Initial Environmental Examination

February 2018

PAK: Balochistan Water Resources Development Sector Project

Project No. 48098-002

Part 2 of 4

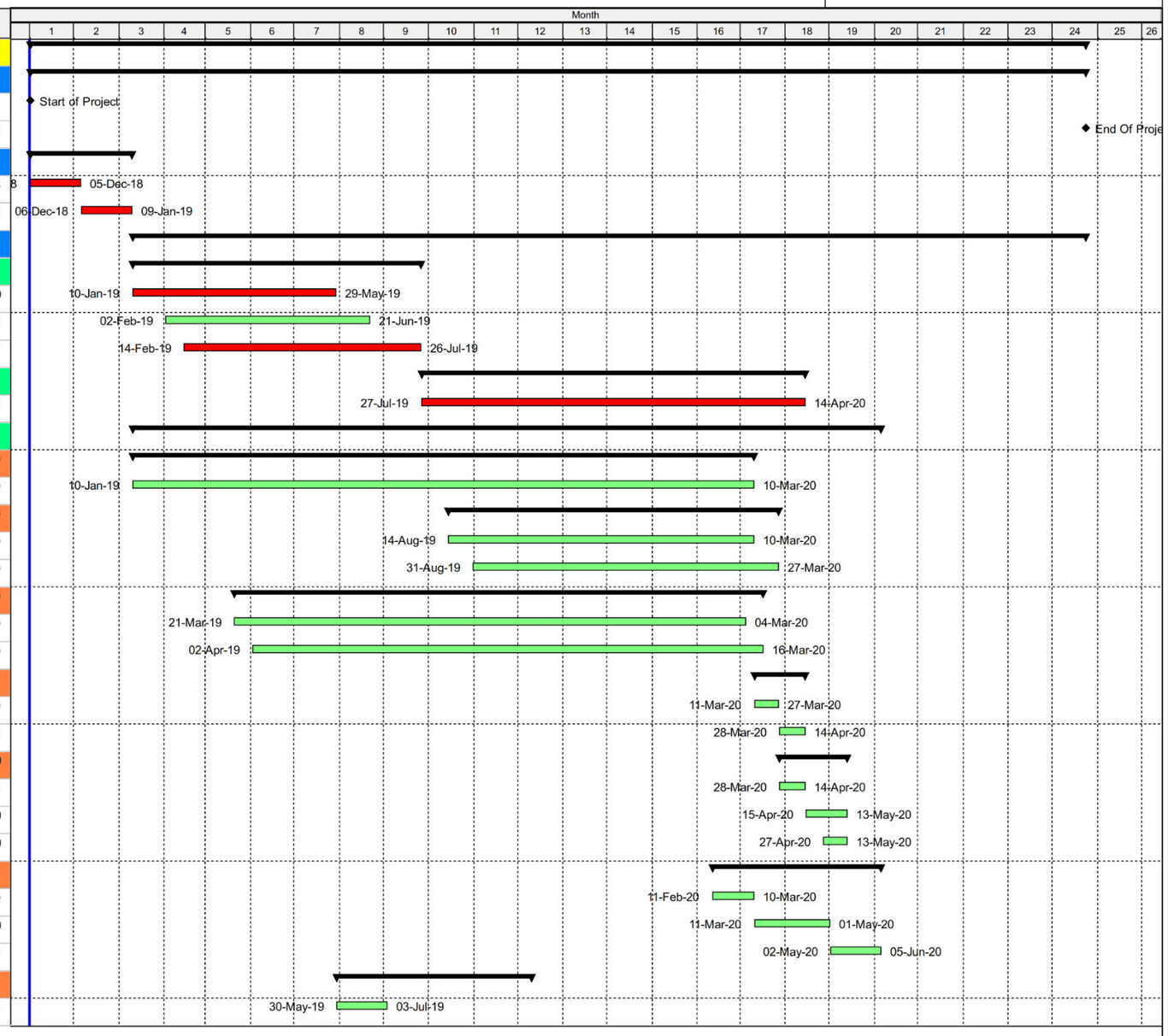
Prepared by Irrigation and Power Department, Government of Balochistan for the Asian Development Bank (ADB).

Figure 14: Construction Schedule

Techno-Consult International
WATER DIVISION

KARKH RIVER CORE SUB-PROJECT, MULA RIVER BASIN

Activity ID	Activity Name	Original Duration	Start	Finish
	KARKH RIVER CORE SUB-PROJECT, MULA RIVER BASIN	620d	01-Nov-18	23-Oct-20
	Key Milestone	620d	01-Nov-18	23-Oct-20
	Start of Project	0d	01-Nov-18	
	End Of Project	0d		23-Oct-20
	MOBILIZATION & SURVEY	60d	01-Nov-18	09-Jan-19
	Mobilizayion of manpower & Equipment	30d	01-Nov-18	05-Dec-18
	Site setting out, Cleaning & Survey work	30d	06-Dec-18	09-Jan-19
	CONSTRUCTION WORK	560d	10-Jan-19	23-Oct-20
	JHALARO WEIR	170d	10-Jan-19	26-Jul-19
	Excavation for weir, and other structure for irrigation system up to the design depth.	120d	10-Jan-19	29-May-19
	Construction of gabbion walls	120d	02-Feb-19	21-Jun-19
	Construction of RCC weir, Toe wall, side walls & deck slabs	140d	14-Feb-19	26-Jul-19
	CHUTTA WEIR REHABILITATION WORKS	225d	27-Jul-19	14-Apr-20
	Chutta weir RCC rehabilitation works.	225d	27-Jul-19	14-Apr-20
	IRRIGATION CHANNEL	440d	10-Jan-19	05-Jun-20
	CHANNEL WORKS	365d	10-Jan-19	10-Mar-20
	Construction of cement concrete channel	365d	10-Jan-19	10-Mar-20
	RCC PIPE LINE (UNDER GROUND)	195d	14-Aug-19	27-Mar-20
	Excavation for pipe Lying	180d	14-Aug-19	10-Mar-20
	Laying sand gravel & RCC pipe.	180d	31-Aug-19	27-Mar-20
	FALL STRUCTURE (5 No)	310d	21-Mar-19	16-Mar-20
	Excavation for structure	300d	21-Mar-19	04-Mar-20
	construction of RCC structure base slab,walls & chute	300d	02-Apr-19	16-Mar-20
	TRANSITION CHAMBER (1 No)	30d	11-Mar-20	14-Apr-20
	Excavation for structure	15d	11-Mar-20	27-Mar-20
	construction of RCC structure base slab & walls	15d	28-Mar-20	14-Apr-20
	SIPHON (1 No)	40d	28-Mar-20	13-May-20
	Excavation for structure	15d	28-Mar-20	14-Apr-20
	construction of RCC structure pipe cradel, base slabs & walls.	25d	15-Apr-20	13-May-20
	Providing and laying pipe, joints & shutters.	15d	27-Apr-20	13-May-20
	WASHING STRUCTURE (6 No)	100d	11-Feb-20	05-Jun-20
	Excavation for structure	25d	11-Feb-20	10-Mar-20
	construction of RCC structure base slab, walls & copping.	45d	11-Mar-20	01-May-20
	Providing and laying pipe, joints & shutters.	30d	02-May-20	05-Jun-20
	CATTLE DRINKING TROUGH (6 No)	115d	30-May-19	10-Oct-19
	Excavation for structure	30d	30-May-19	03-Jul-19



Remaining Level of Effort | Actual Work | Critical Remaining ...
Actual Level of Effort | Remaining Work | Milestone

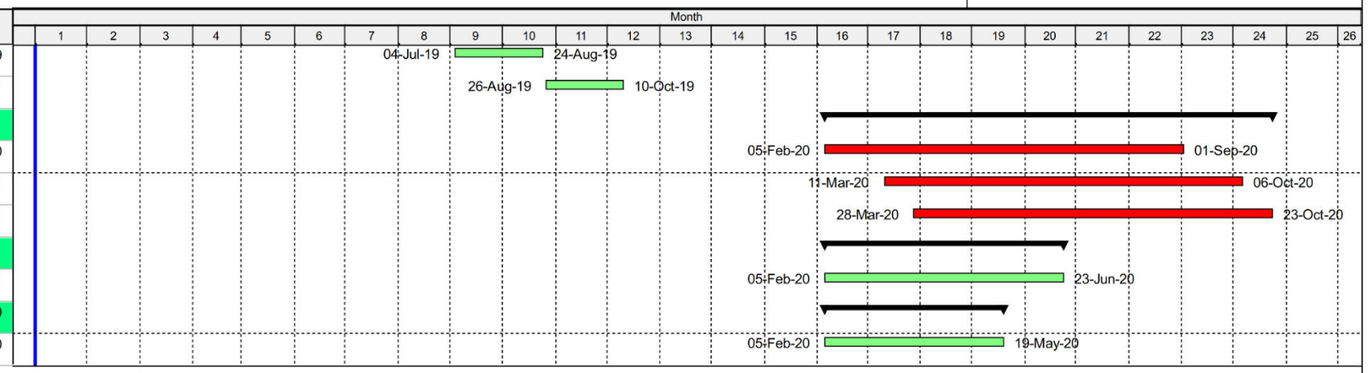
Page 1 of 2

TASK filter: All Activities

Techno-Consult International
WATER DIVISION

KARKH RIVER CORE SUB-PROJECT, MULA RIVER BASIN

Activity ID	Activity Name	Original Duration	Start	Finish
	construction of RCC structure base slab, walls & copping.	45d	04-Jul-19	24-Aug-19
	Providing and laying pipe, joints & shutters.	40d	26-Aug-19	10-Oct-19
	PROTECTION WORKS (FLOOD AND GUIDE BUN	225d	05-Feb-20	23-Oct-20
	Excavation for Flood Protection bund / Structures in all kinds of soils upto required depth	180d	05-Feb-20	01-Sep-20
	Formation of Embankment from Borrow excavation	180d	11-Mar-20	06-Oct-20
	Providing and laying grouted stone pitching & Rip Rap	180d	28-Mar-20	23-Oct-20
	RIVER BED CLEANING AND OTHER WORKS	120d	05-Feb-20	23-Jun-20
	River Cleaning works of Wandri Weir, khadri Weir, Acherwand Weir, Singori Weir & Chutta Weir	120d	05-Feb-20	23-Jun-20
	WATER SUPPLY	90d	05-Feb-20	19-May-20
	Supply and Fixing of Winching Machine including all acessories	90d	05-Feb-20	19-May-20



Remaining Level of Effort
Actual Level of Effort
Actual Work
Remaining Work
Critical Remaining ...
Milestone

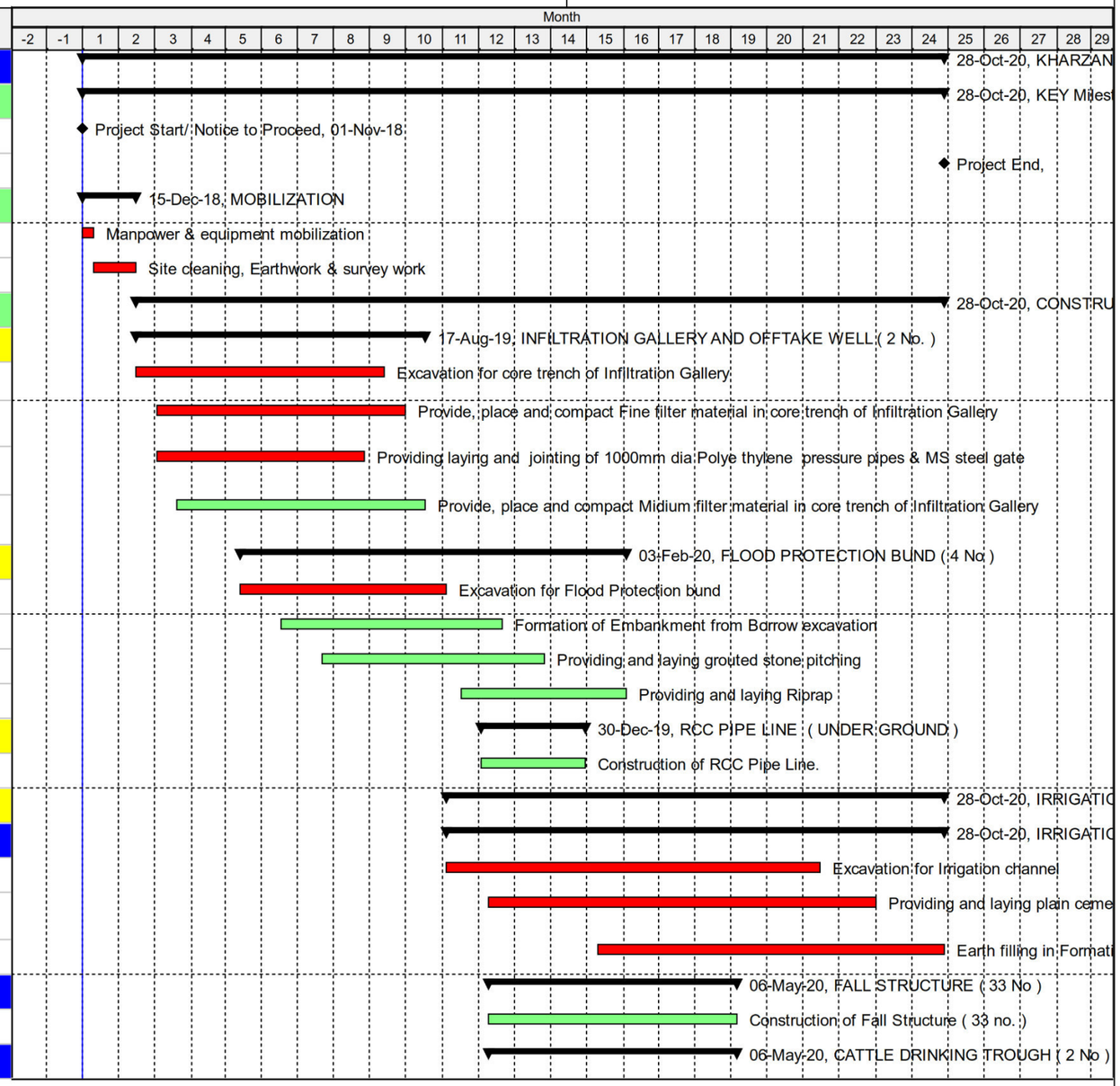
Page 2 of 2

TASK filter: All Activities

Techno-Consult International
WATER DIVISION

KHARZAN HATACHI CORE-SUB-PROJECT, MULA RIVER BASIN

#	Activity ID	Activity Name	Original Duration	Start	Finish
1		KHARZAN HATACHI CORE-SUB-PROJECT, MULA RIVER B.	624d	01-Nov-18	28-Oct-20
2		KEY Milestone	624d	01-Nov-18	28-Oct-20
3		Project Start/ Notice to Proceed	0d	01-Nov-18	
4		Project End	0d		28-Oct-20
5		MOBILIZATION	39d	01-Nov-18	15-Dec-18
6		Manpower & equipment mobilization	9d	01-Nov-18	10-Nov-18
7		Site cleaning, Earthwork & survey work	30d	10-Nov-18	15-Dec-18
8		CONSTRUCTION WORKS	585d	15-Dec-18	28-Oct-20
9		INFILTRATION GALLERY AND OFFTAKE WELL (2	210d	15-Dec-18	17-Aug-19
10		Excavation for core trench of Infiltration Gallery	180d	15-Dec-18	13-Jul-19
11		Provide, place and compact Fine filter material in core trench of Infiltration Gallery	180d	02-Jan-19	31-Jul-19
12		Providing laying and jointing of 1000mm dia Polye thylene pressure pipes & MS steel gate	150d	02-Jan-19	26-Jun-19
13		Provide, place and compact Midium filter material in core trench of Infiltration Gallery	180d	19-Jan-19	17-Aug-19
14		FLOOD PROTECTION BUND (4 No)	280d	13-Mar-19	03-Feb-20
15		Excavation for Flood Protection bund	150d	13-Mar-19	04-Sep-19
16		Formation of Embankment from Borrow excavation	160d	17-Apr-19	21-Oct-19
17		Providing and laying grouted stone pitching	160d	22-May-19	25-Nov-19
18		Providing and laying Riprap	120d	16-Sep-19	03-Feb-20
19		RCC PIPE LINE (UNDER GROUND)	75d	03-Oct-19	30-Dec-19
20		Construction of RCC Pipe Line.	75d	03-Oct-19	30-Dec-19
21		IRRIGATION CHANNEL	360d	04-Sep-19	28-Oct-20
22		IRRIGATION CHANNEL WORKS	360d	04-Sep-19	28-Oct-20
23		Excavation for Irrigation channel	270d	04-Sep-19	15-Jul-20
24		Providing and laying plain cement concrete & rubble masonary in irrigation channel	280d	09-Oct-19	31-Aug-20
25		Earth filling in Formation of Embankments	250d	10-Jan-20	28-Oct-20
26		FALL STRUCTURE (33 No)	180d	09-Oct-19	06-May-20
27		Construction of Fall Structure (33 no.)	180d	09-Oct-19	06-May-20
28		CATTLE DRINKING TROUGH (2 No)	180d	09-Oct-19	06-May-20



Remaining Level of Effort | Actual Work | Critical Remaining ...
Actual Level of Effort | Remaining Work | Milestone

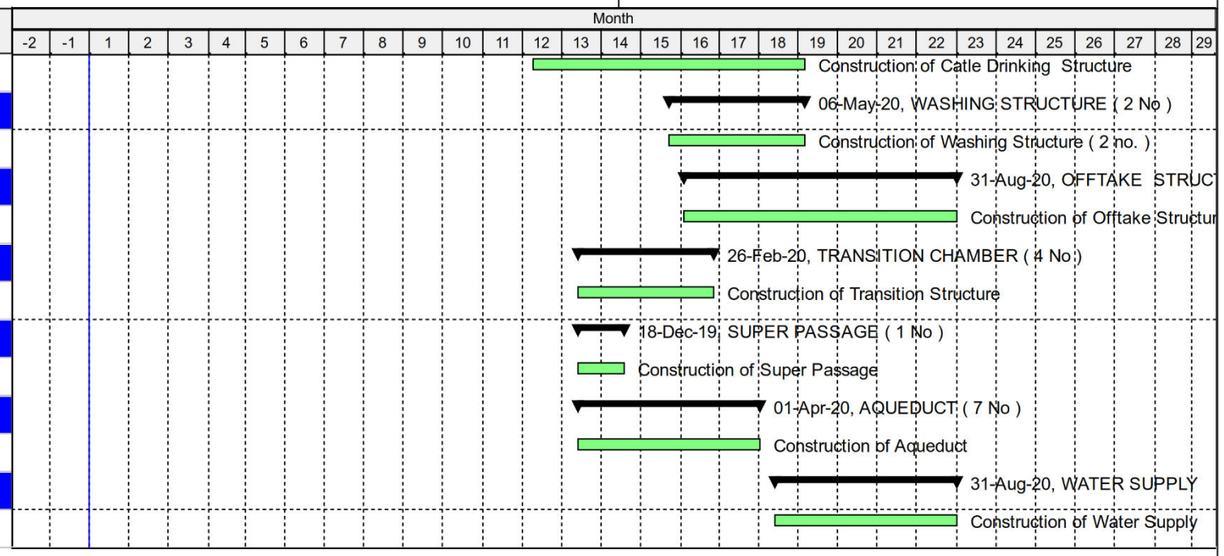
Page 1 of 2

TASK filter: All Activities

Techno-Consult International
WATER DIVISION

KHARZAN HATACHI CORE-SUB-PROJECT, MULA RIVER BASIN

#	Activity ID	Activity Name	Original Duration	Start	Finish
29		Construction of Catle Drinking Structure	180d	09-Oct-19	06-May-20
30		**WASHING STRUCTURE (2 No)**	90d	22-Jan-20	06-May-20
31		Construction of Washing Structure (2 no.)	90d	22-Jan-20	06-May-20
32		**OFFTAKE STRUCTURE (20 No)**	180d	03-Feb-20	31-Aug-20
33		Construction of Offtake Structure (20 No)	180d	03-Feb-20	31-Aug-20
34		**TRANSITION CHAMBER (4 No)**	90d	13-Nov-19	26-Feb-20
35		Construction of Transition Structure	90d	13-Nov-19	26-Feb-20
36		**SUPER PASSAGE (1 No)**	30d	13-Nov-19	18-Dec-19
37		Construction of Super Passage	30d	13-Nov-19	18-Dec-19
38		**AQUEDUCT (7 No)**	120d	13-Nov-19	01-Apr-20
39		Construction of Aqueduct	120d	13-Nov-19	01-Apr-20
40		**WATER SUPPLY**	120d	13-Apr-20	31-Aug-20
41		Construction of Water Supply	120d	13-Apr-20	31-Aug-20



Remaining Level of Effort | Actual Work | Critical Remaining ...
Actual Level of Effort | Remaining Work | Milestone

Page 2 of 2

TASK filter: All Activities

4. ALTERNATE ANALYSIS

4.1 Project Need and Justification

4.1.1 Karkh

169. Karkh Subproject includes the extension of lined channels, repair and raising of existing weirs, cleaning of grass and weeds along the river way and channels, extension of flood protection bund to protect a command area of 2,250 ha.

170. This subproject will help to meet the project target for improvement of 20,000 ha existing irrigation lands. All of the six selected schemes are located on main Karkh River.

4.1.2 Kharzan-Hatachi Infiltration Gallery

171. Although Kharzan is already receiving its required irrigation water, but there is conflict on the water use among the two villages (Kharzan and Hatachi). Construction of the infiltration galleries for each village will resolve this issue.

172. Furthermore, as Hatachi is downstream of Kharzan Village it receives irrigation water only when the water requirement of Kharzan has been met by Mula River flow. This causes an unreliable situation of irrigation supplies in Hatachi.

173. The existing off-take well, constructed under BCIAP (1997) is dysfunctional since the last major flood in 2005. Presently, flow from Mula River is being diverted through a temporary arrangement to Kharzan and onwards to Hatachi. The system has a low capacity and fails to fulfill the irrigation water requirements of both villages.

174. This project will assure water supplies to 575ha existing commands, and also adding 106 ha new command area in Hatachi, Flood protection for Kharzan and Hatachi villages with proper distribution of readily available water with little investment and optimum productivity.

175. Owing to the above argument, conceptual plans were developed for determining the feasibility of the subprojects. During the pre-feasibility stage phase in the project cycle several alternatives were evaluated. Following alternatives were discussed to finalize the conceptual design of the subprojects:

4.2 No Project Alternative

4.2.1 Six weirs at Karkh River

176. Weirs at the Karkh river were constructed over 20 years ago and have been operating successfully over the passage of time. The lack of maintenance has damaged the existing infrastructure and have become useless for irrigation works.

177. Due to this reason, the existing command area will reduce and cause a decline in the socio-economic aspect of the 6 villages at Karkh river.

4.2.2 Hatachi – Kharzan Infiltration Gallery

178. An intake structure and water channel has been constructed about 20 years ago with protection wall of gabion. Over the years, some part of gabion wall has been damaged due to flood flows in the Mula River. The intake structure is damaged and not supplying water to the supply channel. Absence of proper flow diversion structure restricts the villagers to use the perennial flow and is adversely affecting the irrigation capability of the command area.

4.3 Alternatives Interventions at Karkh River

179. Weirs at the Karkh river were constructed over 20 years ago and have been operating successfully over the passage of time. The lack of maintenance has damaged the existing infrastructure and have become useless for irrigation works. The rehabilitation of existing structures with minor additional works and cleaning of weeds is proposed because of its success in the past. Therefore, alternative analysis of Karkh River interventions is not carried out. Minor additional works at all the six locations have been proposed as following:

- Irrigation network rehabilitation and lining
- Extension of flood protection bund
- Rehabilitation of Chutta weir i.e. The upstream cutoff wall of the existing weir at Chutta is damaged. The computed upstream and downstream cutoff wall is 2 m deep from the structure's base which will be rehabilitated.
- Construction of weir at Jhalaro

180. As discussed in para 122 that Karkh River intervention mainly focused on rehabilitation works therefore alternative analysis is not required. However, at Jhalaro a new weir is to be constructed consequently the alternative analysis for the same is required. **Table 12** below provides comparison of alternatives with respect to design:

Table 12: Comparison of Alternatives for Jhalaro

S. No.	Option	Reasons for selection/Rejection
1	**Offtake well**	Since, the perennial flow is available at Jhalaro, offtake well is considered as the most economical option. However, the river axis is very wide and the active streams change their path after every flood. It was assumed that the offtake well would be left abandoned after one of two years. Therefore, this option was not selected.
2	**Infiltration Gallery**	As a second design estimate, infiltration gallery was considered as most economical head regulator to irrigate the command area of Jhalaro Village. But the topography of the area is very mild. The conveyance conduit from the infiltration gallery would lost a huge patch of cultivable land till the daylight point. Therefore, this option was also not selected.
3	**Weir**	The surface flow is available at Jhalaro. Therefore, construction of weir was considered as the best option. The weir would create the required head which can divert the water to the command area. To save the cost, the material of the weir is replaced from concrete to gabion.

181. Comparison of alternative as mentioned in **Table 13** shows that the infiltration gallery is the best alternative with respect to availability of water for the whole year.

4.4 Interventions at Mulla River (Hatachi – Kharzan Infiltration Gallery)

4.4.1 Alternatives

182. The following two options were considered at Hatachi-Kharzan:

- A water intake structure, as head works, with proper flood protection works for canal system and lining the entire water channel to the command area including drainage structures.
- An infiltration gallery along with lined irrigation channel up to the command area.

183. It was duly noted during field investigations that the surface water would not be available during the entire year however the subsurface water (river back flow) is available all year round hence the selection of an Infiltration gallery across the entire river bed has been proposed.

184. The objective of the project is to provide more irrigation water to the existing and available command area in Kharzan and Hatachi Villages.

185. The subproject will also provide with the protection bund along some reaches of command area to preserve it from flood water. The provision of permanent infrastructure will improve system efficiency by reducing losses and conveyance times between the source and outlets. Availability of water round the year will increase productivity of the area and enhance income generation activities in the area.

186. **Table 13** below provides comparison of alternatives with respect to cost, design and environment:

Table 13: Comparison of Alternatives

Parameters	Weir	Infiltration Gallery
Cost	700 Million PKR	535.4 Million PKR
Design	Weir can only be operateable during surface flow of river.	Infiltration gallery can provide water to agricultural field around the year
Perceived Environmental Impacts	Soil erosion, loss of natural vegetation, deployment of external labor force.	Soil erosion, loss of natural vegetation, deployment of external labor force.

187. Comparison of alternative as mentioned in **Table 13** shows that the infiltration gallery is the best alternative with respect to cost and availability of water for whole year.

5. ENVIRONMENTAL & SOCIAL BASELINE CONDITIONS

188. Spatial project boundary is defined as the specific site area that includes the areas of construction and operation and the zones of influence around the project site i.e. physical, biological and socioeconomic. The area of influence around the proposed subproject interventions are attached **Annexure - 6**. It specifically includes the construction area and the land adjacent to it. The adjacent land includes any area that is directly disturbed by the construction and operational activities of the project. The project boundary may vary for different major areas covered under physical, biological and socioeconomic environment depending upon the areas of influence. This chapter describes the environmental setting of the proposed interventions.

189. The data presented in the following sections has been collected from both secondary and primary sources. For secondary data acquisition, the project team contacted the relevant departments and gathered the required information. Primary data was collected during reconnaissance surveys and detailed visits during May 2017. The secondary data was also verified, and visual observations were made during these visits.

5.1 Physical Resources

5.1.1 Geography

190. Balochistan is situated in the southwest of Pakistan and covers an area of 347,190 square kilometers (134,050 sq. mi). It is Pakistan's largest province by area, constituting 44% of Pakistan's total land mass. The province is bordered by Afghanistan to the north and north-west, Iran to the south-west, Punjab and Sindh, and Khyber Pakhtunkhwa and the Federally Administered Tribal Areas to the north-east. To the south lies the Arabian Sea. Balochistan is located on the south-eastern part of the Iranian plateau. It borders the geopolitical regions of the Middle East and Southwest Asia, Central Asia and South Asia. Balochistan lies at the mouth of the Strait of Hormuz and provides the shortest route from seaports to Central Asia. Its geographical location has placed the otherwise desolate region in the scope of competing global interests for all of recorded history.[9]

191. Balochistan is rich in exhaustible and renewable resources; it is the second major supplier of natural gas in Pakistan. The province's renewable and human resource potential has not been systematically measured or exploited due to pressures from within and without Pakistan. Local inhabitants have chosen to live in towns and have relied on sustainable water sources for thousands of years.[10]

[9] https://en.wikipedia.org/wiki/Balochistan,_Pakistan#Geography
[10] https://en.wikipedia.org/wiki/Balochistan,_Pakistan#Geography

192. The capital city Quetta is located in a densely populated portion of the Sulaiman Mountains in the north-east of the province. It is situated in a river valley near the Bolan Pass, which has been used as the route of choice from the coast to Central Asia, entering through Afghanistan's Kandahar region. The British and other historic empires have crossed the region to invade Afghanistan by this route.[11]

5.1.2 Geology

193. The geological features of Karkh River Development subproject area comprise of Oligocene and Eocene Sedimentary Rocks. Area adjacent to the subproject location, and also some part of the command area has underlying Eocene Sedimentary Rocks. [12]

194. The geological features of **Kharzan-Hatachi subproject area** comprise of Paleocene sedimentary rocks. Area adjacent to the subproject location, and also some part of the command area has underlying Eocene sedimentary rocks.[13]

5.1.3 Seismicity

195. The entire province of Balochistan lies in a seismically active region. The province has experienced devastating earthquakes in the past. A powerful earthquake with a magnitude of 7.0 on the Richter scale was recorded on May 31, 1935 and devastated Quetta town and resulting in 35,000 fatalities.

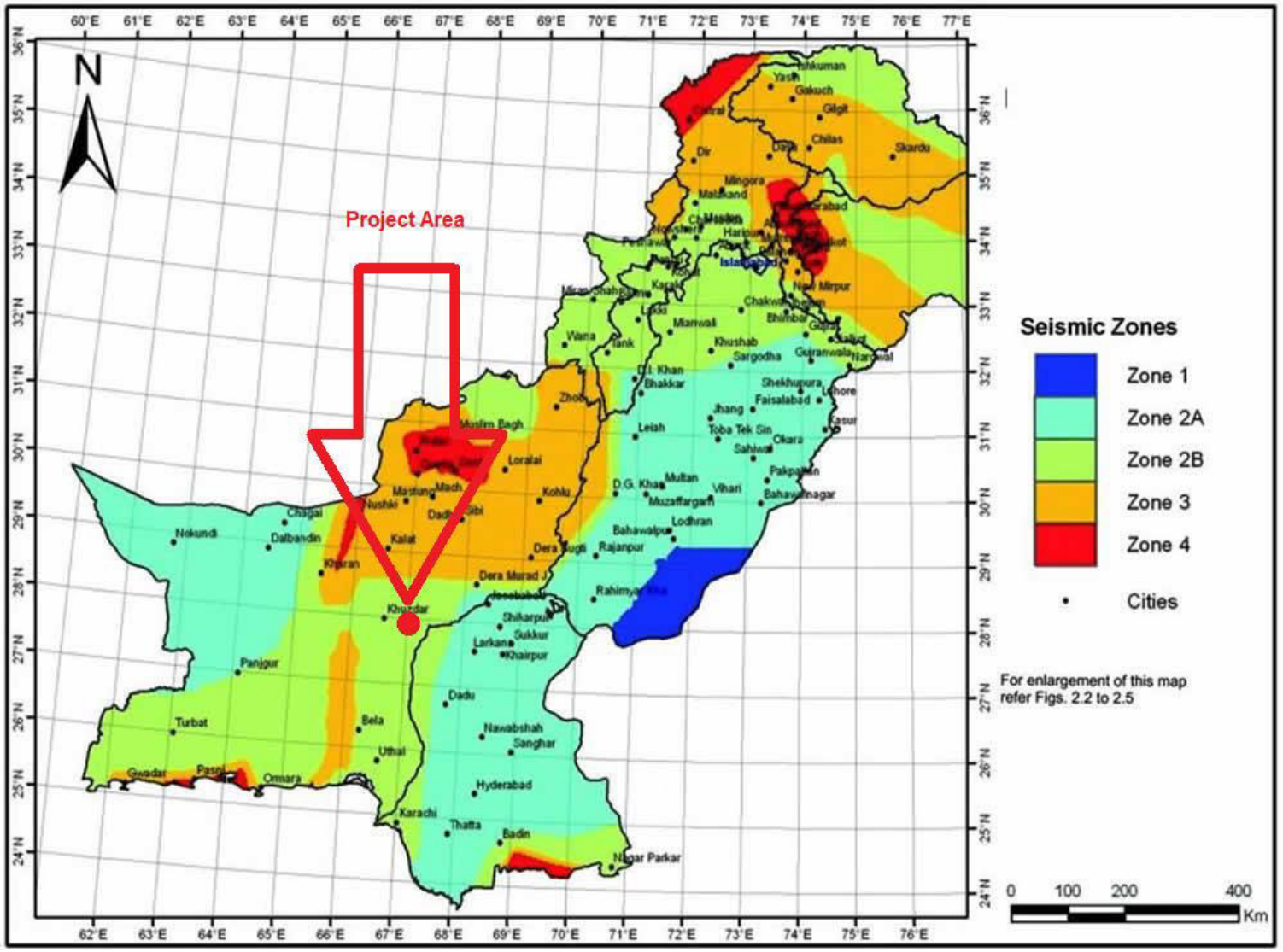
196. Again, on the Nov 28th, 1945, an earthquake measuring 8.6 on the Richter scale hit Balochistan killing almost 4,000 people.

197. A history of recorded earthquakes is attached as **Annexure - 7**.

198. The seismic zoning map of Pakistan, indicates that the project area lies in the **zone 2B**. This zone is liable to MSK VI or less and is classified as the Low Damage Risk Zone. The Medvedev–Sponheuer–Karnik scale, also known as the MSK or MSK-64, is a macroseismic intensity scale used to evaluate the severity of ground shaking on the basis of observed effects in an area of the earthquake occurrence. An explanation of MSK intensity is given as **Annexure-7**. The updated Seismic Zoning Map of Pakistan is shown below as **Figure 15.**

[11] Bolan Pass – Encyclopædia Britannica Eleventh Edition
[12] Standard interpretation of Geological map of Pakistan by Geological Survey of Pakistan
[13] Standard interpretation of Geological map of Pakistan by Geological Survey of Pakistan

Figure 15: Seismic Zoning Map of Pakistan



Source: Geological Survey of Pakistan

5.1.4 Topography

- ***Karkh River Development subproject area***

199. High mountains having steep slopes are found in the upstream areas of the subproject. The terrain is generally flat in the subproject area and is suitable for command area development. The subprojects are constructed on narrow gorges having a river width varies from 100 m to 150 m. The Karkh River has a longitudinal slope of 1:175 in these reaches.[14]

- **Kharzan-Hatachi subproject area**

200. The subproject is located in the middle reach of Mula River. The subproject is proposed on relatively wide gorge where the river is bounded by high mountains on both sides. The river has a width of 530 m and an elevation of 638 m above mean sea level at the subproject location. Moreover, the river is very steep in this reach having a longitudinal slope of 1:70.[15]

201. Kharzan and Hatachi are the largest bents on the river. Both bents are bounded by high hills on one side and Mula River on the other side. The terrain is generally flat in the subproject area and is suitable for command area development. The new command area is on a degraded rangeland.

5.1.5 Climate

202. The climate of Balochistan is generally arid (Rasul et al., 2012; Burke et al., 2005). The province can be divided into three broad climatic zones:

- Hyper-arid (<100 mm/year) - Chaghai, Makran coastal areas and south-east of Lasbela
- Arid (100-250 mm/year) - Northeast of Zhob, Loralai, Sibi, Kachhi, Lasbela plains, and Pab-Mor ranges
- Semi-arid (250 – 400 mm/year) - Sulaiman ranges covering Toba Kakari area, Marri Bugti areas, and Pab Khirthar mountain ranges and Brahui ranges.

203. The temperature regime in Balochistan is extremely variable and is directly related with the altitude.

204. High altitude areas with cooler temperatures usually experience a mean annual temperature between 10°C to 18°C. Frost and snow prevail during winters. Low altitude temperate climate region has mean annual temperature between 18°C and 24°C. Tropical temperature dominates in the low mountain belt and low land facing the Arabian Sea with

[14] Sub - Project Feasibility Report
[15] Sub - Project Feasibility Report

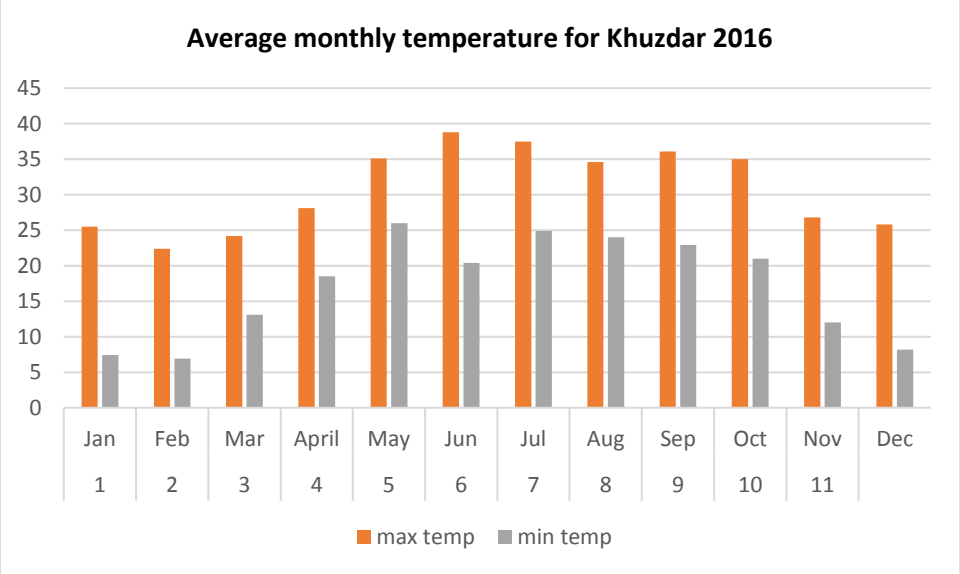
a mean annual temperature between 29°C and 37°C (Rees et al., 1990; Burke et al., 2005).

205. The province experiences frequent spells of droughts and occasional but torrential floods. Perennial rivers are rare in the region and life is mostly dependent on runoff farming ('Khushkaba') or Spate irrigation (flood water harvesting or 'Sailaba'). Approximately 40% of irrigation water in Balochistan comes from the Indus River which irrigates only 5% of the province. This is because of rugged terrain and poor infrastructure.

