ENERGY POLICY PROGRAM

RAPID ENVIRONMENTAL ANALYSIS

ALLAI KHWAR RUN-OF-RIVER HYDROELECTRIC POWER PROJECT

July 2014

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ALLAI KHWAR RUN-OF-RIVER HYDROELECTRIC POWER PROJECT

Contract No: AID-EPP-I-00-03-00004
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House 4, Street 88, Sector G-6/3
Ataturk Avenue, Islamabad, Pakistan
Tel: +92 (51) 835 7072, Fax: +92 (51) 835 7071
Email: jhicks@ep-ep.com.pk

Advanced ENGINEERING
Advanced Engineering Associates International

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Acronyms

AEAI	Advanced Engineering Associates International, Inc.
AKHP	Allai Khwar Hydroelectric Power Project
AOR	Agreement Officer's Representative
BEO-OAPA	Bureau Environmental Officer-Office of Afghanistan and Pakistan Affairs
CE	Ecological Impact during Construction stage
CFR	Code of Federal Regulations
COR	Contracting Officer's Representative
CP	Physical Impact during Construction stage
CS	Social Impact during Construction stage
DE	Ecological impact during Design stage
DKHP	Duber Khwar Hydroelectric Power Project
DMEO	Deputy Mission Environmental Officer
DP	Physical Impact during design stage
DS	Social impact during Design stage
EIA	Environmental Impact Assessment
EMMP	Environmental Mitigation and Monitoring Plan
EMP	Environmental Management Plan
EPP	Energy Policy Program
HBP	Hagler Bailly Pakistan
IEE	Initial Environmental Examination
KP	Khyber Pakhtunkhwa
m3	cubic meters
m3/s	cubic meters per second
MEO	Mission Environmental Officer
OE	Ecological Impact during Operation stage
OP	Physical Impact during Operation stage
OS	Social Impact during Operation stage
PC-1	Planning Commission Form 1
REA	Rapid Environmental Analysis
REA-OAPA	Regional Environmental Advisor-Office of Afghanistan and Pakistan
SoW	Scope of Work
USAID	United States Agency for International Development
WAPDA	Pakistan Water and Power Development Authority

Environmental Documentation Form

Commissioning and Completion of Allai Khwar Hydroelectric Power Project

A. Applicant Information

Contractor/grantee (Organization): AEAI-EPP	**Parent grant of project:** Energy Policy Program (EPP)
Individual contact and title: Mr. Jimmy Roland Hicks, COP	**Address, phone and email (if available)** Advanced Engineering Associates International Inc. House # 4, Street 88, G-6/3, Islamabad – Pakistan Tel: +92 (0) 51 8357 072 jhicks@ep-ep.com.pk
Activity (brief description) Commissioning and completion of Allai Khwar Hydroelectric Power Project	**Amount:** U.S. $11.25 Million
Location of activity Allai Khwar Hydroelectric Power Project (AKHP), Allai, Khyber Pakhtunkhwa	**Start and end date of activity** FY 2013- Dec 2015

B. Activities, Screening Results, and Recommended Determination

Activity Breakdown	**Screening Result (Step 3 of instructions)**			**Recommended Determinations** (Step 6 of instructions Complete for all moderate and high risk activities)		
	Very Low Risk	**Moderate Risk**	**High Risk**	**No significant adverse impact**	**With specified mitigation, no significant adverse impact,**	**Significant Adverse Impact**
Management • Project/ Program Management • Environmental Monitoring	✓			Categorical Exclusion per 22 CFR 216. (c)(1)(i)		
Technical Assistance • Technical assistance, training programs except to the extent such programs include activities directly affecting the environment. • Financial, accounting, management and other capacity building	✓			Categorical Exclusion per 22 CFR 216. (c)(2)(i)		
Documentation • Development of manuals and documents etc. • Studies required to support construction and other aspect of the program • Analyses, investigations, reviews, assessments, planning, studies (monitoring, impact evaluation and	✓			Categorical Exclusion per 22 CFR 216. (c)(2)(iii)		

Activity Breakdown	Screening Result (Step 3 of instructions)			Recommended Determinations (Step 6 of instructions Complete for all moderate and high risk activities)		
	Very Low Risk	Moderate Risk	High Risk	No significant adverse impact	With specified mitigation, no significant adverse impact,	Significant Adverse Impact
other social. Technical studies etc.), surveys, mapping, workshops, seminars, conferences and meetings • Preparation of environmental documentation including environmentally required studies. • Information and experience sharing sessions						
Media and Communications • Document and information transfer • Public outreach, awareness campaigns, media campaigns, advocacy campaigns and Public information campaigns, including development of print or other media	✓			Categorical Exclusion per 22 CFR 216. (c)(2)(v)		
Civil Works • Payment for Construction Machinery used during construction		✓			Negative Determination with Conditions per 22 CFR 216.3 (a)(2)(iii)	
Civil Works in Progress • Miscellaneous works		✓			Negative Determination with Conditions per 22 CFR 216.3 (a)(2)(iii)	
E&M Works • E&M-FOB Payment as per contract		✓			Negative Determination with Conditions per 22 CFR 216.3 (a)(2)(iii)	

C. Summary of Recommended Determinations (check all that apply)

The activity contains	*(equivalent regulation 216 terminology)*
☒ Very low risk sub-activities	*Categorical exclusion per 22 CFR 216.2 c(1)(i) and (c)(2)(i):* Management Technical Assistance Documentation Media and Communications
☐ After environmental review, sub-activities Determined to have no significant adverse impacts	*Negative determination(s)*
☒ After environmental review, sub-activities determined to have no significant adverse impacts, given appropriate mitigation and monitoring	*Negative determination(s) with conditions per 22 CFR 216.3(2)(iii)* Civil Works Civil Works in Progress E&M Works
☐ After environmental review, sub-activities determined to have significant adverse impacts	*Positive determinations(s)*

Confidential information redacted

Confidential information redacted

Executive Summary

The Energy Policy Program (EPP) is a multi-year, United States Agency for International Development (USAID)-funded initiative to increase power generation, improve transmission capacity and reliability. EPP works with selected energy enterprises to assist the Government of Pakistan's sector reform efforts. The Pakistan Water and Power Development Authority (WAPDA) requested that USAID assist in expediting the commissioning and completion of the run-of-river Allai Khwar Hydroelectric Power Project (AKHP or the 'Project') in Khyber Pakhtunkhwa (KP) Province. USAID is currently assessing what work remains, and has decided to fund AKHP's completion. The USAID has assessed the works that remain and has decided to fund the AKHP, and is reviewing the costs and requirements to for commissioning and completion of the Project. In order to meet regulatory requirements, USAID must ensure that the environmental assessment of the Project is compliant with the national laws of Pakistan, international best practice, and U.S. environmental regulations (22 CFR 216); and that implementation has been in accordance with agreed-upon environmental mitigation and monitoring measures. USAID's IEE (Tracking #: OAPA-14-Jan-Pak-0017) states that the ongoing construction activity will result in a *Negative Determination with Conditions* for completion AKHP and associated power transmission lines. The conditions include the use of environmentally sound materials and safe construction practices, monitoring and evaluation, and preparation of specific Environmental Mitigation and Monitoring Plan for the activity.

AKHP is located in KP's remote Battagram district with the diversion weir on the Allai Khwar, a left bank tributary of the Indus River, and the powerhouse is located on the left bank of the Indus River. The Project's maximum designed power output is 121 megawatt (MW); and it will ultimately be able to produce approximately 463 gigawatt hours (GWh). The Project began generating electricity in March 2013[1], and currently operates under the Defect Liability Period with some work still to be completed and the weir is connected to the powerhouse via a pressure tunnel that is 2,359 meters (m) in length, and 2.2 m in diameter. A 310 m diversion tunnel was built on the Allai Khwar during the construction period to divert the original flow of the Khwar, and to provide a dry environment to allow for construction of the weir structure.

The direction of Allai Khwar is nearly parallel to the Indus river, but flows in the opposite direction. The elevation of the Allai Khwar at the wier is much higher than the elevation of the powerhouse on the Indus River and a gross head of nearly 700 m is available for hydropower generation. This will be achieved by diverting water from the Allai Khwar to the Indus River through a tunnel under a narrow ridge between the two valleys.

This Rapid Environmental Analysis (REA) was carried out to evaluate the impacts of Project design, construction and operation on the physical environment, terrestrial ecological resources, and the socioeconomic environment. This exercise analyzed the impacts discussed in WAPDA's EIA, the assessment carried out by the Team, and comments from community and institutional stakeholders concerning the impacts identified. This exercise also summarized the current EHS mitigation, monitoring, and supervision on site. During the field visit, field documents such as accident registers, health and safety guidelines and environmental mitigation and monitoring documents were also reviewed where available. Interviews were conducted with WAPDA staff working on site (guards, cleaners, engineers, and administrative staff). Separate meetings with WAPDA officials in Besham were also conducted to collect useful information on AKHP.

The field assessment revealed that the security situation in the area is of concern. The primary source of the security threat is perceived or real grievances from the community directed against the Project; and the ability of Project Management to address them. However, the Team observed

[1] WAPDA, Projects for USAID Assistance (Ongoing – New) for 2013 – 2018, October 2013

that the powerhouse and other facilities are secure, and there is limited possibility for a breach. During consultations in the adjoining areas, it was noted that there were no potential grievances among the locals regarding the powerhouse that may lead to a serious security situation. The local security guard at the powerhouse reported that incidents of road blockages by local inhabitants were common, and they mainly demanded free or subsidized electricity. Local inhabitants also complained that WAPDA had no community liaison officer.

An Environmental Mitigation and Monitoring Plan (EMMP) was developed for the design and construction phases, and is based on the REA. It summarizes the mitigation and monitoring plans, institutional arrangements and strengthening requirements, training requirements, occupational safety measures, and environmental and social audit requirements. Relatively minor mitigation recommendations, and associated monitoring and monitoring indicators are required. However, a major recommendation in the EMMP is institutional strengthening, and restructuring of the Environmental Management Unit and associated monitoring.

1. Introduction

1.1 Background

The Energy Policy Program (EPP) is a multi-year, United States Agency for International Development (USAID)-funded initiative to increase power generation, decrease losses and increase cost recovery in Pakistan's power sector by working with selected energy infrastructure and facilitating the Government of Pakistan's (GOP) reform efforts by providing technical assistance and new technology. The program supports the joint goals of the United States Government (USG) and the Government of Pakistan (GOP) in reforming the power sector, and is designed to address Pakistan's chronic electricity shortage.

The Pakistan Water and Power Development Authority (WAPDA) has requested that USAID assist in expediting the commissioning and completion of the run-of-river Allai Khwar Hydroelectric Power Project (AKHP or the 'Project') in Khyber Pakhtunkhwa Province (KP) (Figure 1). The Project was originally co-funded by the Islamic Development Bank (IDB) and WAPDA. WAPDA does not have sufficient resources to complete the Project, and the GOP has not disbursed the funds that were intended to be allocated to WAPDA under the annual Public Sector Development Programs (PSDP).

USAID has assessed the work that remains, and has decided to fund the AKHP, and is reviewing the costs and requirements for final commissioning an completion of the project. In order to meet regulatory requirements, USAID must ensure that the environmental assessment of the Project is compliant with the national laws of Pakistan, international best practice, and U.S. environmental regulations (22 CFR 216); and that implementation has been in accordance with agreed-upon environmental mitigation and monitoring measures. USAID's Initial Environmental Examination (IEE) (Tracking #: OAPA-14-Jan-Pak-0017) states that the ongoing construction activity will result in a *Negative Determination with Conditions*[2] for completion of AKHP and associated power transmission lines. The conditions include the use of environmentally sound materials and safe construction practices, monitoring and evaluation, and preparation of specific Environmental Mitigation and Monitoring Plan for the activity.

To that end, USAID has requested a Rapid Environmental Analysis (REA) of the Project. Advanced Engineering Associates International, Inc. (AEAI), USAID's implementing partner for EPP, engaged the services of Hagler Baily Pakistan (HBP) to conduct the REA.

[2] Section 2.6 of this report provides a discussion of the USAID procedure for environmental assessment of USAID funded projects

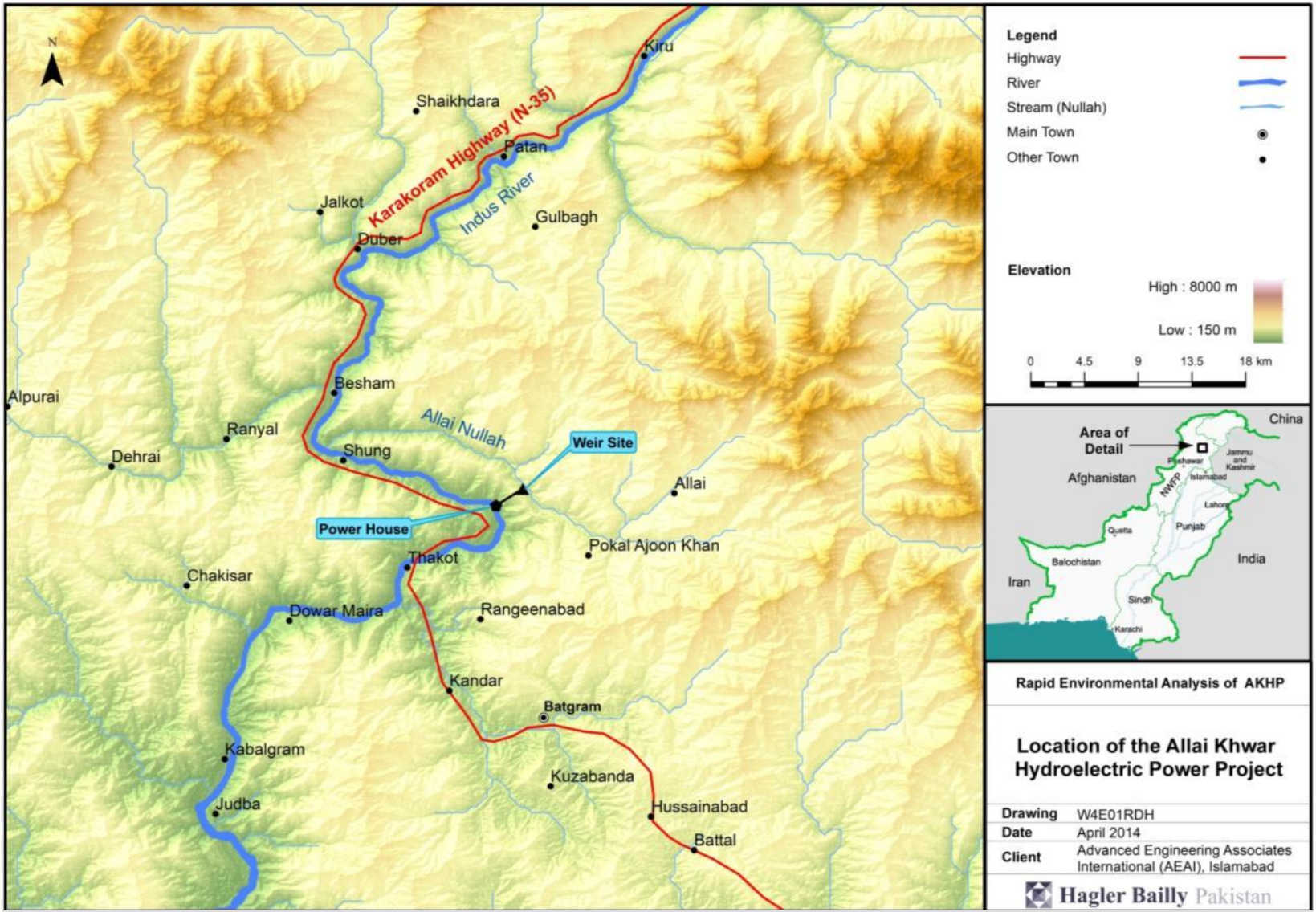

Figure 1: Location of the Allai Khwar Hydroelectric Power Project

1.2 Objectives and Scope of the REA

The Scope of Work (SOW) for the project is provided in Annex I. The SOW calls for a "very diligent and comprehensive 'desk study' to investigate project records and describe the basis and justification for the design, delay in construction, and the cost overrun with particular focus on the approved projects' Environmental Impact Assessments (EIA), and implementation of and compliance with environmental mitigation and monitoring measures, established in the EIAs, and environmental and social issues and the damages caused due to 2010 floods".

Based on the technical requirements of the SOW, the following represent the broad objectives for the REA:

Objective 1: Determine whether the Project has been designed (siting and operation) and constructed in compliance with national environmental laws.

Objective 2: Determine whether the Project design and operation plan conforms to international best practice and, in particular, with USAID's 22 CFR 216 (U.S. Government's environmental regulations) and identify gaps, if any.

Objective 3: Determine whether all mitigation measures identified in the environmental reports for Project design and construction have been implemented, and whether the measures are adequate to address potential adverse environmental impacts under national laws and international best practices.

Objective 4: Determine whether any environmental liabilities have been created during the construction phase of the Project.

