

# Environmental Impact Assessment

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February 2018

## PAK: Balochistan Water Resources Development Sector Project

Project No. 48098-002

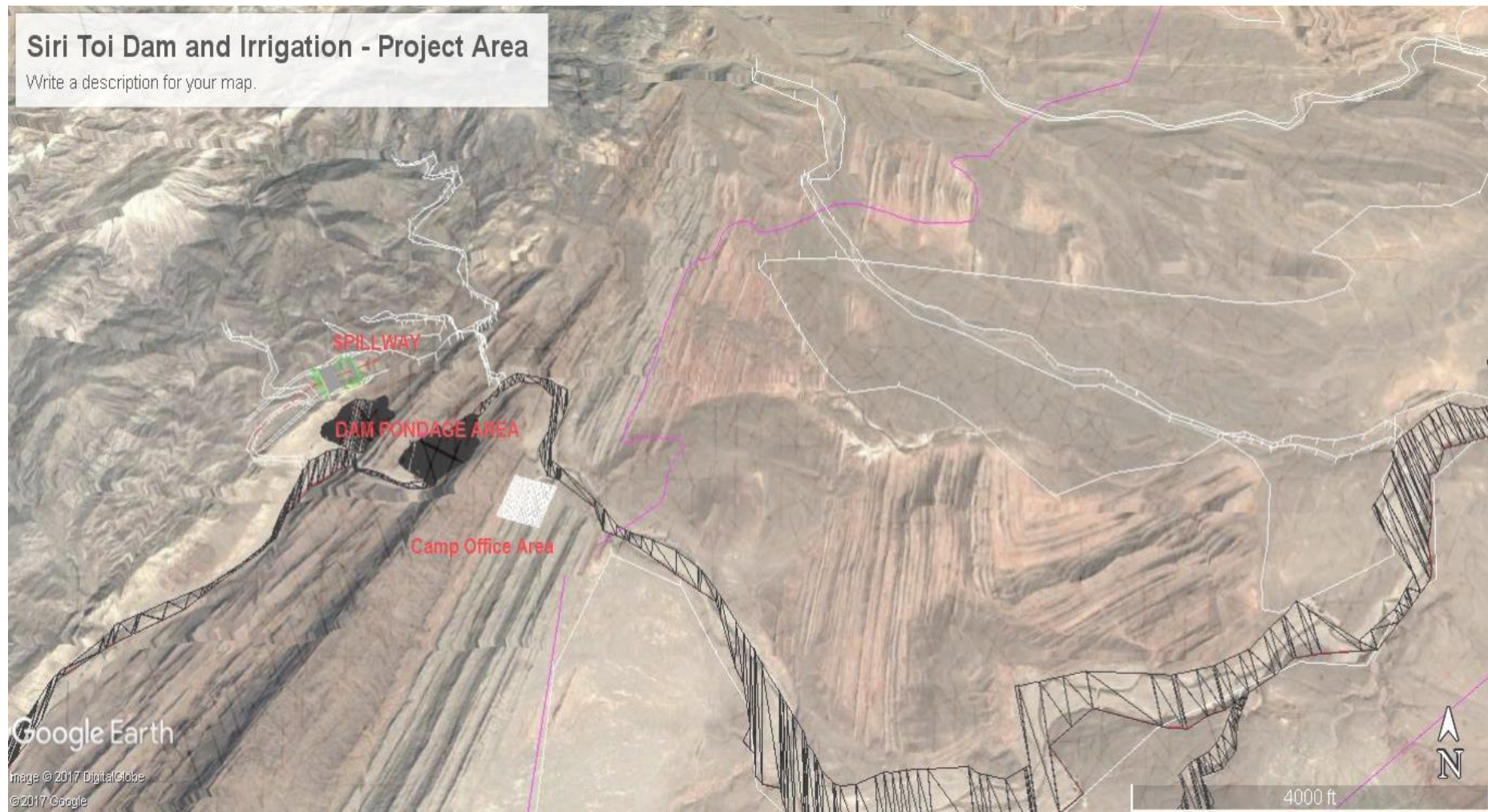
Part 5 of 5

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

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## Annexure 10: Camp Site Map



## Annexure 11: A History of Recorded Earthquakes in Balochistan

Year	Place	Intensity at R/Scale
1909	Kech	7.2
1987	Quetta, Chaman	5.6
1935	Quetta, Mach	7.0
1990	Quetta, Kalat, Khuzdar, Mastung, Kalat, Nushki, Surab	5.8-6.1
1935	Quetta, Mastung, Kalat	7.5
1992	Khuzdar, Nal, Quetta	5.7
1941	Quetta	5
1993	Quetta/Pishin, Makran/Gwadar	5.7
1945	Pasni/Makran	8.6
1995	Quetta	5.2
1952	Loralai	5.8
1996	Quetta	5.3
1954	Khuzdar, Nal, Wadh	5.7
1997	Quetta, Mastung, Mach, Sibi, Harnai	5-6.2
1955	Quetta	6
1998	Quetta, Dalbandin	5.3
1956	Kalat, Barkan	6
1999	Barkan	5.2
1957	Khuzdar	5.5
2000	Quetta, Sibi, Ziarat, Harnai and Duki	6
1975	Quetta	5.4
2002	Balochistan Boarder	6
1978	Quetta, Nushki	5.3
2003	Naukundi, Musa Khail	5.3
1983	Khuzdar	6.5
2004	Sibi	5.5
1986	Khuzdar	5.4

Source: Data extracted from Meteorological Department – Quetta Station

## Annexure 12: Explanation of MSK Intensity

### Medvedev–Sponheuer–Karnik scale

The **Medvedev–Sponheuer–Karnik scale**, also known as the **MSK** or *MSK-64*, is a macro seismic intensity scale used to evaluate the severity of ground shaking on the basis of observed effects in an area of the [earthquake](#) occurrence.

The scale was first proposed by [Sergei Medvedev](#) ([USSR](#)), [Wilhelm Sponheuer](#) ([East Germany](#)), and [Vít Kárník](#) ([Czechoslovakia](#)) in 1964. It was based on the experiences being available in the early 1960s from the application of the [Modified Mercalli intensity scale](#) and the 1953 version of the [Medvedev scale](#), known also as the [GEOFIAN scale](#).<sup>[1]</sup>

With minor modifications in the mid-1970s and early 1980s, the MSK scale became widely used in [Europe](#) and the [USSR](#). In early 1990s, the [European Seismological Commission \(ESC\)](#) used many of the principles formulated in the MSK in the development of the [European Macroseismic Scale](#), which is now a *de facto* standard for evaluation of seismic intensity in European countries. MSK-64 is still being used in [India](#), [Israel](#), [Russia](#), and throughout the [Commonwealth of Independent States](#).

The Medvedev–Sponheuer–Karnik scale is somewhat similar to the [Modified Mercalli \(MM\) scale](#) used in the [United States](#). The MSK scale has 12 intensity degrees expressed in [Roman numerals](#) (to prevent the use of decimals):

<b>I. Not perceptible</b>	Not felt, registered only by <a href="#">seismographs</a> . No effect on objects. No damage to buildings.
<b>II. Hardly perceptible</b>	Felt only by individuals at rest. No effect on objects. No damage to buildings.
<b>III. Weak</b>	Felt indoors by a few. Hanging objects swing slightly. No damage to buildings.
<b>IV. Largely observed</b>	Felt indoors by many and felt outdoors only by very few. A few people are awakened. Moderate vibration. Observers feel a slight trembling or swaying of the building, room, bed, chair etc. China, glasses, windows and doors rattle. Hanging objects swing. Light furniture shakes visibly in a few cases. No damage to buildings.
<b>V. Fairly strong</b>	Felt indoors by most, outdoors by few. A few people are frightened and run outdoors. Many sleeping people awake. Observers feel a strong shaking or rocking of the whole building, room or furniture. Hanging objects swing considerably. China and glasses clatter together. Doors and windows swing open or shut. In a few cases window panes break. Liquids oscillate and may spill from fully filled containers. Animals indoors may become uneasy. Slight damage to a few poorly constructed buildings.


<b>VI. Strong</b>	Felt by most indoors and by many outdoors. A few persons lose their balance. Many people are frightened and run outdoors. Small objects may fall and furniture may be shifted. Dishes and glassware may break. Farm animals may be frightened. Visible damage to masonry structures, cracks in plaster. Isolated cracks on the ground.
<b>VII. Very strong</b>	Most people are frightened and try to run outdoors. Furniture is shifted and may be overturned. Objects fall from shelves. Water splashes from containers. Serious damage to older buildings, masonry chimneys collapse. Small landslides.
<b>VIII. Damaging</b>	Many people find it difficult to stand, even outdoors. Furniture may be overturned. Waves may be seen on very soft ground. Older structures partially collapse or sustain considerable damage. Large cracks and fissures opening up, rockfalls.
<b>IX. Destructive</b>	General panic. People may be forcibly thrown to the ground. Waves are seen on soft ground. Substandard structures collapse. Substantial damage to well-constructed structures. Underground pipelines ruptured. Ground fracturing, widespread landslides.
<b>X. Devastating</b>	Masonry buildings destroyed, infrastructure crippled. Massive landslides. Water bodies may be overtopped, causing flooding of the surrounding areas and formation of new water bodies.
<b>XI. Catastrophic</b>	Most buildings and structures collapse. Widespread ground disturbances, tsunamis.
<b>XII. Very catastrophic</b>	All surface and underground structures completely destroyed. Landscape generally changed, rivers change paths, tsunamis.


## References:

[https://en.wikipedia.org/wiki/Medvedev%E2%80%93Sponheuer%E2%80%93Karnik\\_scale](https://en.wikipedia.org/wiki/Medvedev%E2%80%93Sponheuer%E2%80%93Karnik_scale)



## Annexure 13: Lab Results


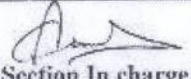
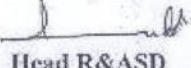


ISO 9001:2000 CERTIFIED  


## PERAC RESEARCH & DEVELOPMENT FOUNDATION

TEST REPORT				Page 08 of 12
Customer's Name	M/s NEC Consultant (Pvt) Ltd	Test Report No	2421G/2016-2017	
Customer's Ref	E-mail	Reporting Date	08-06-2017	
Date	05-05-2017	Sample Code	7007	
Sample Description	Surface Water (Zhob River Wall Site # 1)	Sampling Date	16-05-2017	

TEST METHOD	METHOD TITLE	TEST RESULTS
HACH-8237	Turbidity, NTU	Nil
APHA-209C	Total Suspended Solids, mg/L	Nil
APHA-209B	Total Dissolved Solids (TDS), mg/L	2041
D-1293	pH @ 25 °C	8.15
	<b>Chemical</b>	
By AA	Aluminum (Al), mg/L	Nil
By AA	Antimony (Sb), mg/L	Nil
By AA	Arsenic (As), mg/L	Nil
By AA	Barium (Ba), mg/L	Nil
By AA	Boron (B), mg/L	Nil
By AA	Cadmium (Cd), mg/L	Nil
By AA	Chromium (Cr), mg/L	Nil
By AA	Copper (Cu), mg/L	Nil
By AA	Lead (Pb), mg/L	Nil
By AA	Manganese (Mn), mg/L	Nil
By AA	Nickel (Ni), mg/L	Nil
APHA-320	Mercury (Hg), mg/L	Nil
By AA	Selenium (Se), mg/L	Nil
By AA	Zinc (Zn), mg/L	Nil

 <b>Prepared by</b>	 <b>Section In charge (E)</b>	 <b>Head R&amp;ASD</b>
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The analyses based on Sample(s) provided to us by the Client. The interpretation of opinions expressed represent the best judgment (R & G.E.). We have no responsibility and warranty or representation in connection with which such report is used.

