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Kurram Tangi Dam Construction



Environmental Mitigation and Monitoring Plan Main Report

December, 2013

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Map to Kurram Tangi Dam Project Documents

Shown below is the suite of documents submitted to USAID under Contract AID-391-C-13-00002 for the KTDP. This report is shaded in red in order to show its relationship to the full set of documentation.

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SUPPLEMENTAL REPORT ON CLIMATE CHANGE

All documents may be read as stand-alone documents, but the reader should be aware of the full set of documents available. Any one document may reference other documents in the suite in order to avoid duplication.

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Kurram Tangi Dam Construction Environmental Mitigation and Monitoring Plan

USAID Environmental Assessment of Kurram Tangi Dam Construction
Contract Number: AID-391-C-13-00002
From MWH Americas, Inc.
To USAID/Pakistan Energy Office
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The author's views expressed in this publication do not necessarily reflect the views of the United States Agency for International Development or the United States Government.

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List of Acronyms

Acronym	Term
AOI	Area of Influence
APA	Assistant Political Agent
CCA	Cultivable Command Area
CBO	Community Based Organization
CFR	Code of Federal Regulations
CGMS	Community Grievance Management System
CR	Change Request
EA	Environmental Assessments
EIA	Environmental Impact Assessment
EMMP	Environmental Mitigation and Monitoring Plans
EMC	Environmental Management Cell
EMP	Environmental Management Plan
EPA	Environmental Protection Agency
FATA	Federally Administered Tribal Areas
IEE	Initial Environmental Examination
KP	Khyber Pakhtunkhwa
KTDC	Kurram Tangi Dam Consultants
KTDP	Kurram Tangi Dam Project
LAU	Land Acquisition Unit
MWH	MWH Global, Inc. or MWH, Inc.
NEQS	National Environmental Quality Standards
NOC	No Objection Certificate
NGO	Non-governmental Organization
OP	Operational Policy
PA	Political Agent
PAP	Project Affected Person
Pak-EPA	Pakistan Environmental Protection Agency
PD KTDP	Project Director Kurram Tangi Dam Project
PEPA	Pakistan Environmental Protection Act
PMP	Pest Management Plan
PMU	Project Management Unit
RAP	Resettlement Action Plan
ROW	Right of Way
SC	Supervisory Consultant
USAID	United States Agency for International Development
VTP	Vulnerable Tribes Plan
WAPDA	Water and Power Development Authority

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Environmental Mitigation and Monitoring Plan

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EXECUTIVE SUMMARY

This Environmental Management and Mitigation Plan (EMMP) and its annexes presents the measures for managing the project's potential¹ impacts of the Kurram Tangi Dam Project (KTDP), a multipurpose water development project, on the physical, natural, and human resources of its surroundings. The Project is located on the Kurram and Kaitu Rivers in northwest Pakistan, with its principal structure, Kurram Tangi Dam, about 30 kilometers north of Bannu City. The Project has three principal components that are described below.

This EMMP has been developed as a part of the Environmental Assessment (EA) undertaken by USAID as a result of the positive determination in the Initial Environmental Examination (IEE) prepared in accordance with 22 CFR 216 by USAID/Pakistan in 2012 to provide a first review of the reasonably foreseeable effects on the environment of the project and to recommend threshold decisions for additional environmental analysis. To the extent feasible, requirements of international donors as well as USAID have been followed.

. The EA includes this EMMP; a Health and Safety Framework Plan, a Watershed Management Framework; a Waste Management Plan; an Emergency Preparedness Plan for downstream communities in the event of a dam failure; a Fisheries Management Plan; and an Instrumentation and Monitoring Plan. At the same time a series of additional documents focusing on key social issues are being prepared separately. These include: a Resettlement Policy Framework; a Resettlement Action Plan; a Gender Plan; a Cultural Heritage Preservation Plan; and, a Vulnerable Tribes and Peoples Plan.

The Project has three principal components, briefly described below. An abbreviated project description based on the detailed description in the EA is presented in this EMMP (see EA, Chapter 3 for more detail). For ease of planning and execution, the project has been divided by WAPDA into three major components as follows:

- Component 1 comprises the Kaitu Weir and associated structures, the irrigation command areas on the Sheratalla and Spaira Raghha plains, as well as two powerhouses (IV and V) and a transmission line from Powerhouse IV to the Domail substation.
- Component 2 comprises the Kurram Tangi reservoir and dam, a saddle dam on the southeast arm of the reservoir, three powerhouses (I, II and III) with transmission interconnections to the main transmission line built in Component 1.
- Component 3 comprises remodeling of the existing Kurram Garhi Headworks, the construction of the new Thal Canal and its command area, and the rehabilitation and upgrade of the existing Marwat and Civil Canals and Command areas.

The EMMP, sometimes referred to as the Environmental Management Plan, is meant to be a practical tool for applying mitigation and enhancement programs across the project and for making sure that they function as intended.

It identifies and describes programs to mitigate significant adverse environmental (including social) effects of the Project throughout its life, actions to enhance the beneficial effects of the project and the monitoring and surveillance programs for the Project.

The EMMP comprises two main parts: a Mitigation Plan and a Monitoring Plan. The former describes each mitigation action as well as the entities responsible for implementation of the action, while the

¹ Throughout this report "potential impacts" means "potential significant environmental and social impacts". These potential impacts can be either adverse (negative) or positive.

latter describes the environmental receptors that should be monitored and by whom. These are presented by Component and phase, i.e. Pre-Construction, Construction, Operation and Decommissioning (where pertinent).

If there is a lag of one or more years, between the preparation of this EMMP and the EA and the initiation of construction, the baseline information of the EA and the indicators and contents of the EMMP should be re-examined and updated.

The EMMP calls out exclusions based on USAID regulations.

The institutional arrangements and roles and responsibilities of the proposed institutions in implementation of the EMMP are described. A key recommendation is the creation of an Environmental Monitoring Cell (EMC) under the direct supervision of the WAPDA General Manager (North). The EMC will have three components namely Health, Safety and Environment (HSE), Environment and Social Team (E&ST) and a Land Acquisition Unit that will carry out their duties in close coordination with the Contractor and Supervisory Consultant (SC) during construction. After construction the E&ST will be merged with the HSE, which will oversee the environmental management of the KTDP throughout its life cycle.

Uncertainties about the project and future recommended actions designed to remove them are discussed. The uncertainties are related to location of contractors' construction camps, location and identification of borrow areas, water supply alternatives, ecological flow requirements, water balance and availability of water, Probable Maximum Precipitation and Probable Maximum Flood, arrangements for the construction and operation of the project landfill, the extent of rehabilitation of existing roads and bridges and alignments of new roads, the right of way for transmission lines, and coordination between WAPDA and the relevant Agriculture and Irrigation Department for development of the irrigation command areas.

The costs of addressing uncertainties are estimated at US\$930,000, US\$, and US\$2,945,000 and US\$1,300,000 respectively for Components 1, 2 and 3.

Annual monitoring costs have been determined to the extent possible by Component and Phase. These are shown in Table ES 1 below.

Table ES 1: Summary of Annual Monitoring Costs - KTDP	
Phase	Monitoring cost (US\$)
Component 1	
Equipment Purchase	32,000
Pre-Construction	252,950
Construction	267,875
Operation	219,840
Component 2	
Equipment Purchase	80,000
Pre-Construction	301,185
Construction	425,435
Operation	343,675
Component 3	
Pre-Construction	319,390
Construction	348,600
Operation	298,715

As the EMMP is a living document it has to be revised to reflect changes in Project conditions and modification of mitigation measures, if those prove less effective than anticipated. The Change

Management process establishes an orderly and effective procedure for tracking the submission, coordination, review, evaluation, categorization, and approval for release of all changes.

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I INTRODUCTION

I.1 Objectives and Context of the Environmental Mitigation and Monitoring Plan

I.1.1 General

The EMMP, sometimes referred to as the Environmental Management Plan, is intended to provide a practical tool for applying mitigation and enhancement programs across the project and for making sure that they function as intended.

Specifically, an EMMP is expected to:

- Identify and describe programs to mitigate significant adverse environmental (including social) effects of the Project throughout its life.
- Identify and describe actions to enhance the beneficial effects of the project.
- Identify and describe the monitoring and surveillance programs that serve to:
 - Ensure that the mitigation and enhancement programs function as intended.
 - Ensure compliance with established norms, laws, and regulations.
 - Detect important changes or trends in the project's physical, biological, or social surroundings, caused by the Project or affecting its functioning, or that would affect the success of the mitigation and enhancement measures.

The USAID Initial Environmental Examination (IEE) for the KDTP (USAID, 2012)² requires that:

- The project contractor has the technical capability and financial resources to implement the EMMP during the preconstruction and construction phases and to report to USAID.
- The project sponsor [the "owner"] be committed and have adequate technical and financial resources to implement the EMMP during the operational phase of the Project.

This EMMP is a living document and has to be revised to reflect changes in Project conditions and modification of mitigation measures, if those prove less effective than anticipated. The Change Management process (Chapter 7) establishes an orderly and effective procedure for tracking the submission, coordination, review, evaluation, categorization, and approval for release of all changes.

This EMMP shall be a binding instrument, which may be fine-tuned during the pre-construction phase and shall be adhered to by the contractor(s) to ensure prevention, reduction, compensation and mitigation of potentially significant adverse environmental and social impacts to acceptable levels.

USAID and any eventual future donor organization have an important role to play in ensuring that the EMMP is fully implemented. Disbursement of funds should be conditional on construction contracts including contractual obligations to implement and adhere to the EMMP as well as actual implementation of the EMMP.

I.2 Structure and Contents of the EMMP

This document contains two principal parts: a Mitigation Plan and a Monitoring Plan. In the former, each action of mitigation is described to guide the conditions to be followed by the Construction Contractor and the Owner (WAPDA). The monitoring program describes the environmental receptors that should be monitored and by whom.

² USAID. (2012). Initial Environmental Examination Kurram Tangi Dam and Associated Primary Irrigation System.

The Mitigation Plan has three sections, one for each Project component. Each section addresses mitigation prior to construction (called the Pre-construction Phase in the EA and this EMMP. This includes design and planning and may include construction of some infrastructure necessary for construction activities), during construction, during operation and during decommissioning (where pertinent). The Monitoring Plan is organized in a parallel fashion. However, given that decommissioning if it occurs will only take place at least 50 to 60 years in the future, no monitoring requirements have been developed for this phase of activities.

The three Project Components are:

- Component 1 concerns the Kaitu weir to provide hydropower (two powerhouses) and canals providing irrigation to the new Sheratalla Command Area (12,300 acres) and a new Spaira Ragha Command Area (4,080 acres) plus a 30-mile transmission line to Domail in Bannu District.
- Component 2 concerns the development of the Kurram Tangi Dam and Reservoir plus three powerhouses and two additional weirs.
- Component 3 entails upgrading of the Kurram Garhi Headworks and its offtake canals, development of a new Thal Canal to provide irrigation for 68,000 acres and rehabilitation of the Marwat and Civil Canals and irrigation areas.

The EMMP is typically prepared as part of the EA process. If there is a lag, such as one or more years, between the preparation of the EA and the initiation of construction, the baseline information of the EA and the indicators and contents of the EMMP should be re-examined and updated.

Under the Pakistan Environmental Protection Agency (Review of IEE and EIA) Regulations, 2000, the approval of an EA and its accompanying EMMP is valid for commencement of construction within three years from its issue. If construction commences within this period, the validity is extended for a further three years from the date of commencement of construction. However, if construction does not commence within the three year period the Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) shall be revised and resubmitted to the environmental authority for approval. In addition, where significant changes are made to a project during detailed design, these changes together with a report on their potential impacts must be submitted to the environmental authority for further review. If deemed necessary, the environmental authority may impose further conditions on the approval after this review.

In addition, an Environmental Management Plan must indicate mitigation measures and procedures as for the life of the project as well as include provisions for monitoring, reporting and auditing. These regulations do not prescribe any specific requirements for monitoring.

1.3 Exclusions from the EMMP

By USAID regulations, neither the Environmental Assessment nor the Environmental Mitigation and Monitoring Plan can recommend the following actions:

- Assistance, procurement, or use of genetically modified organisms.
- Procurement or use of asbestos containing materials, polychlorinated biphenyls, or any other toxic or hazardous substances prohibited by the United States Environmental Protection Agency, as noted at www.epa.gov/asbestos and/or under international agreements and conventions, such as the Stockholm Convention on Persistent Organic Pollutants.
- The use of USAID funds, directly or indirectly, to produce, acquire, store, sell, transport, or otherwise deal with ammonium nitrate for agricultural purposes or calcium ammonium nitrate for agricultural or construction/demolition purposes.

Any of the above actions would require an amendment to the IEE approved by the USAID Bureau Environmental Officer.

1.4 Project Description

A detailed description of the Project, including construction sequences, is found in Chapter 3 of the EA. A summary of the detailed project description is presented in the following paragraphs.

The Kurram Tangi Multipurpose Dam Project is a water resources development project that will provide both power and irrigation benefits. It focuses on the development of the Kurram and Kaitu river systems. The project lies mostly in North Waziristan (FATA), the Frontier Region (FR) of Bannu, and the Districts of Bannu, Lakki Marwat and Karak (Map I-1). The catchment areas spread across the international border between Pakistan and Afghanistan. The current estimated cost of the project is approximately \$600 million. WAPDA has already completed all the regulatory paper-work to start construction as soon as funds become available.

For ease of planning and execution, the project has been divided by WAPDA into three major components (Map I-2, Figure I-1).

1.4.1 Component I: Kaitu Weir, Power and Irrigation (Tribal Area Development)

Component I involves construction of Kaitu Weir, Sheratalla Canal System, Spaira Ragma Canal System, Feeder Tunnel, Pump Stations, Powerhouse-IV, Powerhouse-V and other ancillary works such as roads and transmission lines.

A low-head weir will be constructed in the Kaitu River about 400 feet upstream of the Mir Ali -Thal Road Bridge. The weir forms a pool of water facilitating the diversion of water to irrigation canals on the right bank and to the Kurram Tangi Dam Reservoir via Powerhouse-IV. In addition, the weir provides a means to safely pass Kaitu flood during monsoon.

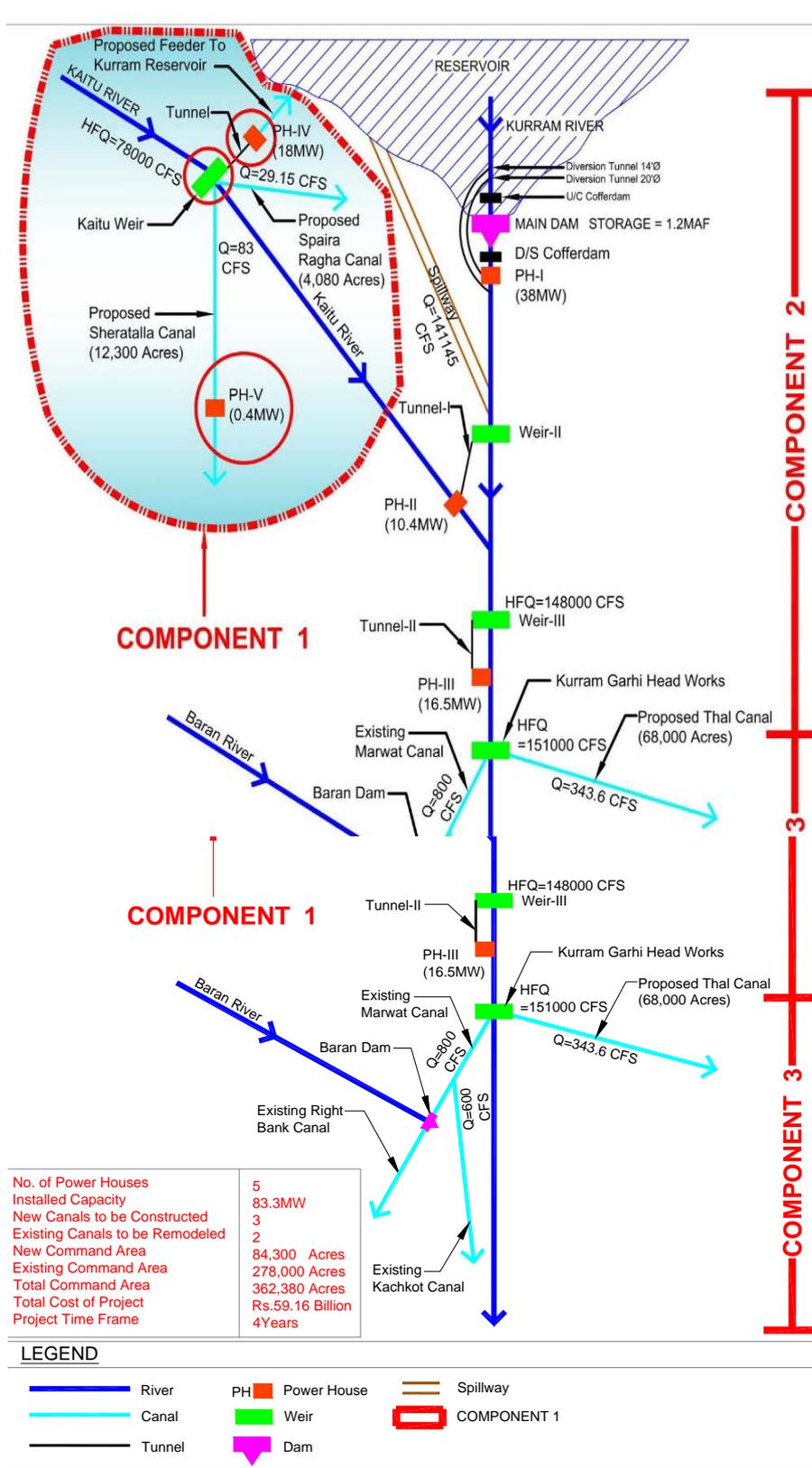
From the Kaitu Reservoir, there will be two separate off-takes for the Sheratalla and Spaira Ragma. The proposed Spaira Ragma Canal System located on the left bank of the Kaitu River will consist of concrete lined gravity and lift channels provided with regulating structures, cross drainage structures, bridges, culverts, escape structures and outlets. A pumping station, capable of lifting 10 cubic feet per second will feed water to Spaira Ragma Canal. The pumping station will comprise a pump house, five electric pumping sets and ancillary electrical and mechanical works.

The proposed Sheratalla Canal System on right bank will consist of a main canal, eight distributaries, seven minors and sub-minors, regulating structures including head regulators, cross drainage structures, bridges, escape structures and outlets. The canals will have differing sizes at various segments but will have a trapezoidal shape and will have a concrete lining throughout. The scope of Component I works is limited to the construction of the main, distributary and minor canals. The tertiary canals will be constructed by the Irrigation Department.

There will be a third off-take from the Kaitu Reservoir to provide water for a powerhouse located in the Kurram River watershed. A sediment excluder is provided at the beginning of the waterway. The excluder will be a 60 foot wide and 120- foot long concrete structure allowing the suspended sediment to settle down before entering the feeder channel. Water then travels through a 950-foot long feeder channel leading to a 14-foot diameter feeder tunnel excavated under the high mountain located in the left bank of the Kaitu River. The 6,100-foot long tunnel is followed by a 15,000-foot headrace channel and a 900 feet steel penstock culminating in the Powerhouse IV. A short tailrace channel will discharge water from the powerhouse to the Kurram Tangi Dam Reservoir. Powerhouse IV and associated waterways thus facilitate the diversion of Kaitu

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Figure I-1: Overall Diagram of Components 1, 2 and 3



River flows in excess of irrigation requirement at the Spaira Ragma and Sheratalla systems for storage in Kurram Tangi Dam and generate a maximum of 18 MW of hydropower.

A new 32 kV transmission line, about 30 miles long, will connect the Powerhouse IV switchyard to the existing substation at Domail near Bannu. A state-of-the-art computer based control system will be provided for the powerhouse.

The possibility of energy recovery from the gravity flow of the Sheratalla Canal has been identified. To that end, a small powerhouse will be constructed along the Sheratalla Canal. The energy generated from the Powerhouse V is expected to be used to run the pumping station provided in the Spaira Ragma Canal. Water will be conveyed to the powerhouse via a waterways system consisting of a feeder tunnel, headrace channel and two parallel penstocks.

The Mir Ali-Thal Road and the bridges along the road will be upgraded to make them suitable for handling the design loads required to transport the heaviest piece of equipment used in the project. The Spinwam Bridge, especially, will be inspected for soundness. If its design loading is found to be insufficient to carry heavy load construction vehicles, the existing ford downstream could be modified with the addition of a concrete slab crossing.

1.4.2 Component 2: Kurram Tangi Dam and Related Structures (Dams and Hydropower Development)

The basic purpose of the proposed Kurram Tangi Dam, with a planned crest length of 1,035 feet and height of 322 feet above the river bed, is the storage of water for irrigation and for power generation. At present, up to 50 percent of the flows from Kurram River are underutilized, as there is a lack of storage capacity within the river basin. By constructing the proposed Kurram Tangi Dam, flows from Kurram River will be regulated. Water will be released according to the irrigation requirements and downstream user demands, while the excess water available will be stored for use during low flow periods. The Kurram Tangi Dam will also store excess water from the Kaitu River basin that will be diverted via a diversion tunnel. Additionally, a main powerhouse (Powerhouse I) with an installed capacity of 38.0 MW is proposed at the foot of dam, and two additional powerhouses (Powerhouse II and Powerhouse III) with a capacity of 10.4 and 16.5 MW respectively are proposed between the main dam and the Kurram Garhi Headworks.

The proposed Kurram Tangi reservoir will be used mainly to meet irrigation needs of the existing Civil Canals, Marwat Canal and the new area in Thal Plain. Water from the reservoir will be released back to Kurram River after generating electrical power. These releases will reach Kurram Garhi Headworks after passing through Powerhouse I as well Powerhouses II and III. At the Kurram Garhi Headworks water will be diverted to the respective canals as per their requirements and quotas.

Table I-1: Kurram Tangi Dam and Reservoir Characteristics

Kurram Tangi dam and Reservoir Characteristics	
Crest elevation	2,142 feet above sea level
Crest width	45 feet
Crest length	1,035 feet
Maximum height above river bed	322 feet
Full Reservoir Capacity	1.2 million acre feet
Live storage	0.9 million acre feet
Dead storage	0.3 million acre feet

Reservoir area	10,939 acres
Average annual flow at dam site	908,000 acre feet

Weirs II and III: There are two weirs along Kurram River downstream of the dam, which are used to create small reservoirs for power generation. Weir II, located approximately 8,000 feet downstream of the main dam, will be used to divert water to Powerhouse II and will be 418 feet long and 20 feet high. Weir III, also located along the Kurram River, is about 30,000 feet downstream of the main dam. Weir III will be 1,190 feet long and 75 feet high.

Powerhouses I, II, and III: Three powerhouses are proposed in Component 2. Powerhouse I, the main powerhouse, will be located at the toe of the dam, and have an installed capacity of 38.0 MW. Powerhouse II will be located 2.1 miles downstream of the dam and has an installed capacity of 10.4 MW. A tunnel 16 feet in diameter and 5,400 feet long will be connected to the penstock through a forebay for conveying water to Powerhouse II. Powerhouse III will be located 4.8 miles downstream of Powerhouse II. A tunnel 16 feet in diameter and 3,250 feet long will be connected to the penstock to convey water to Powerhouse III with an installed capacity of 16.5 MW. These three powerhouses will be connected by a new transmission line to the existing substation at Domail.

Road improvements include construction of a new access road for Powerhouse II on the right bank of the river. This road will take off from new access road from dam site and follow the existing track to Powerhouse II. It involves rock cutting but does not involve any bridge. Its length will be five miles. Its width will be 30 feet.

A new approach road for Powerhouse III will also be needed. The road involves construction of a bridge. The road will be constructed along the right bank of the river for access to the intake tunnel and powerhouse. The total length of roads will be two miles.

The existing road from the dam site to Powerhouse III on the left bank of the river will be improved. The existing road is about 10 miles. Upgrades will include construction of 1 bridge, 12 culverts, and 12 causeways.

1.4.3 Component 3: New Thal Canal and Command Areaa (Irrigation System Development)

Component 3 includes the new Thal Canal and the rehabilitation and upgrading of the existing civil canals to improve the water conveyance performance of the present systems.

A new head regulator will be constructed at the Kurram Garhi Headworks to service the new Thal Canal. The head regulator has one bay with vertical lift gate. Thal Canal will be on the left bank of Kurram Garhi Headworks and leads to a tunnel. The tunnel will run underneath the high mountain for 3,100 feet before it transitions back into a trapezoidal channel. The canal takes its course through undulating hills, crosses various streams and ends in Karak District. The canal system will have 19 distributaries, 4 minors, 2 sub-minors totaling in length about 73 miles.

The project will also upgrade about 200 miles of old canals (collectively called the Civil Canals and built by landowners) with a command area of approximately 107,000 acres, and the Marwat Canal with a command area of 170,000 acres.

The existing Marwat Canal located on the left bank of the Kaitu River will be upgraded to concrete lined gravity channels provided with new or rehabilitated regulating structures, cross-drainage structures, bridges, culverts, escape structures and outlets.

The canals will have differing sizes at various segments but will have a trapezoidal shape and will have a concrete lining throughout. The scope of Component 3 works is limited to the construction of the

main, distributary and minor canals. For publicly owned canals (Thal and Marwat) tertiary construction and rehabilitation is the responsibility of the Irrigation Department. For civil canals, the community is responsible.

2 PROPOSED INSTITUTIONAL ARRANGEMENTS: ROLES AND RESPONSIBILITIES

2.1 Institutional Arrangements

2.1.1 Proponent

KTDP will be implemented and administrated by WAPDA (proponent) in coordination with FATA Secretariat during the construction phase, while during the operational phase WAPDA and Irrigation Department Bannu will be the key players. WAPDA was established as an autonomous body in 1959 with a purpose to lay focus on investigation, planning and execution of irrigation, drainage, prevention of water logging and reclamation for saline land. Led by WAPDA Authority, it consists of the Power Wing and the Water Wing. In 2007 local power distribution was outsourced by establishing the Pakistan Electric Power Company (PEPCO) which runs nine regional distribution companies, while the National Transmission Dispatch Company deals with national level distribution. Environmental and social issues are mostly addressed through the Water Wing as the Power Wing focuses on production and has consequently limited interaction with people and the environment.

The Planning Division of WAPDA Water Wing, headed by a General Manager, looks after all the planning activities on the water side. The activities of water resources and hydropower development and vision-2025 are handled by three General Managers i.e. Technical, South, North, GM (P&D) and GM Hydro Development.

General Manager (North) is assisted by the General Manager (Technical Services), General Manager (Land Acquisition and Resettlement), and WAPDA's Environment Cell (WEC). The last two are significantly under-resourced and therefore generally not able to engage actively in the implementation of projects and have focused their attention in the past mostly on supervision and high-level guidance.

2.1.1.1 WAPDA Environmental Cell

WEC works under the GM (P & D) of Water Wing. Currently WEC consists of two sections working under the Director General (DG), and another section of WEC working under the Project Director (WRPO). The main section of the WEC is in Lahore. Current strength of WEC is about 30 professional and para-professional staff. Technical staff consists of environmental engineers, geologists, ecologists and civil engineers. WEC staff is well aware of the EA and RAP.

2.1.1.2 Proposed Setup for the KTDP

The proposed organizational setup for the construction and operation phases of the Project is shown in Figures 2-1 and 2-2. The implementation and operation of the Project is the core responsibility of WAPDA. The KTDP will be implemented under the General Manager (Projects) North of WAPDA and overall supervision of Member Water Wing through the aid of the Project Director KTDP (PD KTDP) and a Project Management Unit (PMU) that assembles national and international experts. The immediate requirement, considering the existing institutional setup of WAPDA, is the establishment of an Environmental Monitoring Cell (EMC) under the direct supervision of General Manager (North). EMC will have three components namely a Health, Safety and Environment (HSE), a Land Acquisition Unit (LAU) and an Environment and Social Team (E&ST) that will carry out their duties in close coordination with the Contractor and Supervisory Consultant (SC). It is a pre-requisite that all the resettlement and land acquisition issues and compensation to Project Affected Persons (PAPs) need to be handled and covered before mobilization of Contractor.

The overall responsibility for implementation of mitigation measures will rest with General Manager (North) through the Project Director (PD) and his team. HSE department will handle occupational health and safety issues and the Land Acquisition Unit will deal with all land and resettlement issues including monitoring, while E&ST will focus its activities on monitoring, specifically during the construction phase of the weirs, dam, and other allied facilities. The E&ST will remain on-board

throughout construction and will finally be merged into the proposed HSE department during operation. The department will primarily be responsible for tackling all the HSE issues throughout the project cycle.