Objective 5: Clearly identify all measures that are required to meet the obligations of the Project under national laws; and whether environmental approval of the Project by the KP Environmental Protection Agency (EPA) has been obtained. Address any environmental liabilities, and bridge the gaps identified, if any, in Objective 2.

Objective 6: Verify or provide the cost of implementing the measures identified in Objective 5.

Objective 7: Evaluate other issues, including security, and provide high-level comments on issues such as construction cost overruns and any identified design flaws.

Section 5.0 of the SOW provides the specific technical requirements for the REA, while Table 1 demonstrates how these requirements are addressed.

Table 1: Addressing the Specific Technical Requirements of Scope of Work

Specific Technical Requirement from the SOW	Where Addressed
Complete review of the PC-1s as revised and/or amended, feasibility studies and other relevant project documents. Collect secondary data from relevant sources to compare with the information available in current project documents.	Section 1 Section 4 and secondary information is referred to in Section 5.
Review of the project, its objectives, and a statement of economic and social benefits.	Project Description appears in Section 3, and benefits in Section 5.9 (Beneficial Social and Environmental Impacts)
Review the engineering documents and ongoing work to determine the cost of the work remaining based on current rates.	Section 3.7 Technical Review of AKHP
Review the requirements of IEE (Tracking #: OAPA-14-Jan-Pak-0017) and 22 CFR 216, as well as the required identification of new significant environmental effects detected during the REA.	Review of the requirements of the IEE appear in Section 1.4.2, and new environmental effects in Section 5
Determine the inspection and reporting already completed to determine compliance with existing requirements established in the approved EIAs and signed contracts.	The inspection and reporting already complete was assessed through document reviews, a site visit and consultations. The results are summarized in Section 5 REA
Review the safety requirements, meet with stakeholders, collect environmental and social data, collect designs and cost estimate documents from WAPDA, etc.	Meetings with community and institutional stakeholders, and collection of environmental and social data were carried out during the site visit. The data collected is summarized in Section 5
Review the projects siting/design impacts identified in WAPDA's IEE, and identify any additional impacts with project siting/design.	Project design impacts identified in the Project EIA are summarized in Section 5.3, and additional impacts are identified in Section 5.4
Carry out engineering, environmental and social review/ survey to verify the costs, designs, environmental and social compliance issues, flaws, construction adequacy, and economic impact of the project.	Engineering review (Section 3.7) and environmental and social review (Section 5.3-5.12)
Review details of the security situation and identify local tribal leaders who could serve as contact points for ensuring security arrangements.	Details of the security situation are described in Section 6, and identification of local tribal leaders appears in Section 6.7
Describe the areas as they currently exist with the ongoing construction of the hydroelectric power project, transmission lines, etc. This task will require onsite assessment in the field, and should cover different areas that impact the environment, such as physical, biological, climate, water resources, geology and socioeconomic factors. Address any resettlement and land acquisition, cultural heritage, and indigenous peoples-related issues	Covered in detail in Section 5 of the REA

Specific Technical Requirement from the SOW	Where Addressed
Review all EIA/EAs, EMMPs and other environmental documents, including compliance and performance monitoring reports that were prepared and approved from 1999-2010, and conduct an independent rapid environmental due diligence analysis to determine: • The main environmental and social effects of the Project, both in the Project area and in the surrounding area; and the timescale of the impacts, the defined mitigation and monitoring measures, and compliance. • Environmental mitigations required and the inspection and reporting already complete to determine compliance with existing requirements established in the approved EIAs and signed contracts. • Evaluate the understanding of environmental mitigation and monitoring requirements by the Project implementation and construction staff. • Evaluate the existing environmental and social problems associated with the development of the hydroelectric power project that should be resolved as they result in adverse environmental and social impacts. • The size and extent of the impacts, both adverse and beneficial, (the effectiveness of the mitigation measures should be based as much as possible on quantitative data rather than qualitative assessments). • Any potential impact on human health, social fabric of communities, etc. • The impact on rare species of plants or animals in the area. • Appropriateness of the construction and operation practices, on-going supervision as well as implementation of environmental mitigation and monitoring measures (and Contractor's capabilities) as proposed in the original, approved IEE/EA/EIA. • The significance of existing and potential adverse environmental and social impacts due to the construction and operation of the hydroelectric power project and associated infrastructure, and update or develop an Environmental Monitoring and Mitigation Plan (EMMP) for each project with a budget and responsibilities that should comply with GOP and USAID/USG environmental regulations and international best practices.	Review of Project EIA is summarized in Section 5 according to the design, construction and operation stage impacts. Environmental mitigations required are presented in Section 7.
Based on the above, prepare a summary for each project addressing the environmental issues, positive or negative impacts, and propose mitigation and monitoring measures (in tabular form) for the scope of the activities under both projects in their area of influence. Highlight any changes in the environmental conditions since the existing (original) reports were written and commencement of construction	Provided in Section 7 EMMP
Conduct an independent social assessment to determine: Those groups that have benefited and those that have been left disadvantaged by the Project, with particular focus on women. Identify any pending resettlement/land-take/legal claims/compensation issues.	Social Assessment in Section 5.11 and re-settlement issues discussed in Section 5.3
Identify responsibility for ongoing operations and maintenance, and provide suggestions on the best approach to ensure compliance.	Section 7.3.2
Review and report on the on-going compliance with environmental monitoring requirements of the existing EAs	Section 5 and in tables in Section 7 and Appendix B
Identify mitigating measures that may be necessary to ensure project completion and ongoing operations and maintenance, and how they should be incorporated into the Project's design.	Section 7

Specific Technical Requirement from the SOW	Where Addressed
Draft a monitoring and evaluation scope of work to ensure that the Project is successfully completed, expected impact is attained, mitigating measures are implemented, and potential issues are avoided.	Section 7
Identify further assessments that may be necessary in order to determine the Project's impact and viability.	Section 8 (Conclusions)
Review the comments from USAID Environmental Officers and address these concerns.	-

1.3 Project Overview

AKHP is located in KP's remote Battagram district on the Allai Khwar, a left bank tributary of the Indus River (Figure 2). The Project is accessible by road, and is 245 kilometers (km) from Islamabad, and 270 km from Peshawar, the provincial capital. The Project's maximum designed power output is 121 MW. Upon commissioning, it will be able to produce approximately 463 GWh, out of which 160 GWh will be available during a 4 hour period of the day when the demand is high, known as the peak demand. The Project was originally approved by the Executive Committee of the National Economic Council (ECNEC)[3] on September 2, 2002, and a revised cost for the project was approved on August 20, 2009. Power from the Project will be transmitted to the national grid through a 220 kilovolt (kV) double circuit transmission line, which will also transport power from the Khan Khwar and Duber Khwar hydroelectric power projects (two other projects in the vicinity of the AKHP).

The Project began generating electricity in June 2013, and is currently operates under the Defect Liability Period[4] with some remaining work to be completed.

1.4 Review of the Past Environmental Assessment

1.4.1 Review of Project EIA

An EIA for the Project was prepared in May 2000[5] and submitted to KP EPA. This document is referred to as the "WAPDA EIA" in this report, or where the context does not suggest otherwise, simply as the "EIA." The major findings of the review for the WAPDA EIA include:

- Baseline information and data is not sufficient to fully characterize the pre-existing environment.
- The EIA largely addresses impacts associated with construction.
- The monitoring plan is general and does not address the detailed environmental monitoring required to detect potential environmental degradation.
- The responsibility of environmental monitoring is incorrectly assumed to be the responsibility of other government departments, such as those of fisheries and wildlife.
- Details on how the mitigation and monitoring plan will be implemented are not present in sufficient detail (e.g. details on the proposed Environmental Management Unit, functions of environmental staff, and how it will operate have not been provided).

[3] ECNEC is the highest decision-making body of the Government of Pakistan for approval of development projects. It is headed by the prime minister of the country. All projects exceeding PKR 500 million in cost must be approved by this body. (Government of Pakistan, Planning Commission, Planning and Development Division, Islamabad. *Handbook on Planning Commission Government of Pakistan*, May 2008. www.pc.gov.pk/organization/Handbook-Planning%20Commission.pdf. Accessed May 11, 2014)

[4] A set period of time after the completion of the construction of a project during the owner of a project has the right to return the site to the contractor in case of any defects in the project construction and the contractor is contractually bound to remedy the defects.

[5] Feasibility Study of Allai Khwar Hydropower Project, Daily Storage Alternative, Appendix 6, Environmental Impact Assessment, May 2000. Programme for National Hydropower Development, Government of Pakistan, Ministry of Water and Power in collaboration with GTZ, German Agency for Technical Co-operation.

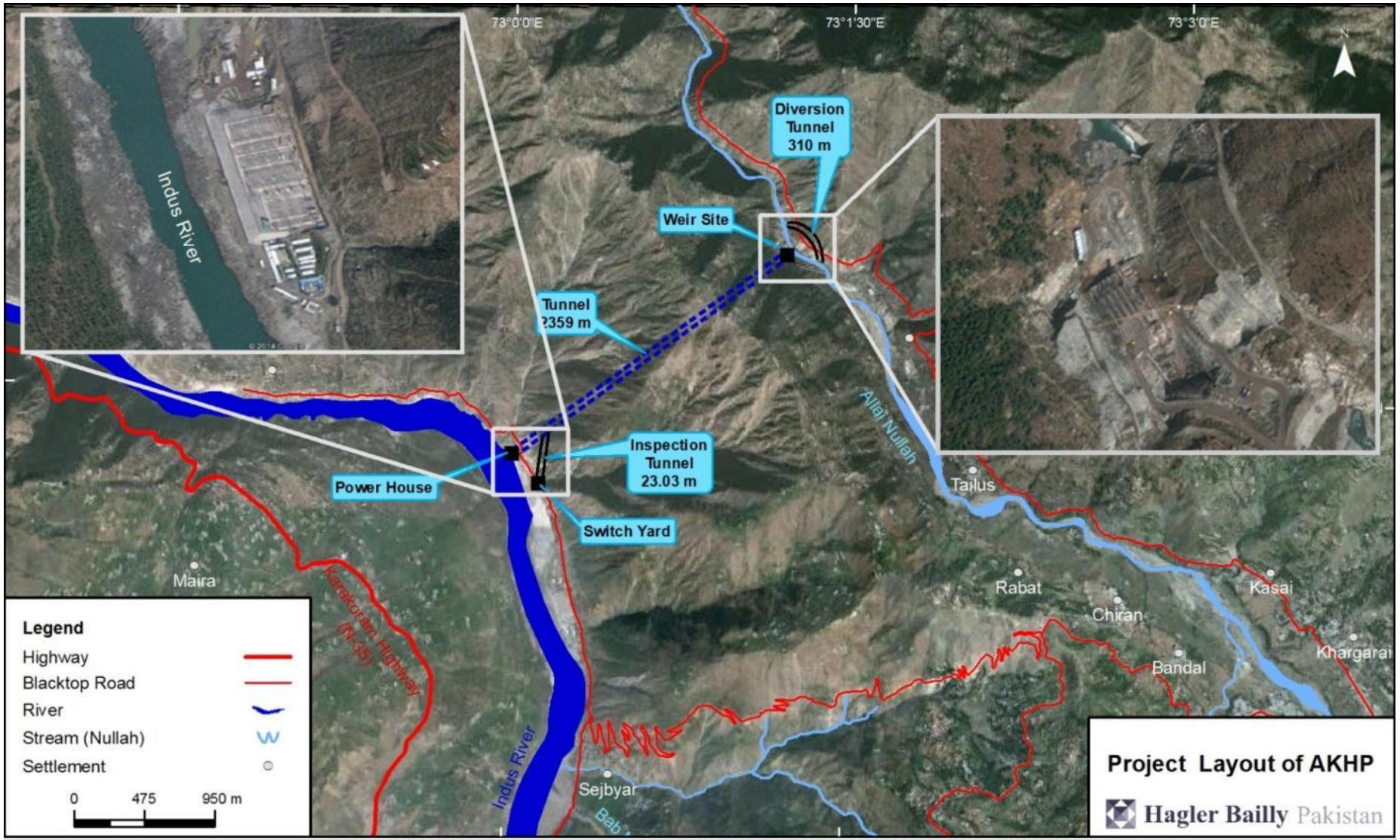

Figure 2: Project Layout of AKHP

1.4.2 Review of USAID's IEE of the Project

USAID's IEE (Tracking #: OAPA-14-Jan-Pak-0017) states that the ongoing construction activity will result in a Negative Determination with Conditions for completion of the two run-of-River projects and associated power transmission lines. The conditions will include the use of environmentally sound materials and safe construction practices, monitoring and evaluation, and preparation of specific Environmental Mitigation and Monitoring Plan (EMMP) for the Activity. A paid Environmental Assessment (REA) is required subsequent to the approval of the IEE by BEO-OAPA. The REA has the following requirements:

- Review the environmental reports and any conditions under the approved Environmental Assessments for both run-of-river projects; and prepare, as part of each project, positive or negative impacts and proposed mitigation and monitoring measures for the scope of activities under each project. The REA should highlight any changes in the environmental conditions, and highlight issues that have arisen since the existing reports were written and construction commenced.
- Describe the areas as they currently exist with the on-going construction of the run-of-river hydroelectric power plant and transmission lines. This task will require an on-site assessment, and should cover different factors that impact the environment (physical, biological, climate, water resources, geology, and socioeconomic). Construction and operation practices, ongoing supervision, as well as implementation of environmental mitigation and monitoring measures (and the Contractor's capabilities) as proposed in the approved EMMPs should be reviewed and documented for compliance with approved, new legislation (e.g. Seismic Code, etc.). The REA should also determine the significance of existing and potential adverse environmental and social impacts due to the construction and operation of the projects and associated infrastructure, and update or develop an EMMP for each project.
- A detailed EMMP with budget and responsibilities that should comply with GOP and USAID/USG environmental regulations and international best practice.
- If the completed REA indicates the potential for significant environmental and social impacts, an EA process will be launched in consultation with the A/COR and MEO/DMWO, and with the concurrence of REA/OAPA and BEO/OAPA. The process will follow the requirements set forth in 22 CFR 216.6.
- All activities will be completed in compliance with Pakistan's environmental, OHS, construction regulations, standards, norms and guidelines, national obligations under ratified international environmental agreements, and conditions established in the approved EAs for each individual project. Absent this, activities should be completed in accordance with international best practices appropriate to the seismicity levels in Pakistan and in the projects' respective districts. This should be acceptable to USAID.

1.5 Overview of other Documents

A list of the documents reviewed for the REA is presented in Table 2.

