalties for violation of any provision of the Act.

The project site does not fall in under any forest area.

3.8.5 The Cutting of Trees (prohibition) Act, 1992

The Cutting of trees (prohibition) Act, 1992 mandates that no person shall, without prior written approval from authorized officer shall cut, fell or damage trees growing in:

First Zone (Area adjacent to and beyond the external frontier of Pakistan to a line at four kilometers measured from the external frontiers of Pakistan) if the number of remaining trees in any field falls short of the number to be calculated at the rate of fifteen trees per acre; and

Second Zone (Area adjacent to and beyond the first zone extending towards Pakistan to a line at four kilometers measured from the first zone) if the number of remaining trees in any field falls short of the number to be calculated at the rate of ten trees per acre.

This does not apply to a tree growing on land occupied as the site of a town or village or in a dwelling-house.

Section 3: It prohibits any person, without prior approval, from cutting, felling or damaging any tree growing in first and second zones as mentioned above.

Section 4: It imposes penalty of fine which may extend to five thousand rupees for contravention relating to first zone and imposes penalty of fine which may extend to two thousand and five hundred rupees for contravention relating to second zone.

3.8.6 Antiquities Act, 1975

The act ensures the protection of cultural resources in Pakistan. It is designed to protect antiquities from destruction, theft, negligence, unlawful excavation, trade and export. Antiquities have been defined in the Act as ancient products of human activity, historical sites, or sites of anthropological or

8 The Forest Act,1927(XVI of 1927)

cultural interest, national monuments etc. The Act prohibits new construction in the proximity of a protected antiquity and empowers the Government of Pakistan to prohibit excavation in any area, which may contain articles of archaeological significance. The developers are obligated to ensure that no activity is undertaken within 61 m (200 ft) of a protected antiquity, and to report to the GoP's Dept. of Archaeology if any archaeological discovery made during the course of the project.

None of the archeological site exists in the microenvironment of project area.

3.8.7 Guidelines for Sensitive and Critical Areas, 1997

The above guidelines list up a number of areas subject to protection in terms of sensitive ecosystems and archaeological importance.

None of such sites however exist within the corridor of impact of the proposed Project.

3.8.8 The Biodiversity Action Plan, 2000

The Biodiversity Action Plan, 2000 has been the most significant direct step towards addressing the issue of biodiversity loss. It details the current status & trends and direct & indirect causes of biodiversity; its principles, goals and aims; proposals for action plan including planning & policies, legislation, identification and monitoring, in situ & ex situ conservation, sustainable use, research and training, public education and awareness, Environmental Impact Assessment, information extraction and financial resources etc.

3.8.9 The Canal and Drainage Act, 1873

The Canal and Drainage Act, 1873 prohibits corruption or fouling of water canals (defined to include channels, tube wells, reservoirs and watercourses), or obstruction of drainage.

3.8.10 The Mines Act, 1923

This Act relates to the regulation, inspection and occupational health and safety aspects of mines. The above Act has stipulations with respect to working hours, occupational diseases, periodic medical checkups, employment of female and children, employment of medical and welfare officers etc. Various provisions of this Act are discussed as under:

Section 4: A Chief Inspector (CI) and inspectors of mines are appointed.

Section 6: The Chief Inspector and Inspectors of mines have powers to enforce this Act and they may enter, inspect and examine any mine for ventilation, bye-laws, safety (health & welfare of staff) and may take any material and substance for analyses.

Section 12: Mining Board shall have powers of Civil Court for the purpose of deciding or reporting any matter referred to it.

Section 14, 15 & 16: Related to management of mining operations and fixes duties and responsibilities of managers, owners and agents of mines.

Section 17 to 22: Related to provisions of health and safety. These provisions require conservancy, canteens, shelters, medical appliances, first aid rooms etc. CI or Inspectors may give notice to mines if they find that any matter, thing or practice in or connected with mine is dangerous to human life, health or safety etc. and need to be remedied. Mine management is required to report any accident, loss of life or influx of inflammable or noxious gases etc. to appropriate authorities.

Section 22 (A&B): Limits the time of work for any person in a mine to a maximum of six days a week and not more than forty eight hours in any week and not more than eight hours in a day.

Section 23-C: Bans the appointment of woman in any part of mine below ground. For above ground work, woman shall not work from 7 pm to 6 am.

Section 26: Prohibits child labor in a mine.

Section 34 to 44: Imposes penalties on any person who violates any of the provisions of this Act such as obstructs work of CI or Inspectors, falsifies records, omits to furnish plans, contravenes provisions regarding employment of labor, notice of accidents or disobeys orders etc. with imprisonment or fine or both.

3.8.11 National Mineral Policy, 1996 and 2013

Realizing the importance of minerals in the development of any country, the Government of Pakistan has formulated National Mineral Policy offering appropriate institutional arrangements, investment friendly regulatory regime and internationally competitive fiscal incentives. The main objectives from expansion of mineral sector activities are expansion of employment opportunities, sustainable development of mineral bearing area, expanded business opportunities, technology transfer and regional infrastructure development etc. Under Constitution, minerals are a provincial subject except oil, gas and nuclear minerals and those occurring in special areas (FATA and NA). Provincial Governments are responsible for development and exploitation of minerals, which fall in their domain. The main sections of National Mineral Policy, 1995 are as mentioned under:

Section 4.3.2: A Mineral Investment Facilitation Authority (MIFA) will be setup in each province headed by Chief Minister and other members such as Minister for Mineral Development, Chief Secretary and Secretary Mineral Development Department etc. MIFA shall ensure regular monitoring and direction of mineral related activities, periodic review of the new regulatory regime and ensure adequate protection of environment etc.

Section 4.3.3: Each mineral rich province will establish a separate Department of Mineral Development under separate Secretary for development of mineral resources, consideration of applications and grant of license and leases, regulating and monitoring mining operations etc.

Section 4.4: Mineral Investment Facilitation Board (MIFB) headed by Prime Minister and members including Federal Minister for Petroleum & Natural resources, Governor NWFP, all CMs etc. for development of mineral resources not only on fiscal policies but also in international contacts with donor agencies and negotiation of mineral agreements.

Other Sections: Section 4.5 refers to Public Sector Mineral Corporations, Section 4.6 refers to Geological Survey of Pakistan (GSP), Section 4.7 refers to Geo-Data Centre of Pakistan (GDCP), Section 4.8.3 mentions about Reconnaissance License (RL), Section 4.8.4 refers to Exploration License (EL), Section 4.8.6 enumerates conditions for Mining Lease (ML), Section 4.8.7 covers environmental issues and protection of environment from mining activities etc.

Major sections of National Mineral Policy, 2013 related to the proposed project are as described below:

Section 1: The main objective of National Mineral Policy, 2013 is to endeavor for increasing the economy, competitiveness, coordination & exploration, development & production of Pakistan's mineral resources and encouraging small scale mining.

Section 3: Mineral Investment Facilitation Authorities (MIFAs) are established at both Federal and Provincial level. A Licensing Division, the Provincial Directorates General of Mines & Minerals, exploration & Coordination Directorates, Exploration Promotion Divisions, the Directorates General of Mines and Minerals (which will provide interface with international investors; identify mineral prospects; compile, evaluate and disseminate geo-data etc.).

Section 4: A Mineral Investment Board (MIB) headed by Prime Minister (with all CMs as members) will be established as a consultative forum to encourage the flow of investments, assist Provincial Governments, recommend on fiscal and taxation policies etc.

Section 5: Geological Survey of Pakistan (GSP) is charged with the responsibility of availability of geological, geophysical and geochemical maps and reliable geo data and research.

Section 6: A Geo-data Centre of Pakistan (GDCP) will perform the functions such as managing and disseminating geo-data; creating a centralized digital map production and distribution facility; training; links with Provincial Departments etc.

Section 7: The Provincial Mineral Concession Rules, 2002 which flowed out of the 1995 National Mineral Policy, were a positive step towards modernizing the existing regulatory regime, providing for mineral titles, development and exploitation of any mineral deposits; eliminating discretionary powers, and ensuring simplicity and transparency; and updating the mining laws to deal with international mining practices in Pakistan such as open pit mining and working practices.

Companies will be expected to ensure that their mining operations are carried out in an environmentally acceptable and safe manner. The holder of a mineral title shall have certain exclusive rights for example the right to enter upon the licensed/leased area and to carry out reconnaissance etc. The Provincial Governments may enter into an agreement (Mineral Agreement) with an investor, with respect to certain matters relating to the carrying out of operations under license/lease. Any question or dispute shall be handled through dispute resolution mechanism. The award of mineral title would be made through a transparent process.

Section 8: Mining activities being carried out in Pakistan are mainly through small scale mining by sole proprietorships, association of persons (partnerships) and in certain cases by private limited liability companies. These would prepare their financial statements in accordance with International Financial Reporting Standards.

Section 9: Rate of royalty for minerals will be determined by respective governments from time to time.

Section 11: Development of Infrastructure in mineral bearing areas would be given due regard.

Section 17: Provincial Inspectorates of Mines will carry out the various functions such as enhancing health and safety, research and development.

Section 19: Miscellaneous Matters such as protection of Foreign Investment and insurance for mining operators.

Section 20: The respective Federal and Provincial Ministries/Departments will take all measures to give full effect to the provisions of this Policy.

3.8.12 The Explosives Act, 1884

This Act has been formed to regulate the manufacture, possession, use, sale, transport and importation of explosives. An explosive has been defined (Section 4(a)) as the gunpowder, nitroglycerine, dynamite, gun-cotton, dinitro-toluene ,trinitro toluene, picric acid, dinitro-phenol, trinitro resorcinol (styphnic acid), cyclotrimethylence trinitramine, penta erythritol-tetranitrate, tetryl, nitroguanidine, lead azide, lead styphynate, blasting powders, fulminate of mercury or of other metals, diazo dinitro phenol, colored fires and any other substances, whether a single chemical compound or a mixture of substances, whether solid or liquid or gaseous, used or manufactured with a view to produce a practical effect by explosion, or a pyrotechnic effect.

Section 5: Government may make rules to regulate, prohibit, manufacture, possess, use, transport, import or export explosives or any specified class of explosives. The following matters may be provided for:

a) the authority by which licenses may be granted,

b) the fees to be charged,

c) The manner in which application for licenses must be and the matters to be specified in such applications etc.

Section 6: Government may from time to time, either absolutely or subject to conditions, prohibit manufacture, possess, transport, import and export etc. any explosive.

Section 7: Government may make rules consistent with this Act authorizing any officer to enter, inspect, seize and examine etc. any place, carriage etc. in which an explosive is being used or sold etc.

Section 8: Any explosion by fire that causes loss of human life, serious injury to person or property etc. must be reported by the occupier or master etc. to Secretary Home Department and to the nearest police station.

Section 9: District Magistrate shall, in cases attended by loss of human life, or in any other case, direct a Magistrate Subordinate to hold an inquiry.

Sections 10 to 14: These sections deal with forfeiture of explosives by court; distress of aircraft or vessel; punishment for abetment and attempts; power to arrest without warrant persons committing dangerous offence; saving and power to exempt (to armed forces, person employed under the Government for enforcement of this Act or by notification etc.) respectively.

Section 19: Transportation of explosives by air shall be carried out in accordance with rules and regulations of International Civil Aviation Organization (ICAO), International Air Association (IATA) and Civil Aviation Authority of Pakistan (CAA).

3.8.13 The Explosive Substances Act, 1908

The Explosive Substances Act, 1908 deals exclusively with the acts of explosions or intentions to cause explosions and gives detail of the punishments to be awarded to the non-complier.

This law regulates the possession and use of explosive substances, including materials for the manufacture of explosives as well as machinery, tools and materials that can be used to cause an explosion (Section 2). Causing an explosion is punishable with a maximum sentence of life in prison, whether or not the event causes any injury to persons or damage to property (Section 3). The same maximum penalty applies to making or possessing explosives with intent to cause an explosion (Section 4). Although the law does not specify conditions under which it is legal to possess explosive materials, possession of such substances for a purpose that is not "lawful" is an offence (Section 5), implying that some form of regulatory mechanism is to be put in place. Powers under this Act have been delegated to provincial governments, which may restrict or allow the courts to proceed with the trial of suspected offenders (Section 7).

3.8.14 The Regulation of Mines and Oil-Fields and Mineral Development Act, 1948

This Act is provided to make provisions for certain matters connected with the regulation of mines and oil-fields and mineral development. The appropriate Government shall have power to make rules on different matters relating:

a) To the manner in which and authority to whom application for the grant or renewal of an exploration or prospecting license, a mining lease or other mining concession shall be made, and the prescribing of the fees to be paid on such application.

b) The condition in accordance with which the grant or renewal license, lease or concession may be made or refused; determination of rates of royalties, rents and taxes; the refinement of ores; control of production; fixation of prices and any such matter etc.

The Act also imposes penalties for breach of rule. The appropriate Government shall have power to exempt any mineral or mineral oil or any class or description thereof.

3.8.15 Framework of Environment and Wildlife Institution in Pakistan

Headed by a Federal Minister, the Ministry of Environment, Local Government and Rural Development is the main government organization responsible for the protection of environment and resource conservation. The Ministry works with the Pakistan Environmental Protection Council (PEPC), and the Federal and Provincial Environmental Protection Agencies formed under the PEPA 1997. The roles, responsibilities and authorities of PEPC and the EPA's are defined in the PEPA 1997.

The PEPC has been formed by the Federal Government. Its member includes the President of Pakistan, or someone appointed by the President, as the Chairperson; the Minister of the Ministry of Environment, Local Government and Rural Development as the vice-Chairperson; Governors of the Provinces; Ministers in charge of the subject of environment in the Provinces; Secretary of the Federal Government in-charge of the Ministry of Environment, Local Government and Rural Development; Director General Federal EPA; heads of other federal and provincial departments; environmentalists and community representatives including scientists. The functions and powers of the Council include formulation of national environmental policy, enforcement of PEPA 1997, approval of NEQS, incorporation of environmental considerations in to national development plans and policies and provide guidelines for the protection and conservation of biodiversity in general and for the conservation of renewable and non-renewable resources.

The Federal government has also formed the Federal EPA, which is headed by the Director General and has wide-ranging functions given in the PEPA 1997. These include the preparation and co-ordination of national environmental policy for approval by PEPC, administering and implementing the PEPA 1997 and preparation, revision or establishment of NEQS.

The Provincial Environmental Protection Agencies are formed by the respective Provincial Governments. A Director General who exercises power delegated to him by the Provincial Government heads each Provincial EPA. IEE's and EIA's are submitted to Provincial EPA's for approval.

The National Council for Conservation of Wildlife (NCCW) is responsible for the formulation of national wildlife policies, co-ordination with provincial wildlife department on the implementation of these policies and co-ordination with international organizations on the matter related to the international treaties. The NCCW works under the Ministry of Environment, Local Government and Rural Development and is headed by the IG Forests. NCCW comprises of an advisory council, which is chaired by the Ministry of Environment and includes representatives from provincial wildlife departments, NGO's, members of the civil society and other ministries. A NCCW secretariat based in Islamabad handles the day-to-day affairs and the actual implementation of policies and recommendations of the advisory council. At provincial level almost each province has a wildlife department and a wildlife protection act.

3.9 Provincial Acts, rules and ordinance

3.9.1 Balochistan Local Government Ordinance, 2001

Under Clause 48 of the 6th Schedule of this Ordinance, the local governments are empowered to restrict any project causing pollution to air, water or land. They may also initiate schemes for improving the environment vide this legislation. The local government offices at union council level are given the authority through this law, to monitor any polluting activity and issue instructions to the responsible person for undertaking pollution prevention measures. Proponent will be responsible to ensure that the proposed activities in the Project area are undertaken in accordance with the environmental management requirements and recommendations given in this EIA as well as the NOC which will be issued for this project.

3.9.2 Balochistan Local Government Act, 2010

The Act was enforced to provide for the constitution and continuance of Local Government Institutions in Balochistan, and to consolidate law relating to the Local Government and to provide for the matters connected therewith and ancillary thereto. Article 32 requires the State to encourage Local Government Institutions composed of elected representatives of the areas concerned and having special representation of peasants, workers and women. The Constitution requires the provincial government to decentralize the government administration under Article 140-A so as to facilitate expeditious disposal of its business to meet the convenience and requirements of the public.

Section 7: This section provides for the Constitution of Local Councils i.e. there shall be a Union Council for each Union; a District Council for each District; a Municipal Committee for each Municipality; a Municipal Corporation for each City; and a Metropolitan Corporation for the Capital City.

Section 10: This section provides for Composition of Local Councils consisting of different members in these councils such as general members, non-Muslim members, members from workers and women etc. There shall also be chairmen elected from amongst the members. The number of these members would vary such as general members may be seven to fifteen in union councils and thirty to fifty for a municipal corporation.

Sections 13 to 62: These sections describe detailed process of conducting local government elections including election of chairmen etc.

Sections 63 to 68: These sections provide for executive powers of local government and manner of conduct of business. The executive authority shall be exercised by chairmen or the mayor as the case may be. The business shall be disposed at its meeting.

Sections 69: This section provides for local council service.

Section 70: This section provides for Balochistan Local Government Board.

Sections 78 to 85: These sections state that local councils may undertake any or all of the functions mentioned in fifth schedule.

Section 86: This section states that Development Plans in local councils shall be prepared on specified sectorial proforma mentioning name and location of project, cost, objectives and justification etc.

Section 96 to 106: These sections provide for local fund and public account for every council, budgets, application of funds, account and audits etc.

Sections 107 to 111: These sections provide for ownership of property, use and disposal of property etc.

Section 112 to 119: These sections provide for rules related to local council taxation.

Section 120 to 122: These sections provide for constitution of local grant committee headed by Minister Finance with Secretaries of Finance, P&D etc. for award of grant to local councils.

Remaining sections relate to supervision of local councils, divisional co-ordination committee and inter council matters, offences and penalties and appointment of whole time Magistrates etc.

Fifth Schedule (Section 78): Under 5th Schedule of this Act, the Urban Councils are required to undertake preparation and implementation of schemes for the prevention of the pollution of air, water, land gases, dust or other substances exhausted or emitted by automobiles, engines, factories, brick or lime kilns, crushing machines for grains, stone, salt or other materials and such other sources of air pollution. In continuation to this, the urban councils are responsible to keep a check on activities within its jurisdiction to ensure that the same does not result in contamination or pollution of the natural ambient environment.

The proponent of the proposed project will comply with the entire clauses of Balochistan Local Government Act 2010 related to the proposed project.

3.9.3 Balochistan Wildlife (Protection, Preservation, Conservation and Management) Act, 2014

The Balochistan Wildlife (Protection, Preservation, Conservation, and Management) Act, 2014 caters to the protection of wildlife resources in the province. Besides ensuring an environment conducive for their rearing and livelihood, the Act also regulates hunting, poaching, possession, and trade in birds and animals. Government can notify and amend lists of protected ecosystems, national parks, wildlife sanctuaries, safari parks, and game reserves.

Key features of the Balochistan Wildlife Protection Act include:

1. Ban on hunting of protected animals unless permitted otherwise in accordance with the requirements of the Act.

2. Prohibition of any activity (residence, cultivation, land use that could damage vegetation, hunting, killing or capturing of any wild animal etc.), inside a wildlife sanctuary or National Park.

3. Prohibition of any activity (hunting and shooting etc. of a wild animal) in the game reserve, except under a special permit.

4. Penalties for those who contravene the provisions of the law.

The latest Act, 2014 was passed by the Balochistan Assembly to seek measures by the provincial government to curb poaching of endangered wildlife species. According to the Act, no person will possess and use any wild animal for fighting or baiting with other wild animal of the same or other species or with any other kind of animal. No one should put, keep or carry in a cage or enclosure any wild animal which is not big enough for its movement and comfortable living, transport or handling. The Act mentions a game animal may be hunted only with a valid license or permit, as the case may be, subject to restrictions and no person will hunt any game animal in the privately-owned areas. It further mentions that a person should not keep any wild animal, dead or alive or its parts unless the person is in possession of a valid certificate of lawful possession granted in respect thereof by the authorized officer. According to the law, a person will not import or attempt to import into province any animal of an indigenous or exotic species, or any trophy, meat or derivative thereof, except under an import permit granted under this Act.

BME shall implement a "No hunting, No trapping" policy for protection of wildlife existing in the project area. Land clearing for project activities will be undertaken by adopting "soft start" approach in order to slowly move away the animals inhabiting the project area. Burrows, dens and other habitats of animals will not be destroyed during project activities. Besides these, additional measures such as fencing of activity area, containment of waste materials etc. will also be adopted to prevent any possible harm to the wildlife.

3.10 Environmental and Social Guidelines

The environmental as well as social guidelines related to the proposed project are as discussed under:

- **Policy & Procedures for the Filing, Review and Approval of Environmental Assessments, 2000**

The Policy & Procedures for the Filing, Review and Approval of Environmental Assessments, 2000, prepared by the PEPA under the powers conferred upon it by the Pakistan Environmental Protection Act, provide the necessary details on the preparation, submission, and review of the Initial Environmental Examination (IEE) and the Environmental Impact Assessment (EIA).

This EIA Study has followed the procedures defined in the PEPA, 1997 and Review guidelines, 2000, and the EIA will be submitted to BEPA in whose jurisdiction the project will be implemented. The PEPA has, however, been given the right to review any environmental report at any time and the power to revoke the decision of the provincial EPA, if it deems this to be necessary.

- **Guidelines for Preparation & Review of Environmental Reports**

These guidelines require proponents to prepare terms of reference for the environmental assessment reports. It requires that all studies should contain baseline data on the area and must contain an assessment of the potential environmental impacts and the recommended mitigation measures.

3.11 World Bank Guidelines on Environmental Aspects[9]

The principal World Bank publications that contain environmental guidelines are listed below:

- Environmental Assessment Operational Policy 4.01. Washington, DC, USA. World Bank 1999;
- Environmental Assessment Sourcebook, Volume I: Policies, Procedures, and Cross Sectoral Issues. World Bank Technical Paper Number 139, Environment Department, the World Bank, 1991,;
- Environmental Assessment Sourcebook, Volume III: Guidelines for Environmental Assessment of Energy and Industry Projects. World Bank Technical Paper No. 154, Environment Department, the World Bank, 1991; and
- Pollution Prevention and Abatement Handbook: Towards Cleaner Production, Environment Department, the World Bank, United Nations Industrial Development Organization and the United Nations Environment Program, 1998.

The first two publications listed here provide general guidelines for the conduct of an IEE/EIA, and address the IEE/EIA practitioners themselves as well as project designers. While the Source book in particular has been designed for the Bank projects, and is especially relevant for the impact assessment of large-scale infrastructure projects, it contains a wealth of information which is useful to environmentalists and project proponents.

The Source book identifies a number of areas of concern, which should be addressed during impact assessment. It sets out guidelines for the determination of impacts, provides a checklist of tools to identify possible biodiversity issues and suggests possible mitigation measures. Possible development project impacts on wild lands, wetlands, forests etc. are also identified and mitigation measures suggested. The Sourcebook also highlights concerns in social impact assessment, and emphasizes the need to incorporate socio-economic issues in EIA exercises.

- **IFC Environmental, Health, and Safety Guidelines for Mining**

The Environmental, Health, and Safety (EHS) Guidelines are technical reference documents with general and industry specific examples of Good International Industry Practice (GIIP). These industry sector EHS guidelines are designed to be used together with the General or multiple industry-sector guidelines as may be necessary. The EHS Guidelines contain the performance

[9] www.ifc.org/ehsguidelines *(World Bank Guidelines)*

levels and measures that are generally considered to be achievable in new facilities by existing technology at reasonable costs. Application of the EHS Guidelines to existing facilities may involve the establishment of site-specific targets, with an appropriate timetable for achieving them. The applicability of the EHS Guidelines should be tailored to the hazards and risks established for each project on the basis of the results of an environmental assessment in which site-specific variable, such as host country context, assimilative capacity of the environment etc. This justification should demonstrate that the choice for any alternate performance levels is protective of human health and the environment.

Section 1.0: Industry-Specific Impacts and Management

This provide the Environment, Health & Safety guidelines associated with mining activities (and including ore processing facilities) which may occur during the exploration, development and construction, operation, closure and decommissioning, and post-closure phases, along with recommendations for their management.

Potential Environmental Issues

- Water use and quality
- Wastes
- Hazardous materials
- Land use and biodiversity
- Air quality
- Noise and vibrations
- Energy use
- Visual Impacts

Occupational Health and Safety

- General workplace health and safety
- Hazardous substances
- Use of explosives
- Electrical safety and isolation
- Physical hazards
- Fitness for work
- Travel and remote site health
- Thermal stress

Section 2.0: Performance Indicators and Monitoring

Environment

Guideline values for process effluents in mining sector are indicative of good international industry practice. Effluent guidelines should be applicable for site runoff and treated effluents to surface waters for general use. Site-specific discharge levels may be established based on the availability and conditions in the use of publicly operated sewage collection and treatment systems or, if discharged directly to surface waters, on the receiving water use classification as described in the General EHS Guideline

Table 3.6. Effluent Guidelines

Pollutants	Units	Guideline Value
Total Suspended Solids	mg/L	50
pH	S.U	6-9
COD	mg/L	150
BOD_5	mg/L	50
Oil and Grease	mg/L	10
Arsenic	mg/L	0.1
Cadmium	mg/L	0.05
Chromium (VI)	mg/L	0.1
Copper	mg/L	0.3
Cyanide	mg/L	1
Cyanide Free	mg/L	0.1
Cyanide WAD	mg/L	0.5
Iron (total)	mg/L	2.0
Lead	mg/L	0.2
Mercury	mg/L	0.002
Nickel	mg/L	0.5
Phenols	mg/L	0.5
Zinc	mg/L	0.5
Temperature	°C	< 3 degree differential
Note: Metals concentrations represent total metals.		

Environmental monitoring programs for this sector should be implemented to address all activities that have been identified to have potentially significant impacts on the environment, during normal operations and upset conditions. Environmental monitoring activities should be based on direct or indirect indicators of emissions, effluents, and resource use applicable to the particular project.

In some mining projects monitoring should extend for a minimum period of three years after closure or longer if site conditions warrant. Monitoring frequency should be sufficient to provide representative data for the parameter being monitored.

Monitoring should be conducted by trained individuals following monitoring and record-keeping procedures and using properly calibrated and maintained equipment. Monitoring data should be analyzed and reviewed at regular intervals and compared with the operating standards so that any necessary corrective actions can be taken. Additional guidance on applicable sampling and analytical methods for emissions and effluents is provided in the General EHS Guidelines.

Occupational Health and Safety Performance

Occupational health and safety performance should be evaluated against internationally published exposure guidelines, of which examples include the Threshold Limit Value (TLV®) occupational exposure guidelines.

Projects should try to reduce the number of accidents among project workers (whether directly employed or subcontracted) to a rate of zero, especially accidents that could result in lost work time, different levels of disability, or even fatalities.

The working environment should be monitored for occupational hazards relevant to the specific project. Monitoring should be designed and implemented by accredited professionals as part of an occupational health and safety monitoring program with recognition for post-closure long term health concerns.

Facilities should also maintain a record of occupational accidents and diseases and dangerous occurrences and accidents. Additional guidance on occupational health and safety monitoring programs is provided in the General EHS Guidelines.

World Bank / IFC Performance Standards, 2012[10]

The IFC Performance Standards are international benchmarks for identifying and managing environmental and social risks and have been adopted by many organizations as a key component of their environmental and social risk management. IFC's Environmental, Health, and Safety (EHS) Guidelines provide technical guidelines with general and industry-specific examples of good international industry practice to meet IFC's Performance Standards.

In many countries, the scope and intent of the IFC Performance Standards is addressed or partially addressed in the country's environmental and social regulatory framework. Among eight Standard Performances the Standards relevant to proposed Project is as discussed under:

Performance Standard 1: Assessment and management of environmental and social risks and impacts

This Performance Standard applies to business activities with environmental and/or social risks and/or impacts. It emphasizes the importance of managing environmental and social performance throughout the life of a project. An effective Environmental and Social Management System (ESMS) is a dynamic and continuous process initiated and supported by management, and involves engagement between the clients, its workers, local communities directly affected by the project (the Affected Communities) and, where appropriate, other stakeholders. Followings are the major objectives;

- To identify and evaluate environmental and social risks and impacts of the project

[10] *World Bank / IFC Performance Standards, 2012*

- To adopt a mitigation hierarchy to anticipate and avoid, or where avoidance is not possible, minimize, and, where residual impacts remain, compensate/offset for risks and impacts to workers, Affected Communities, and the environment

- To promote improved environmental and social performance of clients through the effective use of management systems

- To ensure that grievances from Affected Communities and external communications from other stakeholders are responded to and managed appropriately

- To promote and provide means for adequate engagement with Affected Communities throughout the project cycle on issues that could potentially affect them and to ensure that relevant environmental and social information is disclosed and disseminated

Performance Standard 2: Labor and working conditions

This Performance Standard stresses the protection of the fundamental rights of workers for better execution of the project. That can be achieved by developing effective worker-management relationship. The requirements have been guided by a number of international conventions and instruments, including those of the International Labor Organization (ILO) and the United Nations (UN). Followings are major objectives;

- To promote the fair treatment, non-discrimination, and equal opportunity of workers.
- To establish, maintain, and improve the worker-management relationship.
- To promote compliance with national employment and labor laws.
- To protect workers, including vulnerable categories of workers such as children, migrant workers, workers engaged by third parties, and workers in the client's supply chain.
- To promote safe and healthy working conditions, and the health of workers.
- To avoid the use of forced labor

Performance Standard 3: Resource efficiency and pollution prevention

This Performance Standard outlines a project-level approach to resource efficiency and pollution prevention and control in line with internationally disseminated technologies and practices. This Standard recognizes that increased economic activity and urbanization often generate increased levels of pollution to air, water, and land, and consumes resources in a manner that may threaten people and the environment at the local, regional, and global levels.

This Standard also stresses effective management of Hazardous materials which are sometimes used as raw material or produced as product by the project. The client will avoid / minimize and control the release of hazardous materials and will prefer less hazardous substitutes where possible. Followings are the main objectives;

- To avoid or minimize adverse impacts on human health and the environment by avoiding or minimizing pollution from project activities.
- To promote more sustainable use of resources, including energy and water.

- To reduce project-related GHG emissions.

Performance Standard 4: Community health, safety and security

This Performance Standard underscores the client's responsibility to avoid or reduce the risks and impacts to community health, safety, and security that may arise from project related-activities, with particular attention to vulnerable groups. Followings are the main objectives;

- To anticipate and avoid adverse impacts on the health and safety of the affected community during the project life from both routine and non-routine circumstances.
- To ensure that the safeguarding of personnel and property is carried out in accordance with relevant human rights principles and in a manner that avoids or minimizes risks to the affected communities

Performance Standard 5: Land Acquisition and Involuntary Resettlement

Performance Standard 5 recognizes that project-related land acquisition and restrictions on land use can have adverse impacts on communities and persons that use this land.

Involuntary resettlement refers both to physical displacement (relocation or loss of shelter) and to economic displacement (loss of assets or access to assets that leads to loss of income sources or other means of livelihood) as a result of project-related land acquisition and/or restrictions on land use.

Resettlement is considered involuntary when affected persons or communities do not have the right to refuse land acquisition or restrictions on land use that result in physical or economic displacement. Followings are the main objectives;

- To avoid, and when avoidance is not possible, minimize displacement by exploring alternative project designs.
- To avoid forced eviction.
- To anticipate and avoid, or where avoidance is not possible, minimize adverse social and economic impacts from land acquisition or restrictions on land use by (i) providing compensation for loss of assets at replacement cost and (ii) ensuring that resettlement activities are implemented with appropriate disclosure of information, consultation, and the informed participation of those affected.
- To improve, or restore, the livelihoods and standards of living of displaced persons.
- To improve living conditions among physically displaced persons through the provision of adequate housing with security of tenure at resettlement sites.

Performance Standard 6: Biodiversity conservation and sustainable management of living natural resources

This Performance Standard recognizes that protecting and conserving biodiversity, maintaining ecosystem services, and sustainably managing living natural resources are fundamental to sustainable development. Followings are main objectives;

- To protect and conserve biodiversity.

- To maintain the benefits from ecosystem services.
- To promote the sustainable management of living natural resources through the adoption of practices that integrate conservation needs and development priorities

Performance Standard 7: Indigenous Peoples

Performance Standard 7 recognizes that Indigenous Peoples, as social groups with identities that are distinct from mainstream groups in national societies, are often among the most marginalized and vulnerable segments of the population. In many cases, their economic, social, and legal status limits their capacity to defend their rights to, and interests in, lands and natural and cultural resources, and may restrict their ability to participate in and benefit from development. Indigenous Peoples are particularly vulnerable if their lands and resources are transformed, encroached upon, or significantly degraded. Followings are main objectives;

- To ensure that the development process fosters full respect for the human rights, dignity, aspirations, culture, and natural resource-based livelihoods of Indigenous Peoples.
- To anticipate and avoid adverse impacts of projects on communities of Indigenous Peoples, or when avoidance is not possible, to minimize and/or compensate for such impacts.
- To promote sustainable development benefits and opportunities for Indigenous Peoples in a culturally appropriate manner.
- To establish and maintain an ongoing relationship based on Informed Consultation and Participation (ICP) with the Indigenous Peoples affected by a project throughout the project's life-cycle.
- To ensure the Free, Prior, and Informed Consent (FPIC) of the Affected Communities of Indigenous Peoples when the circumstances described in this Performance Standard are present.
- To respect and preserve the culture, knowledge, and practices of Indigenous Peoples.

Performance Standard 8: Cultural Heritage

Cultural heritage encompasses properties and sites of archaeological, historical, cultural, artistic and religious significance as well as unique environmental features and cultural knowledge, innovations and practices of communities embodying traditional lifestyles, which are protected for current and future generations. Commercial clients/investees are required to avoid significant damage to cultural heritage due to their business activities. Following are main objectives;

- To protect cultural heritage from the adverse impacts of project activities and support its preservation.
- To promote the equitable sharing of benefits from the use of cultural heritage.

3.12 International Environmental Convention and Treaties

International environmental treaties and conventions, endorsed by Pakistan that is applicable to the proposed project are as mentioned below:

1. Climate Change and the Ozone Layer

- United Nations Framework Convention on Climate Change, 1992
- Kyoto Protocol to the United Nations Framework Convention on Climate Change, 1997 aims to reduce emissions of six greenhouse gases, including CO2, methane (CH4), and nitrous oxide (N2O) by 2008-2012 and Pakistan has signed and acceded to the agreement.
- Vienna Convention for the Protection of the Ozone Layer, 1985
- The Montreal Protocol on Substances that Deplete Ozone Layer and associated amendments, 1987

2. Waste and Pollution

- Basel Convention on the Control of Trans boundary Movement of Hazardous Wastes and their Disposal, 1989.

3. Biodiversity and the Protection of Plants and Animals

- Convention on Biological Diversity (CBD), singed in Rio de Janiero in 1992 which Pakistan ratified in 1994,
- Convention on International Trade in Endangered Species of Wild Fauna & Flora (CITES), 1973 of which Pakistan became a party in 1976,
- International Plant Protection Convention, 1997
- RAMSAR Convention, 1971for the Conservation and wise use of natural resources and includes all aspects of wetland conservation. Pakistan is a signatory to the RAMSAR Convention since 1978 and so far 16 sites in Pakistan have been declared as wetlands of International Importance or RAMSAR Sites with a surface area of 283,952 hectares.
- IUCN red list published by IUCN and includes those species that are under potential threat of extinction. These species have been categorized as endangered, vulnerable in decline, lower risk and data deficient.
- Convention on Conservation of Migratory Species of Wildlife Animals, adopted in Bonn, Germany in 1979 which Pakistan ratified in 1987

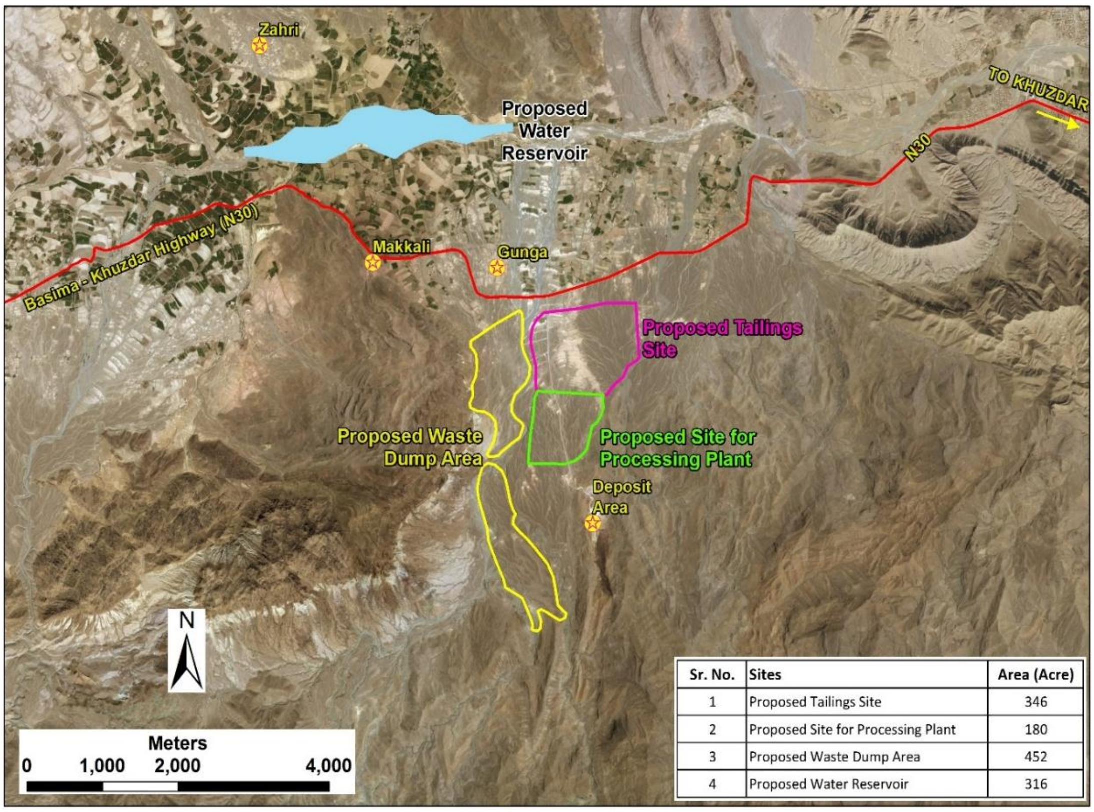
4 Environmental & Social Baseline

The description of the environment of the project site comprises on the following sections;

- Physical Environment
- Ecological Resources
- Socioeconomic Environment

The data presented in the following sections has been collected from both primary and secondary sources. A multi-disciplinary team of experienced scientists and environmental professionals was assembled to carry out the required resource assessment, generation and analysis of baseline data, determination of potential impacts and recommendation of mitigation measures. The members of the EIA Professional Team are given in Chapter 1. An interactive approach among the environmental team members and other project professionals was adopted and was facilitated by team meetings as required.

Bolan Mining Enterprises has proposed the Barite-Lead-Zinc Project Development and Processing Plans at Barite Lead Zinc Deposits near Gunga, Khuzdar. The Gunga deposit area is situated 16 km to the southwest of Khuzdar city and about 3 km to the southeast of village Gunga, in Khuzdar tehsil and Khuzdar District, Balochistan.



Sr. No.	Sites	Area (Acre)
1	Proposed Tailings Site	346
2	Proposed Site for Processing Plant	180
3	Proposed Waste Dump Area	452
4	Proposed Water Reservoir	316

Figure 4.1: Location of deposits, subproject sites and nearby settlements

Table 4.1: Distances of settlement from Project sites

Project sites	Approx. Distance (km)			
	Gunga	Makkali-Gooki	Kunj	Azeempur
Deposit Area	3.5	4.3	5.5	4.1
Proposed Site for Processing Plant	2.3	3.3	4.8	3.2
Proposed Tailings Site	1.3	2.8	4.7	2.5
Proposed Waste Dump Area	2.6	3.1	4.2	4.0
Proposed Water Reservoir	2.2	1.5	3.0	4.6

Baseline data collection on the study area was conducted and included climate, hydrology, geology, noise, air quality, traffic, topography, socioeconomic, flora and fauna. Data was garnered from field, aerial photographs other relevant reports held within various governmental and non-governmental organizations. The study involved the execution of the following tasks:

- Review of the Project Description to understand the nature and components of the structures and activities of the proposed development.
- Collation of available maps, plans, reports and data of relevance to the project and their review by desk study to understand the overall framework and to guide field investigation of the development site and its environs;
- Field reconnaissance of the development site and its environs to confirm the desk study interpretation and collect such additional data as was possible.

4.1 Physical Environment

4.1.1 Geography and Topography

District Khuzdar lies between 28.858N, 66.890E & 25.784N, 67.038E and 26.602N, 65.143E & 27.785N, 67.444E. Khuzdar was separated from Kalat after having district status on 1 March, 1974. The district headquarter is in “Khuzdar” town. The district is located in the center of Balochistan, sharing its boundaries in the east with Sindh Province and District Jhal Magsi, while Awaran and Kharan Districts are in the west. Lasbela is in the south and Kalat in north.

Figure 4.2: Geographical Location of District Khuzdar

The topography of the Project area and vicinity is predominantly hilly. Topography of District Khuzdar is mountainous, consisting of numerous ridges and valleys of varying width. The important hill ranges are Jhalawan, Moda, Pab and Kirthar. Moola, Mosina, Nal and Kalachi are the main rivers in the district.

Figure 4.3: Topography of the Project Area

4.1.2 Physiography

The physiography of the Balochistan province is very varied: mountain ranges alternate with low lying plains, deserts and plateau areas. As all over the world, habitation is mainly concentrated in valleys. Balochistan is the largest province of Pakistan: the distance from the southernmost tip along the Arabian Sea to the northernmost point at the boundary with South Waziristan amounts to 850 km.

Balochistan Plateau, which is one of the six natural regions of Pakistan, extends westward with many ridges running across it from the northwest to the southeast. It is separated from Indus Plains by the Sulaiman and Kirthar Ranges. This plateau can be divided into 5 zones.

- The Coastal Zone: stretching over a 50km wide coastal belt.
- The Flat Plain Zone: extending from Sibi and Dhadar to Usta Mohammed.
- The Low Upland Zone: consisting of the areas of Loralai and Khuzdar and Chagi and Turbat District at elevations of 700 to 1,300 meters.
- Medium Upland Zone: including the areas of Quetta, Kalat and Zohb at an elevation from 1300 to 2000 meters.
- High Upland Zone: stretching from 2,000 to 2,700 meters, with very cold, long winters and mild, short summer. It includes the Tobina Plateau, Ziarat Areas, etc.

Khuzdar Knot, with an area of about 3000 sq km, is composed mainly of irregular shaped intensely deformed geological features. It is the part of Northern Kirthar Range. The intensity of the deformation decreases southeastward. Thick to massive limestone of Jurassic age with varying orientation of tightly folded anticlinal hills are separated by narrow, irregularly shaped small valleys. It is apparently a large horst block developed during a rift phase and reactivated during compressional tectonics. The general structural trend near the Khuzdar Knot area is N-S, NNE or NNW, whereas within Knot no particular trend can be observed. This geometry of a highly disturbed zone probably resulted due to combined effects of salt, postulated to be present over the basement, and the compressional-transpressional tectonic.

The area has been influenced by the tectonic events as a result of separation of the Indian Plate from the African Plate during the Jurassic and northward movement with anticlockwise rotation and collision with the Eurasian Plate in the north during Tertiary. Rifting formed horsts and grabens on the western margin of Indo-Pakistan Plate.

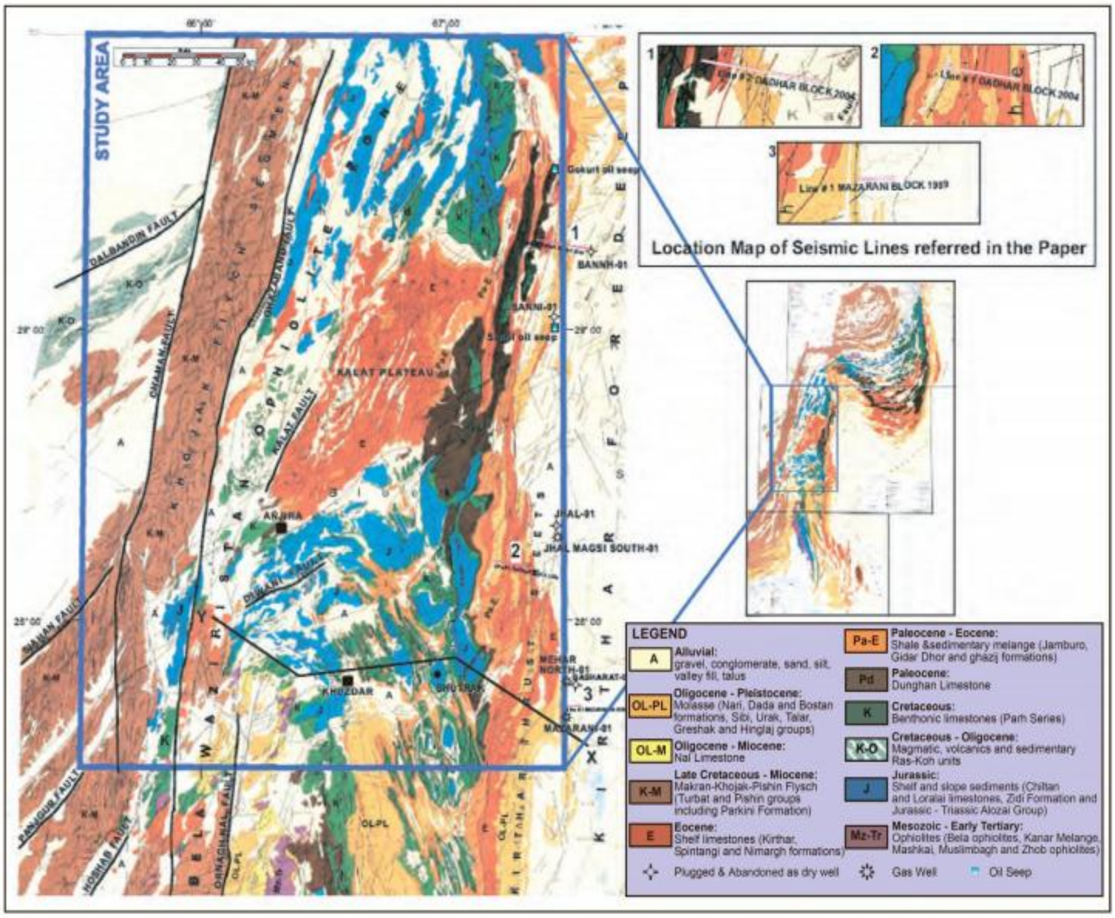


Figure 4.4: Generalized geologic map of Northern Kirthar Range showing rocks from Jurassic to Recent[11]

4.1.3 Geology & Geomorphology

Important vein or cavity filling barite deposits of Pakistan occur at many places along Axial Belt in Hazara division of Northwest Frontier Province. According to Husain et al. (1991, 1996) and Khan et al. (1994), the vein-type barite mineralization is reported from Precambrian slates to Eocene limestone occurring in Haripur, Havelian and Kohala districts in Hazara (Figure below). Barite associated with many of the carbonate-hosted epigenetic strata bound zinc-lead deposits occur at several places in Khuzdar-Lasbela belt including Gunga.

[11] Hasany.S.T; et al. (2012). Identification of New Potential Source and Reservoir Rock of Early Jurassic Age, supported with Basin Modeling and discussion of Exploration Constraints in the Northern Kirthar Range, Pakistan. Search and Discovery Article #30262 (2012)

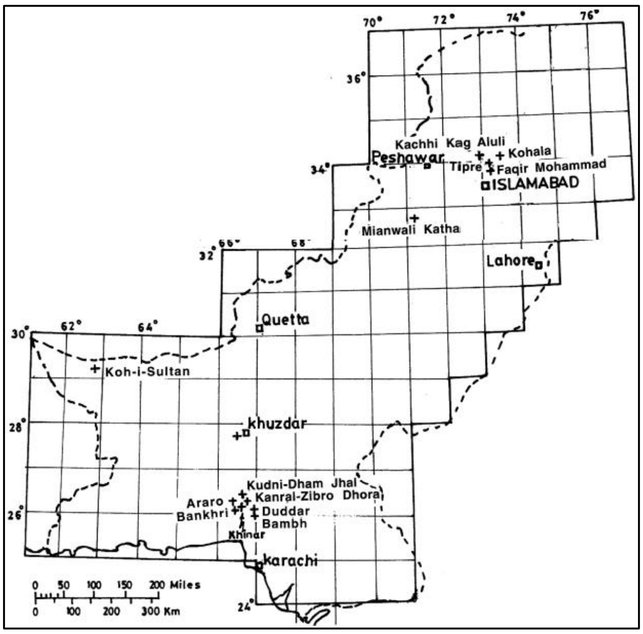


Figure 4.5: Locations of vein type barite deposits in Hazara division of Northwest Frontier Province and stratabound epigenetic barite deposits of Khuzdar-Lasbela belt in Balochistan[12]

Barite is present only as a minor constituent in Duddar (Lasbela) but it is the major ore mineral in the Gunga (Khuzdar) deposits. In Gunga, barite mineralization occurs in limestone interbedded with shale belonging to the Anjira Formation (Ferozabad Group) of Jurassic age.

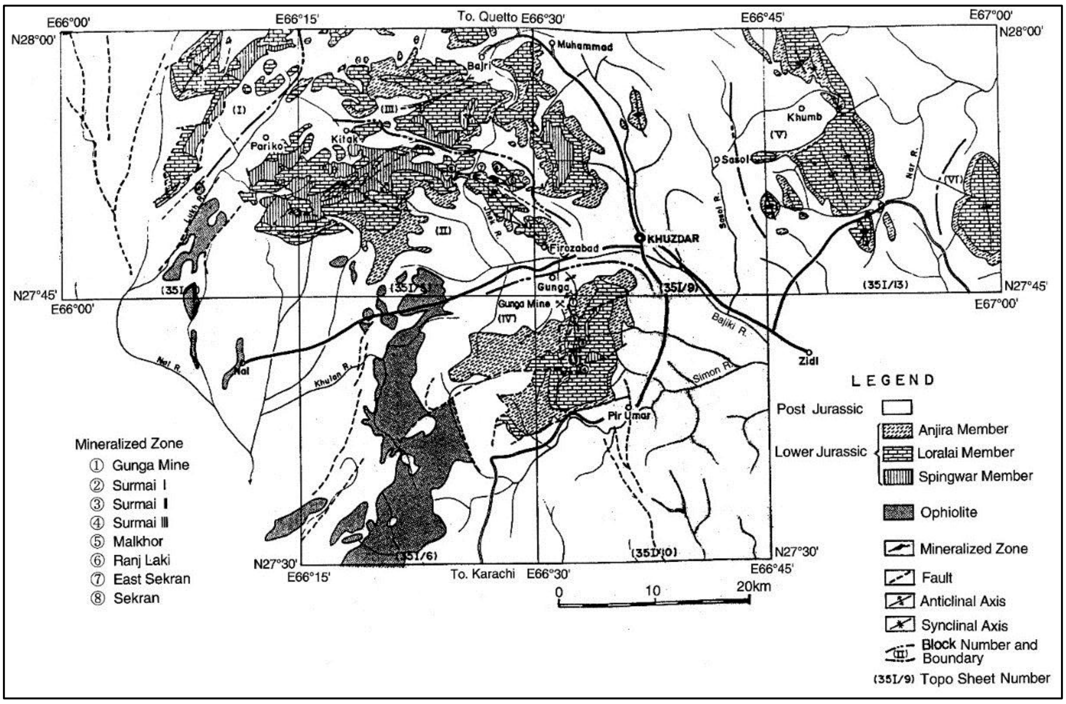


Figure 4.6: Geological map of Khuzdar district prepared by Geological Survey of Pakistan

[12] Husain. V. et al (2002). Geochemical Investigations of Stratabound Gunga Barite Deposits of Khuzdar (Balochistan), Pakistan. RESOURCE GEOLOGY, vol. 52, no. 1, 49–58, 2002.

Several studies have described the geology, mineralogy and genesis of the Gunga barite deposits. However, very little work has been done on the geochemical characteristics of the Gunga deposits, particularly on the type of barite mineralization. The present work is an attempt to explain the mode of deposition in the light of chemical and isotopic composition of the Gunga barite samples.

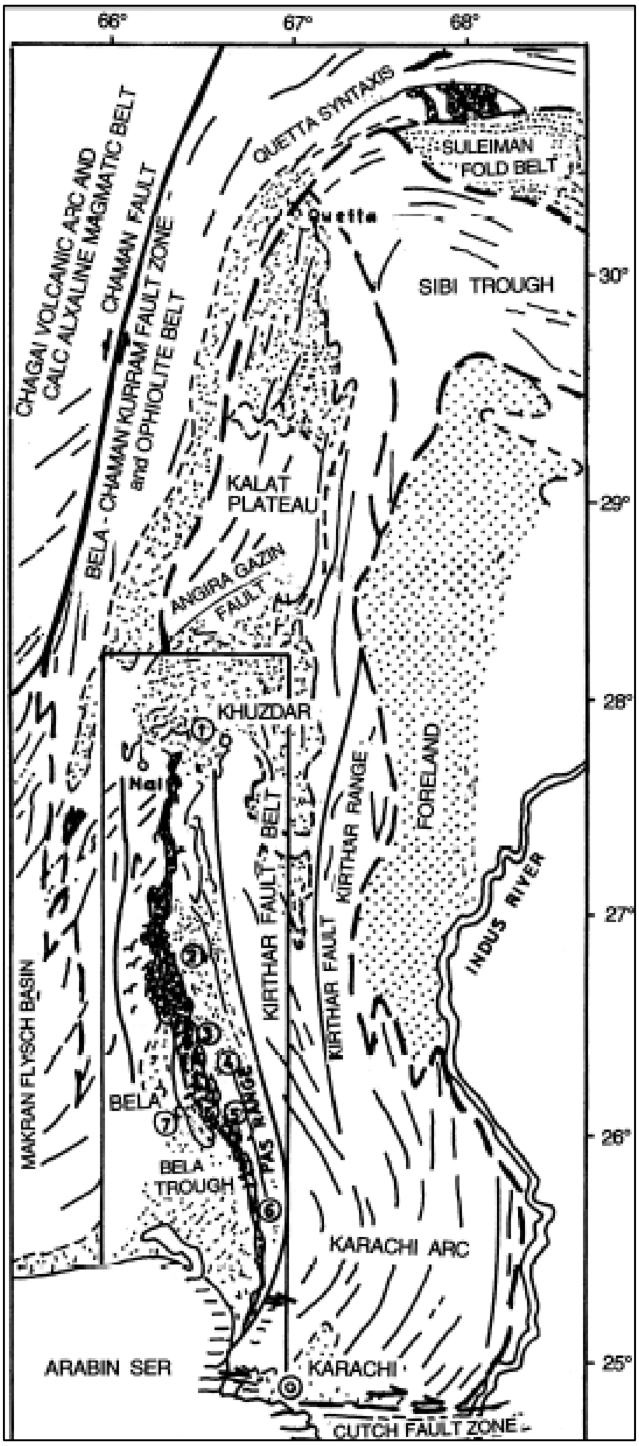


Figure 4.8: Geological map of Pb-Zn-Ba deposits of Khuzdar-Lasbela area[13]

[13] after Sarwar and Dejong, 1979; Ahsan and Mallick, 1996

Large barite and sulfide deposits of Pakistan occur along the Axial Belt in Khuzdar and Lasbela districts. This axial belt is the result of northward movement of the Indo-Pakistan Plate and subsequent collision with the Afghan and central Iran - Lut blocks of the Eurasian Plate. The zinc-leadbarite deposits of Khuzdar-Lasbela belt are most important sulfide mineral deposits in Pakistan. In Gunga, about 11 million tons of barite ore with over 6 % zinc and 1 % lead combined have been estimated by JICA and MMAJ (1987). Duddar zinc-lead-barite deposits on the other hand, have been estimated as 4.2 million tons at an average grade of 11.2 % zinc and 1.7 % lead (Allen and Anwer, 1994). These barite and sulfide mineral deposits are located in the narrow metallogenic zone of Balochistan known as the Khuzdar-Lasbela belt. This belt is about 300 km long and is reported to contain several stratabound and vein type zinc-lead-barite occurrences. These deposits are widely distributed in Jurassic sediments in Khuzdar and Lasbela districts.

The Gunga barite deposits occur about 10 km SW of Khuzdar city, which is 400 km from Karachi on Quetta-Karachi road. These deposits lie within latitude of 27°44' N and longitude 66° 32' E. The Gunga barite is being mainly used as drilling mud by local petroleum industry.

The Gunga deposits belong to Khuzdar-Lasbela metallogenic province and are formed along the western margin of the Indian Plate. According to Sillitoe (1978) one of the five post Paleozoic environments recognized in Pakistan and adjoining regions is Mississippi Valley type barite-lead-zinc and fluorite mineralization in Khuzdar-Lasbela districts, generated in Jurassic limestone on the northern miogeosynclinal margin of the Indian shield, perhaps during incipient rifting heralding India's separation from Gondwana land.

The geological history of the Lasbela–Khuzdar belt can be split into two major periods. The earlier relates to the break-up of the super-continent Gondwana land during Jurassic. The Indo-Pakistan subcontinent separated from the Gondwana motherland about 170 million years ago. The key processes operating at that time were rifting and extention. The rifting process is reflected in the vertical facies transition of the Jurassic Ferozabad Group, which was deposited in a transgressive continental shelf environment.

The Gunga (Khuzdar) barite and Duddar (Lasbela) zinc-lead-barite deposits are hosted by a succession of Jurassic-Cretaceous carbonate and clastic sediments. These rocks record a major marine transgression during the rifting and break up of Gondwana land. The area lies in the easterly verging Paleocene-Eocene collision zone between the Indian and Afghanistan-Iranian Plates.