Rev. No. 0	Dated: 21-01-2000	E-10-05
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 Website : www.prdlab.com E-mail: info@prdlab.com, prd@cyber.net.pk



## PERAC RESEARCH &amp; DEVELOPMENT FOUNDATION



TEST REPORT		Page 09 of 12	
Customer's Name	M/s NEC Consultant (Pvt) Ltd	Test Report No	2421H/2016-2017
Customer's Ref	E-mail	Reporting Date	08-06-2017
Date	05-05-2017	Sample Code	7008
Sample Description	Surface Water (Zhob River Storage Area)	Sampling Date	16-05-2017

TEST METHOD	METHOD TITLE	TEST RESULTS
HACH-8237	Turbidity, NTU	Nil
APHA-209C	Total Suspended Solids, mg/L	Nil
APHA-209B	Total Dissolved Solids (TDS), mg/L	1917
D-1293	pH @ 25 °C	8.15
	<b>Chemical</b>	
By AA	Aluminum (Al), mg/L	Nil
By AA	Antimony (Sb), mg/L	Nil
By AA	Arsenic (As), mg/L	Nil
By AA	Barium (Ba), mg/L	Nil
By AA	Boron (B), mg/L	Nil
By AA	Cadmium (Cd), mg/L	Nil
By AA	Chromium (Cr), mg/L	Nil
By AA	Copper (Cu), mg/L	Nil
By AA	Lead (Pb), mg/L	Nil
By AA	Manganese (Mn), mg/L	Nil
By AA	Nickel (Ni), mg/L	Nil
APHA-320	Mercury (Hg), mg/L	Nil
By AA	Selenium (Se), mg/L	Nil
By AA	Zinc (Zn), mg/L	Nil

Prepared by	Section In charge (E)	Head R&ASD

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TEST REPORT		Page 10 of 12	
Customer's Name	M/s NEC Consultant (Pvt) Ltd	Test Report No	24211/2016-2017
Customer's Ref	E-mail	Reporting Date	08-06-2017
Date	05-05-2017	Sample Code	7009
Sample Description	Surface Water (Zhob River) Wall Side # 2	Sampling Date	16-05-2017

TEST METHOD	METHOD TITLE	TEST RESULTS
HACH-8237	Turbidity, NTU	Nil
APHA-209C	Total Suspended Solids, mg/L	Nil
APHA-209B	Total Dissolved Solids (TDS), mg/L	1807
D-1293	pH @ 25 °C	8.30
	<b>Chemical</b>	
By AA	Aluminum (Al), mg/L	Nil
By AA	Antimony (Sb), mg/L	Nil
By AA	Arsenic (As), mg/L	Nil
By AA	Barium (Ba), mg/L	Nil
By AA	Boron (B), mg/L	Nil
By AA	Cadmium (Cd), mg/L	Nil
By AA	Chromium (Cr), mg/L	Nil
By AA	Copper (Cu), mg/L	Nil
By AA	Lead (Pb), mg/L	Nil
By AA	Manganese (Mn), mg/L	Nil
By AA	Nickel (Ni), mg/L	Nil
APHA-320	Mercury (Hg), mg/L	Nil
By AA	Selenium (Se), mg/L	Nil
By AA	Zinc (Zn), mg/L	Nil

Prepared by	Section In charge (E)	Head R&ASD

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## TEST REPORT

Page 11 of 12

Customer's Name	M/s NEC Consultant (Pvt) Ltd	Test Report No	2421J/2016-2017
Customer's Ref	E-mail	Reporting Date	08-06-2017
Date	05-05-2017	Sample Code	7010-7019
Sample Description	Noise Analysis	Sampling Date	16-05-2017

## TEST RESULTS

Code #	LOCATION	Noise dB (A) By Analyzer
7010	Chutta	38
7011	Wandari	41
7012	Khadri	35
7013	Jhalaro	36.2
7014	Acharwand	37
7015	Sinjori	36
7016	Hatachi Khizran Infiltration Gallery	32
7017	Zhob River Wall Side 1	30.1
7018	Zhob River Storage Area	<28
7019	Zhob River Wall Side 2	<28
NEQS Limits		85

Prepared by	Section In charge (E)	Head R&ASD

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## TEST REPORT

Page 12 of 12

Customer's Name	M/s NEC Consultant (Pvt) Ltd	Test Report No	2421K/2016-2017
Customer's Ref	E-mail	Reporting Date	08-06-2017
Date	05-05-2017	Sample Code	7020-7029
Sample Description	SPM, $\mu\text{g}/\text{Nm}^3$ Analysis	Sampling Date	16-05-2017

Code #	LOCATION	TEST RESULTS
7020	Chutta	12
7021	Wandari	14
7022	Khadri	15
7023	Jhalaro	11
7024	Acharwand	Nil
7025	Sinjori	4
7026	Hatachi Khizran Infiltration Gallery	Nil
7027	Zhob River Wall Side 1	8 ✓
7028	Zhob River Storage Area	Nil ✓
7029	Zhob River Wall Side 2	12 ✓

Prepared by	Section In charge (E)	Head R&ASD

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 Website : www.prdlab.com E-mail: info@prdlab.com, prd@cyber.net.pk



## Annexure 14: Photographs of few Floral

### Trees



*Pinus gerardiana*



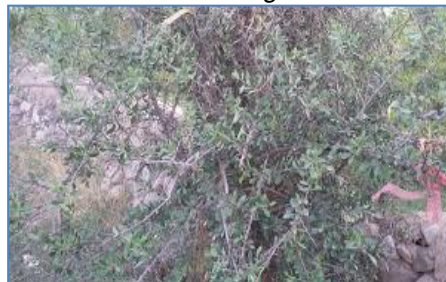
*Olea ferrugenea*



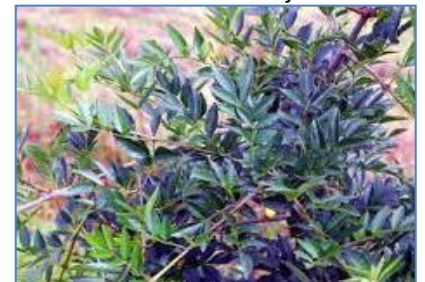
*Pistacia khinjik*



*Pistachia cabulica*



*Reptonia buxifolia*



*Fraxinus xanthoxyloides*

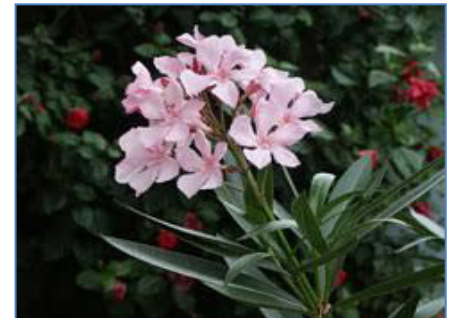
### Shrubs



*Periploca aphylla*



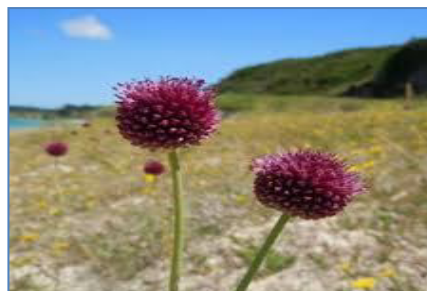
*Datura fastuosa*



*Narium odorum*



*Achillea santolina*



*Allium sphaerocephalum*



*Artemisia merittima*





*Daphne oleoides*



*Eremurus aucheriana*



*Malcolmia africana*



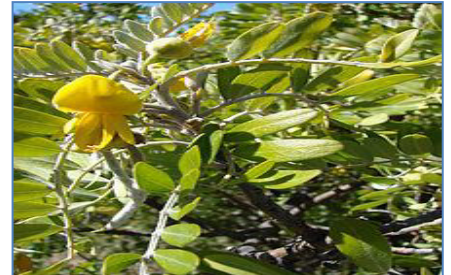
*Othonnopsis intermedia*



*Plantago ovata*



*Reptonia buxifolia*

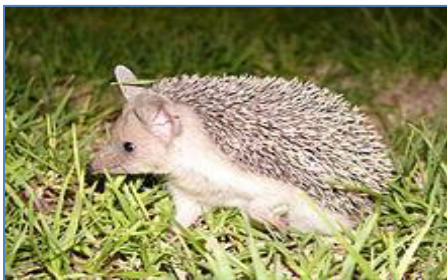


*Rhazya stricta*

*Scorzonera mollis*

*Sophora griffithii*

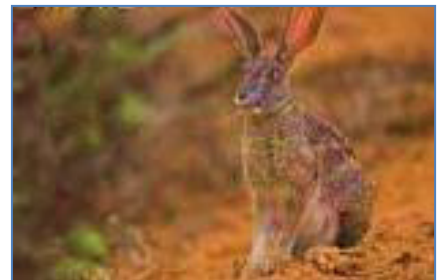
### Photographs of few faunal representatives



*Hemiechinus auritus megalotis*



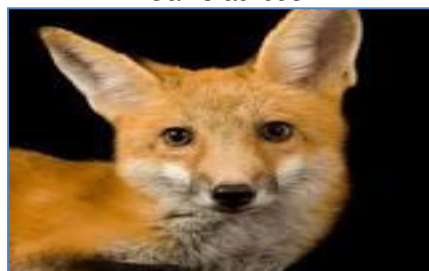
*Canis aureus*



*Lepus capensis*



*Capra falconeri*



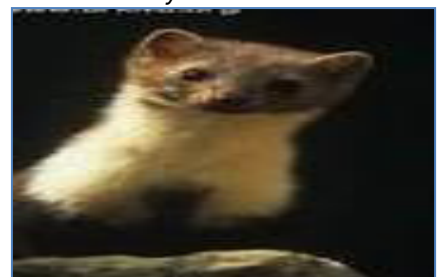
*Vulpes cana*



*Hystrix indica*



*Ovis vignei*



*Martes foina*



## Birds



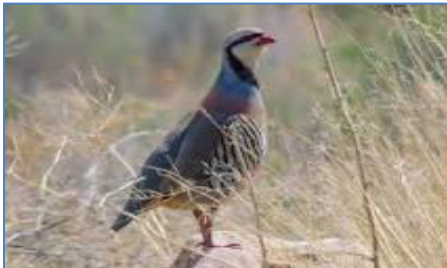
*Passeridae*



*Emberiza citrinella*



*Fringillidae*



*Alectoris chukar*



*Ammoperdix griseogularis*



*Pteroclididae*



## Migratory Birds



## Reptiles



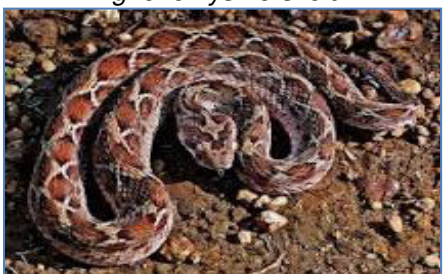
*Agrionemys horsfieldii*



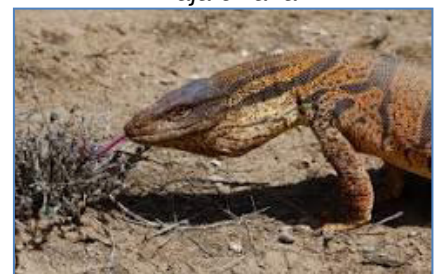
*Macrovipera lebetina*



*Naja oxiana*



*Echis carinatus*



*Varanus griseu*

## **Annexure 15: Blasting Management Plan**

### **1.0 GENERAL**

This document presents Blasting Management Plan (BMP) for construction of Sri Toi Dam. It outlines safety and operational procedures that must be followed in blasting events to ensure safe practices to accomplish the task.

#### **1.1 Rationale for the Blasting Management Plan**

The Blasting management plan is prepared in accordance with the following criteria:

##### **1.1.1 Air Blast Overpressure Criteria**

The air blast overpressure level from blasting operations carried out in or on the premises must not exceed at any residence or other noise sensitive receiver:

- (a) 115 dB (Linear Peak) for more than 5% of the total number of blasts during each reporting period; and
- (b) 120 dB (Linear Peak) at any time.

##### **1.1.2 Ground Vibration Criteria**

The ground vibration peak particle velocity from blasting operations carried out in or on the premises must not exceed at any residence or other noise sensitive receiver:

- (a) 2 mm/s for more than 5% of the total number of blasts carried out in or on the premises during each reporting period; and
- (b) Exceed 10 mm/s at any time.

#### **1.2 Blasting/Vibration Management Plans**

The blasting plan for project is given below that caters the following major considerations:

- (i) Control of blasting area
- (ii) Time schedule
- (iii) Training
- (iv) Announcement/Communication
- (v) Hazardous material handling and storage
- (vi) Waste disposal
- (vii) Post blast re-entry
- (viii) Health and safety

##### **1.2.1 Control of blasting area**

Three zones of responsibility are established around every blast to mitigate risks and control hazard. The blasting area shall be restricted into three different zones are as follows:

- (i) Blast zone
- (ii) Exclusion zone
- (iii) Community zone



The blast zone is a 300m zone around the blast area that is controlled by the short firer. The exclusion zone is a 700m radius zone around the blast area that is controlled by the construction team. Prior to blasting it will ensure the exclusion zone has been cleared of people. A community zone has been established and represents all sensitive receivers as well as community interface outside of the exclusion zone.