Table 2: List of Documents Reviewed

Document Type	Document
PC-I (2nd Revision)	Title: PC-I Proforma for Allai Khwar Hydropower Project (121 MW) (2nd Revision) Date: February 2013 Organization: General Manager Projects (Northern Areas), WAPDA, Hattian, District Attock File Name: AKP Rev (PC-I).PDF, Pages (in PDF): 113

Document Type	Document
EIA (Feasibility Study Appendix)	Title: Feasibility Study for Allai Khwar Hydropower Project Appendix 6 Environmental Impact Assessment Date: May 2000 Organization: Programme for National Hydropower Development in collaboration with German Agency for Technical Co-operation File Name: EIA-Allai.PDF, Pages (in PDF): 70
Feasibility Study	Title: Feasibility Study for Allai Khwar Hydropower Project Daily Storage Alternative Main Report Vol 1 of 2 Date: May 2000 Organization: Government of Pakistan, Ministry of Water and Power in collaboration with German Agency for Technical Co-operation, Pages (in hard copy): 248
	Title: Feasibility Study Allai Khwar Hydropower Project Daily Storage Alternative Main Report Vol 2 of 2 Date: May 2000 Organization: Government of Pakistan, Ministry of Water and Power in collaboration with German Agency for Technical Co-operation
Safety and Emergency Plan	Title: Allai Khwar Hydropower Project Safety Plan and Emergency Procedure Date: May 2004 Organization: Pakistan Water and Power Development Authority, Pages (in hard copy): 31
Drawings	Title: Allai Khwar Hydropower Project Atlas of Drawings Date: December 2003 Organization: Pakistan Water and Power Development Authority, Pages (in hard copy): 100
Progress Reports	Title: Indus Tributaries High Head Hydropower Complex Project Monthly Progress Report No.128 Date: January 2014 Organization: Water and Power Development Authority (WAPDA) File Name: Monthly Progress Report-Jan 2014.PDF, Pages (in PDF): 144
	Title: Indus Tributaries High Head Hydropower Complex Project Monthly Progress Report No.127 Date: December 2013 Organization: Water and Power Development Authority (WAPDA) Pages (in hard copy): 128
	Title: Indus Tributaries High Head Hydropower Complex Project Monthly Progress Report No.126 Date: November 2013 Organization: Water and Power Development Authority (WAPDA) Pages (in hard copy): 131
	Title: Indus Tributaries High Head Hydropower Complex Project Monthly Progress Report No.125 Date: October 2013 Organization: Water and Power Development Authority (WAPDA) Pages (in hard copy): 132
	Title: Indus Tributaries High Head Hydropower Complex Project Monthly Progress Report No.124 Date: September 2013 Organization: Water and Power Development Authority (WAPDA) Pages (in hard copy): 132
	Title: Indus Tributaries High Head Hydropower Complex Project Monthly Progress Report No.123 Date: August 2013 Organization: Water and Power Development Authority (WAPDA) Pages (in hard copy): 127

Document Type	Document
	Title: Indus Tributaries High Head Hydropower Complex Project Monthly Progress Report No.122 Date: July 2013 Organization: Water and Power Development Authority (WAPDA) Pages (in hard copy): 128
	Title: Indus Tributaries High Head Hydropower Complex Project Monthly Progress Report No.121 Date: June 2013 Organization: Water and Power Development Authority (WAPDA) Pages (in hard copy): 139
Initial Environmental Examination	Title: Initial Environmental Examination for Run of River Hydroelectric Power projects Date: 24th January 2014 Organization: USAID Pakistan File Name: OAPA 14 JAN PAK 0017 – Run of Rivers Hydroelectric Power Projects Completion and Commissioning.PDF, Pages (in PDF): 28
Status of Land Acquisition	High Head Hydropower projects- WAPDA-Besham Allai Khwar Hydro Power Project Status of Land Acquisition
KP EPA Letter	Letter from KP EPA communication no objection to on the application of Allai Khwar Hydropower Project to be considered as CDM projects (Dated 13/08/2010)
Punch List	Allai Khwar Hydropower Project Contract DC-02, LOT C&HS Punch List of Civil Works As on December 22-31, 2013

1.6 Organization of the Report

The report is organized as follows:

- **Section 1** (*Introduction*) provides the background to the current work−including the REA−,the objectives and SOW, overview of AKHP, and a basic review of the previous environmental assessment.
- **Section 2** (*Legal, Regulatory and Institutional Frameworks*) provides a summary of the legal instruments (at the international and national levels), standards, and guides that are utilized in carrying out the REA, and further utilized for the EMMP.
- **Section 3** (*Project Description*) provides a detailed project description for AHKP.
- **Section 4** (*Overview of Baseline Conditions*) provides an overview of the base conditions that existed before the Project and related activities commenced.
- **Section 5** (*Rapid Environmental and Social Assessment*) provides the analysis and results of the Rapid Environmental and Social Assessment, and reports the findings of the field visits.
- **Section 6** (*Security Assessment*) provides an assessment of current security issues and concerns.
- **Section 7** (*Environmental Mitigation and Monitoring Plan*) provides detail on the mitigation and monitoring, against issues and impacts identified in the WAPDA EIA, REA and utilizing other observations in the field visit, that need to be adopted and carried out to ensure project completion in an environmentally and socially responsible manner.
- **Section 8** (Conclusion) provides a summary of the conclusions of the rapid environmental and social assessment, security assessment, security assessment and mitigation and monitoring requirements.

2. Legal, Regulatory and Institutional Framework

This chapter provides a summary of the national and international legislation and guidelines that are relevant to the assessment of the Project's environmental components. The review of the legal and institutional framework and relevant laws helps identify the policy directives and required procedures to investigate social responsibility, environmental accountability and financial soundness of the Project. This chapter also discusses the compliance status of the Project against the laws that must be followed during implementation. The EIA prepared by WAPDA in May 2000[6] serves as the reference document to determine the Project's compliance status against applicable laws.

2.1 National Legislative and Regulatory Framework

2.1.1 Statutory Framework for Environment

The development of statutory and other instruments for environmental protection and management has steadily gained priority in Pakistan since the late 1970s. The *Pakistan Environmental Protection Ordinance 1983* was the first piece of legislation designed specifically for the protection of the environment. The promulgation of this ordinance was followed in 1984 by the establishment of the Pakistan Environmental Protection Agency, the primary government institution dealing with environmental issues. Significant work on developing environmental policy was carried out in the late 1980s, which culminated in the drafting of the Pakistan National Conservation Strategy. Provincial environmental protection agencies were also established at about the same time. The National Environmental Quality Standards (NEQS) were established in 1993. The enactment of the *Pakistan Environmental Protection Act 1997* (PEPA 1997) conferred broad-based enforcement powers to the environmental protection agencies. The publication of the *Pakistan Environmental Protection Agency Review of Initial Environmental Examination and Environmental Impact Assessment Regulations 2000* (IEE-EIA Regulations 2000) provided the necessary details on the preparation, submission, and review of IEE and EIA. In addition to the PEPA 1997, Pakistan's statute books contain a number of other laws that have clauses concerning the regulation and protection of the environment.

One of the key components of the 18th Amendment to the Constitution, passed by the parliament in 2010, was devolution of power from the federal to provincial governments. Through this amendment, the *concurrent legislative list* of the constitution was abolished, and all legislative powers on subjects included in the concurrent legislative list, which included environmental protection, were transferred to the provinces. Thus, after the passage of the 18th amendment, the federal government lost its power to legislate on environmental protection, and only provincial governments could make laws for the protection of environment. As PEPA 1997 was a federal law, the 18th Amendment made it necessary for the provinces to enact their own environmental protection laws. The KP government has drafted a law, however it has not been passed by the provincial assembly yet. Until the passage of the new law, PEPA 1997 will remain in force in KP.

2.1.2 Provisions of PEPA 1997

The PEPA 1997 is the basic legislative tool that empowers the government to frame regulations for the protection of the environment. The act is applicable to a broad range of issues and extends to air, water, industrial liquid effluent, marine, and noise pollution; as well as to the handling of hazardous waste. The articles of PEPA 1997 that have a direct bearing on the REA are discussed below.

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[6] Feasibility Study of Allai Khwar Hydropower Project, Daily Storage Alternative, Appendix 6, Environmental Impact Assessment, May 2000. Programme for National Hydropower Development, Government of Pakistan, Ministry of Water and Power in collaboration with GTZ, German Agency for Technical Co-operation.

2.1.2.1 National Environmental Quality Standards

Article 11(1) of the PEPA 1997 states that "Subject to the provisions of this Act and the rules and regulations made thereunder no person shall discharge or emit or allow the discharge or emission of any effluent or waste or air pollutant or noise in an amount, concentration or level which is in excess of the National Environmental Quality Standards."

NEQS have been established for gaseous emission, liquid effluent, ambient air quality, noise, and drinking water. From the date of enforcement of the NEQS, all projects, whether in operation on that date or constructed later, are required to comply with these standards.

The Project needs to comply with all applicable standards, and Project proponents and contractors should ensure that no activity results in the emission of pollutants and effluents exceeding limits as prescribed in NEQS.

The applicability of the NEQS to the Project is described in Table 3.

The review of the available documents with Project proponents indicates that regular monitoring was not undertaken for any of the parameters listed in Table 3, hence the compliance status during construction cannot be established.

Table 3: NEQS Applicable to the Project

NEQS	Applicability During Construction	Applicability During Operation	Effective Date
Gaseous Emission	All power generators	Any back-up generator	Original 1 Jul 1994 Revised 8 Aug 2000
Noise emission	All noise sources	Not applicable	26 Nov 2010
Emission from motor vehicles	All project vehicles	All project vehicles	1 Jul 1994
Noise from motor vehicles	All project vehicles	All project vehicles	1 Jul 1994
Ambient air quality	Changes in air quality of the surrounding are due to construction activities	Not applicable	26 Nov 2010
Liquid effluent	Sanitary waste and other liquid waste discharged to the environment	Sanitary waste and other liquid waste discharged to the environment	Original 1 Jul 1994 Revised 8 Aug 2000
Drinking water	Water supplied by the owners and contractors to staff	Water supplied by the owners and contractors to staff	26 Nov 2010

2.1.2.2 Preparation and Submission of EIA

Article 12(1) states that "No proponent of a Project shall commence construction or operation unless he has filed with the Federal Agency[7] an [IEE] or, where the project is likely to cause adverse environmental effects an [EIA], and has obtained from the Federal Agency approval in respect thereof".

[7] The term 'Federal Agency' is defined in the Act to mean the government agency which has the power or to which the powers have been delegated to implement the provisions of this act. In case of this Project, the concerned agency is the KP EPA.

Hydroelectric power generation projects with capacities greater than 50 MW require an EIA per the categorization of the IEE-EIA Regulations 2000. The law requires that the EIA must be submitted and approved by the provincial EPA before any construction activities can commence.

An EIA for the Project was prepared in May 2000.[8] It was submitted to KP EPA. WAPDA communicated that environmental approval was issued by KP's EPA, however it was unable to provide a copy of the approval.

It may be pertinent to point out a legal issue regarding submission of the EIA. The PEPA 1997 was enacted in December 1997. As stated above, environmental assessment of development projects was a mandatory requirement in the Act through Article 12(1). However, no procedural details for the implementation of Article 12(1) were provided by the Act. Article 12(6) of the Act states that "[t]he provisions of [Article 12(1)] … shall apply to such categories of projects and in such manner as may be prescribed." The term "prescribed" is explicitly defined in the Act to mean as prescribed by rules made under PEPA 1997. As the regulations that provided the categorization and procedures for submission and approval of EIAs was notified in June 2000,strictly speaking, the requirement for submission of EIAs to EPA did not exist when the EIA was prepared. However, when construction on the project started in 2005, the regulations were already notified.

2.2 Other Laws with Bearing on Environmental Performance

There are a number of other laws in Pakistan's statute books that have bearing on the environmental performance of the project. These are listed in the Table 4.

Table 4: Compliance Status of the Laws Relevant to the Project

Law	Description	Applicability to the Project
The Forest Act, 1927	This Act authorizes provincial forest departments to establish forest reserves and protected forests. The Act prohibits any person from: setting fires in the forest; quarrying stone; removing any forest produce; or causing any damage to the forest by cutting trees or clearing areas for cultivation or any other purpose without the express permission of the relevant provincial forest department.	The Project area does not include any forest reserve or protected forests established by the provincial forest department. Therefore, this law is not applicable to the Project
Land Acquisition Act, 1894	This Act is the primary law for acquisition of land and built-up properties for public interest in Pakistan, and also sets out procedures for land acquisition and payment of compensation to land-owners, including compensation fo any damage caused to their properties, crops and trees by a Project. However, it lacks the mechanism to address the complex issue of resettlement.	This law was applicable to the development of access roads and reservoir where land acquisition was required. During field visit and community consultations conducted by the Team, it was noted that adequate compensation was paid to the land-owners. WAPDA officials at the Project office in Besham provided a signed Memorandum of Understanding (MOUs) with the local population for land acquisition.

[8] Feasibility Study of Allai Khwar Hydropower Project, Daily Storage Alternative, Appendix 6, Environmental Impact Assessment, May 2000. Programme for National Hydropower Development, Government of Pakistan, Ministry of Water and Power in collaboration with GTZ, German Agency for Technical Co-operation.

Law	Description	Applicability to the Project
NWFP Wildlife Protection, Preservation, Conservation and Management Act, 1975 (NWFP Act No. V of 1975)	This law was enacted to protect the province's wildlife resources, directly, and other natural resources, indirectly. It classifies wildlife by degree of protection (animals that may be hunted on a permit or special license, and species that are protected and cannot be hunted under any circumstances). The Act specifies restrictions on hunting and trade in animals, trophies, or meat. The Act also defines various categories of wildlife-protected areas, such as National Parks, Wildlife Sanctuaries, and Game Reserves	The Project area does not include any protected wildlife species; therefore, this law is not applicable to the Project.
Fisheries West Pakistan. Ordinance XXX of 1961 Amended Vide NWFP Fisheries (Amendment) Ordinance 1982	The law prohibits the destruction of fish by explosives, poisoning the water, and hunting protected fish species. The law also forbids the use of net or fixed engine traps without a permit or license. The law grants power to Director General (DG) Fisheries to issue permits to catch fish. The ordinance protects the fish against 1) Destruction of fish by explosives, and 2) Destruction of fish by poisoning the water	This law was applicable to the Project, as Project staff could conceivably catch fish as subsistence food. The law also makes it obligatory to obtain a license from the Fisheries Department before commencing any fishing activities. However, during community consultation and interviews with the Project staff, it was noted that no fishing activities were carried in Allai Nullah and its tributaries

2.3 Environmental Guidelines

This section provides a brief introduction to both the national and international environmental guidelines that are relevant to the implementation of AKHP.

2.3.1 Guidelines for the Preparation and Review of Environmental Reports 1997

These guidelines on the preparation of environmental reports address Project proponents, and specify:

- the nature of the information to be included in environmental reports;
- the minimum qualifications of the EIA consultant;
- the need to incorporate suitable mitigation measures into every stage of Project implementation; and
- the need to specify monitoring procedures.

Terms of reference for the reports are to be prepared by the Project proponents, themselves. The reports must contain baseline data on the Project area, a detailed assessment, and mitigation measures.

2.3.2 Policy and Procedures for Filing, Review and Approval of Environmental Assessments 1997

These policies and procedures define the policy context and the administrative procedures that govern the environmental assessment process, from the Project pre-feasibility stage to the approval of the environmental report.

2.3.3 Guidelines for Public Consultation 1997

These guidelines deal with approaches to public consultation and techniques for designing an effective program of consultation that reaches out to all major stakeholders and ensures the incorporation of their concerns in the impact assessment.

2.3.4 Guidelines for Sensitive and Critical Areas 1997

These guidelines identify officially notified protected areas in Pakistan, including critical ecosystems and archaeological sites, and present checklists for environmental assessment procedures to be carried out within or near such sites. Environmentally sensitive areas include, among others, archaeological sites, biosphere reserves and natural parks, and wildlife sanctuaries and preserves. None of these are relevant to the Project area.

2.4 Environmental Regulatory Authorities

2.4.1 Environmental Protection Agency

The success of environmental assessments as a means for ensuring that development Projects are environmentally sound and sustainable depends in large measure on the capabilities of regulatory institutions responsible for environmental management. The institutional framework for decision-making and policy formulation relevant to environmental and conservation issues is described below.

The KP EPA was established in 1989. It is a monitoring and regulating agency with the following principal functions:

- Administer and implement the Act 1997, its rules and regulations.
- Review the IEE-EIA, preparation of procedures and guidelines.
- Preparation, revision and enforcement of NEQS (industries, municipalities and vehicular emissions).
- Establish and maintain laboratories, certification of laboratories, for conducting tests and analysis.
- Assist local councils/authorities and government agencies in execution of Projects.
- Establish system for surveys, monitoring, examination and inspection to combat pollution.
- Conduct training for government functionaries and industrial management.
- Provide information and education to the public on environmental issues.
- Publish annual state of the environment report. Survey qualitative and quantitative data on air, soil, water, industrial/municipal and traffic emissions.
- Take measures to promote environment related research and development activities.

2.4.2 Environmental Protection Council

The Pakistan Environmental Protection Council established in 1984 does not have regulatory powers over KP. After enactment of KP's environmental protection law, a provincial-level environmental protection council will be established. It will be the highest inter-ministerial statutory body in the province, and responsible for:

- formulating environmental policies;
- overseeing enforcement of environmental law;
- approving of the NEQS; and
- incorporating environmental considerations into development plans and policies.

2.5 International Treaties

Important international environmental treaties that have been signed by Pakistan and may have relevance to the Project are listed in Table 5. They concern climate change and depletion of the ozone layer; biological diversity and trade in wild flora and fauna; desertification; waste and pollution; and cultural heritage.

These treaties have no direct bearing on the Project. Wherever required, the federal or provincial governments have enacted laws to comply with the provisions of the treaties listed in this section. Thus, the Project is only obliged to comply with the pertinent laws.