The barite deposits of Gunga are associated with interbedded Jurassic limestone and shale belonging to the Anjira Formation of the Ferozabad Group. It mainly constitutes the lower division of the Jurassic sequence of the Lower Indus Basin. The Ferozabad Group is widely developed in the Sulaiman and Kirthar ranges and more particularly in the adjoining Axial Belt.

The term Ferozabad Group given by Fatmi et al. (1986) is more commonly used in preference to the Shirinab Formation. It has been intensely folded and is characterized by tight and steeply dipping isoclinal folds derived from pre-Himalayan deformation. The Ferozabad Group is divided into three formations, Spingwar, Loralai and Anjira (Table below). The Ferozabad Group is intensely folded and is disconformable with the overlying Sember Formation of Early Cretaceous age in Lasbela area but in the vicinity of Khuzdar, either the Sember Formation is absent or scarcely exposed.

Table 4.2: Stratigraphy of Khuzdar-Lasbela

Group	Formation	Lithology	Tickness	Age
Parh	Sember	Siltstones	>200m	Jurassic-Cretaceous
		Disconformity		
Ferozabad	Anjira	Peri-platformal Limestones	250 to 500m	Jurassic
	Loralai	Platformal Limestones	>200m	Jurassic
	Spingwar	Shallow Marine Sandstones	>400m	Triassic-Jurassic

Source: Allen and Anwar, 1994

The Middle Jurassic rocks of the Ferozabad Group record a gradual transition from shallow marine siliciclastic and continental margin deposits (Spingwar Formation) to platformal carbonate deposition (Loralai Formation) to peri-platformal, comparatively deeper water limestone and mudstone (Anjira Formation). Late Jurassic to Early Cretaceous sediments are represented by deep water shale, siltstone and sandstone belonging to the Sember Formation.

The Jurassic period in the Axial Belt and the Lower Indus Basin is represented by a great thickness of several thousand meters of marine limestone and shale with subordinate sandstone. Fossils of cephalopods, radiolarians, foraminifers, corals, brachiopods, crinoids and algae are also distributed in Jurassic sediments.

The regional strike of the Jurassic carbonate rocks intercalated with shale and sandstone is generally N-S throughout Khuzdar-Lasbela area, but it progressively changes to E-W. The regional dip ranges from 0 to 90° because the Jurassic stratified rocks are highly folded and faulted into anticlinoriums and dome structures.

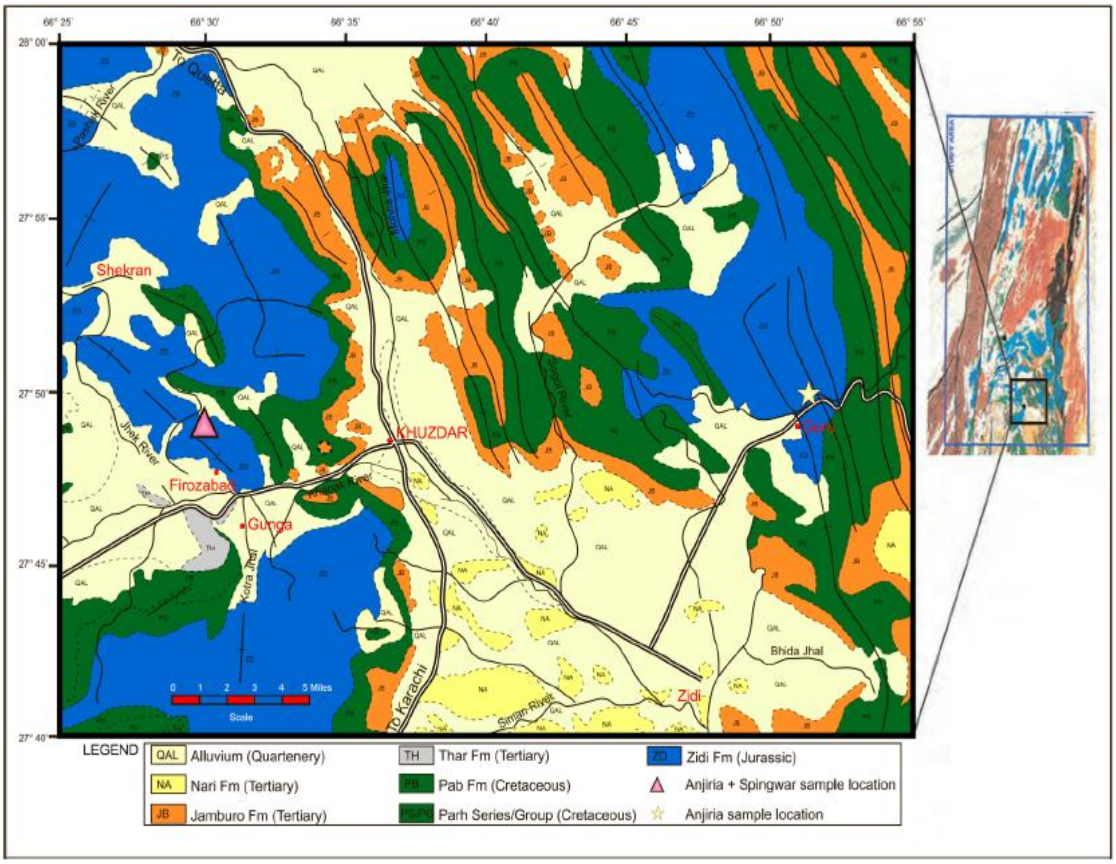


Figure 4.9: Generalized geological map of the Khuzdar area showing Jurassic to Recent rocks. Location of Firozabad Section is also given[14]

4.1.4 Character of Ore Deposits

The Gunga barite deposits extend for about 1500-2000 m within Jurassic limestone, comprising a series of disconnected barite lenses of 3 to 5 m thickness. Most of the lenses gradually pinch out along the strike, but some terminate more abruptly by feathering out into siliceous rocks or brecciated zones.

In Gunga, two mineralized zones are recognized. The upper zone is mainly composed of barite, but significant concentration of sphalerite and galena are found in the lower mineralized zone. The model, generated by the interactive gravity modelling indicates that the Gunga mineralization has been deformed by the post tectonic activities and the complex structural set up controls the geometry of the Gunga mineralized zones.

The wall rocks have been altered in Gunga by silicification, leaching as well as by the introduction and oxidation of iron. This alteration appears to be partly related to barite deposition. According to JICA and MMAJ (1987) the mode of barite mineralization in Gunga is divided into following four types -

[14] Hasany.S.T; et al. (2012). Identification of New Potential Source and Reservoir Rock of Early Jurassic Age, supported with Basin Modeling and discussion of Exploration Constraints in the Northern Kirthar Range, Pakistan. Search and Discovery Article #30262 (2012)

stratabound replacement associated with 1) fracture filling, 2) open space fillings in solution collapsed breccia, 3) replacement in fault, and 4) veinlets associated with all these three types. The wall rocks in Gunga are hydrothermally altered. The alteration is not confined to the ore zones but is widespread. It appears that in Gunga like Mississippi Valley, the stratigraphic and structural control provided open space which facilitated fluid flow and mineral growth.

4.1.5 Types of Mineralization

Barite deposits formed through the processes of direct precipitation (syngenetic) and through replacement or fissure fillings observed at various places in the area are of the following types: i) stratiform, ii) stratabound-replacement type, iii) vein and cavity fillings and iv) residual.

The stratiform barite deposits, occurring at Duddar and Gunga, are huge in quantity and good in quality. These are being commercially exploited. The deposits are hosted typically in black shale, argillaceous limestone and mudstone of the Anjira Formation[15].

The stratabound replacement type is confined to the selective coarse textured limestone beds of the Loralai and Spingwar Formations. The most promising deposits are Kanraj-Zibro Dhoro and Kundni-Dham Jhal on the eastern and western flanks of the Mor Range in the Lasbela district. At places small scale open pit mining is carried out by the local owners and supplied to the milling companies of Sindh and Balochistan.

The vein/fissure and cavity filling type are widespread. These are hosted by all the three formations, the promising ones are in clastic rocks of the Spingwar Formation, e.g., Bankhri and Kundni localities in the Lasbela district. The residual barite deposits are in the form of nodules, concretions and disseminated larger grains in sedimentary rocks. Barite nodules are in late Jurassic-early Cretaceous mudstone and shales of the Lasbela and Khuzdar districts.

4.1.6 Mineralogy

Mineralogy of the deposits is relatively simple and occurrence of sphalerite, galena, pyrite, marcasite, dolomite, siderite, and calcite with barite is common, however, relative abundance of these minerals varies from place to place. Complete sequence of deposition is seldom present in any of the deposits, and the ratio of galena and sphalerite to barite is more variable, even among the deposits of the same district. In some localities like Bankhri the barite appears to be the main mineral of considerable economic significance.

Barite occurring as fine to coarse crystals, sometimes gigantic up to several centimeters in association with massive and radiating crystals exhibiting spherulitic textures were noted. The bedded/stratiform barite classified as baritite is typically present at the top of stratiform sulphide mineralization in the Anjira Formation of this district. The occurrence of barite either in upper or at the periphery is

[15] Ahsan.S.N; et al. (1999). Geology and Genesis of Barite Deposits of Lasbela and Khuzdar Districts, Balochistan, Pakistan. RESOURCE GEOLOGY, vol. 49, no. 2, 105–111, 1999

anticipated to indicate the crystallization of residual solution at a later stage. These bedded barites exhibit fine granular aggregates with fine lamination, streaks and patches of carbonaceous-argillaceous sediments. The barite is generally grey. The coarse, white, translucent and platy/lath-shaped crystals as clusters/rosette and dissemination in dolomites are most widespread as replacement products in limestones. Calcite, quartz and clay minerals are common impurities. Transparent calcite nearly colorless to amber is present as fine aggregates commonly corroding barite grains. Solidification is conspicuous as quartz veins and druses. Gypsum in varying proportion is present at places as secondary veins in the mineralized area. The fine aggregates of poorly formed crystals are suggestive of relatively rapid crystallization, while the larger crystals grew in relatively slower rate of crystallization at a later stage with higher degree of freedom for crystallization.

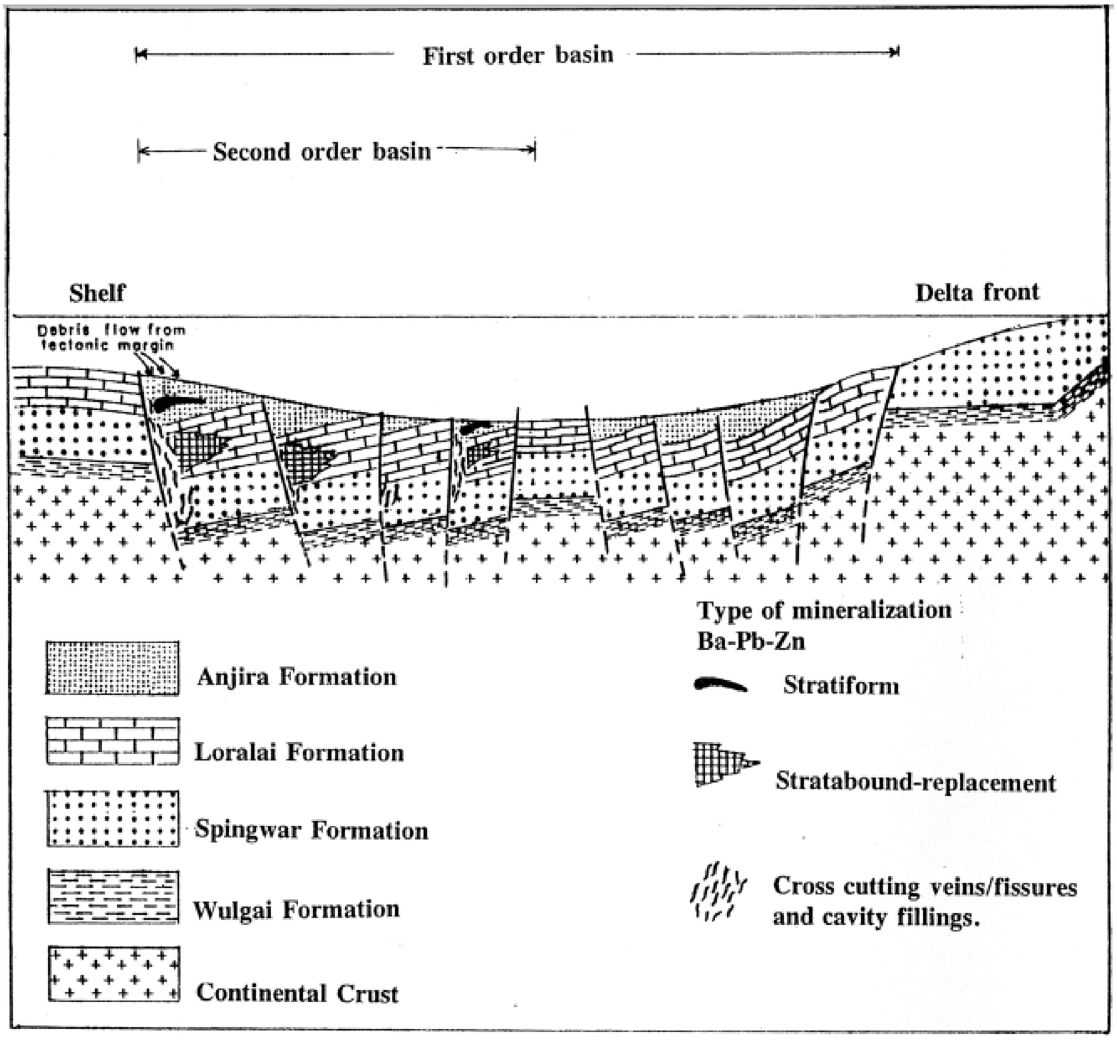


Figure 4.10: Possible geotectonic setting of sediment-hosted barite and lead-zinc sulphide deposits in the Lasbela and Khuzdar districts[16]

[16] Ibid.

4.1.7 Seismicity

Pakistan is situated on the western-fractured edge of the Indo-Pakistan sub-continental plate and lies on the northwestern corner of the Indian lithospheric plate, the southern part of the Afghan craton, and the northern part of the Arabian oceanic sub-ducting plate (Zaigham and Mallick, 2000). The Indian subcontinent has been impacting with Eurasian sub-continent in the course of last 30-40 million years (Aitchinson et al., 2007). Throughout this period continental lithosphere longer than 2000 km has abbreviated to huge mountain ranges. Northern, Western and Southern Pakistan, Kashmir and Northern India and Afghanistan are along zones of high seismic movement. Earthquakes happen along an extremely active thrust fault framework in the locale. Earthquakes along active faults in Pakistan and adjacent faults in India and Afghanistan are the direct result of the Indian sub-continent moving northward and colliding with the Eurasian continent at a rate of about 5cm/year (Sitharam et al., 2013). Before this collision, this plate was moving with the highest rate of 20cm/year (Kumar et al., 2007). This major tectonic impact is initiating elevate that prepares the most noteworthy mountain tops on the planet incorporating the Himalayan, the Karakoram, the Pamir and the Hindu Kush ranges.

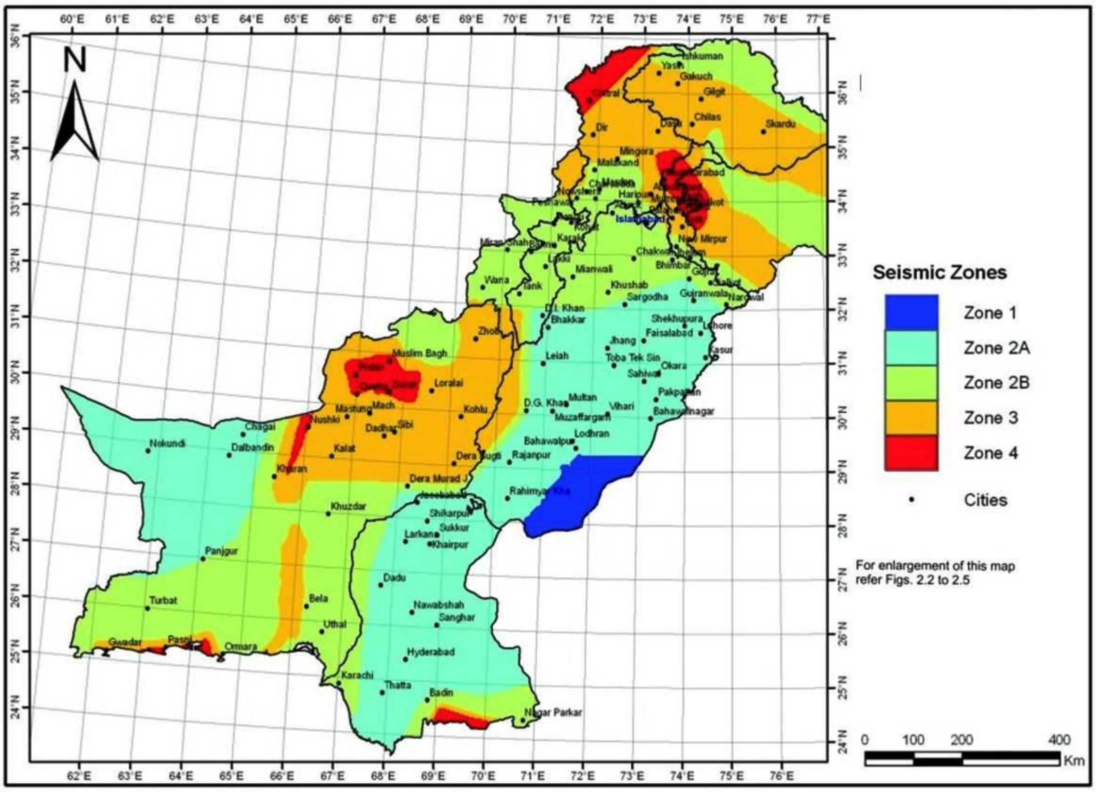


Figure 4.11: Seismic Zones of Pakistan

The major tectonic features of Pakistan and surrounding areas are based on the information provided by Building Code of Pakistan (Khan, 2011). The major fault zones in Pakistan include the Sulaiman stretch in transpression and the Himalayan zone under-thrusting the Eurasian plate (Jadoon, 1992). According to the seismic zoning map of Pakistan, project area lies in the zone 2B, resulting in moderate to medium earthquakes occurred in past.

- Seismic factor at the project site is: g/15~g/20
- Earthquake factor: qE(0-0.35)
- UBC 1979 zone(1-4): 2
- RICHTER Magnitude: (3.9-7.1)
- RICHTER Magnitude: below 3.9

According to United States Geological Survey (USGS), over 38 earthquakes of magnitude 4.5 or greater have occurred in the past two decades in the Khuzdar region[17].

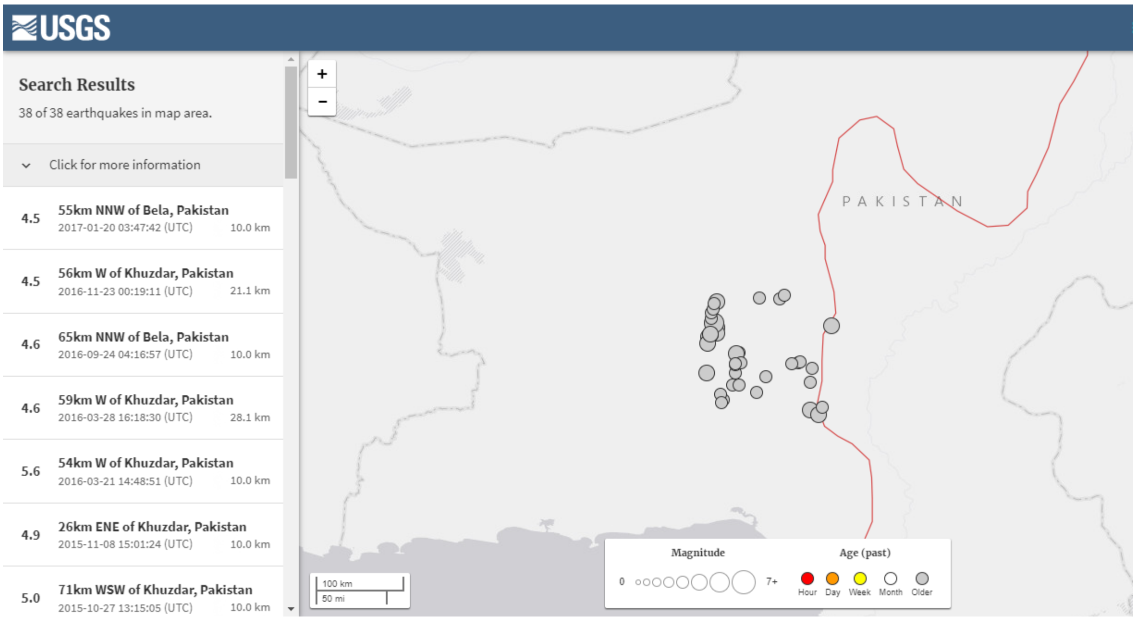


Figure 4.12: Earthquake frequency in Khuzdar region since 1990s (magnitude 4.5 or greater on Richter scale)[18]

4.1.8 Soils Types

An investigation on soil quality was carried out by Shah et al. (2016)[19] of Balochistan University of Information Technology, Engineering and Management Sciences (BUITEMS) on soil quality monitoring of Barite Mine of Bolan Mining Enterprise (BME) in Khuzdar. A total of five samples were collected from Bolan Mining Enterprises Khuzdar. All samples were collected from active faces offering continuous excavation of Barite .Samples were collected from Face dumping area, Face 2, Face 4, Face 5 and Face 6 respectively. At the time of collecting samples the samples were carefully tagged with corresponding areas they were collected from. Before undertaking experimentation Conning and Quartering was performed on all samples to get a representative sample to be tested for accurate pH and Soil Elemental Analysis. pH values of the soil samples are shown below;

[17] United States Geological Survey (USGS). Retrieved from earthquake.usgs.gov/earthquakes/.
[18] United States Geological Survey (USGS)
[19] Shah et al. (2016). Soil Quality Monitoring of Barite Mine Khuzdar. Published at BUITEMS.

Table 4.3: pH of Soil Samples from BME Barite Mine Area		
S. No	Sample	pH
1	Face Dumping Area	6.21
2	Face 2	8.41
3	Face 4	7.49
4	Face 5	6.52
5	Face 6	6.27

Results of soil elemental analysis are depicted below;

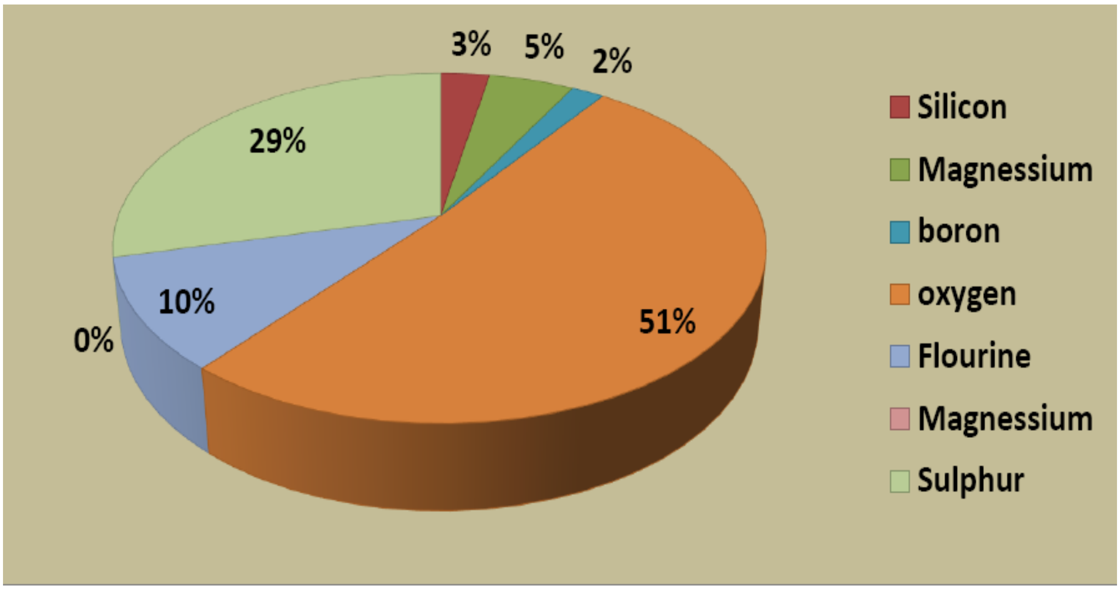


Figure 4.13: Dumping Area Face sample Elemental Analysis

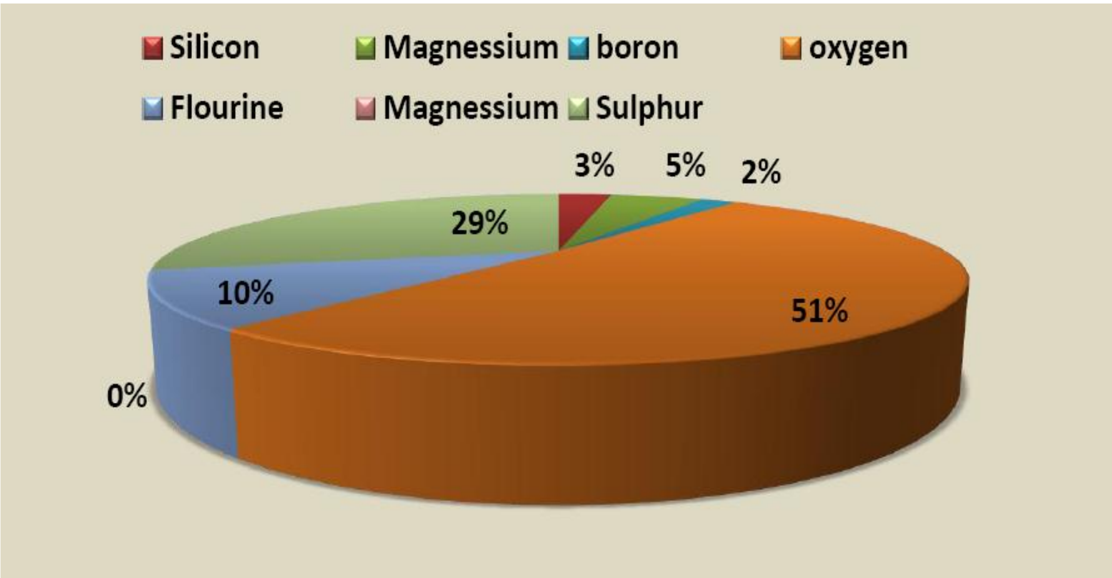


Figure 4.14: Face Area 2 sample Elemental Analysis

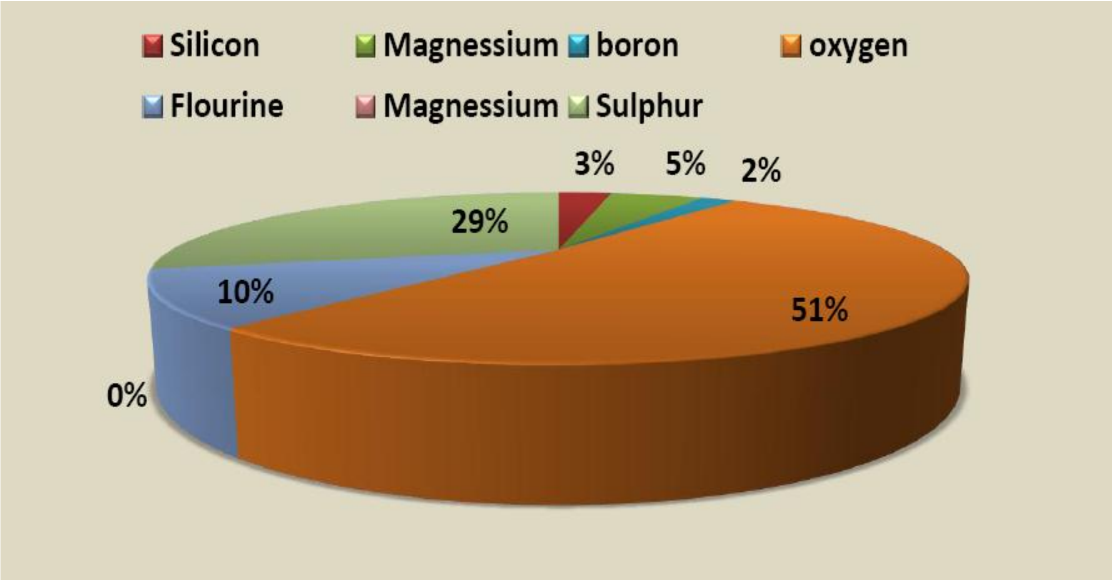


Figure 4.15: Face Area 4 sample Elemental Analysis

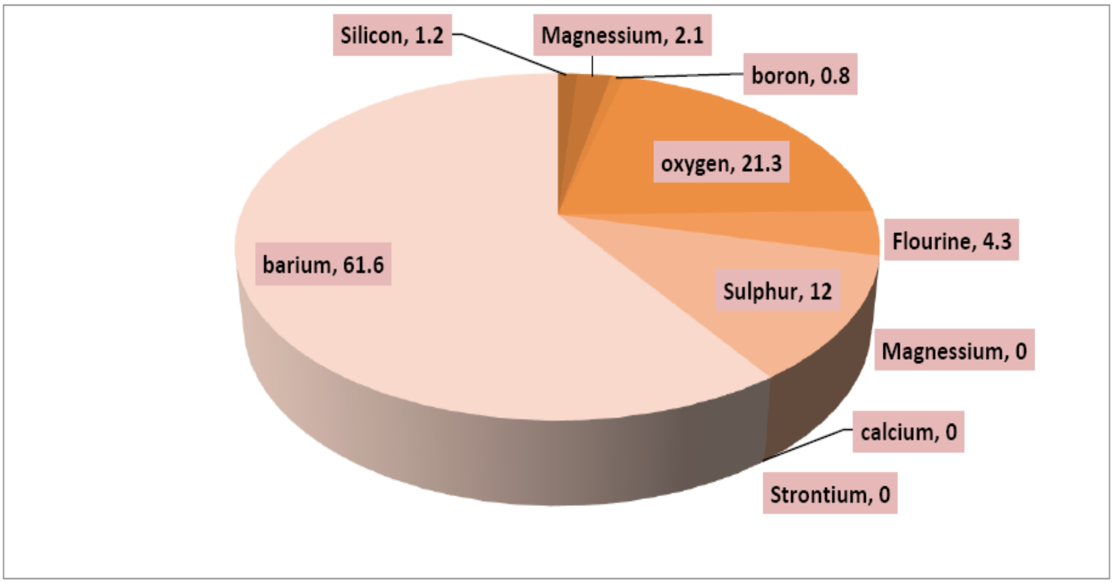


Figure 4.16: Face Area 5 sample Elemental Analysis

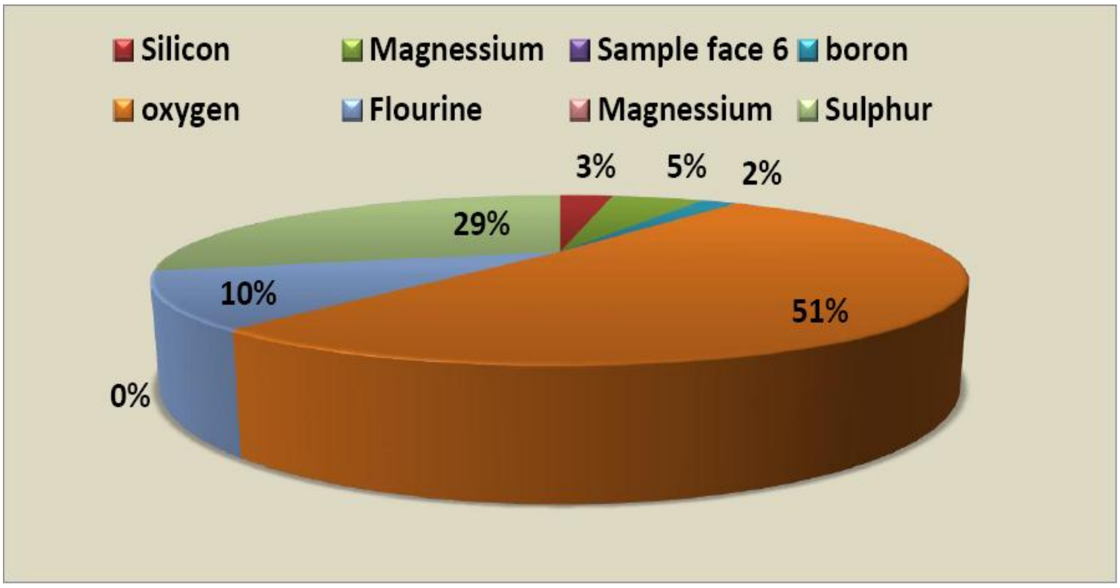


Figure 4.17: Face Area 6 sample Elemental Analysis

The district Khuzdar in general, comprises various types of soil known as matt, karkats, rikpoad, halli and sarah in which mattis best and richest clay natured soil, consisting of silt washed down from the hills. Karkat is considered second best. It is harder, cracks when dry and requires breaking up after ploughing, and requires less water than matt. Both matt and karkat are suitable for spring crops and are found in Surab, Gidar, Pandran, parts of Baghwana, Tutak, Nal, Kalo, Karkh, Korask and Jan. Rikpoad is a light sandy soil found in Wadh. It is suitable for wheat, barley and jaur but the crops are considered substandard to those grown on matt or karkat. It is also well suited for melons, onions and vegetables. Halli is a gravely soil, found in the irrigated areas of Surab and Khuzdar, on the skirts of hills and along the banks of rivers. It is suitable for vegetable but the crops cultivated on it are thin and need great care. Sorah or salt land is the lowest quality soil among all and is found in large tracts at Hisar, Zehri, Gidar, Nondrav valley and between Mir-na-Shaher and Bajoi in Baghwana[20].

Khan et al. (2010) investigated the soil quality in Khuzdar and Kalat districts in relation to the analysis of Phytonematode Associated with Pomegranate. Results of the soil quality investigation in Khuzdar district are shown below in the table;

Table 4.4: Soil Quality at Various Locations in District Khuzdar

Site	Soil	Soil pH	Max. water holding capacity (%)	Grass Cover
Ornach	Sandy-loam	8.0	35.4	Low
Wadh	Sandy	8.0	35.6	Medium
Piromal	Sandy-loam	7.8	28.0	Medium
Khuzdar	Rocky-sandy	8.0	36.0	None

[20] District Development Profile 2011. Khuzdar. P&DD Government of Balochistan in Collaboration with UNICEF

Table 4.4: Soil Quality at Various Locations in District Khuzdar				
Site	Soil	Soil pH	Max. water holding capacity (%)	Grass Cover
Kork	Sandy	8.2	21.5	Low
Musiani	Sandy	8.1	22.4	Low
Source: Khan et al. (2010). An Analysis Of Phytonematode Associated With Pomegranate In Khuzdar And Kalat District, Balochistan. Pakistan J. Agric. Res. Vol 23 No. 3-4, 2010.				

4.1.9 Climate

Pakistan is divided into five different microclimatic zones based on the locations of meteorological stations. These zones are named A, B, C, D and E as shown in the figure below along with their latitudinal extent;

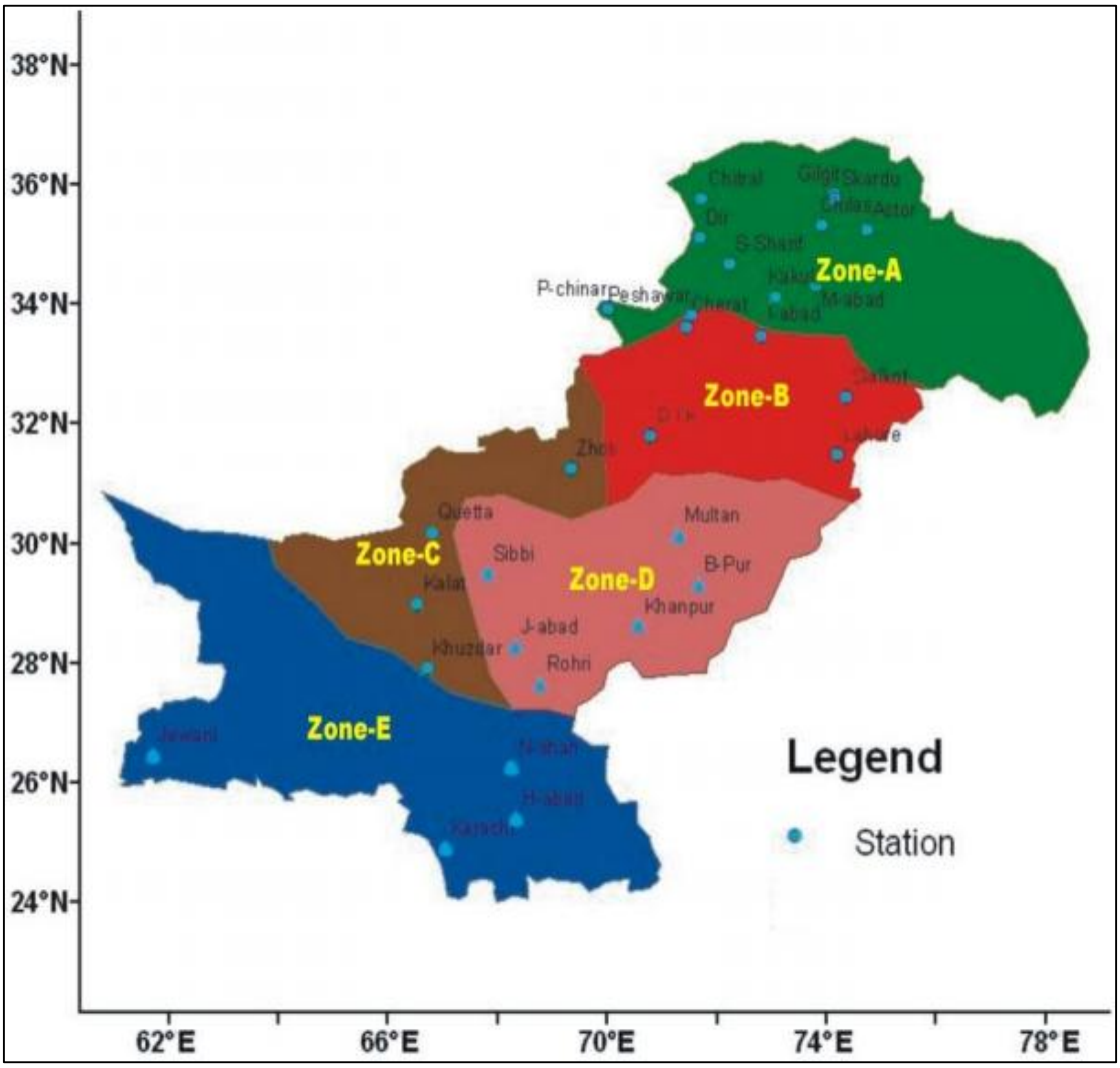


Figure 4.18: Microclimatic Zones of Pakistan. Locations of meteorological stations are also depicted[21]

[21] Salma, S. et al. (2012). Rainfall Trends in Different Climate Zones of Pakistan. Pakistan Journal of Meteorology. Vol. 9, Issue 17: Jul 2012.

Macro-Environment District Khuzdar

District Khuzdar lies in Zone C and E. Climate of this zone is cold in winters and hot in summers. The coastal part comprises only a small part of this region and climate above coastal parts in Balochistan as well as in Sindh province is mostly arid to hyper arid. Annual average rainfall is about 250 mm, hence, indicating semi-aridity in the area. The principal winds are the northerly (goorich) and the southern and south-eastern wind (nambi). The cessation of the goorich and garro in summer causes rust in the wheat crop; while people have higher risks to attract fever. The nambi and the gazgi are the precursors of rain. The southern area of the district is warmer than the northern part.

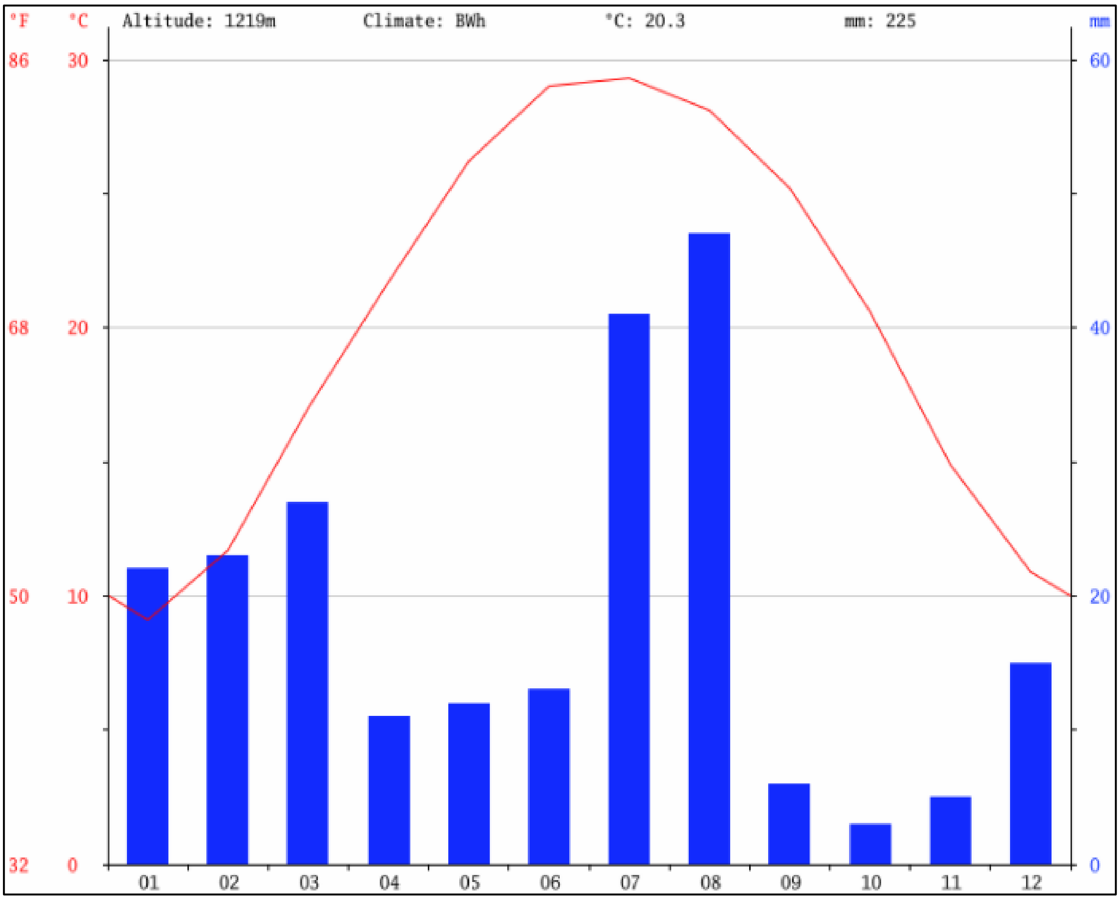


Figure 4.19: Climate Profile of Khuzdar[22]

[22] Retrieved from https://en.climate-data.org/location/3395/

Mean annual daily temperature map of Pakistan, based on the data of three decades (1971-2000) is depicted below;

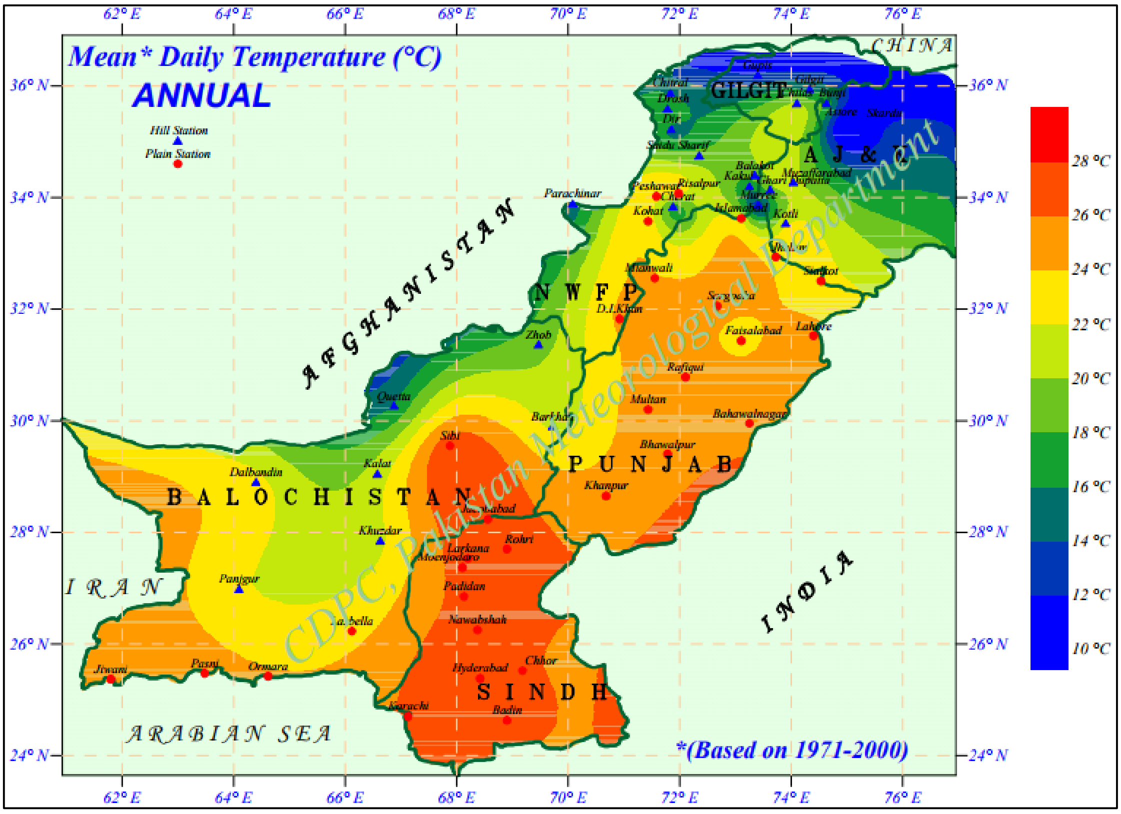


Figure 4.20: Annual mean daily temperature map of Pakistan[23]

Mean daily temperature of district Khuzdar is in the range of 20°C to 24°C. Extreme minimum of -8.0°C was recorded on 16-01-1996. Extreme maximum of 47.7°C was recorded on 18-07-1997[24]. Mean monthly temperature of district Khuzdar is shown in the table below;

Table 4.5: Mean monthly temperature in Khuzdar												
Temperature	**Jan**	**Feb**	**Mar**	**April**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Average	9.1	11.7	17	21.7	26.2	29	29.3	28.1	25.2	20.6	14.9	10.9
Minimum	1.3	3.6	8.7	13.2	17.5	20.5	22.1	20.7	16.9	11.2	5.6	2.2
Maximum	17	19.8	25.3	30.2	34.9	37.6	36.5	35.5	33.5	30	24.2	19.6
Source: Climate Data												

Mean annual rainfall map of Pakistan, based on the data of three decades (1971-2000) is depicted below;

[23] Pakistan Meteorological Department (PMD). Retrieved from http://www.pmd.gov.pk/cdpc/Pakistan_mean_temperature.pdf

[24] Regional Meteorological Centre Balochistan. Retrieved from http://rmcbalochistan.pmd.gov.pk/historical-events.html

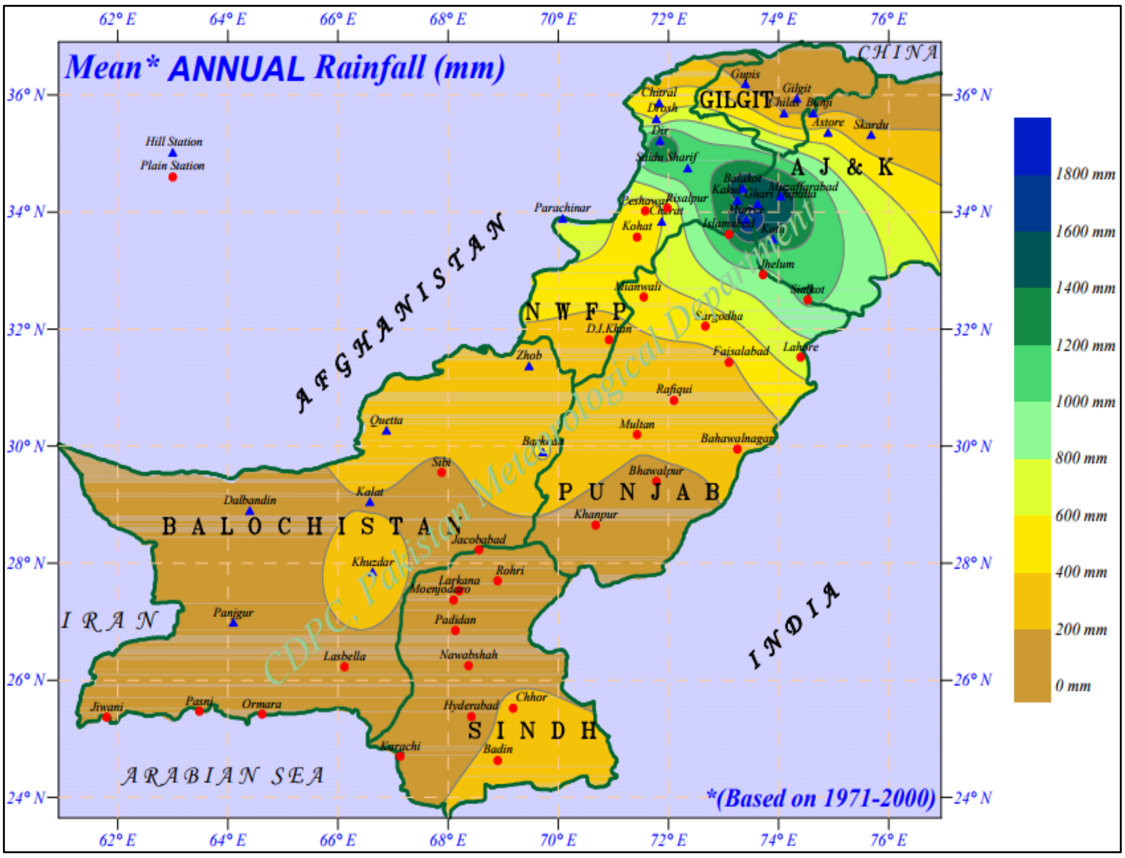


Figure 4.21: Mean annual rainfall map of Pakistan[25]

Mean annual rainfall of District Khuzdar is in the range of 200mm to 400mm. Mean monthly rainfall in Khuzdar is shown below in the table;

Table 4.6: Mean monthly rainfall in Khuzdar												
Month	**Jan**	**Feb**	**Mar**	**April**	**May**	**June**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Precipitation/Rainfall	22	23	27	11	12	13	41	47	6	3	5	15
Source: Climate Data												

Microenvironment-Project Site

The monitoring of key metrological parameters had been conducted on project site on 29th & 30th November, 2017. The metrological data had been collected at the intervals 1 hr which include the wind speed (m/s), atmospheric pressure (mbar), wind direction (degree), ambient temperature and humidity (%). It can be observed from the microenvironment wind direction that prevailing wind is westerly at the project site.

[25] Pakistan Meteorological Department (PMD). Retrieved from http://www.pmd.gov.pk/cdpc/Pakistan_mean_rainfall.pdf

Table 4.7: Metrological Data at Project Site.

Date	Time	Wind speed (m/s)	Pressure (mbar)	Wind direction (degree)	Air Temperature (°C)	Humidity (%)
Pak- NEQS (2013)		NA	NA	NA	NA	NA
29-11-2017	14:00	0.0	1018.9	108.1	21.1	10
29-11-2017	15:00	0.0	1019.7	138.9	21.7	9
29-11-2017	16:00	1.9	1019.3	173.0	21.7	9
29-11-2017	17:00	1.1	1019.7	127.7	21.1	10
29-11-2017	18:00	0.4	1019.5	120.5	18.3	14
29-11-2017	19:00	0.7	1019.9	220.6	16.1	17
29-11-2017	20:00	1.0	1020.1	257.2	14.4	20
29-11-2017	21:00	0.4	1019.9	278.5	12.8	23
29-11-2017	22:00	1.1	1020.2	276.3	11.7	25
29-11-2017	23:00	2.0	1019.6	319.2	10.6	28
30-11-2017	0:00	1.8	1020.3	315.6	8.9	31
30-11-2017	1:00	0.0	1019.1	279.5	8.3	33
30-11-2017	2:00	0.0	1019.4	252.3	7.2	35
30-11-2017	3:00	0.0	1019.8	268.4	6.7	36
30-11-2017	4:00	0.0	1019.2	307.1	6.1	38
30-11-2017	5:00	0.0	1019.2	305.9	5.6	39
30-11-2017	6:00	0.0	1019.2	289.1	5.0	40
30-11-2017	7:00	0.0	1018.7	280.5	5.0	40
30-11-2017	8:00	0.0	1018.3	262.9	6.1	35
30-11-2017	9:00	0.0	1018.6	297.5	8.3	27
30-11-2017	10:00	0.0	1018.1	295.5	13.3	20
30-11-2017	11:00	0.0	1017.7	278.1	16.7	15
30-11-2017	12:00	0.0	1018.5	266.0	18.9	12
30-11-2017	13:00	1.1	1017.7	273.2	20.6	11

4.1.10 Ambient Air Quality & Noise Quality

Ambient Air quality in the most of the project area appears fairly good based on observations during the study period. There are some minor neighboring domestic sources of air pollution in the town of Gunga, such as emissions from wood and kerosene burning stoves as well as small diesel standby generators in some households. The main vehicular emissions could possibly through the nearest highway (N-30 Basima Khuzdar) from the project site. Air quality in the project area appeared unpolluted during the study period.

Ambient Air Quality monitoring had been conducted and the parameters measured include the SPM, PM10, PM2.5 and metrological parameters.

Ambient Air Monitoring Activities at Project Site , 2017

Location of Ambient Air Monitoring	At proposed project Site	
Coordinates	Latitude	27° 44' 43.31" N
	Longitude	66° 31' 53.17" E
Date of Ambient Air Sampling	29th November 2017 to 30th November 2017	
Compliance Status	All Ambient Parameters are in compliance of NEQS	

The average concentration of SPM, PM_{10}, $PM_{2.5}$ levels were 372$\mu g/m^3$, 131$\mu g/m^3$ & 34$\mu g/m^3$ respectively. All particulate matter values were in limits of NEQS except $PM_{2.5}$.

The measured minimum and maximum concentrations for SPM were 336 mg/m^3 & 396 mg/m^3.

The measured minimum and maximum concentrations for PM_{10} were 124 mg/m^3 & 139 mg/m^3.

The measured minimum and maximum concentrations for $PM_{2.5}$ were 25 mg/m^3 & 39 mg/m^3.

Table 4.8: Ambient Air Quality at Project site.				
Date	**Time**	**SPM (µg/m³)**	**PM $_{10}$ (µg/m³)**	**PM $_{2.5}$ (µg/m³)**
Pak- NEQS (2013)		**500**	**150**	**35**
29-11-2017	14:00	355	128	38
29-11-2017	15:00	365	128	35
29-11-2017	16:00	388	135	39
29-11-2017	17:00	354	126	36
29-11-2017	18:00	363	124	34
29-11-2017	19:00	362	128	36
29-11-2017	20:00	374	126	39
29-11-2017	21:00	386	128	38
29-11-2017	22:00	387	135	34
29-11-2017	23:00	389	130	35
30-11-2017	0:00	388	136	36
30-11-2017	1:00	395	134	35
30-11-2017	2:00	396	130	32
30-11-2017	3:00	378	139	36
30-11-2017	4:00	396	135	35
30-11-2017	5:00	374	130	33
30-11-2017	6:00	386	136	35
30-11-2017	7:00	378	134	35
30-11-2017	8:00	365	133	39
30-11-2017	9:00	355	139	35
30-11-2017	10:00	378	132	36
30-11-2017	11:00	345	129	32
30-11-2017	12:00	352	127	29
30-11-2017	13:00	336	126	25
Average Result		372	131	34

Noise level monitoring conducted by EMC representative at different locations and the results mentioned in Table 4.4. The objective of the noise pollution survey around the project site was to identify existing noise sources and to measure the noise levels.

Table 4.9: Noise Monitoring Results			
S.No	**Location Description**	**Coordinates**	**Noise Level dB(A)**
01.	Noise level near camp office	27°44'43.46"N	64

	BME	66°31'52.36"E	
02.	Noise level near Quarry Area	27°44'28.88"N 66°32'08.08"E	68
03.	Noise level near proposed process plant	27°45'05.93"N 66°32'04.58"E	63
04.	Noise level near Gunga Ferozabad	27°46'12.57"N 66°31'07.78"E	62
05.	Noise level near Makkali Village	27°46'14.07"N 66°30'19.41"E	64
06.	Noise level near Agricultural Field Killi Gunga	27°45'49.15"N 66°31'22.19"E	58

Table 4.10: Noise Level Monitoring at Project Site

Location # 01		Location # 02	
Noise level near camp office BME	Coordinate: **27°44'43.46"N 66°31'52.36"E**	Noise level near near Quarry Area	Coordinate: **27°44'28.88"N 66°32'08.08"E**
Measuresrd Noise Levels: 64 dB(A)	NEQS Limits: 75 dB(A)	Measuresrd Noise Levels: 68 dB(A)	NEQS Limits: 75 dB(A)

Location # 03		Location # 04	
Noise level near proposed process plant	Coordinate: 27°45'05.24"N 66°32'04.58"E	Noise level near killi Gunga Ferozabad	Coordinate: 27°46'12.57"N 66°31'07.78"E
Measuresrd Noise Levels: 63 dB(A)	NEQS Limits: 75 dB(A)	Measuresrd Noise Levels: 62 dB(A)	NEQS Limits: 75 dB(A)

Location # 05		Location # 06	
Noise level near Makkali Village	Coordinate: 27°45'43.21"N 66°28'56.73"E	Noise level near Agricultural Field Killi Gunga	Coordinate: 27°46'21.02"N 66°30'53.35"E

Table 4.10: Noise Level Monitoring at Project Site

Measuresrd Noise Levels: 64 dB(A)	NEQS Limits: 75 dB(A)	Measuresrd Noise Levels: 58 dB(A)	NEQS Limits: 75 dB(A)
			

4.1.11 Hydrology

There is no major surface water body in or near the project site. Intermittent streams of Katta Jhal and Girnal Jhal are located in the vicinity of the project site. Water plays a significant role in the economy of the Balochistan province. Development of the agricultural sector depends on secure supplies of good-quality water. There is an urgent need to use available water resources in the most efficient ways and to develop new resources to the maximum.