Table 14: Average Monthly Temperature for Khuzdar 2016

S.No.	Month 2016	UoM	Max temp	Min temp
1	January	°C	25.5	7.4
2	February	°C	22.4	6.9
3	March	°C	24.2	13.1
4	April	°C	28.1	18.5
5	May	°C	35.1	26
6	June	°C	38.8	20.4
7	July	°C	37.5	24.9
8	August	°C	34.6	24
9	September	°C	36.1	22.9
10	October	°C	35	21
11	November	°C	26.8	12
12	December	°C	25.8	8.2
Source: Pakistan Meteorological Department				

206. The **Table 14** provides minimum and maximum temperatures of Khuzdar district of 2016. The hottest months are June and July while the coldest months are January and February.



5.1.6 Rainfall

207. Approximately 40% of average rainfall in eastern and southern Balochistan occurs in the months of July and August (monsoon dominated environments). However, less than 10% of average rainfall occurs in monsoon in western parts of the province (temperate climate regions). This makes rainfall dependability throughout upland Balochistan generally low (Rees et al., 1990).

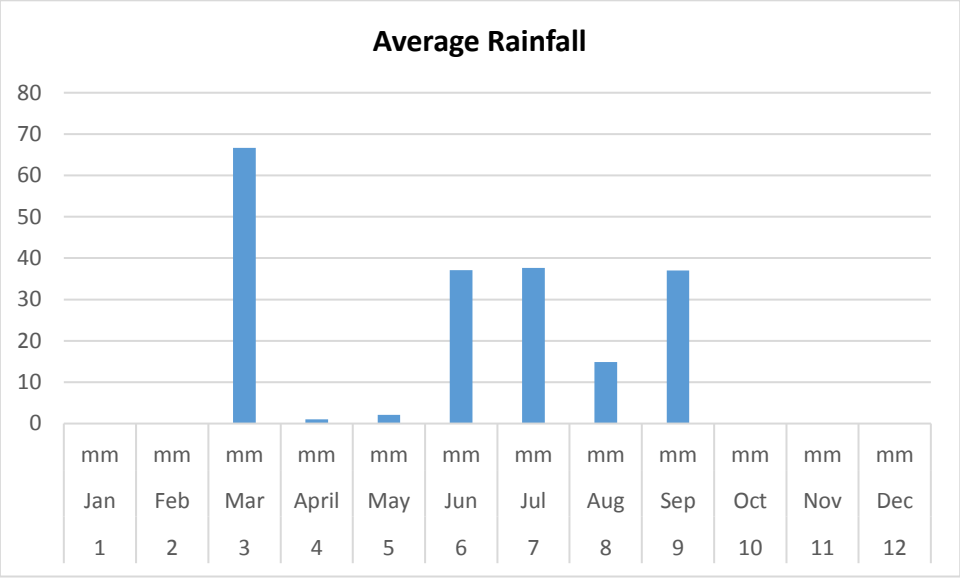
208. In a report published by Pakistan' National Disaster Management Authority, Monsoon Season 2016 unfolded with five rain spells at regular intervals starting from 28 June to 16 September 2016. As per Pakistan Meteorological Department (PMD), Monsoon 2016 remained 25% Above Normal against predicted rainfall of 10 - 20% Above Normal. During the month of August, rainfall was largely in excess across much of the Country while in July, the Country experienced slightly less rainfall[16].

[16] Pakistan' National Disaster Management Authority, "POST DISASTER REPORT MONSOON 2016", http://www.ndma.gov.pk/publications/Post%20Monsoon%202016%20Report%202%20March%202017.pdf

Table 15: Average rainfall data for Khuzdar 2016

S.No.	Month 2016	UoM	Average Rainfall
1	January	mm	0
2	February	mm	0
3	March	mm	66.7
4	April	mm	1.0
5	May	mm	2.1
6	June	mm	37.1
7	July	mm	37.6
8	August	mm	14.9
9	September	mm	37.0
10	October	mm	0
11	November	mm	0
12	December	mm	0
Source: Pakistan Meteorological Department			

209. The **Table 15** shows that March received the maximum rainfall in 2016, while June, July and September received approximately same amount of rainfall (around 37mm).



5.1.7 Hydrology and Floods

- ***Karkh River Development subproject area***

210. The overall water balance at basin level is carried out through hydrological modeling of the whole river basin. Stream flow and base flow is predicted for each subproject by specifying location on the particular river reach in a GIS interface supported hydrological model ArcSWAT. ArcSwat model is used to simulate groundwater and surface water

based on the available meteorological, land use and soil data records. The calibration of the model was carried out for observed stream flow data for 9 years. The results of the water balance study represent the proportion of each component of the hydrological cycle.

- ***Kharzan-Hatachi subproject area***

211. The overall water balance at basin level is carried out through hydrological modeling of the whole river basin. Stream flow and base flow is predicted for each subproject by specifying location on the particular river reach in a GIS interface supported hydrological model ArcSWAT. ArcSwat model is used to simulate groundwater and surface water based on the available meteorological, land use and soil data records. The calibration of the model was carried out for observed stream flow data for 9 years. The results of the water balance study represent the proportion of each component of the hydrological cycle

212. The site is located in the middle part of the basin on main Mula River. There are number of existing subproject diversion upstream of this location. However, there is substantial potential for a new subproject having a catchment area of 5,219 sq.km. The annual average availability of water is nearly 125.8 Million Cubic Meter (MCM). There is perennial surface flow at the site.

213. The results from the model were compared with measured flows during the site visit. During the site visit in November (2016), 5.09 cumec flow was observed in the river. The ArcSWAT model for November estimates that the river will have 3.39 cumec flow. This shows that the order of magnitude estimated by the model is in close conformity with the actual flows.

5.1.8 Water Quality

- ***Karkh River Development subproject area***

214. Water samples at weirs were tested and presented in the **Table 16**. The coordinates of these samples are given in the following table along with laboratory analysis. The analytical methods used for the analysis of these sample are given and can be referred from the Laboratory reports attached **Annexure- 8** and Location Map of sampling points are attached as **Annexure – 9** of this report

Table 16: River water analysis at Karkh River Development project area

#	Parameter	UoM	Weir – Surface Water					
			Chutta	Wandari	Khadri	Jhalaro	Acharwand	Sinjhvari
		UTM Coordinates	3068483.89 N 318183.44 E	3067656.38 N 318230.36 E	3069147.25 N318735.75 E	3069450.82 N 318965.12 E	3071029.12 N 319626.61 E	3073729.22 N 320874.34 E
1	Turbidity	NTU	BDL	1	1	BDL	1	BDL
2	Total Suspended solids	mg/L	BDL	BDL	BDL	BDL	BDL	BDL
3	Total Dissolved Solids	mg/L	540	542	588	600	1,099	1,050
4	pH		7.87	7.89	7.97	7.91	7.87	8.30
5	Aluminum	mg/L	BDL	BDL	BDL	BDL	BDL	BDL
6	Antimony	mg/L	BDL	BDL	BDL	BDL	BDL	BDL
7	Arsenic	mg/L	BDL	BDL	BDL	BDL	BDL	BDL
8	Barium	mg/L	BDL	BDL	BDL	BDL	BDL	BDL
9	Boron	mg/L	BDL	BDL	BDL	BDL	BDL	BDL
10	Cadmium	mg/L	BDL	BDL	BDL	BDL	BDL	BDL
11	Chromium	mg/L	BDL	BDL	BDL	BDL	BDL	BDL
12	Chromium	mg/L	BDL	BDL	BDL	BDL	BDL	BDL
13	Copper	mg/L	BDL	BDL	BDL	BDL	BDL	BDL
14	Lead	mg/L	BDL	BDL	BDL	BDL	BDL	BDL
15	Manganese	mg/L	BDL	BDL	BDL	BDL	BDL	BDL
16	Nickel	mg/L	BDL	BDL	BDL	BDL	BDL	BDL
17	Mercury	mg/L	BDL	BDL	BDL	BDL	BDL	BDL
18	Selenium	mg/L	BDL	BDL	BDL	BDL	BDL	BDL
19	Zinc	mg/L	BDL	BDL	BDL	BDL	BDL	BDL

BDL: Below Detection Limit

- ***Kharzan-Hatachi subproject area***

215. The soil type is very deep clay. The soil was moderately calcareous. No salinity and sodacity was encountered in soils. [17]

216. River water samples were tested and presented in the **Table 17** and Location Map of sampling points are attached as **Annexure – 9** of this report.

[17] Feasibility Report Paragraph 70

Table 17: River Water Analysis at Kharzan-Hatachi Project Area

#	Parameter	UoM	Kharzan-Hatachi Infiltration Gallery Surface Water UTM Coordinates 313763.63 E 3104294.59 N
1	Turbidity	NTU	BDL
2	Total Suspended solids	mg/L	BDL
3	Total Dissolved Solids	mg/L	357
4	pH		7.99
5	Aluminum	mg/L	BDL
6	Antimony	mg/L	BDL
7	Arsenic	mg/L	BDL
8	Barium	mg/L	BDL
9	Boron	mg/L	BDL
10	Cadmium	mg/L	BDL
11	Chromium	mg/L	BDL
12	Chromium	mg/L	BDL
13	Copper	mg/L	BDL
14	Lead	mg/L	BDL
15	Manganese	mg/L	BDL
16	Nickel	mg/L	BDL
17	Mercury	mg/L	BDL
18	Selenium	mg/L	BDL
19	Zinc	mg/L	BDL

BDL: Below Detection Limit

217. The river water is fresh in this reach having TDS value less than 500 ppm.

5.1.9 Ambient Air Quality

218. Ambient air in the Project Area, in general, is apparently clean, because no major industrial activity exists in the immediate surroundings of the Project Area and vehicular traffic.

219. Ambient air quality parameter as per site conditions only includes Suspended Particulate Matters was spot monitored for on all seven interventions (Chutta, Wandari, Khadri, Jhalaro, Acharwand, Sinjhvari, Hatachi – Kharzan). **Table 18** below shows **average 2 hours** results. The equipment used for air monitoring is **Hazdust EPAM 5000** and test method is **USEPA PM_{10}, 2.5 method 201a**. The results range from 0 to 15 µg/m^3 details are presented in **Annexure – 8** of this report.

Table 18: Ambient Air Quality Results (Suspended Particulate Matters)

S. No.	Location	Test Results (µg/Nm^3)	NEQS (avg. 24 hrs. µg/m^3)
1	Chutta	12	500
2	Wandari	14	500
3	Khadri	15	500
4	Jhalaro	11	500
5	Acharwand	BDL	500
6	Sinjori	4	500
7	Haatachi Khizran Infiltration Gallery	BDL	500

5.1.10 Ambient Noise

220. Under this assignment, ambient noise levels were measured at all seven locations (Chutta, Wandari, Khadri, Jhalaro, Acharwand, Sinjhvari, Hatachi – Kharzan), which range between 32-41 dB(A). This range corresponds to a low-level noise atmosphere of the rural areas, associated with some of vehicular traffic. The details of the analysis are presented in **Annexure – 8** of this report.

221. Ambient noise levels were measured and the average 2 hours monitoring results are given as following in **Table 19**. Noise monitoring was done with a type 1 noise meter.

Table 19: Summarized Results of Noise Monitoring

S. No.	Location	Noise Level dB(A)	NEQS / WHO Day Time	NEQS / WHO Night Time
1	Chutta	38	55	45
2	Wandari	41	55	45
3	Khadri	35	55	45
4	Jhalaro	36.2	55	45
5	Acharwand	37	55	45
6	Sinjori	36	55	45
7	Haatachi Khizran Infiltration Gallery	32	55	45

Source: Monitored in the Project Area by Laboratory Team.

222. Sensitive receptors are people or other organisms that may have a significantly increased sensitivity or exposure to contaminants by virtue of their age and health (e.g. schools, day care centers, hospitals, nursing homes), status (e.g. sensitive or endangered species), proximity to the contamination, dwelling construction (e.g. basement), or the

facilities they use (e.g. water supply well). The location of sensitive receptors must be identified in order to evaluate the potential impact[18]. There are no sensitive receptors within the area. The nearest villages around the both Core SubProjects are about 3-5 kms away.

5.2 Ecological Resources[19,20,21,22]

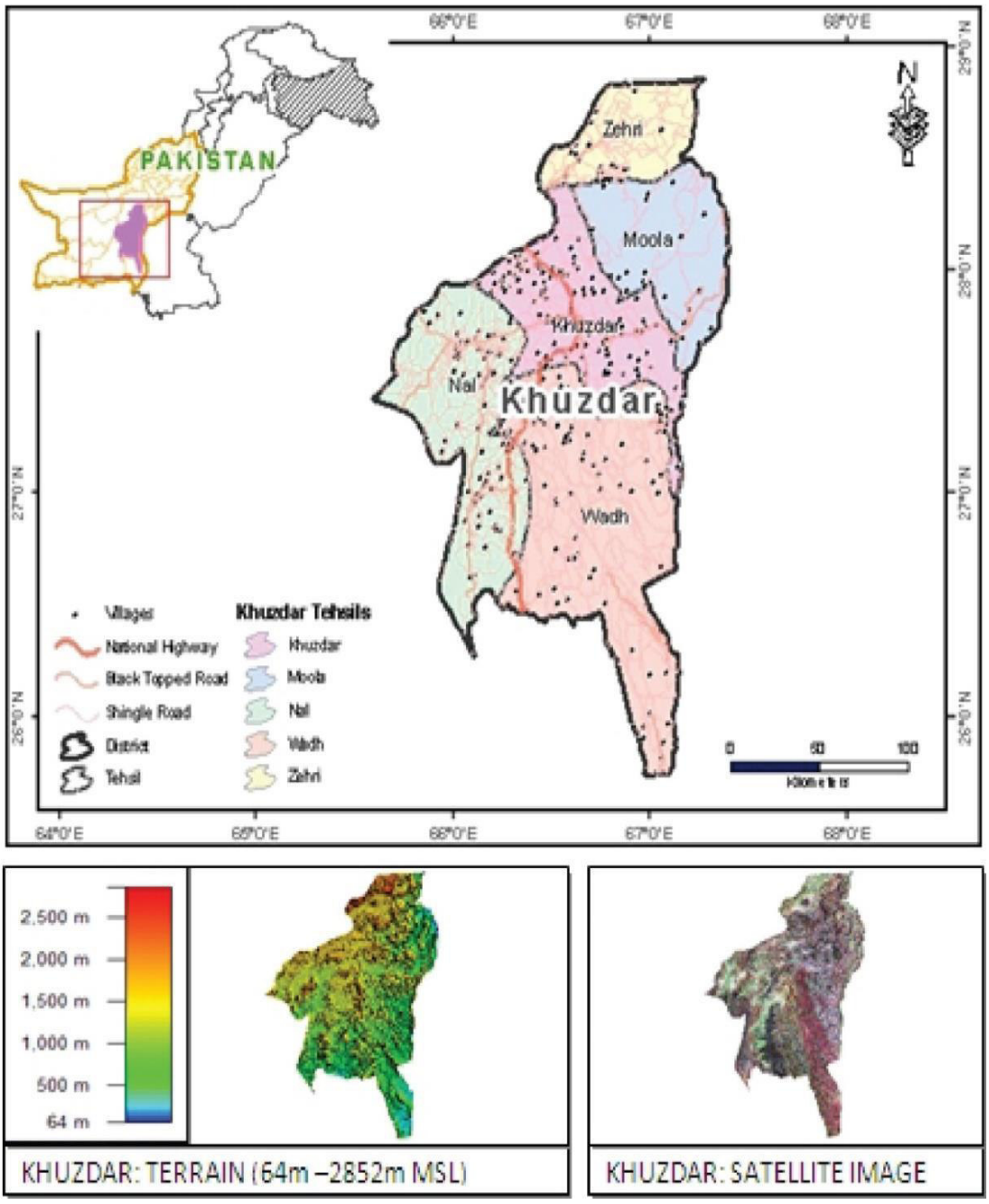
5.2.1 Ecology

223. Khuzdar is recognized as "Dry sub-tropical and temperate semi-evergreen scrub" zone of the province. The region from 7,430 feet above sea level and lower, accommodates a variety of scrub vegetation.

[18] http://www.smchealth.org/sites/main/files/file-attachments/651311584receptor_survey.pdf

[19] UNESCO- 2011- Developmental Profile of Khuzdar,
[20] IUCN- 2005- Balochistan Conservation Strategy,
[21] GEF- 2006- Protected areas of Pakistan.
[22] Balochistan Forest and Wildlife Department- Government of Balochistan.

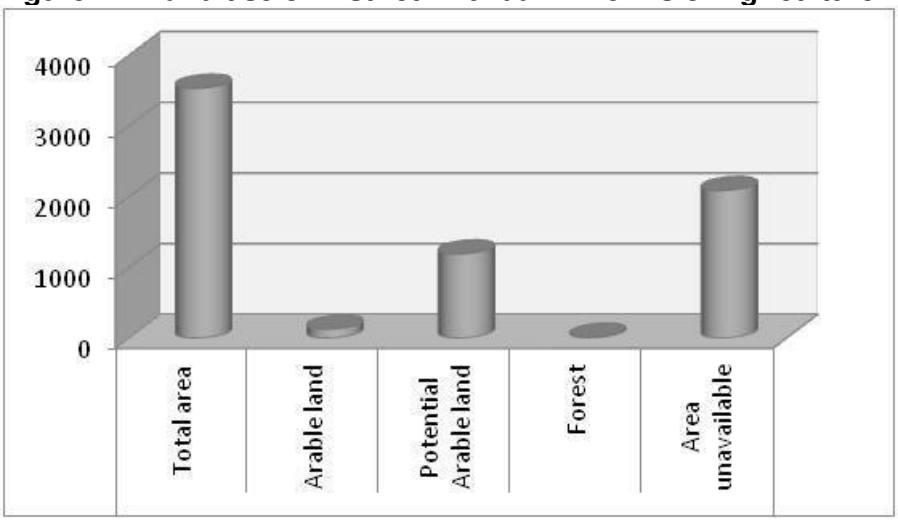
Figure 16: Administrative Profile of Khuzdar District



- **Topographic and administrative divide in Khuzdar** (Development profile of Khuzdar-2011)

224. Edaphically they are uphill steep slopes and Foot hills, Piedmont plains and stream beds, represented by a range of floristics and faunal composition. The uphill steep slopes represent a less diverse composition due to limited availability of associated factors supporting to establish an ecosystem; whereas the Piedmont plains and stream beds were seen with more diverse representation.

Figure 17: Land use of District Khuzdar in Terms of Agriculture[23]



- **Landuse pattern in Khuzdar district** (Development profile of Khuzdar-2011)

225. Mula tehsil is sparsely populated area, located in the north eastern corner of Khuzdar district, specifically characterized as alpine desert formations, Karakh represents the Piedmont plains and stream beds of Karkh river, which ultimately pours in Mula river, here the stream flows were wisely used for agricultural purpose, though the system has not a reliable flow system to called as obligatory perineal system, it faces stress time in hot weathers and when the natural downpour is inadequate. This has been pretty much reflected by the surrounding vegetation types, with compound leaves, thorny formations and dominated by xeric shrubs. The land use pattern is almost identical to the overall pattern for district, the natural forest representation is minimal and dominated by Kandi, Procopis cinererila and Acacia nilotica, and Tamatix sp. The stream bed has been seen dominated by Typha sp and Cyprus sp.



[23] UNESCO- 2011- Developmental Profile of Khuzdar,

❑ Karkh at a glance

226. The Kharzan-Hitachi area is slightly different in topographic dynamics, as it lays in the main river bed of Mula River, though the area and population are very limited, but the extent of agriculture is quite well established.

❑ Kharzan at a glance

227. The Karkh area has been fed with a limited but steady flow of Karkh river, which collects water from the surrounding hills and apparently fed in to Mula system, the comparative micro ecological analysis identified two different mechanism of water management determined on the basis of its quantity and availability. The flow in Karkh River has been wisely retained and diverted for agriculture and domestic uses, which promoted an ecosystem in the river bed identical to fresh water pond, dominated by the set of flora dominated by Typha sp.

228. The conditions in Hitachi- Kharzan area were relatively different, the flow is relatively more and consistent, and the team witnessed presence of water in channels even in dry month. The ecology of riverbed reveled a different story, by representing Narium sp. and Tamarix sp., which are perennials and indicates a relatively stable ecological behavior.

- **Narium oliender growing the river bed of Mulla River**

229. It has moderately dense forests and a negligible area has been conserved as state forest, overall natural vegetation, including shrubs, bushes and grasses can be aptly termed as rangelands. These rangelands are substantially contributing to the ecological stability of important ecosystems and economic uplift of people in the district.

Table 20: Cumulative Floristic List of Karkh and Hitachi Area

#	Taxon	Family	Life form	Vernacular name
01	Acacia nilotica	Fabaceae	Tree	Babbur
02	Acacia sengal	Fabaceae	Shrub	Babbur
03	Prosopis cineraria	Fabaceae	Tree	Kandi
04	Prosopis glandulosa	Fabaceae	Shrub	Kandi
05	Prosopis juliflora	Fabaceae	Shrub	Devi
06	Tamarix sultanii	Tamaricaceae	Shrub	Kirri
07	Zizyphus nummularia	Rhamnaceae	Shrub	Ber
08	Aerva javanica	Amarantheaceae	Shrub	Gujo
09	Periploca aphylla	Ascalpidaceae	Shrub	
10	Capparis decidua	Capparidiaceae	Shrub	
11	Haloxylon recurvum	Amarantheaceae	Shrub	
12	Suaeda fruiticosa	Amarantheaceae	Shrub	
13	Suaeda ferinosa	Amarantheaceae	Shrub	
14	Grewia domaine	Malvaceae	Shrub	
15	Alhaji marorum	Fabaceae	Shrub	
16	Salvadora oleoides	Salvadoraceae	Shrub	
17	Salvadora persica	Salvadoraceae	Shrub	
18	Heliotropium sp	Boragenaceae	Shrub	Merin
19	Calligonum polygonoides	Polygonaceae	Shrub	
20	Rhazya stricta,	Apocynaceae	Shrub	
21	Euphorbia caducifolia	Euphorbiaceae	Shrub	
22	Commiphora mukal	Burseraceae	Shrub	Gugul
23	Inula montaine	Asteraceae	Herb	Kulumurak
24	Inula grantoides	Asteraceae	Herb	Kulumurak
25	Grewia tenex	Malvaceae	Shrub	Chill
26	Phoenix dyctylefera	Palmea	Tree	Khajoor
27	Cymbopogon sp	Poaceae	Grass	
28	Cenchrus sp	Poaceae	Grass	
29	Aristida sp	Poaceae	Grass	Nadak
30	Chrysopogon sp	Poaceae	Grass	
31	Sericostoma	Boraginaceae	herb	

#	Taxon	Family	Life form	Vernacular name
	pauciflorum			
32	Typha sp	Typhaceae	Shrub	
33	Convolvulus spinosus	Convulvolaceae	Twiner	
34	Fagonia indica	Zygophyllaceae	Shrub	
35	Salsola sp	Chenopodiaceae	Shrub	

230. The majority of area does offer much of the conducive condition to grow, except for the river beds and its surroundings, one can have the extent of such habitat by looking at the following images;

Karkh

Hitachi- Khizran

Table 21: Cumulative faunal list of Karkh and Hitachi area

#	Taxon	Common name	Life form	Conservation status
01	Gazella bennettii	Chinkara	Mammals	Rare
02	Capra aegagrus	Sindh Wild Goat	Mammals	Occasional
03	Ovis orientalis blanfordi	Urial (Gut)	Mammals	Occasional
04	Vulpes grifithii	Hill fox	Mammals	Occasional
05	Hysrix indica	Porcupine	Mammals	Common
06	Felis libyca	Desert Cat	Mammals	Occasional
07	Hyaena	Striped Hyaena	Mammals	Occasional
08	Vulpes	Desert Fox	Mammals	Occasional
09	Canis aureus	Asiatic Jackal	Mammals	Occasional
10	Canis lupus	Wolf	Mammals	Occasional
11	Hemiechinus auritus megalotis	Hedgehog	Mammals	Common
12	Goluda ellioti	Bush rat	Mammals	Common
13	Lepus capensis	Cape hare	Mammals	Common
14	Chlamydotis undulata	Houbara Bustard	Bird	Migratory
15	Ammoperdix griseogularis	See-see Partridge	Bird	Reported

#	Taxon	Common name	Life form	Conservation status
16	Dupetor flavicollis	Black Bittern	Bird	Reported
17	Aquila heliaca	Imperial Eagle	Bird	Reported
18	Falco peregrinus	Peregrine Falcon	Bird	Reported
19	Pterocles coronatus	Crowned Sandgrouse	Bird	Migratory
20	Falco naumanii	Lesser Kestrel	Bird	Reported
21	Falco concolor	Sooty Falcon	Bird	Reported
22	Pterocles lichtensteini	Close-barred/ Lichtenstein Sandgrouse	Bird	Reported
23	Francolinus pondicerianus	Grey Partridge	Bird	
24	Pseudibis papillosa	Black Ibis	Bird	Reported
25	Corvus ruficollis	Brown-necked Raven	Bird	
26	Varanus griseus knoiecznyi	Indian desert monitor	Reptile	
27	Naja	Indian Cobra	Reptile	Common
28	Ablepharus pannonicus	Easter dwarf skink	Reptile	
29	Eristicophis macmahonii	Leaf nose viper	Reptile	

5.2.2 Protected areas / National Sanctuaries

231. There were some five areas initially documented in Khuzdar district, however after administrative adjustments, they were left over as follows:

Table 22: Protected Areas in Khuzdar

#	Area	Status	Tehsil	Distance from Karkh River Interventions	Distance from Haatachi Khizran Infiltration Gallery
1	Kera Dhori 8,094 hectares	Wildlife Sanctuary	Khuzdar	51 km away	55 km away
2	Chorani (19,433 hectare)	Notified forest	Khuzdar	88 km away	92 km away

232. Mula tehsil of Khuzdar district, does not have any of the listed protected sites, neither has any wetlands of national and international importance. Therefore, its ecological sensitivity has been found at lower risk or the proposed project activities do not have any significant impact on the existing natural ecosystem.

233. A combined map showing protected area and project area is given as **Annexure 10**.

5.3 Economic Development

5.3.1 Land Use and Economic Activities

234. Khuzdar district falls in the dry temperate ecological zone with a total potential agriculture area of 1,195,494 ha (Agriculture Statistics, 2008 – 09) which is about 33.8% of the total area of the district. Land use of district Khuzdar in terms of agriculture is as follows[24]:

Table 23: Land use of District Khuzdar in Terms of Agriculture

S. No:	Category	Area (Hectares)
1.	Current fallow	55,838
2.	Net sown	76, 211
3.	Arable land	132,049
4.	Culturable waste	1,063,445
5.	Potential area	1,195,494
Source: (Agriculture Statistics 2008-09)		

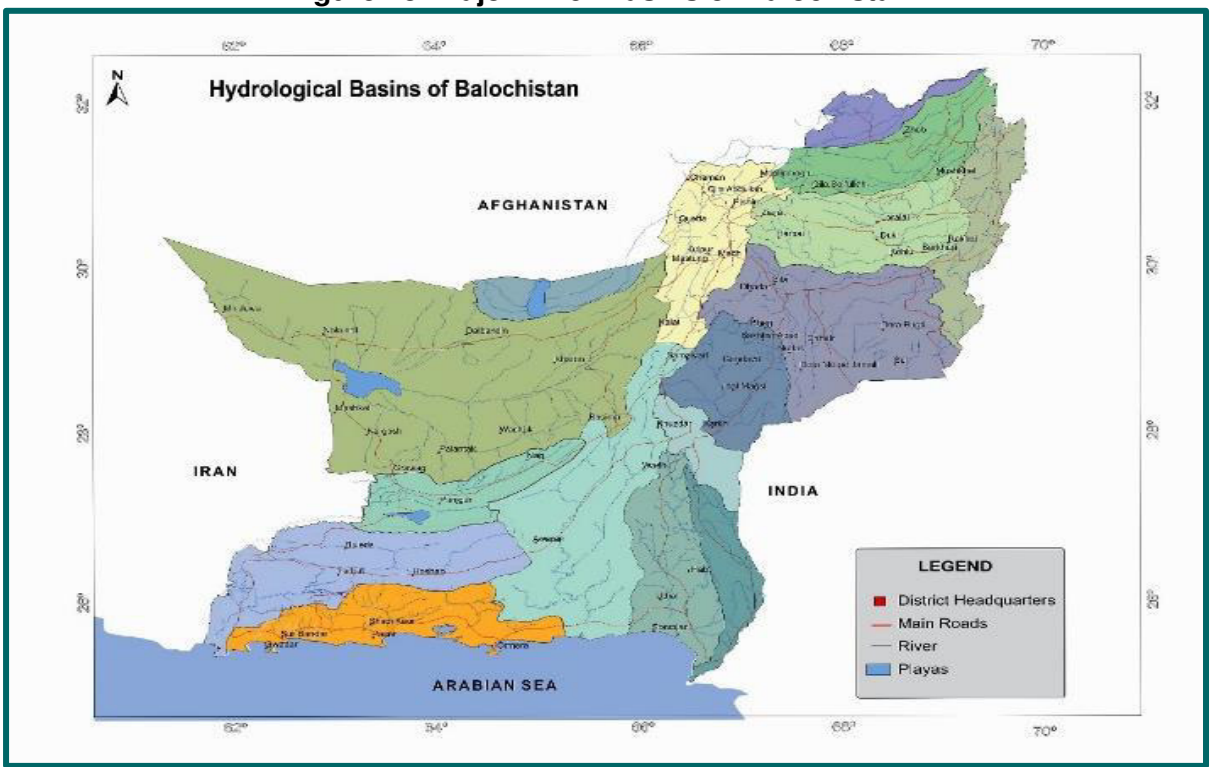
235. During 2005 to 2009, the current fallow land increased from 35% to 42%, this indicates that more area was made available for cultivation and new sown area decreased from 65% to 58%. In the district major Rabi season crops are wheat followed by fodder. It has been observed that wheat is grown on 81% of the area, while fodder crops occupy 8% of the total area. During Kharif season, mostly vegetables are grown in the district. However, cotton and melon are considered as major crops. Cottons is grown over 23.6% of the area, while melon is own on 15.7% of the total land sown during Kharif season. Among fruit crops pomegranate occupies the top position with a production of 14,505 kg per ha. Other major fruits produced in the district include: almond, apples, apricot, grapes, peach, plum, pistachio dates, citrus, banana, and guava[25].

5.3.2 Settlement Patterns

236. The current population of Balochistan province, of around 10.5 million in 2016, lives in the 18 river basins (See **Figure 18**) and is largely rural.

[24] Planning & Development Department, Government of Balochistan – UNICEF, "District Development Profile 2011", Khuzdar,
[25] Ibid, et el.

Figure 18: Major River Basins of Balochistan



5.3.3 Agriculture and Irrigation

- **Karkh River Development subproject area**

237. Karkh is located in the east of Khuzdar town at a distance of the 72 Km. Unlike Khuzdar town, ecologically the area falls in the Hot Arid Lowland Plain. Since irrigated water through construction of Perennial Irrigation Schemes (PIS) has been made available in the Karkh, therefore, the general cropping pattern in such area with proportion include:

Table 24: General cropping pattern at Karkh area[26]

Crop	Cropping area (approx.)
Wheat – Barley	44%,
Oilseeds	5%,
Fodder	8%,
Vegetable	5%,
Cotton	9%
Rice	5%,
Fruits	4%,
Sorghum	5%
Onion	15%.

[26] UNESCO- 2011- Developmental Profile of Khuzdar,

238. In Karkh river area, crops are cultivated both during Rabi season as well as during Kharif. During Rabi, the crops grown include: wheat, cauliflower, onion, tomatoes, while during Kharif following crops are sown: Onion, tomatoes, cucumber, water melon, melon, rice, cotton. In addition to the field crops, the farmers in the communities also have grown horticulture/fruit crops. Fruit crops grown in the area included: mangoes, grapes, apple, pomegranate, pistachio date palm, chiko, orange, banana and guava. The ratio between field and horticulture crops ranges from 90:10 to 80:20 in the entire area of Karkh. The major reason for the low horticulture crop production is the lack of knowledge/information and technical knowhow on the horticulture crop production. Besides, the communities informed that availability of good varieties of seedling of trees is also a major issue in promotion of horticulture crop production in the area. In the past that is before the construction of irrigation weirs/perennial irrigation schemes, the farmers in the communities used to divert water from river through kutcha/earthen dikes/bunds. However, these structures did not have enough strength to face the high intensity flood during the monsoon and spring season. Most often these structures were breached, which not only deprived the farmers from precious flood water but also damaged/eroded the valuable agriculture land.

- **Resource Base for Agriculture in Karkh area**

a. Land:

239. At present only about 2000 ha (1000 acres) is being cultivated in the Karkh area. All of this cultivated area is perennially irrigated through the PIS. Besides, this 2000 ha (1000 acres) under-cultivation, an additional area of 250 ha (6000 acres) of land in the shape of cultivable wasteland is still available, which can be developed for crop production if water resources for irrigation are made available. Irrigated agriculture over 2000 ha (1000 acres) has played a very important role in providing the livelihood opportunities to the resident community members of Karkh valley. Agriculture is thus playing a pivotal role in the local economy of Karkh area. Majority of the population living in the area is dependent upon agriculture and related disciplines for their livelihoods. Bringing another 250 ha (600 acres) would further help in increasing the agriculture crop production in the area and providing extra income earning opportunities to the population of the area.

b. Water:

240. The **major water** resource in the Karkh area is the water diverted through construction of diversion weirs under the PIS. The level of water flowing in the Mula river as sub-surface flow has been raised through construction of diversion weirs and diverted for crop production. A total of 6-weirs namely: Wandri PIS, Chutta PIS, Kadari PIS, Jhalaro PIS,

Acherwand PIS and Sinjori PIS, have been constructed under the PIS, the detail of which has been mentioned in **Table – 1**.

241. These diversion weirs have been placed strategically in the Mula River at suitable distances. From each of these diversion Weirs a channel takes water to the cropland, where it is distributed through an established traditional system. All these water channels, emanating from these PIS, put together supplies water for cultivable command area of 2,250 ha. Here it is important to mention that the water secured and diverted through these diversion weirs from the Mula River is available 24 hours for crop irrigation. During monsoon season i.e. from July to August/September, water level in the river rises, making extra water available for crop production during this season. This allows farmers of the community for brining extra land under cultivation that helps in increasing the agriculture crop production in the area. However, from March to June/July, the water level decreases in the river, which affects irrigation of crops and therefore production is low. Water distribution is managed by the Farmers Organization. The communities have a traditional system of water distribution in place, which is just managed by the members of Farmer Organization. The disputes/conflicts that may arise on water distribution or related matters are also resolved by the Farmer Organization through traditional norms.

c. Land Tenure System:

242. Following tribes are resident of the area: Mosiyanini, Akhund, Chutta, Notani, Mengal, Jamot, Chandia, Rind and Jathak. In Karkh Brahvi and Sindhi languages are spoken by the resident community members. Agriculture land is mostly cultivated by the owners; however, the tenancy is also prevalent. Three main types of **tenancy arrangements**, viz: owner operators, tenants and owner-cum-tenants are prevalent in the Karkh area of Mula River. However, it was observed that majority of the cases it was mostly the owner operators who cultivate their lands themselves. Like other areas of district Khuzdar, the tenants are of three kinds viz: occupancy tenants, who have permanent and hereditary occupancy rights, tenants- at-will are without any permanent rights and can be ejected at any time from the land they cultivate, contractors who lease the land from owners on fixed cash rent for a fixed period. The owner-cum-tenants are usually small farmers who in addition to cultivating their own land, take land on share basis from other owners in the area.

d. Level of Technology and Productivity:

243. In the Karkh area of Mula River, the farmers in the communities after the construction of Diversion Weirs through PIS have started a progressive increase in the use of various components of improved production technologies such as improved varieties, fertilizer, pesticides and farm machinery, has occurred over the years. This has resulted in a substantial increase in productivity and total production of major field and horticultural

crops. However, there are a number of gaps which, if filled, can lead to a further sustainable growth in productivity. Such gaps are attributable to non-availability of appropriate technology/input, farmers' ignorance of the modern technology, farmers' inability to adopt technology because of lack of resources or simply due to an indifferent attitude of the farmers. Major technology gaps that were observed are as follows:

- Farmers in the Karak area have adopted the use of improved varieties of wheat and other crops under irrigated condition. However, the changeover is not being adequately supported through a regular supply of quality/certified seed to ensure a reasonable rate of replacement.
- The use of fertiliser has consistently increased, concentrated more on irrigated high value crops. However, it was observed that the use is still far below the recommended doze and is highly imbalanced. Thus, the production potential of this known technology has not been fully realised, particularly under irrigated crop production.
- Although Karak area has now been connected with Khuzdar and Shahdad Kot towns through Khuzdar – Ratho Dairo Road, still the availability of fertiliser and other farm inputs is still a problem. Furthermore, technical advice for soil nutrition management, based on soil analysis, is not available. Here it is pertinent to mention that a Soil Analysis Laboratory has been established in the Agriculture Office Khuzdar, which can provide valuable services to the community farmers on soil nutrition management.
- The ratio of orchard to field crops is very low. Community farmers are gradually getting inclined towards planting fruit trees, however, this shift of cropping from field to orchards is very slow. This can be boosted up through the availability of quality plants of recommended varieties. Similarly improving some vital management practices such as pruning, and training of trees, irrigation and plant nutrition management can also help in promoting horticultural crops in the area. Major deficiencies in this context are adapted varieties, quality seed, and pest and disease control.
- Technological support, from public sector institutions, for shift towards high value crops (e.g. horticulture and floriculture), is lacking. This is adversely affecting the overall agriculture crop production in the area.
- Apart from ecological constraints, productivity of irrigated farming system is low due to lack of improved technologies for on farm water management, moisture conservation and crop production management.
- The harvest and post-harvest management in both field as well as horticultural crops is still mostly traditional and due to this very reason, a sizeable portion of field and horticultural products are wasted. It was observed that due to lack of knowhow among community farmers, major lapses occur during harvest, grading, packing, on-farm storage, transportation and marketing.
- Community farmers have though adopted the pesticide sprays for the control of insect pests and diseases in orchards and vegetables, the effectiveness is constrained by the relevance and quality of material available in the market and by the total lack of any advisory service on the timing and quantity of spray based on pest assessment.

- Although community farmers in Karkh area are using farm machinery to bring efficiency and productivity to the farm, still information on appropriate use in relevance to soil conditions and cropping system is totally lacking. This improper use of machinery is hampering the production of agriculture crops.
- In Karkh area, where the PIS have been implemented, agriculture land is located on both sides of the Mula River. During monsoon and spring season, when high floods occur, the agriculture lands located along the river banks is eroded, which leads to reduction in the land area. A strong need has been felt for construction of protection bund/gabion structure to protect valuable agriculture land from erosion.

❑ **Karkh River Development subproject area**

a. Existing and Projected Agriculture

244. At present, there is fair agricultural productivity is in the subproject. The existing cropped area is 2,000 ha with 89% cropping intensity followed by annual cropping pattern wheat – Kharif vegetables – melon – fodder.

