

**ENVIRONMENTAL IMPACT ASSESSMENT
(EIA)**

of

DHARABI PRIVATE WILDLIFE RESERVE



By

CHROMATEX CHEMICALS (PRIVATE) LIMITED



at

**Dhoke Morian, Mouza Rehna Sadaat,
Tehsil Kalar Kahar, District Chakwal**

Prepared By



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TABLE OF CONTENTS

	Page
EXECUTIVE SUMMARY	I
1. INTRODUCTION	
1.1 Project Background.....	11
1.2 Purpose of the Report.....	12
1.3 Specific Objectives of this EIA	13
1.4 Identification of the Project.....	13
1.5 Details of the Proponent.....	13
1.6 Details of Consultant.....	14
1.7 Project Nature, Size and Location.....	14
1.8 Extent and Scope of Study.....	15
1.9 Persons Performing the EIA Study.....	15
1.10 Study Methodology.....	16
1.10.1 Scoping.....	16
1.10.2 Data Collection.....	17
1.10.2.1 Important Issues Raised during Public Consultation.....	17
1.10.2.2 Interview.....	17
1.10.2.3 Primary Data.....	17
1.10.2.4 Secondary Data.....	17
1.10.3 Determination of Significant Impacts.....	18
1.10.4 Mitigations Proposed.....	18
1.10.5 Environmental Management Plan.....	18
2 DESCRIPTION OF THE PROJECT	
2.1 Screening.....	19
2.2 Objective of the Project.....	19
2.3 Alternatives.....	20
2.3.1 Project Alternative.....	20
2.3.2 Economic Alternatives.....	21
2.3.3 Construction Alternatives.....	21
2.3.3.1 Benefits of Reinforced Cement Concrete.....	21
2.3.4 Technology Alternatives and Selection Criteria.....	21
2.3.5 Site Alternatives.....	22
2.3.5.1 Site Selection Criteria.....	22
2.3.6 Environmental Alternatives.....	23
2.4 Location and Site Layout of the Project.....	23
2.5 Land Use on the Site.....	24
2.6 Road Access.....	24
2.7 Vegetation Features of the Site.....	24
2.8 Cost and Magnitude of Operation.....	24
2.9 Schedule of Implementation	24
2.10 Description of the project.....	25
2.10.1 Pre-Construction Phase.....	25
2.10.2 Construction Phase.....	25
2.10.2.1 Temporal Boundaries of the project.....	26

2.10.2.2 Workforce Required.....	26
2.10.2.3 Power Supply.....	26
2.10.2.4 Water Supply and Water Balance.....	26
2.10.3 Operation Phase.....	26
2.10.3.1 Machinery Details.....	26
2.10.3.2 Water Requirement and Water Balance.....	27
2.10.3.3 Electricity Requirement.....	27
2.10.3.4 Man Power Involved in the Operation.....	27
2.11 Restoration and Rehabilitation Plans.....	28
2.12 Government Approvals Required for the Project.....	29

3 DESCRIPTION OF THE ENVIRONMENT

3.1 General.....	30
3.2 Baseline Physical Environment.....	30
3.2.1 Topography.....	30
3.2.2 Geography.....	31
3.2.3 Regional Geological Conditions.....	32
3.2.4 Soil.....	35
3.2.5 Climate.....	36
3.2.6 Seismicity.....	37
3.2.7 Water Resources.....	37
3.2.7.1 Site Area Water Supply.....	37
3.2.8 Flood Control.....	39
3.2.7 Ambient Air Quality.....	39
3.2.8 Noise.....	40
3.2.9 Liquid Effluents.....	40
3.2.10 Solid Waste.....	40
3.3 Baseline Ecological Environment.....	41
3.3.1 Fauna.....	41
3.3.1.1 Aquatic Fauna.....	41
3.3.1.2 Mammals.....	41
3.3.1.3 Birds.....	41
3.3.1.4 Reptiles.....	42
3.3.1.5 Amphibians.....	42
3.3.1.6 Critical Habitats.....	42
3.3.2 Forestry.....	42
3.3.3 Flora.....	44
3.3.4 Endangered Species.....	45
3.3.4.1 Punjab Urial.....	45
3.3.4.2 White Headed Duck.....	45
3.3.5 Agriculture.....	54
3.4 Baseline Socioeconomic Environment.....	55
3.4.1 Population and Communities.....	55
3.4.2 Political and Administrative Set-up.....	55
3.4.3 Industries.....	55
3.4.4 Infrastructure.....	56
3.4.4.1 Potable Water Supply.....	56
3.4.4.2 Sanitation and Drainage.....	56
3.4.5 Land Use Planning.....	56

3.4.6 Power Sources and Transmission	57
3.4.7 Agricultural Development	57
3.4.8 Quality of Life Values	57
3.4.8.1 Main Occupations	57
3.4.8.2 Family Life	57
3.4.8.3 Religion	58
3.4.8.4 Transportation	58
3.4.8.4.1 Roads	58
3.4.8.4.2 Railways	58
3.4.8.4.3 Airport	58
3.4.8.5 Housing	58
3.4.8.6 Public Health	58
3.4.8.7 Education	59
3.4.8.8 Recreational Resources	59
3.4.8.9 Aesthetic and Cultural Values	59
3.4.8.10 Language	60
3.4.8.11 Ethnicity	60
3.4.8.12 Role of Women	60
3.4.8.13 Archeological and Historical Treasures	60
3.4.8.13.1 Dharabi Lake	60
3.4.8.13.2 Kallar Kahar Lakes	60
3.4.8.13.3 Chinji National Park	61
3.4.8.13.4 Swaik Lake	61
3.4.8.13.5 Malot Fort	62
3.4.8.13.6 Neela-Wahn	62
3.4.8.13.7 Takht-e-Babri	62
3.5 Lab Reports of Environmental Analysis	62
3.6 Suitability of the Site	63

4. SCREENING OF POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

4.1 General	65
4.2 Impact Assessment Methodology	65
4.2.1 Checklists	65
4.2.2 Thinking through Stages of the Project	65
4.3 Impacts Associated with Project Location	66
4.4 Impacts Associated with Project Design	66
4.5 Characteristics of Impacts Associated with Construction Phase and their Mitigation Measures	66
4.5.1 Noise and Vibration	67
4.5.2 Impact on Soil	67
4.5.3 Impact on Air Quality	68
4.5.4 Solid Waste	69
4.5.5 Impact on Water Resources	70
4.5.6 Impact on Ecological Environment	71
4.5.7 Impact on Socio-economic Conditions	72
4.5.8 Occupational Health and Safety	73
4.5.9 Traffic Flow	74

4.6 Characteristics of Impacts Associated with Operation Phase & their Mitigation Measures	75
4.6.1 Air Emissions	75
4.6.2 Wastewater & Water Balance	76
4.6.3 Noise	76
4.6.4 Solid Waste	77
4.6.5 Impact on Flora and Fauna	78
4.6.6 Occupational Health and Safety	79
4.6.7 Impact on Socio-economic Conditions	80
4.6.8 Traffic Flow	81
4.7 Potential Environmental Enhancement Measures	81

5 ENVIRONMENTAL MANAGEMENT PLAN AND MONITORING PROGRAM

5.1 General	83
5.2 Objectives of EMP	83
5.3 Components of EMP	86
5.4 Legislative Guidelines	86
5.4.1 Policy Framework Guiding the Management of Protected Area	86
5.4.2 Collaboration and Transparency	87
5.5 Institutional Capacity/Roles & Responsibilities of Environmental Management Team	87
5.5.1 Top Management-The Management Authority	88
5.5.1.1 Chief Executive Officer	88
5.5.1.2 General Manager	89
5.5.1.3 Contractor	89
5.5.1.4 Manager Operations	90
5.5.2 Construction Manager	90
5.5.3 Role of EPA-Punjab	91
5.6 Environmental Management Plan	91
5.6.1 Pre-Construction Phase EMP	91
5.6.1.1 Design Stage	91
5.6.1.2 Approvals	91
5.6.1.3 Contractual Provisions	92
5.6.2 Construction Phase	92
5.6.3 Operations Phase	92
5.7 Mitigation Plan	92
5.8 Operational Management Framework	102
5.8.1 Determination of Priorities for Strategic Outcomes	102
5.9 Strategic Management Framework	102
5.9.1 Vision of DPWR	103
5.9.2 Objectives & Strategic Outcomes of DPWR	103
5.9.2.1 Legal Compliance and Law Enforcement	107
5.9.2.2 Stakeholders Engagement	111
5.9.2.3 Buffering Mechanism and Regional Management	113
5.9.2.3.1 Protected/Zone of Influence Management	113
5.9.2.3.2 Regional Management	114
5.9.2.4 Biodiversity Resource and Conservation Management	117
5.9.2.4.1 Fire Management	117

5.9.2.4.2 Invasive/Alien Plants Species Control	121
5.9.2.5 Wildlife Management	123
5.9.2.6 Sustainable use of Natural and Biological Resources	128
5.9.2.7 Species Replenishment Plan	131
5.10 Monitoring Program to Assess Performance of EMP	134
5.10.1 Responsibilities for Monitoring	134
5.11 Reporting and Reviewing Procedures	134
5.12 Training Needs and Schedule	134
5.12.1 Training Syllabus Contents	135
5.12.2 Environmental Education and Awareness	135
5.13 Conservation Development Framework	138
5.13.1 Zonation Plan	139
5.14 Environmental Monitoring Program	144
5.15 Equipment Maintenance Schedule	147
5.16 Communication and Documentation	150
5.17 Environmental Management Budget	150
5.18 Schedule of Implementation of EMP	151

6 STAKEHOLDER CONSULTATION

6.1 General	156
6.2 Importance of Public Consultation	156
6.3 Objectives	156
6.4 Methodology	157
6.5 Identification of Stakeholders	157
6.5.1 Proponent's Environmental Management Team	157
6.5.2 The Responsible Authority	158
6.5.3 Other Departments & Agencies	158
6.5.4 Environmental Practitioners & Experts	158
6.5.5 Affected & Wider Community	158
6.6 Concerns of the Stakeholders	159
6.7 Mitigation Measures proposed for addressing the Stakeholder's Concerns	160

7 CONCLUSION AND RECOMMENDATIONS

7.1 Conclusions	164
7.2 Recommendations	164

TABLES

Table 1.1: Boundary Coordinates of Dharabi Private Wildlife Reserve, Chakwal	14
Table 2.1: Implementation Schedule	25
Table 3.1: Result of Chemical Analysis Test Report (Ground Water)	39
Table 3.2: Result of Chemical Analysis Test Report (Ambient Air)	40
Table 3.3: Noise Levels of project area	40

Table 3.4: List of Fauna Species Observed in Dharabi Private Wildlife Reserve and its Surrounding Area.....	47
Table 5.1: Environmental Management Plan of Construction Stage.....	93
Table 5.2: Environmental Management Plan of Operational Stage.....	97
Table 5.3: Objectives and Strategic Outcomes of the Dharabi Private Wildlife Reserve.....	104
Table 5.4: Framework for Legal Compliance and Law Enforcement.....	108
Table 5.5: Framework for Stakeholders Engagement.....	112
Table 5.6: Framework for Buffering Mechanism and Regional Management.....	114
Table 5.7: Framework for Biodiversity Resource and Conservation Management-Fire Management.....	119
Table 5.8: Alien and Invasive species monitoring and control plan for Dharabi Private Wildlife Reserve.....	121
Table 5.9: Framework for Biodiversity Resource and Conservation Management-Wildlife Management and Conservation Targets.....	125
Table 5.10: Framework to Ensure Sustainable Use of Natural and Biological Resources.....	129
Table 5.11: Framework for Operational Management-Game Management-(Species Replenishment Plan).....	132
Table 5.12: Framework for Environmental Education and Awareness.....	137
Table 5.13: Environmental Monitoring Plan during Construction Phase.....	144
Table 5.14: Annual Surveillance and Monitoring Schedule Plan during Operations Phase.....	145
Table 5.15: Requirements for the compliance of legislations and maintenance of facilities/infrastructure.....	148
Table 5.16: Environmental Management Budget.....	150
Table 5.17: Schedule of Implementation.....	152
Table 6.1 List of Stakeholders consulted.....	158

FIGURES

Figure 2.1: Organizational Hierarchy of Dharabi Private Wildlife Reserve.....	24
Figure 3.1: Topography of the Project Area.....	30
Figure 3.2: Topography of DPWR.....	31
Figure 3.3: Chakwal in Punjab Province.....	32
Figure 3.4: Geology and Soils of the reserve area.....	33
Figure 3.5: Geological Maps of the Project Area.....	34
Figure 3.6: Soil map of Dharabi Wildlife Private Reserve.....	36
Figure 3.7: Seismic Zoning of Punjab.....	37
Figure 3.8: Hydrology of the project area.....	38
Figure 3.9: Khan Dam inside Dharabi Private Wildlife Reserve.....	38
Figure 3.10: Fauna of the project area.....	43
Figure 3.11: Vegetation Map Flora of the project area.....	44
Figure 3.12: Flora of the project area.....	46
Figure 3.13: Agricultural Fields near the project area.....	54
Figure 3.14: Sightings of Grey and Black Francolins During Survey of Dharabi Private Wildlife Reserve, District Chakwal.....	64
Figure 5.1: Dharabi Private Wildlife Reserve Management Authority.....	89

Figure 5.2: Zonation Map of DPWR.....	140
Figure 6.1: Highlights of Public Consultation Survey-A.....	161
Figure 6.2: Highlights of Public Consultation Survey-B.....	162
Figure 6.3: Meeting with Deputy Director, Wildlife, Salt Range Region, Kallar Kahar as part of Stakeholder Consultation.....	162
Figure 6.4: Meeting with Assistant Professor, Environmental Sciences Punjab University.....	163
Figure 6.5: Meeting with CEO, Well On Techniques, a Water Treatment Company.....	163

ANNEXURES

Annexure-I: Glossary.....	167
Annexure-II: List of Abbreviations and Symbols.....	169
Annexure-III: List of individuals and organizations consulted along with their written feedback.....	170
Annexure-IV: Team Members of EIA Study Project.....	172
Annexure-V: Terms of Reference.....	173
Annexure-VI: Google Map and Drawings of Proposed Project.....	174
Annexure-VII: Baseline Parameters Monitoring Test Reports (Ambient Air, Ground Water, Noise).....	175
Annexure-VIII: Property Ownership Documents.....	176
Annexure-IX: Documents related with Land Use & relevant legislation.....	177
Annexure-X: Checklist (EIA) Pak-EPA Guidelines for preparation And Review of Environmental Reports-1997.....	178
Annexure-XI: References.....	179

EXECUTIVE SUMMARY

This is the study of Environmental Impact assessment of Establishment of Dharabi Private Wildlife Reserve by Chromatex Chemicals (Private) Limited.

Title of the Project: Establishment of Dharabi Private Wildlife Reserve by Chromatex Chemicals (Private) Limited.

Location of Project: Dhoke Morian, Mouza Rehna Sadaat, Kallar Kahar, Chakwal
Coordinates 32°52'6.84"N, 72°40'21.64"E
Coordinates (Decimal):
32.86856667 N, 72.67267778 E

Proponent: Chromatex Chemicals (Private) Limited,
Mailing Address: 1-Km, Aitchison Colony Road,
Thokar Niaz Baig, Raiwind Road, Lahore
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Brief Outline of the Proposal

The proponent Chromatex Chemicals (Private) Limited proposes to establish Dharabi Private Wildlife Reserve at Dhoke Morian, Mouza Rehna Sadaat, Tehsil Kallar Kahar, District Chakwal. The Dharabi Private Wildlife Reserve shall be the first privately owned protected areas in District Chakwal intended for registration under Section-12 of the Punjab Protected Areas Act, 2020 and Rule-4(a)(i) of the Private Wildlife Reserve Rules, 2023. The main objectives of the establishment of reserve are conservation of wildlife and regulation of area for sustainable use of wildlife resources. For effective management of such protected area, the preparation, approval and implementation of the management plan under Rule-6 of the Punjab Protected Areas Rules, 2022 have been included in legislative regime as mandatory. The management plan of Dharabi Private Wildlife Reserve, District Chakwal shall be prepared in an attempt to comply with the said provisions of the rules in order for effective management of the reserve to achieve its strategic objectives. The vision of the Dharabi Private Wildlife Reserve has been set as:

“To be renowned leader in the conservation world particularly of Punjab, Pakistan in the field of biodiversity and game management by Private Sector”.

Total project area shall be 1202 Kanals, 6 Marla, 97 Sq. feet. The project establishment shall involve fencing of boundary of the area and 03 security guard posts to prohibit encroachment in the area.

According to Section-12 of PEPA 1997 (Amendment 2012), "No proponent of a project shall commence construction or operation unless he has filed with the Provincial 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 Provincial Agency approval in respect thereof." According to Punjab Environmental Protection Review of IEE and EIA Regulations-2022, the project falls under Schedule-II, therefore requires an EIA. In that context, Environmental Impact Assessment has been carried out and is being presented in the form of this EIA Report.

The scope of the EIA study includes environmental assessment of the project including collection of data related to physical, biological and socio-economic environment, assessment of impacts, which may be caused by the project activities and mitigation measures for the abatement of potential environmental impacts. This encompasses all the phases of the project.

Brief detail of the project is as follows:

The Project Area

The Dharabi Private Wildlife Reserve, is located 9-Km northeast to the Kalar Kahar City of District Chakwal, Punjab. It lies along the motorway (M-2) between Kalar Kahar/Balksar towns and approachable through a kacha Jeep-able track passing through the villages of Ratta Sharif and Dhok Morian. The eastern side of the reserve is mainly bordered with Rakh Rahna a natural forest plantations which is further bordered with River Duhrab, hence providing the natural protection to reserve at eastern limits. The northern side is pounded naturally with the Dharabi Dam, the western side after embankment with agricultural lands harbor well protected Motorway beat, whereas, the southern side is still away from the populated area being encompassed with Agricultural land of adjoining villages.

Being located at easy approach and bordered with Dharabi Dam (a tourist spot) as well as the natural forests, the reserve, therefore, does offer some low use tourism activities like picnic spot, sport fishing, walking tracks and birds watching etc. with the potential to improve it in future.

Knowledge on the baseline environmental conditions was obtained by collecting and reviewing the available secondary data of the project area. The review process was also helpful in establishing the scope and methodology for collection of field data inside the project area. The EIA team comprising of environmentalists, chemists, civil engineers, architects, wildlife conservationists and surveyors collected area specific primary data.

Facilities

This project area is a wild area with scattered human settlements. There is road network, electricity distribution system, telecommunications system and petrol stations. Project site is accessible through a jeepable track.

Availability of Utilities

Main source of electricity shall be from WAPDA through Islamabad Electric Supply Company. The community does not have water supply and sanitation from government. People draw water from borehole pumps for their use and dispose sewerage in septic tanks. Toilets are linked with septic tanks. Natural gas supply is not found. People either use gas cylinders or firewood for cooking.

The summarized outline of the report has been described below:

Chapter-1: Introduction

In this chapter, an introduction to this report has been given. A little detail about project has been provided. Project background, purpose of the report, specific objectives of this EIA, identification of the project, details of proponent and consultant, project nature, size and location, extent and scope of study, EIA study team, study methodology, scoping, temporal boundaries of environmental assessment, spatial boundaries of environmental assessment, important issues raised during public consultation have been described.

Chapter-2: Description of the Project

This chapter describes the specifications of the proposed project i.e. screening, objective of the project, alternatives including project alternative, economic alternatives, construction design alternatives, technology alternatives, site alternatives, site selection criteria, environmental alternatives, location and site layout of the project, land use on the site, road access, vegetation features of the site, cost and magnitude of operation, schedule of implementation, description of pre-construction phase, construction phase and operation phase of the of the project, restoration and rehabilitation plans and government approvals required for the project.

Chapter-3: Description of the Environment

This chapter describes the existing environmental conditions around the proposed project area. Information that has been collected from different sources including public, literature, reports of other studies conducted in this area, knowledge with the proponent and the concerned government departments and the first-hand surveys and field measurements has been presented in this chapter. This encompasses all the important aspects of local environment such as physical, ecological and socio-economic resources. Environmental testing has also been carried out through an environmental laboratory certified by EPA-Punjab in the presence of EPA-Punjab officials to

know about quality of ambient air, ground water and noise. Suitability of the site for project has also been discussed.

Chapter-4: Screening of Potential Environmental Impacts and Mitigation Measures

This chapter identifies the characteristic potential impacts due to the implementation of project on the physical, ecological and social environment of project area. This chapter also identifies measures that will help mitigate the project's adverse environmental effects and enhance positive impacts. Impact assessment methodology, characteristics of impacts associated with project location, project design, construction phase, operation phase on the environment have been described in this chapter. Potential Environmental Enhancement Measures have also been described. The summary of potential environmental impacts of the project, mitigation measures to be taken and proposed monitoring are summarized below:

Chapter-5: Environmental Management Plan and Monitoring Program

This chapter presents the implementation mechanism in the form of an Environmental Management Plan (EMP) for dealing with the potential environmental impacts identified during EIA and reported in Chapter 4 of this document. This EMP addresses the adverse environmental impacts of the proposed project during its execution, to enhance project benefits and to introduce standards of good practices to be adopted for all project activities.

In this chapter, objectives of EMP, components of EMP, institutional capacity/roles & responsibilities of environmental management team, reporting and reviewing procedures, training needs and schedule, training syllabus contents, equipment maintenance schedule, communication and documentation, environmental management budget and schedule of implementation of EMP have been described.

Environmental monitoring and management have been proposed to be carried out in all stages of the project namely pre-construction, construction and operational phases. EMP will be operational to ensure legal environmental compliance. Environmental Monitoring by a third party will further support operations in environmentally sustainable fashion.

Chapter-6: Stakeholders Consultation

This chapter includes the output of consultations carried out with the stakeholders including people of the project area. These include local residents who also carry out different businesses such as shop keepers, farmers. Their feedback regarding the project has been recorded through a questionnaire and interviewing them to fill the questions of questionnaire. Mitigation measures proposed for addressing the stakeholder's concerns have been described.

Potential Impact	Magnitude of Impact	Mitigation Measures
CONSTRUCTION PHASE		
<p>Solid Waste</p> <p>Solid waste shall be generated in the form of excavation soil, broken bricks, wasted aggregate material etc.</p>	Major/Long term	<p>All types of waste shall be kept segregated.</p> <p>The waste shall never be piled and shall be managed regularly.</p> <p>Excavated soils shall be managed within project area.</p> <p>The remaining construction waste shall be disposed of at TMA designated site.</p> <p>The recyclable part of the waste shall be sold to recyclers in Bhaun Main Bazar.</p>
<p>Air Pollution</p> <p>Transport of construction materials such as sand, aggregate etc. for guard posts may cause particulate pollution.</p> <p>Off-road or on-road automobiles may cause particulate and exhaust pollution.</p>	Minor/Short lived	<p>Construction contractor shall be asked to ensure using only well-conditioned and tuned automobiles and equipment.</p> <p>Sprinkling of water on the exposed surfaces.</p> <p>Covering of all carts loaded with sand, soil and other such loose construction materials.</p> <p>Use of appropriate masks by workers to prevent entry of dust in their breathing system.</p>
<p>Water Quality</p> <p>Water shall only be needed for making aggregate concrete for pavement of floors and for curing of</p>	Minor/Short Lived	<p>Water consumption shall be kept at minimum.</p> <p>Extra run off will mostly percolate to ground water table thus recharging it.</p>

<p>building structures at guard posts.</p> <p>For fencing water shall not be needed.</p>		<p>Leakage and wastage shall be prevented.</p>
<p>Noise Pollution</p> <p>Movement of off-road or on-road automobiles.</p>	<p>Minor/Short Lived</p>	<p>Maintain and lubricate all moving parts of the automobiles.</p> <p>Use of ear plugs by workers if needed.</p>
<p>Traffic Flow</p> <p>Only a little increase in the traffic of the area because of movement of transport carrying construction materials.</p>	<p>Minor/Short Lived</p>	<p>This is already a jeepable track. There is not much traffic expected to be impacted.</p>
<p>Occupational Health & Safety</p> <p>Ergonomic issues due to loading and off-loading of construction materials e.g. cement sacks etc.</p>	<p>Minor</p>	<p>Construction workers shall be provided with adequate awareness and training about HSE aspects of the project.</p> <p>Work at height shall be performed with appropriate safety arrangements to prevent fall from height.</p> <p>Construction materials shall be distributed into small packs during loading and off-loading.</p> <p>Safety shoes shall be worn by the workers.</p> <p>The workers shall also be provided with suitable Personal Protective Equipment.</p> <p>Emergency preparedness and response plan shall be prepared and followed.</p>
<p>Ecology</p>	<p>Minor/Temporary</p>	<p>The noise of the equipment shall be kept under control.</p>

The animals and vegetation not likely to be impacted.		The construction staff shall be guided not to interfere with the habitat of local biota.
Socioeconomic Concerns of local population Jobs for the locals	Minor/Temporary	Locals shall be informed before the commencement of construction activity. The local cultural and moral values shall be taken care of. Only locals shall be hired for construction work.
OPERATIONAL PHASE		
Solid Waste Solid waste shall not be generated as such. From guard posts, municipal waste may be generated.	Major/Long term	All kinds of wastes shall be kept in segregated and color coded bins. The municipal waste shall be converted into compost and utilized for local vegetation. All other operational waste shall be sold to market at Bhaun for reuse and recycling as may be appropriate.
Air Pollution There shall be no sources of air pollution due to operations. The tractor or other motorized agricultural equipment shall be only source of air pollution.	Minor/Long term	The agricultural vehicle shall be equipped with air pollution control devices such as catalytic convertor.
Water Pollution Sewerage shall be the main waste water.	Minor/Long term	Water wastage shall be prevented. Septic tanks shall be used at guard posts for sewerage.
Noise There shall not be any sources of noise except	Minor/Long term	Better maintenance and lubrication of all the agricultural equipment shall keep the noise under control.

vehicles.		Regular monitoring of noise may be carried out every year to check the efficacy of control measures.
<p>Occupational Health & Safety</p> <p>Working hours of guards.</p> <p>Fire safety management.</p>	Minor/Long term	<p>Adequate arrangements for utilities including illumination, temperature and ventilation at guard posts shall be made.</p> <p>Training about OHS aspects shall be made to all staff.</p> <p>The workers shall be provided with all of the required personal protective equipment to prevent any harm.</p> <p>Fire extinguishers, water bouser shall be made available.</p> <p>Guards shall be trained for fire fighting</p>
<p>Ecology</p> <p>The primary aim of the project is already preservation and conservation of biodiversity of the area. Therefore, there shall be no impact on biota due to operations.</p>	Minor	<p>The noise of the agricultural equipment shall be kept under control to prevent disturbance to fauna especially the birds.</p> <p>The operation staff shall be guided not to interfere with the habitat of local biota.</p> <p>The proponent shall plant trees throughout the operations.</p>
<p>Socioeconomic</p> <p>Concerns of local population</p> <p>Jobs for the locals</p>	Minor/Temporary	The operational staff hired shall be amongst the local population. They shall respect the local cultural and moral values and behave well.
<p>Traffic Flow</p> <p>There shall be a little increase in the traffic of the jeepable track area because of movement of</p>	Minor	Overall, this impact shall be insignificant.

guards.		
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Proposed Monitoring

The purpose of monitoring is to get acquainted with actual quantitative assessment of environmental aspects to verify that their values are within permissible limits as defined by Punjab Environmental Quality Standards. Therefore, in order to remain rational with the help of quantitative assessments instead of merely making assumptions about status of environmental aspects, following environmental monitoring plan has been proposed. The project establishment shall involve only few months. Therefore, during construction phase, only one time monitoring shall be sufficient:

Environmental Aspect	Parameters	Concerned Location	Frequency
Construction Phase			
Ambient Air	CO, SO _x , NO _x , O ₃ , PM	Project Site	Once
Ground Water	All parameters as described in PEQS	Water Connection at site	Once
Noise	Industrial Noise	Project Site	Once
Solid Waste	Generation Rate according to type of waste	Project Site	Fortnightly
Occupational Health & Safety	Fire, ERP, PPE's	Project Site	Daily
Operational Phase			
Solid Waste	Generation Rate according to type of waste	Solid Waste Bins	Fortnightly
Occupational Health & Safety	Fire, ERP, PPE's	Whole unit	Daily

Chapter-7: Conclusion and Recommendations

This chapter recommends for issuance of environmental approval by EPA-Punjab. Construction and operations of Dharabi Private Wildlife Reserve will be under strict environmental management controls while sticking to the requirements of the Punjab Environmental Quality Standards (PEQS) and Punjab Environmental Protection Act 1997 (Amendment 2012). Therefore, project at the proposed site will have no adverse effects on any segment of the environment or on people of the area.

Conclusion

It is concluded that the project is a need for protection of wildlife in the country. The project will be a benchmark to motivate others to contribute their part. The site has been examined with respect to the Pakistan Environmental Protection Agency guidelines and found to be in line with the criteria developed.

On the basis of the overall impact assessment, this has been concluded that environmental impacts during its construction and operational phases can be prevented with the mitigation measures included in this EIA report.

CHAPTER-1

INTRODUCTION

1.1 Project Background

Wildlife plays an important role in delivery of ecosystem services, keeping ecological integrity and balance in nature. However, many species of wildlife are under continuous threat of extinction due to rapid urbanization, pollution, climatic changes, deforestation, over-grazing, habitat degradation and utmost messy poaching. To cope with the situation, the Punjab wildlife and Parks department right from promulgation its umbrella legislation viz., “The Punjab Wildlife (Protection, Preservation, Conservation and Management Act, 1974”, is continuously striving to improve further its legislations along with introduction of various management strategies. Amongst such management strategies the community involvement in conservation is the most affective one as obvious from the stabilization of the dwindling population of Punjab Urrial in Salt Range during last decade.

The Dharabi Private Wildlife Reserve is the first privately owned protected areas in District Chakwal intended for registration under Section-12 of the Punjab Protected Areas Act, 2020 and Rule-4(a)(i) of the Private Wildlife Reserve Rules, 2023 (Annexure-IX). The main objectives of the establishment of reserve are conservation of wildlife and regulation of area for sustainable use of wildlife resources.

The Dharabi Private Wildlife Reserve covering an area of 1202K, 6M & 97Sft, is located 9-Km northeast to the Kalar Kahar City of District Chakwal, Punjab. It lies along the motorway (M-2) between Kalar Kahar/Balksar towns and approachable through a kacha Jeep-able track passing through the villages of Ratta Sharif and Dhok Morian. The eastern side of the reserve is mainly bordered with Rakh Rahna a natural forest plantations which is further bordered with River Duhrah, hence providing the natural protection to reserve at eastern limits. The Northern side is pounded naturally with the Dharabi Dam, the Western side after embankment with agricultural lands harbor well protected Motorway beat, whereas, the Southern side is still away from the populated area being encompassed with Agricultural lands of adjoining villages.

Being located at easy approach and bordered with Dharabi Dam (a tourist spot) as well as the natural forests, the reserve, therefore, does offer some low use tourism activities like picnic spot, sport fishing, walking tracks and birds watching etc. with the potential to improve it in future.

1.2 Purpose of the Report

Section-12 of the Punjab Environmental Protection Act, 1997 (Amended 2012) requires that for any development project to be commenced in Punjab, it is mandatory to obtain Environmental Approval from EPA-Punjab by filing an Initial Environmental Examination or Environmental Impact Assessment, as defined in Punjab Environmental Protection Review of IEE/EIA Regulations-2022 or recommended by EPA-Punjab. This involves impact assessment of such development on the environment. Section-12 reads as follows:

“No proponent of a project shall commence construction or operation unless he has filed with the Provincial 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 Provincial Agency approval in respect thereof.”

According to Punjab Environmental Protection Review of IEE/EIA Regulations-2022, this proposed project falls under Schedule-II which requires the proponent to submit an Environmental Impact Assessment (EIA) of the project. Therefore, Environmental Impact Assessment has been carried out to assess various environmental impacts and devise relevant mitigation measures and is being presented in the form of this EIA Report. The EIA report is being submitted to the Environmental Protection Agency (EPA)-Punjab, Lahore.

The purpose of this EIA report is to support an application for environmental approval from the EPA-Punjab. This is in compliance with many other national and international environmental laws besides PEPA 1997 (Amended 2012) for obtaining Environmental Approval (EA) before commencement of the project.

The study has been conducted according to Guidelines issued by Environmental Protection Agency-Government of Pakistan in 1997. Both primary and secondary data has been used to carry out the study. This EIA Report highlights environmental aspects and impacts of the project both during construction and its regular operation. It also provides necessary measures to be adopted to mitigate any adverse environmental impacts. It also gives information used to help decision makers i.e., EPA-Punjab, for issuing the Environmental Approval.

The proponent of the project is environmentally responsible. Therefore, considering environmental obligations in addition to technical feasibility requirements, the proponent has proceeded for environmental feasibility of the construction and operation phase of the project.

The scope of the EIA study includes environmental assessment of the project including collection of data related to physical, biological and socio-economic environment, assessment of impacts which may be caused by the project activities and mitigation measures for the abatement of potential environmental impacts.

1.3 Specific Objectives of this EIA

The EIA study is aimed at promoting environmentally sustainable developmental activities. The specific objectives of this EIA include:

- Collection and scrutiny of data related to physical, biological, and socio-economic environment of the project area before commencement of the project in order to prepare baseline environmental profile
- Identification of environmental aspects of the proposed project area
- Identification, prediction and evaluation of likely environmental impacts of the proposed project
- Quantitative evaluation of the significance of the impacts
- Assess public perceptions and ensure the participation of all stakeholders in decision making
- Evaluation of public participation/consultation and identification of vulnerable groups present in the area
- Propose mitigation measures to keep the impact of the project activities within permissible limits i.e., PEQS
- Preparation of an Environmental Management and Monitoring Plan.
- To assist the proponent in receiving the environmental approval from the agency by fulfilling requirement of EPA-Punjab for EIA.

1.4 Identification of Project

The proponent Chromatex Chemicals (Private) Limited, proposes to establish Dharabi Private Wildlife Reserve. Title of the proposed Project is "Establishment of Dharabi Private Wildlife Reserve by Chromatex Chemicals (Private) Limited" at their owned area at Dhok Morian, Rehna Sadaat, Tehsil Kallar Kahar, District Chakwal. Total project area is 1202 Kanal, 6 Marlas, 97 Sft. Total cost of the project shall be PKR 31.55 Millions.

1.5 Details of Proponent

The proponent, Chromatex Chemicals (Private) Limited are manufacturers of auxiliary chemicals for textile, paper, leather and paint industries. Management of Chromatex Chemicals (Private) Limited has empowered Mr. Ahmed Hussain Khan (the Director) to look after the all affairs of Dharabi Private Wildlife Reserve. Board Resolution attached herewith under Annexure-VIII.



Proponent Name: M/s Chromatex Chemicals (Private) Limited

Project Location: Dhok Morian, Mouza Rehna Sadaat,
Tehsil Kallar Kahar, District Chakwal

Mailing Address: 1-Km, Aitchison Colony Road, Thokar Niaz Baig, Raiwind
Road, Lahore

Phone: +92-300-9411900

Email: chromatex@live.com

1.6 Details of Consultant

SDG Consultancy Services
55-Shah Kamal Road, Street 21-A, Mujahidabad,
Mughalpura, Lahore
Phone: +92-334-9746517
Email: sdgcs_envohs@yahoo.co.uk



1.7 Project Nature, Size and Location

The proponent Chromatex Chemicals (Private) Limited proposes to establish a private wildlife reserve at their owned land comprising 1202 Kanal, 6 Marlas, 97 Sft. located at Dhok Morian, Mouza Rehna Sadaat, Tehsil Kallar Kahar, District Chakwal. Boundary coordinates of the project area are shown in Table 1.1. The project establishment shall involve fencing the boundary line of the area and three guard posts. The operations shall involve prevention of encroachment in the area and that of entry of grazing animals.

The project shall be established and operated in compliance with all applicable local, national and international legal and regulatory protocols.

Table 1.1: Boundary Coordinates of Dharabi Private Wildlife Reserve, Chakwal

Latitude	Longitude	Latitude	Longitude	Latitude	Longitude
72.67068	32.85674	72.67002	32.87185	72.67773	32.86733
72.67050	32.85775	72.66999	32.87171	72.67764	32.86724
72.67037	32.85848	72.66940	32.86955	72.67763	32.86723
72.67016	32.85968	72.66933	32.86932	72.67735	32.86689
72.67001	32.86053	72.66916	32.86867	72.67673	32.86646
72.66963	32.86261	72.66889	32.86769	72.67639	32.86629
72.66929	32.86417	72.67207	32.86847	72.67624	32.86614
72.66926	32.86429	72.67300	32.86881	72.67432	32.86552
72.66853	32.86721	72.67387	32.86912	72.67359	32.86402
72.66858	32.86773	72.67397	32.86916	72.67353	32.86385
72.66861	32.86801	72.67559	32.86974	72.67387	32.86138
72.66862	32.86809	72.67658	32.87031	72.67387	32.86135
72.66872	32.86905	72.67783	32.87137	72.67384	32.86106
72.66884	32.87016	72.67789	32.87138	72.67208	32.85971
72.66895	32.87110	72.67794	32.87139	72.67191	32.85886
72.66898	32.87150	72.67858	32.87137	72.67192	32.85847
72.66899	32.87159	72.67924	32.87201		
72.66907	32.87230	72.67764	32.87273		
72.66907	32.87230	72.67831	32.87305		
72.66908	32.87243	72.67861	32.87288		
72.66929	32.87434	72.67869	32.87282		

72.66933	32.87465	72.67905	32.87267
72.66824	32.87722	72.67913	32.87393
72.66629	32.87678	72.67992	32.87600
72.66620	32.87675	72.68023	32.87592
72.66544	32.87658	72.68084	32.87538
72.66524	32.87671	72.68073	32.87494
72.66513	32.87713	72.68068	32.87473
72.66509	32.87727	72.68041	32.87368
72.66493	32.87789	72.68028	32.87313
72.66618	32.87871	72.68024	32.87297
72.66703	32.87884	72.68007	32.87228
72.66756	32.87892	72.67999	32.87198
72.66764	32.87893	72.67820	32.86982
72.66848	32.87906	72.67798	32.86935
72.66927	32.87918	72.67795	32.86917
72.67020	32.87788	72.67834	32.86891
72.67025	32.87700	72.67879	32.86897
72.67109	32.87584	72.67949	32.86758
72.67163	32.87442	72.67949	32.86759
72.67163	32.87442	72.67918	32.86777
72.67163	32.87442	72.67860	32.86782

1.8 Extent and Scope of Study

The approach adopted for carrying out the EIA study includes review of the available secondary data, collection of primary data, analysis of collected data, establishing environmental baseline of the project related to physical, ecological & social aspects of the environment. Information relating to the physical, technical and environmental parameters has been collected from the proponent and other agencies. Local inhabitants were interviewed in detail to understand the socio-economic, culture and customs of the area. An extensive literature review was also carried out in this step.