Water resources budget of the Balochistan province is shown below;

Table 4.11: Water resources budget of Balochistan

S#	Description	Quantity (MAF)		
		Available	**Utilized**	**Balance**
A. Indus Water as per Indus Accord				
1	Perennial	3.870	3.052	0.820
2	Flood	4.620	-	4.620
	Total	8.490	3.052	5.440
B. Non Indus Basin				
1	Flood runoff	10.793	2.222	8.571
2	Groundwater	2.210	2.659	(-) 0.459
	Total	13.003	4.881	8.112
	Grand Total	21.493	7.933	13.552

Source: Water Resource Development in Balochistan. Irrigation Department. GoB. 2014 & 2015.

Water budget/productivity in all the systems i.e. Canal, Perennial, Groundwater, is low as compared to the other provinces of the country. The water budget of province is highly segmented as compared to water budget of other provinces which is highly integrated and where the different sources supplement each other against any risk and threat.

Means of water exploitation in Balochistan are depicted below;

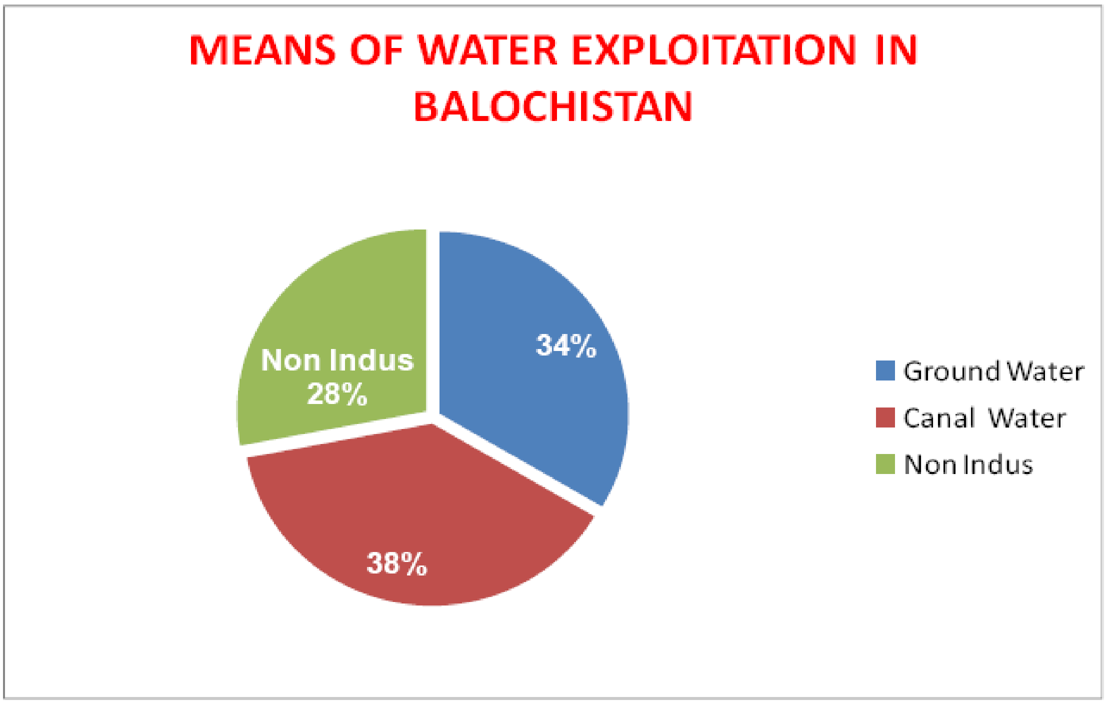


Figure 4.6: Means of Water Exploitation in Balochistan[26]

Availability, estimated present and proposed utilization of water as per the Indus Water Accord 1991 is tabulated below;

Table 4.12: Availability, present and proposed utilization of water as per the Indus Water Accord 1991 (in Million Acre Feet)	
Water Availability	
Perennial as per Water Accord	3.870 MAF
Share of Balochistan as result of Mangla Dam Rising	0.360 MAF
Flood Supplies	4.620 MAF
Total	8.850 MAF
Present Utilization	
Patfeeder Canal	1.8604 MAF
Khirther Canal	0.8586 MAF
Uch Canal	0.0989 MAF
Manuthi Canal	0.0566 MAF
Khan Wah, Faizabad and Direct Outlets	0.1775 MAF
Total	3.0520 MAF
Proposed Utilization Against Balance Availability	
Patfeeder Remodelling and Extension	0.2020 MAF

[26] Water Resource Development in Balochistan. Irrigation Department. GoB. 2014 & 2015.

Kachhi Canal (0.451 MAF Perennial + 1.570 MAF Flood)	2.0210 MAF
Total	2.2230 MAF
Source: Water Resource Development in Balochistan. Irrigation Department. GoB. 2014 & 2015.	

Basinal Water Resources of the province are summarized below in the table;

Table 4.13: Water resources of Balochistan	
Total River Basins in Balochistan	18
Sub Basins	73
The annual average rainfall	50 – 400mm
Decline of water table due to over draft	2-3 m per year (Cumulative)
Total average annual runoff generated	10.793 MAF
Runoff utilized/conserved so far through Dams/Flood Dispersal Structures	2.222 MAF
Balance available to be harnessed through Storage Dams/Flood Dispersal Studies	8.571 MAF
Source: Water Resource Development in Balochistan. Irrigation Department. GoB. 2014 & 2015.	

Basin map of Balochistan is provided below;

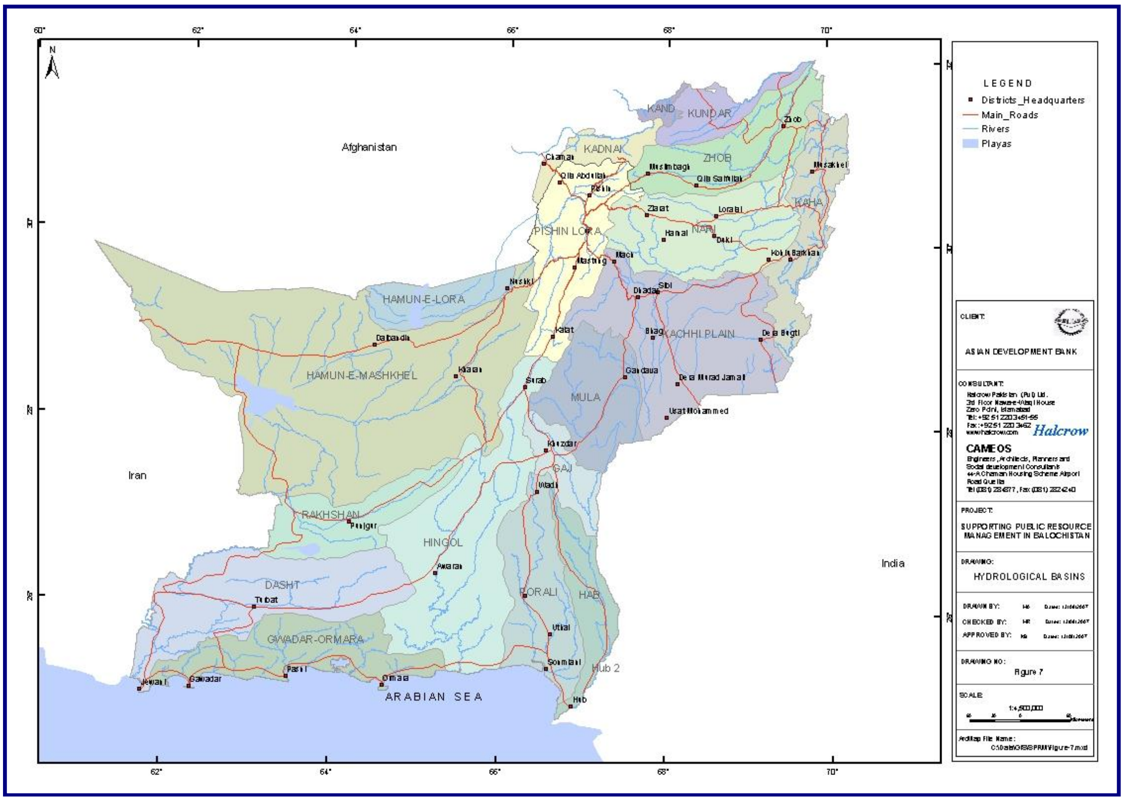


Figure 4.8: River Basins in Balochistan Province (Source: Environmental Assessment. Irrigation Department, GoB. Jan 2016)

Surface water availability through these basins is shown below;

Table 4.14: Surface water availability in Balochistan

Basin	Water Available (MCM)	Water Used (MCM)	Balance Available (MCM)
Dasht River Basin	660	83	577
Gaj River Basin	233	25	207
Gawadar - Ormara	546	64	482
Hamun-e-Lora	189	28	161
Hamun-e-Mashkel	2078	312	1766
Hingol River Basin	942	136	806
Hub River Basin	380	80	300
Kachhi Plain	1902	634	1268
Kadanai River Basin	77	10	67
Kaha Basin	515	103	413
Kand River Basin	18	2	16
Kunder River Basin	103	27	76
Mula River Basin	338	43	295
Nari River Basin	817	126	691
Pishin Lora Basin	302	169	133
Porali River Basin	1106	237	869
Rakhshan River Basin	320	34	286
Zhob River Basin	267	110	157
Balochistan	**10793**	**2223**	**8570**
Source: ibid			

Khuzdar district spans over part of Mula, Morali, Hingol and Hub river basins. Canal and drainage system of Balochistan is also depicted below;

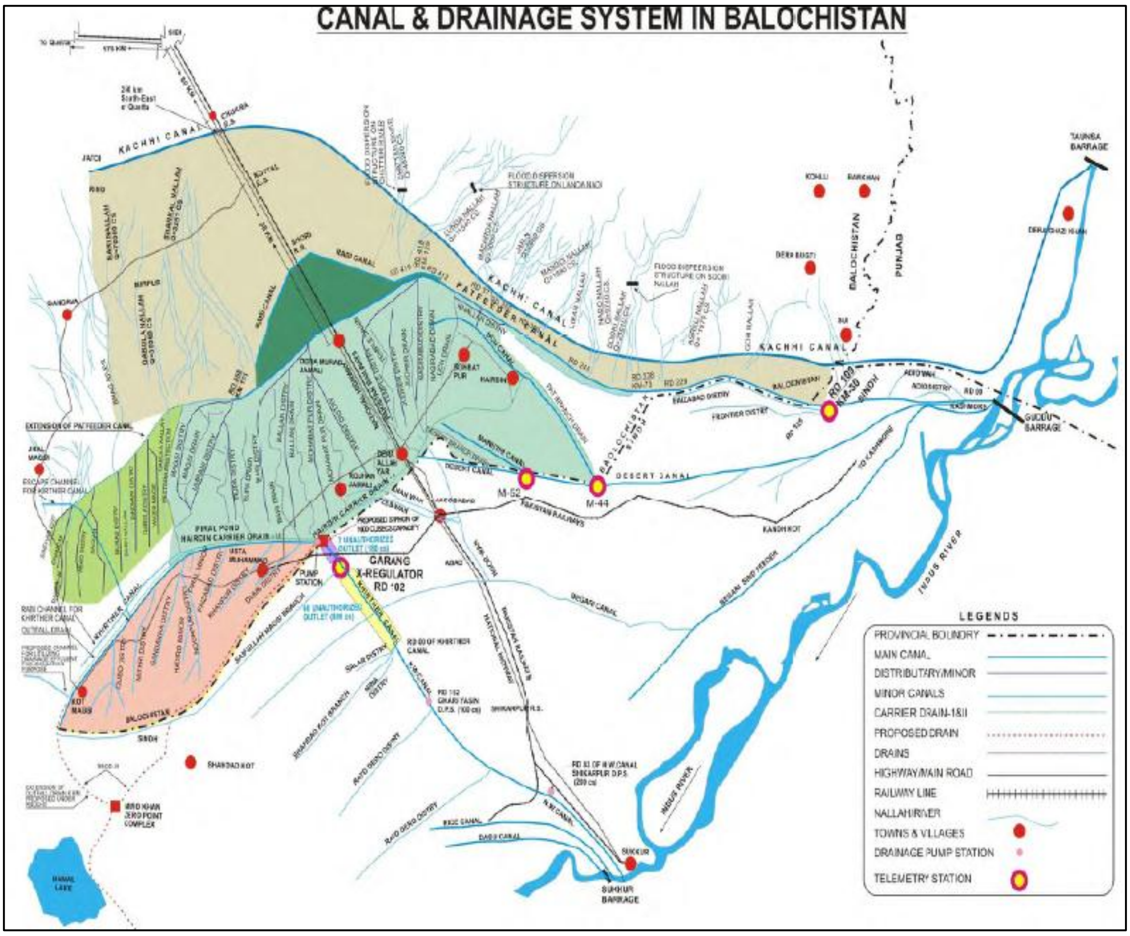


Figure 4.8: Canal and Drainage System in Balochistan[27]

Water availability in Balochistan has always been remained deficient against the demand, as per UN standers availability of 30 gallon water per capita is ideal arrangement but in Balochistan hardly 10 gallon of water per capita is being made available to about 60% of population. In-efficient use of the available surface water resources, in-discriminate exploitation of the ground water, wastage of heavy flood water, watershed degradation, coupled with the phenomenon of climate change leading to extreme events of flood and drought has made water management a difficult mandate. Despite interventions in water sector, population growth urbanization, development of the mining, industrial sector and expansion in agriculture activities the water demand has increased, putting great stress on the water resources of the province which are otherwise in deficit due to peculiar environment of the region.

Primary reasons for the water scarcity in the province are as follows;

- Geographic Location
- Low Rainfall
- Geo-Morphological Characteristics
- Global Warming Climate Change & its Impacts (Drought, Flooding Sea level raise)

[27] Water Resource Development in Balochistan. Irrigation Department. GoB. 2014 & 2015.

- Poor Watershed Management / Watershed degradation.
- Traditional Cropping Pattern / Irrigation Systems (Flooding of field)
- Rapid Growth in Population/Urbanization
- Poor Mass-Awareness
- Poor legislative frame works and its Implementation.

The province of Balochistan has suffered long drought spell of 8 years from 1997-2005 and also 3 continual high intensity cyclonic, riverine and excessive rain floods in 2007, 2010, 2012 having divesting impacts on all social sectors but more pronounced on water sector.

Issues and challenge to the water resources of Balochistan are highlighted as follows;

- Growing demand of water for different social sectors to ensure, sustainable progress.
- Sharpe depleting ground water table due to over draft / exploitation.
- Poor / limited canal infrastructure and its poor maintenance.
- Water logging and salinity issues in canal command area.
- Drying up surface water bodies due to scanty rainfall in the catchment area, degradation in the water shed area.
- Pollution of fresh water aquifer due to intrusion of saline water.
- Frequent floods and drought due to climate change factor and its negative impacts.
- Poor pricing and valuation of water.
- In-equitable distribution and water allocation for different sectors.

4.1.12 Water Quality

Daud. M. K et al. (2017)[28] reveals that Biological and chemical water quality of Baluchistan are not satisfactory as revealed by various studies. In four cities of Baluchistan, that is Ziarat, Loralai, Quetta, and Khuzdar, the water quality was badly contaminated with microorganisms making water unfit for human use. Water samples of these cities showed that NO_3 concentration was higher than the recommended limits of WHO. About 50% of water samples, collected from Ziarat, were found highly contaminated with NO_3. The drinking water quality assessment of different colonies in Quetta city revealed that pH, TDS, and hardness value of all samples were within the WHO range but 50% of the samples were found to have high EC value and COD of all samples was above the critical limits of WHO. The drinking water quality of Quetta was inadequate having bad taste, foul smell/odor, change in appearance, and pathogens being 57%, 44%, 39%, and 60%, respectively.

Temperature examination revealed a little fluctuation in results between 12.10 and 13.50°C. The highest value was determined in Thole channel water while the lowest was found in Nilt tank water. According to WHO and EPA, turbidity must not exceed 5 NTU and water having turbidity less than 1.00 NTU is excellent for domestic consumption. Turbidity of all samples was less than 5 NTU. The surface and groundwater sources of drinking water throughout Baluchistan were highly contaminated with coliforms, heavy metals, and pesticides. Human activities like improper disposal of municipal and

[28] Daud. M. K. et al. (2017). Review Article Drinking Water Quality Status and Contamination in Pakistan. BioMed Research International Volume 2017 (2017), Article ID 7908183, 18 pages.

industrial effluents and indiscriminate applications of agrochemicals in agriculture are the main factors contributing to the deterioration of water quality. The fluoride concentration in various drinking water samples collected from tap and wells water in Quetta indicated that all samples were within permissible limits of WHO, except one sample of tap water.

Z. A. Soomro et al. (2011)[29] collected and examined the drinking water samples from various cities in Pakistan. Samples were also collected from Khuzdar, Loralai, Quetta and Ziarat districts. Water samples analyzed found to be contaminated by microbes in all cities; the best quality in any of four cities was even contaminated up to 68%. Other parameter which strongly affected the water quality and made water unsafe for drinking purposes is Nitrate. 50% of the water samples from Ziarat found to be unsafe due to higher presence of Nitrates. Results are summarized in table below;

Table 4.15: Water Quality Status in Khuzdar and other Districts of Balochistan

District/Parameters Analyzed	Total	TDS	Turbidity	K	Na	As	F	Fe	NO3	Microbial
Khuzdar	11	0	0	0	0	0	0	0	2	10
Loralai	11	1	1	0	0	0	1	0	1	10
Quetta	34	3	3	0	2	0	8	9	8	23
Ziarat	10	0	1	0	0	0	0	2	5	10

Source: Soomro. Z. A. et al (2011). Drinking Water Quality Challenges In Pakistan. World Water Day April-2011.

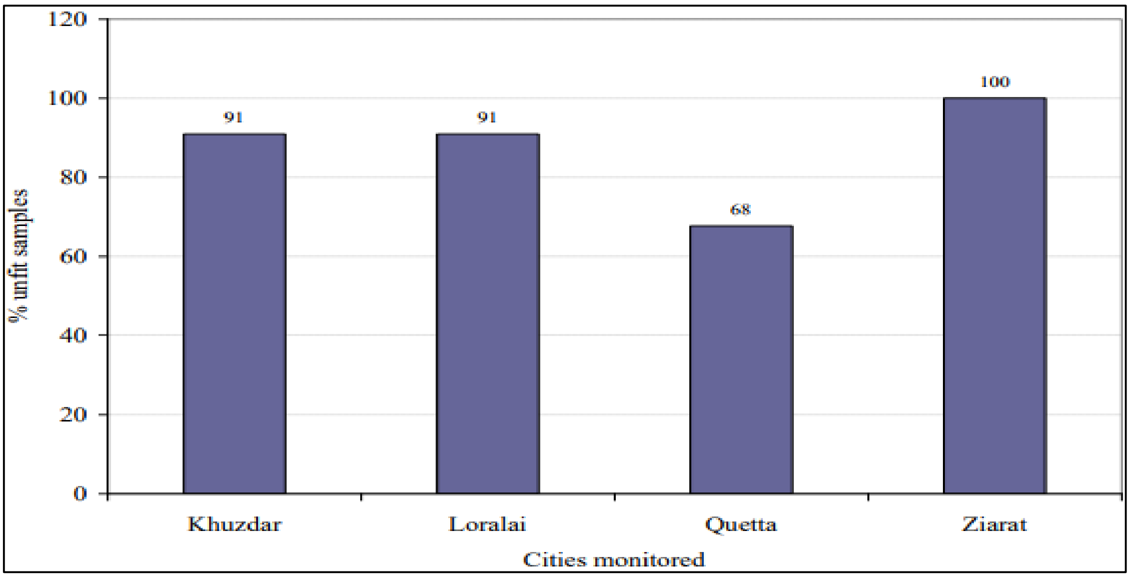


Figure 4.9: Microbiological contamination in Khuzdar and other districts of Balochistan[30]

[29] Somro. Z. A. et al (2011). Drinking Water Quality Challenges In Pakistan. World Water Day April-2011.

[30] Daud. M. K. et al. (2017). Review Article Drinking Water Quality Status and Contamination in Pakistan. BioMed Research International Volume 2017 (2017), Article ID 7908183, 18 pages.

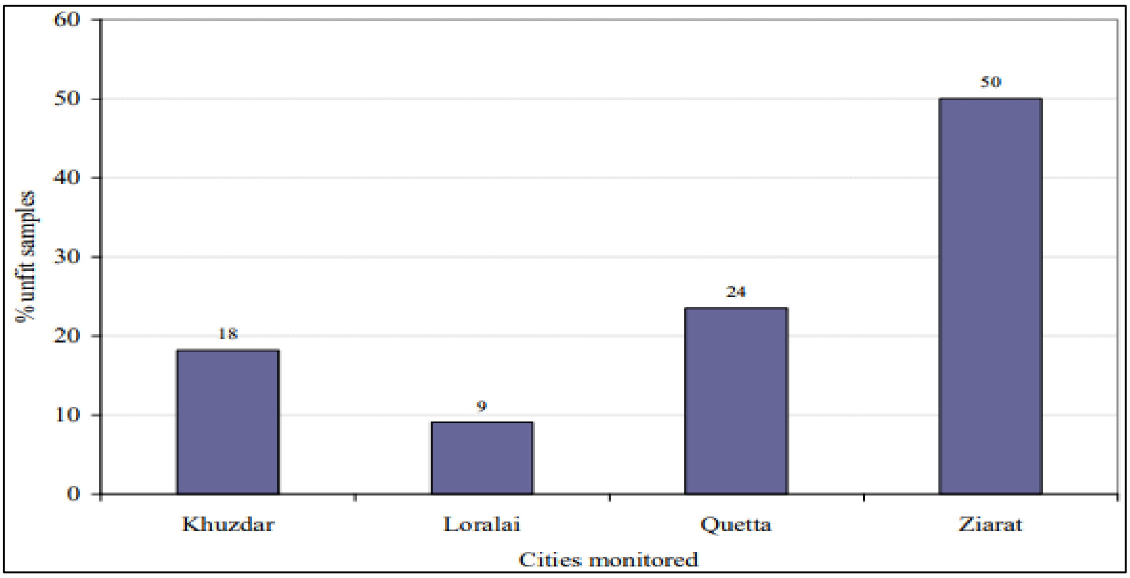


Figure 4.9: Nitrate contamination in Khuzdar and other districts of Balochistan

EMC representatives have collected water samples during field survey and brought back the samples by followed the proper sampling protocols and submitted into the EMC associated firm. Water samples include bore water and Gunga village water .

Table 4.16: Water Sampling Points

S.No	Location Description	Coordinates
01.	Bore Well-01 (900 ft) near Gunga Village	27°44'21.71"N 66°31'15.54"E
02.	Bore Well -02 (900 ft)	27°45'49.00"N 66°31'21.00"E
03.	Gunga Village Water	27°46'17.66"N 66°31'16.86"E

Fig 4.10: Water sample collection by EMC Team

The analytical test results of bore well -01 water are mentioned in the table 4.15. pH was recorded 7.29 which is considered range (6.5-8.5), TDS, Chloride, T.H values were 140mg/L, 28mg/L and 51mg/L respectively and all in the limits. Nitrate (0.08mg/L), Nitrite (0.002mg/L), Fluoride (0.02 mg/L) and Residual chlorine is not detected. The sulphate was measured (18mg/L) and but the barium was remained not detected. All physical and chemical parameters are found within the limits.

Table 4.17: Test result of Bore well - 01 water

S. No	Parameters	NSDWQ	Concentration	Method
1	pH Value	6.5 – 8.5	7.29	USEPA 150.1
2	Total Dissolved Solids (mg/l)	<1000	140	Hach 8160
3	Chloride (mg/l)	<250	28	Hach 8206
4	Total Hardness (mg/l)	<500	51	Hach 8213
5	Nitrate (mg/l)	<50	0.08	Hach 8039
6	Nitrite (mg/l)	<3	0.002	Hach 8153
7	Phenolic compounds (as Phenol) (mg/l)	…	ND	USEPA 420.1
8	Fluoride (mg/l)	<1.5	0.02	USEPA 340.1
9	Sulfate (mg/l)	-	18	Hach

Table 4.17: Test result of Bore well - 01 water				
S. No	**Parameters**	**NSDWQ**	**Concentration**	**Method**
10	Barium (mg/l)	0.7	ND	Hach
11	Residual Chlorine (mg/l)	0.5	ND	Hach 8167
12	Zinc (mg/L)	5.0	ND	Hach
13	Lead (mg/L)	≤0.05	ND	Hach
ND = Not Detected **NOTE:** Above tests are conducted by Quality Testing Service (QTS)				

The analytical test results of bore well - 02 water are mentioned in the table 4.15. pH was recorded 7.24 which is considered range (6.5-8.5), TDS, Chloride, T.H values were 158 mg/L, 31 mg/L and 63 mg/L respectively and all in the limits. Nitrate (0.07mg/L), Nitrite (0.003mg/L), Fluoride (0.06 mg/L) and Residual chlorine is not detected. The sulphate was measured (19mg/L) and but the barium, zinc & lead were remained not detected. All physical and chemical parameters are found within the limits.

Table 4.18: Test result of Bore well - 02				
S. No	**Parameters**	**NSDWQ**	**Concentration**	**Method**
1	pH Value	6.5 – 8.5	7.24	USEPA 150.1
2	Total Dissolved Solids (mg/l)	<1000	158	Hach 8160
3	Chloride (mg/l)	<250	31	Hach 8206
4	Total Hardness (mg/l)	<500	63	Hach 8213
5	Nitrate (mg/l)	<50	0.07	Hach 8039
6	Nitrite (mg/l)	<3	0.003	Hach 8153
7	Phenolic compounds (as Phenol) (mg/l)	…	ND	USEPA 420.1
8	Fluoride (mg/l)	<1.5	0.06	USEPA 340.1
9	Sulfate (mg/l)	-	22	Hach
10	Barium (mg/l)	0.7	ND	Hach
11	Residual Chlorine (mg/l)	0.5	ND	Hach 8167
12	Zinc (mg/L)	5.0	ND	Hach
13	Lead (mg/L)	≤0.05	ND	Hach
ND = Not Detected **NOTE:** Above tests are conducted by Quality Testing Service (QTS)				

The analytical test results of are mentioned in the table 4.16. The other water sample was taken from the village Gunga. Recorded pH was 7.38 which is considered range (6.5-8.5), TDS, Chloride, T.H values were 167mg/L, 31 mg/L and 57 mg/L respectively and all in the limits. Nitrate (0.07mg/L), Nitrite (0.001mg/L), Fluoride (0.02 mg/L) and Residual chlorine were not detected. The sulphate was measured (20mg/L) and but the barium, zinc & lead were remained not detected.All physical and chemical parameters are found within the limits.

Table 4.19: Water Sampling from nearby village (Gunga) of project site

S. No	Parameters	NSDWQ	Concentration	Method
1	pH Value	6.5 – 8.5	7.38	USEPA 150.1
2	Total Dissolved Solids (mg/l)	<1000	167	Hach 8160
3	Chloride (mg/l)	<250	31	Hach 8206
4	Total Hardness (mg/l)	<500	57	Hach 8213
5	Nitrate (mg/l)	<50	0.07	Hach 8039
6	Nitrite (mg/l)	<3	0.001	Hach 8153
7	Phenolic compounds (as Phenol) (mg/l)	…	ND	USEPA 420.1
8	Fluoride (mg/l)	<1.5	0.02	USEPA 340.1
9	Sulfate (mg/l)	-	20	Hach
10	Barium (mg/l)	0.7	ND	Hach
11	Residual Chlorine (mg/l)	ND	ND	Hach 8167
12	Iron (mg/L)	1	ND	Hach
13	Lead (mg/L)	≤0.05	ND	Hach

ND = Not Detected
NSDWQ= National Standard for Drinking Water Quality
NOTE: Above tests are conducted by QTS.

4.2 Biological Environment

4.2.1 Fauna

Introduction

Balochistan is situated at the South-eastern edge of the Iranian plateau. It strategically bridges the Middle East and Southwest Asia to Central Asia and South Asia and form the closest oceanic frontage for the land-locked countries of Central Asia. Balochistan is the largest province by area of Pakistan with an area of 347,190 km^2. The population density is very low due to dry desert, mountainous areas and the shortage of water.

Distirct Khuzdar, which lies in central region of Balochistan, is rich in animal biodiversity. Most of the areas are covered with mountains, dry desert, rocky and stony slopes. Such habitats are ideal places for reptiles, small mammals and birds.

Habitat Location;

N 27°45'90.0" E 66°31'47.2"

N 27°45'05.3" E 66°31'49.3"

N 27°44'45.3" E 66°31'53.5"

Faunal survey was conducted during 18th to 20th September. Survey revealed that project area encompasses habitat which contains the Dry Stream bed, Stony and Mountain area. The habitat is covered with scattered bushes, Herbs and Shrubs. They are the ideal places for small mammals such as Balochistan Gerbil, Fox and Jackal which is common in these habitat.

Figure 4.11: Fuana Survey at the project site by EMC Expert Team

Ecology

Ecology is mountainous and rocky slope. The natural vegetation consists of herbs, shrubs and with thick bushes that provides shelter, survival of the enemies, living holes. The most common specie are Mouse-like Hamster. Red Fox and Jackal are found in mountain area.

The stony area covered with small stones and scattered bushes. The most common specie of the area is Indian Gerbil which lives under stones and it is omnivores, subsisting mainly on vegetable matter, seeds, young shoots, and berries in winter season. It is nocturnal. These are very active and runs from one shelter to another.

The mountainous & hilly area is covered with the natural vegetation which consists of the bushes, herbs and shrubs. Afghan Hedgehog is also reported. It eats food spiders, scorpions, amphibian as well as small lizards, dung beetles and it is nocturnal. It holes in ground and mostly found over hills.

Common birds observed during the survey include Hume's Wheatear for which the ideal habitat are the hilly areas. Birds spotted near human settlements include Little Brown Dove, Collared Dove and Common Myna. They nestle on large trees. The mountainous areas are ideal place for birds of prey because of their height and safety for these birds. Kestrel, which is the resident bird of the area, feeds on the Mice, insects and scans the ground and bushes for food.

Figure 4.12: Habitat of Gunga, Ferozabad

Methodology of Mammals

(1) One hour plot searching and making location by GPS.

(2) Spot lighting Method: This method is used for locating small mammals such as red fox etc. as they all are nocturnal animals and move for food during after sunset. In this way the populations of different species at different locations is estimated.

(3) Counting the fresh holes, tracks by animals. By using this method, the population range, shelter and status of mammals are determined. Fresh holes and tracks are counted in the study area of 500 m and with the help of holes, population are estimated.

Results of Mammals

During the survey, 3 Orders, 3 Families and 7 species of small mammals were recorded in the study area. 1 Specie i.e. Balochistan Gerbil, Fox are common 2 Species Jackal, Indian Gerbil, House mouse, Hedgehog are less common, 1 Species is Mouse like Hamster rare.

Figure 4.20: List of small mammals observed in the study area

Sr. No.	Order	Family	Scientific Name	Common Name	Status
1	Rodentia	Muridae	*Mus Musculus*	House Mouse	Less common
2	Rodentia	Muridae	*Tatera indica*	Indian Gerbil	Common
3	Carnivora	Canidae	*Vulpes Vulpes*	Red Fox	Less common
4	Rodentia	Muridae	*Gerbillus nanus*	Balochistan Gerbil	Common
5	Carnivora	Canidae	*Canis aureus*	Jackal	Less common

6	Eulipotyphla	Erinaceidae	*Hemiechinus auritus megalotis*	Afghan Hedgehog	Less common
7	Rodentia	Muridae	*Calamyscys bailwardi*	Mouse-like Hamster	Rare

	
Fox hole	Balochistan Gerbil
	
Red Fox[31]	Afghan Hedgehog[32]

Methodology of Reptiles

Following methods have been used for reptilian survey;

A) Direct Counting

(1) One hour plot searching using GPS

(2) Spot Lighting

(3) Incidental Sightings

(4) Turning Stones and rotten trees

(5) By basking behavior

(6) By hand picking method

(B) Indirect Counting

[31] https://forum.americanexpedition.us/
[32] http://www.hedgehogcentral.com

(1) Information from different sources

Presence of signs like faecal pellets, Tracks, den or Tunnels (Egg laying Excavation).

2) One hour plot searching using GPS.

This method is used for searching habitat with the help of GPS.

(3) Spot lighting

This method can be used mostly for nocturnal animals.

(4) Incidental Sighting

This method can be used by suddenly observation.

(5) Turning Stones and Rotten Trees

This method can be used for those species which hide under the stones and bushes.

(6) By Basking Behavior

This method can be used when the species sunbath during daytime.

(C) Indirect Method

1) Information from various sources:

Meeting with locals and taking information from them.

2) Presence of signs like pellets Tracks, Den or Tunnels (Egg Laying Excavation). This method can be used when some evidence can be found like footprints, dropping, eggs, etc.

3) Counting the fresh borrows, tracks by used this method the population Range, shelter and status of reptiles is determined. Fresh borrows and tracks are counted in the study area of 500m. With the help of borrows, population is estimated.

Results of Reptiles

During the survey 10 species of herpetofauna were recorded from Ferozabad. 7species are common, 3 species are less common and 5 families were recorded from the study area.

Table 4.21: List of Reptile Species in the Project Area

Sr. No.	Family	Scientific Name	Common Name	Status
1	Agamidae	*Phrynocephalus scullatus*	Bended toad agama	Less common
2	Agamidae	*Trapelus megalonyx*	Ocellate Ground agama	Common
3	Vipernidae	*Echis carinatus*	Saw scaled viper	Common
4	Lacertidae	*Ophisops jerdonii*	Rugose spectled lacerta	Less common
5	Agamidae	*Laudakia melanura*	Black rock agama	Common
6	Bufonidae	*Bufo stomaticus*	Indus valley toad	Common
7	Agamidae	*Calotes versicolor*	Common Tree lizard	Common

8	Agamidae	*Phrynocephalus luteoguttatus*	Yellow spectled toad agama	Less common
9	Geckkonidae	*Hamidactylus flaviviridis*	Yellow belly Common House gecko	Common
10	Agamidae	*Laudakia melanura*	Black rock agama	Common


Black Rock Agama


Indus Valley Toad

Methodology of Birds

Following methods are used for the observation and watching of the avifauna.

1) Binocular Method

Binocular is used the watching the birds. Few distant binoculars are focused towards the birds, observing the species and for their identification.

2) Spotting Scope Method

The Spotting Scope is fixed at some angle and good sighting place will be select. Scope is then fix and the birds are observed.

3) By Naked Eye

The birds watching with naked eye means direct sighting the birds.

Results of Birds Survey

During the survey, 29 species of birds were recorded in the study area. 8 Species are common, 18 Species Less common, 3 Species are Rare in the study area.

Table 4.22: List of Birds in Study Area

S. No	Scientific Name	Common Name	Status
Order: Passeriformes			
Family: Alaudidae			
1	Galerida cristata	Crested Lark	Common
2	*Alauda gulgula*	Sky's lark	Common
3	*Melanocorypha calandra*	Calandra lark	Less Common
4	*Calandrella cinerea*	Short toed lark	Common
5	Ammomanes deserti	Desert lark	Common

6	*Alaemom alaudipes*	Hoopoe lark	Less Common
7	*Ammomanes deserti*	Bar tailed desert lark	Less Common
Family: Hirundinidae			
8	Riparia riparia	Sand Martin	Less Common
9	*Delichon urbica*	House Martin	Less Common
Family: Tudinae			
10	*Oenanthe alboniger*	Humes wheatear	Common
11	*Oenanthe picata*	Variable wheatear	Less Common
12	*Oenanthe deserti*	Desert wheatear	Less Common
Family: Laniide			
13	Lanius excubitor	Great Grey Shrike	Less Common
Family: Cisticoliidae			
14	*Prinia inornata*	Plain Prinia	Less Common
Family: Motaciilidae			
15	Motacilla alba	White Wagtail	Less Common
Family: Passeridae			
16	Passer domestics	House Sparrow	Less Common
Family: Muscicapidae			
17	Phlloscopus collybita	Chiffchaff	Less Common
Family: Sturnidae			
18	Acridotheris tristis	Common Myna	Less Common
Order: Columbiformes			
Family Columbidae			
19	Streptopelia senegalensis	Little brown dove	Less Common
20	*Streptopelia decaocto*	Collard dove	Less Common
Order: Galiformes			
Family: Phasianidae			
21	Ammopedrix griseogularis	See-See Partridge	Common
Order: Coraciiformes			
Family: Alacedinidae			
	Halcyon smyrnensis	White throated kingfisher	Rare
22	Alcedo atthis	Common Kingfisher	Rare
Family: Meropidae			
23	Meropus orientalis	Little green bee-eater	Common
24	*Meropus philippinus*	Blue tailed bee-eater	Less Common
Family: Upupidae			
25	Upupa epops	Hoopoe	Less Common
Family: Corcidae			
26	Coracias benghalensis	Indian roller	Less Common
Order: Caprimulgiformes			
Family Caprimulgidae			
27	Camprimulgus asiaticus	Indian Nightjar	Rare
Family: Corvidae			

28	Corvus ruficollis	Brown Necked Raven	Common
Family: Pycnonotidae			
29	Pycnonotus leucogenys	White cheeked bulbul	Common

Little Green Bee-Eater

Litte Brown Dove

Crested Lark[33]

See-See Patridge[34]

House sparrow[35]

Plain Priana[36]

[33] http://www.hbw.com/
[34] http://www.hbw.com/
[35] https://t1.ea.ltmcdn.com
[36] http://www.manojcsindagi.in

Threats to Small Mammals and Reptiles

In province of Balochistan, threats to small mammals include raptors like Buzzards, Eagles, Kites, Jackal, fox and owl as the main natural threats.

Car accidents are one of the leading causes of injury and death of reptiles. Reptiles are frequently hit by cars when they go to search for feed and cross the roads. Loss habitat by removing vegetation is also a threat. Other threat includes the trappers in the form of "Jogi" who trap the endemic reptiles during summer month and brought them to Karachi to sell.

Recommendation

As the region is important in terms of Reptilian and Mammalian fauna, it is highly recommended that during construction and mining phase, large trees and shrubs should not be routed so as not to destroy habitat as the destruction will result in loss and mortality of the species. The dense and thick bushes provide resting, breeding, and hiding places for the animals. In the project area, periodic monitoring of the small mammals should be conducted to check the habitat, fauna, and disturbance.

4.2.2 Flora

Baluchistan province has a total geographical area of 34.73 million ha and area wise it is the biggest province of Pakistan. The climate of the province ranges from arid to semi-arid with annual rainfall increasing from 50 mm in the west to over 400 mm in the east. The precipitation distribution is very erratic and most of the rainfall is received in the winter season. The temperatures are also highly variable, which rises to 50°C in Sibi plains and drops to 1-3°C in Kalat, Quetta and Muslimbagh areas in winter. About 80% of area can be classified as inter-mountainous and the remaining 20% consists of flood plains, and alluvial deposits with a high potential for cultivations. The main land use is grazing as about 93% area is classified as rangelands. Geomorphologically, the Rangelands in Baluchistan can be distributed into 6 types of landscape, including mountains, uplands, piedmont, desert, flood plains and coastal plains. Some of the important mountainous ranges in the province are Sulaiman, Toba-Kakar, Central Brahui, Khirthar, Chaghai, and Raskoh hills, Siahan, Pab, Central Makran and Makran Coast.

Rangelands of Baluchistan can further be divided primarily in to following 3 main categories:

Central Baluchistan Ranges: These ranges spread over Quetta and Kalat Divisions, a region with Mediterranean climate where annual precipitation varies from 100 to 400 mm, most of which is received in during winter season.

Western Baluchistan Ranges: These ranges cover the desert areas of Chagai, Kharan, Panjgor, Makran, Turbat, Gwadar, and Lasbela Districts. Raifall is erratic and scanty (50-200 mm).

Eastern Baluchistan Ranges: These are located in Zhob and Loralai districts of Baluchistan, where bio-climate is influenced by summer monsoon rainfall.

Sulaiman Mountain Ranges: Sulaiman mountain ranges cover about 1.5 mil ha and extend along Afghanistan border. The elevation is between 1540-3400 m above sea level. The climate of the tract is arid mountainous, sub-tropical continental, annual rainfall is 200-250 mm, of which 50% is received in monsoon months. May, June and July are the hottest months, where mean maximum temperature is 40° C, whereas, January is the coldest month.

Ecological Zones of Balochistan

The ecological zones are based on the agronomic practices, natural vegetation, temperature, rainfall local penology, type and production systems of livestock etc. The following ecological zones are identified in the province:

Suleiman Mountainous Region (SMR)

This region includes Dera Bugti, Kohlu, Barkhan, part of Loralai and Zhob, Musakhail and Sherani districts of the province. The Suleiman mountain series is located south to north and bordering between Punjab and Balochistan province.

Flora

The home tract of a wide plant biodiversity and the vegetation of the region comprises trees like *Zizyphus nummolaria* (Karkana), *Ziz. mauritiana* (ber), *Z. sativa* (Helani), *Oleao ferruginea* (Showan), *Oleao officinalus* (showan), *Pistacia cabulica* (wanna), *Tamarix indica* (Ghaz), *Prunus eburnean* (Zarga, zangli badam) and *Salvadora oleoides* (pilu or perpegh). Bushes of the regions are as fallowing. *Haloxylon recurvum* (Ghelmi), *Nannorhops ritchieana* (Mazari or Pish), *Caragana ambigua* (makhie), *Alhagi camelorum*, (Aghzai or Tindan) and *Periploca aphylla* (Barar). The grasses include *Stipa capillata* (Saba), *Cocculus leæba* (Parwatgi), *Sorghum halepense* (Barawa), *Allium sphærocephalum* (khokhae) and *Atriplex canescens* (sargarae).

Northern highlands (MHL)

This region includes historic Kakar Khurasan, Loralai, Zirat, Zhob, Pishin, Qillaabdullah and Quetta valleys. The region falls in the north of the province bordering Afghanistan. This region is severely affected and the rangelands are degraded due to many reasons, i.e. influx of Afghan Migrants, over population, deforestation and the long prevailed drought (1994-2004).

Flora

The major vegetation of the region comprises trees like *Zizyphus nummolaria*, *Oleao ferruginea*, *Oleao officinalus*, *pistacia cabulica*, *Prunus eburnean*, *Tamarax aphylla*, *Juniporis excelsa* and *Pinus Geranandiana*. The bushes are the major feed of camel and comprises of *Haloxylon recurvum*, *Nannorhops ritchieana*, *Caragana ambigua*, *Alhagi camelorum*, and *Periploca aphylla*. The grasses include Stipa capillata, *Cocculus leæba*, *Sorghum halepense*, *Allium sphærocephalum*, and *Atriplex canescens*.

Central Brahvi Highlands (CBH)

This region comprises Mastung, Kalat, Khuzdar, mountainous part of Dhadar and Awaran districts of Balochistan province. The region is characterized by high and arid mountains with very hot summers and very cold winters.

Flora: The vegetation of the region consists of *Tamarix*, *Halloxylon grifithii*, *Alhaji camelorum*, *Sacharum revanae*, *Chrysopogon aucheri*, *C. mantanus*, *C. schoenanthus*, *Cenchrus ciliaris* and *Pannisetum orientale.*

Kacchi Basin Region

This region comprises of Sibi, part of Dhadar, Jaffarabad, Naseerababd, Lehri and Jhal Magsi locale of the province. The region is plain area, formed of alluvial soil and slopes from north to south with an elevation of about 50 to 100 meters above sea level. The humidity is highest in summer, particularly in the area adjacent to the Pat feeder canal, where rice cultivation takes place.

Flora: The type of vegetation in the region includes *Spicigra* (Kandi), *Capparis Aphylla* (Kirar), *Salvadora Olevides* (Khabbar), *Sisyphus jujuba* (Bari) and *Calotropis Gi Gantea* (Ak).

Chaghai Kharan Desert (CKD)

Chaghai Kharan is one of the famous ecological zones of the country and comprises of the districts Chaghai, Kharan, Noshki, Washuk and part of Makran. The region is unique of its kind and mostly comprised of disserted plains, steppe and mountainous desert. The region is located in the extreme west of Pakistan bound on the north by the desert region (Raig) of Afghanistan.

The region is home tract of many herbal plants and bushes which are being use for grazing of livestock especially camel and goat since unknown times. The speedy deforestation of those bushes, long drought and over grazing had adverse the condition of the region and its ecological landscape diversity is under threat.

Flora: The major vegetation includes tree species like Khanjak, (*Pistecia Khanjak*), Ghaz (*Tamarix Articula*), shrub like Taghaz (*Haloxylon Amodendron*), bushes like Hashwarg (*Rhazya Stricta*), Pog (*Calegnum Polygonaides*) Cotor (*Stockcia Brohinca*), Lara (*Salsola Kali*), Kandar (*Alhagi Camelarum*), Barshonk, Karwankush, Narronk (*Salsola Arbuscula*), Tusso (*Gaillaina Aucheri*) and grasses like Mughair (*Atriplex Dimprphostegium*), Kash (*Saccharum Siliare*), Righith (*Suoeda Monica*) Shanaluk (*Allium Rubellum*).

Balochistan Coastal Region (BCR)

The region is comprised of Lasbella and Makran locale of the region.

Flora: The extensive plains have vast area of sparse vegetation which includes plants species like *Salsola sp.*, *Panicum antidotale*, *Alerupus repens*, *A. macrstachyus*, *Cnechrus ciliaris*, *C. pennisetiformis*, *C. religerus*, *C. biflrus* besides there are *Prosopis cineraria*, *Salvadora oleoides*, *Capparis aphylla*, *Zizyphus sp* and *Prosopis juliflora*.

Ecology of District Khuzdar

The climate of district Khuzdar can be categorized as "warm summer and mild winter". Annual average rainfall is more than 250 mm, of which more than 50% is received in monsoon months and the remaining in winter months. The southern area of the district is warmer than the northern part. Hence, Khuzdar falls in Dry Sub-Tropical to temperate-ecological zone. The terrain of the district consists of mountains and valleys ranging in ground elevation from 64 -2,852 meters above mean sea level. As per 1998 census, the population of Khuzdar District was 417,000. The geographical area of the district is 3,538,000 ha of which 11% is arable land and 17% area is declared as Forests. Due to low rainfall and mountainous topography, the main land use of the district is grazing followed by agriculture. Around 82% of the livestock population comprises small ruminants.

Major Khuzdar Vegetation

Forests play an important role in the maintenance of environmental balance, but the ecological conditions in Khuzdar district permits only Dry Sub-Tropical and temperate Semi-Evergreen Scrub vegetation. Hence, its vast area is used as a rangeland and plant species such as *Rhazya stricta, Nerium oleander, Withania coagulans, Vitex spp., Mazri, Salsola foetida spp. Tecomella undulata, Zizyphus numularia, Zizyphus jujube, Calotropis procera, Prosopis spicigera*, etc. were commonly seen on the site.

	
Withania coagulans	*Vitex spp.*
	
Rhazya stricta	*Nerium oleander*

Tecomella undulata

Zizyphus numularia

Nannorhops ritchieana

A few important tree species such as Hapurse (Juniperus excelsa polycarpos), (Fraxinus xanthoxyloides), Zaithoon (Olea cuspidate), and Gawan (Pistacia khinjjak) are found over a very small area adjacent to Harboi hills, Drakhel and Pharas hills representing a negligible amount of overall vegetation cover.

The Other species include found in different proportions in the district are: Janglee Badaam (Prunus amygdalus)., dranna or Jir (Artemisia maritime),Kala Zira (Carum bulbocastanum), Chitirk (Caragana ullcina), Aur trik (Dodonia viscose), Archin (Prunus amygdales), Aveshk (Clematis orientalis), Baibru (Withania somnifera), Bakarwali (Convolvulus arvensis), Bar (Solanum indicum), Bibi Batav (Pycnoeyela aucheriana), Birori (Alhaji maurorum), Bishkhaf (Eremo-tachyys viearyl), Boe-Madran (Haloxylon grifithii), Chitirk (Caragana ullcina), Dhatura (Datura fastuosa), Drab or Drug (Eragrostis cynosuroides), Gandil (Eleusine flagellifera), Garbust (lepidium draba), Ghaz (Tamarix orientalis), Get (Salix acmophylla), Gorka (Stipa capillata), Gulgulab (Rosa damasccena), Hatam bai (Erysimum repandum), Hawe (Cymbopogon jwarancusa), Hashwarg (Rgazya sricta), Hum (Periploca aphylla), Izghand (Thymus serphylum), Jaghun (Salsola kali), Jaur (Narium odorum), Jhil (Indigofera pauciflora), Kahero (Ehretia obtusifolia), Kaler (Caparis aphylla), Kalpora (tecurium stocksianum), Kapet-kawa (Fumaria parviflora), Karag (Calotropis gigantean), Karwan kushi (Pterophyrum olivieri), Kashum (Saccharum ciliare), Kasur (Pistacia mutica), Kisankor (Peganum harmala), Kul (Typha angustifolia), Manguli (Orthonnopsis intermedia), Marmutk (Boucerosfa aucheriana), Matetave (Salvia nepeta), Nal (Phragmites communis), Naromb (Ephedra pachyelada), Panerband (Withania cougulans), Parpuk (Ticoma undulate), Pathk (Populus euphratica),Pipal (Daphene oleoides), Pish

(Nannorhops ritchiana), Piun pulli (Matricaria lusiocarpa), Pochko (Althaea ludwigii), Purchink (Mentha sylvestris), Puzho (Convolvulus microphyllus), Rang (Astralagalus squamosus), Righit (Suaeda monoiea), Ritach (Euphorbia caeladenia), Riza (Cuminum cyminum), Rush (Sisymbrium Sophia), Sadagh (Haloxylon grifithii), Shampastir (Sophora grifithii), Shinz (Alhaji camelorum), Simsok (Nepeta glomerulosa),Tplapissi (Zizyphus spina), Zarch (Berberis vulgaris) and Khakshir(Sisymbrium sophia).

However, the ground cover is mainly constituted by Stipa himalacia, Dichanthium annulatum, Chrysopogon aucheri and Cymbopogon spp.

Figure 4.13: Flora of Project site, Khuadar

4.3 Socio Economic Environment

The socio-economic context of an area can play an important role in determining a project's efficacy, implementation and sustainability. Both the larger macro-environment of the project and the project environs are important to examine the socio-economic factors that can pose challenges for the project during the project's construction and operational phases. The socio-economic baseline section, therefore, presents both the major socio-economic trends in the area and highlights the settlements and social services around the project location.

4.3.1 Administrative Context

District Khuzdar was notified as a district on 1 March 1974. Previously it was a sub-division of Kalat District. On 11 November 1992, the district was bifurcated into two districts i.e. Khuzdar and Awaran. Khuzdar town is now the divisional headquarter of Kalat division.

The Local Government System was introduced in 1979 following the establishment of the Local Government Department, with the aim to ensure participation of local population. Thereafter, Balochistan Local Government Ordinance (BLGO) of 1980 was executed which was later replaced by BLGO 2001. Under BLGO 2001, District Khuzdar was divided into 5 Tehsils and 34 Union Councils. The district was administrated from a single line of administration covering both, rural as well as the urban areas. The system continued for two tenures and later modified through the approval of BLGA 2010. The present system under the Local Government Act 2010 is similar to BLGO 1980 and stresses upon a rural-urban management functions.

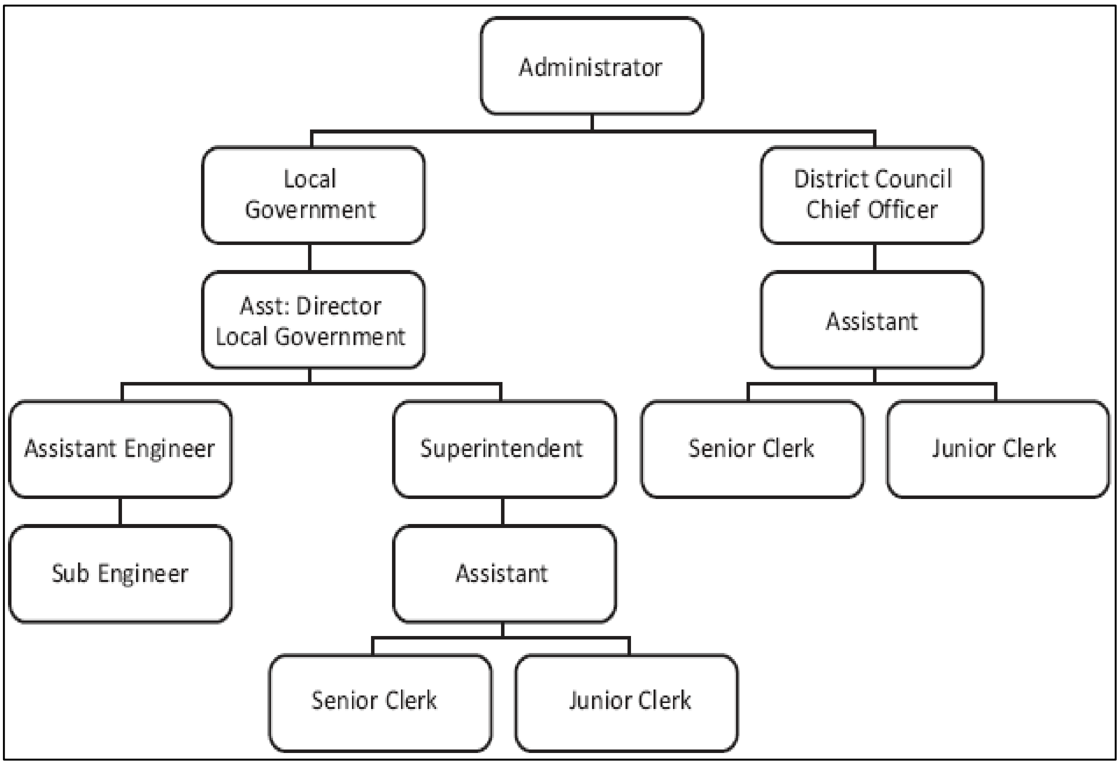


Figure 4.14: Local Government Organogram

Table 4.23: Tehsil and Union Council of District Khuzdar	
Tehsil	**Union Council**
Khuzdar	Baghbana, Balina Khattan, Faizabad, Ferozabad, Gazgi, Khand, Parko, Sasol, Tootak, Zeedi, Zerina Khattan
Moola	Abad Karkh, Moola, Sun Chakoo, Kharzan
Naal	Durnaili, Goni Garesha, Hazar Ganji, Killi Alam Khan, Kocho, Nal, Ornach, Sar Raij
Wadh	Arenji, Badari, Loop, Pesi Kapper, Saroona, Shah Noorani, Wadh, Waheer
Zehri	Chashma, Ghat, Noorgama Zehri

(Local Government, Balochistan, 2005)

4.3.2 Demography

According to 2017 census, district has a population of 802,207. Out of this only a total of 277,136 was recorded as urban inhabitants. While people was recorded as rural dewllers. The male population was recorded 275,488 and 145,780 in rural and urban areas, respectively. The female population was recorded 249,583 and 131,356 in rural and urban areas, respectively. Population average annual growth rate was increased to 3.21. The sex ratio is 110.59 in district and the total households are 120,405 units out of this 81,296 in rural areas and 39,109 in urban areas. In 1998 census, the population of Khuzdar was 417,466 out of that 287,884 in rural areas and 129,582 in urban areas[37].