Zones around the blasting area are defined in general and will be updated upon confirmation of the point of blasting, if any.

### **1.2.2 Time Schedule**

The time schedule is devised taking into consideration the general population density of the area, the frequency of routine of the community round the blasting area. The most appropriate time for blasting is suggested is in afternoon between 12:00 pm to 3:00 pm.

### **1.2.3 Training**

The personnel involved in blasting and related activities shall be trained to minimize and manage the possible hazards. The training shall include the following:

- (i) Safe blasting procedures
- (ii) Material handling
- (iii) Personnel protection
- (iv) Community and ecosystem protection
- (v) Communication with in the team and community

### **1.2.4 Announcement/communication**

The size of the community zone has the potential increase with intensity of each blast and current weather conditions. The planned schedule of the blasting shall be announced to the community through media and announcements in mosques and madrassas/schools. Signage around the are shall be updated, and information shall be posted at least 24 hrs. prior to a blast, and notify emergency services in the locality. Prior to blasting firing shall be done to clear the area of any possible faunal species.

### **1.2.5 Hazardous material handling and storage**

Safe handling of hazardous material shall be taken into consideration. The storage of hazardous material shall be on cemented floor with proper drainage and the access of unconcerned/untrained people shall be restricted. The blasting contractor shall provide and maintain, onsite, all required and necessary MSDS for inspection and use in the event of an emergency. Ensure that the site is secure for workers after blasting and any unexploded or misfired blasting material left over (fuse, detonator etc.) should be handled safely. The site shall be clear of the risk involving landslides or rock instability. The transporting, handling, storage and use of explosives, blasting agents, and blasting equipment shall be directed and supervised by a qualified blast officer.

### **1.2.6 Waste disposal**

Waste involving explosives from the blasting site shall be safely handled, neutralized, and disposed of. An individual trained in the proper techniques for handling, neutralizing and disposing of the explosives in a safe manner shall be designated.

### **1.2.7 Post blast re-entry**

Post blast re-entry shall be allowed only to the authorized person (Blast officer) after the smoke, fumes and dust have cleared. The baster-in-charge shall authorize the "All Clear" signal to be sounded, only after the area is deemed safe-to-enter.

### **1.2.8 Health and safety**

The activities of blasting shall adhere to the considerations minimizing risks of health and safety of the workers, community and the ecosystem. Following shall be considered to the minimum:

- Any access closures and evacuations occur within the zone of exclusion.
- Blast monitoring stations are operational.
- Required levels of ground vibration are not exceeded.
- Required levels of noise are not exceeded.
- Required levels of air blast are not exceeded.
- No fly rock is emitted beyond zone of exclusion.
- No visible emissions of dust/fumes from site.
- Interruptions to road are minimized.
- A safe area is evacuated around all blasts.
- All blasts are monitored.
- No damage occurs to people, property, livestock or power lines if any.
- Personal Protective Equipment shall be provided ad worn by the personnel involved in blasting operations.
- First aid kit shall be available at easily accessible location.
- The team shall be able to handle emergency situations and the possible emergency services shall be notified in advance.
- All complaints are recorded and responded to in a timely and professional manner.
- The Blast Record shall be maintained containing all the information required to re-create the blast site, locate blast holes and shot/loading details.

### **1.3 Implementation of BMP**

The blasting management plan shall be thoroughly inspected for proper implementation by Deputy Commissioner Zhob, Contractor and must be monitored by ADB representative.

### **1.4 Conclusion**

The blasting management plan presents the protocol for the management of various impacts resulting from blasting activities. It ensures the compliance with regulatory requirements; minimize hazards to surrounding residents, property, livestock and other infrastructures, respond to the emergencies and complaints in a timely and professional manner.

## Annexure 16: Emergency Response Plan for Breach of Dam and Canal Bank

### A. EMERGENCY RESPONSE PLAN FOR BREACH OF DAM

#### DAM EMERGENCY PLAN SRI TOI WATER STORAGE DAM AND IRRIGATION SYSTEM SRI TOI, ZHOB

#### 1. Dam Emergency Plan

The purpose of this Dam Emergency Plan (DEP) is to reduce the risk of human life loss and injury and minimize property damage during an unusual or emergency event at Sri Toi Dam.

This DEP has been prepared with the intent of coping and responding to the disaster in case of dam failure or breaching.

#### 2. Basic Dam Description

Dam Name:	<b>Sri Toi Water Storage Dam</b>
Dam Location	Union Council of Mir Ali Khel, tehsil and district Zhob, about 62 km north-east of Zhob on Sri Toi river
Dam Type:	Earthfilled
Height:	70 m
Spillway	2,782 m <sup>3</sup> /sec capacity
Storage Volume:	36 Million m <sup>3</sup>
Coordinates (i.e. lat/long or UTM):	Latitude = 31° 35' 52" North, Longitude = 69° 15' 58" East Mean altitude = 1350 m above mean sea level

#### 3. Disaster Risk Management

Disasters can be divided into four major phases:

1. Non-Disaster Phase
2. Pre-Disaster Phase
3. During-Disaster Phase
4. Post-disaster phase



## PRE-DISASTER PHASE

1. Use Guidance notes provide as **Annexure A** of this document, to quality of emergency.
2. In the event of any emergency / disaster, inform the relevant following departments:

Level	Agency	Contact Person Details (to be filled)
National Level:	National Disaster Management Commission(NDMC)	
	National Disaster Management Authority (NDMA)	
Provincia I Level	Provincial Disaster Management Commission (PDMC)	
	Provincial Disaster Management Authority (PDMA)	
	Balochistan Irrigation and Power Department	
	Chief minister secretariat	
District Level:	District Disaster Management Authority (DDMC)	
	Administration such as Commissioner, DC, AC Zhob	
Dam Level	Dam Operators	Emergency Contact details

3. District Disaster Management Authority (DDMC) and District Administration, Zhob to prepare Evacuation Plan for events such as Dam failure including evacuation area and route. They should have an idea of the population that will need to be evacuated.
4. District Disaster Management Authority (DDMC) and District Administration, Zhob should also initiate capacity building and train local community for such events.

## DISASTER PHASE

The following are the basic emergency planning and response roles and responsibilities for the key agencies involved when an emergency occurs.

1. BIPD to undertake appropriate remedial actions as given in Annexure B of this document.
2. BIPD to break the news on national, regional TV and radio.
3. Issue immediate evacuation warnings to people in the vicinity of the dam likely to be affected,
4. BIPD to provide updates of the situation to the press and local emergency authority to assist them in making timely and accurate decisions regarding warnings and evacuations.
5. District Disaster Management Authority support and coordinate the overall emergency response activities within its geographical or functional jurisdiction.

## POST DISASTER PHASE

1. District administration to undertake DEP exercises as appropriate.

2. District Disaster Management Authority to provide leadership to assure the DEP is reviewed and updated annually and copies of the revised DEP are distributed to all who received copies of the original DEP including the records for the local emergency authorities.
3. District Disaster Management Authority will decide when to terminate the emergency.

### Appendix A: Guidance for Determining the Emergency

Event	Situation
Earth spillway flow	Reservoir water surface elevation at spillway crest or spillway is flowing with no active erosion
	Spillway flowing with active gully erosion
	Spillway flow that could result in flooding of people downstream if the reservoir level continues to rise
	Spillway flowing with an advancing headcut that is threatening the control section
	Spillway flow that is flooding people downstream
Embankment overtopping	Reservoir level is 1 foot below the top of the dam
	Water from the reservoir is flowing over the top of the dam
Seepage	New seepage areas in or near the dam
	New seepage areas with cloudy discharge or increasing flow rate
	Seepage with discharge greater than 10 gallons per minute
Sinkholes	Observation of new sinkhole in reservoir area or on embankment 2
	Rapidly enlarging sinkhole
Embankment cracking	New cracks in the embankment greater than 1/4-inch wide without seepage
	Cracks in the embankment with seepage
Embankment movement	Visual movement/slippage of the embankment slope
	Sudden or rapidly proceeding slides of the embankment slopes
Instruments	Instrumentation readings beyond predetermined values
Earthquake	Measurable earthquake felt or reported on or within 50 kilometers of the dam
	Earthquake resulting in uncontrolled release of water from the dam
	Earthquake resulting in visible damage to the dam or appurtenances
Security threat	Verified bomb threat that, if carried out, could result in damage to the dam
	Detonated bomb that has resulted in damage to the dam or appurtenances
Sabotage/ vandalism	Damage to dam or appurtenance with no impacts to dam function
	Modification to the dam or appurtenances that could adversely impact the functioning of the dam
	Damage to dam or appurtenances that has resulted in seepage flow
	Damage to dam or appurtenances that has resulted in uncontrolled water release

### Appendix B: Emergency Remedial Actions

The following emergency remedial actions should be considered and Immediate implementation of these remedial actions may delay, moderate, or prevent the failure of the dam.

Several of the listed adverse or unusual conditions may be apparent at the dam at the same time, requiring implementation of several modes of remedial actions.

Close monitoring of the dam must be maintained to confirm the success of any remedial action taken at the dam.

### ***Embankment overtopping***

1. If the water level in the reservoir is no longer rising, place sandbags along the low areas of the top of the dam to control wave action, reduce the likelihood of flow concentration during minor overtopping, and to safely direct more water through the spillway.
2. Cover the weak areas of the top of the dam and downstream slope with riprap, sandbags, plastic sheets, or other materials to provide erosion-resistant protection.

### ***Seepage and sinkholes***

1. Open the low-level outlet gate to lower the reservoir level as rapidly as possible to a level that stops or decreases the seepage to a non-erosive velocity. If the gate is damaged or blocked, pumping or siphoning may be required.  
Continue lowering the water level until the seepage stops.
2. If the entrance to the seepage origination point is observed in the reservoir (possible whirlpool) and is accessible, attempt to reduce the flow by plugging the entrance with readily available materials such as hay bales, bentonite, soil or rockfill, or plastic sheeting.
3. Cover the seepage exit area(s) with several feet of sand/gravel to hold fine-grained embankment or foundation materials in place. Alternatively, construct sandbag or other types of ring dikes around seepage exit areas to retain a pool of water, providing backpressure and reducing the erosive nature of the seepage.
4. Prevent vehicles and equipment from driving between the seepage exit points and the embankment to avoid potential loss from the collapse of an underground void.

### ***Embankment movement***

1. Open outlet(s) and lower the reservoir to a safe level at a rate commensurate with the urgency and severity of the condition of the slide or slump. If the gate is damaged or blocked, pumping or siphoning may be required.
2. Repair settlement of the crest by placing sandbags or earth and rockfill materials in the damaged area to restore freeboard.
3. Stabilize slides by placing a soil or rockfill buttress against the toe of the slide.

### ***Earthquake***

1. Immediately conduct a general overall visual inspection of the dam.
2. Perform a field survey to determine if there has been any settlement and movement of the dam embankment, spillway, and low-level outlet works.
3. Drain the reservoir, if required.

Adverse or unusual conditions that can cause the failure of a dam are typically related to aging or design and construction oversights. Extreme weather events that exceed the original designed conditions can cause significant flow through the spillway or overtopping of the embankment. However, accidental or intentional damage to the dam may also result in emergency conditions. The conditions have been grouped to identify the most likely

emergency-level condition. The groupings are provided as guidance only. Not all emergency conditions may be listed, and the dam operator is urged to use conservative judgment in determining whether a specific condition should be defined as an emergency situation at the dam.

Pre-existing conditions on this dam: There has been a small seepage area near the downstream toe on the north side of the release channel. This was first noticed in the 1990s, but has not changed since that time.

### **Earth Spillway Flows**

Potential dam failure situation; rapidly developing:

1. Significant erosion or headcutting of the spillway is occurring, but the rate does not appear to threaten an imminent breach of the spillway crest that would result in an uncontrolled release of the reservoir.
2. Flow through the earth spillway is or is expected to cause flooding that could threaten people, homes, and/or roads downstream from the dam.

### **Urgent; dam failure appears imminent or is in progress**

1. Significant erosion or headcutting of the spillway is occurring at a rapid rate, and a breach of the control section appears imminent.
2. Flow through the earth spillway is causing flooding that is threatening people, homes, and/or roads downstream from the dam.