Table 5: International Environmental Treaties Endorsed by Pakistan

Topic	Convention	Date of Treaty	Entry into Force in Pakistan
Climate change and the ozone layer	United Nations Framework Convention on Climate Change - the primary objective is the stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.	1992	1994
	Kyoto Protocol to the United Nations Framework Convention on Climate Change - enabled by the above Convention on Climate Change. It has more powerful and legally binding measures. It sets binding targets for 37 industrialized countries and the European community for reducing greenhouse gas emissions.	1997	2005
	Vienna Convention for the Protection of the Ozone Layer - acts as a framework for the international efforts to protect the ozone layer with a primary objective to protect human health and the environment against adverse effects resulting from human activities that modify or are likely to modify the ozone layer.	1985	1993
	The Montreal Protocol on Substances that Deplete Ozone Layer and associated amendments - enabled by the Vienna Convention, it is designed to protect the ozone layer by phasing out the production and consumption of a number of substances believed to be responsible for ozone depletion.	1987	1993
Waste and pollution	Basel Convention on the Control of Trans Boundary Movements of Hazardous Wastes and their Disposal - regulates the trans boundary movement of hazardous waste and other waste with a stated purpose to protect human health and the environment against the adverse effects from generation and management of hazardous waste and other waste. The Convention provides for three sets of measures with binding obligations. These are: Strict control of trans boundary movement of hazardous waste; Environmentally sound management of hazardous waste; and Enforcement and implementation of the provisions of the convention at international and national levels.	1989	1994
	International Convention on Oil Pollution Preparedness, Response and Co-operation	1990	1995
	Stockholm Convention on Persistent Organic Pollutants - seeks to protect human health and the environment from Persistent Organic Pollutants, which are chemicals that remain intact in the environment for long periods, become widely distributed geographically and accumulate in the fatty tissue of humans and wildlife.	2001	2008
	International Convention for the Prevention of Pollution from Ships (MARPOL) – is the main international convention that's covers prevention of pollution of the marine environment by ships from operational or accidental causes. The Convention includes regulations aimed at preventing and minimizing pollution from ships, both accidental pollution and that from routine operations, and currently includes six technical Annexes.	1983	

Topic	Convention	Date of Treaty	Entry into Force in Pakistan
Desertification	International Convention to Combat Desertification – with an objective to combat desertification and mitigate the effects of drought. It is supported by international cooperation and partnership arrangements, with the aim of achieving sustainable use of land and water resources and sustainable development in affected areas.	1994	1997
Biodiversity and the protection of plants and animals	Convention on Biological Diversity – covering ecosystems, species, and genetic resources and also the field of biotechnology. The objectives are: • conserve of biological diversity; • sustainable use of its components; and • fair and equitable sharing of benefits arising from genetic resources.	1992	1994
	Cartagena Protocol on Biosafety to the Convention on Biological Diversity - addresses potential risks posed by living modified organisms resulting from modern biotechnology.	2000	2009
	Bonn Convention on the Conservation of Migratory Species of Wild Animals - aims to conserve terrestrial, marine and avian migratory species throughout their range. It is concerned with the conservation of wildlife and habitats on a global scale.	1979	1987
	Memorandum of Understanding concerning Conservation Measures for the Siberian Crane - parties undertakes to provide strict protection to Siberian Cranes, and identify and conserve wetland habitats essential for their survival.	1998	1999
	Convention on International Trade in Endangered	1973	1976
	Species of Wild Fauna and Flora - to ensure that international trade in specimens of wild animals and plants does not threaten their survival.		
	International Plant Protection Convention (1997 Revised Text) - to prevent the international spread of pests and plant diseases. It requires maintenance of lists of plant pests, tracking of pest outbreaks, and coordination of technical assistance between member nations.	1951/52	1954
	Agreement for the Establishment of the Near East Plant Protection Organization - to establish the Near East Plant Protection Organization (NEPPO), which promotes international co-operation with a view to implementing International Plant Protection Convention.	1993	2009
	Plant Protection Agreement for the Asia and Pacific Region and amendments – establishes the Asia and Pacific Plant Protection Commission to review and promote the region's progress in the implementation of the Agreement. Trade in plants and plant products are regulated by certification, prohibition, inspection, disinfection, quarantine, destruction, etc., as necessary.	1955 (amend-ment 1967)	1958 (amend-ment 1969)
	Convention on Wetlands of International Importance especially as Waterfowl Habitat and associated protocols and amendments - to promote conservation and sustainable use of wetlands. The Ramsar List of Wetlands of International Importance now includes almost 1,800 sites (known as Ramsar Sites). There are currently 19 Ramsar sites in Pakistan.	1971 (amended 1987)	1976 (amended 1994)

Topic	Convention	Date of Treaty	Entry into Force in Pakistan
Cultural heritage	Convention concerning the Protection of the World Cultural and Natural Heritage - requires parties to adapt a general policy on the protection of the natural and cultural heritage, to set up services for such protection, to develop scientific and technical studies, to take appropriate legal, technical, scientific and administrative measures and to foster training and education for such protection.	1972	1976

2.6 USAID Environmental Procedures

This section provides policy directives and required procedures on how to apply Title 22 of the Code of Federal Regulations, Part 216 (22 CFR 216) to USAID's assistance process. These directives and procedures ensure that the assessment of the environmental consequences of all programs, activities, and substantive amendments are in full compliance with the requirements of this Federal Regulation; and implement the underlying legislation and out-of-court settlement.

Environmental sustainability is integral to USAID's overall goal, and therefore must be mainstreamed into all activities to achieve optimal results. Ultimately, this will avoid inadvertent harm to people and the environment. To meet this goal, USAID incorporates environmental considerations into results-based planning, achieving, and assessing and learning. This section defines what USAID and its operating units must do to integrate environmental issues into its programs, both to meet USG legal environmental obligations and to optimize economic and social development results. USAID's IEE (Tracking #: OAPA-14-Jan-Pak-0017) states that the ongoing construction activity will result in a Negative Determination with Conditions for completion of the two run-of-river projects and associated power transmission lines. The conditions include the use of environmentally sound materials and safe construction practices, monitoring and evaluation, and preparation of a specific Environmental Mitigation and Monitoring Plan for the Activity. An REA is required subsequent to the approval of the IEE by BEO-OAPA.

The Foreign Assistance Act, Section 117, requires USAID to develop procedures that take environmental impacts fully into account in their funded projects. FAA Section 118 was added, requiring any program or project affecting tropical forests to take full account of environmental impacts into consideration. Section 119 of the FAA includes parallel language applying to endangered species and biodiversity. These obligations are implemented through Title 22 (Foreign Relations) of CFR, Volume 1, Part 216, hereinafter referred to as 22 CFR 216.

22 CFR 216 includes USAID's procedures for undertaking Environmental Impact Assessments of the agency's funded programs. The procedures apply to every USAID officer who has a role in the agency's funded programs, and to every partner who seeks the agency's financial support for implementing development programs.

The basic requirements of 22 CFR 216 are:

- Every program, project, activity, or amendment must undergo an environmental impact assessment prior to the obligation of funds;
- Potential impacts must be considered, and mitigation measures or design changes must be incorporated; and
- The processes and procedures should be documented and made available to the public.

Further details of the procedure can be found on USAID's website
http://www.usaid.gov/our_work/environment/compliance/regulations-procedures

3. Project Description

This chapter provides a description of the Project. The information in the chapter is extracted from the EIA carried out by WAPDA (in collaboration with GTZ) in May 2000,[9] and the revised PC–I for the Project[10].

The Allai Khwar Hydropower Project (AKHP) is one of three projects to be built under "Vision 2025"[11].

3.1 Project History

The hydroelectric power generating potential at Allai Khwar was first recognized in the late 1980s. The subsequent history of the project is described in Table 6.

3.2 Project Justification

The energy requirements for different consumer sectors are increasing rapidly. Due to the shortfall between supply and demand, various industries have shuttered their operations, and the country has seen a major decline in its annual growth rates over the past decade.

The prevailing power shortage presents a serious constraint to economic growth. Power outages of six to eight hours can be attributed to growth in demand for power, poor management of electricity transmission and distribution systems in the public sector, electricity theft due to meager resources for adequate collection and enforcement, a shortfall in the supply of natural gas to the combined cycle Independent Power Producers (IPPs), the circular debt from withholding of payments by the government for fuel as well as power produced by the generating units, fluctuating prices of crude oil in international markets, and increasing electricity rates in the country. The peak summer shortfall in 2013 reached 6,000 MW, corresponding to nearly one-fourth of the estimated demand in the country. Put simply, Pakistan must generate more power to feed into the national grid. Any delay in adding of new generation capacity or fuel for existing plants will further widen the gap between supply and demand.

[9] Feasibility Study of Allai Khwar Hydropower Project, Daily Storage Alternative, Appendix 6, Environmental Impact Assessment, May 2000. Programme for National Hydropower Development, Government of Pakistan, Ministry of Water and Power in collaboration with GTZ, German Agency for Technical Co-operation

[10] General Manager Projects (Northern Areas), WAPDA, Hattian, District Attock, PC-I Proforma for Allai Khwar Hydropower Project (121 MW) (2nd Revision), February 2013

[11] "Vision 2025" is presented as Project justification statement in revised PC–I while discussing the provision of the Project in Public Sector Development Program (PSDP).

Table 6: Project History of Allai Khwar Hydroelectric Power Project

1987-1990	Sarhad Hydel Development Organization (SHYDO), in collaboration with the German Agency for Technical Cooperation (GTZ), prepared an inventory of hydroelectric power potential in KP. The study identified Allai Khwar as one of the most promising site.
1990-91	A conceptual design for the Allai Khwar Hydropower Project was prepared by FECTO, a private sector investor, with the assistance of WAPDA and GTZ for a probable capacity of 2×70 MW, with a possibility for installation of a third 70 MW unit in future.
1993-94	The first comprehensive feasibility study, named Allai Khwar Hydel Development, was conducted by Lahmayer International and Knight & Piésold for SHYDO. The study was financed by KfW of Germany. SHYDO also appointed a Panel of Experts. The study proposed a 163 MW hydropower plant by constructing a high dam, a large reservoir, and diversion of water from other streams. The proposed scheme was not considered economically, financially, and environmentally viable due to environmental issues associated with the proposal.
1999	On the advice of the Ministry of Water and Power, GTZ reviewed the proposal and proposed an alternate design where instead of a high dam, a weir of moderate size was proposed. This eliminated the large reservoir from the design. As a result, the capacity of the proposed plant was reduced to 121 MW, which would mainly be available for peaking. The main advantage of the revised design was significant reduction in environmental and social impacts, and also a reduction in cost to nearly half of the original design.
2002	The Project is approved by ECNEC.
2003	Work on detailed design of the Project commenced.
2005	Construction of the Project commenced.
2009	Revised cost of the Project approved by ECNEC

3.3 Project Objectives

The objectives of AKHP are to reduce the dependency on expensive imported oil for power generation, and to introduce affordable and renewable power generation methodologies. The project rationale also addresses the vision of WAPDA to increase the percentage of hydroelectric power in energy supply mix, and develop sustainable, environmentally friendly, and reliable low-cost power.

3.4 Project Location

AKHP is located on the Allai Khwar, a left bank tributary of the Indus River near Besham in KP's District Battagram. The Project location is shown in Figure 1 in Section 1.1.

AKHP is situated in the southern foothills of the Himalayan Massif. The elevation of the peaks in the area decreases from the northeast and southwest axis, ranging from 6,500 to 2,000 meters above mean sea level (m.a.s.l.). The high head hydropower project is facilitated by sharp rises in upstream slopes of all the tributaries of the Indus River, and a substantial augmentation of flows by snow melt during the late dry season.

The powerhouse itself is situated on the left bank of the Indus River (34° 50′ 46″ N, 73° 00′ 01″ E), is accessible by road, and is approximately 245 km from Rawalpindi, and 270 km from Peshawar. The weir is located tp the northeast of the powerhouse on the Allai Khwar (34° 51′ 31″ N, 73° 01′ 13″ E) at a geodesic distance of 2.366 km from the powerhouse. The weir is connected to the powerhouse via a pressure tunnel that is 2,359 m in length, and 2.2 meters (m) in diameter. A 310 m diversion tunnel was constructed on the Allai Khwar during the construction phase to divert the original flow of the Allai Khwar, and to create a dry environment to carry out construction of the weir structure. A general layout of AKHP is provided in Figure 2. A detailed layout of Allai weir and its components is in Figure 3.

Figure 3: Allai Weir Site

3.5 Project Components

AKHP has an installed capacity of 121 MW, corresponding to a designed maximum discharge of 21 cubic meters per second (m^3/s), at a mean gross head of 683 m achieved from a horizontal conduit of 2,359 meters. AKHP is capable of producing 463 GWh per year.

The description of the major structures and components of the Project appear in Sections 3.5.1 to 3.5.6, while the salient features of the Project are summarized in Table 7.

Table 7: Salient Features of the Project

Features	Details
Allai Khwar	
Catchment area at weir site	298 km^2
Mean annual discharge	14.02 m^3/s
Total annual flow	442 Mm^3
Hydrology	
Natural annual discharge of Allai Khwar	442×10^6 m^3/annum
Mean annual discharge of Allai Khwar	14.02 m^3/s
Mean expected annual bed load	10,000 tons/annum
Mean expected annual suspended load	2,000,000 tons/annum
Layout Characteristics	
Design discharge	21 m^3/s
Design capacity	121 MW
Maximum gross head	687 m
Minimum gross head	679 m

Features	Details
Reservoir	
Maximum operation level (dry season)	1,239 m.a.s.l.
Minimum operation level	1,231 m.a.s.l.
Maximum flood level	1,242 m.a.s.l.
Maximum fluctuation of reservoir level	8 m
Live volume	1.13×10^6 m^3
Dead volume	0.72×10^6 m^3
Total reservoir volume	1.85×10^6 m^3
Inundated area	180,000 m^2
Powerhouse	
Type of powerhouse	External powerhouse
Number of units	2 units (60.5 MW each)
Type of turbines	Vertical Pelton (6-nozzles each)
Rotation of units	500 rpm
Generator voltage	11 kV
Turbine level	554 m.a.s.l
Power and Energy	
Installed Capacity	121 MW
Firm capacity	81 MW
Mean annual peak energy	160 GWh
Mean annual off peak energy	303 GWh/annum
Total mean annual energy	463 GWh/annum
Plant factor	44%
Daily peak hours	4

3.5.1 Reservoir

The live storage of the reservoir required to achieve the four hours daily peak is met at the following reservoir levels:

Maximum Operation Level: 1,239 m.a.s.l.

Minimum Operation Level: 1,231 m.a.s.l.

3.5.2 Weir Structure

The weir structure located 2.366 km to the northeast of the powerhouse is based on the following criteria:

- Topography;
- Geology;
- Flood control;
- Seismicity in the region;
- Cost of the Project, that is, high dam versus low weir;
- Optimum size of the plant; and
- Daily peaking needs.

The diversion tunnel is designed to accommodate a peak flow of 570 m^3/s. The flow corresponds to a 10-year average recurrence interval (ARI) which, in turn, is equivalent to a 10% annual exceedance

probability (AEP). This means there there is 1% chance that the flow of 570 m^3/s will be exceeded in any one year.

The details of the weir structure appear in Table 8.

Table 8: Details of the Weir Structure

Components	Details
Type of Weir	Concrete Gravity Weir
Height of Weir above River Bed	32.5 m
Exclusion of Sediments	Sedimentation in the Reservoir and Sand Trap
Sediments Flushing	Live Volume Discharge (Q) > 110 m^3/s
Capacity of Flood Control	2,400 m^3/s
Design Flood for 1,000-years	1,200 m^3/s
Flood Control During Construction	570 m^3/s
Length of Diversion for construction	310 m
Inclined Steel Lined Pressure Tunnel	L = 236 m, D = 2.2 m
Design Discharge	21 m^3/s
Length of Tailrace	43 m

3.5.3 Conduit System

The conduit system of AKHP from the reservoir to the powerhouse consists of the following:

- Intake system and sand trap;
- Access tunnel from the weir to pressure tunnel;
- Pressure tunnel (2,359 m in length and 2.2 m in diameter). No surge tank was foreseen for the project; and
- The design mean head height of the conduit system is 683 m.

3.5.4 Powerhouse

The powerhouse, located on the left bank of the Indus River, consists of the following:

- An open powerhouse (instead of cavern);
- Two turbines at a distance of 12 m from each other, each with the capacity of 60.5 MW; and
- A 220 kV switchyard on the left bank of the Indus River to dispatch the generated power to the national grid.

3.5.5 Hydro-Mechanical Equipment

The design discharge of 21 m^3/s uses the arrangement of two Pelton turbines, each with a 60.5 MW capacity to generate the 121 MW of electric power at a rated turbine speed of 500 revolutions per minute (rpm). The design net head will vary from 687 m to 679 m, with the design head of 683 m at maximum discharge.

3.5.6 Electrical Equipment

The electrical equipment consists of the following:

- Two vertical shaft generators each with the capacity of 75 MVA are connected via 11 kV cables to the respective 78 MVA 11/120 kV block transformer located in a 220 kV outdoor switchyard connected to two outgoing transmission lines;

- Auxiliary supply for all power needs of the powerhouse is supplied through one 6.3 MVA 132/11 kV grid station transformer; and
- Control and protection devices.

3.6 Project Construction Cost

The cost of different phases and components of AKHP are provided in Table 9. A summary of the Project's capital costs is shown in Table 10.

Table 9: Project Costs

Components	Cost in First Revised PC–I[12] in (Million Rupees)	Cost in Second Revised PC–I in (Million Rupees)	Difference[13] in (Million Rupees)
Preliminary Works			
Environmental Impact Mitigation Cost	50.979	74.570	23.591
Improvement of Existing and Construction of New Access Roads	442.984	396.335	-26.649
Site Installation, Camps/Housing during Construction	72.235	112.235	40
Total	**566.198**	**583.140**	**16.942**
Civil works			
Reservoir and River Diversion	4,724.041	6,239.545	1,515.504
Weir Intake Area			
Pressure Shaft			
Powerhouse and Tailrace			
Permanent Residential Buildings/Stores/Workshops			
Hydraulic Steel Works	781.534	995.191	213.657
Hydro Mechanical Equipment	892.839	1273.134	380.295
Electrical Equipment	1,644.724	2,092.673	447.949

[12] The Planning Commission is a financial and public policy development institution of the Government of Pakistan. PC–I is the Planning Commission's proforma for development of public projects in production, infrastructure and social sectors. The form includes technical and financial information, project justification and its provision in Public Sector Development Programmes (PSDP). The proforma is filled and submitted to the Planning Commission by the project proponent for its approval and allocation of funds.