Table 4.24: Population by Sex and Rural/Urban 2017

District khuzdar	House holds	Population - 2017			Population 1998	Sex ratio 2017	1998- 2017 average annual growth rate
		Male	Female	All Sexes			
TOTAL	**120,405**	**421,268**	**380,939**	**802,207**	**417,466**	**110.59**	**3.49**
RURAL	81,296	275,488	249,583	525,071	287,884	110.38	3.21
URBAN	39,109	145,780	131,356	277,136	129,582	110.98	4.07

Source: Pakistan Bureau of Statistics

[37] District wise census result 2017, Pakistan Bureau of Statistics GOP

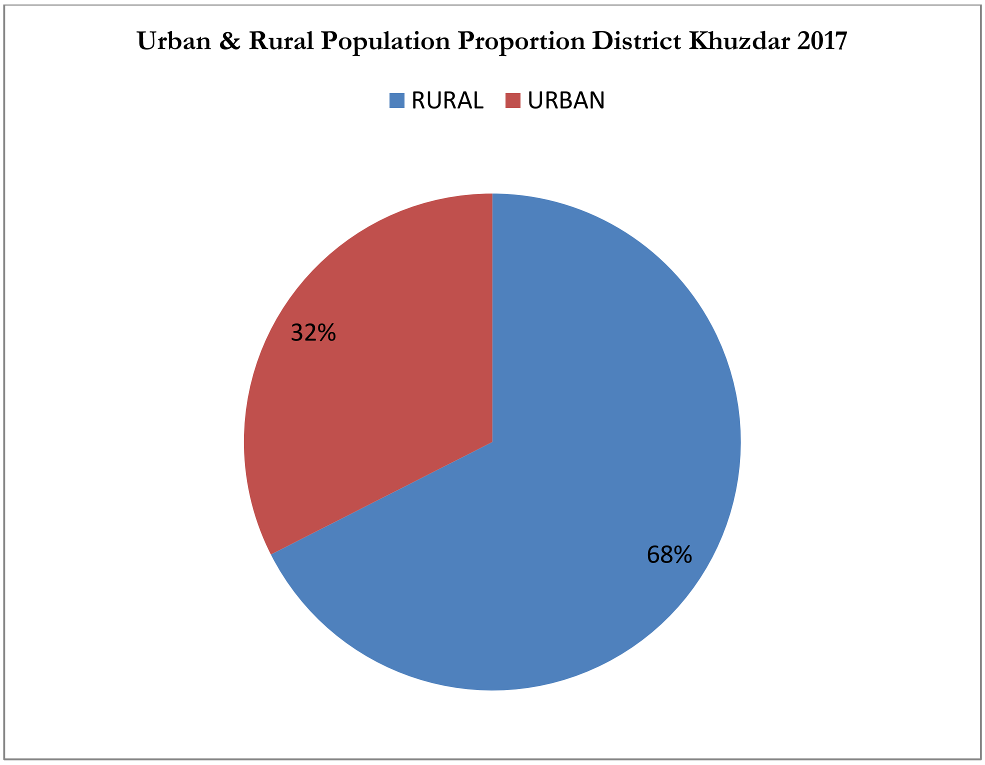


Figure 4.15: Urban & Rural Population proportion district Khuzdar 2017
Source: Pakistan Bureau of Statistics

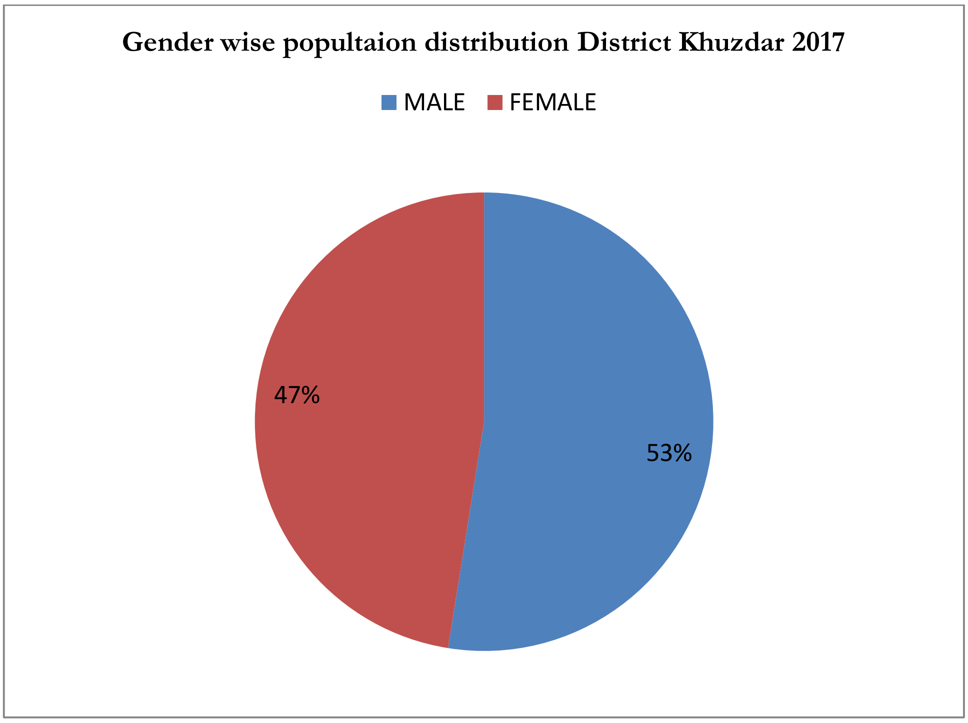


Figure 4.16: Gender wise population distribution District Khuzdar 2017
Source: Pakistan Bureau of Statistics

4.3.3 Languages and Ethnic Groups

Baloch is the main ethnic group, while Brahvi, Balochi and Sindhi are the major languages of the district.The major Baloch tribes in the district are Zehri, Sumalani, Mengal, Kalandrani, Mohammad Hasni, Sajidi, Bizenjo, Nichari, Qambrani, Pandrani, Mirwani, Rekizai, Gurganari, Jattak, Rodeni and Sasoli.

4.3.4 Education

According to Balochistan Bureau of Statistics annual census, the overall student population in 631 public primary, 62 middle and 33 high schools. Total 24408 students in primary school out of which 13841 male and 10567 female, Similarly 7067 students in middle school consist of 3205 male and 3862 female. Total students 10007 students in high school out of which 6234 male and 3773 female.

Table 4.25: Number of Govt. Schools in Khuzdar 2014-15

Type of School	Male	Female	Total
Primary	460	171	631
Middle	27	35	62
High	24	9	33
Source: (i)BEMIS, Directorate of Education Balochistan ii)Balochistan Bureau of Statistics			

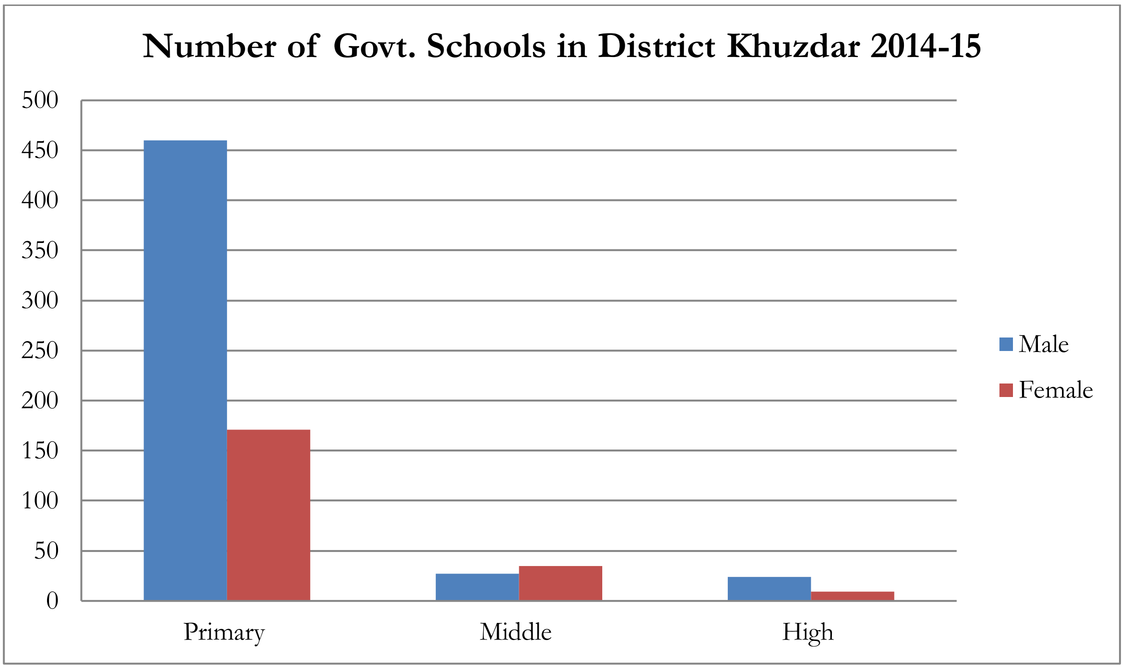


Figure 4.17: Number of Govt. Schools in District Khuzdar 2014-2015
Source: (i)BEMIS, Directorate of Education Balochistan
ii)Balochistan Bureau of Statistics

Table 4.26: Enrolment data of Schools district Khuzdar 2014-15			
Type of School	**Male**	**Female**	**Total**
Primary	13841	10567	24408
Middle	3205	3862	7067
High	6234	3773	10007
Source: (i)BEMIS, Directorate of Education Balochistan			
ii)Balochistan Bureau of Statistics			

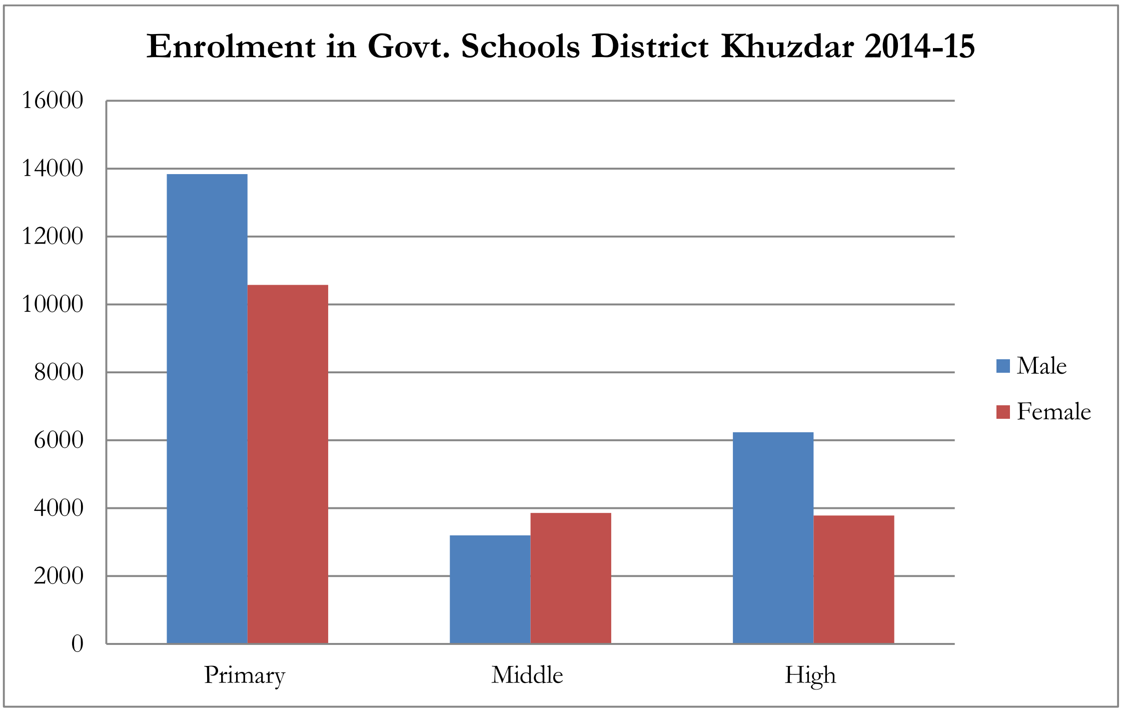


Figure 4.18: Enrolment in Govt. Schools District Khuzdar 2014-2015
Source: (i)BEMIS, Directorate of Education Balochistan
ii)Balochistan Bureau of Statistics

Table 4.27: Literacy ratio upto 10 years district Khuzdar			
	Male	**Female**	Total
Urban	65%	40%	53%
Rural	58%	18%	40%
Total	60%	26%	45%
Source : Source: PSLM Survey 2014-15 PBS			

Table 4.28: Adult literacy ratio 15 years and older			
	Male	**Female**	**Total**
Urban	58%	33%	46%
Rural	51%	12%	32%
Total	53%	20%	37%

4.3.5 Health Facilities

The highly subsidized public healthcare system is the major provider of curative and preventive care services to the local population.

The health facility infrastructure includes: 3 Hospital, 6 Rural Health Centers (RHCs), 44 Basic Health Units (BHUs), 1 Maternal & Child Health Center (MCHC), 1 TB Clinic and 29 dispensary.

Table 4.29: Health facilities in Khudar 2014-15		
Facility	**Hospital**	**No.Beds**
Hospital	3	120
Dispensary	29	-
RHC	6	100
BHU	44	-
MCH	1	-
TB Clinic	1	-
Source: (i) Directorate of Health Balochistan ii)Balochistan Bureau of Statistics		

The details regarding medical staff and capacity of the public health facilities are given in Table 4.25 based on the District Development Profile of 2011. Clearly, a ratio of 1 doctor for nearly 10,000 people a ratio of 1 bed for nearly 3,000 people shows the need for significant enhancements in the area of public health facilities for the district.

Table 4.30: Details of Health Staff and Facilities in District Khuzdar						
S. No	**Health Facilities**	**Doctors M/F**	**Nurses M/F**	**Paramedical Staff M/F**	**Beds**	**Units**
1.	Hospitals	30/6	7/2	25/-	90	1
2.	Dispensaries	0	0	34/-	0	31
3.	Rural Health Centre (RHC)	9/2	0	71/4	100	6
4.	Basic Health Unit (BHU)	9/-	0	79/18	0	34
5.	MCH Centres	0	0	-/1	0	1
6.	TB Clinic	1/-	0	1/-	0	1
7.	Toal	57	9	233	190	74
8.	Unit/population	9,792	62,019	2,396	2,938	7,543

	ratio						
District Development Profile 2011.Khuzdar. P&DD, GoB in collaboration with UNICEF							

4.3.6 Land Utilization

The geographical area of the District Khuzdar is 3,538 thousand hectares out of which 59.1% (2,091,902 hectares) is not available for cultivation. The Potential Area of 33.8% available for agricultural crops cultivation is 1,195,494 hectares. Mean Fallow Land had been at 38.6% and the trend of mean Net Sown Area had been 61.4% for a five-year period.

The area under Culturable Waste Land has almost remained same since 2005-06 to 2008-09 from 89.3% to 89.0% respectively. The ratio of cropping intensity decreased during both in Rabi and Kharif seasons, this most likely reflects the non-availability of irrigation water. However, the difference of decrease in the Culturable Waste Land ranged from 1,068,052 hectares to 1,063,445 hectares between 2004-05 and 2008-09.

The Net Sown Area during 2008-09 increased nearly 1.4% as compared to the previous four years while area under total Arable Land increased to about 0.2%.

Table 4.31: Land Utilization by year (Area in '000' hectare)

Land Utilization	2004-05	2005-06	2006-07	2007-08	2008-09
Total Geographic Area	3,538	3,538	3,538	3,538	3,538
Total Arable Land	127 (11%)	127 (11%)	128 (11%)	129 (11%)	132 (11%)
Total Potential Area for Cultivation	1195 (34%)	1195 (34%)	1195 (34%)	1195 (34%)	1195 (34%)
Net Sown Area	83 (65%)	80 (62%)	84 (66%)	73 (56%)	76 (58%)
Current Fallow Land	45 (35%)	48 (38%)	44 (34%)	57 (44%)	56 (42%)
Culturable Waste	1068 (89%)	1068 (89%)	1068 (89%)	1066 (89%)	1063 (89%)
Forest	17 (0%)	17 (0%)	17 (0%)	17 (0%)	17 (0%)
Area Unavailable for Cultivation	2092 (59%)	2092 (59%)	2092 (59%)	2092 (59%)	2092 (59%)
Source: Agricultural Statistics Balochistan, 2008-09					

4.3.7 Agriculture & Irrigation

Khuzdar falls in the temperate-ecological zone bearing a total potential agricultural area of 1,195,494 hectares (Agriculture Statistics, 2008-09), which is approximately 33.8% of the total geographical area of District Khuzdar. The recommended crops for the district according to its ecological zone are given in the table below:

Table 4.32: Agro-ecological Zone and Recommended Crops

Ecological Zone	Name of District	Altitude (feet)	Recommended Crops
Temperate	Punjgoor, Khuzdar, Loralai, Barkhan, Musakhail, and Kharan, Washuk	3000-4500	Wheat, Barley, Cumin, Gram, Mutte r Pulse, Masoor, Vegetables, Fodders, Sunflower, Safflower, Rice, Jowar, Maize, Pulses, Onion, Potato, Melons, Chilies, Coriander, Garlic, Cotton, Almond, Apple, Apricot, Grapes, Peaches, Plum, Pear, Pomegranate, Cherry, Pistachio, Dates, Citrus, Banana, G uava, Chickoo and Fig.

District Khuzdar has two major cropping seasons: Rabi and Kharif. Rabi crops include Wheat, Barley, Peas, Pulse, Vegetables, Fodder and Sunflower. These crops are sown in winter or during early summer and harvested in late summer. Kharif crops include Rice, Sorghum (Jowar), Millet (Bajra), Maize, Mung bean, Mash bean, Moth, Fruit, Onion, Vegetables, Melons, Chilies, Fodder, Coriander and Cotton. All these crops come under cash crops and they are sown in summer and harvested in the late summer or early winter. Amongst the major Rabi crops, wheat occupied the majority area of 43,445 hectares, which is 81% of the total area (53,632 hectares) followed by fodder having a share of 9.29% of the irrigated area. More than 83% area of wheat cultivation was under un-irrigated field. Under the area of major Kharif crops, cotton occupied the maximum area of 5,351 hectares which is 23.62% of the total area (22,657 hectares) followed by melons having a share of 15.70% of the area. The area under vegetables and onions remained at 10.20%and 9.05% respectively.

Main sources of irrigation used include tube wells, wells, canals and Karezes/ springs. Privately owned tube-wells are maintained by the owners themselves, whereas, the government owned tube-wells are maintained by the Irrigation Department. The majority of crop cultivation area of (69,575 hectares.) is irrigated by means of tube wells, encompassing 57.94% of all irrigation sources followed by well irrigation which covers (23,010 hectares.) at 33.07% followed by canals on (6,000hectares) at 8.62% of the total irrigation sources in District Khuzdar. However, Karezes/Springs contribute to 0.59% of the area (408 hectares.) in total. There are a certain number of wells, which are spread at (670 hectares) area contributing to the source of irrigation at 23.99%. Ten tube wells were installed by the government while 110 are owned privately.

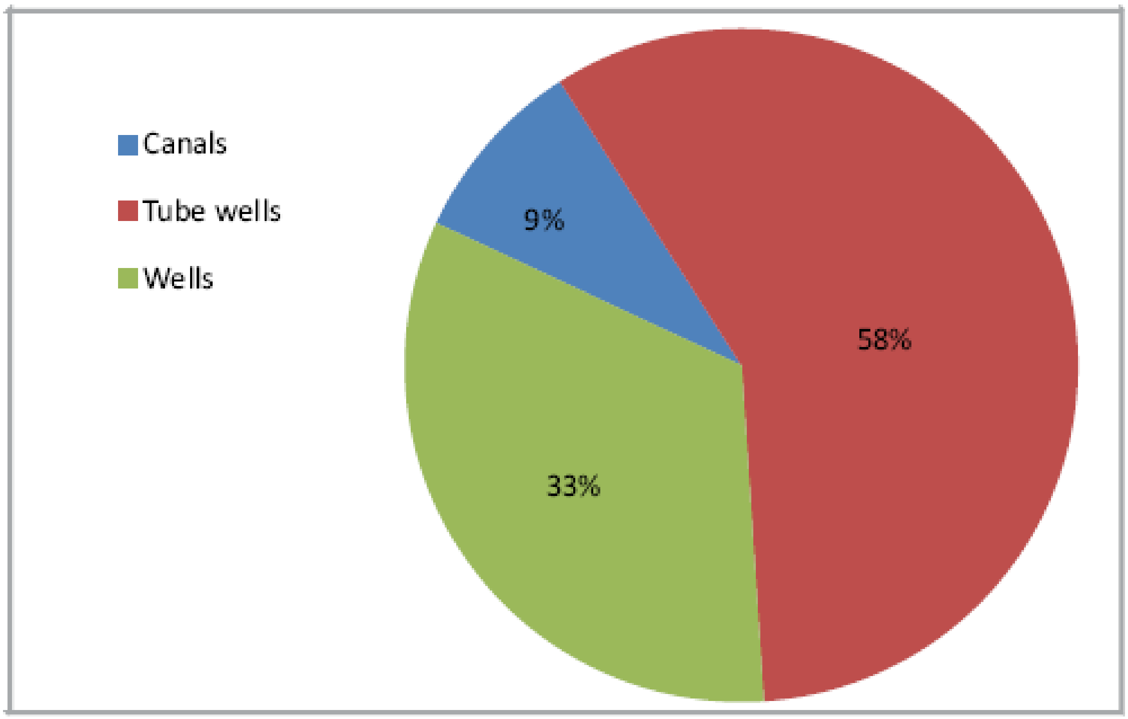


Figure 4.19: sources of Irrigation (%)
Source: Agricultural Statistics Balochistan, 2008-09

4.3.8 Livestock

District Khuzdar has enormous potential in the livestock sector which provides livelihood to many poor families. The areas of Nal, Zehri, Wadh and Moola are suitable for livestock development, especially for raising cattle, as fodder grows in large quantity in these areas. The nomadic population depends on livestock. Livestock farming is a traditional activity in the district and comprises mostly of Goats, Sheep, Cows, Buffaloes, Cattle, Camels and Asses. Goat constitutes the major portion of the livestock population in District Khuzdar. The highest reported population among all ruminants was that of sheep and goats (Livestock Census, 2015). The livestock population reported over the last two decades in various categories is presented in the following table.

Table 4.33: Projected Population Of Livestock And Domistic Poultry 2015 (Khuzdar)

Cattle	Buffaloes	Sheep	Goats	Camels	Horses	Mules	Asses	Total	Poultry
186736	13496	1297619	1303569	32065	1211	461	57699	2892856	422893
Source:- Livestock Department, Balochistan Quetta.									

4.3.9 Civic Amenities

Water supply and Sanitation

Access to safe drinking water, sanitation and solid waste disposal is considered to be the fundamental right of every human being. It is duty of the state to provide these facilities by practicing comprehensive policies and good governance. Provision of safe water and sanitation services are effective interventions that help reduce the mortality caused by waterborne disease by an average of 65% and the related morbidity by 26%. Inadequate sanitation and water result not only in more sickness and death but also in higher health costs, lower worker productivity and lower school enrollment.

Situation in District Khuzdar is relatively better when compared with rest of the province. Recent surveys have shown marked increase in the use of improved drinking water and sanitation facilities.

Table 4.34: Water and Sanitation Indicators (percent)		
Indicator	**2004**	**2010**
Use of Improved water sources	52	74
Access to safe means of excreta disposal	30	70
Source: Multiple Indicators Cluster Survey (MICS), 2004, 2010		

The survey conducted by MICS 2010 shows that 74% population has access to one or more improved water sources, of which, protected dug wells (33%)constitutes major source followed by tube wells or boreholes (20%) and piped water (20%).Other minor improved sources include protected springs (1%). Major unsafe watersources are unprotected dug wells (23%) and unprotected springs (2%) About 35% household population have no water on their premises and have to travel long distances to fetch water.

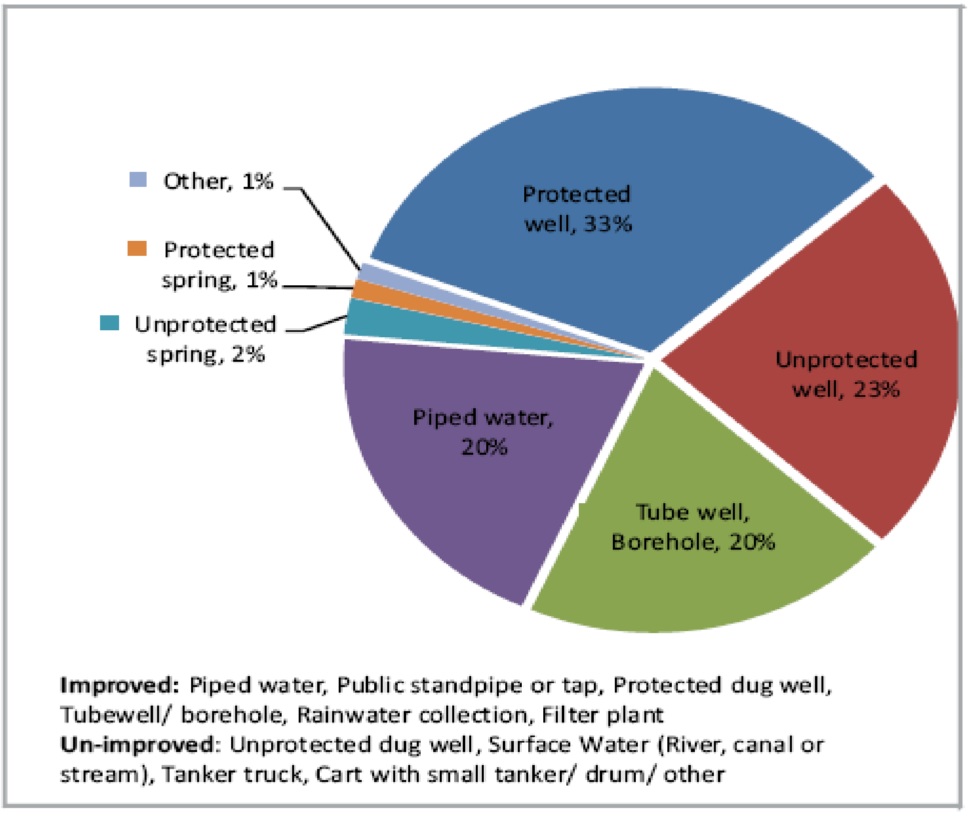


Figure 4.20: Sources of Drinking Water (%)

Source: Multiple Indicators Cluster Survey, 2010

About 70% households in the districts are using improved sanitary toilets for human excreta disposal. Of those, 21% have access to flush system, while others are using different types of pit latrines. Whereas, 27% have no toilet facility and defecate in the open fields/bushes, raising the risk of disease transmission through air, insects/flies or other means.

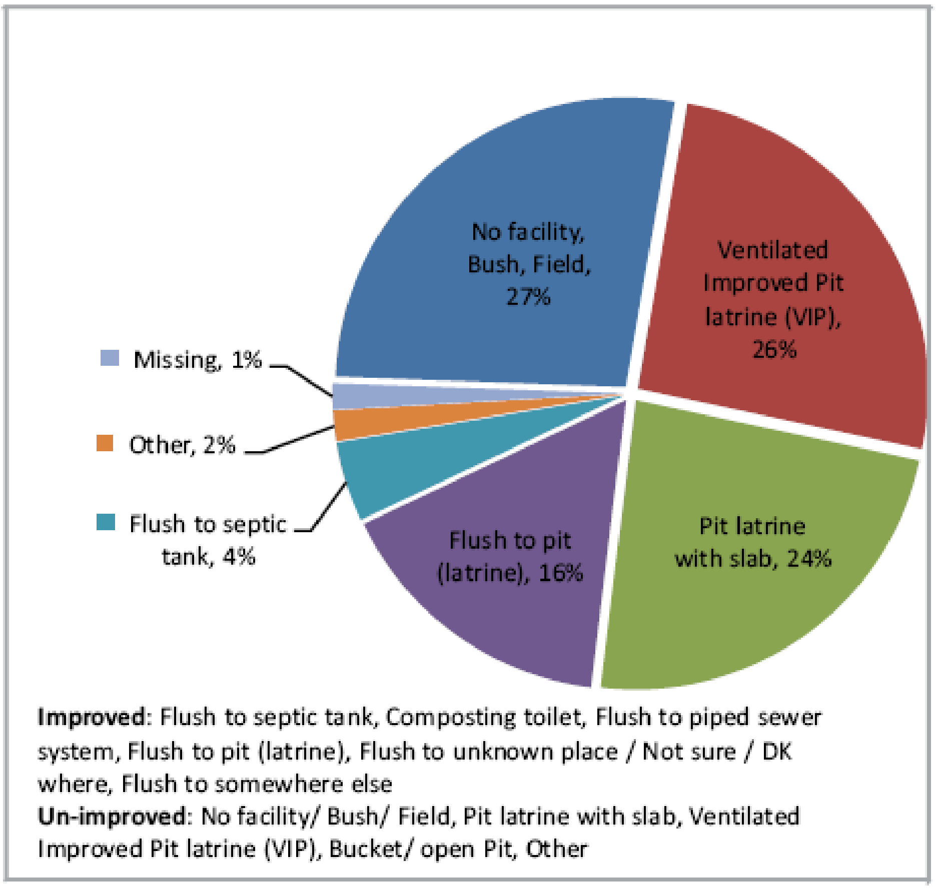


Figure 4.21: Sanitation Facilities (%)

Source: Multiple Indicators Cluster Survey, 2010

WAPDA provides electricity to a large number of villages in Khuzdar District through feeders of 8, 11, 33 KV which cover about 35 percent of the rural and 95 percent of the urban population through 6,527 connections. There is no pipeline connection of natural gas to the district: some people use gas cylinders for cooking and heating. The data for gas cylinder use in the area is not available.

4.3.10 Transport Infrastructure and Communication

Infrastructure plays a key role in promoting economic development and thus contributes towards welfare of the masses. District Khuzdar has comparatively better road linkages than many other districts of Balochistan. The district has National Highways and district roads. Major road link is the National Highway which links Quetta with Karachi via Khuzdar. There is no railway in the district. Khuzdar is connected to other parts of the country by road and air. Postal facilities are available to the major towns of the district while about 40% of the population has access to electricity.

The total length of roads in Khuzdar is 1,974 km, out of which, 522 km is black topped road (metalled road). Major portion of the total roads comprises of shingle roads. Quetta Karachi highway is the life line of Khuzdar which forms a large part of the metalled roads in the district. Most of the villages and towns are interconnected through shingle roads.

Khuzdar has active transportation linkages with other parts of the country including Quetta, Karachi and Shahdad Kot. As Khuzdar is located halfway on the RCD highway, transport for Quetta and Karachi is available 24 hours a day. Motorcycles are the most common means of transportation for local people. A large number of vehicles are registered at Karachi and Quetta.

No railway service exists in the district. Khuzdar is linked with Karachi, Sukkur, Turbat and Moen-jo-Daro by air, however, the airport in Khuzdar is not functional. Pakistan Telecommunication Corporation (PTC) has established a network of telephones in the district. Khuzdar District has 9 telephone exchanges.

4.3.11 Mining

Exploitation of mineral weatlth is a capital-intensive activity. Besides, to get maximum output, use of specialized machinery is preferred that calls for employment of highly skilled labor. Existence of basic services such as power, water and access roads are also necessary. Traditionally, Balochistan has suffered from neglect of its development sector, similar has been the fate of mineral exploration. There is a severe shortage of both the required technology and skilled manpower.

Khuzdar has deposits of dimentions stones. Lime stone and marble are being mined at a large scale. Dimension stones are being explored in different colors including cream, white, brown and grey. From Wadh towards Bela, a large area is covered with ultramafic rocks mainly composed of Dunite, Serpentinite and Chromite; these minerals are mined at different localities. The Cr2O3 concentration in these deposits ranges from 16 % to 45%, while of Manganese ranges from 20-35%. The Manganese minerals are pislomelane and pyrolusite occur in red shale layer which are mined by local people around Sonaro. The ore bodies of Manganese are found at Khisona Khai, Gahito Drngi, Surmago deosits, Bhamboli Jhal and Madohi Nala deposits near Sonaro.

Other than Marble, Lead and Zinc are also among main minerals in the district. Common minerals of economic significance are Galena (PbS) and Sphelerite (Zn, Fe). Some of the important Lead Zinc prospects of District Khuzdar require detailed exploration. Gunga Lead Zinc Barite has deposit of 10 million tones according to preliminary estimates (Geological Survey of Pakistan) wheres Surmai Lead Zinc deposit are estimated at 3 million tons.

Iron Ore deposits of Hematite are of economic significance in different localities in ultramafic rocks near Monar Talar. These deposits are being mined by the private sector and transported down country in raw form. Strontium and Copper deposits of good quality have been reported too. The Barite mineral in chemical composition of BaSo4 owing to its high specific gravity is used in production of oil well drilling mud, in paints, chemical ceramics, paper industries and manufacture of barium chemicals. Its large deposits occur at Gunga, 16 Km to south-east of Khuzdar city with ore in interbedded limestone and shale. Massive Sulphide Copper deposits are also found in the area.

Seventeen prospective licenses and 10 mining leases have been granted to the private sector. During the years 2005-10, the production of Chromite increased from 1,162 metric tons to 7,317 metric tons, whereas Marble's production was 262, 098 metric tons during 2009-10. During the fiscal year 2005-06 to 2009-10, the production reported in the district is given in the following table.

Table 4.35: Major Minerals and Production

Mineral	No of Prospecting Licenses 2009-10		No of Mining Leases 2009-10		Production (in metric tons)				
	No.	Acreage	Number	Acreage	2005-06	2006-07	2007-08	2008-09	2009-10
Marble	50	29107.7	7	2699.83	240,860	187,705	108,984	311469	262,098
Barite	0	0	1	316	44,573	44,249	48,829	58596	43,839
Limestone	3	926.4	1	50	1,875	n/a	n/a	n/a	n/a
Chromite	17	23329.5	1	1280	1,162	307	n/a	n/a	7,317
Hametite	1	569.4	0	0	n/a	n/a	5,000	n/a	n/a
Source: Mines and Minerals Department, GoB									

4.3.12 Industry

Major industry is not available; however, small enterprises in the area include carpet centers, woodwork, mazri making and furniture making workshops. Few cottage industries are also functional in the area where local embroidery work is carried out by women and girls. Major factors that limit the development of industry and manufacturing are non-existence of infrastructure and marketing network, unavailability of micro-credit and absence of skilled labor.

The Industries Department reserved the land for industrial sector in the district but the development work could not start due to budget constraints. Three industrial units were established in Khuzdar and one was closed down due to nonavailability of raw materials .The table given below shows the manufacturing units of the district:

Table 4.36: Number of Running Units and Workers

Type of Unit	Workers			
	0-10	**10-35**	**65-100**	**Total**
Cotton Ginning	1	n/a	n/a	1
Flour	n/a	1	n/a	1
Barites	n/a	n/a	1	1
Total	1	1	1	3
Source: Directorate of Industries, Balochistan				

4.3.13 Social Organization

The social organization in the rural areas of the district is tribal and the social structure is patriarchal. Being a male dominated society, women have limited decision-making in family and social affairs. The tribe, locally called Qaum, is divided into a number of groups. These groups are further sub-divided into groups called pira, representing families. Zai is the generic term for a group representing either the tribe or any of its divisions. Each tribe has its own leader called Sardar (chief) of the whole tribe who is assisted by Mirs, who are the heads of their respective clans (the term is also applied to the Sardar's brothers and near relatives). A Motabar or Kamash is the head of one of the units which the clan is composed of. The positions of Sardar, Mir and Motabar are hereditary, while the leadership of smaller groups generally depends on the age, influence and intelligence of a person.

4.3.14 Socio-Economic Profile of Project Environs

A field survey was conducted in the surrounding villages of the proposed project area which included Gunga Village, Kunj Village, Azeempur Village, Makkali Gooki & Kunj Village in district Khuzdar in order to assess the current socio-economic parameters.

The villagers primarily depend on livestock, agriculture and labour for their livelihood. Wheat is the most abundantly grown crop while rice farming is another major source of income. The main source of water for the villagers is groundwater. Bore holes and wells have been dug at a depth of 300 feet. The water extracted from these groundwater sources is used for both domestic (drinking, washing, cooking) and irrigation purposes. Moreover, in order to compensate for low agricultural output, largely due to insufficient agricultural water supply, a large proportion of the population are also pastoralists. domestic farming includes the breeding, raising, gathering of poultry and domesticated wild animals, such as cattle, sheep and dogs.

The area suffers from long hours of load-shedding. Some of the houses were seen with solar panels installed to overcome the electricity shortfall, as the main electricity grids are far from where most of the population is. A house with an installed solar panel for meeting the electricity requirement.

	
Village Gunga, Ferozabad Khuzdar	Main access road Khuzdar

	
Villages and house structure- Gunga, Khuzdar	
	
Dry Dug Well in Gunga, Khuzdar	Open drain system for domestic waste water, Gunga Khuzdar
	
Solar Panels uses for the backup electricity	Primary school in Gunga, Khuzdar

5 Stakeholder Consultation

Stakeholder Consultation and Public Participation are two effective tools of social interaction. Stakeholder Consultation is an important tool to build up confidence between the stakeholders and the project formulators to minimize the risk of delay of project implementation. It also counters erroneous information, if any, about the project. It helps the project proponent (Bolan Mining Enterprises, BME) make informed assessments of public opinion about the project, and the nature and extent of opposition likely to occur during the implementation stage.

5.1 Public Consultation

The process of stakeholder participation and consultation was endorsed in the United Nations Conference on Environment and Development (UNCED) in 1992 through Agenda 21, one of the key documents of the UNCED. Agenda 21 was adopted as a comprehensive strategy for global action on sustainable development to deal with issues regarding human interaction with the environment. It emphasizes the role of public participation in environmental decision-making for achieving the goals of sustainable development.

The participation of project stakeholders in project planning, design and implementation is now universally recognized as an integral part of environmental & social impact assessment. Local communities, their representatives, government and national and international NGOs and the civil society at large may all be able to contribute to, and benefit from, the dialogue directed at identifying and resolving key project-related issues. Stakeholder consultation presents an opportunity for mutual information-sharing and dialogue between the project proponent and stakeholders. An effective public consultation process provides concrete suggestions that can help improve project design, resolve conflicts at an early stage, identify management solutions to mitigate potentially adverse consequences and enhance positive impacts, and develop guidelines for effective monitoring and reporting of project activities throughout the project cycle.

Providing the public with adequate, reliable information of the planned project is of significant importance in creating public trust and acceptance. Moreover, experience indicates that unexpected project effects on the local community generally give rise to significant issues and concerns. Such problems are avoided and reduced if people are properly informed and consulted about the project and given the opportunity of being heard.

This section provides an overview of the public consultation process that was adopted by the project proponent and presents the findings of the stakeholder consultations. The key aspects, including consultation objectives, consultation framework and stages of the consultation process have been outlined in this section.

5.2 Objectives of Stakeholder Consultation

The stakeholder consultation process developed for the proposed project is in line with the key objectives of stakeholder consultation identified below:

- Provide information related to proposed project activities;
- Facilitate and maintain dialogue;
- Seek participation of all interested parties;
- Identify stakeholder interests and issues;
- Identify solutions for addressing these concerns and integrating them into project design, operations, and management; and
- Enhance the project by learning from, and incorporating, the expertise of individuals, professionals, communities and organizations.

5.3 Identification of Stakeholders

Comprehensive identification of stakeholders is one of the major steps of designing an effective consultation process. Stakeholders are individuals, groups, or institutions that may be affected by, can significantly influence, or are important to the achievement of the proposed objectives of a project.

The main aim of this exercise was to disseminate information on proposed project activities to stakeholders so that any feedback received could be used to address the issues at an early stage. Consultation meeting were conducted with the stakeholders particularly linked with the concerned area for the upcoming proposed project. The stakeholders were briefed during meeting sessions about the objectives of the BME proposed activities in Khuzdar. Observations of the respondents were noted and have been incorporated into the text of the EIA.

The following stakeholders were identified in the project area

- Union Councilor Ferozabad (Gunga), Khuzdar
- The District Forest Officer (DFO), Khuzdar
- Local residents
- Workers/Labour
- Shop owners
- Farmers
- Small Scale business persons

5.4 Consultation Methodology

The team of consultants carried out public consultations at the proposed project site in September, 2017. The public consultation targeted the residential, commercial area and administrative instuitions in the project area. Following strategy was adopted for public consultation:

- Selection of the stakeholders for consultation, reconnaissance of the proposed project site and initial discussions with the residents, workers, labour, farmers and shopkeepers etc.
- Appraising the targeted stakeholders initially for consultation by briefing them regarding the project.

A summary of the major consultations conducted, along with dates and venues are provided in the table below.

Stakeholders	Date	Venue
Consultations with Locals/Residents	18-9-2017	Project site
Union Councillor Ferozabad Town and Villagers	19-9-2017	Local Utak
Divisional Forest Officer (DFO)	19-9-2017	District Forest office

5.5 Institutional Stakeholder Consultaton Feedback

5.5.1 Union Councilor of Ferozabad Town (Ward no. 1- Ward no.06), Thesil Khuzdar, District Khuzdar

The consultation meeting was held at local Utak with union councilor Ferozabad town Mr. Abdul Kareem who is the supervisor for ward no.1 to ward no.6 of Ferozabad town. They were briefed about the proposed project activities in Gunga and were asked for their recommendations and mitigation measures for the proposed project activities. The meeting was attended by the following participants.

Respondent Name	Profession/Occupation
• Mr. Abdul Kareem	Union Councilor (UC) Ferozabad Town
• Mr. Ahmed Khan	Resident Gunga
• Mr. Saleem	Resident Gunga
• Mr. Khair Jann	Farmer
• Mr. Haroon	Shopkeeper
• Mr. Munir Ahmed	Farmer
• Mr. Amjad Khan	Shopkeeper
• Mr. Muhammad Zahor	Shopkeeper
• Mr. Hasan Khan	Farmer
• Mr. Zahid Ali	Shopkeeper
• Mr. Ghullam Muhammad	Farmer
• Mr. Imad Khan	Farmer

Consultation meeting with Union Councillor Ferozabad Town and Villagers

The following recommendations and suggestions were made by the Union Councilor and Local People:

- Appreciated the project activities and welcomed the proposed project by Bolan Mining Enterprises in Gunga, Khuzdar
- Prosperity will come in the area after the commencement of project
- Positive development for economic growth
- The area will be improved remarkably with infrastructure facilities with this development.
- BME should give priority to local residents in the job recruitment process.
- Initiate the training & capacity building programs for the local people.
- A certain percentage for the locals jobs should be allocated in recruitment process.
- Provide a primary school which runs under the supervision of independent institute or any NGO
- Provide drinking water tank in Gunga village connected through tube well.
- Expected project activities would not disturb their daily routine life
- Willing to provide every support to BME in project execution as this project is beneficiary for our country's development.
- Proposed project activities must be carried out in sustainable way by following the all EIA mitigation measures.

5.5.2 The Divisional Forest Officer (DFO), The Forest & Wildlife Department, District Khuzdar.

Another meeting was also held with Mr. Muhammad Owais the DFO Khuzdar. EMC team briefed him about the proposed project activities and location of project area and discussed the protected areas limitation in district Khuzdar.s

Mr. Muhammad Owais (DFO Khuzdar) said that the forest and wildlife both sections come under the supervision of DFO Kuzdar. The details of protected areas in Khuzdar were provided and the EMC team was informed that the proposed project does not fall in any protected area.

Consultation underway with Divisional Forest Officer (DFO), Khuzdar

The following were the recommendations and suggestions by the Divisional Forest Officer (DFO), Khuzdar:

- It is considered as mega project because it would enhance the country's economy growth by becoming the top exporters of barite in the world.
- The project is benefical for the people of khuzdar as it would bring the prosperity and create jobs for locals.
- BME should enhance the corporate social responsibility (CSR) activities in the region by prior consideration to eduction sector.
- BME should introduce some skill developments programs for the capacity building of local people.

- BME must take care of wildlife species in their area during activities and the EIA report must provide strict measures for the protection of wildlife.
- Comprehensive tree plantation should be a part of CSR activities
- Blasting activities could disturb the wildlife activities so strict implementation of environmental management plan will be required.
- The proposed project activities must be carried out in sustainable way by following the all EIA mitigation measures.

5.6 Community Consulation Feedback

- Inhabitants of village (Gunga) have no objections regarding the upcoming proposed project, they believe that the area will be improved by the commencement of proposed project with major infrastructure facilities.
- The inhabitants were concerned about dust and noise pollution that would result from the mining activities of the project.
- Local residents are fully satisfied by this proposed project activity, they believe , it would generate employment, more investment and business opportunities and improvement to the status of the proposed surroundings.
- Locals have major concern over basic health facilities that are not up to the mark in the project area.
- Local residents emphasized on the local jobs and suggested to initiate the mechanism of training programs and capacity building for local people.
- Livestock is one of their sources of income but due to unavailability of veterinary hospital in their area, they suffer so they requested to be provided some veterinary facilities for their animals.
- Another concern was that the community have only two tube wells in their area, which are far from their village and it is a hassle to get water from those tube wells. Therefore, they asked to have a tube well installed in their village.
- People requested for a primary school in the area under the supervision of any NGO's or independent institutions, as our students have to travel to Khuzdar city area.
- They asked for medical health unit and free dispensary for locals as they need to go Kuzdar city. Moreover, they requested a particular ambulance should be dedicated for the surrounding communities in case of emergency.
- Mitigation measures should be adopted to control dust pollution during extraction phase of the proposed project and they should follow the Environmental Management Plan, a concern raised by the local community.
- People emphasized that proper mitigation measures should be implemented to control the water and solid waste pollution.

5.6.1 List of Public Consultations

A series of roadside and focus group discussions were carried out with local communities in the Project area to find out their opinion about the Project. Male respondents were included in the consultation process at the community level.

Their view points are listed below:

Table 5.1 List of Community Consulation

S. No	Name	Occupation	Remarks/concerned Issues
1.	Ahmed Khan & Saleem Ali	Resident of Village Gunga, Ferozabad-Khuzdar	• Local people should be trained and employed in the proposed project. • Medical health facilities especially for female should be provided. • BME should provide some scholarship to local students. • Ensure the project activities wouldn't disturb our daily routine life.
2.	Khair Jann, Munir Ahmed & Hassan Khan	Local Farmers of Village Gunga, Ferozabad-Khuzdar	• Agricultural farming is one of the major sources of income. Mostly wheat, barley & rice are main fields and others include some seasonal vegetables farming. • Employment generation • BME should include the farmers trainings provision in their CSR activities program • Environmental friendly disposal of tailing water during the operation phase should be mandatory as it could be hazardous for the farming activites in the surrounding land. • Proper measures should be taken in order to minimize the dust & noise emissions during mining activities.
3.	Ghullam Muhammad	Livestock (owner) Resident of Azeempur Village	• Employment Generation • showed support for the proposed project and requested BME to provide job in the proposed project • Prosperity will come in the area, as there is no major industry in the area. • Provide some education facility in the area • Speed limits of vehicles or equipment should be controlled as it may harm the villagers' livestock. • Upgradation of roads is necessary from city to project site. • Showed support to BME in the commencement of proposed project.
4.	Muhamad Zahor	Shopkeeper Resident of Azeempur Villager	• Mining activities could create the dust problem in the area. • Dust emissions should be controlled • Prosperity will come in the area after the commencement of project

			• The proposed project will be beneficial for the local people.
5.	Imad Khan	Resident of Makkali-Gooki Village	• Medical health facilities should be provided. • Aesthetic degradation should be avoided. • Corporate social responsibilities must be made priority • Job preferences should be given to local people. • BME will ensure strict implementation of all the mitigation measures suggested in EIA
6.	Rasool Bux	Labour, Village Makkali-Gooki	• Employment generation • Land costs will likely increase from the industrial activities in the area. • We strongly support the new development of BME that will have positive impacts on the Khuzdar city. • Will provide every possible support to BME in the development of our area.
7.	Zaheer Ahmed	Shopkeeper, Village Kunj	• Local people should be given priority for employment. • Health facilities should be improved • Educational facilities should be improved • Employment • There should be strict implementation on pollution control
8.	Muhammad Karim	Local Resident, Kunj	• There should be a strict implementation of pollution control techniques. • Prosperity will likely to come as there is no major industry in the area. • Respect of cultural norm • Provide jobs to local. • We ensure our cooperation at each level of the proposed development.
9.	Muhammad Younis	Farmer, Kunj	• There should be provision of farmers training in their CSR activities program. • Wheat, barley & rice are main fields and others include some seasonal vegetables farming. • supportive of the project activities in the area. • Proper measures should be provided to handle tailing water as it could be hazardous for the farming activites in the surrounding land. • Proper measures should be taken in order to minimize the dust & noise emissions during mining activities. • BME ensure the proper implementation of environmental management plan proposed in the EIA report.

5.6.2 Key findings of Public Consultations

A summary of major findingsare presented below:

- Preference for employment opportunities should be given to local people of the area.
- Health facilities, potable water and education to be provided in the project area.
- Pollution control must be strickly implemented.
- A full-fledged Corporate social responsibility (CSR) Programme covering the aforementioned themes, including a training and capacity building center for local people.

Photographs of Consultation Meetings


Consultation with the Gunga Villagers, Ferozabad- Khuzdar


Consultation with the Kunj Villagers, Khuzdar


Consultation with Makkali-Gooki Village- Khuzdar

Consultation with shopkeeper Local People, Azeempur Village, Gunga- Khuzdar

6 Screening of Potential Environmental Impacts & Proposed Mitigation Measures

6.1 General

The term "environmental impact" is used broadly to include a range of ecological, social, and economic impacts that may result from any of the activities associated with development of the project. This chapter documents the findings of assessment of potential environmental and socio-economic impacts and proposes their mitigation measures. It includes identification, analysis, prediction, significance and characteristics of the impacts and mitigation measures to prevent unacceptable adverse effects through the implementation of appropriate project modifications.

This section presents the screening process that identifies the environmental aspects and makes assessment of impact of different activities during the siting, construction and commissioning phases of the proposed project. The screening process has through review of literature, primary as well as secondary baseline data, and expert judgment made assessment of the potential impacts of said activities on the physical, biological, and socioeconomic environment of the Project. Mitigation measures have been proposed to reduce, minimize or compensate for the identified potential negative impacts and their adoption has been recommended.

6.2 Methodology of Impact Evaluation

6.2.1 General Approach

The type, nature (positive, negative, direct, indirect), magnitude, timing (during design, operation), duration (short term/temporary, long term/permanent) and significance of impacts will be assessed in this section. The evaluation approach implemented in this study is a **Receptor-Specific Analysis** approach addressing the various sources of impacts from the project's different implementation phases including mobilization, site preparation, commissioning, drilling/quarrying operations, and site restoration. The analysis covers all potential fields of impacts and/ potential receptors:

- Ambient Air Quality;
- Geology and Water Resources (groundwater and surface water);
- Noise and Vibration;
- Land-use
- Biodiversity (fauna and flora);
- Visual and Aesthetics;
- Socio-Economic Environment;

The general evaluation process will include the following stages:

- **Step 1:** Identification of project related activities (sources) and environmental aspects;
- **Step 2:** Identification of potential impacts to the environment (physical, biological, human and cultural);

- **Step 3:** Evaluation and assessment of the related unmitigated impact significance;
- **Step 4:** Identification of Best Practicable Environmental Options (BPEO); and
- **Step 5:** Re-evaluation and assessment of the mitigated impact significance.

6.2.2 Impact Evaluation Pre-Screening Level

The screening methodology that is adopted for the purpose of this EIA study comprises a preliminary screening process followed by a more delicate and detailed secondary screening process. The pre-screening process includes an intensive literature research and review of mining industry projects implemented in other parts of the world as well as in Pakistan. The pre-screening highlighted some of the major impacts that might be associated with normal operations based on the literature research and the nature of the surrounding environment.

The key issues identified were further investigated and evaluated based on planned project operations including proposed BME activities, time duration, national and provincial environmental regulations, BME HSE policies and commitment, and the environmental baseline conditions. Given the data gathered by EMC Pakistan team from the ground and those provided by BME, the results were channeled to a secondary screening process.

6.2.3 Impact Evaluation Secondary Screening Level

A secondary screening level systematically screens the wide range of possible sources and potential previously highlighted impacts. This screening level also assesses the impacts in terms of their significance, duration, reversibility, likelihood of occurrence and geographical extent.

In the secondary screening level, consequence criteria were ranked into six levels of significance listed in Table 6-1. Then, the likelihood of the occurrence of the impact was rated according to the criteria outlined in Table 6-2. Based on the level of significance, and likelihood of occurrence, the impact severities (risk) are determined.

The assigned impact severity assessment was first undertaken in accordance to BME currently planned project design and mitigation measures incorporated. The assessment was conducted to identify the potential unmitigated impacts and the residual impacts under current project designs and BME control measures.

Having identified and characterized the potential significant impacts during each phase using the screening procedure identified above, an Environmental Impact Severity Matrix (EISM) was developed to summarize all identified impacts during each phase of the project.

The assigned impact severity was derived from:

- Round table scoring exercise by all team experts,
- Results from analysis and calculations, and

- Scientific predictions based on experience of every team member in the member in the field of his/her expertise and from outcomes from similar projects conducted abroad or locally.

Table 6.1: Secondary Screening Consequence Level Criteria

CRITERIA	CONSEQUENCE
Massive impact over a large area resulting in extensive, potentially irreparable damage to a VEC*. Has a measurable effect on the livelihood of those using a resource over a period of years. Massive impact over a large area resulting in extensive, potentially irreparable damage to a site of social and/or cultural importance.	5. Catastrophic
Long term or continuous impact resulting in substantial adverse changes in a VEC, well outside the range of natural variation. Unassisted recovery could be protracted. Area of effect is extensive and/or encompasses an area that supports a statistically significant proportion of a VEC population or ecosystem. Has a measurable effect on the livelihood of those using a resource over a period of months. Significant damage / impact to a site of social and/or cultural importance.	4. Significant
Moderate adverse changes in a VEC or area that supports a VEC population. Changes may exceed the range of natural variation though potential for recovery within a few years without intervention is good. Area of effect encompasses an area that supports either a moderate or minor proportion of a VEC population or ecosystem. Long term (> 5 yrs) changes over an area which is not considered to be a VEC. Has a measurable effect on the livelihood of those using a resource over a period of weeks. Moderate damage to a site of social and/or cultural importance.	3. Moderate
Minor adverse changes in a VEC. Changes will be noticeable but fall within the range of normal variation and be typically short-lived, with unassisted recovery possible in the near term. However, it is recognized that a low level of impact may remain. Medium term impact (1-5 yrs) in an area that does not encompass a VEC or whose impact is highly localized within a VEC. Long term impact over a discrete, small area which does not support a VEC. May be noticed but does not affect the livelihood of those utilizing a resource. Minor impact to a site of social and/or cultural importance.	2. Minor
Short term changes in an ecosystem that are unlikely to be noticeable (i.e. fall within the scope of natural variation). Area of effect is restricted to the immediate vicinity of the source.	1. Negligible

Has no discernible effect on the environmental resource as a whole and is likely to go unnoticed by those who already use it. Negligible impact to a site of social and/or cultural importance.	
Changes that result in a net positive impact to an ecosystem, environment or population.	Beneficial

*VEC means Valuable Ecosystem Component, used to refer to components of the environment that are considered to be of commercial and/or ecological importance.

Table 6.2: Likelihood Evaluation Criteria

LIKELIHOOD TO OCCUR	CATEGORY	SCORE
Impact is highly likely or certain to occur under normal operating/ construction conditions	**High**	**C**
Impact may possibly occur under operating/construction conditions.	**Medium**	**B**
Impact is unlikely to occur under normal operating/construction conditions but may occur in exceptional circumstances.	**Low**	**A**

Table 6.3: Impact Assessment Management Matrix

		LIKELIHOOD RATING		
		A	B	C
CONSEQUECE RATING	1	1A	1B	1C
	2	2A	2B	2C
	3	3A	3B	3C
	4	4A	4B	4C
	5	5A	5B	5C
	6	6A	6B	6C

KEY

Consequences		Likelihood	Acceptability	
4- Negligible	4-Significant	D- Low		Minor
5- Minor	5-Catastrophic	E- Medium		Moderate
6- Moderate	6-Beneficial	F- High		Significant

6.3 Pre-Screening of Environmental Impacts and Pathways

Based on the methodology described in section 6.2.2, the various impacts of the project were prescreened according to the project's construction and operations phases as well as the pathway of the impact. Table 6-4 lists the potential adverse and beneficial environmental, social and economic impacts that could result from the project.

Table 6.4: Summary of Potential Environmental and Socio-Economic Impact

Phase	Source/Activity	Types of Emissions/ Resultants	Type of Impact
Mobilization and Construction	Site preparation, land clearance (project foot print), movement of heavy machinery/ equipment, road grading and excavation/ construction works	Emissions to atmosphere (CO, NOx, SOx, Particulate matter), Leakage diesel/ oil spills, Solid waste generation (inert; soil, vegetation, domestic, hazardous, spare damaged equipment and noise generation	Vegetation clearance Top soil removal and alteration of surface soils profile Degradation of local air quality Disturbance to local population Habitat alteration and destruction Potential land-use conflict and resettlement Visual intrusion from high rise structures and night lights disturbance and interference to local population. Damage to surface and underground physical Infrastructure (roads...)
	Influx of labor and workforce	Increased water consumption rates and waste generation (liquid and solid effluents) Increased background noise level Heavy traffic movement	Employment prospects in development area for skilled and unskilled workers and service providers (beneficial) Increase in commercial trade with nearby communities (beneficial) Traffic congestion/risk of collision Depletion of natural water resources (groundwater and surface water if any) Increased risk of social conflicts/disputes Increased risk on health and safety of occupational workers and public community
	Transportation for logistics support, material/goods & services	Fine particle suspension especially in desert area, Emissions to atmosphere (CO, NOx, SOx), Leakage diesel/oil spills,	Enhance local trading and commerce (beneficial) Increased road traffic and accidents Soil compaction and quality deterioration

		Solid waste (raw material, products), Noise generation	Behavioral change of native Faunal species. Increased risk for occupational Injuries (stress, fatigue...)
Operation & maintenance	Quarrying / Drilling	Noise and vibration due to explosion and machinery use Water consumption Drainage / run-offs/ wash water Water consumption Emissions from raw material and transportation of manpower and onsite equipment; mainly dust and vehicular emissions, Explosive and chemical handling/use	Employment opportunities for skilled and unskilled labour (beneficial) Loss of flora, fauna, archaeological artefacts (if any) Scaring of existing land and compromised visual aesthetics Medical waste generation Contamination of soil by heavy metals, salts, hydrocarbons, etc. Contamination of groundwater and surface water Aquifers Occupational health and Safety risk hazard due to risk of abnormal operations (blasting, emergencies, fire, etc) Nuisance to local population (particularly those suffering with respiratory morbidities)
	Maintenance	Spare damaged equipment Waste discharge Spent chemicals/oil/grease	Hydrocarbon Contaminated waste Heavy metals generation
	Process Operations (Processing plant, power plant stack emissions) minerals processing Hauling, loading and unloading of raw material as	Atmospheric Emissions mainly SO_2, NO_X, CO_2, particulate matter/TSP Fugitive dust emissions Vehicular exhaust Solid waste generation (slag, fly ash, Over burden & left-over waste) and liquid industrial effluents (blow down, wash water, Tailing water),	Degradation of Air Quality, Land and Underground and Surface waters Disturbance to land aesthetics and local biodiversity Traffic congestion Occupational health and safety risks Nuisance to local population (particularly those suffering with

	well as finished product,	Increased vehicular movement and risk of vehicle collision	respiratory morbidities) Stress on existing water resources
Accidental events	Collision of trucks / vehicle accidents Fire / Explosion and process failure	Leakage diesel spills, Noise generation Emissions to atmosphere (CO, NOx, SOx) - Fine particle suspension especially in desertlike area	Contaminant dispersion (Groundwater, soil) Increased risk for occupational injuries (stress, fatigue...) Loss of flora, fauna, archaeological artefacts (if any), visual impacts Increased risk for occupational Injuries (stress, fatigue...)
Site Restoration/ quarry rehabilitation	Restoration activities (green area plantation)	Nil	Restoration of site and landscape (beneficial)

6.4 Screening of Potential Impacts related to siting of Proposed Project

6.4.1 Land Use

BME already has a lease for mining activity in the region which comprises an area of about 1500km². BME is involved in Barite mining in the area since 1995. The proposed mining activity and processing plant construction for Barite, Lead and Zinc will take place within the same leased area. Beside mining activity, other major component of the proposed project are Processing Plant, Tailing Pond, Waste Dump Area and Water Reservoir. The proposed activities will be performed adjacent to the existing mining activity and within the leased area for the same purpose hence, potential impacts during the sitting of the proposed project are insignificant.