### **Embankment Overtopping**

Potential dam failure situation; rapidly developing:

1. The reservoir level is within 1 foot from the top of the dam.

Urgent; dam failure appears imminent or is in progress:

1. The reservoir level has exceeded the top of the dam, and flow is occurring over the embankment.

### **Seepage and Sinkholes**

#### **Potential dam failure situation; rapidly developing:**

1. Cloudy seepage or soil deposits are observed at seepage exit points or from internal drain outlet pipes.
2. New or increased areas of wet or muddy soils are present on the downstream slope, abutment, and/or foundation of the dam, and there is an easily detectable and unusual increase in volume of downstream seepage.
3. Significant new or enlarging sinkhole(s) near the dam or settlement of the dam is observed.
4. Reservoir level is falling without apparent cause.
5. The following known dam defects are or will soon be inundated by a rise in the reservoir:
  - Sinkhole(s) located on the upstream slope, crest, abutment, and/or foundation of the dam; or
  - Transverse cracks extending through the dam, abutments, or foundation.

#### **Urgent; dam failure appears imminent or is in progress:**



1. Rapidly increasing cloudy seepage or soil deposits at seepage exit points to the extent that failure appears imminent or is in progress.
2. Rapid increase in volume of downstream seepage to the extent that failure appears imminent or is in progress.
3. Water flowing out of holes in the downstream slope, abutment, and/or foundation of the dam to the extent that failure appears imminent or is in progress.
4. Whirlpools or other evidence exists indicating that the reservoir is draining rapidly through the dam or foundation.
5. Rapidly enlarging sinkhole(s) are forming on the dam or abutments to the extent that failure appears imminent or is in progress.
6. Rapidly increasing flow through crack(s) eroding materials to the extent that failure appears imminent or is in progress.

### **Embankment Movement and Cracking**

#### **Potential dam failure situation; rapidly developing:**

1. Settlement of the crest, slopes, abutments and/or foundation of the dam that may eventually result in breaching of the dam.
2. Significant increase in length, width, or offset of cracks in the crest, slopes, abutments, and/or foundation of the dam that may eventually result in breaching of the dam.

Urgent; dam failure appears imminent or is in progress:

1. Sudden or rapidly proceeding slides, settlement, or cracking of the embankment crest, slopes, abutments, and/or foundation, and breaching of the dam appears imminent or is in progress.

## **B. EMERGENCY RESPONSE PLAN FOR BREACH OF CANAL BANK**

Flood-fighting measures are emergency measure deployed in the event when flood protection / control structures and flood proofing measures have failed or rendered ineffective with a sole objective of mitigating flood impacts

Reasons of Flooding:

- Failure of dykes, flood walls and embankments;
- Reduced capacity of river channels, flood ways, and flood bypass channels;
- Failure of weirs and barrages with consequent devastating flood waves;
- Failure of land drainage systems causing flooding of agriculture land; and
- Failure of urban drainage systems causing flooding within protected urban area.

Emergency Responses for flood-fighting in a typical case of failure of flood protection / control structures include the following:

- Closing of gaps in flood walls by sand bags or other available methods;
- Protection of river banks by sand bags, stone, or other available methods;
- Counteracting piping which is the main cause of collapse of embankment and dykes etc.;
- Protection of bridge piers, weirs, barrages and dams against erosion by rockfill, sand bags and other available methods;
- Construction of temporary non-structural protection measures to prevent the propagation of flood on non-protected land;
- Cutting of embankment, dykes etc. in order to allow flooding of less important areas, and thus to save other more important areas;
- Removing obstacles from active or potential flood ways, relief and flood bypass channels; and
- Protection of structures exposed to strong wind wash action.

## Annexure 17: The list of Restricted Pesticides

Table 1. Extremely Hazardous (Class Ia) Technical grade Active Ingredients in Pesticides

Common name	CAS no	UN no	Chem type	Phys state	Main use	GHS	LD <sub>50</sub> mg/kg	Remarks
carb [ISO]	116-06-3	2757	C	5	I-S	1	0.93	DS 53; <a href="#">EHC 121</a> ; HSG 64; <a href="#">IARC 53</a> ; <a href="#">ICSC 94</a> ; <a href="#">JMPR 1993, 1996a</a>
difacoum [ISO]	56073-10-0	3027	CO	5	R	1	0.3	DS 57; <a href="#">EHC 175</a> ; HSG 93
radiolone [ISO]	28772-56-7	3027	CO	5	R	1	1.12	DS 88; <a href="#">EHC 175</a> ; HSG 94
methalin [ISO]	63333-35-7	2588		5	R	1	2	
ium cyanide [C]	592-01-8	1575		5	FM	2	39	Adjusted classification; see note 1; <a href="#">ICSC 407</a>
tafol [ISO]	2425-06-1			5	F	5	5000	Adjusted classification; see note 2; HSG 49; <a href="#">IARC 53</a> ; <a href="#">ICSC 119</a> ; <a href="#">JMPR 1978, 1986a</a> ; see note 3
orethoxyfos [ISO]	54593-83-8	3018	OP	L	I	1	1.8	Extremely hazardous by skin contact ( $D = 12.5$ mg/kg); <a href="#">ICSC 1681</a>
ormephos [ISO]	24934-91-6	3018	OP	L	I	2	7	<a href="#">ICSC 1682</a>
rophacinone [ISO]	3691-35-8	2588		5	R	1	3.1	DS 62; <a href="#">EHC 175</a>
enacoum [ISO]	56073-07-5	3027	CO	5	R	1	1.8	<a href="#">EHC 175</a> ; HSG 95
ethialone [ISO]	104653-34-1	2588		5	R	1	0.56	<a href="#">EHC 175</a>
hacinone [ISO]	82-66-6	2588		5	R	1	2.3	<a href="#">EHC 175</a>
ulfoton [ISO]	298-04-4	3018	OP	L	I	1	2.6	DS 68; <a href="#">JMPR 1992, 1997a</a> ; <a href="#">ICSC 1408</a>
I	2104-64-5	2783	OP	5	I	2	14	See note 4; <a href="#">ICSC 753</a>
oprophos [ISO]	13194-48-4	3018	OP	L	I-S	2	D26	DS 70; <a href="#">JMPR 2000</a> ; <a href="#">ICSC 1660</a> ; [Oral $LD = 33$ mg/kg]
coumafen	90035-08-8	3027		5	R	1	0.25	<a href="#">EHC 175</a> ; <a href="#">ICSC 1267</a>
achlorobenzene [ISO]	118-74-1	2729	OC	5	FST	5	D10000	Adjusted classification (notes 3 and 5); <a href="#">IARC 79</a> ; <a href="#">ICSC 895</a> ; <a href="#">EHC 195</a>
rcuric chloride [ISO]	7487-94-7	1624	HG	5	F-S	1	1	See note 3; <a href="#">ICSC 979</a>
vinphos [ISO]	26718-65-0	3018	OP	L	I	1	D4	DS 14; <a href="#">ICSC 924</a> ; <a href="#">JMPR 1998b</a> ; [Oral $LD = 3.7$ mg/kg]
athion [ISO]	56-38-2	3018	OP	L	I	2	13	See note 3; DS 6; HSG 74; <a href="#">IARC 30, Suppl. 7</a> ; <a href="#">ICSC 6</a> ; <a href="#">JMPR 1996b</a>
athion-methyl [ISO]	298-00-0	3018	OP	L	I	2	14	See note 3; DS 7; <a href="#">EHC 145</a> ; HSG 75; <a href="#">ICSC 626</a> ; <a href="#">JMPR 1985c, 1996b</a>

Common name	CAS no	UN no	Chem type	Phys state	Main use	GHS	LD <sub>50</sub> mg/kg	Remarks
Phenylmercury acetate [ISO]	62-38-4	1674	HG	S	FST	2	24	Adjusted classification; see notes 3 and 6; ICSC 540
Phorate [ISO]	298-02-2	3018	OP	L	I	1	2	DS 75; JMPR 1997b, 2005; ICSC 1060
Phosphamidon	13171-21-6	3018	OP	L	I	2	7	See note 3; DS 74; ICSC 189; JMPR 1987b
Sodium fluoroacetate [C]	62-74-8	2629		S	R	1	0.2	DS 16; ICSC 484
Sulfotep [ISO]	3689-24-5	1704	OP	L	I	1	5	ICSC 985
Tebupirimfos [ISO*]	96182-53-5	3018	OP	L	I	1	1.3	Extremely hazardous by skin contact (LD 9.4 mg/kg in rats)
Terbufos [ISO]	13071-79-9	3018	OP	L	I-S	1	c2	JMPR 1991, 2004

EHC = Environmental Health Criteria Monograph; DS = Pesticide Data Sheet; HSG = Health and Safety Guide; IARC = IARC Monographs on the Evaluation of

Carcinogenic Risks to Humans; ICSC = International Chemical Safety Card; JMPR = Evaluation by the Joint FAO/WHO Meeting on Pesticide Residues.

#### Notes to Class Ia

1. Calcium cyanide is in Class Ia as it reacts with moisture to produce hydrogen cyanide gas. The gas is not classified under the WHO system (see Table 8).
2. Captafol is carcinogenic in both rats and mice.
3. The international trade of captafol, hexachlorobenzene, mercury compounds, parathion, parathion-methyl, and phosphamidon is regulated by the Rotterdam convention on Prior Informed Consent (see <http://www.pic.int/>), which entered into force on 24 February 2004. See Table 7, p. 51
4. EPN has been reported as causing delayed neurotoxicity in hens.
5. Hexachlorobenzene has caused a serious outbreak of porphyria in humans. The use and production of hexachlorobenzene is severely restricted by the Stockholm convention on persistent organic pollutants, which entered into force on 17 May, 2004. See <http://www.pops.int/>
6. Phenylmercury acetate is highly toxic to mammals and very small doses have produced renal lesions: teratogenic in the rat.

THE FINAL CLASSIFICATION OF ANY PRODUCT DEPENDS ON ITS FORMULATION  
See Pages 7 & 8, and the Appendix



Table 2. Highly hazardous (Class Ib) technical grade active ingredients in pesticides

Common name	CAS no	UN no	Chem type	Phys state	Main use	GHS	LD <sub>50</sub> mg/kg	Remarks
Acrolein [C]	107-02-8	1092		L	H	2	29	EHC 127; HSG 67; IARC 63; ICSC 90
Allyl alcohol [C]	107-18-6	1098		L	H	3	64	Highly irritant to skin and eyes; ICSC 95; <i>Adjusted classification (see note 3)</i>
Azinphos-ethyl [ISO]	2642-71-9	2783	OP	S	I	2	12	DS 72; JMPR 1974
Azinphos-methyl [ISO]	86-50-0	2783	OP	S	I	2	16	DS 59; ICSC 826; JMPR 1992, 2009b
Blasticidin-S	2079-00-7	2588		S	F	2	16	
Butocarboxim [ISO]	34681-10-2	2992	C	L	I	3	158	JMPR 1986a; <i>Adjusted classification (see note 3)</i>
Butoxycarboxim [ISO]	34681-23-7	2992	C	L	I	3	D288	<i>Adjusted classification (see note 3)</i>
Cadusafos [ISO]	95465-99-9	3018	OP	L	N,I	2	37	JMPR 1992
Calcium arsenate [C]	7778-44-1	1573	AS	S	I	2	20	EHC 18, 224; IARC 84; ICSC 765; JMPR 1969
Carbofuran [ISO]	1563-66-2	2757	C	S	I	2	8	DS 56; ICSC 122; JMPR 1997b, 2003b, 2009a; <i>See note 2.</i>
Chlorfenvinphos [ISO]	470-90-6	3018	OP	L	I	2	31	ICSC 1305; JMPR 1995b
3-Chloro-1,2-propanediol [C]	96-24-2	2689		L	R	3	112	<i>Adjusted classification (see notes 1 and 3)</i>
Coumaphos [ISO]	56-72-4	2783	OP	S	AC,MT	2	7.1	ICSC 422; JMPR 1991
Coumatetralyl [ISO]	5836-29-3	3027	CO	S	R	2	16	
Cyfluthrin [ISO]	68359-37-5		PY	S	I	2	c15	JMPR 2008; <i>See note 9, p. 8</i>
Beta-cyfluthrin [ISO]	68359-37-5		PY	S	I	2	c11	JMPR 2008; <i>See note 9, p. 8</i>
Zeta-cypermethrin [ISO]	52315-07-8	3352	PY	L	I	3	c86	<i>See note 9, p. 8; HSG 22; ICSC 246; JMPR 2008; Adjusted classification (see note 3)</i>
Demeton-S-methyl [ISO]	919-86-8	3018	OP	L	I	2	40	DS 61, EHC 197; ICSC 705; JMPR 1990
Dichlorvos [ISO]	62-73-7	3018	OP	L	I	3	56	Volatile, DS 2; EHC 79; HSG 18; IARC 20, 53; ICSC 690; JMPR 1994; <i>Adjusted classification (see note 3)</i>
Dicrotophos [ISO]	141-66-2	3018	OP	L	I	2	22	ICSC 872
Dinoterb [ISO]	1420-07-1	2779	NP	S	H	2	25	