The proposed minimum staffing requirements are listed below:

E&ST:

- Senior Environmental Engineer (Masters in Environmental Engineering: 10 years' experience in dams and water sector; and
- Senior Sociologist (Master in Social Work/Sociology): 5 years' experience in resettlement sector.

LAU

- Senior Sociologist (Master in Social Work/Sociology): 10 years' experience in resettlement sector.
- Social Expert (Master in Social Work/Sociology) 5 years of experience in land acquisition and resettlement
- Stakeholder engagement specialist (Master in Social work/sociology) 5 years of experience in handling land acquisition related stakeholder engagement
- Land Administration Specialist (Master in Land Management) 5 years of experience in land administration and setting up new land records and cadastres
- Livelihood Restoration Specialist (Master in Social Work/Agriculture, Sociology) 5 years of experience in enhancing capacities on irrigated agriculture

HSE:

- Senior Safety Engineer (Masters in Environmental Engineering): 10 years' experience in HSE; and
- HSE Engineer (Masters in Environmental Engineering): 5 years' experience in HSE.

2.1.1.3 Institutional Arrangements for Resettlement

The institutional arrangement for resettlement is shown in Figure 2-3 below. The PMU will include a Department for Land Acquisition and Resettlement (LAR). While formally reporting to the Managing Director of the PMU, the LAR will benefit from a close collaboration and from strategic advice provided by a Steering Committee comprising a) the WAPDA General Manager for Land Acquisition and Resettlement, b) the Assistant Political Agent for North Waziristan, c) the Assistant Deputy Commissioner for FR Bannu, d) Deputy Commissioners for the Bannu, Lakki Marwat and Karak District as well as e) representatives of the funding agencies.

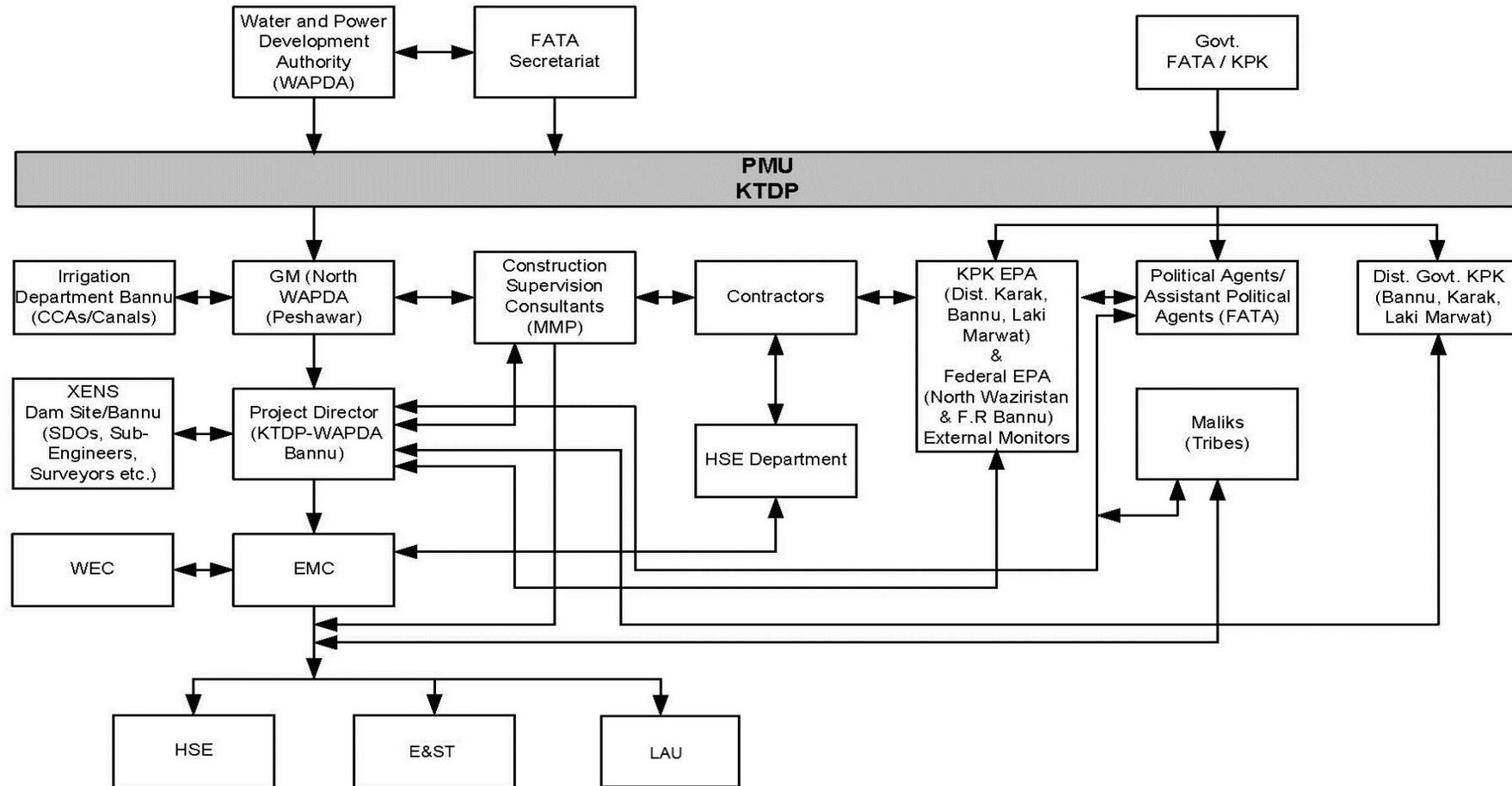
Land Acquisition Unit (LAU)

The RAPs will be implemented by the Land Acquisition Unit (LAU) established by hiring at least five national land acquisition and resettlement experts under the supervision of PMU. The RAPs will be implemented through LAU in accordance with the implementation schedule to be established in the RAPs as well as for civil works activities.

Resettlement Supervision Committee (RSC)

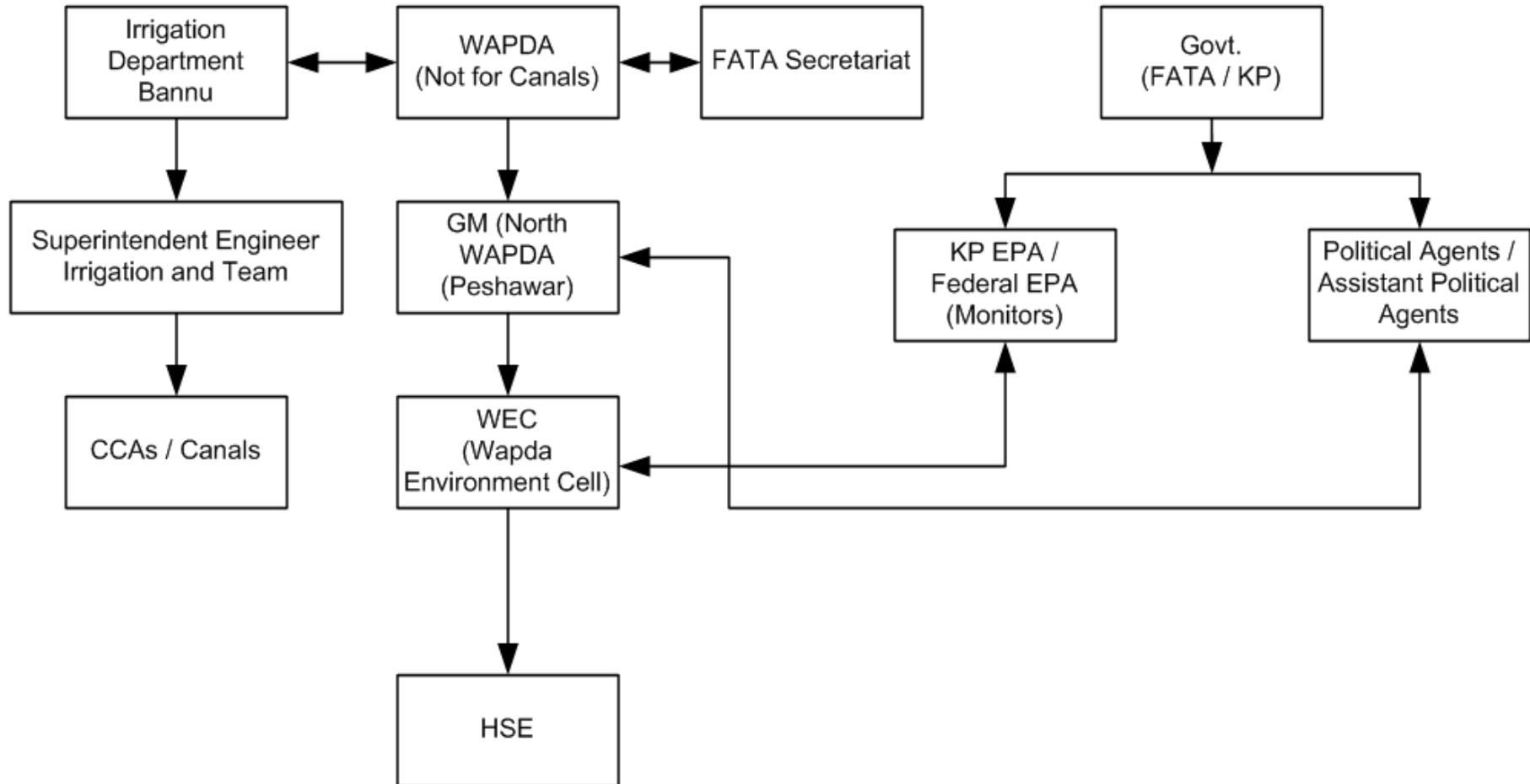
The objective of the Resettlement Committee (RSC) is to assure the smooth communication between the LAU and the PAPs. There will be three RSCs four Component 1, two for Component 2 and three for Component 3.

Figure 2-1: Proposed Institutional Structure-Construction Phase



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Figure 2-2: Proposed Institutional Structure – Operational Phase



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Resettlement Panel of Experts

Such expertise is routinely employed in projects involving large scale resettlement. The use of such panels in the planning stage helps a resettlement program improve substantially, as demonstrated by the impressive preparation of the resettlement components of the Ghazi Barotha Hydropower Project in Pakistan. The reports from the panel of experts should be made public after the draft report is revised to take into account the initial comments of the project agency.

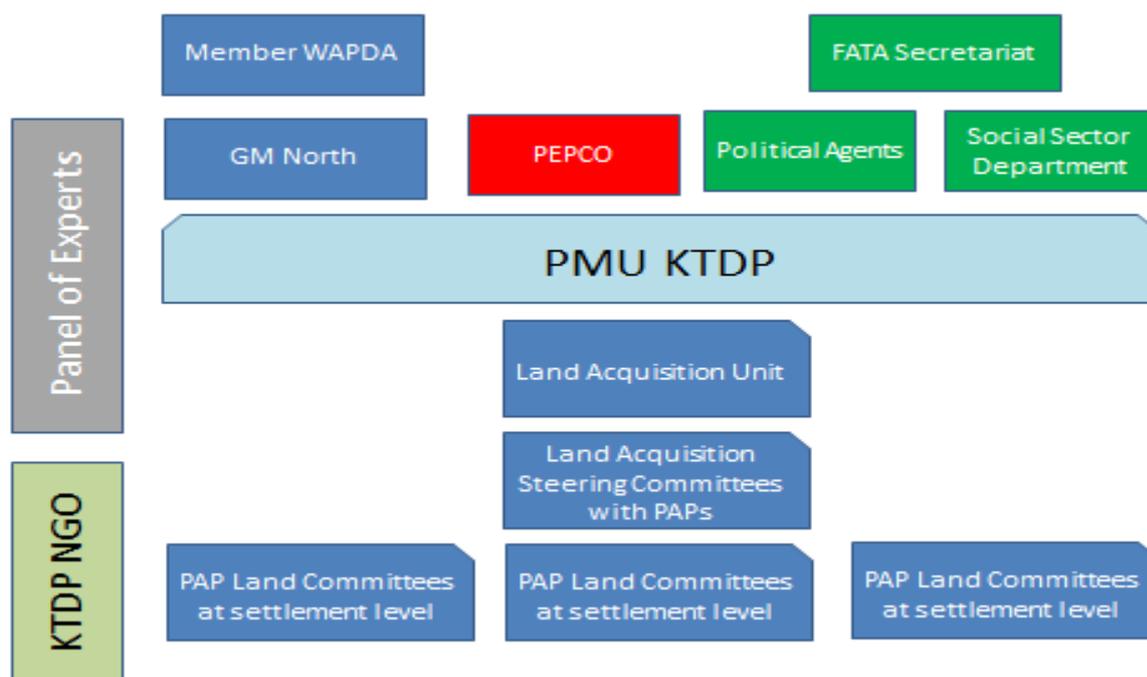
To assure alignment with international standards, the LAU shall be supported by a panel of three international land acquisition experts that undertake inspection missions at least four times every year to the PMU, LAU and the project region to review the progress made against the RAP for Component I and the RPF.

Three experts are proposed as best practice requires that always two experts conduct a supervision mission and commonly such senior experts are fully occupied. Therefore, the third is there to assure that two experts can be mobilized at short notice at critical junctures in the project such as reviewing the amended RAP.

NGOs supporting the PAPs

Nongovernmental organizations (NGOs) play an important role as “watch dogs” for all kind of issues and/or informing affected people about their rights and options and/or assist them in the decision making and relocation process. In Pakistan the Project Non-Governmental Organization that was formed for the Ghazi Barotha Hydropower Project demonstrated that NGOs can play a vital role in during land acquisition and resettlement planning and implementation.

Figure 2-3: Institutional Arrangements for Resettlement



2.1.2 EPA, KPK and FATA Secretariat:

EPA, KP and FATA Secretariat are the regulatory authorities for issuance of a No Objection Certificate (NOC) for this proposed project. Their mandate includes responsibility for protection of the environment (water, air and noise). Therefore, these agencies will undertake audits (as and when required) of the activities of the project (both phases) with respect to the protocols as defined in Section 2.2 below (Roles and Responsibilities).

2.1.3 Project Contractor

For the proposed Project, WAPDA will select Contractor(s) for construction and other project activities. The Contractor(s) will be responsible for the physical execution / implementation of the EMMP, or adherence to all the provisions of the EA and EMMP and any environmental or other code of conduct required by KPK, EPA and FATA Secretariat. This EMMP shall be a binding instrument and shall be adhered to by the contractor. In addition, as discussed below, the Contractor will prepare a site specific environmental management plan, based on this EMMP. Overall responsibility for the Contractor's environmental performance will rest with the WAPDA.

The Contractor will be contractually obliged to have an HSE department having qualified professional staff. WAPDA must consider this matter while selecting the Contractor. At a minimum this department will be under the direction of an appropriately qualified HSE Manager, who will be assisted by qualified Health and Safety and Environmental Officers (HSO, EO). The HSE Manager should have at least ten years' experience, of which at least five at managerial level, in HSE in the dams and water sector. The HSO(s) and ECO(s) should have at least five years' experience in their respective domains in the dams and water sector.

The HSE manager, with the assistance of the ECOs and HSOs, will be responsible for:

- Overall HSE supervision of the contractor's activities;
- Preparation of the site specific environmental management plan;
- Day-to-day running of the Contractor's HSE department;
- Daily site inspections;
- Implementation of all legal, regulatory and contractual requirements concerning the environment, health and safety as well as the management and monitoring measures in this EMMP;
- Implementation and compliance discussions with staff at routine site meetings;
- Environmental and health and safety training;
- Keeping of records and appropriate documentation for review by the Supervisory Consultant (SC);
- Informing SC of any incidents or emergencies on site, together with a record of action taken;
- Reporting and recording all accidents and incidents resulting in injury or death of workers.

The contractor will be contractually obliged to prepare site-specific environmental management plan.

2.1.4 Supervisory Consultant

A Supervisory Consultant for the project will be selected by WAPDA, and will be designated as the "SC". He will be responsible for the supervision of engineering mitigation measures as well as for the environmental monitoring of the project activities. The role of SC will only be during the construction stage of the project. The Consultant will be responsible for:

- Supervising the Project's Contractor(s) activities and ensuring that all the contractual obligations related to the design and construction, as well as environmental and social compliance are met;
- Ensuring that day-to-day construction activities are carried out in an environmentally sound and sustainable manner;
- Monitoring of the environmental aspects of the project during construction to ensure that the environmental requirements of the contract and the mitigation measures proposed in the EMMP are implemented;
- Developing and conducting environmental training activities for Contractors;

- Ensuring that the construction camps and other facilities are properly sited and installed in accordance with the contract;
- Identification of the exact locations of air, noise and water quality monitoring in accordance with the contractual provisions;
- Undertaking critically important routine visual monitoring of the construction activities, waste disposal and overall environmental management practices by the Contractor(s);
- Frequent site visits and observations; and.
- Devising solutions to the environmental issues as they arise.

2.1.5 Khyber Pakhtunkhwa Environmental Protection Agency and FATA Secretariat

The Khyber Pakhtunkhwa (KP) Environmental Protection Agency (EPA) will issue the (NOC) to the project which will define the conditions associated with the NOC. KP EPA and FATA Secretariat will monitor all the commitment made in the EA and EMMP by the project proponent.

2.1.6 Political Agent and Assistant Political Agent

The Political Agent (PA) and Assistant Political Agent (APA) in FATA have a very important role to play. The Project proponent's senior representatives i.e., GM (North), P KTDP should have close coordination with the PA and APA in issues related to the local community, security, etc. All communication with the local communities and residents should be done through PA and APA.

2.1.7 Non-Governmental Organizations

In addition to the non-governmental organization that will be involved with resettlement issues, a strategy is needed to outline the ways and means through which NGOs and community based organizations (CBOs) can play their part in the sustainable development of this project. To date, there is only one NGO in the Project Area of Influence (AOI) providing support to the local communities, mostly in the form of small grants. Still more NGO works (awareness programs, dialogues, financial support) are required to focus on social welfare problems with attention to environmental and development issues. That will increase their role in networking and public decision-making.

2.1.8 Advisory EA Panel and Dam Safety Panel

Based on international donor requirements, specifically those of the World Bank, complex projects such as the KTDP should utilize the advice of an Environmental Assessment advisory panel. Dam projects in particular have special requirements for an expert panel. Both are recommended for the KTDP.

Projects that are highly risky or contentious or that involve serious and multidimensional environmental concerns, typically require the engagement of an advisory panel of independent, internationally recognized environmental specialists to advise on all aspects of the project relevant to the EA. The panel is expected to advise on: (a) the terms of reference for the EA, (b) key issues and methods for preparing the EA, (c) recommendations and findings of the EA, (d) implementation of the EA's recommendations, and (e) development of environmental management capacity (World Bank, OP 4.01, Environmental Assessment). In this case, the EA terms of references and issues and methods related to preparing the EA have already been accomplished. Nevertheless, it is recommended that USAID require that WAPDA engage an independent panel or that USAID engage such a panel itself.

For large dams³, an independent panel of experts should be engaged. Such a panel consists of three or more experts acceptable to the donor, with expertise in the various technical fields relevant to

³ Large dams are defined as those over 15 meters. KTD and Weir III both qualify as large dams. Dams that are between 10 and 15 meters in height are treated as large dams if they present special design complexities--

the safety aspects of the particular dam. The primary purpose of the panel is to review and advise the borrower on matters relative to dam safety and other critical aspects of the dam, its appurtenant structures, the catchment area, the area surrounding the reservoir, and downstream areas. Normally, the panel's composition and terms of reference is extended beyond dam safety to cover such areas as project formulation; technical design; construction procedures; and, for water storage dams, associated works such as power facilities, river diversion during construction, ship lifts, and fish ladders. to review: (a) the investigation, design, and construction of the dam and the start of operations; (b) preparation and implementation of detailed plans: a plan for construction supervision and quality assurance, an instrumentation plan, an operation and maintenance plan, and an emergency preparedness plan; (c) prequalification of bidders during procurement and bid tendering, and (d) periodic safety inspections of the dam after completion. Following the filling of the reservoir and start-up of the dam, the donor would typically review the panel's findings and recommendations. If no significant difficulties are encountered in the filling and start-up of the dam, the panel may be disbanded. (See World Bank Op 4.37 for additional information.)

For small dams, generic dam safety measures designed by qualified engineers are usually adequate. The EA should, according to World Bank procedures, confirm that there would be no risk or negligible risk of significant adverse impacts due to potential failure of the structure to local communities and assets, including assets to be financed as part of the proposed project. Based on such determination potential adverse impacts would be addressed through the EA and measures included in the Environmental Management Plan (equivalent to an EMMP).

2.2 Roles and Responsibilities

The foremost responsibilities of WAPDA GM (North), EMC (E&ST, HSE and LAU), the Contractor and the SC are given in Table 2-1 below.

The Contractor is the main force behind meeting the project goals. Once the design stage concludes, the Contractor is essentially deemed as the commercial leader of the project. In close coordination with the client, he has to manage and ensure some of the most important elements of the project including safety of the project workers, equipment handling, HSE compliance, budget control, time allocation and remaining costs of the project.

During the operational stage WAPDA (GM (North) with his team Irrigation Department Bannu and FATA secretariat will be responsible for the implementation of mitigation measures. However, their roles and responsibilities will be defined after the completion of construction phase as presently there is no information in the Tender Document and Feasibility Report (2004) allowing their definition.

Table 2-1: Institutional Roles and Responsibilities

Organization	Designation	Responsibilities	Operating Documents
WAPDA	Project Director (PD)	<ul style="list-style-type: none"> ▪ Overall in-charge and supervision of EMC's activities. ▪ Ensure the project's compliance with the PEPA 1997 and other national environmental regulations and stakeholder participation in the project construction and operation 	<ul style="list-style-type: none"> ▪ Contract with construction SC and Contractor. ▪ Relevant documents of USAID, WB, ADB and EPA on environmental safeguards.

for example, an unusually large flood-handling requirement, location in a zone of high seismicity, foundations that are complex and difficult to prepare, or retention of toxic materials.

		<p>stages.</p> <ul style="list-style-type: none"> ▪ Liaison with SC and Contractor. 	<ul style="list-style-type: none"> ▪ EA report prepared for the Project.
EMC Construction Phase	E&ST	<ul style="list-style-type: none"> ▪ Monitor the SC's activities and check the proper implementation of all mitigation measures for physical, ecological and social sectors. ▪ Ensure compliance and implementation of national rules and regulations enforced by Environment Protection Agencies especially regarding social and environmental aspects. ▪ Obtain necessary approvals from the concerned departments. ▪ Document the social complaints and prepare the social complaint register. ▪ Monitor and evaluate environmental and social performance of the project. ▪ Carry out consultation with the tribes with regards to any social issue that needs to be resolved. 	<ul style="list-style-type: none"> ▪ EMMP-EA Report. ▪ RAP, RPF. ▪ National and International environmental procedures, guidelines and standards (NEQS, USAID, WB and ADB). ▪ Reporting system (EMMP). ▪ Site-Specific EMPs.
	HSE	<ul style="list-style-type: none"> ▪ Oversee all the HSE activities being carried out by the Contractor. ▪ Implement the HSE activities as provided in HSE plan. ▪ Liaison with Contractor and SC. ▪ Conduct site visits to ensure compliance with HSE protocols. 	<ul style="list-style-type: none"> ▪ HSE procedures of Contractor. ▪ EMMP-EA. ▪ Reporting mechanism as given in EMMP. ▪ Comply with National and International Public Health and Safety (PHS) Acts and standards. ▪ Site-Specific Health and Safety Plans.
Department for Land Acquisition and Resettlement	LAU	<ul style="list-style-type: none"> ▪ Implement RAPs (details of RAP implementation are provided in the RAP for Component I) 	<ul style="list-style-type: none"> ▪ RPF ▪ RAPs
Supervisory Consultant	Environment Team	<ul style="list-style-type: none"> ▪ Ensure the implementation of the mitigation measures suggested in the EMMP and in the Site-Specific EMPs and Health and Safety Plans ▪ Monitor construction activities and ensure that they are carried out in an environmentally and socially sound and sustainable manner. ▪ Liaison with EMC. 	<ul style="list-style-type: none"> ▪ EA Report. ▪ EMMP-EA Report. ▪ Contractor Health and Safety Plans and Site Specific EMPs. ▪ Contractor method statements ▪ Site-Specific EMPs.

		<ul style="list-style-type: none"> ▪ Supervise the Contractor’s activities and make sure that all the contractual obligations related to environmental and social compliance are met. ▪ Prepare periodic Environmental Reports and distribute according to the requirements of EMMP. 	
Contractors	HSE Team	<ul style="list-style-type: none"> ▪ Preparation of a site-specific Environmental Management Plans and Health and Safety Plans. ▪ Compliance of all the monitoring programs as given in EMMP (Mitigation management matrix, emergency plan, waste management plan etc.). ▪ Ensure health & safety of site workers. ▪ Training of workers. ▪ Strict compliance with social mitigation measures. ▪ Effective liaison with local residents and communities and head of tribes and villages. 	<ul style="list-style-type: none"> ▪ Agreement with WAPDA. ▪ EMMP-EA. ▪ Comply with national health and safety laws. ▪ SC’s environmental reports.
KP, EPA and FATA Secretariat		<ul style="list-style-type: none"> ▪ Audit of the activities being undertaken by Contractors and all other organizations as per the proposed institutional plan. ▪ Liaison with GM (North) and PD (KTDP) Bannu, and EMC to check compliance of measures required by the EMMP during operation stage. 	<ul style="list-style-type: none"> ▪ EMMP. ▪ EA. ▪ PEPA Act, 1997.

2.3 Training

In order to ensure success of the EMMP the training of EMC staff and all others involved in implementation and monitoring of the EMP, including the construction contractor and all sub-consultants, will be required.

All staff responsible for the management, implementation and oversight of the EMMP shall be adequately trained for their role. Training shall be conducted prior to the various actors when their involvement in the Project commences, and be supplemented by regular refresher courses. Training records shall be maintained on site, for each employee, to provide evidence for auditing/inspection purposes.

The following training shall be implemented.

2.3.1 Environmental Monitoring Cell

As discussed in Section 2.1.1.2 the EMC shall be established under the direct supervision of General Manager (North). The EMC training should be designed to qualify EMC staff to provide on-site training to all WAPDA employees as well as to perform their specialized jobs and tasks. Specific environmental training to the EMC should include:

- Pakistan, USAID and International Financial Institution (IFI) legal, regulatory and policy requirements applicable to the project;
- Fundamentals of environmental management;
- Compliance assessment, monitoring and follow-up, including monitoring requirements, methodologies (e.g. water quality testing and analysis) and record keeping;
- Environmental auditing;
- Community relations and public consultation; and,
- Fundamentals of aquatic ecology and environmental flows associated with construction and operation of hydroelectric projects.

In addition, the EMC should receive health and safety training including:

- An initial orientation to identify the general work conditions and potential hazards of the work environment;
- Pakistan, USAID and IFI legal, regulatory and policy requirements applicable to the site;
- Training to review occupational hazards, safety procedures, and information sources (e.g., Material Safety Data Sheets [MSDS] and warnings on barrels and containers);
- Emergency evacuation plans and escape-ways;
- Firefighting procedures and responses to emergency situations;
- Health hazards associated with certain tasks or assignments;
- Dam safety and relevant aspects of their design, construction, maintenance, and monitoring; and,
- First aid and CPR training for all employees.

It is recommended that the institutions that fund the Project requires this training as a condition for disbursement, and funds the training. Such training could form part of the training center that will be set up for the Project. Overall costs of setting up and running the training centers for each Component are discussed in Section 4. I.

2.3.2 Supervisory Consultant

The SC shall either have environmental, social and health and safety staff trained to ensure contractor compliance with the EMMP requirements or subcontract this responsibility to adequately trained personnel. Training records, including attendance and contents of courses, shall be kept for inspection by the EMC. Environmental training should include:

- Pakistan, USAID and IFI legal, regulatory and policy requirements applicable to the project;
- Fundamentals of environmental management, with a focus on construction-related environmental management (civil works, sediment and erosion control, soil handling and vegetation removal);
- Compliance assessment, monitoring and follow-up;
- Air, soil and water sampling procedures and record keeping;
- Waste management;
- Fuel and hazardous materials management;
- Fundamentals of aquatic ecology;
- Construction camp management;
- Community relations and public consultation, and,
- Auditing.