- There is no resettlement/rehabilitation issue because the proposed project is within the leased area of BME.
- Project site has no sensitive areas such as protected sites including wildlife sanctuaries, game reserves or national parks, or any archaeological, historical or cultural heritage in its immediate neighborhood; as such its siting would have no sensitivity in this regard.

6.4.2 Seismic Hazard

According to seismic zoning map of Pakistan, the project area lies in zone 2B which suggest low magnitude of earthquake in the zone. Such Seismic Zoning would correspond to Magnitude between V and VII on Modified Mercalli Scale and should be adopted for siting the proposed project for constructions and operations. The regional tectonic stability of the area is comparatively low.

6.4.3 Visual Effect

Mining operations, and in particular surface mining activities, may result in negative visual impacts to resources associated with other landscape uses. Potential contributors to visual impacts include, erosion, discolored water, haul roads, waste dumps, slurry ponds, abandoned mining equipment and structures, garbage and refuse dumps, open pits, and deforestation.

Visual impact depends on the visual contrast between plant structure and visual character of landscape. Although landscape alteration does not directly affect public health, it may produce an adverse reaction among potential observers and compromise the use and potential growth of the surrounding territory. As the proposed open pit mining and also the site is situated in an existing mining area hence, not altering the land use. Therefore, the visual effects of the project are assessed as insignificant. However, for better management following measure are proposed:

- Mining operations should prevent and minimize negative visual impacts through consultation with local communities about potential post-closure land use, incorporating visual impact assessment into the mine reclamation process.
- Reclaimed lands should, to the extent feasible, conform to the visual aspects of the surrounding landscape.
- The reclamation design and procedures should take into consideration the proximity to public viewpoints and the visual impact within the context of the viewing distance.
- Mitigation measures may include strategic placement of screening materials including trees and use of appropriate plant species in the reclamation phase as well as modification in the placement of ancillary facilities and access roads.

6.5 Screening of Potential Impacts at Construction Phase of Processing plant

The impacts caused by the construction of mineral processing plant will be temporary and will no longer exist after the construction work is completed. The construction activities will include:

- Foundation excavations and installation of concrete footings;
- Erection of building steel frames and cladding;
- Utilities and services connections to site;
- Installation of equipment;
- Ancillary facilities erection;
- Services and utilities connections;
- Building fitting-out; and Commissioning.

6.5.1 Air Quality

Emissions of air pollutants from the project's construction phase are mainly associated to transportation i.e. vehicle movement and site clearance activities and vehicular emissions.

Combustion and Exhaust Emissions

The construction phase of the project is likely to involve combustion and exhaust emissions generating from activities such as ground excavation, site clearance, material handling and vehicle/equipment movements. These emissions can be estimated from established methodologies that depend on the number and type of construction equipment/vehicles which will be used during the site preparation phase. However, the main air pollutants likely to be associated with these emission sources include: Oxides of Nitrogen (NOx), Sulfur Dioxide (SO_2), Carbon Dioxide (CO_2), Carbon Monoxide (CO), and Particulate Matter (PM). The primary environmental consequences of air pollutants are respiratory difficulties in humans and animals, damage to vegetation, and soil acidification.

However, lack of maintenance, poor quality fuel, unnecessary idling periods, long operation period (especially power generators) and absence of exhaust emission control units will result in the increase of pollutants concentration emissions. Emissions concentration of sulphur dioxides and hydrogen sulphide depend upon the sulphur content of the diesel fuel used, particularly when used as a power source. The lower the sulphur content, the lesser the concentration emitted. Similarly, partially burned hydrocarbons are emitted during combustion when the engine's fuel/air mixture is incorrect. However, little can be done to lower NOx emission, other than to purchase low NOx generating equipment.

The effect on Air Quality (Gaseous Emissions) during Construction Activities will be **Moderate** in nature and likelihood of the impact will be **High.** Therefore the overall acceptability of this activity is expected as **Moderate (3C).**

Table 6.5: Air Quality (Gaseous Emissions) Impacts Rating Before Mitigation Measures

Siting Phase	Construction Phase ☑	Mining & Processing Phase	Restoration Phase

Consequences		Likelihood		Impact Rating			Acceptability	
1- Negligible		A- Low		1A	1B	1C	Minor	
2- Minor		B- Medium		2A	2B	2C	**Moderate**	☜
3- Moderate	☜	**C- High**	☜	3A	3B	**3C**	Significant	
4- Significant				4A	4B	4C		
5- Catastrophic				5A	5B	5C		
6- Beneficial				6A	6B	6C		

Mitigation Measures: However, it is recommended that various mitigation measures be adopted, including:

- Using continually well designed maintained and operated equipment's / vehicles by the contractor. Precautionary control measures for atmospheric emissions reduction could include proper engine fuel mixtures, regularly serviced exhaust emission systems, suitable engine tuning, and purchase of diesel fuel with low sulfur content (5% sulfur content).

- Investigating the environmental benefits of employing environmentally friendly equipment by the contractor such as machinery with higher fuel efficiency or those equipped with air pollution control devices to minimize exhaust emissions. Examples include vehicles equipped with 2 or 3 way catalytic converters;
- Avoiding idling vehicles and equipment engines that are left running unnecessarily;
- Reporting monthly fuel consumption records;

When the mitigation measures recommended above are adopted, The Impacts due to Mining and Processing activities will become **Minor (2A).**

Table 6.5: Air Quality (Gaseous Emissions) Impacts Rating After Mitigation Measures

Siting Phase	Construction Phase ☑	Mining & Processing Phase	Restoration Phase

Consequences		Likelihood		Impact Rating			Acceptability	
1- Negligible		**A- Low**	☜	1A	1B	1C	**Minor**	☜
2- Minor	☜	B- Medium		**2A**	2B	2C	Moderate	
3- Moderate		C- High		3A	3B	3C	Significant	
4- Significant				4A	4B	4C		
5- Catastrophic				5A	5B	5C		
6- Beneficial				6A	6B	6C		

Impacts from Dust Generation

The primary sources of dust generation would be related to construction activities. These sources include a combination of on-site excavation and civil works such as compaction and trenching activities, contact of construction machinery with uncovered soil and exposure of bare soil and soil piles to wind. These activities are expected to result in the disturbance of surface soil hence increasing the atmospheric dust levels.

Estimation of the quantity of dust generated is closely related to the type of equipment used, and the duration and nature of the civil works. Further increase in atmospheric dust levels are anticipated by the movement of trucks and vehicles transporting people, material and equipment to the work sites. The amount of dust generated by the activity is difficult to estimate at this stage, however the occurrence and significance of the dust generation depend upon meteorological and ground conditions at the time and location of the civil works activities. However, under normal meteorological conditions, dust impacts should be limited to within several hundred meters of the activity areas.

The main environmental concerns associated with dust generation are likely to be limited to occupational health risk (visual intrusion due to dust clouds) and irritation to humans (i.e. construction workers and nearby local community).

The effect on Air Quality (Dust Generation) during Construction Activities will be **Significant** in nature and likelihood of the impact will be **High.** Therefore the overall acceptability of this activity is expected as **Significant (4C).**

Table 6.6: Air Quality (Dust Generation) Impacts Rating Before Mitigation Measures

Siting Phase	Construction Phase ☑	Mining & Processing Phase	Restoration Phase

Consequences		Likelihood		Impact Rating			Acceptability	
1- Negligible		A- Low		1A	1B	1C	Minor	
2- Minor		B- Medium		2A	2B	2C	Moderate	
3- Moderate		**C- High**	☜	3A	3B	4C	**Significant**	☜
4- Significant	☜			4A	4B	**4C**		
5- Catastrophic				5A	5B	5C		
6- Beneficial				6A	6B	6C		

Mitigation Measures: Techniques for minimizing and preventing fugitive dust emissions during the construction activities can be accomplished through dust suppression measures. The main dust control measures, which are recommended to be considered, include the following:

- Watering-down work area/s.
- Efficient scheduling of deliveries.
- Maintaining stockpiles at minimum heights and forming long-term stockpiles into the optimum shape (i.e. stabilization) to reduce wind erosion.
- Maintaining handling areas in a dust free state as far as practicable.
- Establishing and enforcing appropriate speed limits over all unpaved surfaces.
- Traveling on existing and paved tracks wherever possible.
- Avoiding open burning of solid waste through segregation and recycling, and through disposal according to a solid waste management plan.

When the mitigation measures recommended above are adopted, the impacts due to dust generation from site preparation and civil works will be **Moderate (2C).**

Table 6.7: Air Quality (Dust Generation) Impacts Rating After Mitigation Measures

Siting Phase	Construction Phase ☑	Mining & Processing Phase	Restoration Phase

Consequences		Likelihood		Impact Rating		Acceptability

1- Negligible		A- Low		1A	1B	1C	Minor	
2- Minor	☜	B- Medium		2A	2B	**2C**	**Moderate**	☜
3- Moderate		**C- High**	☜	3A	3B	3C	Significant	
4- Significant				4A	4B	4C		
5- Catastrophic				5A	5B	5C		
6- Beneficial				6A	6B	6C		

6.5.2 Noise

During construction, construction equipment, including dozer, scrapers, concrete mixers, generators, vibrators and power tools will be the sources of noise. Vehicular movements during construction phase for loading/unloading of raw and finished materials and other transportation activity may increase noise level. Construction noise is difficult to predict because the level of activity constantly change. The use of heavy equipment during site clearance and construction works inevitably generates noise, which may create a nuisance for persons in the vicinity. Most of construction activities are expected to produce noise level within the prescribed limit. The noise generated from various sources will be of short duration. Therefore, no significant impacts are envisaged on the construction force & no community within the close proximity of processing plant.

The effect on Noise Quality during Construction Activities will be **Significant** in nature and likelihood of the impact will be **High.** Therefore the overall acceptability of this activity is expected as **Significant (4C).**

Table 6.8: Noise Quality Impacts Rating Before Mitigation Measures

Siting Phase	Construction Phase ☑	Mining & Processing Phase	Restoration Phase

Consequences		Likelihood		Impact Rating			Acceptability	
1- Negligible		A- Low		1A	1B	1C	Minor	
2- Minor		B- Medium		2A	2B	2C	Moderate	
3- Moderate		**C- High**	☜	3A	3B	3C	**Significant**	☜
4- Significant	☜			4A	4B	**4C**		
5- Catastrophic				5A	5B	5C		
6- Beneficial				6A	6B	6C		

Mitigation Measures: The impact mainly depends on the characteristic of the noise generating sources, topography and atmospheric conditions. Following measures shall be taken to mitigate the nuisance during the construction phase.

- The noise generating sources shall be enclosed with acoustic proof material to cut down the noise levels.
- Construction machinery and vehicles shall be serviced at regular intervals in order to keep noise to minimum level.
- Green belt shall be developed in and around the proposed plant.
- Noise level in and around the plant site shall be measured.
- Workers shall be equipped with earplugs or earmuffs.
- Employees shall be trained on noise abatement and PPE's (personal protective equipment) practice.
- Workers operating equipment that generates noise should be equipped with the appropriate noise protection gear.
- The working hours shall be imposed on construction workers.
- Work discipline shall be enforced on site.
- Warning signs shall be posted within the vicinity of the impacts.

When the mitigation measures recommended above are adopted, the impacts due to dust generation from site preparation and civil works will become **Moderate (2B).**

Table 6.9: Noise Quality Impacts Rating After Mitigation Measures

Siting Phase	Construction Phase ☑	Mining & Processing Phase	Restoration Phase

Consequences		Likelihood		Impact Rating			Acceptability	
1- Negligible		A- Low		1A	1B	1C	Minor	
2- Minor	☜	**B- Medium**	☜	2A	**2B**	2C	**Moderate**	☜
3- Moderate		C- High		3A	3B	3C	Significant	
4- Significant				4A	4B	4C		
5- Catastrophic				5A	5B	5C		
6- Beneficial				6A	6B	6C		

6.5.3 Impact on Soil

The construction of the proposed plant will disrupt the land and soil strata, but the disruption is for the positive development in the country. Excavation works for construction of the Processing plant will expose soils in the affected areas, leaving them vulnerable to erosion by surface run-off during heavy rainfall. However, it is important to conserve the "topsoil" wherever possible for later restoration.

The effect on Soil Quality during Construction Activities will be **Moderate** in nature and likelihood of the impact will be **High.** Therefore the overall acceptability of this activity is expected as **Moderate (3C).**

Table 6.10: Soil Impacts Rating Before Mitigation Measures

Siting Phase	Construction Phase ☑	Mining & Processing Phase	Restoration Phase

Consequences		Likelihood		Impact Rating			Acceptability	
1- Negligible		A- Low		1A	1B	1C	Minor	
2- Minor		B- Medium		2A	2B	2C	**Moderate**	☜
3- Moderate	☜	**C- High**	☜	3A	3B	**3C**	Significant	
4- Significant				4A	4B	4C		
5- Catastrophic				5A	5B	5C		
6- Beneficial				6A	6B	6C		

Mitigation Measures: To minimize the impacts that could arise during the construction phase following measures will be adopted

- The contractor must minimize the area of exposed soil at any given time and to wet, compact and resurface the disturbed areas during the construction phase.
- Removal topsoil with vegetation in it (rather than cutting off the vegetation) so that the vegetation helps to hold and enrich the soil while it is in stockpiles.
- Maintain stockpiles against erosion where necessary
- Stockpile topsoil in conical heaps not exceeding 2m in height (to permit moisture and oxygen to penetrate the heaps), and in localities.

When the mitigation measures recommended above are adopted, the impacts due to construction activity will become **Moderate (2B).**

Table 6.11: Soil Impacts Rating After Mitigation Measures

Siting Phase	Construction Phase ☑	Mining & Processing Phase	Restoration Phase

Consequences		Likelihood		Impact Rating			Acceptability	
1- Negligible		A- Low		1A	1B	1C	Minor	
2- Minor	☜	**B- Medium**	☜	2A	**2B**	2C	**Moderate**	☜
3- Moderate		C- High		3A	3B	3C	Significant	
4- Significant				4A	4B	4C		
5- Catastrophic				5A	5B	5C		
6- Beneficial				6A	6B	6C		

6.5.4 Impact on Vegetation

The clearance and grading of the site will therefore not have significant impact on biodiversity. Slightly removal of the sparsely shrub will result in a minor loss of vegetation in the short term and in the longer term the development will prevent the possibility of re-colonization by invasive species.

The effect on Vegetation during Construction Activities will be **Moderate** in nature and likelihood of the impact will be **Medium.** Therefore the overall acceptability of this activity is expected as **Moderate (3B).**

Table 6.12: Vegetation Impact Rating Before Mitigation Measures

Siting Phase	Construction Phase ☑	Mining & Processing Phase	Restoration Phase

Consequences			Likelihood			Impact Rating				Acceptability	
1- Negligible			A- Low			1A	1B	1C		Minor	
2- Minor			**B- Medium**	☜		2A	2B	2C		**Moderate**	☜
3- Moderate	☜		C- High			3A	**3B**	3C		Significant	
4- Significant						4A	4B	4C			
5- Catastrophic						5A	5B	5C			
6- Beneficial						6A	6B	6C			

Mitigation Measures: Following mitigation shall be considered during construction activity in order to preserve any loss of terrestrial habitat and biodiversity.

- To establish as many green areas as possible around the facility.
- Site clearance and setting out of the facility must avoid the removal of vegetation wherever possible
- Establishment of green areas on the site should include the planting of bird feeding trees.

When the mitigation measures recommended above are adopted, the impacts due to construction activity will become **Minor (2A).**

Table 6.13: Vegetation Impact Rating After Mitigation Measures

Siting Phase	Construction Phase ☑	Mining & Processing Phase	Restoration Phase

Consequences			Likelihood			Impact Rating				Acceptability	
1- Negligible			**A- Low**	☜		1A	1B	1C		**Minor**	☜

2- Minor	☜		B- Medium			**2A**	2B	2C		Moderate
3- Moderate			C- High			3A	3B	3C		Significant
4- Significant						4A	4B	4C		
5- Catastrophic						5A	5B	5C		
6- Beneficial						6A	6B	6C		

6.5.5 Impact on Water Quality

Water is used in numerous construction activities such as concreting, curing, plastering, domestic etc. Water requirement for construction phase will be met by drawing from the borehole and external sources such as water tankers to fulfill the required quantity. Construction activities for the proposed development can have insignificant impact on hydrology and ground water quality of the area if the construction waste leaches into ground. Potential sources of impacts on the hydrology and ground water quality during the construction phase are as follows:

- Soil runoff from the site leading to off-site contamination (particularly during rainy season).
- Improper disposal of construction debris leading to off-site contamination of water resources.
- Spillage of oil and grease from the vehicles and wastewater stream generated from onsite activities such as vehicles washing, workshop etc.

The effect on Water Quality during Construction Activities will be **Significant** in nature and likelihood of the impact will be **High.** Therefore, the overall acceptability of this activity is expected as **Significant (4C).**

Table 6.14: Water Quality Impact Rating Before Mitigation Measures

Siting Phase	Construction Phase ☑	Mining & Processing Phase	Restoration Phase

Consequences			Likelihood			Impact Rating				Acceptability
1- Negligible			A- Low			1A	1B	1C		Minor
2- Minor			B- Medium			2A	2B	2C		Moderate
3- Moderate			**C- High**	☜		3A	3B	3C		**Significant** ☜
4- Significant	☜					4A	4B	**4C**		
5- Catastrophic						5A	5B	5C		
6- Beneficial						6A	6B	6C		

Mitigation Measures: To mitigate these impacts precautions and preventive measure shall be taken at the site during construction to avoid any ground and surface water contamination. Following mitigation measures shall be adopted as conservation.

- Not allowing water to leave the construction site.
- Construction of storm water diversion channels to divert storm runoff from flowing over the construction areas.
- Regular monitoring of water consumption.
- Regular monitoring of water quality for good quality concreting.
- Use of leak proof storage tanks.
- Monitoring of the ground water table to evaluate the impact of construction activity on ground water, if possible.

When the mitigation measures recommended above are adopted, the impacts due to construction activity will become **Moderate (3B).**

Table 6.15: Water Quality Impact Rating After Mitigation Measures

Siting Phase	Construction Phase ☑	Mining & Processing Phase	Restoration Phase

Consequences		Likelihood		Impact Rating			Acceptability	
1- Negligible		A- Low		1A	1B	1C	Minor	
2- Minor		**B- Medium**	☜	2A	2B	2C	**Moderate**	☜
3- Moderate	☜	C- High		3A	**3B**	3C	Significant	
4- Significant				4A	4B	4C		
5- Catastrophic				5A	5B	5C		
6- Beneficial				6A	6B	6C		

6.5.6 Solid Waste

Typical solid waste generated during construction include waste concrete, steel scrap, wooden scaffolding, excavated soil, wood remains etc. Solid waste generated during land clearance and Earth-fill material would be in large quantities. This waste has the potential to cause negative impact on the surroundings if not properly managed and disposed of. It is likely to block nearby drainage channels that can ultimately cause localized flooding during the monsoon. Irregular storage of this waste is hazardous to the workers at the site as well. Windblown debris is a nuisance to the nearby dwelling units. Poor waste management practices would result in short term, and long term negative impact on the aesthetics of the surrounding.

The effect on Solid Waste during Construction Activities will be **Moderate** in nature and likelihood of the impact will be **Medium.** Therefore the overall acceptability of this activity is expected as **Moderate (3B).**

Table 6.16: Solid Waste Impact Rating Before Mitigation Measures

Siting Phase	Construction Phase ☑	Mining & Processing Phase	Restoration Phase

Consequences		Likelihood		Impact Rating			Acceptability	
1- Negligible		A- Low		1A	1B	1C	Minor	
2- Minor		**B- Medium**	☜	2A	2B	2C	**Moderate**	☜
3- Moderate	☜	C- High		3A	**3B**	3C	Significant	
4- Significant				4A	4B	4C		
5- Catastrophic				5A	5B	5C		
6- Beneficial				6A	6B	6C		

Mitigation Measures: To mitigate impacts from construction waste contractors shall be required to adopt good construction site housekeeping practices:

- A Comprehensive Waste management Plan for Construction phase should be developed.
- Construction sites should be equipped with temporary refuse bins, and construction wastes should be collected on a daily basis and contained in a temporary designated waste storage area on each site.
- Designated waste storage areas should not be within 50 m of water ways.
- Construction sites generate considerable waste and provision will be made for suitable separation and storage of waste in designated and labeled areas throughout the site.
- Wastes should be routinely collected from the designated area and disposed at licensed waste disposal facilities approved by local EPA.
- Trainings shall be conducted regarding solid waste segregation and housekeeping issues on site.
- Segregation of hazardous and non-hazardous waste will be done in accordance with color coding system.

When the mitigation measures recommended above are adopted, The Impacts due to Construction activity will become **Minor (2A).**

Table 6.17: Solid Waste Impact Rating After Mitigation Measures

Siting Phase	Construction Phase ☑	Mining & Processing Phase	Restoration Phase

Consequences		Likelihood		Impact Rating			Acceptability	
1- Negligible		**A- Low**	☜	1A	1B	1C	**Minor**	☜
2- Minor	☜	B- Medium		**2A**	2B	2C	Moderate	

3- Moderate			C- High			3A	3B	3C		Significant
4- Significant						4A	4B	4C		
5- Catastrophic						5A	5B	5C		
6- Beneficial						6A	6B	6C		

6.5.7 Occupational Health & Safety

The construction of plant contains engineering workout poses an inherent risk of injury to workers from accidents and hazardous working environments. There will be a very likely impact of sunlight causing Heat stress to construction worker during summer season. The project corridor is a barren land and no vegetative cover is there.

The effect on Occupational Health and Safety during Construction Activities will be **Significant** in nature and likelihood of the impact will be **High.** Therefore the overall acceptability of this activity is expected as **High (4C).**

Table 6.18: Occupational Health & Safety Impact Rating Before Mitigation Measures

Siting Phase	Construction Phase ☑		Mining & Processing Phase			Restoration Phase	
Consequences		Likelihood		Impact Rating			Acceptability
1- Negligible		A- Low		1A	1B	1C	Minor
2- Minor		B- Medium		2A	2B	2C	Moderate
3- Moderate		**C- High**	☜	3A	3B	3C	**Significant** ☜
4- Significant	☜			4A	4B	**4C**	
5- Catastrophic				5A	5B	5C	
6- Beneficial				6A	6B	6C	

Mitigation Measures: To mitigate these potential impacts prior to the commencement of civil works the EHS officer will develop a construction phase Occupational Health and Safety Plan (OHSP). The OHSP should:

- Provide for the provision of appropriate personal protective equipment (PPE) to minimize risks, such as but not limited to appropriate (insulated if necessary) outerwear, boots and gloves; eye protectors; ear plugs safety helmets, etc.;
- Provide for the provision of appropriate fire extinguishers and fire response plans and appropriately trained first aid response staff;
- Provide for the provision of appropriately stocked first-aid equipment and stations at work sites including appropriately trained first-aid staff on site and provision of adequate transport facilities for moving injured persons to the nearest hospital;

- Provide training for workers, and establish appropriate incentives to use and comply with health and safety procedures and utilize PPE;
- Provide cold refuges to the worker , provide plenty of drinking water and break the working in shifts
- Include procedures for documenting and reporting occupational accidents, diseases, and incidents; and
- Include emergency prevention, preparedness, and response arrangements in place. With the development of an effective OHSP, occupational health and safety risks will be minimized.

When the mitigation measures recommended above are adopted, the impacts due to construction activity will become **Moderate (3B).**

Table 6.19: Occupational Health & Safety Impact Rating After Mitigation Measures

Siting Phase	Construction Phase ☑	Mining & Processing Phase	Restoration Phase

Consequences		Likelihood		Impact Rating			Acceptability	
1- Negligible		A- Low		1A	1B	1C	Minor	
2- Minor		**B- Medium**	☜	2A	2B	2C	**Moderate**	☜
3- Moderate	☜	C- High		3A	**3B**	3C	Significant	
4- Significant				4A	4B	4C		
5- Catastrophic				5A	5B	5C		
6- Beneficial				6A	6B	6C		

6.6 Screening of Potential Impacts for Mining and Processing of Barite, Lead and Zinc

The quarrying operations, subsequent haulage of the mined material and processing of mined material for Barite, Lead and Zinc extraction is expected to cause impacts on the environment. The following are the important aspects.

6.6.1 Air Quality

Air quality deterioration will be one of the most significant impact of the mining operations. The air flow (direction) varies with the seasons. Management of ambient air quality at mine sites is important at all stages of the mine cycle. Airborne emissions may occur during each stage of the mine cycle, although in particular during exploration, development, construction, and operational activities. The principal sources include fugitive dust from blasting, excavation, exposed surfaces such as tailings facilities, stockpiles, waste dumps, haul roads and infrastructure, loading/unloading and transportation of material. Other sources include dust emissions from Crushing, Grinding, Milling and to a lesser extent, gases from combustion of fuels in stationary and mobile equipment.

The effect on Air Quality (Gaseous Emissions) during Mining and Processing Activities will be **Significant** in nature and likelihood of the impact will be **High.** Therefore the overall acceptability of this activity is expected as **Significant (4C).**

Table 6.20: Air Quality Impacts Rating Before Mitigation Measures

Siting Phase	Construction Phase	Mining & Processing Phase ☑	Restoration Phase

Consequences		Likelihood		Impact Rating			Acceptability	
1- Negligible		A- Low		1A	1B	1C	Minor	
2- Minor		B- Medium		2A	2B	2C	Moderate	
3- Moderate		**C- High**	☜	3A	3B	3C	**Significant**	☜
4- Significant	☜			4A	4B	**4C**		
5- Catastrophic				5A	5B	5C		
6- Beneficial				6A	6B	6C		

Mitigation Measures:

Dust emissions from querying and processing operations, dry surfaces of tailings facilities, waste dumps, stockpiles and other exposed areas should be minimized. Recommended dust management strategies include:

- Dust suppression techniques (e.g. wetting down, use of all-weather surfaces, use of agglomeration additives) for roads and work areas, optimization of traffic patterns, and reduction of travel speeds;
- Exposed soils and other erodible materials should be revegetated or covered promptly;
- New areas should be cleared and opened-up only when absolutely necessary;
- Surfaces should be re-vegetated or otherwise rendered non-dust forming when inactive;
- Storage for dusty materials should be enclosed or operated with efficient dust suppressing measures;
- Loading, transfer, and discharge of materials should take place with a minimum height of fall, and be shielded against the wind, and consider use of dust suppression spray systems;
- Conveyor systems for dusty materials should be covered and equipped with measures for cleaning return belts.
- Deploy a grader and water bowsers on a 12-hour shift basis for road maintenance and dust suppression.
- Vehicle speed limit will be imposed at 20km/hr to minimize dust generation.
- The raw materials in the dump truck and belt conveyor will be sprayed with water as it leaves the quarry to ensure dust suppression during transportation.
- Workers on the site shall be issued with dust masks/respirators for use during dry and windy conditions.

- The machines will be maintained to decrease the emission of dust and vehicles will be put on regular maintenance to ensure they are in good running condition and also not to emit smoke profusely.
- Dust collection system (e.g., filter bags) must be installed at point sources like crushing and grinding where applicable.

When the mitigation measures recommended above are adopted, the impacts due to mining and processing activity will become **Moderate (3B).**

Table 6.21: Air Quality Impacts Rating After Mitigation Measures

Siting Phase		Construction Phase		Mining & Processing Phase ☑			Restoration Phase	
Consequences		Likelihood		Impact Rating			Acceptability	
1- Negligible		A- Low		1A	1B	1C	Minor	
2- Minor		**B- Medium**	☜	2A	2B	2C	**Moderate**	☜
3- Moderate	☜	C- High		3A	**3B**	3C	Significant	
4- Significant				4A	4B	4C		
5- Catastrophic				5A	5B	5C		
6- Beneficial				6A	6B	6C		

6.6.2 Water Use and Quality

Management of water use and quality, in and around mine sites, can be a significant issue. Potential contamination of water sources may occur early in the mine cycle during the exploration stage and many factors including indirect impacts (e.g. population in-migration) can result in negative impacts to water quality. Reduction of surface and groundwater availability is also a concern at the local level and for communities in the vicinity of mining sites, particularly, in arid regions, or in regions of high agricultural potential. Mining activities should therefore include adequate monitoring and management of water use, in addition to treatment of effluent streams including storm water run-off from the mine property.

Mines can use large quantities of water, mostly in processing plants and related activities, but also in dust suppression among other uses. Water is lost through evaporation in the final product but the highest losses are usually into the tailings stream. All mines should focus on appropriate management of their water balance. Mines with issues of excess water supply, such as in moist tropical environments or areas with snow and ice melt, can experience peak flows which require careful management.

The effect on Water Use and Quality during Mining and Processing Activities will be **Significant** in nature and likelihood of the impact will be **High.** Therefore the overall acceptability of this activity is expected as **Significant (4C).**

Table 6.14: Water Use and Quality Impact Rating Before Mitigation Measures

Siting Phase	Construction Phase	Mining & Processing Phase ☑	Restoration Phase

Consequences		Likelihood		Impact Rating			Acceptability	
1- Negligible		A- Low		1A	1B	1C	Minor	
2- Minor		B- Medium		2A	2B	2C	Moderate	
3- Moderate		**C- High**	☜	3A	3B	3C	**Significant**	☜
4- Significant	☜			4A	4B	**4C**		
5- Catastrophic				5A	5B	5C		
6- Beneficial				6A	6B	6C		

Mitigation Measures:

- Establishing a water balance (including probable climatic events) for the mine and related process plant circuit and use this to inform infrastructure design;
- Developing a Sustainable Water Supply Management Plan to minimize impact to natural systems by managing water use, avoiding depletion of aquifers, and minimizing impacts to water users;
- Minimizing the amount of make-up water;
- Consider reuse, recycling, and treatment of process water where feasible (e.g. return of supernatant from tailings pond to process plant);
- Consider the potential impact to the water balance prior to commencing any dewatering activities;
- Consultation with key stakeholders (e.g. government, civil society, and potentially affected communities) to understand any conflicting water use demands and the communities' dependency on water resources and/or conservation requirements that may exist in the area.
- The quality and quantity of mine effluent streams discharged to the environment, including storm water, leach pad drainage, process effluents, and overall mine works drainage should be managed and treated to meet the applicable effluent discharge guideline.
- In addition, discharges to surface water should not result in contaminant concentrations in excess of local ambient water quality criteria outside a scientifically established mixing zone.
- Efficient oil and grease traps or sumps should be installed and maintained at refueling facilities, workshops, fuel storage depots, and containment areas, and spill kits should be available with emergency response plans;
- Water quality in open storage systems (e.g. leachate areas, solution ponds, and tailings ponds or impoundments) should be based on the results of a site-specific risk assessment with appropriate control measures put in place to mitigate the risk or meet the effluent guideline values.
- Sanitary wastewater should be managed via reuse or routing into septic or surface treatment.

Storm Water:

Key issues associated with management of storm water include separation of clean and dirty water, minimizing run-off, avoiding erosion of exposed ground surfaces, avoiding sedimentation of drainage systems and minimizing exposure of polluted areas to storm water. Recommended storm water management strategies have been broadly categorized into phases of operation (although several measures span more than one phase including the decommissioning and closure phase). As such; From exploration onwards, management strategies include:

- Reducing exposure of sediment-generating materials to wind or water (e.g. proper placement of soil and rock piles);
- Divert run-off from undisturbed areas around disturbed areas including areas that have been graded, seeded, or planted. Such drainage should be treated for sediment removal;
- Reducing or preventing off-site sediment transport (e.g. use of settlement ponds, silt fences);
- Storm water drains, ditches, and stream channels should be protected against erosion through a combination of adequate dimensions, slope limitation techniques, and use of rip-rap and lining. Temporary drainage installations should be designed, constructed, and maintained for recurrence periods of at least a 25-year/24-hour event, while permanent drainage installations should be designed for a 100-year/24-hour recurrence period. Design requirements for temporary drainage structures should additionally be defined on a risk basis considering the intended life of diversion structures, as well as the recurrence interval of any structures that drain into them.

From construction onwards, recommended management strategies include:

- Timely implementation of an appropriate combination of contouring techniques, terracing, slope reduction /minimization, runoff velocity limitation and appropriate drainage installations to reduce erosion in both active and inactive areas;
- Access and haul roads should have gradients or surface treatment to limit erosion, and road drainage systems should be provided;
- Facilities should be designed for the full hydraulic load, including contributions from upstream catchments and nonmined areas;
- Storm water settling facilities should be designed and maintained according to internationally accepted good engineering practices, including provisions for capturing of debris and floating matter. Sediment control facilities should be designed and operated to meet local and international standards and guidelines, taking into consideration background conditions and opportunities for overall improvement of the receiving water body quality. Discharge water quality should also be consistent with the receiving water body use.

From operations onwards, recommended management strategies include:

- Final grading of disturbed areas, including preparation of overburden before application of the final layers of growth medium, should be along the contour as far as can be achieved in a safe and practical manner;
- Revegetation of disturbed areas including seeding should be performed immediately following application of the growth medium to avoid erosion.

Acid Rock Drainage:

Acid Rock Drainage (ARD) refers to acid formation that occurs when Potentially Acid Generating (PAG) materials with acid generating sulfide minerals in excess of acid neutralizing minerals, principally carbonates, oxidize in an environment containing oxygen and water.

- ARD should be prevented and controlled as described in the 'Solid Waste' section of this document.
- Management of PAG and ARD should extend for as long as there is a need to maintain effluent quality to the levels required to protect the local environment, including where necessary, into the decommissioning, closure, and post-closure phases of the mine.

The ARD issues apply to waste rock, tailing materials and any exposed rock surfaces such as road cuts and pit walls.

Groundwater Resource Protection:

In addition to the prevention and control of effluents, wastes, and potential releases of hazardous materials, additional recommendations for the management of potential sources of groundwater contamination should be adopted.

When the mitigation measures recommended above are adopted, the impacts due to mining and processing activity will become **Moderate (4B).**

Table 6.15: Water Use and Quality Impact Rating After Mitigation Measures

Siting Phase	Construction Phase	Mining & Processing Phase ☑	Restoration Phase

Consequences		Likelihood		Impact Rating			Acceptability	
1- Negligible		A- Low		1A	1B	1C	Minor	
2- Minor		**B- Medium**	☜	2A	2B	2C	**Moderate**	☜
3- Moderate		C- High		3A	3B	3C	Significant	
4- Significant	☜			4A	**4B**	4C		
5- Catastrophic				5A	5B	5C		
6- Beneficial				6A	6B	6C		

6.6.3 Noise and Vibration

Nuisance from noise pollution will be the specific impact of the mining operation. Sources of noise emissions associated with mining may include noise from vehicle engines, loading and unloading of rock into steel dumpers, chutes, power generation, and other sources related to mining activities. Additional examples of noise sources include shoveling, ripping, drilling, blasting, transport, crushing, grinding, and stockpiling.

The blasting activity, loading and transportation of the mined material will generate considerable amount of noise in the area.

The most significant vibrations are usually associated with blasting activities; however, vibrations may also be generated by many types of equipment like crushing, grinding, milling etc.

The effect on Noise and Vibration during Mining and Processing Activities will be **Moderate** in nature and likelihood of the impact will be **High.** Therefore the overall acceptability of this activity is expected as **Moderate (3C).**

Table 6.22: Noise and Vibration Impacts Rating Before Mitigation Measures

Siting Phase	Construction Phase	Mining & Processing Phase ☑	Restoration Phase

Consequences			Likelihood			Impact Rating				Acceptability	
1- Negligible			A- Low			1A	1B	1C		Minor	
2- Minor			B- Medium			2A	2B	2C		**Moderate**	☜
3- Moderate	☜		**C- High**	☜		3A	3B	**3C**		Significant	
4- Significant						4A	4B	4C			
5- Catastrophic						5A	5B	5C			
6- Beneficial						6A	6B	6C			

Mitigation Measures:

Noise

Good practice in the prevention and control of noise sources should be established based on the prevailing land use and the proximity of noise receptors such as communities or community use areas. Recommended management strategies include:

- Noise levels at the nearest sensitive receptor should meet the noise guidelines;
- Where necessary, noise emissions should be minimized and controlled through the application of techniques which may include:
- Implementation of enclosure and cladding of processing plants
- Installation of proper sound barriers and / or noise containments, with enclosures and curtains at or near the source equipment (e.g. crushers, grinders, and screens)
- Installation of natural barriers at facility boundaries, such as vegetation curtains or soil berms
- Optimization of internal-traffic routing, particularly to minimize vehicle reversing needs (reducing noise from reversing alarm) and to maximize distances to the closest sensitive receptors.

Vibrations

- Mines should minimize significant sources of vibration, such as through adequate design of
- crusher foundations. For blasting-related emissions the following management practices are recommended:
- Mechanical ripping should be used, where possible, to avoid or minimize the use of explosives;
- Use of specific blasting plans, correct charging procedures and blasting ratios, delayed / microdelayed or electronic detonators, and specific in-situ blasting tests (the use of downhole initiation with short-delay detonators improves fragmentation and reduces ground vibrations);

- Development of blast design, including a blasting-surfaces survey, to avoid over confined charges, and a drill-hole survey to check for deviation and consequent blasting recalculations;
- Implementation of ground vibration and overpressure control with appropriate drilling grids;
- Adequately designing the foundations of primary crushers and other significant sources of vibrations.

Other Measures

- To minimize the nuisance effect during mining stage following measures will be considered.
- Blasting activities will be restricted to daytime in the approved timing of the schedule
- Loading and haulage will be restricted to the 12hr daytime operation
- Unnecessary hooting of vehicles and horns will not be permitted
- Ensure the PPE's compliance (especially ear muff) during the blasting operation.
- During blasting in the quarry site, emergency alarm will be deployed to conscious the nearby dwellers.

When the mitigation measures recommended above are adopted, The Impacts due to Mining and Processing activities will become **Minor (2A).**

Table 6.23: Noise and Vibration Quality Impacts Rating After Mitigation Measures

Siting Phase		Construction Phase		Mining & Processing Phase ☑			Restoration Phase	
Consequences		Likelihood		Impact Rating			Acceptability	
1- Negligible		**A- Low**	☜	1A	1B	1C	**Minor**	☜
2- Minor	☜	B- Medium		**2A**	2B	2C	Moderate	
3- Moderate		C- High		3A	3B	3C	Significant	
4- Significant				4A	4B	4C		
5- Catastrophic				5A	5B	5C		
6- Beneficial				6A	6B	6C		

6.6.4 Waste Generation

Mines generate large volumes of waste. Structures such as waste dumps, tailing impoundments / dams, and containment facilities should be planned, designed, and operated such that geotechnical risks and environmental impacts are appropriately assessed and managed throughout the entire mine cycle. Major solid mine waste from the mining sites include waste rock/overburden and Tailings.

Solid wastes may be generated in any phase of the mine cycle. The most significant waste generating mining activities will likely occur during the operational phases, which require the movement of large amounts overburden and creation of rock waste and tailings. Other types of solid wastes, depending on the type of mining undertaken, may include leach pad waste, workshop scrap, household and non-process-related industrial waste, as wells as waste oils, chemicals, and other potentially hazardous wastes.

Waste Rock Dumps:

Depending on the stripping ratio (in open pit mines), large quantities of overburden or waste rock often need to be removed to expose the mineral to be mined. The overburden and waste rock are often disposed of in constructed waste rock dumps. Management of these dumps during the mine life cycle is important to protect human health, safety and the environment.

Tailings:

Tailings management strategies vary according to site constraints and the nature / type of the tailings. Potential environmental impacts may include groundwater and surface water contamination due to the generation of acid rock drainage (ARD) containing runoff sedimentation of drainage networks, dust generation and the creation of potential geotechnical hazards associated with the selected management option. Tailings management strategies should consider how tailings will be handled and disposed of during operation, in addition to permanent storage after decommissioning. Strategies should consider the site topography, downstream receptors and the physical nature of tailings (e.g. projected volume, grain size distribution, density, water content, among other issues).

Environmental impacts from the mining wastes include:

- Surface water pollution from discharge of wastewater contaminated with solids, heavy metals and other constituents of mine waste.
- Large tracts of land becoming barren as a result of annihilation of biodiversity by the dump due to its adverse effects on the local ecology.
- Underground water pollution if the dump is located in a geotechnically unsuitable site. Leachate from the dump has the potential to pollute underground water sources.
- Degradation of aesthetic quality of the site during waste handling practices at the mining sites. Huge piles of waste materials which not only add more particulate matter to the air but also reduce the aesthetic value of the site.
- Waste rock produced by the rock mass excavation is primarily composed of coarse-grained materials that are, in most cases, hauled to the surface and disposed of in stockpiles. The large size of waste piles raises the risk of them becoming geotechnically unstable, particularly along slopes or within the foundations. This risk however is not easily analyzed because of the strongly heterogeneous nature of the material stored in waste dumps.

Other type of solid waste will be from human waste and related activities such as leftover food and food packaging materials for workers on site. Impact of solid and liquid wastes generated from the mining operation and processing will be significant.

The effect on Noise and Vibration during Mining and Processing Activities will be **Significant** in nature and likelihood of the impact will be **High.** Therefore the overall acceptability of this activity is expected as **Significant (4C).**

Table 6.24: Waste Generation Impacts Rating Before Mitigation Measures

Siting Phase	Construction Phase	Mining & Processing Phase ☑	Restoration Phase

Consequences		Likelihood		Impact Rating			Acceptability	
1- Negligible		A- Low		1A	1B	1C	Minor	
2- Minor		B- Medium		2A	2B	2C	Moderate	
3- Moderate		**C- High**	☜	3A	3B	3C	**Significant**	☜
4- Significant	☜			4A	4B	**4C**		
5- Catastrophic				5A	5B	5C		
6- Beneficial				6A	6B	6C		

Mitigation Measures:

For management of waste rock dumps:

- Dumps should be planned with appropriate terrace and lift height specifications based on the nature of the material and local geotechnical considerations to minimize erosion and reduce safety risks;
- Management of Potentially Acid Generating (PAG) wastes should be undertaken as described in the guidance below;
- Potential change of geotechnical properties in dumps due to chemical or biologically catalyzed weathering should be considered. This can reduce the dumped spoils significantly in grain size and mineralogy, resulting in high ratios of clay fraction and a significantly decreased stability towards geotechnical failure. These changes in geotechnical properties (notably cohesion, internal angle of friction) apply especially to facilities which are not decommissioned with a proper cover system, which would prevent precipitation from percolating into the dump's body. Design of new facilities has to provide for such potential deterioration of geotechnical properties with higher factors of safety. Stability / safety assessments of existing facilities should take these potential changes into account.

For Tailings Management:

- Design, operation, and maintenance of structures according to specifications of ICOLD and ANCOLD, or other internationally recognized standards based on a risk assessment strategy. Appropriate independent review should be undertaken at design and construction stages with ongoing monitoring of both the physical structure and water quality, during operation and decommissioning;
- Where structures are located in areas where there is a risk of high seismic loadings, the independent review should include a check on the maximum design earthquake assumptions and the stability of the structure to ensure that the design is such that during seismic events there will be no uncontrolled release of tailings;
- Design of tailings storage facilities should take into account the specific risks / hazards associated with geotechnical stability or hydraulic failure and the associated risks to downstream economic assets, ecosystems and human health and safety. Environmental considerations should thus also

consider emergency preparedness and response planning and containment / mitigation measures in case of catastrophic release of tailings or supernatant waters;

- Any diversion drains, ditches, and stream channels to divert water from surrounding catchment areas away from the tailings structure should be built to the flood event recurrence interval standards outlined elsewhere in this Section;
- Seepage management and related stability analysis should be a key consideration in design and operation of tailings storage facilities. This is likely to require a specific piezometer based monitoring system for seepage water levels within the structure wall and downstream of it, which should be maintained throughout its life cycle;
- Consideration of zero discharge tailings facilities and completion of a full water balance and risk assessment for the mine process circuit including storage reservoirs and tailings dams. Consideration of use of natural or synthetic liners to minimize risks;
- Design specification should take into consideration the probable maximum flood event and the required freeboard to safely contain it (depending on site specific risks) across the planned life of the tailings dam, including its decommissioned phase;
- Where potential liquefaction risks exist, including risks associated with seismic behavior, the design specification should take into consideration the maximum design earthquake;
- On-land disposal in a system that can isolate acid leachate-generating material from oxidation or percolating water, such as a tailings impoundment with dam and subsequent dewatering and capping. On-land disposal alternatives should be designed, constructed and operated according to internationally recognized geotechnical safety standards;
- Thickening or formation of paste for backfilling of pits and underground workings during mine progression.

Waste Geochemical Characterization:

Mining operations should prepare and implement ore and waste geochemical characterization methods for proper routing of Potentially-Acid-Generating (PAG) materials and ARD management programs that include the following elements:

- Conducting a comprehensive series tests from feasibility study stage onwards, to evaluate the potential for ARD in all formations foreseen to be disturbed or otherwise exposed by the mine according to internationally recognized methodologies;
- Conducting comprehensive ARD testing / mapping on an ongoing basis with decreasing block size as formations are transferred from long- to medium- and short-term mining plans;
- Implementation of ARD preventive actions to minimize ARD including:
  - Limiting exposure of PAG materials by phasing of development and construction, together with covering, and/or segregating runoff for treatment
  - Implementation of water management techniques such as diverting clean runoff away from PAG materials, and segregating "dirty" runoff from PAG materials for subsequent treatment; grading PAG material piles to avoid ponding and infiltration; and removing pit water promptly to minimize acid generation
- Controlled placement of PAG materials (including wastes) to provide permanent conditions that avoid contact with oxygen or water including:

- Submerging and/or flooding of PAG materials by placing PAG materials in an anoxic (oxygen free) environment, typically below a water cover
- Isolating PAG materials above the water table with an impermeable cover to limit infiltration and exposure to air. Covers are typically less of a concern in arid climates where there is limited precipitation, and should be appropriate for local climate and vegetation (if any).
- Blending of PAG materials with non-PAG or alkaline materials can also be employed to neutralize acid generation, as appropriate. Blending should be based on full characterization of each of the blended materials, the ratio of alkaline materials to acid generating materials, the case histories of failed operations, and the need for static and long-term kinetic tests.

For General Non-Hazardous Waste:

Recommended practices for the management of household and non-process related industrial waste include the following:

- Non-hazardous solid wastes should be managed in environmental friendly manner;
- Non-hazardous solid waste should be collected for recycling or disposal at an approved sanitary landfill. External landfills should be audited by the mine to ensure appropriate waste management practices. When such a facility is not available within a feasible distance, the mine should establish and operate its own with appropriate regulatory permits and scientifically defensible studies that can demonstrate that the disposal of the hazardous waste will not impact human health and the environment;
- Non-hazardous solid waste should not be disposed of together with waste rock or overburden except under exceptional circumstances to be fully documented in the environmental and social assessment of the project.

For Hazardous Waste:

Recommended practices for the management of hazardous waste include the following:

- Hazardous waste, including waste oils and chemicals, spent packaging materials and containers, should be managed as per local standards and international guidelines.
- Hazardous waste should be handled by specialized providers (EPA Approved Contractor) of hazardous waste management facilities specifically designed and operated for this purpose. When such services are unavailable within a feasible distance of the mine, the mine should establish and operate its own waste facility with the necessary permits;

- Any medical waste will be transported to an approved facility for incineration for final disposal.
- Solid residue from the septic tanks will be transported to an approved facility for incineration for final disposal.

Other Measures:

- The stripped soil cover in the quarrying operation and associated vegetation matter will be dumped in some designated areas in order to make compost. This can later be used in the gardening process and partial filling of redundant pits.
- Leftover food and food packaging material will be deposited in the dustbins, and the dust bins will be emptied at the temporary garbage bins of the administration.

- The company will also provide latrine for employees to use.
- Domestic waste of campsites will be segregated at source.
- Waste will be kept in segregated containers in a designated area.
- Materials suitable for recycling will be stored separately and sold to approve recycling contractors.
- Food waste will be mixed with overburden and disposed during backfilling

When the mitigation measures recommended above are adopted, the impacts due to mining and processing activity will become **Moderate (3B).**

Table 6.25: Waste Generation Impacts Rating After Mitigation Measures

Siting Phase	Construction Phase	Mining & Processing Phase ☑	Restoration Phase

Consequences		Likelihood		Impact Rating			Acceptability	
1- Negligible		A- Low		1A	1B	1C	Minor	
2- Minor		**B- Medium**	☜	2A	2B	2C	**Moderate**	☜
3- Moderate	☜	C- High		3A	**3B**	3C	Significant	
4- Significant				4A	4B	4C		
5- Catastrophic				5A	5B	5C		
6- Beneficial				6A	6B	6C		

6.6.5 Land Use and Biodiversity

Habitat alteration is one of the most significant potential threats to biodiversity associated with mining. Habitat alteration may occur during any stage of the mine cycle with the greatest potential for temporary or permanent alteration of terrestrial and aquatic habitats occurring during construction and operational activities. Additionally, exploration activities often require the development of access routes, transportation corridors, and temporary camps to house workers which may all result in varying degrees of land-clearing and population in-migration.

Depending on the type of mining, development and construction activities often require land clearing for the mine as well as for the process plant, tailings facility, waste and stockpile areas, and infrastructure such as buildings, roads, construction camps, town sites, water management structures, power plant, transmission lines and access corridors to the mine site.

The protection and conservation of biodiversity is fundamental to sustainable development. Integrating conservation needs and development priorities in a way that meets the land use needs of local communities is often a critical issue for mining projects.

The effect of Land Use and Biodiversity during Mining and Processing Activities will be **Moderate** in nature and likelihood of the impact will be **Medium.** Therefore the overall acceptability of this activity is expected as **Moderate (3B).**

Table 6.26: Land Use and Biodiversity Impacts Rating Before Mitigation Measures

Siting Phase	Construction Phase	Mining & Processing Phase ☑	Restoration Phase

Consequences		Likelihood		Impact Rating			Acceptability	
1- Negligible		A- Low		1A	1B	1C	Minor	
2- Minor		**B- Medium**	☜	2A	2B	2C	**Moderate**	☜
3- Moderate	☜	C- High		3A	**3B**	3C	Significant	
4- Significant				4A	4B	4C		
5- Catastrophic				5A	5B	5C		
6- Beneficial				6A	6B	6C		

Mitigation measures:

Recommended strategies include consideration of the following:

- Whether any critical natural habitats will be adversely impacted or critically endangered or endangered species reduced;
- Whether the project is likely to impact any protected areas; not in this case.
- The potential for biodiversity offset projects (e.g. proactive management of alternative high biodiversity areas in cases where losses have occurred on the main site due to the mining development) or other mitigative measures;
- Whether the project or its associated infrastructure will encourage in-migration, which could adversely impact biodiversity and local communities;
- Consideration of partnerships with internationally accredited scientific organizations to, for example, undertake biodiversity assessments, conduct ongoing monitoring, and manage biodiversity programs;
- Consultation with key stakeholders (e.g. government, civil society, and potentially affected communities) to understand any conflicting land use demands and the communities dependency on natural resources and / or conservation requirements that may exist in the area.

Terrestrial Habitats

Temporary and permanent terrestrial habitat alteration should be minimized to the extent feasible and be consistent with the requirement to protect and preserve critical habitat.

Recommended management strategies include:

- Siting access routes and facilities in locations that avoid impacts to critical terrestrial habitat, and planning, exploration and construction activities to avoid sensitive times of the year;
- Minimizing disturbance to vegetation and soils;
- Implementation of mitigation measures appropriate for the type of habitat and potential impacts including, for example, post-operation restoration (which may include baseline inventories, evaluations, and eventual rescue of species), offset of losses, or compensation of direct users;
- Avoiding or minimizing the creation of barriers to wildlife movement, or threats to migratory species (such as birds) and providing alternative migration routes when the creation of barriers cannot be avoided;
- Planning and avoiding sensitive areas and implementing buffer zones; Conducting activities such that the risk of landslides, debris or mud flows, and bank or alluvial fan destabilization is minimized;
- Implementing soil conservation measures (e.g. segregation, proper placement and stockpiling of clean soils and overburden material for existing site remediation); key factors such as placement, location, design, duration, coverage, reuse, and single handling should be considered;
- Where topsoil is pre-stripped, it should be stored for future site rehabilitation activities. Topsoil management should include maintenance of soil integrity in readiness for future use. Storage areas should be temporarily protected or vegetated to prevent erosion;
- Conserving the quality and composition of growth medium for use (e.g. for capping) during site reclamation and closure activities;
- Ensuring that the growth medium is sufficient to support native plant species appropriate for the local climate and consistent with proposed future land uses. Overall thickness of the growth medium should be consistent with surrounding undisturbed areas and future land use;
- Manage vegetation growth along access roads and at permanent above-ground facilities. Remove invasive plant species and replant native species. Vegetation control should employ biological, mechanical and thermal vegetation control measures and avoid the use of chemical herbicides as much as possible.

If it is demonstrated that the use of herbicides is required to control vegetation growth along access roads or at facilities, then personnel should be trained in their use. Herbicides that should be avoided include those listed under the World Health Organization (WHO) recommended Classification of Pesticides by Hazard Classes 1a and 1b, the WHO recommended Classification of Pesticides by Hazard Class II, and Annexes A and B of the Stockholm Convention, except under the conditions noted in the convention.

When the mitigation measures recommended above are adopted, The Impacts due to Mining and Processing activities will become **Minor (2A).**

Table 6.27: Land Use and Biodiversity Impacts Rating After Mitigation Measures

Siting Phase	Construction Phase	Mining & Processing Phase ☑	Restoration Phase

Consequences		Likelihood		Impact Rating			Acceptability	
1- Negligible		**A- Low**	☜	1A	1B	1C	**Minor**	☜
2- Minor	☜	B- Medium		**2A**	2B	2C	Moderate	
3- Moderate		C- High		3A	3B	3C	Significant	
4- Significant				4A	4B	4C		
5- Catastrophic				5A	5B	5C		
6- Beneficial				6A	6B	6C		

6.6.6 Soil resource

Mining of the quarry site will pose significant impact on the soil resource by aggravating soil erosion and disturbance, over burden removal of soil, pit lakes occurrence and land degradation.

The effect on Soil Resources during Mining and Processing Activities will be **Significant** in nature and likelihood of the impact will be **High.** Therefore the overall acceptability of this activity is expected as **Significant (4C).**

Table 6.26: Soil Resource Impacts Rating Before Mitigation Measures

Siting Phase	Construction Phase	Mining & Processing Phase ☑	Restoration Phase

Consequences		Likelihood		Impact Rating			Acceptability	
1- Negligible		A- Low		1A	1B	1C	Minor	
2- Minor		B- Medium		2A	2B	2C	Moderate	
3- Moderate		**C- High**	☜	3A	3B	3C	**Significant**	☜
4- Significant	☜			4A	4B	**4C**		
5- Catastrophic				5A	5B	5C		
6- Beneficial				6A	6B	6C		

Mitigation Measures: To minimize the impacts related to soil resource, following mitigations will be adopted.

- The surface soil layer will be stored separately from the rest of the overburden soil.
- Erosion control measures will be put in place, which will protect exposed surface with vegetation cover.
- The overall pit slope will be maintained to avoid bench failure, and the pit lakes will be useful in groundwater recharge.

- The entire periphery of the mine will be banded and garland drainage provided to avoid inrush of surface water during rainy season.

When the mitigation measures recommended above are adopted, The Impacts due to Mining and Processing activities will become **Moderate (3B).**

Table 6.27: Waste Generation Impacts Rating After Mitigation Measures

Siting Phase	Construction Phase	Mining & Processing Phase ☑	Restoration Phase

Consequences	Likelihood	Impact Rating			Acceptability
1- Negligible	A- Low	1A	1B	1C	Minor
2- Minor	**B- Medium**	2A	2B	2C	**Moderate**
3- Moderate	C- High	3A	**3B**	3C	Significant
4- Significant		4A	4B	4C	
5- Catastrophic		5A	5B	5C	
6- Beneficial		6A	6B	6C	

6.6.7 Use of Hazardous Materials

Hazardous materials should be handled, stored, and transported so as to avoid leaks, spills or other types of accidental releases into soils, surface water, and groundwater resources.

The effect of Use of Hazardous Materials during Mining and Processing Activities will be **Significant** in nature and likelihood of the impact will be **High**. Therefore, the overall acceptability of this activity is expected as **Significant (4C).**

Table 6.28: Hazardous Materials Impacts Rating Before Mitigation Measures

Siting Phase	Construction Phase	Mining & Processing Phase ☑	Restoration Phase

Consequences	Likelihood	Impact Rating			Acceptability
1- Negligible	A- Low	1A	1B	1C	Minor
2- Minor	B- Medium	2A	2B	2C	Moderate
3- Moderate	**C- High**	3A	3B	3C	**Significant**
4- Significant		4A	4B	**4C**	
5- Catastrophic		5A	5B	5C	
6- Beneficial		6A	6B	6C	

Mitigation Measures:

In order to minimize the risk associated with accidental spills from storage tanks and pipelines (e.g. tailings pipelines) the recommended mitigation measures include:

- Providing secondary containment to restrict movement into receiving water bodies (e.g. sumps, holding areas, impermeable liners), for example:
- Constructing pipelines with double-walled or thick-walled sections at critical locations (e.g. large stream crossings)
- Installing shutoff valves to minimize spill volumes and to isolate flow in critical areas.

When the mitigation measures recommended above are adopted, The Impacts due to Mining and Processing activities will become **Minor (2A).**

Table 6.29: Hazardous Materials Impacts Rating After Mitigation Measures

Siting Phase	Construction Phase	Mining & Processing Phase ☑	Restoration Phase

Consequences		Likelihood		Impact Rating			Acceptability	
1- Negligible		A- Low		1A	1B	1C	Minor	
2- Minor		**B- Medium**	☜	2A	2B	2C	**Moderate**	☜
3- Moderate		C- High		3A	3B	3C	Significant	
4- Significant	☜			4A	**4B**	4C		
5- Catastrophic				5A	5B	5C		
6- Beneficial				6A	6B	6C		

6.6.8 Energy Use

Among the most substantial energy consuming activities in mining are transport, exploration activities, drilling, excavation, extraction, grinding, crushing, milling, pumping, and ventilation processes.