The impacts of the project activities on the physical, ecological and socio-economical resources in the immediate surroundings of the project area during all phases of the project have been assessed and where applicable mitigation measures have been proposed. Environmental management plan has been prepared for all of the phases so that the impacts can be kept within permissible limits.

1.9 Persons Performing the EIA Study

The proponent has received consultancy services from M/s SDG Consultancy Services for carrying out environmental study and preparation of this final EIA report. The members of team who carried out EIA study are shown in Annexure-IV. Only main role of the members has been described as they mostly performed multiple tasks related with this EIA study.

1.10 Study Methodology

This Environmental Impact Assessment (EIA) has been carried out to prepare this report according to "Guidelines for the preparation and review of Environmental Reports, October 1997," approved by the Government of Pakistan. The following steps have been followed for carrying out the EIA study of the proposed project:

1.10.1 Scoping

In this step, the limits of the study have been defined. The nature of proposal and its project area has been considered for defining the limits of the study. In order to avoid wastage of resources on unnecessary investigations, the aspects of physical, biological and socioeconomic aspects, assessment of impacts which may be caused by the project activities and mitigation measures for the abatement of potential environmental impacts have been identified.

1.10.1.1 Temporal Boundaries of Environmental Assessment

Temporal boundaries of construction phase of project have been elaborated through Table 2.4. The temporal boundaries for the environmental effects, assessment of traditional land and resource use are defined through following phases. Phase wise time schedule of the project has been elaborated in Table 2.2.

1.10.1.1.1 Preliminary Phase

During this phase, after land acquisition, contouring studies, soil investigations are carried out. Then project designs are finalized. This phase is currently under process. Land has been acquired.

1.10.1.1.2 Start-up Phase

The project construction from ground breaking shall be started. Subsequently proper civil work shall be carried out. Basic infrastructure shall be established.

1.10.1.1.3 Wrap-up Phase

The project construction activities shall be finalized. Finishing activities shall be carried out. This shall be followed by establishment of basic infrastructures such as water supply system, electrical supply etc.

1.10.1.1.4 Commissioning Phase

After completion of all construction and other related activities, the project shall be handed over to proponent for desired use.

1.10.1.1.5 Operation Phase

The operation begins when actual objectives of the project are materialized.

1.10.1.2 Spatial Boundaries of Environmental Assessment

The construction phase shall have potential to cause impacts mostly within boundaries of project area. These impacts shall be insignificant. The spatial boundaries of the operation phase of the project shall not be having any negative impact outside the boundaries of project plot. Instead, this shall impart good impact on overall environment of the area. Still the study has been composed of area outside of Dharabi especially adjoining small villages within radius of about 5 Kilometers of the boundaries of Dharabi Private Wildlife Reserve.

1.10.2 Data Collection

It involves the collection of primary as well as secondary data in order to prepare the baseline profile of the project area. Various departments have been visited to collect relevant data. These include Wildlife & Forestry Department, Geological Survey of Pakistan, Pakistan Meteorological Department, Land Revenue Department, Punjab Land Records Department, District Chakwal Office of Environment and many others. The data for all phases of the project has been obtained through literature review and also from the proponent. The sources of literature review included web published data as well as various books. Teachers from College of Earth & Environmental Sciences as well as Institute of Geology of University of the Punjab, Lahore have also been consulted.

1.10.2.1 Important Issues Raised during Public Consultation

Detailed group discussion was carried out with various classes of people living in the surrounding areas. During the discussion, the relevant responses, opinions were recorded. They were asked about the information of the project. Their perception and expectations about the project were asked.

1.10.2.2 Interviews

Local residents were interviewed. A semi-structured interview was used as a tool for data collection. Personal observations were also included in the methodology in order to collect relevant information about village and people of the community. They were asked about the project and their stakes relevant to it.

1.10.2.3 Primary Data

Quantitative data for baseline of ambient air, ground water and noise has been obtained through real-time monitoring of their samples by EPA-Punjab certified environmental laboratory in the presence of EPA-Punjab authorized officials.

1.10.2.4 Secondary Data

Secondary data was also used to collect important information regarding village, the people and the project. For this purpose, data provided by the

project proponent and published data from other relevant sources were used. The previous reports prepared by other environmental consultants have also been consulted. Data published by Pakistan Bureau of Statistics has also been used.

1.10.3 Determination of Significant Impacts

The environmental items from Aldo Leopold matrix have been selected for assessing the impacts of the project on the environmental resources during pre-construction, construction and operational phases of the project qualitatively. This assessment was based on professional judgment.

1.10.4 Mitigations Proposed

A range of cost-effective mitigation measures keeping in view of best available environmental options and best available techniques not entailing to environmental cost, have been proposed where applicable. All the approaches have been considered in order to meet Punjab Environmental quality standards.

1.10.5 Environmental Management Plan

Environmental management plan has been prepared to manage the environmental impacts during all phases of the project to ensure that impacts of the project remain within permissible limits of Punjab Environmental Quality standards.

In EMP, roles and responsibilities have been defined. Required resources have been defined and their cost have been assessed and defined.

CHAPTER-2

DESCRIPTION OF THE PROJECT

This chapter describes the specifications of the proposed project i.e. type and category of the project, project objectives, project alternatives and reasons for their rejection, project location, project site layout, land use on the site and surroundings, topographic and vegetation features of the site, cost and magnitude of the project, activities involved in construction and operation, processes and materials involved in project, project implementation schedule, details of restoration and rehabilitation plans at the end of project life and government approvals.

2.1 Screening

Punjab Environmental Protection Review of IEE and EIA Regulations 2022 classify the projects under two schedules called Schedule-I and Schedule-II. Regulation 3 thereof reads that a proponent of a project falling in any category specified in Schedule I shall file an IEE with the Provincial Agency, and the provisions of section 12 shall apply to such project whereas Regulation 4 reads that a proponent of a project falling in any category specified in Schedule II shall file an EIA with the Provincial Agency, and the provisions of section 12 shall apply to such project.

The proposed project involves establishment of a private wildlife reserve. According to the contents of these regulations, the proposed project falls under Schedule-II, Category I i.e. All projects situated in sensitive areas.

The Punjab Wildlife Department under the Punjab Protected Areas Act, 2020 has recommended use of Dharabi Private Wildlife Reserve for ecotourism (although this has not been the actual objective of the proponent so far). In case of such use, the project falls under Schedule-II, Category J-2 i.e. large scale tourism development projects. In both cases, the project requires an EIA.

2.2 Objective of the Project

In close consistency with the Section-3(2) of the "Punjab Protected Areas Act, 2020" the objectives of DPWR are to:

- Protect biological diversity, its natural landscapes and waterscapes;
- Preserve ecological integrity and conserve biodiversity;
- Protect ecosystem, habitats and species naturally occurring there;
- Protect threatened or rare species if occurring or occupy the habitat after extensive protection measures;
- Ensure sustainable use of natural and biological resources;
- Create or augment destinations for nature-based tourism;

- Rehabilitation and restoration of degraded ecosystems and promotion of endangered and vulnerable species recovery;
- Promote Research and biological diversity conservation;
- Promotion of sustainable sport hunting of surplus wild birds species as permissible under the rules
- Manage the interrelationship between natural environmental biodiversity, human settlement and economic development

2.2.1 Vision

To be renowned leader in the conservation world particularly of Punjab, Pakistan in the field of biodiversity and game management by private sector.

2.2.2 Mission Statement

“Preserve Ecological integrity, conserve biodiversity and ensure sustainable use of natural and biological resources for the benefit of present and future generations

2.2.3 Core Values

Passion: Will be passionate in what we do to achieve our strategic goals.

Respect: We shall perform our duties in professional and ethical manners.

Trust: We shall act transparently with integrity and honesty in all we do.

Innovation: We shall embrace a culture of learning, adaptation and creativity at all times.

Excellence: We shall strive to apply best practices to achieve the highest quality of standard all the times

2.2.4 Strategic Outcomes

- Preservation of ecological integrity and conservation of Biodiversity
- Rehabilitation and restoration of degraded / prone to degradation ecosystems and promotion of the recovery of endangered and vulnerable species.
- Environmental assets and natural resources that are well protected and continually enhanced.
- To be an efficient, effective and complaint conservation organization with good governance.
- To effectively promote the mandate of organization to stakeholders
- Sustainable use of natural resources will be ensured

2.3 Alternatives

2.3.1 No Project Alternative

One of the alternatives may be not to establish this project. In that case, the encroachers can get into the area and may cause harm to hatched eggs of the birds. Moreover, they may allow their animals to overgraze. Both of these

activities may lead to disadvantage to flora and fauna. Therefore, fencing of the area has been proposed. Government also encourages the protection of the wildlife of the area.

2.3.2 Economic Alternatives

2.3.2.1 Economic Alternative-1

One of the alternatives, which was considered was to use the land commercially for tourism. The proponent has sufficient funds to bear the expenses of the establishment and operations of private wildlife reserve and also have personal keen interest in wildlife protection. Therefore, the proponent has avoided the use of the project area for commercial tourism.

2.3.2.2 Economic Alternative-2

Other economic alternative which was considered, was to allow conventional kind of tourism. As evident from other parts of Pakistan, such kind of tourism does not sustain longer and causes various kinds of environmental impacts. Therefore, this alternative was rejected.

2.3.2.3 Economic Alternative-3

Keeping in view the environmental importance of the wilderness of the area, alternative of proposal of ecotourism has been opted. Although ecotourism has not been aimed by the proponent yet in future this can be considered in order to sustain the reserve. Presently, the proponent does not have any plans to immediately launch any such activity to generate revenue from the project.

2.3.3 Construction Design Alternatives

The construction alternatives included masonry wall along boundary of the project area. Another alternative considered was RCC wall. Both of these options can lead to make a barrier in the development of flora and fauna in the area. Therefore, the proponent has chosen to install galvanized wire mesh fencing along boundary of the reserve.

For guard posts, the proponent could make RCC structure. But the proponent has decided to utilize waste wooden pallets from their chemicals manufacturing unit to make roof of the guard huts. This wooden roof shall be supported by masonry wall.

2.3.4 Technology Alternatives and Selection Criteria

The technology and equipment proposed for operating wildlife reserve shall be updated and state of the art. Sprinkler system shall be installed for irrigation. This shall be environment friendly and energy efficient. Water shall not be wasted.

Solar system shall be used to meet electricity requirements.

2.3.5 Site Alternatives

There was no alternative site available to be considered. Reasons described below justify the selection of Dharabi at Dhoke Morian as option for the proponent for establishment of the wildlife reserve:

2.3.5.1 Site Selection Criteria

Dharabi Wildlife Private Reserve project area is a naturally wild area providing habitat to a large variety of the flora and fauna. Therefore, the project at the present site is well justified. These factors taken into consideration while selecting site for the project have been summarized below:

i) Natural Values

- An area of unique natural beauty and a relatively untransformed landscape.
- Contribute to protection of important vegetation types, habitat and species.
- Provide protection for threatened and endangered species of plants and animals and their habitats occurring in the reserve area.
- Provides important ecosystem services (Resources, water, soil etc.).
- Biodiversity Hot Spot.
- Organic Agriculture farming in the area to avoid loss to biodiversity due to extensive use of pesticides / fertilizers in conventional practices

ii) Heritage Values

- Protection of Ecologically important natural site.
- Protect important living heritage including spiritual and ritual values for the local community including cultural tradition, oral history and rituals as well as indigenous knowledge and cultural landscapes.
- Eco-tourism site

iii) Socio- economic Values

- Contribute to the local economy through community incentives, regular as well as seasonal job opportunities etc.
- Low scale tourism with the potential to increase.
- Increased Environmental and cultural awareness.
- Protected Area Expansion with economic benefits.
- Development of self sustainable conservation zone with sport hunting opportunities

iv) Basic Infrastructure

The project site is linked with the other parts of the country through a network of roads. This is just near to Lahore-Islamabad motorway M2.

v) Land Price

The price of the land is remarkably cheaper. This factor motivates the proponent.

vi) Environment

The surrounding environmental conditions are congenial for the project. The area offers a good habitat for flora and fauna. Thus birds can be allowed to hatch their next generations.

vii) Utilities

All utilities such as electricity, water, telecommunication including telephone and internet are conveniently available at the project site. For operations, water shall be needed for irrigation of planted trees. This shall also be needed for and drinking, cooking and sanitation purposes. This need of water can be met with borehole ground water.

viii) Area Profile

Kallar Kahar is already a tourist destination. Kallar Kahar is visited by many hunters. Wilderness can still be found here.

ix) Site Availability

The proponent purchased this 1202 Kanal, 6 Marla and 97 Sft. Area. and is administered by TMA, Kallar Kahar who have allowed for this project.

x) Site Access

The project area is accessible through a jeepable track linked with Lahore-Islamabad Motorway M2. This can also be accessed through Bhaun.

Of all the alternatives examined on basis of above required criteria, the present option merited on all others for project. Accordingly, the present site was selected and purchased.

2.3.6 Environmental Alternatives

The proponent could just operate the reserve without fencing. This could have led to negative exploitation by encroachers. The proponent also has opted for making nests for facilitating hatching of migratory birds. Extensive and systematic tree plantation shall be ensured throughout the year.

2.4 Location and Site Layout of the Project

The proposed project area is located near Dhoke Morian, Mouza Rehna Sadaat, Tehsil Kallar Kahar, District Chakwal. The coordinates are shown in

Table 1.1. Google map and site layout is annexed as Annexure-VI. Site layout is irrelevant as extensive construction is not involved.

2.5 Land Use on the Site

With regard to specifications, the land area of DPWR constitutes the typical land form of the Salt Range i.e. mountainous zone comprised on sand stone. The soil type is red marl and sandy red marl based on the adjacent habitats of the reserve. The land closer to natural mountainous area, agricultural lands and forest lands is comprised mainly on mixed type, whereas, that of in premises to Dharabi dam area or other water bodies is mainly composed of sandy soils along with small proportions of loamy soil. Out of total area of land proposed for the reserve, 08% comprised on the agricultural area, 82% as natural landscape including water bodies, whereas, about 10% comprised on natural cum man-made plantation of olive trees. However, overall the land area proposed for the reserve is perfectly suitable for the purpose. Furthermore, the agricultural practices inside the reserve are observed purely in organic farm and such practices will also be regularized in the premises of reserve in order to ensure minimum hazards for biodiversity. The only conflicting problem is the livestock of adjoining areas grazing within the reserve.

2.6 Road Access

The project area is accessible through Lahore-Islamabad Motorway M2 and also through Bhaun. This is further accessible through a jeepable track connected with motorway link road.

2.7 Vegetation Features of the Site

The habitat type of the reserve is representative of typical dry sub-tropical semi-evergreen scrub forest with some broad leaved trees, shrubs and a basal grass cover.

2.8 Cost and Magnitude of Operation

The estimated capital cost of the project shall be PKR 31.55 Million comprising construction cost (1.5 Million), land cost (30.05 millions) and machinery cost (4 millions).

The project construction phase shall involve fencing of boundary and establishment of 3 guard posts. The operations shall involve tree plantation, hatching of eggs of migratory birds and controlled grazing.

2.9 Schedule of Implementation

The estimated period required for the implementation of project is 3 months. The implementation schedule is given in Table 2.1. This schedule also serves to describe the temporal boundaries of the construction phase of the project.

Table 2.1: Implementation Schedule

Project Phases	Details	Expected Completion
Preliminary Phase	The land for project is acquired.	Already purchased
Start-up Phase	Start-up of construction.	Immediately after approval.
Wrap-up Phase	Completion of Construction Phase	2 Months
Commissioning	Commissioning	0.5 Month
Operation phase	Start up	0.5 Month

2.10 Description of the Project

2.10.1 Pre-Construction Phase

The following activities will form part of the pre-construction stage:

- Conducting necessary feasibility studies including the cost benefit analysis and the expected internal rate of return.
- Preparation of the project documents and the cost estimates.
- Conducting investigative studies such as geo-technical studies, environmental impact assessment, and economic feasibility studies.
- Obtaining registrations, approvals, and NOCs from different departments of the Government.
- Selecting the appropriate and the best suited machinery and equipment for fast track implementation of the project and completion of construction within the scheduled timeframe.
- Signing the contracts for construction, procurements, installations, and implementation of the project facilities.

2.10.2 Construction Phase

The main sequence shall be fencing of boundary line of the project. Check posts shall be made at three different locations along boundary wall of the project area. The project construction cost shall be PKR 1.5 Million. Locations of check posts are:

Check Post No. 1 (North)

N 32.876221 E 72.679062

Check Post+Staff Residence comprising 2 rooms and toilet (Size 10'X12')

Check Post No. 2 (South)

N 32.856498 E 72.670771

Single room Check Post and toilet (Size 8'X8')

Check Post No. 3 (West)

N 32.867071 E 72.668510

Single room Check Post and toilet (Size 8'X8')

2.10.2.1 Temporal Boundaries of Construction Phase

The project construction shall be completed in about 2 months.

2.10.2.2 Workforce Required

During construction phase of the project 08 persons will be required that will include site engineer, masons and labors.

2.10.2.3 Power Supply

Electricity shall not be required during construction phase. The main source of power will be from IESCO, WAPDA.

2.10.2.4 Water Supply and Water Balance

Water shall only be required for construction of 03 check posts. This need shall be met with borehole. 10% of the total needed water shall be consumed for sanitation purposes.

2.10.3 Operation Phase

The operations shall involve only hunting during hunting period of 01 October to 15 February every year. Rest of the year, efforts shall be made to promote the hatching of the eggs of birds in order to conserve the number of hunted birds. Nests and other kinds of hatcheries shall be made to allow the birds to use the as their habitat.

In addition to promoting the birds; species, a 25 feet deep natural water reservoir covering an area of 04 Acre named as Khan Dam by the proponent shall be used for growing various species of fish especially Rahu. 3000 fish have already been put in this lake to develop and reproduce.

Furthermore, tree plantation shall be continued throughout the year. Indigenous species shall be planted in order to increase tree cover in the area. This shall also be done to provide congenial habitat to local and migratory birds. Besides other trees, Olive and red-blooded citrus fruits shall be extensively planted.

2.10.3.1 Machinery Details

Following machinery shall be required for tree plantation. The machinery shall cost PKR 4 Million:

- 01 Chisel Plough

- 02 Tractor
- 01 Rotavator
- 01 Normal Plough
- 01 Trolley
- 02 Earth Auger
- 02 Tree Planting Drills

2.10.3.2 Water Requirement and Water Balance

Water shall only be required for sanitation at 03 check posts. This need shall be met with borehole.

2.10.3.3 Electricity Requirement

Electricity shall not be required during operation phase. The main source of power will be solar panels.

2.10.3.4 Man Power Involved in the Operation

The Dharabi Private Reserve will be managed administratively by M/S Chromatex Chemicals (Pvt.) Limited (“The Management Authority”) through its CEO (among Board of Directors of the Company) assisted by the additional staff as set out through organizational structure in Figure 2.1. The figure represents the staff complement and positions that are required to enable the effective operation, management and protection of Dharabi Private Wildlife Reserve.

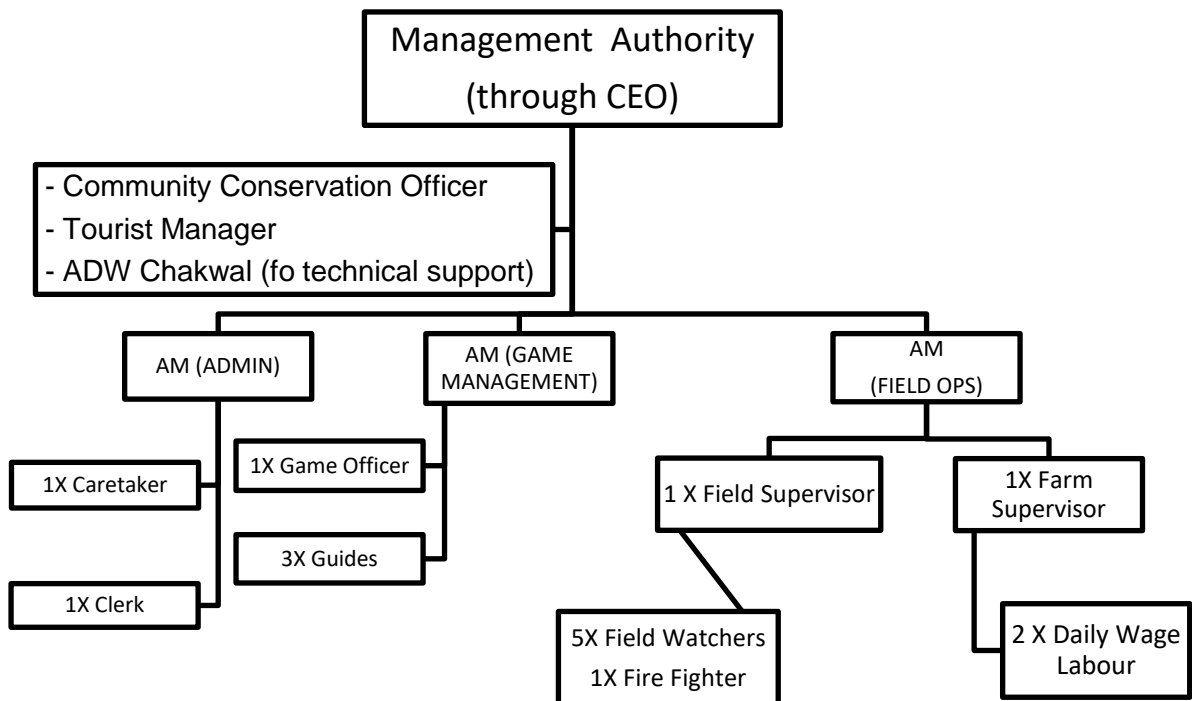


Figure 2.1: Organizational Hierarchy of Dharabi Private Wildlife Reserve

The Registration certificate of M/S Chromatex Chemicals (Pvt.) Limited (“the Management Authority”) as company is appended as Annexure-VIII, whereas, the proceedings of “Board Resolution” whereby Mr. Ahmad Hussain Khan S/O Muhammad Anwar Khan, CNIC # 35202-3864413-9, amongst the Directors of Company has been authorized to manage the Reserve on behalf of Company (as Chief Executive Officer) is appended as Annexure-VIII.

The staff, if additionally required for any imminent arrangements (i.e. hiring of staff during fire season etc.) will be hired out of contingent budget reserved in the financial plan and preferably hired from local community.

2.11 Restoration and Rehabilitation Plans

The project site is situated inside environmentally sensitive areas which may need rehabilitation. Rehabilitation and restoration of degraded ecosystems and promotion of endangered and vulnerable species recovery shall be aimed.

Punjab wildlife and Parks department as per its mandate, is striving to achieve the endeavors of protection, preservation, conservations and management of wildlife resources across the Province of Punjab. Wildlife plays an important role in delivery of ecosystem services, keeping ecological integrity and balance in nature. However, many species of wildlife are under continuous threat of extinction due to rapid urbanization, pollution, climatic changes, deforestation, over-grazing, habitat degradation and utmost messy poaching. To cope with the situation, the Department right from promulgation its umbrella legislation viz., “The Punjab Wildlife (Protection, Preservation, Conservation and Management Act, 1974”, is continuously striving to improve further its legislations along with introduction of various management strategies. Amongst such management strategies the community involvement in conservation is the most affective one as obvious from the stabilization of the dwindling population of Punjab Urial in Salt Range during last decade.

The Punjab Protected Areas Act, 2020 (Annexure-IX) developed in order to further improve the legislative regime and in compliance of the Strategic Plan for Biodiversity 2011-2020 under Convention on Biological Diversity (CBD) including Aichi Targets, is amongst the one concrete step towards achievement of the department mandate. The promulgation of Act *ibid* is specifically focuses on Strategic Goal-D of the said Strategic Plan viz., “*Enhance the benefits to all from biodiversity and ecosystem services envisages on full and effective participation of indigenous and local communities at all levels*”. For practical implications of the community involvement in conservation, the framing of rules under the Act were imminently needed which has been met through notifying “The Punjab Protected Areas Rules, 2022” (Annexure-IX), “The Community Based Conservancy Rules, 2023 and “The Private Wildlife Reserve Rules, 2023 (Annexure-IX). Provisions for different modes of community involvement i.e. through registration of community based conservancies and private wildlife reserves etc. have been included under the aforesaid rules to achieve the

goal of sustainable ecosystem & wildlife management and their conservation/preservation.

The primary legislation guiding the management of protected areas declared in the Punjab Province is the “Punjab Protected Areas Act, 2020 (XXIII of 2020)”. For effective implementation of the Act, the Punjab Wildlife & Parks Department has further formulated relevant “Rules” as per provisions of the Section-32 of the Act *ibid*. The rules guiding the management of such protected areas are the “Punjab Protected Areas Rules, 2022 and more specifically the “Private Wildlife Reserve Rules, 2023.

The act establishes the legal basis for the creation and administration of protected areas in Punjab Province, as its objectives includes provisions “*for the protection of ecosystem, habitats and species naturally occurring there*”. Similarly, the said objectives further stated to “*ensure sustainable use of natural and biological reserves*”. Together with the relevant rules envisaged above, the Act sets out the mechanisms for the declaration of protected areas and the requirements for their management. Relevant legislations are provided at Annexure-IX. The Management Authorities (MA) are required to familiarize themselves with the purposes and contents of the regulations/statutes and their subsequent amendments as well.

2.12 Government Approvals Required for the Project

For the management of a private owned Protected Area i.e. the Dharabi Private Wildlife Reserve, its Management Authority must get it familiarize with the provisions of the Act under Sections-12, 14, 17, 18 & 23, the provisions under Rules, 5, 6, 7 & 12 of the Punjab Protected Areas Rules, 2023 and Rules-3, 4, 6, 8 & 9 of the Private Wildlife Reserve Rules.

Rule-3 of the “Private Wildlife Reserve Rules, 2023” provides for specifications of land and requirement of Management Plan as well as Management Agreement for registration/operations of the protected area. Similarly, the “Punjab Protected Areas Rules, 2023” through rule-6 provides guidelines for preparation of Protected Areas Management Plan. Hence the primary planning approach is the guidelines for management of protected areas as envisaged under the Punjab Protected Areas Act, 2020 and Rules framed there-under.

In order to execute the management plan of the project, Environmental Approval from the EPA-Punjab, Lahore is the major requirement. For seeking approval from Environmental Protection Agency-Punjab, this Environmental Impact Assessment Report is being submitted. Subject to this approval, permission from Punjab Wildlife and Parks Department (PWPD) shall be granted. They have provisionally approved the project subject to Environmental Approval from the EPA-Punjab (Annexure-VIII).

CHAPTER-3

DESCRIPTION OF THE ENVIRONMENT

3.1 General

This chapter describes the existing environmental baseline conditions in the proposed project area. An environmental baseline study is intended to establish a database against which potential project impacts can be predicted and managed later. The existing environmental conditions around the proposed project have been considered with respect to physical, biological and socio-economic aspects. For this purpose, only those environmental items from Aldo Leopold's master checklist of environmental items have been considered which pertain to this project. Mitigation measures have been proposed in next chapter according to these physical, biological and socio-economic aspects defined in environmental baseline. The described information has been collected from foot survey, public consultation, literature, previous studies about project area, knowledge with the proponent and the concerned government departments. Real-time monitoring of samples of ambient air, noise and ground water has also been carried to know the baseline conditions.

3.2 Baseline Physical Environment

3.2.1 Topography

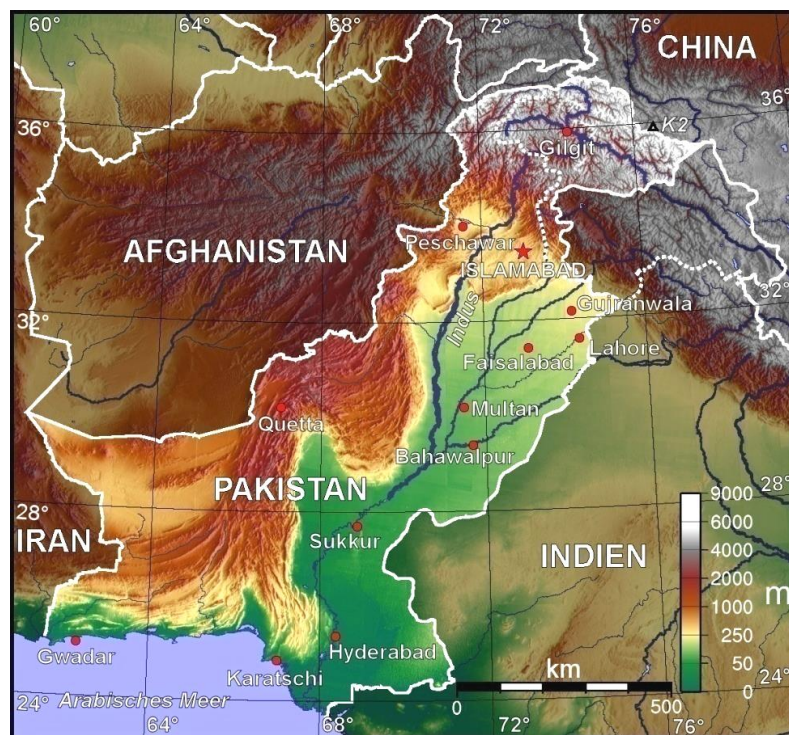


Figure 3.1: Topography of the Project Area

The topography of the project area is bad. The topography of the Dharabi Private Wildlife Reserve has established as a result of the underlying geology which through various weathering processes driven primarily by climate has exposed the diverse, ever changing landscapes. The reserve portion also consists of the Sandstone with the characteristic higher lying plateau and capping typically representing the Permian Salt Range Strata of Nilawan Group. Where the sandstone has eroded, the rocks incorporate the underlying more easily erodible tillite deposits, which have formed the steep slopes leading into the valley bottoms. This natural eroding process has resulted in the rugged nature of the landscape within the DPWR. The topography of the reserve area has been shown in the Figure 3.2.

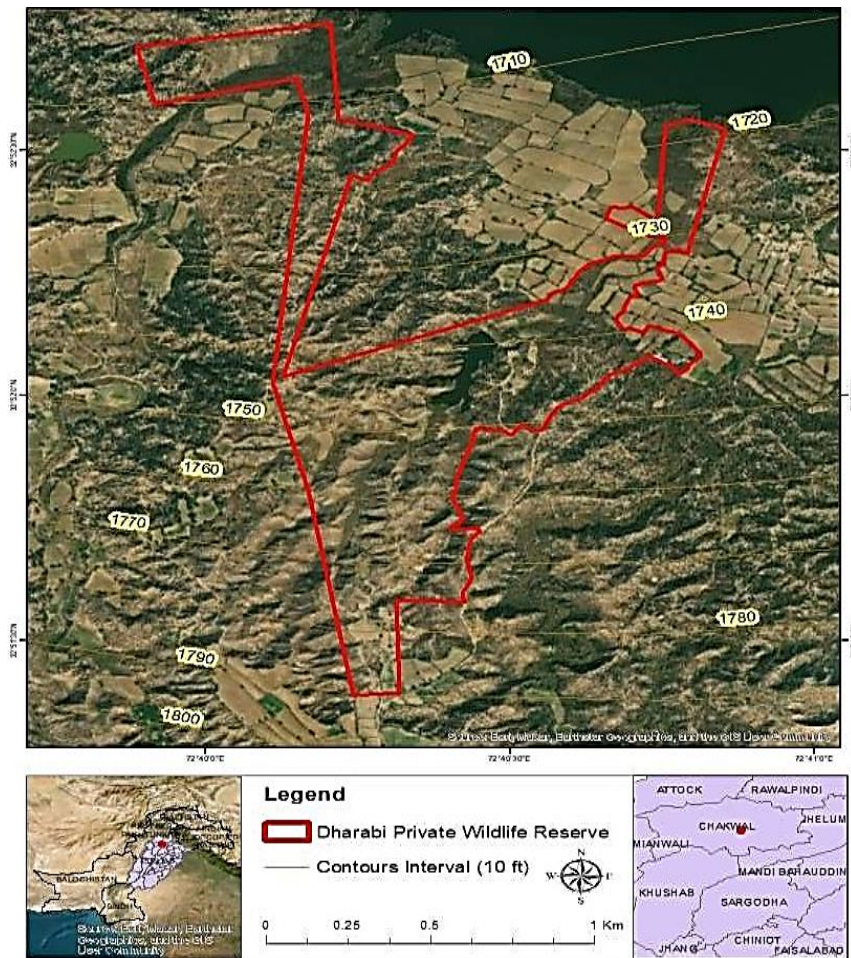


Figure 3.2: Topography of DPWR

3.2.2 Geography

The eastern side of the reserve is mainly bordered with Rakh Rahna, the natural forest plantations which is further bordered with River Duhrab, hence providing the natural protection to reserve at eastern limits. The northern side is pounded naturally with the Dharabi Dam, the western side after embankment with agricultural lands harbor well protected Motorway beat, whereas, the

southern side is still away from the populated area being encompassed with agricultural land of adjoining villages. The geographical representation of the District Chakwal is as follows:

- Located in the Pothohar Plateau of Punjab, Pakistan
- Total area of Chakwal is 1,864,934 acres
- Elevation of Chakwal is 498 m above sea level
- Chakwal District is bordered by Khushab to its south, Rawalpindi to its northeast, Jhelum to its east, Mianwali to its west and Attock to its northwest
- It is located 90 km southeast of the federal capital, Islamabad and 270 km from the provincial capital, Lahore
- The southern portion runs up into the Salt Range and includes the Chail Peak, 3,701 feet (1,128 m) above the sea, the highest point in the district. Between this and the Sohan river which follows more or less the northern boundary, the country consists of what was once a fairly level plain, sloping down from 2,000 feet (610 m) at the foot of the hills to 1,400 feet (430 m) in the neighborhood of the Sohan; the surface is now much cut up by ravines and is very difficult to travel over.

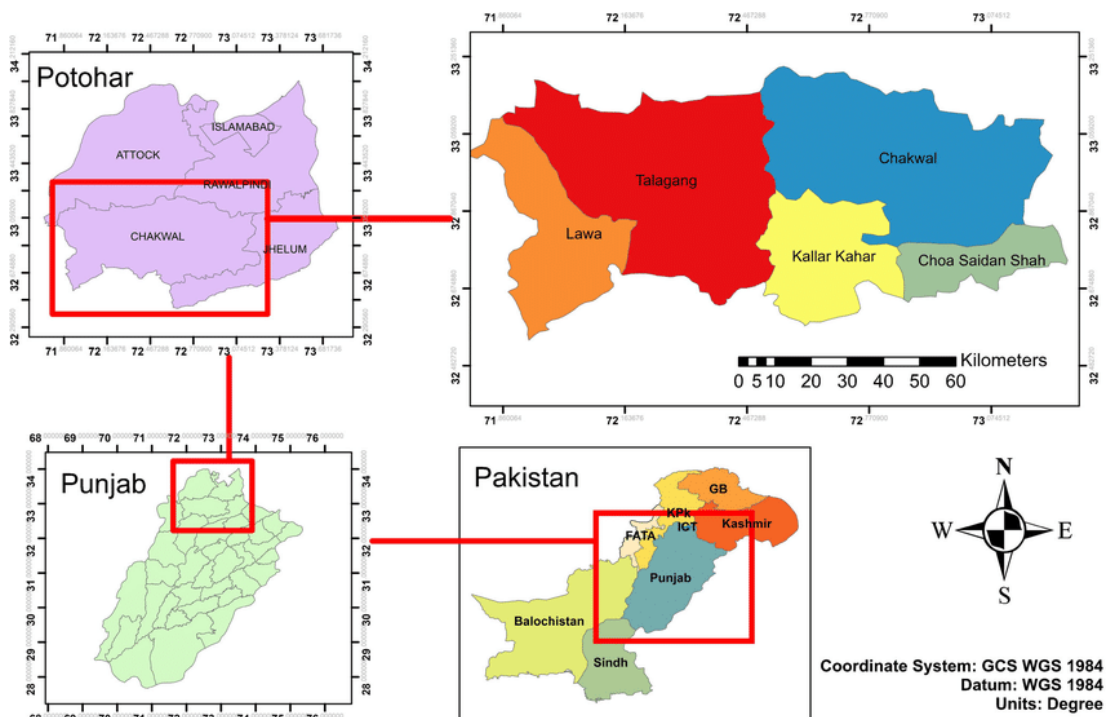


Figure 3.3: Chakwal in Punjab Province

3.2.3 Regional Geological Conditions

The project area has geological conditions associated with siwalik group. The Siwalik group is a range of southern Himalayan mountains extending from southwest Kashmir through India into southern Nepal. The extensive fossil remains are found in widely separated areas along the foothills of Himalayas.