In addition, SC staff should receive the same Health and Safety training as outlined in Section I.I above. It is recommended that the institution(s) that funds the Project requires this training as a condition for disbursement, and funds the training. Such training could form part of the training center that will be set up for the Project.

2.3.3 Construction Contractor

The construction contractor shall have environmental, social and health and safety staff trained to ensure contractor and all subcontractor compliance with the requirements of the EMMP. The construction contractor shall keep complete training records, including attendance and contents of courses, for inspection by the SC and EMC. Training courses for the construction contractor's HSE department should include the following:

- Pakistan, USAID and IFI legal, regulatory and policy requirements applicable to the project
- Fundamentals of environmental management, with a focus on construction-related environmental management (civil works, sediment and erosion control, soil handling and vegetation removal);
- Compliance assessment, monitoring, record keeping and follow-up;
- Air, soil and water sampling procedures;
- Waste management;
- Fuel and hazardous materials management;
- Construction camp management;
- Community relations and public consultation procedures; and,
- Auditing and follow-up.

All contractor personnel shall receive general health, safety, environmental, and social awareness training that emphasizes each employee's responsibility for complying with environmental and social laws, regulations, commitments, and policies and guidelines. At a minimum health and safety training will cover the same subjects as those described for the EMC in Section 1.1 above. Environmental, Social and Health and Safety Training should be included as a requirement in the construction contract(s).

2.4 Community Grievance Management System

As described in the RAP, the KTDP LAU will establish a community grievance management system (CGMS). E&ST will assist the LAU in setting up and managing the CGMS. The CGMS is a formal and documented process to receive, assess, record and resolve grievances concerning any aspect of the performance or behavior of the KTDP, its contractors or its employees. In addition, the KTPD LAU will establish an Independent Mediation Committee (IMC) to try to resolve grievances that cannot be resolved at the local level.

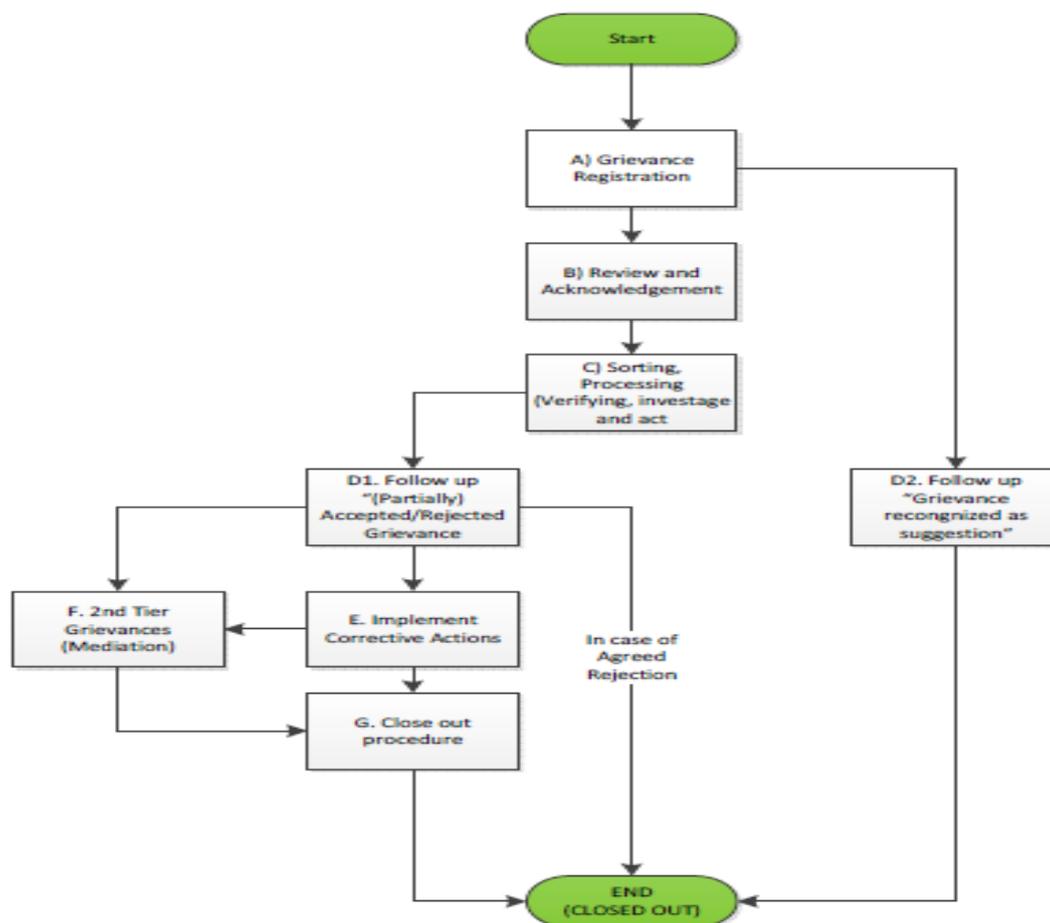
The objectives of the Community Grievance Management System are to:

- Establish a consistent, transparent, accessible and credible grievance management process for individuals, households, and communities affected by the KTDP;
- Create outcomes that are considered by all parties as realistic, fair, effective, and sustainable;
- Promote and establish open and clear lines of community engagement concerning grievances;
- Manage and reduce community and company risks by effectively addressing grievances so that they can be resolved before they escalate into larger conflicts; and,
- In instances where solutions cannot be reached through direct dialogue with the KTDP, by using the amicable grievance/dispute resolution process or through the functioning of the Independent Mediation Committee, either party (the complainant or the KTDP) may apply to the competent Judicial Court to resolve disputes in line with applicable legislation. In disputes with community members⁴, the KTDP shall refrain from recourse to the Court first unless all amicable complaint resolution mechanisms (including IMC) are exhausted. Complainants are in any event free to

⁴ This commitment does not apply to labor disputes and contractual disputes with contractors, amongst others.

resort to judicial proceedings to raise or resolve a grievance, regardless of whether or how the KTDP’s grievance management system or the Independent Mediation Committee might be engaged. The KTDP shall comply with all verdicts and outcomes of judicial proceedings. The following figure presents a visual overview of this process.

Figure 2-4: Grievance Management System



2.4.1 Stages in the CGMS

Upon receiving a complaint in verbal or written form, LAU shall log it in its internal management system, and shall provide the complainant with a written acknowledgement of receipt within seven calendar days. This acknowledgement of receipt shall include a brief summary text explaining the complaint resolution process. Unless impractical, LAU shall seek to arrive at an initial proposal for the resolution of complaint within 30 calendar days of its reception. If this time limit cannot be met, the LAU shall advise the complainant in writing that it requires additional time.

If the proposed solution is not accepted by the complainant, he or she (or a group of people, if more than one person is involved) can take their grievance to the Independent Mediation Committee, which shall seek to analyze the case and propose its solution within a further 60 days. An outline of steps in the grievance management process is shown in the table below.

Table 2-2: Principal Steps of the Grievance Management Process

Step	Description	Timeline
1	Receipt of the grievance	
2	Completion of the grievance form	
3	Entry of the complaint into the grievance database	
4	Preliminary assessment of grievance: internal evaluation of the severity of the complaint (or "Community Impact Ranking,"	
5	Written acknowledgement of the receipt of the grievance within 7 calendar days. If key information is missing from the grievance, request for further information	
6	Investigation and resolution of grievance	
7	Response letter and registration in database. If the solution is accepted, resolution (including any payments) and closure of the case	
8	If the proposal is not accepted by the complainant, referral to the Independent Mediation Committee	
9	At any stage in the process, the complainant can resort to judicial measures	

2.4.2 Independent Mediation Committee

The Independent Mediation Committee (IMC) is a structure that shall be established by the Project to independently and impartially resolve grievances through mediation and dispute resolution. Mediation by the IMC is only to take place in the event of complainant dissatisfaction with the initial resolution proposed by the Project through the CGMS. The IMC shall use mediation to resolve disputes or complaints submitted to it.

The IMC shall operate independently from the Project but shall have access to any information that the Project has regarding the complaint. The determinations of the IMC are non-binding on either party. The IMC shall meet on an as needed basis, in function of registered complaints and disputes, and its members shall receive a stipend from the KTDP to cover costs of attending meetings. If a solution that is acceptable to all parties emerges out of the meetings with the IMC, the grievance may be considered resolved and closed out. All parties shall then be notified. If no acceptable solution is agreed upon, either party has the option of taking legal action.

3 PROJECT UNCERTAINTIES

In any project, whether small or large scale, there will typically be some unknowns or uncertainties. These may be termed as 'Project Uncertainties'. This is even more so with the KTDP- as there are major security issues surrounding the project area that will required the selected construction contractor to work closely with the army. Therefore many issues as listed below have been left for the contractor to decide.

The project uncertainties may last only up to the pre-construction phase, until early in the construction phase or until the end of the construction phase. All current policy level decisions regarding project uncertainties should be confirmed during the selection and mobilization phases of the construction contractor. All project uncertainties that still exist should be subject to further field and office investigation before and during the construction phases of the project.

The known uncertainties and actions to address them are stipulated in the Table below.

Table 3-1: Uncertainties

Sr. #	Issues	Uncertainty	Required Actions	Responsibility
1	Location and design of contractors' construction camps, laydown areas and camp for executives	The 2004 Feasibility Report (KTDC, 2004) mentioned two construction camps, one near Spaira Ragma area and the other one somewhere in Bannu. These camps were for the construction of the three Components. However, for Component I, recent consultations with WAPDA revealed that, for security reasons, the Contractor will select sites of its own choice, in coordination with the army.	WAPDA should discuss this issue with the selected Contractor, before award of contract and mobilization of the contractor. Contractor and WWAPDA to agree on sites, carry out site evaluation (including environmental impacts and mitigation) and organize land acquisition	WAPDA/ Contractor
2	Location and identification of borrow areas (aggregate, sand, etc.)	A large amount of borrow materials will be required for the construction of the dam, weirs, tunnels, powerhouses, canals, etc. in all three components. At the time of writing of this report, the locations for borrow areas are marked on a drawing (Tender Documents, 2011) but no detailed information is available such as why these sites were selected, whether the material available is in adequate quantity, etc. Potential sites need to be checked for potential environmental impacts and sensitivity. It is currently not clear whether the supply of aggregate and sand for concrete will either be purchased from local resources or acquired from outside the project area.	Perform a detailed field investigation (including environmental evaluation) and procurement study.	WAPDA/ Contractor
3	Water supply alternatives	This is one of the most critical aspects of the project	For construction, the contractor will have to	WAPDA/ Contractor

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	(construction and operation)	uncertainties. No plans or information were given in the Design or Tender Documents for the constant supply of fresh water for workers daily demand as well as for construction and operation activities.	develop his own water resources in the form of tube wells or arrange for the necessary approvals from the relevant authority for the use of local water resources.	
4	Arrangements for landfill(s)(construction and operation)	There is uncertainty about the disposal of solid waste generated during the construction and operation phases of the KTDP. No quantified data are documented in the Design or Tender Documents.	Landfill site (s) will have to be selected prior to the mobilization of the construction contractor for each component.	WAPDA/ Contractor
5	Ecological flow requirements	While an initial estimate of ecological flow and environmental requirements has been made in the EA, it is only an initial estimate. A biologically based determination is required. Note this will be needed as an input to the water balance study below.	Conduct a Riverine Habitat Simulation (RHABSIM 3.0) refinement of the, Physical Habitat Simulation Model (PHABSIM) to determine final ecological flow requirements prior to construction. Revised total flow requirements shall be written into Kaitu Weir and Kurram Tangi Dam, Weir II and Weir III operating procedures.	WAPDA
6	Water balance and availability of water	No detailed studies have been conducted on water balance for the Kaitu and Kurram Rivers. The accuracy of hydrological data needs to be confirmed first of all.	A water balance study should be conducted, with the aim of analyzing the match between the water availability patterns during the hydrological year and the irrigation water demand pattern (monthly irrigation requirements of the command areas and riparian areas), the hydropower demand pattern and the environmental and ecological flow requirements.	WAPDA
7	Probable Maximum Flood (PMF) and Probable Maximum Precipitation (PMP)	Estimates are too low	Revise PMP and review and recalculate peak flow of the PMF. Evaluate adequacy of proposed spillway and revise design	WAPDA
8	Fisheries	Existing baseline on Kurram and Kaitu Rivers is insufficient to determine potential impacts and mitigation measures for existing fisheries.	WAPDA and FATA Fisheries Department should perform fisheries survey.	WAPDA and FATA Fisheries
9	Rehabilitation of existing roads and	The extent of rehabilitation of the existing roads and bridges as well as the alignment and design of all	WAPDA should discuss this issue with the selected Contractor, before award	WAPDA/ Contractor

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	bridges and access roads	new access roads and relocated roads have not been clearly defined and analyzed in the existing Design and Tender Documents. WAPDA and its Technical Consultant stated that this activity will be performed by the selected construction contractor.	of contract and mobilization of the contractor.	
10	Transmission lines	There is no Right of Way (ROW) defined for the transmission line between Powerhouses IV and I. The proposed ROW for the transmission line between P Powerhouse I and the existing substation at Domail may need to be further optimized.	WAPDA should perform a detailed study of the transmission lines and optimize the ROWs.	WAPDA
10	Planning and coordination	The planning, design and the construction of the main structures (Kaitu weir, main canal network) is the responsibility of WAPDA while the development of the tertiary distribution networks, watercourses and on-farm development is the responsibility of the KP Irrigation Department. This could lead to a long time lag between the construction of the main structure and the actual use of the systems for irrigated production. Designs for canals and the tertiary system are not available, and there is no consideration of drainage	Coordination between WAPDA and provincial irrigation department in developing the required designs and implementation schedule.	WAPDA

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4 COSTS

4.1 Environmental Mitigation Costs

Mitigation

The EA team attempted to develop fixed/capital costs and annual costs for the mitigative measures shown in the tables in this chapter. The construction or civil works contractor(s) will be responsible for implementing many of the mitigative measures associated with the construction phase, other than those associated with supervision of the construction work itself. Costs borne by the civil works contractor would have to be part of a construction bid or amendments to bids and would become part of the capital cost of the project. It is not possible to predict how bidders will respond to the costs of the work, given the security issues and the complexity of the work, which are likely to be the dominant cost drivers rather than the mitigative measures. However, as a general rule, environmental mitigation and monitoring costs borne by a civil works contractor amount to about 8-12 percent of total construction costs.

As far as construction supervision is concerned, the costs of the Supervisory Consultant are an integral part of the engineering cost, and can amount to anywhere between 10 percent and 25 percent of the engineering supervision cost. As Component 2 is more complex than Component 1, it is considered likely to have higher annual supervision costs during construction than Component 1. Component 3 is likely to have supervision costs somewhat less than Component 1 during construction.

In addition, because of the uncertainties about aspects of the project design and project footprint and the lack of available data (fisheries, for example), costs could not be developed for many of the measures that were outside the responsibility of the civil works contractor. In sum, costs could only be developed for about 10 percent of the recommended mitigative measures. Presenting these partial costs is considered to be inaccurate and misleading.

Additional design and baseline studies have been recommended. Approximate costs for these are shown in Tables 4-1 to 4-3 below. These are estimated at US\$930,000, US\$, and US\$2,945,000 and US\$1,300,000 respectively for Components 1, 2 and 3.

Table 4-1: Estimated costs for Additional Design and Baseline Studies – Component 1

Project Phase	Environmental Parameter	Mitigation Measures	Estimated Cost
PRE-CONSTRUCTION/DETAILED DESIGN	Geology, Geotechnical and Seismicity	Carry out additional field investigations as per Supplemental Report on Geotechnical Aspects Perform seismic stability analysis using new ground motion parameter (0.8g) Review foundation designs for structures on overburden material Carry out additional design work	\$500,000
	Hydrology	Design flood analysis (redesign) Conduct water balance studies Determine water supply alternatives for Construction Contractor use Refine assessment and estimation of actual erosion and sedimentation rates. Install gauges to measure both bed load and suspended sediments	\$250,000
	Aquatic Resources	Conduct Fish and Water Quality Survey per Fisheries Management Plan (Annex IV) with input into ecological flow studies	\$45,000
		Ecological Flow Studies	\$10,000
		Design vertical slot fishway for Kaitu Weir and determine need for its	

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		construction based on Fish and Water Quality Survey results per Fisheries Management Plan (Annex IV).	\$15,000
	Health	Conduct baseline health surveys	\$10,000
	Resettlement Studies	Addendums to existing RAP for Component 1	\$100,000
Total			\$930,000

Table 4-2 Estimated costs for Additional Design and Baseline Studies – Component 2

Project Phase	Environmental Parameter	Mitigations (Actions to be taken or adopted)	Estimated Cost
PRECONSTRUCTION/DETAILED DESIGN	General	Appoint independent advisory panel of experts	\$100,000
	Geology, Geotechnical Aspects and Seismicity	Carry out additional field investigations as per Supplemental Report on Geotechnical Aspects Perform seismic stability analysis using new ground motion parameter (0.8g) Review foundation designs for structures on overburden material Carry out additional design work (including saddle dam, cofferdam, diversion system)	\$1,250,000
	Hydrology	Revise PMP, PMF and update spillway design Conduct water balance studies Determine water supply alternatives for Construction Contractor use Refine assessment and estimation of actual erosion and sedimentation rates. Regular (annual) bathymetric surveys of the Kurram Garhi Headworks reservoir to estimate bed load sediment Install gauges to measure both bed load and suspended sediments	\$500,000
	Aquatic Resources	Conduct Fish and Water Quality Survey per Fisheries Management Plan	\$30,000
		Ecological Flow Studies	\$15,000
	Health	Conduct baseline health surveys	\$10,000
	Cultural Heritage	Walk through survey	\$20,000
	Vulnerable Tribes	Settle land disputes, local content development	\$20,000
	Resettlement studies	Find suitable resettlement site in close consultations with tribes and Develop Component 2 RAP in compliance with RPF	\$1,000,000
Total			\$2,945,000

Table 4-3 Estimated costs for Additional Design and Baseline Studies – Component 3

Project Phase	Environmental Parameter	Mitigations (Actions to be taken or adopted)	Estimated Cost
PRE-CONSTRUCTION/DETAILED DESIGN	Geology Geotechnical and Seismic	Geotechnical field investigations and constructions materials assessment Results shall feed into design	\$250,000
	Cultural Heritage	Walk Through Survey	\$ 30,000
	Resettlement studies	Develop Component 3 RAP	\$ 1,000,000

Table 4-3 Estimated costs for Additional Design and Baseline Studies – Component 3

Project Phase	Environmental Parameter	Mitigations (Actions to be taken or adopted)	Estimated Cost
	Health	Conduct baseline health surveys	\$ 20,000
Total			\$1,300,000

During operation, costs will be incurred, for example, as part of emergency notification programs, technical assistance and training for agricultural extension, removal of sediment from the pool behind the Kaitu weir, various types of community outreach. These and other similar recommendations could not be costed at this time.

4.2 Environmental Monitoring Costs

The EA team has developed costs for monitoring, which includes both the installation of equipment and measuring devices, the taking of samples and surveys and field observations, and the analysis and reporting of the results. The bulk of the monitoring costs shown are those for the salaries and operating costs of the EMC and the LAU (see Chapter 2), who is responsible for monitoring during construction and operation.

In addition monitoring will also be carried out by the SC and the Construction Contractor. Costs borne by the Construction Contractor or the SC would have to be part of their respective bids. As for mitigation, it is not possible to predict how bidders will respond to the costs of the work.

Capital costs for the WAPDA monitoring team are estimated at US\$52,000 for Component 1 and US\$80,000 for Component 2. There are no up-front capital costs for Component 3 as it is assumed that equipment purchased for Components 1 and 2 will be used for Component 3 monitoring. WAPDA monitoring costs (Tables 4-4 to 4-6) are estimated at US\$252,950 during pre-construction for Component 1, US\$301,185 for Component 2 and US\$319,390 for Component 3. During construction the annual costs are estimated at US\$267,857, US\$425,435 and US\$348,600 respectively for Components 1, 2 and 3. During operation, the annual costs are estimated at US\$219,840, US\$343,675, and US\$298,715 respectively for Components 1, 2 and 3.

4.3 Training Costs

For each Component estimated costs for training are as follows:

- Year One: Setting up training center US\$500,000; training US\$500,000.
- Training costs for each subsequent year: US\$500,000.

Table 4-4: Environmental Monitoring Costs – Component I

Mitigation Measure(s)/ Monitoring	Responsible Party	Cost US\$	Remarks
Initial Capital Costs			
Vehicles – Jeep (Potohar) - 3		18,000	
Water monitoring kits 1 for EMC-HSE		10,500	
Fish and water survey equipment		15,000	
Portable Air Monitoring Kit for EMC EMAP 5000 – particulates (or equivalent)		5,000	
Aeroqual 500 gases (or equivalent)		2,000	
Portable noise monitor - Optimus Class 1, 1:1 and 1:3 Octave band (or equivalent)		6,000	
Equipment cost - EMC		52,000	
Pre-Construction (Planning and Design)			
EMC field visits plus supervision of water/air /noise sampling Fuel costs Salaries	EMC	500 93,600	
Ambient air quality monitoring - 2 sample sites (additional to portable meter sampling by EMC during site visits)	EMC subcontracted to SEAL	1,240	Additional to monitoring by EMC using portable equipment
Noise level monitoring - 2 sample sites (additional to portable meter sampling by EMC during site visits)	EMC subcontracted to SEAL	100	Additional to monitoring by EMC using portable equipment
Surface water quality - 7 sample sites (additional to portable meter sampling by EMC during site visits)	EMC subcontracted to SEAL	1,015	Additional to monitoring by EMC using portable equipment
Ground Water quality – 5 sites (additional to portable meter sampling by EMC during site visits)	EMC subcontracted to SEAL	520	Additional to monitoring by EMC using portable equipment
Fish and water quality survey; Ecological flow monitoring Salaries Fuel Analyses (turbidity)	WAPDA Fisheries Dept.	32,075 1000 400	
General socio-economic monitoring	EMC/LAU/NGO	20,000	

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Vulnerable Tribes	EMC/LAU/NGO	2,500	
Cultural Heritage	EMC/LAU/NGO	50,000	
Resettlement	LAU/NGO	50,000	
Annual Cost (Preconstruction)		252,950	
Construction			
EMC Site visits – weekly	EMC		
Fuel Charges		2,000	
Salaries		93,600	
Soak pit testing (laboratory analysis)	EMC subcontracted to SEAL	2,750	Additional to monitoring by contractor
Soil - Discrete grab sampling and laboratory testing around chemicals storage, refueling areas etc.	EMC subcontracted to SEAL	6,200	Calculated for an entire year Approximately 10 points. Parameters: Oil and grease, chlorides, and metals.
Ambient air quality monitoring - 2 sample sites	Construction Contractor (outside laboratory check)	2,480	Semi-Annual: Additional to contractor monitoring using own portable equipment. If contractor has no equipment increase frequency to monthly
Noise level monitoring - 2 sample sites	Construction Contractor (outside laboratory check)	100	Quarterly: Additional to contractor monitoring using own portable equipment. If contractor has no equipment increase frequency to monthly
Surface water quality - 7 sample sites	Construction Contractor (outside laboratory check)	4,050	Quarterly: Additional to contractor monitoring using own portable equipment. If contractor has no equipment increase frequency to monthly
Ground Water Quality – 5 sample sites	Construction Contractor (outside laboratory check)	2,070	Quarterly: Additional to contractor monitoring using own portable equipment. If contractor has no equipment increase frequency to monthly
Fish and water quality survey; Ecological flow monitoring	WAPDA Fisheries Dept.	30,725	
Salaries		1000	
Fuel			

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Analyses (turbidity)		400	
General socio-economic monitoring	EMC/LAU/NGO	20,000	
Vulnerable Tribes	EMC/LAU/NGO	2,500	
Cultural Heritage	EMC/LAU/NGO	50,000	
Resettlement	LAU/NGO	50,000	
Annual Cost (Construction)		267,875	
Operation			
Site inspections – weekly	EMC		
Salaries		53,000	
Fuel		1,000	
Soil Discrete grab sampling and laboratory testing	EMC	6,200	Approximately 10 points. Parameters: Oil and grease, chlorides, and metals.
Ambient air quality monitoring - 2 sample sites	EMC	2,980	Semi-annual. Additional to portable unit monitoring
Noise level monitoring - 2 sample sites	EMC	100	Additional to portable unit monitoring
Surface water quality - 7 sample sites	EMC	695	Additional to portable unit monitoring
Ground Water Quality – 5 sample sites	EMC	1,240	Additional to portable unit monitoring
Fish monitoring (in River)	WAPDA	30,725	Additional to portable unit monitoring
Fuel	Fisheries Dept.	1000	
Analyses		400	
General socio-economic monitoring	EMC/LAU/NGO	20,000	
Vulnerable Tribes	EMC/LAU/NGO	2,500	
Cultural Heritage	EMC/LAU/NGO	50,000	
Resettlement	LAU/NGO	50,000	
Annual Cost (Operation)		219,840	

Table 4-5: Environmental Monitoring Costs – Component 2

Mitigation Measure(s)/ Monitoring	Responsible Party	Cost US\$	Remarks
Initial Capital Costs			
Vehicles – Jeep (Potohar) - 1		6,000	Assumes Jeeps from Component 1

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			are used in Component 2
Water monitoring kits 1 for EMC-HSE		10,500	Assumes there will be at least two separate monitoring teams during construction. One will use equipment from Component 1
Portable Air Monitoring Kit for EMC EMAP 5000 – particulates (or equivalent)		5,000	
Aeroqual 500 gases (or equivalent)		2,000	
Portable noise monitor - Optimus Class 1, 1:1 and 1:3 Octave band (or equivalent)		6,000	
Equipment for reservoir fisheries monitoring (See Annex IV)		40,000	
Equipment cost - EMC		80,000	
Pre-Construction Phase			
EMC field visits plus supervision of water/air /noise sampling	EMC		
Fuel costs		500	
Salaries		93,600	
Ambient air quality monitoring - 2 sample sites	WAPDA-EMC	1,240	Additional to monitoring by EMC using portable equipment
Noise level monitoring - 2 sample sites	WAPDA-EMC	10	Additional to monitoring by EMC using portable equipment
Surface water quality - 8 sample sites	WAPDA-EMC	1,160	Additional to monitoring by EMC using portable equipment
Fish and water quality survey; Ecological flow monitoring	WAPDA		
Salaries	Fisheries Dept.	39,575	
Fuel		1,000	
Analyses (turbidity)		1,600	
General socio-economic monitoring	EMC/LAU/NGO	30,000	
Vulnerable Tribes	EMC/LAU/NGO	2,500	
Cultural Heritage	EMC/LAU/NGO	50,000	
Resettlement	LAU/NGO	80,000	
Annual Cost (Pre-Construction Phase)		301,185	
Construction			
EMC Site visits – weekly	EMC		Contractor Camp
Fuel Charges		4,000	(Fuel charges for 24 visits)
Salaries (Senior)		93,600	
Salaries (Assistants)		48,600	

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Contaminated soils	Contractor (subcontract to Laboratory)	7,500	Testing in event of contamination
Soak pit testing (laboratory analysis)	EMC subcontracted to SEAL	2,750	Additional to monitoring by contractor
Soil Discrete grab sampling and laboratory testing	EMC subcontracted to SEAL	6,200	Calculated for an entire year Approximately 10 points. Parameters: Oil and grease, chlorides, and metals.
Ambient air quality monitoring - 2 sample sites	Construction Contractor	2,480	Semi-Annual: Additional to contractor monitoring and EMC monitoring using portable equipment. If contractor has no equipment increase frequency to monthly
Noise level monitoring - 2 sample sites	Construction Contractor	100	Quarterly: Additional to contractor monitoring and EMC monitoring using own portable equipment. If contractor has no equipment increase frequency to monthly
Surface water quality - 8 sample sites	Construction Contractor	4630	Quarterly: Additional to contractor monitoring and EMC monitoring using own portable equipment. If contractor has no equipment increase frequency to monthly
Fish and water quality survey; Ecological flow monitoring	WAPDA Fisheries Dept.	34,175	
Salaries		1,000	
Fuel		1,600	
Analyses (turbidity)			
Reservoir monitoring (fisheries)		56,300	
Salaries			
Cost/sample - unknown			
General socio-economic monitoring	EMC/LAU/NGO	30,000	
Vulnerable Tribes	EMC/LAU/NGO	2,500	
Cultural Heritage	EMC/LAU/NGO	50,000	