The effect due to Use of Energy during Mining and Processing Activities will be **Moderate** in nature and likelihood of the impact will be **Medium.** Therefore the overall acceptability of this activity is expected as **Moderate (3B).**

Table 6.30: Energy Use Impacts Rating Before Mitigation Measures

Siting Phase	Construction Phase	Mining & Processing Phase ☑	Restoration Phase

Consequences		Likelihood		Impact Rating			Acceptability	
1- Negligible		A- Low		1A	1B	1C	Minor	
2- Minor		**B- Medium**	☜	2A	2B	2C	**Moderate**	☜
3- Moderate	☜	C- High		3A	**3B**	3C	Significant	
4- Significant				4A	4B	4C		
5- Catastrophic				5A	5B	5C		
6- Beneficial				6A	6B	6C		

Mitigation Measures:

Recommended energy conservation measures include the following:

- Use of non-invasive technologies such as remote sensing and ground-based technologies to minimize exploratory digging and drilling;
- Correctly sizing motors and pumps used in the excavation, ore moving, ore crushing, and ore handling process, as well as using adjustable speed drives (ASDs) in applications with highly varying load requirements.
- Use energy efficient equipment and machinery
- Regular maintenance of equipment and machinery

When the mitigation measures recommended above are adopted, The Impacts due to Mining and Processing activities will become **Minor (2A).**

Table 6.31: Energy Use Impacts Rating After Mitigation Measures

Siting Phase	Construction Phase	Mining & Processing Phase ☑	Restoration Phase

Consequences		Likelihood		Impact Rating			Acceptability	
1- Negligible		**A- Low**	☜	1A	1B	1C	**Minor**	☜
2- Minor	☜	B- Medium		**2A**	2B	2C	Moderate	
3- Moderate		C- High		3A	3B	3C	Significant	
4- Significant				4A	4B	4C		
5- Catastrophic				5A	5B	5C		
6- Beneficial				6A	6B	6C		

6.6.9 Occupational Health and Safety

In open-pit mining, there is a wide range of possibilities of encountering hazardous situations due to differences among various occupational groups in terms of working conditions. The traditional picture of the working conditions in mining and quarrying is that the work is physically demanding and dangerous due to heavy and awkward loads, unstable underground structures, heavy tools and equipment, great accident risks, exposure to toxic dusts and chemicals, heat and cold. The most frequent occupational diseases in mining are respiratory diseases, noise-induced hearing loss, and musculoskeletal disorders (joint, tendon or muscle inflammation; back problems).

The effect on Occupational Health and Safety during Mining and Processing Activities will be **Significant** in nature and likelihood of the impact will be **High.** Therefore the overall acceptability of this activity is expected as **Significant (4C).**

Table 6.32: Occupational Health and Safety Impacts Rating Before Mitigation Measures

Siting Phase	Construction Phase	Mining & Processing Phase ☑	Restoration Phase

Consequences		Likelihood		Impact Rating			Acceptability	
1- Negligible		A- Low		1A	1B	1C	Minor	
2- Minor		B- Medium		2A	2B	2C	Moderate	
3- Moderate		**C- High**	☜	3A	3B	3C	**Significant**	☜
4- Significant	☜			4A	4B	**4C**		
5- Catastrophic				5A	5B	5C		
6- Beneficial				6A	6B	6C		

Mining activities should seek to provide an operation where people are able to work without being injured and where the health of the workforce is promoted. Facility-specific occupational health and safety hazards should be identified based on job safety analysis or comprehensive hazard or risk assessment using established methodologies such as a hazard identification study [HAZID], hazard and operability study [HAZOP], or a quantitative risk assessment [QRA]. As a general approach, health and safety management planning should include the adoption of a systematic and structured approach for prevention and control of physical, chemical, biological, and radiological health and safety hazards.

Occupational health and safety issues occur during all phases of the mine cycle and can be classified according to the following categories:

- General workplace health and safety
- Hazardous substances
- Use of explosives
- Electrical safety and isolation
- Physical hazards
- Ionizing radiation
- Fitness for work
- Travel and remote site health
- Thermal stress
- Noise and vibration

Mitigation Measure:

To mitigate these potential impacts of operational phase, the HSE officer shall develop an Occupational Health and Safety Plan (OHSP).

- BME shall use Bag Filter with high performance in turn to de-dust and treat the emission of SOx, NOx, dust, etc. below the provincial emission limits before released into the atmosphere.
- Provide for the provision of appropriate fire extinguishers and fire response plans and appropriately trained first aid response staff;

- Provide for the provision of appropriately stocked first-aid equipment and stations at work sites including appropriately trained first-aid staff on site and provision of adequate transport facilities for moving injured persons to the nearest hospital;
- Provide for the provision of appropriate personal protective equipment (PPE) to minimize risks, such as but not limited to appropriate (insulated if necessary) outerwear, boots and gloves; eye protectors; ear plugs safety helmets, etc.;
- Provide training for workers, and establish appropriate incentives to use and comply with health and safety procedures and utilize PPE;
- Include procedures for documenting and reporting occupational accidents, diseases, and incidents; and
- Include emergency prevention, preparedness, and response arrangements in place.

General Workplace Health and Safety:

Mining exploration and development activities should manage occupational health and safety hazards as part of a comprehensive health and safety management plan incorporating the following aspects:

- Preparation of emergency response plans specifically applicable to exploration and production activities (considering the often geographically isolated nature of mining sites) and including the provision and maintenance of necessary emergency response and rescue equipment;
- Sufficient number of first aid trained employees to respond to emergencies;
- Implementation of specific personnel training on worksite health and safety management including a communication program with a clear message about corporate management's commitment to health and safety. The communication program should also include regular meetings such as daily talks prior to initiation of work shifts;
- Integration of behavioral considerations into health and safety management, including on-the-job behavioral observation processes;
- Training of employees on the recognition and prevention of occupational hazards specifically applicable to work in remote areas such as safety with respect to wildlife; protection against the elements; thermal stress; acclimatization; disease exposure; and navigational aids to avoid becoming lost;
- Illumination systems should be adequate and safe for the planned working conditions in travel paths, mine working areas, and within and around surface facilities and dumpsites of mines. Additional illumination guidance includes adherence to local standard requirements for illumination for mobile equipment operating above ground and on public roads;
- Signage in hazardous and risky areas, installations, materials, safety measures, emergency exits, and other such areas should be in accordance with international standards (including standards of cleanliness, visibility and reflectance in areas of potentially poor illumination or sources of dust and pollution), be known and easily understood by workers, visitors, and as appropriate the general public;
- To the extent that alternative technologies, work plans or procedures cannot eliminate or sufficiently reduce a hazard or exposure, the mine operators should provide workers and visitors with the necessary personal protective equipment (PPE), and provide instruction and monitoring

in their appropriate maintenance and use. Applicable PPE include, at a minimum, safety helmets and footwear, in addition to ear, eye, and hand protection devices.

- Occupational health assessments should be conducted for employees on a regular basis, based on exposure to risk. Medical records should be retained for at least 20 years.

Hazardous Substances:

- Working areas should be provided with adequate ventilation and dust / fume extraction systems to ensure that inhalation exposure levels for potentially corrosive, oxidizing, reactive or siliceous substances are maintained and managed at safe levels as per international Guidelines (IFC Guidelines).
- In addition, eye wash and emergency shower systems should be provided in areas where there exists the possibility of chemical contamination of workers and the need for rapid treatment.
- Materials Safety Data Sheets (MSDSs) should be available for all hazardous materials held on site.

Use of Explosives:

Blasting activities that may result in safety impacts are typically related to accidental explosion and poor coordination and communication of blasting activities. Recommended explosives management practices include:

- Using, handling, and transporting explosives in accordance with local and / or national explosives safety regulations;
- Assigning certified blasters or explosives experts to conduct blasts;
- Actively managing blasting activities in terms of loading, priming, and firing explosives, drilling near explosives, misfired shots and disposal;
- Specific warning devices (e.g. horn signals, flashing lights) and procedures should be implemented before each blasting activity to alert all workers and third parties in the surrounding areas (e.g. the resident population). Warning procedures may need to include traffic limitation along local roadways and railways;
- Specific personnel training on explosives handling and safety management should be conducted;
- Blasting-permit procedures should be implemented for all personnel involved with explosives (handling, transport, storage, charging, blasting, and destruction of unused or surplus explosives);
- Blasting sites should be checked post-blast by qualified personnel for malfunctions and unexploded blasting agents, prior to resumption of work;
- Specific audited procedures should be implemented for all activities related to explosives (handling, transport, storage, charging, blasting, and destruction of unused or surplus explosives) in accordance with relevant national or internationally recognized fire and safety codes;
- Qualified security personnel should be used to control transport, storage, and use of explosives on site.

Electrical Safety and Isolation:

Electrical safety and isolation of all sources of hazardous energy and hazardous substances should be undertaken in accordance with the national and international Guidelines. Recommended management practices for mining operations include:

- Development of electrical competency standards and safe work procedures for all electrical work, including construction, decommissioning and demolition of electrical equipment;
- Use of electrical safety devices on all final distribution circuits, and appropriate testing schedules applied to such safety systems;
- All sources of hazardous energy or hazardous substances should have written procedures for isolation, identifying how the system, plant or equipment can be made and kept safe.

Physical hazards:

Physical hazards in mining activities may include: the threat of landslides, rockfalls, face slumping, hazards related to transport (e.g. trucks, elevated haul roads, and railways), hazards related to height and falling, and use of fixed and mobile equipment, lifting and hoisting devices, and moving machinery. Recommended prevention and control strategies include:

Geotechnical Safety:

- Planning, designing, and operating all structures such as open pits, waste dumps, tailing dams, containment facilities and underground excavations such that geotechnical risks are appropriately managed throughout the entire mine cycle.
- Additional levels of safety should be applied in active seismic areas and those potentially exposed to extreme climatic events. Systematic monitoring and regular review of geotechnical stability data should be carried out Long term stability of worked-out sites should be adequately addressed for both surface and underground mines;
- For waste dumps, fills and other containment structures, static safety factors should be established based on the level of hazard for the operational phase of a facility and at closure;
- Potential change of geotechnical properties in dumps due to chemical or biologically catalyzed weathering should be considered. Design of new facilities has to provide for such potential deterioration of geotechnical properties with higher factors of safety. Stability / safety assessments of existing facilities should take these potential changes into account;
- Accurate assessment of worksite safety from rockfall and/or landslide should be conducted. Particular attention should be given after heavy rainfall, seismic events and after blasting activities. Risks should be minimized by appropriate bench and pit slope design, blast pattern design, rock scaling, protective berms and minimizing traffic.
- Assessment of the natural topography around the mine site, as well as mine related infrastructure such as cut slopes, road alignments should be included in geotechnical stability analyses. Modern topographical 3D deformation measurements and related specific processing and evaluation software should be the standard method for stability monitoring.

Machine and Equipment Safety:

To prevent and control hazards related to machine and equipment use, measures for the enhancement of visibility should be applied throughout the mine. Specific visibility management practices may include the following:

- Use of contrast coloring on equipment / machinery, including the provision of reflective markings to enhance visibility;
- Use of moving equipment / machinery equipped with improved operator sight lines;

- Issuing workers high visibility clothing;
- Use of reflective markings on structures, traffic junctions, and other areas with a potential for accidents (e.g. walls in static locations should be whitewashed for improved reflectance);
- Use of appropriate illumination for the immediate operating areas of frequently turning and reversing equipment / machinery;
- Installing safety barriers in high-risk locations of internal roads / transport corridors. Barriers may be constructed with refuse or other materials capable to stopping vehicles.

Ionizing Radiation:

Where natural radiation hazards exist, the recommended mitigation measures include the following:

- Implementing a radiation dosimetry monitoring program for any areas where workers may be expected to receive whole body doses of greater than 6 millisieverts in a 12month period. The program should include workplace assessments as well as personal monitoring.

Fitness for work:

Mining operations often have a number of activities where fatigue or other causes of impaired fitness for work could produce potential for serious injury, equipment damage or environmental impact. A risk assessment should be conducted to identify roles where "fitness for work" (including personal fitness) is required to ensure that the activity is completed with minimized risk. The recommended mitigation measures could include:

- Review of shift management systems to minimize risk of fatigue among employees;
- Tailoring of pre-placement medical exams to the requirements expected of an employee (i.e. good eyesight for a driver);
- Development of an alcohol and other drugs policy for the operation.

Travel and remote site health:

Mining operations are often located in very remote regions, with limited access to high quality emergency or general medical services. To minimize risk from health impacts associated with frequent travel (as seen in exploration teams) and remote sites, the following mitigation measures can be recommended:

- Development of programs to prevent both chronic and acute illnesses through appropriate sanitation and vector control systems;
- Identification of risks associated with operating at altitude;
- Where food is prepared at a mining operation, food preparation, storage and disposal should be reviewed regularly and monitored to minimize risk of illness.

Thermal stress:

Mining operations can require exposure of workers to extreme weather conditions. High temperature conditions generated by industrial processes can also result in thermal stress and should be considered. Thermal stress related to underground operations is discussed later in the document.

Noise and Vibration:

Noise and vibration sources should be managed as described above in Section 6.6.3. Additional recommendations for the management of occupational exposures to noise and vibrations include:

- Reduction of noise to acceptable occupational exposure levels.
- Ensuring that large equipment (e.g. excavators, dumpers, dozers, wagon-drills, and other automated equipment that requires an operator) is equipped with a soundproof cab;
- Use of appropriate personal hearing protection.
- Exposure to hand-arm vibration from hand and power tools or whole-body vibration from surfaces on which the worker stands or sits should be adequately controlled through the selection and maintenance of equipment which meets occupational vibration exposure standards.

When the mitigation measures recommended above are adopted, The Impacts due to Mining and Processing activities will become **Moderate (3B).**

Table 6.33: Occupational Health and Safety Impacts Rating After Mitigation Measures

Siting Phase	Construction Phase	Mining & Processing Phase ☑	Restoration Phase

Consequences		Likelihood		Impact Rating			Acceptability	
1- Negligible		A- Low		1A	1B	1C	Minor	
2- Minor		**B- Medium**	☜	2A	2B	2C	**Moderate**	☜
3- Moderate	☜	C- High		3A	**3B**	3C	Significant	
4- Significant				4A	4B	4C		
5- Catastrophic				5A	5B	5C		
6- Beneficial				6A	6B	6C		

6.6.10 Community Health and Safety

Community health and safety issues that may be associated with mining activities include transport safety along access corridors, transport and handling of dangerous goods, impacts to water quality and quantity, inadvertent development of new vector breeding sites, and potential for transmission of communicable diseases, e.g., respiratory and sexually transmitted infections resulting from the influx of project labor. In addition, there can be significant household and community level effects on the social determinants of health, e.g., drug, alcohol, gender violence, and other psychosocial effects, associated with the rapid influx of labor during construction and operational phases. The rapid influx of labor and their associated extended family members may also place a significant burden on existing community health facilities and resources. Finally, because of their large and generally positive economic impacts, large mining developments can rapidly move local communities from a pattern of infectious diseases, e.g., malaria, respiratory and gastrointestinal infections, to a pattern of non-communicable diseases, e.g., hypertension, diabetes, obesity and cardiovascular disorders.

The Community Health and Safety issues which are associated with Mining and Processing Activities have Moderate effect and likelihood of the impact will be **High.** Therefore the overall acceptability of this activity is expected as **Moderate (3C).**

Table 6.33: Community Health and Safety Impacts Rating Before Mitigation Measures

Siting Phase	Construction Phase	Mining & Processing Phase ☑	Restoration Phase

Consequences		Likelihood		Impact Rating			Acceptability	
1- Negligible		A- Low		1A	1B	1C	Minor	
2- Minor		B- Medium		2A	2B	2C	**Moderate**	☜
3- Moderate	☜	**C- High**	☜	3A	3B	**3C**	Significant	
4- Significant				4A	4B	4C		
5- Catastrophic				5A	5B	5C		
6- Beneficial				6A	6B	6C		

Mitigation Measures:

Recommendations for the management of these issues are described in the IFC General EHS Guidelines. Additional concerns specific to mining activities, with community health and safety implications, and also broader EHS implications are considered under the following headings:

Tailings Dam Safety:

Dams, wet tailing impoundments, and other major wet containment facilities represent a potential risk depending on their location with regards to human settlements and other community resources. Tailings dam health, safety and environment considerations are covered earlier in this document.

Water Storage Dams:

Water storage dams can potentially create and change the existing pattern of vector breeding sites. In areas where malaria is common, the shorelines of the WSD may create a mosquito breeding site because of the presence of a large, shallow, and vegetated shoreline. In addition, the WSD may also create a new breeding site for the snail host of schistosomiasis, an important parasitic disease that is common in many tropical climates.

Emergency Preparedness and Response:

Emergency preparedness and response arrangements should be commensurate to the potential for emergency situations, reflecting the measures described in the IFC General EHS Guidelines.

Communicable Diseases:

The nature of mining projects (e.g. location in remote areas with long material / product supply chains) requires proactive and sustained interventions to minimize the incidence and transmission of communicable diseases caused by the influx of migrant workers, associated extended family members and other service workers at the site. Long haul transport activities may serve as disease conduits particularly for sexually transmitted infections. At the mine site, good international industry practice for solid waste management, surface water drainage, and sanitary wastewater management are usually effective in reducing vector borne and water related communicable diseases.

Project housing and catering facilities and services should be designed and maintained according to internationally accepted standards. Worker living quarters that are designed and maintained to prevent over-crowding can reduce the transmission of communicable respiratory diseases that may transfer to local communities. Catering facilities and services that are designed, maintained and operated according to internationally accepted Hazard Analysis Critical Control Point (HACCP) standards reduce the potential for transmission of food related illnesses from the project to the community.

Over time, the spread of HIV / AIDS is not only the cause of immense human misery and suffering, but can also negatively affect the company in terms of staff turnover, declining productivity, increasing costs, changing markets, and access to contracts and procurement opportunities. Mining operations should define and understand the potential effect of HIV / AIDS, and design an appropriate management response, including use of:

- Strategies to manage the impact of diseases through assessment, surveillance, actions plans, and monitoring;
- A workplace program to prevent new HIV infections and provide care and support for infected and affected employees;
- Outreach activities within the community, sector and / or broader society.
- Typical measures undertaken to reduce communicable disease incidence involve:
- Preventing illness among workers and their families and in local communities by:
    - Undertaking health awareness and education initiatives
    - Training health workers in disease treatment
    - Providing treatment through standard case management in on-site or community health care facilities (e.g. immunization programs)

Specific Vector Control and Prevention Strategies:

Reducing the impact of vector-borne disease (e.g. malaria) on the long-term health of workers and in local communities is best accomplished through implementation of an integrated set of interventions aimed at eliminating the factors that lead to disease. Therefore, there are significant roles for both project engineering and medical staffs. Project sponsors, in close collaboration with community health authorities, should implement an integrated control strategy for mosquito and other arthropod-borne diseases that should generally involve:

- Implementation of an integrated vector control program;
- Engineering design reviews including careful scrutiny of roads, water storage and control facilities and surface water management strategies;
- Collaboration and exchange of in-kind services with other control programs in the project area to maximize beneficial effects, particularly distribution of treated bed nets;
- Development of the "A-B-C-D" program for all project workers where A = awareness, B = bite control, C = chemoprophylaxis for non-immune personnel and D = diagnosis and treatment;

- Selective use of residual indoor spraying (IRS) for project housing. IRS programs are complex and involve careful design review, particularly a clear understanding of the local mosquito vectors and their pre-existing resistance to available insecticides; Development of an effective short and long-term monitoring and evaluation program for both workers and potentially affected communities.

When the mitigation measures recommended above are adopted, The Impacts due to Mining and Processing activities will become **Minor (2A).**

Table 6.34 Community Health and Safety Impacts Rating After Mitigation Measures

Siting Phase	Construction Phase	Mining & Processing Phase ☑	Restoration Phase

Consequences		Likelihood		Impact Rating			Acceptability	
1- Negligible		**A- Low**	☜	1A	1B	1C	**Minor**	☜
2- Minor	☜	B- Medium		**2A**	2B	2C	Moderate	
3- Moderate		C- High		3A	3B	3C	Significant	
4- Significant				4A	4B	4C		
5- Catastrophic				5A	5B	5C		
6- Beneficial				6A	6B	6C		

6.7 Mine Closure and Post-Closure

Closure and post-closure activities should be considered as early in the planning and design stages as possible. Mine sponsors should prepare a Mine Reclamation and Closure Plan (MRCP) in draft form prior to the start of production, clearly identifying allocated and sustainable funding sources to implement the plan. For short life mines, a fully detailed Mine Reclamation and Closure Plan (with guaranteed funding) as described below should be prepared prior to the start of operations.

The effect on Closure and post-closure activities which are associated with Restoration Phase will be **Moderate** in nature and likelihood of the impact will be **Medium.** Therefore the overall acceptability of this activity is expected as **Moderate (3B).**

Table 6.35 Mine Closure and Post-Closure Impacts Rating Before Mitigation Measures

Siting Phase	Construction Phase	Mining & Processing Phase	Restoration Phase ☑

Consequences		Likelihood		Impact Rating			Acceptability	
1- Negligible		A- Low		1A	1B	1C	Minor	
2- Minor		**B- Medium**	☜	2A	2B	2C	**Moderate**	☜
3- Moderate	☜	C- High		3A	**3B**	3C	Significant.	
4- Significant				4A	4B	4C		

5- Catastrophic					5A	5B	5C		
6- Beneficial					6A	6B	6C		

Mitigation Measures:

A mine closure plan that incorporates both physical rehabilitation and socio-economic considerations should be an integral part of the project life cycle and should be designed so that:

- Future public health and safety are not compromised;
- The after-use of the site is beneficial and sustainable to the affected communities in the long term;
- Adverse socio-economic impacts are minimized and socio-economic benefits are maximized.

The MRCP should address beneficial future land use (this should be determined using a multi-stakeholder process that includes regulatory agencies, local communities, traditional land users, adjacent leaseholders, civil society and other impacted parties), be previously approved by the relevant national authorities, and be the result of consultation and dialogue with local communities and their government representatives.

The closure plan should be regularly updated and refined to reflect changes in mine development and operational planning, as well as the environmental and social conditions and circumstances. Records of the mine works should also be maintained as part of the post-closure plan.

Closure and post closure plans should include appropriate aftercare and continued monitoring of the site, pollutant emissions, and related potential impacts. The duration of post-closure monitoring should be defined on a risk basis; however, site conditions typically require a minimum period of five Years after closure or longer.

The timing for finalization of the MRCP is site specific and depends on many factors, such as potential mine life, however all sites need to engage in some form of progressive restoration during operations. While plans may be modified, as necessary, during the construction and operational phases, plans should include contingencies for temporary suspension of activities and permanent early closure and meet the following objectives for financial feasibility and physical / chemical / ecological integrity.

Financial Feasibility:

The costs associated with mine closure and post-closure activities, including post-closure care, should be included in business feasibility analyses during the planning and design stages. Minimum considerations should include the availability of all necessary funds, by appropriate financial instruments, to cover the cost of closure at any stage in the mine life, including provision for early, or temporary closure. Funding should be by either a cash accrual system or a financial guarantee. The two acceptable cash accrual systems are fully funded escrow accounts (including government managed arrangements) or sinking funds. An acceptable form of financial guarantee must be provided by a reputable financial institution. Mine closure requirements should be reviewed on an annual basis and the closure funding arrangements adjusted to reflect any changes.

Physical Integrity:

All structures (e.g. tailings impoundments) should remain stable such that they do not impose a hazard to public health and safety as a result of physical failure or physical deterioration. Tailings structures should be decommissioned so that water accumulation on the surface is minimized and that any water from the surface of the structure can flow away via drains or spillways and these can accommodate the maximum probable flood event. Spillways, drains and diversion ditches must continue to be maintained as required after closure, as they can easily become choked after storm events. Structures should not erode or move from their intended location under extreme events or perpetual disruptive forces. Consideration should be given to backfilling of mine workings.

Chemical Integrity:

Surface water and groundwater should be protected against adverse environmental impacts resulting from mining and processing activities. Leaching of chemicals into the environment should be prevented, so as to avoid endangering public health or safety or exceed water quality objectives in downstream surface water and groundwater systems.

Ecological Habitat Integrity:

While ecological habitat integrity is partially determined by the above factors (e.g. physical issues such as slope stability) and chemical issues (e.g. such as metal contaminants), it is also addressed with consideration towards replacement of habitat that is beneficial for future ecological use. The Mine Reclamation and Closure Plan (MRCP) should contain comprehensive measures for concurrent reclamation during the operating life of the mine according to a plan approved with the environmental and mineral authorities and with the engagement of local government and communities.

When the mitigation measures recommended above are adopted, The Impacts due to Mining and Processing activities will become **Minor (2A).**

Table 6.36 Mine Closure and Post-Closure Impacts Rating After Mitigation Measures

Siting Phase	Construction Phase	Mining & Processing Phase	Restoration Phase ☑

Consequences		Likelihood		Impact Rating			Acceptability	
1- Negligible		**A- Low**	☜	1A	1B	1C	**Minor**	☜
2- Minor	☜	B- Medium		**2A**	2B	2C	Moderate	
3- Moderate		C- High		3A	3B	3C	Significant	
4- Significant				4A	4B	4C		
5- Catastrophic				5A	5B	5C		
6- Beneficial				6A	6B	6C		

6.8 Socio-Economic Impacts

The positive impact of the proposed activity is expected by commencement of the proposed project. Besides the local population would have employment opportunities in factory services. This will lead to the economic growth of the area.

- As much as possible, junior staff will be sourced from qualified members of the local communities. Skill acquisition program will be established to assist members of the project-affected communities to acquire useful skills. A micro-credit scheme may be put in place to assist locals that may take up to trading/self-employment.
- BME will develop an influx management plan and participating with local communities during festivals such as Eid, Christmas and other religion ceremonies, New Year Festivals, etc. and also improving basic facilities/utilities such as water supply, school, and health infrastructure/supply will undergo.
- Speed limits will be enforced for all vehicles approaching the BME facility. Traffic warden/ security guard (Local person) shall be stationed at strategic locations to guide traffic, especially around and within the factory site. Separate timing will be provided for trucks moving into and out of the factory.

The Socio-Economic Impacts which are expected by commencement of the proposed project will be **Beneficial** in nature and likelihood of the impact will be **Medium.** Therefore the overall acceptability of this activity is expected as **Beneficial (6B).**

Table 6.47: Socio-Economic Impact Rating

Siting Phase		Construction Phase ☑		Mining & Processing Phase ☑			Restoration Phase	
Consequences		Likelihood		Impact Rating			Acceptability	
1- Negligible		A- Low		1A	1B	1C	Negligible with minor measure	
2- Minor		**B- Medium**	☜	2A	2B	2C	Minimize Impacts	
3- Moderate		C- High		3A	3B	3C	Significant/ Major Mitigation	
4- Significant				4A	4B	4C	**Beneficial**	☜
5- Catastrophic				5A	5B	5C		
6- Beneficial	☜			6A	**6B**	6C		

6.9 Consolidated Matrix of Environmental Impact Assessment

Table 6.48: Comparison between Environmental Impact Severity Matrix – a) No Mitigation Measures Applied b) Measures in Place

ACTIVITY/ SOURCE OF THE IMPACT			b) UNMITIGATED IMPACTS		b) MITIGATED IMPACTS
Consequence			Likelihood	Acceptability	
1- Negligible			A-Low	Negligible with minor mitigation	
2- Minor			B-Medium	Minimize Impacts	
3- Moderate					
4-Significant			C-High	Significant/ Major Mitigation	
5-Catastrophic					
6-Beneficial				Beneficial	
Construction Phase					
- Air Quality (Gaseous Emissions)			3C		2A
- Air Quality (Dust Generation)			4C		2C
- Noise			4C		2B
- Impact on Soil			3C		2B
- Impact on Vegetation			3B		2A
- Impact on Water Quality			4C		3B
- Solid Waste			3B		2A
- Occupational Health and Safety			4C		3B
Mining and Processing Phase					
- Air Quality			4C		3B
- Water Use and Quality			4C		4B
- Noise and Vibration			3C		2A
- Waste Generation			4C		3B
- Land Use and Biodiversity			3B		2A
- Soil Resources			4C		3B
- Use of Hazardous Materials			4C		4B
- Energy Use			3B		2A
- Occupational Health and Safety			4C		3B
- Community health and safety			3C		2A
Mine Closure and Post Closure Phase			3B		2A
Socio-Economic impacts					6B

7 Environmental Management Plan (EMP)

7.1 Introduction

This Section of the EIA Study lays out the Environmental Management Plan (EMP) for the works concerning the Designing, Pre-Construction, Construction and Post-Construction including the Mining and Processing of Barite-Lead-Zinc proposed project.

7.2 Objectives of Environmental Management Plan

Some of the key objectives of EMP are:

- To assign the responsibilities to relevant departments/persons;
- To enable implementation of standards and guidelines which are legally required in context to the project;
- To define a monitoring mechanism and identify monitoring parameters to ensure that all proposed mitigation measures are completely and effectively implemented;
- To identify training requirements at various levels and provide a plan for the implementation of training sessions; and
- To help identify the resources required for implementation of EMP.

7.3 Roles and Responsibilities

Formal responsibilities are necessary to be designated in order to ensure that key procedures are executed and mitigation measures are implemented effectively.

Key players for overseeing the environmental affairs of mining and other related issues involve:

- Inspector of Mines as the lead player
- Environmental Engineers and Specialists as mediators
- Contractors
- Supporting staff
- Independent Monitoring Consultant (IMC)

Proposed roles and responsibilities of the officials are detailed below.

7.3.1 Inspector of Mines

The Inspector of mines shall:

- Ensure that all specifications, legal constraints, standards and procedures pertaining to the project specifically with regards to environment have been adequately communicated to those concerned.
- Ensure that all stipulations within the EMP are communicated and adhered to by contractor(s).
- Ensure that monitoring is being conducted periodically in accordance with the EMP.
- Ensure the implementation of the EMP throughout the project by means of site inspections and meetings.

- Review and approve mining methods and practices, with input from the Site Manager, where necessary.

7.3.2 Environmental Engineers and Officers

The Environmental Engineer shall:

- Be fully conversant with the Environmental Assessment and conditions of its approval.
- Be fully conversant with the EMP.
- Be fully conversant with all relevant environmental legislation, policies and procedures and ensure compliance with these.
- Have overall responsibility for the implementation of EMP.
- Conduct audits to ensure compliance to the EMP.
- Liaise with the Project Manager or his delegate, the Environmental Officer and relevant discipline engineers on matters concerning the environment.
- Prevent actions that will harm or may cause harm to the environment, and take steps to prevent pollution on the site.
- Confirm activities to the demarcated mine site.
- Undertake regular and comprehensive inspection of the site and surrounding areas in order to monitor compliance with the EMP.
- Take appropriate action if the specifications contained in the EMP are not followed.
- Monitor and verify that environmental impacts are kept to a minimum, as far as possible.
- Compile progress reports on regular basis, with input from the other officials.

7.3.3 Contractors and Service Providers

Environmental management is part of on-site quality management. Under the environmental management plan, the contractor:

- Shall propose measures to minimize environmental impacts during mining, and submit them to the Environmental Officer.
- In case of having impacts on the environment, the contractor will inform them to the Environmental Officer in time to get instructions and then take next step.
- Comply with the environmental management specifications;
- Adhering to any instructions issued by the Project Manager;
- Submitting a report at each site meeting which will document all incidents that have occurred during the period before the site meeting.
- Maintaining a public complaint register.
- Arrange that all his employees and those of his subcontractors receive training before the commencement of construction.

7.3.4 Independent Monitoring Consultant

It is recommended that proponent engages an Independent Monitoring Consultant on the basis of clearly defined criteria including their experience and resources, to ensure monitoring of the project's compliance with the EMP, and to document the status of the project environment at least once every year starting from the inception of the project. These monitoring records may be used for compliance purposes as legal records of environmental performance on mining sites. The Monitoring firm's terms of reference will define a clear work plan, including monitoring indicators, reporting structures and time lines. Proponent will provide the necessary logistical support to facilitate the selected firm in the monitoring process. The firm engaged for independent monitoring will report its findings directly to the Proponent.

Independent Monitoring Consultant appointed will be headed by Project Manager. He along with his team will regularly monitor mining activities to ensure fulfillment of all contractual obligations. The Independent Monitoring Consultant (IMC) shall:

- Ensure that all environmental and social parameters/provisions comply with the applicable standards;
- Ensure that day-to-day mining and processing activities are carried out in an environmentally sound and sustainable manner.
- Organize periodic environmental training programs and workshops for the Contactor's staff and Site staff in consultation with the administration; and
- Develop "good practice" mining and processing guidelines to assist the Contractors and Administrative staff in implementing the EMP.

7.3.5 Role of EPA

The Balochistan Environmental Protection Agency (BEPA) is mandated to oversee and regulate environmental compliance. BEPA may check at any point whether activities comply with national environmental legislation and monitor enforcement of recommendations for environmental mitigation measures as prescribed in the EIA.

7.4 Environmental Monitoring and Inspection

7.4.1 Purpose

This procedure identifies environmental responsibilities for the project offices and for the construction site. It also provides procedural guidance for environmental training, inspection, and monitoring functions during construction and operation phase.

7.4.2 Scope

Primary scope of environmental monitoring / inspection is to comply with the environmental requirements of the project. Management is also responsible for inspecting, documenting, and ensuring that construction meets environmental responsibilities through an integrated program of personnel orientation and training, and inspection of construction activities. In addition, the proponent will assist in implementing environmental management plans through its program of construction inspection.

7.4.3 Environmental Quality Objectives

This section will outline criteria for management's quality objectives and generation of solid waste and wastewater quality, air and noise quality. The management of BME will review Environmental Objectives once a year and try to complete them in the stipulated time frame. This will also include any applicable treatment criteria meeting the National Environmental Quality Standards (NEQS).

7.4.4 Compliance Monitoring

It would be required by the management of BME to comply with the Environmental Monitoring Plan laid in the subsequent section. The compliance for periodic reporting is also required for the monitoring results in form of report submitted to the Environmental Protection Agency. It is also understood that monitoring will be done by an independent consultant /organization. It would be further required to make the annual environmental report public as laid under the Equator Principles.

7.5 Environmental Monitoring Programme

Environmental monitoring is a vital component of an EMP. It is the mechanism through which the effectiveness of the EMP is gauged. The feedback provided by environmental monitoring is instrumental in identifying any problems and planning corrective actions.

7.5.1 Objective of Monitoring

The main objectives of environmental monitoring during the construction phase of the proposed project will be:

- To provide a mechanism to determine whether the project construction contractors and the owner's plant management are carrying out the project in conformity with the EMP.
- To identify areas where the impacts of the projects are exceeding the criteria of significance and, therefore, require corrective actions.
- To document the actual project impacts on physical, biological, and socioeconomic receptors, quantitatively where possible, in order to design better and more effective mitigation measures.
- To provide data for preparing the monitoring report to be submitted to the Balochistan-EPA in accordance with the relevant law requirement.

7.5.2 Performance Indicator

The environmental parameters that may be qualitatively and quantitatively measured and compared are selected as 'performance indicators' and recommended for monitoring during project stages. These monitoring indicators will be monitored to ensure compliance with the national or other applicable standards and comparison with the baseline conditions established during design stage. The list of indicators and their applicable standards to ensure compliance are given below.

Construction Phase

- Ambient air quality– National Environmental Quality Standards for Ambient Air, (NEQS) 2000
- Noise levels –National Environmental Quality Standards for Noise, NEQS 2000

Operation Phase (Mining and Processing)

- Stack emissions – NEQS. Continuous emission monitoring on new equipment. Monthly testing on existing equipment.
- Ambient air quality– National Environmental Quality Standards,(NEQS) 2000
- Noise levels – National Environmental Quality Standards for Noise, NEQS 2000
- Drinking water quality- National Standard Drinking Water Quality (NSDWQ, 2000)
- Wastewater quality – National Environmental Quality Standards, NEQS 2000

7.5.3 Environmental Monitoring Plan

The detailed environmental monitoring plan will be finalized prior to commencement of construction and operation. The requirements identified in the environmental assessment are presented in Table 7.3 for construction phase and in Table 7.4 for operation phase.

Table 7.1: Environmental Management Plan (Construction Phase)

Environmental Concern	Objective	Mitigation Measures recommended	Timing to Implement	Locations to Implement	Responsibility	Monitoring
Construction Phase						
Air Quality	To minimize the dust effectively and avoid complaints due to the airborne particulate matter, the gaseous & vehicular emissions	- Dust exposed surfaces should be regularly wetted in a manner that effectively keeps down the dust at the construction site. - Watering of stripped road surfaces along which construction vehicles and trucks travel will control dust emissions by up to 70%. - A fulltime watering truck shall be maintained on site for watering road surfaces as needed to minimize fugitive dust emissions. - Vehicles transporting earth materials shall be covered en-route. - Mixing equipment shall be sealed properly and vibrating equipment shall be equipped with dust removing devices. - Ensure the proper maintenance of vehicles and generators used at the construction site to produce low emission. - Dust masks shall be provided to operators in order to protect them from dust impacts.	During all Construction	Construction Site	Contractor's Should maintain acceptable standard activities & BME -HSE	IMC
Noise level	To minimize noise	- The noise generating sources shall be	Prior to start	Construction site	Contractor's Should	IMC

Table 7.1: Environmental Management Plan (Construction Phase)

Environmental Concern	Objective	Mitigation Measures recommended	Timing to Implement	Locations to Implement	Responsibility	Monitoring
	during construction activities.	enclosed with acoustic proof material to cut down the noise levels. - Construction machinery and vehicles shall be serviced at regular intervals in order to keep noise to minimum level. - Green belt shall be developed in and around the proposed plant. - Noise level in and around the plant site shall be measured. - Workers shall be equipped with earplugs or earmuffs. - The working hours shall be imposed on construction workers. - Work discipline shall be enforced on site. - Employees shall be trained on noise abatement and PPE's (personal protective equipment) practice. - Workers operating equipment that generates noise should be equipped with the appropriate noise protection gear.	and during the construction period	as well as the generators, equipment and the vehicles.	maintain acceptable standard activities	
Soil Erosion	To minimize the impacts arising from the soil erosion	- The contractor must minimize the area of exposed soil at any given time and to wet, compact and resurface the disturbed areas during the construction phase.	Prior to start and during the construction period	Construction site and its surrounding areas up to 5kms in radius	Contractor	IMC

Table 7.1: Environmental Management Plan (Construction Phase)						
Environmental Concern	**Objective**	**Mitigation Measures recommended**	**Timing to Implement**	**Locations to Implement**	**Responsibility**	**Monitoring**
		- The contractor must also construct the drainage system during the very initial stage of the project. - The area of exposed soil at any given time and to wet, compact and resurface the disturbed areas.				
Terrestrial Habitat and Biodiversity	To minimize the impacts on terrestrial habitat and biodiversity	- To establish as many green areas as possible around the facility. - Site clearance and setting out of the facility must avoid the removal of trees wherever possible - Establishment of green areas on the site should include the planting of bird feeding trees.	Prior to start and during the construction period	Construction site and its surrounding areas up to 5kms in radius	Contractor	IMC
Water Consumption and Conservation	To minimize the impacts associated with water consumption	- Not allowing water to leave the construction site. - Construction of storm water diversion channels to divert storm runoff from flowing over the construction areas. - Regular monitoring of water consumption. - Regular monitoring of water quality for good quality concreting. - Use of leak proof storage tanks. - Monitoring of the ground water table to evaluate the impact of construction activity on ground water, if possible.	Prior to start and during the construction period	Construction site	BME HSE officer/ Contractor	BME HSE officer

Table 7.1: Environmental Management Plan (Construction Phase)

Environmental Concern	Objective	Mitigation Measures recommended	Timing to Implement	Locations to Implement	Responsibility	Monitoring
Solid Waste Management	To minimize the impacts associated with solid waste generation.	- Construction sites should be equipped with temporary refuse bins, and construction wastes should be collected on a daily basis and contained in a temporary designated waste storage area on each site. - Designated waste storage areas should not be within 50 m of water ways. - Construction sites generate considerable waste and provision will be made for suitable separation and storage of waste in designated and labeled areas throughout the site. - Wastes should be routinely collected from the designated area and disposed at licensed waste disposal facilities approved by local EPA. - Trainings shall be conducted regarding solid waste segregation and housekeeping issues on site. - Segregation of hazardous and non-hazardous waste will be done in accordance with color coding system.	Prior to start and during the construction period	Dumping: A list of temporary stockpiling areas and more permanent dumping areas to be prepared at the contract stage for agreement. A list of temporary stockpiling areas and more permanent dumping areas to be prepared at the contract stage for agreement (in WM Plan)	BME should supervise and take action to ensure that contractor's complete relevant activities according to EIA/ EMP requirements & NEQS.	IMC
Occupational Health and Safety	To mitigate the H & S incident risk	- Provide measures for the management and appropriate disposal of hazardous wastes to ensure protection of the workforce and the prevention and	Prior to start and during the construction period	Construction site	Contractor	BME HSE

Table 7.1: Environmental Management Plan (Construction Phase)

Environmental Concern	Objective	Mitigation Measures recommended	Timing to Implement	Locations to Implement	Responsibility	Monitoring
		control of releases and accidents; - Provide for the provision of appropriate fire extinguishers and fire response plans and appropriately trained first aid response staff; - Provide for the provision of appropriately stocked first-aid equipment and stations at both work sites including appropriately trained first-aid staff on site and provision of adequate transport facilities for moving injured persons to the nearest hospital; - Provide for the provision of appropriate personal protective equipment (PPE) to minimize risks, such as but not limited to appropriate (insulated if necessary) outerwear, boots and gloves; eye protectors; ear plugs safety helmets, etc.; - Provide training for workers, and establish appropriate incentives to use and comply with health and safety procedures and utilize PPE; - Include procedures for documenting and reporting occupational accidents, diseases, and incidents; and - Include emergency prevention,				

Table 7.1: Environmental Management Plan (Construction Phase)

Environmental Concern	Objective	Mitigation Measures recommended	Timing to Implement	Locations to Implement	Responsibility	Monitoring
		preparedness, and response arrangements in place.				
Heat Stress	To reduce the heat effect during construction	- Provide cold refuges to the worker - Provide plenty of drinking water - Break the working in shifts	Prior to start and during the construction period	Construction site	Contractor	BME HSE

Table 7.2: Environmental Management Plan (Mining and Processing Phase)

Environmental Concern	Objective	Mitigation Measures recommended	Timing to Implement	Locations to Implement	Responsibility	Monitoring
Operation Phase						
- **Air Quality**	To minimize dust effectively and avoid complaints due to the airborne particulate matter released to the atmosphere.	- Dust suppression techniques (e.g. wetting down, use of all-weather surfaces, use of agglomeration additives) for roads and work areas, optimization of traffic patterns, and reduction of travel speeds; - Exposed soils and other erodible materials should be revegetated or covered promptly; - New areas should be cleared and opened-up only when absolutely necessary; - Surfaces should be re-vegetated or otherwise rendered non-dust forming when inactive; - Storage for dusty materials should be enclosed or operated with efficient dust suppressing measures; - Loading, transfer, and discharge of materials should take place with a minimum height of fall, and be shielded against the wind, and consider use of dust suppression spray systems; - Conveyor systems for dusty materials should be covered and equipped with measures for cleaning return belts. - Deploy a grader and water bowsers on a 12-hour shift basis for road maintenance and dust suppression. - Vehicle speed limit will be imposed at 20km/hr to	Mining and Processing Phase	Project site	BME HSE officer	IMC

Table 7.2: Environmental Management Plan (Mining and Processing Phase)

		minimize dust generation. - The raw materials in the dump truck and belt conveyor will be sprayed with water as it leaves the quarry to ensure dust suppression during transportation. - Workers on the site shall be issued with dust masks/respirators for use during dry and windy conditions. - The machines will be maintained to decrease the emission of dust and vehicles will be put on regular maintenance to ensure they are in good running condition and also not to emit smoke profusely. - Dust collection system (e.g., filter bags) must be installed at point sources like crushing and grinding where applicable.				
Water Use and Quality	To minimize the impact of water usage and waste water during Mining and Processing Phase.	- Establishing a water balance (including probable climatic events) for the mine and related process plant circuit and use this to inform infrastructure design; - Developing a Sustainable Water Supply Management Plan to minimize impact to natural systems by managing water use, avoiding depletion of aquifers, and minimizing impacts to water users; - Minimizing the amount of make-up water; - Consider reuse, recycling, and treatment of process water where feasible (e.g. return of supernatant from	Mining and Processing Phase	Project Site	BME HSE officer	IMC

Table 7.2: Environmental Management Plan (Mining and Processing Phase)

		tailings pond to process plant); - Consider the potential impact to the water balance prior to commencing any dewatering activities; - Consultation with key stakeholders (e.g. government, civil society, and potentially affected communities) to understand any conflicting water use demands and the communities' dependency on water resources and/or conservation requirements that may exist in the area. - The quality and quantity of mine effluent streams discharged to the environment, including storm water, leach pad drainage, process effluents, and overall mine works drainage should be managed and treated to meet the applicable effluent discharge guideline. - In addition, discharges to surface water should not result in contaminant concentrations in excess of local ambient water quality criteria outside a scientifically established mixing zone. - Efficient oil and grease traps or sumps should be installed and maintained at refueling facilities, workshops, fuel storage depots, and containment areas, and spill kits should be available with emergency response plans; - Water quality in open storage systems (e.g. leachate areas, solution ponds, and tailings ponds or impoundments) should be based on the results of a				

Table 7.2: Environmental Management Plan (Mining and Processing Phase)

		site-specific risk assessment with appropriate control measures put in place to mitigate the risk or meet the effluent guideline values. - Sanitary wastewater should be managed via reuse or routing into septic or surface treatment. - Management of PAG and ARD should extend for as long as there is a need to maintain effluent quality to the levels required to protect the local environment, including where necessary, into the decommissioning, closure, and post-closure phases of the mine. - Infiltration of toxic leach solutions should be prevented through the provision of appropriate liners and sub- drainage systems to collect or recycle solution for treatment, and minimize ground infiltration; - Pipeline systems carrying pregnant solutions should be designed with secondary bunded containment; - Leak detection equipment should be installed for pipeline and plant systems with appropriate leak response systems in place; - Process solution storage ponds and other impoundments designed to hold non-fresh water or non-treated leach process effluents should be lined, and be equipped with sufficient wells to enable monitoring of water levels and quality. - Sufficient monitoring wells should be installed around				

Table 7.2: Environmental Management Plan (Mining and Processing Phase)

		cavities to enable monitoring of pressure levels, as well as water quantity and quality.				
Noise and Vibrations	To minimize impact of noise and vibrations during Mining and Processing Phase.	***Noise:*** - Noise levels at the nearest sensitive receptor should meet the noise guidelines; - Where necessary, noise emissions should be minimized and controlled through the application of techniques which may include: - Implementation of enclosure and cladding of processing plants - Installation of proper sound barriers and / or noise containments, with enclosures and curtains at or near the source equipment (e.g. crushers, grinders, and screens) - Installation of natural barriers at facility boundaries, such as vegetation curtains or soil berms - Optimization of internal-traffic routing, particularly to minimize vehicle reversing needs (reducing noise from reversing alarm) and to maximize distances to the closest sensitive receptors. ***Vibrations:*** - Mines should minimize significant sources of vibration, such as through adequate design of - crusher foundations. For blasting-related emissions the following management practices are recommended:	Mining and Processing Phase	Project vicinity	BME HSE officer	IMC

Table 7.2: Environmental Management Plan (Mining and Processing Phase)

		- Mechanical ripping should be used, where possible, to avoid or minimize the use of explosives; - Use of specific blasting plans, correct charging procedures and blasting ratios, delayed / microdelayed or electronic detonators, and specific in-situ blasting tests (the use of downhole initiation with short-delay detonators improves fragmentation and reduces ground vibrations); - Development of blast design, including a blasting-surfaces survey, to avoid over confined charges, and a drill-hole survey to check for deviation and consequent blasting recalculations; - Implementation of ground vibration and overpressure control with appropriate drilling grids; - Adequately designing the foundations of primary crushers and other significant sources of vibrations. ***<u>Other Measures:</u>*** - To minimize the nuisance effect during mining stage following measures will be considered. - Blasting activities will be restricted to daytime in the approved timing of the schedule - Loading and haulage will be restricted to the 12hr daytime operation - Unnecessary hooting of vehicles and horns will not be permitted				

Table 7.2: Environmental Management Plan (Mining and Processing Phase)

		- Ensure the PPE's compliance (especially ear muff) during the blasting operation. - During blasting in the quarry site, emergency alarm will be deployed to conscious the nearby dwellers.				
Waste Generation	To minimize the impacts on land and water due to waste generation. To prevent contamination of land and surface & ground water.	***For management of waste rock dumps:*** - Dumps should be planned with appropriate terrace and lift height specifications based on the nature of the material and local geotechnical considerations to minimize erosion and reduce safety risks; - Management of Potentially Acid Generating (PAG) wastes should be undertaken as described in the guidance below; - Potential change of geotechnical properties in dumps due to chemical or biologically catalyzed weathering should be considered. This can reduce the dumped spoils significantly in grain size and mineralogy, resulting in high ratios of clay fraction and a significantly decreased stability towards geotechnical failure. These changes in geotechnical properties (notably cohesion, internal angle of friction) apply especially to facilities which are not decommissioned with a proper cover system, which would prevent precipitation from percolating into the dump's body. Design of new facilities has to provide for such potential deterioration of geotechnical properties with	Mining and Processing Phase	Project Site	BME HSE officer	IMC

Table 7.2: Environmental Management Plan (Mining and Processing Phase)

		higher factors of safety. Stability / safety assessments of existing facilities should take these potential changes into account. ***For Tailings Management:*** - Design, operation, and maintenance of structures according to specifications of ICOLD and ANCOLD, or other internationally recognized standards based on a risk assessment strategy. Appropriate independent review should be undertaken at design and construction stages with ongoing monitoring of both the physical structure and water quality, during operation and decommissioning; - Where structures are located in areas where there is a risk of high seismic loadings, the independent review should include a check on the maximum design earthquake assumptions and the stability of the structure to ensure that the design is such that during seismic events there will be no uncontrolled release of tailings; - Design of tailings storage facilities should take into account the specific risks / hazards associated with geotechnical stability or hydraulic failure and the associated risks to downstream economic assets, ecosystems and human health and safety. Environmental considerations should thus also				

Table 7.2: Environmental Management Plan (Mining and Processing Phase)

		consider emergency preparedness and response planning and containment / mitigation measures in case of catastrophic release of tailings or supernatant waters; - Any diversion drains, ditches, and stream channels to divert water from surrounding catchment areas away from the tailings structure should be built to the flood event recurrence interval standards outlined elsewhere in this Section; - Seepage management and related stability analysis should be a key consideration in design and operation of tailings storage facilities. This is likely to require a specific piezometer based monitoring system for seepage water levels within the structure wall and downstream of it, which should be maintained throughout its life cycle; - Consideration of zero discharge tailings facilities and completion of a full water balance and risk assessment for the mine process circuit including storage reservoirs and tailings dams. Consideration of use of natural or synthetic liners to minimize risks; - Design specification should take into consideration the probable maximum flood event and the required freeboard to safely contain it (depending on site specific risks) across the planned life of the tailings				

Table 7.2: Environmental Management Plan (Mining and Processing Phase)

		dam, including its decommissioned phase; - Where potential liquefaction risks exist, including risks associated with seismic behavior, the design specification should take into consideration the maximum design earthquake; - On-land disposal in a system that can isolate acid leachate-generating material from oxidation or percolating water, such as a tailings impoundment with dam and subsequent dewatering and capping. On-land disposal alternatives should be designed, constructed and operated according to internationally recognized geotechnical safety standards; - Thickening or formation of paste for backfilling of pits and underground workings during mine progression. ***<u>For General Non-Hazardous Waste:</u>*** - Non-hazardous solid wastes should be managed in environmental friendly manner; - Non-hazardous solid waste should be collected for recycling or disposal at an approved sanitary landfill. - Non-hazardous solid waste should not be disposed of together with waste rock or overburden except under exceptional circumstances to be fully documented in the environmental and social assessment of the project. ***<u>For Hazardous Waste:</u>***				

Table 7.2: Environmental Management Plan (Mining and Processing Phase)

		- Hazardous waste, including waste oils and chemicals, spent packaging materials and containers, should be managed as per local standards and international guidelines. - Hazardous waste should be handled by specialized providers (EPA Approved Contractor) of hazardous waste management facilities specifically designed and operated for this purpose. When such services are unavailable within a feasible distance of the mine, the mine should establish and operate its own waste facility with the necessary permits; - Any medical waste will be transported to an approved facility for incineration for final disposal. - Solid residue from the septic tanks will be transported to an approved facility for incineration for final disposal. ***Other Measures:*** - The stripped soil cover in the quarrying operation and associated vegetation matter will be dumped in some designated areas in order to make compost. This can later be used in the gardening process and partial filling of redundant pits. - Leftover food and food packaging material will be deposited in the dustbins, and the dust bins will be emptied at the temporary garbage bins of the				

Table 7.2: Environmental Management Plan (Mining and Processing Phase)

		administration. - The company will also provide latrine for employees to use. - Domestic waste of campsites will be segregated at source. - Waste will be kept in segregated containers in a designated area. - Materials suitable for recycling will be stored separately and sold to approve recycling contractors. - Food waste will be mixed with overburden and disposed during backfilling.				
Land Use and Biodiversity	To minimize impacts on land Use and biodiversity during the mining and processing phase.	- Whether any critical natural habitats will be adversely impacted or critically endangered or endangered species reduced; - Whether the project is likely to impact any protected areas; not in this case. - The potential for biodiversity offset projects (e.g. proactive management of alternative high biodiversity areas in cases where losses have occurred on the main site due to the mining development) or other mitigative measures; - Whether the project or its associated infrastructure will encourage in-migration, which could adversely impact biodiversity and local communities; - Consideration of partnerships with internationally	Mining and Processing Phase	Project Site	BME HSE officer	IMC

Table 7.2: Environmental Management Plan (Mining and Processing Phase)

		accredited scientific organizations to, for example, undertake biodiversity assessments, conduct ongoing monitoring, and manage biodiversity programs; - Consultation with key stakeholders (e.g. government, civil society, and potentially affected communities) to understand any conflicting land use demands and the communities dependency on natural resources and / or conservation requirements that may exist in the area. ***Terrestrial Habitats:*** - Siting access routes and facilities in locations that avoid impacts to critical terrestrial habitat, and planning, exploration and construction activities to avoid sensitive times of the year; - Minimizing disturbance to vegetation and soils; - Implementation of mitigation measures appropriate for the type of habitat and potential impacts including, for example, post-operation restoration (which may include baseline inventories, evaluations, and eventual rescue of species), offset of losses, or compensation of direct users; - Avoiding or minimizing the creation of barriers to wildlife movement, or threats to migratory species (such as birds) and providing alternative migration routes when the creation of barriers cannot be				

Table 7.2: Environmental Management Plan (Mining and Processing Phase)

		avoided; - Planning and avoiding sensitive areas and implementing buffer zones; Conducting activities such that the risk of landslides, debris or mud flows, and bank or alluvial fan destabilization is minimized; - Implementing soil conservation measures (e.g. segregation, proper placement and stockpiling of clean soils and overburden material for existing site remediation); key factors such as placement, location, design, duration, coverage, reuse, and single handling should be considered; - Where topsoil is pre-stripped, it should be stored for future site rehabilitation activities. Topsoil management should include maintenance of soil integrity in readiness for future use. Storage areas should be temporarily protected or vegetated to prevent erosion; - Conserving the quality and composition of growth medium for use (e.g. for capping) during site reclamation and closure activities; - Ensuring that the growth medium is sufficient to support native plant species appropriate for the local climate and consistent with proposed future land uses. Overall thickness of the growth medium should be consistent with surrounding undisturbed areas and				

Table 7.2: Environmental Management Plan (Mining and Processing Phase)

		future land use; - Manage vegetation growth along access roads and at permanent above-ground facilities. Remove invasive plant species and replant native species. Vegetation control should employ biological, mechanical and thermal vegetation control measures and avoid the use of chemical herbicides as much as possible.				
Soil Resource	To minimize impacts associated with soil	- The surface soil layer will be stored separately from the rest of the overburden soil. - Erosion control measures will be put in place, which will protect exposed surface with vegetation cover. - The overall pit slope will be maintained to avoid bench failure, and the pit lakes will be useful in groundwater recharge. - The entire periphery of the mine will be banded and garland drainage provided to avoid inrush of surface water during rainy season.	Mining and Processing Phase	Project surrounding areas up to 5km in radius	BME HSE officer	IMC

Table 7.2: Environmental Management Plan (Mining and Processing Phase)

Use of Hazardous Materials	To minimize the waste impacts of Hazardous Material Usage.	- Providing secondary containment to restrict movement into receiving water bodies (e.g. sumps, holding areas, impermeable liners), for example: - Constructing pipelines with double-walled or thick-walled sections at critical locations (e.g. large stream crossings) - Installing shutoff valves to minimize spill volumes and to isolate flow in critical areas.	Mining and Processing Phase	At the final stage of disposal i.e. Septic Tank	BME HSE officer	IMC
Energy Use	To ensure efficient use of energy. To minimize the indirect impacts of energy production.	- Use of non-invasive technologies such as remote sensing and ground-based technologies to minimize exploratory digging and drilling; - Correctly sizing motors and pumps used in the excavation, ore moving, ore crushing, and ore handling process, as well as using adjustable speed drives (ASDs) in applications with highly varying load requirements. - Use energy efficient equipment and machinery. - Regular maintenance of equipment and machinery	Mining and Processing Phase	Project Site	BME HSE officer	IMC
Occupational Health and Safety	To ensure workers safety and health by reducing impacts during Mining and processing	- BME shall use Bag Filter with high performance in turn to de-dust and treat the emission of SOx, NOx, dust, etc. below the provincial emission limits before released into the atmosphere. - Provide for the provision of appropriate fire extinguishers and fire response plans and appropriately	Mining and Processing Phase	Project Site	BME HSE officer	IMC

Table 7.2: Environmental Management Plan (Mining and Processing Phase)

		trained first aid response staff; - Provide for the provision of appropriately stocked first-aid equipment and stations at work sites including appropriately trained first-aid staff on site and provision of adequate transport facilities for moving injured persons to the nearest hospital; - Provide for the provision of appropriate personal protective equipment (PPE) to minimize risks, such as but not limited to appropriate (insulated if necessary) outerwear, boots and gloves; eye protectors; ear plugs safety helmets, etc.; - Provide training for workers, and establish appropriate incentives to use and comply with health and safety procedures and utilize PPE; - Include procedures for documenting and reporting occupational accidents, diseases, and incidents; and - Include emergency prevention, preparedness, and response arrangements in place. - Implementation of site specific mitigation measures as discussed in previous chapter to reduce the impacts of following: • General workplace health and safety • Hazardous substances • Use of explosives • Electrical safety and isolation				

Table 7.2: Environmental Management Plan (Mining and Processing Phase)

		• Physical hazards • Ionizing radiation • Fitness for work • Travel and remote site health • Thermal stress • Noise and vibration				
Community Health & Safety		- Recommendations for the management of these issues are described in the IFC General EHS Guidelines. - Tailings dam health, safety and environment impacts shall be managed. - Emergency preparedness and response arrangements should be commensurate to the potential for emergency situations, reflecting the measures described in the IFC General EHS Guidelines. - Strategies to manage the impact of diseases through assessment, surveillance, actions plans, and monitoring; - A workplace program to prevent new HIV infections and provide care and support for infected and affected employees; - Outreach activities within the community, sector and / or broader society. - Typical measures undertaken to reduce communicable disease incidence involve: - Preventing illness among workers and their families	Mining and Processing Phase	Project Site	BME HSE officer	IMC

Table 7.2: Environmental Management Plan (Mining and Processing Phase)

		and in local communities by: • Undertaking health awareness and education initiatives • Training health workers in disease treatment • Providing treatment through standard case management in on-site or community health care facilities (e.g. immunization programs) - Implementation of an integrated vector control program; - Engineering design reviews including careful scrutiny of roads, water storage and control facilities and surface water management strategies; - Collaboration and exchange of in-kind services with other control programs in the project area to maximize beneficial effects, particularly distribution of treated bed nets; - Development of the "A-B-C-D" program for all project workers where A = awareness, B = bite control, C = chemoprophylaxis for non-immune personnel and D = diagnosis and treatment; - Selective use of residual indoor spraying (IRS) for project housing. IRS programs are complex and involve careful design review, particularly a clear understanding of the local mosquito vectors and their pre-existing resistance to available insecticides;				

Table 7.2: Environmental Management Plan (Mining and Processing Phase)

		Development of an effective short and long-term monitoring and evaluation program for both workers and potentially affected communities.				
Socio-Economic Impacts	To achieve best socio-Economic development of local communities and surrounding areas.	- As much as possible, junior staff will be sourced from qualified members of the local communities. Skill acquisition program will be established to assist members of the project-affected communities to acquire useful skills. A micro-credit scheme may be put in place to assist locals that may take up to trading/self-employment. - BME will develop an influx management plan and participating with local communities during festivals such as Eid, Christmas and other religion ceremonies, New Year Festivals, etc. and also improving basic facilities/utilities such as water supply, school, and health infrastructure/supply will undergo. - Speed limits will be enforced for all vehicles approaching the BME facility. Traffic warden/ security guard (Local person) shall be stationed at strategic locations to guide traffic, especially around and within the factory site. Separate timing will be provided for trucks moving into and out of the factory.	Mining and Processing Phase	Project Site	BME HSE officer	IMC

Table 7.3 Environmental Monitoring Plan(Construction Phase)

Environmental Concern	Parameters to be Monitored	Monitoring Location	Frequency	Responsibility
Construction Phase				
Air Quality				
Dust Pollution (Mainly particulate matter) during construction	SPM (Suspended Particulate Matter) PM10 (Particulate Matter<10 microns) PM2.5 (Particulate Matter <2.5 microns)	Construction site	Once in every three months	-BME HSE officer ensure to Contractor's -IMC
	Visible dust	Construction site	Daily during construction period	BME HSE and Contractor's HSE officers
Exhaust emissions from generators and other construction equipment	Gaseous emission includes COx, NOx, SOx and PM from generators and other equipment	All exhaust at construction site	First time equipment use, and once in a month after that	-BME HSE officer ensure to Contractor's -IMC
Vehicular emissions	Vehicular emissions include Smoke, COx and Noise from vehicle exhaust vent.	Vehicle exhaust vent at construction site	Monthly	-BME HSE officer ensure to Contractor's -IMC
Noise level	Continuous Noise level Leq dB(A) monitoring	Construction site as well as the generators, equipment and the vehicles.	Monthly	-BME HSE officer ensure to Contractor's -IMC

Table 7.3 Environmental Monitoring Plan(Construction Phase)				
Soil Erosion	Visual inspections and photographic evidences	Construction site and its surrounding up to 5km in radius	Weekly	BME HSE and Contractor's HSE officers,
Terrestrial Habitat and Biodiversity	Visual inspections and photographic evidences	Construction site and its surrounding up to 5km in radius	Weekly	BME HSE and Contractor's HSE officers,
Solid Waste Management	Record and logging of daily generated waste. Hazardous and non-hazardous waste quantity	Construction site	Daily	BME HSE and Contractor's HSE officers,
Occupational Health and Safety	EHS compliance	Construction site	Daily	BME HSE and Contractor's HSE officers,

Table 7.4 Environmental Monitoring Plan (Mining and Processing Phase)				
Environmental Concern	**Parameters to be Monitored**	**Monitoring Location**	**Frequency**	**Responsibility**
Mining and Processing Phase				
Air Quality				
Dust (Particulate matter) are emitted through the different stages	SPM (Suspended Particulate Matter) PM_{10} (Particulate Matter<10 microns) $PM_{2.5}$ (Particulate Matter <2.5 microns) SOx, NOx, CO, SPM, PM_{10}, $PM_{2.5}$,O_3 and lead (Pb)	Mine area Crushing area Proportioning and grinding area and Processing plant	Bi-annually	-BME HSE officer -IMC
Exhaust emissions	Gaseous emission includes COx, NOx, SOx and PM from stacks, generators and other equipment	Exhaust at operational site Generators Equipment etc.	Monthly	-BME HSE officer -IMC
Vehicular emissions	Vehicular emissions include Smoke, COx and Noise from vehicle exhaust vent.	All Vehicles exhaust vent at operational site	Monthly	-BME HSE officer -IMC
Noise level	Continuous Noise level Leq dB(A) monitoring	Project vicinity	Monthly	-BME HSE officer -IMC
Soil Resource	Visual inspection	Project vicinity	Bi-annually	-BME HSE officer -IMC
Effluent water	Temp., pH, TSS, Cod, BOD5, oil & Grease, Arsenic, Cadmium, Chromium (VI), Copper, Cyanide, Cyanide free, Cyanide WAD,	At the final stage of disposal and Septic Tanks	Monthly	-BME HSE officer -IMC

Table 7.4 Environmental Monitoring Plan (Mining and Processing Phase)

	Iron (total), Lead, mercury, Nickel, Phenols and Zinc.			
Waste Management	-Records of hazardous material used Record of Hazardous waste generation and disposal -Inspections of hazardous substances containment facilities, instrumentation and detection systems. -Volume of different wastes types disposed of to landfill or incineration -Volume of different waste types recycled or reused	Project site and Waste disposal site	Continuous	-BME HSE officer
Ecological monitoring	Number of trees cut and planted during mining	Project site	Continuous	-BME HSE officer
Community	Community grievances or complaints, categorized by type.	Grievance register maintained at Project site	Monthly	-BME HSE officer
Occupational Health & Safety	-EHS Records -Accident Injuries Record -Workers Health and Fitness Records -IFC Guidelines	Project site (Mining and Processing)	Continuous	-BME HSE officer
Ground Water Quality	Drinking Water Parameters as per NEQS	Surrounding s of Waste Disposal site and Tailing pond	Monthly	-BME HSE officer

7.6 Risk Assessment & Disaster Management Plan

7.6.1 Introduction

Emergency may be defined as a sudden event causing or has the potential to cause serious human injury and/or environmental degradation of large magnitude. Prevention and remaining in preparedness are the best options in case of emergency.