The Siwaliks in Himalayan foreland form a continuous belt ranging from Pakistan to Eastern India. It has an average elevation of 1000 m and width of 20 km. It is associated to the most active thrust across Himalayas, which is the main frontal thrust. The name Siwalik was introduced by Medlicott (1864) for the sub-himalayan rocks. This term derived from the Siwalik Hills in Deharadun, India. The term is commonly used for the Neogene sediments found in foothills of Himalayas. The most fossiliferous layers of the Siwaliks found in Pakistan are in Potwar Plateau. Here, it is composed of Dhok Pathan, Nagri and Chinji Formations.

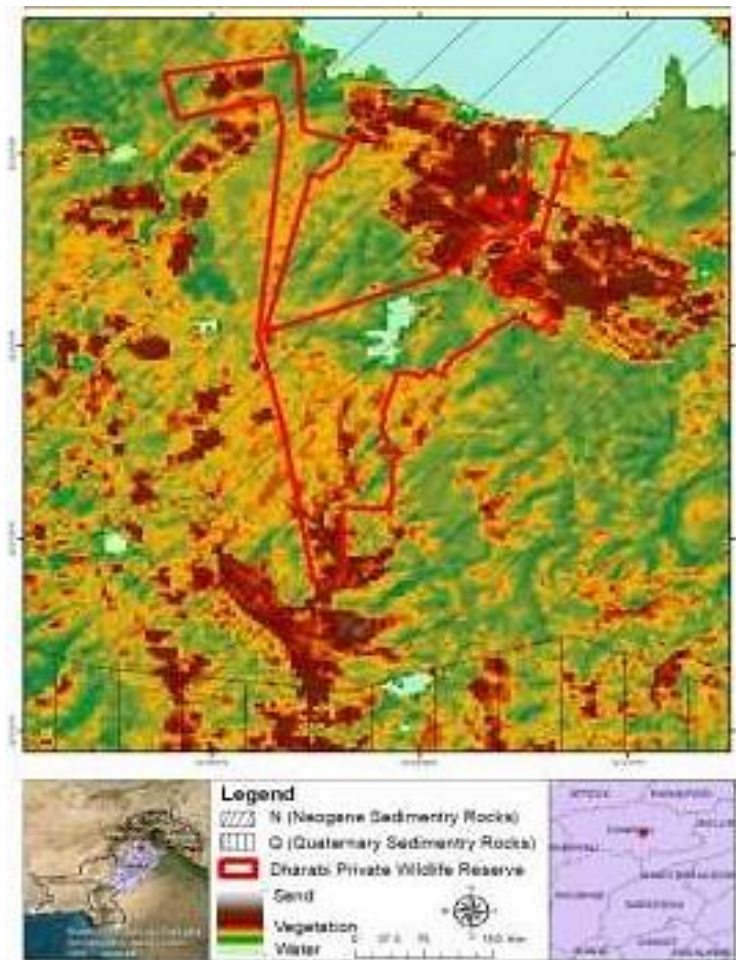


Figure 3.4: Geology and Soils of the reserve area

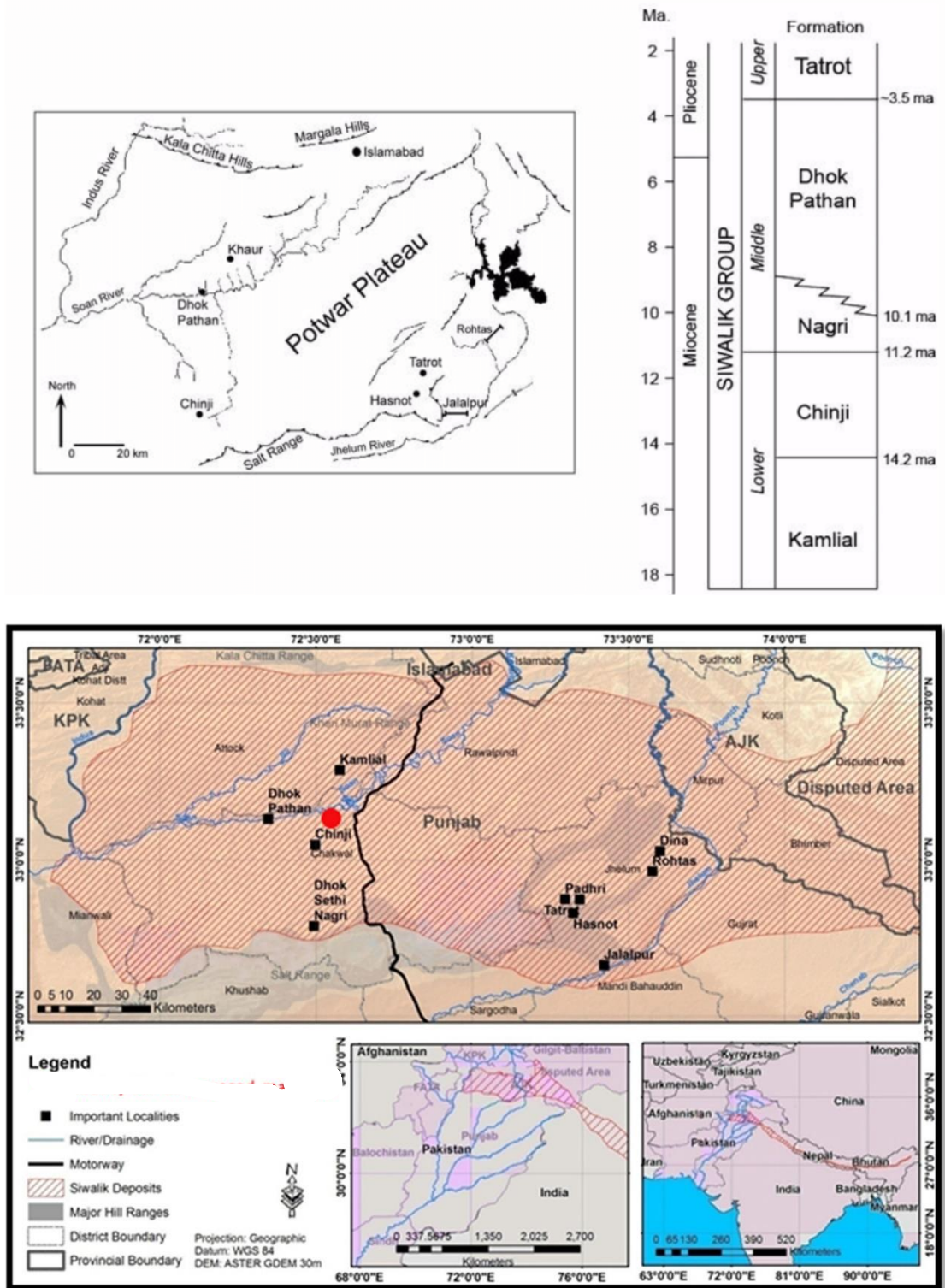


Figure 3.5: Geological Maps of the Project Area

The Nagri Formation consists of sandstone with secondary shale and conglomerate beds. The sandstone is grayish to greenish gray, fine to medium-grained, coarse-grained texture observed in lower part. The sandstone is cross-

bedded, thick bedded to massive. Occasionally the sandstone is bluish to reddish gray, calcareous and weakly cemented. The shale observed unevenly proportioned from section to section is sandy or silty, dark brown or reddish brown and light orange. The percentage of conglomerates has extremely diverse in thickness and composition in different areas. The conglomerate beds composed of particles of hard rocks and Eocene sedimentary rocks particularly of limestone

The Chinji Formation is a characteristic phase of about 2,300 feet of bright red clays, carrying beds of what Pilgrim has termed "pseudo-conglomerates." This zone contains the typical Lower Siwalik fauna. Originally recognized two divisions of the Chinji are named a lower and an upper division. Later work would seem to show that the fossils range pretty well throughout the thickness of the Chinji deposits, and that the upper and lower horizons really represent levels of unusual abundance of fossils, rather than zones of faunal differences. An unconformity, the only definite break in the Siwalik series, separates the Chinji from the lowest of the Siwalik zones. The age of formation is considered to be Late Miocene. At the type locality, near the Chinji village, the lower contact of the Chinji Formation with the Kamli Formation is gradational, while the upper contact is conformable with the Nagri Formation.

3.2.4 Soil

Like other areas of the Salt Range and being comprised of the rocky terrain, though minimum owing to much preserved vegetation cover, the erosion rates are still considerable. The situation lead to exposing the bare sheet rocks devoid of any soil layers. The major components of rocks are limestone and sandstone individually or both. Due to similar reasons of erosion at more steep rocks, infertile red marl soil is exposed, the characteristics red colour of the soil of the area coupled with chemical weathering effect viz., "terarosa", represents the phenomenon of dominancy of red colour in soil. The presence of "lappies" within the highlands of the reserve further strengthens this major characteristic of the soil. The soils are rich in basic rock salt but poor in Nitrogenous matter. Whereas, like other areas of the salt range the area though have minerals e.g. salt, coal, lime, different kinds of clay and gypsum in rocks but not so rich as occurring in higher plateau. However, the soil in cultivated area of the reserve composed of high contents of sand and lower of red marl soil letting the portion fairly suitable for agriculture. The soils near the water bodies are more in sand contents.

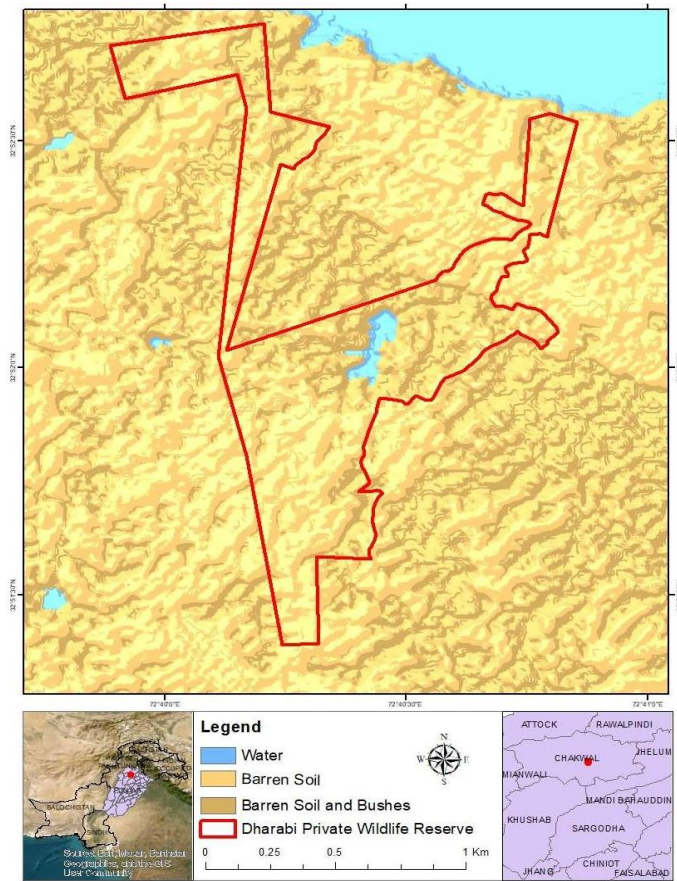


Figure 3.6: Soil map of Dharabi Wildlife Private Reserve

3.2.5 Climate

The climate of the area is considered to be a local steppe climate. Dust storms occur occasionally during summer season relieving temporarily the intensity of heat. Monsoon spells start from the end of June. The summer season starts from the month of April and continues till October. May and June are the hottest months with day temperature usually ranging from 40°C to 45°C. The winter season begins from the month of November and continues till March. January is the coldest month with a minimum temperature of 1°C.

In the area falling within the DPWR, the summers are sweltering, humid, and clear and the winters are short, cold, dry, and mostly clear. Over the course of the year, the temperature typically varies from 35°F to 99°F and is rarely below 30°F or above 106°F.

The hot season lasts for 3.1 months, from May 1 to August 6, with an average daily high temperature above 91°F. The hottest month of the year is June, with an average high of 99°F and low of 75°F. Whereas, the cool season lasts for 2.8 months, from December 3 to February 26, with an average daily high temperature below 68°F. The coldest month of the year is January, with an average low of 35°F and high of 61°F.

3.2.6 Seismicity

According to the building code of Pakistan, the area is located in the seismic zone 2B of Pakistan. Zone 2B represents peak ground acceleration (PGA) from 0.16 to 0.24g.

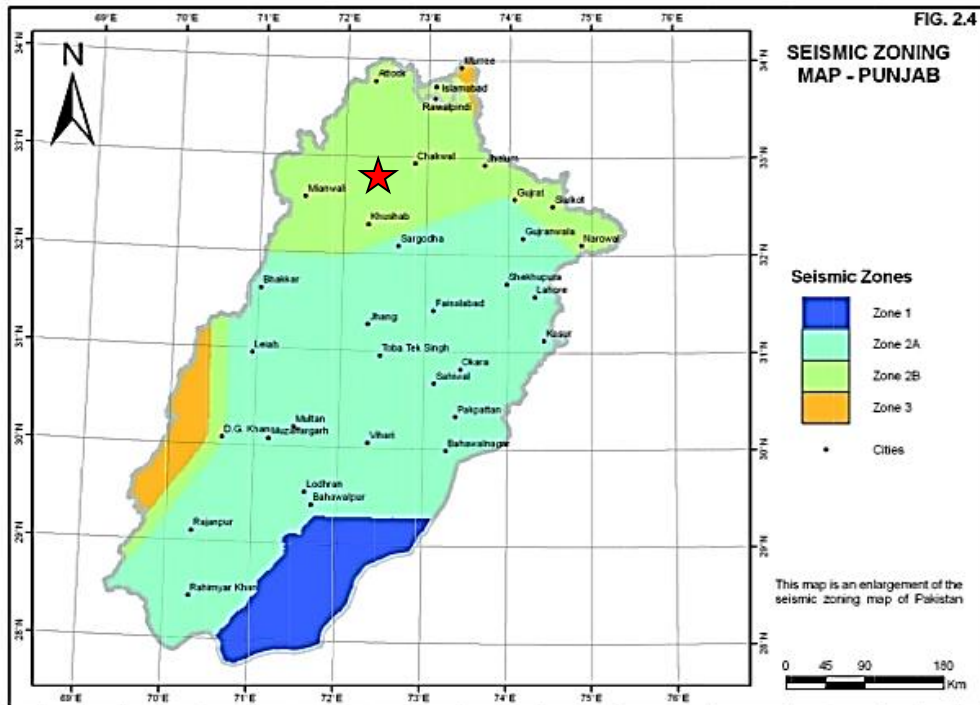


Figure 3.7: Seismic Zoning of Punjab

3.2.7 Water Resources

The reserve area is representative of the arid characteristics of the region. However, the reserve area is not only enriched with surrounding water bodies i.e. River Dhurab and Dharabi Dam but there is also a small dam inside it, developed by the management of reserve. The said private dam named as Khan Dam is ample to meet the requirement of water in reserve area.

3.2.7.1 Site Area Water Supply

Specifically, for Dharabi Private Wildlife Reserve area, the ground water shall be drawn with borehole for drinking as well as irrigation purposes. The quality of ground water has been tested through EPA-Punjab certified environmental laboratory validated by EPA-Punjab officials. According to the data (annexed under Annexure-VII), all the parameters of water are within ranges as provided by Punjab Environmental Quality Standards.



Figure 3.8: Hydrology of the project area



Figure 3.9: Khan Dam inside Dharabi Private Wildlife Reserve

Table 3.1: Result of Chemical Analysis Test Report (Ground Water)

S#	Parameters	Units	PEQS	Result
1	pH	--	6.5-8.5	7.63
2	TDS	mg/l	<1000	507
3	Chloride	mg/l	<250	142.4
4	Fluoride	mg/l	≤ 1.5	BDL
5	Taste	Object./Unobject.	Unobject.	Unobject.
6	Hardness	mg/l	<500	128
7	Odor	Object./Unobject.	Unobject.	Unobject.
8	Color	TCU	1.5	0.02
9	Turbidity	NTU	<5 NTU	0.05
10	Lead	mg/l	0.05	BDL
11	Zinc	mg/l	5	0.04
12	Aluminium	mg/l	0.2	BDL
13	Chromium	mg/l	0.05	BDL
14	Cadmium	mg/l	0.01	0.0
15	Copper	mg/l	2	0.3
16	Boron	mg/l	0.3	0.03
17	Barium	mg/l	0.7	0.16
18	Nitrate (NO ₃)	mg/l	≤ 50	BDL
19	Nitrite (NO ₂)	mg/l	≤ 3	BDL
20	Antimony	mg/l	0.02	BDL
21	Arsenic	mg/l	0.05	BDL
22	Cyanide	mg/l	0.05	0.008
23	Mercury	mg/l	0.001	BDL
24	Nickel	mg/l	0.02	0.005
25	Residual Chlorine	mg/l	0.2-0.5	0.39
26	Total Coliform	Number/100ml	0/100ml	0
27	Thermo Coliform	Number/100ml	0/100ml	0
28	E. Coli	Number/100ml	0/100ml	0

3.2.8 Flood Control

This area has never been flooded from upstream areas.

3.2.9 Ambient Air Quality

The main sources of air pollutants are gaseous emissions from traffic on road. Environmental Protection Department of Punjab has issued Punjab Environmental Quality Standards for criteria pollutants, i.e. Particulate Matter, Ozone, Oxides of Nitrogen, Sulphur Dioxide and Carbon Monoxide. For assessing the current status of these air pollutants in the study area, these pollutants have been monitored through EPA-Punjab approved laboratory validated by EPA-Punjab officials. Results have been described in Table 3.2. The monitoring reports of Environmental Testing Laboratory have been

attached in Annexure-VII. All of the parameters are already within permissible limits of Punjab Environmental Quality Standards.

Table 3.2: Result of Chemical Analysis Test Report (Ambient Air)

S#	Parameters ($\mu\text{g}/\text{m}^3$)	Time	PEQS	Results
1	Carbon Monoxide (CO)	8 hours	5 mg/m ³	3.17 mg/m ³
2	Nitrogen Oxides (NO _x)	24 hours	120 $\mu\text{g}/\text{m}^3$	41.15 $\mu\text{g}/\text{m}^3$
3	Respirable Particulate Matter (PM ₁₀)	24 hours	150 $\mu\text{g}/\text{m}^3$	136.42 $\mu\text{g}/\text{m}^3$
4	Respirable Particulate Matter (PM _{2.5})	24 hours	35 $\mu\text{g}/\text{m}^3$	16.72 $\mu\text{g}/\text{m}^3$
5	Sulphur Dioxide (SO ₂)	24 hours	120 $\mu\text{g}/\text{m}^3$	39.14 $\mu\text{g}/\text{m}^3$

3.2.10 Noise

Surroundings of the area is in residential as well as in agricultural use. Current levels of sound have been monitored. Monitoring reports annexed in Annexure-VII. Results have been described in Table 3.3. The result shows that noise levels are already within PEQS.

Table 3.3: Noise Levels of project area

S#	Time	PEQS	Range of Noise Levels dB(A)
1	Day Time	75 dB (A)	46.4-55.2
2	Night Time	75 dB (A)	48.4-55.8
3	Day Time	75 dB (A)	56.7-64.5

3.2.11 Liquid Effluents

The sewerage system covers 20% of the city and serves 30% of the population. Waste water is generally disposed of through open drains to the nearby sewer system, which is noticed to cause environmental contamination and water borne diseases. The residential area is expanding continuously on all sides without any proper planning. World bank has recently started some water supply and sanitation schemes through Punjab Rural Municipal Services Company (PRMSC) under Punjab Rural Sustainable Water Supply & Sanitation Project (PRSWSSP). For Dharabi Private Wildlife Reserve, sewerage of guard posts shall be managed through properly designed RCC septic tanks.

3.2.12 Solid Waste

For management of municipal solid waste of DWPR, color coded plastic bins shall be placed. The waste in these containers shall be managed by making compost. Recyclables shall be sold to recyclers (or kabadia) in the local market.

Generally, the solid waste management outside the project area is poor. This may be attributed partly to lack of awareness among people and partly to the poor management of authorities. There is no proper waste disposal service in the area so the villagers dispose waste in an open/vacant area. and burn it.

The existing solid waste management system is being managed by the Tehsil Municipal Administration (TMA), but its performance is not up to the mark and even the waste collection bins are not available. In study area, there is no proper waste collection system and the waste is thrown by people along the road side which is seldom picked up by TMA.

3.3 Baseline Ecological Environment

3.3.1 Fauna

The iconic fauna species of the reserve used to be the main game species viz., Grey & Black Francolins, populations of which are ranked to be healthy.

3.3.1.1 Aquatic Fauna

The Reserve area, particularly having Ecotone with aquatic habitats is also home to numerous migratory waterfowl species, hence, the area has the potential to be preserved and manage it with sustainable harvesting of permissible species apart from conservation of migratory waterfowls.

3.3.1.2 Mammals

Dominant mammalian fauna of the reserve area includes Indian Pangoline (*Manis crassicaudata*), Cape hare (*Lepus capensis*) Asiatic Jackal (*Canis aureus*) and Hill or Red Fox (*Vulpes vulpes*). Similarly, Indian crested Porcupine (*Hystrix cristatus*), Indian wild boar (*Sus scrofa cristatus*), Jungle cat (*Felis chaus*) and variety of species of mongoose and small rodents were also recorded in the area during survey (*Sus scrofa cristatus*), Jungle cat (*Felis chaus*) and variety of species of mongoose and small rodents were also recorded in the area during survey.

Being harboring natural forests adjacent to slightly high mountains the prospective expansion of Punjab Urial (*Ovis vignei punjabiensis*), the icon of Salt Range may also be noticed in future after extending protection to the reserve area.

3.3.1.3 Birds

Among Avifauna, the dominant species includes Grey Partridge (*Francolinus pondicerianus*), Black Partridge (*Francolinus francolinus*), Blue rock pigeon (*Columba livia*), Common Wood Pigeon (*Columba plumbus*), Common quail (*Coturnix coturnix*) Indian Tree Pie (*Dendrocitta vagabunda*), Golden oriole (*Oriolus oriolus*), Indian Ring Dove (*Streptopelia decaocto*), Red turtle dove

(*Streptopelia tranqueberica*), little brown dove (*Streptopelia senegalensis*), white cheeked bulbul (*Pycnonotus leucogenys*), and Shikra (*Accipiter badius*).

3.3.1.4 Reptiles

Indian flap-shell (*Lissemys punctata andersoni*), Indian garden lizard (*Calotes v. versicolor*), Black rock agama (*Laudakia m. melanura*), Salt-range ground Gecko (*Cyrtopodion montiumsalsorum*), Bengal monitor (*Varanus bengalensis*), Brahminy blind Snake (*Ramphotyphlops braminus*), Cliff racer (*Platyceps r. rhodorachis*), Indian or common Krait (*Bungarus c. caeruleus*), Black Cobra (*Naja n. naja*), Russell's chain viper (*Daboia. Russelii*) were found common.

3.3.1.5 Amphibians

Among amphibians, Marbled Toad (*Bufo stomaticus*), Bull-frog (*Hoplobatrachus tigerinus*), and Skittering frog (*Euphlyctis c. cyanophlyctis*) are common.

3.3.1.6 Critical Habitats

Whole project area is wild life sanctuary for many birds. Dharabi Dam is a critical habitat.

3.3.2 Forestry

The habitat type of the reserve is representative of typical dry sub-tropical semi-evergreen scrub forest with some broad leaved trees, shrubs and a basal grass cover. Plant varieties of forests include keekar, kau, phulai, Sanatha, wild beri, gurgura and potaki. The underbush mainly consists of saryala, khawi, mesquite and karir.

At present a total of 92382 acres of the district are under reserve forest and 57868 acres are under unclassed forest. The main reserve and unclassed forests in the district are at Diljabbah, Surullah, Drangan, Karangal, Gandala, Dalwal, Makhiala, Dandot, Chinji, Kot Kala, Simbli, Nurpur, Bagga, Sammarqand and Thirchak.

Forests in Chakwal district is taken care of by the Chakwal Forest Division, headed by the Divisional Forest Officer who is assisted by four Sub-divisional Forest Officers. The Chakwal Forest Division is spread over an area of 150250 acres which includes 375 KM roadside and 40 KM rail side plantations.

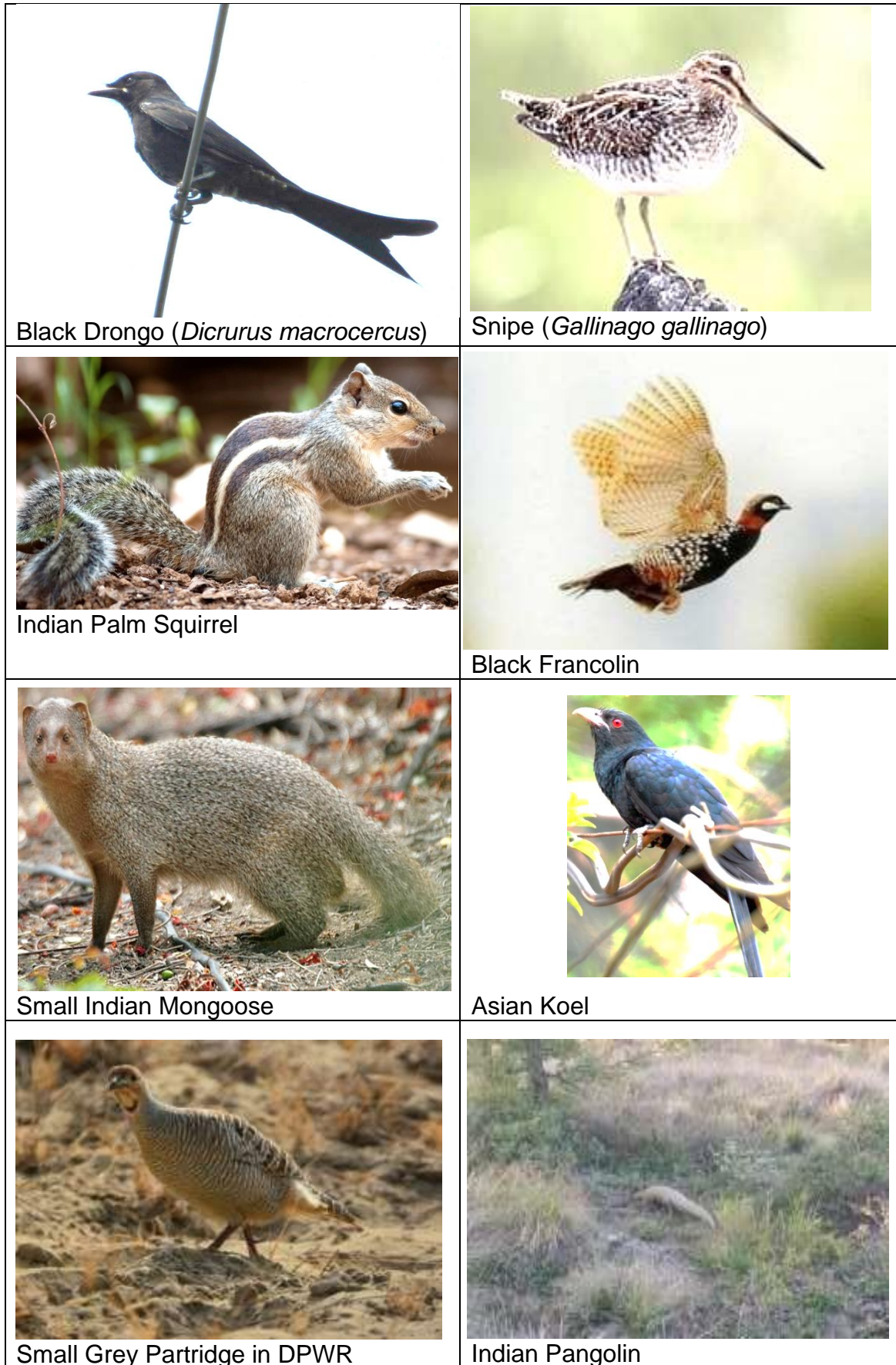


Figure 3.10: Fauna of the project area

3.3.3 Flora

In the flora of the reserve there are both African-Arabian and Mediterranean elements. The vegetation data pertaining to species occurring in the area, apart from field visits /survey also obtained from secondary data sources (Arshad, 2011 and Awan & Akbar, 2012). The vegetation around the water bodies within/adjacent to the DPWR was modified due to abundant soil moisture, marshy conditions and water salinity. The vegetations in the dam / bank sites have been dominated by grasses viz., *Phragmites karka*, *Heteropogon spp.*, *Cynodon dactylon*, the sedge *Fimbristylis dichotoma* and the cat- tail *Typha domingensis*. The Chenopods viz., *Kochia indica* and *Suaeda fruticosa* were found present as co-dominants. All these Species are resistant to water- logging and salinity. The general, area situated near the dams was dominated by grasses *Cynodon dactylon* (Khabbal), Bombay grass (*Cymbopogon jwarancusa*), Goose grass (*Eleusine compressa*), Black Spear Grass (*Heteropogon contortus*), Six weeks three awn or common needle grass (*Aristida adscensionis*), Barnyard Grass (*Echinochloa esculenta.*), *Saccharum spp.* and *Brachiaria ramose*.



Figure 3.11: Vegetation Map Flora of the project area

The herbs species are representative dominantly by *Cannabis sativa*, *Parthenium hysterophorus*, *Malvastrum coromandelianum*, *Datura innoxia*, *Oxalis corniculata*, *Amaranthus viridis* and *Aerva javanica*, etc. Whereas, common shrubs species includes *Justicia adhatoda*, *Dodonaea viscosa*, *Asparagus gracilis*, *Opuntia dillenii*, etc. were also common.

The dominant tree species of the reserve area includes: Phulai (*Acacia modesta*), Kahu (*Olea ferrugenia*), Kikar (*Acacia nilotica*), Ber (*Zizyphus nummularia*), Honey musquite (*Prosopis juliflora*) and to some extent the Shisham (*Dalbergia sissoo*).

As per primary data and study quoted above, a total of 51 plant species belonging to 27 families were recorded from the habitats representing the reserve area. Poaceae was the largest family contributing 11 species of grasses. Asteraceae contributed 4 species; while Amaranthaceae, Chenopodiaceae and Cyperaceae were represented by 3 species each. Asclepiadaceae, Liliaceae, Malvaceae, Mimosaceae and Papilionaceae had 2 species each. The rest of the families were represented by one species each.

Hence, being comprised mostly on natural land areas, the reserve harbors a great variety of vegetations ranging from small herbs to large trees. The phytoplankton's were found enormous representing a fairly preserved aquatic habitat inside and adjoining to the reserve area. A zone in the reserve has also been planted with Olive plants which are growing well there.

3.3.4 Endangered Species

As described in the former paragraphs, the area is also home to the endangered and most vulnerable specie to illegal trading, the "Indian Pangolin (*Manis crassicaudata*)", hence, through management of the reserve this species shall also be preserved.

3.3.4.1 Punjab Urial

The Punjab Urial (*Ovis vignei punjabiensis*) is endemic to northern Punjab, Pakistan, and is currently classified as endangered by the IUCN. The distribution of the animal in Pakistan is between the Indus and Jhelum rivers at elevations of 250-1,500 m primarily in the Kala Chitta and Salt Ranges. The dominant habitat type in the area is Dry Sub-tropical Semievergreen Scrub Forest. Punjab Urial were once present over all northern Punjab Mountains, but in recent decades underwent a severe decline in both range and numbers, disappearing from much of their historic range.

3.3.4.2 White headed duck

White headed duck (*Oxyura leucocephala*) is an important winter migrant to the Salt Range Wetlands in Pakistan. It is globally threatened species and its population has declined significantly in its entire range of distribution due to disturbance, habitat degradation and illegal hunting.



Figure 3.12: Flora of the project area

Table 3.4: List of Fauna Species Observed in Dharabi Private Wildlife Reserve and its Surrounding Area

S #	Species Name	Taxonomy	English/ Vernacular Name	Activity Pattern	Feeding Habits
MAMMALS					
1	<i>Bandicota bengalensis</i>	Order: Rodentia Family: Muridae	Indian Mole Rat or Rice Rat	Nocturnal	Granivore
2	<i>Golunda ellioti</i>		Indian Bush rat	Nocturnal	Granivore
3	<i>Mus musculus</i>		Common House mouse	Nocturnal	Granivore
4	<i>Rattus rattus</i>		Common Rat	Non specific	Granivore
5	<i>Funambulus pennantii</i>	Order: Rodentia Family: Petromidae	Palm Squirrel	Diurnal	Granivore
6	<i>Hystrix cristatus</i>	Order: Rodentia Family: Hystricidae	Indian Crested porcupine	Nocturnal	Herbivore
7	<i>Herpestes edwardsi</i>	Order: Carnivora Family: Herpestidae	Common Indian Mongoose	Diurnal	Carnivore
8	<i>Herpestes javanicus</i>		Small Indian Mongoose	Diurnal	Carnivore
9 10	<i>Viverra indica</i>	Order: Carnivora Family: Viverridae	Small Indian civet	Non specific	Carnivore
11	<i>Hemiechinus collaris</i>	Order: Insectivora Family: Erinaceidae	Long-eared hedgehog	Nocturnal	Carnivore
12	<i>Lepus nigricolis</i>	Order: Lagomorpha Family: Leporidae	Indian Hare	Nocturnal	Herbivore
13	<i>Suncus murinus</i>	Order: Insectivora Family: Soricidae	Indian Musk Shrew	Nocturnal	Insectivore
14	<i>Pteropus giganteus</i>	Order: Chiroptera Family: Pteropodidae	Flying fox	Nocturnal	Frugivore
15	<i>Scotophilus heathii</i>	Order: Chiroptera Family: Vespertilionidae	Common Yellow- bellied Bat	Nocturnal	Insectivore
16	<i>Hipposideros cineraceus</i>	Order: Chiroptera Family: Hipposideridae	Least leaf-nosed bat	Nocturnal	Insectivore
17	<i>Felis Chaus</i>	Order: Carnivora Family: Felidae	Jungle Cat	Non specific (Mostly Diurnal)	Carnivore

ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

18	<i>Canis Aureus</i>	Order: Carnivora Family: Canidae	Golden Jackal	Non specific (Mostly nocturnal)	Carnivore
19	<i>Sus scrofa cristatus</i>	Order: Artiodactyla Family: Suidae	Wild boar	Nocturnal	Omnivore
AMPHIBIANS AND REPTILES					
Sr. #	Species Name	Taxonomy	English / Verna- cular Name	Activity Pattern	Feeding Habits
1	<i>Bufo stomaticus</i>	Class: Amphibia Order: Anura Family: Bufonidae	Marbled Toad / Daddoo	Non-specific (Mostly nocturnal)	Insectivore
2	<i>Hoplobatrachus tigerinus</i>	Class: Amphibia	Bull-frog/ Daddo	Nocturnal	Insectivore
3	<i>Euphlyctis c. cyanophlyctis</i>	Order: Anura Family: Ranidae	Skittering frog/ Daddoo	Non specific (mostly nocturnal)	Insectivore
4	<i>Fejervarya limnocharis</i>		Alpine cricket frog/ Daddo	Nocturnal	Insectivore
5	<i>Sphaeroteca breviceps</i>		Burrowing frog/ Daddoo	Nocturnal	Insectivore
6	<i>Microhyla ornata</i>	Class: Amphibia Order: Anura Family: Microhylidae	Ant frog/ Daddoo	Nocturnal	Insectivore
7	<i>Lissemys punctata andersoni</i>	Class: Reptilia Order: Chelonia Family: Trionychidae	Indian flap- shell/ Karkooma	Diurnal	Omnivore (mostly carnivore)
8	<i>Eublepharis macularius</i>	Class: Reptilia Order: Sauria Family: Eublepharidae	Fat-tail gecko/ Bindowa	Nocturnal	Insectivore
9	<i>Calotes v. versicolor</i>	Class: Reptilia	Indian garden lizard/Sedar	Diurnal	Insectivore
10	<i>Laudakia m. melanura</i>	Order: Sauria Family: Agamidae	Black rock agama/Sedar	Diurnal	Insectivore
11	<i>Trapelus agilis agilis</i>		Brilliant agama/ Korr Kirili	Diurnal	Insectivore
12	<i>Hemidactylus flaviviridis</i>		Yellow-bellied house gecko/ Korr Kirili	Nocturnal	Insectivore
13	<i>Hemidactylus brookii</i>	Class: Reptilia Order: Sauria Family: Gekkonidae	Spotted Indian house gecko/ Korr Kirili	Nocturnal	Insectivore
14	<i>Cyrtopodion scaber</i>		Keeled rock gecko/ Korr Kirili	Nocturnal	Insectivore
15	<i>Cyrtopodion montiumsalsorum</i>		Salt-range ground gecko/Korr Kirili	Nocturnal	Insectivore

ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

16	<i>Acanthodactylus cantoris</i>	Class: Reptilia Order: Sauria Family: Lacertidae	Indian fringe-toed sandy lizard/ Kirili	Diurnal	Insectivore
17	<i>Mesalina watsonana</i>		Long-tailed desert lacerta/ Kirili	Diurnal	Insectivore
18	<i>Ophisops jerdonii</i>		Punjab snake-eyed lacerta/ Guddi	Diurnal	Insectivore
19	<i>Eutropis dissimilis</i>	Class: Reptilia Order: Sauria Family: Scincidae	Striped grass skink/ Kirili	Diurnal	Insectivore
20	<i>Ablepharus pannonicus</i>		Red-tailed snakeeyed skink/Kirili	Diurnal	Insectivore
21	<i>Varanus bengalensis</i>	Class: Reptilia Order: Sauria Family: Varanidae	Bengal monitor/ Gho	Non specific (mostly diurnal)	Carnivore
22	<i>Varanus griseus koniecznyi</i>		Indo-pak desert monitor/ Gho	Non specific (mostly diurnal)	Carnivore
23	<i>Leptotyphlops macrorhynchus</i>	Class: Reptilia Order: Serpentes Family: Leptotyphlopidae	Beaked thread snake/ saanp	Non specific	Decompose org. matter
24	<i>Ramphotyphlops braminus</i>	Class: Reptilia Order: Serpentes Family: Typhlopidae	Brahminy blind snake/ saanp	Non specific	Decompose org. matter
25	<i>Eryx johnii</i>	Class: Reptilia Order: Serpentes Family: Boidae	Indian sand boa/ Doomoi	Nocturnal	Carnivore
26	<i>Amphiesma stolatum</i>	Class: Reptilia Order: Serpentes Family: Colubridae	Striped keel-back/ saanp	Diurnal	Carnivore
27	<i>Platyceps v. ventromaculatus</i>		Glossy-bellied racer/saanp	Nocturnal	Carnivore
28	<i>Platyceps r. rhodorachis</i>		Cliff racer/ saanp	Diurnal	Carnivore
29	<i>Ptyas m. mucosus</i>		Rope snake or Dhaman/ Dadmaar	Diurnal	Carnivore
30	<i>Spalerosophis atriceps</i>		Red-spotted diadem Snake / Sat Garrhi saanp	Nocturnal	Carnivore
31	<i>Xenochrophis p. piscator</i>		Checkered keel-back	Non specific	Carnivore
32	<i>Bungarus c. caeruleus</i>	Class: Reptilia Order: Serpentes	Indian or common Krait/ Sangchoor	Nocturnal	Carnivore

ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

33	<i>Naja n. naja</i>	Family: Elapidae	Black Cobra/ Chalyap	Non specific (mostly diurnal)	Carnivore
34	<i>Echis carinatus sochureki</i>	Class: Reptilia Order: Serpentes	Sochurek's sawscaled viper/ Pissi	Nocturnal	Carnivore
35	<i>Daboia r. russelii</i>	Family: Viperidae	Russell's chain viper/ Dhai Garrhi	Nocturnal	Carnivore
AVIFAUNA					
1	<i>Elanus caeruleus</i>	Order: Accipitriformes	Black shoulder Kite	Resident	Common
2	<i>Milvus migrans</i>	Family: Accipitridae	Black Kite	Resident	Common
3	<i>Anas crecca</i>	Order: Anseriformes	Common Teal	Wintering	Abundant
4	<i>Aythya ferina</i>	Family: Anatidae	Common Pochard	Wintering	Abundant
5	<i>Anas platyrhynchos</i>		Mallard	Wintering	Abundant
6	<i>Caprimulgus asiaticus</i>	Order: Caprimulgiformes Family: Caprimulgidae	Indian Nightjar	Resident	Common
7	<i>Himantopus himantopus</i>	Order: Charadriiformes Family: Recurvirostridae	Black-winged Stilt	Resident	Abundant
8	<i>Hoplopterus indicus</i>	Order: Charadriiformes	Red-wattled Lapwing	Resident	Abundant
9	<i>Charadrius dubius</i>	Family: Charadriidae	Little Ringed Plover	Resident	Common
10	<i>Actitis hypoleucos</i>	Order: Charadriiformes Family: Tringinae	Common Sand Piper	Wintering	Common
11	<i>Egretta garzetta</i>	Order: Ciconiformes Family: Ardeidae	Little Egret	Resident	Common
12	<i>Bubulcus ibis</i>		Cattle Egret	Resident	Common
13	<i>Egretta intermedia</i>		Intermediate Egret	Resident	Frequent
14	<i>Egretta alba</i>		Large Egret	Irregular Migrant	Common
15	<i>Egretta gularis</i>		Indian Reef Heron	Resident	Common
16	<i>Ardea purpurea</i>		Purple Heron	Resident	Common
17	<i>Ardea cinerea</i>		Grey Heron	W/PM	Common
18	<i>Nycticorax nycticorax</i>		Night Heron	Irregular Migrant /Resident	Common
19	<i>Ardeola grayii</i>		Pond Heron or Paddy Bird	Resident	Common
20	<i>Streptopelia decaocto</i>		Order: Columbiformes Family: Columbidae	Ringed or Collard Dove	Resident
21	<i>Streptopelia senegalensis</i>	Little brown Dove		Resident	Abundant
22	<i>Columba livia</i>	Blue Rock Pigeon		Vagrant	Abundant

ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

23	<i>Columba plumbus</i>		Common Wood Pigeon	Irregular (Mostly winter visitor)	Abundant
24	<i>Halcyon smyrnensis</i>	Order: Coraciiformes Family: Alcedinidae	White breasted Kingfisher	Resident	Common
25	<i>Merops orientalis</i>	Order: Coraciiformes Family: Meropidae	Little green Bee-eater	Resident	Abundant
26	<i>Merops philpinus</i>		Blue-tailed Bee-eater	Summer Migrant	Common
27	<i>Upupa epops</i>	Order: Coraciiformes Family: Upupidae	Hoopoe	Resident	Common
28	<i>Coracias benghalensis</i>	Order: Coraciiformes Family: Coraciidae	Indian Roller or Blue Jay	Resident	Common
29	<i>Eudynamys scolopacea</i>	Order: Cuculiformes Family: Cuculidae	Common Koel	Resident	Common
30	<i>Centropus sinensis</i>		Crow Pheasant	Resident	Common
31	<i>Falco tinnunculus</i>	Order: Falconiformes Family: Falconidae	Common Kestrel	Resident	Common
32	<i>Francolinus francolinus</i>	Order: Galliformes Family: Phasianidae	Black Francolin	Resident	Common
33	<i>Francolinus pondicerianus</i>		Grey Partridge	Resident	Abundant
34	<i>Ammoperdix griseogularis</i>		See see Partridge	Resident	Rare
35	<i>Coturnix coturnix</i>		Common Quail	Vagrant	Common
36	<i>Coturnix coromandelica</i>		Rain Quail	Vagrant	Rare
37	<i>Gallinula chloropus</i>		Order: Gruiformes Family: Rallidae	Water hen or Moorhen	Resident
38	<i>Porphyrio porphyry</i>	Purple Moorhen		Irregular Migrant	Common
39	<i>Fulica atra</i>	Order: Gruiformes Family: Turnicidae	Coot	Wintering	Abundant
40	<i>Megalaimahaema cephalo</i>	Order: Piciformes Family: Capitonidae	Coppersmith Barbet	Resident	Common
41	<i>Tachybaptus ruficollis</i>	Order: Podicipediformes Family: Podicipedidae	Little Grebe	Resident	Common
42	<i>Corvus splendens</i>	Order: Passeriformes	House Crow	Resident	Very Common
43	<i>Dendrocitta vagabunda</i>		Indian Tree-pie	Resident	Common

ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

44	<i>Corvus macrorhynchos</i>	Family: Corvidae	Jungle Crow	Vagrant	Rare
45	<i>Coracias bengalensis</i>	Order:	Indian Roller	Resident	Common
46	<i>Coracias garulus</i>	Passeriformes Family: Coraciidae	Eurasian Roller	Summer Visitor	Frequent
47	<i>Dicrurus macrocerus</i>	Order: Passeriformes Family: Dicruridae	Black Drongo	Resident	Abundant
48	<i>Lonchura punctulata</i>	Order: Passeriformes Family: Estrildidae	Spotted Munia	Resident	Frequent
49	<i>Hirundo rustica</i>	Order: Passeriformes Family: Hirundinidae	Common Swallow	Resident	Abundant
50	<i>Lanius schach</i>	Order: Passeriformes Family: Laniidae	Rufous-backed Shrike	Wintering	Frequent
51	<i>Lanius excubitor</i>		Great Grey Shrike	Vagrant	Rare
52	<i>Lanius vittatus</i>		Bay-backed Shrike	Vagrant	Rare
53	<i>Motacilla flava</i>	Order: Passeriformes Family: Motacillidae	Yellow Wagtail	Wintering	Uncertain
54	<i>Motacilla maderapatensis</i>		Large pied Wagtail	Resident	Uncertain
55	<i>Nectarinia asiatica</i>	Order: Passeriformes Family: Nectariniidae	Purple sunbird	Resident	Common
56	<i>Oriolus oriolus</i>	Order: Passeriformes Family: Oriolidae	Golden Oriole	Summer Migrant	Common
57	<i>Passer domesticus</i>	Order: Passeriformes Family: Passeridae	Common Sparrow	Resident	Very Abundant
58	<i>Ploceus philippinus</i>	Order: Passeriformes Family: Ploceidae	Indian Baya	Resident	Abundant
59	<i>Pycnonotus leucogenys</i>	Order: Passeriformes Family: Pycnonotidae	White cheeked Bulbul	Resident	Abundant
60	<i>Pycnonotus cafer</i>		Red vented Bulbul	Resident	Abundant
61	<i>Acridotheres tristis</i>	Order: Passeriformes Family: Sturnidae	Common Myna	Resident	Very Abundant
62	<i>Acridotheres ginginianus</i>		Bank Myna	Resident	Common
63	<i>Sturnus vulgaris</i>		Common Starling	Winter Visitor	Abundant
64	<i>Sturnus roseus</i>		Rosy Starling	Summer Migrant	Abundant

ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

65	<i>Orthotomus sutorrus</i>	Order: Passeriformes Family: Sylviidae	Tailor bird	Resident	Common
66	<i>Cercomela fusca</i>	Order: Passeriformes Family: Turdidae	Brown Rock Chat	Resident	Frequent-Scarce
67	<i>Myiophoneus caeruleus</i>		Blue Whistling Thrush	Resident	Frequent
68	<i>Phoenicurus ochruros</i>		Black or Indian Redstart	Wintering	Common
69	<i>Copsychus saularis</i>		Magpie Robbin	Resident	Scarce
70	<i>Turdoides caudatus</i>	Order: Passeriformes Family: Timaliidae	Common Babbler	Resident	Abundant
71	<i>Argya striata</i>	Order: Passeriformes Leiothrichidae	Jungle Babbler	Resident	Abundant
72	<i>Saxicola caprata</i>	Order: Passeriformes Family: Turdinae	Pied stone-chat or bush-chat	Resident	Common
73	<i>Zosterops palpebrosa</i>	Order: Passeriformes Family: Zosterops palpebrosa	Indian White eye	Resident	Abundant
74	<i>Psittacula eupatria</i>	Order: Psittaciformes Family: Psittaculidae	Alexandrine Parakeet	Resident	Scarce
75	<i>Psittacula krameri</i>		Rose-ringed parakeet	Resident	Common
Sr . #	Species Name	Taxonomy	English / Vernacular Name	Origin	Habits
FISH FAUNA					
1	<i>Channa morulis</i>	Order: Anabantiformes Family: Channidae	Soul	Introduced	Carnivore
2	<i>Channa punctata</i>		Snake-head / Daula	Native	Carnivore
3	<i>Oreochomis mossambicus</i>	Order: Cichliformes Family: Cichlidae	Tilapia	Introduced	Herbivore
4	<i>Cirrhinus mrigala</i>	Order: Cypriniformes Family: Cyprinidae	Mrigal / Mori	Native	Planktivore
5	<i>Cyprinus carpio</i>		Common Carp	Native	Omnivore
6	<i>Labeo rohita</i>		Rahu / Dhambra	Native	Omnivore
7	<i>Hypophthalmichthys molitrix</i>		Chinese or Silver Carp	Introduced	Filter Feeder
8	<i>Hypophthalmichthys nobilis</i>		Bighead Carp	Introduced	Filter Feeder
9	<i>Ctenopharyngodon idella</i>	Order: Cypriniformes Family:	Grass Carp	Introduced	Herbivore
10	<i>Gibelion catla</i>		Thaila	Native	Planktivore
11	<i>Labeo calbasu</i>		Kalbans	Native	Carnivore

12	<i>Labeo gonius</i>	Cyprinidae	Sereeha	Native	Omnivore
13	<i>Puntius sophore</i>		Sophora popra	Native	Insectivore
14	<i>Gambusia affinis</i>	Order: Cyprinodontiformes Family: Poeciliidae	Gambusia	Introduced	Insectivore
15	<i>Notopterus notopterus</i>	Order: Osteoglossiformes Family: Notopteridae	Pari	Native	Carnivore
16	<i>Sperata sarwari</i>	Order: Siluriformes Family: Bagridae	Cat Fish / Singhari	Native	Carnivore
17	<i>Calupisoma garua</i>	Order: Siluriformes Family: Schilbeidae	Bachwa	Introduced	Carnivore
18	<i>Eutropiichthys vacha</i>		Cat Fish / Jhalli	Native	Carnivore
19	<i>Ompok bimaculatus</i>	Order: Siluriformes Family: Siluridae	Cat Fish / Pafta	Native	Carnivore
20	<i>Wallago attu</i>		Cat Fish / Mulli	Introduced	Carnivore
21	<i>Bagarius bagarius</i>	Order: Siluriformes Family: Sisoridae	Cat Fish / Khagga	Native	Carnivore
22	<i>Mastacembelus armatus</i>	Order: Synbranchiformes Family: Mastacembelidae	Bam / Marmahi	Native	Carnivore

3.3.5 Agriculture

The surrounding area of the project is predominated with agricultural use. This is barani area. The wheat, groundnuts, oil seeds, lentils, maize, millets, jawar, vegetables, brassica (Sarson), legumes and pulses and animal fodder are among the major crops.



Figure 3.13: Agricultural Fields near the project area

Fruit orchards, especially of citrus, have also been planted by farmers but only small areas owing to shortage of water. Fair sized Loquat orchards exist in Kallar Kahar.

3.4 Baseline Socioeconomic Environment

Socioeconomic baseline has been developed for the project through a review of secondary data as well as primary data collected using checklists and discussion with locals (residents, farmers, shopkeepers, students, pedestrians, drivers) in the project area. Social survey was conducted to assess the present socio-economic and socio-cultural conditions of local population of the project area. The availability of basic amenities of life to community living in the project area is indicator of its socio-economic condition. Secondary data used include census report and previous research carried out in the area.

3.4.1 Population and Communities

The project site is situated in wild and residential zone and the nearest community is present at a distance of about 3 Km. According to census of 2017, the population of Tehsil Kallar Kahar is 1,69,238. The average annual growth rate according to 2017 Census is 1.71%. The surrounding villages of Dharabi Private Wildlife Reserve are Dhoke Bhattian, Dhoke Choi, Dhoke Morian and Rehna Sadaat. All these villages are nearest from the project site. Basic needs of life like electricity are present. However, natural gas, water supply and basic infrastructure like roads and drainage system are not present in these villages.

3.4.2 Political and Administrative Set-up

The project is located in Tehsil Kallar Kahar, Chakwal district, one of the 42 districts of the Punjab province. The latest survey (2017), recorded a population of 1,69,238 inhabitants in tehsil Kallar Kahar, covering a surface of 953 km². The population density was recorded at 178 inhabitants per km². This district Chakwal is divided into 5 tehsils (administrative sub-division of a district). These are Chakwal, Choa Saidan Shah, Kallar Kahar, Lawa and Tala Gang. The project is located in the Kallar Kahar tehsil, with the city of Chakwal being its headquarter. It has Tehsil Municipal Administration. Under TMA, lower tiers of local government such as union councils function. Other than TMA, there are different departments involved in Municipal Services. i.e. includes Public Health Engineering Department, District Environment Department, Traffic Police and District Transport Department, District Road Department.

3.4.3 Industries

The project area is predominantly rural district with agrarian economy. The type of industries mainly includes flour mills, poultry feed mills and spinning mills.

Small scale industrial sectors include brick kilns, poultry farms, hatcheries, fish farms, cattle farms, marble factories, furniture manufacturing, shoe manufacturing and clay crockery manufacturing units. Khhusa making, wood

work, clay utensils, silver and gold works are the important sectors of cottage industry.

3.4.4 Infrastructure

The Dharabi Private Wildlife Reserve is not yet fenced and at present is fairly open for any outsider intrusion except small portion comprising on 50 Acres fenced and gated for protection to Olive garden. There is proper kacha track around the Southern, eastern and to some extent northern peripheries of the reserve whereas, the western limit is pounded with natural vegetation/rugged hilly terrain.

There is proper power supply of WAPDA supplied by IESCO to the various reserve's infrastructure. The power backup in the form of Solar system and generators is also available at the reserve.

3.4.4.1 Potable Water Supply

To meet the permanent water supply to the reserve and its amenities, there is a small dam developed within the reserve over an area of approximately 05 Acres. The water capacity of the dam is quite sufficient to support the requirements at reserve. The dam is stocked with the varieties of fish species in order to provide sport fishing opportunities for the hunters/public visiting the reserve alongwith to meet the requirement of boarding for the hunters. The requirements of water supply would also be met through the overflow of Dharabi Dam (a Government owned Dam at Northern limits of the reserve).

3.4.4.2 Sanitation and Drainage

Presently water sanitation and drainage system does not exist in the project area. Sewerage system in the surrounding villages is also very poor. Toilets connected with septic tanks made for each of the homes. This is old 'Naali' system ultimately reaching open areas and drains. The waste water is generally disposed off through open drains to the nearby sewer system, which are not only polluting the environment but also causing many waterborne diseases.

3.4.5 Land Use Planning

Under the present Government system, the District Government is responsible for all land use planning according to the provincial laws. Punjab Land Records Authority, Board of Revenue, Government of the Punjab keeps the record of land use of the area (Annexure-VIII). Out of total area of land proposed for the reserve, 08% comprised on the Agricultural area, 82% as natural landscape including water bodies, whereas, about 10% comprised on natural cum man-made plantation of olive trees. However, overall the land area proposed for the reserve is perfectly suitable for the purpose. Furthermore, the Agricultural practices inside the reserve are observed purely in organic farm and such practices will also be regularized in the premises of reserve in order to ensure minimum hazards for biodiversity. The only conflicting problem is the livestock of adjoining areas grazing within the reserve.

3.4.6 Power Sources and Transmission

Electric supply is also available to all of the project area through WAPDA overhead transmission lines from IESCO (Islamabad Electric Supply Company).

3.4.7 Agricultural Development

Local residents earn their livelihoods from agriculture and livestock. However, with time, the areas are getting urbanized and converted into residential societies. The major crops include wheat, bajra, maize, fodder plants and some vegetables.

3.4.8 Quality of Life Values

3.4.8.1 Main Occupations

Survey of the project area reveals that agriculture is the main source of income for people of the area. Majority of the people around the project site belongs to poor section of the society. They have elementary occupations followed by skilled agricultural and fishery workers, service workers, shopkeepers and market sales workers, brick kiln workers, craft and related trade workers. A very small percentage is employed in trading sector, a smaller as industrial and mining labour and a very small fraction is employed in technical fields. A very small group belongs to affluent portion of the society including industrialists, bankers, politicians, educationists, medical professionals, businessmen and real estate business owners. We can find that a large portion of residents join armed forces of Pakistan. We can find many houses from where at least one family member belongs to any of the armed forces.

3.4.8.2 Family Life

The culture of Chakwal is primarily based on the way of living as taught in Islam; but owing to the fact that Chakwal before independence was an area where a large number of Hindus lived, it is influenced by Hindu rites, rituals and even ideas.

The people of the project area live a simple and straight life as enjoined by their religion. The elders themselves strictly follow the old traditions in every walk of life while living in the affluent society. Their children are trying to follow the life style of the affluent society. In spite of all the modernized lifestyle, virtually elders are responsible to make decisions and their decisions are valued by the family members. Print and electronic media are influencing almost all walks of life of the people. There is a lot of awareness about education. Rich or poor all families are trying hard to get their children educated. Mostly joint family system prevails. Most of the families are quite coherent. There is a rising trend in the society to change their old traditional socioeconomic pattern of life.

3.4.8.3 Religion

Predominant religion of the area is Islam with some percentage of Christian community.

3.4.8.4 Transportation

The transport infrastructure in the project area is generally inadequate for existing requirements. There is no urban bus or van services are available. On all roads, mostly motorcycle rickshaws or auto rickshaws are being used as urban transport services.

3.4.8.4.1 Roads

Two main roads facilitate commutation from Chakwal; Motorway on its one side and Grand Trunk Road on the other. Sufi Bus Service and other bus services operate from the city to multiple cities of Pakistan. There is a regular bus/Hiace service available running from early hours of the morning to late in the night. Daily routes include Rawalpindi, Islamabad, Lahore, Gujrat, Gujranwala, Sialkot, Mandi Bahauddin, Sargodha, Jhelum, Karachi and Faisalabad.

The project area is accessible only through a jeepable kacha track. No proper road goes there. This jeepable track may be accessed either via Dhoke Morian coming from Motorway or Rehna Sadaat coming from Bhaun.

3.4.8.4.2 Railways

Although very damaged railway station exists at Chakwal yet there is no railway line. Thus the project area is not connected to national rail network.

3.4.8.4.3 Airport

New Islamabad International Airport is situated at 90.3 Km from project site.

3.4.8.5 Housing

Most of the people have built pacca houses. Recent development in housing sector has also influenced the area upgrading the living standards of people of the area. However, we can also find migrants from other parts of the city and country coming to reside in the area of locals. This migration has both positive and negative impacts on the life of the local people.

3.4.8.6 Public Health

Sanitation facilities are very poor. These cause muddy bumps on the roads. Drinking water supply is through bore hole pumps. Only small scale dispensaries are available at some villages of the area. Chakwal district has six hospitals in total including five hospitals in the government sector and one private hospital. The government hospitals have 360 beds in total and private

hospitals have a capacity of 10 beds. Nearest hospital to the sub-project area is THQ Hospital Kalar Kahar.

3.4.8.7 Education

Mostly people are illiterate. They used to earn their livelihood as farmers. However, with passage of time, literacy rate is rising up. Small schools are present in the nearby villages mostly up to middle level. For government owned higher education institutions, students have to go to Kallar Kahar or Chakwal. TEVTA approved Technical Training Institutes has also been established with an objective to train local people to meet the needs of industrial units. People desire to join cadet schools and colleges. There is popular trend to join any of the armed forces of Pakistan.

3.4.8.8 Recreational Resources

Dog race and ox race events called as Maila are very common. People are establishing some other sources of recreation.

3.4.8.9 Aesthetic and Cultural Values

Chakwal is a fascinating place because of its distinct culture and long history. Chakwal is known for its rich culture, art, history, and lavish surroundings. Chakwal, which was once known as a picnic destination for the Mughal Dynasty and British Lords, still provides visitors a distinct scenery.

Shalwar Kameez is the most common attire. Some people also wear Turbans or Dhoti although it's not very popular. Over a shalwar kameez, well-off men frequently wear a Koti or coat. Women may choose to cover themselves with a 'Burqa,' a huge black voluminous garment. The most common footwear is sandals, Chapels, or flip-flops. Many non-Muslim minorities, particularly Hindus, lived in this area before the partition, and many of them went to India following the separation. The Hindu culture has affected this region, just as it has influenced the rest of the country. At weddings, large dowries are given to the bridesmaids, and a Mehndi ritual is held. The 'Gharoli bharna' ritual, in which the boy's sister-in-law or other close female relatives visit another relative's home to fill a mud pot with water for blessings, is also popular at weddings. Families and castes continue to have a major impact. Until now, the Awan, Chaudhary, and Rajput clans have dominated the region. People prefer to marry within their own caste, hence intercaste marriage is avoided. The caste system is so entrenched in certain communities that each caste has its own mosque.

Because of limited income, most of the common people live marginalized status of life. They had completely rural standards of living. Gradually the people are getting urbanized. However, old traditional and simple life typical of the Punjab villages is the prevailing cultural and aesthetic characteristic of life style of majority of the people. Old people prefer to live conservative life style. Decades old culture and customs in every walks life are dominant. General attitude to visitors is quite welcoming.

3.4.8.10 Language

Punjabi is the main language. Many dialects of Punjabi can be found in practice.

3.4.8.11 Ethnicity

The main castes and groups of the project area are Syed, Arain, Awan, Kurrar, Malik, Madwal and Khallan.

3.4.8.12 Role of Women

Women of the area are mostly illiterate. It is not considered very appropriate to educate women beyond the school or intermediate levels. It is true that the attitudes of people are changing, but the change is very gradual. However, they do assist their male family members in all of their activities. Women mostly reside within homes and do not get out for any occupation.

3.4.8.13 Archeological and Historical Treasures**3.4.8.13.1 Dharabi Lake**

Dharabi Lake is a reservoir that has been developed for the collecting and storage of water that comes from "The Dharab River." Dharabi Lake is perfect for all forms of water sports, including boating, canoeing, surfing, and fishing, due to its topographical characteristics. Because of this, the place hosts both public and private family festivals and water sports competitions all year long. This is another reason why Dharabi is one of Chakwal's most visited lakes. Once fully completed, this tourist attraction in Punjab would be the ideal weekend destination for families from adjacent cities.

3.4.8.13.2 Kallar Kahar Lakes

This location is renowned for its Kallar Kahar Lake, Takht-e-Babri, and exquisite peacock species. This lake is a saltwater lake that is located at an elevation of 500 meters above sea level, with an area of 8 kilometers, and a maximum depth of 4-5 feet. When going from Kabul to assault Delhi with his army, the renowned Mughal emperor Zahir-ud-Din Babar encamped in Kallar Kahar. During his stay, a large rock was carved into a throne from which he addressed his soldiers. Later, the throne became known as Takht-e-Babri. It remains in Kallar Kahar and serves as a renowned tourist destination. Bagh-e-Safa is a supposedly Babar-planted garden. Babar described Kallar Kahar as a "charming spot with good air" and a site of natural beauty.

Kallar Kahar Lake is historically one of the important tourist's spot, famous for fruit gardens and holy shrine of Hazrat Hu-Bahu where wild peacocks have special attraction for the visitors. The other tourist attractions are the famous garden, Bagh-e-Safa which was constructed by the Mughal King Babar who was inspired by the landscape beauty of the Kallar Kahar Lake. Takht-e-Babri is a small table land cut from limestone formation & adjusted into a stage platform

which is located in the fruit garden from where the Mughal King Babar use to view lake and addresses his army There are a number of fresh water springs which are used to irrigate fruit gardens and also a perennial source of recharge for Kalar Kahar Lake. After the construction of motorway during year 1997, the Kalar Kahar Lake has gained special importance because motorway has provided a direct access of major cities of Punjab to the Lake through Kalar Kahar Interchange. Hence the number of tourists increased many folds. To meet the requirements of the tourists the Government initiated several measures such as increase of parking area, construction of new markets in private sector for providing food and other picnic items.

Kalar Kahar Lake is also one of unique wetland located in salt range of Pakistan where every year thousands of migratory birds from Central Asia land and spend 3-4 months from late November to March. It is one of the ideal abode for a number of migratory birds. The important migratory birds which land in Kalar Kahar Lake include Water fowls, Russian ducks and Siberians crines The protection of the ecosystem for various species of migratory birds, as well as for healthy tourism it is very essential to keep the pollution free water in the lake, to find the causes and propose protection measures (Floater, 2002). Otherwise the continuation of present situation may result in loss of wetland (Devis & Froend, 1998).

3.4.8.13.3 Chinji National Park

Located on Sargodha road in Talagang Tehsil, Chakwal District, Punjab, Pakistan. Chinji National Park, also referred to simply as Chinji, was established in 1987 and is classified as a category II protected area by the IUCN (national park). It extends across an area that has a total of 6,095 hectares (15,061 acres). The Chinji National Park is located in the ecoregion known as the "Balochistan xeric woodlands," and it features deserts as well as xeric shrublands as its dominant biomes. The region is recognized for its subtropical vegetation, which is home to a great number of important plant species. The Urial, the Bengal fox, the Golden jackal, the Indian wolf, and the Indian pangolin are just a few of the mammals that may be found in this region. However, some game birds are also included like the Grey Francolin and the Common Wood Pigeon.

3.4.8.13.4 Swaik Lake

Swaik Lake (also known as Khandowa Lake). It is a well-known destination for vacationers, and it provides options for swimming and water sports. In addition, the lake features a waterfall in its surroundings. It is commonly known as Neela Pani. Its entire surface is composed of the highest and most breathtaking mountains, cliffs, and rocks, creating an outstanding, shallow body of water. The ideal time to explore the area is during the day, but there are few shops and rest breaks nearby, so be sure to bring enough food, water, and medications. It is essential for newcomers to exercise caution, especially when camping near these places.

3.4.8.13.5 Malot Fort

Located at 32°41'0N 72°48'E lying to the west of Kallar Kahar with an altitude of 230 meters (757 feet). The village of Malot is in Chakwal, which is in Kallar Kahar. But there is also a town with the same name near the Malot Fort. In particular, the town used to be called Malik Kot, but that name was changed to Malot. In the Tuzk-e-Babri, the transition of the region's name from Malik Kot to Mal-Kot and subsequently to Malot is obvious. The fort dates back to the 10th century AD and features a hybrid architecture that draws inspiration from both Greek and Kashmiri styles. Archives say that Malot was built around the year 980 AD. As is the case with many historical sites in the Salt Range, the Malot Fort, a beautiful and unique fort in the area, is getting worse because it isn't being taken care of.

3.4.8.13.6 Neela-Wahn

Neela Wahn, Kallar Kahar is a beautiful natural waterfall and lake, located on Khushab Road, near Kallar Kahar, Punjab, Pakistan. Neela is an Urdu word that means "blue," and "Wahn" means "pond." So, the name of the place fits with what it has to offer. Locals call it Chashma Aab-e-Hayat because the water is clear and blue, which is a sign of purity. It is known for its saltwater lake, peacocks, and natural gardens. Neela Wahn is full of natural waterfalls and freshwater streams. It's the perfect place for hiking and camping. The trip to Neela Wahn is great for people who want to try something new and for people who want to get away from the noise of the city.

3.4.8.13.7 Takht-e-Babri

Takht-e-Babri is located in Kallar Kahar, in the District Chakwal along the motorway. Kallar Kahar is the subdivision of Chakwal District Punjab. A very popular tourist site is located thirty kilometers south of Dharabi Lake. It was one of the most visited historical sites in Punjab, Pakistan, with tens of thousands of visitors per day. It is a rock-based platform with a cutout in the shape of a throne and is regarded as the very first structure constructed by the Mughals. The Takht-i-Babri is a historical platform that was used by King Babur, the first Mughal Emperor, to deliver speeches to his soldiers as they marched into Delhi in their pursuit of the crown. After the Motorway was built in this area, the historical point became more popular.

3.5 Lab Reports of Environmental Analysis

For assessing the current status of baseline quality of environmental parameters including ground water, ambient air and noise in the study area have been monitored through Punjab-EPA approved laboratory in the presence of Punjab-EPA officials. The monitoring reports of Environmental Testing Laboratory containing the results have been annexed in Appendix-VII.

According to the data, all the parameters of water are within ranges as provided by Punjab Environmental Quality Standards.

The main sources of air pollutants are gaseous emissions from the industries and traffic on road. Environmental Protection Department of Punjab has issued Punjab Environmental Quality Standards for criteria pollutants, i.e., Particulate Matter, Ozone, Oxides of Nitrogen, Sulphur Dioxide and Carbon Monoxide. Results have been described in Table 3.3. According to the data, all the parameters of air are within ranges as provided by Punjab Environmental Quality Standards. These may be subsequently monitored for knowing impact of project construction and operational activity on the value of these pollutants.

Area is in industrial as well as in commercial use. Current levels of sound have been monitored. Results have been described in Table 3.4. The result shows that Noise levels are already within PEQS.

3.6 Suitability of the Site

Rule-6(1)(c) of the Punjab Protected Areas Rules, 2023 requires to illustrate the sustainable capacity of the protected area in relation to per capita requirements of the concerned species for inhabitation. For this purpose, a survey of both species of concern i.e. Grey & Black partridges has been undertaken during last week of July, 2023 for collection of primary baseline data in this respect. The estimated population of Grey partridge and Black Francolin of the reserve as well as surrounding areas was calculated as 8.65 and 2.27 birds per hectare respectively (total population 526 & 138 birds respectively). In order to assess the sustainable capacity of the DPWR area, the results of present survey were compared with the results of a study conducted by Khalil & Anwar (2016) on habitat preferences of Grey Partridge in the area of Salt Range. Based on the habitat preferences of the species, the results of the study revealed a population range of 9.85 to 15.5 birds per hectare in different habitats studied. The study data collected from more or less same habitats as of the DPWR, further suggested that the Grey francolin showed high preferences for the habitat type comprising of mixed tree species with associated grassland at an elevation of 505 to 523 meters and 697 to 704 meters. Since the reserve and its surrounding areas perfectly have the representative of all studied habitats as well as elevation (Figure 3.15), therefore, the reserve area may even support more than 12 Grey Francolin on the average (if protected area is managed through the current management plan) than estimated through the present survey i.e. 8.65 birds per hectare. Similarly, Basit et. al., (2021) estimated highest population density of 2.19 birds/ hectare in mountainous habitats with forests and associated grasslands in Kala Chaitta ranges of Potohar region. As the results of the said study (2.19 birds/hectare) are in consonance with the present survey (2.27 birds/hectare) of the reserve area with similar habitat range, therefore, the reserve area is perfectly suitable for sustainability of the population of the species. The sightings of Grey and Black Francolins during survey of the area have been illustrated through Figure 3.15 below.

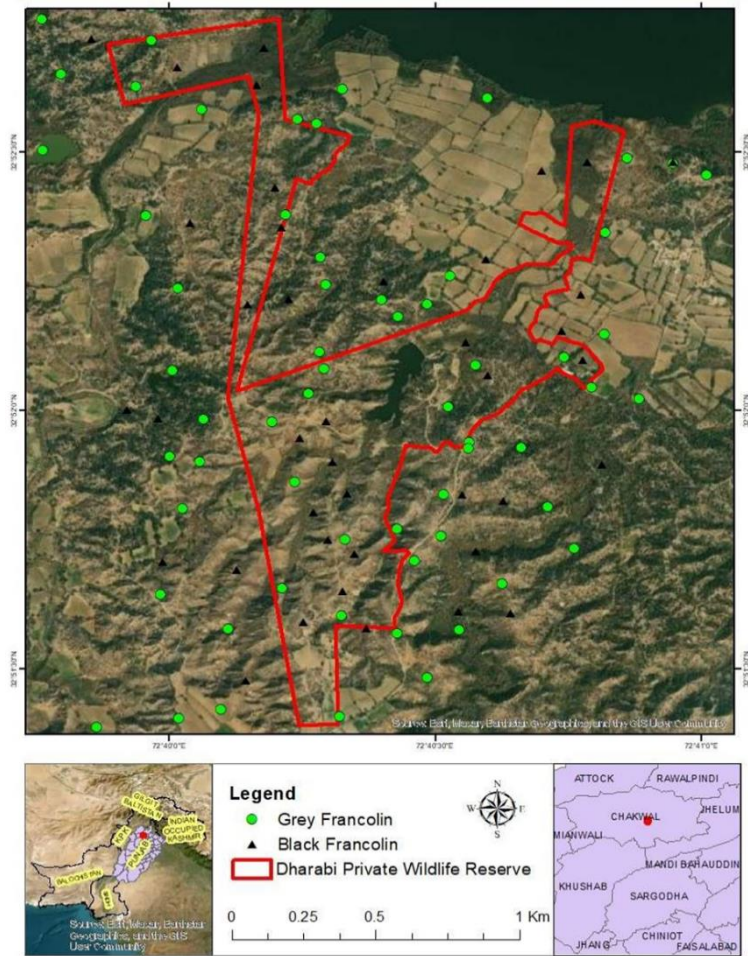


Figure 3.14: Sightings of Grey and Black Francolins During Survey of Dharabi Private Wildlife Reserve, District Chakwal

CHAPTER-4

SCREENING OF POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

4.1 General

This chapter identifies the potential impacts due to the implementation of project on the physical, ecological and social environment of project area. The chapter also identifies measures that will help mitigate the project's adverse environmental effects and enhance positive impacts. This shows the environmental responsibility on the part of the proponent.

The proponent is submitting an undertaking on stamp paper with EPA-Punjab that they shall ensure that the project shall be executed throughout all of its phases strictly in compliance with all applicable legal and regulatory obligations regarding environment. Therefore, we can say that the project activities shall not have significant negative environmental impact on any aspect of the environment.

4.2 Impact Assessment Methodology

Following methods have been used for impact assessment:

4.2.1 Checklists

The environmental aspects of the project during all stages namely pre-construction, construction and operation have been selected from Aldo Leopold's master list of environmental items which is widely used world over for this purpose. The extent of qualitative and quantitative impacts has been described and mitigation measures have been proposed to keep them within permissible limits.

The systematic strategy developed to provide an assessment of the potential impacts on the environment of the project area included:

- Considering general guidelines
- Surveying, environmental baseline monitoring and stakeholders consultations to identify potential environmental impacts
- Situational analysis to know magnitude and significance of impacts
- Proposing best available and cost effective mitigation measures for environmental management

4.2.2 Thinking through Stages of the Project

The project stages have been defined as pre-construction, construction and operation phase. The actions and likely impacts of each stage of the project

have been described on the basis of professional judgment. Environmental monitoring of selected parameters shall also be carried out. The best available techniques not entailing to environmental costs and best practicable options have been recommended to mitigate the negative impacts.

4.3 Impacts Associated with Project Location

The project envisages the establishment of Dharabi Private Wildlife Reserve at Dhoke Morian, Mouza Rehna Sadaat, Tehsil Kalla Kahar, District Chakwal. The site location is already a wild area. Government of the Punjab has dedicated this location for agricultural use. Therefore, the aims of the project can be achieved here.