245. The projection of agriculture for the subproject has been made keeping in view the current irrigated cropped area, cropping intensity, yield and production in the subprojects through findings of the agronomic field survey in and around the subproject area. Development in the subproject area will enrich the cropped area from 2,000 ha to 2,250 ha and the cropping intensity will be enhanced from 89% to 120%. The detailed existing and proposed / projected agriculture analysis and gross irrigation requirement area are given in **Annexure – 11**.

b. Irrigation Water Right

246. They have equal water rights without any confliction in terms of water distribution / rights. The available water is being diverted to cultivated land / field as per land capacity / farm size according to the time division rule and they ensured that they will follow this current rule of water distribution / right in the future as well.

c. Proposed Agricultural Development

247. It is expected that the cropping intensity would be completed within 2 to 3 years after commencement of the project. The cropping pattern will be change with high yield and profitable crops. Efficient crop management can increase the profits of local farmers and decrease their costs involved in fruit production.

❑ **Kharzan-Hatachi subproject area**

248. Kharzan – Hitachi, are two villages that are located in the north-east at a distance of 120 km from the district headquarters Khuzdar town. Both of the villages are located on the opposite banks of the main Mula River. Just like Karkh area, ecologically the Kharzan and Haatachi fall in the Hot Arid Lowland Plain. In Kharzan and Hitachi, an infiltration gallery has been constructed under Perennial Irrigation Schemes (PIS). A water channel emanating from this infiltration gallery irrigates the crop in both the villages through a traditional system of water distribution.

249. In Kharzan and Hitachi crops are cultivated both during Rabi season as well as in Kharif season. During Rabi, the crops grown include: wheat, Mash bean, onion, tomatoes, while during Kharif following crops are sown: Onion, tomatoes, cucumber, water melon, melon, rice, cotton. In Kharzan and Hitachi a very good variety of rice known as Subdasi is cultivated. It is mainly used for household consumption, while in lesser quantities it is also sent to Khuzdar for sale. In addition to the field crops, the farmers in the communities also have grown horticulture/fruit crops. Fruit crops grown in the area included: mangoes, date palm, lemon. The ratio between field and horticulture crops like that in Karkh was low. The major reason for the low horticulture crop production is the lack of knowledge/information and technical knowhow on the horticulture crop production as well as non-availability of proper commercial market. In Kharzan and Hitachi, proper farm to market road is not available. Now a black top road is being constructed, which would serve as farm to market road for the community. Due to non-availability of proper marketing mechanism, the agriculture produces in Khazran and Hitachi is mainly disposed of through barter system wherein the community member exchanges the agriculture produce in lieu of another commodity or any other article/object of value.

- **Resource Base for Agriculture in Karkh area:**

a. Land:

250. At present only about 3,450 acres of land is available in both the village for cultivation. Out of these 2,500 acres are present in Kharzan, while remaining 950 acres are located in Hitachi village. In Khazran village an area of 500 acres has been brought under cultivation through the water made available by the PIS. While in Hitachi village the area brought under cultivation is 350 acres. In Khazran village an area of 2000 acre is present a culturable waste, whereas in Hitachi land that can be brought under cultivation is 600 acres. Present scheme which relates to the extension of infiltration gallery can help in bringing extra land under cultivation in both the villages. Although due to non-availability of farm to market road very little agriculture produce is marketed to Khuzdar, still agriculture has played a very vital role in bringing an upward change in the lives of both communities. Almost all the population living in these villages is dependent upon agriculture for their livelihoods. Bringing another 105 ha (260 acres) would further help in

increasing the agriculture crop production in the area and providing extra income earning opportunities to the population of the area.

b. Water:

251. The major **water resource** in the Khazran and Hitachi is the infiltration gallery through constructed the PIS in 2000. This infiltration is providing about 15 cusecs of water through a channel which is distributed by both the villages through a traditional system. Unlike Karkh area, the river span is very wide here and does not allow for construction of diversion weir. Therefore, infiltration gallery has been construction to secure and divert the sub-surface flow in the river for crop production.

252. The infiltration gallery has been constructed close to the Hitachi village. A water channel takes water to the croplands, where it is distributed through an established traditional system. A total of 576 ha has been brought under cultivation through construction of infiltration gallery. Here it is important to mention that the water secured and diverted through the infiltration gallery from the Mula River is available 24 hours for crop irrigation. During monsoon season i.e. from July to August/September, water level in the river rises, making extra water available for crop production during this season. This allows farmers of the community for brining extra land under cultivation that helps in increasing the agriculture crop production in the area. However, from March to June/July, the water level decreases in the river, which affects irrigation of crops and therefore production is low. Water distribution is managed by the Farmers Organization. The communities have a traditional system of water distribution in place, which is managed by the members of Farmer Organization. The disputes/conflicts that may arise on water distribution or related matters are also resolved by the Farmer Organization through traditional norms.

c. Land Tenure System:

253. The villages of Khazran and Hitachi are mostly inhabited by the Mosiyani, sub-tribe of the Zehri tribe. Brahvi language is mostly spoken by the resident community members of Khazran and Hitachi. Besides Brahvi, Sindhi is also spoken and understood in these villages. Agriculture land is mostly cultivated by the owners; however, the tenancy is also prevalent in both the villages.

254. Rest of the variable/parameters related to the agriculture sector in the Khazran and Hitachi are same as discussed in section for Karkh except for marketing. In Khazran and Hitachi due to long distances and non-availability of farm to market road, agriculture produce is mostly consumed at the household level, whereas some quantities are exchanged in a barter system, while very little is transported to the Khuzdar town for

marketing. In institutional support for the future, marketing should be given top priority for Khazran and Hitachi so that community may earn hard cash for their agriculture produce.

- **Existing and projected agriculture**

255. At present the agricultural productivity is fair in the subproject but due to inadequate irrigation system in the subproject area, the landowner cannot bring the whole command area under cultivation. The existing cropped area is 572 ha with 84% cropping intensity followed by annual cropping pattern wheat – Rabi and Kharif vegetables – fodder – rice - melon – pulse etc. The yield and production are not good enough to support the landowner to enhance agricultural productivity.

256. The projection agriculture for the subproject has been made keeping in view the current irrigated cropped area, cropping intensity, yield and production in the subprojects through findings the agronomic field survey in and around the subproject area. The landowners are much interested to propose the profitable crops and fruits in the future as by the subproject development. The existing cropped area will be enriched from 572 ha to 817 ha and the cropping intensity will be enhanced from 84% to 120%. The gross irrigation requirement & detailed existing and proposed / projected agriculture analysis are given in **Annexure – 12**.

- **Irrigation water rights**

257. The available water is being diverted to cultivated land / field as per land capacity / farm size according to the time division rule and they ensured that they will follow this current rule water distribution / right in the future as well.

5.3.4 Proposed agricultural development

258. It is expected that the design cropping intensity 120 percent would be completed within three years after commencement the project. The cropping pattern will be change with high yield and profitable crops such as cotton.

5.3.5 Livestock[27]

259. Livestock census of 2006 has data for 26 districts as districts like Washuk. Nushki, Harnai and Sherani were part of other districts. General categories of livestock for which data was collected comprised cattle, buffalo, sheep, goat, camel, horses, mules, asses and poultry. Situation of Khuzdar is ranked (based on sorting order largest to the smallest)

[27] Planning & Development Department, Government of Balochistan – UNICEF, "District Development Profile 2011", Khuzdar,

below among the then 26 districts. In total livestock population ranking, Khuzdar district has the largest population.

Table 25: Livestock Population

Livestock Category	Cattle	Buffalo	Sheep	Goats	Camel	Horse	Mule	Asses	Poultry
Khuzdar District Ran	10	7	4	1	6	14	8	3	4

260. The above ranking shows that in case of small ruminants, Khuzdar large population as compared to other districts while in case of large ruminants too population is substantial. Area wise Khuzdar is second largest district and human population wise it ranks third largest (among 30 districts) while population density per square kilometer in only 15 (on project population, 2010).

261. District Khuzdar has enormous potential in 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 Goats, Sheep, Cows, Buffaloes, Cattle, Camels and Asses. Goat constitutes the major portion of the livestock population in District Khuzdar.

262. Livestock Department, headed by the Deputy Director along with its staff, manages and controls all the activities pertaining to livestock including animal health coverage and husbandry. Vaccination is being carried out free of cost whereas the treatment is provided at 50% subsidized rates.

5.3.6 Power

263. Electricity at subproject areas is supplied by Quetta Electric Supply Company (QESCO). Quetta Electric Supply Company (QESCO) is a Public Limited Utility Company, established in 1998 under Companies Ordinance 1984 and is responsible for distribution of Electric Power to the entire province of Baluchistan excluding Lasbela district under a Distribution Electric Power within its territorial jurisdiction and presently serving approximately over 0.5 Million Customers (Domestic, Commercial, Agricultural, Industrial and others) in the thirty districts of Balochistan province.

264. Recently QESCO has undertaken the ADB's power distribution enhancement investment project PDEIP Tranche III to enhance the capacity of its power distribution system. This project covers construction work of two 2 Nos. of new double circuit 132KV Transmission line in jurisdiction of Quetta Electric Supply Company (QESCO) across 08

Districts of Balochistan i.e. Quetta, Mastung Khuzdar, Kalat, Loralai, Qila saifullah, Muslim Bagh, and Pashin districts.[28]

5.3.7 Water Supply Service

265. The task of water supply and sanitation at the subproject area lies with the Public Health Engineering (PHE) department for domestic uses. The residents of Khuzdar city have protested against the shortage of water supply by the PHE department29. Alternately the residents of subproject area use the canal water supply for their daily chores. No incidents of gestro-intestinal diseases have been reported during discussions with the community.

5.3.8 Transport

266. The subproject areas are well connected to surrounding cities of Balochistan and Sindh. The RCD highway connects Khuzdar to Karkh area and Hatachi-Khazran area with a travel time of 1.5 and 4 hours respectively. The Khuzdar – Shahdadkot Road (M-8, 58 Km long Project) is also widely used by traders and agriculturist of Karkh area to transport their produce to market at Shahdadkot.

5.4 Social and Cultural Resources

5.4.1 Population and Community Structures

267. The current population of Balochistan province, of around 10.5 million in 2016, lives in the 18 river basins and is largely rural.

268. Altogether residents of 5 villages would be part of the subproject. As Acherwand and Sinjori are two mouzas having same beneficiaries which are resident in Nokjo village. The land and water rights belong to different tribes resident in five villages including Akhundani, Karela, Chutta Botani, Chandio, Rind, Sasoli, Jamot.

269. About 1200 Households were reported in the whole subproject area will be benefited from the subproject, the detail of which is shown in **Table 26.**

[28] http://www.qesco.com.pk/PDF/EMReport%20T-3.pdf
[29] https://www.dawn.com/news/1298685

Table 26: Demography of Ahmadzai Perennial and Floodwater Irrigation Subproject Area[30]

No.	Village Name	Estimated No of Households
1	Wandri	256
2	Chutta	130
3	Khadri	259
4	Jhalaro	325
5	Nokjo (Sinjori, Acherwand)	230
	Total	1200

5.4.2 Involuntary Resettlement and Indigenous People

270. No involuntary resettlement and indigenous people issue is anticipated on the subproject.

5.4.3 Community Consultation

271. The community was very much willing to participate in the subproject development. While no dispute was reported on land and water rights.

272. The demand of beneficiaries of five subprojects already constructed was repair in the weirs headwork, repair in the lined channels, lining of new channels for new command areas, protection bunds for command areas of each subproject. While the beneficiaries of the new subproject Jhalaro demanded for construction of new headwork, lining of channel up to last command areas and protection bund for the command area.

5.4.4 Land Availability, Ownership Land Tenure

273. The land rights are equitable and all residents of five villages have share in land. The land of all six subprojects is reported in the cadastral record. While nearly all land in each subproject have been distributed by the shareholders after the construction of subprojects in 2001. While Jhalaro subproject is new subproject and lot of land is available for expansion, which would be distributed after development. The cultivated land reported and observed in all six subprojects altogether is about 2000 Ha, while the expandable land is about 250 Ha. Flood irrigation is not practiced in all of the six subprojects.

5.4.5 Water Rights, Allocation of Water and Warabandi

[30] Social Survey Report TCI

274. The source of all six Subprojects is the Karkh River water. While out of six, five subprojects were constructed by GoB under BCIAP project funded by World Bank in 2001 and water is diverted through five weirs built in series. While one of the subprojects Jhalaro is completely a new subproject and water is diverted by kacha traditional diversion bund. The water rights in all of the six subprojects are equitable and well established.

275. The water rights of the water source are of the Sardar family having about 4-6 shareholders.

5.4.6 Education

276. Primary schools both government and private run are well established in the subproject area in Karkh as well as Moola Tehsil.

277. Chutta, Jhalaro and Hatachi are largely populated areas and have primary as well as secondary schools. There are degree colleges separate for boys (2Nos) and girls (1Nos.) at Khuzdar that are affiliated with the Balochistan Board of Intermediate & Secondary Education (BBISE).

278. Religious schools (or Madersas) are also well established in the subproject areas and Madersa Darul Toheed at Jhalaro Karkh is one the largest among them. There are several other madersa also in the surrounding areas such as Wadh and Naal etc.

5.4.7 Health[31]

279. 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: 1 Hospital, 6 Rural Health Centers (RHCs), 34 Basic Health Units (BHUs), 31 Civil Dispensaries (CDs), 1 Maternal & Child Health Center (MCHC) and 1 TB Clinic. There are 190 beds, out of which 100 are situated in RHCs. Apart from these health facilities, there are two leprosy clinics and two private hospitals with 30 beds.

280. Special Health Programs and Initiatives currently being carried out in the Khuzdar district are:

- Expanded Program on Immunization (EPI)
- TB Control Program
- Malaria Control Program
- Hepatitis Prevention Control Program
- AIDS Control Program

[31] Planning & Development Department, Government of Balochistan – UNICEF, “District Development Profile 2011”, Khuzdar,

- National Program for Family Planning & Primary Health Care
- National Maternal, Newborn and Child Health (MNCH) Program

5.4.8 Cultural Heritage[32]

281. The central position of Khuzdar, at the point of convergence of roads from Multan (via the Mula pass), Makran and Kandhar (province of Afghanistan), made it a very important place for the Arabs invading India; also, its moderate climate made the locality attractive and acceptable for the Arabs. In the Arab Tenure, Khuzdar was protected by a small fortress, which was probably on the peak overlooking the valley; is now known as Biradari (Shahi Bagh).

282. Therefore, the Arabs made frequent attacks upon Khuzdar and in 664 AD, in the caliphate of Muawiya, Al-Manzar, son of Al-Jarud-al-Abdi, was appointed to the frontiers of India after conquering Nukan and Kikan, captured Khuzdar. Al-Manzar is said to have died here. During the caliphate of Al-Mutasimbillah (833-41 AD), Umar, who was nominated as the governor of Sindh, transferred the inhabitants of Kandabel (Gandava) to Khuzdar.

283. In 976 AD, Khuzdar was governed by an Arab named Muin bin Ahmed. A year after, Amir Nasir-ud-din Subuktegin commenced series of invasion on India and conquered Khuzdar but its possession was restored to the previous rulers through a treaty. The treaty stipulated that immediately a sum of money must be paid and that the ruler would thereafter send a tribute every year. Subuktegin again attacked the wayward ruler. During the days of Mahmud Ghaznivi, the rulers of Khuzdar again became disaffected and withheld the tribute. Mahmud Ghaznavi marched to Khuzdar and it was indeed owing to Mahmud's possession of Khuzdar that his subsequent conquests in Sindh were largely effective. Khuzdar was included in Mahmud's territory in 1031 AD.

284. With the downfall of the Ghaznivids, Khuzdar passed to the Ghorids and then to Nasir-ud-din Kabacha. In 1225 AD, Khuzdar was given to Shamsuddin Altamash. Afterwards, the country appears to have passed sovereignty to the Mughals. In 1590 AD, Abdul Fazal speaks of the Zehri section of the Baloch tribe. Decline of Mughal power was followed by the rise of the Brahvis to a position of greater or lesser independence. During the reign of Mir Mahmud Khan, Pottinger visited Jhalawan in 1810 AD, travelled to Kalat via Bela and Khuzdar. He described Khuzdar as a small town not having more than 500 houses.

285. The influence of Hindus from Multan and Shikarpur appeared immense that the keys of the town gate were entrusted to the then senior Brahmin every night. During 18th century, the people of Khuzdar were very religious. The rulers of that period had

[32] Planning & Development Department, Government of Balochistan – UNICEF, “District Development Profile 2011”, Khuzdar,

implemented the Islamic Laws very effectively. Since the death of Gauhar Khan, chief of Jhalawan, the area has enjoyed a long period of repose.

286. Khuzdar region was full of karezes and lush green cultivation, at the time it was a province of Khurasan. Khuzdar was situated on the route for caravans taking merchandise on camel backs to Makran Port for export, to the middle-eastern countries. The forces of Muhammad bin Qasim passed through this area gaining access to Sind through Mula pass. The mud-fort in Khuzdar was built by Khan Khuda Dad Khan in 1870, during a war with Jams of Lasbela.

287. In 1903, British Government appointed a political agent at Khuzdar to carry out administrative affairs of the government. This administrative system continued till partition of India. Before March 1974, Khuzdar was a sub-division of Kalat District.

288. A number of mounds of archaeological interest have also been found in Khuzdar. The most important one is Meri Bhar or Palace Mound. It is believed to be the seat of last Mongol governor of Khuzdar, Malik Chap, who was killed by Kurd inhabitants of Khuzdar. The “Shahi Bagh” at Khuzdar gives an indication of its importance and condition in ancient times. Many old dams and tombs are scattered throughout the district. A beautiful mosque, symbol of modern Islamic architecture on the RCD highway in Khuzdar, attracts many people.

289. Any site of cultural or historical importance were not seen in the project areas.

5.4.9 Gender Issues

290. The female population in Pakistan according to the 1998, Census, is around 48%. In view of this situation, the gender issues[33] assume special focus and need to be properly addressed and evaluated. The status of women in rural Balochistan, as for the rest of the villages in Pakistan, is acutely disadvantaged. Women bear a disproportionately high share of burden of poverty; have unequal access to economic options and social services lower endowments of land and other productive assets. Women are severely hindered in their horizontal and vertical social mobility. Gender Discrimination has become an issue in Pakistan with many Government and Non-Government Organizations working to resolve the issue. Other parts of Pakistan, women in Balochistan commonly face problems in family law, discrimination at work place, discrimination in education, physical or psychological abuse, and social restrictions. The literacy rate and school enrolment ratio of girls in province is very low, with girls remaining at home to complete domestic chores. The predominant role of women in agriculture has enabled most women farmers to become increasingly responsible for educational and other material needs of their wards, especially for female headed households.

[33] The subproject specific gender issues are to be discussed in PSA/Gender Disaggregated Socio-Economic Baseline report.

5.5 Stakeholder Consultation

291. In the consultation process for IEE, following key stakeholders were consulted:

- Irrigation Dept.
- Local communities, Men and village elders attended meetings.
- IUCN
- landlord and their representatives
- BRSP

292. Meetings with stakeholders consisted of community consultation meetings, focus group discussions, and in-depth interviews and discussions with landlords and their representatives. The location of the meetings, the process followed, and the outcomes are discussed in this section. The list of the villages where public consultation was carried out is given in **Annexure – 13** while the photographs of consultations are included as **Annexure -14**.

❑ Stakeholder Consultation

293. The summary of the various stakeholder consultations is given below.

294. The consultations were considered a good gesture and appreciated, especially by the landowners and locals of the project Karakh rivers interventions. The Consultants probed about the anticipated irrigation problems from the local community and presented the proposed project interventions as a solution to their problems. The local community perceived that the proposed project would improve their financial well-being to a great extent because 80% people job associated with Agriculture work. They emphasized that local villagers should be given priority when employing people for various project-related works and activities according to their skills because non-Local work force coming in the project area that will not be aware of the local customs and norms, may result in conflicts with the local community, keeping in mind the sensitive law and order situation and culture of the area. Local also expressed some fear that vehicles would disturb their cattle and that their livestock might get hurt or run away or die accidental death due to vehicular (heavy machines) movement. No reservations for proposed project interventions shown by the community during focused group discussions.

295. During a meeting with **Syed Perveiz Bukhari, Chief Engineer of the Irrigation and Power Department, Government of Balochistan** presented the project background information. The consultants probed the justification of the project and conditions on the ground. The Chief Engineer was very positive that the project would have a positive impact on the community of the subproject areas. The consultants asked if the BIPD held discussions with the community regarding their issues and how the BIPD can facilitate to resolve their issues. The Chief Engineer informed that he and his department were

constantly in contact with the community and the proposed design is based on informal meetings and discussions with the local community.

296. The consultations with **Balochistan Rural Support Program (BRSP)** were considered a good gesture and appreciated. They informed the consultants of successful work done by BRSP. The consultants briefed the BRSP team of the project interventions. BRSP expressed views on the positive impact the project may have on the local people and BRSP's role on agriculture extension in the project area. BRSP advocated synergistic approach as implementing partner for the sustainability of proposed interventions and wellbeing for the villagers. The consultants probed the functions of BRSP in the region and its past progress. This was done to find possible solutions of getting BRSP involved in the project at a later stage in the form of educating agriculturists of the area. Suggestions of CEO were duly noted and are presented in the conclusion and recommendations chapter.

297. A meeting was held with Mr. Naseeb ullah Khan at IUCN- Pakistan, Balochistan Program office Quetta. The Project was briefed by the team with the help of maps. IUCN shared its input and endorsed the need of the projects in Balochistan while focusing on improving water efficiency. IUCN shared its sensitivities about the protected areas and threaten species. During the consultation it was revealed that no protected areas and no threaten species are reported in the Project area.

298. A meeting was held with Mr. Iqbal Zehri, Conservator, Balochistan Forest and Wildlife Department, Khuzdar, at his residence at Khuzdar. The consultants shared project details with him and benefited with the organizational knowledge of the Conservator. Mr. Zehri discussed the formations present in and around the project areas. He also confirmed about no protected sites of ecological importance in and around the project areas, Mr. Zehri was of the opinion that the project will contribute to the wellbeing of the community as well as ecology. The team further asked Mr. Iqbal Zehri how the proposed project can help conserve the forest and wildlife. He proposed that if any tree is fallen, some additional trees should be planted to compensate its effect. The type and number would be finalized by Balochistan Environmental Protection Agency in consultation with Balochistan Forest and Wildlife Department at the time of IEE approval.

6. ASSESSMENT OF ENVIRONMENTAL IMPACTS & MITIGATION MEASURES

6.1 General

299. This chapter identifies the significant potential environmental and socio-economic impacts which may occur during the project life. The appropriate mitigation measures are also discussed in this and the subsequent chapters of this report. A brief qualitative description of each aspect and the affected environment in the Project Area is presented in the following sections.

6.2 Impact Assessment Methodology

300. For the purpose of evaluating the environmental impact of this proposed project, the following steps have been executed:

- Scoping of impacts
- Environmental screening
- Qualitative impact evaluation
- Describing mitigation measures
- Residual impact significance
- Determining cumulative impacts

301. Each of these steps undertaken for the evaluation of environmental impacts and to describe mitigation measures, is described in the following section.

6.3 Scoping of Impacts

302. Potential environmental impacts of the Project on various environmental features in the Project Area are identified through the following studies:

- Environmental quality baseline monitoring of air, noise and water;
- Detailed review and analysis of primary and secondary data available for all environmental parameters in Project Area such as physical, ecological and social resources;
- Desktop study of engineering investigations, studies and designs;
- Consultations with implementing agencies, local government, affected community, traditional and religious leaders of community;
- Stakeholder consultations with relevant government agencies and national NGOs;
- Knowledge assimilation of international best practices on environmental assessment of irrigation projects.

6.4 Notion of Significance

303. The term ***"Environmental Impact"*** or simply ***"Impact"*** covers the negative, adverse or harmful as well as positive, desirable or beneficial impacts of the project on environmental settings. Prediction of impacts of the proposed activity is based on factual data; however, the significance of these impacts involves subjective judgment. The nature of the impacts may be categorised in terms of:

- **Direction** - Positive or Negative
- **Duration** - Long or Short Term
- **Effect** - Direct or Indirect
- **Extent** - Wide or Local

304. Impact significance depends on both the nature of the impact and on the sensitivity of the receptor. The more sensitive the receptor the greater will be the significance of impact of that change. For this IEE Report, nature of change is combined with the sensitivity of the receptor to evaluate the significance of the impact. The significance of impact is characterized as very low, low, moderate, high and very high. Environmental issues having "moderate", "high" and "very high" significance would be provided with mitigation measures. Residual impacts after implementation of mitigation measures have also been provided.

6.5 Environmental Screening

305. For identification of potential impacts of the project, screening of activities causing impacts had been carried out in different phases of the project life. In the impact assessment exercise, major project activities with their associated environmental issues were identified and then their impacts on the relevant physical, ecological, and socio-economic elements of the area were evaluated.

306. In broader spectrum, the project activities could be categorized in the following three phases:

- Planning & Design Phase;
- Implementation & Construction Phase; and
- Operations & Maintenance Phase.

307. During the first phase, the focus will be not only on the engineering design, but also on laying the foundation for integrated planning for water resources management. Extensive inter-departmental coordination will be necessary at this stage for improvement in institutional arrangements and capacity in the areas of environmental and social management and monitoring. Development of decision support systems and training to

develop local expertise is expected to substantially improve the management and monitoring of social and environmental impacts.

308. The planning, information management, and capacity-building activities are all intended to facilitate increased awareness-raising to foster ownership, understanding and mainstreaming of environmental and social considerations. Such activities to be planned and partly to be implemented.

309. The construction phase mainly entails rehabilitation of weirs, construction of infiltration gallery, new canal and other irrigation structures. Rehabilitation of weirs, construction of the infiltration gallery, new canal and other irrigation structures are expected to introduce direct significant benefits to the local population. This phase will be very sensitive in terms of environmental and social implications, because of a wide range of issues including the very extent of construction activities etc. The interventions planned under this component will become less damage to environment, if the EMP is implemented in letter and spirit.

310. Operations & Maintenance will be another stage where major impacts, both positive and negative, can surface, and the earlier predictions could be validated. This phase will comprise commissioning the newly rehabilitated weirs, constructed infiltration gallery, new canal and other irrigation structures. While the operation phase mostly consists of engineering activities, it has an equally important requirement of continued inter-departmental coordination, for harvesting the full potential of positive impacts of the project.

311. **Table 27** below presents the screening of activities for proposed infiltration gallery, new canal and irrigation system during design, construction and O&M phases.

Table 27: Screening of Activities

Proposed Sub-activities	Screening Results			Significance Prior to Mitigation			Potential Impacts
	Very Low Risk	Moderate Risk	High Risk	Low	Moderate	High	
Karkh River Intervention: Irrigation Network Rehabilitation and Lining of Canals							
A. Design & Planning Phase							
Field surveys	✓			✓			• No potential Impact
Assessment of water availability		✓			✓		• Failure of design
Route selection (Alignment) of proposed new canal and its land acquisition		✓			✓		• Social issues • Resettlement/relocation of assets
Design works construction of new canal as per proper engineering standards		✓			✓		• In case of design failure system will be collapsed and Social issues
Traditional water rights considerations		✓			✓		• Social issues
Public disclosure of final design		✓			✓		• Social issues
Disruption to public life	✓			✓			• No potential Impact
Disruption to wildlife	✓			✓			• No potential Impact
Risk due to Natural Hazard i.e. flooding and earthquakes		✓			✓		• System sustainability
B. Implementation and Construction Phase							
Security and Safety Risks		✓			✓		• Delay in project execution
Construction contractor mobilization and establishment of campsite and machinery/ equipment Yard		✓			✓		• Changes in land use pattern • Influx of external work force • Social conflicts

Proposed Sub-activities	Screening Results			Significance Prior to Mitigation			Potential Impacts
	Very Low Risk	Moderate Risk	High Risk	Low	Moderate	High	
							• Workshop facilities may spread oils & chemicals • Deterioration of air quality due to machinery & equipment • Noise • Land degradation due to solid waste disposal of camp site • Water contamination • Loss of vegetation Health and Safety issues
Excavation, backfilling and compaction works: New Canal Total Length= 2,115 m		✓			✓		• Soil erosion • Site overburden • Borrow pit • Loss of natural vegetation • Damage to infrastructure • Sites of Historical, Cultural, Archeological or Religious Significance • Noise pollution • Air pollution • Health and safety issues • Blocked of access due to earth works and stockpiling of excavated material
Concrete lining of Canal = 14,770 m		✓			✓		• Noise pollution • Air pollution • Health and safety issues • Blocked of access due to construction works
Existing Canal to be Repaired = 1,810 m		✓			✓		• Noise pollution • Air pollution

Proposed Sub-activities	Screening Results			Significance Prior to Mitigation			Potential Impacts
	Very Low Risk	Moderate Risk	High Risk	Low	Moderate	High	
							• Health and safety issues • Blocked of access due to construction works
C. Operation & Maintenance Phase							
Breaching of Canal		✓			✓		• System sustainability
Conflicts caused by unavailability or improper distribution of water in the area		✓			✓		• Social issue
Use of water for drinking purposes		✓			✓		• Health issues • Social issues
Disposal waste (connection of waste streams) in the Canal		✓			✓		• Degradation of irrigation water • Health issues
Periodic cleaning and maintenance of the system		✓			✓		• Solid waste generation
Increase of agricultural lands		✓			✓		• Loss of pastoral lands
Ground water contamination in command area		✓			✓		• In case of improper drainage ground water will be contaminated
Community Participation for management and operation of the irrigation system		✓			✓		• Social issues • System sustainability
Risk due to Natural Hazard i.e. Flooding and Earthquakes		✓			✓		• System sustainability

Proposed Sub-activities	Screening Results			Significance Prior to Mitigation			Potential Impacts
	Very Low Risk	Moderate Risk	High Risk	Low	Moderate	High	
Use of fertilizers & pesticides		✓			✓		• Banned fertilizer & pesticides will cause health issues • Contamination of fresh water through surface runoff
Disruption to wildlife		✓			✓		• Conservation issues
Karkh River Intervention: Flood Protection Bund							
A. Design & Planning Phase							
Field surveys	✓			✓			• No potential Impact
Design works construction of flood protection bund as per proper engineering standards		✓			✓		• In case of design failure system will be collapsed and Social issues
Public disclosure of final design		✓			✓		• Social issues
Risk due to Natural Hazard i.e. flooding and earthquakes		✓			✓		• System sustainability
B. Implementation & Construction Phase							
Construction contractor mobilization and Establishment of campsite and machinery/ equipment Yard		✓			✓		• Changes in land use pattern • Influx of external work force • Social conflicts • Workshop facilities may spread oils & chemicals • Deterioration of air quality due to machinery & equipment • Noise

Proposed Sub-activities	Screening Results			Significance Prior to Mitigation			Potential Impacts
	Very Low Risk	Moderate Risk	High Risk	Low	Moderate	High	
							• Land degradation due to solid waste disposal of camp site • Water contamination • Loss of vegetation • Health and Safety issues
Transportation of construction material		✓			✓		• Soil erosion and contamination • Air pollution • Noise pollution • Health and Safety issues • Damage to infrastructure
Earthen Bund with Stone Pitching: 1. Protection Bund -1 1,060 m 2. Protection Bund -2 480 m 3. Protection Bund -3 450 m 4. Protection Bund -4 400 m 5. Protection Bund -5 680 m 6. Protection Bund -6 560 m 7. Protection Bund -7 330 m 8. Protection Bund -8 300 m 9. Protection Bund -9 980 m		✓			✓		• Soil erosion • Site overburden • Loss of natural vegetation • Damage to infrastructure • Sites of Historical, Cultural, Archeological or Religious Significance • Noise pollution • Air pollution • Health and safety issues • Blocked of access due to earth works and stockpiling of excavated material
C. Operation & Maintenance Phase							

Proposed Sub-activities	Screening Results			Significance Prior to Mitigation			Potential Impacts
	Very Low Risk	Moderate Risk	High Risk	Low	Moderate	High	
Breaching of flood protection bund		✓			✓		• System sustainability
Risk due to Natural Hazard i.e. Flooding and Earthquakes		✓			✓		• System sustainability
Karkh River Intervention: Construction of New Weir at Jhalaro and Repair of Cutoff Wall of Chutta Weir							
A. Design & Planning Phase							
Field surveys	✓			✓			• No potential Impact
Assessment of water availability		✓			✓		• Failure of design
Design works construction of weir as per proper engineering standards		✓			✓		• In case of design failure system will be collapsed and Social issues
Traditional water rights considerations		✓			✓		• Social issues
Public disclosure of final design		✓			✓		• Social issues
Disruption to public life	✓			✓			• No potential Impact
Disruption to wildlife	✓			✓			• No potential Impact
Risk due to Natural Hazard i.e. flooding and earthquakes		✓			✓		• System sustainability
B. Implementation & Construction Phase							
Construction contractor mobilization and Establishment of campsite and machinery/ equipment Yard		✓			✓		• Changes in land use pattern • Influx of external work force • Social conflicts • Workshop facilities may spread oils & chemicals

Proposed Sub-activities	Screening Results			Significance Prior to Mitigation			Potential Impacts
	Very Low Risk	Moderate Risk	High Risk	Low	Moderate	High	
							• Deterioration of air quality due to machinery & equipment • Noise • Land degradation due to solid waste disposal of camp site • Water contamination • Loss of vegetation • Health and Safety issues
Security and Safety Risks		✓			✓		• Delay in project execution
Transportation of construction material		✓			✓		• Soil erosion and contamination • Air pollution • Noise pollution • Health and Safety issues • Damage to infrastructure
Earth Works For 106m long and 1m high Gabion Weir		✓			✓		• Soil erosion • Site overburden • Borrow pit • Loss of natural vegetation • Damage to infrastructure • Sites of Historical, Cultural, Archeological or Religious Significance • Noise pollution • Air pollution • Health and safety issues • Blocked of access due to earth works and stockpiling of excavated material
Concrete and Form		✓			✓		• Noise pollution

Proposed Sub-activities	Screening Results			Significance Prior to Mitigation			Potential Impacts
	Very Low Risk	Moderate Risk	High Risk	Low	Moderate	High	
Works for New Weir and Repair of Cutoff Wall of Chutta Weir							• Air pollution • Health and safety issues • Blocked of access due to construction works
C. Operation & Maintenance Phase							
Breaching of Weir		✓			✓		• System sustainability
Conflicts caused by unavailability or improper distribution of water in the area		✓			✓		• Social issue
Use of water for drinking purposes		✓			✓		• Health issues • Social issues
Periodic cleaning and maintenance of the system		✓			✓		• Solid waste generation
Increase of agricultural lands		✓			✓		• Loss of pastoral lands
Community Participation for management and operation of the irrigation system		✓			✓		• Social issues • System sustainability
Use of fertilizers & pesticides		✓			✓		• Banned fertilizer & pesticides will cause health issues • Contamination of fresh water through surface runoff
Disruption to wildlife		✓			✓		• Conservation issues
Risk due to Natural Hazard i.e. Flooding and Earthquakes		✓			✓		• System sustainability

Proposed Sub-activities	Screening Results			Significance Prior to Mitigation			Potential Impacts
	Very Low Risk	Moderate Risk	High Risk	Low	Moderate	High	
Infiltration Gallery at Hatachi - Kharzan (extension of infiltration gallery tunnel, lining of infiltration gallery wells, infiltration gallery tunnel cleaning; lining of covered channel, open channel lining, social structures and time division structures)							
A. Design & Planning Phase							
Field surveys	✓			✓			• No potential impact
Assessment of water availability		✓			✓		• Failure of design
Location, land use and land acquisition of the selected subproject area	✓			✓			• No potential impacts
Design works construction of infiltration gallery as per proper engineering standards		✓			✓		• In case of design failure system will be collapsed and Social issues
Traditional water rights considerations	✓			✓			• No impacts as water rights have been distributed and settled between both villages (Kharzan and Hatachi)
Public consultation and sharing of proposed design considerations		✓			✓		• Social issues
Disruption to public life	✓			✓			• No potential Impact
Disruption to wildlife	✓			✓			• No potential Impact
Risk due to Natural Hazard i.e. flooding and earthquakes		✓			✓		• System sustainability
B. Implementation & Construction Phase							
Construction contractor mobilization and		✓			✓		• Changes in land use pattern

Proposed Sub-activities	Screening Results			Significance Prior to Mitigation			Potential Impacts
	Very Low Risk	Moderate Risk	High Risk	Low	Moderate	High	
Establishment of campsite and machinery/ equipment Yard							• Influx of external work force • Social conflicts • Workshop facilities may spread oils & chemicals • Deterioration of air quality due to machinery & equipment • Noise • Land degradation due to solid waste disposal of camp site • Water contamination • Loss of vegetation • Health and Safety issues
Security and Safety Risks		✓			✓		• Delay in project execution
Transportation of construction material		✓			✓		• Soil erosion and contamination • Air pollution • Noise pollution • Health and Safety issues • Damage to infrastructure
Earthen works		✓			✓		• Soil erosion • Site overburden • Borrow pit • Loss of natural vegetation • Damage to infrastructure • Sites of Historical, Cultural, Archeological or Religious Significance • Noise pollution • Air pollution • Health and safety issues

Proposed Sub-activities	Screening Results			Significance Prior to Mitigation			Potential Impacts
	Very Low Risk	Moderate Risk	High Risk	Low	Moderate	High	
							• Blocked of access due to earth works and stockpiling of excavated material
Concrete and Form works		✓			✓		• Noise pollution • Air pollution • Health and safety issues • Blocked of access due to construction works
C. Operation & Maintenance Phase							
Conflicts caused by unavailability or improper distribution of water in the area		✓			✓		• Social issue
Use of water for drinking purposes		✓			✓		• Health issues • Social issues
Periodic cleaning and maintenance of the system		✓			✓		• Solid waste generation
Increase of agricultural lands		✓			✓		• Loss of pastoral lands
Community Participation for management and operation of the irrigation system		✓			✓		• Social issues • System sustainability
Use of fertilizers & pesticides		✓			✓		• Banned fertilizer & pesticides will cause health issues • Contamination of fresh water through surface runoff
Disruption to wildlife		✓			✓		• Conservation issues

Proposed Sub-activities	Screening Results			Significance Prior to Mitigation			Potential Impacts
	Very Low Risk	Moderate Risk	High Risk	Low	Moderate	High	
Risk due to Natural Hazard i.e. flooding and earthquakes		✓			✓		• System sustainability
Mula River Intervention: Flood Protection Bund							
A. Design & Planning Phase							
Field surveys	✓			✓			• No potential Impact
Design works construction of flood protection bund as per proper engineering standards		✓			✓		• In case of design failure system will be collapsed and Social issues
Public disclosure of final design		✓			✓		• Social issues
B. Implementation & Construction Phase							
Construction contractor mobilization and Establishment of campsite and machinery/ equipment Yard		✓			✓		• Changes in land use pattern • Influx of external work force • Social conflicts • Workshop facilities may spread oils & chemicals • Deterioration of air quality due to machinery & equipment • Noise • Land degradation due to solid waste disposal of camp site • Water contamination • Loss of vegetation • Health and Safety issues
Transportation of construction material		✓			✓		• Soil erosion and contamination

Proposed Sub-activities	Screening Results			Significance Prior to Mitigation			Potential Impacts
	Very Low Risk	Moderate Risk	High Risk	Low	Moderate	High	
							• Air pollution • Noise pollution • Health and Safety issues • Damage to infrastructure
Earthen Bund with Stone Pitching: Hatachi Village = 3,140 m Long Kharzan Village = 3,460 m Long		✓			✓		• Soil erosion • Site overburden • Loss of natural vegetation • Damage to infrastructure • Sites of Historical, Cultural, Archeological or Religious Significance • Noise pollution • Air pollution • Health and safety issues • Blocked of access due to earth works and stockpiling of excavated material
C. Operation & Maintenance Phase							
Breaching of flood protection bund		✓			✓		• System sustainability
Risk due to Natural Hazard i.e. Flooding and Earthquakes		✓			✓		• System sustainability

6.6 Assessment of Risk – Environmental Aspects

312. The next stage of the IEE process is a detailed assessment to forecast the characteristics of the main potential impacts. Known as impact analysis. Impact identification and prediction are undertaken against an environmental baseline, often through indicators e.g. air/water, noise, ecological sensitivity, biodiversity. The aim is to take account of all of the important environmental/project impacts and interactions, making sure that indirect and cumulative effects, which may be potentially significant, are taken into consideration.