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Resettlement	LAU/NGO	80,000	
Annual Cost (Construction Phase)		425,435	
Operation			
Site inspections	EMC		
Salaries		53,000	
Fuel		1,000	
Soils	EMC	10,820	Calculated for an entire year Approximately 10 points. Parameters: Oil and grease, chlorides, and metals.
Discrete grab sampling and laboratory testing			
Ambient air quality monitoring - 2 sample sites	EMC	2,980	Additional to portable unit monitoring
Noise level monitoring - 2 sample sites	EMC	100	Additional to portable unit monitoring
Surface water quality - 1 sample site	EMC	175	Additional to portable unit monitoring
Fish and water quality survey; Ecological flow monitoring; reservoir monitoring	WAPDA Fisheries Dept.		
Salaries		110,000	
Fuel		1,500	
Analyses (turbidity)		1,600	
General socio-economic monitoring	EMC/LAU/NGO	30,000	
Vulnerable Tribes	EMC/LAU/NGO	2,500	
Cultural Heritage	EMC/LAU/NGO	50,000	
Resettlement	LAU/NGO	80,000	
Annual Cost (Operation Phase)		343,675	

Table 4-6: Environmental Monitoring Costs – Component 3

Mitigation Measure(s)/ Monitoring	Responsible Party	Cost US\$	Remarks
Initial Capital Costs		0	Equipment from Components 1 and/or 2 will be used
Pre-Construction Phase			
EMC field visits plus supervision of water/air /noise sampling	EMC		
Fuel costs		500	

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Salaries		93,600	
Ambient air quality monitoring – 5 sample sites (additional to portable meter sampling by EMC during site visits)	EMC subcontracted to SEAL	3,100	Additional to monitoring by EMC using portable equipment
Noise level monitoring - 5 sample sites (additional to portable meter sampling by EMC during site visits)	EMC subcontracted to SEAL	100	Additional to monitoring by EMC using portable equipment
Surface water quality - 8 sample sites (additional to portable meter sampling by EMC during site visits)	EMC subcontracted to SEAL	1,160	Additional to monitoring by EMC using portable equipment
Ground Water quality – 9 sites (additional to portable meter sampling by EMC during site visits)	EMC subcontracted to SEAL	930	Additional to monitoring by EMC using portable equipment
General Socio-economic monitoring	EMC/LAU/NGO	50,000	
Resettlement	LAU/NGO	70,000	
Cultural Heritage	EMC/LAU/NGO	100,000	
Annual Cost (Pre-Construction Phase)		319,390	
Construction Phase			
EMC Site visits – weekly	EMC		
Fuel Charges		2,000	
Salaries		93,600	
Contaminated soils	Contractor (subcontract to Laboratory)	14,880	Testing in event of contamination
Soak pit testing (laboratory analysis)	EMC subcontracted to SEAL	3,470	Additional to monitoring by contractor
Soil - Discrete grab sampling and laboratory testing around chemicals storage, refueling areas etc.	EMC subcontracted to SEAL	6,200	Calculated for an entire year Approximately 10 points. Parameters: Oil and grease, chlorides, and metals.
Ambient air quality monitoring – 5 sample sites	Construction Contractor (outside laboratory check)	6,200	Semi-Annual: Additional to contractor monitoring and EMC monitoring using portable equipment. If contractor has no equipment increase frequency to

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			monthly
Noise level monitoring - 5 sample sites	Construction Contractor (outside laboratory check)	100	Quarterly: Additional to contractor monitoring and EMC monitoring using own portable equipment. If contractor has no equipment increase frequency to monthly
Surface water quality - 8 sample sites	Construction Contractor (outside laboratory check)	4,630	Quarterly: Additional to contractor monitoring and EMC monitoring using own portable equipment. If contractor has no equipment increase frequency to monthly
Ground Water Quality – 9 sample sites	Construction Contractor (outside laboratory check)	3,720	Quarterly: Additional to contractor monitoring and EMC monitoring using own portable equipment. If contractor has no equipment increase frequency to monthly
General Socio-economic monitoring	EMC/LAU/NGO	50,000	
Resettlement	LAU/NGO	70,000	
Cultural Heritage	EMC/LAU/NGO	100,000	
Annual Cost (Construction)		348,600	
Operation			
Site inspections	EMC		
Salaries		53,000	
Fuel		1000	
Soils Discrete grab sampling and laboratory testing	EMC	10,820	Approximately 8 points (analytical costs) Parameters: Oil and grease, chlorides, and metals.
Ambient air quality monitoring – 5 sample sites	EMC	7440	Semi-annual. Additional to portable unit monitoring
Noise level monitoring - 5 sample sites	EMC	50	Semi-annual. Additional to portable unit monitoring
Surface water quality - 12 sample sites	EMC	4,170	Semi-annual. Additional to portable unit monitoring
Ground Water Quality – 9 sample sites	EMC	2,235	Semi-annual. Additional to portable unit monitoring
General Socio-economic monitoring	EMC/LAU/NGO	50,000	

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Resettlement	LAU/NGO	70,000	
Cultural Heritage	EMC/LAU/NGO	100,000	
Annual Cost (Operation)		298,715	

5 COMMUNICATIONS AND DOCUMENTATION

This section describes the program for communication and documentation to implement the EMMP.

5.1 Kick-Off Meeting

A kick-off meeting will take place among GM (North), Peshawar, EMC, SC and the Contractor before the start of construction. The purpose of this kick off meeting will be to demonstrate the regulatory and monitoring requirements prior to the start of the individual project activities. This kick-off will also show the commitment of all the key players to the protection of the environment and health and safety. During the meeting all the parties discuss implementation of the EMMP and nominate the key persons for each organization. There may be more than one kick-off meeting.

5.2 Meetings and Reports

5.2.1 Monthly Meetings

Monthly meetings will be held during the construction phase at the construction camp. The purpose of these meetings will be to discuss the activities of the last month, non-compliances noted by EMC and SC and their remedial measures. The meeting will be chaired by the representative nominated by each entity. The meeting will be recorded in the form of a Monthly Environmental Report (MER) to be prepared by EMC and reviewed by WAPDA, GM (North) and PD, KTDP. The report will include but not be limited to:

- Summary of project activities during the last month;
- Summary of the monitoring activities; and,
- Non-compliances observed and the mitigation measures taken or required.

A summary of these reports will also be reported to FATA Secretariat and the KP EPA by the GM (North) or PD KTDP. EMC will ensure that these reports are delivered to these agencies.

5.2.2 Semi-Annual Reports

EMC will prepare a summary of monthly reports after six months. These reports will be reported to GM (North) or PD, KTDP. After the finalization of the Semi-Annual Reports by the WAPDA, these will be shared with the Donor agency, EPA, KP and FATA secretariat.

5.2.3 Complaints Register

The EMC will maintain a register of complaints received from local tribes, individuals and communities and measures taken to mitigate these concerns during the construction phase of the project. All complaints received will be sent to the Project Director (PD), KTDP for further action. A similar register will also be maintained by the WAPDA field staff during the operational stage of the project.

Every complaint, whether in verbal or written form, shall be included in the Complaints Register which at a minimum shall include the following:

- Name of complainant (individual or organization);
- Date the complaint was lodged;
- Nature of the complaint;
- Follow up action taken;
- Result; and,
- How and when result was communicated to complainant.

5.2.4 Change Record Register

All changes to the EMMP or the project will be handled through the Change Record Register. During the construction phase, EMC will be responsible to maintain the change record register; during the operational phase, HSE (EMC) will maintain the register along with date, type of change, persons responsible for change and action taken to approve the change from PD, KTDP-Bannu.

5.2.5 Accident Register

In addition to accident reporting requirements prescribed by Pakistan legislation, there will be an accident register noting the time, location and nature of each accident. In the event of any loss of life or serious injury, the SC, WAPDA and project funder shall be notified within 48 hours. A complete accident report analyzing the cause of the accident as well as measures presenting measures that will be implemented to prevent and/or avoid similar accidents should be submitted to all concerned within 30 days.

5.2.6 Environmental Monitoring/Inspection Reports

The results of all monitoring and inspection will be documented. At a minimum, such documentation will include the following:

- Monitoring activity (e.g. verification of sprinkling).
- Observations including non-conformances.
- Remedial action required (type of action, responsible person, time frame for implementation).
- Date of inspection.
- Name, function and signature of the inspector.
- Name and signature of the official project manager

In the event that remedial action is required, a follow up inspection shall be carried out and the results of implementation of the remedial action shall be recorded.

All inspection and follow up records shall be kept on file for the life of the project.

5.2.7 Final Monitoring Report

A final monitoring report will be prepared by EMC and SC after the completion of the construction phase. The report should address the following:

- Introduction;
- Monitoring Team;
- Details of the Project Activities Completed Component wise;
- Summary of non-conformances identified during the Construction Phase;
- Summary of action taken for non-conformances; and
- Conclusions and Recommendations.

5.3 Photographic Record

SC and the contractor will maintain a photographic record that contains coordinates of all the areas affected during the implementation of the project. The photographic record will be taken before the start of construction, during construction works and after the completion of construction activities. As a minimum, the photographic record will include the photographs of the sites, access routes, camp sites, tunnels, weirs, canals, storage area, etc. This record will be particularly pertinent for areas affected by blasting, so that before and after conditions and damages can be compared.

5.4 Document Control

The purpose of document control is to ensure that the documents are controlled so that only the latest authorized version of documents are used. All the documents will be dated and assigned a Document Control Number indicating the version.. Each EMMP Procedure and the records will be signed by the PD, KTDP-Bannu as the 'issuer'. The original version of each document will be kept in

the official file located at EMC and WAPDA site office. When finalized by all concerned, these documents will be filed at Headquarters. Electronic files will be saved on a shared directory. The current version is to be saved in a folder labeled “Current” and older versions are saved in a folder labeled “Archived” and marked as ‘Obsolete’ for future reference.

5.5 Auditing

The audit of the proposed project will be carried out both internally by WAPDA and externally by the external auditor (EPA, KP, FATA Secretariat). The primary aim of the auditing is to assess the compliance and effectiveness of the EMMP as well as the alternative environmental and social objectives, and also to assess the effectiveness of the previous corrective actions. The audit will also suggest remedial measures to overcome any unresolved environmental and social problems.

Following are the main objectives of the audit:

- To evaluate whether the monitoring done by EMC is in compliance with the targets as set in EA/EMMP;
- To determine the conformity with the EMMP and identify non-conformity in environmental and social parameters as per EA/EMMP; and
- Meet regulatory requirements and commitments.

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6 CHANGE MANAGEMENT PLAN

The Change Management process establishes an orderly and effective procedure for tracking the submission, coordination, review, evaluation, categorization, and approval for release of all changes to the project.

The change order documentation should identify not just the cost impact of the change, but also any schedule, quality, and safety or environmental considerations. These are key issues to be addressed in the decision making process. Proposed change should be dealt with in a timely manner. Once authorized, the change should be incorporated in the EMMP. For example, if the Contractor notices a new or unanticipated activity or condition on site during the construction stage, he must notify the EMC/SC so that the appropriate management actions can be identified cooperatively and implemented.

Similarly, in the case of an already identified and quantified impact if the Contractor encounters some amount of deviation or unforeseen alteration of actual ground conditions, it must be managed by the Contractor in coordination with the EMC/ SC to effectively mitigate it.

6.1 Purpose of Change Management

The Change Management process, which is outlined in Table 6-1 below, is an integral part of the EMMP. Its intended audience is the Donor, Proponent, Contractor and SC..

Step	Description
Generate a Change Request (CR)	A submitter (Contractor) completes a CR Log/ Form and sends the completed form to the EMC/ SC.
Log CR Status	The EMC/ SC enters the CR into the CR Log. The CR's status is updated throughout the CR process as needed.
Evaluate Change Request	EMC/ SC reviews the CR and provides an estimated level of effort to process and develop a proposed solution for the suggested change.
Authorize	Approval to move forward with incorporating the suggested change into the EMMP.
Implement	If approved, Contractor will take immediate action.

All Project Affected Persons (PAPs) will need to be involved in the change management process for successful implementation of the Project. The involvement of PAPs will be through the following protocol.

- Contractor will contact the representative of PAPs and will inform them about the repercussions of change;
- PAPs will communicate with the EMC/SC and lodge their concerns and reservations (if they do not agreed with the actions);
- EMC/SC and Contractor will negotiate with the PAPs and will adopt measures acceptable to those affected and, if necessary, provide compensation.

The format of a CR should be developed by the EMC. At a minimum, the data shown in Table 6-2 below should be included on the project's CR Form and Change Management Log.

Element	Description
Date	The date the CR was created
CR#	Assigned by the EMC/ SC
Title	A brief description of the change request
Description	Description of the desired change, the impact, and/or benefits of the change
Submitter	Name of the person completing the CR Form and who can answer questions regarding the suggested change
Phone	Phone number of the submitter

Evaluation and Authorization of change request is a critical step in overall management of Change during the course of the construction phase. In order to evaluate and prioritize a change request effectively, EMC/SC and the Contractor will decide, based upon joint meetings, and the Contractor will take action as soon as possible.

7 ENVIRONMENTAL MITIGATION PLAN

The mitigation plan is presented in three parts in tabular format; each component is treated separately. For each component, mitigative measures appropriate to project phases, pre-construction, construction, operation and decommissioning (where pertinent), are listed. The term Pre-Construction Phase as used in this report refers to tasks that are carried out during detailed design and planning as well as other activities that may be carried out prior to the start of project construction. Such activities could include development of infrastructure necessary for the construction activities.

In addition to the measures outlined below vehicles and equipment used for the KTP should comply with the following standards:

- NEQS for Motor Vehicles Exhaust and Noise.
- NEQS for Motor Vehicles Exhaust and Noise for New Diesel Vehicles, Passenger Cars and Light Commercial Vehicles.
- NEQS for Motor Vehicles Exhaust and Noise for New Diesel Vehicles, Heavy Duty Diesel Engines and Large Goods Vehicles.
- NEQS for Motor Vehicles Exhaust and Noise for New Petrol Vehicles.
- USEPA New Source Performance Standards 40 CFR Part 60 Subpart IIII
- USEPA 40CFR Part 66.

Standards and designs to which structures shall be constructed are set out in the design report⁵ and tender documents⁶. They should be included in the construction contract.

Additional requirements for design and construction are as follows:

- Transformers that are used for the project shall not contain PCBs (it should be noted that it has been WAPDA policy not to use PCBs since 1969. The distribution companies already prohibit use of PCBs in new power transformers⁷).
- No asbestos containing materials shall be used for construction of the KTDP.
- All installed electrical equipment shall conform to the most recent International Electrotechnical Commission Standards.

⁵ Pakistan Engineering Services (pvt) Ltd (PES). 201 Ia. Kurram Tangi Dam Project. Detailed Engineering Design Report, Report to Wapda. 2 vol

⁶ Pakistan Engineering Services, (pvt) Ltd. (PES). 201 Ib. Kurram Tangi Dam Project Contract I: Construction of Civil Engineering works along with Design, Supply and Installation of Hydraulic Steel, Mechanical and Electrical Works Bidding Documents, Prepared for WAPDA, rev June 2011. 3 vol.

⁷ Peshawar Electric Supply Company. (2009). Power Transmission Enhancement Multitranche Financing Facility – Tranche 2- 132KV D.I.Khan Industrial DGS and TXL. Initial Environmental Examination (IEE) Report.

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7.1 Environmental Mitigation Plan - Component I

ENVIRONMENTAL MITIGATION PLAN - COMPONENT I					
Project Phase	Environmental Parameter	Potential Impacts	Mitigation Measures	Executing Agency	Monitoring Agency
PRE-CONSTRUCTION	Land Resources				
	Geology, Geotechnical and Seismicity	<p>Insufficient geotechnical investigation and analyses</p> <p>Current ground motion parameter too low</p> <p>No static or dynamic foundation analysis</p>	<p>Carry out additional field investigations</p> <p>Perform seismic stability analysis using new ground motion parameter (0.8g)</p> <p>Review foundation designs for structures on overburden material</p> <p>Carry out additional design work</p>	Design Engineer	WAPDA
	Agriculture and Irrigation	<p>Planning, design and the construction of the main structures (Kaitu weir, main canal and sub-canal network) is the responsibility of WAPDA while the development of the tertiary distribution networks, watercourses and on-farm development is the responsibility of Agriculture and Irrigation Department of FATA. These actions are actually not coordinated and synchronized. This will lead to a long time lag between the construction of the main structure and the factual use of the systems for irrigated production.</p>	<p>-Strong coordination between WAPDA and the Agriculture and Irrigation Department of FATA is recommended concerning the planning and design of the whole systems, particularly of the water courses and on-farm irrigation development and the surface drainage network.</p>	Agriculture and Irrigation Department FATA, WAPDA, Design Engineer	WAPDA
	Waste Management	<p>Feasibility and Detailed Design done previously for KTDP do not address waste management issues adequately</p> <p>No quantification of waste generation been carried out.</p> <p>Absence of a waste Management Plan (WMP) during the pre-construction phase will lead to mismanagement of waste.</p> <p>Project Concept Document-I prepared by WAPDA contains no contractual obligations for solid waste and wastewater</p>	<p>The EMMP contains a framework WMP (Annex III), however given the current data gaps, it will be necessary to convert the framework plan into a full plan during the pre-Construction Phase.</p>	Design Engineer	WAPDA

ENVIRONMENTAL MITIGATION PLAN - COMPONENT I

Project Phase	Environmental Parameter	Potential Impacts	Mitigation Measures	Executing Agency	Monitoring Agency
		management.			
		Absence of a training program will result in non-compliance of WMP.	Plan and develop appropriate training/awareness programs for construction personnel and waste management staff including the sanitation staff.	EMC	WAPDA
		Absence of quarry management plan may cause the mishandling of earthworks along the Kaitu River in Component I increasing downstream sediment loads and turbidity	A quarry management plan should be developed including estimations of required material and measures to manage waste.	Design Engineer Construction Contractor	EMC
		Absence of landfill site will result deterioration of Kaitu River, Civil Canals (Datta Khel) and other streams confluence with Kaitu river.	Construction Contractor should identify the landfill sites in consultation with PD (WAPDA-Bannu), District Councils (Karak, Lakki Marwat, and Bannu), Miranshah office, Municipalities situated within the project area. Landfill should be selected considering the pre-defined criteria and to be properly designed.	Design Engineer Construction Contractor	EMC
Water Resources					
	Hydrology	<p>No synthesized flows or design flood analysis. May affect flows to irrigation and/or downstream during operations An initial estimate of ecological and environmental flows has been made but needs confirmation</p> <p>No water balance studies Water supply alternatives for construction water and camps' potable water are unknown Uncertainty about erosion and sedimentation rates</p>	<p>Develop synthesized flows for Kaitu River Analyse flood design</p> <p>Adjust Ecological Flows based on Tennant Method, by using Riverine Habitat Simulation Model (RHABSIM). Starts with Fish Survey under Aquatic Resources. Update Environmental Flow Releases and include the flows and schedule of their release in the weir operating procedures Conduct water balance studies Determine water supply alternatives for Construction Contractor use Refine assessment and estimation of actual erosion and sedimentation rates. Install gauges to measure both bed load and suspended sediments Update Weir design and operating procedures</p>	Design Engineer WAPDA	<p>FATA Fisheries Department</p> <p>WAPDA</p>

Kurram Tangi Dam Project
Environmental Mitigation and Monitoring Plan

ENVIRONMENTAL MITIGATION PLAN - COMPONENT I

Project Phase	Environmental Parameter	Potential Impacts	Mitigation Measures	Executing Agency	Monitoring Agency
	Aquatic Resources	Inadequate fisheries and water quality baseline data	Conduct Fish and Water Quality Survey per Fisheries Management Plan (Annex IV) with input into ecological flow studies	WAPDA	FATA Fisheries Department
Socio-economic Environment					
	Demography/ Society	Influx of workers and security guards into remote tribal lands	Establish and implement code of conduct & comply with voluntary principles on security and human rights	WAPDA, Army	Independent, contracted agency (e.g., NGO)
	Vulnerable Peoples	Conflicts between tribes about territorial boundaries in the Culturable Command Areas (CCAs)	Implement VTP that among other issues outlines a mediation and consultation process to obtain free, prior and informed consent of the affected tribes to each subcomponent and activity	FATA	Independent, contracted agency (e.g., NGO)
	Economy	Physical and economic displacement	Update, amend and implement RAP to assure fair compensation and livelihood restoration for all affected people	WAPDA, Department of Agriculture	Independent, contracted agency (e.g., NGO)
	Land	Large scale land acquisition Transmission line ROW needs to be detailed and optimized	Update, amend and implement RAP	WAPDA, Department of Agriculture	Independent, contracted agency (e.g., NGO)
	Settlement pattern	None			
	Health	Insufficient baseline data Health requirements for construction not stipulated in tender documents	Conduct baseline health surveys Requirements to be included in tender documents and Contractors Health and Safety Plan	WAPDA	Health Authorities
	Education	None			
	Fuel, Water, Sanitation	None			
	Culture	Exposure of tribal society to external influence and control	Establish and implement comprehensive code of conduct incl. compliance with voluntary principles on	WAPDA, FATA, Department of	Independent, contracted

ENVIRONMENTAL MITIGATION PLAN - COMPONENT I

Project Phase	Environmental Parameter	Potential Impacts	Mitigation Measures	Executing Agency	Monitoring Agency
			security and human rights. Implement VTP to assure free, prior and informed consent of tribes to all subcomponents	Agriculture, Army	agency (e.g., NGO)
	Roads, Bridges and Traffic	The Detailed Design Report and Tender Documents do not provide road alignments, profile and cross sectional details with reference to roads and bridges. Land will be required for the upgrading and construction of roads. Road infrastructure requirements for resettlement sites are unknown. This will likely involve land acquisition	Road alignments cross sectional details/ designs, ROW and topographic surveys will all be done during the detailed design stage and mitigation measure reassessed. People whose land will be acquired for the Project will be compensated as per terms stated in the RAP. Once the details become available for any additional road infrastructure required for resettlement the potential impacts will need to be assessed and addressed in compliance with the RAP	Design Engineer WAPDA, Department of agriculture	WAPDA Independent, contracted agency (e.g., NGO)
CONSTRUCTION	Land Resources				
	Topography	Potential visual impact of construction activities	No mitigation required		
	Drainage	Obstruction of drainage lines during road construction and or upgrades and by spoil heaps.	Roads shall not be widened beyond design specifications. Disturbance of natural drainage shall be avoided and culverts constructed to maintain drainage where required. Spoil heaps and soil stockpiles shall be located so as not to disturb natural drainage	Construction Contractor	WAPDA , Federal EPA
	Geology, Geotechnical Aspects and Seismicity	No consideration of downstream cofferdam No provision for dewatering Lack of provision for tunnel support/lining Disposal of excavated material/suitability for reuse	Construct downstream cofferdam if necessary Put dewatering measures in place Install tunnel support and lining as needed Reuse suitable material. Dispose of unsuitable/excess as per waste management below	Design Engineer SC Contractor	WAPDA, SC
	Soils	Construction of the proposed Spaira Ragha and Sheratalla canal networks (main, distributaries and minors), roads and associated temporary structures	Good engineering practices such as appropriate siting of borrow pits and fill storage depots, keeping spoil/borrow materials covered, construction of protection structures (gabions, rip raps, stone	Construction Contractor	EMC, SC

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Environmental Mitigation and Monitoring Plan

ENVIRONMENTAL MITIGATION PLAN - COMPONENT I

Project Phase	Environmental Parameter	Potential Impacts	Mitigation Measures	Executing Agency	Monitoring Agency
		(Construction Contractor camps etc.) may trigger soil erosion and landslides, particularly in bad weather conditions, due to uneven slopes, blasting, drilling, compaction, improper cutting and siting/location of borrow pits and fill storage depots, improper handling of spoils.	pitching) for embankment slopes, proper cutting of slopes, plantation of trees and shrubs, drainage.		
		Construction of the proposed Spaira Ragha and Sheratalla canal networks (main, distributaries and minors), roads and associated temporary structures (Construction Contractor camps etc.) may lead to temporary soil degradation by improper disposal of construction materials as well as soil pollution by leaks of combustibles and lubricants, disposal of wastewater etc.	Proper disposal and storage of materials and chemicals (in impervious lined pits), correct handling of chemicals and construction materials, checking for leaks and spill of oil and chemical products, proper waste management, proper training of workers for storage and handling of materials on construction sites and Construction Contractor camps.	Construction Contractor	EMC, SC
		Construction of the canal networks and roads will imply the use of heavy earth moving equipment. These machines will need routes (for instance to borrow pits etc.) which are not limited to the canal or road width but will also affect neighboring areas, including cultivated land. This can lead to soil compaction which will affect soil suitability for agricultural production.	Restriction of machinery and vehicles to designated areas. Monetary compensation of affected households for foregone production during the construction phase. Land restoration of the original soil structure of the cultivated land which could involve ripping and deep plowing.	Construction Contractor	EMC, SC
		Soil in the Project Area is fragile and neogenic in nature therefore soil erosion, sloughing and land sliding may occur as a direct result of road works.	Design slopes to appropriate grades Replant cut batter slopes Rock armor steep water channels and provide regular structures to reduce water velocity Construction of gabions and maintenance of roads especially in the upper watershed according to erosion control principles. Implement management practices such as slope protection, grass strips, sediment traps and proper drainage systems. No water will be directly discharged	Construction Contractor	EMC, SC

Kurram Tangi Dam Project
Environmental Mitigation and Monitoring Plan

ENVIRONMENTAL MITIGATION PLAN - COMPONENT I

Project Phase	Environmental Parameter	Potential Impacts	Mitigation Measures	Executing Agency	Monitoring Agency
			from construction sites to any natural water course.		
	Land use	Land will be needed for the construction of the Kaitu Weir, associated structures and the irrigation system, drains, feeder roads and on-farm development.	Implement RAP to assure fair compensation and livelihood restoration for all	WAPDA Department of Agriculture	Independent, contracted agency (e.g., NGO)
		The canal systems cross various nullahs. Temporary drainage blockage could occur	Provision of temporary culverts and drains to evacuate excess water.	Construction Contractor	EMC, SC
		The construction of the Spaira Ragha canal may cause relocation of built up areas in Datta Khel.	Implement RAP to assure fair compensation and livelihood restoration for all	WAPDA Department of Agriculture	Independent, contracted agency (e.g., NGO)
		Loss of grazing lands and blocked access.	Making routes to reach grazing lands with all needed facilities as canal, nullah and road crossings, drinking pools supplied by canal water, fences Promote the cultivation of fodder crops (alfalfa, berseem) to compensate for the loss of grazing lands.	Construction Contractor/ WAPDA/ Detail Design Engineer	EMC, SC
Agriculture and Irrigation		Construction of the canal networks, roads and associated structures and works (land clearance, excavation, soil fill depots, blasting etc.) may hinder access to fields and markets, disturb agricultural activities and affect cropping in the surroundings of the construction sites.	Restriction of machinery and vehicles to designated areas. Monetary compensation of affected households for foregone production during the construction phase. Preferential hiring of affected farmers on the canal construction crews and on the larger Kaitu structures.	WAPDA, Construction Contractor	EMC, SC
		During the construction phase, a large labor force will be required. This may result in a shift of local labor from agriculture to construction.	Tribal Heads (Maliks) to be consulted about employment of local labor.	Construction Contractor	EMC, SC
		Outside workers and suppliers to may not follow local customs in this conservative society where women are required to be very private and there is a strict etiquette on any form of communication with men	Ensure foreign workers are made aware of the local culture and customs. Instigate a process for communities to report any contract workers not complying with the rules around access to settlements.	Construction Contractor	EMC, SC