Common name	CAS no	UN no	Chem type	Phys state	Main use	GHS	LD <sub>50</sub> mg/kg	Remarks
DNOC [ISO]	534-52-1	2779	NP	S	I-S,H	2	25	JMPR 1965a; EHC 220; ICSC 462. See note 2.
Edifenphos [ISO]	17109-49-8	3018	OP	L	F	3	150	JMPR 1982. <i>Adjusted classification (see note 3)</i>
Ethiofencarb [ISO]	29973-13-5	2992	C	L	I	3	200	JMPR 1983. <i>Adjusted classification (see note 3)</i>
Famphur	52-85-7	2783	OP	S	I	2	48	
Fenamiphos [ISO]	22224-92-6	2783	OP	S	N	2	15	DS 92; ICSC 483; JMPR 1998b, 2003b
Flucythrinate [ISO]	70124-77-5	3352	PY	L	I	3	c67	JMPR 1986b; see note 9, p.8; <i>Adjusted classification (see note 3)</i>
Fluoroacetamide [C]	640-19-7	2588		S	R	2	13	ICSC 1434. See note 2
Formetanate [ISO]	22259-30-9	2757	C	S	AC	2	21	
Furathiocarb	65907-30-4	2992	C	L	I-S	2	42	
Heptenophos [ISO]	23560-59-0	3018	OP	L	I	3	96	<i>Adjusted classification (see note 3)</i>
Isoxathion [ISO]	18854-04-8	3018	OP	L	I	3	112	<i>Adjusted classification (see note 3)</i>
Lead arsenate [C]	7784-40-9	1617	AS	S	L	2	c10	EHC 18, 224; IARC 84; ICSC 911; JMPR 1969
Mecarbam [ISO]	2595-54-2	3018	OP	Oil	I	2	36	JMPR 1987a
Mercuric oxide [ISO]	21908-53-2	1641	HG	S	O	2	18	ICSC 981; CICAD 50. See note 2
Methamidophos [ISO]	10265-92-6	2783	OP	S	I	2	30	HSG 79; ICSC 176; JMPR 1991, 2003b; See note 2
Methidathion [ISO]	950-37-8	3018	OP	L	I	2	25	JMPR 1998b; ICSC 1659
Methiocarb [ISO]	2032-65-7	2757	C	S	I	2	20	JMPR 1999
Methomyl [ISO]	16752-77-5	2757	C	S	I	2	17	DS 55, EHC 178; HSG 97; ICSC 177, JMPR 1989, 2002
Monocrotophos [ISO]	6923-22-4	2783	OP	S	I	2	14	See note 2; HSG 80; ICSC 181; JMPR 1996b
Nicotine [ISO]	54-11-5	1654		L		1	D50	ICSC 519
Omethoate [ISO]	1113-02-6	3018	OP	L	I	2	50	JMPR 1997a
Oxamyl [ISO]	23135-22-0	2757	C	S	I	2	6	DS 54; JMPR 1986b, 2003b
Oxydemeton-methyl [ISO]	301-12-2	3018	OP	L	I	3	65	JMPR 1990, 2003b; <i>Adjusted classification (see note 3)</i>
Paris green [C]	12002-03-8	1585	AS	S	L	2	22	Copper-arsenic complex
Pentachlorophenol [ISO]	87-86-5	3155		S	I,F,H	2	D80	See note 2; Irritant to skin; EHC 71; HSG 19; IARC 20, 53; ICSC 69

Common name	CAS no	UN no	Chem type	Phys state	Main use	GHS	LD <sub>50</sub> mg/kg	Remarks
Propetamphos [ISO]	31218-83-4	3018	OP	L	I	3	106	<i>Adjusted classification (see note 3)</i>
Sodium arsenite [C]	7784-46-5	1557	AS	S	R	2	10	EHC 224; IARC 84; ICSC 1603
Sodium cyanide [C]	143-33-9	1689		S	R	2	6	ICSC 1118; CICAD 61
Strychnine [C]	57-24-9	1692		S	R	2	16	ICSC 197
Tefluthrin	79538-32-2	3349	PY	S	I-S	2	c22	See note 9, p. 8
Thallium sulfate [C]	7446-18-6	1707		S	R	2	11	DS 10, EHC 182; ICSC 336
Thiofanox [ISO]	39196-18-4	2757	C	S	I-S	2	8	
Thiometon [ISO]	640-15-3	3018	OP	Oil	I	3	120	DS 67; ICSC 580; JMPR 1980; <i>Adjusted classification (see note 3)</i>
Triazophos [ISO]	24017-47-8	3018	OP	L	I	3	82	JMPR 1994, 2003b; <i>Adjusted classification (see note 3)</i>
Vamidotion [ISO]	2275-23-2	3018	OP	L	I	3	103	JMPR 1989; ICSC 758; <i>Adjusted classification (see note 3)</i>
Warfarin [ISO]	81-81-2	3027	CO	S	R	2	10	DS 35, EHC 175; HSG 96; ICSC 821
Zinc phosphide [C]	1314-84-7	1714		S	R	2	45	DS 24, EHC 73; ICSC 602

EHC = Environmental Health Criteria Monograph; DS= Pesticide Data Sheet; HSG = Health and Safety Guide; IARC = IARC Monographs on the Evaluation of Carcinogenic Risks to Humans; ICSC = International Chemical Safety Card; JMPR = Evaluation by the Joint FAO/WHO Meeting on Pesticide Residues.

#### Notes to Class Ib

1. 3-Chloro-1,2-propanediol in nonlethal dosage is a sterilant for male rats. This compound is also known as alpha chlorhydrin.
2. The international trade of carbofuran, DNOC, fluoroacetamide, mercury compounds, methamidophos, monocrotophos and pentachlorophenol is regulated by the Rotterdam convention on Prior Informed Consent (see <http://www.pic.int/>), which entered into force on 24 February 2004. See Table 7, p. 51.
3. As a precautionary measure, the classification of certain liquid pesticides has been adjusted to avoid those pesticides being assigned to a less hazardous Class in the process of aligning the WHO Classification with the GHS. Details of how the WHO Classification has been aligned with the GHS Acute Toxicity Hazard Categories are described in the introductory notes for Part II.

THE FINAL CLASSIFICATION OF ANY PRODUCT  
DEPENDS ON ITS FORMULATION  
See Pages 7 & 8, and the Appendix



Table 3. Moderately Hazardous (Class II) Technical Trade Active Ingredients in Pesticides

Common name	CAS no	UN no	Chem type	Phys state	Main use	GHS	LD <sub>50</sub> mg/kg	Remarks
Acephate [ISO]	30560-19-1		OP	S	I	4	945	JMPR 1991, 2003b, 2006b; ICSC 748
Acifluorfen [ISO]	50594-66-6			S	H	4	1370	Strong irritant to eyes
Alachlor [ISO]	15972-60-8	2588		S	H	4	930	See note 1; DS 86; IARC 19, 36, 63; ICSC 371
Alanycarb [ISO]	83130-01-2		C	S	I	4	330	
Allethrin [ISO]	584-79-2		PY	Oil	I	4	c685	See note 9, page 8; EHC 87; HSG 24; ICSC 212; JMPR 1965a
Ametryn [ISO]	834-12-8		T	S	H	4	110	
Amitraz [ISO]	33089-61-1			S	AC	4	800	ICSC 98; JMPR 1999
Anilofos [ISO]	64249-01-0		OP	S	H	4	472	
Azaconazole	60207-31-0			S	F	4	308	
Azamethiphos [ISO]	35575-96-3		OP	S	I	4	1010	
Azocyclotin [ISO]	41083-11-8	2786	OT	S	AC	3	80	JMPR 1990, 1995b, 2006b
Bendiocarb [ISO]	22781-23-3	2757	C	S	I	3	55	DS 52
Benfuracarb [ISO]	82560-54-1	2992	C	L	I	3	205	
Bensulide [ISO]	741-58-2	2902		L	H	3	270	ICSC 383
Bensultap [ISO]	17606-31-4			S	I	4	1100	
Bentazone [ISO]	25057-89-0			S	H	4	1100	HSG 48; ICSC 828; JMPR 1999, 2005
Bifenthrin	82657-04-3	3349	PY	S	I	3	c55	JMPR 1993
Bilanafos [ISO]	71048-99-2			S	H	3	268	
Bioallethrin [C]	584-79-2		PY	L	I	4	c700	See note 2; note 9, p. 8; ICSC 227
Bromoxynil [ISO]	1689-84-5	2588		S	H	3	190	
Bromuconazole	116255-48-2			S	F	4	365	ICSC 1264
Bronopol	52-51-7			S	B	3	254	ICSC 415
Butamifos [ISO]	36335-67-8		OP	L	H	4	630	
Butralin [ISO]	33629-47-9			S	H	4	1049	

Common name	CAS no	UN no	Chem type	Phys state	Main use	GHS	LD <sub>50</sub> mg/kg	Remarks
Butoxydim [ISO]	138164-12-2			S	H	4	1635	
Butylamine [ISO]	13952-84-6	1992		L	F	4	380	Irritant to skin; ICSC 401; JMPR 1982, 1985b
Carbaryl [ISO]	63-25-2	2757	C	S	I	3	c300	DS 3; EHC 153; HSG 78; IARC 12, Suppl.7; ICSC 121; JMPR
Carbosulfan [ISO]	55285-14-8	2992	C	L	I	3	250	JMPR 1987a, 2004
Cartap [ISO]	15263-53-3			S	I	4	325	EHC 76; JMPR 1996a
Chloralose [C]	15879-93-3			S	R	4	400	
Chlordane [ISO]	57-74-9	2996	OC	L	I	4	460	See notes 3 and 4; DS 36; EHC 34; HSG 13; IARC 79; ICSC 740; JMPR 1995a
Chlorfenapyr [ISO]	122453-73-0			S	I,MT	4	441	
Chlormequat (chloride) [ISO]	999-81-5			S	PGR	4	670	ICSC 781; JMPR 2000
Chloroacetic acid [C]	79-11-8	1751		S	H	4	650	Irritant to skin and eyes; data refer to sodium salt; ICSC 235
Chlorphonium chloride [ISO]	115-78-6	2588		S	PGR	3	178	Irritant to skin and eyes
Chlorpyrifos [ISO]	2921-88-2	2783	OP	S	I	3	135	DS 18; ICSC 851; JMPR 2000
Clomazone [ISO]	81777-89-1			L	H	4	1369	
Copper hydroxide [C]	20427-59-2		CU	S	F	4	1000	
Copper oxychloride [C]	1332-40-7		CU	S	F	4	1440	
Copper sulfate [C]	7758-98-7		CU	S	F	3	300	ICSC 751
4-CPA [ISO]	122-88-3		PAA	S	PGR	4	850	
Cuprous oxide [C]	1317-39-1		CU	S	F	4	470	ICSC 421, EHC 200
Cyanazine [ISO]	21725-46-2		T	S	H	3	288	ICSC 391
Cyanophos [ISO]	2636-26-2		OP	L	I	4	610	
Cyhalothrin [ISO]	68085-85-8	3352	PY	Oil	Ix	3	c144	See note 9, p. 8; EHC 99; HSG 38; ICSC 858; JMPR 1985c; JECFA 2000b
Cyhexatin [ISO]	13121-70-5		OT	S	AC	3	265	EHC 15; JMPR 1995b, 2006b
Cymoxanil [ISO]	57966-95-7			S	F	4	1196	