313. The anticipated environmental impacts due to project is based on the methodology provided in chapter 1 of this report presented below in Table 28.

314. Residual impacts after implementation of mitigation measures have also been provided.

315. The project and its activities may have a potential to impact the environment and this section intends to evaluate the significant impacts. It is imperative that the project is considered into its different aspects. The following environmental impacts have been evaluated:

- Impacts owing to Design Phase
- Impacts owing to Construction Phase
- Impacts owing to Operations Phase

316. The impacts of Design and Operational Phases are similar for all intervention. However, impacts for construction phase is specific with respect to sites.

Table 28: Anticipated Environmental Impacts Assessment

Activity / Issue	Site Specific Impacts	Assessment of Risk	Site Specific Mitigation Measures	Residual Impacts
Karkh River Intervention: Irrigation Network Rehabilitation and Lining of Canals				
A. Design & Planning Phase				
Field surveys	No potential impact	-		No potential impact
Assessment of water availability	Failure of design	C-3	Design works will ensure the assessment of water. Hydrological and flood & drought management analysis shall ensure the feasibility of project success.	C-1
Route selection (Alignment) of proposed new canal and its land acquisition	Failure of design	C-3	Irrigation Department and Land Revenue Department to ensure that the land acquisition act 1894 procedures are followed in a transparent manner. Complete records should be maintained, particularly for asset valuation and compensation payment. The communities' grievances associated with the land acquisition and compensation should be addressed on priority basis, in order to avoid any unrest/mistrust among the communities towards the project.	C-1
Design works construction of new canal as per proper engineering standards	Social issues and Resettlement/relocation of assets	D-4	Review of engineering design works will ensure the proper design of the system. The system should be designed on proper engineering standards.	D-1
Traditional water rights considerations	In case of design failure system will be collapsed and Social issues	D-4	Acquire full information about traditional water rights and ensure that these are not disturbed	D-1

Activity / Issue	Site Specific Impacts	Assessment of Risk	Site Specific Mitigation Measures	Residual Impacts
Public disclosure of final design	Social issues	D-4	Continual two-way communication with relevant stakeholders to understand causes of previous failures, community needs, and establish rationale perceptions	D-1
Disruption to public life	No potential impact	-		No potential impact
Disruption to wildlife	No potential impact	-		No potential impact
Risk due to Natural Hazard i.e. flooding and earthquakes	The Project area lies in zone 2B as per seismic map of Pakistan which clearly shows that the area is in moderate risk zone. So due to earthquake the breaching canal and other irrigation structures can be possible. This impact would be of moderate significance. The other natural hazard which affect the area is flood which would also be of moderate significance.	D-4	Design engineer should ensure that seismic design of canal and other allied and irrigation structures should be carried out on international engineering standards. By adopting the above measure, the impact would be of low significance. Flood protection bunds has been included as an integral component of the project to control the damages occurred by floods. By adopting the above measure, the impact would be of low significance.	D-2
B. Implementation & Construction Phase				

Activity / Issue	Site Specific Impacts	Assessment of Risk	Site Specific Mitigation Measures	Residual Impacts
Construction contractor mobilization and establishment of campsite and machinery/ equipment Yard	Changes in land use pattern Loss of vegetation Cultural conflict	B-2	Location for establishment of campsite shall be duly discussed and approved by BIPD. This will include provision for solid waste disposal, latrines / soakpits etc. Soakpits shall be properly designed approved by BIPD before establishment of campsite. Photographs of site before establishment of campsite shall be taken and it will be responsibility of the contractor to make site better or as good as original. A comparison report shall be submitted to Chief Engineer, BIPD before release of final payment. Site for camp site shall be selected keeping in view the cultural norms of the area to avoid undue interference of the Construction contractor's staff with the local residents. The land shall be rented for the camp site and equipment yard. No resettlement is envisaged for this purpose.	B-1
	Influx of external work force		Residents of village shall be employed for the construction phase (mostly for unskilled jobs).	
	Workshop facilities may spread oils	B-2	Spent Oil shall be properly collected in impermeable containers. Spent oil shall be disposed in accordance with MSDS shall be ensured.	B-1
			Good housekeeping practices shall be ensured at workshop areas.	

Activity / Issue	Site Specific Impacts	Assessment of Risk	Site Specific Mitigation Measures	Residual Impacts
	Deterioration of air quality due to machinery & equipment	B-2	Proper engine tuning of machinery/ equipment every month shall be carried out to comply with National Environmental Quality Standards of Pakistan.	B-1
	Noise	B-2	Equipment with high levels shall be fitted with noise reduction devices	B-1
			Regular inspection, maintenance and lubrication of the construction vehicle and equipment shall be performed	
			Use of PPEs such as ear plugs and ear muffs by the workers shall be ensured	
			Activity having high noise potential shall be postponed to day time i.e. in between 0800hrs to 1700hrs	
	Land degradation due to solid waste disposal of camp site	B-2	Since landfill sites at Wandhri do not exist and the areas surrounding the intervention area are dedicated to irrigation practices such as cultivation, wheat thrashing etc., construction contractor shall not dispose of any solid waste in the area. Contractor shall collect in separate bins and segregate solid waste according to its type. An impervious liner shall be laid to waste sites before the dumping of solid waste. The impervious liner shall be approved by the supervision consultant. The Contractor shall transport and dispose solid waste at existing municipal dump site at the outskirts of Khuzdar	B-1

Activity / Issue	Site Specific Impacts	Assessment of Risk	Site Specific Mitigation Measures	Residual Impacts
			after acquiring approval / NOC from Town Municipal Authority at Khuzdar every month. The contractor shall submit the NOC to the office of BIPD every month.	
	Water - Feaces contamination	B-2	Appropriate measures for disposal of sewage – such as septic tank and soaking pits shall be prepared by contractor and submitted for approval to the Chief Engineer, BIPD.	B-1
	Loss of vegetation	B-2	The construction crew shall be provided with LPG as cooking (and heating, if required) fuel. Use of fuel wood shall not be allowed.	B-1
	Health and Safety issues	B-2	Protective fencing to be installed around the Camp and its latrines to avoid any accidents. Open defecation shall not be allowed.	B-1
			Firefighting equipment shall be made available at the camps. Sand being excessively available shall also be used and stored in buckets along with other necessary fire fighting equipment.	
			The camp staff shall be provided firefighting training.	
			All safety precautions shall be taken to transport, handle and store hazardous substances, such as fuel	
			Contractor shall prepare and submit a Health & Safety Plan for approval by Supervision consultant / BIPD	

Activity / Issue	Site Specific Impacts	Assessment of Risk	Site Specific Mitigation Measures	Residual Impacts
Security and Safety Risks	Delay in project execution	C-3	Frequent consultation with local community leaders should be carried out to ensure that any social frictions are identified and resolved before they become inflamed. There are safety requirements for construction projects that include control of public access to the site along with regulations aimed at safeguarding workers. Suitable arrangements that conform to national health and safety requirements and also appropriate international best practice will need to be followed. There are specific procedures that need to be observed for the transport, storage and handling of explosives that will be required for the operation of quarries and also underground excavation. It will be necessary to liaise with local communities and initiate and support a public awareness program, particularly targeted at children, about the risks and dangers of large construction sites	C-1
Transportation of construction material	Soil erosion and contamination	B-2	Only Ratodero-Gawadar (M-8) paved highway shall be used for transportation of construction material. Vehicles and equipment shall not be repaired in the field.	B-1
	Air pollution due to vehicle fuel	B-2	Vehicles shall be kept in good working condition and properly tuned, in order to minimize the exhaust emissions	B-1
	Noise pollution due to vehicle movement	B-2	Vehicles shall have exhaust mufflers (silencers) to minimize noise generation	B-1

Activity / Issue	Site Specific Impacts	Assessment of Risk	Site Specific Mitigation Measures	Residual Impacts
			Construction material shall be transported during 0800hrs to 1700hrs to avoid night time disturbance. If unavoidable, the Supervising Consultant in consultation with BIPD and Contractor shall resolve this issue and shall ensure that such incidents do not become a regular feature.	
	Health and Safety issues	B-2	Road signage shall be fixed at appropriate locations to reduce safety hazard associated with project-related vehicular traffic	B-1
			Project drivers shall be trained on defensive driving	
			Vehicle speeds near / within the communities shall be limited to 10-15 km/hr. to avoid damage to infrastructure.	
	Damage to infrastructure	B-2	All damaged infrastructure shall be restored to original or better condition.	B-1
Construction Works: 1. Excavation, backfilling and compaction works: New Canal Total Length= 2,115 m 2. Concrete lining	Soil erosion and contamination	B-2	Material borrowing and disposal plan should be prepared by contractor and submitted to Supervising Consultant / BIPD for approval.	B-1
			Lands used for agricultural purposed shall not be used borrowing material.	
			Written consent of the land owner should be obtained for material (soil) borrowing	
			Photographic record (before and after) should be kept for the borrow and disposal areas.	

Activity / Issue	Site Specific Impacts	Assessment of Risk	Site Specific Mitigation Measures	Residual Impacts
of Canal = 14,770 m 3. Existing Canal to be Repaired = 1,810 m			Leveling of borrow sites shall be done by contractor on his own expense.	
	Loss of natural vegetation	B-2	Compensatory tree plantation (ten times the trees cut down for construction) should be carried out at appropriate locations within the project area.	B-1
	Damage to infrastructure	B-2	All damaged infrastructure shall be restored to original or better condition.	B-1
	Sites of Historical, Cultural, Archeological or Religious Significance	B-2	In case of chance find of any sites or artifacts of historical, cultural, archeological or religious significance, contractor shall immediately stop work and notify the provincial and federal archeological departments along with Supervising Consultant and BIPD. The appropriate line of action shall be sought from the concerned department before resumption of the construction activities at such sites.	B-1
	Noise pollution	B-2	Equipment with high levels shall be fitted with noise reduction devices	B-1
			Regular inspection, maintenance and lubrication of the construction vehicle and equipment shall be performed	
			Use of PPEs such as ear plugs and ear muffs by the workers shall be ensured	
			Construction work shall be carried out during 0800hrs to 1700hrs to avoid night time disturbance. If unavoidable, the Supervising Consultant in consultation	

Activity / Issue	Site Specific Impacts	Assessment of Risk	Site Specific Mitigation Measures	Residual Impacts
			with BIPD and Contractor shall resolve this issue and shall ensure that such incidents do not become a regular feature.	
	Air pollution	B-2	Vehicles shall be kept in good working condition and properly tuned, in order to minimize the exhaust emissions Water should be sprinkled where needed and appropriate, particularly at work sites near the communities to suppress dispersion of dust.	B-1
	Health and Safety issues	B-2	Demarcation tapes to be installed around the construction site to avoid any unauthorized entry Personal protective equipment should be made available at site and the usage of the PPEs should be ensured. Health & safety plan should be prepared by contractor and get it approved by supervision consultant	B-1
C. Operation and Maintenance Phase				
Breaching of Canal	System sustainability	D-4	The Irrigation Department should monitor the system on a regular basis. Capacity building of the communities should be carried out in the O&M activities. Liaison with the communities to be maintained to identify potential weaknesses in the system that could cause breaches.	D-2

Activity / Issue	Site Specific Impacts	Assessment of Risk	Site Specific Mitigation Measures	Residual Impacts
Conflicts caused by unavailability or improper distribution of water in the area	Social issues	C-3	Agreements between different communities/tribes. Perennial irrigation schemes may function smoothly in normal conditions and circumstances but do face problems during extraordinary situations, i.e. when flow is higher or lower than normal. From the outset water management rules and regulations must incorporate ways to tackle such issues as water scarcity and surplus flows. Local water user associations and groups need to be trained and involved to operate the canals, channels, gates, inlets, outlets and other structures. This needs to be done on collaborative basis with irrigation and agriculture department where communication system among farmers, water user association and department is assured. Farmers in downstream areas should be compensated in case they lose their water rights. All villages deprived of Project's water rights should be compensated for drinking water supply schemes otherwise very soon all villages and settlements will be deserted as underground water may not be fit for drinking purpose for every village and it would probably not be within the	C-1

Activity / Issue	Site Specific Impacts	Assessment of Risk	Site Specific Mitigation Measures	Residual Impacts
			financial or technical capacity of local population to initiate such schemes on their own.	
Use of water for drinking purposes	Health issues	C-3	Proper treatment system shall be provided Water quality will be tested as per WHO/ NEQS standards to ensure the integrity of the water supply system. Turbidity and free residual chlorine tests shall be regularly performed. Arsenic will be tested as per WHO standards.	C-1
Disposal waste (connection of waste streams) in the Canal	Degradation of irrigation water and Health issues	C-3	Proper monitoring of canal alignment and disconnect all identified waste streams	C-1
Periodic cleaning and maintenance of the system	Solid waste generation	C-3	Ensure proper disposal of waste at designated landfill/disposal sites.	C-1
Increase of agricultural lands	Loss of pastoral lands	C-3	Stall feeding practices for livestock, so that remaining pastoral lands are available for wild animals.	C-1
Community Participation for management and operation of the irrigation system	Social issues and System sustainability	C-3	Ensure community participation in management and operation of the irrigation system Training of community	C-1
Disruption to wildlife	Conservation issues	C-3	Design has already provided cattle drinking troughs at different intervals	C-1

Activity / Issue	Site Specific Impacts	Assessment of Risk	Site Specific Mitigation Measures	Residual Impacts
			and pedestrian bridge for canal crossing approximately at 500 m interval. It will be the responsibility of BIPD to ensure the proper maintenance of aforementioned structures. By adopting the aforementioned measures, the impact would be finally of low significance.	
Use of fertilizers & pesticides	Banned fertilizer & pesticides will cause health issues Contamination of fresh water through surface runoff	C-3	Concerted efforts by the department of agriculture to disseminate information regarding sustainable use of fertilizers will help in keeping the use at an optimal level; Ammonium Nitrate (AN) and Calcium Ammonium Nitrate (CAN) fertilizers will not be allowed; and Use of restricted pesticides identified by WHO shall not be allowed. The list of restricted pesticides is attached as **Annexure 19** of this report	C-1
Risk due to Natural Hazard i.e. Flooding and Earthquakes	System sustainability	C-3	Emergency Response Plan for Breaching of Canal will be followed which is attached as **Annexure 15** of this report.	C-1
Karkh River Intervention: Flood Protection Bund				
A. Design & Planning Phase				
Field surveys	No potential impact	-		No potential impact
Design works construction of flood protection	In case of design failure system will be	D-4	Review of engineering design works will ensure the proper design of the system.	D-1

Activity / Issue	Site Specific Impacts	Assessment of Risk	Site Specific Mitigation Measures	Residual Impacts
bund as per proper engineering standards	collapsed and Social issues		The system should be designed on proper engineering standards.	
Public disclosure of final design	Social issues	D-4	Continual two-way communication with relevant stakeholders to understand causes of previous failures, community needs, and establish rationale perceptions	D-1
B. Implementation & Construction Phase				
Construction contractor mobilization and establishment of campsite and machinery/ equipment Yard	Changes in land use pattern Loss of vegetation Cultural conflict	B-2	Location for establishment of campsite shall be duly discussed and approved by BIPD. This will include provision for solid waste disposal, latrines / soakpits etc. Soakpits shall be properly designed approved by BIPD before establishment of campsite. Photographs of site before establishment of campsite shall be taken and it will be responsibility of the contractor to make site better or as good as original. A comparison report shall be submitted to Chief Engineer, BIPD before release of final payment. Site for camp site shall be selected keeping in view the cultural norms of the area to avoid undue interference of the Construction contractor's staff with the local residents. The land shall be rented for the camp site and equipment yard. No resettlement is envisaged for this purpose.	B-1

Activity / Issue	Site Specific Impacts	Assessment of Risk	Site Specific Mitigation Measures	Residual Impacts
	Influx of external work force		Residents of Wandhri village shall be employed for the construction phase.	
	Workshop facilities may spread oils	B-2	Spent Oil shall be properly collected in impermeable containers. Spent oil shall be disposed in accordance with MSDS shall be ensured.	B-1
			Good housekeeping practices shall be ensured at workshop areas.	
	Deterioration of air quality due to machinery & equipment	B-2	Proper engine tuning of machinery/ equipment every month shall be carried out to comply with National Environmental Quality Standards of Pakistan.	B-1
	Noise	B-2	Equipment with high levels shall be fitted with noise reduction devices	B-1
			Regular inspection, maintenance and lubrication of the construction vehicle and equipment shall be performed	
			Use of PPEs such as ear plugs and ear muffs by the workers shall be ensured	
			Activity having high noise potential shall be postponed to day time i.e. in between 0800hrs to 1700hrs	
	Land degradation due to solid waste disposal of camp site	B-2	Since landfill sites at Wandhri do not exist and the areas surrounding the intervention area are dedicated to irrigation practices such as cultivation, wheat thrashing etc., construction contractor shall not dispose of any solid waste in the area. Contractor shall collect in separate bins	B-1

Activity / Issue	Site Specific Impacts	Assessment of Risk	Site Specific Mitigation Measures	Residual Impacts
			and segregate solid waste according to its type. An impervious liner shall be laid to waste sites before the dumping of solid waste. The impervious liner shall be approved by the supervision consultant. The Contractor shall transport and dispose solid waste at existing municipal dump site at the outskirts of Khuzdar after acquiring approval / NOC from Town Municipal Authority at Khuzdar every month. The contractor shall submit the NOC to the office of BIPD every month.	
	Water - Feaces contamination	B-2	Appropriate measures for disposal of sewage – such as septic tank and soaking pits shall be prepared by contractor and submitted for approval to the Chief Engineer, BIPD.	B-1
	Loss of vegetation	B-2	The construction crew shall be provided with LPG as cooking (and heating, if required) fuel. Use of fuel wood shall not be allowed.	B-1
	Health and Safety issues	B-2	Protective fencing to be installed around the Camp and its latrines to avoid any accidents. Open defecation shall not be allowed. Firefighting equipment shall be made available at the camps. Sand being excessively available shall also be used and stored in buckets along with other necessary fire fighting equipment.	B-1

Activity / Issue	Site Specific Impacts	Assessment of Risk	Site Specific Mitigation Measures	Residual Impacts
			The camp staff shall be provided firefighting training.	
			All safety precautions shall be taken to transport, handle and store hazardous substances, such as fuel	
			Contractor shall prepare and submit a Health & Safety Plan for approval by Supervision consultant / BIPD	
Transportation of construction material	Soil erosion and contamination	B-2	Only Ratodero-Gawadar (M-8) paved highway shall be used for transportation of construction material.	B-1
			Vehicles and equipment shall not be repaired in the field.	
	Air pollution due to vehicle fuel	B-2	Vehicles shall be kept in good working condition and properly tuned, in order to minimize the exhaust emissions	B-1
	Noise pollution due to vehicle movement	B-2	Vehicles shall have exhaust mufflers (silencers) to minimize noise generation	B-1
			Construction material shall be transported during 0800hrs to 1700hrs to avoid night time disturbance. If unavoidable, the Supervising Consultant in consultation with BIPD and Contractor shall resolve this issue and shall ensure that such incidents do not become a regular feature.	
	Health and Safety issues	B-2	Road signage shall be fixed at appropriate locations to reduce safety hazard associated with project-related vehicular traffic	B-1
			Project drivers shall be trained on defensive driving	

Activity / Issue	Site Specific Impacts	Assessment of Risk	Site Specific Mitigation Measures	Residual Impacts
			Vehicle speeds near / within the communities shall be limited to 10-15 km/hr. to avoid damage to infrastructure.	
	Damage to infrastructure	B-2	All damaged infrastructure shall be restored to original or better condition.	B-1
Construction Works: Earthen Bund with Stone Pitching: 1. Protection Bund -1 1,060 m 2. Protection Bund -2 480 m 3. Protection Bund -3 450 m 4. Protection Bund -4 400 m 5. Protection Bund -5 680 m	Soil erosion and contamination	B-2	Material borrowing and disposal plan should be prepared by contractor and submitted to Supervising Consultant / BIPD for approval.	B-1
			Lands used for agricultural purposed shall not be used borrowing material.	
			Written consent of the land owner should be obtained for material (soil) borrowing	
			Photographic record (before and after) should be kept for the borrow and disposal areas.	
			Leveling of borrow sites shall be done by contractor on his own expense.	
	Loss of natural vegetation	B-2	Compensatory tree plantation (ten times the trees cut down for construction) should be carried out at appropriate locations within the project area.	B-1
	Damage to infrastructure	B-2	All damaged infrastructure shall be restored to original or better condition.	B-1

Activity / Issue	Site Specific Impacts	Assessment of Risk	Site Specific Mitigation Measures	Residual Impacts
6. Protection Bund -6 560 m 7. Protection Bund -7 330 m 8. Protection Bund -8 300 m 9. Protection Bund -9 980 m	Sites of Historical, Cultural, Archeological or Religious Significance	B-2	In case of chance find of any sites or artifacts of historical, cultural, archeological or religious significance, contractor shall immediately stop work and notify the provincial and federal archeological departments along with Supervising Consultant and BIPD. The appropriate line of action shall be sought from the concerned department before resumption of the construction activities at such sites.	B-1
	Noise pollution	B-2	Equipment with high levels shall be fitted with noise reduction devices	B-1
			Regular inspection, maintenance and lubrication of the construction vehicle and equipment shall be performed	
			Use of PPEs such as ear plugs and ear muffs by the workers shall be ensured	
			Construction work shall be carried out during 0800hrs to 1700hrs to avoid night time disturbance. If unavoidable, the Supervising Consultant in consultation with BIPD and Contractor shall resolve this issue and shall ensure that such incidents do not become a regular feature.	
	Air pollution	B-2	Vehicles shall be kept in good working condition and properly tuned, in order to minimize the exhaust emissions	B-1

Activity / Issue	Site Specific Impacts	Assessment of Risk	Site Specific Mitigation Measures	Residual Impacts
			Water should be sprinkled where needed and appropriate, particularly at work sites near the communities to suppress dispersion of dust.	
	Health and Safety issues	B-2	Demarcation tapes to be installed around the construction site to avoid any unauthorized entry	B-1
			Personal protective equipment should be made available at site and the usage of the PPEs should be ensured.	
			Health & safety plan should be prepared by contractor and get it approved by supervision consultant	
C. Operation and Maintenance Phase				
Breaching of flood protection bund	System sustainability	D-4	The Irrigation Department should monitor the system on a regular basis. Capacity building of the communities should be carried out in the O&M activities. Liaison with the communities to be maintained to identify potential weaknesses in the system that could cause breaches.	D-2
Risk due to Natural Hazard i.e. Flooding and Earthquakes	System sustainability	C-3	Emergency Response Plan for Flood Protection Bund will be followed which is attached as **Annexure – 16** of this report.	C-1

Activity / Issue	Site Specific Impacts	Assessment of Risk	Site Specific Mitigation Measures	Residual Impacts
Karkh River Intervention: Construction of New Weir at Jhalaro and Repair of Cutoff Wall of Chutta Weir				
A. Design & Planning Phase				
Field surveys	No potential impact	-		
Assessment of water availability	Failure of design	C-3	Design works will ensure the assessment of water. Hydrological and flood & drought management analysis shall ensure the feasibility of project success.	C-1
Design works construction of weir as per proper engineering standards	In case of design failure system will be collapsed	D-4	Review of engineering design works will ensure the proper design of the system	D-1
Traditional water rights considerations	Social issues	D-4	Acquire full information about traditional water rights and ensure that these are not disturbed	D-1
Public disclosure of final design	Social issues	D-4	Continual two-way communication with relevant stakeholders to understand causes of previous failures, community needs, and establish rationale perceptions	D-1
Disruption to public life	No potential impact	-		No potential impact
Disruption to wildlife	No potential impact	-		No potential impact
Risk due to Natural Hazard i.e. flooding and earthquakes	The Project area lies in zone 2B as per seismic map of Pakistan which clearly shows that the area is in moderate risk zone. So due to earthquake the	D-4	Design engineer should ensure that seismic design of weir and other allied and irrigation structures should be carried out on international engineering standards. By adopting the above measure, the impact would be of low significance.	D-2

Activity / Issue	Site Specific Impacts	Assessment of Risk	Site Specific Mitigation Measures	Residual Impacts
	breaching weir, canal and other irrigation structures can be possible. This impact would be of moderate significance. The other natural hazard which affect the area is flood which would also be of moderate significance.		Flood protection bunds has been included as an integral component of the project to control the damages occurred by floods. By adopting the above measure, the impact would be of low significance.	
B. Construction Phase (Construction of Weirs at Jhalaro)				
Construction contractor mobilization and establishment of campsite and machinery/ equipment Yard	Establishment of fuel depot / Workshop facilities may spread oils	B-2	In order to avoid spread of oil by virtue of establishment of fuel depot / Workshop facilities, the contractor should avoid it altogether. Incase, it cannot be avoided, the contractor must house it and underlay the area with proper liner. Dispensing pumps should be used. Spent Oil shall be properly collected in impermeable containers. Spent oil shall be disposed in accordance with MSDS shall be ensured. Good housekeeping practices shall be ensured at workshop areas.	B-1
	Loss of vegetation	B-2	The construction crew shall be provided with LPG as cooking (and heating, if	B-1

Activity / Issue	Site Specific Impacts	Assessment of Risk	Site Specific Mitigation Measures	Residual Impacts
			required) fuel. Use of fuel wood shall not be allowed.	
	Influx of external work force	B-2	Farmer's Organization will be contacted by the contractor and with their assistance, the contractor will get a tentative list of workers for employment. Residents of Jhalaro village shall be employed for the construction phase.	B-1
	Land degradation due to solid waste disposal of camp site	B-2	Construction contractor shall not dispose of any solid waste in the area. The construction Contractor may dump solid waste with proper lining material in depressions and have a daily and monthly cover on it. Contractor shall collect in separate bins and segregate solid waste according to its type. An impervious liner shall be laid to waste sites before the dumping of solid waste. The impervious liner shall be approved by the supervision consultant. The Contractor shall transport and dispose solid waste at existing municipal dump site at the outskirts of Khuzdar after acquiring approval / NOC from Town Municipal Authority at Khuzdar every month. The contractor shall submit the NOC to the office of BIPD every month.	B-1

Activity / Issue	Site Specific Impacts	Assessment of Risk	Site Specific Mitigation Measures	Residual Impacts
	Changes in land use pattern	B-2	Location for establishment of campsite shall be duly discussed and approved by BIPD. This will include provision for solid waste disposal, latrines / soakpits etc. Soakpits shall be properly designed approved by BIPD before establishment of campsite. Photographs of site before establishment of campsite shall be taken and it will be responsibility of the contractor to make site better or as good as original. A comparison report shall be submitted to Chief Engineer, BIPD before release of final payment. Site for camp site shall be selected keeping in view the cultural norms of the area to avoid undue interference of the Construction contractor's staff with the local residents. The land shall be rented for the camp site and equipment yard. No resettlement is envisaged for this purpose.	B-1
	Health and Safety issues	B-2	Protective fencing to be installed around the Camp and its latrines to avoid any accidents. Open defecation shall not be allowed. Firefighting equipment shall be made available at the camps. Sand being excessively available shall also be used	B-1

Activity / Issue	Site Specific Impacts	Assessment of Risk	Site Specific Mitigation Measures	Residual Impacts
			and stored in buckets along with other necessary fire fighting equipment. The camp staff shall be provided firefighting training. All safety precautions shall be taken to transport, handle and store hazardous substances, such as fuel Contractor shall prepare and submit a Health & Safety Plan for approval by Supervision consultant / BIPD	
	Deterioration of air quality due to machinery & equipment	B-2	Proper engine tuning of machinery/ equipment every month shall be carried out to comply with National Environmental Quality Standards of Pakistan.	B-1
	Noise	B-2	Equipment with high levels shall be fitted with noise reduction devices	B-1
			Regular inspection, maintenance and lubrication of the construction vehicle and equipment shall be performed	
			Use of PPEs such as ear plugs and ear muffs by the workers shall be ensured	
			Activity having high noise potential shall be postponed to day time i.e. in between 0800hrs to 1700hrs	
	Water - Feaces contamination	B-2	Appropriate measures for disposal of sewage – such as septic tank and soaking pits shall be prepared by	B-1

Activity / Issue	Site Specific Impacts	Assessment of Risk	Site Specific Mitigation Measures	Residual Impacts
			contractor and submitted for approval to the Chief Engineer, BIPD.	
Security and Safety Risks	Delay in project execution	C-3	Frequent consultation with local community leaders should be carried out to ensure that any social frictions are identified and resolved before they become inflamed. There are safety requirements for construction projects that include control of public access to the site along with regulations aimed at safeguarding workers. Suitable arrangements that conform to national health and safety requirements and also appropriate international best practice will need to be followed. There are specific procedures that need to be observed for the transport, storage and handling of explosives that will be required for the operation of quarries and also underground excavation. It will be necessary to liaise with local communities and initiate and support a public awareness program, particularly targeted at children, about the risks and dangers of large construction sites	C-1
Transportation of construction material	Soil erosion and contamination	B-2	Only Ratodero-Gawadar (M-8) paved highway shall be used for transportation of construction material.	B-1
			Vehicles and equipment shall not be repaired in the field.	
	Air pollution due to vehicle fuel	B-2	Vehicles shall be kept in good working condition and properly tuned, in order to minimize the exhaust emissions	B-1

Activity / Issue	Site Specific Impacts	Assessment of Risk	Site Specific Mitigation Measures	Residual Impacts
	Noise pollution due to vehicle movement	B-2	Vehicles shall have exhaust mufflers (silencers) to minimize noise generation Construction material shall be transported during 0800hrs to 1700hrs to avoid night time disturbance. If unavoidable, the Supervising Consultant in consultation with BIPD and Contractor shall resolve this issue and shall ensure that such incidents do not become a regular feature.	B-1
	Health and Safety issues	B-2	Road signage shall be fixed at appropriate locations to reduce safety hazard associated with project-related vehicular traffic. Project drivers shall be trained on defensive driving Vehicle speeds near / within the communities shall be limited to 10-15 km/hr. to avoid damage to infrastructure.	B-1
	Damage to infrastructure	B-2	All damaged infrastructure shall be restored to original or better condition.	B-1

Activity / Issue	Site Specific Impacts	Assessment of Risk	Site Specific Mitigation Measures	Residual Impacts
Construction Works: 1. Earth Works for 106m long and 1m high Gabion Weir 2. Concrete and Form Works for New Weir and Repair of Cutoff Wall of Chutta Weir	Soil erosion and contamination	B-2	Material borrowing and disposal plan should be prepared by contractor and submitted to Supervising Consultant / BIPD for approval. Lands used for agricultural purposed shall not be used borrowing material. Written consent of the land owner should be obtained for material (soil) borrowing Photographic record (before and after) should be kept for the borrow and disposal areas. Leveling of borrow sites shall be done by contractor on his own expense.	B-1
	Loss of natural vegetation	B-2	Compensatory tree plantation (ten times the trees cut down for construction) should be carried out at appropriate locations within the project area.	B-1
	Damage to infrastructure	B-2	All damaged infrastructure shall be restored to original or better condition.	B-1
	Sites of Historical, Cultural, Archeological or Religious Significance	B-2	In case of chance find of any sites or artifacts of historical, cultural, archeological or religious significance, contractor shall immediately stop work and notify the provincial and federal archeological departments along with Supervising Consultant and BIPD. The appropriate line of action shall be sought from the concerned department before resumption of the construction activities at such sites.	B-1

Activity / Issue	Site Specific Impacts	Assessment of Risk	Site Specific Mitigation Measures	Residual Impacts
	Noise pollution		Equipment with high levels shall be fitted with noise reduction devices. Regular inspection, maintenance and lubrication of the construction vehicle and equipment shall be performed Use of PPEs such as ear plugs and ear muffs by the workers shall be ensured. Construction work shall be carried out during 0800hrs to 1700hrs to avoid night time disturbance. If unavoidable, the Supervising Consultant in consultation with BIPD and Contractor shall resolve this issue and shall ensure that such incidents do not become a regular feature.	B-1
	Air pollution	B-2	Vehicles shall be kept in good working condition and properly tuned, in order to minimize the exhaust emissions Water should be sprinkled where needed and appropriate, particularly at work sites near the communities to suppress dispersion of dust.	B-1
	Health and Safety issues	B-2	Demarcation tapes to be installed around the construction site to avoid any unauthorized entry. Personal protective equipment should be made available at site and the usage of the PPEs should be ensured.	B-1

Activity / Issue	Site Specific Impacts	Assessment of Risk	Site Specific Mitigation Measures	Residual Impacts
			Health & safety plan should be prepared by contractor and get it approved by supervision consultant	
C. Operation and Maintenance Phase				
Breaching of Weir	System sustainability	D-4	The Irrigation Department should monitor the system on a regular basis. Capacity building of the communities should be carried out in the O&M activities. Liaison with the communities to be maintained to identify potential weaknesses in the system that could cause breaches.	D-2
Conflicts caused by unavailability or improper distribution of water in the area	Social issues	C-3	Agreements between different communities/tribes Perennial irrigation schemes may function smoothly in normal conditions and circumstances but do face problems during extraordinary situations, i.e. when flow is higher or lower than normal. From the outset water management rules and regulations must incorporate ways to tackle such issues as water scarcity and surplus flows. Local water user associations and groups need to be trained and involved to operate the canals, channels, gates, inlets, outlets and other structures. This needs to be done on collaborative basis	C-1

Activity / Issue	Site Specific Impacts	Assessment of Risk	Site Specific Mitigation Measures	Residual Impacts
			with irrigation and agriculture department where communication system among farmers, water user association and department is assured. Farmers in downstream areas should be compensated in case they lose their water rights. All villages deprived of Project's water rights should be compensated for drinking water supply schemes otherwise very soon all villages and settlements will be deserted as underground water may not be fit for drinking purpose for every village and it would probably not be within the financial or technical capacity of local population to initiate such schemes on their own.	
Use of water for drinking purposes	Health issues	C-3	Proper treatment system shall be provided Water quality will be tested as per WHO/ GOP standards to ensure the integrity of the water supply system. Turbidity and free residual chlorine tests shall be regularly performed. Arsenic will be tested as per WHO standards.	C-1

Activity / Issue	Site Specific Impacts	Assessment of Risk	Site Specific Mitigation Measures	Residual Impacts
Periodic cleaning and maintenance of the system	Solid waste generation	C-3	Ensure proper disposal of waste at designated landfill/disposal sites.	C-1
Increase of agricultural lands	Loss of pastoral lands	C-3	Stall feeding practices for livestock, so that remaining pastoral lands are available for wild animals.	C-1
Community Participation for management and operation of the irrigation system	Social issues and System sustainability	C-3	Ensure community participation in management and operation of the irrigation system Training of community	C-1
Disruption to wildlife	Conservation issues	C-3	Design has already provided cattle drinking troughs at different intervals and pedestrian bridge for canal crossing approximately at 500 m interval. It will be the responsibility of BIPD to ensure the proper maintenance of aforementioned structures. By adopting the aforementioned measures, the impact would be finally of low significance.	C-1
Use of fertilizers & pesticides	Banned fertilizer & pesticides will cause health issues Contamination of fresh water through surface runoff	C-3	Concerted efforts by the department of agriculture to disseminate information regarding sustainable use of fertilizers will help in keeping the use at an optimal level; Ammonium Nitrate (AN) and Calcium Ammonium Nitrate (CAN) fertilizers will not be allowed; and Use of restricted pesticides identified by WHO shall not be allowed. The list of	C-1

Activity / Issue	Site Specific Impacts	Assessment of Risk	Site Specific Mitigation Measures	Residual Impacts
			restricted pesticides is attached as **Annexure 19** of this report	
Risk due to Natural Hazard i.e. Flooding and Earthquakes	System sustainability	C-3	Emergency Response Plan for Breaching of Weir will be followed which is attached as **Annexure – 17** of this report.	C-1

Activity / Issue	Potential Impact	Assessment of Risk	Mitigation Measures	Residual Impacts
Infiltration Gallery at Hatachi - Kharzan (extension of infiltration gallery tunnel, lining of infiltration gallery wells, infiltration gallery tunnel cleaning; lining of covered channel, open channel lining, social structures and time division structures)				
A. Design & Planning Phase				
Field Surveys	No potential impact	-	-	-
Assessment of water availability	Failure of design	C-3	Design works will ensure the assessment of water. Hydrological and flood & drought management analysis shall ensure the feasibility of project success.	C-1
Location, land use and land acquisition of the selected subproject area	No potential impact	-		
Design works construction of infiltration gallery as per proper engineering standards	In case of design failure system will be collapsed	D-4	Review of engineering design works will ensure the proper design of the system	D-1
Traditional water rights considerations	Social issues	D-4	Acquire full information about traditional water rights and ensure that these are not disturbed	D-1
Public consultation and sharing of proposed design considerations	Social issues	D-4	Continual two-way communication with relevant stakeholders to understand causes of previous failures, community needs, and establish rationale perceptions	D-1
Disruption to public life	No potential impact	-	-	-
Disruption to wildlife	No potential impact	-	-	-