ENVIRONMENTAL MITIGATION PLAN - COMPONENT I

Project Phase	Environmental Parameter	Potential Impacts	Mitigation Measures	Executing Agency	Monitoring Agency
		outside of their family. This could cause social conflict.	Personnel will be restricted to the worksites and worker camps		
		During construction of the weir, the land clearance, blasting and excavation activities could affect the quality of water used for domestic use, livestock and irrigation downstream in the Datta Khel area.	The Construction Contractor must ensure that a waste management plan should be implemented and strictly adhered to minimize any pollution of the river. Construction Contractor to ensure compliance with measures given in Water Quality Section.	Construction Contractor	EMC, SC
	Waste Management	Untreated construction wastewater and runoff from spoil stockpiles entering surface waters will increase sediment loads and therefore turbidity in surface waters affecting downstream users and aquatic ecology.	Permanent spoil stockpiles should be re-vegetated progressively (if possible) to minimize run off. Run off control measures should be implemented. These could include directing run off into cut-off trenches and channeling of the water to silt traps prior to discharge into surface water bodies. Efforts should be made to reutilize spoil Oil water separators and grease traps should be installed and maintained at appropriate refueling facilities, workshops, parking areas, fuel storage and contaminant areas.	Construction Contractor	EMC, SC
		Construction activities will generate waste	Regular waste collection. Appropriate waste collection equipment Dumper trucks must be covered with nets to avoid littering of solid waste.	Contractor	EMC Federal EPA (FATA Secretariat), EPA-KP
		Medical waste may cause hazardous conditions which could negatively affect the health of personnel and medical staff working at construction site and for local residents if they have access to sites where such waste is disposed of.	Medical waste should only be disposed of in special containers (such as sharps disposal containers) and transported to an appropriate facility. Safe disposal of such waste is through incineration; however, this process requires skilled labor and cost.	Contractor	EMC, SC, KP-APA, FATA Secretariat
		Contamination by direct disposal of untreated domestic wastewater from into natural water bodies.	Suitable mechanism for the discharge of wastewater. Disposal of sewage in the soakage pit constructed near the camp area.. Wastewater from construction camps must be treated before its final disposal. A combined soak pit/septic tank system is recommended. Soak	Contractor	WAPDA (EMC), SC EPA-KP, FATA Secretariat

ENVIRONMENTAL MITIGATION PLAN - COMPONENT I

Project Phase	Environmental Parameter	Potential Impacts	Mitigation Measures	Executing Agency	Monitoring Agency
			pit/septic tank siting guidelines to avoid groundwater contamination are presented in the Waste Management Plan (Annex III). Wastewater should be treated to meet the NEQS-prior to discharge		
		Improper storage and handling of hazardous materials may be a hazard to workers and communities.	Construction Contractor should abide by the rules and regulations of National Hazardous Material Laws.	Contractor	WAPDA (EMC), SC EPA-KP, FATA Secretariat
		The storage, collection, transport and disposal of solid waste (municipal, construction and demolition waste), if not managed properly may result in odor, nuisance, unsanitary and unaesthetic conditions.	Construction Contractor to provide a waste management plan acceptable to SC.	Contractor	EMC, SC
		Health and Safety of sanitation workers (camps).	Waste and sanitation personnel must be issued with the appropriate Personal Protected Equipment (PPE). In addition, the Construction Contractor should ensure that these personnel are vaccinated against pathogens likely to be encountered in the waste stream.	Contractor	EMC, SC
Ambient Air and Noise					
	Air	Gaseous vehicular emissions and fugitive dust emissions from construction machinery movement, construction and upgrading of roads and excavation of borrow areas will affect air quality. Dust emissions/Particulate Matter emissions due to blasting activities during tunnel construction and operation of concrete batching plant will affect air quality.	Ensure equipment and vehicles are properly tuned and maintained to minimize exhaust emissions. Compliance of vehicles and equipment with relevant NEQS, USEPA 40CFR Part 60 subpart IIII and 40 CFR Part 66. Dust meters to check whether the dust exceeds permissible limits and use of ventilation (including fans) as needed Sprinkling of water to reduce dust on access roads and tracks, and in construction zones and material storage areas. Use of tarpaulins on haul trucks carrying earth, sand,	Construction Contractor	EMC, SC

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Environmental Mitigation and Monitoring Plan

ENVIRONMENTAL MITIGATION PLAN - COMPONENT I

Project Phase	Environmental Parameter	Potential Impacts	Mitigation Measures	Executing Agency	Monitoring Agency
			aggregate and other materials to contain dust.		
	Noise and Vibrations	Use of heavy machinery and equipment, blasting and construction activities may result in high noise levels which will affect the nearby residents and workers. Damage to buildings from blasting vibrations	<p>Construction Contractor should define adequate work method statements and standard operating procedures to reduce noise.</p> <p>Construction Contractor should give public notice of date and time of blasting, number of blasting, announcement of blasting in the field etc.</p> <p>Installing noise barriers as a wall or earth wall, where construction site is near a settled area.</p> <p>Limit movement of construction machinery to day time to minimize noise disturbance.</p> <p>Construction machinery and equipment should be tuned and maintained.</p> <p>Labor working on site should be provided with ear muffs/ear plugs and should work in shifts.</p> <p>Hours of work to be limited near settlements to reduce disruption to local residents</p> <p>Vehicles to meet noise level allowable by PEPA NEQS</p> <p>Local residents to be notified of blasting times to avoid panic and anxiety</p> <p>Blasting to be limited in sensitive habitats</p> <p>Carry out dilapidation surveys of houses and buildings within a radius of 500 m (or as decided upon by the supervising engineer) of blasting sites prior to blasting.</p> <p>Any buildings suffering damage due to blasting activities shall be reinstated by the Construction Contractor to the satisfaction of the building's owner and supervising engineer.</p>	Construction Contractor	EMC, SC
	Water Resources				
	Hydrology	Change in river morphology	No mitigation possible		

ENVIRONMENTAL MITIGATION PLAN - COMPONENT I

Project Phase	Environmental Parameter	Potential Impacts	Mitigation Measures	Executing Agency	Monitoring Agency
	Water Quality	During construction of the weir, land clearance, blasting and excavation activities could affect downstream water quality (increased Total Suspended Solids (TSS) and Turbidity) Construction of cofferdam will affect flows and water quality.	No direct disposal of waste into water bodies Use of rip-rap floor to be investigated Use silt fencing for in river work if needed Water quality monitoring	Construction Contractor	EMC, SC
Biological Resources					
	Biological Resources (general)	Lack of awareness may lead to environmentally destructive practices	Environmental awareness training at induction and regular intervals throughout Construction	Constructor Contractor, SC	EMC
	Vegetation and habitat	Unnecessary damage to vegetation and habitat due to excessive clearance.	Minimize vegetation clearance. Prohibit cutting of fuelwood Provide source of fuel for construction camps Develop plan for Construction Contractor to stockpile fuelwood from clearing activities to be made available to communities	Construction Contractor WAPDA	WAPDA Federal EPA
	Wildlife	Potential impacts on wildlife	Fencing to exclude wildlife Prohibit hunting Prohibit carrying and use of firearms (except for authorized security personnel) Any pesticides used (e.g. against termites in the camp) shall comply with the provisions of USAID ⁸ PERSUAP and 2013 PERSUAP ⁹	Construction Contractor	EMC, SC Federal EPA
	Aquatic Resources	Loss of riffle habitat as a result of removal of borrow materials	Avoidance of riffles downstream of Kaitu Weir	Construction Contractor	EMC, SC
		Water quality degradation resulting from erosion and runoff from river side borrow	Place silt fencing between borrow areas and river	Construction Contractor	EMC, SC

⁸ Schroeder, A. (2007). Pakistan Pesticide Evaluation Report and Safer Use Action Plan (PERSUAP)

⁹ Schroeder, A. and Irshad, A. (2013). 2013 Pakistan Programmatic Umbrella PERSUAP.

Kurram Tangi Dam Project
Environmental Mitigation and Monitoring Plan

ENVIRONMENTAL MITIGATION PLAN - COMPONENT I

Project Phase	Environmental Parameter	Potential Impacts	Mitigation Measures	Executing Agency	Monitoring Agency
		areas			
		Water quality degradation resulting from discharge of seepage water behind cofferdam into river	Pump seepage water into water retention pond prior to discharge	Construction Contractor	EMC, SC
	Demography/ Society	Influx of workers and security guards into remote tribal lands	Establish and implement code of conduct & comply with voluntary principles on security and human rights	WAPDA, Army	Independent, contracted agency (e.g., NGO)
	Vulnerable Peoples	Conflicts between tribes about territorial boundaries in CCAs	Implement VTP	FATA	Independent, contracted agency (e.g., NGO)
	Economy	Physical and economic displacement	Implement RAP to assure fair compensation and livelihood restoration for all	WAPDA, Department of agriculture	Independent, contracted agency (e.g., NGO)
	Land	Large scale land acquisition Land allocation in CCA	Implement RAP to assure fair compensation and livelihood restoration for all Prioritise affected and local people in land allocation process and follow cultural norms and standards	WAPDA Department of Agriculture	Independent, contracted agency (e.g., NGO)
	Settlement pattern	None			
	Health	Increase in transmittable diseases due to the influx of large numbers of construction workers and security personal, The staff at the health unit is not up to their task leading to unreasonable high number of fatalities	Access to camp only with appropriate health certificates Maintain Disease Data Sheet and monitor regularly Offer free vaccinations and prophylactic measures Make Health and Safety training mandatory during induction and a refresher once every four months Construction Contractor to develop Health and Safety Plan which includes all health and safety requirements in tender Documents	Contractor	Independent, contracted agency EMC, SC (approval)
	Education	None			

ENVIRONMENTAL MITIGATION PLAN - COMPONENT I

Project Phase	Environmental Parameter	Potential Impacts	Mitigation Measures	Executing Agency	Monitoring Agency
	Fuel, Water, Sanitation	None			
	Culture	Exposure of tribal society to external influence and control Chance finds of cultural heritage	Implement comprehensive code of conduct and VTP Implement CHMP	WAPDA, FATA, Department of Agriculture, Army, Ministry of Culture	Independent, contracted agency (e.g., NGO); Min Culture
	Roads, Bridges and Traffic	Potential noise, vibration , air quality and soil impacts Contamination from work within waterways Significant increase in traffic due to construction which will increase the risk of accidents to road users. Road works are likely to cause disruption to local traffic through delays at construction sites and detour routes Outside workers and suppliers to may not	See relevant sections Construction of bridge piers and fords require work areas to be isolated from the waterway to prevent concrete spills and excess silt contaminating the waterway Vehicles will be cleaned regularly to prevent them carrying detritus or oil into waterways The Construction Contractor must prepare a detailed traffic management plan for approval by both engineer and Bannu XEN Highway Department, which must include measures for safety such as signs, pavement markings, flag men, lights, speed limits, securely fixed loads, vehicle roadworthy tests Provide traffic access through the AOI during construction, (leaving a lane open, detours, limit road closures, consult with local communities) All the drivers to be suitably trained Where ever possible reroute traffic so it does not need to pass through settlements In areas of significant pedestrian traffic provide clear separation between pedestrian access and vehicle access Have a well-established accident response procedure that includes first aid training Reroute traffic around settlements and do not allow workmen or transporters to stop in settlements.	Construction Contractor	EMC, SC

ENVIRONMENTAL MITIGATION PLAN - COMPONENT I

Project Phase	Environmental Parameter	Potential Impacts	Mitigation Measures	Executing Agency	Monitoring Agency
		follow local customs in this conservative society where women are required to be very private and there is a strict etiquette on any form of communication with men outside of their family. This could cause social conflict.	Ensure foreign workers are made aware of the local culture and customs. Instigate a process for communities to report any contract workers not complying with the rules around access to settlements. Personnel will be restricted to the worksites and worker camps		
	Land Resources				
	Topography	Potential visual impact of pond upstream of Kaitu, and of powerline	No mitigation required		
	Drainage	Extension of canal networks	Positive benefits – no mitigation required		
	Geology, Geotechnical Aspects and Seismicity	Failure of Kaitu Weir causing downstream flooding and loss of human life, property, livestock and crops	Design for 0.8g ground motion parameter Emergency alert system similar to that in the Emergency Preparedness Plan (Annex V) should be prepared for the Kaitu Weir	WAPDA	Relevant Federal and Provincial Authorities
	Soils	Waterlogging and Salinization	See under 'Agriculture and Irrigation'		
OPERATION	Land Use	Changes in land use will occur as pasture is transformed into irrigated agricultural land In the long run if development objectives are achieved increased urbanization and associated land use changes would occur	See Socio-economic mitigation Develop an land use plan	WAPDA Agency Authorities	WAPDA, FATA Secretariat Pak-EPA
	Agriculture and Irrigation	The use of pesticide and fertilizers may increase. This will result in pollution of groundwater and surface water by leaching of nutrients and pesticide residues.	Crop Rotation. Mechanical Weed Destruction Green Manuring Frequent split doses of fertilizers. Training of the farmers on safe use of pesticides/ fertilizers Launch pilot projects for integrated pest management (IPM) through farmer field schools Prepare pest management plan (PMP) per OP 4.09 of	Agriculture and Irrigation Department FATA	FATA Secretariat/ Federal EPA

ENVIRONMENTAL MITIGATION PLAN - COMPONENT I

Project Phase	Environmental Parameter	Potential Impacts	Mitigation Measures	Executing Agency	Monitoring Agency
			the World Bank Pesticide use to comply with USAID ¹⁰ PERSUAP and 2013 PERSUAP ¹¹		
		Risk of waterlogging and secondary salinization in the command areas of Component I will increase in time	Effective water management: minimize conveyance losses through the lining of the main and secondary canal networks (already part of project) and watercourses; consider precision land leveling Complementary network for the drainage of excess rainfall that links to the natural drainage channels (nullahs) need to be planned in advance (design phase). Biological reclamation of saline soil areas e.g. the 53 acres in the Sheratalla plain could be considered.	Agriculture and Irrigation Department FATA	FATA Secretariat/ Federal EPA
		With the conversion from rainfed to irrigated agriculture, implying a more intensive agriculture, the requirements of agricultural inputs will increase. Local farmers may face capital shortage	Financial assistance through credit facilities..	Agricultural and Irrigation Departments FATA, FATA Secretariat	FATA Secretariat
	Waste Management	Poorly managed solid waste will be a source of odors and potentially a breeding ground for disease vectors.	Appropriate waste disposal (e.g. maintain construction landfill as operations landfill)	WAPDA Irrigation Department Bannu	Pak-EPA
		Untreated wastewater may impact water quality.	Soak pits and septic tanks should be provided in the colonies and offices any discharged treated wastewater should comply with NEQS-PAK.	WAPDA Irrigation Department Bannu	Pak-EPA
	Ambient Air Quality				
	Air	Vehicular traffic on the upgraded Mir Ali - Thal road and any other new roads will	Compliance of vehicles and equipment with relevant NEQS, USEPA 40CFR Part 60 subpart IIII and 40 CFR	Federal and KP EPA	Federal and KP EPA

¹⁰ Schroeder, A. (2007). Pakistan Pesticide Evaluation Report and Safer Use Action Plan (PERSUAP)

¹¹ Schroeder, A. and Irshad, A. (2013). 2013 Pakistan Programmatic Umbrella PERSUAP.

Kurram Tangi Dam Project
Environmental Mitigation and Monitoring Plan

ENVIRONMENTAL MITIGATION PLAN - COMPONENT I

Project Phase	Environmental Parameter	Potential Impacts	Mitigation Measures	Executing Agency	Monitoring Agency
		increase vehicular emissions and affect air quality.	Part 66.		
	Noise	Vehicular traffic on the upgraded Mir Ali - Thal road and any other new roads will increase vehicular emissions and affect air quality.	Compliance with vehicular noise NEQS	Federal and KP EPA	Federal and KP EPA
Water Resources					
	Hydrology	Reduced downstream flows will affect downstream water availability, particularly for lower riparian areas Sedimentation of the Weir pool	Minimum flow releases to be maintained for downstream uses Substitution of temporary weirs of stones by low permanent weirs Consider use of alternative water resources. Updated Environmental Flow Releases and schedule of their release shall be included in the weir operating procedures Regular flushing of sediment through the undersluice Develop and implement Watershed Management Plan based on Watershed Management Framework (Annex II)	WAPDA Department of Forestry	KP EPA, FATA Fisheries Department FATA Secretariat
	Water Quality	Diversion of water from Kaitu River will result in reduction of assimilative capacity Minor increase in oil and grease after the water has passed through the turbine of power houses IV and V. The agricultural runoff of nutrient laden water from Spaira Ragma and Sheratalla Canals will deteriorate the water quality downstream, this effect may be more pronounced in the low flow conditions. Seepage of nutrients laden water will deteriorate the ground water quality	Minimum flow releases to be maintained for downstream uses Monitor water from powerhouses and treat if required before discharge. No direct disposal of powerhouse operation and maintenance water into the canal. See mitigation under Agriculture	WAPDA	Federal EPA/ WEC/ KP EPA

ENVIRONMENTAL MITIGATION PLAN - COMPONENT I

Project Phase	Environmental Parameter	Potential Impacts	Mitigation Measures	Executing Agency	Monitoring Agency
	Biological Resources				
	Aquatic Resources	Loss of Aquatic Habitat for Fish Spawning and Maintenance as a result of reduced flows downstream of Kaitu Weir	Maintain ecological flows based upon previous studies	WAPDA	FATA Fisheries Department
		Loss of Aquatic Habitat for Fish Spawning and Maintenance as a result of Kaitu Weir blockage of upstream spawning migrations	Design vertical slot fishway for Kaitu Weir and determine need for its construction based on Fish and Water Quality Survey results per Fisheries Management Plan (Annex IV).	WAPDA	FATA Fisheries Department
	Demography/ Society	Influx of non-local populations into CCAs	Prioritize affected and local people in land allocation process in CCAs, provide titles to them and follow cultural norms and standards if non-local people are encouraged to use new irrigation areas	Department of Agriculture, FATA	Independent, contracted agency (e.g., NGO)
	Vulnerable Peoples	None			
	Economy	Change in land use pattern from rainfed agriculture and pastoral use to irrigated agriculture	Training, Agricultural Extension, Water user groups; in-put supply associations, credit associations, storage depots, marketing arrangements. Consider provision of livestock passageways to avoid degradation of command areas	Department of Agriculture	Independent, contracted agency (e.g., NGO)
	Land	Land allocation in CCA	Prioritize affected and local people in land allocation process in CCAs, provide titles to them and follow cultural norms and standards if inviting external people	Department of Agriculture	Independent, contracted agency (e.g., NGO)
	Settlement pattern	None			
	Health	The establishment of a water bodies in a dry arid area may facilitate vector-borne diseases. Intake trash may be a source of/host to disease vectors	Offer health education Offering free vaccinations	WAPDA	Independent, contracted agency (e.g., NGO)
	Safety	Drowning risk, particularly for children	Raise awareness amongst population of risks Build bridges (planned in project)	WAPDA	Relevant Ministry

ENVIRONMENTAL MITIGATION PLAN - COMPONENT I

Project Phase	Environmental Parameter	Potential Impacts	Mitigation Measures	Executing Agency	Monitoring Agency
	Education	None			
	Fuel, Water, Sanitation	Negative perception towards project as settlements near powerhouse and transmission line don't have electricity	Implement rural electrification project in villages near to powerhouse 4 and along transmission line	WAPDA	Independent, contracted agency (e.g., NGO)
	Culture	None			
	Roads, Bridges and Traffic	Overloading damages road pavements which reduces their safety. Improved roads may result in higher driving speeds and more accidents. Also see issues under construction	Comply with all legal load restrictions when hauling material and equipment on public roads Install Truck Weighing Strips at the beginning of each stretch of road to ensure that vehicles comply with loading limits. Enforce speed limits and sensitize local communities.	Highway Department FATA and KP	Highway Department FATA and KP
DECOMMISSIONING	Land Resources - Waste Management	Poor disposal of demolition and other wastes	Maintain and upgrade infrastructure to avoid decommissioning or develop and implement decommissioning and abandonment plan	WAPDA	Relevant Government Departments
	Water Resources – Water Quality	Reduction in water quality			
	Aquatic Resources	Damage to fish and macroinvertebrates			
	Socio-economic Environment	Loss of power generation and irrigation benefits			

7.2 Environmental Mitigation Plan - Component 2

ENVIRONMENTAL MITIGATION PLAN - COMPONENT 2					
Project Phase	Environmental Parameter	Potential Impacts	Mitigations (Actions to be taken or adopted)	Executing Agency	Monitoring Agency
PRECONSTRUCTION	General	Project involves serious and multidimensional environmental concerns	Appoint independent advisory panel of experts	WAPDA	Donor
	Land Resources				
	Geology, Geotechnical Aspects and Seismicity	Insufficient geotechnical investigation and analyses Current ground motion parameter too low No static or dynamic foundation analysis	Carry out additional field investigations Perform seismic stability analysis using new ground motion parameter (0.8g) Review foundation designs for structures on overburden material Carry out additional design work (including saddle dam, cofferdam, diversion system) At start of phase appoint Dam Safety Panel as per O.P. 4.37. Panel will consider entire system including the Dam, Weirs II and III and other upstream and downstream structures	Design Engineer WAPDA	WAPDA Dam Safety Panel Donor
	Waste Management	Waste management inadequately addressed in previous studies; lack of contractual requirements.	See measures in Component I.	Design Engineer	WAPDA
	Water Resources				
	Hydrology	PMP and PMF estimates too low – impacts dam safety during operations An initial estimate of ecological and environmental flows has been made but needs confirmation No water balance studies	Evaluate adequacy of spillway in light of revised PMP and PMF; update design if necessary Adjust Ecological Flows based on Tennant Method, by using Riverine Habitat Simulation Model (RHABSIM). Starts with Fish Survey under Aquatic Resources. Update Environmental Flow Releases and include the flows and schedule of their release in the Dam and weir operating procedures Conduct water balance studies	Design Engineers, WAPDA	FATA Fisheries Department WAPDA

ENVIRONMENTAL MITIGATION PLAN - COMPONENT 2

Project Phase	Environmental Parameter	Potential Impacts	Mitigations (Actions to be taken or adopted)	Executing Agency	Monitoring Agency
		Water supply alternatives for construction water and camps' potable water are unknown Uncertainty about erosion and sedimentation rates estimation – impacts dead and live storage capacity	Determine water supply alternatives for Construction Contractor use Refine assessment and estimation of actual erosion and sedimentation rates. Regular (annual) bathymetric surveys of the Kurram Garhi Headworks reservoir to estimate bed load sediment Install gauges to measure both bed load and suspended sediments Update designs and operational procedures		
	Aquatic Resources	Inadequate Fisheries and Water Quality Baseline Data	Conduct Fish and Water Quality Survey per Fisheries Management Plan	WAPDA	FATA Fisheries Department
Socio-economic Environment					
	Demography/ Society	Influx of workers and security guards into remote tribal lands	Establish and implement comprehensive code of conduct & comply with voluntary principles on security and human rights	WAPDA, Army	Independent, contracted agency (e.g., NGO)
	Vulnerable Peoples	Limited chances to find suitable resettlement sites due to on-going conflicts between clans over land rights	Implement VTP that among other issues outlines a mediation and consultation process to obtain free, prior and informed consent of the affected tribes	FATA	Independent, contracted agency (e.g., NGO)
	Economy	Physical and economic displacement	Develop and implement Component 2 RAP in compliance with RPF	WAPDA	Independent, contracted agency (e.g., NGO)
	Land	Large scale land acquisition	Develop and implement Component 2 RAP in compliance with RPF	WAPDA	Independent, contracted agency (e.g., NGO)
	Settlement pattern	18 settlements with more than 1,600 houses to be relocated	Find suitable resettlement site in close consultations with tribes. and implement Component 2 RAP	WAPDA, FATA	Independent, contracted agency (e.g., NGO)

ENVIRONMENTAL MITIGATION PLAN - COMPONENT 2

Project Phase	Environmental Parameter	Potential Impacts	Mitigations (Actions to be taken or adopted)	Executing Agency	Monitoring Agency
	Health	Insufficient baseline data Health requirements for construction may not be stipulated in tender documents	Conduct baseline health surveys Requirements to be included in tender documents and Contractors Health and Safety Plan	WAPDA	Health Authorities
	Education	None			
	Fuel, Water, Sanitation	None			
	Culture	Exposure of tribal society to external influence and control Relocation of the shrine of the Fakir of Shewa	Implement VTP Develop and implement Component 2 RAP in compliance with RPF	WAPDA, FATA, Army	Independent, contracted agency (e.g., NGO)
	Roads, Bridges and Traffic	Lack of detailed road alignments, profile and cross sectional details with reference to roads and bridges. Land acquisition for new/realigned roads. Road infrastructure requirements for resettlement sites are unknown. This will likely involve land acquisition	Road alignments, cross sectional details/ designs, ROW and topographic surveys will all be done during the detailed design stage and mitigation measure reassessed. Consultation with communities on road alignments Develop and implement Component 2 RAP Once known, implement Component 2 RAP	Design Engineer WAPDA, Department of agriculture	WAPDA Independent, contracted agency (e.g., NGO)
CONSTRUCTION	Land Resources				
	Topography	Change to visual resources	Plant vegetation along roadsides	Construction Contractor	WAPDA Federal EPA, EPA-KP
	Drainage	Obstruction of drainage lines during road construction and or upgrades and by spoil heaps.	Roads shall not be widened beyond design specifications. Avoid disturbance of natural drainage; construct culverts to maintain drainage Locate spoil heaps and soil stockpiles so as not to disturb natural drainage	Construction Contractor	SC, WAPDA Federal EPA, EPA-KP
	Geology,	Lack of provision for tunnel support/lining	Install tunnel support and lining as needed	Design Engineer	WAPDA, SC

ENVIRONMENTAL MITIGATION PLAN - COMPONENT 2

Project Phase	Environmental Parameter	Potential Impacts	Mitigations (Actions to be taken or adopted)	Executing Agency	Monitoring Agency
	Geotechnical aspects and Seismicity	Disposal of excavated material/suitability for reuse Rock slope instability	Reuse suitable material. Dispose of unsuitable/excess as per waste management below Stability analyses	SC Contractor	Dam Safety Panel
	Soils	Potential impacts on soils will be the same as those identified for Component 1	Mitigation measures will be the same as those identified for Component 1	Construction Contractor	SC, EMC
	Land use	Loss of pastures, barani and irrigated land houses and other constructions and existing vegetation to reservoir. Relocation of settlements	Develop and implement Component 2 RAP	WAPDA, Department of agriculture	Independent, contracted agency (e.g., NGO)
	Agriculture and Irrigation	The water supply to areas downstream of the dam will be affected with the construction of the dam, especially the riparian areas (floodplains outside the Civil Canals and Marwat Command areas). In these mainly gravity irrigated areas, The flow of nutrient-carrying sediment load to the downstream riparian areas will also be disturbed. This may increase the cost of maintaining soil fertility in these areas.	Substitution of the temporary weirs of stones by low permanent weirs	WAPDA	WAPDA
		During the construction phase, a labor force of 1,100 will be required. This may result in a shift of local labor from agriculture to construction.	Tribal Heads (Maliks), communities to be consulted about employment of local labor.	Construction Contractor	EMC, SC
	Waste Management	The potential impacts identified for construction stage of Component 2 would be same as Component 1. The affected water bodies are the Kurram River and downstream irrigation canals	The mitigation measures for the potential impacts identified for Component 2 would be same as for Component 1. In addition suitable spoil should in backfill of Component 1 borrow areas to the extent possible.	Construction Contractor	EMC, SC
	Ambient Air Quality				
	Air	The potential impacts are the same as those described for construction phase of	The mitigation measures are the same as those described for construction phase of Component 1.	Construction Contractor	EMC, SC

ENVIRONMENTAL MITIGATION PLAN - COMPONENT 2

Project Phase	Environmental Parameter	Potential Impacts	Mitigations (Actions to be taken or adopted)	Executing Agency	Monitoring Agency
		Component 1 (i.e. vehicular emissions, dust, and fugitive dust emissions).			
	Noise	Use of heavy machinery and equipment, blasting and construction activities may result in high noise levels which will affect the nearby residents and workers.	The mitigation measures are the same as those described for construction phase of Component 1.	Construction Contractor	EMC, SC
Water Resources					
	Hydrology	Change in river morphology Reduced downstream flow during impounding	No mitigation possible Maintain environmental and ecological flows	WAPDA	KP EPA, FATA Fisheries Department
	Water Quality	The potential impacts identified for construction stage of Component 2 are the same as those identified for Component 1.	The mitigation measures are the same as those described for construction phase of Component 1	Construction Contractor	EMC, SC
Biological Resources					
	Vegetation, habitat and wildlife	Potential impacts will be the same as those identified for Component 1	Mitigation measures will be the same as those identified for Component 1	Construction Contractor	EMC, SC Federal EPA
	Aquatic Resources	Loss of riffle habitat as a result of removal of borrow materials	Avoidance of riffles downstream of Kurram Tangi Dam and Weirs II and III	Construction Contractor	EMC
		Water quality degradation from erosion and runoff from river side borrow areas	Place silt fencing between borrow areas and river	Construction Contractor	EMC
		Water quality degradation resulting from discharge of seepage water behind cofferdams into river	Pump seepage water into water retention ponds prior to discharge	Construction Contractor	EMC
Socio-economic					
	Demography/ Society	Influx of workers and security guards into remote tribal lands	Establish and implement comprehensive code of conduct & comply with voluntary principles on security and human rights	WAPDA, Army	Independent, contracted agency (e.g., NGO)
	Vulnerable Peoples	Conflicts between tribes about territorial boundaries	Implement VTP	FATA	NGO