The establishment of this Dharabi Private Wildlife Reserve is not expected to cause any significant negative impact in the location of the project because all the environmental aspects shall be kept under strict controls with the help of stringent mitigation measures incorporated in management plan.

4.4 Impacts Associated with Project Design

Design stage is the most important stage where environmental consideration can comfortably be incorporated without any financial and environmental damages. Subsequent modifications in order to bring the project in compliance with legal requirements after the initiation of the project often causes wastage of valuable natural and financial resources.

The construction shall involve only boundary fencing of the project area and also establishment of 03 guard posts. All guard posts shall have wooden roofs supported by masonry walls. The civil work for guard posts will be excavation for foundations, construction of masonry walls followed by installation of wooden planks to male roof. Localized drilling shall be done to excavate for foundations. The localized drilling shall keep the impact of construction within limits. Similarly, localized drilling shall be done to excavate for foundations for fencing. In the excavated pits, pre-cast RCC pillars shall be installed to support the steel wire mesh fence. The project has been designed to adhere to all standard technical as well as environmental requirements in order to avoid impacts on environment. The construction contractors will be selected from among contractors who have significant experience in similar construction developments. These contractors shall have competence to care about environmental aspects of the project.

4.5 Characteristics of Impacts Associated with Construction Phase and their Mitigation Measures

The project shall involve only minor construction. Therefore, the impact of construction shall be controlled.

4.5.1 Noise and Vibration

During construction activities, only minor noise shall be generated. This may cause temporary disturbance to local public and fauna of the area. Operation of earth moving and excavation equipment, cutting operations may also be sources of noise. Loading and off-loading of materials and equipment shall also be a source of noise.

4.5.1.1 Duration

On the whole, the duration of the noise shall be temporary. The construction activities shall be performed only during day light hours.

4.5.1.2 Extent & Location

The noise and vibration shall remain restricted within 30-40 ft. of the project area.

4.5.1.3 Reversibility

As soon as the construction phase is complete, the noise and vibration due to construction activities shall cease to exist.

4.5.1.4 Likelihood (Risk)

The noise levels shall be mostly within acceptable limits. Only construction staff shall be at risk. If they adopt following mitigation measures, their risk shall be managed. Residential areas are very far away from the project site. Thus, these shall not be impacted due to noise and vibration.

Mitigation Measures

- Activities with the greatest potential to generate noise to be planned during periods of the day that will result in least disturbance.
- Such equipment shall be used which has been designed by default with noise control elements.
- Proper lubrication and maintenance of all construction equipment shall prevent unwanted sounds leading to noise.
- Operation of noise producing machinery shall be kept limited.
- Ear plugs shall be provided to workers during construction (if needed).

4.5.2 Impact on Soil

Initially the soil shall be disintegrated to a little extent due to excavation for foundation pillars.

4.5.2.1 Duration

After construction phase, the soil particles shall settle down and get consolidated. Therefore, the duration shall be temporary.

4.5.2.2 Extent & Location

The excavation for foundation pillars shall cause only local disintegration of soil. The soil disintegration shall be within the project site.

4.5.2.3 Reversibility

Bare soil shall be vegetated. Deep soil shall not be disturbed as such except holes for filling foundation pillars with concrete.

4.5.2.4 Likelihood (Risk)

The disintegrated soil shall be immediately replaced with replacement soil. Therefore, there is no likelihood of any risk.

Mitigation Measures

- Excavation shall be done for foundation with the help of vertical drilling thus restricting its area of impact only to the specified points of the site
- Compacting the surfaces properly
- Preventing the movement of soil particles into the water channels
- Vegetating exposed areas after construction promptly

4.5.3 Impact on Air Quality

Initially construction activities may generate emission of dust caused by a combination of on-site excavation, filling, movement of earth materials, contact of construction machinery with bare soil, and exposure of bare soil and soil piles to wind. A secondary source of emissions may include exhaust from combustion engines of earth moving equipment on-site.

Use of uncovered vehicles for transportation of building materials such as gravel, sand and cement as well as their storage on the construction site can lead to inadvertent dispersal of materials during heavy rains or high winds during dry periods. This may have a little negative impact on the surroundings the form of particulate matter (PM).

4.5.3.1 Duration

Temporary. At the end of construction phase, the above stated sources of air pollution shall cease to exist.

4.5.3.2 Extent & Location

The air pollution shall spread only upto radius of about 50 feet from the boundaries of project plot. However, if precautions not taken, movement of material carrying vehicles can cause dispersion of particulate matter in the surrounding areas.

4.5.3.3 Reversibility

At the end of construction phase, the above stated sources of air pollution shall cease to exist. Therefore there shall not be any air pollution due to above mentioned sources after completion of construction phase. Thus environment shall get reversed.

4.5.3.4 Likelihood (Risk)

The air pollution shall comprise particulate matter as major component. This may lead to cough and problem in comfortable breathing if precautions not taken.

Mitigation Measures

- Restricting the excavation only to the specified points with the help of drilling excavator
- Covering the stockpiles of construction materials and/or watering where possible
- Covering all carts carrying earth, sand, aggregate and other materials with tarpaulin to help contain construction materials being transported within the body of each carrier.
- Use of such construction equipment and vehicles which uses environment friendly fuels shall be preferred
- Good housekeeping should be observed at the site generally.
- Provision of PPE's to workers to prevent entry of air pollutants in their breathing system.

4.5.4 Solid Waste

Solid waste expected to be generated from construction activities may include broken bricks, left over of sand and cement, excess fill materials, concrete waste, sanitary wares, electricity wires, wooden cuttings, scrap metals, cement packaging etc. Municipal solid waste will also be generated due to worker's activities. Overall, the solid waste shall be combination of biodegradable and non-biodegradable kinds.

4.5.4.1 Duration

Temporary. At the end of construction phase, the above stated sources of solid waste shall cease to exist.

4.5.4.2 Extent & Location

The sources of solid waste shall be restricted to the project plot. It shall not be causing any impact on the surrounding areas. The recyclables shall be sold to junk handlers.

4.5.4.3 Reversibility

At the end of construction phase, the above stated sources of solid waste shall cease to exist after completion of construction phase. Thus environment shall get reversed.

4.5.4.4 Likelihood (Risk)

The solid waste shall not cause any harm to the environment. However, this shall depend on the maintenance of rate of removal of solid waste according to the generation rate.

Mitigation Measures

- Excavated soil shall be dumped in nearby depressions.
- Construction material waste shall also be dumped in the depressions. This shall not cause any harm to the environment of the area.
- Waste management hierarchy of reduce, reuse and recycle shall be ensured for all of the construction activities.
- A comprehensive solid waste management plan will be devised and adhered to collect, segregate and dispose solid waste.
- Recyclable and non-recyclable waste will be segregated, stored separately at source.
- Segregated recyclable waste will be sold to shops at Bhaun Bazar which further sell them out to contractors in recycling market
- No on-site burning of wastes will be allowed at any time.
- All employees shall be trained regarding proper waste management
- Collection schedule of waste will be according to the rate of generation
- Municipal solid waste shall be managed by converting it into compost to be used for vegetation of the area. On the site, the color coded bins for collection of municipal solid waste shall be available to prevent the chances of its attraction by scavengers.

4.5.5 Impact on Water Resources

There are no surface water resources which are expected to be impacted by the project activities. The construction activity shall use water for making aggregate and concrete mix for plastering of masonry walls, foundations and pavement of the floors. The water requirement shall be met with borehole ground water. There shall be a little additional load on ground water resources. The water from this source shall also be used for sanitation purposes.

Construction activities may cause the generation of sanitary wastewater discharges in varying quantities depending on the number of workers involved. This wastewater shall be in septic tanks of areas used by construction crew.

4.5.5.1 Duration

At the end of construction phase, the need for above stated extraction of water shall cease to exist.

4.5.5.2 Extent & Location

The local water table shall be impacted. The project area shall get meet its need of water from borehole pump getting water from ground right beneath it within project area.

4.5.5.3 Reversibility

The quantity water extracted out for use during construction phase shall be naturally recovered to the aquifer through natural rainfall. Therefore the impact shall be reversed.

4.5.5.4 Likelihood (Risk)

There is no risk of extensive depletion of water due to this project construction.

Mitigation Measures

- All kinds of wastewater shall be segregated.
- Water usage shall be kept as minimum as possible.
- Water reuse and recycling shall be ensured where possible.
- Adequate portable or permanent sanitation facilities serving all construction workers shall be provided. Mostly toilets in the surrounding areas shall be used.
- If camping needed, sewage from construction camps shall be disposed of by development of on-site sanitation systems i.e. septic tanks.

4.5.6 Impact on Ecological Environment

The construction activity will be carried out in the proposed site which is situated within already wild area. The purpose is to protect significant flora and fauna. Therefore, no adverse impact on fauna and flora is anticipated due to the proposed activity. There will be no cutting of any trees. There will be removal of grass and weeds from the location of proposed site.

4.5.6.1 Duration

At the end of construction phase, the sources of particulate pollution from this project shall cease to exist.

4.5.6.2 Extent & Location

The birds and some other animals (mostly rodents) shall feel noise and vibration and may migrate in immediate local surroundings of few feet from project area.

4.5.6.3 Reversibility

The impact during construction shall be reversible.

4.5.6.4 Likelihood (Risk)

There is no risk of loss of or damage to any biodiversity due to this project construction.

Mitigation Measures

- The construction activities should be performed in such a manner that it does not impact vegetation of the project area.
- Tree plantation shall be carried out after construction to improve the ecological condition.
- Breeding places for shall be made to increase their population.

4.5.7 Impact on Socio-economic Conditions

The implementation of the proposed project will not involve dislocation or involuntary resettlement of people. Positive impact is anticipated in terms of employment opportunity as many skilled, semi-skilled and un-skilled personnel will get direct and indirect employment during construction phase. Construction activities, particularly movement of carts and machinery may affect the workers as well as the residents.

4.5.7.1 Duration

The mason, labor and other skilled and unskilled workers shall get temporary employment during construction activity. At the end of construction phase, their jobs will be terminated.

4.5.7.2 Extent & Location

The construction staff shall be from immediate surrounding locality.

4.5.7.3 Reversibility

After construction phase, the staff shall lose their jobs from this project. They may get jobs at some other projects. Thus the impact during construction shall be reversible.

4.5.7.4 Likelihood (Risk)

There is only risk of loss of jobs after this project construction.

Mitigation Measures

- This shall be ensured that local people be preferred for all kinds of jobs during construction phase.
- The contractor will select specific timings for heavy machinery operation so as to cause least disturbance to the adjoining community by considering their peak movement hours.

4.5.8 Occupational Health and Safety

For guard posts, work at height shall be involved which needs safety management. Moving machinery shall also have potential of injuries to the workers. Plus, there may also be electric hazards.

Handling of construction materials usually causes skin problems. Due to only day time construction activity, there are less chances of night fatigue.

During hot season of the summer, there may be chances of heat stress.

4.5.8.1 Duration

The construction activity will be performed only 08 hours a day and additional time for lunch break. The risk of injury shall exist only when performing certain hazardous activity.

4.5.8.2 Extent & Location

The impact shall be restricted within site of the project plot.

4.5.8.3 Reversibility

After construction phase, the occupational health and safety impacts due to construction activity shall cease to exist. Thus the impact during construction shall be reversible.

4.5.8.4 Likelihood (Risk)

There are risks of injuries from work at height, electrical hazards, musculoskeletal disorders due this project construction.

Mitigation Measures

- Adequate scaffolding and shuttering shall be established and used for all kinds of construction activities.

- Work at height shall be performed only after permit to work by HSE staff who shall issue such permit to work at height after taking all appropriate measures.
- Work site layout shall be designed to minimize the need for manual transfer of heavy loads.
- Electrical cords should be located in common areas and marked corridors.
- Safety signage should be adequately displayed
- Clean drinking water availability shall be ensured for use by all construction staff.
- In order to prevent spread of infectious diseases, only the workers tested for harmful infectious diseases should be hired. Screening test may be performed at the time of hiring
- Emergency response plan should be made, communicated to all and maintained during all of the construction activities
- First aid facility should be readily available for the workers at the site.
- Good house-keeping should be practiced prevent the events of slips, trips and fall.
- Mandatory personal protective equipment like masks, gloves and helmets should be strictly used by the labor according to their assignments at the work site.
- Smoking should be avoided to prevent any fire incident
- Fire and any other emergency shall be managed with the help of emergency services provided by Government of the Punjab Emergency Services 1122.
- Adequate training and awareness about occupational and safety shall be provided to all of the employees.
- During hot season, outdoor work timing may be changed. In case of inevitable circumstances, workers should be given adequate breaks.
- Workers should be given mineralized fluids during hot season to balance electrolytes in their body.

4.5.9 Traffic Flow

The project plot is situated in a wild area accessible through a jeep-able track. The transportation of construction materials through this track shall temporarily cause increased load on the track.

4.5.9.1 Duration

The congestion shall be of temporary duration only during construction phase of the project.

4.5.9.2 Extent & Location

The impact shall be restricted along jeep-able track.

4.5.9.3 Reversibility

Traffic flow shall get smooth after movement of construction materials vehicles. Thus, the impact shall be reversible.

4.5.9.4 Likelihood (Risk)

There is risk of injuries from collision of vehicles.

Mitigation Measures

- Transportation of construction materials shall be scheduled during off-peak hours so far as possible.
- Vehicle operators shall be instructed to maintain low speed to prevent any accidents.

4.6 Characteristics of Impacts Associated with Operation Phase and their Mitigation Measures

4.6.1 Air Emissions

The operations of this private wildlife reserve shall not cause any air emissions.

4.6.1.1 Duration

The probable impacts (if any) shall be permanent throughout operation phase.

4.6.1.2 Extent & Location

The impact shall be positive in the proximities.

4.6.1.3 Reversibility

The particulate matter (if any) may get settle down naturally due to flocculation. Thus, the impact shall be reversible.

4.6.1.4 Likelihood (Risk)

There are no risks of respiratory problems.

Mitigation Measures

- Vegetation/Tree plantation shall improve air quality.
- Workers shall be provided with masks to prevent entry of particulates into their breathing system.

4.6.2 Wastewater & Water Balance

Water shall be needed for irrigation and also for hygiene purposes in toilets of guard posts. The source of water for meeting all needs of water shall be ground water supplied through borehole pump. The sewerage shall be generated from toilets. Such waste water is not part of regular operations and may not have very hazardous composition. The toilets shall be septic tank based. Overall requirement shall be 7500 liters per month.

4.6.2.1 Duration

Water shall be permanently needed for irrigation of the project. Water for hygiene purpose shall also be permanently needed throughout operation phase of the project.

4.6.2.2 Extent & Location

The impact shall be on the local ground water resources within radius of about 1 Km from project boundaries.

4.6.2.3 Reversibility

The unpaved soils shall absorb the excess water from irrigation of vegetated area. Rainfall shall also contribute to water recharging. Khan dam and Dharabi Lake shall recharge the groundwater table.

4.6.2.4 Likelihood (Risk)

There are risks of water depletion if careful steps not taken for water conservation.

Mitigation Measures

- The sprinkler system shall installed for irrigation.
- Water bouser shall be used for irrigation where sprinkler not installed.
- The septic tank shall be established for sewerage.
- Periodic cleaning shall be carried out.
- Better piping design shall be ensured to facilitate draining of the lines.

4.6.3 Noise

The sources of noise shall be the firing of guns only during hunting season.

4.6.3.1 Duration

The noise from firing guns shall be intermittent and of temporary duration.

4.6.3.2 Extent & Location

The impact of noise and vibration shall be within hunting area.

4.6.3.3 Reversibility

The potential damage caused to human ear may be either reversible or irreversible depending upon intensity of instantaneous noise.

4.6.3.4 Likelihood (Risk)

This noise shall not be significant and remain well below Punjab Environmental Quality Standards. Following precautions shall further reduce the risk caused by noise and vibration.

Mitigation Measures

- Surrounding vegetation in the area shall absorb noise.
- Plantation of trees all over the project area shall further reduce impact of noise reasonably.
- Hunters shall use ear plugs/muffs.

4.6.4 Solid Waste

Due to movement of public and guards, municipal solid waste shall be generated. This shall comprise recyclable and non-recyclable components.

4.6.4.1 Duration

The operational solid waste shall be generated on daily basis. It shall be segregated at source and managed according to following mitigation measures.

4.6.4.2 Extent & Location

The impact of both operational solid waste shall be within project area.

4.6.4.3 Reversibility

Following measures shall assist in reducing the quantity of solid waste thus reversing the circumstances.

4.6.4.4 Likelihood (Risk)

If solid waste not collected timely, there shall be nuisance. Plus, there may be occupation of space by solid waste. Piling of solid waste may cause development of microorganisms and rodents.

Mitigation Measures

- The recyclables and non-recyclables shall be segregated.
- Putrescible and organic waste shall be subject to composting and used over vegetation in the project area.

- All of the recyclables including plastic waste wrappers etc. shall be collected and sold to junk handlers (Kabadia) in the Bhaun Bazar.
- Overall, waste management hierarchy of reduce, reuse and recycle for all of the operations shall be ensured.
- A comprehensive solid waste management plan will be devised and adhered to collect, segregate and dispose solid waste.
- No on-site burning of wastes will be allowed at any time.
- Training of all employees regarding proper waste management
- Collection schedule of waste will be according to the rate of generation.

4.6.5 Impact on Flora and Fauna

During survey of the area, it was recognized that the Dharabi Private Wildlife Reserve does not contain absolutely complete or unaltered ecosystems. This, combined with increasing and cumulative disturbances from sources outside of the protected area such as adjacent land use, upstream effects of pollution, colonization of invasive and alien species particularly of flora, and visitor use, is likely to result in irreversible degradation of the protected area's ecosystems, loss of biodiversity and impoverishment of gene pools.

4.6.5.1 Duration

Otherwise, the operational activities shall not harm flora and fauna. Instead these are supportive for them.

4.6.5.2 Extent & Location

The operational activities shall not cause harm to flora and fauna. The impact of shall be within as well as outside project area.

4.6.5.3 Reversibility

Following mitigation measures shall assist in reversing the impact caused. If flora replenished sustainably then the caused impact (if any) shall be reversed.

4.6.5.4 Likelihood (Risk)

There may be risk of migration of local fauna to other locations if precautions not taken. Local flora, if not replenished, may become extinguished from locality.

Mitigation Measures

- Decision-making associated with the protection of protected area's ecosystems will be scientifically based on internationally accepted principles and concepts of conservation biology. The Protected area ecosystems will be managed with minimal interference to natural processes.

- Ornamental plants and fruit trees have been proposed to be planted on very large sized lawns inside the project area to improve aesthetic beauty, landscape and create a suitable habitat for fauna.
- Extensive tree plantation shall be carried out.
- Within the protected area, effort must be directed at maintaining ecosystems in, as natural a state as possible and human induced disturbance must primarily be avoided. Where, in those rare circumstances avoidance cannot be achieved the disturbance must be mitigated and ameliorated in compliance with relevant legislations/policies.
- Ecosystem management must be derived from a conceptual and strategic basis for the protection of reserve ecosystems. It must involve a holistic view of the natural environment to ensuring that all management decisions take into consideration the complex interactions and dynamic nature of the ecosystems and their limited capacity to withstand and recover from human induced disturbance. It was further recognized that, in particular cumulative, human induced disturbance or poor management practices i.e. through agricultural practices have far-reaching, long-lasting and potentially irreversible negative impacts effects on species, habitats, ecosystems and the protected area as a whole. It is thus recognized that a cautious and risk adverse approach must be exercised.

4.6.6 Occupational Health and Safety

The handling of agricultural equipment, firing guns and ammunition needs are occupational health and safety aspects of the operational phase of the project.

4.6.6.1 Duration

The occupational health and safety aspects of the operational phase of the project shall remain matter of concern throughout project.

4.6.6.2 Extent & Location

The occupational health and safety aspects of the operational activities of the project shall remain matter of concern within project area.

4.6.6.3 Reversibility

A sound corrective and preventive action plan may prevent and/or reverse the potential consequences.

4.6.6.4 Likelihood (Risk)

There may be risk from hazardous firing ammunitions.

Mitigation Measures

- Occupational health and safety management plan shall be established and adhered to during operations.
- All the equipment and materials shall be handled according to the required handling instructions provided by their manufacturers.
- Fire extinguishers, water bouser shall be made available.
- Emergency response plan shall be made, communicated to all and maintained during all of the operations activities.
- Punjab Emergency services 1122 shall address Emergency incidents.
- First aid facility shall be readily available at all guard posts.
- Good house-keeping shall be practiced all over the reserve area.
- A program shall be established focused on making available the most modern and best quality of PPEs for ensuring occupational health and safety of all hunters and guards.
- Smoking shall be avoided to prevent any fire incident.
- Clean drinking water availability shall be ensured.
- During summer, mineralized fluids shall be served to the man power to manage impacts of hot season and prevent chances of heat stress.
- In order to prevent spread of infectious diseases, only the workers tested for harmful infectious diseases shall be hired. Screening test shall be performed at the time of hiring
- Adequate training and awareness about occupational and safety shall be provided to all of the employees.
- Every incident, accident or near miss shall be reported and recorded in order to ensure safe culture and with the objective of attaining zero incidences of mishaps.

4.6.7 Impact on Socio-economic Conditions

A positive impact is anticipated in terms of employment opportunity, as skilled, semi-skilled and un-skilled personnel will get direct and indirect employment during operational phase of the proposed project.

4.6.7.1 Duration

The operational phase of the project shall have life-long impact on socio-economic conditions of the local population.

4.6.7.2 Extent & Location

The population in immediate surroundings of the project plot can get employment depending upon their skill match with the requirement of the operational phase of the project.

4.6.7.3 Reversibility

There may be some groups of people which may have concerns with the operational phase of the project. Their concerns have been discussed in Chapter-6, Stakeholder Consultation, in order to better manage them.

4.6.7.4 Likelihood (Risk)

There may be risk of negative thoughts about the project if they are not involved/consulted to express their concerns over the project.

Mitigation Measures

In order to enhance the socioeconomic benefits of the project, local people should be preferably hired for all of the operational activities so that they feel ownership of the project.

4.6.8 Traffic Flow

The transportation through jeepable track shall temporarily cause increased load on the track. Especially large size vehicles shall increase the problem.

4.6.8.1 Duration

The transport during operational phase of the project shall have life-long impact on socio-economic conditions of the local population.

4.6.8.2 Extent & Location

Traffic flow may get impacted because of narrow size of jeepable track.

4.6.8.3 Reversibility

The impact shall be insignificant.

4.6.8.4 Likelihood (Risk)

There may be risk of accidents in case of collision. In case of undisciplined traffic flow, traffic congestion may occur.

Mitigation Measures

- Traffic signs and guiding mirrors should be installed at dangerous turns of jeepable track.
- Vehicle operators should be instructed to maintain low speed to prevent any accidents.

4.7 Potential Environmental Enhancement Measures

Following steps shall be taken for environmental enhancement:

- Breeding places shall be especially taken care of.
- Regular cleaning of breeding places shall be ensured.
- All of the reserve area shall be vegetated with flowering plants and fruit trees for environmental enhancement.
- Additionally, the proponent shall keep planting a large number of trees as part of environmental responsibility.
- Adequate fire fighting system will be established and maintained at all times.
- Visual impact of the unit and its surroundings shall be given due consideration.

CHAPTER-5

ENVIRONMENTAL MANAGEMENT PLAN AND MONITORING PROGRAM

5.1 General

This chapter describes the Environmental Management Plan (EMP) for the environmental and social mitigation measures identified during the Environmental Impact Assessment and reported in Chapter 4 of this document. The Environmental Management Plan (EMP) is a site specific plan developed to ensure that the project is implemented in an environmental sustainable manner where all interested parties understand the potential environmental risks arising from the proposed project and take appropriate actions to properly manage that risk. EMP also ensures the project implementation is carried out by taking appropriate mitigative actions to reduce adverse environmental impacts during its life cycle. Existing environmental regulations are complied with and potential adverse environmental impacts resulting from the project activities are minimized as practicably as possible. This EMP provides the delivery mechanism to address the adverse environmental impacts of the proposed project during its execution, to enhance project benefits and to introduce standards of good practices to be adopted for all project works.

The plan outlines existing and potential problems that may adversely impact the environment and recommends preventive and corrective measures where required. Also, the plan outlines roles and responsibility of the key personnel who are charged with the responsibility to manage the project site.

Environmental monitoring and management have been proposed to be carried out in all stages of the project. EMP will be operational to ensure legal environmental compliance. Environmental Monitoring will further ensure operation in environmentally sustainable fashion. The proponent will ensure that the implementation of all phases of the project is in line with the EIA report and Environmental Management Plan.

5.2 Objectives of EMP

For the effective implementation and management of the mitigation measures Environmental Management Plan (EMP) has been prepared to ensure compliance with the basic provisions of the Punjab Environmental Protection Act (Amendment) 2012. A structure of EMP is being given for the assistance of the management of Dharabi Private Wildlife Reserve. It is recommended that project management must implement this EMP and where required, changes must be made accordingly. Protected area management plans are high-level, strategic documents that provide the direction for the development and operation of protected areas. The plan guides management at all levels,

from the staff on-site through to the CEO, the Management Authority (MA) and the relevant statutory department. The key objectives of the EMP are:

- Define roles and responsibilities for all of the interested parties including the project proponent, contractors and construction supervision consultants for implementation of the plan.
- Mention standards which need to be achieved. All relevant legislation is complied with prescribed procedures/standards.
- All environmental safeguards are carried out correctly.
- Provide mechanism for unanticipated environmental situation.
- Identify training requirements at various levels.
- The EMP provides a delivery mechanism to address potential impacts of project activities.
- Minimization of adverse impacts on environment.
- Monitoring of the project for environmental impacts.

The Dharabi Private Wildlife Reserve is the first privately owned protected areas in District Chakwal intended for registration under Section-12 of the Punjab Protected Areas Act, 2020 and Rule-4(a)(i) of the Private Wildlife Reserve Rules, 2023 (Annexure-IX). The main objectives of the establishment of reserve are conservation of wildlife and regulation of area for sustainable use of wildlife resources. For effective management of such protected areas, the preparation, approval and implementation of the management plan under Rule-6 of the Punjab Protected Areas Rules, 2022 have been included in legislative regime as mandatory. The management plan of Dharabi Private Wildlife Reserve, District Chakwal has, therefore, been prepared in an attempt to comply the said provisions of the rules in order for effective management of the reserve to achieve its strategic objectives. The management plan has been developed initially for five years i.e. 2023-24 to 2027-28 and the same shall be extended for another term based on the management effectiveness assessment and as per provisions of the rules/regulations in this regard. The format developed by Ezemvelo KZN Wildlife, Protected Areas Management Planning Unit, Pietermaritzburg, KwaZulu-Natal, South Africa for development of Management Plan for Opathe Game Reserve (version-1), 2016 has been adopted for development of this plan.

The vision of the Dharabi Private Wildlife Reserve has been set as *“To be renowned leader in the conservation world particularly of Punjab, Pakistan in the field of biodiversity and game management by Private Sector”*.

The purpose of the management plan recommended by Wildlife department in compliance with legal and regulatory requirements is to:

- ensure compliance of the Section-12 & 14 of the “Punjab Protected Areas Act, 2020”, the Rule-6 & 7 of the “Punjab Protected Areas Rules, 2023 and the Rule-3 of the “Private Wildlife Reserve Rules, 2023;
- facilitate compliance of the Strategic Plan for Biodiversity 2011-2020 under Convention on Biological Diversity (CBD) including Aichi Targets,

- with special emphasize to the Strategic Goal-D of the plan;
- facilitate the compliances of Bonn Convention on the conservation of migratory species;
- provide the primary strategic tool for management of Dharabi Private Wildlife Reserve (DPWR), informing the need for certain mandatory measures and operational procedures;
- provide financial framework and indicators that the budget is spent correctly & efficiently;
- build accountability into the management of Dharabi Private Wildlife Reserve;
- provide for capacity building, future thinking and continuity of management;
- enable Management Authority of the reserve to develop and manage it in such a way that its values and the purpose for which it was established are protected;
- ensure sustainable hunting of wildlife species allowed to be harvested from the reserve;
- facilitate the effective management of DPWR in accordance with relevant provincial, national and international norms and standards;

The plan outlines the implementation of the conditions laid out in the Protected Area Management Agreement for DPWR, which are to:

- Compliance of all statutory requirements under relevant legislations;
- Preserve the ecological integrity (including vulnerable and ecologically sensitive areas) of the reserve;
- Conserve the biodiversity of the reserve;
- Protect areas representative of all ecosystems, habitats and species naturally occurring there;
- Protect threatened or rare species if present in the area of the reserve;
- Assist in ensuring the sustained supply of environmental goods and services provided by the reserve;
- Provide for the sustainable use of natural and biological resources
- Create or augment destinations for educational and nature- based tourism (where applicable);
- Manage the interrelationship between the natural environment, biodiversity, human settlement and economic development;
- Rehabilitate and restore degraded ecosystems and promote the recovery of threatened and vulnerable species (if present there).

The compliance of the Strategic Plan for Biodiversity 2011-2020 under Convention on Biological Diversity (CBD) including Aichi Targets, with special emphasize to the Strategic Goal-D of the plan i.e. “the active participation of local communities in conservation”; will also be favoured through implementation of this protected Areas Management Plan. Migratory Birds under Rule-4 of the Private Wildlife Reserve Rules, 2023 have legal cover of the treaties agreed by the member countries under Bonn Convention on the conservation of migratory species.

5.3 Components of EMP

The EMP of the identified environmental impacts associated with this project consists of the following components:

- Description of the activities that are to be carried during all phases of project.
- Description of aspects which are likely to be impacted due to proposed project.
- Mitigation plan to reduce the severity of associated impacts
- Institutional arrangement and framework for monitoring, reporting and supervision of EMP
- Specific requirements for communication, documentation, training, management and implementation of the mitigation measures
- Monitoring the implementation of the EMP
- Monitoring plan to monitor the impacts and their severity
- Actions required for assessing the effectiveness of the mitigation measures employed such as guide through the monitoring mechanism and identifying related parameters required for confirming the effective implementation of the mitigation measures
- Environmental and social trainings to raise awareness
- Allocation of resources required to implement the EMP and outline relevant expenses arrangements.

5.4 Legislative Guidelines

Rule-3 of the “Private Wildlife Reserve Rules, 2023” provides for specifications of land and requirement of Management Plan as well as Management Agreement for registration/operations of the protected Area. Similarly, the “Punjab Protected Areas Rules, 2023” through rule-6 provides guidelines for preparation of Protected Areas Management Plan. Hence the primary planning approach is the guidelines for management of protected areas as envisaged under the Punjab Protected Areas Act, 2020 and Rules framed thereunder.

5.4.1 Policy Framework Guiding the Management of Protected Area

In conserving and managing the biodiversity of Punjab Province, apart from provincial legislations, Wildlife operations are undertaken within a specified framework of guidelines / policies. At provincial/national level, such initiatives are set out in:

- The Draft Wildlife Policy and Action Plan, 2018.
- The Sustainable Development Goals (SDGs) with 169 targets within them, officially known as transforming our world: the 2030 Agenda for Sustainable Development, the relevant is “Goal-15, Life on Land”.
- Community involvement in conservation through Provincial regulations i.e. “Community Based Conservancy Rules, 2023” for conservation through active participation of communities and appointment of

- Honourary Officers under the Punjab Protected Areas, Rules, 2023.
- The Convention on Biological Diversity
 - Convention on International Trade in endangered species of wild fauna and flora (CITES);
 - Convention on Wetlands of International Importance (Ramsar Convention);
 - Convention Concerning the Protection of the World Cultural and Natural Heritage (World Heritage Convention)
 - United Nations convention to Combat Desertification;
 - United Nations Framework Convention on Climate Change and
 - Convention on Migratory Species (CMS or Bonn Convention).

5.4.2 Collaboration and Transparency

Stakeholder involvement and support as well as transparency in functions are important aspect of effective protected area management. These are also required in terms of Section 4, 12, 17 and 26(2) of the Punjab the Punjab Protected Areas Act, 2020, Rules 8, and 9 of the Private Wildlife Reserve Rules, 2023 and Rule 7, 11 and 12 of the Punjab Protected Areas Rules, 2023.

Technical support from the Department and relevant Stakeholders has been included. Similarly, regular monitoring and implementation of relevant regulations by the Department shall ensure the transparency.

Accordingly, the development of this management plan has been undertaken through a collaborative process, involving key stakeholders.

5.5 Institutional Capacity/Roles & Responsibilities of Environmental Management Team

In Punjab Province, under Section- 14 of the Act, the Management of Protected Areas shall be exercised by the Management Authorities (MA's) notified in this respect. The Department shall govern the performance of management authority through the set indicators as provided under Section-17 of the Act.

The management of DPWR will be undertaken in accordance with relevant legislation and the management policies of the department, which mainly includes a commitment to maintain and protect biological diversity, natural landscapes and waterscapes and to preserve ecological integrity.

The MA of the DPWR shall be responsible to submit annual reports to the Department and shall further be governed institutionally through Management Board as per provisions of the Section-5 of the Act.

Environmental management will be the integral part of the project policy. Therefore, committing to reduce the environmental impacts will reflect the management approach and believe that good performance in this area is identical with running a well-managed efficient project operations.

Environmental management is basically the institutional arrangement which delegates some specific assigned responsibilities and those responsibilities are to be monitored properly. During operation phase, main responsibility for environmental performance will be supervised by top management of this medical devices manufacturing unit, while the daily management will be performed under the direction of Manager Operations and Administrator. Under their supervision, environmental management during operations will be performed as per the mitigation and monitoring plans outlined in this EIA. A brief structure of role and responsibilities is given below:

5.5.1 Top Management-The Management Authority

Project proponent will be responsible for monitoring and evaluation. He shall be able to do so with consultation of his Environment Consultant who will be responsible to monitor EMP implementation and reporting to the proponent. The Environment Specialist of consultant will carry out a final evaluation at the end of the project construction. Management will undertake overall responsibility for compliance with the EMP. It will ensure that all activities, management executes with contractors, comply with positive environmental sensitivities as well as it will cooperate with the concerned regulatory agencies such as the Environmental Protection Agency-Punjab.

The Dharabi Private Reserve will be managed administratively by M/S Chromatex Chemicals (Pvt.) Limited (“The Management Authority”) through its CEO (among Board of Directors of the Company) assisted by the additional staff as set out through organizational structure in Figure 2.1. The figure represents the staff complement and positions that are required to enable the effective operation, management and protection of Dharabi Private Wildlife Reserve.

The Registration certificate of M/S Chromatex Chemicals (Pvt.) Limited (“the Management Authority”) as company is appended as Annexure-VIII, whereas, the proceedings of “Board Resolution” whereby Mr. Ahmad Hussain Khan S/O Muhammad Anwar Khan, CNIC # 35202-3864413-9, amongst the Directors of Company has been authorized to manage the Reserve on behalf of Company (as Chief Executive Officer) is appended as Annexure-VIII. The composition of Dharabi Private Wildlife Reserve Management Authority is as shown in Figure 5.1:

For effective environmental management, responsibilities shall be set internally as follows:

5.5.1.1 Chief Executive Officer

- To cooperate and consult with relevant environmental agency in order to perform in better way.
- Over all in-charge of all the Environmental Management Plan (EMP) and EMtP.
- He will be responsible to ensure smooth functioning of the EMP and EMtP system.

- To evaluate the progress of development and implementation of this management plan.
- Daily progress on the state of the environmental performance will be reported to him by General Manager.
- All Environmental Management and Monitoring matters, issues and problems will be reported to him.
- To approve any change in decision making with the consultation of respective managers, if appropriate.

5.5.1.2 General Manager

- He will be responsible to look into smooth functioning of the processes in environmentally sustainable fashion.
- He will directly report and will be answerable to the higher management in all matters relating to EMP.
- He will be responsible to rectify any problem regarding environmental matters.
- He will be responsible to get all environmental monitoring carried out according to the monitoring schedule and will keep records

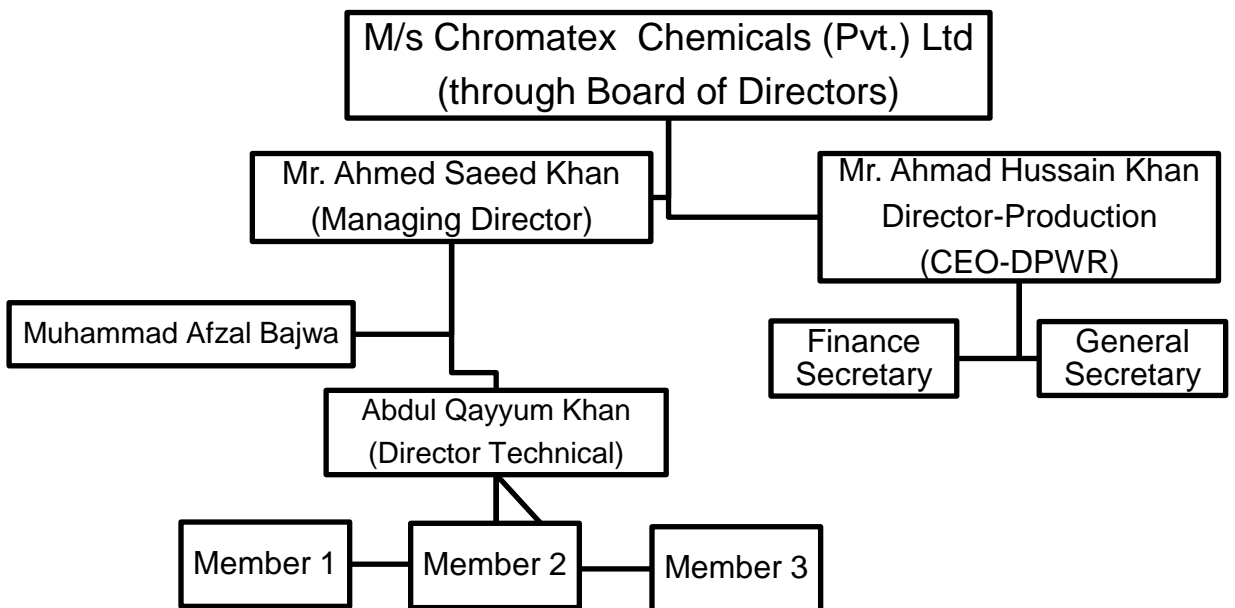


Figure 5.1: Dharabi Private Wildlife Reserve Management Authority

5.5.1.3 Contractor

The contractor will carry out field activities as part of the proposed project that includes relevant and subsidiary construction work. The contractor will be subjected to certain liabilities under the environmental laws of the country which will be mentioned in the contract with the project site engineer. On

behalf of contractor, top management will be responsible for all issues pertaining to environment related with the assigned contractor. The delegated roles and responsibilities of the contractor will consist of the following basic points:

- To carry out construction activities in environmentally sound manner.
- To coordinate with the HSE Officer to resolve issues arise during construction phase.
- To manage and implement environmental management practices as per the impact assessment report as well as HSE polices belong to both contractor and project site engineer.
- To manage construction crew and reduce the environmental impacts.