[13] The difference shows the variation in costs between first revised PC–I and second revised PC–I proformas. The negative sign before cost (if any) shows that the cost has been reduced after the second revision.

Components	Cost in First Revised PC–I[12] in (Million Rupees)	Cost in Second Revised PC–I in (Million Rupees)	Difference[13] in (Million Rupees)
Consultancy Services (Engineering and Supervision)			
Evaluation of Bids and Award of Contracts	264.417	380.059	115.642
Monitoring, Coordination and Approval of Construction Design, and Preparation of go ahead orders on behalf of the client for Implementation			
Inspection of Works, Construction Supervision and Progress Monitoring, Contract Administration and Control			
Supervision of Installation, Commissioning and acceptance Tests			
Training of personnel, Maintenance, Completion, Reports, As Built Drawings and Manuals			
Administration, Audits and Accounts	355.109	354.508[14]	-0.601

Table 10: Summary of Project Capital Cost

Component	Estimated Cost in (Million Rupees)		
	Local	Foreign	Total
Preliminary Works	583.140	0.000	583.140
Civil works	1,676.699	4,652.846	6,329.545
Hydraulic Steel Structures	239.690	755.501	995.191
Hydro-mechanical Equipment	25.842	1,247.292	1,273.134
Electrical Equipment	94.152	1,998.521	2,092.673
Transmission system	2,135.000	0.000	2,135.000
Synchronous Digital Hierarchy (SDH) System	0.000	0.000	0.000
Purchase of Vehicles and other Unspecified Items	200.000	0.000	200.000
Engineering and Supervision	145.027	235.032	380.059
Custom Duties	314.000	0.000	314.000
Administration, Audit and Accounts	354.508	0.000	354.508
Authority's Overhead	238.134	0.000	238.134
Base Cost	**6,006.192**	**8,889.192**	**14,895.384**
Interest During Construction	1,326.460	0.000	1,326.460
Total Project Cost	**7,332.652**	**8,889.192**	**16,221.844**

[14] The expenditure of this item up to January 31, 2013 was 296.880 M, and for the anticipated period it is estimated as 2% of the project works cost. 200.000

3.7 Implementation Arrangement

The implementation arrangements for the Project included the following:

- The project was initially identified by SHYDO in collaboration with GTZ between 1987 and 1991.
- The project was handed over to WAPDA for execution in 2001.
- WAPDA conducted site identification studies through Engineering Consultancy International Limited (ECIL) to determine the most suitable location for the construction of the weir at Allai Khwar and an associated powerhouse.
- After site selection, WAPDA contracted High-Head Hydropower Consultants NDC, Lahmeyer, Barqaab, BAK, PES, EGC, RC, IDC and DMC14 as consultants.
- The contactor was DEC Astron and VA Tech15.
- The donor was the Government of Pakistan14.

3.8 Technical Review of AKHP

The area where AKHP is located has seen two major natural disasters during the past 10 years—the 2005 earthquake and the 2010 floods. These events resulted in cost overruns for the projects. A brief description of the events following these natural disasters is discussed below.[16]

3.8.1 The 2005 Earthquake

The 2005 7.6 magnitude Kashmir Earthquake struck at 8:50 AM, local time, on October 8, 2005. The epicenter of the earthquake was located roughly 21 km northeast of Muzaffarabad, in Azad Jammu and Kashmir (34.493°N, 73.629°E). The epicenter was approximately 70 km southeast of the project site. Allai was one of the affected areas, where more than 2,000 people lost their lives.[17]

In light of the 2005 earthquake, an assessment[18] of the adequacy of earthquake design parameters for AKHP was carried out. While the assessment was independent, the results were similar to the previous seismic analysis. Nevertheless, a decision was taken to increase the earthquake resistance of AKHP's structures to accommodate the maximum credible acceleration (MCA) instead of the operational base earthquake (OBE). Increasing the earthquake resistance increased the project's costs, as additional material, such as steel and concrete, were required.

3.8.2 The 2010 Floods

No design changes were carried out following the 2010 floods. The design flow for AKHP's spillway was higher than the 2010 floods. Some visceral damage to the surface of the spillway was observed after the 2010 floods. While the spillway is not prone to major failure due to floods lower than the design flood, extremely large boulders carried by the flood waters caused some visceral damage to the spillway. The spillway required minor repairs; however, these repairs cost relatively little.

The major costs associated with the 2010 floods were due to the following:

- The floods caused a halt in construction activities and delayed the Project. Since the contractors were still mobilized, charges were claimed by them.
- A period of large scale land-sliding upstream of AKHP followed, where debris flow and sediment buildup were factors. During this period, additional costs were incurred for the continuous earth moving requirements.
- When construction resumed, contractor fees and construction material costs had increased due to inflation.

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[15] WAPDA, Projects for USAID Assistance (Ongoing – New) For 2013 – 2018, October 2013.

[16] The information is based on information provided during a meeting held between WAPDA (headed by General Manger Projects (Northern Areas) tenured while the AKHP was constructed), AEAI and the HBP teams.

[17] 2005 Earthquake: Voice of Allai, The Express Tribune Blogs, http://blogs.tribune.com.pk/story/8373/2005-earthquake-voice-of-allai/, accessed June 2014.

[18] High-Head Power Consultants, Allai Khwar, Duber Khwar and Khan Khwar High Head Hydropower Projects – Provision of Additional Copy of Engineer's Interim Seismic Hazard Assessment Report and Engineer's Recommendation for Upgrading of Earthquake Design Loading for Project Structures, October 21 2005

4. Overview of Baseline Conditions

4.1 Overview of Area

The Project area is located at approximately 34° 50′ north and 73° 00′ east. Allai Khwar is a left bank tributary of the Indus River. The confluence is situated on the downstream side of Besham village.

At the lowest section of its flow, the direction of Allai Khwar is nearly parallel to the Indus River, flows in the opposite direction. As Allai Khwar's descent is much steeper than the Indus River's, a gross head of nearly 700 m is available for hydropower generation. This is achieved by diverting water from the Allai Khwar to the Indus River, crossing the narrow ridge between the two valleys.

4.2 Physical Environment

4.2.1 Access

Access to the Project area from various places is listed in the Table 11.

Table 11: Access Routes to the Project Area

Access	Approximate Distance (km)
Peshawar – Besham Quila via Mingora	270
Peshawar – Besham Quila via Abbottabad (KKH)	325
Islamabad- Besham Quila via Abbottabad (KKH)	245
Peshawar – Mingora	140
Mingora –-Besham Quila	130
Rawalpindi – Mansehra	140
Mansehra – Thakot (KKH)	100
Thakot – Besham Quila (KKH)	30
Thakot - Banna (Truckable Road)	29
Besham – Quila -Banna (Jeepable Road)	30

4.2.2 Topography

The Allai Khwar is a left bank tributary of the Indus River. Its catchment lies to the north of Mansehra West District in the Northwest Frontier Province. The catchment area of the Allai Khwar is bordered by Indus Kohistan District to the north, almost in the center KP. The area is mountainous, with peak elevations of approximately 2,000 to 5,700 m a.s.l. The catchment is drained by the Allai Khwar, with its main tributaries being the Rupkani Khwar, the Batila Khwar, and the Gangwal Khwar. The river flows predominantly in an east-west direction, until its confluence with the Indus River near Besham Quila village of, which is located at the Karakoram Highway.

In its lower part, downstream of Bana, the Allai Khwar passes almost parallel to a pronounced bend in the Indus River. The Allai Khwar is separated from the Indus River by a mountain ridge approximately 3 to 4 km wide.

A topographical map of the area is given in Figure 4.

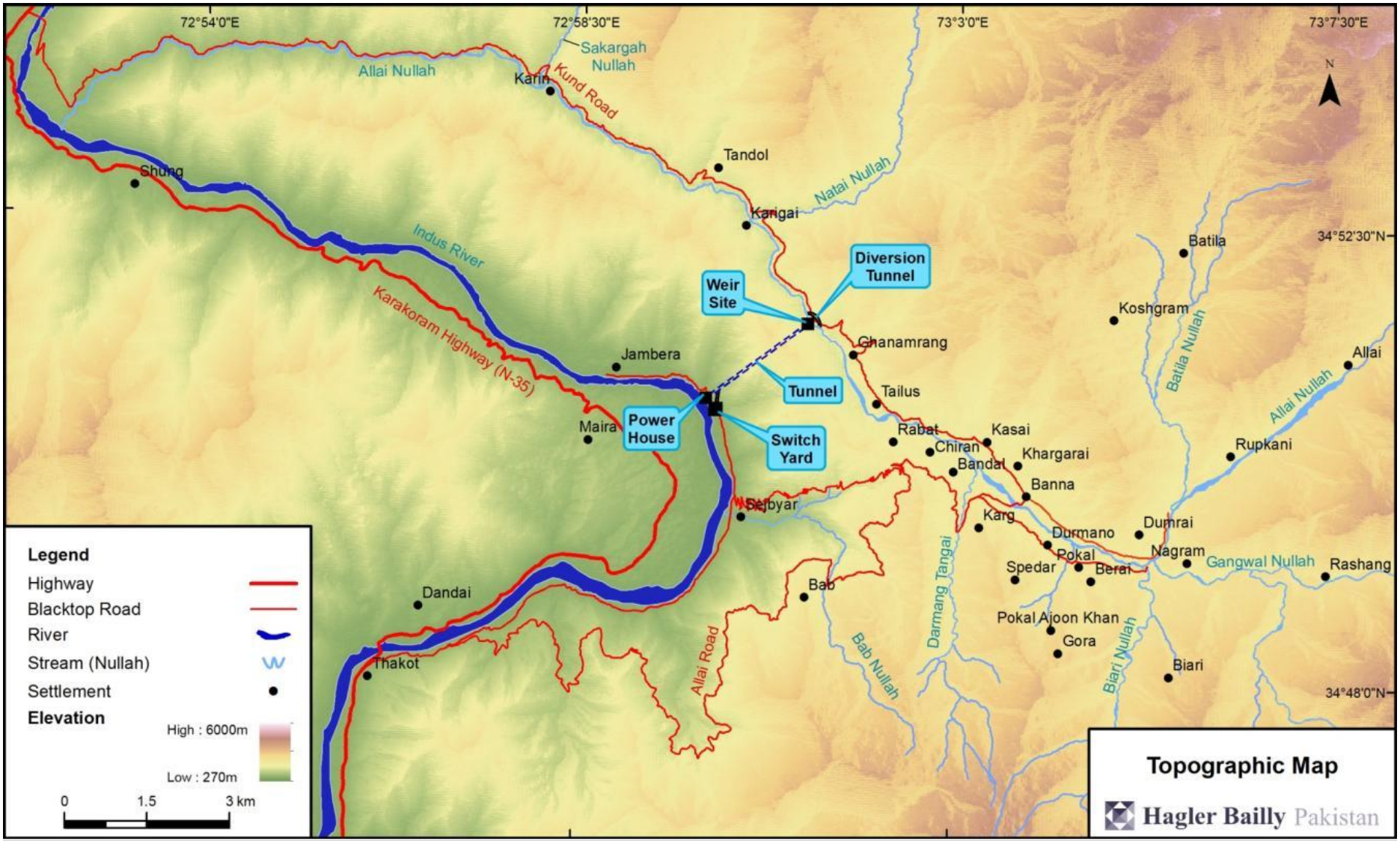

Figure 4: Topographic Map

4.2.3 Meteorology

The catchment of the Allai Khwar lies in a temperate zone. The run-off in the area is generated by snowmelt in the early part of the year, and by monsoon rains during the latter part of the year. Monsoon rains that commence in late June reduce the air temperature and increase humidity. The dam and reservoir site receive very light snowfall.

In Allai Khwar's catchment, precipitation increases with elevation up to about 1,500 m a.s.l., and starts decreasing above this level (Figure 5). The mean monthly precipitation in the Allai Khwar catchment, recorded by meteorological stations indicates higher levels of precipitation in March, July, and August due to monsoon and snowmelt.

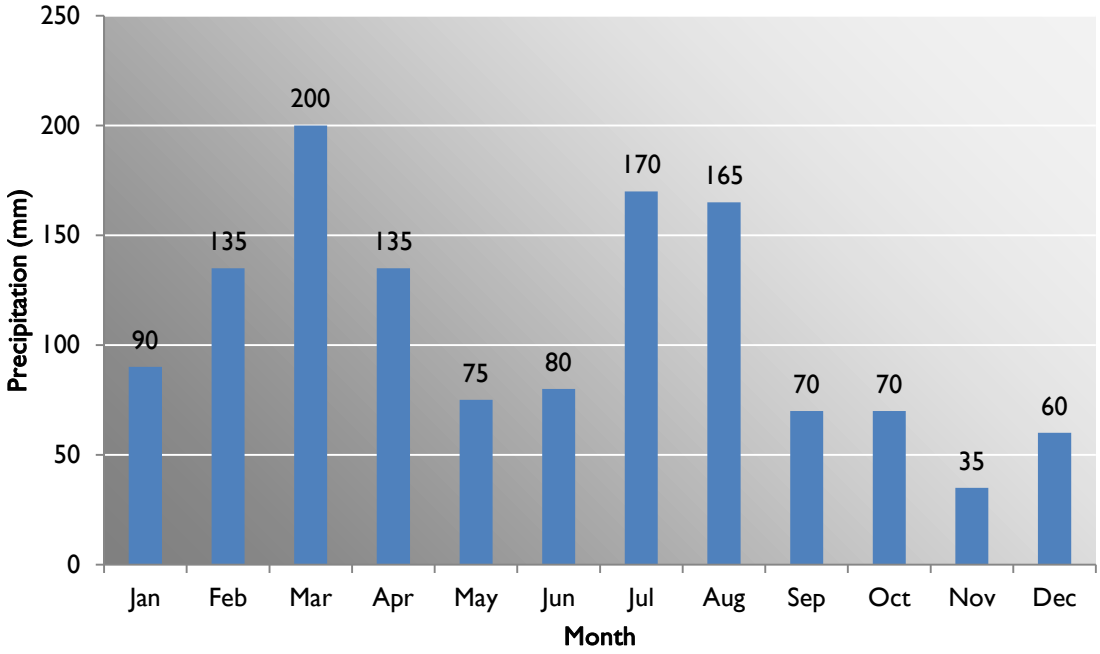

Figure 5: Mean Monthly Precipitation in Allai Khwar's Catchment

4.2.4 Geology and Seismicity

The area is geologically marked by intruded, folded and faulted metamorphic and igneous rocks. The presence of the Indus Suture parallel to the Allai Khwar, which passes through the upper reaches of its main confluences, resulted in a severe earthquake in December 1974, but the project area itself sustained no damage.

Within the project area, the tectonic setting is dominated by the presence of the Main Mantle Thrust (MMT)[19]. The MMT crosses the project area about one kilometer north of the dam site. The Thakot shear zone[20] was positively identified at the site. Therefore, a serious concern is the potential for seismic events, which could result in very high peak ground accelerations (PGA). As shown in Figure 6, prior to the 2005 Earthquake, the Allai region was categorized as Zone 2 under the

[19] The single Indus suture was bifurcated into two sutures in the western Ladakh which extends into Pakistan. The two sutures are differentiated as the Northern Megashear and the Main Mantle Thrust (MMT). The MMT is one of the important major tectonic scars on the northwestern terminus of the Himalaya.
(Tahirkheli, R.A. Khan . "The Main Mantle Thrust: Its Score in Metallogeny of Northern Pakistan." *Geological Bulletin* Vol. 13, no. 19 (1979): pp 193 - 198. http://nceg.upesh.edu.pk/GeologicalBulletin/Vol-13-1979/Vol-13-1979-Paper21.pdf Acessed on **7 May 2014**.)

[20] The Thakot-Allai road passes through several weak geological features/zones known as the Thakot Shear Zone. (Khan, Mohammad Abid. *Journal of Himalayan Earth Sciences* Vol. 47, no. 01 (2014): pp. 131-140. http://nceg.upesh.edu.pk/GeologicalBulletin/Vol-47(1)-2014/Vol-47(1)-2014-Paper11.pdf Accessed on **7 May 2014**)

Building Code of Pakistan[21]. Subsequent to the earthquake, the zoning was revised. Figure 7 shows that the Allai region was re-categorized as seismic Zone 3 after the 2005 earthquake.