ENVIRONMENTAL MITIGATION PLAN - COMPONENT 2

Project Phase	Environmental Parameter	Potential Impacts	Mitigations (Actions to be taken or adopted)	Executing Agency	Monitoring Agency
	Economy	Physical and economic displacement	Implement Component 2 RAP to assure fair compensation and livelihood restoration for all	WAPDA	Independent, contracted agency (e.g., NGO)
	Land	Large scale land acquisition	Implement Component 2 RAP to assure fair compensation and livelihood restoration for all	WAPDA	Independent, contracted agency (e.g., NGO)
	Settlement pattern	18 settlements with more than 1,600 houses to be relocated	Implement Component 2 RAP and provide tangible benefits to host community	WAPDA, FATA	Independent, contracted agency (e.g., NGO)
	Health	Increase in transmittable diseases due to the influx of large numbers of construction workers and security personal, The staff at the health unit is not up to their task leading to unreasonable high number of fatalities	Access to camp only with appropriate health certificates Maintain Disease Data Sheet and monitor regularly Offer free vaccinations and prophylactic measures Mandatory Health and Safety training at induction with quarterly refreshers Construction Contractor to develop Health and Safety Plan which includes all health and safety requirements in tender Documents	Contractor	Independent, contracted agency WAPDA EMC, SC (approval)
	Education	None			
	Fuel, Water, Sanitation	None			
	Culture	Loss of cultural heritage Relocation of the shrine of the Fakir of Shewa	Implement CHMP Implement Component 2 RAP based on free prior and informed consent on how to deal with cultural and community property	WAPDA, Ministry of Culture	Independent, contracted agency (e.g., NGO)
	Roads, Bridges and Traffic	Potential impacts will be the same as those identified for Component 1	Mitigation measures will be the same as those identified for Component 1	Construction Contractor	EMC, SC

ENVIRONMENTAL MITIGATION PLAN - COMPONENT 2

Project Phase	Environmental Parameter	Potential Impacts	Mitigations (Actions to be taken or adopted)	Executing Agency	Monitoring Agency
OPERATION	Land Resources				
	Topography	Potential visual impact of Kurram Tangi Reservoir and ponds upstream of Weir II and Weir III	Cannot be mitigated. Could be considered as positive enhancement of aesthetic value of area		
	Geology, Geotechnical Aspects and Seismicity	Catastrophic failure of Kurram Tangi Dam results in major downstream flooding, destruction of infrastructure and habitations, loss of property and crops and loss of human and animal life	Design and build structure with a ground motion parameter of 0.8g Implement Instrumentation and Monitoring Plan (Annex VI) Implement Emergency Preparedness Plan (Annex V)	WAPDA	Relevant Federal and Provincial Authorities Dam Safety Panel
	Soils	Kurram Tangi Dam Reservoir may inhibit the transport of vital nutrients for the downstream users who are involved in agriculture practices. This potential impact can cause the farmers to use excessive fertilizers	Proper training and awareness of the local farmers on sustainable farming and limited use of fertilizers and pesticides.	Agriculture and Irrigation Department Bannu	WAPDA/WEC
	Agriculture and Irrigation	The water supply to downstream riparian areas will suffer with the regulated dam releases to meet the irrigation water requirements of Thal, Civil canals and Marwat command areas.	Ensure and maintain environmental flow releases	WAPDA	WAPDA KP District Government
	Waste Management	Potential impacts will be the same as those identified for Component I	Mitigation measures will be the same as those identified for Component I	WAPDA	WAPDA EMC
	Ambient Air Quality				
	Air	Potential impacts will be the same as those identified for Component I	Mitigation measures will be the same as those identified for Component I	Federal and KP EPA	Federal and KP EPA
	Noise	Potential impacts will be the same as those identified for Component I	Mitigation measures will be the same as those identified for Component I	Federal and KP EPA	Federal and KP EPA
	Water Resources				

ENVIRONMENTAL MITIGATION PLAN - COMPONENT 2

Project Phase	Environmental Parameter	Potential Impacts	Mitigations (Actions to be taken or adopted)	Executing Agency	Monitoring Agency
	Hydrology	Seasonal regulation of downstream flow Change in soil conditions downstream of dam Sediment build up in the dam	Ensure and maintain environmental flow releases Updated Environmental Flow Releases and schedule of their release shall be included in the Dam and weir operating procedures Develop and implement Watershed Management Plan based on Watershed Management Framework (Annex II)	See Agriculture and Irrigation Department of Forestry	See Agriculture and Irrigation FATA Secretariat
	Water Quality	Thermal Stratification in the reservoir in summer will limit mixing of water column further causing DO to drop well below the standard limits and turbidity to increase. Reduction in assimilative capacity of water bodies Pollution of water passing through turbines	Temperature Monitoring should be done, followed by analysis for further action such as mixing of surface water with hypolimnial water to minimize shifts in water regime. Mitigation measures will be the same as those identified for Component I	WAPDA	Federal EPA/ WEC/ KP EPA
Biological Resources					
	Vegetation and habitat	Unnecessary destruction of habitat or vegetation for fuel wood	Operating and landscaping staff should be provided with heat and cooking fuel, rendering the use of fuel wood unnecessary.	WAPDA	Federal and KP EPA
	Wildlife	Wildlife, Rodents and snakes fleeing reservoir filling; larger mammals that flee and exposed to hunters.	Alert residents of villages bordering the reservoir that they may be increase in crop pests and snakes. If venomous snakes are expected to flee the reservoir filling, local clinics should be provided with antivenins.	WAPDA	Federal and KP EPA
	Aquatic Resources	Loss of Aquatic Habitat for Fish Spawning and Maintenance as a result of reduced flows downstream of Kurram Tangi Dam and Weirs II and III.	Maintain ecological flows based upon previous studies	WAPDA	FATA Fisheries Department
		Loss of Aquatic Habitat for Fish Spawning and maintenance as a result of blockage of upstream spawning migrations by Kurram Tangi Dam and Weirs II and III.	Develop commercial fisheries in the Kurram Tangi Reservoir and the Weir III Reservoir.	WAPDA and FATA Fisheries Department	FATA Fisheries Department

ENVIRONMENTAL MITIGATION PLAN - COMPONENT 2

Project Phase	Environmental Parameter	Potential Impacts	Mitigations (Actions to be taken or adopted)	Executing Agency	Monitoring Agency
Socio-economic Environment					
	Demography/ Society	None			
	Vulnerable Peoples	None			
	Economy	Inadequate livelihood restoration in resettlement sites	Implement Component 2 RAP. Regular monitoring of programs	Department of agriculture	Independent, contracted agency (e.g., NGO)
	Land	Insecurity of land rights after relocation of 1,600 households	Implement Component 2 RAP. In particular provide titles to relocated households and communities	WAPDA,	Independent, contracted agency (e.g., NGO)
	Settlement pattern	Insecurity of land rights after relocation of 1,600 households	Implement Component 2 RAP. In particular provide titles to relocated households and communities as well as hosts		
	Health	The establishment of a water bodies in a dry arid area may facilitate vector-borne diseases. Intake trash may be a source of/host to disease vectors	Offer health education Offering free vaccinations	WAPDA	Independent, contracted agency (e.g., NGO)
	Safety	Drowning risk, particularly for children	Raise awareness amongst population of risks	WAPDA	Relevant Ministry
	Education	None			
	Fuel, Water, Sanitation	Negative perception towards project as settlements around reservoir and near powerhouses and transmission line don't have electricity	Implement rural electrification projects in villages around reservoir and near to powerhouses and along transmission line		
	Culture	None			
	Roads, Bridges and Traffic	Potential impacts will be the same as those identified for Component 1	Mitigation measures will be the same as those identified for Component 1	Highway Department FATA and KPK	Highway Department FATA and KPK
DECOMMISSIONING	Land Resources - Waste Management	Poor disposal of demolition and other wastes	Maintain and upgrade infrastructure to avoid decommissioning or develop and implement decommissioning and abandonment plan	WAPDA	Relevant Government Departments

ENVIRONMENTAL MITIGATION PLAN - COMPONENT 2

Project Phase	Environmental Parameter	Potential Impacts	Mitigations (Actions to be taken or adopted)	Executing Agency	Monitoring Agency
	Water Resources – Water Quality	Reduction in water quality			
	Aquatic Resources	Damage to fish and macroinvertebrates			
	Socio-economic Environment	Loss of power generation and irrigation benefits			

7.3 Environmental Mitigation Plan – Component 3

ENVIRONMENTAL MITIGATION PLAN - COMPONENT 3						
Project Phase	Environmental Parameter	Potential Impacts	Mitigations (Actions to be taken or adopted)	Executing Agency	Monitoring Agency	
PRE-CONSTRUCTION	Land Resources					
	Geology Geotechnical and Seismic	No geotechnical investigations or geotechnical design parameters No seepage analysis	Geotechnical field investigations and constructions materials assessment Results shall feed into design	Design Engineer	WAPDA	
	Agriculture and Irrigation	The planning and the design of the construction of the main structures (remodeling of the Kurram Garhi Headworks, Thal main canal network) and the tertiary distribution networks are not coordinated. This could lead to a long time lag between the construction of the main structure and the use of the system for irrigated production.	Strong coordination between WAPDA and the Agriculture and Irrigation Department of FATA is recommended concerning the planning and design of the whole systems, particularly of the water courses and on-farm irrigation development and the surface drainage network.	Agricultural and Irrigation Departments KP	WAPDA/ Detail Design Consultants	
	Waste Management	Waste management inadequately addressed in previous studies; lack of contractual requirements.	See measures in Component 1.	Design Engineer	WAPDA	
	Water Resources					
	Hydrology	See Component 2				
	Aquatic Resources	Inadequate Fisheries and Water Quality Baseline Data	Conduct Fish and Water Quality Survey per Fisheries Management Plan	WAPDA	FATA Fisheries Department	
	Demography/ Society	None				
	Vulnerable Peoples	None				
	Economy	Physical and economic displacement	Develop and implement Component 3 RAP (based on RPF) to assure fair compensation and livelihood restoration	WAPDA, Department of agriculture	Independent, contracted agency (e.g., NGO)	
Land	Large scale land acquisition	Develop and implement Component 3 RAP (based on	WAPDA	Independent,		

ENVIRONMENTAL MITIGATION PLAN - COMPONENT 3

Project Phase	Environmental Parameter	Potential Impacts	Mitigations (Actions to be taken or adopted)	Executing Agency	Monitoring Agency
		Land allocation in CCA	RFP) to assure fair compensation and livelihood restoration Prioritise affected and local people in allocation process	Department of Agriculture	contracted agency (e.g., NGO)
	Settlement pattern	None			
	Health	Insufficient baseline data Health requirements for construction may not be stipulated in tender documents	Conduct baseline health surveys Requirements to be included in tender documents and Contractors Health and Safety Plan	WAPDA	Health Authorities
	Education	None			
	Fuel, Water, Sanitation	None			
	Culture	None			
	Roads, Bridges and Traffic	Lack of road alignments, profile and cross sectional details with reference to roads and bridges. Land acquisition for new/realigned roads and roads in resettlement sites	Road alignments, cross sectional details/ designs, ROW and topographic surveys will all be done during the detailed design stage and mitigation measure reassessed. Consultation with communities on road alignments Implement Component 3 RAP	Design Engineer WAPDA, Department of agriculture	WAPDA Independent, contracted agency (e.g., NGO)
CONSTRUCTION	Land Resources				
	Topography	Potential visual impact of construction activities	No mitigation required		
	Drainage	None			
	Soils	Potential impacts on soils will be the same as those identified for Component I.	Mitigation measures will be the same as those identified for Component I	Construction Contractor	SC, EMC
	Land Use	Land acquisition will be required for remodeling of the Kurram Garhi	Implement Component 3 RAP	WAPDA Department of	Independent, contracted

ENVIRONMENTAL MITIGATION PLAN - COMPONENT 3

Project Phase	Environmental Parameter	Potential Impacts	Mitigations (Actions to be taken or adopted)	Executing Agency	Monitoring Agency
		Headworks and the irrigation systems, drains, feeder roads and on-farm development.		Agriculture	agency (e.g., NGO)
		The canal systems cross various nullahs. Temporary drainage blockage could occur	Provision of temporary culverts and drains to evacuate excess water.	Construction Contractor	EMC, SC
	Agriculture and Irrigation	Potential impacts on Agriculture and Irrigation will be the same as those identified for Component 1.	Mitigation measures will be the same as those identified for Component 1	Construction Contractor	SC, EMC
		In addition during remodeling of the Marwat and Civil Canals, the irrigation water supply may be interrupted	Proper planning of construction activities, coordination with the affected farmers. Monetary compensation of affected households for foregone production during the construction phase as per the Component 3 RAP	Construction Contractor	WAPDA/ EMC, SC
	Waste Management	The potential impacts identified for construction stage of Component 3 would be same as Component 1. The affected water bodies are the Kurram River, local nullahs and irrigation canals	The mitigation measures are the same as those described for construction phase of Component 1	Construction Contractor	EMC, SC
Ambient Air Quality					
	Air	The potential impacts identified for construction stage of Component 3 are the same as those identified for Component 1.	The mitigation measures are the same as those described for construction phase of Component 1	Construction Contractor	EMC, SC
	Noise	The potential impacts identified for construction stage of Component 3 are the same as those identified for Component 1.	The mitigation measures are the same as those described for construction phase of Component 1.	Construction Contractor	EMC, SC
Water Resources					
	Hydrology	Increased downstream turbidity	See Water Quality	See Water Quality	See Water Quality
	Water Quality	The potential impacts identified for construction stage of Component 3 are the	The mitigation measures are the same as those described for construction phase of Component 1	Construction Contractor	EMC, SC

ENVIRONMENTAL MITIGATION PLAN - COMPONENT 3

Project Phase	Environmental Parameter	Potential Impacts	Mitigations (Actions to be taken or adopted)	Executing Agency	Monitoring Agency
	Education	None			
	Fuel, Water, Sanitation	None			
	Culture	Loss of cultural heritage	Implement CHMP	WAPDA, Department of Agriculture, Ministry of Culture	Independent, contracted agency (e.g., NGO)
	Roads, Bridges and Traffic	Potential impacts will be the same as those identified for Component 1	Mitigation measures will be the same as those identified for Component 1	Construction Contractor	EMC, SC
OPERATION	Land Resources				
	Topography	None			
	Drainage	Extension of canal networks	Positive benefits – no mitigation required		
	Soils	Waterlogging and Salinization	See under 'Agriculture and Irrigation'.		
	Land Use	The diversion of required irrigation flows for the Thal, Civil Canals and Marwat command areas may diminish river flows and water levels downstream of the Kurram Garhi Head works, especially in the periods of low river flow (Rabi season). This potential impact will be most felt in the lower riparian areas which not are part of the Civil Canals and Marwat command areas.	Substitution of the temporary weirs of stones by low permanent weirs to make gravity irrigation possible.	WAPDA	WAPDA/ FATA Secretariat
		Loss of grazing lands and blocked access.	Provide access routes, nullah and road crossings, drinking pools supplied by canal water, fences Promote the cultivation of fodder crops	WAPDA	WAPDA/ FATA Secretariat
Agriculture and Irrigation	Risk of waterlogging and secondary salinization in the command areas of Component 3 will increase in time	Effective water management: minimize conveyance losses through the lining of the main and secondary canal networks (already part of project) and watercourses; consider precision land leveling	Agricultural and Irrigation Departments KP, Bannu	Agricultural and Irrigation Departments KP, Bannu	

ENVIRONMENTAL MITIGATION PLAN - COMPONENT 3

Project Phase	Environmental Parameter	Potential Impacts	Mitigations (Actions to be taken or adopted)	Executing Agency	Monitoring Agency
			Complementary network for the drainage of excess rainfall that links to the natural drainage channels (nullahs) need to be planned in advance (design phase). Biological reclamation of saline soil areas could be considered.		
		The use of pesticide and fertilizers may increase. This will result in pollution of groundwater and surface water by leaching of nutrients and pesticide residues.	Crop Rotation. Mechanical Weed Destruction Green Manuring Frequent split doses of fertilizers. Training of the farmers on safe use of pesticides/ fertilizers Launch pilot projects for IPM through farmer field schools Prepare PMP per OP 4.09 of the World Bank Pesticide use to comply with of USAID ¹² PERSUAP and 2013 PPERSUAP ¹³	Agricultural and Irrigation Department KP, Bannu	Agricultural and Irrigation Department KP, Bannu
		With the conversion from rainfed to irrigated agriculture, implying a more intensive agriculture, the requirements of agricultural inputs will increase. Local farmers may face capital shortage	Financial assistance through credit facilities	KP District Government	KP District Government
		Inequitable irrigation water distribution between head and tail end of system, particularly in Civil Canals Command Area	Constitution of Water Users Associations (WUA) in the command area to encourage equitable water distribution Water rights clearly defined and agreed upon for upstream and downstream farmers	WAPDA/ Agricultural and Irrigation Department KP, Bannu	KP District Government

¹² Schroeder, A. (2007). Pakistan Pesticide Evaluation Report and Safer Use Action Plan (PERSUAP)

¹³ Schroeder, A. and Irshad, A. (2013). 2013 Pakistan Programmatic Umbrella PERSUAP.

ENVIRONMENTAL MITIGATION PLAN - COMPONENT 3

Project Phase	Environmental Parameter	Potential Impacts	Mitigations (Actions to be taken or adopted)	Executing Agency	Monitoring Agency
	Waste Management	Potential impacts will be the same as those identified for Component I	Mitigation measures will be the same as those identified for Component I	WAPDA	WAPDA EMC
	Ambient Air Quality				
	Air	Potential impacts will be the same as those identified for Component I	Mitigation measures will be the same as those identified for Component I	Federal and KP EPA	Federal and KP EPA
	Noise	Potential impacts will be the same as those identified for Component I	Mitigation measures will be the same as those identified for Component I	Federal and KP EPA	Federal and KP EPA
	Water Resources				
	Hydrology	None			
	Water Quality	Potential impacts will be the same as those identified for Component I	Mitigation measures will be the same as those identified for Component I	WAPDA	Federal EPA/ WEC/ KPK EPA
	Biological Resources				
	Wildlife	Increase of crop pests due to expansion of cultivation during construction of Thal CCA may lead to increased pesticide use	See Agriculture and Irrigation mitigation		WAPDA Federal EPA
	Aquatic Resources	Loss of Aquatic Habitat for Fish Spawning and Maintenance as a result of reduced flows downstream of Kurram Garhi Headworks.	Maintain ecological flows based upon previous studies	WAPDA	FATA Fisheries Department
	Demography/ Society	None			
	Vulnerable Peoples	None			
	Economy	Change in land use pattern from rain-fed to irrigated agriculture	Training, Agricultural Extension, Water user groups; in-put supply associations, credit associations, storage depots, marketing arrangements. Consider provision of livestock passageways to avoid degradation of command areas	Department of agriculture	Independent, contracted agency (e.g., NGO)
	Land	Insecurity of land rights after relocation and in CCAs	Prioritize affected and local people in allocation process and provide titles to all	Department of Agriculture	Independent, contracted agency (e.g.,

ENVIRONMENTAL MITIGATION PLAN - COMPONENT 3

Project Phase	Environmental Parameter	Potential Impacts	Mitigations (Actions to be taken or adopted)	Executing Agency	Monitoring Agency
					NGO)
	Settlement pattern	None			
	Health	The establishment of a water bodies in a dry arid area may facilitate vector-borne diseases.	Offer health education Offering free vaccinations	WAPDA	Independent, contracted agency (e.g., NGO)
	Safety	Drowning risk, particularly for children	Raise awareness amongst population of risks Build bridges (planned in project)	WAPDA	Relevant Ministry
	Education	None			
	Fuel, Water, Sanitation	None			
	Culture	None			
	Roads, Bridges and Traffic	Mitigation measures will be the same as those identified for Component I	Highway Department FATA and KPK	Highway Department FATA and KPK	Impacts are the same as those identified for Component I

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8 ENVIRONMENTAL MONITORING PLAN

The monitoring plan is presented in three parts in tabular format: each component is treated separately. For each component monitoring measures appropriate to project phases -- pre-construction, construction and operation -- are listed. The monitoring plan lists monitoring frequency, parameters and responsibilities. Monitoring will be carried out by the contractor's HSE Department (internal monitoring), the SC as part of construction supervision and WAPDA EMC (proponent oversight). The results of all monitoring and inspection will be documented. At a minimum, such documentation will include the following:

- Monitoring activity (e.g. verification of sprinkling).
- Observations including non-conformances.
- Remedial action required (type of action, responsible person, time frame for implementation).
- Date of inspection.
- Name, function and signature of the inspector.
- Name and signature of the official project manager

In the event that remedial action is required, a follow up inspection shall be carried out and the results of implementation of the remedial action shall be recorded.

All inspection and follow up records shall be kept on file for the life of the project.

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8.1 Environmental Monitoring Plan Component I

ENVIRONMENTAL MONITORING PLAN - COMPONENT I					
Phase	Receptor or Item	Location	Monitoring Mechanism	No. Frequency and Parameters	Monitoring Agency
PRE-CONSTRUCTION	Waste Management	Not applicable	Verify contractual requirements in bid documents Review and approve Contractors' waste management plan	Verify presence of waste management requirements Prior to issue of bid documents Prior to Start of construction	WAPDA EMC SC
		Construction Site Contractor Camp	Check training records	Content and attendance at waste management trainings Every six months	EMC SC
		Construction Site Contractor Camp	Use of appropriate Personal Protective Equipment (PPE)	Monitor use of PPE Daily (During camp and laydown development) Spot Checks	SC EMC
		Landfill sites	Waste disposal sites are operational	Landfill sites have been developed and include stormwater and leachate management systems installed – pre start up	EMC SC
		Borrow sites	Review and approve Contractor's Quarry Management Plan	Prior to start of construction	EMC SC
		Spoil heaps, chemicals storage areas, fuel depots and refueling areas	Visual observation	Verify stormwater management and erosion controls are in place Appropriate chemicals storage constructed Appropriate fuel depots and refueling areas constructed During laydown area and spoil area development	EMC SC
		Construction camps Staff buildings and colonies	Provision of proper sewerage system	Design before construction start up Verify construction according to design – during camp construction	Design Engineer SC
	Air Quality	A1 -Bobali A2-Kaitu Weir Site (Map 8-1)	Ambient air quality monitoring Visual observations. Traffic count.	Once prior to commencement of construction. PM ₁₀ , SO ₂ , NO _x , CO, HC	WEC
	Noise	N1 - Bobali	Noise level monitoring	Once prior to commencement of	WEC

ENVIRONMENTAL MONITORING PLAN - COMPONENT I

Phase	Receptor or Item	Location	Monitoring Mechanism	No. Frequency and Parameters	Monitoring Agency
		N2 - Kaitu Weir Site (Map 8-1)		construction. Noise levels on dB (A) scale.	
	Hydrology	Upstream and downstream of proposed Kaitu Weir site	Electronic gauges	Continuous flow monitoring.	WEC
	Surface Water	As marked on Map 8-2	Sampling and analysis of water samples, using laboratory approved by authorities and regulators.	Once before the start of construction Parameters: 1. Color 2. Taste 3. Odor 4. Turbidity 5. DO 6. TDS 7. pH 8. Boron 9. Chloride 10. Fluoride 11. Nitrate 12. Nitrite 13. Pesticides 14. Temperature 15. BOD ₅ 16. COD 17. TSS 18. Oil & Grease 19. An-ionic Detergents 20. Sulfate 21. Sulfide 22. Phosphorous 23. Ammonia 24. Cadmium 25. Arsenic 26. Fecal Coliform	WEC

ENVIRONMENTAL MONITORING PLAN - COMPONENT I

Phase	Receptor or Item	Location	Monitoring Mechanism	No. Frequency and Parameters	Monitoring Agency
	Ground Water	As marked on Map 8-2	Sampling and analysis of water samples, using laboratory approved by authorities and regulators.	Once before the construction of the Project. Parameters: 1. Color 2. Taste 3. Odor 4. Turbidity 5. TDS 6. pH 7. Boron 8. Chloride 9. Fluoride 10. Nitrate 11. Nitrite 12. Pesticides 13. Temperature 14. TSS 15. Oil & Grease 16. An-ionic Detergents 17. Sulfate 18. Sulfide 19. Phosphorous 20. Ammonia 21. Cadmium 22. Arsenic	WEC
	Fisheries Resource	Kaitu River from confluence with Kurram River to Pakistan border	Fish, macroinvertebrate and water quality sampling per Fisheries Management Plan (Annex IV).	Monthly sampling April-September; 3 times during October - March <u>Parameters</u> Distribution and abundance of fish and macroinvertebrate species; and water quality parameters: temperature, dissolved oxygen, pH and turbidity	WAPDA
	Demography/ Society	Influx of security guards and workers in camp	Headcount	Quarterly	NGO
	Vulnerable Peoples	Conflict over territory in CCAs etc.	See Vulnerable Tribes Plan (VTP)	See VTP	NGO
	Economy	Physical and economic displacement	See RAP	See RAP	NGO
	Land	Large scale land acquisition	See RAP	See RAP	NGO

ENVIRONMENTAL MONITORING PLAN - COMPONENT I

Phase	Receptor or Item	Location	Monitoring Mechanism	No. Frequency and Parameters	Monitoring Agency
CONSTRUCTION	Culture	Influx of security guards and workers in camp	See VTP	See VTP	NGO
	Drainage	Upgraded and new roads	Measure road and compare to design specifications Visual inspection of drainage lines Visual inspection of spoil heap siting	Road width – check once during construction and at end of construction Check no blockages – weekly during construction and at end of construction Ensure spoil heap sites are not on drainage lines at start of construction	SC Contractor
	Soils	Equipment washbays Borrow and quarry areas Chemicals and fuel storage areas. Refueling depots Spillage points of fuel, concrete, chemicals and lubricants	Visual observations Discrete grab sampling and laboratory testing	Daily Spot checks 10 sites at cited localities Quarterly Parameters: Oil and grease, chlorides, concrete spoils and metals.	Contractor, SC EMC Contractor
	Land Use	Cultivated land/ vegetation near all construction sites Construction camps, borrow areas, spoil heaps	Visual checks	Land use change. (as and when required) Tentatively: every 3 months (Quarterly) Restriction of machinery and vehicles within designated area Spot checks Location of contractor camps, spoil heaps and borrow areas take into account existing land use During site selection	EMC SC Contractor SC
	Waste Management	Waste transport routes from Construction site and camp to landfill	Visual inspection	Designated waste transport routes are being used Weekly Spot Checks	SC Contractor EMC
		Waste disposal	Visual inspection	No burning of waste Daily Spot checks	SC Contractor EMC
		Construction Site Contractor Camp	Visual inspection	Hazardous materials and waste are stored appropriately Weekly Spot Checks	SC Contractor EMC
		Construction Site Storage areas	Visual as well as testing (testing by contractor)	Visual inspection for leaks, soil contamination Daily	SC Contractor

ENVIRONMENTAL MONITORING PLAN - COMPONENT I

Phase	Receptor or Item	Location	Monitoring Mechanism	No. Frequency and Parameters	Monitoring Agency
				Spot checks	EMC
		Landfill site	Visual monitoring	Every six months Ensure stormwater and leachate management systems are functioning	EMC SC Contractor
		Contractor Camp	Visual inspection	Monthly Correct disposal of medical waste Incinerator performance	EMC SC Contractor
		Contractor Camps	Visual inspection and sampling (sampling by contractor)	Monthly Functioning of soak pits and septic tanks	EMC SC Contractor
		Spoil heap sites	Spoil heap management, Quantity of spoil,	Monthly Check spoil heaps Check spoil transport records	EMC SC Contractor
Air Quality	A1 -Bobali A2-Kaitu Weir Site (Map 8-1)		Ambient air quality monitoring Visual observations. Traffic count.	Semi-annually PM ₁₀ , SO ₂ , NO _x , CO, HC	EMC
Noise	N1 - Bobali N2 - Kaitu Weir Site (Map 8-1)		Noise level monitoring	Quarterly Noise levels on dB (A) scale.	EMC
Hydrology	Upstream and downstream of proposed Kaitu Weir site		Electronic gauges	Continuous flow monitoring.	EMC
Surface Water	As marked on Map 8-3		Water sampling and analysis using laboratory approved by authorities and regulators.	Quarterly Parameters: See Pre-construction	EMC
Ground Water	As marked on Map 8-3		Water sampling and analysis using laboratory approved by authorities and regulators.	Quarterly Parameters: See Pre-construction	EMC
Vegetation and habitat	All areas of construction activity and camps		Visual checking	Daily Ensure clearance is confined to demarcated areas Ensure no fuelwood is being cut Ensure heavy equipment remains within designated areas Spot checks	Contractor SC EMC
Wildlife	Construction camps, all		Periodic visual inspection of camps,	Spot checks	Contractor