5.5.1.4 Manager Operations

The role of these managers will be crucial during the operation phase as all of the key environmental aspects listed fall into their respective domains. Followings are some of the common roles and responsibilities given to these positions:

- To ensure that the points of views of staff, are considered and placed in the EMP accordingly
- To regularly meet and resolve the upcoming and on-going environmental issues.
- To identify issues and where possible propose solutions for inclusion in the management plan review process.
- To make sure that relevant staff is adequately trained to carry out their respective duties in order to improve environmental performance of the medical devices manufacturing operations.
- To contribute towards the actions to deliver the management plan and ensure its continued improvement.

5.5.2 Construction Manager

The role of Construction Manager is very important. The success of an EMP will mainly depend upon effective management by this person. During the construction phase, main responsibility of environmental performance will reside with proponent's construction manager, who will be assisted in daily activities monitoring by site HSE Officer. Followings are some of the roles and responsibilities given to the Construction Manager:

- To ensure that the staff, contractors and HSE Officer's point of views are considered and placed in the EMP accordingly.
- To identify issues and where possible, propose solutions for inclusion in the management plan review process.
- To improve coordination and exchange of information between management, employees, contractors, etc.
- To contribute towards the actions to deliver the management plan and ensure its continued development.

- To monitor the progress of development and implementation of this management plan.

5.5.3 Role of EPA-Punjab

District Office of the EPA-Punjab will monitor the overall environmental performance of all phases of the project.

5.6 Environmental Management Plan

The preparation of this plan has involved an extensive and detailed program of investigation to the processes and issues involved and with consultation of project's management and all others concerned. Therefore, this network will provide a structure to assist in the implementation of the management plan accordingly.

The success of the management plan will lie with its implementation. An EMP requires to be executed in three stages. Those are, planning & design stage, construction stage and operation stage.

5.6.1 Pre-Construction Phase EMP

Implementation of EMP at this stage may tackle the environmental issues before they arise i.e., prior to the construction phase. Following three main components to be considered in EMP are given below:

5.6.1.1 Design Stage

It describes the location of proposed project, its adjoining conditions in the area, facilities to be installed in particular locations as well as their mechanics and other related operations. If any design parameter changes at time of approval, management will assess the environmental impacts that may arise from such changes. If the impacts are found to be different and in excess of those mentioned in the report, project management will develop further mitigation measures with respect to the changes to minimize these impacts and seek approval for the required change from Environmental Protection Agency-Punjab as well as other regulatory authorities.

5.6.1.2 Approvals

The proponent is bound to get all relevant clearances and necessary approvals required by the government prior to commencing the project activities regarding medical devices manufacturing unit. Hence No Objection Certificate from the Environmental Protection Agency-Punjab will not relieve the project management and they have to fulfil the other requirements as well for starting their project. Approval from Wildlife Department, Government of the Punjab shall be required.

5.6.1.3 Contractual Provisions

The requirements of environmental impact assessment in terms of environmental mitigation shall be incorporated into the operations plans and procedures of the contract. Therefore, signing of contract will strictly bind contractor to follow those procedures and must comply the environmental regulations.

5.6.2 Construction Phase

During the construction phase, the management will implement all environmental related issues as per the mitigation matrix in the EIA.

5.6.3 Operations Phase

During normal operations of the project, the proponent will assign all specific environmental related actions to respective departments who will be fulfilling their responsibilities as per the mitigation and monitoring matrices.

5.7 Mitigation Plan

The Environmental Management Plan is meant for mitigation, management, avoidance of the adverse impacts. It defines all the impacts and their remedies with highlighting the responsible personals to work on those mitigations. The identified impacts and suggested mitigation measures with institutional responsibilities are tabulated in Table 5.1 and Table 5.2. All these impacts and mitigations have already been given in previous chapter of this report. Project management and construction contractor will be required to adhere these mitigation measures throughout the project. For each mitigation measure to be taken, its location, timeframe, implementation and supervising responsibilities are listed in the EMP.

Table 5.1: Environmental Management Plan of Construction Stage

Anticipated Environmental Aspects and Impacts	Proposed Mitigation Measures	Institutional Responsibility		
		Implementation	Supervision	Monitoring
<p>Solid Waste</p> <p>Solid waste shall be generated in the form of excavation soil, small concrete spills, broken bricks, wasted concrete material, scrap wood and metals, etc.</p>	<p>The excavated soil shall be dumped within project area.</p> <p>Development of proper solid waste management system (Collection, storage, segregation, transportation and disposal).</p> <p>All kinds of solid waste shall be kept segregated.</p> <p>Temporary bins shall be kept for segregated waste collection.</p> <p>The waste collection and disposal schedule shall be made so as to prevent any kind of nuisance at the site.</p> <p>The construction staff shall be trained regarding housekeeping practices.</p> <p>Municipal waste shall be converted into compost.</p>	Construction Staff	PMU	Proponent
<p>Water Quality</p>	Spills and wastage should be prevented.	Construction Staff	PMU	Proponent

<p>Borehole pump shall be installed to meet all construction and operations requirements of water.</p> <p>If needed, through overhead water tanks can be kept filled</p> <p>Workers shall use toilets in surrounding areas.</p>	<p>Water consumption shall be kept at minimum and even the amount used also will mostly percolate to ground water table thus recharging it.</p> <p>Sanitary wastewater shall not be separately discharged during construction phase.</p>			
<p>Air Quality</p> <p>Particulate matter may arise due to localized excavation in soil for foundation purpose, ground leveling activities, deposits of construction materials and also due to movement of off-road or on-road automobiles.</p> <p>Off-road or on-road automobiles shall also cause exhaust pollution.</p>	<p>Carts carrying, soil, sand, aggregate and other materials will be kept covered with tarpaulin to contain the construction materials being transported within the body of each carrier.</p> <p>Regular tuning and maintenance of engines ensures good efficiency.</p> <p>Waste burning will not be allowed.</p> <p>The workers shall be provided with appropriate masks for use against air pollution.</p>	<p>Construction Staff</p>	<p>PMU</p>	<p>Proponent</p>
<p>Noise</p> <p>During the construction phase of the project, noise sources may include construction</p>	<p>All construction equipment should be maintained in good working order.</p> <p>The noise shall be absorbed by surrounding cover of vegetation and not</p>	<p>Construction Staff</p>	<p>PMU</p>	<p>Proponent</p>

<p>machinery, cutting of metal fence parts, on-road and off-road vehicles.</p>	<p>spread to far areas. Therefore, noise during construction phase shall meet the applicable standard in PEQS.</p> <p>Avoid use of pressure horns.</p> <p>Provision and use of PPEs shall be ensured.</p> <p>Lubricate all moving parts of the machinery.</p> <p>Work shall only be done during day time thus sleep of the surrounding community shall not be disturbed.</p>			
<p>Soil</p> <p>Soil may erode by exposure of soil surface to rain and wind during site clearing, earth moving, and excavation activities.</p>	<p>Providing adequate surface material compaction and maintenance.</p> <p>Only localized excavation shall be done with drilling equipment.</p>	<p>Construction Staff</p>	<p>PMU</p>	<p>Proponent</p>
<p>Traffic Flow</p> <p>A slight increase in traffic is apprehended due to the transportation of construction materials for proposed project at jeepable track.</p>	<p>The transportation of construction materials may be scheduled during off-peak hours.</p> <p>This is a small scale project and shall need transport of materials only few times.</p>	<p>Construction Staff</p>	<p>PMU</p>	<p>Proponent</p>

<p>Occupational Health and Safety</p> <p>There may be risks associated with work at height and minor injuries.</p> <p>Due to interaction of workers from various backgrounds, there is possibility of contagious diseases.</p> <p>Construction activity pose particulate pollution hazard to workers.</p> <p>Fire safety measures.</p>	<p>First aid facilities should be readily available</p> <p>Construction workers shall be provided with adequate awareness and training about HSE aspects of the project.</p> <p>Provision and use of suitable Personal Protective Equipment.</p> <p>Work at height should be performed under supervision of HSE Officer who shall issue work at height permit after taking all appropriate measures.</p> <p>Emergency response plan should be made and relevant facilities established and maintained</p> <p>Safety signs should be displayed.</p> <p>Smoking should be prevented to prevent fire hazard.</p> <p>Safety shoes shall be worn by the workers while performing jobs related with electric equipment.</p> <p>Punjab Emergency Service 1122 may assist in fire and other kinds of</p>	<p>Construction Staff</p>	<p>PMU</p>	<p>Proponent</p>
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	<p>emergency management.</p> <p>Reporting and documentation of all incidents, accidents and near misses shall be ensured.</p>			
Construction materials such as sand, gravel etc.	<p>Stockpiles should be covered to prevent dispersion of materials</p> <p>These should be surrounded by low brick wall to prevent their spreading on the ground.</p>	Construction Staff	PMU	Proponent
Socioeconomic Impacts	<p>Aesthetic of the area should be protected so far as possible</p> <p>Unnecessary use of horns should be prevented</p> <p>Local people shall be hired from the area</p>	Construction Staff	PMU	Proponent

Table 5.2: Environmental Management Plan of Operational Stage

Anticipated Environmental Aspects and Impacts	Proposed Mitigation Measures	Institutional Responsibility		
		Implementation	Supervision	Monitoring
<p>Air Pollution</p> <p>Due to movement of vehicles, ambient air may get polluted.</p>	<p>The transport vehicles will be kept in good working condition and properly tuned, in order to minimize the exhaust emissions.</p>	General Manager	Environment Consultant.	Proponent
<p>Water Quality</p>	<p>Sprinkler system shall be used to</p>	General	Environment	Proponent

<p>The operations shall involve use of water for irrigation of vegetation.</p> <p>Water shall also be used for sanitation by check posts' staff.</p> <p>Sanitary waste from toilets.</p>	<p>safe amount of water.</p> <p>Septic tanks and drainage lines of check posts shall be periodically cleaned.</p> <p>There shall be separate lines for drainage of storm water and waste water.</p> <p>According to PIEDMC bye-laws, septic tanks shall be constructed for wastewater management.</p> <p>Sewerage shall flow to septic tank from where it shall be safely disposal through scheduled emptying.</p>	<p>Manager</p>	<p>Consultant</p>	
<p>Noise</p> <p>Noise is not expected to be generated by operations.</p> <p>Only hunting season, firing of guns shall produce noise.</p>	<p>Ear plugs/muffs shall be used by hunters to prevent entry of sound waves into ear canal.</p>	<p>General Manager</p>	<p>Environment Consultant</p>	<p>Proponent</p>
<p>Solid Waste</p> <p>Packing of eatables.</p> <p>Municipal waste shall also be</p>	<p>Provision of sufficient waste collection points and regular collection of waste.</p> <p>All solid waste shall be carefully</p>	<p>General Manager</p>	<p>Environment Consultant</p>	<p>Proponent</p>

<p>generated.</p>	<p>segregated according to the type and sold in the market for reuse and recycling as may be appropriate.</p> <p>Municipal Solid Waste shall be carefully segregated and converted into compost for vegetation of the project area.</p> <p>Packing of eatables shall be segregated according to the type and either sold in Bhaun market or transported to TMA approved site.</p> <p>Thus the operational solid waste shall be managed in an environment friendly manner.</p> <p>No on-site burning of wastes will be allowed at any time.</p> <p>Training of personnel in proper waste management practices.</p>			
<p>Occupational Health & Safety</p> <p>Fire Safety measures.</p> <p>Ergonomic issues</p>	<p>The guard posts shall be provided with illumination and comfortable temperatures shall be maintained whole of the year.</p> <p>All employees should undergo</p>	<p>General Manager</p>	<p>Environment Consultant</p>	<p>Proponent</p>

	<p>occupational health and safety training including training about safe lifting practices.</p> <p>First Aid kit shall be provided.</p> <p>Fire extinguishers and water bouser shall be available for fire safety.</p> <p>Workers shall be provided with appropriate kind and number of Personnel Protective Equipment (PPE).</p> <p>Emergency response plan should be made and relevant facilities established and maintained</p> <p>Safety signs should be displayed.</p> <p>Smoking should be prevented to prevent fire hazard.</p> <p>Punjab Emergency Services 1122 shall assist in fire and other kinds of emergency management.</p> <p>All safety incidents shall be recorded and monitored with the objective of attaining zero incidences of mishaps.</p>			
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<p>Ecology</p>	<p>Plantation of trees shall be carried out in and around the project site throughout the year.</p> <p>A large portion of the plot has been proposed to be planted with fruit trees and flowering plants.</p>	<p>General Manager</p>	<p>Environment Consultant</p>	<p>Proponent</p>
<p>Socioeconomic Impacts</p> <p>Local norms and values</p> <p>Standard of Living</p>	<p>Local norms and values should be respected.</p> <p>Unnecessary use of horns should be prevented.</p> <p>Only local people shall be hired.</p>	<p>General Manager</p>	<p>Environment Consultant.</p>	<p>Proponent</p>
<p>Traffic Flow</p> <p>A slight increase in congestion is apprehended at jeepable track due to proposed project.</p>	<p>Marshaling may be introduced to prevent any traffic congestions.</p>	<p>General Manager</p>	<p>Environment Consultant.</p>	<p>Proponent</p>

5.8 Operational Management Framework

The management plan for DPWR translates the strategic management framework described in previous section described above into management activities and targets, which will be used to inform annual plans of operation and the resources required to implement them. The management targets will form the basis for monitoring of performance in implementing the plan and are thus measurable.

5.8.1 Determination of Priorities for Strategic Outcomes

In the tables that follow in this section, a column has been included entitled "Priority", which is intended to convey the level of priority attached to its management target. The purpose of prioritizing activities is to direct funds and resources to the most important activities, in the event that there are insufficient funds or resources to undertake all of the activities outlined in a particular year. Priorities are ordered in three categories, which have been determined on the following basis:

Priority 1

A management target that is central to the compliance of relevant legislations/Regulations of the Punjab Wildlife & Parks Department or that addresses an aspect of management that is fundamental to the protection of the values and purpose of Dharabi Private Wildlife Reserve.

Priority 2

A management target that addresses an aspect of management that contributes towards community/stakeholders (including Department) involvement and support for the conservation of Dharabi Private Wildlife Reserve, which is a key principle of effective protected area management.

Priority 3

A management target that indirectly contributes towards the protection of biodiversity or the development of social and/or economic benefits and opportunities for Dharabi Private Wildlife Reserve and/or its surrounding local communities particularly in terms of employment opportunities for locals.

5.9 Strategic Management Framework

For effective management of the Dharabi Private Wildlife Reserve, the following strategic framework has been developed. The purpose of effort is aimed at providing the strategic basis for the protection, development and operation of the protected area over the next five years. Furthermore, the same has been prepared collaboratively through a process involving consultation with stakeholders, the communities around the protected area and complying with the relevant legislations/policies.

The vision describes the overall long-term goal for the operation, protection and development of Dharabi Private Wildlife Reserve. Whereas, the objectives and strategic outcomes that follow are intended to provide the basis for the achievement of the vision. Furthermore, the objectives provide a broad description of the goals for each key performance area.

5.9.1 Vision of DPWR

- To be renowned leader in the conservation world particularly of Punjab, Pakistan in the field of biodiversity/game management by Private Sector,
- to contribute to biodiversity conservation, sound resource management, while providing sustainable eco-tourism and
- to form the core of a consolidated self-sufficient conservation area through Bio-economy nodes with community support by means of employment opportunities, environmental awareness and education.

5.9.2 Objectives & Strategic Outcomes of DPWR

An objective has been identified for each of Reserve's key performance areas, which follow from the management challenges, issues and opportunities, and relate to the important functions and activities necessary to protect, develop and manage it effectively. The objectives have then been translated into strategic outcomes, which form the basis for the management activities and targets set out in the operational management framework. Table 5.2 sets out the key performance areas, the objective for each key performance area and the strategic outcomes, required to realize the objectives:

Table 5.3: Objectives and Strategic Outcomes of the Dharabi Private Wildlife Reserve

S#	KEY PERFORMANCE AREAS	OBJECTIVES	STRATEGIC OUTCOMES
1	Legal Compliance and Law Enforcement	Comply with and enforce legislation pertaining to the protection, development and management of Dharabi Private Wildlife Reserve.	<ul style="list-style-type: none"> ▪ Ensure that the full extent of the protected area is appropriately demarcated. ▪ Ensure that there is adequate law enforcement at the Reserve under relevant legislations. ▪ Ensure effective control of legitimate access points in to Reserve.
2	Stakeholder Engagement	Enable and maintain effective stakeholder relations through communication and collaboration.	<ul style="list-style-type: none"> ▪ Constructive interaction and co-operation with local neighbouring community and stakeholders. ▪ Ensure as far as possible that the Dharabi Private Wildlife Reserve enjoys public support.
3	Buffering Mechanisms & Regional Management	Protect the biodiversity and cultural assets of Dharabi Private Wildlife Reserve by promoting compatible Land-use, activities and water-use in areas surrounding the protected area.	<ul style="list-style-type: none"> ▪ Ensure that the size of the Reserve is sufficient to achieve its management objectives i.e. compatible with the minimum requirement as per rules as well as per capita area requirements of species concerned. ▪ Determination of the buffer zone / zone of influence requirements around the Reserve. ▪ Ensure that water-use planning and Land-use planning take cognizance of the Reserve's objectives.
4	Environmental Education & Awareness	Actively promote an understanding and appreciation of the values of Reserve.	<ul style="list-style-type: none"> ▪ Implement an effective Environmental education and awareness programme linked to the objectives of the Reserve and focused on the surrounding communities.

5	Eco-tourism Management & Development	Maintain sustainable nature based eco-tourism in Reserve area to provide a high quality visitor experience whilst promoting the natural and cultural values of the protected area.	<ul style="list-style-type: none"> ▪ Ensure that all current eco-tourism infrastructure are maintained. ▪ Ensure general maintenance of the reserve area. ▪ Augment destinations for nature-based tourism
6	Biodiversity Resource & Conservation Management	Protect the ecological integrity, habitat, ecosystems, landscapes and waterscapes of Dharabi Private Wildlife Reserve through active interventions based on principles of adaptive and ecosystem based management	<ul style="list-style-type: none"> ▪ Maintenance of Fire Management regime. ▪ Adequate fire safety within the Reserve is ensured. ▪ Ensure control on invasion of alien/invasive plants species in the protected area. ▪ Clear all invasive plant infestations in the protected area. ▪ Implementation of procedures to identify, rehabilitate and manage areas that have been significantly impacted by soil erosion. ▪ Implementation of procedures to control Alien animal species within the protected area. ▪ If extractive resource use is undertaken, it is done legally and in conformity with the Punjab Protected Areas Act, 2020 and its relevant Rules. ▪ If bio-prospecting is undertaken, it is done legally and conforms to relevant legislation <i>ibid</i>. ▪ Develop and implement a strategy for the introduction and management of wildlife into the protected area in accordance with legislations/regulations of the Punjab Wildlife & Parks Department.

			<ul style="list-style-type: none"> ▪ Development and implementation of a strategy for human/wildlife conflict. ▪ Ensure that there is sufficient information and understanding of biodiversity in Reserve to inform and support the achievement of specific biodiversity objectives. ▪ Establishment of processes to determine success of management interventions in protecting the ecosystems, communities and species of the protected area.
7	Ensure sustainable use of natural and biological resources	Ensure the protection to natural resources and sustainable harvesting of permissible resources of Dharabi Private Wildlife Reserve in accordance with statutory requirements	<ul style="list-style-type: none"> ▪ Protection to natural resources through operational interventions and harvesting of permissible resources on sustainable basis achieving the objectives of establishment and preserving the values of Dharabi Private Wildlife Reserve. ▪ Defined harvestable limit. ▪ Wildlife Act 1st Schedule species breeding, release and harvesting mechanisms
8	Operational Management	Provide adequate human resources, equipment, infrastructure and funding to enable the effective protection, development/management of Reserve and procedures for sustainable resources utilization	<ul style="list-style-type: none"> ▪ Development and implementation of a five-year financial plan that identifies the resource needs to achieve the objectives for the protected area. ▪ Ensure that the protected area is resourced with a sufficient staff establishment for its effective management and operation ▪ Ensure that there is an effective staff management programme in place. ▪ Defining and implementation of Census / Survey timelines for declaration of surplus stock

			<p>for harvest purpose.</p> <ul style="list-style-type: none"> ▪ Developments for species replenishment and implementation of replenishment plans. ▪ Defining of Timeline for processing of cases for hunting expeditions and permits issuance etc. ▪ Ensure that there is an effective staff management programme in place. ▪ Ensure that the protected area is compliant with the Punjab Wildlife (Protection, Preservation, Conservation and Management) (Amendment) Act, 2007, the Punjab Protected Areas Act, 2020 and relevant regulations. ▪ Ensure that facilities and infrastructure in the protected area are adequately maintained
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5.9.2.1 Legal Compliance and Law Enforcement

Complying with its mandate to undertake the conservation and management of protected areas in Punjab, the Department must ensure that the province’s protected areas are appropriately legally protected and that the laws governing the use of protected areas and the prohibition of particular activities are enforced. In fulfilling this role, the Management Authority of Dharabi Private Wildlife Reserve shall adhere to the following guiding principles:

- Utmost efforts within legal coverage must be made to ensure the effective protection / conservation of biodiversity within and on the boundaries of the protected area.
- Cooperative structures should be established to enable participation by key stakeholders such as local communities, District & Regional Department formations and the respective Police Department in addressing offences and breaches of the law.
- Law enforcement within the protected area will be undertaken through surveillance patrolling, monitoring and appropriate reaction in the event of an offence.
- Managers should familiarize them with all relevant legislation and legal agreements and apply this to their management actions

Table 5.4: Framework for Legal Compliance and Law Enforcement

Strategic Outcome	Management Activities	Management Target	Target Indicator (Evidence)	Indicators of Concern	Priority	Responsibility
Ensure that the full extent of the Protected Area is appropriately demarcated.	<ul style="list-style-type: none"> ▪ Erect and maintain signage to ensure sufficient demarcation at all entry points. ▪ Start to erect fencing of the Reserve area and/or upgrade the areas with damaged or missing fence. 	<ul style="list-style-type: none"> ▪ Appropriate demarcation of boundaries in Reserve. ▪ Maintenance of existing fence (where already erected). 	<ul style="list-style-type: none"> ▪ PA map. ▪ Signage at main access areas. ▪ Fence/boundary specifications and monitoring reports 	<ul style="list-style-type: none"> ▪ Damaged Fence/unmanned areas or of unrestricted entry. ▪ Lack of financial and human resources to maintain fence. 	Year 1	Assistant Manager (Field Operations)
Ensure that there is adequate law enforcement at the Reserve under relevant legislations.	<ul style="list-style-type: none"> ▪ Develop and implement an integrated security strategy (Integrated Compliance Plan) for the Dharabi Private Wildlife Reserve, which ensures collaboration with all relevant institutions. ▪ 	<ul style="list-style-type: none"> ▪ Creation of cooperative structures with local communities and law enforcement officials/Departments. ▪ Informant networks. ▪ Coordinated protection/security efforts. 	<ul style="list-style-type: none"> ▪ Minutes and attendance registers of Meetings of cooperative structures/security officials. ▪ Integrated Compliance Plan. 	<ul style="list-style-type: none"> ▪ Ad-hoc security measures that are not integrated into the broader protection/security strategies and programmes. 	Year 2	--do--

	<ul style="list-style-type: none"> Develop and gazette internal rules for controlling use & activities in DPWR 	<ul style="list-style-type: none"> Compliance with the Provincial Wildlife Legislations in terms of gazetting of internal rules that will facilitate effective law enforcement. 	<ul style="list-style-type: none"> Copy of Gazette Notice for internal rules 	<ul style="list-style-type: none"> Lack of control of use & activities in DPWR. 	Year 2	Management Authority
continued	<ul style="list-style-type: none"> Ensure that there is sufficient law enforcement capacity including staff numbers, skills, equipment and support/collaboration with Department/relevant law enforcing agencies. 	<ul style="list-style-type: none"> Capacitated work force that can fulfill the organization's mandate in terms of law enforcement. 	<ul style="list-style-type: none"> Organogram. Asset register Skills audit Occupational health and safety file Training/field attachments 	<ul style="list-style-type: none"> Protected Area management lacks the capacity or is constrained by limited capacity to enforce the law in keeping with the organization's mandate 	Ongoing	Assistant Manager (Field Operations) with relevant Department Regional /District field staff
	<ul style="list-style-type: none"> Regular patrols covering the full extent of the DPWR Prosecution of any offender caught committing an offence 	<p>Legal protection of the full extent of the Dharabi Private Wildlife Reserve in terms of Department legislations/Regulations.</p>	<ul style="list-style-type: none"> Reserve specific rules Standard Operating Procedure Patrol book/reports Challan records 	<ul style="list-style-type: none"> Increase or frequent recovery of snares Increase in security breaches Recorded losses of game 	Ongoing	--do--

			<ul style="list-style-type: none"> ▪ Fire records (arson fires) ▪ Incident reports 	<p>species and/or losses of rare and endangered species</p> <ul style="list-style-type: none"> ▪ Increase in arson fires ▪ Conflicts with surrounding community 		
Ensure effective Control of legitimate access points in to Dharabi Private Wildlife Reserve	<ul style="list-style-type: none"> ▪ Compile a servitude register of all servitudes and their specific conditions for Dharabi Private Wildlife Reserve 	<ul style="list-style-type: none"> ▪ Enforcement of conditions of relevant servitudes by Reserve staff 	<ul style="list-style-type: none"> ▪ Register/copy of servitudes and their conditions on station 	<ul style="list-style-type: none"> ▪ Lack of knowledge of PA staff of servitudes and their conditions and therefore lack of enforcing these correctly 	Year 1	Assistant Manager (Field Operations)
	<ul style="list-style-type: none"> ▪ Develop and implement Standard Operating Procedures/Station orders for gate/entry point access and control ▪ Ensure staff is capacitated to control protected area access ▪ Maintain access 	Effective control Measures for Protected area access	Standard operating Procedures/ Management orders	<ul style="list-style-type: none"> ▪ Ineffective or partially effective control measures to control protected area access. ▪ Increase in illegal entry incidents. 	Ongoing	--do--

	control records ▪ Maintain a key register for Dharabi Private Wildlife Reserve		Challan books records			
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5.9.2.2 Stakeholders Engagement

Dharabi Private Wildlife Reserve, as illustrated in the context section is bounded with lands of surrounding communities, a state-owned forest and an under- development tourist spot viz., Dharabi Dam. Similarly being located along the Motorway (M-2) the reserve is also in close proximity with the motorway forces. Constructive relationships with adjacent landowners and communities are an important aspect of the effective conservation of protected areas. Stakeholder engagement should be aimed at developing a strong sense of partnership between the neighbours/communities as well as other stakeholders including relevant departments/law enforcement agencies, concerned with the protected area and its managers. In this respect, the following guiding principles should be adhered to:

- Efforts should be made to ensure that the communities living around the protected area are aware of the role that it fulfils in biodiversity protection and the provision of ecosystem services to the region.
- Stakeholder engagement should be undertaken to engender a sense of ownership of the protected area, within the communities, and support for its biodiversity conservation objectives.
- A common understanding of the issues that affect both the protected area and the surrounding communities should be developed and efforts to resolve them should be undertaken cooperatively.

The detailed operational requirements for Stakeholder engagement are set out in Table 5.5:

Table 5.5: Framework for Stakeholders Engagement

Strategic Outcome	Management Activities	Management Target	Target Indicator (Evidence)	Indicators of Concern	Priority	Responsibility
<p>Constructive interaction and co-operation with local neighbouring community and stakeholders.</p>	<ul style="list-style-type: none"> ▪ Identify/update list of key neighbours and stakeholders of Dharabi Private Wildlife Reserve ▪ Establish the Reserve Advisory Forum (Including community reps. and local Regional Officers of the Department) ▪ Facilitate regular constructive meetings with the Advisory Forum to facilitate input into the decision making process 	<ul style="list-style-type: none"> ▪ Key neighbours have been identified and there is a formalized programme of regular pro-active interaction between PA management and neighbouring land users ▪ The formal community forums provide a platform to raise concerns between both parties 	<ul style="list-style-type: none"> ▪ Updated list/database with contact details of key neighbours, and stakeholders ▪ Terms of reference of the Advisory Forum ▪ Advisory Forum meetings agendas and minutes ▪ Attendance register 	<ul style="list-style-type: none"> ▪ Neighbours, communities and stakeholders is not known to the Protected area managers. ▪ No process is in place for engagement with key neighbours, communities and stakeholders. 	<p>Ongoing</p>	<p>Community Conservation Officer</p>

Ensure as far as possible that the Dharabi Private Wildlife Reserve enjoys public support.	<ul style="list-style-type: none"> ▪ Actively encourage support for the protected area through open communication channels and conflict resolution ▪ Co-Management Agreements with the Public Stakeholder Departments 	<ul style="list-style-type: none"> ▪ Public support 	<ul style="list-style-type: none"> ▪ Records of mitigating measures, meetings, minutes and attendance records, school outings, educational programmes 	<ul style="list-style-type: none"> ▪ The protected area is not supported by neighbours and public and there is antagonism towards the protected area management. 	Annually	Community Conservation Officer, Assistant Manager (Field Operations), Local Revenue Officer
	<ul style="list-style-type: none"> ▪ Facilitate an economic and social benefit assessment for Dharabi Private Wildlife Reserve 	<ul style="list-style-type: none"> ▪ An objective assessment of social and economic benefits of DPWR 	<ul style="list-style-type: none"> ▪ Social & economic benefit report for DPWR 	<ul style="list-style-type: none"> ▪ Economic and social benefit is unknown. 		Year 4

5.9.2.3 Buffering Mechanism and Regional Management

5.9.2.3.1 Protected/Zone of Influence Management

Punjab Wildlife & Parks Department, in implementation phase of the Punjab Protected Areas Act, 2020 has prioritized the expansion of Protected Areas network in the province. Apart from declaration of protected areas in the public sector, the department has also focused on the inclusion of private sector in protected areas network of the Punjab. However, for better management and in order to safeguard the biodiversity within a protected area and to counter any threatening processes or edge effects, suitable buffer zones and appropriate land uses in these zones should be identified. Appropriate actions may then be taken to secure these buffer zones through protected area expansion mechanisms and local planning tools. Similarly, the management of relationship between a buffer zone and other protected areas is also amongst the objectives of the Act *ibid*. In ensuring the

protection of biodiversity of Dharabi Private Wildlife Reserve, the following guiding principles will be adopted in terms of protected area expansion through co- management with Department and of buffer zone management:

- If under threat, efforts must be made to formally/voluntarily protect the areas of critical habitat, located outside of the protected area.
- Threatening processes and edge effects on the protected area's boundary and beyond it must be identified
- Appropriate actions must be taken to manage threatening processes and edge effects on the protected area's boundary and beyond it

5.9.2.3.2 Regional Management

With Punjab Wildlife & Parks Department, the concepts of buffer zones, management planning and co-management under the Punjab Protected Areas Act, 2020 are primarily based on the zonation requirement of protected areas. It is either achieved through the declaration of areas adjacent to the public PA's as buffer zones or expansion of PA's in private sectors through entering into co-management for a public PA. Hence, in provincial/local regional management planning of the Department the concept of zonation is existent. Furthermore, for management planning of protected areas in Punjab, internationally standardized planning approaches have been adopted which also encompasses the zonation within and around the concerned PA. Therefore, it is necessary to ensure that buffer zone considerations are captured in planning of the Dharabi Private Wildlife Reserve. In this respect relationship with local, other provincial and national departments to develop collaborative sense of conservation needs to be adhered. The detailed operational requirements for buffer zone protection and regional management are set out in Table 5.3 below

Table 5.6: Framework for Buffering Mechanism and Regional Management

Strategic Outcome	Management Activities	Management Target	Target Indicator (Evidence)	Indicators of Concern	Priority	Responsibility
PROTECTED AREA EXPANSION						

<p>Ensure that the size of the Reserve is sufficient to achieve its management objectives</p>	<ul style="list-style-type: none"> ▪ Identify opportunities for protected area expansion/stewardship in areas surrounding Dharabi Private Wildlife Reserve 	<p>Expanding the size of the reserve</p>	<p>Map and proclamation of expansion opportunities e.g. protected area expansion, stewardship, agreements etc.</p>	<ul style="list-style-type: none"> ▪ The design of the protected area severely limits the achievement of the protected area objectives ▪ No expansion opportunities 	<p>Year 3</p>	<p>CEO</p>
<p>LOCAL AND REGIONAL PLANNING</p>						
<p>Determination of the buffer zone/zone of influence requirements around the Reserve</p>	<ul style="list-style-type: none"> ▪ Determine the ecological impacts and edge effects influencing the ecology of the Reserve on its boundary ▪ Determine the areas that should be demarcated as buffer zones for the purposes of protecting the biodiversity within the Reserve ▪ Negotiate protected area buffer and enter into agreements with surrounding Stakeholders 	<ul style="list-style-type: none"> ▪ Knowledge of threatening processes on the Reserve's boundary ▪ Spatial representation (map) of the protected area buffer ▪ Agreements with neighbouring landowners and Stakeholders particularly with Department 	<ul style="list-style-type: none"> ▪ Analysis of threat/threatening processes in buffer area ▪ Map of protected area buffer ▪ Biodiversity agreements with landowners ▪ Co-management agreements 	<ul style="list-style-type: none"> ▪ No protected area buffer has been established ▪ Incompatible land uses that negatively affect the protected area values in areas surrounding the PA. ▪ Edge effects such as invasive plant encroachment along the Reserve's boundary 	<p>Year 2</p>	<p>CEO</p>

	<ul style="list-style-type: none"> ▪ Pro-actively encourage neighbours to introduce 'soft'/ conservation- friendly land-uses to facilitate buffering of the protected area. 	<ul style="list-style-type: none"> ▪ Conservation friendly/'soft' land-uses in areas surrounding the Reserve's boundary 	<ul style="list-style-type: none"> ▪ Minutes of meetings to address Land-use issues and awareness imparted 	<ul style="list-style-type: none"> ▪ Unsustainable and/or detrimental Land-use in the area surrounding the protected area. 	Ongoing	CEO and Community Conservation Officer
Ensure that water- use planning and Land-use planning take cognizance of the Reserve objectives.	<ul style="list-style-type: none"> ▪ Incorporate requirements for the Dharabi Private Wildlife Reserve's protection into Land use planning schemes of Govt. ▪ Input into water-use planning in relevant catchments to ensure that the protected area ecological requirement and infrastructure requirements (potable water) are addressed in the planning process ▪ Active membership 	<ul style="list-style-type: none"> ▪ Retention of existing benign land uses in the areas immediately surrounding the protected area ▪ Maintenance of ecological functioning of the protected area in terms of water use ▪ Provision of sufficient good quality water to staff and tourists 	<ul style="list-style-type: none"> ▪ Local relevant Departments that acknowledge the importance of and requirements for the protection of the Dharabi Private Wildlife Reserve ▪ Minutes from Land and Water use meetings ▪ Proof of membership of catchment management 	<ul style="list-style-type: none"> ▪ Identification/ approval of environmentally harmful land uses on the boundaries of the Dharabi Private Wildlife Reserve. ▪ Adjacent Land-use and water-use planning do not consider the protected area's objectives 	Annually	CEO and Assistant Manger (Field Operations)

	of the relevant catchment management forum		forum <ul style="list-style-type: none"> ▪ Water monitoring quality/quantity report ▪ Water quality scores 			
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5.9.2.4 Biodiversity Resource and Conservation Management

5.9.2.4.1 Fire Management

Fire plays an important role in the ecological dynamics of grasslands and wetlands, and has important effects on vegetation composition, primary productivity and nutrient cycling. In developing burning and fire management strategies for the protected area, the following guiding principles should be adhered to:

- Burning where necessary, should be undertaken in such a way that it maintains spatial and temporal heterogeneity within the landscape.
- Burning must be undertaken with due consideration to the biodiversity conservation requirements of the protected area and the need to protect rare and endangered species.