The Emergency situations arise in case of:

- Spillage of large quantity of hazardous liquid;
- Natural calamity such as heavy rain, flooding, dust storm, landslide, earthquake, etc.;
- Threat or any sabotage / terrorist activity;
- Release of process wastewater;
- Any other incident involving all or large part of the premises and its workers.

A Project-specific ERP will be developed which primarily relates to the different activities of the project. It supports the EMP and addresses actions and required responses of personnel, employees and contractors.

The main objective of the emergency response plan is to establish the general guidelines for actions to be taken in the event of calamities such as fire, explosion, accidents or hydrocarbon spills/leaks and spills of process chemicals, natural disasters and sabotage, it aims at minimizing the impacts and consequences, and to protect the physical integrity or the lives of the following:

- BME personnel or third-party personnel present at the Mine site;
- Residents of the Campsite and villages in proximity;
- Ecosystems in the surroundings of the operational mine sites.

The Contingency Plan will be applied at the mine sites, including loading, handling, and storage areas.

7.6.2 Risk Situations

In the emergency conditions there are numerous risk situations which a project may face. With respect to the project some such risk situations may arise from the following:

Table 8.1: Emergency / Risk Situations Relevant to Project

Risk Situation	Description
Internal Risks	• Fire/explosions • Spill of stored hazardous chemicals • Occupational accidents (serious or fatal) due to failure to comply with operating rules and procedures, negligence of the personnel, falls, traffic accidents, burns, poor use of equipment and personal protection items, etc.
Natural Risks	• Earthquake • Land slide • Floods • Dust and thunder storms

External Risks	• Terrorism • Vandalism • Any other delinquent action
Personnel Transportation Risks	• While the personnel are traveling to/from the mining area using own or third party's automobile

7.6.3 Risk Management

The management of contingencies at the mine sites is based on:

- Early detection (alarms, detectors, setting off of safety elements);
- Confinement of emergency area;
- Application of adequate response procedure;
- Follow-up and monitoring.

7.6.4 Emergency Procedures

Emergency Coordinator Responsibilities:

Whenever there is an imminent or actual emergency situation such as an explosion, fire, or release, the emergency coordinator (or his designated person, when the emergency coordinator is on call) shall:

- Identify the character, exact source, amount, and a real extent of any released hazardous materials;
- Assess possible hazards to human health or the environment that may result from the explosion, fire, or release. This assessment must consider both direct and indirect effects (e.g. the effects of any toxic, irritating, or asphyxiating gases that are generated, the effects of any hazardous surface water run-off from water or chemical agents used to control fire, etc.);
- Activate communications systems, where applicable, to notify all personnel and workers onsite;
- Notify National Disaster Management & Rescue Operations Authority as well as the Balochistan Environment Protection Agency (BEPA) (in case of serious situation);
- Notify the Local Authorities such as Fire Brigade/Emergency Services in case of fire;
- Before operations are resumed in affected areas, the emergency coordinator shall:
- Provide for proper storage and disposal of recovered waste, contaminated soil or surface water, or any other material that results from an explosion, fire, or release at the facility;
- Ensure that all emergency equipment is cleaned, fit for its intended use, and available for use;

Post-Incident Reporting/Recording

A written Emergency Incident Report, including, but not limited to a description of the incident and the response to the incident, must be submitted to the senior management for review and necessary recommendations and instructions for future control.

The report shall include:

- Name, address, and telephone number of the contractor /operator;
- Name and address of the mine site;
- Date, time, and type of incident (e.g. fire, explosion, etc.);

- Name and quantity of material(s) involved;
- The extent of injuries, if any;
- An assessment of actual or potential hazards to human health or the environment, where this is applicable;
- Estimated quantity and disposition of recovered material that resulted from the incident;
- Cause (s) of the incident;
- Actions taken in response to the incident;
- Administrative or engineering controls designed to prevent such incidents in the future.

7.6.5 Framework for Grievance Redress Mechanism

The BME will implement a stakeholder grievance redress mechanism at each of its mining site as timely and effective redress of stakeholder grievances contribute to bringing sustainability in the operations of a project. In particular, it will help advocate the process of forming and strengthening relationships between project management and the stakeholder community groups and bridge any gaps to create a common understanding, providing the project management the 'social license' to operate in the area.

The grievance redress mechanism proposed for the mining activities in Balochistan will help achieve the objectives of sustainability and cooperation by dealing with the environmental and social issues of the Project. The proposed grievance redress mechanism has been designed to cater for the issues of the people that may be affected by mining activities.

It is recommended that the BME devise an effective mechanism to ensure timely and effective handling of grievances related to the Project. It may include:

- A Public Complaints Unit (PCU), which will be responsible to receive, log, and resolve complaints;
- A Grievance Redress Committee (GRC), responsible to oversee the functioning of the PCU as well as the final non-judicial authority on resolving grievances that cannot be resolved by PCU; and
- Grievance Focal Points (GFPs), which will be educated people from the community that can be approached by the community members for their grievances against the Project.

8 Conclusion

The EIA process finds that the impacts of the project activities at the pre-construction, construction and operation stages have been adequately addressed and mitigation measures duly proposed wherever needed. Adoption of mitigation measures will ensure reduction of impact on the micro and macroenvironment as well as socio-economic conditions to acceptable levels. The development of this project will be compatible with the requirements of the Balochistan Environmental Protection Act 2012. The issue of environment, health & safety has been duly incorporated in the design, construction & operations phases of the project.

On the basis of the findings of the EIA Study, it is possible to conclude that:

- The implementation of mitigation measures for the potential impacts during construction and operation of Barite-Lead-Zinc Project Development and Installation of Processing Plants will have no significant impact on the physical, biological as well as socio-economic composition of the microenvironment and macroenvironment of the project area in district Khuzdar.
- The likely impact of construction & operation of the proposed project will be appropriately mitigated through proven technologies, careful planning and landscaping.

Mitigation will be assured by a program of environmental monitoring conducted to ensure that all measures are provided as intended, and to determine whether the environment is protected as envisaged. This will include observations on and off site, document checks, and interviews with workers and beneficiaries, and any requirements for remedial action will be reported to the Balochistan-EPA.

There are two essential recommendations that need to be followed to ensure that the environmental impacts of the project are successfully mitigated. The Implementing Agency (BME) shall ensure that:

- All mitigation and enhancement measures proposed in this EIA report are implemented in full, as described in the document;
- The Environmental Management and Monitoring Plan is implemented in letter and spirit.

It is envisaged that the current commitment of the proponent to maintain the quality of life in and around the project area through implementation of the environmental management plan and manpower engagement/employment plan, specifically developed for the project would mitigate the likely adverse impacts. The Project will thus respond to all aspects of sustainability: Economic, social and environmental and will thus be a sustainably viable project.

ANNEXURES

Annexure – I: Baluchistan Environmental Protection Act, 2012

BALOCHISTAN PROVINCIAL ASSEMBLY SECRETARIAT

BALOCHISTAN ENVIRONMENTAL PROTECTION BILL 2012 BILL NO. ___

OF 2012.

A

BILL

Balochistan Environmental Protection Bill 2012.

to provide for the protection, conservation, rehabilitation and improvement of the environment, for the prevention and control of pollution, and promotion of sustainable development

Preamble

Whereas, it is expedient to provide for the protection, conservation, rehabilitation and improvement of the environment, prevention and control of pollution, promotion of sustainable development, and for matters connected therewith and incidental thereto;

Short title, extent and commencement

1. It is enacted as follows:-

(1) *This Act, shall be called the Balochistan Environmental Protection Act, 2012.*

(2) *It extends to the whole Province of Balochistan except Tribal Areas.*

(3) It shall come into force at once.

Definitions

2. In this Act, unless there is anything repugnant in the subject or context,—

(a) adverse environmental effect" means impairment of, or damage to, the environment and includes—

(i) human health and property or biodiversity, coast, beaches and ecosystem;

(ii) pollution; and

(iii) any adverse environmental effect on Land, Air and Water;

(b) "Agricultural waste" means waste from farm and agricultural activities including poultry, cattle farming, animal husbandry residues from the use of fertilizers, pesticides and other farm . chemicals;

(c) "Air pollutant" means any substance that causes pollution of air and includes soot, smoke, dust particles, odour, light, electro-magnetic, radiation, heat, fumes, combustion exhaust, exhaust gases, noxious gases, hazardous substances and radioactive substances;

(d) *"Alien species" means a species that does not occur naturally in Balochistan.*

(e) *"Balochistan coastline or coastal zone" means the territorial jurisdiction of the coastline of the Province of Balochistan.*

(f) *"Best practicable environmental option" means the best method for preventing or minimizing adverse effects on the environment, having regard to, among other things:*

(i) the nature of the discharge and the sensitivity of the receiving environment to adverse effects;

(ii) the financial implications, and the effect on the environment, of that option when compared with other options; and

(iii) the current state of technical knowledge and the likelihood that the option can be successfully applied.

(g) "Biodiversity" or "biological diversity" means the variability among living organisms from all sources, including inter alia terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part, including diversity within species, between species and of ecosystems;

(h) *"Clinical waste" means any waste produced by hospitals, clinics, nursing homes, doctor's offices, medical laboratories, medical research facilities and veterinarians which is infectious or potentially infectious.*

(i) "Council" means the Balochistan Environmental Protection Council established under section 3;

(j) "Discharge" includes spilling, leaking, pumping, depositing, seeping, releasing, flowing out, pouring, emitting, emptying or dumping;

(k) "Ecosystem" means a dynamic complex of plant, animal and micro-organism communities and their non- living environment interacting as a functional unit;

(l) "Effluent" means any material in solid, liquid or gaseous form or combination thereof being discharged from industrial activity or any other source and includes a slurry, suspension or vapor;

(m) "Electronic waste" means discarded computers, office electronic equipment, entertainment device electronics, mobile phones, television sets, Cathode ray tubes (CRT) and refrigerator, VCRs, stereos, copiers, and fax machines. It also includes used electronics which are destined for reuse, resale, salvage, recycling, or disposal and electronic products nearing the end of their "useful life."

(n) "Emission standards" means the permissible standards established by the Provincial Agency for emission of air pollutants and noise and for discharge of effluent and waste;

(o) "Endemic and indigenous species" means a species which occurs naturally in the wild only in Balochistan, or a species which only breeds in the wild in Balochistan.

(p) "Environment" means—

(i) air, water and land;

(ii) all layers of the atmosphere;

(iii) all organic and inorganic matter and living organisms;

(iv) the ecosystem and ecological relationships;

(v) buildings, structures, roads, facilities and works;

(vi) all social and economic conditions affecting community life; and

(vii) the inter-relationships between any of the factors specified in sub-clauses (i) to (vi);

(q) "Environmental impact assessment" means an environmental study comprising collection of data, prediction of qualitative and quantitative impacts, comparison of alternatives, evaluation of preventive, mitigation and compensatory measures, formulation of environmental management and training plans and monitoring arrangements, and framing of recommendations and such other components as may be prescribed;

(r) "Environmental Magistrate" means the Magistrate of the First Class appointed under Section 32 ;

(s) “Environmental Tribunal” means the Balochistan Environmental Protection Tribunal constituted under section 28;

(t) "Exclusive Economic Zone" shall have the same meaning as in the Territorial Waters and Maritime Zones Act, 1976 (LXXXII of 1976);

(u) "Factory" means any premises in which industrial activity is being undertaken;

(v) “Genetic Resource” means any material of plant, animal, microbial or other origin containing functional units of heredity of actual or potential value.

(w)“Government” means the Government of Balochistan.

(x) "Government Agency" includes—

(i) a department, attached department, bureau, section, commission, board, office or unit of the Provincial Government;

(ii) a developmental or a local authority, company or corporation established or controlled by the Provincial Government; and

(iii) the Balochistan Environmental Protection Agency. ; and

(iv) any other body defined and listed in the Rules of Business of the Provincial Government.

(y) "Handling", in relation to any substance, means the manufacture, processing, treatment, package, storage, transportation, collection, destruction, conversion, offering for sale, transfer or the like of such substance;

(z) "Hazardous substance" means—

(i) a substance or mixture of substances, other than a pesticide as defined in the Agricultural Pesticides Ordinance, 1971 (II of 1971), which, by reason of its chemical activity or toxic, explosive, flammable, corrosive, radioactive or other characteristics, causes, or is likely to cause, directly or in combination with other matters an adverse environmental effect; and

(ii) any substance which may be prescribed as a hazardous substance;

(aa) "Hazardous waste" means waste which is or which contains a hazardous substance or which may be prescribed as hazardous waste and includes hospital waste and nuclear waste;

(bb) "Historic waters" means such limits of the waters adjacent to the land territory of Pakistan as may be specified by notification under section 7 of the Territorial Waters and Maritime Zones Act, 1976 (LXXXII of 1976);

(cc) "Hospital waste" includes waste medical supplies and materials of all kinds, and waste blood, tissue, organs and other parts of the human and animal bodies, from hospitals, clinics and laboratories;

(dd) "Industrial activity" means any operation or process for manufacturing, making, formulating, synthesizing, altering, repairing, ornamenting, finishing, packing or otherwise treating any article or substance with a view to its use, sale, transport, delivery or disposal, or for mining, for oil and gas exploration and development, or for pumping water or sewage, or for generating, transforming or transmitting power or for any other industrial or commercial purpose;

(ee) "Industrial waste" means waste resulting from an industrial activity;

(ff) "Initial Environmental Examination" means a preliminary environmental review of the reasonably foreseeable qualitative and quantitative impacts on the environment of a proposed project to determine whether it is likely to cause an adverse environmental effect for requiring preparation of an environmental impact assessment;

(gg) “Integrated pollution control” means the holistic system aimed at pollution prevention and minimization at source, managing the impact of pollution and waste on the receiving environment and remediation of damaged and polluted environments.

(hh) “Living modified organism” means any living organism that possesses a novel combination of genetic material obtained through the use of modern technology.

(ii) "local authority" means regional or district set up of EPA or any Agency designated by the Provincial Government, by notification in the official Gazette, to be a local authority for the purposes of this Act;

(jj) "Local council" means a local council constituted or established under a law relating to local Government;

(kk) "Motor vehicle" means any mechanically propelled vehicle adapted for use upon land whether its power of propulsion is transmitted thereto from an external or internal source, and includes a chassis to which a body has not been attached, and a trailer, but does not include a vehicle running upon fixed rails;

(ll) "Municipal waste" includes sewage, refuse, garbage, waste from abattoirs, sludge and human excreta and the like;

(mm) "Environmental Quality Standards" means standards established by the Federal/Provincial Agencies under clause (e) of sub-section (1) of section 6 and approved by the Council under clause (c) of sub - section (1) of section 4;

(nn) "Noise" means the intensity, duration and character of sounds from all sources, and includes vibration;

(oo) "Nuclear waste" means waste from any nuclear reactor or nuclear plant or other nuclear energy system, whether or not such waste is radioactive;

(pp) "Person" means any natural person or legal entity and includes an individual, firm, association, partnership, society, group, company, corporation, co-operative society, Government Agency, non-governmental organization, community-based organization, village organization, local council or local authority and, in the case of a vessel, the master or other person having for the time being the charge or control of the vessel;

(qq) "Pollution" means the contamination of air, land or water by the discharge or emission of effluent or wastes or air pollutants or noise or other matter which either directly or indirectly or in combination with other discharges or substances alters unfavorably the chemical, physical, biological, radiation, thermal or radiological or aesthetic properties of the air, land or water or which may, or is likely to make the air, land or water unclean, noxious or impure or injurious, disagreeable or detrimental to the health, safety, welfare or property of persons or harmful to biodiversity;

(rr) "Prescribed" means prescribed by rules made under this Act;

(ss) "Project" means any activity, plan, scheme, proposal or undertaking involving any change in the environment and includes—

(i) construction or use of buildings or other works;

(ii) construction or use of roads or other transport systems;

(iii) construction or operation of factories or other installations;

(iv) mineral prospecting, mining, quarrying, stone-crushing, drilling and the like;

(v) any change of land use or water use; and

(vi) alteration, expansion, repair, decommissioning or abandonment of existing buildings or other works, roads or other transport systems, factories or other installations;

(tt) "Protection of environment" means the qualitative and quantitative improvement of the different components of the environment and prevention of the deterioration of qualitative and quantitative standards;

(uu) "Proponent" means the person who proposes or intends to undertake a project;

(vv)"Provincial Agency" means the Balochistan Environmental Protection Agency established under section 5, or any Government Agency, local council or local authority exercising the powers and functions of the Provincial Agency;

(ww) "Rules &Regulations" means rules and regulation made under this Act;

(xx) "Sewage" means liquid or semi-solid wastes and sludge from sanitary conveniences, kitchens, laundries, washing and similar activities and from any sewerage system or sewage disposal works;

(yy) “Ship breaking” means breaking up of various types of ship for recycling**.**

(zz) "Standards" means qualitative and quantitative standards for discharge of effluent and wastes and for emission of air pollutants and noise either for general applicability or for a particular area, or from a particular production process, or for a particular product, and includes the Environmental Quality Standards, emission standards and other standards established under this Act and the rules and regulations;

(aaa) “Strategic Environmental Assessment” Strategic environmental assessment (SEA) is a system of incorporating environmental considerations into policies, plans, programmes and strategies. It is sometimes referred to as strategic environmental impact assessment.

(bbb) "Sustainable Development" means development that meets the needs of the present generation without compromising the ability of future generations to meet their needs;

(ccc) “Sustainable Management” means management of the use of natural resources to provide for the health, safety and social, cultural and economic well-being of people and communities taking into account the following:

(i) safeguarding the life-supporting capacity of natural resources and ecosystems;

(ii) ensuring the maintenance of the life-supporting capacity and quality of natural resources and ecosystems to meet the reasonably foreseeable needs of future generations;

(iii) avoiding the creation of adverse effects and, where adverse effects cannot be avoided, mitigates and remedies adverse effects.

(ddd) "*Territorial waters" shall have the same meaning as in the Territorial Waters and Maritime Zones Act, l 976 (LXXXII of 1976);*

(eee) "Vessel" includes anything made for the conveyance by water of human beings or of goods; and

*(*fff*)* "Waste" means any substance or object which has been, is being or is intended to be, discarded or disposed of, and includes liquid waste, solid waste, waste gases, suspended waste, industrial waste, agricultural waste, nuclear waste, municipal waste, hospital waste, used polyethylene bags and residues from the incineration of all types of waste.

(ggg) “Water resource” includes surface water, an aquifer or ground water , a river or spring, a natural channel in which water flows regularly or intermittently, and a wetland, lake or dam into which, or from which, water flows.

Establishment of the Balochistan Environmental Protection Council.—

3. (1) The Provincial Government shall, by notification in the official Gazette, establish a Council to be known as the Balochistan Environmental Protection Council consisting of—

(a) Chief Minister or such other person as the Chief Minister may nominate in this behalf.	Chairperson
(b) Minister for Environment	Vice chairperson
(c) Chief Secretary Balochistan	Member
(d) Secretary Environment	Member/Secretary
(e) Secretary Finance	Member
(f) Secretary Industries	Member
(g) Secretary Agriculture	Member
(h) Secretary Forest	Member
(i) Secretary P&D	Member
(j) Secretary S&GAD	Member
(k) Director General EPA	Member

(l) Such other persons not exceeding six (6) as the Provincial Government may appoint, with the following representation:

One from the Balochistan Chamber of Commerce & Industries and one from the Balochistan Chamber of Agriculture, Two Environment experts/Scientist, One Educationist and One from Non Governmental Organization.

(2) The Members of the Council, other than ex-officio members, shall be appointed in accordance with the prescribed procedure and shall hold office for a term of two years.

(3) The Council may constitute committees of its members and entrust them with such functions as it may deem fit, and the recommendations of the

committees shall be submitted to the Council for approval. The council or any of such committee may seek assistance from any Government Department or expert in the relevant environmental field in performance of its functions.

Functions and powers of the Council.—

4. (1) The Council shall:-

(a) co-ordinate and supervise enforcement of the provisions of this Act; and

(b) approve comprehensive environmental policies and ensure their implementation within the framework of a National /Balochistan conservation strategy as may be approved by the Federal/Provincial Government from time to time;

(c) approve the Environmental Quality Standards;

(d) provide guidelines for the protection and conservation of species, habitats, and biodiversity in general, and for the conservation of renewable and non-renewable resources.

(e) co-ordinate integration of the principles and concerns of sustainable development into development plans and policies;

(f) The Council shall frame its own rules of procedure.

(g) The Council shall hold meetings, as and when necessary, but not less than two meetings, shall be held in a year.

(2) The Council may direct the Provincial Agency or any Government Agency to prepare, submit or implement projects for the protection, conservation, rehabilitation and improvement of the environment and the sustainable development of resources or to undertake research in any aspect of environment.

Establishment of the Balochistan Environmental Protection Agency.

5. (1) The Government of Balochistan shall by a notification in the official Gazette established Balochistan Environmental Protection Agency to exercise the powers and perform the functions assigned to it under this Act and the rules and regulations made there under.

(2) The Balochistan Environmental Protection Agency shall be headed by a Director-General who shall be appointed by the Government of Balochistan on such terms and conditions as it may determine.

(3) The Balochistan Environmental Protection Agency shall have such administrative, technical and legal staff, as the Government of Balochistan may specify, to be appointed in accordance with Balochistan Civil Servant Act 1974.

(4) The powers and functions of the Balochistan Environmental Protection Agency shall be exercised and performed by the Director-General.

(5) The Director-General may, by general or special order, delegate any of the powers and functions to staff appointed under sub-section (3).

(6) For assisting the Balochistan Environmental Protection Agency in the discharge of its functions the Government of Balochistan shall establish Advisory Committees for various sectors and appoint as members thereof representatives of the relevant sector, educational institutions and non- governmental organizations.

Functions of the Balochistan Environmental Protection Agency

6. (1) The Balochistan Environmental Protection Agency shall—

(a) administer and implement this Act and the rules and regulations made;

thereunder;

(b) prepare, in co-ordination with the relevant Government Agency and in consultation with the concerned sectors Advisory Committees, environmental policies for approval by the Council;

(c) take all necessary measures for the implementation of the national environmental policies approved by the Council;

(d) prepare and publish an Annual Environment Report on the state of the environment;

(e) establish standards for the quality of the ambient air, water and land, by notification in the official Gazette in consultation with the other relevant Government Departments/ Agencies.

(f) Revise the Environmental Quality Standards with approval of the Council:

Provided that

(i) before seeking approval of the Council, the Balochistan Environmental Protection Agency shall publish the proposed Environmental Quality Standards for public opinion in accordance with the prescribed procedure; and

(ii) different standards for discharge or emission from different sources and for different areas and conditions may be specified; where standards are less stringent than the Environmental Quality Standards prior approval of the Council shall be obtained;

(iii) certain areas, with the approval of the Council, may exclude from carrying out specific activities, projects from the application of such standards;

(g) co-ordinate environmental policies and programmes;

(h) establish systems and procedures for surveys, monitoring, measurement, examination, investigation, research, inspection and audit to prevent and control pollution, and to estimate the costs of cleaning up pollution and rehabilitating the environment in various sectors;

(i) take measures to promote research and the development of science and technology which may contribute to the protection of the environment, and sustainable development;

(j) certify one or more laboratories as approved laboratories for conducting tests and analysis and one or more research institutes as environmental research institutes for conducting research and investigation for the purposes of this Act.

(k) initiate legislation in various sectors of the environment;

(l) render advice and assistance in environmental matters including such information and data available with it as may be required for carrying out the purposes of this Act:

Provided that the disclosure of such information shall be subject to the restrictions contained in the proviso to sub-section (3) of section 15;

(m) assist the local councils, local authorities, Government Agencies and other persons to implement schemes for the proper disposal of wastes so as to ensure compliance with the standards established by it;

(n) provide information and guidance to the public on environmental matters;

(o) recommend environmental courses, topics, literature and books for incorporation in the curricula and syllabi of educational institutions;

(p) promote public education and awareness of environmental issues through mass media and other means including seminars and workshops;

(q) specify safeguards for the prevention of accidents and disasters which may cause pollution, collaborate with the concerned person in the preparation of contingency plans for control of such accidents and disasters, and co-ordinate implementation of such plans;

(r) encourage the formation and working of non-governmental organizations, community organizations and village organizations to prevent and control pollution and promote sustainable development;

(s) perform any function which the Council may assign to it.

(2) The Balochistan Environmental Protection Agency may—

(a) undertake inquiries or investigation into environmental issues, either of its own accord or upon complaint from any person or organization;

(b) request any person to furnish any information or data relevant to its functions;

(c) initiate with the approval of the ***Provincial/Federal Government,*** requests for foreign assistance in support of the purposes of this Act and enter into arrangements with foreign agencies or organizations for the exchange of material or information and participate in international seminars or meetings;

(d) recommend to the Government of Balochistan the adoption of financial and fiscal programmes, schemes or measures for achieving environmental objectives and goals and the purposes of this Act, including—

(i) incentives, prizes awards, subsidies, tax exemptions, rebates and depreciation allowances; and

(ii) taxes, duties and other levies;

(e) establish and maintain laboratories to help in the performance of its functions under this Act and to conduct research in various aspects of the environment and provide or arrange necessary assistance for establishment of similar laboratories in the private sector;

(f) provide or arrange, in accordance with such procedure as may be prescribed, financial assistance for projects designed to facilitate the discharge of its functions.

Powers of the Balochistan Environmental Protection Agency

7. Subject to the provisions of this Act*, the Balochistan Environmental Protection Agency may*

(a) lease, purchase, acquire property both moveable and immovable;

(b) fix and realize fees, rates and charges for rendering any service or providing any facility, information or data under this Act or the rules and regulations;

(c) enter into contracts, execute instruments subject to approval of the Provincial Government, necessary for proper management and conduct of its business made thereunder;

(d) subject to approval of the Provincial Government appoint in accordance with prescribed procedures such experts and consultants as it considers necessary for the efficient performance of its functions on appropriate terms and conditions;

(e) summon and enforce the attendance of any person and require him to supply any information or document needed for the conduct of any enquiry or investigation into any environmental issue;

(f) The Director General Balochistan EPA or any other Regional officer specifically authorized in this behalf by the Director General shall have the power to impose fine/administrative penalty up to rupees one hundred thousand from case to case basis.

(i) the fine/administrative penalty shall be recovered as per land revenue act.

(ii) the fine/administrative penalty initially or for an interim period shall be placed with the Balochistan EPA till the decision of the Environmental Tribunal or Magistrate; and

(iii) the fine/administrative penalty after the final decision shall be deposited in the public exchequer.

(g) enter and inspect and under the authority of a search warrant issued by the Environmental Court or Environmental Magistrate, search at any reasonable time, any land, building, premises, vehicle or vessel or other place where or in which. there are reasonable grounds to believe that an offence under this Act has been, or is being, committed;

(i) Subject to the provisions of this Act, any person generally or specifically authorized in this behalf by the Director General shall be entitled to enter, at all reasonable times, with such assistance as he considers necessary, any building or place for the following purposes, namely:-

a) to perform duties conferred on him under this Act or rules;

b) to inspect any activity in such building or place in accordance with this Act, the rules or any notice, order or direction issued thereunder;

c) to examine or test any equipment, industrial plant, record, register or any other important matter relating thereto;

d) to conduct a search of any building or place which the said person has reason to believe to have been the place of occurrence of any offence in contravention of any notice, order or direction issued under this Act or the rules;

e) to seize/close any equipment, industrial plant, record, register, document or other matter which may serve as evidence of the commission of any offence punishable under this Act or the rules.

(ii) The provisions of the Code of Criminal Procedure shall be applicable in respect of any search or seizure under this Act.

(a) take samples of any materials, products, articles or substances or of the effluent, wastes or air pollutants being discharged or emitted or of air, water or land in the vicinity of the discharge or emission;

(b) arrange for test and analysis of the samples at a certified laboratory;

(i) Every person authorized in this behalf by the Director General may, in such manner as may be prescribed by rules, collect from any factory, premises or place samples of air, water, soil or of any other substance for the purpose of analysis.

(ii) The results of the analysis of samples collected under clause (i) shall not be admissible in evidence in any legal proceeding unless the provisions of the clauses (iii) and (iv) have been complied with.

(iii) Subject to the provisions of sub-section (4), the officer collecting a sample under clause (i) shall-

(a) serve notice on the owner or proponent or agent of the said place, in such manner as may be prescribed by rules, of his intention to collect such sample;

(b) collect the sample in the presence of the said occupier or agent;

(c) put the sample into a container and affix on it a seal bearing the signatures of himself and of the occupier or agent;

(d) prepare a report of the sample collected and sign it himself and take the signature of the occupier or agent;

(e) send without any delay, the said container to the laboratory specified by the Director General EPA.

(iv) Where a sample is collected under clause (i) and a notice is served by the collecting officer under sub clause a) of clause (iii), the collecting officer shall, if the occupier or agent willfully absents himself at the time of the collection of the sample or, though being present, refuses to sign the sample or report, in the presence of two witnesses, give his signature and attest and seal it and shall send it without any delay to the laboratory specified by the Director General, mentioning that the occupier or agent had not been present or, as the case may be, refused to give his signature.

(i) confiscate any article used in the commission of the offence where the offender is not known or cannot be found within a reasonable time:

Provided that the power under clauses (f), (h), (I) and (j) shall be exercised in accordance with the provisions of the Code of Criminal Procedure, 1898 (Act V of 1898). or the rules made under this Act and under the direction of the Environmental

Tribunal or Environmental Magistrate; and

(j) establish an Environmental Co-ordination Committee comprising the Director-General as its chairman and the heads of relevant Government Agencies and such other persons as the Government of Balochistan may appoint as its members to exercise such powers and perform such functions as may be delegated or assigned to it by the Government of Balochistan for carrying out the purposes of this Act and for ensuring inter departmental co-ordination in environmental policies.

Establishment, powers and functions of the Regional or District Environmental Protection Agencies.—

8. (1) Government of Balochistan shall, by notification in the official Gazette, establish the Regional or District Environmental Protection Agency, to exercise such powers and perform such functions as may be delegated to it by the Government of Balochistan under sub-section (2) of section 34.

(2) The Regional or District Environmental Protection Agency shall be headed by an officer at least of the rank of regional Director or Deputy Director who shall be appointed by the Provincial Government on such terms and conditions as prescribed in the Balochistan Civil Servant Act 1974.

(3) The Regional or District Environmental Protection Agency shall have such administrative, technical and legal staff as the Government of Balochistan may specify, to be appointed in accordance with the Balochistan Civil Servants Appointment, Promotion and Transfers Rules 2009 such procedure as may be prescribed.

(4) The powers and functions of the Regional or District Environmental Protection Agency shall be exercised and performed by an Officer of the rank of regional Director or Deputy Director appointed as head.

(5) The Director General may, by general or special order, delegate any of the powers and functions to staff appointed under sub-section (3).

Establishment of the Balochistan Sustainable Development Funds.—

9. (1) There shall be established in the Province a Balochistan Sustainable Development Fund.

(2) The Balochistan Sustainable Development Fund shall be derived from the following sources, namely:—

(a) grants made or loans advanced by the Federal Government or the Provincial Government;

(b) aid and assistance, grants, advances, donations and other non-obligatory funds received from foreign governments, national or international agencies, and non-governmental organizations; and

(c) contributions from private organizations and other persons.

(3) The Balochistan Sustainable Development Fund shall be utilized in accordance with such procedure as may be prescribed for—

(a) providing financial assistance to the projects in the public/private sector designed for the protection, conservation, rehabilitation and improvement of the environment, the prevention and control of pollution, the sustainable development of resources and for research in any aspect of environment; and

(b) any other purpose which in the opinion of the Board shall help to achieve environmental objectives and the purposes of this Act.

Management of the Balochistan Sustainable Development Fund.—

10. (1) The Balochistan Sustainable Development Fund shall be managed by a Board known as the Sustainable Development Fund Board consisting of:-

(i) Secretary Environment Department — Chairperson

(ii) Secretary Industries Department — Member

(iii) Secretary Social welfare Department — Member

(iv) Secretary Finance Department — Member

(v) Secretary Forest Department — Member

(vi) Secretary Agriculture Department — Member

(vii) such non-official persons not exceeding six (6) as the Members Government of Balochistan may appoint including two (2)representatives of the Balochistan Chamber of Commerce and Industry, two (2) representatives of the Balochistan Chamber of Agriculture and two (2) representative of leading non-governmental organizations/donors.

(viii) Director General, Balochistan Environmental Protection Agency — Member/Secretary

(2) the Board shall have the power to—

(a) sanction financial assistance for eligible projects; as specified in section 9(3) of this Act

(b) invest moneys held in the Balochistan Sustainable Development Fund in such profit - bearing Government bonds, savings schemes and securities as it may deem suitable; and

(3) The Board shall constitute committees of its members to undertake regular monitoring of projects financed from the Balochistan Sustainable Development Fund and to submit progress reports to the Board which shall publish an Annual Report incorporating its annual audited accounts and performance evaluation based on the progress reports.

(4) Audit of the fund shall be conducted on annual basis.

Inter-Provincial Environmental issues:-

11. (1) The project falling within the geographical jurisdiction of two or more Provinces, the IEE or EIA may be submitted by the proponent to each Provincial Environmental Agencies for review and approval.

(2) In case of any dispute or concerns the matter shall be settled through mutual consultation of the Provinces to avoid any inconveniences or future litigation.

(3) The concerned Provinces may constitute a joint technical or review committee including a representative of the concerned Federal Ministry dealing with Environment and coordination.

Multilateral Environmental Agreements:-

12. (1) The obligation of the International Conventions, Treaties and Protocols shall be observed as before devolution of the subject of Environment to the Province on Environment or climate change. In case of any international/ bilateral cooperation, the matter shall be proceeded with consultation with the concerned Federal Ministries.

(2) The Government of Balochistan/ Environmental Protection Agency shall extend support to those obligation of the International Conventions, Treaties and Protocols where adequate assistance provided by the Federal Government.

Strategic Environment Assessment (SEA):-

13. (1) This section regulates the conditions, methods and procedure according to which the assessment of impact of certain plans and programmes on the environment (hereinafter referred to as: strategic assessment) shall be carried out in order to provide for the environmental protection and improvement of sustainable development through integration of basic principles of environmental protection into the procedure of preparation and adoption of plans and programmes.

(2) The Government at all levels of administration and in every sector shall incorporate environmental considerations into policies, plans, programmes and strategies.

Prohibition of certain discharges or emissions and potential harmful items or materials .—

14. (1) Subject to the provisions of this Act and the rules and regulations no person shall discharge or emit or allow the discharge or emission of any effluent or waste or air pollutant or noise in an amount, concentration or level or is likely to cause, a significant adverse effect on the environment or human health which is in excess of the Environmental Quality Standards or, where applicable, the standards established under sub -clause (ii) of clause (f) of section 6.

(2) The Government of Balochistan shall not allow any imported or locally made commodities or items or materials or equipment or instruments or automobile or pesticides etc, into its provincial jurisdiction which may have any potential of causing Environmental problems.

(3) No person or company related to public and private sector shall introduce any of the imported or locally made items or materials or equipment or instruments or automobile or pesticides etc as per subsection (2) for any purpose unless it has filed an application to the Balochistan Environmental Protection Agency, as the case may be, and has obtained approval from the Government Agency in respect thereof.

(4) The Government of Balochistan may levy a pollution charge on any person who contravenes or fails to comply with the provisions of sub-section (1), to be calculated at such rate, and collected in accordance with such procedure as may be prescribed.

(5) Any person who pays the pollution charge levied under sub-section (2) shall not be charged with an offence with respect to that contravention or failure.

(6) The approved license in terms of section 15 of this Act does not affect the applicant's duty to obtain any other authorization required in order to undertake the activity or implement the project concerned, whether in terms of this Act or any other legislation

(7) A person /firm causing discharge of pollutants shall take all reasonable measures to ensure that the best practicable environmental option is adopted in relation to the discharge of emission and conservation of the environment.

Initial Environmental Examination and Environmental Impact Assessment.—

15. (1) No proponent of a project of public and private sector shall commence construction or operation unless he has filed an Initial Environmental Examination with the Government Agency designated by Balochistan Environmental Protection Agency, as the case may be, or, where the project is likely to cause an adverse environmental effects an environmental impact assessment, and has obtained from the Government Agency approval in respect thereof.

(2) The Government Agency shall subject to standards fixed by the Balochistan

Environmental Protection Agency—

(a) review the initial environmental examination and accord its approval, or require submission of an environmental impact assessment by the proponent; or

(b) review the environmental impact assessment and accord its approval subje to such conditions as it may deem fit to impose, require that the environmental impact assessment be re-submitted after such modifications as may be stipulated c reject the project as being contrary to environmental objectives.

(3) Every review of an environmental impact assessment shall be carried out with public participation and no information will be disclosed during the course of such public participation which relates to—

(i) trade, manufacturing or business activities, processes or techniques of a proprietary nature, or financial, commercial, scientific or technical matters which the proponent has requested should remain confidential, unless for reasons to be recorded in writing, the Director General of the Balochistan Environmental Protection Agency is of the opinion that the request for confidentiality is not well- founded or the public interest in the disclosure outweighs the possible prejudice to the competitive position of the project or its proponent; or

(ii) international relations, national security or maintenance of law and order, except with the consent of the Government of Balochistan; or

(iii) matters covered by legal professional privilege.

(4) The Government Agency shall communicate its approval or otherwise within a period of four months from the date the initial environmental examination or environmental impact assessment is filed complete in all respects in accordance with the prescribed procedure, failing which the initial environmental examination or, as the case may be, the environmental impact assessment shall be deemed to have been approved, to the extent to which it does not contravene the provisions of this Act and the rules and regulations.

(5) Subject to sub-section (4) the appropriate Government may in a particular case extend the aforementioned period of four months if the nature of the project so warrants.

(6) The provisions of sub-sections (1), (2), (3), (4) and (5) shall apply to such categories of projects and in such manner as may be prescribed.

(7) The Government Agency shall maintain separate registers for initial environmental examination and environmental impact assessment projects, which shall contain brief particulars of each project and a summary of decisions taken thereon, and which shall be open to inspection by the public at all reasonable hours and the disclosure of information in such registers shall be subject to the restrictions specified in sub-section (3).

(8) No concession areas for any developmental activities shall be awarded to any International/National groups or firms without consultation and concurrence of the Government of Balochistan/Environmental Protection Agency.

(9) The prospect licenses for mining, quarrying, crushing etc. shall only be awarded/ granted in compliance with the sub section (1), (2), (3), (4) and (5) .

(10) The cellular companies shall obtain environmental approval from the Balochistan EPA before installing Base Transceivers Station (BTS).

(11) BTS Stations should be required to undergo routine evaluation for Compliance. Whenever an application is submitted to the Balochistan EPA for construction or modification of a transmitting facility. EPA shall have the authority to take action if a cellular base station antenna does not comply with the International Commission on Non-Ionizing Radiation Protection (ICNIRP) Guidelines and recommendations of the report titled `Environmental and Health Related Effects of the Cellular Base Station Antennas' carried out by IT and Telecom Division, Ministry of Information Technology.

(12) No person or company related to public and private sector shall commence construction or operation unless the concerned building authority accord approval under the provisions of the in vogue Building Code.

(13) after fulfilling the sub section (12) an action plan shall be submitted to the concerned municipal/town/union council to carry out the activities for a specific time period as to provide the general public or road users an alternative corridor.

(14) the waste generated during the construction or maintenance or repair of any building shall be appropriately disposed of or transported or collected to a designated place allocated for the purpose like any land fill site to avoid public nuisance.

(15) the construction or repair activities especially in the main city area shall be carried out in a manner to minimize the road congestion or blockage.

(16) the proponent of the project shall remit fifty thousand rupees as review fee of an Initial Environmental Examination (IEE) and one hundred thousand as review fee for Environmental Impact Assessment (EIA).

(17) the person or company in public or private sector intend to commence any scheme or project do not falling under schedule I and II of this Act shall remit twenty five thousand rupees as an Environmental approval fee to the Balochistan Environmental Protection Agency.

Prohibition of import of hazardous waste.—

16. No person shall import hazardous waste into Balochistan and its jurisdiction limits.

Handling of hazardous substances and License:-

17. (1) Subject to the provisions of this Act, no person shall generate, collect, consign, transport, treat, dispose of, store, handle or import any hazardous substance except—

(a) under a license issued by the Government of Balochistan and in such manner as may be prescribed; or

(b) in accordance with the provisions of any other law for the time being in force, or of any international treaty, convention, protocol, code, standard, agreement or other instrument to which Pakistan is a party.

(2) Every owner or proponent of any land or premises on which hazardous waste is kept, treated or disposed of shall make a written application to the Balochistan Environmental Protection Agency for a hazardous waste management license, which shall at least include details of:

a) the chemical composition, nature and volume of the waste which is being, or will be, produced;

b) the industrial process, trade or activity giving rise to the waste;

c) the way in which the applicant proposes to keep, treat or dispose of the hazardous waste, including storage and handling procedures;

d) the precautions which will be taken to avoid any adverse effects on the environment being caused by the hazardous waste.

(3). the Balochistan Environmental Protection Agency shall evaluate each application for a license under this Article in the following manner:

a) grant a hazardous waste management license, with or without conditions, if satisfied that the proposed method of keeping, treating and disposing of the hazardous waste will not cause any adverse effects; or

b) refuse to grant a license giving reasons for the refusal in writing to the applicant.

(4). the Balochistan Environmental Protection Agency would take a decision in regard to subsection 2 within thirty (30) days of the date of lodging of the application for a license.

(5) The license shall be granted for a reasonable period not exceeding five years. On expiry of the license for renewal same procedure shall be followed.

Electronic Wastes:-

18. (1) Every producer, distributer, collection centre, refurbisher, dismantler or recyclers shall store the electronic waste for a period not exceeding six months and shall maintain a record of collection, sale, transfer, storage and segregation of wastes and make these records available for inspection:

Provided that the Balochistan Environmental Protection Agency may extend the said period in following cases, namely:

(a) Dismantlers and Recyclers up to six months of their annual storage capacity of the owner; or

(b) Collection centers who do not have access to any registered dismantling or recycling facility; or

(c). the waste which needs to be specifically stored for development of a process for its recycling, reuse.

(2) Every producer, distributer, collection centre, refurbisher, dismantler or recyclers shall make arrangements for the environmentally sound management and disposal of electronic waste.

(3) the 'environmentally sound management of electronic waste' as "taking all steps required to ensure that electronic waste are managed in a manner which shall protect health and environment against any adverse effects, which may result from hazardous substance contained in such wastes."

(4) the provisions of this section shall apply to every producer, consumer and bulk consumer involved in manufacture, sale, purchase and processing of electronic equipment or components.

(5) information dissemination on electronic waste and the environmentally sound management of electronic waste is also mandated from producers.

(6) to regulate the provisions of this section all the relevant international conventions, protocols and treaties collectively called as multilateral environmental agreements (MEAs) shall be applicable where Pakistan is signatory or ratified the MEAs.

(7) any person or company or unit who contravenes or fails to comply with the provisions of the above subsections shall be imposed penalty under section 25 of this act.

General Prohibition in relation to Solid and Hospital Waste management and Waste Management License:-

19. (1) No person may collect, transport, sort, recover, store, dispose of or otherwise manage waste in a manner that results in a significant adverse effect.

(2) Every person who imports, produces, collects, recovers, transports, keeps, treats or disposes of waste shall take all reasonable measures to prevent a significant adverse effect on the environment from occurring.

(3) The owner or proponent of every premises upon which solid and hazardous hospital waste is produced shall ensure that all hazardous waste whether solid or hospital waste is separated from other waste, and is stored in separate containers pending disposal, in accordance with the requirements of the Balochistan Environmental Protection Agency as set out in regulations, published guidelines or license conditions.

(4) A person shall not dispose of solid and hazardous hospital waste in such a manner that it becomes litter or is likely to become litter.

(5) Unless in possession of a valid waste management license issued by the Balochistan Environmental Protection Agency, no person may construct, own or operate a landfill site, incinerator or other facility at which waste is permanently disposed of or is stored indefinitely.

(6). The Balochistan Environmental Protection Agency shall evaluate each application for a license and shall do the following:

a) grant a license if the Balochistan Environmental Protection Agency is satisfied that the applicant has sufficient expertise to undertake the activity in question in accordance with the law and in a manner that will not have significant adverse effects; or

b) refuse to grant a license giving reasons for the refusal in writing to the applicant.

(7). The Balochistan Environmental Protection Agency shall reach a decision in regard to subsection 2 within thirty (30) days of the date of lodging of the application for a license with the Balochistan Environmental Protection Agency.

(8). If there are reasonable grounds to grant license, and those grounds are communicated to the license holder in writing, the Balochistan Environmental Protection Agency may amend, revoke or impose new conditions in an existing waste management license.

(9). The license granted under subsection (6) shall be subject to review if condition of license granted are not fulfilled.

Management of Water Resources:-

20. **(**1) All persons, for the purpose of protection, conservation, development, use, control and management of water resources, would take into account the following measures:

a) protecting aquatic and associated ecosystems and their biological diversity;

b) reducing and preventing pollution and degradation of water resources.

(2) When preparing water resource management plans, Departments and other relevant institutions shall at least take the following into account:

a) provisions for integrated watershed management;

b) regulation of sustainable abstraction of groundwater;

c) regulation of the use of ground or surface water for agricultural, industrial, mining, and urban purposes;

d) measures to protect human health and ecosystems;

e) measures to protect wetlands and their associated ecosystems;

f) any other provision necessary for the sustainable use and management of water resources.

(3) An owner of land or a person who uses the land on which any activity or process is performed or undertaken which causes or is likely to cause significant pollution of a water resource must take measures to prevent any such pollution.

Regulation of motor vehicles.

21. (1) Subject to the provisions of this Act, and the rules and regulations, no person shall operate a motor vehicle from which air pollutants or noise are being emitted in an amount, concentration or level which is in excess of the Environmental Quality Standards, or where applicable the standards established under clause (e) of section 6 (1).

(2) For ensuring compliance with the standards mentioned in sub-section (1), the Balochistan Environmental Protection Agency may direct that any motor vehicle or class of vehicles shall install such pollution control devices or other equipment or use such fuels or undergo such maintenance or testing as may be prescribed.

(3) Where a direction has been issued by the Government Agency under subsection (2) in respect of any motor vehicles or class of motor vehicles, no person shall operate any such vehicle till such direction has been complied with.

(4) To regulate the provision of this Act a green squad comprising of representative of Traffic Police, Motor Vehicle Examiner, Excise & Taxation and EPA Balochistan shall be in place to monitor and inspect the automobiles running on the road as per the Environment Quality Standard.

(5) The inspection or monitoring shall be carried out at least once in a month wherein a mechanism be chalked out for issuance of warning tickets (red: Highly polluted, Blue: less polluted) on a prominent on the vehicle, as the case may be for specific period of time not exceeding 30 days to maintain the vehicle in order .

(6) Whoever contravenes or fails to comply with the provision of subsection (5) such vehicle should be made off road or punishable with fine at least twenty thousand rupees which may be extended to one hundred thousand rupees. In the case of continuing contravention or failure the vehicle shall be impounded.

Alien Species and Living Modified Organisms:-

22. (1) The import into Balochistan of alien species and of living modified organisms is prohibited without a permit issued by the relevant authority under any law enforce in Balochistan. The Balochistan Environmental Protection Agency in consultation with the Departments of Agriculture, Livestock and Animal Husbandry and Food shall monitor the matter.

(2) No permit for the introduction of an alien species or of a living modified organism shall be issued unless the environmental impact indicates that there is a reasonable certainty that no harm to indigenous natural resources or human health will result from the proposed introduction.

(3) Subsection 1 and 2 of this Section shall apply equally to introductions of alien species and living modified organisms into the Province of Balochistan and to introductions from one ecosystem to another within the province.

(4) The introduction of alien species and living modified organisms into protected areas shall not be allowed.

Coastal Zone:-

23. (1) Subject to the provisions of this Act the activities or concentration or level of discharges of the following units established on onshore and offshore shall be monitored strictly to prevent the pollution and environmental degradation caused by the following multi-magnitude and multidisciplinary units.

a) Ports and shipping
b) Fisheries
c) Ship dismantling
d) Shipping Traffic (Oil Tankers & Vessels) & dredging.
e) Oil and gas mineral exploration.
f) Coastal power plants and Energy sector.
g) Oil refineries and Industries

(2) The ship breaking at Gaddani or anywhere else in the coastal belt/zone of this province shall be subject to fulfilling all the relevant obligations under the Basel Convention “on the Control of Trans-boundary Movements of Hazardous Waste and their Disposal”, Rotterdam Convention “on the prior Informed Consent(PIC) Procedure for certain Hazardous Chemicals and Pesticides in International Trade” and other relevant Treaties/Protocols and provisions of this Act.

(3) During the process of ship breaking/dismantling the waste, hazardous waste or sludge or Polychlorinated biphenyls or asbestos etc, shall be disposed of in a manner to ensure Protection of Terrestrial and Marine environment.

(4) The activities of ship breaking/dismantling activities on shore or offshore within territorial limit of Balochistan shall be monitored at least biannually to ensure environmental protection and prevent degradation and pollution.

(5) The disposal of untreated sewage and domestic wastes and untreated disposal of industrial effluents into the sea is an offence any person or company or unit who contravenes or fails to comply with the provisions of this Act shall face to penalty under section 25.

Environmental protection order.

24. (1) Where the Balochistan Environmental Protection Agency is satisfied that the discharge or emission of any effluent, waste, air pollutant or noise, or the disposal of waste, or the handling of hazardous substances, or any other act or omission is likely to occur, or is occurring, or has occurred, in violation of the provisions of this Act, rules or regulations or of the conditions of a license, and is likely to cause, or is causing or has caused an adverse environmental effect, the Balochistan Environmental Protection Agency may, after giving the person responsible for such discharge, emission, disposal, handling, act or omission an opportunity of being heard, by order direct such person to take such measures that the Balochistan Environmental Protection Agency may consider necessary within such period as may be specified in the order.