Activity / Issue	Potential Impact	Assessment of Risk	Mitigation Measures	Residual Impacts
Risk due to Natural Hazard i.e. flooding and earthquakes	The Project area lies in zone 2B as per seismic map of Pakistan which clearly shows that the area is in moderate risk zone. So due to earthquake the breaching infiltration gallery, canal and other irrigation structures can be possible. This impact would be of moderate significance. The other natural hazard which affect the area is flood which would also be of moderate significance.	D-4	Design engineer should ensure that seismic design of infiltration gallery and other allied and irrigation structures should be carried out on international engineering standards. By adopting the above measure, the impact would be of low significance. Flood protection bunds has been included as an integral component of the project to control the damages occurred by floods. By adopting the above measure, the impact would be of low significance.	D-2
B. Implementation and Construction Phase				
Construction contractor mobilization and Establishment of campsite and machinery/ equipment Yard	Changes in land use pattern Cultural conflicts Influx of external work force Land degradation due to solid waste disposal of camp site Workshop facilities will spread oils & chemicals Soil erosion	B-2	Site for camp site shall be selected keeping in view the cultural norms of the area to avoid undue interference of the Construction contractor's staff with the local residents. Local residents shall be given priority in the employment opportunities generated during construction and operations phase The land shall be rented for the camp site and equipment yard. No resettlement is envisaged for this purpose.	B-1

Activity / Issue	Potential Impact	Assessment of Risk	Mitigation Measures	Residual Impacts
	Workshop facilities may spread oils & chemicals	B-2	Proper disposal of used oil and chemical waste in accordance with MSDS shall be ensured. Efficient Use of Chemicals shall be ensured. Good housekeeping practices shall be ensured at workshop areas. Mixing of waste into fresh water sources shall not be allowed.	B-1
	Deterioration of air quality due to machinery & equipment	B-2	Proper engine tuning of machinery/ equipment to meet National Environmental Quality Standards of Pakistan limits. Water should be sprinkled where needed and appropriate, particularly at work sites near the communities.	B-1
	Noise Pollution	B-2	Equipment with high levels shall be fitted with noise reduction devices Regular inspection, maintenance and lubrication of the construction vehicle and equipment shall be performed Use of PPEs such as ear plugs and ear muffs by the workers shall be ensured Avoid night time activity	B-1

Activity / Issue	Potential Impact	Assessment of Risk	Mitigation Measures	Residual Impacts
	Land degradation due to solid waste disposal of camp site	B-2	Ensure proper disposal of camp site waste at designated landfill/disposal sites. If the project area does not have any disposal site the construction contractor shall use any depression for waste dumping. Prior to dumping the contractor should get the NOC from local authorities for disposal of solid waste. An impervious liner shall be laid to waste sites before the dumping of solid waste. The impervious liner shall be approved by the supervision consultant. After the dumping of solid waste the depression should be covered by scarified material. Good housekeeping practices within the camp site shall be adopted to minimize waste generation. Disposal of campsite waste near residential colonies or in agricultural fields shall not be allowed	B-1
	Water contamination	B-2	Waste management plan to be prepared for appropriate disposal of sewage – such as septic tank and soaking pits	B-1
	Loss of vegetation	B-2	The construction crew shall be provided with LPG as cooking (and heating, if required) fuel. Use of fuel wood shall not be allowed.	B-1

Activity / Issue	Potential Impact	Assessment of Risk	Mitigation Measures	Residual Impacts
	Health and Safety issues	B-2	Protective fencing to be installed around the Camp to avoid any accidents Firefighting equipment shall be made available at the camps The camp staff shall be provided firefighting training. All safety precautions shall be taken to transport, handle and store hazardous substances, such as fuel Health & safety plan should be prepared by contractor and get it approved by supervision consultant	B-1
Security and Safety Risks	Delay in project execution	C-3	Frequent consultation with local community leaders should be carried out to ensure that any social frictions are identified and resolved before they become inflamed. There are safety requirements for construction projects that include control of public access to the site along with regulations aimed at safeguarding workers. Suitable arrangements that conform to national health and safety requirements and also appropriate international best practice will need to be followed. There are specific procedures that need to be observed for the transport, storage and handling of explosives that will	C-1

Activity / Issue	Potential Impact	Assessment of Risk	Mitigation Measures	Residual Impacts
			be required for the operation of quarries and also underground excavation. It will be necessary to liaise with local communities and initiate and support a public awareness program, particularly targeted at children, about the risks and dangers of large construction sites	
Transportation of construction material	Soil erosion and contamination	B-2	Vehicular traffic on unpaved roads shall be avoided as far as possible. Vehicles and equipment shall not be repaired in the field. If unavoidable, impervious sheathing shall be used to avoid soil and water contamination. Water should be sprinkled where needed and appropriate, particularly at work sites near the communities to suppress dispersion of dust	B-1
	Air pollution	B-2	Vehicular traffic on unpaved roads shall be avoided as far as possible. Operation of vehicles and machinery close to the water channels, water reservoir shall be minimized. Vehicles shall be kept in good working condition and properly tuned, in order to minimize the exhaust emissions	B-1

Activity / Issue	Potential Impact	Assessment of Risk	Mitigation Measures	Residual Impacts
	Noise pollution	B-2	Vehicles shall have exhaust mufflers (silencers) to minimize noise generation. Nighttime traffic shall be avoided near the communities. Local population shall be taken in confidence if such work is unavoidable.	B-1
	Health and Safety issues	B-2	Road signage shall be fixed at appropriate locations to reduce safety hazard associated with project-related vehicular traffic Project drivers shall be trained on defensive driving. Vehicle speeds near / within the communities shall be kept low, to avoid safety hazard and dust emissions.	B-1
	Damage to infrastructure	B-2	All damaged infrastructure shall be restored to original or better condition.	B-1
Construction Works	Soil erosion and contamination	B-2	Material borrowing and disposal plan should be prepared. Cultivation fields should be avoided for borrowing material to the extent possible. Written consent of the land owner should be obtained for material (soil) borrowing.	B-1

Activity / Issue	Potential Impact	Assessment of Risk	Mitigation Measures	Residual Impacts
			Photographic record (before, during, after) should be kept for the borrow and disposal areas. Leveling of borrow sites.	
	Loss of natural vegetation	B-2	Compensatory tree plantation (five times the trees cut down for construction) should be carried out at appropriate locations within the project area	B-1
	Site overburden	B-2	Wind direction shall be considered while selecting sites for stock piles. Stockpiles of overburden shall be kept covered where possible. Ensure proper disposal of construction waste at designated landfill/disposal sites. If the project area does not have any disposal site the construction contractor shall use any depression for waste dumping. Prior to dumping the contractor should get the NOC from local authorities for disposal of solid waste. Proper disposal of waste material. Demarcate the waste site and provide details of land use. Finally take approval from supervision consultant. An impervious liner shall be laid to waste sites before the dumping of	B-1

Activity / Issue	Potential Impact	Assessment of Risk	Mitigation Measures	Residual Impacts
			solid waste. The impervious liner shall be approved by the supervision consultant. After the dumping of solid waste, the depression should be covered by scarified material Dismantled asphalt pavement shall be dumped to the waste site.	
	Borrow pit management	B-2	As far as possible wasteland or natural areas with a high elevation will be demarcated for borrowing earth material. Where the use of agriculture land is unavoidable, the top 300 mm of the plough layer will be stripped and stockpiled for redressing the land after the required borrow material has been removed. Where deep ditching is to be carried out, the top 1 m layer of ditching area will be stripped and stockpiled. The ditch will initially fill with scrap material from construction and then leveled with the stockpiled topsoil. Ditches or borrow pits that cannot be fully rehabilitated will be landscaped to minimize the erosion and to avoid creating hazards for people and livestock.	B-1

Activity / Issue	Potential Impact	Assessment of Risk	Mitigation Measures	Residual Impacts
			Land owners will be compensated according to the terms of lease agreement negotiated with the land owners, and restoration action agreed upon by the contractor will be duly carried out.	
	Damage to infrastructure	B-2	All damaged infrastructure shall be restored to original or better condition.	B-1
	Sites of Historical, Cultural, Archeological or Religious Significance	B-2	Proponent shall ensure that the construction contractor staff is educated about the location and importance of the cultural sites that exist in the Project area. The contractor shall ensure that these sites are not affected by the construction related activities including movement of the project vehicles and obtaining borrow material for construction. These aspects will be included in the trainings to be conducted for the contractor's staff. In case of chance find of any sites or artifacts of historical, cultural, archeological or religious significance, contractor shall ensure that the work is stopped at that site, the provincial and federal archeological departments are notified immediately, and their advice is sought before resumption	B-1

Activity / Issue	Potential Impact	Assessment of Risk	Mitigation Measures	Residual Impacts
			of the construction activities at such sites.[34] Graveyards shall not be disturbed during the construction activities including movement of the project vehicles and obtaining borrow material for construction.	
	Noise pollution	B-2	Equipment with high levels shall be fitted with noise reduction devices Regular inspection, maintenance and lubrication of the construction vehicle and equipment shall be performed Use of PPEs such as ear plugs and ear muffs by the workers shall be ensured Avoid night time activity	B-1
	Air pollution	B-2	Proper engine tuning of machinery/ equipment to meet National Environmental Quality Standards of Pakistan limits. Water should be sprinkled where needed and appropriate, particularly at work sites near the communities.	B-1

[34] Project routing does not envisage any archeological site, however in case of any chance find the ***"Chance Find Procedures"*** should be adopted as given in **Annexure-18**.

Activity / Issue	Potential Impact	Assessment of Risk	Mitigation Measures	Residual Impacts
	Blocked of access due to earth works and stockpiling of excavated material	B-2	A bypass route should be constructed at the project site to divert the through traffic, thus avoiding the public traffic passing through the site.	B-1
	Health and Safety issues	B-2	Demarcation tapes to be installed around the construction site to avoid any unauthorized entry Personal protective equipment should be made available at site and the usage of the PPEs should be ensured. Health & safety plan should be prepared by contractor and get it approved by supervision consultant	B-1
C. Operation and Maintenance Phase				
Conflicts caused by unavailability or improper distribution of water in the area	Social issues	C-3	Agreements between different communities/tribes Perennial irrigation schemes may function smoothly in normal conditions and circumstances but do face problems during extraordinary situations, i.e. when flow is higher or lower than normal. From the outset water management rules and regulations must incorporate ways to tackle such issues as water scarcity and surplus flows.	C-1

Activity / Issue	Potential Impact	Assessment of Risk	Mitigation Measures	Residual Impacts
			Local water user associations and groups need to be trained and involved to operate the canals, channels, gates, inlets, outlets and other structures. This needs to be done on collaborative basis with irrigation and agriculture department where communication system among farmers, water user association and department is assured. Farmers in downstream areas should be compensated in case they lose their water rights. All villages deprived of Project's water rights should be compensated for drinking water supply schemes otherwise very soon all villages and settlements will be deserted as underground water may not be fit for drinking purpose for every village and it would probably not be within the financial or technical capacity of local population to initiate such schemes on their own.	
Use of water for drinking purposes	Health issues	C-3	Proper treatment system shall be provided Water quality will be tested as per WHO/ GOP standards to ensure the integrity of the water supply system.	C-1

Activity / Issue	Potential Impact	Assessment of Risk	Mitigation Measures	Residual Impacts
			Turbidity and free residual chlorine tests shall be regularly performed. Arsenic will be tested as per WHO standards.	
Periodic cleaning and maintenance of the system	Solid waste generation	C-3	Ensure proper disposal of waste at designated landfill/disposal sites.	C-1
Increase of agricultural lands	Loss of pastoral lands	C-3	Stall feeding practices for livestock, so that remaining pastoral lands are available for wild animals.	C-1
Community Participation for management and operation of the irrigation system	Social issues and System sustainability	C-3	Ensure community participation in management and operation of the irrigation system Training of community	C-1
Disruption to wildlife	Conservation issues	C-3	Design has already provided cattle drinking troughs at different intervals and pedestrian bridge for canal crossing approximately at 500 m interval. It will be the responsibility of BIPD to ensure the proper maintenance of aforementioned structures. By adopting the aforementioned measures, the impact would be finally of low significance.	C-1
Use of fertilizers & pesticides	Banned fertilizer & pesticides will cause health issues Contamination of fresh water through surface runoff	C-3	Concerted efforts by the department of agriculture to disseminate information regarding sustainable use of fertilizers will help in keeping the use at an optimal level;	C-1

Activity / Issue	Potential Impact	Assessment of Risk	Mitigation Measures	Residual Impacts
			Ammonium Nitrate (AN) and Calcium Ammonium Nitrate (CAN) fertilizers will not be allowed; and Use of restricted pesticides identified by WHO shall not be allowed. The list of restricted pesticides is attached as **Annexure 19** of this report	
Risk due to Natural Hazard i.e. flooding and earthquakes	System sustainability	C-3	Emergency Response Plan for Infiltration Gallery will be followed which is attached as **Annexure – 15** of this report.	C-1
Activity / Issue	**Potential Impact**	**Assessment of Risk**	**Mitigation Measures**	**Residual Impacts**
Mula River Intervention: Flood Protection Bund				
A. Design & Planning Phase				
Field surveys	No potential impact	-	-	-
Design works construction of flood protection bund as per proper engineering standards	In case of design failure system will be collapsed	D-4	Review of engineering design works will ensure the proper design of the system	D-1
Public disclosure of final design	Social issues	D-4	Continual two-way communication with relevant stakeholders to understand causes of previous failures, community needs, and establish rationale perceptions	D-1
Implementation & Construction Phase				

Activity / Issue	Potential Impact	Assessment of Risk	Mitigation Measures	Residual Impacts
Construction contractor mobilization and Establishment of campsite and machinery/ equipment Yard	Changes in land use pattern Cultural conflicts Influx of external work force Land degradation due to solid waste disposal of camp site Workshop facilities will spread oils & chemicals Soil erosion	B-2	Site for camp site shall be selected keeping in view the cultural norms of the area to avoid undue interference of the Construction contractor's staff with the local residents. Local residents shall be given priority in the employment opportunities generated during construction and operations phase The land shall be rented for the camp site and equipment yard. No resettlement is envisaged for this purpose.	B-1
	Workshop facilities may spread oils & chemicals	B-2	Proper disposal of used oil and chemical waste in accordance with MSDS shall be ensured. Efficient Use of Chemicals shall be ensured. Good housekeeping practices shall be ensured at workshop areas. Mixing of waste into fresh water sources shall not be allowed.	B-1
	Deterioration of air quality due to machinery & equipment	B-2	Proper engine tuning of machinery/ equipment to meet National Environmental Quality Standards of Pakistan limits. Water should be sprinkled where needed and appropriate, particularly at work sites near the communities.	B-1

Activity / Issue	Potential Impact	Assessment of Risk	Mitigation Measures	Residual Impacts
	Noise Pollution	B-2	Equipment with high levels shall be fitted with noise reduction devices Regular inspection, maintenance and lubrication of the construction vehicle and equipment shall be performed Use of PPEs such as ear plugs and ear muffs by the workers shall be ensured Avoid night time activity	B-1
	Land degradation due to solid waste disposal of camp site	B-2	Ensure proper disposal of camp site waste at designated landfill/disposal sites. If the project area does not have any disposal site the construction contractor shall use any depression for waste dumping. Prior to dumping the contractor should get the NOC from local authorities for disposal of solid waste. An impervious liner shall be laid to waste sites before the dumping of solid waste. The impervious liner shall be approved by the supervision consultant. After the dumping of solid waste, the depression should be covered by scarified material. Good housekeeping practices within the camp site shall be adopted to minimize waste generation.	B-1

Activity / Issue	Potential Impact	Assessment of Risk	Mitigation Measures	Residual Impacts
			Disposal of campsite waste near residential colonies or in agricultural fields shall not be allowed	
	Water contamination	B-2	Waste management plan to be prepared for appropriate disposal of sewage – such as septic tank and soaking pits	B-1
	Loss of vegetation	B-2	The construction crew shall be provided with LPG as cooking (and heating, if required) fuel. Use of fuel wood shall not be allowed.	B-1
	Health and Safety issues	B-2	Protective fencing to be installed around the Camp to avoid any accidents Firefighting equipment shall be made available at the camps The camp staff shall be provided firefighting training. All safety precautions shall be taken to transport, handle and store hazardous substances, such as fuel Health & safety plan should be prepared by contractor and get it approved by supervision consultant	B-1
Transportation of construction material	Soil erosion and contamination	B-2	Vehicular traffic on unpaved roads shall be avoided as far as possible. Vehicles and equipment shall not be repaired in the field. If unavoidable, impervious sheathing shall be used	B-1

Activity / Issue	Potential Impact	Assessment of Risk	Mitigation Measures	Residual Impacts
			to avoid soil and water contamination.	
	Air pollution	B-2	Vehicular traffic on unpaved roads shall be avoided as far as possible. Operation of vehicles and machinery close to the water channels, water reservoir shall be minimized. Vehicles shall be kept in good working condition and properly tuned, in order to minimize the exhaust emissions	B-1
	Noise pollution	B-2	Vehicles shall have exhaust mufflers (silencers) to minimize noise generation Nighttime traffic shall be avoided near the communities. Local population shall be taken in confidence if such work is unavoidable.	B-1
	Health and Safety issues	B-2	Road signage shall be fixed at appropriate locations to reduce safety hazard associated with project-related vehicular traffic Project drivers shall be trained on defensive driving Vehicle speeds near / within the communities shall be kept low, to avoid safety hazard and dust emissions.	B-1

Activity / Issue	Potential Impact	Assessment of Risk	Mitigation Measures	Residual Impacts
	Damage to infrastructure	B-2	All damaged infrastructure shall be restored to original or better condition.	B-1
Construction Works: Earthen Bund with Stone Pitching: 1. Hatachi Village = 3,140 m Long 2. Kharzan Village = 3,460 m Long	Soil erosion and contamination	B-2	Material borrowing and disposal plan should be prepared Cultivation fields should be avoided for borrowing material to the extent possible Written consent of the land owner should be obtained for material (soil) borrowing Photographic record (before, during, after) should be kept for the borrow and disposal areas. Leveling of borrow sites.	B-1
	Loss of natural vegetation	B-2	Compensatory tree plantation (five times the trees cut down for construction) should be carried out at appropriate locations within the project area	B-1
	Damage to infrastructure	B-2	All damaged infrastructure shall be restored to original or better condition.	B-1
	Sites of Historical, Cultural, Archeological or Religious Significance	B-2	Proponent shall ensure that the construction contractor staff is educated about the location and importance of the cultural sites that exist in the Project area. The	B-1

Activity / Issue	Potential Impact	Assessment of Risk	Mitigation Measures	Residual Impacts
			contractor shall ensure that these sites are not affected by the construction related activities including movement of the project vehicles and obtaining borrow material for construction. These aspects will be included in the trainings to be conducted for the contractor's staff. In case of chance find of any sites or artifacts of historical, cultural, archeological or religious significance, contractor shall ensure that the work is stopped at that site, the provincial and federal archeological departments are notified immediately, and their advice is sought before resumption of the construction activities at such sites.35 Graveyards shall not be disturbed during the construction activities including movement of the project vehicles and obtaining borrow material for construction.	
	Noise pollution	B-2	Equipment with high levels shall be fitted with noise reduction devices Regular inspection, maintenance and lubrication of the construction	B-1

[35] Project routing does not envisage any archeological site, however in case of any chance find the ***"Chance Find Procedures"*** should be adopted as given in **Annexure-18**.

Activity / Issue	Potential Impact	Assessment of Risk	Mitigation Measures	Residual Impacts
			vehicle and equipment shall be performed Use of PPEs such as ear plugs and ear muffs by the workers shall be ensured Avoid night time activity	
	Air pollution	B-2	Proper engine tuning of machinery/ equipment to meet National Environmental Quality Standards of Pakistan limits. Water should be sprinkled where needed and appropriate, particularly at work sites near the communities.	B-1
	Health and Safety issues	B-2	Demarcation tapes to be installed around the construction site to avoid any unauthorized entry Personal protective equipment should be made available at site and the usage of the PPEs should be ensured. Health & safety plan should be prepared by contractor and get it approved by supervision consultant	B-1
C. Operation and Maintenance Phase				
Breaching of Flood Protection Bund	System sustainability	D-4	The Irrigation Department should monitor the system on a regular basis.	D-2

Activity / Issue	Potential Impact	Assessment of Risk	Mitigation Measures	Residual Impacts
			Capacity building of the communities should be carried out in the O&M activities. Liaison with the communities to be maintained to identify potential weaknesses in the system that could cause breaches.	
Risk due to Natural Hazard i.e. Flooding and Earthquakes	System sustainability	C-3	Emergency Response Plan for Flood Protection Bund will be followed which is attached as **Annexure – 16** of this report.	C-1

7. ENVIRONMENTAL MANAGEMENT PLAN

7.1 Environmental Management Plan (EMP)

7.1.1 General

317. The EMP is a strategic approach towards the effective implementation of the mitigation measures and environmental protection of the Project Area and its surroundings. This EMP ensures that the undue or reasonably adverse impacts of a project are prevented and the positive benefits of the project are enhanced. According to this plan, all the activities related to various phases of the project are controlled and monitored.

318. This EMP encompasses all the phases of the project and may be used as a quick reference by the personnel(s) of client and contractors for effective implementation of the proposed mitigation measures and tracking the overall environmental performance of the project.

319. This EMP addresses all the significant impacts that are identified during the impacts identification process. It should be amended in consultation with the concerned regulatory authority; if any issue has been overlooked or if any need would arise as the project continues.

7.1.2 Structure of EMP

320. The contents of this chapter are given below:

- Purpose & Need of the EMP
- Objectives of the EMP
- Scope of the EMP
- Environmental Management Plan
- Implementation of EMP
- Stakeholder Coordination
- Trainings
- Communication & Documentation
- Institutional Arrangement for Implementation of EMP
- Institutional Arrangement for Implementation of EMP during Construction Phase
- Institutional Arrangement for Implementation of EMP during Operation Phase
- Grievance Redressal Mechanism (GRM)
- Environmental Management Cost

7.1.3 Purpose & Need of the EMP

321. Primarily, the purpose of this EMP is to serve as a quick reference for the consultants, contractor as well as the proponents to implement the proposed mitigation measures effectively and to monitor the overall environmental performance of the project. Furthermore, to house the procedure, which the proponent follows to implement and maintain this EMP. The need of the EMP is mentioned as follows:

- Ensure that attention is paid to the actual environmental effects arising from construction, and operation of the proposed project;
- Ensure that anticipated impacts are maintained within the levels predicted;
- Ensure that unanticipated impacts are managed or mitigated before they become a problem; and
- Ensure that environmental management brings about real environmental benefits and achieves environmental sustainability, rather than the Environmental Approval Process being a mere paper chase to secure a development approval[36].

7.1.4 Objectives of the EMP

322. The main objectives of the EMP during different phases of the project is to implement mitigation measures and to evaluate the effectiveness of mitigation measures as proposed in the IEE and recommend improvement if any need would arise.

7.1.5 Scope of the EMP

323. The scope of the EMP includes the following phases of the project:

- Design Phase
- Construction Phase; and
- Operation Phase.

324. All the activities performed during these phases will be controlled and monitored according to this EMP.

[36] Guidelines for Preparation and Review of Environmental Reports, 1997

7.1.6 Environmental Management Plan

325. The EMP is a document setting out environmental impact mitigation actions, monitoring actions, responsibility, and schedule. Environmental impact monitoring is undertaken during both the construction and operational phases to ensure the effectiveness of the proposed mitigation measures. Responsibilities for the collection and analysis of data as well as the reporting requirements have been outlined in **Table 29**. Implementation of environmental impact mitigation measures during construction is to avoid and reduce short- and long-term potential environmental impacts. Incorporation of environmental impact mitigation considerations into the tender and contract documents is a fundamental pre-requisite for effective implementation of the EMP.

Table 29: Environmental Management and Monitoring Plan

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
Karkh River Intervention: Irrigation Network Rehabilitation and Lining of Canals					
A. Design & Planning Phase					
Assessment of water availability	• Failure of design	• Design works will ensure the assessment of water. Hydrological and flood & drought management analysis shall ensure the feasibility of project success.	• Feasibility and Design report before project execution	• Once before start of construction works	• Design Engineer
Route selection (Alignment) of proposed new canal and its land acquisition	• Failure of design	• Irrigation Department and Land Revenue Department to ensure that the land acquisition act 1894 procedures are followed in a transparent manner. Complete records should be maintained, particularly for asset valuation and compensation payment. • The communities' grievances associated with the land acquisition and compensation should be addressed on priority basis, in order to avoid any unrest/mistrust among the communities towards the project.	• Feasibility and Design report before project execution	• Once before start of construction works	• Design Engineer

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
Design works construction of new canal as per proper engineering standards	• Social issues and Resettlement/relocation of assets	• Review of engineering design works will ensure the proper design of the system	• Design Report	• Once before start of construction works	• Design Engineer
Traditional Water Rights Considerations	• In case of design failure system will be collapsed and Social issues	• Acquire full information about traditional water rights and ensure that these are not disturbed	• Water Rights Consideration Included in the Design Report	• Once before start of construction works	• Design Engineer • Project Director
Public disclosure of final design	• Social issues	• Continual two-way communication with relevant stakeholders to understand causes of previous failures, community needs, and establish rationale perceptions	• Minutes of Meetings with Stakeholders	• Once before start of design works • Once before start of construction works	• Design Engineer • Project Director
Risk due to Natural Hazard i.e. flooding and earthquakes	• The Project area lies in zone 2B as per seismic map of Pakistan which clearly shows that the area is in moderate risk zone. So due to earthquake the breaching canal and other irrigation structures can be possible. This impact would be of moderate significance. The other natural hazard which affect the area is	• Design engineer should ensure that seismic design of canal and other allied and irrigation structures should be carried out on international engineering standards. By adopting the above measure, the impact would be of low significance. • Flood protection bunds has been included as an integral component of the	• Design Report	• Once before start of construction works	• Design Engineer

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
	flood which would also be of moderate significance	project to control the damages occurred by floods. By adopting the above measure, the impact would be of low significance.			
B. Implementation & Construction Phase					
Construction contractor mobilization and establishment of campsite and machinery/ equipment Yard	• Changes in land use pattern • Loss of vegetation Cultural conflict	• Location for establishment of campsite shall be duly discussed and approved by BIPD. This will include provision for solid waste disposal, latrines / soakpits etc. Soakpits shall be properly designed approved by BIPD before establishment of campsite. Photographs of site before establishment of campsite shall be taken and it will be responsibility of the contractor to make site better or as good as original. A comparison report shall be submitted to Chief Engineer, BIPD before release of final payment. Site for camp site shall be selected keeping in view the cultural norms of the area to	• Monthly rent receipts.	• Strict compliance monitoring on fortnightly basis • Monthly Reporting by SC and submitted to PMU	• Execution by construction contractor • Monitoring by Supervision Consultant

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
		avoid undue interference of the Construction contractor's staff with the local residents. The land shall be rented for the camp site and equipment yard. No resettlement is envisaged for this purpose.			
	• Influx of external work force	• Residents of village shall be employed for the construction phase (mostly for unskilled jobs).	• Development & implementation of policy on local employments • Employment record	• Strict compliance monitoring on fortnightly basis • Quarterly Reporting	• Execution by construction contractor • Monitoring by Supervision Consultant
	• Workshop facilities may spread oils	• Spent Oil shall be properly collected in impermeable containers. Spent oil shall be disposed in accordance with MSDS shall be ensured. • Good housekeeping practices shall be ensured at workshop areas.	• Visual inspection • Photographic record	• Daily monitoring report • Quarterly Reporting	• Execution by construction contractor • Monitoring by Supervision Consultant
	• Deterioration of air quality due to machinery & equipment	• Proper engine tuning of machinery/ equipment every month shall be carried out to comply with National Environmental	• Monitoring shall be done on stack of machinery and equipment. The parameters required to be monitored are	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant PM

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
		Quality Standards of Pakistan.	Smoke, H2S, SOx, CO, VOCs and NOx. • Evidence of measurement records.		
	• Noise	• Equipment with high levels shall be fitted with noise reduction devices • Regular inspection, maintenance and lubrication of the construction vehicle and equipment shall be performed • Use of PPEs such as ear plugs and ear muffs by the workers shall be ensured	• Monitoring compliance to NEQS for noise (SRO 72 (KE) / 2009) • The sampling shall be done twice on monthly basis at 7m from the source. The duration of sampling shall be 24 hours @ 15 seconds interval over 15 minutes every hour (averaged)	• Fortnightly monitoring reports • Quarterly Reporting	• Execution by construction contractor • Monitoring by Supervision Consultant
	• Land degradation due to solid waste disposal of camp site	• Since landfill sites do not exist and the areas surrounding the intervention area are dedicated to irrigation practices such as cultivation, wheat thrashing etc., construction contractor shall not dispose of any solid waste in the area. • Contractor shall collect in separate bins and	• Visual inspection	• Weekly monitoring reports • Weekly waste tracking register. • Quarterly Reporting	• Execution by construction contractor • Monitoring by Supervision Consultant

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
		segregate solid waste according to its type. An impervious liner shall be laid to waste sites before the dumping of solid waste. The impervious liner shall be approved by the supervision consultant. The Contractor shall transport and dispose solid waste at existing municipal dump site at the outskirts of Khuzdar after acquiring approval / NOC from Town Municipal Authority at Khuzdar every month. The contractor shall submit the NOC to the office of BIPD every month.			
	• Water - Feaces contamination	• Appropriate measures for disposal of sewage – such as septic tank and soaking pits shall be prepared by contractor and submitted for approval to the Chief Engineer, BIPD.	• Monitoring compliance to NEQS of sanitary wastewater generated from campsite. The monitoring parameters will be TSS, BOD, COD and Oil & Grease. • Waste management plan in place • Photographic record	• Fortnightly wastewater testing/monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
	• Loss of vegetation	• The construction crew shall be provided with LPG as cooking (and heating, if required) fuel. Use of fuel wood shall not be allowed.	• Use of LPG cylinders at campsite	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant
	• Health and Safety issues	• Protective fencing to be installed around the Camp and its latrines to avoid any accidents. Open defecation shall not be allowed. • Firefighting equipment shall be made available at the camps. Sand being excessively available shall also be used and stored in buckets along with other necessary fire fighting equipment. • The camp staff shall be provided firefighting training. • All safety precautions shall be taken to transport, handle and store hazardous substances, such as fuel • Contractor shall prepare and submit a Health & Safety Plan for approval by	• Use of personal protective equipment at campsite • Health & safety plan in place	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
		Supervision consultant / BIPD			
Security and Safety Risks	• Delay in project execution	• Frequent consultation with local community leaders should be carried out to ensure that any social frictions are identified and resolved before they become inflamed. There are safety requirements for construction projects that include control of public access to the site along with regulations aimed at safeguarding workers. Suitable arrangements that conform to national health and safety requirements and also appropriate international best practice will need to be followed. There are specific procedures that need to be observed for the transport, storage and handling of explosives that will be required for the operation of quarries and also underground excavation. It will be necessary to liaise with local communities and	• Minutes of meetings of community consultation • Dissemination material	• Monthly reporting	• Contractor

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
		initiate and support a public awareness program, particularly targeted at children, about the risks and dangers of large construction sites			
Transportation of construction material	• Soil erosion and contamination	• Only Ratodero-Gawadar (M-8) paved highway shall be used for transportation of construction material. • Vehicles and equipment shall not be repaired in the field. • Water should be sprinkled where needed and appropriate, particularly at work sites near the communities to suppress dispersion of dust.	• Log of vehicle and equipment repairs	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant
	• Air pollution due to vehicle exhaust	• Vehicles shall be kept in good working condition and properly tuned, in order to minimize the exhaust emissions	• Route maps of vehicle movement • Log of vehicle maintenance • Monitoring shall be done on stack of machinery and equipment. The parameters required to be monitored are	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
			Smoke, H2S, SOx, CO, VOCs and NOx.		
	• Noise pollution due to vehicle movement	• Vehicles shall have exhaust mufflers (silencers) to minimize noise generation • Construction material shall be transported during 0800hrs to 1700hrs to avoid night time disturbance. If unavoidable, the Supervising Consultant in consultation with BIPD and Contractor shall resolve this issue and shall ensure that such incidents do not become a regular feature.	• Log of vehicle movement time • Visual inspections of the vehicles • Monitoring compliance to NEQS for noise (SRO 72 (KE) / 2009) • The sampling shall be done twice on monthly basis at 7m from the source. The duration of sampling shall be 24 hours @ 15 seconds interval over 15 minutes every hour (averaged)	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant
	• Health and Safety issues	• Road signage shall be fixed at appropriate locations to reduce safety hazard associated with project-related vehicular traffic • Project drivers shall be trained on defensive driving • Vehicle speeds near / within the communities shall be limited to 10-15 km/hr. to	• Visual inspections • Training record	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
		avoid damage to infrastructure.			
	• Damage to infrastructure	• All damaged infrastructure shall be restored to original or better condition.	• Visual inspections • Photographic records • Infrastructure restoration records	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant
Construction Works: 1. Excavation, backfilling and compaction works: New Canal Total Length= 2,115 m 2. Concrete lining of Canal = 14,770 m 3. Existing Canal to be Repaired = 1,810 m	• Soil erosion and contamination	• Material borrowing and disposal plan should be prepared by contractor and submitted to Supervising Consultant / BIPD for approval. • Lands used for agricultural purposed shall not be used borrowing material. • Written consent of the land owner should be obtained for material (soil) borrowing • Photographic record (before and after) should be kept for the borrow and disposal areas. • Leveling of borrow sites shall be done by contractor on his own expense.	• Evidence of plan in place. • Photographic record	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant
	• Loss of natural vegetation	• Compensatory tree plantation (ten times the trees cut down for	• Evidence of plantation. • Photographic record	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
		construction) should be carried out at appropriate locations within the project area.			• Monitoring by Supervision Consultant
	• Damage to infrastructure	• All damaged infrastructure shall be restored to original or better condition.	• Visual inspections	• Daily monitoring reports • Quarterly Reporting	• Execution by construction contractor • Monitoring by Supervision Consultant
	• Sites of Historical, Cultural, Archeological or Religious Significance	• In case of chance find of any sites or artifacts of historical, cultural, archeological or religious significance, contractor shall immediately stop work and notify the provincial and federal archeological departments along with Supervising Consultant and BIPD.[37] • The appropriate line of action shall be sought from the concerned department before resumption of the construction activities at such sites	• Evidence of training provided to contractor staff. • Evidence of maps in place with these sites shown. • Record of appropriate action taken in case of chance find. • Photographic record of chance find	• Immediately after chance find, to be reported in next quarter.	• Execution by construction contractor • Monitoring by Supervision Consultant

[37] Project routing does not envisage any archeological site, however in case of any chance find the ***"Chance Find Procedures"*** should be adopted, as given in **Annexure-18**

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
	• Noise pollution	• Equipment with high levels shall be fitted with noise reduction devices • Regular inspection, maintenance and lubrication of the construction vehicle and equipment shall be performed • Use of PPEs such as ear plugs and ear muffs by the workers shall be ensured • Construction work shall be carried out during 0800hrs to 1700hrs to avoid night time disturbance. If unavoidable, the Supervising Consultant in consultation with BIPD and Contractor shall resolve this issue and shall ensure that such incidents do not become a regular feature.	• Monitoring compliance to NEQS for noise (SRO 72 (KE) / 2009) • The sampling shall be done twice on monthly basis at 7m from the source. The duration of sampling shall be 24 hours @ 15 seconds interval over 15 minutes every hour (averaged)	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant
	• Air pollution	• Vehicles shall be kept in good working condition and properly tuned, in order to minimize the exhaust emissions • Water should be sprinkled where needed and appropriate, particularly at	• Monitoring shall be done on stack of machinery and equipment. The parameters required to be monitored are Smoke, H_2S, SOx, CO, VOCs and NOx.	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
		work sites near the communities to suppress dispersion of dust.	• Evidence of measurement records.		
	• Health and Safety issues	• Demarcation tapes to be installed around the construction site to avoid any unauthorized entry • Personal protective equipment should be made available at site and the usage of the PPEs should be ensured. • Health & safety plan should be prepared by contractor and get it approved by supervision consultant	• Use of personal protective equipment • Health & safety plan in place	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant
C. Operation & Maintenance Phase					
Breaching of Canal	• System sustainability	• The Irrigation Department should monitor the system on a regular basis. • Capacity building of the communities should be carried out in the O&M activities. • Liaison with the communities to be maintained to identify potential weaknesses in the system that could cause breaches.	• Monitoring reports	• Quarterly reporting	• Environmental Specialist to develop reports • PD to review and take management actions, where needed

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
Conflicts caused by unavailability or improper distribution of water in the area	• Social issues	• Agreements between different communities/tribes • Perennial irrigation schemes may function smoothly in normal conditions and circumstances but do face problems during extraordinary situations, i.e. when flow is higher or lower than normal. From the outset water management rules and regulations must incorporate ways to tackle such issues as water scarcity and surplus flows. • Local water user associations and groups need to be trained and involved to operate the canals, channels, gates, inlets, outlets and other structures. This needs to be done on collaborative basis with irrigation and agriculture department where communication system among farmers, water user association and department is assured. • Farmers in downstream	• Agreement between parties • Training records	• Quarterly reporting	• Environmental Specialist to develop reports • PD to review and take management actions, where needed

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
		areas should be compensated in case they lose their water rights. • All villages deprived of Project's water rights should be compensated for drinking water supply schemes otherwise very soon all villages and settlements will be deserted as underground water may not be fit for drinking purpose for every village and it would probably not be within the financial or technical capacity of local population to initiate such schemes on their own.			
Use of water for drinking purposes	• Health issues	• Proper treatment system shall be provided • Water quality will be tested as per WHO/ GOP standards to ensure the integrity of the water supply system. • Turbidity and free residual chlorine tests shall be regularly performed. • Arsenic will be tested as per WHO standards.	• WHO/ NEQS Drinking Water Standards	• Daily monitoring reports of turbidity and free residual chlorine test • Monthly analysis of water quality parameters • Quarterly reporting	• Environmental Specialist to develop reports • PD to review and take management actions, where needed

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
Disposal waste (connection of waste streams) in the Canal	• Degradation of irrigation water and Health issues	• Proper monitoring of canal alignment and disconnect all identified waste streams	• Visual inspection • Monitoring records	• Monthly monitoring and quarterly reporting	• Irrigation department
Periodic cleaning and maintenance of the system	• Solid waste generation	• Ensure proper disposal of waste at designated landfill/disposal sites.	• Periodic cleaning records • Visual inspection	• Monthly monitoring and quarterly reporting	• Irrigation Department • Water User Association
Increase of agricultural lands	• Loss of pastoral lands	• Stall feeding practices for livestock, so that remaining pastoral lands are available for wild animals	• Monitoring records	• Monthly monitoring and quarterly reporting	• Agriculture Department • Forestry Department • Wildlife Department
Community Participation for management and operation of the irrigation system	• Social issues • System sustainability	• Ensure community participation in management and operation of the irrigation system • Training of community	• Training records • Community participation records	• Monthly monitoring and quarterly reporting	• Irrigation Department • Water User Association
Disruption to wildlife	• Conservation issues	• Design has already provided cattle drinking troughs at different intervals and pedestrian bridge for canal crossing approximately at 500 m interval. • It will be the responsibility of BIPD to ensure the proper maintenance of aforementioned structures.	• Monitoring and maintenance records	• Monthly monitoring and quarterly reporting	• Irrigation Department • Wildlife Department