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ENVIRONMENTAL MONITORING PLAN - COMPONENT I

Phase	Receptor or Item	Location	Monitoring Mechanism	No. Frequency and Parameters	Monitoring Agency
		construction sites	worksites and environs	Check for evidence of hunting including the presence of animal remains or the evidence of firearms (including spent shells)	SC EMC
	Aquatic Resources (Fisheries Resource)	Kaitu River from confluence with Kurram River to Pakistan border	Fish, macroinvertebrate and water quality sampling per Fisheries Management Plan (Annex IV).	Monthly sampling April-September; 3 times during October - March <u>Parameters</u> Distribution and abundance of fish and macroinvertebrate species; and water quality parameters: temperature, dissolved oxygen, pH and turbidity	WAPDA
	Aquatic Resources (Surface Water)	Kaitu River from site of Weir to confluence with Kurram River	Visual inspection of surface water upstream and downstream of cofferdam, and water in settling basin	Daily inspections during construction activities <u>Parameters</u> Water color and level of turbidity	Contractor SC
	Aquatic Resources (River Substrate)	Kaitu River from site of Weir to confluence with Kurram River	Visual inspection of borrow areas	Daily inspections during construction activities <u>Parameters</u> Location of borrow areas, avoiding riffle areas; Water color and level of turbidity in river adjacent to borrow areas	Contractor SC
	Demography/ Society	Influx of security guards and workers in camp	Headcount	Quarterly	NGO
	Vulnerable Peoples	Conflict over territory in CCAs etc.	See VTP	See VTP	NGO
	Economy	Physical and economic displacement	See RAP	See RAP	NGO
	Land	Large scale land acquisition	See RAP	See RAP	NGO
	Culture	Influx of security guards and workers in camp	See VTP	See VTP	NGO
	Roads and Bridges	Active construction sites	Visual checks for excessive dust Visual inspection to ensure use of health and safety equipment (See Health and Safety Plan Framework) Dilapidation Survey (Visual Inspection with photographic records) Visual vehicle inspections	Daily Spot checks Once before the beginning of construction to monitor the potential impacts of blasting on buildings and review existing structural conditions. At the beginning of each day to ensure in	Contractor SC EMC Contractor Contractor

ENVIRONMENTAL MONITORING PLAN - COMPONENT I

Phase	Receptor or Item	Location	Monitoring Mechanism	No. Frequency and Parameters	Monitoring Agency	
			Noise levels by meter Visual inspection for erosion Visual inspection of water bodies downstream of construction activities Visual inspection of all structures on haul roads Review statistics for work site accidents and incidents	good working order and all appropriate compliance certificates are up to date At regular intervals each day at the boundary of the construction site to ensure noise levels are not extreme Visual inspection to be carried out across the work site after any significant rain event At regular intervals each day inspect waterway for discoloration due to silt or concrete Monthly inspections to monitor any deterioration or damage to structures Monthly review of statistics to identify any patterns in accidents and incidents so appropriate improvements can be made	Contractor Contractor SC Contractor SC Contractor SC Contractor SC	
OPERATION	Soils	Command areas	Measuring and registering depth and quality of groundwater	Depth of groundwater to monitor secondary salinization danger Electric conductivity (EC) of groundwater to monitor salinity of groundwater N concentration as proxy for leaching of fertilizers and pollution of groundwater Sampling: at critical (low) sites in the command areas, 1 borehole per 5 sq. Mile.	EMC Agricultural and Irrigation Department FATA	
	Land Use	Inundated Kaitu weir pool area Agricultural water users residing downstream of the Kaitu weir (Datta Khel)	Social Complaint registers.	Lower Riparian Land use changes. (as and when required)	EMC	
	Waste Management	Kaitu River	Refer to the Water Quality Monitoring Plan			
		Office buildings, workplaces	Visual inspection	Weekly Correct waste transport routes are being used	EMC	
Air Quality	A1 -Bobali A2-Kaitu Weir Site (Map 8-1)	Ambient air quality monitoring Visual observations.	Semi-annually PM ₁₀ , SO ₂ , NO _x , CO, HC	EMC FATA Secretariat Pak-EPA		

ENVIRONMENTAL MONITORING PLAN - COMPONENT I

Phase	Receptor or Item	Location	Monitoring Mechanism	No. Frequency and Parameters	Monitoring Agency
			Traffic count.		
	Noise	N1 - Bobali N2 - Kaitu Weir Site (Map 8-1)	Noise level monitoring	Semi-annually Noise levels on dB (A) scale.	EMC FATA Secretariat Pak-EPA
	Hydrology	Upstream and downstream of the Kaitu Weir	Electronic gauges	Continuous flow monitoring.	EMC
	Surface Water	As marked on Map 8-4	Water sampling and analysis using laboratory approved by authorities and regulators.	Semi-annually Parameters: See Component I	EMC FATA Secretariat Pak-EPA
	Ground Water	As marked on Map 8-4	Water sampling and analysis, using laboratory approved by authorities and regulators.	Parameters: I. See Component I	EMC FATA Secretariat Pak-EPA
	Vegetation	All banks of major canals	Visual inspection	During regular canal inspections Condition of trees	EMC Pak-EPA
	Wildlife	Canal command area	Field inspections	Semi-annually shortly before Rabi and Kharif harvests	Agriculture Department
	Fisheries Resource	Kaitu River from confluence with Kurram River to Pakistan border	Fish, macroinvertebrate and water quality sampling per Fisheries Management Plan (Annex IV).	Monthly sampling April-September; 3 times during October - March <u>Parameters</u> Distribution and abundance of fish and macroinvertebrate species; and water quality parameters: temperature, dissolved oxygen, pH and turbidity	WAPDA and FATA Fisheries Department
		Fish sampling sites in Kaitu River from confluence with Kurram River to Kaitu Weir, plus an additional site above the Weir	Staff gauges at fish sampling sites per Fisheries Management Plan (Annex IV). Electronic gauges just upstream and downstream of project structures	Monthly sampling April-September; 3 times during October - March <u>Parameters</u> River flow	WAPDA
		If fishway installed at Kaitu Weir, within fishway, and upstream and downstream of fishway	Fish sampling, collection and observation	Sampling 5 days/week during period of upstream migration by target species <u>Parameters</u> Distribution and abundance of target fish species upstream, downstream and within fishway	WAPDA and FATA Fisheries Department
	Demography/ Society	Influx of security guards and workers in camp	Headcount	Quarterly	NGO
	Economy	Physical and economic	See RAP	See RAP	NGO

ENVIRONMENTAL MONITORING PLAN - COMPONENT I

Phase	Receptor or Item	Location	Monitoring Mechanism	No. Frequency and Parameters	Monitoring Agency
		displacement			
	Land	Large scale land acquisition	See RAP	See RAP	NGO
	Fuel, Water, Sanitation	Benefit sharing related to hydropower	Number of people with new connections to grid	Quarterly	NGO
	Roads and Bridges	AOI (Refer to Map 4-30/31)	Annually review of accident statistics Measure vehicle weights Measure vehicle speeds Visual inspection of all structures Visual inspection of all roads	Review trends in accidents Regular vehicle monitoring and enforcement of legal weight limits Regular vehicle monitoring and enforcement of vehicle speeds Annual inspection of all structures to monitor any deterioration and damage Six monthly inspection of all roads to identify maintenance requirements	Highway Division FATA and KPK KPK District Police/Political Agents/ Assistant Political Agents North Waziristan Agency and FR Bannu

8.2 Environmental Monitoring Plan - Component 2

ENVIRONMENTAL MONITORING PLAN - COMPONENT 2					
Phase	Receptor or Item	Location	Monitoring Mechanism	No. Frequency and Parameters	Monitoring Agency
PRE-CONSTRUCTION	Waste Management	Not applicable	Verify contractual requirements in bid documents Review and approve Contractors' waste management plan	Verify presence of waste management requirements Prior to issue of bid documents Prior to Start of construction	WAPDA EMC SC
		Construction Site Contractor Camp	Check training records	Content and attendance at waste management trainings Every six months	EMC SC
		Construction Site Contractor Camp	Use of appropriate Personal Protective Equipment (PPE)	Monitor use of PPE Daily (During camp and laydown development) Spot Checks	SC EMC
		Landfill sites	Waste disposal sites are operational	Landfill sites have been developed and include stormwater and leachate management systems installed – pre start up	EMC SC
		Borrow sites	Review and approve Contractor's Quarry Management Plan	Prior to start of construction	EMC SC
		Spoil heaps, chemicals storage areas, fuel depots and refueling areas	Visual observation	Verify stormwater management and erosion controls are in place Appropriate chemicals storage constructed Appropriate fuel depots and refueling areas constructed During laydown area and spoil area development	EMC SC
		Construction camps Staff buildings and colonies	Provision of proper sewerage system	Design before construction start up Verify construction according to design – during camp construction	Design Engineer SC
	Air Quality	A3 -Dam Site A4-Gumbatai (Map 4-28)	Ambient air quality monitoring to be done by approved laboratory to check compliance with NEQS standards. Visual observations. Traffic count.	Once prior to commencement of construction work. PM ₁₀ , SO ₂ , NO _x , CO, HC	WEC
	Noise	N3 - Dam Site N4 – Gumatti (Map 8-1)	Noise level monitoring to be done by approved laboratory to check compliance with NEQS standards.	Once prior to commencement of construction work. Noise levels on dB (A) scale.	WEC

ENVIRONMENTAL MONITORING PLAN - COMPONENT 2

Phase	Receptor or Item	Location	Monitoring Mechanism	No. Frequency and Parameters	Monitoring Agency
	Hydrology	Upstream and downstream of proposed Dam, Weir II and Weir III sites	Electronic gauges	Continuous flow monitoring.	WEC
	Surface Water	As marked on Map 8-2	Water sampling and analysis using laboratory approved by authorities and regulators. River flows - electronic gauges just upstream and downstream of proposed project structures	Please refer to frequency and parameters of Component I during the pre-construction phase. River flow.	WEC
	Fisheries Resource	Kurram River from Kurram Garhi Headworks to Pakistan border	Fish, macroinvertebrate and water quality sampling per Fisheries Management Plan (Annex IV).	Monthly sampling April-September; 3 times during October - March <u>Parameters</u> Distribution and abundance of fish and macroinvertebrate species; and water quality parameters: temperature, dissolved oxygen, pH and turbidity	WAPDA
	Demography/ Society	Influx of security guards and workers in camp	Headcount	Quarterly	NGO
	Vulnerable Peoples	Conflict over territory for potential resettlement site	See VTP	See VTP	NGO
	Economy	Physical and economic displacement	See Resettlement Policy Framework (RPF)	See RPF	NGO
	Land	Large scale land acquisition	See RPF	See RPF	NGO
	Settlement pattern	Land scale physical relocation	See RPF	See RPF	NGO
	Culture	Influx of security guards and workers in camp	See VTP	See VTP	NGO
CONSTRUCTION	Drainage	Upgraded and new roads	Measure road and compare to design specifications Visual inspection of drainage lines Visual inspection of spoil heap siting	Road width – check once during construction and at end of construction Check no blockages – weekly during construction and at end of construction Ensure spoil heap sites are not on drainage lines at start of construction	SC Contractor
	Soils	Equipment washbays Borrow and quarry areas Chemicals and fuel storage areas. Refueling depots	Visual observations Discrete grab sampling and laboratory testing	Daily Spot checks 10 sites at cited localities Quarterly	Contractor, SC EMC Contractor

ENVIRONMENTAL MONITORING PLAN - COMPONENT 2

Phase	Receptor or Item	Location	Monitoring Mechanism	No. Frequency and Parameters	Monitoring Agency
		Spillage points of fuel, concrete, chemicals and lubricants		Parameters: Oil and grease, chlorides, concrete spoils and metals.	
	Land Use	Cultivated land/ vegetation near all construction sites	Visual checks	Land use change. (as and when required) Tentatively: every 3 months (Quarterly) Restriction of machinery and vehicles within designated area Spot checks	EMC SC
		Construction camps, borrow areas, spoil heaps		Location of contractor camps, spoil heaps and borrow areas take into account existing land use During site selection	Contractor SC
	Waste Management	Waste transport routes from Construction site and camp to landfill	Visual inspection	Designated waste transport routes are being used Weekly Spot Checks	SC Contractor EMC
		Waste disposal	Visual inspection	No burning of waste Daily Spot checks	SC Contractor EMC
		Construction Site Contractor Camp	Visual inspection	Hazardous materials and waste are stored appropriately Weekly Spot Checks	SC Contractor EMC
		Construction Site Storage areas	Visual as well as testing (testing by contractor)	Visual inspection for leaks, soil contamination Daily Spot checks	SC Contractor EMC
		Landfill site	Visual monitoring	Every six months Ensure stormwater and leachate management systems are functioning	EMC SC Contractor
		Contractor Camp	Visual inspection	Monthly Correct disposal of medical waste Incinerator performance	EMC SC Contractor
		Contractor Camps	Visual inspection and sampling (sampling by contractor)	Monthly Functioning of soak pits and septic tanks	EMC SC Contractor
		Spoil heap sites	Spoil heap management, Quantity of spoil,	Monthly Check spoil heaps	EMC SC

ENVIRONMENTAL MONITORING PLAN - COMPONENT 2

Phase	Receptor or Item	Location	Monitoring Mechanism	No. Frequency and Parameters	Monitoring Agency
				Check spoil transport records	Contractor
	Air Quality	A3 -Dam Site A4-Gumbatai (Map 8-1)	Ambient air quality monitoring Visual observations. Traffic count.	Semi-annually PM ₁₀ , SO ₂ , NO _x , CO, HC	EMC
	Noise	N3 - Dam Site N4 – Gumatti (Map 8-1)	Noise level monitoring	Quarterly Noise levels on dB (A) scale.	EMC
	Hydrology	Upstream and downstream of proposed Dam, Weir II and Weir III sites	Electronic gauges	Continuous flow monitoring.	EMC
	Surface Water	As marked Map 8-3	Water sampling and analysis using laboratory approved by authorities and regulators.	Quarterly Parameters: See Pre-construction	EMC
	Vegetation and habitat	All areas of construction activity and camps	Visual checking	Daily Ensure clearance is confined to demarcated areas Ensure no fuelwood is being cut Ensure heavy equipment remains within designated areas Spot checks	Contractor SC EMC
	Wildlife	Construction camps, all construction sites	Periodic visual inspection of camps, worksites and environs	Spot checks Check for evidence of hunting including the presence of animal remains or the evidence of firearms (including spent shells)	Contractor SC EMC
	Aquatic Resources (Fisheries Resource)	Kurram River from Kurram Garhi Headworks to Pakistan border	Fish, macroinvertebrate and water quality sampling per Fisheries Management Plan (Annex IV).	Monthly sampling April-September; 3 times during October - March <u>Parameters</u> Distribution and abundance of fish and macroinvertebrate species; and water quality parameters: temperature, dissolved oxygen, pH and turbidity	WAPDA
	Aquatic Resources (Surface Water)	Kurram River from Kurram Tangi Dam to confluence with Kurram Garhi Headworks	Visual inspection of surface water upstream and downstream of cofferdam, and water in settling basin	Daily inspections during construction activities <u>Parameters</u> Water color and level of turbidity	Construction Contractor
	Aquatic Resources (River)	Kurram River from Kurram Tangi Dam to confluence with	Visual inspection of borrow areas	Daily inspections during construction activities	Construction Contractor

ENVIRONMENTAL MONITORING PLAN - COMPONENT 2

Phase	Receptor or Item	Location	Monitoring Mechanism	No. Frequency and Parameters	Monitoring Agency
	Substrate)	Kurram Garhi Headworks		<u>Parameters</u> Location of borrow areas, avoiding riffle areas; Water color and level of turbidity in river adjacent to borrow areas	
	Demography/ Society	Influx of security guards and workers in camp	Headcount	Quarterly	NGO
	Vulnerable Peoples	Conflict over territory in CCAs etc.	See VTP	See VTP	NGO
	Economy	Physical and economic displacement	See RPF	See RPF	NGO
	Land	Large scale land acquisition	See RPF	See RPF	NGO
	Settlement pattern	Land scale physical relocation	See RPF	See RPF	NGO
	Culture	Influx of security guards and workers in camp	See VTP	See VTP	NGO
	Roads and Bridges	Active construction sites	Visual checks for excessive dust Visual inspection to ensure use of health and safety equipment (See Health and Safety Plan Framework) Dilapidation Survey (Visual Inspection with photographic records) Visual vehicle inspections Noise levels by meter Visual inspection for erosion Visual inspection of water bodies downstream of construction activities Visual inspection of all structures on haul roads Review statistics for work site accidents and incidents	Daily Spot checks Once before the beginning of construction to monitor the potential impacts of blasting on buildings and review existing structural conditions. At the beginning of each day to ensure in good working order and all appropriate compliance certificates are up to date At regular intervals each day at the boundary of the construction site to ensure noise levels are not extreme Visual inspection to be carried out across the work site after any significant rain event At regular intervals each day inspect waterway for discoloration due to silt or concrete Monthly inspections to monitor any deterioration or damage to structures Monthly review of statistics to identify any patterns in accidents and incidents so	Contractor SC EMC Contractor Contractor Contractor SC Contractor SC Contractor SC Contractor SC

ENVIRONMENTAL MONITORING PLAN - COMPONENT 2

Phase	Receptor or Item	Location	Monitoring Mechanism	No. Frequency and Parameters	Monitoring Agency
OPERATION				appropriate improvements can be made	
	Land Use	Inundated Kurram Tangi Dam reservoir area Agricultural water users residing in downstream areas of the Kurram River (Bannu, Ghoriwala, Sadakhel, Naurang Sera, Lakki Marwat)	Social Complaint registers	Lower Riparian Land use changes. As and when required	WAPDA WEC
	Waste Management	Kurram River, downstream water bodies and irrigation canals	Refer to the Water Quality Monitoring Plan	Water Quality	EMC
		Office buildings, workplaces	Visual inspection	Weekly Correct waste transport routes are being used	
	Air Quality	A3 -Dam Site A4-Gumbatai (Map 4-28)	Ambient air quality Visual observations. Traffic count.	Semi-annually PM ₁₀ , SO ₂ , NO _x , CO, HC	EMC FATA Secretariat Pak-EPA
	Noise	N3 - Dam Site N4 – Gumatti (Map 8-1)	Noise level monitoring to be done by approved laboratory to check compliance with NEQS standards.	Semi-annually Noise levels on dB (A) scale.	EMC FATA Secretariat Pak-EPA
	Hydrology	Upstream and downstream of Dam, Weir II and Weir III sites	Electronic gauges	Continuous flow monitoring.	EMC
	Surface Water	As marked on 8-4	Water sampling and analysis using laboratory approved by authorities and regulators.	Please refer to frequency and parameters of Component I during the operation phase.	EMC FATA Secretariat Pak-EPA
	Wildlife	Reservoir and Weir III Periphery	Surveys and/or interviewing local residents.	Presence of pest animals and snakes Weekly surveys during annual high flow period and impoundment	EMC
Fisheries Resource	Kurram River from Kurram Garhi Headworks to Pakistan border	Fish, macroinvertebrate and water quality sampling per Fisheries Management Plan (Annex IV).	Monthly sampling April-September; 3 times during October - March <u>Parameters</u> Distribution and abundance of fish and macroinvertebrate species; and water quality parameters: temperature, dissolved oxygen, pH and turbidity	WAPDA and FATA Fisheries Department	
	Fish sampling sites in Kurram	Staff gauges at fish sampling sites per	Monthly sampling April-September; 3 times	WAPDA	

ENVIRONMENTAL MONITORING PLAN - COMPONENT 2

Phase	Receptor or Item	Location	Monitoring Mechanism	No. Frequency and Parameters	Monitoring Agency
		River at sites under the influence of the Ecological Flow, plus upstream control sites	Fisheries Management Plan (Annex IV).	during October - March <u>Parameters</u> River flow	
		Kurram Tangi Reservoir and Weir III Reservoir	Fish and water quality sampling per Fisheries Management Plan (Annex IV).	Sampling 9 times per year <u>Parameters</u> Distribution, abundance, weight and length of target and stocked fish species in reservoirs to determine species composition, growth rates and condition factors. Fish analyzed once per year for mercury levels in flesh. Water quality parameters: temperature, dissolved oxygen, pH and turbidity	WAPDA and FATA Fisheries Department
	Economy	Security of titles for resettled persons	See RPF	See RPF	NGO
	Land	Security of titles for resettled persons	See RPF	See RPF	NGO
	Settlement pattern	Land scale physical relocation	See RPF	See RPF	
	Fuel, Water, Sanitation	Benefit sharing related to hydropower	Number of people with new connections to grid	Quarterly	NGO
	Roads and Bridges	AOI (Refer to Map 4-30/31)	Annually review of accident statistics Measure vehicle weights Measure vehicle speeds Visual inspection of all structures Visual inspection of all roads	Review trends in accidents Regular vehicle monitoring and enforcement of legal weight limits Regular vehicle monitoring and enforcement of vehicle speeds Annual inspection of all structures to monitor any deterioration and damage Six monthly inspection of all roads to identify maintenance requirements	Highway Division FATA and KPK KPK District Police/Political Agents/ Assistant Political Agents North Waziristan Agency and FR Bannu

8.3 Environmental Monitoring Plan - Component 3

ENVIRONMENTAL MONITORING PLAN - COMPONENT 3					
Phase	Receptor or Item	Location	Monitoring Mechanism	No. Frequency and Parameters	Monitoring Agency
PRE-CONSTRUCTION	Waste Management	Not applicable	Verify contractual requirements in bid documents Review and approve Contractors' waste management plan	Verify presence of waste management requirements Prior to issue of bid documents Prior to Start of construction	WAPDA EMC SC
		Construction Site Contractor Camp	Check training records	Content and attendance at waste management trainings Every six months	EMC SC
	Construction Site Contractor Camp	Use of appropriate Personal Protective Equipment (PPE)	Monitor use of PPE Daily (During camp and laydown development) Spot Checks	SC EMC	
	Landfill sites	Waste disposal sites are operational	Landfill sites have been developed and include stormwater and leachate management systems installed – pre start up	EMC SC	
	Borrow sites	Review and approve Contractor's Quarry Management Plan	Prior to start of construction	EMC SC	
	Spoil heaps, chemicals storage areas, fuel depots and refueling areas	Visual observation	Verify stormwater management and erosion controls are in place Appropriate chemicals storage constructed Appropriate fuel depots and refueling areas constructed During laydown area and spoil area development	EMC SC	
	Construction camps Staff buildings and colonies	Provision of proper sewerage system	Design before construction start up Verify construction according to design – during camp construction	Design Engineer SC	
	Air Quality	A5- Kurram Garhi Headworks A6- Bannu A7-Domail	Ambient air quality	Once prior to commencement of construction work. PM ₁₀ , SO ₂ , NO _x , CO, HC	EMC

ENVIRONMENTAL MONITORING PLAN - COMPONENT 3

Phase	Receptor or Item	Location	Monitoring Mechanism	No. Frequency and Parameters	Monitoring Agency
		A8 -Road Connecting Mianwali and Bannu (near Alamshiri Kala) A9-Lakki Marwat (Map 8-1)	Visual observations. Traffic count.		
	Noise	N5 - Kurram Garhi Headworks N6 - Bannu N7 - Domail N8 - Road Connecting Mianwali and Bannu (near Alamshiri Kala) N9- Ziarat Umer Khan (Map 8-1)	Noise level monitoring	Once prior to commencement of construction work. Noise levels on dB (A) scale.	EMC
	Hydrology	Kurram Garhi Headworks		Continue existing monitoring	
	Surface Water	As marked on Map 8-2	Water sampling and analysis using laboratory approved by authorities and regulators.	Please refer to frequency and parameters of Component I during the pre-construction phase.	EMC
	Ground Water	As marked on Map 8-2	Water sampling and analysis using laboratory approved by authorities and regulators.	Please refer to frequency and parameters of Component I during the pre-construction phase.	EMC
	Fisheries Resource	Kurram River from Kurram Garhi Headworks to	Fish, macroinvertebrate and water quality sampling per Fisheries Management Plan (Annex IV).	Monthly sampling April-September; 3 times during October - March <u>Parameters</u> Distribution and abundance of fish and macroinvertebrate species; and water quality parameters: temperature, dissolved oxygen, pH and turbidity	WAPDA
	Economy	Physical and economic displacement	See RPF	See RPF	NGO
	Land	Large scale land acquisition	See RPF	See RPF	NGO
CONSTRUCTION	Drainage	No monitoring required			
	Soils	Equipment washbays Borrow and quarry areas Chemicals and fuel storage areas. Refueling depots Spillage points of fuel, concrete, chemicals and lubricants	Visual observations Discrete grab sampling and laboratory testing	Daily Spot checks 10 sites at cited localities Quarterly Parameters: Oil and grease, chlorides, concrete spoils and metals.	Contractor, SC EMC Contractor
	Land Use	Cultivated land/ vegetation near all construction sites	Visual checks	Land use change. (as and when required)	EMC SC

ENVIRONMENTAL MONITORING PLAN - COMPONENT 3

Phase	Receptor or Item	Location	Monitoring Mechanism	No. Frequency and Parameters	Monitoring Agency
		Construction camps, borrow areas, spoil heaps		Tentatively: every 3 months (Quarterly) Restriction of machinery and vehicles within designated area Spot checks Location of contractor camps, spoil heaps and borrow areas take into account existing land use During site selection	Contractor SC
Waste Management	Waste transport routes from Construction site and camp to landfill		Visual inspection	Designated waste transport routes are being used Weekly Spot Checks	SC, Contractor HSE Dept. EMC
			Visual inspection	No burning of waste Daily Spot checks	SC, Contractor HSE Dept. EMC
	Construction Site Contractor Camp		Visual inspection	Hazardous materials and waste are stored appropriately Weekly Spot Checks	SC, Contractor HSE Dept. EMC
	Construction Site Storage areas		Visual as well as testing (testing by contractor)	Visual inspection for leaks, soil contamination Daily Spot checks	SC, Contractor HSE Dept. EMC
	Landfill site		Visual monitoring	Every six months Ensure stormwater and leachate management systems are functioning	EMC, SC, Contractor HSE Dept.
	Contractor Camp		Visual inspection	Monthly Correct disposal methods for medical waste are being used (special containers are use e.g. such as sharps disposal containers; waste transported to an appropriate facility for incineration	EMC, SC, Contractor HSE Dept.
	Contractor Camps		Visual inspection and sampling (sampling	Monthly	EMC, SC,

ENVIRONMENTAL MONITORING PLAN - COMPONENT 3

Phase	Receptor or Item	Location	Monitoring Mechanism	No. Frequency and Parameters	Monitoring Agency
			by contractor)	Functioning of soak pits and septic tanks	Contractor HSE Dept.
		Spoil heap sites	Spoil heap management, Quantity of spoil,	Monthly Check spoil heaps Check spoil transport records	EMC, SC, Contractor HSE Dept.
Air Quality	A5– Kurram Garhi Headworks A6- Bannu A7-Domail A8 -Road Connecting Mianwali and Bannu (near Alamshiri Kala) A9–Lakki Marwat (Map 8-1)		Ambient air quality Visual observations. Traffic count.	Semi-annually PM ₁₀ , SO ₂ , NO _x , CO, HC	EMC
Noise	N5 - Kurram Garhi Headworks N6 - Bannu N7 - Domail N8 - Road Connecting Mianwali and Bannu (near Alamshiri Kala) N9- Ziarat Umer Khan (Map 8-1)		Noise levels	Quarterly Noise levels on dB (A) scale.	EMC
Hydrology	Kurram Garhi Headworks			Continue existing monitoring	
Surface Water	As marked on Map 8-3		Water sampling and analysis using laboratory approved by authorities and regulators.	See Component I	EMC
Ground Water	As marked on Map 8-3		Water sampling and analysis using laboratory approved by authorities and regulators.	See Component I	EMC
Vegetation and habitat	All areas of construction activity and camps		Visual checking	Daily Ensure clearance is confined to demarcated areas Ensure no fuelwood is being cut Ensure heavy equipment remains within designated areas Spot checks	Contractor SC EMC
Wildlife	Construction camps, all construction sites		Periodic visual inspection of camps, worksites and environs	Spot checks Check for evidence of hunting including the presence of animal remains or the evidence of firearms (including spent shells)	Contractor SC EMC
Aquatic	Kurram River from Kurram		Fish, macroinvertebrate and water	Monthly sampling April-September; 3 times	WAPDA