(2) In particular and without prejudice to the generality of the foregoing power, such measures may include—

(a) immediate stoppage, preventing, lessening or controlling the discharge, emission, disposal, handling, act or omission, or to minimize or remedy the adverse environmental effect;

(b) installation, replacement or alteration of any equipment or thing to eliminate, control or abate on a permanent or temporary basis, such discharge, emission, disposal, handling, act or omission;

(c) action to remove or otherwise dispose of the effluent, waste, air pollutant, noise, or hazardous substances; and

(d) action to restore the environment to the condition existing prior to such discharge, disposal, handling, act or omission, or as close to such condition as may be reasonable in the circumstances, to the satisfaction of the Balochistan Environmental Protection Agency.

(3) Where the person, to whom directions under sub-section (1) are given, does not comply therewith, the Balochistan Environmental Protection Agency may, in addition to the proceedings initiated against him under this Act, the rules and regulations, itself take or cause to be taken such measures specified in the order as it may deem necessary and may recover the reasonable costs of taking such measures from such person as arrears of land revenue.

Penalties

25. (1) Whoever contravenes or fails to comply with the provisions of sections 14, 15, 16, 18 or section 24 or any order issued there-under shall be punishable with fine which may extend to one million rupees, and in the case of a continuing contravention or failure, with an additional fine which may extend to one hundred thousand rupees for every day during which such contravention or failure continues:

Provided that if contravention of the provisions of section 14 also constitutes contravention of the provisions of section 21, such contravention shall be punishable under sub-section (2) only.

(2) Whoever contravenes or fails to comply with the provisions of section 17, 19, 21, 22 or 23 or any rule or regulation or conditions of any license, any order or direction, issued by the Council or the Balochistan Environmental Protection Agency, shall be punishable with fine which may extend to one hundred thousand rupees, and in case of continuing contravention or failure

with an additional fine which extend to one thousand rupees for every day during which such contravention continues.

(3) Where an accused has been convicted of an offence under sub-sections (1) and (2), the Environmental Court and Environmental Magistrate, as the case may be, shall, in passing sentence, take into account the extent and duration of the contravention or failure constituting the offence and the attendant circumstances.

(4) Where an accused has been convicted of an offence under sub-section (1) and the Environmental Court is satisfied that as a result of the commission of the offence monetary benefits have accrued to the offender, the Environmental Court may order the offender to pay, in addition to the fines under sub-section (1), further additional fine commensurate with the amount of the monetary benefits.

(5) Where a person convicted under sub-sections (1) or sub-section (2) had been previously convicted for any contravention under this Act, the Environmental Court or, as the case may be, Environmental Magistrate may, in addition to the punishment awarded thereunder—

(a) endorse a copy of the order of conviction to the concerned trade or industrial association, if any, or the concerned Provincial Chamber of Commerce and Industry or the Federation of Pakistan Chambers of Commerce and Industry;

(b) sentence him to imprisonment for a term which may extend to two years;

(c) order the closure of the factory;

(d) order confiscation of the factory, machinery, and equipment, vehicle, material or substance, record or document or other object used or involved in contravention of the provisions of the Act:

Provided that for a period of three years from the date of commencement of this Act the sentence of imprisonment shall be passed only in respect of persons who have been previously convicted for more than once for any contravention of sections 14, 16, 17, 18,19 or 24 involving hazardous waste;

(e) order such person to restore the environment at his own cost, to the conditions existing prior to such contravention or as close to such conditions as may be reasonable in the circumstances to the satisfaction of the Balochistan Environmental Protection Agency; and

(f) order that such sum be paid to any person as compensation for any loss, bodily injury, damage to his health or property suffered by such contravention.

(6) The Director-General of the Balochistan Environmental Protection Agency or an officer generally or specially authorized by him in this behalf may, on the application of the accused compound an offence under this Act with the permission of the Environmental Tribunals or Environmental Magistrate in accordance with such procedure as may be prescribed.

(7) Where the Director-General of the Balochistan Environmental Protection Agency is of the opinion that a person has contravened any provision of Act he may, subject to the rules, by notice in writing to that person require him to pay to the Balochistan Environmental Protection Agency an

administrative penalty in the amount set out in the notice for each day the contravention continues; and a person who pays an administrative penalty for a contravention shall not be charged under this Act with an offence in respect of such contravention.

(8) The provisions of sub-sections (6) and (7) shall not apply to a person who has been previously convicted of offence or who has compounded an offence under this Act who has paid an administrative penalty for a contravention of any provision of this Act.

Offences by bodies corporate

26. Where any contravention of this Act has been committed by a body corporate, and it is proved that such offence has been committed with the consent or connivance of, or is attributed to any negligence on the part of, any director, partner, manager, secretary or other Officer of the body corporate, such director, partner, manager, secretary or other officer of the body corporate, shall be deemed guilty of such contravention along with the body corporate and shall be punished accordingly:

Provided that in the case of a company as defined under the Companies Ordinance, 1984 (XLVII of 1984), only the Chief Executive as defined in the said Ordinance shall be liable under this section.

Explanation.— For the purposes of this section, "body corporate" includes a firm, association of persons and a society registered under the Societies Registration Act, 1860 (XXI of 1860), or under the Co-operative Societies Act, 1925 (VII of 1925).

Offences by Government Agencies, local authorities or local councils.

27. Where any contravention of this Act has been committed by any Government Agency, local authority or local council, and it is proved that such contravention has been committed with the consent or connivance of, or is attributable to any negligence on the part of, the Head or any other officer of the Government Agency, local authority or local council, such Head or other officer shall also be deemed guilty of such contravention along with the Government Agency, local authority or local council and shall be liable to be proceeded against and punished accordingly.

Balochistan Environmental Tribunals.—

28. (1) The Government of Balochistan may, by notification in the official gazette establish Balochistan Environmental Protection Tribunals which shall exercise jurisdiction under this Act.

(2) The Balochistan Environmental Protection Tribunal shall consist of a Chairperson who is, or has been, or is qualified for appointment as, a judge of the High Court to be appointed after consultation with the Chief Justice of the High Court and two members to be appointed by the Government of Balochistan which at least one shall be a technical member with suitable professional qualifications and experience; in the environmental field as may be prescribed. For every sitting of the Balochistan Environmental Protection Tribunal the presence of the Chairperson and not less than one Member shall be necessary.

(3) A decision of Balochistan Environmental Protection Tribunal shall be expressed in terms of the opinion of the majority or if the case has been decided by the Chairperson and only one of the members and a there is a difference of opinion between them, the ;decision of the Balochistan Environmental Protection Tribunal shall be expressed in terms of the opinion of the Chairperson.

(4) Balochistan Environmental Protection Tribunal shall not, merely by reason of a change in its composition, or the absence of any member from any sitting, be bound to recall and rehear any witness who has given evidence, and

may act on the evidence already ;recorded by, or produced, before it.

(5) Balochistan Environmental Protection Tribunal may hold its sittings at such places within its territorial jurisdiction as the Chairperson may decide.

(6) No act or proceeding of Balochistan Environmental Protection Tribunal shall be invalid by reason only of the existence of a vacancy in, or defect in the constitution, of, the Balochistan Environmental Protection Tribunal.

(7) The terms and conditions of service of the Chairperson and members of the Balochistan Environmental Protection Tribunal shall be such as may be prescribed.

Jurisdiction and powers of Balochistan Environmental Tribunals.

29. (1) Balochistan Environmental Protection Tribunal shall exercise such powers and perform such functions as are, or may be, conferred upon or assigned to it by or under this Act or the rules and regulations made there under.

(2) All contravention punishable under sub-section (1) of section 25 shall exclusively be triable by Balochistan Environmental Protection Tribunal.

(3) Balochistan Environmental Protection Tribunal shall not take cognizance of any offence triable under sub-section (2) except on a complaint in writing by- -

(a) the Government Agency or local council; and

(b) any aggrieved person, who has given notice of not less than thirty days to the Provincial Agency concerned, of the alleged contravention and of his intention to make a complaint to the Environment Tribunal.

(4) In exercise of its criminal jurisdiction, the Balochistan Environmental Protection Tribunal shall have the same powers as are vested in Court of Session under the Code of Criminal Procedure, 1898 (Act V of 1898).

(5) In exercise of the appellate jurisdiction under section 22 the Balochistan Environmental Protection Tribunal shall have the same powers and shall follow the same procedure as an appellate court in the Code of Civil Procedure, 1908 (Act V of 1908).

(6) In all matters with respect to which no procedure has been provided for in this Act, the Balochistan Environmental Protection Tribunal shall follow the procedure laid down in the Code of Civil Procedure, 1908 (Act V of 1908).

(7) Balochistan Environmental Protection Tribunal may, on application filed by any officer duly authorized in this behalf by the Director-General of the Balochistan Environmental Protection Agency, issue bail able warrant for the arrest of any person against whom reasonable suspicion exist, of his having been involved in contravention punishable under sub-section (1) of Section 25:

Provided that such warrant shall be applied for, issued, and executed in accordance with the provisions of the Code of Criminal Procedure, 1898 (Act V of 1898):

Provided further that if the person arrested executes a bond with sufficient sureties in accordance with the endorsement on the warrant he shall be released from custody, failing which he shall be taken or sent without delay to the officer in-charge of the nearest police station.

(8) All proceedings before the Balochistan Environmental Protection Tribunal shall be deemed to be judicial proceedings within the meaning of section 193 and 228 of the Pakistan Penal Code (Act XLV of 1860), and the Balochistan Environmental Protection Tribunal shall be deemed to be a court for the purpose of section 480 and 482 of the Code of Criminal Procedure, 1898 (Act V of 1898).

(9) No court other than Balochistan Environmental Protection Tribunal shall have or exercise any jurisdiction with respect to any matter to which the jurisdiction of Balochistan Environmental Protection Tribunal extends under this Act, the rules and regulations made thereunder.

(10) Where the Balochistan Environmental Protection Tribunal is satisfied that a complaint made to it under sub-section (3) is false and vexatious to the knowledge of the complainant, it may, by an order, direct the complainant to pay to the person complained against such compensatory costs which may extend to five hundred thousand rupees.

Appeals to the Environmental Tribunal.—

30. (1) Any person aggrieved by any order or direction of the Balochistan Environmental Protection Agency under any provision of this Act, and rules or regulations may prefer an appeal with the Balochistan Environmental Protection Tribunal within thirty days of the date of communication of the impugned order or direction to such person.

(2) An appeal to the Balochistan Environmental Protection Tribunal shall be in such form, contain such particulars and be accompanied by such fees as may be prescribed.

Appeals from orders of the Environmental Tribunal

31. (1) Any person aggrieved by any final order or by any sentence of the Balochistan Environmental Protection Tribunal passed under this Act may, within thirty days of communication of such order or sentence, prefer an appeal to the High Court.

(2) An appeal under sub-section (l) shall be heard by a Bench of not less than two Judges.

Jurisdiction of Environmental Magistrates.

32. (1) Notwithstanding anything contained in the Code of Criminal Procedure, 1898 (Act V of 1898), or any other law for the time being in force, but subject to the provisions of this Act, all contravention punishable under sub-section (2) of section 25 shall exclusively be trial-able by Environmental Magistrate especially empowered in this behalf under section 14 of the Code of Criminal Procedure, 185(Act No. V of 1898).

(2) An Environmental Magistrate shall be competent to impose any punishment specified in sub-sections (2) and (4) of section 25.

(3) An Environmental Magistrate shall not take cognizance of an offence trial able under sub-section (I) except on a complaint in writing by—

(a) the Balochistan Environmental Protection Agency, or Government Agency or a local council; and

(b) any aggrieved person.

Appeals from orders of Environmental Magistrates.

33. Any person convicted of any contravention of this Act or the rules or regulations by an Environmental Magistrate may, within thirty days from the date of his conviction, appeal to the Court of Sessions whose decision thereon shall be final.

Power to delegate.

34. *(1*) The Government of Balochistan may, by notification in the official Gazette, delegate any of its or of the Balochistan Environmental Protection Agency powers and functions under this Act and the rules and regulations to any Government Agency, local council or local authority.

(2) The Balochistan Environmental Protection Agency may also by notification in the official Gazette, delegate any of its powers or functions under this Act and the rules and regulations to EPA Regional or sub-offices. In case of nonexistence of its Regional/Sub-offices may delegate its powers or functions to any local council or local authority in the Province.

Power to give directions.

35. In the performance of its functions the Provincial Agency shall be bound by the direction given to it in writing by the Government.

Indemnity.

36. No suit, prosecution or other legal proceedings shall lie against the Government , the Council, the Balochistan Environmental Protection Agency, the Director-Generals of the Balochistan Environmental Protection Agency, members, officers, employees, experts, advisers, committees or consultants of the Balochistan Environmental Protection Agency or the Environmental Tribunal or Environmental Magistrates or any other person for anything which is in good faith done or intended to be done under this Act or the rules or regulations made thereunder.

Dues recoverable as arrears of land revenue.

37. Any dues recoverable by the Balochistan Environmental Protection Agency under this Act, or the rules or regulations shall be recoverable as arrears of land revenue.

Act to override other laws.

38. The provisions of this Act shall have effect notwithstanding anything inconsistent therewith contained in any other law for the time being in force.

Power to make rules.

39. The Government of Balochistan may, by notification in the official Gazette, make rules for carrying out the purposes of this Act including rules for implementing the provisions of the international environmental Agreements, specified in the Schedule to this Act.

Power to amend the Schedule

40. The Government of Balochistan may, by notification in the official Gazette, amend the Schedule so as to add any entry thereato or modify or omit any entry therein.

Power to make regulations.

41. (1) For carrying out the purposes of this Act, the Balochistan Environmental Protection Agency may, by notification in the official Gazette and with the approval of the Government of Balochistan, make regulations not inconsistent with the provisions of this Act or the rules made thereunder.

(2) In particular and without prejudice to the generality of the foregoing power, such regulations may provide for

(a) submission of periodical reports, data or information by any Government agency, local authority or local council in respect of environmental matters;

(b) preparation of emergency contingency plans for coping with environmental hazards and pollution caused by accidents, natural disasters and calamities;

(c) appointment of officers, advisers, experts, consultants and employees;

(d) levy of fees, rates and charges in respect of services rendered, actions taken and schemes implemented;

(e) monitoring and measurement of discharges and emissions;

(f) categorization of projects to which, and the manner in which, section 15 applies;

(g) laying down of guidelines for preparation of initial environmental examination and environmental impact assessment and Development of procedures for their filing, review and approval;

(h) providing procedures for handling hazardous substances; and

(i) installation of devices in, use of fuels by, and maintenance and testing of motor vehicles for control of air and noise pollution.

Repeal, savings and succession.

42. (1) The provision of Pakistan Environmental Protection Act 1997 (Act No.XXXIV of 1997) applicable to the Province of Balochistan are hereby repealed.

(2) Notwithstanding the repeal of the Pakistan Environmental Protection Act 1997 hereinafter called the repealed Act, any rules or regulations or appointments made, orders passed, notifications issued, powers delegated, contracts entered into, proceedings commenced, rights acquired liabilities incurred, penalties, rates, fees or charges levied, things done or action taken under any provisions of the repealed Act shall, so far as they are not inconsistent with the provisions of this Act be deemed to have been made, passed, issued, delegated, entered into, commenced, acquired, incurred, levied, done or taken under this Act, until they are repealed, rescind, withdrawn, cancelled, replaced or modified in accordance with the provisions of this Act.

(3) On the establishment of the Balochistan Environmental Protection Agency under this Act, all properties, assets and liabilities pertaining to the Balochistan Environmental Protection Agency established under repealed Act shall vest in and be the properties, assets and liabilities, as the case may be, of the Balochistan Environmental Protection Agency established under this Act.

(4) The Balochistan Environmental Protection Agency constituted under the repealed Act and existing immediately before the commencement of this Act shall be deemed to have been constituted under section 5 and the Director General and other officers and employees appointed in the said Agency shall be deemed to be Director General, officers and employees appointed under the Balochistan Civil Servant Act 1974.

(5) Notwithstanding the repeal of the Pakistan Environmental Protection Act 1997(Act No.XXXIV of 1997), all proceeding pending immediately before commencement of this Act, against any person under the repealed Act and rules, regulation or order made thereunder, or any other Law or rules shall continue under that Law and rules, in the manner proceeded thereunder.

SCHEDULE
(See section 39)

1. International Plant Protection Convention, Rome, 1951.

2. Plant Protection Agreement for the South-East Asia and Pacific Region (as amended), Rome, 1956.

3. Agreement for the Establishment of a Commission for Controlling the Desert Locust in the Eastern Region of its Distribution Area in South-West Asia (as amended), Rome, 1963.

4. Convention on Wetlands of International Importance Especially as Waterfowl Habitat, Ramsar, 1971 and its amending Protocol, Paris, 1982.

5. London Convention on Ocean Dumping 1972.

6. Convention Concerning the Protection of World Cultural and Natural Heritage (World Heritage Convention), 1972.

7. MARPOL Convention on Prevention of Pollution from Ship, 1973/78

8. Convention on International Trade in Endangered Species of Wild Funa and Flora (CITES), Washington, 1973.

9. Convention on the Conservation of Migratory Species of Wild Animals, Bonn, 1979.

10. Convention on the Law of the Sea, Montego Bay, 1982.

11. Vienna Convention for the Protection of the Ozone Layer, Vienna, 1985.

12. Montreal Protocol on Substances that Deplete the Ozone Layer, Montreal, 1987 and amendments thereto.

13. Agreement on the Network of Agriculture Centres in Asia and the Pacific, Bangkok, 1988.

14. Convention on the Control of Transboundary Movements of Hazardous Waste and Their Disposal, Basel, 1989.

15. Convention on Biological Diversity, Rio de Janeiro, 1992.

16. United Nations Framework Convention on Climate Change, Rio De Janeiro, 1992.

17. Convention on the Protection and Use of Transboundary Watercourses and International Lakes, 17 March 1992.

18. The Rio Declaration on Environment and Development, 13 June 1992

19. London Amendment to Montreal Protocol on Substances that deplete the ozone layer, 10 Aug 1992

20. United Nations Convention on the Law of the Sea, 16 Nov 1994

21. Washington Declaration on Land Based Marine Pollution 1995.

22. UN Convention on Non-Navigational Uses of International Watercourses, 1995

23. Ban Amendment to the Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes and their Disposal, 22 Sept 1995.

24. The Kyoto Protocol, 11 Dec 1997

25. The Rotterdam Convention on the Prior Informed Consent (PIC) Procedure for Certain Hazardous Chemicals and Pesticides in International Trade, 11 Sept 1998.

26. The Beijing Amendment to the Montreal Protocol on Substances that deplete the ozone layer, 1 Jan 2000

27. The Cartagena Protocol on Biosafety to the Convention on Biological Diversity, 29 Jan 2000.

28. Stockholm Convention on Persistent Organic Pollutants (POPs), 23 May 2001.

29. International Treaty on Plant Genetic Resources for Food and Agriculture, 3 Nov 2001.

30. Hong Kong International Convention For The Safe And Environmentally Sound Recycling Of Ships, 2009

STATEMENT OF OBJECTS AND REASONS.

After the 18th Constitutional amendments the subject of environment vide Notification No.4-9/2011-Min dated 29th June, 2011 stand devolved to the provinces with effect from 1st July, 2011. Even after the deletion of the subject of environment from the concurrent list the Pakistan Environmental Protection Act 1997 remained intact as per Article 270-AA, Sub-Article(6). However, there is provision that the province through an appropriate legislature/competent authority may alter, repeal and amend the laws related to the subject.

To regulate and effectively address the peculiar environmental issues of the province of Balochistan this act namely "Balochistan Environmental Protection Act 2012" is submitted as per provisions of the Article 270-AA, Sub-Article(6) of 18th Constitutional amendments.

(Mir Asghar Rind)

Minister for Environment Department

SECRETARY

Balochistan Provincial Assembly

Dated _______ November, 2012.

Annexure –II: Pakistan Environment Protection Agency (Review of IEE & EIA) Regulations, 2000

PAKISTAN ENVIRONMENTAL PROTECTION AGENCY (REVIEW OF IEE AND EIA) REGULATIONS, 2000

S.R.O. 339 (1)/2001. - In exercise of the powers referred by section 33 of the Pakistan Environmental Protection Act, 1997 (XXXIV of 1997), Pakistan Environmental Protection Agency, with the approval of the Federal Government is pleased to make the following Rules, namely : -

1. Short title and commencement

(1) These regulations may be called the Pakistan Environmental Protection Agency Review of Initial Environmental Examination and Environmental Impact Assessment Regulations, 2000.

(2) They shall come into force at once.

2. Definitions

(1) In these regulations, unless there is anything repugnant in the subject or context –

(a) "Act" means the Pakistan Environmental Protection Act, 1997 (XXXIV of 1997);

(b) "Director-General" means the Director-General of the Federal Agency;

(c) "EIA" means an environmental impact assessment as defined in section 2(xi);

(d) "IEE" means an initial environmental examination as defined in section 2(xxiv); and

(e) "section" means a section of the Act.

(2) All other words and expressions used in these regulations but not defined shall have the same meanings as are assigned to them in the Act.

3. Projects requiring an IEE

A proponent of a project falling in any category listed in Schedule I shall file an IEE with the Federal Agency, and the provisions of section 12 shall apply to such project.

4. Projects requiring an EIA

A proponent of a project falling in any category listed in Schedule II shall file an EIA with the Federal Agency, and the provisions of section 12 shall apply to such project.

5. Projects not requiring an IEE or EIA

(1) A proponent of a project not falling in any category listed in Schedules I and II shall not be required to file an IEE or EIA:

Provided that the proponent shall file –

(a) an EIA, if the project is likely to cause an adverse environmental effect;

(b) for projects not listed in Schedules I and II in respect of which the Federal Agency has issued guidelines for construction and operation, an application for approval accompanied by an undertaking and an affidavit that the aforesaid guidelines shall be fully complied with.

(2) Notwithstanding anything contained in sub-regulation (1), the Federal Agency may direct the proponent of a project, whether or not listed in Schedule I or II, to file an IEE or EIA, for reasons to be recorded in such direction:

Provided that no such direction shall be issued without the recommendation in writing of the Environmental Assessment Advisory Committee constituted under Regulation 23.

(3) The provisions of section 12 shall apply to a project in respect of which an IEE or EIA is filed under sub-regulation (1) or (2).

6. Preparation of IEE and EIA

(1) The Federal Agency may issue guidelines for preparation of an IEE or an EIA, including guidelines of general applicability, and sectoral guidelines indicating specific assessment requirements for planning, construction and operation of projects relating to particular sector.

(2) Where guidelines have been issued under sub-regulation (1), an IEE or EIA shall be prepared, to the extent practicable, in accordance therewith and the proponent shall justify in the IEE or EIA any departure therefrom.

7. Review Fees

The proponent shall pay, at the time of submission of an IEE or EIA, a non-refundable Review Fee to the Federal Agency, as per rates shown in Schedule III.

8. Filing of IEE and EIA

(1) Ten paper copies and two electronic copies of an IEE or EIA shall be filed with the Federal Agency.

(2) Every IEE and EIA shall be accompanied by –

(a) an application, in the form prescribed in Schedule IV; and

(b) copy of receipt showing payment of the Review Fee.

9. Preliminary scrutiny

(1) Within 10 working days of filing of the IEE or EIA, the Federal Agency shall –

(a) confirm that the IEE or EIA is complete for purposes of initiation of the review process; or

(b) require the proponent to submit such additional information as may be specified; or

(c) return the IEE or EIA to the proponent for revision, clearly listing the points requiring further study and discussion.

(2) Nothing in sub-regulation (1) shall prohibit the Federal Agency from requiring the proponent to submit additional information at any stage during the review process.

10. Public participation

(1) In the case of an EIA, the Federal Agency shall, simultaneously with issue of confirmation of completeness under clause (a) of sub-regulation (1) of Regulation 9, cause to be published in any English or Urdu national newspaper and in a local newspaper of general circulation in the area affected by the project, a public notice mentioning the type of project, its exact location, the name and address of the proponent and the places at which the EIA of the project can, subject to the restrictions in sub-section (3) of section 12, be accessed.

(2) The notice issued under sub-regulation (1) shall fix a date, time and place for public hearing of any comments on the project or its EIA.

(3) The date fixed under sub-regulation (2) shall not be earlier than 30 days from the date of publication of the notice.

(4) The Federal Agency shall also ensure the circulation of the EIA to the concerned Government Agencies and solicit their comments thereon.

(5) All comments received by the Federal Agency from the public or any Government Agency shall be collated, tabulated and duly considered by it before decision on the EIA.

(6) The Federal Agency may issue guidelines indicating the basic techniques and measures to be adopted to ensure effective public consultation, involvement and participation in EIA assessment.

11. Review

(1) The Federal Agency shall make every effort to carry out its review of the IEE within 45 days, and of the EIA within 90 days, of issue of confirmation of completeness under Regulation 9.

(2) In reviewing the IEE or EIA, the Federal Agency shall consult such Committee of Experts as may be constituted for the purpose by the Director-General, and may also solicit views of the sectoral Advisory Committee, if any, constituted by the Federal Government under sub-section (6) of section 5.

(3) The Director-General may, where he considers it necessary, constitute a committee to inspect the site of the project and submit its report on such matters as may be specified.

(4) The review of the IEE or EIA by the Federal Agency shall be based on quantitative and qualitative assessment of the documents and data furnished by the proponent, comments from the public and Government Agencies received under Regulation 10, and views of the committees mentioned in sub-regulations (2) and (3) above.

12. Decision

On completion of the review, the decision of the Federal Agency shall be communicated to the proponent in the form prescribed in Schedule V in the case of an IEE, and in the form prescribed in Schedule VI in the case of an EIA.

13. Conditions of approval

(1) Every approval of an IEE or EIA shall, in addition to such conditions as may be imposed by the Federal Agency, be subject to the condition that the project shall be designed and constructed, and mitigatory and other measures adopted, strictly in accordance with the IEE/EIA, unless any variation thereto have been specified in the approval by the Federal Agency.

(2) Where the Federal Agency accords its approval subject to certain conditions, the proponent shall –

(a) before commencing construction of the project, acknowledge acceptance of the stipulated conditions by executing an undertaking in the form prescribed in Schedule VII;

(b) before commencing operation of the project, obtain from the Federal Agency written confirmation that the conditions of approval, and the requirements in the IEE/EIA relating to design and construction, adoption of mitigatory and other measures and other relevant matters, have been duly complied with.

14. Confirmation of compliance

(1) The request for confirmation of compliance under clause (b) of sub-regulation (2) of Regulation 13 shall be accompanied by an Environmental Management Plan indicating the measures and procedures proposed to be taken to manage or mitigate the environmental impacts for the life of the project, including provisions for monitoring, reporting and auditing.

(2) Where a request for confirmation of compliance is received from a proponent, the Federal Agency may carry out such inspection of the site and plant and machinery and seek such additional information from the proponent as it may deem fit:

Provided that every effort shall be made by the Federal Agency to provide the requisite confirmation or otherwise within 15 days of receipt of the request, with complete information, from the proponent.

(3) The Federal Agency may, while issuing the requisite confirmation of compliance, impose such other conditions as the Environmental Management Plan, and the operation, maintenance and monitoring of the project as it may deem fit, and such conditions shall be deemed to be included in the conditions to which approval of the project is subject.

15. Deemed approval

The four-month period for communication of decision stipulated in sub-section (4) of section 12 shall commence from the date of filing of an IEE or EIA in respect of which confirmation of completeness is issued by the Federal Agency under clause (a) of sub-regulation (1) of Regulation 9.

16. Extension in review period

Where the Federal Government in a particular case extends the four-month period for communication of approval prescribed in sub-section (5) of section 12, it shall, in consultation with the Federal Agency, indicate the various steps of the review process to be taken during the extended period, and the estimated time required for each step.

17. Validity period of approval

(1) The approval accorded by a Federal Agency under section 12 read with Regulation 12 shall be valid, for commencement of construction, for a period of three years from the date of issue.

(2) If construction is commenced during the initial three year validity period, the validity of the approval shall stand extended for a further period of three years from the date of issue.

(3) After issue of confirmation of compliance, the approval shall be valid for a period of three years from the date thereof.

(4) The proponent may apply to the Federal Agency for extension in the validity periods mentioned in sub-regulations (1), (2) and (3), which may be granted by the Federal Agency in its discretion for such period not exceeding three years at a time, if the conditions of the approval do not require significant change:

Provided that the Federal Agency may require the proponent to submit a fresh IEE or EIA, if in its opinion changes in location, design, construction and operation of the project so warrant.

18. Entry and inspection

(1) For purposes of verification of any matter relating to the review or to the conditions of approval of an IEE or EIA prior to, during or after commencement of construction or operation of a project, duly authorized staff of the Federal Agency shall be entitled to enter and inspect the project site, factory building and plant and equipment installed therein.

(2) The proponent shall ensure full cooperation of the project staff at site to facilitate the inspection, and shall provide such information as may be required by the Federal Agency for this purpose and pursuant thereto.

19. Monitoring

(1) After issue of approval, the proponent shall submit a report to the Federal Agency on completion of construction of the project.

(2) After issue of confirmation of compliance, the proponent shall submit an annual report summarizing operational performance of the project, with reference to the conditions of approval and maintenance and mitigatory measures adopted by the project.

(3) To enable the Federal Agency to effectively monitor compliance with the conditions of approval, the proponent shall furnish such additional information as the Federal Agency may require.

20. Cancellation of approval

(1) Notwithstanding anything contained in these Regulations, if, at any time, on the basis of information or report received or inspection carried out, the Federal Agency is of the opinion that the conditions of an approval have not been complied with, or that the information supplied by a proponent in the approved IEE or EIA is incorrect, it

shall issue notice to the proponent to show cause, within two weeks of receipt thereof, why the approval should not be cancelled.

(2) If no reply is received or if the reply is considered unsatisfactory, the Federal Agency may, after giving the proponent an opportunity of being heard:

(i) require the proponent to take such measures and to comply with such conditions within such period as it may specify, failing which the approval shall stand cancelled; or

(ii) cancel the approval.

(3) On cancellation of the approval, the proponent shall cease construction or operation of the project forthwith.

(4) Action taken under this Regulation shall be without prejudice to any other action that may be taken against the proponent under the Act or rules or regulations or any other law for the time being in force.

21. Registers of IEE and EIA projects

Separate Registers to be maintained by the Federal Agency for IEE and EIA projects under sub-section (7) of section 12 shall be in the form prescribed in Schedule VIII.

22. Environmentally sensitive areas

(1) The Federal Agency may, by notification in the official Gazette, designate an area to be an environmentally sensitive area.

(2) Notwithstanding anything contained in Regulations 3, 4 and 5, the proponent of a project situated in an environmentally sensitive area shall be required to file an EIA with the Federal Agency.

(3) The Federal Agency may from time to time issue guidelines to assist proponents and other persons involved in the environmental assessment process to plan and prepare projects located in environmentally sensitive areas.

(4) Where guidelines have been issued under sub-regulation (3), the projects shall be planned and prepared, to the extent practicable, in accordance therewith and any departure therefrom justified in the EIA pertaining to the project.

23. Environmental Assessment Advisory Committee

For purposes of rendering advice on all aspects of environmental assessment, including guidelines, procedures and categorization of projects, the Director-General shall constitute an Environmental Assessment Advisory Committee comprising –

(a) Director EIA, Federal Agency … Chairman

(b)	One representative each of the Provincial Agencies	…	Members
(c)	One representative each of the Federal Planning Commission and the Provincial Planning and Development Departments	…	Members
(d)	Representatives of industry and non-Governmental organizations, and legal and other experts	…	Members

24. Other approvals

Issue of an approval under section 12 read with Regulation 12 shall not absolve the proponent of the duty to obtain any other approval or consent that may be required under any law for the time being in force.

SCHEDULE I
(*See* Regulation 3)

List of projects requiring an IEE

A. Agriculture, Livestock and Fisheries

1. Poultry, livestock, stud and fish farms with total cost more than Rs.10 million

2. Projects involving repacking, formulation or warehousing of agricultural products

B. Energy

1. Hydroelectric power generation less than 50 MW

2. Thermal power generation less than 200 KW

3. Transmission lines less than 11 KV, and large distribution projects

4. Oil and gas transmission systems

5. Oil and gas extraction projects including exploration, production, gathering systems, separation and storage

6. Waste-to-energy generation projects

C. Manufacturing and processing

1. Ceramics and glass units with total cost more than Rs.50 million

2. Food processing industries including sugar mills, beverages, milk and dairy products, with total cost less than Rs.100 million

3. Man-made fibers and resin projects with total cost less than Rs.100 million

4. Manufacturing of apparel, including dyeing and printing, with total cost more than Rs.25 million

5. Wood products with total cost more than Rs.25 million

D. Mining and mineral processing

1. Commercial extraction of sand, gravel, limestone, clay, sulphur and other minerals not included in Schedule II with total cost less than Rs.100 million

2. Crushing, grinding and separation processes

3. Smelting plants with total cost less than Rs.50 million

E. Transport

1. Federal or Provincial highways (except maintenance, rebuilding or reconstruction of existing metalled roads) with total cost less than Rs.50 million

2. Ports and harbor development for ships less than 500 gross tons

F. Water management, dams, irrigation and flood protection

1. Dams and reservoirs with storage volume less than 50 million cubic meters of surface area less than 8 square kilometers

2. Irrigation and drainage projects serving less than 15,000 hectares

3. Small-scale irrigation systems with total cost less than Rs.50 million

G. Water supply and treatment

Water supply schemes and treatment plants with total cost less than Rs.25 million

H. Waste disposal

Waste disposal facility for domestic or industrial wastes, with annual capacity less than 10,000 cubic meters

I. Urban development and tourism

1. Housing schemes

2. Public facilities with significant off-site impacts (e.g. hospital wastes)

3. Urban development projects

J. Other projects

Any other project for which filing of an IEE is required by the Federal Agency under sub-regulation (2) of Regulation 5

SCHEDULE II

(*See* Regulation 4)

List of projects requiring an EIA

A. Energy

1. Hydroelectric power generation over 50 MW
2. Thermal power generation over 200 MW
3. Transmission lines (11 KV and above) and grid stations
4. Nuclear power plans
5. Petroleum refineries

B. Manufacturing and processing

1. Cement plants
2. Chemicals projects
3. Fertilizer plants
4. Food processing industries including sugar mills, beverages, milk and dairy products, with total cost of Rs.100 million and above
5. Industrial estates (including export processing zones)
6. Man-made fibers and resin projects with total cost of Rs.100 M and above
7. Pesticides (manufacture or formulation)
8. Petrochemicals complex
9. Synthetic resins, plastics and man-made fibers, paper and paperboard, paper pulping, plastic products, textiles (except apparel),printing and publishing, paints and dyes, oils and fats and vegetable ghee projects, with total cost more than Rs.10 million
10. Tanning and leather finishing projects

C. Mining and mineral processing

1. Mining and processing of coal, gold, copper, sulphur and precious stones
2. Mining and processing of major non-ferrous metals, iron and steel rolling
3. Smelting plants with total cost of Rs.50 million and above

D. Transport

1. Airports

2. Federal or Provincial highways or major roads (except maintenance, rebuilding or reconstruction of existing roads) with total cost of Rs.50 million and above

3. Ports and harbor development for ships of 500 gross tons and above

4. Railway works

E. Water management, dams, irrigation and flood protection

1. Dams and reservoirs with storage volume of 50 million cubic meters and above or surface area of 8 square kilometers and above

2. Irrigation and drainage projects serving 15,000 hectares and above

F. Water supply and treatment

Water supply schemes and treatment plants with total cost of Rs.25 million and above

G. Waste Disposal

1. Waste disposal and/or storage of hazardous or toxic wastes (including landfill sites, incineration of hospital toxic waste)

2. Waste disposal facilities for domestic or industrial wastes, with annual capacity more than 10,000 cubic meters

H. Urban development and tourism

1. Land use studies and urban plans (large cities)

2. Large-scale tourism development projects with total cost more than Rs.50 million

I. Environmentally Sensitive Areas

All projects situated in environmentally sensitive areas

J. Other projects

1. Any other project for which filing of an EIA is required by the Federal Agency under sub-regulation (2) of Regulation 5.

2. Any other project likely to cause an adverse environmental effect

SCHEDULE III
(See Regulation 7)

IEE/EIA Review Fees

Total Project Cost	IEE	EIA
Upto Rs.5,000,000	NIL	NIL
Rs.5,000,001 to 10,000,000	Rs.10,000	Rs.15,000
Greater than Rs.10,000,000	Rs.15,000	Rs.30,000

SCHEDULE IV

[*See* Regulation 8(2)(a)]

Application Form

1.	Name and address of proponent		Phone: Fax: Telex:	
2.	Description of project			
3.	Location of project			
4.	Objectives of project			
5.	IEE/EIA attached?	IEE/EIA :	Yes/No	
6.	Have alternative sites been considered and reported in IEE/EIA?		Yes/No	
7.	Existing land use		Land requirement	
8.	Is basic site data available, or has it been measured?	(only tick yes if the data is reported in the IEE/EIA)	Available	Measured
		Meterology (including rainfall)	Yes/No	Yes/No
		Ambient air quality	Yes/No	Yes/No
		Ambient water quality	Yes/No	Yes/No
		Ground water quality	Yes/No	Yes/No
9.	Have estimates of the following been reported?		Estimated	Reported
		Water balance	Yes/No	Yes/No
		Solid waste disposal	Yes/No	Yes/No
		Liquid waste treatment	Yes/No	Yes/No
10.	Source of power		Power requirement	
11.	Labour force (number)	Construction: Operation:		

Verification. I do solemnly affirm and declare that the information given above and contained in the attached IEE/EIA is true and correct to the best of my knowledge and belief.

Date _______

Signature, name and ______
designation of proponent
(with official stamp/seal)

SCHEDULE V
[*See* Regulation 12]

Decision on IEE

1. Name and address of proponent ______________________________
____
2. Description of project ______________________________
3. Location of project ______________________________
4. Date of filing of IEE ______________________________
5. After careful review of the IEE, the Federation Agency has decided –

(a) to accord its approval, subject to the following conditions:

____
____

or (b) that the proponent should submit an EIA of the project, for the following reasons –

____
____

[Delete (a) or (b), whichever is inapplicable]

Dated ________

Tracking no.___

Director-General
Federal Agency
(with official stamp/seal)

SCHEDULE VI
[*See* Regulation 12]

Decision on EIA

1. Name and address of proponent ______________________________
____
2. Description of project ______________________________
3. Location of project ______________________________
4. Date of filing of EIA ______________________________
5. After careful review of the EIA, and all comments thereon, the Federation Agency has decided –

(a) to accord its approval, subject to the following conditions:

____
____

or (b) that the proponent should submit an EIA with the following modifications-

____
____

or (c) to reject the project, being contrary to environmental objectives, for the following reasons:

____
____

[Delete (a)/(b)/(c), whichever is inapplicable]

Dated ________

Tracking no.___

Director-General
Federal Agency
(with official stamp/seal)

SCHEDULE VII

[*See* Regulation 13(2)]

Undertaking

I, (full name and address) as proponent for (name, description and location of project) do hereby solemnly affirm and declare that I fully understand and accept the conditions contained in the approval accorded by the Federal Agency bearing tracking no._____ dated ________, and undertake to design, construct and operate the project strictly in accordance with the said conditions and the IEE/EIA.

Date _______

Signature, name and ______
designation of proponent
(with official stamp/seal)

Witnesses
(full names and addresses)

(1) ______________

(2) ______________

SCHEDULE VIII

(*See* Regulation 21)

Form of Registers for IEE and EIA projects

S. No.	Description	Relevant Provisions
1	2	3
1.	Tracking number	
2.	Category type (as per Schedules I and II)	
3.	Name of proponent	
4.	Name and designation of contact person	
5.	Name of consultant	
6.	Description of project	
7.	Location of project	
8.	Project capital cost	
9.	Date of receipt of IEE/EIA	
10.	Date of confirmation of completeness	
11.	Approval granted (Yes/No)	
12.	Date of approval granted or refused	
13.	Conditions of approval/reasons for refusal	
14.	Date of Undertaking	
15.	Date of extension of approval validity	
16.	Period of extension	
17.	Date of commencement of construction	
18.	Date of issue of confirmation of compliance	
19.	Date of commencement of operations	
20.	Dates of filing of monitoring reports	
21.	Date of cancellation, if applicable	

Annexure –III: National Environmental Quality Standard (NEQS) 2000

REGISTERED No. M-302
L. 7646

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ISLAMABD, THURSDAY, AUGUST 10, 2000

PART-II

Statutory Notification (S.R.O)

GOVERNMENT OF PAKISTAN

MINISTRY OF ENVIRONMENT, LOCAL GOVERNMENT AND
RURAL DEVELOPMENT

NOTIFICATION

Islamabad, the 8th August 2000

S.R.O. 549 (I)/2000.___ In exercise of the powers conferred under clause (c) of sub-section (1) of section of 6 of the Pakistan environmental Protection Act. 1997 (XXXIV of 1997), the Pakistan Environmental Protection Agency, with the prior approval of the Pakistan Environmental Protection Council, is pleased to direct that the following further amendments shall be made in its Notification No. S.R.O. 742(I)/93, dated the 24th August, 1993, namely: ___

In the aforesaid Notification, in paragraph 2._____

[4138(2000)/Ex.GAZ]

Price : Rs. 5.00

(1) for Annex, I the following shall be substituted, namely:_____

Annex-I

"NATIONAL ENVIRONMENTAL QUALITY STANDARDS FOR MUNICIPAL AND LIQUID INDUSTRIAL EFFLUENTS (mg/I, UNLESS OTHERWISE DEFINED)

S. No.	Parameter	Existing Standards	Revised Standards Into Inland Waters	Into Sewage Treatment (5)	Into Sea ( )
1	2	3	4	5	6
1.	Temperature or Temperature Increase *	40^0C	≤3^oC	≤3^oC	≤3^oC
2.	pH value (H^+) .	6-10	6-9	6-9	6-9
3.	Biochemical Oxygen Demand $(BOD)_5$ at 20^0C (1)	80	80	250	80**
4.	Chemical Oxygen Demand (COD) (1)	150	150	400	400
5.	Total Suspended Solids (TSS)	150	200	400	200
6.	Total Dissolved Solids (TDS)	3500	3500	3500	3500
7.	Oil and Grease	10	10	10	10
8.	Phenolic compounds (as phenol)	0.1	0.1	0.3	0.3
9.	Chloride (as $C1^-$)	1000	1000	1000	SC***
10.	Fluoride (as F^-)	20	10	10	10
11.	Cyanide (as CN^-) total ..	2	1.0	1.0	1.0
12.	An-ionic detergents (as MBAS) (2)	20	20	20	20
13.	Sulphate (SO_4^{2-})	600	600	1000	SC***
14.	Sulphide (S^{2-})	1.0	1.0	1.0	1.0
15.	Ammonia (NH_3)	40	40	40	40
16.	Pesticides (3)	0.15	0.15	0.15	0.15

1	2	3	4	5	6
17.	Cadmium (4)	0.1	0.1	0.1	0.1
18.	Chromium (trivalent and hexavalent (4).. ..	1.0	1.0	1.0	1.0
19.	Cooper (4)	1.0	1.0	1.0	1.0
20.	Lead (4)	0.5	0.5	0.5	0.5
21.	Mercury (4)	0.01	0.01	0.01	0.01
22.	Selenium (4)	0.5	0.5	0.5	0.5
23.	Nickel (4)	1.0	1.0	1.0	1.0
24.	Silver (4)	1.0	1.0	1.0	1.0
25.	Total toxic metals	2.0	2.0	2.0	2.0
26.	Zinc	5.0	5.0	5.0	5.0
27.	Arsenic (4)	1.0	1.0	1.0	1.0
28.	Barium (4)	1.5	1.5	1.5	1.5
29.	Iron	2.0	8.0	8.0	8.0
30.	Manganese	1.5	1.5	1.5	1.5
31.	Boron (4)	6.0	6.0	6.0	6.0
32.	Chlorine	1.0	1.0	1.0	1.0

Explanations:

1. Assuming minimum dilution 1:10 on discharge, lower ratio would attract progressively stringent standards to be determined by the Federal Environmental Protection Agency. By 1:10 dilution means, for example that for each one cubic meter of treated effluent, the recipient water body should have 10 cubic meter of water for dilution of this effluent.

2. Methylene Blue Active Substances; assuming surfactant as biodegradable.

3. Pesticides include herbicides, fungicides, and insecticides.

4. Subject to total toxic metals discharge should not exceed level given at S. N. 25.

5. Applicable only when and where sewage treatment is operational and BOD_5=80mg/I is achieved by the sewage treatment system.

6. Provided discharge is not at shore and not within 10 miles of mangrove or other important estuaries.

* The effluent should not result in temperature increase of more than 3^0C at the edge of the zone where initial mixing and dilution take place in the receiving body. In case zone is not defined, use 100 meters from the point of discharge.

** The value for industry is 200 mg/I

*** Discharge concentration at or below sea concentration (SC).

Note:______ 1. Dilution of liquid effluents to bring them to the NEQS limiting values is not permissible through fresh water mixing with the effluent before discharging into the environment.

2. The concentration of pollutants in water being used will be substracted from the effluent for calculating the NEQS limits" and

(2) for Annex-II the following shall be substituted, namely:____

Annex-II

"NATIONAL ENVIRONMENTAL QUALITY STANDARDS FOR INDUSTRIAL GASEOUS EMISSION (mg/Nm^3, UNLESS OTHERWISE DEFINED)."

S. No.	Parameter	Source of Emission	Existing Standards	Revised Standards
1	2	3	4	5
1.	Smoke	Smoke opacity not to exceed	40% or 2 Ringlemann Scale	40% or 2 Ringlemann Scale or equivalent smoke number
2.	Particulate malter	(a) Boilers and Furnaces		
	(1)	(i) Oil fired	300	300
		(ii) Coal fired	500	500
		(iii) Cement Kilns	200	300
		(b) Grinding, crushing, Clinker coolers and Related processes, Metallurgical Processes, converter, blast furnaces and cupolas.	500	500
3.	Hydrogen Chloride	Any	400	400

1	2	3	4	5
4.	Chlorine	Any	150	150
5.	Hydrogen Fluoride	Any	150	150
6.	Hydrogen Sulphide	Any	10	10
7.	Sulphur Oxides (2) (3)	Sulfuric acid/Sulphonic acid plants		
		Other Plants except power Plants operating on oil and coal	400	1700
8.	Carbon Monoxide	Any	800	800
9.	Lead	Any	50	50
10.	Mercury	Any	10	10
11.	Cadmium	Any	20	20
12.	Arsenic	Any	20	20
13.	Copper	Any	50	50
14.	Antimony	Any	20	20
15.	Zinc	Any	200	200
16.	Oxides of Nitrogen	Nitric acid manufacturing unit.	400	3000
	(3)	Other plants except power plants operating on oil or coal:		
		Gas fired	400	400
		Oil fired	-	600
		Coal fired	-	1200

Explanations:-

1. Based on the assumption that the size of the particulate is 10 micron or more.

2. Based on 1 percent Sulphur content in fuel oil. Higher content of Sulphur will case standards to be pro-rated.

3. In respect of emissions of Sulphur dioxide and Nitrogen oxides, the power plants operating on oil and coal as fuel shall in addition to National Environmental Quality Standards (NEQS) specified above, comply with the following standards:-

A. **Sulphur Dioxide**

Sulphur Dioxide Background levels Micro-gram per cubic meter (ug/m^3) Standards.

Background Air Quality (SO_2 Basis)	Annual Average	Max. 24-hours Interval	Criterion I Max. SO_2 Emission (Tons per Day Per Plant)	Criterion II Max. Allowable ground level increment to ambient (ug/m^3) (One year Average)
Unpolluted	<50	<200	500	50
Moderately Polluted*				
Low	50	200	500	50
High	100	400	100	10
Very Polluted**	>100	>400	100	10

* For intermediate values between 50 and 100 ug/m^3 linear interpolations should be used.

** No projects with Sulphur dioxide emissions will be recommended.

B. Nitrogen Oxide

Ambient air concentrations of Nitrogen oxides, expressed as NO_x should not be exceed the following:-

Annual Arithmetic Mean	100ug/m^3 (0.05 ppm)

Emission level for stationary source discharge before missing with the atmosphere, should be maintained as follows:-

For fuel fired steam generators as Nanogram (10^0-gram) per joule of heat input:

Liquid fossil fuel	130
Solid fossil fuel	300
Lignite fossil fuel	260

Note:- Dilution of gaseous emissions to bring them to the NEQS limiting value is not permissible through excess air mixing blowing before emitting into the environment.

[File No. 14(3)/98-TO-PEPC.]

HAFIZ ABDULAH AWAN
DEPUTY SECRETARY (ADMN)

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PART II

Statutory Notifications (S. R. O.)

GOVERNMENT OF PAKISTAN

MINISTRY OF ENVIRONMENT

NOTIFICATIONS

Islamabad, the 18th October, 2010

S. R. O. 1062(I)/2010.—In exercise of the powers conferred under clause (c) of sub-section (I) of section 6 of the Pakistan Environmental Protection Act, 1997 (XXXIV of 1997), the Pakistan Environmental Protection Agency, with the prior approval of the Pakistan Environmental Protection Council, is pleased to establish the following National Environmental Quality Standards for Ambient Air.

National Environmental Quality Standards for Ambient Air

Pollutants	Time-weighted average	Concentration in Ambient Air		Method of measurement
		Effective from 1st July, 2010	Effective from 1st January 2013	
Sulphur Dioxide (SO_2)	Annual Average* 24 hours**	80 $\mu g/m^3$ 120 $\mu g/m^3$	80 $\mu g/m^3$ 120 $\mu g/m^3$	-Ultraviolet Fluorescence method
Oxides of Nitrogen as (NO)	Annual Average* 24 hours**	40 $\mu g/m^3$ 40 $\mu g/m^3$	40 $\mu g/m^3$ 40 $\mu g/m^3$	- Gas Phase Chemiluminescence

[2944(2010)/Ex. Gaz.] *Price: Rs. 5.00*

Pollutants	Time-weighted average	Concentration in Ambient Air Effective from 1st July, 2010	Concentration in Ambient Air Effective from 1st January 2013	Method of measurement
Oxides of Nitrogen as (NO_2)	Annual Average*	40 $\mu g/m^3$	40 $\mu g/m^3$	- Gas Phase Chemiluminescence
	24 hours**	80 $\mu g/m^3$	80 $\mu g/m^3$	
O^3	1 hour	180 $\mu g/m^3$	130 $\mu g/m^3$	-Non dispersive UV absorption method
Suspended Particulate Matter (SPM)	Annual Average*	400 $\mu g/m^3$	360 $\mu g/m^3$	- High Volume Sampling, (Average flow rate not less than 1.1 m3/minute).
	24 hours**	550 $\mu g/m^3$	500 $\mu g/m^3$	
Respirable Particulate Matter. PM_{10}	Annual Average*	200 $\mu g/m^3$	120 $\mu g/m^3$	-β Ray absorption method
	24 hours**	250 $\mu g/m^3$	150 $\mu g/m^3$	
Respirable Particulate Matter. $PM_{2.5}$	Annual Average*	25 $\mu g/m^3$	15 $\mu g/m^3$	-β Ray absorption method
	24 hours**	40 $\mu g/m^3$	35 $\mu g/m^3$	
	1 hour	25 $\mu g/m^3$	15 $\mu g/m^3$	
Lead Pb	Annual Average*	1.5 $\mu g/m^3$	1 $\mu g/m^3$	- ASS Method after sampling using EPM 2000 or equivalent Filter paper
	24 hours**	2 $\mu g/m^3$	1.5 $\mu g/m^3$	
Carbon Monoxide (CO)	8 hours**	5 mg/m^3	5 mg/m^3	- Non Dispersive Infra Red (NDIR) method
	1 hour	10 mg/m^3	10 mg/m^3	

*Annual arithmetic mean of minimum 104 measurements in a year taken twice a week 24 hourly at uniform interval.

** 24 hourly /8 hourly values should be met 98% of the in a year. 2% of the time, it may exceed but not on two consecutive days.

S. R. O. 1063(I)/2010.— In exercise of the powers conferred under clause (c) of sub-section (1) of section 6 of the Pakistan Environmental Protection Act, 1997 (XXXIV of 1997), the Pakistan Environmental Protection Agency, with the prior approval of the Pakistan Environmental Protection Council, is pleased to establish the following National Standards for Drinking Water Quality.

National Standards for Drinking Water Quality

Properties/Parameters	Standard Values for Pakistan	Who Standards	Remarks
Bacterial			
All water intended for drinking (e.Coli or Thermotolerant Coliform bacteria)	Must not be detectable in any 100 ml sample	Must not be detectable in any 100 ml sample	Most Asian countries also follow WHO standards
Treated water entering the distribution system (E.Coli or thermo tolerant coliform and total coliform bacteria)	Must not be detectable in any 100 ml sample	Must not be detectable in any 100 ml sample	Most Asian countries also follow WHO standards
Treated water in the distribution system (E. coli or thermo tolerant coliform and total coliform bacteria)	Must not be detectable in any 100 ml sample In case of large supplies, where sufficient samples are examined, must not be present in 95% of the samples taken throughout any 12-month period.	Must not be detectable in any 100 ml sample In case of large supplies, where sufficient samples are examined, must not be present in 95% of the samples taken throughout any 12 month period.	Most Asian countries also follow WHO standards
Physical			
Colour	≤ 15 TCU	≤ 15 TCU	
Taste	Non objectionable/Acceptable	Non objectionable/Acceptable	
Odour	Non objectionable/Acceptable	Non objectionable/Acceptable	
Turbidity	〈 5 NTU	〈 5 NTU	
Total hardness as $CaCO_3$	< 500 mg/l	----	
TDS	〈 1000	〈 1000	
pH	6.5 – 8.5	6.5 – 8.5	
Chemical			
Essential Inorganic	***mg/Litre***	***mg/Litre***	
Aluminium (Al) mg/l	≤ 0.2	0.2	

Properties/Parameters	Standard Values for Pakistan	Who Standards	Remarks
Antimony (Sb)	≤ 0.005 (P)	0.02	
Arsenic (As)	≤ 0.05 (P)	0.01	Standard for Pakistan similar to most Asian developing countries
Barium (Ba)	0.7	0.7	
Boron (B)	0.3	0.3	
Cadmium (Cd)	0.01	0.003	Standard for Pakistan similar to most Asian developing countries
Chloride (Cl)	< 250	250	
Chromium (Cr)	≤ 0.05	0.05	
Copper (Cu)	2	2	
Toxic Inorganic	***mg/Litre***	***mg/Litre***	
Cyanide (CN)	≤ 0.05	0.07	Standard for Pakistan similar to Asian developing countries
Fluoride (F)*	≤ 1.5	1.5	
Lead (Pb)	≤ 0.05	0.01	Standard for Pakistan similar to most Asian developing countries
Manganese (Mn)	≤ 0.5	0.5	
Mercury (Hg)	≤ 0.001	0.001	
Nickel (Ni)	≤ 0.02	0.02	
Nitrate (NO_3)*	≤ 50	50	
Nitrite (NO_2)*	≤ 3 (P)	3	
Selenium (Se)	0.01(P)	0.01	
Residual chlorine	0.2-0.5 at consumer end 0.5-1.5 at source	—	
Zinc (Zn)	5.0	3	Standard for Pakistan similar to most Asian developing countries

* indicates priority health related inorganic constituents which need regular monitoring.

Properties/Parameters	Standard Values for Pakistan	Who Standards	Remarks
Organic			
Pesticides mg/L		PSQCA No. 4639-2004, Page No. 4 Table No. 3 Serial No. 20- 58 may be consulted.***	Annex II
Phenolic compounds (as Phenols) mg/L		$\leq$ 0.002	
Polynuclear aromatic hydrocarbons (as PAH) g/L		0.01 (By GC/MS method)	
Radioactive			
Alpha Emitters bq/L or pCi	0.1	0.1	
Beta emitters	1	1	

*** PSQCA: Pakistan Standards Quality Control Authority.

Proviso:

The existing drinking water treatment infrastructure is not adequate to comply with WHO guidelines. The Arsenic concentrations in South Punjab and in some parts of Sindh have been found high then Revised WHO guidelines. It will take some time to control arsenic through treatment process. Lead concentration in the proposed standards is higher than WHO Guidelines. As the piping system for supply of drinking water in urban centres are generally old and will take significant resources and time to get them replaced. In the recent past, Lead was completely phased out from petroleum products to cut down Lead entering into environment. These steps will enable to achieve WHO guidelines for Arsenic, Lead, Cadmium and Zinc. However, for bottled water, WHO limits for Arsenic, Lead, Cadmium and Zinc will be applicable and PSQCA Standards for all the remaining parameters.

S. R. O. 1064(I)/2010.—In exercise of the powers conferred under clause (c) of sub-section (1) of section 6 of the Pakistan Environmental Protection Act, 1997 (XXXIV of 1997), the Pakistan Environmental Protection Agency, with the prior approval of the Pakistan Environmental Protection Council, is pleased to establish the following National Environmental Quality Standards for Noise.

National Environmental Quality Standards for Noise

S. No.	Category of Area / Zone	Effective from 1st July, 2010		Effective from 1st July, 2012	
		Limit in dB(A) Leq *			
		Day Time	Night Time	Day Time	Night Time
1.	Residential area (A)	65	50	55	45
2.	Commercial area (B)	70	60	65	55
3.	Industrial area (C)	80	75	75	65
4.	Silence Zone (D)	55	45	50	45

Note: 1. Day time hours: 6.00 a. m to 10.00 p. m.

2. Night time hours: 10.00 p. m. to 6.00 a.m.

3. Silence zone: Zones which are declared as such by the competent authority. An area comprising not less than 100 meters around hospitals, educational institutions and courts.

4. Mixed categories of areas may be declared as one of the four above-mentioned categories by the competent authority.

*dB(A) Leq: Time weighted average of the level of sound in decibels on scale A which is relatable to human hearing.

[No. F. 1(12)/2010-11-General.]

MUHAMMAD KHALIL AWAN,
Section Officer (PEPC).

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