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
		By adopting the aforementioned measures, the impact would be finally of low significance.			
Use of fertilizers & pesticides	• Banned fertilizer & pesticides will cause health issues • Contamination of fresh water through surface runoff	• Concerted efforts by the department of agriculture to disseminate information regarding sustainable use of fertilizers will help in keeping the use at an optimal level; • Ammonium Nitrate (AN) and Calcium Ammonium Nitrate (CAN) fertilizers will not be allowed; and • Use of restricted pesticides identified by WHO shall not be allowed. The list of restricted pesticides is attached as Annexure 19 of this report	• Visual inspection • Monitoring records • Market survey for availability of AN and CAN fertilizers	• Monthly monitoring and quarterly reporting	• Agriculture department
Risk due to Natural Hazard i.e. Flooding and Earthquakes	• System sustainability	• Emergency Response Plan for Breaching of Canal will be followed which is attached as **Annexure – 15** of this report.	• Training record of emergency response plan	• Monthly monitoring and quarterly reporting	• Irrigation Department

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
Karkh River Intervention: Flood Protection Bund					
A. Design & Planning Phase					
Design works construction of flood protection bund as per proper engineering standards	• In case of design failure system will be collapsed and Social issues	• Review of engineering design works will ensure the proper design of the system. The system should be designed on proper engineering standards.	• Design Report	• Once before start of construction works	• Design Engineer
Public disclosure of final design	• Social issues	• Continual two-way communication with relevant stakeholders to understand causes of previous failures, community needs, and establish rationale perceptions	• Minutes of Meetings with Stakeholders	• Once before start of design works • Once before start of construction works	• Design Engineer • Project Director
B. Implementation & Construction Phase					
Construction contractor mobilization and establishment of campsite and machinery/ equipment Yard	• Changes in land use pattern • Loss of vegetation • Cultural conflict	• In order to avoid spread of oil by virtue of establishment of fuel depot / Workshop facilities, the contractor should avoid it altogether. Incase, it cannot be avoided, the contractor must house it and underlay the area with proper liner.	• Visual inspection	• Daily monitoring report • Quarterly Reporting	• Execution by construction contractor • Monitoring by Supervision Consultant

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
		• Dispensing pumps should be used. • Spent Oil shall be properly collected in impermeable containers. Spent oil shall be disposed in accordance with MSDS shall be ensured. • Good housekeeping practices shall be ensured at workshop areas.			
	• Influx of external work force	• Residents of village shall be employed for the construction phase (mostly for unskilled jobs).	• Development & implementation of policy on local employments • Employment record	• Strict compliance monitoring on fortnightly basis • Quarterly Reporting	• Execution by construction contractor • Monitoring by Supervision Consultant
	• Workshop facilities may spread oils	• In order to avoid spread of oil by virtue of establishment of fuel depot / Workshop facilities, the contractor should avoid it altogether. Incase, it cannot be avoided, the contractor must house it and underlay the area with proper liner.	• Visual inspection	• Daily monitoring report • Quarterly Reporting	• Execution by construction contractor • Monitoring by Supervision Consultant

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
		• Dispensing pumps should be used. • Spent Oil shall be properly collected in impermeable containers. • Spent oil shall be disposed in accordance with MSDS shall be ensured. • Good housekeeping practices shall be ensured at workshop areas.			
	• Deterioration of air quality due to machinery & equipment	• Proper engine tuning of machinery/ equipment every month shall be carried out to comply with National Environmental Quality Standards of Pakistan.	• Monitoring shall be done on stack of machinery and equipment. The parameters required to be monitored are Smoke, H2S, SOx, CO, VOCs and NOx. • Evidence of measurement records.	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant PM
	• Noise	• Equipment with high levels shall be fitted with noise reduction devices	• Monitoring compliance to NEQS	• Fortnightly monitoring reports • Quarterly Reporting	• Execution by construction contractor

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
		• Regular inspection, maintenance and lubrication of the construction vehicle and equipment shall be performed • Use of PPEs such as ear plugs and ear muffs by the workers shall be ensured • Activity having high noise potential shall be postponed to day time i.e. in between 0800hrs to 1700hrs	for noise (SRO 72 (KE) / 2009) • The sampling shall be done twice on monthly basis at 7m from the source. The duration of sampling shall be 24 hours @ 15 seconds interval over 15 minutes every hour (averaged)		• Monitoring by Supervision Consultant
	• Land degradation due to solid waste disposal of camp site	• Construction contractor shall not dispose of any solid waste in the area. The construction Contractor may dump solid waste with proper lining material in depressions and have a daily and monthly cover on it. Contractor shall collect in separate bins and segregate solid waste according to its type. An impervious liner shall be laid to waste sites before	• Visual inspection	• Weekly monitoring reports • Quarterly Reporting	• Execution by construction contractor • Monitoring by Supervision Consultant

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
		the dumping of solid waste. The impervious liner shall be approved by the supervision consultant. The Contractor shall transport and dispose solid waste at existing municipal dump site at the outskirts of Khuzdar after acquiring approval / NOC from Town Municipal Authority at Khuzdar every month. The contractor shall submit the NOC to the office of BIPD every month.			
	• Water - Feaces contamination	• Appropriate measures for disposal of sewage – such as septic tank and soaking pits shall be prepared by contractor and submitted for approval to the Chief Engineer, BIPD.	• Monitoring compliance to NEQS of sanitary wastewater generated from campsite. The monitoring parameters will be TSS, BOD, COD and Oil & Grease. • Waste management plan in place • Photographic record	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
	• Loss of vegetation	• The construction crew shall be provided with LPG as cooking (and heating, if required) fuel. Use of fuel wood shall not be allowed.	• Use of LPG cylinders at campsite • Tree cutting approvals • Pictorial evidence of use of LPG	• Monthly monitoring reports • Quarterly reporting	• Construction Contractor • Monitoring by Supervision Consultant and reporting to ESMMC.
	• Health and Safety issues	• Protective fencing to be installed around the Camp and its latrines to avoid any accidents. Open defecation shall not be allowed. • Firefighting equipment shall be made available at the camps. Sand being excessively available shall also be used and stored in buckets along with other necessary fire fighting equipment. • The camp staff shall be provided firefighting training. • All safety precautions shall be taken to transport, handle and store hazardous substances, such as fuel	• Use of personal protective equipment at campsite • Health & safety plan in place	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
		• Contractor shall prepare and submit a Health & Safety Plan for approval by Supervision consultant / BIPD			
Transportation of construction material	• Soil erosion and contamination	• Only Ratodero-Gawadar (M-8) paved highway shall be used for transportation of construction material. • Vehicles and equipment shall not be repaired in the field.	• Log of vehicle and equipment repairs	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant
	• Air pollution due to vehicle fuel	• Vehicles shall be kept in good working condition and properly tuned, in order to minimize the exhaust emissions	• Route maps of vehicle movement • Log of vehicle maintenance • Monitoring shall be done on stack of machinery and equipment. The parameters required to be monitored are Smoke, H2S, SOx, CO, VOCs and NOx.	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant
	• Noise pollution due to vehicle movement	• Vehicles shall have exhaust mufflers (silencers) to minimize noise generation	• Log of vehicle movement time • Visual inspections of the vehicles	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
		• Construction material shall be transported during 0800hrs to 1700hrs to avoid night time disturbance. If unavoidable, the Supervising Consultant in consultation with BIPD and Contractor shall resolve this issue and shall ensure that such incidents do not become a regular feature.	• Monitoring compliance to NEQS for noise (SRO 72 (KE) / 2009) • The sampling shall be done twice on monthly basis at 7m from the source. The duration of sampling shall be 24 hours @ 15 seconds interval over 15 minutes every hour (averaged)		• Monitoring by Supervision Consultant
	• Health and Safety issues	• Road signage shall be fixed at appropriate locations to reduce safety hazard associated with project-related vehicular traffic. • Project drivers shall be trained on defensive driving • Vehicle speeds near / within the communities shall be limited to 10-15 km/hr. to avoid damage to infrastructure.	• Visual inspections • Training record	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
	• Damage to infrastructure	• All damaged infrastructure shall be restored to original or better condition.	• Visual inspections • Photographic records • Infrastructure restoration records	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant
Construction Works: Earthen Bund with Stone Pitching: 1. Protection Bund -1 1,060 m 2. Protection Bund -2 480 m 3. Protection Bund -3 450 m 4. Protection Bund -4 400 m 5. Protection Bund -5 680 m 6. Protection Bund -6 560 m 7. Protection Bund -7 330 m	• Soil erosion and contamination	• Material borrowing and disposal plan should be prepared by contractor and submitted to Supervising Consultant / BIPD for approval. • Lands used for agricultural purposed shall not be used borrowing material. • Written consent of the land owner should be obtained for material (soil) borrowing • Photographic record (before and after) should be kept for the borrow and disposal areas. • Leveling of borrow sites shall be done by contractor on his own expense.	• Evidence of plan in place. • Photographic record	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
8. Protection Bund -8 300 m 9. Protection Bund -9 980 m					
	• Loss of natural vegetation	• Compensatory tree plantation (ten times the trees cut down for construction) should be carried out at appropriate locations within the project area.	• Evidence of plantation. • Photographic record	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant
	• Damage to infrastructure	• All damaged infrastructure shall be restored to original or better condition.	• Visual inspections • Monitoring Particulate Matter PM_{10}	• Daily monitoring reports • Fortnightly monitoring reports of PM_{10} • Quarterly Reporting	• Execution by construction contractor • Monitoring by Supervision Consultant
	• Sites of Historical, Cultural, Archeological or Religious Significance	• In case of chance find of any sites or artifacts of historical, cultural, archeological or religious significance, contractor shall immediately stop work and notify the provincial and federal archeological departments along with	• Evidence of training provided to contractor staff. • Evidence of maps in place with these sites shown. • Record of appropriate action taken in case of chance find.	• Immediately after chance find, to be reported in next quarter.	• Execution by construction contractor • Monitoring by Supervision Consultant

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
		Supervising Consultant and BIPD. [38] • The appropriate line of action shall be sought from the concerned department before resumption of the construction activities at such sites. [1]	• Photographic record of chance find		
	• Noise pollution	Equipment with high levels shall be fitted with noise reduction devices. Regular inspection, maintenance and lubrication of the construction vehicle and equipment shall be performed Use of PPEs such as ear plugs and ear muffs by the workers shall be ensured. Construction work shall be carried out during 0800hrs to 1700hrs to avoid night time disturbance. If unavoidable, the Supervising Consultant in consultation with BIPD and Contractor shall resolve this	• Monitoring compliance to NEQS for noise (SRO 72 (KE) / 2009) • The sampling shall be done twice on monthly basis at 7m from the source. The duration of sampling shall be 24 hours @ 15 seconds interval over 15 minutes every hour (averaged)	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant

[38] Project routing does not envisage any archeological site, however in case of any chance find the ***"Chance Find Procedures"*** should be adopted, as given in **Annexure-18**

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
		issue and shall ensure that such incidents do not become a regular feature.			
	• Air pollution	Vehicles shall be kept in good working condition and properly tuned, in order to minimize the exhaust emissions Water should be sprinkled where needed and appropriate, particularly at work sites near the communities to suppress dispersion of dust.	• Monitoring shall be done on stack of machinery and equipment. The parameters required to be monitored are Smoke, H_2S, SOx, CO, VOCs and NOx. • Evidence of measurement records.	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant
	• Health and Safety issues	Demarcation tapes to be installed around the construction site to avoid any unauthorized entry Personal protective equipment should be made available at site and the usage of the PPEs should be ensured. Health & safety plan should be prepared by contractor and get it approved by supervision consultant	• Use of personal protective equipment • Health & safety plan in place	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant
C. Operation & Maintenance Phase					
Breaching of flood protection bund	• System sustainability	• The Irrigation Department should monitor the system	• Monitoring reports	• Quarterly reporting	• Environmental Specialist to

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
		on a regular basis. • Capacity building of the communities should be carried out in the O&M activities. • Liaison with the communities to be maintained to identify potential weaknesses in the system that could cause breaches.			develop reports • PD to review and take management actions, where needed
Risk due to Natural Hazard i.e. Flooding and Earthquakes	• System sustainability	• Emergency Response Plan for Flood Protection Bund will be followed which is attached as **Annexure – 16** of this report.	• Training record of emergency response plan	• Monthly monitoring and quarterly reporting	• Irrigation Department

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
Karkh River Intervention: Construction of New Weir at Jhalaro and Repair of Cutoff Wall of Chutta Weir					
A. Design & Planning Phase					
Assessment of water availability	• Failure of design	• Design works will ensure the assessment of water. • Hydrological and flood & drought management analysis shall ensure the feasibility of project success.	• Feasibility and Design report before project execution	• Once before start of construction works	• Design Engineer
Design works construction of weir as per proper engineering standards	• In case of design failure system will be collapsed	• Review of engineering design works will ensure the proper design of the system	• Design Report	• Once before start of construction works	• Design Engineer
Traditional water rights considerations	• Social issues	• Acquire full information about traditional water rights and ensure that these are not disturbed	• Water Rights Consideration Included in the Design Report	• Once before start of construction works	• Design Engineer • Project Director
Public disclosure of final design	• Social issues	• Continual two-way communication with relevant stakeholders to understand causes of previous failures, community needs, and establish rationale perceptions	• Minutes of Meetings with Stakeholders	• Once before start of design works • Once before start of construction works	• Design Engineer • Project Director
Risk due to Natural Hazard i.e. flooding and earthquakes	• The Project area lies in zone 2B as per seismic map of Pakistan which clearly shows that the	• Design engineer should ensure that seismic design of weir and other allied and irrigation structures should	• Design Report	• Once before start of construction works	• Design Engineer

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
	area is in moderate risk zone. So due to earthquake the breaching weir, canal and other irrigation structures can be possible. This impact would be of moderate significance. The other natural hazard which affect the area is flood which would also be of moderate significance.	be carried out on international engineering standards. By adopting the above measure, the impact would be of low significance. • Flood protection bunds has been included as an integral component of the project to control the damages occurred by floods. By adopting the above measure, the impact would be of low significance.			
B. Construction Phase (Construction of Weirs at Jhalaro)					
Construction contractor mobilization and establishment of campsite and machinery/ equipment Yard	• Establishment of fuel depot / Workshop facilities may spread oils	• In order to avoid spread of oil by virtue of establishment of fuel depot / Workshop facilities, the contractor should avoid it altogether. Incase, it cannot be avoided, the contractor must house it and underlay the area with proper liner. • Dispensing pumps should be used.	• Visual inspection	• Daily monitoring report • Quarterly Reporting	• Execution by construction contractor • Monitoring by Supervision Consultant

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
		• Spent Oil shall be properly collected in impermeable containers. • Spent oil shall be disposed in accordance with MSDS shall be ensured. • Good housekeeping practices shall be ensured at workshop areas.			
	• Loss of vegetation	• The construction crew shall be provided with LPG as cooking (and heating, if required) fuel. Use of fuel wood shall not be allowed.	• Use of LPG cylinders at campsite	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant
	• Influx of external work force	• Residents of village shall be employed for the construction phase (mostly for unskilled jobs).	• Development & implementation of policy on local employments • Employment record	• Strict compliance monitoring on fortnightly basis • Quarterly Reporting	• Execution by construction contractor • Monitoring by Supervision Consultant
	• Land degradation due to solid waste disposal of camp site	• Construction contractor shall not dispose of any solid waste in the area. The construction	• Visual inspection	• Weekly monitoring reports • Quarterly Reporting	• Execution by construction contractor

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
		Contractor may dump solid waste with proper lining material in depressions and have a daily and monthly cover on it. • Contractor shall collect in separate bins and segregate solid waste according to its type. An impervious liner shall be laid to waste sites before the dumping of solid waste. The impervious liner shall be approved by the supervision consultant. The Contractor shall transport and dispose solid waste at existing municipal dump site at the outskirts of Khuzdar after acquiring approval / NOC from Town Municipal Authority at Khuzdar every month. The contractor shall submit the NOC to the office of BIPD every month.			• Monitoring by Supervision Consultant
	• Changes in land use pattern	• Location for establishment of campsite shall be duly discussed and approved	• Visual inspection	• Weekly monitoring reports • Quarterly Reporting	• Execution by construction contractor

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
		by BIPD. This will include provision for solid waste disposal, latrines / soakpits etc. Soakpits shall be properly designed approved by BIPD before establishment of campsite. • Photographs of site before establishment of campsite shall be taken and it will be responsibility of the contractor to make site better or as good as original. A comparison report shall be submitted to Chief Engineer, BIPD before release of final payment. • Site for camp site shall be selected keeping in view the cultural norms of the area to avoid undue interference of the Construction contractor's staff with the local residents. • The land shall be rented for the camp site and equipment yard. No resettlement is envisaged for this purpose			• Monitoring by Supervision Consultant

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
	• Health and Safety issues	• Protective fencing to be installed around the Camp and its latrines to avoid any accidents. Open defecation shall not be allowed. • Firefighting equipment shall be made available at the camps. Sand being excessively available shall also be used and stored in buckets along with other necessary fire fighting equipment. • The camp staff shall be provided firefighting training. • All safety precautions shall be taken to transport, handle and store hazardous substances, such as fuel • Contractor shall prepare and submit a Health & Safety Plan for approval by Supervision consultant / BIPD	• Use of personal protective equipment at campsite • Health & safety plan in place	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant
	• Deterioration of air quality due to machinery & equipment	• Proper engine tuning of machinery/ equipment every month shall be carried out to comply with	• Monitoring shall be done on stack of machinery and equipment. The	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
		National Environmental Quality Standards of Pakistan.	parameters required to be monitored are Smoke, H2S, SOx, CO, VOCs and NOx. • Evidence of measurement records.		• Monitoring by Supervision Consultant PM
	• Noise	• Equipment with high levels shall be fitted with noise reduction devices • Regular inspection, maintenance and lubrication of the construction vehicle and equipment shall be performed • Use of PPEs such as ear plugs and ear muffs by the workers shall be ensured • Activity having high noise potential shall be postponed to day time i.e. in between 0800hrs to 1700hrs	• Monitoring compliance to NEQS for noise (SRO 72 (KE) / 2009) • The sampling shall be done twice on monthly basis at 7m from the source. The duration of sampling shall be 24 hours @ 15 seconds interval over 15 minutes every hour (averaged)	• Fortnightly monitoring reports • Quarterly Reporting	• Execution by construction contractor • Monitoring by Supervision Consultant
	• Water - Feaces contamination	• Appropriate measures for disposal of sewage – such as septic tank and soaking pits shall be prepared by contractor and submitted for	• Monitoring compliance to NEQS of sanitary wastewater generated from campsite. The	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
		approval to the Chief Engineer, BIPD.	monitoring parameters will be TSS, BOD, COD and Oil & Grease. • Waste management plan in place • Photographic record		
Security and Safety Risks	• Delay in project execution	• Frequent consultation with local community leaders should be carried out to ensure that any social frictions are identified and resolved before they become inflamed. There are safety requirements for construction projects that include control of public access to the site along with regulations aimed at safeguarding workers. Suitable arrangements that conform to national health and safety requirements and also appropriate international best practice will need to be followed. There are specific procedures that need to be observed for the transport, storage and	• Minutes of meetings of community consultation • Dissemination material	• Monthly reporting	• Contractor

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
		handling of explosives that will be required for the operation of quarries and also underground excavation. It will be necessary to liaise with local communities and initiate and support a public awareness program, particularly targeted at children, about the risks and dangers of large construction sites			
Transportation of construction material	• Soil erosion and contamination	• Only Ratodero-Gawadar (M-8) paved highway shall be used for transportation of construction material. • Vehicles and equipment shall not be repaired in the field.	• Log of vehicle and equipment repairs	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant
	• Air pollution due to vehicle fuel	• Vehicles shall be kept in good working condition and properly tuned, in order to minimize the exhaust emissions	• Route maps of vehicle movement • Log of vehicle maintenance • Monitoring shall be done on stack of machinery and equipment. The parameters required	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
			to be monitored are Smoke, H2S, SOx, CO, VOCs and NOx.		
	• Noise pollution due to vehicle movement	• Vehicles shall have exhaust mufflers (silencers) to minimize noise generation • Construction material shall be transported during 0800hrs to 1700hrs to avoid night time disturbance. If unavoidable, the Supervising Consultant in consultation with BIPD and Contractor shall resolve this issue and shall ensure that such incidents do not become a regular feature	• Log of vehicle movement time • Visual inspections of the vehicles • Monitoring compliance to NEQS for noise (SRO 72 (KE) / 2009) • The sampling shall be done twice on monthly basis at 7m from the source. The duration of sampling shall be 24 hours @ 15 seconds interval over 15 minutes every hour (averaged)	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant
	• Health and Safety issues	• Road signage shall be fixed at appropriate locations to reduce safety hazard associated with project-related vehicular traffic. • Project drivers shall be trained on defensive driving	• Visual inspections • Training record	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
		• Vehicle speeds near / within the communities shall be limited to 10-15 km/hr. to avoid damage to infrastructure.			
	• Damage to infrastructure	• All damaged infrastructure shall be restored to original or better condition.	• Visual inspections • Photographic records • Infrastructure restoration records	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant
Construction Works: 1. Earth Works for 106m long and 1m high Gabion Weir 2. Concrete and Form Works for New Weir and Repair of Cutoff Wall of Chutta Weir	• Soil erosion and contamination	• Material borrowing and disposal plan should be prepared by contractor and submitted to Supervising Consultant / BIPD for approval. • Lands used for agricultural purposed shall not be used borrowing material. • Written consent of the land owner should be obtained for material (soil) borrowing • Photographic record (before and after) should be kept for the borrow and disposal areas. • Leveling of borrow sites shall be done by	• Evidence of plan in place. • Photographic record	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
		contractor on his own expense.			
	• Loss of natural vegetation	• Compensatory tree plantation (ten times the trees cut down for construction) should be carried out at appropriate locations within the project area.	• Evidence of plantation. • Photographic record	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant
	• Damage to infrastructure	• All damaged infrastructure shall be restored to original or better condition.	• Visual inspections •	• Daily monitoring reports • Quarterly Reporting	• Execution by construction contractor • Monitoring by Supervision Consultant
	• Noise pollution	• Equipment with high levels shall be fitted with noise reduction devices. • Regular inspection, maintenance and lubrication of the construction vehicle and equipment shall be performed • Use of PPEs such as ear plugs and ear muffs by the workers shall be ensured. • Construction work shall be carried out during 0800hrs to 1700hrs to avoid night	• Monitoring compliance to NEQS for noise (SRO 72 (KE) / 2009) • The sampling shall be done twice on monthly basis at 7m from the source. The duration of sampling shall be 24 hours @ 15 seconds interval over 15 minutes every hour (averaged)	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
		time disturbance. If unavoidable, the Supervising Consultant in consultation with BIPD and Contractor shall resolve this issue and shall ensure that such incidents do not become a regular feature.			
	• Sites of Historical, Cultural, Archeological or Religious Significance	• In case of chance find of any sites or artifacts of historical, cultural, archeological or religious significance, contractor shall immediately stop work and notify the provincial and federal archeological departments along with Supervising Consultant and BIPD. [39] • The appropriate line of action shall be sought from the concerned department before resumption of the construction activities at such sites.	• Evidence of training provided to contractor staff. • Evidence of maps in place with these sites shown. • Record of appropriate action taken in case of chance find. • Photographic record of chance find	• Immediately after chance find, to be reported in next quarter.	• Execution by construction contractor • Monitoring by Supervision Consultant

[39] Project routing does not envisaged any archeological site, however in case of any chance find the ***"Chance Find Procedures"*** should be adopted , as given in **Annexure-18**

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
	• Air pollution	• Vehicles shall be kept in good working condition and properly tuned, in order to minimize the exhaust emissions • Water should be sprinkled where needed and appropriate, particularly at work sites near the communities to suppress dispersion of dust.	• Monitoring shall be done on stack of machinery and equipment. The parameters required to be monitored are Smoke, H_2S, SOx, CO, VOCs and NOx. • Evidence of measurement records.	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant
	• Health and Safety issues	• Demarcation tapes to be installed around the construction site to avoid any unauthorized entry • Personal protective equipment should be made available at site and the usage of the PPEs should be ensured. • Health & safety plan should be prepared by contractor and get it approved by supervision consultant	• Use of personal protective equipment • Health & safety plan in place	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant
C. Operation & Maintenance Phase					
Breaching of Weir	• System sustainability	• The Irrigation Department should monitor the system on a regular basis. • Capacity building of the	• Monitoring reports	• Quarterly reporting	• Environmental Specialist to develop reports • PD to review and

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
		communities should be carried out in the O&M activities. • Liaison with the communities to be maintained to identify potential weaknesses in the system that could cause breaches.			take management actions, where needed
Conflicts caused by unavailability or improper distribution of water in the area	• Social issues	• Agreements between different communities/tribes • Perennial irrigation schemes may function smoothly in normal conditions and circumstances but do face problems during extraordinary situations, i.e. when flow is higher or lower than normal. From the outset water management rules and regulations must incorporate ways to tackle such issues as water scarcity and surplus flows. • Local water user associations and groups need to be trained and involved to operate the canals, channels, gates, inlets, outlets and other	• Agreement between parties • Training records	• Quarterly reporting	• Environmental Specialist to develop reports • PD to review and take management actions, where needed

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
		structures. This needs to be done on collaborative basis with irrigation and agriculture department where communication system among farmers, water user association and department is assured. • Farmers in downstream areas should be compensated in case they lose their water rights. • All villages deprived of Project's water rights should be compensated for drinking water supply schemes otherwise very soon all villages and settlements will be deserted as underground water may not be fit for drinking purpose for every village and it would probably not be within the financial or technical capacity of local population to initiate such schemes on their own.			
Use of water for drinking purposes	• Health issues	• Proper treatment system shall be provided • Water quality will be tested as per WHO/ GOP	• WHO/ GOP Drinking Water Standards	• Daily monitoring reports of turbidity and free residual chlorine test	• Environmental Specialist to develop reports • PD to review and

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
		standards to ensure the integrity of the water supply system. • Turbidity and free residual chlorine tests shall be regularly performed. • Arsenic will be tested as per WHO standards.		• Monthly analysis of water quality parameters • Quarterly reporting	take management actions, where needed
Periodic cleaning and maintenance of the system	• Solid waste generation	• Ensure proper disposal of waste at designated landfill/disposal sites.	• Periodic cleaning records • Visual inspection	• Monthly monitoring and quarterly reporting	• Irrigation Department • Water User Association
Increase of agricultural lands	• Loss of pastoral lands	• Stall feeding practices for livestock, so that remaining pastoral lands are available for wild animals	• Monitoring records	• Monthly monitoring and quarterly reporting	• Agriculture Department • Forestry Department • Wildlife Department
Community Participation for management and operation of the irrigation system	• Social issues • System sustainability	• Ensure community participation in management and operation of the irrigation system • Training of community	• Training records • Community participation records	• Monthly monitoring and quarterly reporting	• Irrigation Department • Water User Association
Disruption to wildlife	• Conservation issues	• Design has already provided cattle drinking troughs at different intervals and pedestrian bridge for canal crossing approximately at 500 m interval.	• Monitoring and maintenance records	• Monthly monitoring and quarterly reporting	• Irrigation Department • Wildlife Department

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
		• It will be the responsibility of BIPD to ensure the proper maintenance of aforementioned structures. By adopting the aforementioned measures, the impact would be finally of low significance.			
Use of fertilizers & pesticides	• Banned fertilizer & pesticides will cause health issues • Contamination of fresh water through surface runoff	• Concerted efforts by the department of agriculture to disseminate information regarding sustainable use of fertilizers will help in keeping the use at an optimal level; • Ammonium Nitrate (AN) and Calcium Ammonium Nitrate (CAN) fertilizers will not be allowed; and • Use of restricted pesticides identified by WHO shall not be allowed. The list of restricted pesticides is attached as Annexure 19 of this report	• Visual inspection • Monitoring records • Market survey for availability of AN and CAN fertilizers	• Monthly monitoring and quarterly reporting	• Agriculture department
Risk due to Natural Hazard i.e. Flooding and Earthquakes	• System sustainability	• Emergency Response Plan for Breaching of Canal will be followed which is attached as **Annexure – 15** of this report.	• Training record of emergency response plan	• Monthly monitoring and quarterly reporting	• Irrigation Department

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
Activity	**Potential Impact**	**Mitigation Measures**	**Monitoring Indicators**	**Monitoring and Reporting Frequency**	**Party(ies) Responsible for Implementation & Monitoring**
Infiltration Gallery at Hatachi - Kharzan (extension of infiltration gallery tunnel, lining of infiltration gallery wells, infiltration gallery tunnel cleaning; lining of covered channel, open channel lining, social structures and time division structures)					
A. Design & Planning Phase					
Assessment of water availability	• Failure of design	• Design works will ensure the assessment of water. • Hydrological and flood & drought management analysis shall ensure the feasibility of project success.	• Feasibility and Design report before project execution	• Once before start of construction works	• Design Engineer
Design works construction of infiltration gallery as per proper engineering standards	• In case of design failure system will be collapsed	• Review of engineering design works will ensure the proper design of the system	• Design Report	• Once before start of construction works	• Design Engineer
Traditional water rights considerations	• Social issues	• Acquire full information about traditional water rights and ensure that these are not disturbed	• Water Rights Consideration Included in the Design Report	• Once before start of construction works	• Design Engineer • Project Director
Public consultation and sharing of proposed design considerations	• Social issues	• Continual two-way communication with relevant stakeholders to understand causes of previous failures, community needs, and establish rationale	• Minutes of Meetings with Stakeholders	• Once before start of design works • Once before start of construction works	• Design Engineer • Project Director

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
		perceptions			
Risk due to Natural Hazard i.e. flooding and earthquakes	• The Project area lies in zone 2B as per seismic map of Pakistan which clearly shows that the area is in moderate risk zone. So due to earthquake the breaching infiltration gallery, canal and other irrigation structures can be possible. This impact would be of moderate significance. The other natural hazard which affect the area is flood which would also be of moderate significance.	• Design engineer should ensure that seismic design of weir and other allied and irrigation structures should be carried out on international engineering standards. By adopting the above measure, the impact would be of low significance. • Flood protection bunds has been included as an integral component of the project to control the damages occurred by floods. By adopting the above measure, the impact would be of low significance.	• Design Report	• Once before start of construction works	• Design Engineer
B. Implementation and Construction Phase					
Construction contractor mobilization and Establishment of campsite and machinery/ equipment Yard	• Changes in land use pattern • Cultural conflicts • Influx of external work force	• Site for camp site shall be selected keeping in view the cultural norms of the area to avoid undue interference of the Construction contractor's staff with the local residents.	• Monthly rent receipts. • Development & implementation of policy on local employments • Employment record	• Strict compliance monitoring on fortnightly basis • Quarterly Reporting	• Execution by construction contractor • Monitoring by Supervision Consultant

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
	• Land degradation due to solid waste disposal of camp site • Workshop facilities will spread oils & chemicals • Soil erosion	• Local residents shall be given priority in the employment opportunities generated during construction and operations phase • The land shall be rented for the camp site and equipment yard. No resettlement is envisaged for this purpose. • Residents of village shall be employed for the construction phase (mostly for unskilled jobs).			
	• Workshop facilities may spread oils & chemicals	• Proper disposal of used oil and chemical waste in accordance with MSDS shall be ensured. • Efficient Use of Chemicals shall be ensured. • Good housekeeping practices shall be ensured at workshop areas. • Mixing of waste into fresh water sources shall not be allowed.	• Visual inspection	• Daily monitoring report • Quarterly Reporting	• Execution by construction contractor • Monitoring by Supervision Consultant
	• Deterioration of air quality due to machinery & equipment	• Proper engine tuning of machinery/ equipment to meet National	• Monitoring shall be done on stack of machinery and	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
		Environmental Quality Standards of Pakistan limits. • Water should be sprinkled where needed and appropriate, particularly at work sites near the communities.	equipment. The parameters required to be monitored are Smoke, H2S, SOx, CO, VOCs and NOx. • Evidence of measurement records.		• Monitoring by Supervision Consultant PM
	• Noise Pollution	• Equipment with high levels shall be fitted with noise reduction devices • Regular inspection, maintenance and lubrication of the construction vehicle and equipment shall be performed • Use of PPEs such as ear plugs and ear muffs by the workers shall be ensured • Avoid night time activity	• Monitoring compliance to NEQS for noise (SRO 72 (KE) / 2009) • The sampling shall be done twice on monthly basis at 7m from the source. The duration of sampling shall be 24 hours @ 15 seconds interval over 15 minutes every hour (averaged)	• Fortnightly monitoring reports • Quarterly Reporting	• Execution by construction contractor • Monitoring by Supervision Consultant
	• Land degradation due to solid waste disposal of camp site	• Ensure proper disposal of camp site waste at designated landfill/disposal sites. If the project area does not have any disposal site the construction contractor shall use any depression for waste dumping. Prior to dumping	• Visual inspection	• Weekly monitoring reports • Quarterly Reporting	• Execution by construction contractor • Monitoring by Supervision Consultant

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
		the contractor should get the NOC from local authorities for disposal of solid waste. An impervious liner shall be laid to waste sites before the dumping of solid waste. The impervious liner shall be approved by the supervision consultant. After the dumping of solid waste, the depression should be covered by scarified material. • Good housekeeping practices within the camp site shall be adopted to minimize waste generation. • Disposal of campsite waste near residential colonies or in agricultural fields shall not be allowed			
	• Water contamination	• Waste management plan to be prepared for appropriate disposal of sewage – such as septic tank and soaking pits	• Monitoring compliance to NEQS of sanitary wastewater generated from campsite. The monitoring parameters will be TSS, BOD, COD and Oil & Grease.	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
			• Waste management plan in place • Photographic record		
	• Loss of vegetation	• The construction crew shall be provided with LPG as cooking (and heating, if required) fuel. Use of fuel wood shall not be allowed.	• Use of LPG cylinders at campsite	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant
	• Health and Safety issues	• Protective fencing to be installed around the Camp to avoid any accidents • Firefighting equipment shall be made available at the camps • The camp staff shall be provided firefighting training. • All safety precautions shall be taken to transport, handle and store hazardous substances, such as fuel • Health & safety plan should be prepared by contractor and get it approved by supervision consultant	• Use of personal protective equipment at campsite • Health & safety plan in place	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant
Security and Safety Risks	• Delay in project execution	• Frequent consultation with local community leaders should be carried out to ensure that any social	• Minutes of meetings of community consultation	• Monthly reporting	• Contractor

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
		frictions are identified and resolved before they become inflamed. There are safety requirements for construction projects that include control of public access to the site along with regulations aimed at safeguarding workers. Suitable arrangements that conform to national health and safety requirements and also appropriate international best practice will need to be followed. There are specific procedures that need to be observed for the transport, storage and handling of explosives that will be required for the operation of quarries and also underground excavation. It will be necessary to liaise with local communities and initiate and support a public awareness program, particularly targeted at children, about the risks and dangers of large construction sites	• Dissemination material		

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
Transportation of construction material	• Soil erosion and contamination	• Vehicular traffic on unpaved roads shall be avoided as far as possible. • Vehicles and equipment shall not be repaired in the field. If unavoidable, impervious sheathing shall be used to avoid soil and water contamination.	• Log of vehicle and equipment repairs	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant
	• Air pollution	• Vehicular traffic on unpaved roads shall be avoided as far as possible. Operation of vehicles and machinery close to the water channels, water reservoir shall be minimized. • Vehicles shall be kept in good working condition and properly tuned, in order to minimize the exhaust emissions	• Route maps of vehicle movement • Log of vehicle maintenance • Monitoring shall be done on stack of machinery and equipment. The parameters required to be monitored are Smoke, H2S, SOx, CO, VOCs and NOx.	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant
	• Noise pollution	• Vehicles shall have exhaust mufflers (silencers) to minimize noise generation • Nighttime traffic shall be avoided near the communities. Local population shall be taken in confidence if such work is unavoidable.	• Log of vehicle movement time • Visual inspections of the vehicles • Monitoring compliance to NEQS for noise (SRO 72 (KE) / 2009)	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
			• The sampling shall be done twice on monthly basis at 7m from the source. The duration of sampling shall be 24 hours @ 15 seconds interval over 15 minutes every hour (averaged)		
	• Health and Safety issues	• Road signage shall be fixed at appropriate locations to reduce safety hazard associated with project-related vehicular traffic • Project drivers shall be trained on defensive driving • Vehicle speeds near / within the communities shall be kept low, to avoid safety hazard and dust emissions.	• Visual inspections • Training record	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant
	• Damage to infrastructure	• All damaged infrastructure shall be restored to original or better condition.	• Visual inspections • Photographic records • Infrastructure restoration records	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant
Construction Works	• Soil erosion and contamination	• Material borrowing and disposal plan should be prepared	• Evidence of plan in place. • Photographic record	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
		• Cultivation fields should be avoided for borrowing material to the extent possible • Written consent of the land owner should be obtained for material (soil) borrowing • Photographic record (before, during, after) should be kept for the borrow and disposal areas. • Leveling of borrow sites.			• Monitoring by Supervision Consultant
	• Loss of natural vegetation	• Compensatory tree plantation (five times the trees cut down for construction) should be carried out at appropriate locations within the project area	• Evidence of plantation. • Photographic record	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant
	• Site overburden	• Wind direction shall be considered while selecting sites for stock piles. • Stockpiles of overburden shall be kept covered where possible. • Ensure proper disposal of construction waste at designated landfill/disposal sites. If the project area does not have any disposal	• Visual inspections • Monitoring Particulate Matter PM_{10}	• Daily monitoring reports • Fortnightly monitoring reports of PM_{10} • Quarterly Reporting	• Execution by construction contractor • Monitoring by Supervision Consultant

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
		site the construction contractor shall use any depression for waste dumping. Prior to dumping the contractor should get the NOC from local authorities for disposal of solid waste. Proper disposal of waste material. Demarcate the waste site and provide details of land use. Finally take approval from supervision consultant. • An impervious liner shall be laid to waste sites before the dumping of solid waste. The impervious liner shall be approved by the supervision consultant. After the dumping of solid waste the depression should be covered by scarified material Dismantled asphalt pavement shall be dumped to the waste site.			
	• Borrow pit management	• As far as possible wasteland or natural areas with a high elevation will be demarcated for borrowing earth material.	• Monthly rent receipts.	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
		• Where the use of agriculture land is unavoidable, the top 300 mm of the plough layer will be stripped and stockpiled for redressing the land after the required borrow material has been removed. • Where deep ditching is to be carried out, the top 1 m layer of ditching area will be stripped and stockpiled. The ditch will initially fill with scrap material from construction and then leveled with the stockpiled topsoil. • Ditches or borrow pits that cannot be fully rehabilitated will be landscaped to minimize the erosion and to avoid creating hazards for people and livestock. • Land owners will be compensated according to the terms of lease agreement negotiated with the land owners, and restoration action agreed upon by the contractor will be duly carried out.			• Monitoring by Supervision Consultant