Common name	CAS no	UN no	Chem type	Phys state	Main use	GHS	LD <sub>50</sub> mg/kg	Remarks
Cypermethrin [ISO]	52315-07-8	3352	PY	L	I	3	c250	See note 9, p. 8; DS 58; EHC 82; HSG 22; ICSC 246; JECFA 1996
Alpha-cypermethrin [ISO]	67375-30-8	3349	PY	S	I	3	c79	See note 9, p 8; EHC 142; JECFA 1996; JMPR 2008
Cyphenothrin [(1R)-isomers] [ISO]	39515-40-7	3352	PY	L	I	4	318	
Cyproconazole	94361-06-5			S	F	4	1020	
2,4-D [ISO]	94-75-7	3345	PAA	S	H	4	375	DS 37; EHC 29, 84; HSG 5; IARC 41, Suppl. 7; ICSC 33; JMPR
Dazomet [ISO]	533-74-4			S	F-S	4	640	Irritant to skin and eyes; ICSC 786
2,4-DB	94-82-6			S	H	4	700	
DDT [ISO]	50-29-3	2761	OC	S	I	3	113	See notes 3 and 4; DS 21; EHC 9, 83; IARC 53; ICSC 34; JMPR
Deltamethrin [ISO]	52918-63-5	3349	PY	S	I	3	c135	See note 9, p. 8; DS 50; EHC 97; HSG 30; IARC 53; ICSC 247; JMPR 2001
Diazinon [ISO]	333-41-5	3018	OP	L	I	4	300	DS 45, EHC 198; ICSC 137; JMPR 1994, 2002, 2008
Dicamba [ISO]	1918-00-9			S	H	4	1707	ICSC 139
Dichlorobenzene [C]	106-46-7			S	FM	4	500-5000	Mixture of isomers: ortho (3) 95-50-1, meta (3) 541-73-1, para (2B)
Dichlorophen [ISO]	97-23-4		OC	S	F	4	1250	
Dichlorprop [ISO]	7547-66-2			S	H	4	800	ICSC 38
Diclofop [ISO]	40483-25-2			S	H	4	565	
Dicofol [ISO]	115-32-2		OC	S	AC	4	c690	DS 81; IARC 30; ICSC 752; JMPR 1993
Difenoconazole [ISO]	119446-68-3			S	F	4	1453	JMPR 2009b
Difenzoquat [ISO]	43222-48-6	2588		S	H	4	470	
Dimepiperate [ISO]	61432-55-1		TC	S	H	4	946	
Dimethachlor [ISO]	50563-36-5			S	H	4	1600	
Dimethipin [ISO]	55290-64-7			S	H	4	1180	JMPR 2000, 2005



## **Annexure 18: Emergency Response Plan for Flood Protection Bund**

Flood-fighting measures are emergency measure deployed in the event when flood protection / control structures and flood proofing measures have failed or rendered ineffective with a sole objective of mitigating flood impacts

Reasons of Flooding:

- Failure of flood walls and embankments;
- Failure of land drainage systems causing flooding of agriculture land; and

Emergency Responses for flood-fighting in a typical case of failure of flood protection / control structures include the following:

- Closing of gaps in flood walls by sand bags or other available methods;
- Protection of river banks by sand bags, stone, or other available methods;
- Counteracting piping which is the main cause of collapse of embankment and dykes etc.;
- Construction of temporary non-structural protection measures to prevent the propagation of flood on non-protected land;
- Cutting of embankment, dykes etc. in order to allow flooding of less important areas, and thus to save other more important areas;
- Removing obstacles from active or potential flood ways, relief and flood bypass channels; and
- Protection of structures exposed to strong wind wash action.

## Annexure 19: Approval Forms and Monitoring Sheets

Construction Contractor

Consultant

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### Preliminary Approval Form for Campsite, Workshop, and Equipment Yard

Land Type _____	
Land Use	<input type="checkbox"/> Agricultural <input type="checkbox"/> Barren
Area of Campsite (Acres)	
Area of Workshop/Equipment Yard (Acres)	
Minimum Distance of Campsite from Nearest Settlement (Meters)	Upwind----- Downwind-----
Minimum Distance of Workshop/Equipment Yard from Nearest Settlement (Meters)	Upwind----- Downwind-----
Location, Campsite, Workshop/ Equipment Yard _____	
Provisional Approval of Location Granted	<input type="checkbox"/> Yes <input type="checkbox"/> No
Date of Submission	
Date of Approval	
_____ PROJECT MANAGER (CONTRACTOR)	_____ RESIDENT ENGINEER (SUPERVISION CONSULTANT)

**Construction Contractor****Consultant**

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**Final Approval Form of Campsite, Workshop, and Equipment Yard**

Type of Land Possession	<input type="checkbox"/> Rented <input type="checkbox"/> Purchased <input type="checkbox"/> Leased
Agreement of Possession Attached	<input type="checkbox"/> Yes <input type="checkbox"/> No
Preliminary Approval Form Attached	<input type="checkbox"/> Yes <input type="checkbox"/> No
Final Approval of Location Granted	<input type="checkbox"/> Yes <input type="checkbox"/> No
Date of Submission	
Date of Approval	
<hr style="border: 0; border-top: 1px solid black; margin-bottom: 5px;"/> PROJECT MANAGER (CONTRACTOR)	<hr style="border: 0; border-top: 1px solid black; margin-bottom: 5px;"/> RESIDENT ENGINEER (SUPERVISION CONSULTANT)

**Construction Contractor****Consultant**

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**Preliminary Approval Form of Borrow Pit Site**

Land Use	<input type="checkbox"/> Agricultural <input type="checkbox"/> Barren
Area (Acres)	
Location Map Attached	<input type="checkbox"/> Yes <input type="checkbox"/> No
Provisional Approval of Location Granted	<input type="checkbox"/> Yes <input type="checkbox"/> No
Date of Submission	
Date of Approval	
<hr style="border: 0; border-top: 1px solid black; margin-bottom: 5px;"/> PROJECT MANAGER (CONTRACTOR)	<hr style="border: 0; border-top: 1px solid black; margin-bottom: 5px;"/> RESIDENT ENGINEER (SUPERVISION CONSULTANT)



**Construction Contractor****Consultant**

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**Final Approval Form of Borrow Pit Site**

Type of Land Possession	<input type="checkbox"/> Rented <input type="checkbox"/> Purchased <input type="checkbox"/> Leased
Agreement of Possession Attached	<input type="checkbox"/> Yes <input type="checkbox"/> No
Preliminary Approval Form Attached	<input type="checkbox"/> Yes <input type="checkbox"/> No
Final Approval of Location Granted	<input type="checkbox"/> Yes <input type="checkbox"/> No
Date of Submission	
Date of Approval	
<hr/> PROJECT MANAGER (CONTRACTOR)	<hr/> RESIDENT ENGINEER (SUPERVISION CONSULTANT)

**Daily Dust Monitoring Form (Construction Site)**

Date: \_\_\_\_\_

**Construction Contractor****Consultant**

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Practice	Yes	No	In Case of Non - Conformance	
			Duration (hrs)	Remarks/Reasons
Speed of vehicles/equipment within the limits (less than 20 km/hr)				
Spraying of water done twice on unpaved tracks				
Haul trucks carrying sand or aggregate covered with tarpaulin				
Cover silos openings during operation				
Monitored by:			<div style="border-top: 1px solid black; width: 80%; margin: 0 auto; margin-bottom: 5px;"></div> SITE ENGINEER	

**Request for Removal of Shrubs and Trees (If Required)****Construction Contractor****Consultant**

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Need Reported to Project Manager by:	Name & Designation:
Reported to Project Manager on	Date:
Location of Vegetation to be Removed	
Reported by Project Manager to Resident Engineer	Date:
Approval Granted by Resident Engineer	<input type="checkbox"/> Yes <input type="checkbox"/> No
Date of Submission	
Date of Approval	
          <hr/> PROJECT MANAGER (CONTRACTOR)	          <hr/> RESIDENT ENGINEER (SUPERVISION CONSULTANT)

## Approval Form for Solid Waste Disposal Site and Impervious Liner

Construction Contractor	Consultant
Land Type	<input type="checkbox"/> Government <input type="checkbox"/> Private
Land Use	<input type="checkbox"/> Agricultural <input type="checkbox"/> Depression Area <input type="checkbox"/> Barren
Area of Disposal Site (Acres)	-----
Minimum Distance of Disposal Site from Nearest Settlement (Meters)	Upwind----- Downwind-----
Minimum Distance of Disposal Site from Campsite (Meters)	Upwind----- Downwind-----
Specification of Impervious Liner	
Selected Liner Approved	<input type="checkbox"/> Yes <input type="checkbox"/> No
Selected Site Approved	<input type="checkbox"/> Yes
Date of Submission	<input type="checkbox"/> No
Date of Approval	
<hr/> PROJECT MANAGER (CONTRACTOR)	<hr/> RESIDENT ENGINEER (SUPERVISION CONSULTANT)



**Form for Recording of Air Quality**

#	Date	Location	Parameter	Results	Test Report Number	Remarks
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
<div style="border-top: 1px solid black; text-align: center; margin-top: 20px;"> PROJECT MANAGER (CONTRACTOR) </div>				<div style="border-top: 1px solid black; text-align: center; margin-top: 20px;"> RESIDENT ENGINEER (SUPERVISION CONSULTANT) </div>		

**Form for Recording of Air Quality @ Stack Machinery/Equipment**

#	Date	Location	Parameter	Results	Test Report Number	Remarks
1						
2						
3						
4						
5						
6						
7						
8						
<div style="border-top: 1px solid black; text-align: center; margin-top: 10px;">PROJECT MANAGER (CONTRACTOR)</div>				<div style="border-top: 1px solid black; text-align: center; margin-top: 10px;">RESIDENT ENGINEER (SUPERVISION CONSULTANT)</div>		

**Form for Recording Noise at Construction Site**

#	Date	Location	Results	Test Report Number	Remarks
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
<div style="border-top: 1px solid black; text-align: center; margin-top: 20px;">PROJECT MANAGER (CONTRACTOR)</div>			<div style="border-top: 1px solid black; text-align: center; margin-top: 20px;">RESIDENT ENGINEER (SUPERVISION CONSULTANT)</div>		

## **Annexure 20: Waste Management Plan for Construction Waste & Campsite Waste during Construction Phase**

This document outlines the plan for management of solid waste during the construction phase:

The **Waste Management Program** should be based on the following hierarchy:

- Source segregation
- Source reduction
- Recycling, reuse and recovery
- Disposal

The following activities are to be carried out:

- Establishment of campsite and machinery/ equipment Yard
- Construction works

**The following activities are expected to play a role in the generation of solid waste:**

- Land degradation due to solid waste disposal of camp site
- Contamination of water by solid waste
- Soil erosion and contamination
- Site overburden

### **Proposed actions**

- Disposal of construction waste shall be done at a properly 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 construction contractor should get the NOC from local authorities for disposal of solid waste and provide details for future land use.
- 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.
- The approval for impervious liner shall be granted by supervision consultant.
- Good housekeeping practices within the camp site shall be adopted to minimize waste generation.

## Annexure 21: Chance Find Procedure

Project routing does not envisage any archaeological site. However, in case of any chance find, the **Construction Contractor** will immediately report through **Chief Resident Engineer** of Supervision Consultant to **Deputy Commissioner (DC)** or his nominated representative, to take suitable further actions to preserve such antiques or sensitive remains; and contact the “**Culture, Tourism & Archives Department, (Archaeology Directorate) Government of Balochistan**” for further action.

Representative of the “**Culture, Tourism & Archives Department, (Archaeology Directorate) Government of Balochistan**” will visit the site and observed the significance of the antique, artifact & Cultural (religious) properties and significance of the project. The site visit report will be prepared and given to the **concerned official** of the **Archaeology Directorate**.

In case any artifact, antiques and sensitive remains are discovered, *Chance Find Procedures* should be adopted by Construction Contractors as follows;

- Stop the construction activities in the areas of chance find;
- Delineate the discovered site or area;
- Consult with the local community and provincial archaeological department;
- The suggestion of the local communities and the concerned authorities will be suitable incorporated during taking the preventive measures to conserve the antique, artifact and Cultural (religious) properties;
- Secure the site to prevent any damage or loss of removable objects. In case of removable antiquities or sensitive remain, a night guard shall be arranged until the responsible local authorities take over;
- After stopping work, the Construction Contractor must immediately report the discovery to the **Chief Resident Engineer** of Supervision Engineer for onwards communication to **Deputy Commissioner (DC)**;
- Once authorization has been given by the responsible authorities (Archaeological Department), the Construction Contractor will be informed when works can resume.