Further, the area of Dharabi Private Wildlife Reserve had the history of Arson wildfires particularly in dry seasons. To combat such situations the protected area must have such plans, equipments, protective clothing and trained personnel for extinguishing fires as may be prescribed or, if not prescribed, reasonably required in the circumstances. It is, therefore, necessary to consider the following in relation to firefighting:

- The need to maintain a system of firebreaks to enable the management of controlled burns and to effectively fight wildfires.
- The size of the protected area and the requirements necessary to access different areas in the event of a wildfire, this relates to both roads and vehicles

- The number of personnel necessary to effectively fight wildfires.
- The equipment necessary to effectively fight wildfires. This would include:
 - Water tankers and pressure pumps mounted on or pulled behind tractors and/or installation of hydrants at vulnerable places.
 - Firefighting equipment mounted on the backs of vehicles.
 - Backpack sprayers.
 - Fire extinguisher at designated places.
 - Beaters.
 - Safety equipment for personnel involved in firefighting.

In case the controlled fires are necessary, the following guidelines will assist in making a decision regarding when and where to apply fire:

- 1) The fire should not be able to escape from the area it is intended to burn, particularly onto an adjacent property.
- 2) Accumulated herbage which should not have flushed i.e. green material should comprise less than 10% of herbaceous biomass (always prone to arson fires).
- 3) Patchy burns are acceptable when of sufficient size to prevent overgrazing.

To avoid wildfires following should be the consideration:

- Where possible, natural boundaries (e.g. streams, dense vegetation) should be used to control the extent of each fire.
- At the beginning of March each year, the Reserve Management should inspect the reserve and identify the blocks susceptible to fires
- In February and March, all fire equipment (including, fire pumps, extinguishers and fire beaters should be inspected, repaired and serviced in preparation for the commencement of the burning season.
- Boundary firebreaks should be prepared annually starting in April.
- Fence lines should be kept clear of vegetation by the application of an herbicide (e.g. Roundup) toward the end of summer.
- For ease of access, management and financial reasons fire-lines have been aligned with management roads.
- The internal fire break should be at least thirty meters (30m) wide at all points.

- The concerned Reserve Manager should annually in March or April, hold a meeting with neighbours especially with Forest Department officials to combat fires in the season.
- Apply controlled fires on the material prone to wildfires

The detailed operational requirements for fire management are set out in Table 5.4:

Table 5.7: Framework for Biodiversity Resource and Conservation Management-Fire Management

Strategic Outcome	Management Activities	Management Target	Target Indicator (Evidence)	Indicators of Concern	Priority	Responsibility
Environmental Education and Awareness						
Maintenance of Fire Management regime.	<ul style="list-style-type: none"> ▪ Develop and update the fire management plan to address the fire management objectives viz., scientific understanding, legal compliance, equipment, personnel training requirements, monitoring and research required ▪ Annual pre-burn assessment ▪ Ecological fires burnt 	Adoption and implementation of the fire management plan	Fire management plan Annual pre- burn assessment sheets Fire returns Fire maps	Burning regimes that result in ecological degradation of the protected area	Year 3	Assistant Manager (Game Management)

	<p>as per the fire management plan</p> <ul style="list-style-type: none"> Post-burn monitoring and record keeping 					
<p>Adequate fire safety within the Reserve is ensured.</p>	<ul style="list-style-type: none"> Maintain a system of firebreaks within the protected area at appropriate time. Ensure availability of trained staff and adequate firefighting equipment. Maintain close liaison with local firefighting agencies. 	<p>Scientific management of fires to increase reserve productivity and reduced fire hazards</p> <p>Compliance with the relevant provisions of Forest Act, 1927 in this respect</p>	<p>Fire returns</p> <p>Correspondences with surrounding community and relevant Departments</p> <p>Training record</p> <p>Liaison memo with fire fighting agencies.</p>	<p>Inadequate staff and fire fighting equipments</p> <p>Wildfires spreading from the protected area to neighbouring properties or vice versa.</p> <p>Lack of funding</p> <p>Incapacity of staff</p> <p>History of Arson/ run away fires</p>	<p>Ongoing</p>	<p>Assistant Manager (Field Operations)</p>

5.9.2.4.2 Invasive/Alien Plants Species Control

An invasive species means any species, which is not actually the resident of a specific habitat / area and whose establishment and spread occurs outside of its natural distribution range. Such species are considered to be a serious threat to the ecological functioning of natural systems and to water production, hence, must be strictly controlled. Similarly, the exotic species introduced accidentally or intentionally may cause the competition with local species and normally override upon them leading to loss to ecological integrity of the area.

The control of alien/Invasive species in PA's is a statutory requirement under legislation of the PWPD.

In undertaking invasive plants control, the following guiding principles will be adhered to:

- Invasive plant control will require an ongoing programme that prioritizes key infestations along water courses, drainage lines and upper catchment areas.
- Initial clearing efforts should focus on containing infestations that are most likely to spread into new areas.

All follow-up requirements must be strictly adhered to otherwise the problem will be exacerbated.

Table 5.8: Alien and Invasive species monitoring and control plan for Dharabi Private Wildlife Reserve

Sr. #	Specie	Local Name	Invasion Extant	Impacts
1	<i>Prosopis juliflora</i>	Mesquite	Frequent	<ul style="list-style-type: none"> ▪ Suppression of native species ▪ Change in Ecosystem functions ▪ Difficulty in maintenance of area ▪ Decline in population and biodiversity of the infested area

ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

2	<i>Leaucena leucocephala</i>	Ipil ipil	Frequent on area bordering Motorway	<ul style="list-style-type: none"> ▪ Food competitions with local species ▪ Alteration in natural habitat Ecology ▪ Prolific grower ▪ Allelopathic effects in animals especially sheeps when taken in excess and continuously ▪ Data Deficient
3	<i>Parthenium hysterophorus</i>	Gajar Boti	Abundant	<ul style="list-style-type: none"> ▪ Food competitions with native herb species ▪ Most troublesome weed ▪ Prolific grower ▪ Allergic Respiratory Problems, contact dermatitis, mutagenicity in human and animals ▪ Data Deficient
4	<i>Lantana camara</i>	Punj phuli	Common	<ul style="list-style-type: none"> ▪ Food competitions with native shrub species ▪ Subject for spread of arson fires ▪ Data Deficient

Management Measures

- Detection mapping through Hypersepctral Remote Sensing
- Appraisal of ecological sensitivity of the infested areas
- Pasture management for replenishment with local grasses
- Regular Monitoring with scheduled data collection as below:

Species	Timelines	
<i>Prosopis juliflora</i>	Twice a year (Start of February and August)	
<i>Leaucena leucocephala</i>	End of August every year	
<i>Parthenium hysterophorus</i>	Month of April each year	
<i>Lantana camara</i>	Month of May each year	
Control Operations		
Species	Control Measure	Timelines
<i>Prosopis juliflora</i>	<ul style="list-style-type: none"> ▪ Mechanical Uprooting ▪ Post monitoring ▪ Controlled herbicides application on new germinated stumps 	<ul style="list-style-type: none"> ▪ November – December ▪ After eradication ▪ Start of Spring season

<i>Leaucena leucocephala</i>	<ul style="list-style-type: none"> ▪ Hand pul seedlings ▪ Grazing on seedlings by livestock ▪ Continous cutting of sprouts ▪ Girdling on trees 	<ul style="list-style-type: none"> ▪ February – March ▪ February – March and August-September ▪ --do— ▪ December
<i>Parthenium hysterophorus</i>	<ul style="list-style-type: none"> ▪ Natural Control by spreading of wild merigold seeds ▪ Spraying brine salt solution (15% common Salt), collection and burning of dry out plants ▪ Mechanical Removal ▪ Pasture management 	<ul style="list-style-type: none"> ▪ February – March ▪ April-May ▪ August every year ▪ Immediately after removal
<i>Lantana camara</i>	<ul style="list-style-type: none"> ▪ Current infestation not required a prompt measures ▪ Collection and burning of existing chunks of specie to control invasion 	Dry & Humid season

5.9.2.5 Wildlife Management

Based on its objectives of establishment, in Dharabi Private Wildlife Reserve, the management interventions will be intended mainly for achievements of the target set for sustainable harvesting of wild birds species mentioned in Schedule-I of the Punjab Wildlife (Protection, Preservation, Conservation and Management) (Amendment) Act, 2007. The management interventions related to indigenous wildlife will be limited to those that are for the purposes of safeguarding populations of rare and endangered species or to meet set conservation targets. Interventions may also be required for problematic animal's management. In addressing wildlife management, the following guiding principles should be adhered to:

- Wildlife management must be focused primarily on protecting the ecological functioning of the protected area and meeting set provincial conservation targets for species and vegetation types.
- The introduction of indigenous species into the protected area must be undertaken in accordance with relevant policies/guidelines.
- Population management of wildlife species may be required to ensure that such species are not causing ecological degradation of the protected area.
- Animals that become a danger or excessive nuisance to persons, wildlife species of the PA and property must be managed in accordance with

relevant Department's policies. As a guideline, the predators shall be managed through re- location

The important element of genetic diversity within the reserve will be accomplished through breeding of indigenous game species within the reserve, harvesting of surplus older ones and release of confiscated stock (wild caught from poachers) by the Punjab Wildlife and Parks Department. To facilitate the operations of the reserve on self-sufficient basis, the sport hunting activities will also be augmented through breeding of other game birds species as mentioned in 1st schedule of the wildlife Act. (Annexure-IX)

Furthermore, key wildlife species such as predators also require specific management interventions (especially control on over population) and these strategies needs to be recorded and monitored in order to facilitate adaptive management. Conservation targets and management strategies will be included in the Operations Plan for Dharabi Private Wildlife Reserve to be used with the APO for implementation of the plan.

The detailed operational requirements for the wildlife management and achievement of the conservation targets are set out in Table-17 below.

Table 5.9: Framework for Biodiversity Resource and Conservation Management-Wildlife Management and Conservation Targets

Strategic Outcome	Management Activities	Management Target	Target Indicator (Evidence)	Indicators of Concern	Priority	Responsibility
WILDLIFE MANAGEMENT						
Develop and implement a strategy for the introduction and management of wildlife into the protected area in accordance with legislations/regulations of the Punjab Wildlife & Parks Department	<ul style="list-style-type: none"> ▪ Ensure that any proposals for the introduction of wildlife species conform to Department Regulations ▪ Ensure that only species known to have historically occurred in the protected area are re-introduced ▪ Ensure that species introductions are adequately documented 	<ul style="list-style-type: none"> ▪ An agreed upon approach to future wildlife species introductions 	<ul style="list-style-type: none"> ▪ Introduction proposals and relevant Departmental/ MA's, internal committee approvals ▪ Introduction permits and monitoring reports 	<ul style="list-style-type: none"> ▪ Adhoc introductions of species, particularly those that may not have historically occurred in the protected area 	Year 5	Assistant Manager (Game Management)

<p>--do--</p>	<ul style="list-style-type: none"> ▪ Ensure adequate population control measures for the management of wildlife in the protected area 	<ul style="list-style-type: none"> ▪ Wildlife Population management based on the determined ecological carrying capacity 	<ul style="list-style-type: none"> ▪ Monitoring reports ▪ Population trend graphs and reports 	<ul style="list-style-type: none"> ▪ Ecological degradation as a result of overstocking of wildlife species ▪ Complaints from tourists/hunters due to understocking of wildlife species 	<p>Ongoing</p>	<p>--do--</p>
<p>Development and implementation of a strategy for human/wildlife conflict</p>	<ul style="list-style-type: none"> ▪ Undertake preventative measures, such as boundary fence maintenance, to minimize the need for human/wildlife conflict ▪ Apply appropriately humane methods, if animals must be destroyed or captured ▪ Meetings with the stakeholders and surrounding communities ▪ Compensation plan 	<ul style="list-style-type: none"> ▪ Effective procedures and Relationships with ▪ Neighbours in dealing with human/wildlife conflict 	<ul style="list-style-type: none"> ▪ Records of preventative actions ▪ Incident reports ▪ Permits ▪ Losses compensation ▪ Dedicated grazing lands ▪ Standard operating procedures documents ▪ Minutes of community meetings 	<ul style="list-style-type: none"> ▪ Frequent complaints from surrounding communities with no clear response 	<p>Year 1</p>	<p>Community Conservation Officer, Assistant Manager (Game Management)</p>

	<ul style="list-style-type: none"> ▪ Development of SOP's for controlled grazing rights to surrounding communities ▪ Local communities employment for reserve operations 					
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Strategic Outcome	Management Activities	Management Target	Target Indicator (Evidence)	Indicators of Concern	Priority	Responsibility
CONSERVATION TARGETS						
Ensure that there is sufficient information and understanding of biodiversity in Reserve to inform and support the achievement of specific biodiversity objectives.	<ul style="list-style-type: none"> ▪ Identify priority/key species, habitats and ecosystems ▪ Identify gaps in available knowledge with regard to these species ▪ Develop internal and external partnerships to address these gaps ▪ Ensure that the above mentioned data is in an 	<ul style="list-style-type: none"> ▪ Priority species, Habitats and ecosystems have been identified and information is available on site to support planning and decision making 	<ul style="list-style-type: none"> ▪ Priority species, habitat and ecosystem conservation targets ▪ List of required information/ research needs ▪ Information management system containing supporting information 	<ul style="list-style-type: none"> ▪ Priority species, Habitats and ecosystems have not been identified ▪ Information is not sufficient to support planning and decision making 	Year 2 and then annually	CEO and Assistant Manager (Game Management)

	understandable format and readily accessible for decision making purposes to the Conservation Manager.					
Establishment of Processes to determine success of management interventions in Protecting the ecosystems, communities and Species of the protected area	<ul style="list-style-type: none"> Develop surveillance and monitoring plans for key management interventions in accordance with standard procedures in this respect 	<ul style="list-style-type: none"> Achievement of protected area conservation targets 	<ul style="list-style-type: none"> Surveillance and monitoring plans for key management interventions Monitoring plans for key rare and endangered species 	<ul style="list-style-type: none"> Lack of awareness of the status of key threatening processes including infestations of invasive plant Species and severity and extent of soil erosion 	Year 3	--do--

5.9.2.6 Sustainable use of Natural and Biological Resources

The declaration of Dharabi Private Wildlife Reserve as protected area has been intended with the main objective to regulate the sustainable use of wildlife resources under Section-12 of the Punjab Protected Areas Act, 2020 and Rule-4(1)(a) of the Private Wildlife Reserve Rules, 2023 framed thereunder. The purposes of notifying a wildlife reserve under Section-12(4)(a&b) of the Act ibid are reproduced as under:

Section-12(4)(a) “to regulate an area for sustainable use of Wildlife resources”; and

Section-12(4)(b) “to regulate harvesting of surplus wildlife of the wildlife reserve”.

The Private Wildlife Reserve Rules, 2023 further categorized the wildlife reserves in private sector for the purposes mentioned above. The Dharabi Private Wildlife Reserve has been intended for notification under Category-I of Rule-4(1)(a).

Under the rules *ibid*, the Category-I private wildlife reserve shall be allowed conservation and hunting of species mentioned in the First Schedule (Annexure-IX) of the Punjab Wildlife (Protection, Preservation, Conservation and Management) Act, 1974 (II of 1974). Further, the hunting shall be allowed on permissible days as per the provisions of Act and as per bag limits specified against each in the schedule. However, hunting of any migratory species of birds whether included in first schedule or not shall not be allowed in the private wildlife reserve. Hence, while focusing on the main objective of the notification of Dharabi Private Wildlife Reserve i.e. the sustainable use of wildlife resources, the conservation of all species of birds in the schedule is also the responsibility of the reserve management authority. Along with other important game species mentioned in 1st schedule of act, the Primary game species identified at initial stage for sustainable harvesting are Grey & Black Francolins.

The conservation aspect, its strategies and framework to achieve the strategic outcomes of the management has been set up in the former section. This section as its title states, therefore, provides the management interventions/activities directed to achieve the strategic outcomes defined for the sustainable use of natural and biological resources of the DPWR. The detailed operational requirements in this regard are set out in Table-5.10 below:

Table 5.10: Framework to Ensure Sustainable Use of Natural and Biological Resources

Strategic Outcome	Management Activities	Management Target	Target Indicator (Evidence)	Indicators of Concern	Priority	Responsibility
SUSTAINABLE USE OF NATURAL AND BIOLOGICAL RESOURCES						

<p>Protection to natural resources through operational interventions and harvesting of permissible resources on sustainable basis, achieving the objectives of establishment and preserving the values of Dharabi Private Wildlife Reserve</p>	<ul style="list-style-type: none"> ▪ Development of Annual Plan of Operations (APO) for operational interventions. ▪ Enlistment of Harvestable species (Grey Partridge and Black Francolins having healthy populations are considerations yet). ▪ Documentation and defining replenishment modes ▪ Complying regulations under the wildlife legislations 	<ul style="list-style-type: none"> ▪ Compliance of the relevant provisions of Punjab Protected Areas Act, 2020 and Private Wildlife Reserve Rules, 2023 to ensure sustainable resource utilization ▪ Sustainable harvesting of Grey and Black Francolins 	<ul style="list-style-type: none"> ▪ Document of APO and its compliance ▪ Lists of harvestable species ▪ Enlistment of rules/ regulations to be complied ▪ Baseline Survey Reports 	<p>Uncontrolled or unsustainable resources harvesting</p>	<p>Year-1</p>	<p>Assistant Managers (Game Management & Field Operations)</p>
<p>Defined harvestable limit</p>	<ul style="list-style-type: none"> ▪ Baseline Survey and Census ▪ Sharing of reports with Department to define limits for each species ▪ Review of scientific literature 	<ul style="list-style-type: none"> ▪ Defined harvestable limits supported by scientific resource management guidelines against total and hunt-able 	<ul style="list-style-type: none"> ▪ Survey Reports ▪ Minutes of meetings ▪ List of Harvestable Limits ▪ Field 	<ul style="list-style-type: none"> ▪ Unlimited harvest ▪ Absence of baseline reports ▪ Non-scientific approach for Defining of harvestable limits 	<p>Year-1</p>	<p>Assistant Managers (Game Management & Field Operations)</p>

		population of the species of concern	Guidelines on the subject			
Wildlife Act 1st Schedule species breeding, introduction and harvesting mechanisms	<ul style="list-style-type: none"> ▪ Enlistment/ reporting of species (Francolins etc.) ▪ Development of Breeding Pens ▪ captive stock acquisition ▪ Scientific release and harvesting 	<ul style="list-style-type: none"> ▪ Mitigate pressure on naturally occurring endemic species while complying the regulations ▪ Raising of operational funds 	<ul style="list-style-type: none"> ▪ Developed pens/facilities ▪ Acquisition and permits record ▪ Budget Reports ▪ Pictorial Records 	<ul style="list-style-type: none"> ▪ Replenishment of hunted stock not ensured. ▪ Hunting pressure on endemic species ▪ Hunters game demands not fulfilled 	Year-1	Assistant Managers (Game Management & Field Operations)

5.9.2.7 Species Replenishment Plan

In protected areas primarily managed for conservation and sustainable harvesting of natural resources, the chances of fluctuations in populations always remained existent. The reason behind this, apart from the over-hunting may also be the decreased breeding vigor or genetic diversity. To overcome the said limitation the developments relating to the breeding and subsequent introduction or acquisition from outer sources (breeding farms etc.)- acclimatization and release have their own unique significances. Such replenishments not only stabilize the fluctuated population trends but also serve as tool to raise finances for the reserve's operations through provision of continuous supply of game stock.

To further augment the financial resources requirements along with provision of more sport hunting opportunities the inclusion of other permissible game birds species in 1st schedule of the Act in hunting events is best consideration.

Therefore, duly respecting the fact, the inclusion of breeding of game species, scientific release, establishment and subsequent sustainable hunting through such developments has also been incorporated in the management plan of DPWR. This component will also stabilize the financial requirement of the reserve. Apart from acquired game birds (Grey & Black Francolins) from outer sources, their breeding / housing in developed facilities, a target of breeding of at least one thousand per year of such game species has, therefore, been included in the management plan. This will not only serve for finances generation of the reserve but also become cause to reduce the hunting pressure on naturally occurring game species.

The developments include a pre- release pen over an area of at least one acre within the development node's area specified above. The pen also includes breeding stock partitions (for partridges and other game birds) and acclimatization, hatching, brooding as well as quarantine rooms.

The detailed operational requirements for the developments for species replenishment and implementation of replenishment plans are set out in Table-5.11 below:

Table 5.11: Framework for Operational Management-Game Management- (Species Replenishment Plan)

Strategic Outcome	Management Activities	Management Target	Target Indicator (Evidence)	Indicators of Concern	Priority	Responsibility
SPECIES REPLENISHMENT						
	<ul style="list-style-type: none"> ▪ Enlistment of the Species to be considered for replenishment and its approval from management authority ▪ Preparation of site 	<ul style="list-style-type: none"> ▪ Replenishment of harvested stock ▪ Optimized sport hunting management ▪ Enrichment of habitat of reserve 	<ul style="list-style-type: none"> ▪ Development of Breeding facilities ▪ Successful breeding of stock ▪ Hunter finds plenty of 	<ul style="list-style-type: none"> ▪ Depletion of indigenous birds species without consideration of replenishments ▪ Hunters may have not found plenty of game 		

<p>Developments for species replenishment and implementation of replenishment plans</p>	<p>and Layout plans</p> <ul style="list-style-type: none"> ▪ Hiring of execution agencies ▪ Sharing of plan with department for technical assistance ▪ Construction of Hatchery and Pre-release pen ▪ Stocking with enlisted species captive breeding stock ▪ Breeding, rearing, feeding interventions and training to stock ▪ Acquisition and acclimatization of stock ▪ Wild caught confiscation acclimatization and release ▪ Introduction of bred and acquired stock 	<ul style="list-style-type: none"> ▪ Decrease hunting pressure on indigenous species ▪ Creation of source of funding for self-sufficiency of reserve 	<p>game birds for sport hunting</p> <ul style="list-style-type: none"> ▪ Higher incidences of indigenous species during Census/ Survey ▪ Almost wild stock reared through feeding management s in natural habitat of pen ▪ Stabilized financial returns of the reserve 	<p>birds during hunting expeditions</p> <ul style="list-style-type: none"> ▪ Hunters are not satisfied ▪ Lesser incidences of game birds species during survey/census 	<p>Year-1 and then Ongoing</p>	<p>CEO and Assistant Manager (s) (Game Management & Operations)</p>
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5.10 Monitoring Program to Assess Performance of EMP

Environmental monitoring of this medical devices manufacturing unit will be carried out according to schedule as given in Table 5.3 and be reported to the EPA-Punjab and Wildlife Department. Monitoring of all the activities will be required to analyze the impacts of construction and operation phases on the environment. After start-up, a comprehensive monitoring for all PEQS parameters for normal operations will be carried out. Thereafter, subsequent regular monitoring will be restricted to priority parameters. This is to establish that this project does meet the environmental commitments made in this EIA Report.

For external monitoring, proponent shall engage an independent agency to conduct third party validation of EMP implementation. All monitoring data shall be reviewed and analyzed regularly in comparison with the PEQS limiting values. In case of any deviation, immediate necessary corrective actions shall be taken.

5.10.1 Responsibilities for Monitoring

HSE officer will coordinate with construction manager and contractor site representative to monitor environmental parameters during the construction phase.

During operations, the Manager Operations will follow the monitoring plan as mentioned in Table 5.3. They will keep record of all environmental non-compliances and report them along with the corrective actions in regular quarterly meetings with the top management.

5.11 Reporting and Reviewing Procedures

Monitoring schedule will be adhered to and all the data to be monitored will be scrutinized at the level of General Manager and on regular basis at the Chief Executive Officer level. For presentation of the data to the Government Agencies, approved data recording format will be followed. Some of the approaches to be followed during the environmental management practices are given below:

- Complying with the relevant legislation and regulations
- Developing appropriate indicators in order to monitor core impacts.
- Regularly reviewing of the impacts on the environment.
- Setting appropriate annual objective, targets and public reporting on progress.
- Communicating openly with internal and external stakeholders on environmental issues.

5.12 Training Needs and Schedule

Training is another major step for the implementation of EMP. All the employees will require training appropriately to work on EMP effectively.

There are lots of advantages of training including help in minimizing the waste generation and conserving resources. General Manager shall be responsible to determine the training requirements in consultation with project workers.

To enhance the capacity of the proponent as well as the contractor, training will be imparted related to the environmental and social issues of the project, implementation of mitigation measures, the monitoring protocols and reporting mechanism. The training during construction will be conducted by PMU of the project. PMU will ensure in-house training for the project staff i.e., labor, masons etc., contractor, and the supervisory staff covering environmental and social aspects of the project with emphasis on the roles and responsibilities of the proponent and the contractor's staff. This shall be done just after recruitment of staff and also just before commencement of the construction activities. Subsequently, during operations, the proponent shall ensure that all the recruited staff receives basic training as well as recurrent training for his operational role as well as his role and responsibility regarding environmental management at the unit. Basic training shall be imparted just after recruitment of every staff and subsequently recurrent training shall be imparted annually.

5.12.1 Training Syllabus Contents

The training will include the following aspects:

- Identification of all environmental aspects of construction and operation.
- Likely impacts on these aspects of the environment.
- Measures to be adopted for avoiding or minimizing impacts on these aspects of the environment.
- Measures to be adopted for avoiding or minimizing all kinds of pollutions.
- Defining roles, responsibilities and authorities of every one for environmental management plan during construction and operations.
- Safety measures against hazards for workforce and the local communities arising from the construction and operation activities.
- Occupational health and safety aspects, use of personal protective equipment by the workforce during construction and operations.
- Emergency preparedness and response.
- Fire safety and management.
- Fire drill shall be performed every year during operations to aware the employees about their roles, responsibilities and authorities. This shall also help maintenance of the equipment for fire management.
- Safe work practices to ensure safe culture.

5.12.2 Environmental Education and Awareness

Being located adjacent to / within environmentally sensitive area (Dharabi Dam and its 2km buffer zone), environmental interpretation and education of Dharabi Private Wildlife Reserve's natural and cultural resources will be aimed at creating awareness, understanding and appreciation of its unique

cultural heritage (the habitat and natural assets), biodiversity and ecological function, and their significance. In developing an environmental interpretation and education programme, the following guiding principles should be adhered to:

- There should be a strong focus on neighboring communities, in efforts to engage, inform and benefit them.
- Wherever possible, local community members should be trained to assist and operate environmental interpretation and education tours.
- Where possible, partnerships with NGO's and relevant Departments (Forest, Wildlife, TDCP, EPA etc.) should be established to ensure effective environmental education and awareness.
- Opportunities to create awareness based on international initiatives such as celebration of World Wildlife Day, Earth Day etc. should be encouraged.

The detailed operational requirements for Environmental education and awareness are presented in Table 5.12:

Table 5.12: Framework for Environmental Education and Awareness

Strategic Outcome	Management Activities	Management Target	Target Indicator (Evidence)	Indicators of Concern	Priority	Responsibility
<p>Implement an effective Environmental education and awareness programme linked to the objectives of the Reserve and focused on the surrounding communities.</p>	<p>Develop and implement an environmental education and awareness programme for the Reserve focusing on its values and objectives</p> <p>Compile information and material relating to Reserve and its values for distribution among masses</p> <p>Collaborate with partners to arrange environmental education and awareness events i.e. international environmental days</p> <p>Implement a</p>	<p>Alignment of Activities under reserve objectives strictly in consonance with the objectives of Environmentally sensitive area</p> <p>Increased capacity and understanding of the importance of the protection of Dharabi Private Wildlife Reserve by stakeholders and surrounding communities</p> <p>Educational tours x 2 to PA</p> <p>2 x School visits per year in the</p>	<p>Education and awareness programme record and attendance lists</p> <p>Effectiveness of assessment/ monitoring documentation</p> <p>Lack of planning for education and awareness</p> <p>Lack of strategy linking the Environmental Education and Awareness to the protected area objectives</p>	<p>Lack of understanding and awareness of the values of the protected area and biodiversity conservation in communities around the protected area</p>	<p>Year 2</p>	<p>Community Conservation Officer</p>

	<p>monitoring programme to assess the effectiveness of the Environmental Education and Awareness programme</p> <p>Facilitate 2 x educational tours per year from school groups from the surrounding community to Reserve</p>	<p>surrounding community</p>	<p>Lack of Assessment of the effectiveness of the Environmental Education and awareness programme</p>			
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5.13 Conservation Development Framework

To formulate any sound development plan for wildlife conservation of a protected area, the defining of zones within the same is the prime consideration. The purpose of the zonation of Dharabi Private Wildlife Reserve is to control the intensity and type of use within it in efforts to ensure the overriding goals of biodiversity conservation are met, whilst enabling acceptable levels of eco-cultural eco-tourism and other resource use. On this basis, within some zones, the permissible intensity of use will be relatively higher than in others. General principles of zonation are:

- There is a general gradation in the zonation categories ranging from high to low protection.
- An overlay zone provides additional protection and may be overlaid onto another zone in order to strengthen the protection e.g. Key Feature Protection Zone.
- A node is an area where eco-tourism, management and service infrastructure can be developed and that has a specified footprint.
- The Wilderness Zone will be buffered by the Low Use Zone or be the low use zone.
- Where possible both management and eco-tourism infrastructure should be developed outside the protected area.
- Development of infrastructure should preferably be on the periphery of the zone towards a higher impact/less sensitive adjacent zone
- Deviations or exceptions in any zones require approval from the management authority.
- Any activities permitted in a category of higher protection are also permitted in a category of lower protection, e.g. activities permitted in the Low Use Zone can also be permitted in the Moderate Use Zone.

5.13.1 Zonation Plan

The purpose of zonation within a protected area is to identify types and levels of usage that are acceptable, based on an area's sensitivity and resilience, and to manage visitor experience and inter-user conflict. Zonation is used to identify areas in which infrastructure and/or activities may be located or take place. A standardized zonation system developed by Protected Areas Management Planning Unit, of Ezemvelo KZN Wildlife's, South Africa enables a protected area to be zoned according to six categories, which are spread along a continuum, from pristine wilderness to higher intensity nature-based uses. The zonation system recognizes and reflects:

- Sensitive features associated with a protected area (i.e. biophysical, cultural and sense of place).
- A general gradation in the zonation categories, in which the next use level provides a buffer to the lower use level.
- Influence of existing and historic facilities, infrastructure and use.
- Opportunities and constraints (biophysical, social or managerial constraints) for use

Zonation is a composite of ecological zonation (based on natural resource sensitivity), sense of place, cultural features, patterns of environmental settings, and existing development and use patterns. The final zonation map is represented as a desired state, i.e. directing management towards a vision for each zone, which reflects and respects the broader conservation, sustainable natural resources utilization and eco-cultural, eco-tourism objectives for the protected area.

The above illustrated zonation system has been opted for zonation of Dharabi Private Wildlife Reserve. However, not all zonation categories have been

applied in determining the system of zonation for Reserve in question, as some are not appropriate to it. The Zonation plan of Dharabi Private Wildlife Reserve has been presented in Figure 5.2 below, whereas, the Table-5.4 below describes the each category of zonation in the reserve:

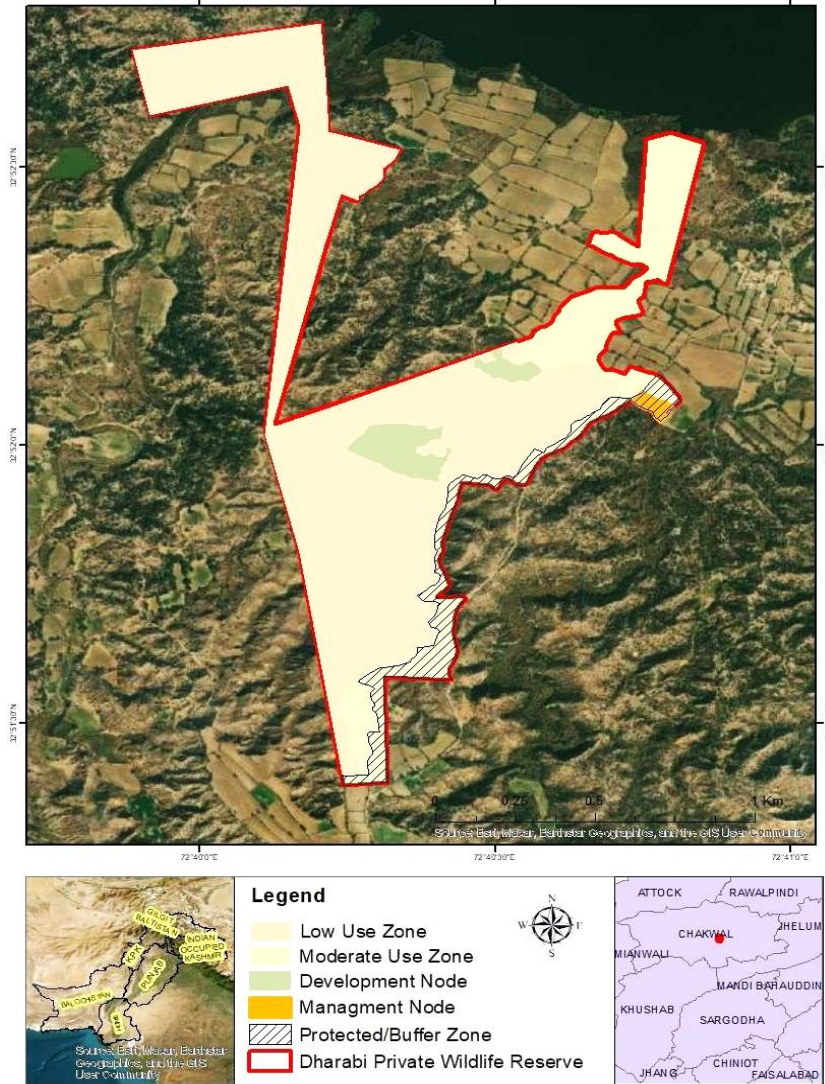


Figure 5.2: Zonation Map of DPWR

LOW USE ZONE	
Description	An area where there is little evidence of modification of natural processes and landscapes, that is more sensitive than the moderate use zone and where the negligible / controlled use of natural resources or co-ecotourism principles of low human impact will prevail. The zone also serves as a buffer to the wilderness zone. In present case of Dharabi Private Wildlife Reserve the low Use Zone shall also be regarded as wilderness zone owing to small size of the protected areas. The Low Use Zone shall be primarily managed for sustainable management of natural resources in Dharabi Private Wildlife Reserve.
Objectives	To designate an area for eco-tourism experiences, sustainable management and conservation development with alignment of activities focusing primarily on low impact on the unaltered habitat of the zone along with mitigation measures.
Activities and Infrastructure	<ul style="list-style-type: none"> ▪ Facilities of a rustic nature such as small bush camps, rustic overnight hiking huts, hides and trails. ▪ Motorized access is low-key and 4 x 2 access is provided to points where trails start or to tourist/hunters facilities. ▪ 4 x 4 tracks are allowed in this zone, however, with limited number and frequency of use strictly as per site specific rules and regulations. ▪ Hiking and formalized trails. Management activities must focus on protecting resources and core values. ▪ Limited management roads and tracks. ▪ CONSERVATION DEVELOPMNT NODE- Breeding Pens for replenishment or temporary stocking etc. ▪ Installations of fire management regime. ▪ Check posts and patrolling points/trails.
Constraints and Implementations	<ul style="list-style-type: none"> ▪ Activities are mostly low impact and low density. ▪ No permanent visitors / tourist facilities are permissible in this zone. ▪ Where possible, facilities should be developed on the periphery of the zone towards the less sensitive adjacent zone.
MODERATE USE ZONE	
Description	An area where natural processes and the landscape may be altered to support protected area operations. This zone is less sensitive than the low use zone and this is where experiences, facilities, infrastructure and services are provided to visitors / hunters and where general management activities of reserve can take place.

Objectives	To designate a comparatively less restricted area that is primarily focused on visitors experience while still securing the values of the protected area and an area that serves the operational and support functions of the protected area.
Activities and Infrastructure	<ul style="list-style-type: none"> ▪ Management roads, tracks and main entrance. ▪ Management activities are directed to maintaining park infrastructure for biodiversity conservation, park operations, equipment and material storage. ▪ Comparatively less restricted Hiking on formalized trails. ▪ Infrastructure is accessible by motorized access. ▪ The eco-tourism road network including access roads and game viewing roads as well as parking facilities. ▪ Traditional game viewing routes with associated more formalized infrastructure. ▪ Agriculture to support boarding requirements of visitors/hunters and man-made cultivated fields to augment the feeding regime of wildlife of the reserve. ▪ Agriculture activities to support restricted livestock grazing facilities for neighboring communities as well as compensation sources in return of damage caused to surrounding agricultural fields by the reserve's wildlife species or restricted use of pesticides by the communities. ▪ Development interventions to control damage to habitat landscape i.e. to control soil erosion of land sliding etc.
Constraints and Implementations	<ul style="list-style-type: none"> ▪ Within the moderate use zone a specific ECO-TOURISM NODE will be defined which could include areas of commercial use. ▪ Where possible this node should be outside the protected area. ▪ The node should preferably be on the periphery of the Moderate and Low Use Zones. ▪ This node should be developed in the less sensitive part of the Moderate Use Zone. ▪ The Eco-tourism Development Node can only be developed in areas where it does not compromise the values of the protected area. ▪ The node must have a specified footprint. ▪ Examples of developments in an Eco-tourism development node include picnic areas, camping sites and interpretation centre. ▪ The interventions under this node may also be extended into the Boarding areas of visitors / hunters. ▪ Consensus on the mode of grazing area use, compensation modalities and controlled pesticides use.