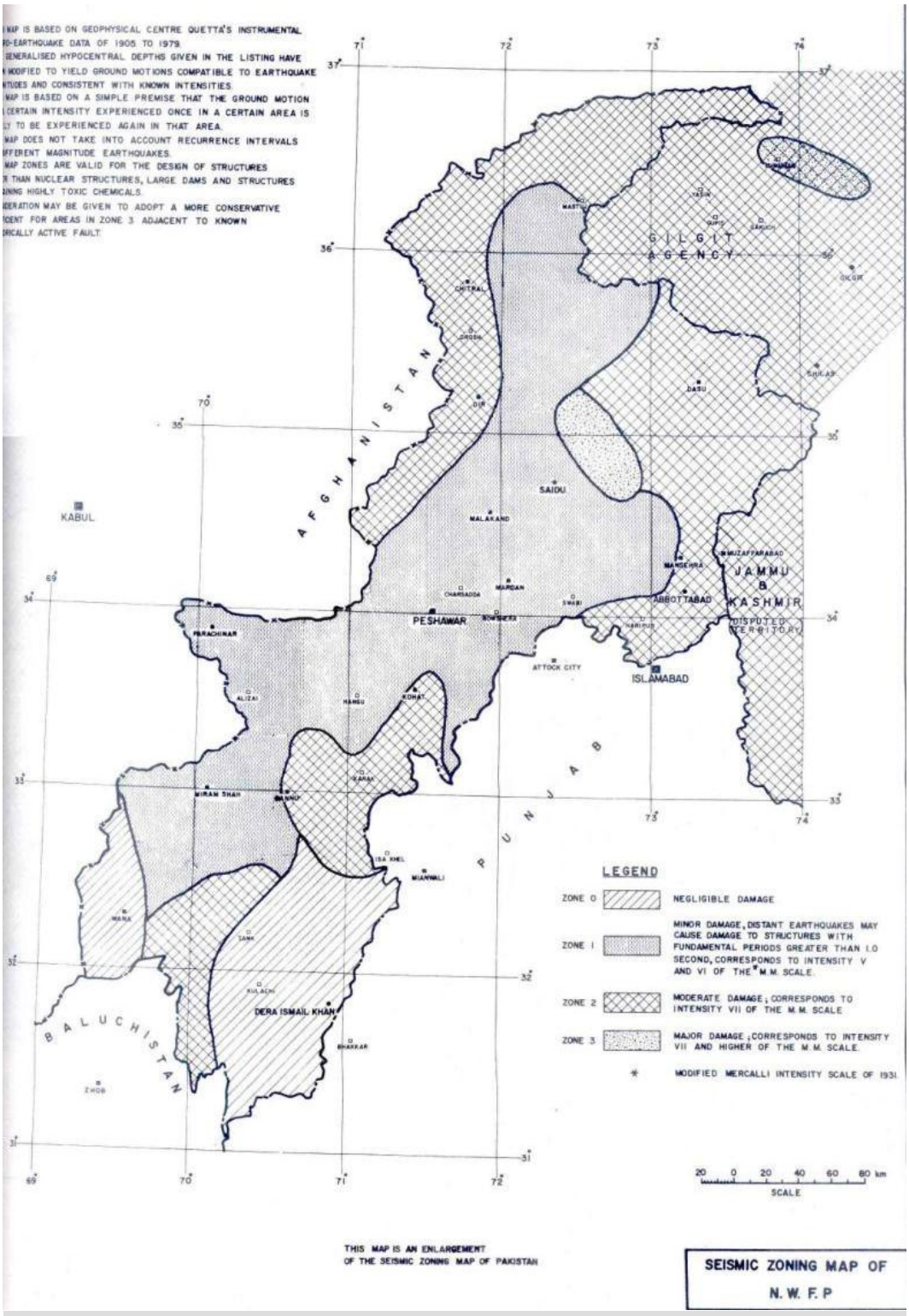

Figure 6: Seismic Zoning Map of Northern Pakistan Prior to 2005

Source: Government of Pakistan, Ministry of Housing and Works, Environment and Urban Affairs Division. Building Code of Pakistan. 1986

[21] Government of Pakistan, Ministry of Housing and Works, Environment and Urban Affairs Division. Building Code of Pakistan. 1986

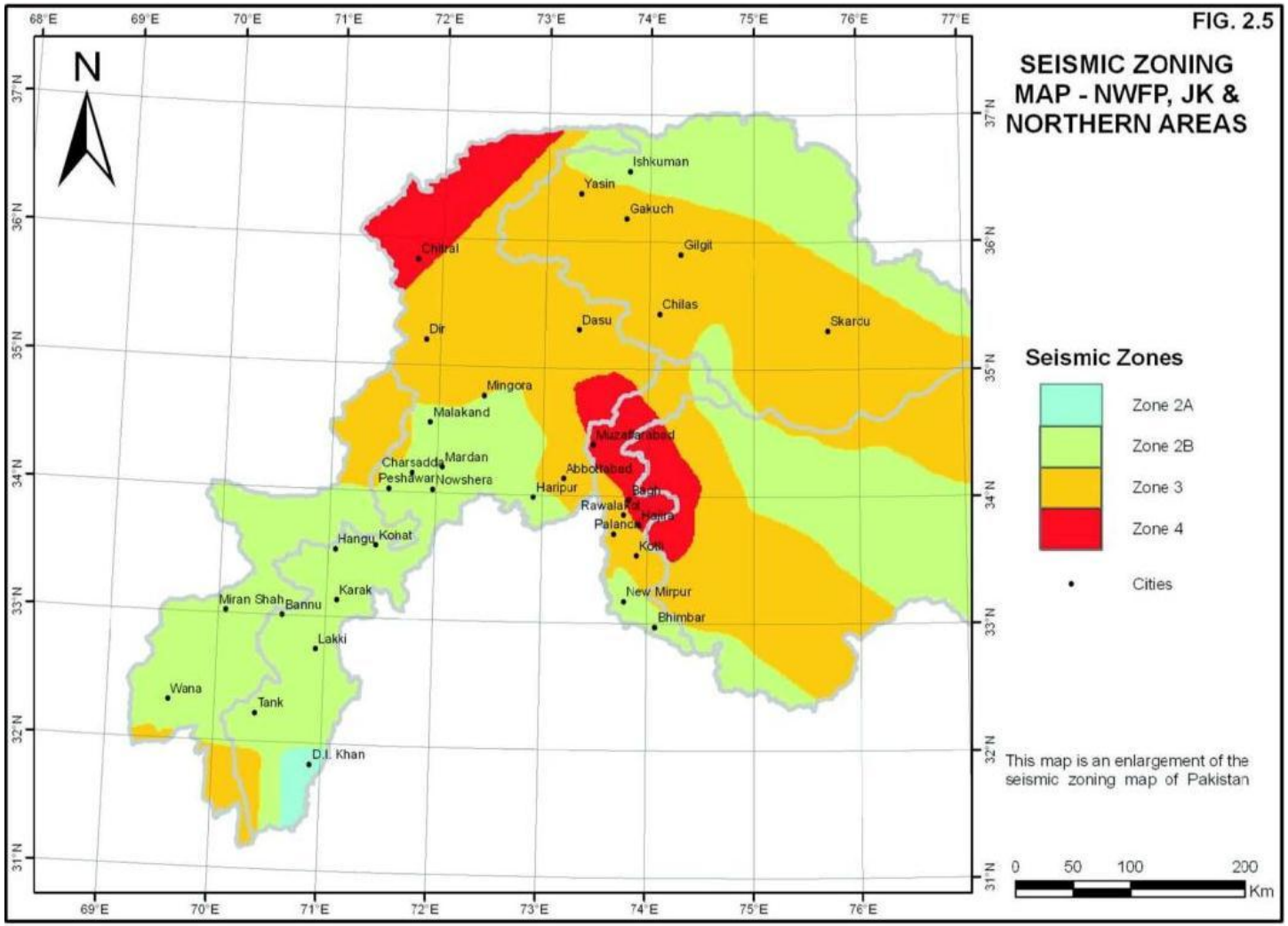

Figure 7: Seismic Zoning Map of Northern Pakistan

Source: Government of Pakistan, *Building Code of Pakistan Seismic Provisions – 2007*, http://www.pec.org.pk/buildingcode.aspx accessed May 2014

4.2.5 Hydrology and Water Quality

The drainage area of the Allai Khwar is located on the southern slopes of the western Himalayas. The catchment area at the confluence of the Allai Khwar and Indus River is 456 square kilometers (km^2). The Allai Khwar's main tributaries, in the downstream direction, are the Gangwai Khwar, the Rupkhani Khwar, the Batila Khwar, and the Natai Khwar.

There is good surface drainage at Allai Khwar, which results from slopes which are, in many cases, higher than 5% and generally above 20%. This results in in terraced cultivation. The characteristic feature of the drainage area is its mean elevation of about 2,343 m a.s.l. The highest point reaches an elevation of 5,700 m a.s.l. The elevation at the confluence of the Indus and Allai Khwar rivers is 558 m a.s.l. The high silt presence is balanced by an analogous sand percentage on narrow terraces. Erosion is a permanent phenomenon, which has increased due to the conversion of about 33% of the basin from forest to cultivation since the 1950s.

No major aquifers appear, and numerous small springs are used for domestic, micro-irrigation, and watermills on the mountain sides. Upstream of the reservoir area, the specific water consumption for evapotranspiration was variously calculated at 1 liter per second per hectare (1 l/s/ha) for rice, and 0.35 liters per second per hectare (0.35 l/s/ha) for maize and wheat.

The abundant surface water resources of the catchment area and dense perennial flows are reduced during the winter months, when precipitation at higher altitudes is stored as snow. Mean flows at the dam site are 11.2 m^3/s.

Water quality monitoring in the Project area reveals that Dissolved Oxygen (DO) content is high, and Biological Oxygen Demand (BOD) and Chemical Oxygen Demand (COD) is low.

4.3 Biological Environment

This section provides an overview of the aquatic and terrestrial ecological resources of the Project site and surrounding area. Information has been derived from the WAPDA EIA, a literature review of scientific journals, review of relevant websites and articles, and a field visit to the Project site from April 24 to April 28, 2014 (April field visit).

4.3.1 Terrestrial Ecological Resources

4.3.1.1 Vegetation

There are four phyto-geographical regions in Pakistan[22]. The Project site (located near Thakot in District Battagram of Khyber Pakhtunkhwa (KP) Province) falls into the Sino-Japanese region. This region is considered very rich in vegetative diversity, and represents 10.6% of the total flora in Pakistan. It consists of evergreen coniferous forests, subtropical thorny forests, and deciduous tree forests. The conifers of this region include blue pine *Pinus wallichana*, cedar *Cederus deodara*, spruce *Picea smithiana* and yew *Taxus baccata*. In addition, some deciduous trees like oak *Quercus baloot*, horse chestnut *Aesculus hippocastanum*, maple *Acer japonicum*, poplar *Populous mexicana* and *Prunus* sp. are also found (Rafiq and Nasir 1995)[23].

District Battagram, where the Project is located, and the adjacent areas including the Kohistan district, are mainly characterized by steep valleys and precipitous mountains. The vegetation in the area mainly consists of West Himalayan temperate forests, subalpine Himalayan forests, and alpine scrub and meadows. The West Himalayan temperate vegetation type covers the lower slopes (up to 3000 m) of the area. The vegetation of this zone is a mix of evergreen coniferous and deciduous broadleaf trees. The main coniferous species found in this zone consist of cedar *Cederus deodara*, blue pine *Pinus wallichana*, siver fir *Abies pindrow*, spuce *Picea smithiana*, oak *Quercus baloot*, and *Quercus semecarpifolia*. A variety of deciduous broadleaf trees are also found, which include maples *Acer japonicum*, amlok *Diopyros lotus*, walnut *Juglans regia*, and rare elm *Ulmus wallichiana*. Main

[22] Rafiq, Rubina A., and Nasir, Yasin J. 1995. Wild Flowers of Pakistan, Oxford University Press.
[23] Rafiq, Rubina A., and Nasir, Yasin J. 1995. Wild Flowers of Pakistan, Oxford University Press.

shrubs species include *Artemisia maritime, Indigofera sp.*, *Ephedra sp.*, *Daphne oleoides, Sophora sp. Cotoneaster sp., Jasminum sp., Sorbaria tomentosa*, and *Caragana sp. (*Raja *et al)*[24]. Above 3,000 m, a subalpine Himalayan birch forest is found grading into the alpine scrub and meadows above 3300 m. The main vegetation species found in this zone are *Betula utilis*, *Pyrus foliosa* and *Rhododendron sp.*

The Project's infrastructure, including the weir and powerhouse, is located on settled, cultivated, or grazed land. [25] There is no continuous canopy of forests at the Project site, and the forests are located at higher elevations. However, some trees and shrubs are present in the Project vicinity. Plant species observed during the April 2014 field visit include *Dodonaea viscosa, Acacia modesta, Saccharum sp., Eucliptus camadulanus, Morus sp., Dalbergia sissoo, Olea ferruginea, Pinus roxburgii, Barbaris,* and *Populus.*

4.3.1.2 Birds

The avi-fauna at the Project site and vicinity is diverse, and consists of both resident birds as well as summer and winter migrants. Birds in the area include the Snow Partridge *Erwa lerwa*, Snow Cock *Tetraogallus himalayensis*, Monal Pheasant *Lophophorus impejanus*, Tragopan *Tragopan melanocephalus*, Koklass Pheasant *Pucrasia macrolopha*, Jungle Crow *Corvus macrorhynchos*, and the Golden Eagle *Aquila chrysaetos*[26]. Of these, the Tragopan *Tragopan melanocephalus* is listed as "vulnerable" on the IUCN Red List 2013[27], while some members of the Family Accipitridae are included in CITES Appendix II. [28]

Ornithological surveys carried out between May 1987 and December 1996 in the Palas Valley, District Kohistan (located approximately 8 km from the Project site) reported 157 bird species from the area[29]. These included primarily pheasants, the globally-threatened Western Tragopan *Tragopan melanocephalus*, for which Palas is believed to support the largest single population in the world. Eight restricted range species have been reported from the Palas Valley, including Western Tragopan *Tragopan melanocephalus*, Kashmir Nuthatch *Sitta cashmirensis*, White-Cheeked Tit *Aegithalos leucogenys*, White-Throated Tit *Aegithalos niveogularis*, Brooks's Leaf Warbler *Phylloscopus subviridis*, Tytler's Leaf Warbler *Phylloscopus tytleri*, Spectacled Finch *Callacanthis burtoni*, and Orange Bullfinch.

4.3.1.3 Mammals

Mammals reported at the Project site and vicinity include the Snow Leopard *Panthera uncia,* Common Leopard *Panthera Pardus*, Markhor *Capra falconeri*, Monkey *Macaca mulatta*, Grey Goral *Nemorhaedus goral*, Himalayan Ibex *Capra ibex*, Musk Deer *Moschus chrysogaster* and Black Bear *Ursus Thibetanus* [30].

Small mammals reported at the Project site and vicinity include the Small Kashmir Flying Squirrel *Hylopetes fimbriatus*, Giant-Red Flying Squirrel *Petaurista peturista*, Royle's Pika *Ochotona roylei*, Indian-Crested Porcupine *Hystrix indica*, Long-Tailed Marmot *Marmota caudata*, Black Rat *Rattus rattus*, Turkestan Rat *Rattus pyctoris*, House Mouse *Mus musculus*, Wood Mouse *Apodemus*

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[24] Raja N. A., Davidson P., Bean R., Drijvers R., Showler D. A., and Baker C. 1999. The birds of Palas, North-West Frontier Province, Pakistan. Forktail (15): 77-85.

[25] Feasibility Study of Allai Khwar Hydropower Project, Daily storage alternative, Appendix 6, Environmental Impact Assessment, May 2000. Ministry of Water and Power in collaboration with GTZ, German Agency for Technical Co-operation

[26] Feasibility Study of Allai Khwar Hydropower Project, Daily Storage Alternative, Appendix 6, Environmental Impact Assessment, May 2000. Programme for National Hydropower Development, Government of Pakistan, Ministry of Water and Power in collaboration with GTZ, German Agency for Technical Co-operation

[27] IUCN 2013. IUCN Red List of Threatened Species. Version 2013.2. <www.iucnredlist.org>. Downloaded on 22 April 2014.

[28] UNEP-WCMC. 24 April, 2014. UNEP-WCMC Species Database: CITES-Listed Species

[29] N.A Raja et al (1999,The birds of Palas Northern-West Frontier Province, Fork tail 15 (1999): 77-85

[30] Feasibility Study of Allai Khwar Hydropower Project, Daily Storage Alternative, Appendix 6, Environmental Impact Assessment, May 2000. Programme for National Hydropower Development, Government of Pakistan, Ministry of Water and Power in collaboration with GTZ, German Agency for Technical Co-operation

sylvaticus, Birch Mouse *Sicista*, Shrew *Crocidura attenuata*, and at least two species of bat *Pipistrellus*[31].

The mammals of conservation importance include the following: the Snow Leopard *Panthera uncia,* Markhor *Capra falconeri*, and Himalayan Musk Deer *Moschus chrysogaster* are listed as Endangered; while the Common Leopard *Panthera Pardus* is listed as Near Threatened; and the Asiatic Black Bear *Ursus Thibetanus* is listed as Vulnerable.

4.3.1.4 Reptiles

Scant information is available about the herpeto-fauna at the Project site and vicinity. However, according to information provided by herpeto-faunal experts[32], no threatened amphibian or reptile species are present at the Project site or vicinity.