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
	• Damage to infrastructure	• All damaged infrastructure shall be restored to original or better condition.	• Visual inspections • Photographic records • Infrastructure restoration records	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant
	• Sites of Historical, Cultural, Archeological or Religious Significance	• Proponent shall ensure that the construction contractor staff is educated about the location and importance of the cultural sites that exist in the Project area. The contractor shall ensure that these sites are not affected by the construction related activities including movement of the project vehicles and obtaining borrow material for construction. These aspects will be included in the trainings to be conducted for the contractor's staff. • In case of chance find of any sites or artifacts of historical, cultural, archeological or religious significance, contractor shall ensure that the work is stopped at that site, the	• Evidence of training provided to contractor staff. • Evidence of maps in place with these sites shown. • Record of appropriate action taken in case of chance find. • Photographic record of chance find	• Immediately after chance find, to be reported in next quarter.	• Execution by construction contractor • Monitoring by Supervision Consultant

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
		provincial and federal archeological departments are notified immediately, and their advice is sought before resumption of the construction activities at such sites.[40] • Graveyards shall not be disturbed during the construction activities including movement of the project vehicles and obtaining borrow material for construction.			
	• Noise pollution	• Equipment with high levels shall be fitted with noise reduction devices • Regular inspection, maintenance and lubrication of the construction vehicle and equipment shall be performed • Use of PPEs such as ear plugs and ear muffs by the workers shall be ensured • Avoid night time activity	• Monitoring compliance to NEQS for noise (SRO 72 (KE) / 2009) • The sampling shall be done twice on monthly basis at 7m from the source. The duration of sampling shall be 24 hours @ 15 seconds interval over 15 minutes every hour (averaged)	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant

[40] Project routing does not envisage any archeological site, however in case of any chance find the ***"Chance Find Procedures"*** should be adopted, as given in **Annexure-18**

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
	• Air pollution	• Proper engine tuning of machinery/ equipment to meet National Environmental Quality Standards of Pakistan limits. • Water should be sprinkled where needed and appropriate, particularly at work sites near the communities.	• Monitoring shall be done on stack of machinery and equipment. The parameters required to be monitored are Smoke, H_2S, SOx, CO, VOCs and NOx. • Evidence of measurement records.	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant
	• Blocked of access due to earth works and stockpiling of excavated material	• A bypass route should be constructed at the project site to divert the through traffic, thus avoiding the public traffic passing through the site.	• Traffic diversion plan	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant
	• Health and Safety issues	• Demarcation tapes to be installed around the construction site to avoid any unauthorized entry • Personal protective equipment should be made available at site and the usage of the PPEs should be ensured. • Health & safety plan should be prepared by contractor and get it approved by supervision consultant	• Use of personal protective equipment • Health & safety plan in place	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
C. Operation and Maintenance Phase					
Conflicts caused by unavailability or improper distribution of water in the area	• Social issues	• Agreements between different communities/tribes • Perennial irrigation schemes may function smoothly in normal conditions and circumstances but do face problems during extraordinary situations, i.e. when flow is higher or lower than normal. From the outset water management rules and regulations must incorporate ways to tackle such issues as water scarcity and surplus flows. • Local water user associations and groups need to be trained and involved to operate the canals, channels, gates, inlets, outlets and other structures. This needs to be done on collaborative basis with irrigation and agriculture department where communication system among farmers, water user association and department is assured.	• Agreement between parties • Training records	• Quarterly reporting	• Environmental Specialist to develop reports • PD to review and take management actions, where needed

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
		• Farmers in downstream areas should be compensated in case they lose their water rights. • All villages deprived of Project's water rights should be compensated for drinking water supply schemes otherwise very soon all villages and settlements will be deserted as underground water may not be fit for drinking purpose for every village and it would probably not be within the financial or technical capacity of local population to initiate such schemes on their own.			
Use of water for drinking purposes	• Health issues	• Proper treatment system shall be provided • Water quality will be tested as per WHO/ GOP standards to ensure the integrity of the water supply system. • Turbidity and free residual chlorine tests shall be regularly performed. • Arsenic will be tested as per WHO standards.	• WHO/ GOP Drinking Water Standards	• Daily monitoring reports of turbidity and free residual chlorine test • Monthly analysis of water quality parameters • Quarterly reporting	• Environmental Specialist to develop reports • PD to review and take management actions, where needed

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
Periodic cleaning and maintenance of the system	• Solid waste generation	• Ensure proper disposal of waste at designated landfill/disposal sites.	• Visual inspection	• Monthly monitoring and quarterly reporting	• Irrigation Department • Water User Association
Increase of agricultural lands	• Loss of pastoral lands	• Stall feeding practices for livestock, so that remaining pastoral lands are available for wild animals	• Monitoring records	• Monthly monitoring and quarterly reporting	• Agriculture Department • Forestry Department • Wildlife Department
Community Participation for management and operation of the irrigation system	• Social issues • System sustainability	• Ensure community participation in management and operation of the irrigation system • Training of community	• Training records • Community participation records	• Monthly monitoring and quarterly reporting	• Irrigation Department • Water User Association
Disruption to wildlife	• Conservation issues	• Design has already provided cattle drinking troughs at different intervals and pedestrian bridge for canal crossing approximately at 500 m interval. • It will be the responsibility of BIPD to ensure the proper maintenance of aforementioned structures. By adopting the aforementioned measures, the impact would be finally	• Monitoring and maintenance records	• Monthly monitoring and quarterly reporting	• Irrigation Department • Wildlife Department

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
		of low significance.			
Use of fertilizers & pesticides	• Banned fertilizer & pesticides will cause health issues • Contamination of fresh water through surface runoff	• Concerted efforts by the department of agriculture to disseminate information regarding sustainable use of fertilizers will help in keeping the use at an optimal level; • Ammonium Nitrate (AN) and Calcium Ammonium Nitrate (CAN) fertilizers will not be allowed; and • Use of restricted pesticides identified by WHO shall not be allowed. The list of restricted pesticides is attached as Annexure 19 of this report	• Visual inspection • Monitoring records • Market survey for availability of AN and CAN fertilizers	• Monthly monitoring and quarterly reporting	• Agriculture department
Risk due to Natural Hazard i.e. Flooding and Earthquakes	• System sustainability	• Emergency Response Plan for Breaching of Infiltration Gallery will be followed which is attached as **Annexure – 15** of this report.	• Training record of emergency response plan	• Monthly monitoring and quarterly reporting	• Irrigation Department

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
Mula River Intervention: Flood Protection Bund					
A. Design & Planning Phase					
Design works construction of flood protection bund as per proper engineering standards	• In case of design failure system will be collapsed	• Review of engineering design works will ensure the proper design of the system. The system should be designed on proper engineering standards.	• Design Report	• Once before start of construction works	• Design Engineer
Public disclosure of final design	• Social issues	• Continual two-way communication with relevant stakeholders to understand causes of previous failures, community needs, and establish rationale perceptions	• Minutes of Meetings with Stakeholders	• Once before start of design works • Once before start of construction works	• Design Engineer • Project Director
B. Implementation & Construction Phase					
Construction contractor mobilization and establishment of campsite and machinery/ equipment Yard	• Changes in land use pattern • Cultural conflicts • Influx of external work force • Land degradation due to solid waste disposal of camp site • Workshop facilities will spread oils & chemicals • Soil erosion	• In order to avoid spread of oil by virtue of establishment of fuel depot / Workshop facilities, the contractor should avoid it altogether. Incase, it cannot be avoided, the contractor must house it and underlay the area with proper liner. • Dispensing pumps should be used. • Spent Oil shall be properly collected in impermeable	• Visual inspection	• Daily monitoring report • Quarterly Reporting	• Execution by construction contractor • Monitoring by Supervision Consultant

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
		containers. Spent oil shall be disposed in accordance with MSDS shall be ensured. • Good housekeeping practices shall be ensured at workshop areas. • Residents of village shall be employed for the construction phase (mostly for unskilled jobs).			
	• Workshop facilities may spread oils & chemicals	• Proper disposal of used oil and chemical waste in accordance with MSDS shall be ensured. • Efficient Use of Chemicals shall be ensured. • Good housekeeping practices shall be ensured at workshop areas. • Mixing of waste into fresh water sources shall not be allowed.	• Visual inspection	• Daily monitoring report • Quarterly Reporting	• Execution by construction contractor • Monitoring by Supervision Consultant
	• Deterioration of air quality due to machinery & equipment	• Proper engine tuning of machinery/ equipment every month shall be carried out to comply with National Environmental Quality Standards of Pakistan.	• Monitoring shall be done on stack of machinery and equipment. The parameters required to be monitored are	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant PM

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
			Smoke, H2S, SOx, CO, VOCs and NOx. • Evidence of measurement records.		
	• Noise Pollution	• Equipment with high levels shall be fitted with noise reduction devices • Regular inspection, maintenance and lubrication of the construction vehicle and equipment shall be performed • Use of PPEs such as ear plugs and ear muffs by the workers shall be ensured • Activity having high noise potential shall be postponed to day time i.e. in between 0800hrs to 1700hrs	• Monitoring compliance to NEQS for noise (SRO 72 (KE) / 2009) • The sampling shall be done twice on monthly basis at 7m from the source. The duration of sampling shall be 24 hours @ 15 seconds interval over 15 minutes every hour (averaged)	• Fortnightly monitoring reports • Quarterly Reporting	• Execution by construction contractor • Monitoring by Supervision Consultant
	• Land degradation due to solid waste disposal of camp site	• Construction contractor shall not dispose of any solid waste in the area. The construction Contractor may dump solid waste with proper lining material in depressions and have a daily and monthly cover on	• Visual inspection	• Weekly monitoring reports • Quarterly Reporting	• Execution by construction contractor • Monitoring by Supervision Consultant

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
		it. Contractor shall collect in separate bins and segregate solid waste according to its type. An impervious liner shall be laid to waste sites before the dumping of solid waste. The impervious liner shall be approved by the supervision consultant. The Contractor shall transport and dispose solid waste at existing municipal dump site at the outskirts of Khuzdar after acquiring approval / NOC from Town Municipal Authority at Khuzdar every month. The contractor shall submit the NOC to the office of BIPD every month.			
	• Water contamination	• Waste management plan to be prepared for appropriate disposal of sewage – such as septic tank and soaking pits	• Monitoring compliance to NEQS of sanitary wastewater generated from campsite. The monitoring parameters will be	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
			TSS, BOD, COD and Oil & Grease. • Waste management plan in place • Photographic record		
	• Loss of vegetation	• The construction crew shall be provided with LPG as cooking (and heating, if required) fuel. Use of fuel wood shall not be allowed.	• Use of LPG cylinders at campsite	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant
	• Health and Safety issues	• Protective fencing to be installed around the Camp and its latrines to avoid any accidents. Open defecation shall not be allowed. • Firefighting equipment shall be made available at the camps. Sand being excessively available shall also be used and stored in buckets along with other necessary fire fighting equipment. • The camp staff shall be provided firefighting training. • All safety precautions shall be taken to transport, handle and store	• Use of personal protective equipment at campsite • Health & safety plan in place	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
		hazardous substances, such as fuel • Contractor shall prepare and submit a Health & Safety Plan for approval by Supervision consultant / BIPD			
Transportation of construction material	• Soil erosion and contamination	• Only Ratodero-Gawadar (M-8) paved highway shall be used for transportation of construction material. • Vehicles and equipment shall not be repaired in the field.	• Log of vehicle and equipment repairs	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant
	• Air pollution	• Vehicles shall be kept in good working condition and properly tuned, in order to minimize the exhaust emissions	• Route maps of vehicle movement • Log of vehicle maintenance • Monitoring shall be done on stack of machinery and equipment. The parameters required to be monitored are Smoke, H2S, SOx, CO, VOCs and NOx.	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant
	• Noise pollution	• Vehicles shall have exhaust mufflers (silencers) to minimize noise generation	• Log of vehicle movement time • Visual inspections of the vehicles	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
		• Construction material shall be transported during 0800hrs to 1700hrs to avoid night time disturbance. If unavoidable, the Supervising Consultant in consultation with BIPD and Contractor shall resolve this issue and shall ensure that such incidents do not become a regular feature.	• Monitoring compliance to NEQS for noise (SRO 72 (KE) / 2009) • The sampling shall be done twice on monthly basis at 7m from the source. The duration of sampling shall be 24 hours @ 15 seconds interval over 15 minutes every hour (averaged)		• Monitoring by Supervision Consultant
	• Health and Safety issues	• Road signage shall be fixed at appropriate locations to reduce safety hazard associated with project-related vehicular traffic. • Project drivers shall be trained on defensive driving • Vehicle speeds near / within the communities shall be limited to 10-15 km/hr. to avoid damage to infrastructure.	• Visual inspections • Training record	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant
	• Damage to infrastructure	• All damaged infrastructure shall be restored to original or better condition.	• Visual inspections • Photographic records	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
			• Infrastructure restoration records		• Monitoring by Supervision Consultant
Construction Works: Earthen Bund with Stone Pitching: 1. Hatachi Village = 3,140 m Long 2. Kharzan Village = 3,460 m Long	• Soil erosion and contamination	• Material borrowing and disposal plan should be prepared by contractor and submitted to Supervising Consultant / BIPD for approval. • Lands used for agricultural purposed shall not be used borrowing material. • Written consent of the land owner should be obtained for material (soil) borrowing • Photographic record (before and after) should be kept for the borrow and disposal areas. • Leveling of borrow sites shall be done by contractor on his own expense.	• Evidence of plan in place. • Photographic record	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant
	• Loss of natural vegetation	• Compensatory tree plantation (ten times the trees cut down for construction) should be carried out at appropriate locations within the project area.	• Evidence of plantation. • Photographic record	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
	• Damage to infrastructure	• All damaged infrastructure shall be restored to original or better condition.	• Visual inspections • Monitoring Particulate Matter PM_{10}	• Daily monitoring reports • Fortnightly monitoring reports of PM_{10} • Quarterly Reporting	• Execution by construction contractor • Monitoring by Supervision Consultant
	• Sites of Historical, Cultural, Archeological or Religious Significance	• In case of chance find of any sites or artifacts of historical, cultural, archeological or religious significance, contractor shall immediately stop work and notify the provincial and federal archeological departments along with Supervising Consultant and BIPD. [41] • The appropriate line of action shall be sought from the concerned department before resumption of the construction activities at such sites. [1]	• Evidence of training provided to contractor staff. • Evidence of maps in place with these sites shown. • Record of appropriate action taken in case of chance find. • Photographic record of chance find	• Immediately after chance find, to be reported in next quarter.	• Execution by construction contractor • Monitoring by Supervision Consultant
	• Noise pollution	• Equipment with high levels shall be fitted with noise reduction devices.	• Monitoring compliance to NEQS for noise (SRO 72 (KE) / 2009)	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor

[41] Project routing does not envisage any archeological site, however in case of any chance find the ***"Chance Find Procedures"*** should be adopted, as given in **Annexure-18.**

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
		• Regular inspection, maintenance and lubrication of the construction vehicle and equipment shall be performed • Use of PPEs such as ear plugs and ear muffs by the workers shall be ensured. • Construction work shall be carried out during 0800hrs to 1700hrs to avoid night time disturbance. If unavoidable, the Supervising Consultant in consultation with BIPD and Contractor shall resolve this issue and shall ensure that such incidents do not become a regular feature.	• The sampling shall be done twice on monthly basis at 7m from the source. The duration of sampling shall be 24 hours @ 15 seconds interval over 15 minutes every hour (averaged)		• Monitoring by Supervision Consultant
	• Air pollution	• Vehicles shall be kept in good working condition and properly tuned, in order to minimize the exhaust emissions • Water should be sprinkled where needed and appropriate, particularly at work sites near the communities to suppress dispersion of dust.	• Monitoring shall be done on stack of machinery and equipment. The parameters required to be monitored are Smoke, H_2S, SOx, CO, VOCs and NOx. • Evidence of measurement records.	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
	• Health and Safety issues	• Demarcation tapes to be installed around the construction site to avoid any unauthorized entry • Personal protective equipment should be made available at site and the usage of the PPEs should be ensured. • Health & safety plan should be prepared by contractor and get it approved by supervision consultant	• Use of personal protective equipment • Health & safety plan in place	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant
C. Operation & Maintenance Phase					
Breaching of flood protection bund	• System sustainability	• The Irrigation Department should monitor the system on a regular basis. • Capacity building of the communities should be carried out in the O&M activities. • Liaison with the communities to be maintained to identify potential weaknesses in the system that could cause breaches.	• Monitoring reports	• Quarterly reporting	• Environmental Specialist to develop reports • PD to review and take management actions, where needed
Risk due to Natural Hazard i.e. Flooding and Earthquakes	• System sustainability	• Emergency Response Plan for Flood Protection Bund will be followed which is	• Training record of emergency response plan	• Monthly monitoring and quarterly reporting	• Irrigation Department

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
		attached as **Annexure – 16** of this report.			

7.1.7 Planning for Implementation of EMP

326. NOC and Other Approvals

- ***BEPA Approval Process***

327. The final IEE duly complete in al respect is to be submitted to Balochistan EPA along with a review fee of Rs. 15,000/=. There is no requirement of Public hearing for IEE. The BEPA shall review (within 45 days) and it shall communicate its approval or otherwise within a period of four months from the date the IEE is filed complete in all respects with BEPA, in accordance with the prescribed procedure, failing (to communicate with) which the IEE shall be deemed to have been approved (through Schedule 5*). No Objection Certificate for Project from BEPA is mandatory before its commencement.

- ***Stakeholder Coordination***

328. Notwithstanding the efforts so far put in for public participation, this activity will have to be pursued through the forthcoming implementation phases of the project. In particular, the focus will be on the improvement and modification of the proposed intervention designs.

329. Participation mechanisms facilitate the consultative process and include information sharing and dissemination, disclosure, and participation of affected people and other stakeholders in the project related activities. In the peculiar social set-up of the Project Area, it is also important to involve the religious leaders as representatives of the public as well as part of effective communication process. They can provide a very effective medium to bring information to the affected male population through Friday prayers. Local business community, specially the affected one, should also be brought into the process of awareness and participation.

330. The related institutional arrangements should also be in place for continuous consultation throughout the process of planning, implementation and liaison with key stakeholders through continuous process of information disclosure, consultation and participation.

7.2 Environmental Training Needs Assessment

331. In order to raise the level of professional and managerial staff, there is a need to upgrade their knowledge in the related areas. An environmental and social training and Technical Assistance (TA) program is to be carried out before the implementation of the project.

332. Contractor's environmental awareness and appropriate knowledge of environmental protection is critical to the successful implementation of the EMP because without appropriate environmental awareness, knowledge and skills required for the implementation of the mitigation measures, it would be difficult for the Contractor(s) workforce to implement effective environmental protection measures. A suitable training program is proposed to train the Contractor(s) staff who will be involved in the Construction Phase and the professional staff from the proponent involved at the operational stage of the project.

333. The supervision / training consultant will organize training courses for Proponent and Contractor staff to train them in specialized areas such as air and noise pollution monitoring and water quality monitoring etc. The details of this training program are presented in **Table 30.**

Table 30: Personnel Training Program

Training Provided by	Contents	Trainees	Duration
supervision / training consultants/ organizations specializing in environmental management and monitoring	Short seminars and courses on: Environmental laws and regulations, daily monitoring and supervision	• Irrigation Staff • Contractor • project staff • Project Implementation Staff	1 day
Training consultants/ organizations specializing in social management and monitoring	Short seminars and courses on: Social awareness	• Project staff dealing • in Social/lands • matters	1 day
Training consultants/ organizations specializing in Occupational, health and safety issues	Short lectures relating to Occupational Safety and Health	• Contractor's staff	2 days

7.3 Communication & Documentation

334. Communication and documentation is an essential feature of EMP. The key features of such mechanism are:

- ***Data Recording and Maintenance***

335. All forms to be used for recording information during the environmental monitoring will follow a standard format which will correspond to the data base in to which all the gathered information will be placed. Check boxes will be used as much as possible to facilitate data entry. Tracking system will be developed for each form.

- ***Database***

336. The database may include the following information:

- Training programs;
- Staff deployment;
- Non-compliance;
- Corrective actions
- List of environmental data and
- List of environmental data to be maintained:
- Soil and land pollution
- Disposal of excavated silt and earth
- Disposal of waste
- Water resource
- Fuel oil and chemical spills
- Vegetation record
- Noise pollution
- Air and dust pollution
- Socio-economic data

- ***Meetings***

337. The following environmental meetings during the project will take place. Primary meeting for setting out the requisite end frame sounding for the regular meetings. Scheduled meetings between Contractor and Supervising Consultants.

338. The purpose of the meeting will be to discuss the conduct of the operation, non – compliances noted by the consultant's environmental team and measures for their remedy. The meeting will be recorded in the form of a daily/monthly environmental report.

7.4 Institutional Arrangement for Implementation of EMP

7.4.1 Institutional Arrangement for Implementation of EMP during Construction Phase

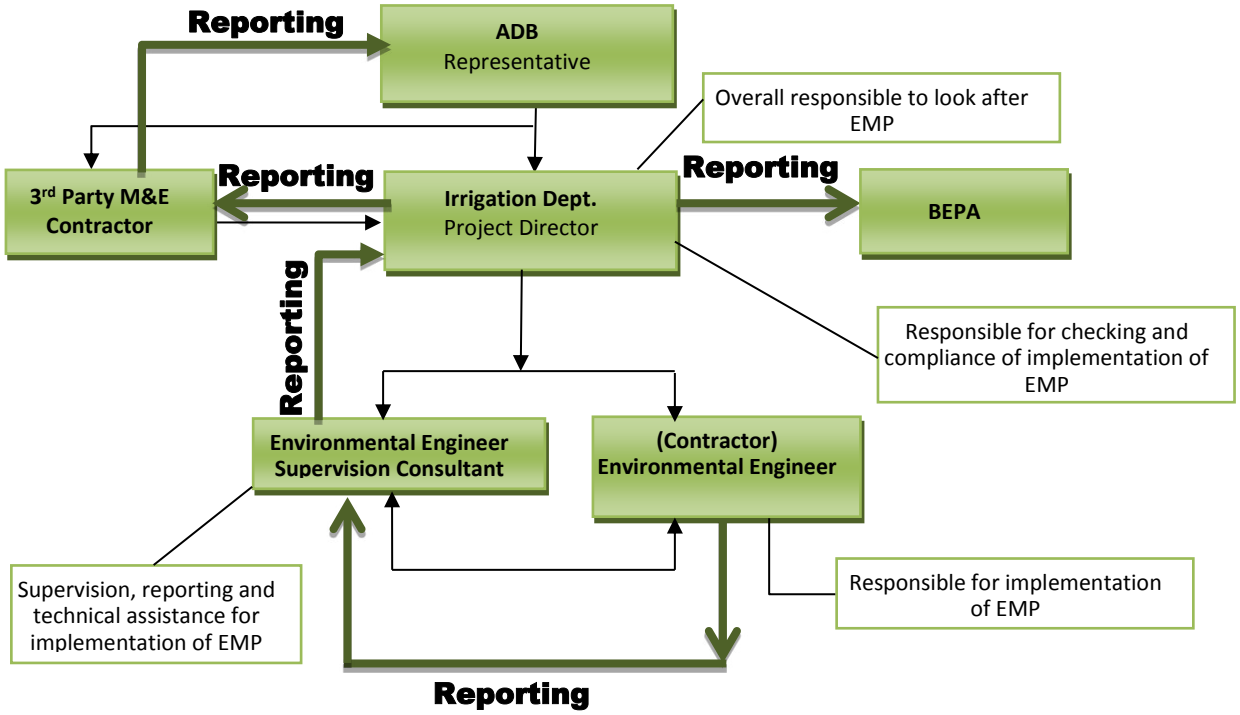
339. The key players involved in the formulation, design, construction and operation of the proposed project are the Project Proponent (Irrigation Department), Asian Development Bank (ADB), 3rd Party M&E Contractor, the Contractor and the Supervisory Consultants (SCs). The roles, remits and responsibilities of these organizations are outlined below.

340. The following staff will be involved in the implementation of EMP;

- ADB Environmental Representative;
- 3rd Party M&E Contractor;
- Environmental Engineer from Supervision Consultant;
- Site Environmental Engineer of Construction Contractor; and
- Representative of Irrigation Department.

341. The Construction Contractor will be bond through contract documents to implement the EMP. The whole EMP will be included as a clause of the contract documents. The Organizational setup for implementation of EMP is given **Figure 19** below:

Figure 19: Organizational Setup for Implementation of EMP (Construction Phase)



7.4.2 Roles and Responsibilities

a) ADB: Environmental Representative

342. Environmental Representative of ADB will make missions to assess on-site measures that would be taken as per EMP.

b) 3rd Party M&E Contractor (if required)[42]

343. 3rd Party M&E shall be responsible for reporting the status of EMP compliance by Construction Contractor to Irrigation Department and ADB. The frequency of reporting will be based on bi-annual basis.

c) Irrigation Department: Project Director

344. Project Director will have responsibility for assuring implementation of EMP. This includes the following:

- Ensuring that the required environmental training is provided to the staff concerned;

[42] Normally in other ADB's Projects 3rd Party M&E contractor performed the monitoring of EMP as well.

- The Project Director will be responsible for carrying out visits to the construction sites to review the environmental performance of the Construction Contractors;
- Monitoring the progress of environment related activities;
- Make sure that the Construction Contractor is implementing the additional measures suggested by the Supervision Consultant in environmental monitoring reports; and
- To assist contractor for obtaining necessary approvals form the concerned departments.

d) Supervision Consultant: Environmental Engineer

345. Environmental Engineer will supervise, monitor, report and assist technically for the implementation of EMP. The Environmental Engineer will also suggest any additional mitigation measures if required.

e) Supervision Consultant: Chief Resident Engineer/Resident Engineer

346. Supervision Consultant will oversee the performance of Construction Contractor to make sure that the Construction Contractor is carrying out the work in accordance with the tender design and follow the specifications.

f) Construction Contractor: Site Environmental Engineer

347. Site Environmental Engineer of contractor will carry out the implementation of the mitigation measures at construction site. Contractor will be bond through contract to take actions against all the special and general provisions of the contract document. Contractor will make sure the compliance of EMP recommendations and will also be responsible for effective liaison with local heads of villages.

7.4.3 Reporting Mechanism

348. Progress reporting related to environmental activities will be responsibility of Supervision Consultant's environmental engineer. He will also be responsible for submitting quarterly EMP compliance report for the project to the PD, Irrigation department. The table of contents of the environmental compliance report is attached as **Annexure 20.**

7.4.4 Non-Compliance of the EMP

349. The implementation of the proposed EMP involves inputs from various functionaries. Construction Contractor will be primarily responsible for ensuring implementation and reporting of the mitigation measures proposed in the EMP, which will be part of the contract documents. The provision of the environmental mitigation cost will be made in the total cost of project, for which Construction Contractor will be paid on the basis of monthly compliance reports. However, if the Construction Contractor fails to comply with the

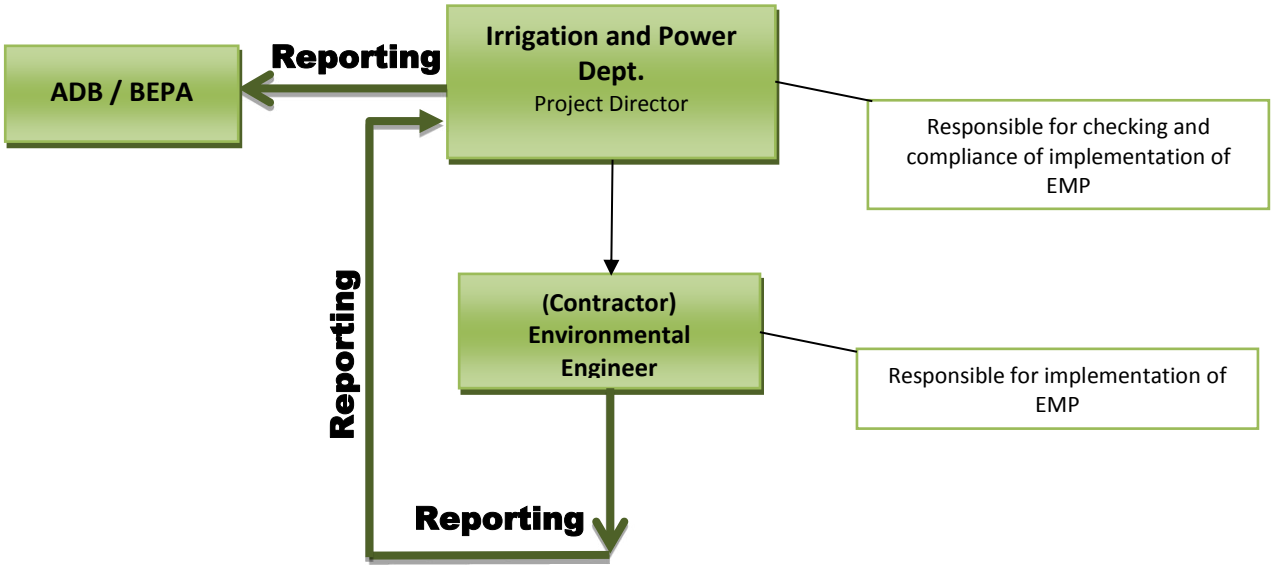
implementation of EMP and submission of the monthly compliance reports, deductions will be made from the payments to the Construction Contractor claimed under the heads of environmental components.

7.4.5 Institutional Arrangement for Implementation of EMP during Operation Phase

350. The key players involved in the formulation, design, construction and operation of the proposed subproject are the Project Proponent (Irrigation and Power Department), 3rd Party M&E Contractor, Water User Associations & Farmer Organizations Chairman and Vice Chairman. The roles, remits and responsibilities of these organizations are outlined below. The following staff will be involved in the implementation of EMP. Organizational setup for implementation of EMP is given **Figure 20** below:

- Water User Association (WUA) and Farmer Organizations (FOs), Chairman & Vice Chairman; and
- Project Proponent Representative (Irrigation and Works Department)

Figure 20: Organizational Setup for Implementation of EMP (Operation Phase)



❑ **Role and Responsibilities**

a) Project Proponent (Irrigation and Power Department): Project Director

351. Project Director will have responsibility for assuring implementation of EMP. This includes the following:

- Ensuring that the required environmental training is provided to the staff concerned;

- The Project Director will be responsible for carrying out visits to the subproject sites to review the environmental performance;
- Monitoring the progress of environment related activities; and
- Make sure that the WUA & FOs is implementing the measures suggested by the EMP in environmental monitoring reports.

b) Water User Association (WUA) and Farmer Organizations (FOs), Chairman & Vice Chairman

352. WUA and FOs will carry out the implementation of the mitigation measures at operation site

❑ **Reporting Mechanism**

353. Bi-annual Progress reporting related to environmental activities will be responsibility of WUA & FOs Chairman and Vice Chairman. Also, responsible for submitting an EMP compliance report for the subproject to the Project Proponent i.e. Project Director – Irrigation and Power department.

7.5 Grievance Redressal Mechanism

354. This section describes mechanism to receive and facilitate the resolution of affected persons' concerns and grievances. It explains how the procedures are accessible to aggrieved party (AP) including women. A grievance mechanism will be available to allow an AP appealing any disagreeable decision, practice or activity arising from land or other assets compensation. APs will be fully informed of their rights and of the procedures for addressing complaints whether verbally or in writing during consultation, survey, and time of compensation. It is preferred that APs/local community should submit their complaints/ concerns and issues formally and accordingly the project staff will enter the complaint on Community Complaint Register (CCR) comprising of a minimum information such as the name and address of complainer, description of complaint, action taken, status of resolution of complaints and other necessary information/ record and reasons; in case the issue is not resolved. Proper consideration will be given to avoid the grievances rather than going through a redress process.

355. A Grievance Redress Committee (GRC) will be established at both project and field level. GRC at project level will include the Project director, representative of PIU/ BIPD, Social Safeguards staff of BIPD, representatives of APs/ or local community and representatives of concerned FO (if any).

- The GRC at project level will include the following members:

i). PD (Balochistan Irrigation and Power Department)

ii). Representative (Project Implementation Unit)
iii). Representative of AP / FO

356. This GRC will work both at the project and field level. The District level BIPD staff will inform the aggrieved party about GRC and mechanism by registering their concerns at concerned office. The complaints will be registered by maintaining a community complaint register (CCR), where the name & address of complainer, date, description of complaint and action taken will be entered.

- The GRC at field (District) level will include:

i). Executive Engineer / Sub-Engineer
ii). Social Mobilizer
iii). Patwari (land record keeper)
iv). Representative of AP/ FO

Table 31: Community Complaints/ Grievance Redress Process

Land Compensation Issues	Other Items Compensation Issues
• First, complaint resolution will be attempted at site (field level) through the involvement of the PIUs/ informal committee/ and or concerned FO (if any).	• First, complaints resolution will be attempted at site (field level) through the involvement of the PIUs/ informal committee/ and or concerned FO (if any).
• If unsettled, a grievance can then be lodged to the DO (Revenue)/ LAC who has 14 days to decide on the case.	• If no solution is reached, a grievance can be lodged to GRC. The GRC will provide the decision within 3 weeks of registering the complaint. The GRC decision must be in compliance with this LARP provision
• If no solution is reached, a grievance can be lodged to GRC. The GRC will provide the decision within 3 weeks of registering the complaint. The GRC decision must be in compliance with this LARP provision.	• If the grievance redress system does not satisfy the DPs, they can pursue further by submitting their case to the appropriate court of law.
• In case, the grievance redressal system does not satisfy the DFs/ DPs, then they can pursue further by submitting their case to the appropriate court of law as per the process set out in Section 18 to 22 of the LAA 1894.	

7.6 Environmental Management Cost

357. The budget presented in **Table 32 and 33** will include estimates for the cost of mitigation measures, staff employed for implementation of the EMP, tree plantation, and technical assistance.

Table 32: Cost for Contractor

Sr. #	Description	Unit Cost* PKR / Month
1	Laboratory Analysis Cost	200,000
2	Contractor Environmental Engineer (each contractor)	80,000
	Total	**Rs. 280,000/-**
* based on unit parameter testing and sampling cost for air, water and noise.		

Table 33: Cost for Proponent

Sr. #	Description	Amount (PKR)*
A	**During Construction Period**	
1	Laboratory Analysis Cost	100,000/Quarter
2	Supervision Consultant/Environmental Officer	100,000/Month
3	Third Party Monitoring	500,000/Quarter
4	Tree Plantation Cost	1,500/Tree
5	Training on EMP	100,000/day
B	**During Operation & Maintenance Period (for initial three years)**	
1	Laboratory Analysis Cost	50,000/Six Months
2	Training & Community Engagement Cost	50,000/Month
3	Third Party Monitoring	300,000/ Six Months
* based on unit parameter testing and sampling cost for air, water and noise.		

8. CONCLUSIONS AND RECOMMENDATIONS

358. This section presents the major conclusions and key recommendations of the IEE study.

8.1 Findings and Recommendations

359. This study was carried out at the planning stage of the project. Predominantly both primary and secondary data with site reconnaissance were used to assess the environmental impacts. The potential environmental impacts were assessed in a comprehensive manner. The report has provided a picture of all potential environmental impacts associated with the subprojects and recommended suitable mitigation measures.

360. There are some further considerations for the planning stages such as submission of IEE report to BEPA for grant of No Objection Certificate for the proposed subproject interventions under Balochistan Environmental Protection Act 2012.

361. No land acquisition and involuntary settlement are involved. No indigenous persons reside or will be affected by the proposed interventions in the areas of influence.

362. The environmental impacts from the project will mostly take place during the construction stage. The impacts are likely to be similar at most locations and impacts have been reviewed in the relevant section of this IEE report.

363. Environmental impacts during the construction phase are related to the establishment of campsite which are temporary and can be minimized with better management. Construction worker camps will not necessarily be based on the scale of the works needed. If for some unforeseen reason a larger workforce is needed, the construction camp will not be located in settlement areas or near sensitive water resources and will be provided with lavatories. Local employment will be preferred to avoid cultural conflicts.

364. During the execution of this study, consultations with relevant government officials, academia, NGOs and local community have been conducted to gain their perceptions of the project and ascertain the nature and scope of local participation in project planning and implementation.

365. Water rights are equally distributed among the agriculturists according to the land holdings. The FOs in the subproject areas have not been active and need to be strengthened. The Agriculture Extension Department in Balochistan can play a vital role in enhancing the cropping intensity of the proposed subproject area with timely knowledge of best agricultural practices.

366. Construction of subproject is going to bring positive changes in the area in terms of availability of water, cultivation of crops, establishment of new settlements and improvement in the standard of life of the inhabitants of the area.

367. Land which is lying barren at present would change to lush green valley through provision of irrigation water.

368. Availability of irrigation and agriculture would support livestock growth and in due course of time would enable farmers to diversify in areas of diary production.

369. The project will generate employment opportunities for local laborers during all three phases of project. The Project will positively contribute in improving the carrying capacity of biological environment and overall improvement of the ecosystem.

370. Household income will increase substantially with irrigation improvement measures owing to availability of water for irrigation, crop yields, increase in the number of animals, and availability of other occupational opportunities.

371. The proposed project does not impact biological component of the area, at construction phase as well as its operation phase. However, the project is likely to bring significant change in opportunities for the community and its surrounding ecosystem in the form of social uplift, agricultural productivity and prosperity.

372. Careful planning and management is recommended to avoid air pollution and generation of solid waste during construction phase especially during storage & transport of overburden soil.

373. Water rights are equally distributed among the agriculturists according to the land holdings. The FOs in the subproject areas have not been actively and need to be strengthened. The Agriculture Extension Department in Balochistan can play a vital role in enhancing the cropping intensity of the proposed subproject area with timely knowledge of best agricultural practices.

8.2 Conclusions

374. Environmental criteria adopted for this study is comprised of three phases, these are as follows:

- Impacts during Planning and Design Phase;
- Impacts during Implementation and Construction Phase; and
- Impacts during Operation and Maintenance Phase.

375. Following is the conclusion statement of the study on the basis of environmental assessment carried out in this report:

376. ***"Some activities under this project have been identified to cause low to moderate environmental negative impacts and their mitigation measures have been prescribed. Proper and timely execution of these measures will reverse most the negative impacts in the long term however there will be some residual impacts of the project. Overall the project causes moderate to high positive impacts on the physical and socio-economic environments and should therefore be approved for implementation."***

ANNEXURES

Annexure 1: REA (Rapid Environmental Assessment (REA) checklist for urban development and water supply)

Country/Project Title:	Pakistan/Balochistan Water Resources Development Project

Environmental Checklist for Karkh irrigation subproject

SCREENING QUESTIONS	Yes	No	REMARKS
A. Project Sitting Is the Project area adjacent to or within any of the following environmentally sensitive areas?			
Protected Area		☒	
Wetland[43]	☒		Project design will provide measures to ensure the minimum flow required.
Mangrove		☒	
Estuarine		☒	
Buffer zone of protected area		☒	
Special area for protecting biodiversity		☒	
B. Potential Environmental Impacts Will the Project cause			
Loss of precious ecological values (e.g. Result of encroachment into forests/swamplands or historical/cultural buildings/areas, disruption of hydrology of natural waterways, regional flooding, and drainage hazards)?	☒		
Conflicts in water supply rights and related social conflicts?	☒		EMP will provide measures to avoid conflicts by adopting local and traditional water rights mechanism already exists in the area.
Impediments to movements of people and animals?	☒		Project design shall include facilities for easy access of people and animals.
Potential ecological problems due to increased soil erosion and siltation, leading to decreased stream capacity?		☒	
Insufficient drainage leading to salinity intrusion?		☒	
Over pumping of groundwater, leading to salinization and ground subsidence?		☒	
Impairment of downstream water quality		☒	

[43] Mula River ends up in Hamal Lake is some 58 kms from Larkana in District Qambar Shahdadkot of Sindh Province. Which is a Wetland and any activity at upstream of the River can affect the health and performance of the wetland.