	<ul style="list-style-type: none"> ▪ Heavy involvement of financial resources.
PROTECTED OR BUFFER ZONE/ZONE OF INFLUENCE	
Description	<ul style="list-style-type: none"> ▪ A highly restricted / controlled area within the boundary of reserve where the administrative infrastructure exists and outside the boundary of the protected area where actions are taken and agreements are made to protect the integrity of the protected area and to enhance the livelihoods of protected area neighbours.
Objectives	Protection of Ecotone areas, restriction of entry to reserve, co-management agreement to protect the integrity of the reserve and adjacent protected areas and to enhance the livelihoods of surrounding communities. To influence land use adjacent to the protected area to manage external pressures and threats that may threaten its values and objectives.
Activities and Infrastructure	<ul style="list-style-type: none"> ▪ PARK MANAGEMENT NODE caters for facilities such as staff accommodation, administrative offices, other operational required infrastructure, waste handling sites etc. ▪ The node must have a specified area as a footprint. ▪ Wherever possible, facilities and infrastructure related to park operations / Administration should be located in separation with other zone particularly of Low Use Zone. ▪ The Park management must define these activities in terms of its specific values and objectives and taking into consideration the following: <ul style="list-style-type: none"> • Alien and invasive species management • Pollution control and prevention • Impact on sense of place • Habitat fragmentation and isolation • Water resource protection • Human/ Wildlife conflict ▪ Highly patrolled area. ▪ Low height boundary fencing to restrict intentional or accidental entry of livestock ▪ Co-management agreement for protection and sustainable resource utilization of neighbouring public protected areas within the PA's or at Ecotone areas
Constraints and Implementations	<ul style="list-style-type: none"> ▪ It is desirable for the intensity of land use to decrease closer to the protected area. Activities that are not compatible with the adjacent protected area zonation, must be discouraged. ▪ Management activities will focus on:

	<ul style="list-style-type: none"> • Strategically promoting and monitoring compatible Land-use and land-care on adjacent lands and upstream catchments • Integrated alien species control • Biodiversity stewardship and environmental awareness ▪ Working collaboratively with neighbours to secure sensitive sites that contribute to the protection of values and objectives of the protected area or enhanced sustainable ecosystem services delivery. ▪ Influencing and input through relevant public departments.
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5.14 Environmental Monitoring Program

The purpose of monitoring is to get acquainted with actual quantitative assessment of environmental aspects to verify that their values are within permissible limits as defined by Punjab Environmental Quality Standards. Therefore, in order to remain rational with the help of quantitative assessments instead of merely making assumptions about status of environmental aspects, following environmental monitoring plan has been proposed during construction phase:

Table 5.13: Environmental Monitoring Plan during Construction Phase

Environmental Aspect	Parameters	Concerned Location	Frequency
Ambient Air	CO, SO _x , NO _x , O ₃ , PM	Project Site	06 Months
Ground Water	All parameters as described in PEQS	Water Connection at site	06 Months
Noise	Industrial Noise	Project Site	06 Months
Solid Waste	Generation Rate according to type of waste	Project Site	Fortnightly
Occupational Health & Safety	Fire, ERP, PPE's	Project Site	Daily

During operations, scientific monitoring programmes may be established to monitor specific management interventions such as measures for the protection of flagship species. Not all of the management interventions will be monitored through the monitoring schedule. Most of the outcomes of the monitoring process will be captured in an annual report, which will be used to inform the

following year’s annual plan of operation. On this basis, a monitoring schedule for Dharabi Private Wildlife Reserve is set out in Table 5.14.

Table 5.14: Annual Surveillance and Monitoring Schedule Plan during Operations Phase

Management issue	Parameters to be monitored	Monitoring measures	Monitoring Frequency	Responsibility	Reporting requirements
Law enforcement	Schedule of patrols	Written record	Weekly	Assistant Managers (Game Management & Field Operations)	Annual Report
	Recovery of snares /traps etc.	Photographs/written record	Weekly		Annual Report
	Illegal incidents	Photographs/written record	Per event		Record of Event
	Disposal of Incidence Cases	Written Record	Monthly		Monthly Report
Stakeholder engagement	Minutes of meetings with the local Department and other stakeholders and community representatives	Written record	Monthly	Community Conservation Officer	Annual report
Buffer zone management	<ul style="list-style-type: none"> ▪ Influx of listed invasive vegetation on the protected area’s boundaries. ▪ Violations at Ecotone ▪ Illegal Entry of livestock ▪ Management of Wildlife at edges 	Surveillance plan	Monthly	Assistant Managers (Field Operations)	Annual report
Local and regional planning	Land uses that are approved in the areas around the protected area	Written record	Annually	CEO assisted by Assistant Managers (Field Operations)	Annual report
Eco-tourism	Visitor statistics (Both for Tourism and hunting expeditions)	Remarks Books	Ongoing	CEO	Annual report
	Burning of firebreaks as part of fire management	Written record/map/photography	Annually	Assistant Managers	Annual report
	Maintenance of Fire fighting Equipment	Photographs/Written Record	Weekly during fire season		Weekly Reports during Season

ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

Fire management	Maintenance of Fire lines	Photographs/Written Record	Weekly during fire season	(Field Operations)	Monthly Reports
	Unplanned Wildfires	Photographs/Map/Written Record	Per Event		Per Event
Invasive plant control	Areas subject to invasive plant control	Monitoring plan	To be determined	Assistant Managers (Field Operations)	Annual report
	State of areas in which invasive plants have been eradicated				
	Records of labour hours/days	Written record	Annually		
	Herbicide usage	Written record	Annually		
Conservation targets	Incidents related to flagship species and their disposal	Photographs/written record/Challan / Decisions	Per event	Assistant Managers (Game Management)	Record of event
	Status of key rare and endangered species, particularly those for which conservation targets have been set	Monitoring plan	Monthly		Annual report
Resource utilization	Extraction of resources from the protected area	Photographs/written records	Per event	Assistant Managers (Field Operations)	Annual report
Human resources	Staffing levels	Number of full-time staff	Annually	Assistant Managers (Admin)	Annual report
Census / Survey of Game Species	Survey timelines and submission of reports	Correspondences with survey committee, Photographs, Survey Reports	Per Survey	Assistant Managers (Game Management)	Annual report
Submission of Hunting Expedition Cases	Timely Processing of Cases	Written Record	Annually	CEO	Annual report
Species Replenishment	Establishment of Development Node	Layout Plan and Establishment Record	Monthly during execution	Assistant Managers (Game Management)	Annual report
	Stock Housing and keeping	Photographs/staff in position	Ongoing		Annual report

	Breeding success as per targets	Stock Position Record	Annually	Assistant Managers (Game Management)	Annual report
	Release Timelines	Photographs, written record	Annually		At Every Release
	Post Release Monitoring	Monitoring Record	Till Survival		Daily
	Predators Relocation	Photographs	Till Removal		Annual Report
	Acclimatization of Confiscated Stock	Behavior monitoring, mortality reports if any	Ongoing till survival		Weekly
	Determinations as stock is self surviving	Mortality Reports/Predation	Ongoing till zero mortality		Annual Report
Facilities and infrastructure	State of roads, 4x4 & biking / hiking tracks and paths	Photographs/written records	Quarterly	Assistant Managers (Field Operations)	Annual report
	State of the boundary fence	Photographs/written records	Monthly		Annual report
	State of facilities and service infrastructure	Maintenance schedule/written records	Monthly	Assistant Managers (Admin)	Annual report
	State of Water Bodies	Maintenance Schedule / Water Quality checking reports	Monthly	Assistant Managers (Game Management)	Annual report

5.15 Equipment Maintenance Schedule

The project involves use of tree plantation machinery and equipment during operations. Maintenance & Repair plan shall be carried out as per procedures advised by the manufacturer of these machinery and equipment and on need basis. Fire safety equipment shall be kept maintained and monitored monthly. The condition of the first aid box and PPEs shall be maintained regularly. The schedule of maintenance shall be daily, weekly and monthly basis for overall cleaning and maintenance check of all of the equipment.

The Dharabi Private Wildlife Reserve as set in its vision intended to be renowned conservation agency in Pakistan in game management and wildlife conservation in private sector. To achieve target set in its vision, the operational requirements for the compliance of legislations/rules and maintenance of facilities/infrastructure are set out in Table 5.15:

Table 5.15: Requirements for the compliance of legislations and maintenance of facilities/infrastructure

Strategic Outcome	Management Activities	Management Target	Target Indicator (Evidence)	Indicators of Concern	Priority	Responsibility
COMPLIANCE OF LEGISLATIONS						
Ensure that the protected area is compliant with the Punjab Wildlife (Protection, Preservation, Conservation and Management) (Amendment) Act, 2007, the Punjab Protected Areas Act, 2020 and relevant regulations.	<ul style="list-style-type: none"> ▪ Thorough understanding of the Department Legislations ▪ Field attachments of the Staff ▪ Training on legislations implementations and Game Management from Department ▪ Strong Collaboration with Regional and District Level field formations of the Department 	<ul style="list-style-type: none"> ▪ Operational Management of the Dharabi Private Wildlife Reserve in Compliance with the relevant legislations of the Department 	<ul style="list-style-type: none"> ▪ Field attachment Records ▪ Attendance sheets of trainees ▪ Record of collaborations ▪ Effective prosecution of offence cases ▪ Satisfactory reports by the Department officials 	<ul style="list-style-type: none"> ▪ Management Authority not familiar with all regulations of the Department ▪ Management Authority exercising management without due consideration of relevant legislations 	Year-1 and then ongoing	CEO
Maintenance of Facilities and Infrastructure						

<p>Ensure that facilities and infrastructure in the protected area are adequately maintained</p>	<ul style="list-style-type: none"> • Ensure that the boundary fence is regularly inspected and adequately maintained to ensure security • Develop and implement a schedule maintenance programme to maintain facilities and infrastructure in a condition that meets relevant environmental, health and safety requirements. 	<p>Regular scheduled maintenance of all facilities and infrastructure</p>	<ul style="list-style-type: none"> • Fence inspection reports • Infrastructure schedule and inspection reports • Rectifications Reports • Visitors Remarks Register • Number of Visitors utilized the facilities 	<ul style="list-style-type: none"> • Environmental, health or safety incidents due to inadequately maintained facilities and infrastructure • Regular escape of key species due to inadequate fencing or entry of stray animals • Reduced number of visitors 	<p>Ongoing</p>	<p>Assistant Manager (Admin & Operations)</p>
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5.16 Communication and Documentation

Progress evaluation, documentation and communication will play a vital role in good management practices. Steps given below will assist in effective communication and documentation.

A kick-off meeting may be arranged at the start of construction phase, which will communicate the importance of meeting. EMP will be provided to the construction contractor and discuss the implementation steps.

Operation/HSE manager will arrange departmental meeting regularly on weekly basis throughout the project. The purpose of this meeting shall be to discuss day-to-day problems arise during work, steps to be taken to resolve problem, overview on the progress of HSE department and contractor with respect to the EMP. An overview on monitoring plan and progress with respect to changes made in operations/documentation/EMP will also be discussed. All the HSE matters will be discussed in detail and if any problem sought, another meeting will be called-on to discuss solutions within time.

Weekly meeting will be attended by Manager Operations/Administrator, HSE officer and contractor representative. Such meetings will help out in the effective monitoring, management and documentation of the environmental performance during construction and operations. Any issues that require attention of higher authorities will be communicated to Top Manager (Operations) for necessary action. Quarterly meetings will also be arranged which will be headed by Top Manager (Operations).

In the end of weekly and quarterly meetings, minutes will be issued that may be incorporated in the record register. Meeting minutes will also be sent to contractor and higher authorities for their own record. On the basis of decisions taken in meetings if any change in documentation required will be incorporated in the respective document.

5.17 Environmental Management Budget

The environmental management cost aside from other costs is as follows:

Table 5.16: Environmental Management Budget

Sr. #	Item	Budget Allocation Year 1 (M)	Budget Projection Year 2 (M)
	Cost of Establishment		
1	Salaries of Staff	4.500	5.000
	Trainings/Field Attachments	0.200	0.250
	Incentives	0.100	0.100
	Total	4.800	5.350
	Development Expenditures		
	Installation of Signage (15 Nos.)	0.150	0.150

2	Erection of Boundary Fence (6500Rft)	0.650	0.700
	Improvement of Hunters Lodge	0.500	1.000
	Improvement of Admin Block	0.500	1.000
	Development of Firebreaks and fire control installations	0.350	0.200
	Development of Tracks/Trails	0.200	0.200
	Development of Breeding Facility	1.200	1.000
	Total	3.550	4.050
3	Maintenance Expenditures		
	Maintenance of Hunters Lodge	0.100	0.100
	Maintenance of Admin Block	0.050	0.075
	Maintenance of Firebreaks	0.050	0.050
	Maintenance of Tracks/Trails	0.100	0.125
	Maintenance of Tourists Installations	0.100	0.200
	Removal of Invasive Plants Species	0.200	0.200
Total	0.600	0.750	
4	Operational Expenditures		
	Breeding/Housing of Game Spp. stock (1000 Breeding Target)	2.000	2.500
	Lodging & Boarding of Tourists/Hunters	Will be included in Permit Fee	
	Meetings with Stakeholders/ Communities	0.100	0.150
	Survey/Census of Game Species	0.200	0.200
	Execution of Hunting Expeditions	0.200	0.300
	POL & Maintenance of Vehicles	0.500	0.500
	Total	1.000	1.150
5	Unforeseen Expenditures		
	Unforeseen	0.200	0.250
	Total	0.200	0.250
6	Grand Total	10.150	11.550

5.18 Schedule of Implementation of EMP

The implementation of environmental management plan shall start from pre-construction stage and shall remain effective throughout all phases of the project namely pre-construction, construction and operation phase. Even when life cycle of the project shall be ending, it shall be carried out under environmental controls.

ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

Activities	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9	Month 10	Month 11	Month 12
Hiring of Establishment												
Trainings of Staff												
Erection / Maintenance of signage												
Law Enforcement												
Patrolling of Reserve and legal Actions against offenders												
Maintenance of attendance Record of staff												
Development and implementation of SOP's for access control												
Enlistment of key Stakeholders and neighbouring communities												
Establishment of Reserve Advisory Forum												
Meetings with Advisory Forum												
Co-Management Agreements												
Ensure Reserve Integrity for resource use planning												
Maintenance of current eco- tourism infrastructure												
Removal of obnoxious vegetation along tracks												


ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

Activities	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9	Month 10	Month 11	Month 12
Maintenance of Track & Trails												
Maintenance of approach road												
Clearance of roads from uneven trees growth												
Maintain a system of firebreaks/lines within the protected area.												
Ensure availability of trained staff and adequate firefighting equipment.												
Maintain close liaison with local firefighting agencies.												
Mapping of Invasive Species and Liaison with Plant Protection Department												
Implementation of Invasion Species control plan												
Population control measure for carrying capacity of reserve area												
Boundary Fencing of Reserve Area												
Development and Implementation of Sop's for controlled grazing and compensation plans etc.												
Enlistment of Game Species												
Documentation and defining of species replenishment												
Baseline Surveys												

Activities	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9	Month 10	Month 11	Month 12
Reporting of surveys reports and allocation of hunting expeditions												
Execution of hunting expeditions												
Management of replenished/acquired stock of local game species												
Enlistment of Wildlife Act 1 st schedule game species, breeding facilities development, acquisition of stock and scientific release, establishment and harvesting												
Financial Review and projections for next five years												
Preparation and approval of budget												
Monitoring and assessment of staff working												
Meetings for Surveys with Department and other Stakeholders												
Development of survey methodologies												
Constitution of survey teams												
Survey of Grey & Black Francolins												
Preparation and Submission of Survey reports to department												

Table 5.17: Schedule of Implementation

Activities	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9	Month 10	Month 11	Month 12
Declaration of Surplus stock and approval of hunting expeditions												
Sharing of hunting expedition details / days of hunting with Department												
Enlistment and approval of permissible Captive Game Species with 1000 Game Birds stock production target												
Development of Breeding Facility												
Acquisition and Breeding of Stock												
Release and Acclimatization of indigenous game birds stock												
Maintenance of facilities and infrastructure												
Development of Hunter Lodge												
Monitoring and Reporting of Management operations												
Annual Review of PA Management Meeting												
Reporting of amendments in management plan (if any)												

 Time Bound plus Mandatory Operations

 Continuous but Mandatory

 Regular Operational Activities

CHAPTER-6

STAKEHOLDERS CONSULTATION

6.1 General

This chapter includes the output of consultations carried out with the people of the project area. This elaborates the findings from the field and data collected from public. These include local residents who also carry out different businesses such as shop keepers, labour, farmers and entrepreneurs. Their feedback regarding the project has been recorded through a questionnaire and interviewing them to fill the questions of questionnaire. Other stakeholders were also consulted.

6.2 Importance of Public Consultation

Public participation is an integral part of EIA. Public participation means that public should be consulted, informed, or involved in the decision making process and public should know about the project in detail. The “Policy and Procedures for the filing, review and approval of environmental assessments” requires proponents to consult with the affected community and NGOs during preparation of an environmental report. The “Guidelines for the preparation and review of environmental reports” by Pakistan Environmental Protection Agency contain a number of references to the need for public involvement. Public participation is compulsory under the Punjab Environmental Protection Act. Section-9 of Punjab Environmental Protection (Review of IEE and EIA) Regulations-2022 requires that public notice should be published in English or Urdu in local newspaper in the affected area 7 days before the public hearing. The public notice contains information on project type, location, name, address of the proponent and the place from where EIA report can be accessed.

The adequacy of the public consultation and information disclosure is one of the basic criteria used to determine the project compliance with the national/international safeguard policies.

6.3 Objectives

The objectives of this process were to:

- Inform the public about what is proposed project.
- Identify and involve all stakeholders, especially local residents, in the consultative and participation process;
- Share information with stakeholders on the design and construction of the proposed project and anticipated impacts on the physical, biological and socioeconomic environment of the project area;
- Understand stakeholders' concerns regarding various aspects of the project, including the existing available facilities and problems,

construction of the project and the likely impacts of construction and operation related activities;

- Provide an opportunity for those otherwise unrepresented to present their views and values therefore allowing more sensitive consideration of mitigation measures and trade offs
- Understand the perceptions, assessment of social impacts and concerns of the communities in the vicinity of the proposed project;
- Provide an opportunity to the public in the public consultation session to provide valuable suggestions for the project design in a positive manner;
- Reduce the chances of conflict through the early identification of controversial issues, and consult them to find acceptable solutions.
- Increase public confidence in proponent, reviewers and decision makers.
- Provide better transparency and accountability in decision making
- Develop truly sustainable proposal.

6.4 Methodology

Guidelines for Public Consultation issued by Pakistan Environmental Protection Agency issued dated October, 1997 have been used for carrying out this process. For public consultation and participation, main stakeholders were interviewed and asked about their concerns. Subject specialists and field experts have also been consulted in order to get their technical verdict.

For ascertaining the perceptions of different stakeholders about the project (during construction/operation) consultation meetings were held with them. These meetings were carried out in the vicinity areas of Dhoke Choi, Djoke Morian, Rehna Sadaat, Dhoke Bhattian.

Firstly, the project has been described briefly before the stakeholders in local language without going into its technical details. Their response has been recorded in the form of a questionnaire (attached herewith under Annexure-III). In this questionnaire, brief introduction of the stakeholder is followed by their response in the form of their answers to asked questions pertaining to the project.

6.5 Identification of Stakeholders

Stakeholders are those who have a direct or indirect interest in project development, and who will be involved in the consultation process. During the field survey, significant efforts were made to identify the possible categories of stakeholders and their stakes. These included local people, other affected communities, proponent, government agencies and interested public.

6.5.1 Proponent's Environmental Management Team

The environmental management team of the proponent shall have to be involved to give their input to better manage all the environmental aspects of across all phases of the project. They shall define all kinds of resources

required for the implementation of the EMP. Therefore, they have to be taken onboard for all decision making.

They will present the project to all stakeholders and record their stakes on the project. In the light of the feedback of stakeholders, better planning shall be possible.

6.5.2 The Responsible Authority

Various personnel of EPA-Punjab, Lahore have been consulted to format this report in accordance with stipulated statutory requirements contained in Punjab Environmental Protection (Amendment) Act-2012 and Punjab Environmental Protection (Review of IEE and EIA) Regulations-2022.

6.5.3 Other Departments & Agencies

Punjab Wildlife & Parks Department has also been consulted to know their specific requirements in the light of prevailing legislation.

6.5.4 Environmental Practitioners & Experts

Teachers from College of Earth & Environmental Sciences, and Institute of Geology, University of the Punjab, Lahore have also been consulted. These included subject specialists of Occupational health and safety, Waste Water Treatment, Hydrology, Geology and Toxicology. Views of other environmental consultants have also been included.

6.5.5 Affected & Wider Community

The stakeholders identified during field survey also included the local residents, politicians, private land & shop owners, shop keepers (renters), customers, pedestrians. Some of the local people were found hesitant to respond. They were engaged and taken into confidence that their response shall be beneficial to them and shall never harm them. Informal group discussions were also held as an additional tool for the assessment of the perceptions of the stakeholders.

Table 6.1 List of Stakeholders consulted

S#	Stakeholder Name	Designation	Area
1	Mr. malik Muhammad Amin	Ex. Saudia	Dhoke Chhoi
2	Mr. Malik Laal Khan	Farmer	Dhoke Chhoi
3	Mr. Shafqat Abbas	Farmer	Dhoke Chhoi
4	Mr. Amanat Hussain	Retired Fauji Sipahi	Dhoke Chhoi
5	Mr. Noor Asab	Retired Fauji Sipahi/Farmer	Dhoke Morian
6	Mr. Ajmal Shahzad	Land Owner	Dhoke Morian
7	Mr. Muhammad	Retired Lance	Dhoke Morian

	Ashraf	Naik/Farmer	
8	Mr. Haji Fazal ur Rehman	Farmer	Dhoke Morian
9	Mr. Arshad Mehmood	Farmer	Dhoke Morian
10	Mr. Muhammad Imran	Livestock Farmer/Driver at Dubai	Dhoke Morian
11	Mr. Muhammad Tauqeer	Domestic Worker	Rehna Sadaat
12	Mr. Amanullah	Farmer	Dhoke Bhattiyan
13	Mr. Aijaz Khan	Plumber	Bhaun
14	Mr. Manzoor Ahmed	Tailor	Rehna Sadaat
15	Dr. Naveed Ahsan	Director	Institute of Geology, University of the Punjab, Lahore
16	Dr. Azhar Ali	Assistant Professor	College of Earth & Environmental Sciences, University of the Punjab, Lahore
17	Yousuf Jamal	CEO, Well-On Techniques	41-B, ZamZam Tower, Johar Town, Lahore

6.6 Concerns of the Stakeholders

The public consultation for Establishment of Dharabi Private Wildlife Reserve by Chromatex Chemicals (Private) Limited has been carried out with specific scope of the establishment of private wildlife reserve. The individual feedback has been annexed in Annexure-III. Their feedback has been summarized as follows:

- Most of the people of the study area perceive overall positive impacts as a result of establishment of this private wildlife reserve. Their attitude towards the project is quite positive.
- They are of the view that the project will open up new direct or indirect job and business opportunities for the people of the project area. This will result in poverty alleviation though to small extent.
- People especially comment that this area needs attention due to its scenic beauty and wilderness.
- Prohibition of outsiders shall increase peace in the area.
- Local residents of the area should be preferred for filling job vacancies of the unit.

- Some people are of the perception that the establishment of this private wildlife reserve shall improve the overall environment of the area.
- People responded that local people should be given jobs in this project.
- The people also perceive accelerated economic activity due to the small business opportunities likely to emerge in the area, e.g. shop keepers, traders, suppliers, contractors, transporters, labor etc.
- Most of the people already know the proponent and perceive strengthening of ties of proponent with them.
- Most of the people take interest in making friends with the proponent.

Public also have shown their apprehensions as follows:

- During construction phase, people can be employed depending upon their respective competence.
- Some people have shown that they will neither be benefited nor be harmed by the project.
- Something should be done about the development of the locality.

6.7 Mitigation Measures proposed for addressing the Stakeholder's Concerns

- Local residents shall be hired during construction and operation phase of the proposed project.
- There shall not be any displacement of the surrounding community due to this private wildlife reserve by Chromatex Chemicals (Private) Limited.
- Detailed framework to engage stakeholders and local community has been described in Chapter-5 of this EIA report.

ENVIRONMENTAL IMPACT ASSESSMENT (EIA)



Figure 6.1: Highlights of Public Consultation Survey-A



Figure 6.2: Highlights of Public Consultation Survey-B



Figure 6.3: Meeting with Deputy Director, Wildlife, Salt Range Region, Kallar Kahar as part of Stakeholder Consultation



Figure 6.4: Meeting with Assistant Professor, Environmental Sciences Punjab University



Figure 6.5: Meeting with CEO, Well On Techniques, an Environmental Consultancy

CHAPTER-7

CONCLUSION & RECOMMENDATIONS

7.1 Conclusion

The project aims at Establishment of Dharabi Private Wildlife Reserve by ChromaTex Chemicals (Private) Limited at Dhoke Morian, Mouza Rehna Sadaat, Kallar Kahar, District Chakwal. According to the “Punjab Environmental Protection (Review of Initial Environmental Examination and Environmental Impact Assessment) Regulations-2022” the project falls in Schedule-II. Accordingly, this Environmental Impact Assessment report has been prepared for issuance of NOC/EA by EPA-Punjab, Government of the Punjab, Lahore before initiation of the project on ground. The study has been conducted according to Guidelines issued by Environmental Protection Agency-Government of Pakistan in 1997.

On the basis of this Environmental Impact Assessment (EIA) Report of the project, it is concluded that:

- i. Dharabi lake is the sensitive elements/segments of environment around the project site.
- ii. Noise level, waste water and solid waste will remain well within the prescribed limits of the PEQS.
- iii. EMP as recommended in this EIA Report is to be put in place during construction as well as operations of the project.
- iv. EMP shall guide about specific actions deemed necessary to assist in mitigating the environmental impact of the project.
- v. If steps described in EMP are fully practiced, the project shall not have significant harmful impacts.
- vi. Monitoring of all environmental parameters by a third party shall endorse that the project will run in accordance with legal requirements.
- vii. The positive impacts of the project outweigh negative impacts.
- viii. Endangered species have been found in the area but these shall not be harmed by the project.
- ix. The project does not involve displacement of the local population.

7.2 Recommendations

Being aware of the environmentally responsibility, the proponent has proceeded for this Environmental Impact Assessment study and making its report. The proponent aims to and commits to comply with all legal requirements pertaining to environmental protection applicable for the time being.

On the basis of the potential impacts, the project can be categorized as favorable and having only low adverse impacts. The project potential impacts will be mitigated by adopting all suggested technical/engineering best

practices and measures. The EMP developed needs to be fully implemented during the both construction and operation stage of the project.

Following are the major recommendations:

1. The project should be established according to the specifications as defined in documents. If any changes needed on the ground, these should also be documented. i.e. there should not be conflict between reality and documentation.
2. Environmental monitoring should be regularly carried out according to schedule defined in this EIA report.
3. All the legal and regulatory provisions should be complied with, Punjab Environmental Quality Standards etc. during all phases of the project.

Detailed and points wise recommendations have already been described in Chapter 4 and 5 and have been summarized in executive summary of this EIA Report.

The facts summarized as above, and the whole discussion made in the foregoing chapters of this report support that the project merits for issuing Environmental Approval by the Environmental Protection Agency-Punjab, Lahore for construction and operation of the project.

ANNEXURES

ANNEXURE-I

GLOSSARY

Air Pollutant:

Any substance that causes pollution of air and includes soot, smoke, dust particles, odor, light, electromagnetic radiation, heat, fumes, combustion exhaust, exhaust gases, noxious gases, hazardous substance and radioactive substances.

Biodiversity:

The variability among living organisms from all sources including inter alia terrestrial, marine and other aquatic ecosystem and the ecological complexes of which they are part; including diversity within species, between species and of ecosystems.

Climate:

The weather conditions prevailing in an area in general or over a long period typically averaged over a period of 30 years.

Ecosystem:

A dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit.

Effluent:

Any material in solid, liquid or gaseous form or combination thereof being discharged from industrial activity or any other source and includes a slurry, suspension or vapor.

Environment:

Air, water, land; all layers of the atmosphere; all organic and inorganic matter and living organisms; the ecosystem and ecological relationships; buildings, structures, roads, facilities and works; all social and economic conditions affecting community life; and the inter-relationships between any of the aforesaid factors.

Environmental Impact Assessment:

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.

Ergonomics:

Derived from the Greek *ergon* (work) and *nomos* (laws) Which means the science of work. It is a scientific discipline concerned with the understanding of interactions among humans and other elements of a system, and the profession that applies theory, principles, data and methods to design workplace in order to optimize human well-being and overall system performance.

Initial Environmental Examination:

A preliminary environmental review of the reasonably foreseeable qualitative and quantitative impacts on the environment of a proposed project to determine whether it is likely to cause an adverse environmental effect for requiring preparation of an environmental impact assessment.

Meteorology:

The scientific study of the atmosphere that focuses on weather processes and forecasting.

Noise:

The intensity, duration and character of sounds from all sources, and includes vibration.

Occupational Health and Safety Aspects:

Health and Safety Aspects pertaining to workplace.

Proponent:

The person who proposes or intends to undertake a project.

Standards:

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 Punjab Environmental Quality Standards, emission standards and other standards established under this act and the rules and regulations made there under.

Waste:

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.

Weather:

The state of the atmosphere at a particular place and time as regards heat, cloudiness, dryness, sunshine, wind, rain, etc.

ANNEXURE-II**LIST OF ABBREVIATIONS AND SYMBOLS**

CO	Carbon Monoxide
CO ₂	Carbon Dioxide
dB(A) Leq	Decibel (A) L Equivalent
DPWR	Dharabi Private Wildlife Reserve
EIA	Environmental Impact Assessment
EA	Environmental Approval
EMP	Environmental Management Plan
EMtP	Environmental Monitoring Plan
EPA	Environmental Protection Agency
EPD	Environmental Protection Department
ERP	Emergency Response Preparedness
GIS	Geographic Information System
IEE	Initial Environmental Examination
HSE	Health, Safety and Environment
IESCO	Islamabad Electric Supply Company
IUCN	International Union for Conservation of Nature
KW	Kilo Watt
MA	Management Authority
MSL	Mean Sea Level
NOC	No Objection Certificate
NO _x	Nitrogen Oxides
O ₃	Ozone
OHS	Occupational Health and Safety
PEPA	Pakistan Environmental Protection Act
PEQS	Punjab Environmental Quality Standards
PGA	Peak Ground Acceleration
PKR	Pakistani Rupees
PM	Particulate Matter
PMU	Project Management Unit
PPE	Personal Protective Equipment
PRMSC	Punjab Rural Municipal Services Company
PRSWSSP	Punjab Rural Sustainable Water Supply & Sanitation Project
PWPD	Punjab Wildlife & Parks Department
RCC	Reinforced Cement Concrete
SIR	Site Investigation Report
SO _x	Sulfur Oxides
Sq. ft.	Square Feet
TEVTA	Technical Educational and Vocational Training Authority
TMA	Tehsil Municipal Administration
TOR	Terms of References
TDS	Total Dissolved Solids
VOCs	Volatile Organic Compounds
WAPDA	Water & Power Development Authority
WCPA	IUCN's World Commission on Protected Areas

ANNEXURE-III

**List of individuals and organizations consulted along with their written
feedback**

List of Individuals Consulted

S#	Stakeholder Name	Designation	Area
1	Mr. malik Muhammad Amin	Ex. Saudia	Dhoke Chhoi
2	Mr. Malik Laal Khan	Farmer	Dhoke Chhoi
3	Mr. Shafqat Abbas	Farmer	Dhoke Chhoi
4	Mr. Amanat Hussain	Retired Fauji Sipahi	Dhoke Chhoi
5	Mr. Noor Asab	Retired Fauji Sipahi/Farmer	Dhoke Morian
6	Mr. Ajmal Shahzad	Land Owner	Dhoke Morian
7	Mr. Muhammad Ashraf	Retired Lance Naik/Farmer	Dhoke Morian
8	Mr. Haji Fazal ur Rehman	Farmer	Dhoke Morian
9	Mr. Arshad Mehmood	Farmer	Dhoke Morian
10	Mr. Muhammad Imran	Livestock Farmer/Driver at Dubai	Dhoke Morian
11	Mr. Muhammad Taugeer	Domestic Worker	Rehna Sadaat
12	Mr. Amanullah	Farmer	Dhoke Bhattiyan
13	Mr. Aijaz Khan	Plumber	Bhaun
14	Mr. Manzoor Ahmed	Tailor	Rehna Sadaat
15	Dr. Naveed Ahsan	Director	Institute of Geology, University of the Punjab, Lahore
16	Dr. Azhar Ali	Assistant Professor	College of Earth & Environmental Sciences, University of the Punjab, Lahore
17	Yousuf Jamal	CEO, Well-On Techniques	41-B, ZamZam Tower, Johar Town, Lahore

ANNEXURE-IV**Team Members of EIA Study Project**

NAME	QUALIFICATIONS	STATUS IN PROJECT
Mr. Zaghum Abbas	MS Environmental Sciences; PGD Environmental Law	Environmentalist
Mr. Yousuf Jamal	MS Environmental Sciences	Environmentalist
Ms. Laraib Afzal	M. Phil. Environmental Sciences	Environmentalist
Ms. Nadia Mehboob	BS Botany	Botanist
Mr. Muhammad Arshad	M. Sc. Chemistry	Lab Manager
Mr. Saad Malik	BS Chemistry	Assistant Lab Manager
Mr. Umer Kazim Ali	BS Analytical Chemistry	Lab Analyst
Mr. Nasir Ali	BS Environmental Sciences	Field Officer

ANNEXURE-V

Terms of Reference

Title:

Establishment of Dharabi Private Wildlife Reserve by Chromatex Chemicals (Private) Limited at Dhoke Morian, Mouza Rehna Sadaat, Tehsil Kallar Kahar, District Chakwal.

Environmental Consultant Organization “M/s SDG Consultancy Services” to carry out the Environmental Impact Assessment of the project in accordance with the guidelines of EPA-Punjab. The consultant scope includes following activities:

- I. Collect all the information relevant/required for the project & are required to compile EIA Report and subsequently obtain approval of same from EPA-Punjab.
- II. Description of the Proposed Project Activities
- III. Review of Alternatives
- IV. Field Survey
- V. Collection and Review of primary and secondary data as per requirement.
- VI. Review of existing environmental legislation, guidelines and standards applicable to the operation and assessing their applicability.
- VII. Stakeholders’ Consultation (if required)
- VIII. Identification and evaluation of environmental impacts
- IX. Recommendations for mitigation measures
- X. Development of Environmental Management Plan
- XI. Any other item deemed necessary to complete the report in-line with guidelines/requirements of Punjab Environmental Protection Act-1997 (Amended) 2012.
- XI. Preparation of a Final Report to meet the requirements of Pakistan EPA.

The Environmental consultant shall prepare Environmental Impact Assessment Report and subsequently submit to relevant authority after obtaining approval from the proponent.

Consultant shall be solely responsible for obtaining the final approval after fulfillment of all pre-requisites as per Punjab Environmental Protection Act-1997 (Amended) 2012.

Overall correspondence and or other financial requirement(s) in this regard are to be taken care by the consultant.

Consultant Signatures

Client Signatures

ANNEXURE-VI

GOOGLE MAP AND AKS SHAJRA OF PROPOSED PROJECT

ANNEXURE-VII

**Baseline Parameters Monitoring Test Reports
(Ambient Air, Ground Water, Noise)**

ANNEXURE-VIII

Property Ownership Documents

- Document by Office of the Deputy Director, Wildlife, Salt Range, Kallar Kahal, Chakwal
- Report to AD Land Records, Tehsil Kallar Kahar
- Assistant Director Land Records (Tehsil Kallar Kahar), Punjab Land Records Authority, Board of Revenue, Government of the Punjab
- Land Record Verification by Assistant Commissioner- Tehsil Kallar Kahar
- Document by ADC (Revenue) Chakwal
- Document by Incharge-Copying Branch, Office of District Collector Chakwal
- Affidavit on Stamp Paper by Owner
- SECP Registration Certificate
- Form-29 SECP
- Chromatex Chemicals (Private) Limited Board Resolution

ANNEXURE-IX

Documents related with Land Use & Relevant Legislation

The Punjab Protected Areas Act 2020

Punjab Protected Areas Rules-2022

Private Wildlife Reserve Rules-2023

**Declaration under Rule-3(2)(b) of the Private Wildlife Reserve Rules-2023
from CEO**

First Schedule of Punjab Wildlife Act-1974

ANNEXURE-X

**CHECKLIST (EIA) PAK-EPA GUIDELINES FOR PREPARATION AND
REVIEW OF ENVIRONMENTAL REPORTS-1997**

ANNEXURE-XI

REFERENCES

- Information and data provided by the proponent
- Project feasibility report
- Technical design data related to the project
- Interviews with project related persons of project proponent
- Technical documents of various machinery/equipment
- Meteorological Data from Pakistan Meteorological Department
- Punjab Environmental Protection Act (Amendment) 2012
- Punjab Environmental Quality Standards for Ambient Air & Noise 2010
- Punjab Environmental Quality Standards for Water 2010
- Guidelines for the preparation and review of Environmental Reports
- Punjab Environmental Protection (Review of Initial Environmental Examination and Environmental Impact Assessment) Regulations-2022
- Punjab Occupational Health and Safety Act-2019
- Higher Education Department, Punjab
- School Education Department, Punjab
- Population Data from Ministry of Population
- Small and Medium Enterprises Development Authority
- Details of Dharabi Dam attractions on <https://flypakistan.pk>
- Assessment of environmental degradation of Kalar Kahar Lake, Salt Range, Pakistan due to anthropogenic activities and its remedial measures by Dr. Muhammad Saleem Khan, UET, Lahore (2011)
- Systematic and paleoecological study of the new remains of Brachypotherium (Rhinocerotidae) from the Middle Miocene Siwaliks (Pakistan)--- Article in Arabian Journal of Geosciences · July 2020 by Abdul Majid Khan et.al.
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