## Annexure 22: Checklist of Mitigation Measure Record Keeping

Activity	Potential Impact	Mitigation Measures	Implementation of Mitigation Measures	
			Yes	NO
Construction of Dam, Main Canal, Left Canal & Right Canal and Irrigation Structures				
A. Implementation & Construction Phase				
A1. Implementation and Contractor Mobilization Phase				
Social Disturbance due to Poor Expectation Management	Social issues	The project proponent should make formal arrangement for continued communication and engagement with local stakeholders, through the BIPD during construction activities.  BIPD will formally keep in record all the issues and rational expectations desired by the local public in a register, to ensure that they are duly addressed and fulfilled by the end of the Project.		
Public Utilities	Social issues	Incorporate technical design features to minimize effects on public utilities and all public utilities likely to be affected by the proposed project need to be relocated well ahead of the commencement of construction work and Contractor to obtain NOCs from concerned Departments		
Continued stakeholder engagement	Social issues	Proponents to establish an environmental & social cell responsible for stakeholder engagement and timely information dissemination		
Construction contractor mobilization and establishment of campsite and machinery/ equipment Yard	Communicable Diseases	Arrange to run an active campaign, in the labor camp, to make people aware of the cause, mode of transmission and consequences of HIV/AIDS;		

Activity	Potential Impact	Mitigation Measures	Implementation of Mitigation Measures	
			Yes	NO
		<p>Strengthen the existing local health &amp; medical services for the benefit of labor as well as the surrounding villages;</p> <p>Ensure cleanliness and hygienic conditions at labor camp by ensuring proper drainage and suitable disposal of solid waste. Inoculation against Cholera will be arranged at intervals recommended by Health Department; and</p> <p>Keep all the camps, offices, material depots, machinery yards and work sites open for the inspection of health and safety measures and related documents.</p>		
	Security and Safety Risks	<p>Frequent consultation with local community leaders should be carried out to ensure that any social frictions are identified and resolved before they become inflamed.</p> <p>Control of public access to the site along with regulations aimed at safeguarding workers.</p> <p>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</p>		
	Lifestyle and Culture	Timely and full public consultation and announcement of mobilizing equipment;		

Activity	Potential Impact	Mitigation Measures	Implementation of Mitigation Measures	
			Yes	NO
		<p>Establishment of formal links with affected communities; Seek assistance from and cooperation with local NGOs; Familiarize outside laborer's on local etiquettes;</p> <p>Local labor should be employed for construction works. A dedicated quota of 50% of unskilled labor should be allocated for the nearby villages; and</p> <p>Water supply and sanitation facilities, Contractor's workforces should exacerbate the existing shortages and environmental hazards; contractor should primarily seek their own sources of water in due distance (min. 1 km) from local user's wells.</p>		
	<p>Changes in land use pattern</p> <p>Influx of external work force</p> <p>Social conflicts</p>	<p>Select campsite in view of the cultural norms of the area to avoid undue interference of the Construction contractor's staff with the local residents. Approval of campsite will be taken as per attached approval form in <b>Annexure 19</b>.</p> <p>Give priority employment to local residents.</p> <p>The land shall be rented for the camp site and equipment yard.</p>		
	Workshop facilities may spread oils & chemicals	<p>Disposal of used oil and chemical waste in accordance with MSDS.</p> <p>Efficient Use of Chemicals.</p>		

Activity	Potential Impact	Mitigation Measures	Implementation of Mitigation Measures	
			Yes	NO
		<p>Good housekeeping practices at workshop areas.</p> <p>Mixing of waste into fresh water sources shall not be allowed.</p>		
	Deterioration of air quality due to machinery & equipment	<p>Proper engine tuning of machinery/ equipment to meet National Environmental Quality Standards of Pakistan limits for air quality <b>Annexure 5</b></p> <p>Water should be sprinkled where needed and appropriate, particularly if the campsite is near the communities;</p> <p>During windy conditions stockpiles of fine material will be wetted or covered with plastic;</p> <p>PPEs such as dust masks will be made available to the construction workers at the site to avoid potential health hazards;</p> <p>Idling of delivery trucks or other equipment will not be permitted during periods of unloading or when they are not in active use;</p> <p>In no case, loose earth will be allowed to pile up along the approach roads;</p> <p>All vehicles and other equipment's used during construction will be properly and regularly tuned and maintained;</p> <p>All permanently deployed vehicles exhausts will be</p>		

Activity	Potential Impact	Mitigation Measures	Implementation of Mitigation Measures	
			Yes	NO
		<p>monitored against NEQS; and</p> <p>The possibility of excessive dust generation may be reduced by adopting the best construction practices, precautions such as periodic watering, covering of construction material and usage of low emission equipment's during construction.</p> <p>Although blasting is planned currently in any project activity, however at any latter stage during construction, blasting may be required for quarrying or any other activity. A blasting management plan has been attached as <b>Annexure 15</b>. Which need to be implemented by construction contractor.</p>		
	Noise	<p>Noise reduction devices on high noise equipment</p> <p>Regular inspection, maintenance and lubrication of the construction vehicle and equipment.</p> <p>Use of PPEs by the workers</p> <p>Avoid night time activity</p>		
	Land degradation due to solid waste disposal of camp site	<p>Ensure proper disposal of camp site waste at designated disposal sites according to waste management plan attached as <b>Annexure 20</b>.</p> <p>An impervious liner shall be laid to waste sites before the dumping of solid waste. The approval for impervious liner shall be granted by</p>		

Activity	Potential Impact	Mitigation Measures	Implementation of Mitigation Measures	
			Yes	NO
		<p>Supervision Consultant on a form attached in <b>Annexure 19</b>.</p> <p>Good housekeeping practices within the camp site.</p> <p>Disposal of campsite waste near residential colonies or in agricultural fields shall not be allowed.</p> <p>Construction work will not be carried out during heavy monsoon rains;</p> <p>Clearance waste and construction debris should be sent to designated disposal site while waste from equipment cleaning and maintenance should be segregated and stored in color coded containers, these can be resold or reprocessed. No accumulation of solid waste at site shall be allowed;</p> <p>Avoid Vehicular traffic on unpaved roads as far as possible;</p> <p>Vehicles and equipment shall not be repaired in the field;</p> <p>If unavoidable, impervious sheathing shall be used to avoid soil and water contamination;</p> <p>Solid waste should be disposed of at designated places and contractor to obtain NOC from district governments for disposal of any material in existing disposal points; and</p>		



Activity	Potential Impact	Mitigation Measures	Implementation of Mitigation Measures	
			Yes	NO
		Contractor to prepare a primary and secondary solid waste collection system within the premises of contractor camps and get approved by BIPD.		
	Water contamination	Proper sewerage disposal arrangements to be provided such as septic tank and soaking pits for camps.		
	Loss of vegetation	<p>The construction crew shall use LPG as cooking fuel. Use of fuel wood shall not be allowed.</p> <p>Although as per impact assessment Sri Toi specifically represents dry arid alpine terrain, with marginal vegetation cover-mainly comprising of shrubs. No tree species were recorded during the transact survey. The construction activity will be no negative impact on the flora of the project area. However, if any possibility of such practice may arise following mitigation measure shall be adopted:</p> <p>Tree cutting to be done only when absolutely necessary, with prior approval as perform given in <b>Annexure 19</b>.</p> <p>Compensatory tree plantation in consultation with Forest department. Removal of one (01) tree should be compensated by plantation of ten (10) trees as per Forest (Amendment) Act 2010.</p>		

Activity	Potential Impact	Mitigation Measures	Implementation of Mitigation Measures	
			Yes	NO
	Health and Safety issues	<p>Protective fencing around the camps.</p> <p>Firefighting equipment at the camps.</p> <p>Firefighting training to the camp staff.</p> <p>First aid facility should be in place.</p> <p>An ambulance should be available at site for 24 hrs. Safety precautions shall be taken to transport, handle and store hazardous substances.</p> <p>Contractor to prepare OHS plan and get it approved by Supervision Consultant.</p>		
Transportation of construction material	Soil erosion and contamination	<p>Avoid vehicular traffic on unpaved roads as far as possible.</p> <p>Vehicles and equipment shall not be repaired in the field and all the repairing work will be done at designated workshop facilities.</p> <p>Construction material should be covered while transportation.</p> <p>If unavoidable, impervious sheathing shall be used to avoid soil and water contamination.</p>		
	Air pollution	<p>Minimize operation of vehicles and machinery close to the water channels, water reservoir.</p> <p>Vehicles shall be kept in good working condition and properly tuned, in order to</p>		

Activity	Potential Impact	Mitigation Measures	Implementation of Mitigation Measures	
			Yes	NO
		minimize the exhaust emissions		
	Noise pollution	<p>Vehicles to have exhaust mufflers (silencers)</p> <p>Nighttime traffic shall be avoided near the communities.</p> <p>Inform local population beforehand if nighttime traffic is unavoidable.</p>		
	Health and Safety issues	<p>Road signage fixed at appropriate locations</p> <p>Train all drivers on defensive driving</p> <p>Low vehicle speeds 15 km/hr near / within the communities.</p>		
<b>A2. Construction Phase</b>				
Excavation, backfilling and compaction works	Soil erosion	<p>Prepare material borrowing and disposal plan</p> <p>Avoid cultivation fields for borrowing material to the extent possible</p> <p>Obtain written consent of the land owner for material (soil) borrowing</p> <p>Keep photographic record (before, during, after) for borrow and disposal areas.</p> <p>Leveling of borrow sites.</p>		
	Water availability for construction works	<p>BIPD should make arrangements to supply water during construction for drinking as well as construction purposes</p> <p>Alternately the contractor shall procure water bowsers and store water on site for</p>		

Activity	Potential Impact	Mitigation Measures	Implementation of Mitigation Measures	
			Yes	NO
		drinking and construction purposes		
	Site overburden	<p>Consider wind direction while selecting sites for stock piles.</p> <p>Keep Stockpiles of overburden covered.</p> <p>Ensure proper disposal of construction waste at designated disposal sites.</p> <p>Take approval for selection of solid waste disposal site if landfill is not available from Supervision Consultant on the form attached in Annexure 19.</p> <p>An impervious liner shall be laid to waste sites before the dumping of solid waste. The approval for impervious liner shall be granted by supervision consultant on a form attached in Annexure 19.</p> <p>It will be ensured that no soil is left unconsolidated after completion of work;</p> <p>Photographic record will be maintained for pre-project, during-construction and post-construction condition of the sites;</p> <p>Monitoring during the project execution will ensure compliance to the above mitigation measures and their adequacy;</p> <p>Prepare material borrowing and disposal plan by the contractor.</p>		
	Borrow pit	Possible wasteland or natural areas with a high elevation will be demarcated		

Activity	Potential Impact	Mitigation Measures	Implementation of Mitigation Measures	
			Yes	NO
		<p>and used for borrowing earth material.</p> <p>Strip and stockpile the top 300 mm of the plough layer for redressing the land where the use of agriculture land is unavoidable.</p> <p>Where deep ditching is to be carried out, the top 1 m layer of ditching area will be stripped and stockpiled. The ditch will be initially filled with scrap material from construction and then leveled with the stockpiled topsoil.</p> <p>Ditches or borrow pits that cannot be fully rehabilitated will be landscaped.</p> <p>Land owners will be compensated according to the terms of lease agreement.</p> <p>The approval forms are attached as <b>Annexure 19</b>.</p>		
	Damage to infrastructure	All damaged infrastructure shall be restored to original or better condition.		
	Sites of Historical, Cultural, Archeological or Religious Significance	<p>Proponent and the Supervision Consultant to ensure that the construction staff is educated about the location and importance of the cultural sites that exist in the Project Area.</p> <p>Contractor to ensure that these sites are not affected by the construction related activities. These aspects will be included in the trainings to be conducted for the contractor's staff.</p>		

Activity	Potential Impact	Mitigation Measures	Implementation of Mitigation Measures	
			Yes	NO
		Stop the work immediately in case of chance find of any sites or artifacts of historical, cultural, archeological or religious significance. Chance Find Procedure, attached as <b>Annexure 21.</b> and Antiquities Act 1975 should be followed.  No disturbance to Graveyards during the construction activities.		
	Noise pollution	Noise reduction devices on high noise equipment  Regular inspection, maintenance and lubrication of the construction vehicle and equipment  Use of PPEs by the workers  Avoid night time activity		
	Air pollution	Proper engine tuning of machinery/ equipment to meet National Environmental Quality Standards of Pakistan limits shall be ensured. NEQS for ambient air quality is attached as <b>Annexure 5.</b>  Water should be sprinkled where needed and appropriate, particularly at work sites near the communities.		
	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.		