4.3.2 Aquatic Ecological Resources

The aquatic ecological resources of the Allai Khwar consist of benthic macro-invertebrate fauna, phytoplankton, and fish fauna. Due to the fast speeds of the Allai Khwar, macrophytes[33] are generally absent. No information is available in literature regarding the phytoplankton species found in the Allai Khwar.

A survey of the nullah carried out for the WAPDA EIA revealed that the benthic macro-invertebrate fauna is generally of low diversity.[34] Diptera was the most abundant taxa identified during the surveys.

A total of eight fish species have been recorded in the Allai Khwar and Indus River at the Project site and vicinity. An outline of these fish species, as well as the flow and migratory requirements for feeding, wintering, and breeding is given below.

4.3.2.1 Diversity of Fish Fauna

A total of eight fish species have been reported from the Allai Khwar and adjacent reaches of the Indus River[35] [36]. Some of these fish species have been reported in both the Indus River and Allai Khwar. These include Alwan Snow Trout, *Schizothorax plagistomus richardsonii,* Tibetan Catfish *Glyptosterrnum reticulatum,* Naseer's' Loach *Schistura naseeri,* Swat Loach *Schistura alepidota*, and Gangetic Latia *Crossocheilus latius*. In addition to these species, three fish species have been reported from the main Indus River, but have not been recorded from Allai Khwar. These include Kunar Snowtrout *Racoma labiate,* Chitral Loach *Triplophysa choprai,* and Nazir's Catfish *Glyptothorax naziri* (Table 12).

Only one species, the *Schizothorax plagistomus richardsonii*, is listed as Vulnerable in the IUCN's Red List,[37] while three fish species, *Glyptothorax naziri, Schistura naseeri* and *Schistura alepidota*, are prevalent throughout Pakistan.

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31 Sarfraz Hayat, July 2009, Palas Valley Conservation project in Kohistan, Pakistan

32 Personal Communication with Rafaqat Masroor, herpeto-faunal expert, Pakistan Museum of Natural History, Islamabad on 7 May, 2014

33 A *macrophyte* is an aquatic plant that grows in or near water and is either emergent, submergent, or floating

34 Feasibility Study of Allai Khwar Hydropower Project, Daily Storage Alternative, Appendix 6, Environmental Impact Assessment, May 2000. Programme for National Hydropower Development, Government of Pakistan, Ministry of Water and Power in collaboration with GTZ, German Agency for Technical Co-operation.

35 Rafique, M 2000. Fish Diversity and Distribution in Indus River and its Drainage system. Pakistan J. Zool., 32(4): 321-332.

36 Rafique, M 2001. Fish fauna of the Himalaya in Pakistan with comments on the origin and dispersal of its High Asian Elements. Pakistan J. Zool., 33(4): 279-288.

37 IUCN 2013. IUCN Red List of Threatened Species. Version 2013.2. <www.iucnredlist.org>. Downloaded on 22 April 2014.

Table 12: Fish Diversity of River Indus and Allai Khwar in Project site and Vicinity

No.	Common Name	Scientific name	Endemism	IUCN Status	Distribution
1	Alwan Snow Trout	*Schizothorax plagistomus richardsonii*		Vulnerable	River Indus and Allai Khwar
2	Tibetan Catfish	*Glyptosterrnum reticulatum*			River Indus and Allai Khwar
3	Naseers' Loach	*Schistura naseeri*	Endemic to Pakistan		River Indus and Allai Khwar
4	Swat Loach	*Schistura alepidota*	Endemic to Pakistan		River Indus and Allai Khwar
5	Gangetic Latia	*Crossocheilus latius*		Least Concern	River Indus and Allai Khwar
6	Kunar Snowtrout	*Racoma labiate*			River Indus
7	Chitral Loach	*Triplophysa choprai*			River Indus
8	Nazir's Catfish	*Glyptothorax naziri*	Endemic to Pakistan		River Indus

The section of the Indus River adjacent to the Allai Khwar is somewhat wider than the upstream river reaches. Since the river receives tributaries from comparatively lower altitudes, the number of fish species found here is higher compared to the upstream river reaches.

4.3.2.2 Flow and Migratory Requirements for Feeding, Wintering, or Breeding of Fish

Schizothorax plagiostomus is primarily a river fish. However, this breed cannot reproduce in the Indus River due to the torrential nature of the river in the northern areas. Before the onset of the breeding season (July/August), the fish migrates to upstream tributaries (nullahs) for feeding and breeding. The newly-hatched fries and fingerlings of this species remain in the tributaries to avoid the fast water currents of the Indus River, and return to the main river for wintering only after they have attained a certain size. The Allai Khwar thus provides breeding ground and habitat for the *Schizothorax plagiostomus.* Although this fish is common in the Indus River in the northern areas of Pakistan, it is globally listed as Vulnerable in the IUCN Red List (the alternative scientific name of this fish is S*chizothorax richardsonii*,), due to drastic declines in many areas of its range caused by introduction of exotics, damming, and overfishing[38].

The Cat Fish *Glyptosterrnum reticulatum* is widespread in the northern areas of Pakistan. It generally inhabits the shallow stream waters, and also breeds and feeds in water bodies with cobbly, stony, and gravely beds.

The species *Schistura naseeri and Schistura alepidota* are endemic species that inhabit shallow waters mainly with stony and gravely beds. They are common in the Himalayan foothill streams, and have been recorded from the springs of Swat and Hazara[39]. The *Schistura naseeri* is common in Swat, Alpuri, Besham, and in the Allai Khwar.

The species *Crossocheilus latius* is one of the most common fish in Pakistan, especially in the streams and rivers the of Himalayan and Sub-Himalayan areas[40] [41]. It can survive in a reservoir-like environment, as well as over-winter in deep waters of the main river.

[38] IUCN 2013. IUCN Red List of Threatened Species. Version 2013.2. <www.iucnredlist.org>. Downloaded on 22 April 2014

[39] Rafique, M and Hamid, I. 2002 Fish fauna of Swat and Bunair Valleys, N.W.F.P., Pakistan. Rec. Zool. Surv. Pakistan, 14: 43-48.

[40] Rafique, M 2001. Fish fauna of the Himalaya in Pakistan with comments on the origin and dispersal of its High Asian Elements. Pakistan J. Zool., 33(4): 279-288.

The fish species *Racoma labiate, Triplophysa choprai,* and *Glyptothorax naziri* are river fish that have been recorded from the Indus River and do not depend on Allai Khwar for migration or breeding.

4.3.3 Protected Area or Critical Habitat

There is no national park or protected area at the Project site or vicinity. Moreover, the area does not meet any of the criteria for Critical Habitat as outlined in Performance Standard 6[42].

4.4 Socioeconomic Environment

4.4.1 History

The history of the area shows that the formerly dominant faith of Buddhism declined in the 7th Century. In the 15th Century, the Pukhtun Yusufzai tribe expanded into neighboring Swat, and by the 19th Century, pushed some of the local population into the Allai Valley, where they settled more than a century ago, in turn pushing out the local Kohistani population.

The present residents of the Allai Valley are called Swati, indicating their origin from Swat. Telus migrated from Jambera on the apparent request from the local people to prevent depredations from the Khan of Allai. Today, the reservoir area is mostly under the Khan of Telus, while the dam site is under the nominal control of the Khan of Allai.

4.4.2 Land Use

In terms of land use, the cultivated area is about 20%, of which 10% is irrigated. Pasture and grassland together constitute about 38%, while forest covers less than 30% of the area. Fallow land and embankments are about 7%, while cultivable land is 5% of the total arable land. There are unresolved differences between official land use data and aerial photograph interpretation, which indicates a discrepancy of 64 km^2 of unmeasured land.

4.4.3 Land Tenure

In the Allai Valley, there is a unique land tenure system. Land leased to a servant of the Khan can be further leased out by the servant. Another typical land tenure system in the valley is *topak*, which gives a bondsman of the Khan a piece of land considered to be sufficient to support a rifleman who forms a part of the Khan's Praetorian Guard. All types of tenancy are either declared publically or entered in the revenue records. Tenancy is based on the share of crop yield, which may be a sixth, a quarter, a third, or a half depending upon the nature and extent of sharing of inputs.

4.4.4 Administration

The Allai Valley has only recently been integrated into the mainstream of state administration (1993) after the creation of cadastral records in 1975-76. It is now a tehsil in the Batagram District of KP. The tehsil has been sub-divided into 44 villages (mauza) overseen by 20 revenue officials (patwari), headed by a senior revenue official (tehsildar) reporting to an Assistant Commissioner. The relevant villages for the dam are Laghari, Telus and Rabat for the reservoir and dam site, Laghari and Nal for the Natai Weir, and Jambera for the powerhouse.

There are 40 local Zakat Committees, which administer relief to the needy.

4.4.5 Demography

The population of the Allai Valley was reported to be approximately 130,000 persons in 2000. The annual population growth rate for KP is 2.04%.[43] Based on this population growth rate and the 2000

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[41] Rafique, M 2000. Fish Diversity and Distribution in Indus River and its Drainage system. Pakistan J. Zool., 32(4): 321-332.

[42] Policy on Social and Environmental Sustainability, January 2012. Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources, International Finance Corporation. The World Bank Group.

[43] Government of Khyber Pakhtunkhwa. http://www.khyberpakhtunkhwa.gov.pk/Departments/Population%20Welfare/Demography-of-NWFP.php. n.d. (accessed May 08, 2014).

population figure, the present population of the Allai Valley in 2014 is 172,500. During project construction, outmigration may have decreased to generate an estimated 2.5% annual growth rate, resulting in an approximate population of 240,000 by the year 2025.

Average household size reported in Allai Valley was 6.6 persons per household in 1998.[44]

4.4.6 Ethnicity and Social Organization

The population is organized in a hierarchical manner, with apical chiefs playing a central role. The pastoralist Gujur tribe constitutes less than 20% of the population, while small Pukhtun groups have settled in the valley. The Gujur pay a pastoral tax[45] to the Khans, or serve as bonded labor for them as pastoralists and in agricultural occupations.

The social organization of the Allai Tehsil (hereafter referred as Allai Valley) is divided into two major Swati groups, the Gelal and the Dotial, headed respectively by the Khans of Allai and Telus. These are further subdivided into smaller clans based on male decent. The Dotial are concentrated on the right bank of the reservoir and the tail-end left bank, as well as the Jambera powerhouse location. The Gelal dominate the left bank of the reservoir and the dam site. The Natai Weir site is occupied by a neutral group of Sayyeds.

4.4.7 Culture

The cultural features of the Allai Valley are marked by Sunni Islam, with a strict religious code. The major festivities are also religious and the same as the rest of Pakistan. A stringent code of honor adopted from the Pukhtuns is the *Pukhtunwali*, a combination of hospitality, generosity, respect for elders, and courage. Armed conflicts between rival groups are usually fights for territory, wealth or women. These conflicts are often viewed as an attractive form of male entertainment with high stakes.

4.4.8 Physical Infrastructure

4.4.8.1 Housing

According to the 1998 District Census Report (DCR) for Batagram District, almost 80% of the houses in the Allai Valley were pacca (masonry), and the remaining were kacha (adobe)[46] (Figure 8).

[44] Population Census Organization. *District Census Report of Khyber Pakhtunkhwa (DCR KPK).* Census Report, Islamabad: Government of Pakistan, 1998.

[45] Tax paid for the keeping or grazing of sheep and cattle on a particular piece of land.

[46] There are three general classes of housing in Pakistan: pukka (or pacca) houses, built of substantial material such as stone, brick, cement, concrete, or timber; katchi (or kacha ["ramshackle"]) houses, constructed of less–durable material (e.g., mud, bamboo, reeds, or thatch); and semi–pukka houses, which are a mix between the two.

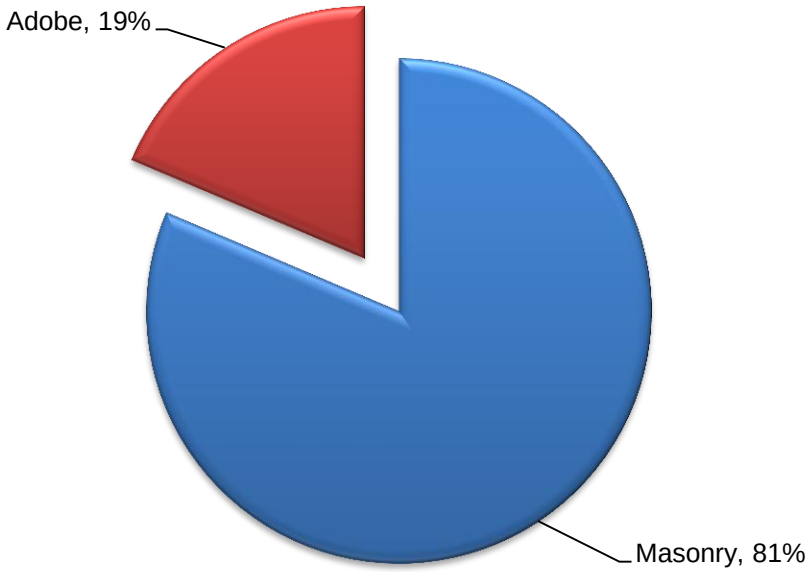

Figure 8: Type of Housing Infrastructure in Allai Valley

4.4.8.2 Communication

Transport

Two major roads, the Bana-Thakot asphalt road (29 km) and the Bana-Besham unsealed road (30 km), link Bana to Karakorum Highway. These are often closed by rockslides during the rainy seasons.

The only form of public transport is a set of approximately 40 privately-owned Datsun pickups based in Bana.

Telecommunication and postal services

There is one public call office (PCO) and one postmaster with one postman at Bana. The six branch post offices in the valley are manned by local volunteers. The powerhouse site has one telephone owned by the Khan of Jambera across the river Indus.

4.4.9 Social Infrastructure

4.4.9.1 Health

Despite the poor state of the population's health, public health facilities are inadequate, forcing critically ill people to go to the district of divisional headquarters.

4.4.9.2 Education

The government provides gender-segregated education, with only 10 girls' schools out of a total of 141. Less than half of the girls' schools and two thirds of the boys' schools are functional because of absentee teachers drawing salaries. There are no colleges or higher education opportunities in the valley.

4.4.10 Crime, Security and Decision Making

The police consist of over 40 constables, four Assistant Sub-Inspectors and 2 Sub-Inspectors. They are supported by a substantial contingent of the Frontier Constabulary housed in fortified barracks at Bana administration.

There are two zones of traditional authority in the valley: a) the Khan of Allai, who controls most of the head reaches and some of the middle reaches of the catchment area; and b) the Khan of Telus,

who controls most of the territory downstream of Bana, and is regarded as a counterweight to the Allai Khan's authority. The progressive introduction of state government from 1976 onwards has reduced the level of feuding, enabling people to move away from compact fortified settlements to more scattered settlements.

4.4.11 Livestock

Animal husbandry surveys estimate 52,205 goats, 62,405 cows/bulls, 43,933 buffaloes, 8,070 goats/sheep, and 22,605 mules/donkeys in the Allai valley. Poultry is also generally available.

4.4.12 Occupations and Employment Opportunities

The Allai Valley's males seek local employment as lower-grade state officials, traders, shopkeepers, drivers, and workshop mechanics. At least one member from each family was a labor migrant to urban centers in Pakistan or the Arabian Peninsula

Milling is undertaken by the artisan class. There were about 112 water mills in the valley in 2000, used for grinding grain, rice-husking, and to generate electricity at night. Depending on the distance from the nearest road for the transport of components, a mill can cost between Rs 1,000 to Rs 70,000. There was only one active mill in the Project area in 2000.

Exports usually consist of illegal timber, and Gujurs undertake livestock trading. The Project area has no forest wealth, and there are no other exports.

4.4.13 Archeological and Historical Sites

Archeological sites are reported more than one kilometer upstream from the reservoir area at Pokal village, which carries on an illegal trade of artifacts from the Buddhist Gandharan period.

The ancestral graveyard of the Khan of Telus Village serves as the main carved wooden mosque with three carved stone gravestones near the dam site.

4.5 Change in Site Conditions and Effect of 2005 Earthquake and 2010 Floods

The Team visited AKHP from April 24-27, 2014. During this visit, a thorough inspection was carried out to establish environmental and social baseline conditions, and to make note of any significant changes relative to conditions discussed in the WAPDA EIA. Prior to the field visit, the GIS Team prepared a land use map (Figure 9) of the area using Google Earth imagery to clearly identify agricultural land, forest land, and land being occupied by community settlements.