SCREENING QUESTIONS	Yes	No	REMARKS
and therefore, impairment of downstream beneficial uses of water?			
Dislocation or involuntary resettlement of people?		☒	
Potential social conflicts arising from land tenure and land use issues?	☒		
Soil erosion before compaction and lining of canals?	☒		
Noise from construction equipment?	☒		Noise control measures to be specified in the emp. Impacts are transient.
Dust?	☒		Dust control measures to be specified in the emp. Impacts are transient.
Labor-related social problems especially if workers from different areas are hired?	☒		Control measures to be specified in the emp. Impacts are transient.
Waterlogging and soil salinization due to inadequate drainage and farm management?	☒		Project design shall ensure proper drainage design.
Leaching of soil nutrients and changes in soil characteristics due to excessive application of irrigation water?		☒	
Reduction of downstream water supply during peak seasons?	☒		
Soil pollution, polluted farm runoff and groundwater, and public health risks due to excessive application of fertilizers and pesticides?	☒		
Soil erosion (furrow, surface)?	☒		
Scouring of canals?	☒		
Logging of canals by sediments?	☒		
Clogging of canals by weeds?	☒		
Seawater intrusion into downstream freshwater systems?		☒	
Introduction of increase in incidence of waterborne or water related diseases?	☒		

Environmental Checklist for Kharzan Hatachi Infiltration Gallery Subproject

SCREENING QUESTIONS	Yes	No	REMARKS
A. Project Sitting Is the Project area adjacent to or within any of the following environmentally sensitive areas?			
Protected Area		☒	
Wetland[44]	☒		Project design will provide measures to ensure the minimum flow required.
Mangrove		☒	
Estuarine		☒	
Buffer zone of protected area		☒	
Special area for protecting biodiversity		☒	
B. Potential Environmental Impacts Will the Project cause			
Loss of precious ecological values (e.g. Result of encroachment into forests/swamplands or historical/cultural buildings/areas, disruption of hydrology of natural waterways, regional flooding, and drainage hazards)?	☒		
Conflicts in water supply rights and related social conflicts?	☒		EMP will provide measures to avoid conflicts by adopting local and traditional water rights mechanism already exists in the area.
Impediments to movements of people and animals?	☒		Project design shall include facilities for easy access of people and animals.
Potential ecological problems due to increased soil erosion and siltation, leading to decreased stream capacity?		☒	
Insufficient drainage leading to salinity intrusion?		☒	
Over pumping of groundwater, leading to salinization and ground subsidence?[45]		☒	
Impairment of downstream water quality and therefore, impairment of downstream beneficial uses of water?		☒	
Dislocation or involuntary resettlement of people?		☒	
Potential social conflicts arising from land tenure and land use issues?	☒		

[44] Mulla River ends up in Hamal Lake is some 58 kms from Larkana in District Qambar Shahdadkot of Sindh Province. Which is a Wetland and any activity at upstream of the River can affect the health and performance of the wetland.

[45] Lead to depletion of ground water

SCREENING QUESTIONS	Yes	No	REMARKS
Soil erosion before compaction and lining of canals?	☒		
Noise from construction equipment?	☒		Noise control measures to be specified in the emp. Impacts are transient.
Dust?	☒		Dust control measures to be specified in the emp. Impacts are transient.
Labor-related social problems especially if workers from different areas are hired?	☒		Control measures to be specified in the emp. Impacts are transient.
Waterlogging and soil salinization due to inadequate drainage and farm management?	☒		Project design shall ensure proper drainage design.
Leaching of soil nutrients and changes in soil characteristics due to excessive application of irrigation water?		☒	
Reduction of downstream water supply during peak seasons?	☒		
Soil pollution, polluted farm runoff and groundwater, and public health risks due to excessive application of fertilizers and pesticides?	☒		
Soil erosion (furrow, surface)?	☒		
Scouring of canals?	☒		
Logging of canals by sediments?	☒		
Clogging of canals by weeds?	☒		
Seawater intrusion into downstream freshwater systems?		☒	
Introduction of increase in incidence of waterborne or water related diseases?	☒		

Source: *As Provided By TCI*

Annexure 2:Pakistan Environmental Protection Act (PEPA), 1997 and National Environmental Quality Standards (NEQS)

Pakistan Environmental Protection Act (PEPA), 1997

The Pakistan Environmental Protection Act 1997 was passed by the National Assembly of Pakistan on September 3, 1997, and by the Senate of Pakistan on November 7, 1997. The Act received the assent of the President of Pakistan on December 3, 1997.
The text of the Environmental Protection Act 1997 is as follows:

Act No. XXXIV of 1997

An Act to provide for the protection, conservation, rehabilitation and improvement of the environment, for the prevention and control of pollution, and promotion of sustainable development.

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; It is hereby enacted as follows:

1) Short Title, Extent and Commencement

(1) This Act may be called the Environmental Protection Act 1997.
(2) It extends to the whole of Pakistan.
(3) It shall come into force at once.

2) Definitions

In this Act, unless there is anything repugnant in the subject or context:

(i) "adverse environmental effect" means impairment of, or damage to, the environment and includes:

(a) impairment of, or damage to, human health and safety or to biodiversity or property;
(b) pollution; and

(c) any adverse environmental effect as may be specified in the regulation.

(ii) "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;

(iii) "air pollutant" means any substance that causes pollution of air and includes soot, smoke, dust particles, odor, light, electro-magnetic, radiation, heat, fumes, combustion exhaust, exhaust gases, noxious gases, hazardous substances and radioactive substances;

(iv) "biodiversity" or "biological diversity" means the variability among living organizations from all sources, including inter alia terrestrial, marine and other aquatic ecosystems and ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems;

(v) "council" means the Pakistan Environmental Protection Council established under section 3;

(vi) "discharge" means spilling, leaking, pumping, depositing, seeping, releasing, flowing out, pouring, emitting, emptying or dumping;

(vii) "ecosystem" means a dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit;

(viii) "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 vapour;

(ix) "emission standards" means the permissible standards established by the Federal Agency or a Provincial Agency for emission of air pollutants and noise and for discharge of effluent and waste;

(x) "environment" means-

(a) air, water and land;
(b) all layers of the atmosphere;
(c) all organic and inorganic matter and living organisms; (d) the ecosystem and ecological relationships;
(e) buildings, structures, roads, facilities and works;
(f) all social and economic conditions affecting community life; and
(g) the inter-relationships between any of the factors in sub-clauses (a) to (f)

(xi) "environmental impact assessment" means an environmental study comprising collection of data, prediction of qualitative and quantitative impacts, comparison of alternatives, evaluation of preventive, mitigatory 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;

(xii) " Environmental Magistrate" means the Magistrate of the First Class appointed under section 24;

(xiii) "Environmental Tribunal" means the Environmental Tribunal constituted under section 20;

(xiv) Exclusive Economic Zone" shall have the same meaning as defined in the

Territorial Waters and Maritime Zones Act, 1976 (LXXXII of 1976);

(xv) "factory" means any premises in which industrial activity is being undertaken;

(xvi) "Federal Agency" means the Pakistan Environmental Protection Agency established under section 5, or any Government Agency, local council or local authority exercising the powers and functions of the Federal Agency;

(xvii) "Government Agency" includes-

(a) a division, department, attached department, bureau, section, commission, board, office or unit of the Federal Government or a Provincial Government;
(b) a development or a local authority, company or corporation established or controlled by the Federal Government or Provincial Government;
(c) a Provincial Environmental Protection Agency; and

(d) any other body defined and listed in the Rules of Business of the Federal Government or a Provincial Government;

(xviii) "hazardous substance" means-

(a) a substance or mixture of substance, other than a pesticide as defined in the Agricultural Pesticide Ordinance, 1971 (II of 1971), which, by reason of its chemical activity is 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
(b) any substance which may be prescribed as a hazardous substance;

(xix) "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;

(xx) "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);

(xxi) "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;

(xxii) "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;

(xxiii) "industrial waste" means waste resulting from an industrial activity;

(xxiv) "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 environmental effect for requiring preparation of an environmental impact assessment;

(xxv) "local authority" means any agency set-up or designated by the Federal Government or a Provincial Government by notification in the official Gazette to be a local authority for the purposes of this Act;

(xxvi) "local council" means a local council constituted or established under a law relating to local government;

(xxvii) "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;

(xxviii) "municipal waste" includes sewage, refuse, garbage, waste from abattoirs, sludge and human excreta and the like;

(xxix) "National Environmental Quality Standards" means standards established by the Federal Agency 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;

(xxx) "noise" means the intensity, duration and character from all sources, and includes vibrations;

(xxxi) "nuclear waste" means waste from any nuclear reactor or nuclear or other nuclear energy system, whether or not such waste is radioactive;

(xxxii) "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;

(xxxiii) "pollution" means the contamination of air, land or water by the discharge or emission or effluents or wastes or air pollutants or noise or other matter which either directly or indirectly or in combination with other discharges or substances alters unfavourably the chemical, physical, biological, radiational, 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;

(xxxiv) "prescribed" means prescribed by rules made under this Act;

(xxxv) "project" means any activity, plan, scheme, proposal or undertaking involving any change in the environment and includes;

(a) construction or use of buildings or other works;
(b) construction or use of roads or other transport systems;
(c) construction or operation of factories or other installations;
(d) mineral prospecting, mining, quarrying, stone-crushing, drilling and the like; (e) any change of land use or water use; and
(f) alteration, expansion, repair, decommissioning or abandonment of existing buildings or other works, roads or other transport systems; factories or other installations;

(xxxvi) "proponent" means the person who proposes or intends to undertake a project;

(xxxvii) "Provincial Agency" means a Provincial Environmental Protection Agency established under section 8;

(xxxviii) "regulations" means regulations made under this Act;

(xxxix) "rules" means rules made under this Act;

(xl) "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;

(xli) "standards" means qualitative and quantitative standards for discharge of effluents 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 National Environmental Quality Standards, emission standards and other standards established under this Act and the rules and regulations made thereunder;

(xlii) "sustainable development" means development that meets the needs of the present generation without compromising the ability of future generations to meet their needs;

(xliii) "territorial waters" shall have the same meaning as defined in the Territorial Waters and Maritime Zones Act, 1976 (LXXXII of 1976);

(xliv) "vessel" includes anything made for the conveyance by water of human beings or of goods; and

(xlv) "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.

3) Establishment of the Pakistan Environmental Protection Council-

(1) The Federal Government shall, by notification in the official Gazette, establish a Council to be known as the Pakistan Environmental Protection Council consisting of;

(i) Prime Minister or such other person as the Prime Minister may nominate in this behalf. **Chairperson**

(ii) Minister Incharge of the Ministry or Division dealing with the subject of environment. **Vice Chairperson**

(iii) Chief Ministers of the Provinces. **Members**

(iv) Ministers Incharge of the subject of environment in the provinces. **Members**

(v) Such other persons not exceeding thirty-five as the Federal Government may appoint, of which at least twenty shall be non-official including five representatives of the Chambers of Commerce and Industry and Industrial Associations and one or more representatives of the Chambers of Agriculture, the medical and legal professions, trade unions, and non-governmental organizations concerned with the environment and development, and scientists, technical experts and educationists. **Members**

vi) Secretary to the Government of Pakistan, in-charge of the Ministry or Division dealing with the subject of environment **Member/Secretary**

(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 three years.

(3) The Council shall frame its own rules of procedure.

(4) The Council shall hold meetings as and when necessary, but not less than two meetings shall be held in a year.

(5) 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.

(6) The Council or any of its committees may invite any technical expert or representative of any Government Agency or non-governmental organization or other person possessing specialized knowledge of any subject for assistance in performance of its functions.

4) Function and Powers of the Council

(1) The Council shall-

(a) co-ordinate and supervise enforcement of the provisions of this Act;

(b) approve comprehensive national environmental policies and ensure their implementation within the framework of a national conservation strategy as may be approved by the Federal Government from time to time;
(c) approve the National 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) coordinate integration of the principles and concerns of sustainable development into national development plans and policies; and
(f) consider the National Environment Report and give appropriate directions thereon.

(2) The Council may, either itself or on the request of any person or organization, direct the Federal Agency or any Government Agency to prepare, submit, promote or implement projects for the protection, conservation, rehabilitation and improvement of the environment, the prevention and control of pollution, and the sustainable development of resources, or to undertake research in any specified aspect of environment.

5) Establishment of the Pakistan Environmental Protection Agency

(1) The Federal Government shall, by notification in the official Gazette, establish the Pakistan Environmental Protection Agency, to exercise the powers and perform the functions assigned to it under the provisions of this Act and the rules and regulations made thereunder.

(2) The Federal Agency shall be headed by a Director General, who shall be appointed by the

Federal Government on such terms and conditions as it may determine.

(3) The Federal Agency shall have such administrative, technical and legal staff as the Federal Government may specify, to be appointed in accordance with such procedure as may be prescribed.
(4) The powers and function of the Federal Agency shall be exercised and performed by the

Director General.

(5) The Director General may, be general or special order, delegate any of these powers and functions to staff appointed under
sub-section (3)

(6) For assisting the Federal Agency in the discharge of its functions, the Federal Government shall establish Advisory Committees for various sectors, and appoint as members thereof eminent representatives of the relevant sector, educational institutions, research institutes and non-governmental organizations.

6) Functions of the Federal Agency

(1) The Federal Agency shall-

(a) administer and implement the provisions of this Act and the rules and regulations made thereunder;
(b) prepare, in coordination with the appropriate Government Agency and in consultation with the concerned sectoral Advisory Committees, national 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 National Environment Report on the state of the environment;
(e) prepare or revise, and establish the National Environment Quality Standards with approval of the Council; Provided that before seeking approval of the Council, the Federal Agency shall publish the proposed National Environmental Quality Standards for public opinion in accordance with the prescribed procedure;
(f) ensure enforcement of the National Environmental Quality Standards;
(g) establish standards for the quality of the ambient air, water and land, by notification in the official Gazette, in consultation with the Provincial Agency concerned; Provided that

(i) different standards for discharge or emission from different sources and for different areas and conditions may be specified;
(ii) where standards are less stringent than the National 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;

(h) co-ordinate environmental policies and programmes nationally and internationally;
(i) 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 in various sectors;
(j) take measures to promote research and the development of science and technology which may contribute to the prevention of pollution, protection of the environment, and sustainable development;
(k) certify one or more laboratories as approved laboratories for conducing tests and analysis and one or more research institutes as environmental research institutes for conducting research and investigation, for the purposes of this Act;
(l) identify the needs for, and initiate legislation in various sectors of the environment;
(m) 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 12;
(n) 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;
(o) provide information and guidance to the public on environmental matters;
(p) recommend environmental courses, topics, literature and books for incorporation in the curricula and syllabi of educational institutions;
(q) promote public education and awareness of environmental issues through mass media and other means, including seminars and workshops;

(r) 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;
(s) encourage the formation and working of non-governmental organizations, community organizations and village organizations to prevent and control pollution and promote sustainable development;
(t) take or cause to be taken all necessary measures for the protection, conservation, rehabilitation and improvement of the environment, prevention and control of pollution and promotion of sustainable development; and
(u) perform any function which the Council may assign to it.

(2) The Federal 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 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 Federal Government 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, cesses 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; and
(f) provide or arrange, in accordance with such procedures as may be prescribed, financial assistance for projects designed to facilitate the discharge of its functions.

7) Powers of the Federal Agency

Subject to the provisions of this Act, the Federal Agency may-

(a) lease, purchase, acquire, own, hold, improve, use or otherwise deal in and with any property both movable and immovable;
(b) sell, convey, mortgage, pledge, exchange or otherwise dispose of its property and assets; (c) 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 made thereunder;
(d) enter into contracts, execute instruments, incur liabilities and do all acts or things necessary for proper management and conduct of its business;
(e) appoint with the approval of the Federal Government and in accordance with such procedures as may be prescribed, such advisers, experts and consultants as it considers necessary for the efficient performance of its functions on such terms and conditions as it may deem fit;

(f) 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;
(g) enter and inspect and under the authority of a search warrant issued by the Environmental Tribunal 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;
(h) take samples of any materials, products, articles or substances or of the effluents, wastes or air pollutants being discharged or emitted or of air, water or land in the vicinity of the discharge or emission;
(i) arrange for test and analysis of the samples at a certified laboratory;
(j) 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
(k) establish a National Environmental Coordination Committee comprising the Director-General as its chairman and the Director-Generals of the Provincial Environmental Protection Agencies and such other persons as the Federal Government may appoint as its members to exercise such powers and perform such functions as may be delegated or assigned to it by the Federal Government for carrying out the purposes of this Act and for ensuring inter–provincial co-ordination in environmental policies;

8) Establishment, Powers and Functions of the Provincial Environmental Protection Agencies

(1) Every Provincial Government shall, by notification in the official Gazette, establish an Environmental Protection Agency, to exercise such powers and perform such functions as may be delegated to it by the Provincial Government under sub-section (2) of section 26.
(2) The Provincial Agency shall be headed by a Director-General who shall be appointed by the

Provincial Government on such terms and conditions as it may determine.

(3) The Provincial Agency shall have such administrative, technical and legal staff as the Provincial Government may specify, to be appointed in accordance with such procedure as may be prescribed.
(4) The powers and functions of the Provincial Agency shall be exercised and performed by the

Director-General.

(5) The Director-General may, by general or special order, delegate any of these powers and functions to staff appointed under sub-section (3).
(6) For assistance of the Provincial Agency in the discharge of its functions, the Provincial Government shall establish sectoral Advisory Committees for various sectors and appoint members from amongst eminent representatives of the relevant sector, educational institutions, research institutes and non-governmental organizations.

9) Establishment of the Provincial Sustainable Development Funds

(1) There shall be established in each Province a Sustainable Development Fund.

(2) The Provincial Sustainable Development Fund shall be derived from the following sources, namely;

(a) grants made or loans advanced by the Federal Government or the Provincial Governments;

(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 Provincial Sustainable Development Fund shall be utilized in accordance with such procedure as may be prescribed for:

(a) providing financial assistance to the projects 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 specified aspect of environment; and

(b) any other purpose which in the opinion of the Board will help achieve environmental objectives and the purpose of this Act.

10) Management of the Provincial Sustainable Development Fund

(1) The Provincial Sustainable Development Fund shall be managed by a Board known as the Provincial Sustainable Development Fund Board consisting of:

i) Chairman, Planning and Development Board/Additional Chief Secretary Planning and Development Department. **Chairperson**

(ii) such officers of the Provincial Governments not exceeding six as the Provincial Government may appoint, including Secretaries in charge of the Finance, Industries and Environment Departments. **Members**

(iii) such non-official persons not exceeding ten as the Provincial Government may appoint including representatives of the Provincial Chamber of Commerce and Industry, non-governmental organizations, and major donors. **Members**

(iv) Director-General of the Provincial Agency. **Member/Secretary**

(2) In accordance with such procedure and such criteria as may be prescribed, the Board shall have the power to:

(a) sanction financial assistance for eligible projects;

(b) invest moneys held in the Provincial Sustainable Development Fund in such profit-bearing Government bonds, savings schemes and securities as it may deem suitable; and

(c) take such measures and exercise such powers as may be necessary for utilization of the Provincial Sustainable Development Fund for the purposes specified in sub-section (3) of section 9.

(3) The Board shall constitute committees of its members to undertake regular monitoring of project financed from the Provincial 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.

11) Prohibition of Certain Discharges or Emissions

(1) Subject to the provisions of this Act and the rules and regulations made thereunder 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 which is in excess of the National Environmental Quality Standards or, where applicable, the standards established under sub-clause (i) of clause (g) of sub-section (1) of section 6.

(2) The Federal Government 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.

(3) 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.

(4) The provisions of sub-section (3) shall not apply to projects which commenced industrial activity on or after the thirtieth day of June, 1994.

12) Initial Environmental Examination and Environmental Impact Assessment

(1) No proponent of a project shall commence construction or operation unless he has filed with the Federal Agency an initial environmental examination or, where the project is likely to cause an adverse environmental effect, an environmental impact assessment, and has obtained from the Federal Agency approval in respect thereof.

(2) The Federal Agency shall;

(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 subject to such conditions as it may deem fit to impose or require that the environmental impact assessment be re-submitted after such modifications as may be stipulated, or 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 Federal 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 it's proponent; or
(ii) international relations, national security or maintenance of law and order, except with the consent of the Federal Government; or

(iii) matters covered by legal professional privilege.

(4) The Federal Agency shall communicate is 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 made thereunder.

(5) Subject to sub-section (4) the Federal 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-section (1), (2), (3), (4) and (5) shall apply to such categories of projects and in such manner as may be prescribed.

(7) The Federal 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 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).

13) Prohibition of Import of Hazardous Waste

No person shall import hazardous waste into Pakistan and its territorial waters, Exclusive

Economic Zone and historic waters.

14) Handling of Hazardous Substances

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 licence issued by the Federal Agency 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.

15) Regulation of Motor Vehicles

(1) Subject to the provisions of this Act and the rules and regulations made thereunder, 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 National Environmental Quality Standards, or where applicable the standards established under clause (g) of sub-section (1) of section 6.
(2) For ensuring compliance with the standards mentioned in sub-section (1), the Federal 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 Federal Agency under sub-section (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.

16) Environmental Protection Order

(1) Where the Federal Agency or a Provincial 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 licence, and is likely to cause, or is causing or has caused an adverse environmental effect, the Federal Agency or, as the case may be, the Provincial 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 Federal Agency or Provincial 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 to 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 or 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 Federal Agency or Provincial Agency.

(3) Where the person, to whom directions under sub-section (1) are given, does not comply therewith, the Federal Agency or Provincial Agency may, in addition to the proceeding initiated against him under this Act or the rules and regulations, itself take or cause to be taken such measures specified in the order as it may deems necessary, and may recover the costs of taking such measures from such person as arrears of land revenue.

17) Penalties

(1) Whoever contravenes or fails to comply with the provisions of section 11, 12, 13, or section

16 or any order issued thereunder 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 and where such contravention or failure continues: Provided that if contravention of the provisions of section 11 also constitutes contravention of the provisions of section 15, such contravention shall be punishable under sub-section (2) only.
(2) Whoever contravenes or fails to comply with the provisions of section 14 or 15 or any rule or regulation or conditions of any licence, any order or direction issued by the Council or by the Federal Agency or Provincial 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-section (1) and (2), the Environmental Tribunal and Environmental Magistrate 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 Tribunal is satisfied that as a result of the commission of the offence monetary

benefits have accrued to the offender, the Environmental Tribunal 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-section (1) or sub-section (2), and had been previously convicted for any contravention under this act, the Environmental Tribunal 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 upto 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 11, 13, 14 or 16 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 Federal Agency or, as the case may be, Provincial 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 Federal Agency or of a Provincial 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 Tribunal or Environmental Magistrate in accordance with such procedure as may be prescribed.

(7) Where the Director-General of the Federal Agency or of a Provincial Agency is of the opinion that a person has contravened any provision of this Act, he may, subject to the rules, by notice in writing to that person require him to pay to the Federal Agency or, as the case may be, Provincial 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 or who has paid an administrative penalty for a contravention of any provision of the is Act.

18) Offences by Bodies Corporate

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 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 purpose 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).

19) Offences by Government Agencies, Local Authorities or Local Councils

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 alongwith the Government Agency, local authority or local council and shall be liable to be proceeded against and punished accordingly.

20) Environmental Tribunals

(1) The Federal Government may, by notification in the official Gazette, establish as many Environmental Tribunals as it considers necessary and, where it establishes more than one Environmental Tribunal, it shall specify territorial limits within which, or the class of cases in respect of which, each one of them shall exercise jurisdiction under this Act.
(2) An Environmental 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 Federal Government of which at least one shall be a technical member with suitable professional qualifications and experience in the environmental field as may be prescribed.
(3) For every sitting of the Environmental Tribunal, the presence of the Chairperson and not less than one Member shall be necessary.
(4) A decision of an Environmental Tribunal shall be expressed in terms of the opinion of the majority of its members, including the Chairperson, or if the case has been decided by the Chairperson and only one of the members and there is a difference of opinion between them, the decision of the Environmental Tribunal shall be expressed in terms of the opinion of the chairperson.
(5) An Environmental 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 rehearany witness who has given evidence, and may act on the evidence already recorded by, or produced, before it.
(6) An Environmental Tribunal may hold its sittings at such places within its territorial jurisdiction as the Chairperson may decide.
(7) No act or proceeding of an Environmental Tribunal shall be invalid by reason only of the existence of a vacancy in, or defect in the constitution of, the Environmental Tribunal.
(8) The terms and conditions of service of the Chairperson and members of the Environmental

Tribunal shall be such as may be prescribed.

21) Jurisdiction and Powers of Environmental Tribunals

(1) An Environmental 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 thereunder.
(2) All contravention punishable under sub-section (1) of section 17 shall exclusively be triable by an Environmental Tribunal.

(3) An Environmental Tribunal shall not take cognizance of any offence triable under sub-section (2) except on a complaint in writing by:

(a) the Federal Agency or any Government Agency or local council; and

(b) any aggrieved person, who has given notice of not less than thirty days to the Federal Agency or the Provincial Agency concerned of the alleged contravention and of his intention to make a complaint to the Environmental Tribunal.

(4) In exercise of its criminal jurisdiction, the Environmental Tribunal shall have the same powers as are vested in the 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 Environmental 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

Environmental Tribunal shall follow the procedure laid down in the Code of Civil Procedure,

1908 (Act V of 1908).

(7) An Environmental Tribunal may, on application filed by any officer duly authorized in this behalf by the Director-General of the Federal Agency or Provincial Agency, issue bailable warrant for the arrest of any person against whom reasonable suspicion exists of his having been involved in contravention punishable under sub-section (1) of section 17:

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 Environmental Tribunal shall be deemed to be judicial proceedings within the meaning of sections 193 and 228 of the Pakistan Penal Code (Act XLV of 1860), and the Environmental Tribunal shall be deemed to be a court for the purposes of sections 480 and 482 of the Code of Criminal Procedure, 1898 (Act V of 1898).

(9) No court other than an Environmental Tribunal shall have or exercise any jurisdiction with respect to any matter to which the jurisdiction of an Environmental Tribunal extends under this Act or the rules and regulations made thereunder.

(10) Where the Environmental 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 one hundred thousand rupees.

22) Appeals to the Environmental Tribunal

(1) Any person aggrieved by any order or direction of the Federal Agency or any Provincial Agency under any provision of this Act and rules or regulations made thereunder may prefer an appeal with the Environmental Tribunal within thirty days of the date of communication of the impugned order or direction to such person.

(2) An appeal to the Environmental Tribunal shall be in such form, contain such particulars and be accompanied by such fees as may be prescribed.

23) Appeals from Orders of the Environmental Tribunal

(1) Any person aggrieved by any final order or by any sentence of the Environmental 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 (1) shall be heard by a Bench of not less than two Judges.

24) Jurisdiction of Environmental Magistrates

(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 contraventions punishable under sub-section (2) of section 17 shall exclusively be triable by a judicial Magistrate of the first class as Environmental Magistrate especially empowered in this behalf by the High Court.
(2) An environmental Magistrate shall be competent to impose any punishment specified in sub- section (2) and (4) of section 17.
(3) An Environmental Magistrate shall not take cognizance of an offence triable under sub-section (1) except on a complaint in writing by:

(a) the Federal Agency, Provincial Agency, or Government Agency or local council; and

(b) any aggrieved person.

25) Appeals from Orders of Environmental Magistrates

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.

26) Power to Delegate

(1) The Federal Government may, by notification in the official Gazette, delegate any of its or of the Federal Agency's powers and functions under this Act and the rules and regulations made thereunder to any Provincial Government, any Government Agency, local council or local authority.
(2) The Provincial Government may, by notification in the official Gazette, delegate any of its or of the Provincial Agency's powers or functions under this Act and the rules and regulations made thereunder to any Government Agency of such Provincial Government or any local council or local authority in the Province.

27) Power to give Directions

In the performance of their function under this Act:

(a) the Federal Agency and Provincial Agencies shall be bound by the directions give to them in writing by the Federal Government; and
(b) a Provincial Agency shall be bound by the directions give to it in writing by the Provincial Government.

28) Indemnity

No suit, prosecution or other legal proceedings shall lie against the Federal or Provincial Governments, the Councils, the Federal Agency or Provincial Agencies, the Director-Generals

of the Federal Agency and the Provincial Agency, members, officers, employees, experts, advisors, committees or consultants of the Federal or Provincial Agencies 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.

29) Dues Recoverable as Arrears of Land Revenues

Any dues recoverable by the Federal Agency or Provincial Agency under this Act, or the rules or regulations made thereunder shall be recoverable as arrears of land revenue.

30) Act to Override Other Laws

The provisions of the Act shall have effect notwithstanding anything inconsistent therewith contained in any other law for the time being in force.

31) Power to Make Rules

The Federal Government 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.

32) Power to Amend the Schedule

The Federal Government may, by notification in the official Gazette, amend the Schedule so as to add any entry thereto or modify or omit any entry therein.

33) Power to Make Regulations

(1) For carrying out the purposes of this Act, the Federal Agency may, by notification in the official Gazette and with the approval of the Federal Government, 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, advisors, experts, consultants and employees;

(d) levy of fees, rates and charged 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 12 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.

34) Repeal, Savings and Succession

(1) The Pakistan Environmental Protection Ordinance, 1983 (XXXVII of 1983) is hereby repealed.
(2) Notwithstanding the repeal of the Pakistan Environmental Protection Ordinance, 1983 (XXVII of 1983), any rules or regulations or appointments made, order 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 that Ordinance 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.
(2) On the establishment of the Federal Agency and Provincial Agencies under this Act, all properties, assets and liabilities pertaining to the Federal Agency and Provincial Agencies established under that Ordinance shall vest in and be the properties,
assets and liabilities, as the case may be, of the Federal Agency and Provincial Agency established under this Act.

SCHEDULE
(See Section 31)

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. Convention Concerning the Protection of World Cultural and Natural Heritage (World

Heritage Convention), Paris, 1972.

6. Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), Washington, 1973.
7. Convention on the Conservation of Migratory Species of Wild Animals, Bonn, 1979.

8. Convention on the Law of the Sea, Montego Bay, 1982.

9. Vienna Convention for the Protection of the Ozone Layer, Vienna, 1985.

10. Montreal Protocol on Substances that Deplete the Ozone Layer, Montreal, 1987 and amendments thereto.
11. Agreement on the Network of Aquaculture Centres in Asia and the Pacific, Bangkok, 1988.

12. Convention on the Control of Transboundary Movements of Hazardous Waste and Their Disposal, Basel, 1989.

13. Convention on Biological Diversity, Rio De Janiero, 1992.

14. United Nations Framework Convention on Climate Change, Rio De Janiero, 1992

National Environmental Quality Standards (NEQS)

National Ambient Air Quality Standards

Pollutants	Time-weighted average	Concentration in Ambient Air		Method of Measurement
		Effective from 1st January 2009	Effective from 1st January 2012	
Sulphur Dioxide (SO^2)	Annual Average*	80µg/m^3	80µg/m^3	-Ultraviolet Fluorescence method
	24 hours**	120µg/m^3	120µg/m^3	
Oxides of Nitrogen as (NO)	Annual Average*	40µg/m^3	40µg/m^3	-Gas Phase Chemiluminescence
	24 hours**	40µg/m^3	40µg/m^3	
Oxides of Nitrogen as (NO^2)	Annual Average*	40µg/m^3	40µg/m^3	-Gas Phase Chemiluminescence
	24 hours**	80µg/m^3	80µg/m^3	
O^3	1 hour	180µg/m^3	130µg/m^3	-Non dispersive UV Absorption method
Suspended Particulate Matter (SPM)	Annual Average*	400µg/m^3	360µg/m^3	-High Volume Sampling, (Average flow rate not less than1.1m3/minute).
	24 hours**	550µg/m^3	500µg/m^3	
Respirable Particulate Matter.PM_{10}	Annual Average*	200µg/m^3	120µg/m^3	-β Ray absorption method
	24 hours**	250µg/m^3	150µg/m^3	
Respirable Particulate Matter.$PM_{2.5}$	Annual Average*	25µg/m^3	15µg/m^3	β Ray absorption method
	24 hours**	40µg/m^3	35µg/m^3	
	1 hour	25µg/m^3	15µg/m^3	
Lead(Pb)	Annual Average*	1.5µg/m^3	1 µg/m^3	-ASS Method after sampling using EPM 2000 or equivalent Filter paper
	24 hours**	2 µg/m^3	1.5µg/m^3	
Carbon Monoxide(CO)	8 hours**	5 mg/m^3	5mg/m^3	-Non Dispersive Infra Red (NDIR) method
	1 hour	10mg/m^3	10mg/m^3	
Annual arithmetic means of minimum104 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.				

NATIONAL ENVIRONMENTAL QUALITY STANDARDS FOR INDUSTRIAL GASEOUS EMISSION (mg/Nm3, UNLESS OTHERWISE DEFINED)

S. No.	Parameter	Source of Emission	Existing Standards	Revised Standards
1	Smoke	Smoke opacity not to exceed	40%or2 Ring-lemann Scale	40%or2 Ring-lemann Scale or equivalent smoke number
2	Particulate matter (1)	(a) Boilers and furnaces:		
		(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, Converters, 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	400	5000
		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

S. No.	Parameter	Source of Emission	Existing Standards	Revised Standards
16	Oxides of Nitrogen (^{3})	Nitric acid manufacturing unit	400	3000
		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 microns or more.
2. Based on 1 percent sulphur content in fuel oil. Higher content of sulphur will cause 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 100ug/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_2 should not be exceed the following:-

Annual Arithmetic Mean 100ug/m^3 (0.05ppm)

Emission levels for stationary source discharges, before mixing with the atmosphere, should be maintained as follows:-

For fuel fired steam generators, as Nanogram (10-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 in to the environment.

[FileNo.14(3)/98-TO-PEPC]

NATIONAL ENVIRONMENTAL QUALITY STANDARDS FOR MUNICIPAL AND LIQUID INDUSTRIAL EFFLUENTS (mg/L, UNLESS OTHERWISE DEFINED)

S. No.	Parameter Standards	Value
1.	Temperature	$40^{o}C$
2.	pH value (acidity/basicity)	6-10pH
3.	5-days Biochemical Oxygen Demand (BOD) at $20^{o}C$	80mg/L
4.	Chemical Oxygen Demand (COD)	150 mg/L
5.	Total Suspended Solids	150 mg/L
6.	Total Dissolved Solids	3500 mg/L
7.	Oil and Grease	10 mg/L
8.	Phenolic compounds (as phenol)	0.1 mg/L
9.	Chloride(asCl^{-})	1000mg/L
10.	Fluoride (as F^{-})	20mg/L
11.	Cyanide (asCN^{-})	2mg/L
12.	An-ionic detergents (2) (as MBAS) (5)	20mg/L
13.	Sulphate($SO4^{2-}$)	600mg/L
14.	Sulphide (S^{2-})	1.0mg/L
15.	Ammonia (NH_3)	40mg/L
16.	Pesticides, herbicides, fungicides and	0.15mg/L
17.	insecticides Cadmium (4)	0.1mg/L
18.	Chromium (4) (trivalent and hexavalent)	1.0 mg/L
19.	Copper (4)	1.0mg/L
20.	Lead (4)	0.5mg/L
21.	Mercury (4)	0.01mg/L
22.	Selenium (4)	0.5mg/L
23.	Nickel (4)	1.0mg/L
24.	Silver (4)	1.0mg/L
25.	Total toxic metals	2.0 mg/L
26.	Zinc	5.0mg/L
27.	Arsenic	1.0mg/L
28.	Barium	1.5mg/L
29.	Iron	2.0mg/L
30.	Manganese	1.5mg/L
31.	Boron	6.0mg/L
32.	Chlorine	1.0mg/L

Explanations:

1. Assuming minimum dilution 1: 10 on discharge. Lower ratios would attract progressively stringent standards to be determined by the Federal Environmental Protection Agency.
2. Assuming surfactant as biodegradable.
3. MBAS means Methylene Blue Active Substances.
4. Subject to total toxic metals discharge as at S. No. 25.

NATIONAL ENVIRONMENTAL QUALITY STANDARDS FOR MOTOR VEHICLE EXHAUST AND NOISE

#	Parameter	Standards (maximum permissible limit)	Measuring method
1	Smoke	40% or 2 on the Ringelmann Scale during engine acceleration mode.	To be compared with Ringlemann Chart at a distance of 6 meters or more.
2	Carbon Monoxide	Emission Standards: New Used Vehicles 4.5% 6%	Under idling conditions: Non-depressive infrared detection through gas analyzer
3	Noise	85 db (A)	Sound-meter at 7.5 meters from the source

[F. No. 2(21)/93-E-II

Drinking Water Standards

Parameters	WHO Standards	GOP Standards
pH @ 25 °C	6.8-8.5	6.8-8.5
Color	Non objectionable/Acceptable	Non objectionable/Acceptable
Odor	Non objectionable/Acceptable	Non objectionable/Acceptable
Aluminium (Al)	≤0.2mg/L	0.2mg/L
Antimony (Sb)	≤0.005mg/L	0.02mg/L
Barium (Ba)	0.7mg/L	0.7mg/L
Cadmium (Cd)	0.01	0.003
Chloride (Cl)	<250	250
TDS	<500mg/L	<500mg/L
Turbidity	<5NTU	<5NTU
Chromium (Cr)	<0.05mg/L	≤0.05mg/L
Copper (Cu)	<2mg/L	2mg/L
Arsenic (As)	<0.01mg/L	≤0.05mg/L
Total Coliform	0.0cfu/100 ml	0.0cfu/100 ml
E-Coli	0.0cfu/100 ml	0.0cfu/100 ml

Annexure 3: Pakistan EPA 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) Meterology (including rainfall) Ambient air quality Ambient water quality Ground water quality	<u>Available</u> Yes/No Yes/No Yes/No Yes/No	<u>Measured</u> Yes/No Yes/No Yes/No Yes/No
9.	Have estimates of the following been reported?	Water balance Solid waste disposal Liquid waste treatment	<u>Estimated</u> Yes/No Yes/No Yes/No	<u>Reported</u> Yes/No Yes/No Yes/No
10.	Source of power		Power requirement	
11.	Labour force (number)	Construction: Operation:		

<u>Verification.</u> 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 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	