Activity	Potential Impact	Mitigation Measures	Implementation of Mitigation Measures	
			Yes	NO
		Health & safety plan should be prepared by contractor and get it approved by Supervision Consultant		
	Blocked of access due to earth works and stockpiling of excavated material	<p>A bypass route should be constructed at the project site to divert the through traffic, thus avoiding the public traffic passing through the site.</p> <p>A traffic diversion plan should be formulated by the Contractor and shall be approved by the Supervision Consultant.</p>		
Construction of Dam, new canal and irrigation structures	Water availability for construction works	<p>BIPD should make arrangements to supply water during construction for drinking as well as construction purposes</p> <p>Alternately the contractor shall procure water bowzers and store water on site for drinking and construction purposes</p>		
	Noise pollution	<p>Noise reduction devices on high noise equipment</p> <p>Regular inspection, maintenance and lubrication of the construction vehicle and equipment</p> <p>Use of PPEs by the workers</p> <p>Avoid night time activity</p>		
	Air pollution	<p>Proper engine tuning of machinery/ equipment to meet NEQS of Pakistan limits shall be ensured. NEQS for ambient air quality is attached as <b>Annexure 5</b>.</p> <p>Water should be sprinkled</p>		

Activity	Potential Impact	Mitigation Measures	Implementation of Mitigation Measures	
			Yes	NO
		where needed and appropriate, particularly at work sites near the communities.		
	Health and safety issues	<p>Demarcation tapes to be installed around the construction site to avoid any unauthorized entry</p> <p>Personal protective equipment should be made available at site and the usage of the PPEs should be ensured.</p> <p>Health &amp; safety plan should be prepared by contractor and get it approved by Supervision Consultant</p>		
	Blocked of access due to construction works	<p>A bypass route should be constructed at the project site to divert the through traffic, thus avoiding the public traffic passing through the site.</p> <p>A traffic diversion plan should be formulated by the contractor and shall be approved by the Supervision Consultant.</p>		

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## Annexure 24: Baseline Faunal Survey Report of Sri Toi Dam Area BWRDP - Sri Toi Irrigation Project in Zhob River Basin

### 1. FAUNA SURVEY OF SRI TOI DAM AREA

The project area is host of several species of mammals, birds and reptiles, wherever suitable habitats are found. The wild animals include the wolf, jackal, hyena, fox, and porcupine, all of which are common throughout the District. Leopards are occasionally found in the high hills of the Suleiman and the Toba Kakari ranges. Wild pigs are met with along the Zhob river. The southern slopes of the Shin-ghar Range, north of the Zhob valley, form a great breeding ground of straight-horned Markhor and wild sheep. Fox and jackal are common. Game birds chakor and sisi are in the higher altitudes, and partridge, pigeon, sandgrouse, quail, and bustard are met with in the plains. Among other birds, the dove, hoopoe starling, and wagtail are the most common. The lammergeyer and large black vulture are common everywhere in the higher ranges. Among reptiles, snakes occur widespread (Zhob district Gazetteer 1907). The project area is an important flyway of migratory birds especially cranes. Each year thousands of birds fly through this way because of wetlands and perineal streams however decline observed (Khan, B. 2011).

The survey was carried out in November 5-10, 2017 in representative central and peripheral areas from Sri Toi dam area. Extensive survey carried out in all ranges and conducted while walking predefined travel routes and from observation points. Drop off points, base camp locations and observation points were documented using GPS technology. Ungulates were observed with aid of 8X and 10X binoculars. Due to different habitat types and tough terrains, different direct and indirect methods were applied including; fix point/vantage surveys, Track counts. For diurnal large mammal such as Suleiman Markhor, direct observation method and for nocturnal large mammals like Common leopard, Red fox and Indian Wolf, indirect observation methods such as, observing pug marks, fecal material, territory marking signs etc. were applied. Interviews of local hunters, nomadic communities, local communities and sheep herders were also recorded. The invertebrate of the Sri Toi stream have not been investigated in any detail. No anurans have been collected.



### 2. WILDLIFE SURVEY RESULTS

1. Through interviews, direct sightings and evidences, we recorded the occurrence of a total Seven mammal species (**Table 1**), of which we confirmed the occurrence of 3 species

fox, wolf and Hyena through direct evidences like (pug marks, pelts, faces, territory marking signs and interviews with local residents. The Balochistan Black Bear, Suleiman Markhor and Afghan Urial, which was reported to occur in the past, are now apparently extinct.

### 3. SMALL MAMMALS

2. Cape hare was found very common in the entire area during survey. A total 07 Cape hare were counted during the survey.

### 4. CARNIVORES

3. For the determination of population status of carnivores, nights walks were arranged. In the plains the survey team used vehicle and search lights. After seeing the eyes of carnivores in high powerful lights, noted the eye colors and consulted the literatures. In foothills, used search light in same way. One Indian gray wolf, 2 red fox, 3 Asiatic jackals and one Indian Crested Porcupine were sighted. While indirect observations were made on the droppings, foot prints of several carnivore species such as stripped hyena, Jungle cat, afghan hedgehog, Caracal and Indian gray wolf. Skin of Panther observed in a house, using for prayers.

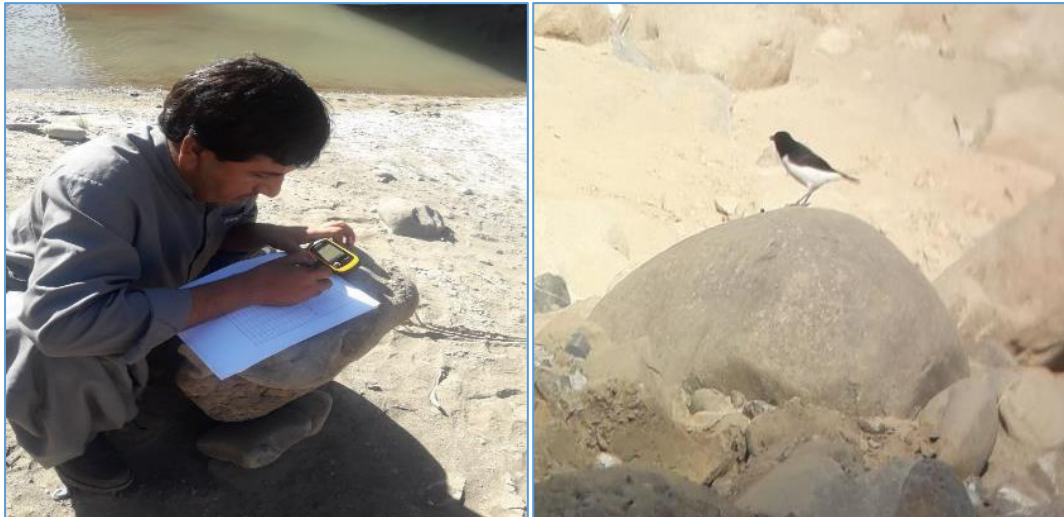
### 5. RESIDENT AND MIGRATORY BIRDS

4. Direct sight techniques like ground nests searching and stand watch techniques were used for this survey. 16 species of birds observed in the area (**Table-2**). Chakoor and Seesee partridges were found very common throughout the area. The birds were mostly observed near water points. 2 small flocks of Chakoor and see see partridges were observed in the area. Hunters to trap eagles were observed on three different locations with hunting materials.

### 6. REPTILES

5. The survey team observed lizards in six different locations. At one location hunted Afghan Tortoise shell was observed. Many snake species are reported from the area. Due to hibernation period, no snake species observed in the present survey while 2 lizard species observed in the survey, Clif rcer (*Coluber rhodoracus*) and Agama (*Agama spp.*) are available in everywhere.

6. No species with endangered or threatened status (as per IUCN red list) were observed in the project area during the faunal survey.



## 7. IMPACTS OF DAM ON ECOSYSTEM AND ASSOCIATED BIODIVERSITY

7. The area used to possess good population of wildlife especially the flagship species of Straight-horned Markhor (*Capra falconeri megaceros*) and Afghan Urial (*Ovis vignei cycloceros*) but war in neighboring Afghanistan led to increased availability of ammunition and automatic arms leading to indiscriminate hunting of these species. By early eighties the populations were reduced to mere fragments and both the species were at the verge of extinction. The endangered mammals vaped out from the area few decades earlier and the proposed dam has no adverse effect on fauna of the area. However, degradation of natural habitats and human influence effects on revitalization of species in their habitats. The environmental consequences of large dams are numerous and varied, positive and negative includes direct impacts to the biological, chemical and physical properties of stream and adjacent environments.

## 8. POSITIVE IMPACTS OF DAM

- The dam area falls in migratory bird's flyway and act rest place of midway.
- Fisheries development activities inside and in adjacent areas will address food security issues and play role in poverty alleviation.
- Water table of the area will have enhanced,
- Livelihoods improvement of the associated communities will be enhanced through agricultural expansion
- Flood control benefits; it decreases and remove the flood effects.
- Land improvement benefits; are the extra benefits that will occur after an increase in the soil productivity because of drainage and land improvement precautions.
- Dam will play an important role in energy conservation and control ground water utilization which is additional support to current environmental situation of Balochistan.
- There will be opportunities of watershed management, agroforestry and social forestry will support carbon sinking and increase forest cover in the area. The alternate forestry will eliminate forest cutting for fuelwood and timber.

## 9. NEGATIVE IMPACTS

- The dam traps sediments, which are critical for maintaining physical processes and habitats downstream of the dam (include the maintenance of productive deltas, barrier islands, fertile floodplains and coastal wetlands).
- Agriculture expansion will disturb habitat and use of chemical sprays will affect biodiversity.



- Discharge of toxic matters (pesticides, toxic metals etc.) and their condensation in food chain may affect sensitive animals immediately; all living organisms may expire when the stream becomes unable to recover itself.
- Hunting of migratory birds because of wetland may affect their population.

## 10. DAM EFFECTS MITIGATION

8. No doubt, the dam has many benefits and need of time to overcome on water issues and food security but mitigation efforts to counter dam effects on environment is also necessary. Mitigation measures reduce the undesirable effects of a dam by modification of its structure or operation, or through changes to the management of the catchment within which the dam is situated. Following measures will be adopting to minimize the impacts to be carried out in dam;

- Watershed management activities on the catchment and stream bank will be afforested.
- Agricultural advisory services will be started to grow organic vegetables and crops,
- Biological control of pests will be adopted through agriculture department support,
- As dam will be constructed, with the coordination of Forest and wild life and conservation organization, environmental awareness regarding hunting control will be raised.

**Table 1: List of Mammal Species in Sri Toi Area**

S. No.	Common Name	Zoological name	Local Name
1	Suleiman Markhor	<i>Capra falconeri jerordeni</i>	Ghar sanay
2	Common leopard	<i>Panthera pardus</i>	Prang
3	Fox	<i>Vulpes vulpes</i>	Gedara
4	Wolf	<i>Canis lupus</i>	Leva
5	Afghan Urial	<i>Ovis orientalis vignei</i>	Sezha
6	Asiatic steppe wild cat	<i>Felis silvestris</i>	Spilmai Gedara
7	Hyena	<i>Hyaena hyaena</i>	Kazhabal

**Table 2: List of birds sighted during survey**

Common Name	Scientific Name
Chukar	<i>Alectoris chukar</i>
See-see Partridge	<i>Ammoperdix griseogularis</i>
Eurasian Griffon	<i>Gyps fulvus</i>
Eurasian Sparrowhawk	<i>Accipiter nisus</i>
Demoiselle Crane	<i>Anthropoides virgo</i>
Rock Pigeon	<i>disambiguation</i>
Eurasian Collared Dove	<i>Streptopelia decaocto</i>
Spotted Sandgrouse	<i>Pterocles senegallus</i>
Common Buzzard	<i>Buteo buteo</i>
Common Swift	<i>Apus apus</i>
Common Kingfisher	<i>Alcedo atthis</i>
Green Bee-eater	<i>Merops orientalis</i>
Hoopoe	<i>Upupa epops</i>
Crested Lark	<i>Galerida cristata</i>
Common Rock Thrush	<i>Monticola saxatilis</i>
Rock Bunting	<i>Emberiza cia</i>

**Table 3: People Who Contributed**

S. No.	Name	Profession
1	Saeedullah Khan	Sociologist
2.	Muzaffar Khan	Field Biologist
3.	Mayen Khan	Zoologist
4.	Naqeebullah Khan	Field Coordinator

Figure 1: Glimpses of Field