ENVIRONMENTAL MONITORING PLAN - COMPONENT 3

Phase	Receptor or Item	Location	Monitoring Mechanism	No. Frequency and Parameters	Monitoring Agency
	Resources (Fisheries Resource)	Garhi Headworks to Pakistan border	quality sampling per Fisheries Management Plan (Annex IV).	during October - March <u>Parameters</u> Distribution and abundance of fish and macroinvertebrate species; and water quality parameters: temperature, dissolved oxygen, pH and turbidity	
	Aquatic Resources (Surface Water)	Kurram River from Kurram Tangi Dam to confluence with Kurram Garhi Headworks	Visual inspection of surface water upstream and downstream of cofferdam, and water in settling basin	Daily inspections during construction activities <u>Parameters</u> Water color and level of turbidity	Construction Contractor
	Economy	Physical and economic displacement	See RPF	See RPF	NGO
	Land	Large scale land acquisition	See RPF	See RPF	NGO
	Culture	Loss of cultural heritage in footprint	See CHMP	See CHMP	Ministry of Culture
	Roads and Bridges	Active construction sites	Visual checks for excessive dust Visual inspection to ensure use of health and safety equipment (See Health and Safety Plan Framework) Dilapidation Survey (Visual Inspection with photographic record) Visual vehicle inspections Noise levels by meter Visual inspection for erosion Visual inspection of water bodies downstream of construction activities Visual inspection of all structures on haul roads Review statistics for work site accidents and incidents	Daily Spot checks Once before the beginning of construction to monitor the potential impacts of blasting on buildings and review existing structural conditions. At the beginning of each day to ensure in good working order and all appropriate compliance certificates are up to date At regular intervals each day at the boundary of the construction site to ensure noise levels are not extreme Visual inspection to be carried out across the work site after any significant rain event At regular intervals each day inspect waterway for discoloration due to silt or concrete Monthly inspections to monitor any deterioration or damage to structures Monthly review of statistics to identify any patterns in accidents and incidents so appropriate improvements can be made	Contractor SC EMC Contractor Contractor Contractor SC Contractor SC Contractor SC Contractor SC

ENVIRONMENTAL MONITORING PLAN - COMPONENT 3

Phase	Receptor or Item	Location	Monitoring Mechanism	No. Frequency and Parameters	Monitoring Agency
OPERATION	Soils	Command areas	Measuring and registering depth and quality of groundwater	Depth of groundwater to monitor secondary salinization danger Electric conductivity (EC) of groundwater to monitor salinity of groundwater N concentration as proxy for leaching of fertilizers and pollution of groundwater Sampling: at critical (low) sites in the command areas, on average 1 borehole per 5 sq. Mile.	EMC Agriculture and Irrigation Department KP
	Land Use	Agricultural water users in the lower riparian areas of the Kurram Garhi Head works	Social complaint registers	Land use changes. (as and when required)	WAPDA, WEC, Agriculture and Irrigation Department KP
	Waste Management	Kurram River, downstream water bodies and irrigation canals	Refer to the Water Quality Monitoring Plan	Water Quality	
		Office buildings, workplaces	Visual inspection	Weekly Correct waste transport routes are being used	EMC
	Air Quality	A5– Kurram Garhi Headworks A6- Bannu A7-Domail A8 -Road Connecting Mianwali and Bannu (near Alamshiri Kala) A9–Lakki Marwat (Map 8-1)	Ambient air quality monitoring	Semi-annually PM ₁₀ , SO ₂ , NO _x , CO, HC	EMC FATA Secretariat Pak-EPA
	Noise	N5 - Kurram Garhi Headworks N6 - Bannu N7 - Domail N8 - Road Connecting Mianwali and Bannu (near Alamshiri Kala) N9- Ziarat Umer Khan (Map 8-1)	Noise levels	Semi-annually Noise levels on dB (A) scale.	EMC FATA Secretariat Pak-EPA
	Hydrology	Kurram Garhi Headworks		Continue existing monitoring	
Surface Water	As marked on Map 8-4	Water sampling and analysis using laboratory approved by authorities and regulators.	EMC FATA Secretariat Pak-EPA	EMC FATA Secretariat Pak-	

ENVIRONMENTAL MONITORING PLAN - COMPONENT 3

Phase	Receptor or Item	Location	Monitoring Mechanism	No. Frequency and Parameters	Monitoring Agency
					EPA
	Ground Water	As marked on Map 8-4	Water sampling and analysis using laboratory approved by authorities and regulators.	Please refer to frequency and parameters of Component I during the operation phase.	WEC/FATA Secretariat in collaboration with Federal EPA
	Vegetation	All banks of major canals	Visual inspection	Condition of trees should be part of the regular report of canal inspections (along with the condition of canal and its control structures).	WAPDA Federal EPA
	Wildlife	Canal command area	Field inspections	Semi-annually shortly before Rabi and Kharif harvests	Agriculture Department
	Fisheries Resource	Kurram River from Kurram Garhi Headworks to Pakistan border	Fish, macroinvertebrate and water quality sampling per Fisheries Management Plan (Annex IV).	Monthly sampling April-September; 3 times during October - March <u>Parameters</u> Distribution and abundance of fish and macroinvertebrate species; and water quality parameters: temperature, dissolved oxygen, pH and turbidity	WAPDA and FATA Fisheries Department
	Economy	Physical and economic displacement	See RPF	See RPF	NGO
	Land	Large scale land acquisition	See RPF	See RPF	NGO
	Roads and Bridges	AOI (Refer to Map 4-30/31)	Annually review of accident statistics Measure vehicle weights Measure vehicle speeds Visual inspection of all structures Visual inspection of all roads	Review trends in accidents Regular vehicle monitoring and enforcement of legal weight limits Regular vehicle monitoring and enforcement of vehicle speeds Annual inspection of all structures to monitor any deterioration and damage Six monthly inspection of all roads to identify maintenance requirements	Highway Division FATA and KPK KPK District Police/Political Agents/ Assistant Political Agents North Waziristan Agency and FR Bannu

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9 ANNEXURE I: LIST OF MAPS

Map I-1: Project Location Map

Map I-2: Project Vicinity and Layout

Map 8-1: Sampling Location Map Air and Noise

Map 8-2: Sampling Location Map Water Quality

Map 8-3: Sampling Location Map Water Quality during Construction

Map 8-4: Sampling Location Map Water Quality during Operation

Kurram Tangi Dam Project
Environmental Mitigation and Monitoring Plan

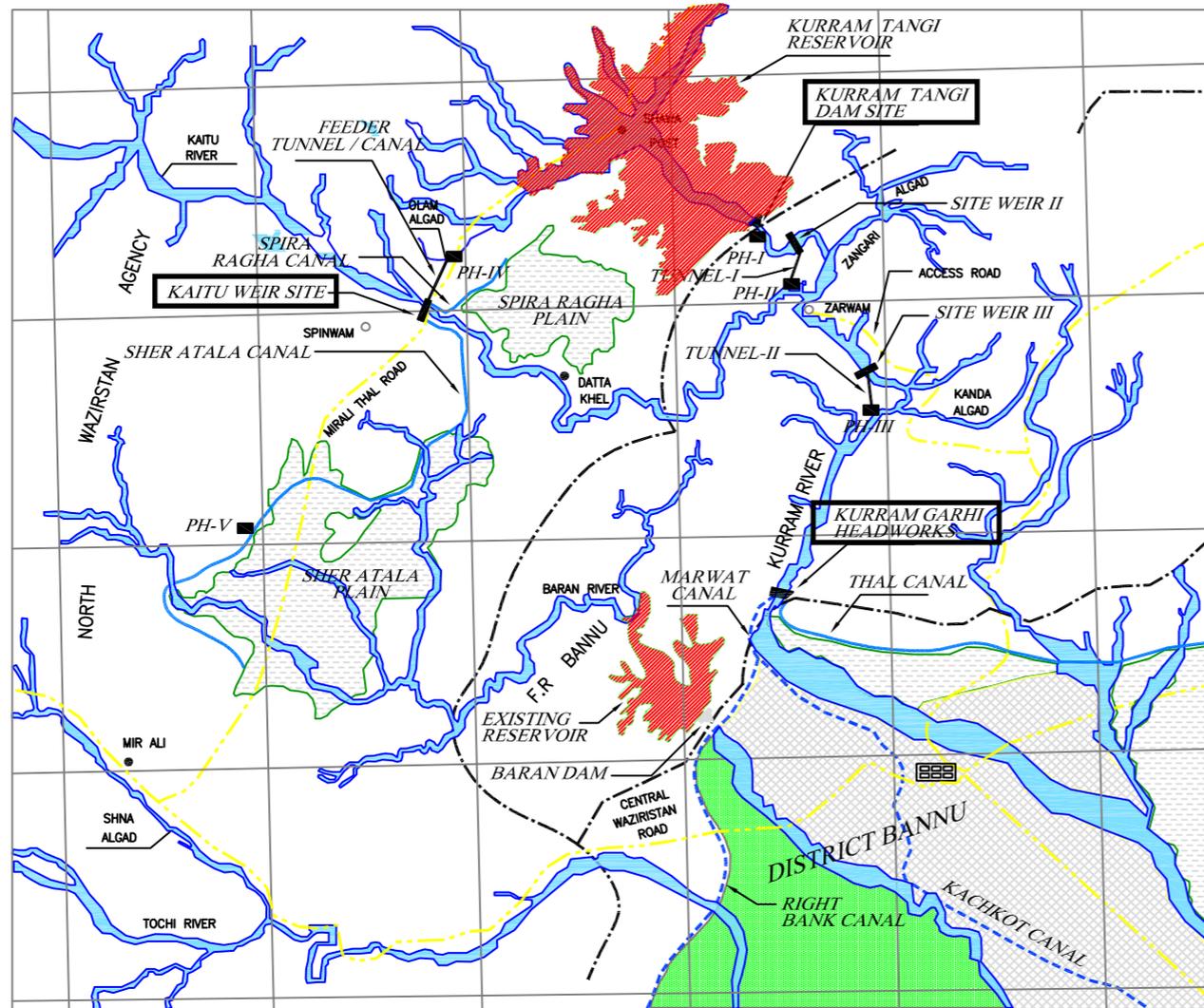
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4.0	30.10.2013	U. AHMAD	U. TARAR	Legend ▲ Major Cities — River — Project AOI ■ Proposed Kurram Tangi Dam Reservoir ■ National Boundary	DISCLAIMER This Map is for informational purposes and may not have been prepared for, or be suitable for legal, engineering, or surveying purposes. Users of this information should review or consult the primary data and information sources to ascertain the usability of the information. This contents / data used in this map are not verified on ground thus NESPAK makes no warranty, express or implied, related to the accuracy or content of these materials and map/data.	PROJECTION INFORMATION Projection: Geographic Datum: WGS84	PROJECT: ENVIRONMENTAL ASSESSMENT OF KURRAM TANGI MULTIPURPOSE DAM PROJECT	CLIENT: UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT (USAID)	DOCUMENT TITLE: PROJECT LOCATION MAP			
3.0	23.09.2013	U. AHMAD	U. TARAR							CONSULTANT: MWH GLOBAL, INC. NATIONAL ENGINEERING SERVICES PAKISTAN (PVT.) LIMITED	DOCUMENT NO. : 3553-NES-KTDP-EA-0001	Map 1 - 1
2.0	03.09.2013	S. HUSSAIN	U. TARAR									
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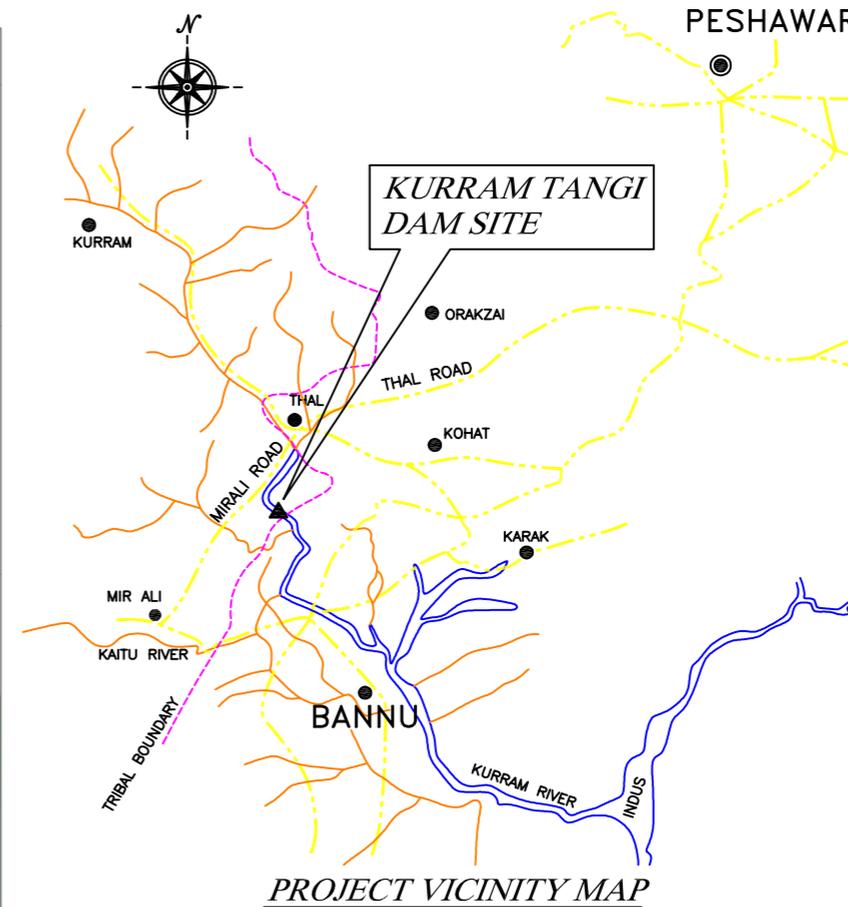
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PROJECT LAYOUT DETAILS

LEGEND :-

- | | | |
|---------------------|----------------------|---------------------|
| ROAD | CITY / TOWN | UNDER CIVIL CANALS |
| EXISTING CANAL | PROPOSED POWER HOUSE | UNDER MARWAT CANALS |
| PROPOSED CANAL | WEIR SITE | NEW COMMAND AREA |
| PROVINCIAL BOUNDARY | DAM SITE | |
| RIVER | RESERVOIR | |



PROJECT VICINITY MAP



KEY MAP

SOURCE: KTDC DETAILED ENGINEERING DESIGN REPORT

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UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT (USAID)

CONSULTANT:
MWH GLOBAL, INC.



DOCUMENT TITLE: PROJECT VICINITY AND LAYOUT

DOCUMENT NO. :

MAP 1 - 2

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1.0	12.09.2013	F.ASLAM	U.AHMAD
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LEGEND	
	Air and Noise Sampling Points
	Dam Site
	Proposed Kaitu Weir
	Kurram Garhi Headworks
	Roads
	Area of Influence
	Important Locations
	Proposed Kurram Tangi Dam Reservoir
	Nullah/ River
	District Boundary

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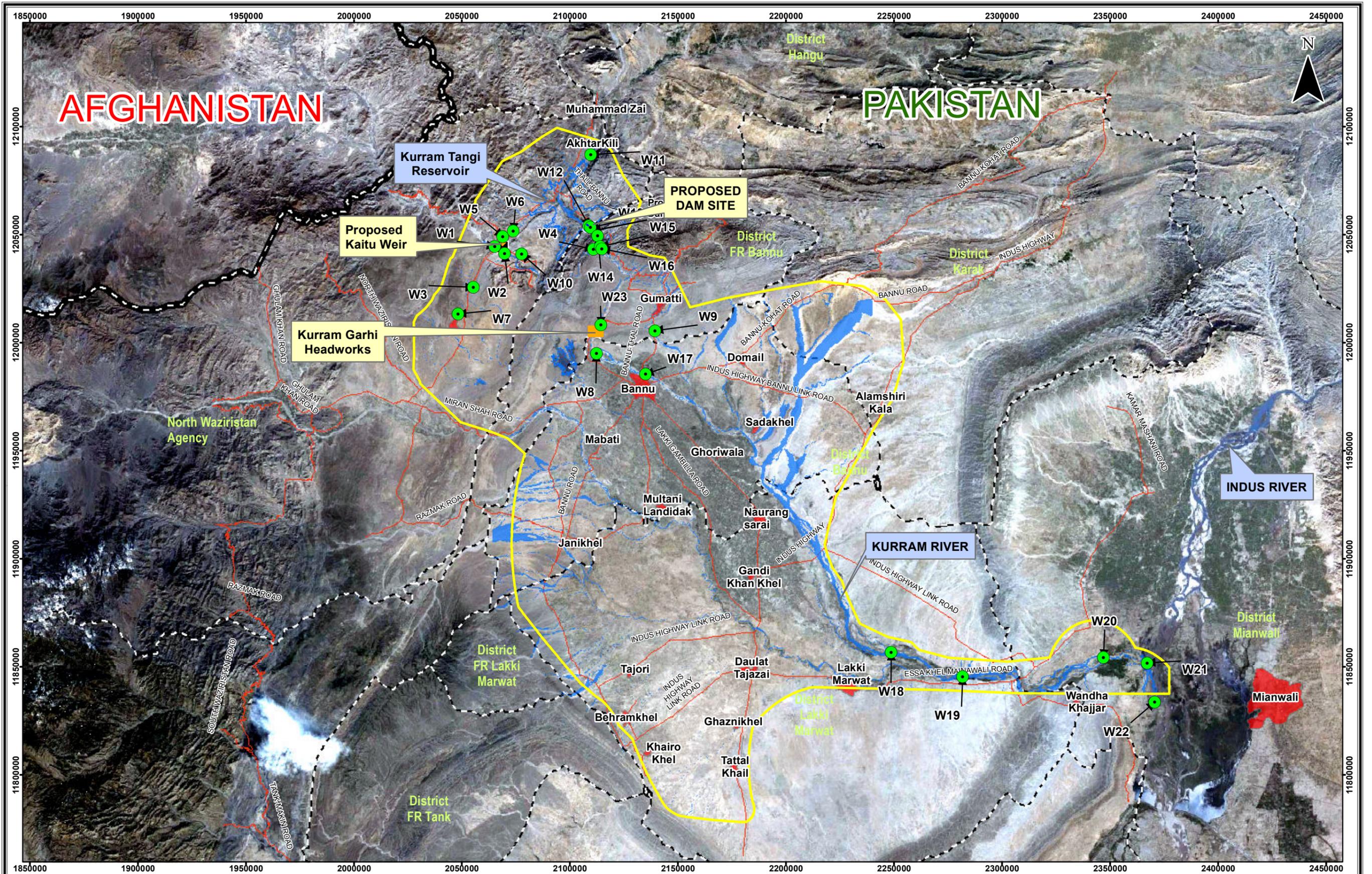
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DOCUMENT TITLE: SAMPLING LOCATION MAP AIR AND NOISE	
DOCUMENT NO. : 3553-NES-KTDP-EA-0039	Map 8 - 1
SCALE: 1:500,000	ORIGINAL SIZE : A3

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Environmental Mitigation and Monitoring Plan

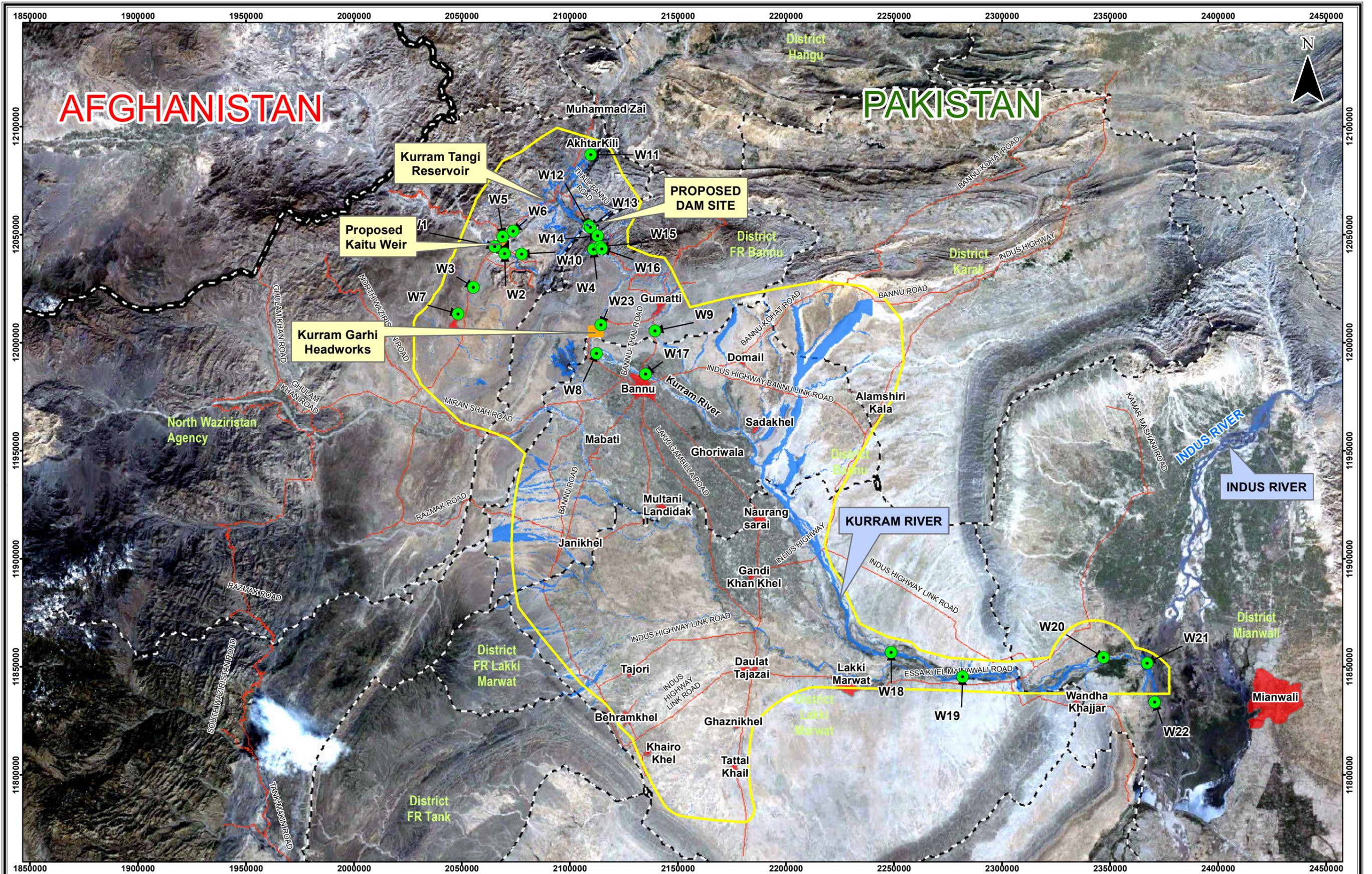
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Environmental Mitigation and Monitoring Plan

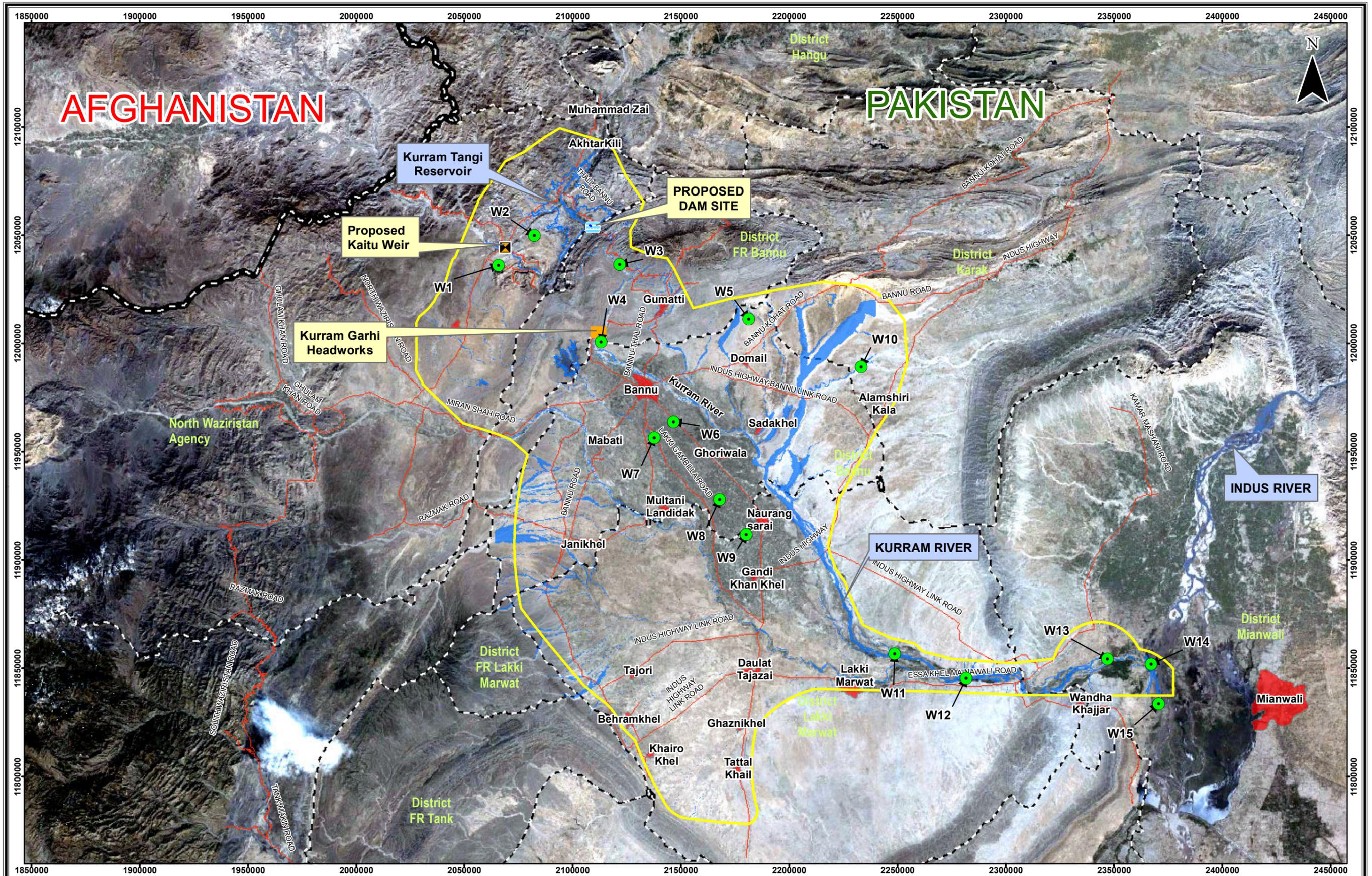
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LEGEND Water Quality (Construction) Dam Site Proposed Kaitu Weir Kurram Garhi Headworks Roads Area of Influence Important Locations Proposed Kurram Tangi Dam Reservoir Nullah/ River District Boundary				DISCLAIMER This Map is for informational purposes and may not have been prepared for, or be suitable for legal, engineering, or surveying purposes. Users of this information should review or consult the primary data and information sources to ascertain the usability of the information. This contents / data used in this map are not verified on ground thus NESPAK makes no warranty, express or implied, related to the accuracy or content of these materials and map/data.		PROJECTION INFORMATION Projection: UTM Zone 42 N Datum: WGS84 Units / Dimensions: Feet / Miles		PROJECT: ENVIRONMENTAL ASSESSMENT OF KURRAM TANGI MULTIPURPOSE DAM PROJECT		CLIENT: UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT (USAID)		DOCUMENT TITLE: SAMPLING LOCATION MAP WATER QUALITY DURING CONSTRUCTION	
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Water Quality (Operational)	Roads	Nullah/ River
Dam Site	Area of Influence	District Boundary
Proposed Kaitu Weir	Important Locations	Proposed Kurram Tangi Dam Reservoir
Kurram Garhi Headworks		

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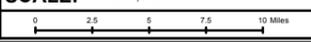
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Environmental Mitigation and Monitoring Plan

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