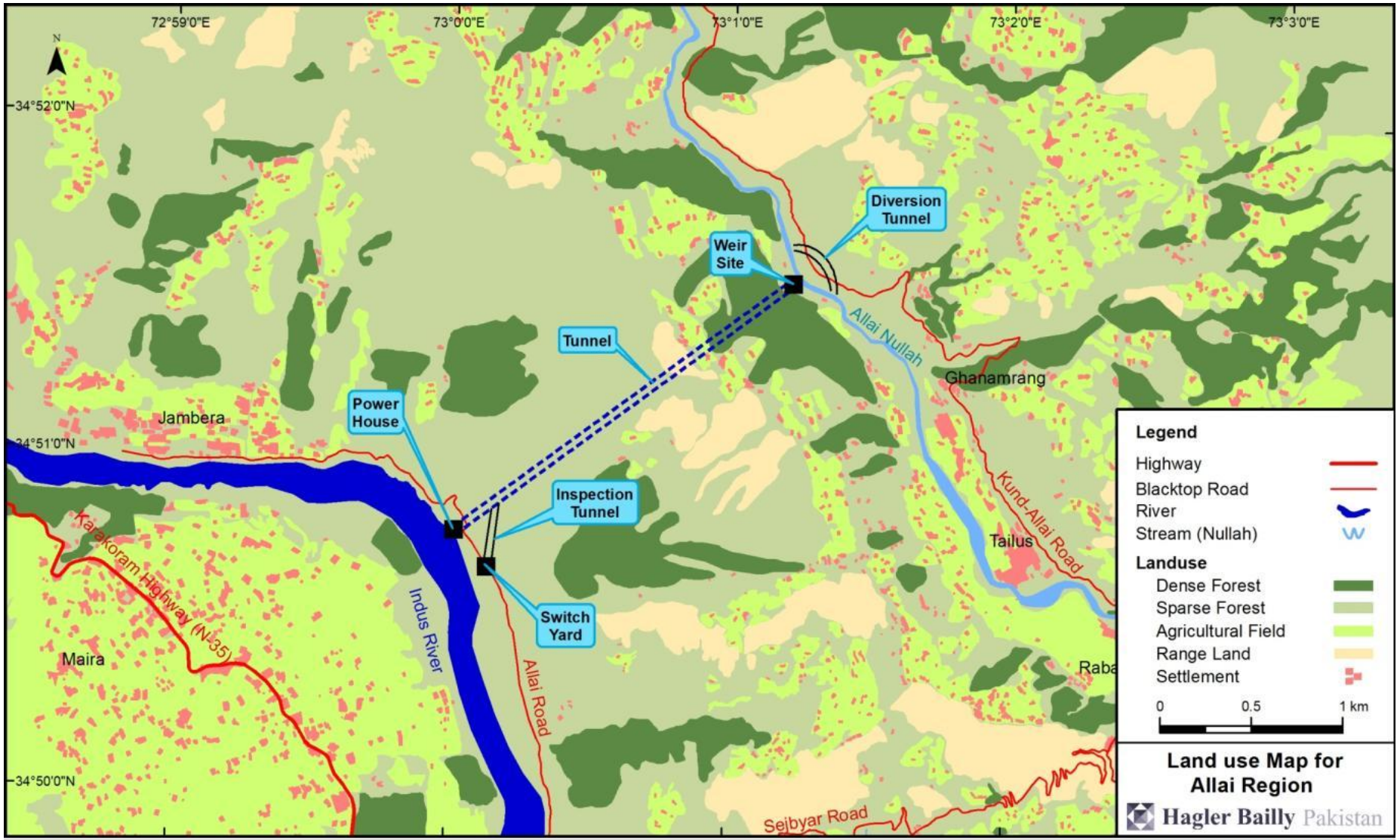

Figure 9: Land use Map for Allai Region

4.5.1 Weir Site

At the weir site, major environmental changes were observed during the field visit. Specific observations include the pattern of the Allai Khwar bed (Figure 10) and the availability of fish in the Allai Khwar. Local communities reported that the 2010 floods caused catastrophic damage in Tailus and Allai. Due to the impact of flows and large-scale erosion, many houses were destroyed due to failing foundations. This was because many communities live very close to the Allai Khwar, such as Tailus, shown in Figure 9. Locals also reported that on both banks of the Allai Khwar, (Figure 11) many agricultural fields were damaged due to the floods in 2010. WAPDA officials at the weir site reported that although the 2010 floods were major, they did not cause any major damages to Allai's weir.

On October 8, 2005, a massive 7.6 magnitude earthquakestruck Pakistan. It affected 3.5 million people and killed 87,000. Allai was one of the most affected areas in Khyber-Pakhtunkhwa, with over 2,188 people killed and 256 injured.[47] In 2007, the partnership of the recovery program for the development of Allai was initiated by Save the Children, Sungi Foundation, Church World Service and the Interactive Resource Centre. According to the locals, the shockwaves of the earthquake were very severe, and many man-made structures in Telus collapsed during the event. WAPDA officials did not report any major damage to the weir construction site due to the earthquake in 2005. A seismic map is provided in Figure 12.

Besides changes caused by the floods in 2010 and the earthquake in 2005, no major changes in the physical or social environment were observed.

Figure 10: Allai Khwar Bed

[47] 2005 Earthquake: Voice of Allai, The Express Tribune, October 9, 2011

Figure 11: Agricultural Fields

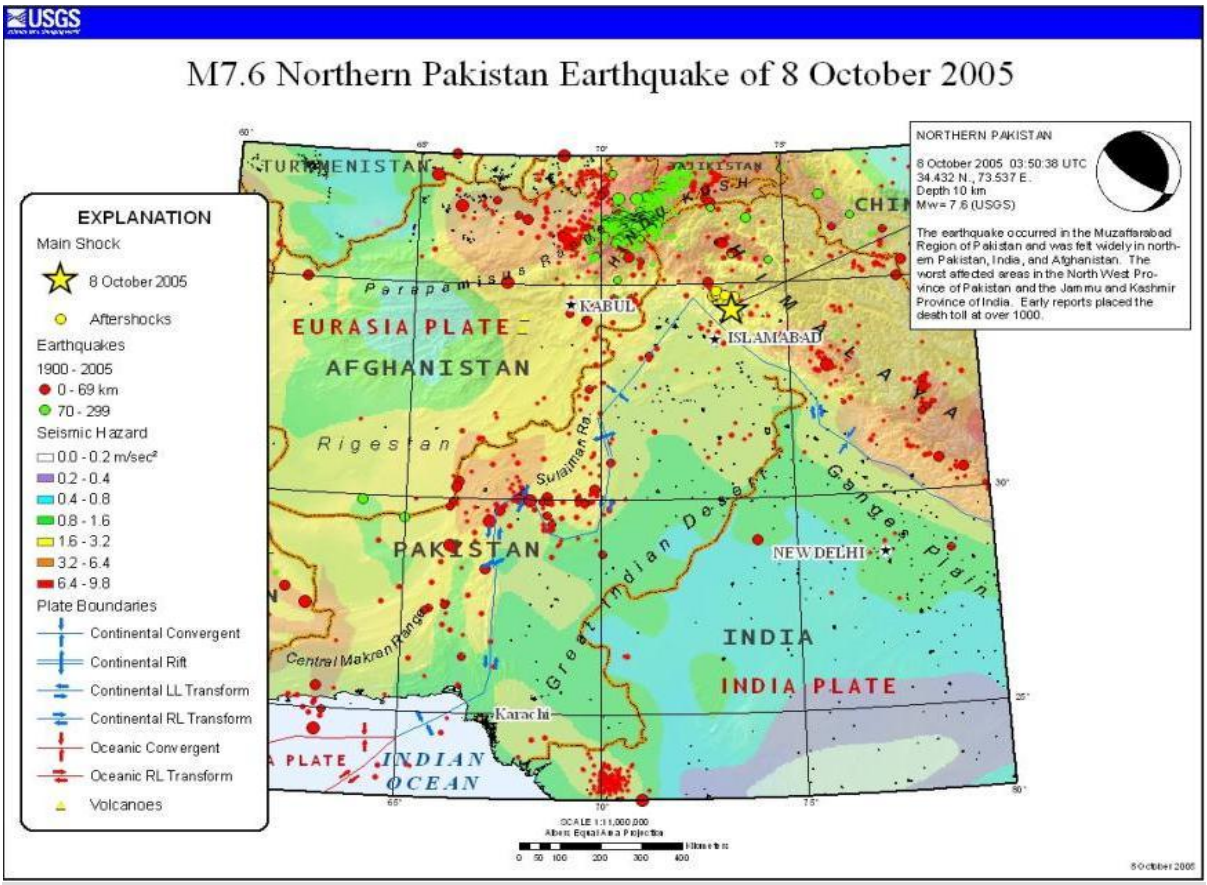

Figure 12: Northern Pakistan Earthquake of October 8, 2005

4.5.2 Powerhouse

At the powerhouse site, the Team observed no major changes in the Indus River bed (Figure 13). The local communities reported that although the floods in 2010 were severe, the Indus River bed was wide enough to accommodate the high flows. WAPDA officials reported that the floods caused no damage to the powerhouse construction or structure. Major damage to houses was not caused in this area, either, because people do not live in close proximity to the Indus River (see Figure 9).

The earthquake in 2005 was a major disaster in the area, causing large-scale damage to the village of Allai and surrounding areas. Damage was mainly in the form of landslides from the slopes, debris fall, and collapsing structures.

Besides changes caused by the floods in 2010 and the earthquake in 2005, no major changes in the physical or social environment were observed.

Figure 13: Landscape around Allai Powerhouse

5. Rapid Environmental and Social Assessment of Allai Khwar Hydroelectric Power Project

5.1 Introduction

This section summarizes the impacts of Project design, construction, and impact on the physical environment, terrestrial ecological resources, and the socioeconomic environment. It includes the impacts identified in the WAPDA EIA and impacts identified by the REA Team. Comments from stakeholders' concerning the identified impacts are also included. Finally, this section summarizes the current EHS mitigation, monitoring, and supervision on site.

5.2 Methodology

The WAPDA EIA was reviewed, including the potential impacts and recommended monitoring and mitigation plans. From the data collected during reviews, an inventory of issues was developed before the field visit. This inventory is presented in Annex II. The field visit was carried out from April 24 to April 27, 2014. The visit helped assess compliance with environmental guidelines, mitigation measures identified in the WAPDA EIA, and to assess additional environmental issues identified by the Team. Additional documents provided during the field visit were also incorporated into the inventory.

The Team thoroughly inspected the Project facilities and environmental aspects associated with implementation during the field visit. Field documents such as accident registers, health and safety guidelines and environmental mitigation/monitoring documents were also reviewed where these were available. Interviews were conducted with WAPDA staff working on site, such as guards, cleaners, engineers, and administrative staff. Separate meetings with WAPDA officials in Besham were also conducted to collect useful information on AKHP. Further verification of information regarding environmental and social impacts was carried out through community stakeholder consultations conducted by the Team at the following locations.

- Shop owners in nearby areas
- Residents in nearby areas
- Local Member of Provincial Assembly (MPA) and local influential people
- Communities downstream of Allai weir
- Communities upstream of Allai weir

Pictures taken at the Project site during the inspection of the weir and powerhouse are provided in Figure 15. Pictures of consultations with local tribal leaders and communities are also attached in Figure 15. Locations where consultations were carried out are shown in Figure 14. Per local cultural norms, pictures were not allowed during most of the consultation meetings.

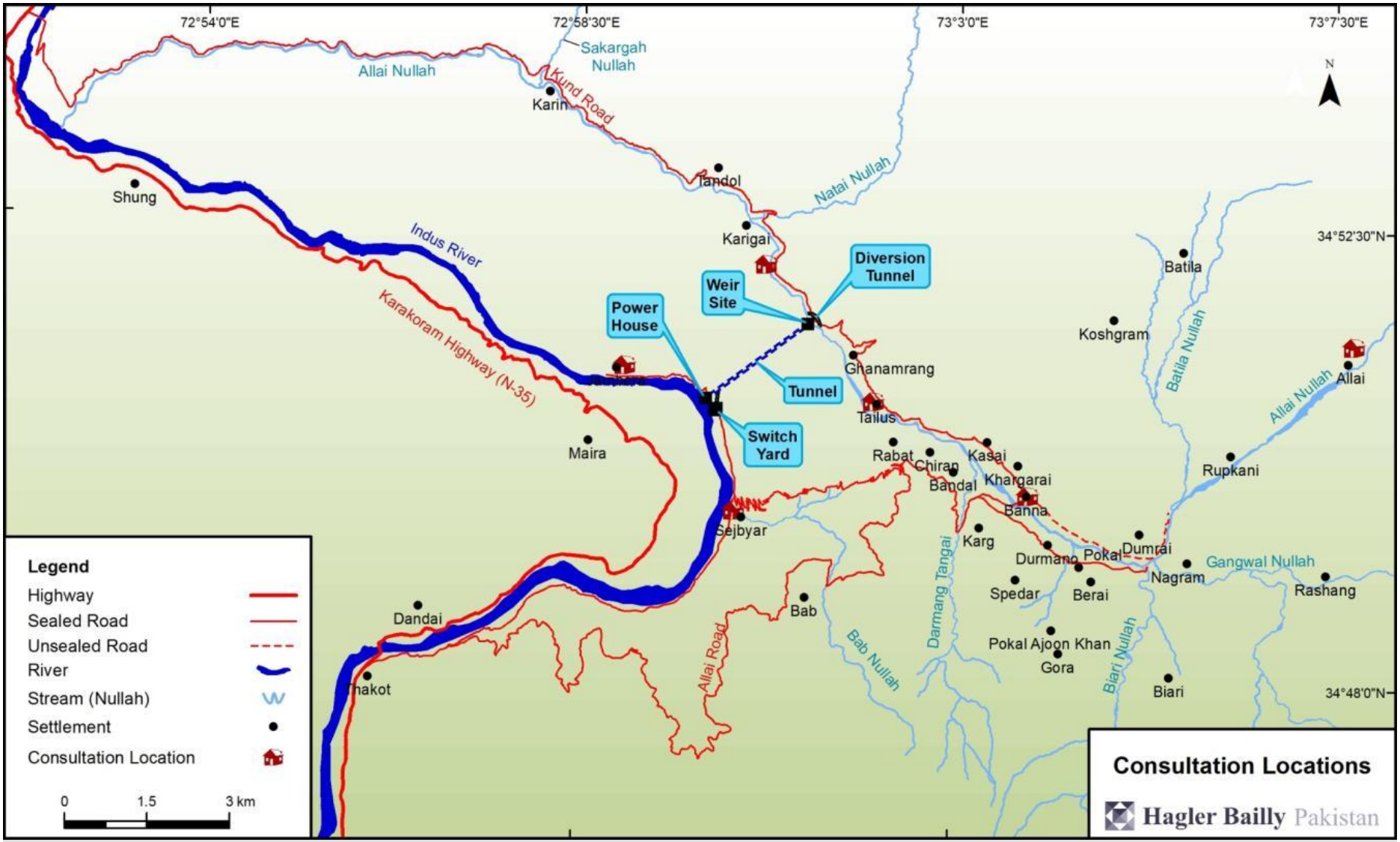

Figure 14: Consultation Locations

5.3 Project Siting and Design Impacts identified in WAPDA EIA

5.3.1.1 DS1: Resettlement and loss of land

A social impact on the local settlements around the weir and powerhouse was identified in the EIA. However, only one household was expected to be affected by the reservoir and had agreed to relocate in the same area if given adequate compensation by WAPDA. Mitigation for this impact suggested in the EIA was compensation for land property.

During field visit, the Team observed that the household had resettled upstream of the reservoir. The family was consulted during the field visit and reported that adequate compensation was provided and they were satisfied.

5.3.1.2 DS2: Loss of livelihood for tenant farmers

The EIA identified a potential loss of livelihood by a tenant farmer working on a field that was expected to be inundated by the reservoir. The standard of living of this family had to be protected, and the Khan of Telus committed to provide land elsewhere.

The tenant farmer was consulted during the site visit, and reported that he was given employment on the AKHP weir construction site. He is now semi-skilled and currently works as a daily wage laborer in Allai.

5.3.1.3 DS3: Loss of grazing land for livestock owners

It was expected that grazing land would be affected due to construction of project facilities and inundation by the reservoir. It was identified in the EIA that all members of the local community with grazing rights in the affected area would be eligible for compensation. Individual compensation entitlements would be calculated based on these rights and the total compensation value divided proportionally. These amounts would be paid in cash. Loss of trees and shrubs was proposed to be compensated in the same way. Local communities complained that compensation given to them was not adequate.

WAPDA authorities reported that compensation was provided to the local communities after detailed assessments carried out by Revenue Department. The Team reviewed the documents and receipts of compensation transactions made to the locals by WAPDA.

5.3.1.4 DS5: Loss of livelihood by a mill owner

It was identified in the EIA that a local mill owner operating at the right bank of the reservoir would lose his livelihood. The mill owner was consulted during the site visit, and he reported that he was given a job opportunity at the weir construction site and now works as a daily wage laborer. He reported that he was satisfied.

5.3.1.5 DS6: Loss of power to small-scale hydropower generators

The EIA stated that a loss to the power generator owner near the settlement of Ghanamranga was expected and proposed compensation for two generators in cash. In addition, the EIA stated that 300 m of a channel would be affected and compensation to the channel and landowner would be provided.

Local communities reported that cash compensation was provided to the owner of the hydropower generator and the landowner. No pending claims were reported to the Team.

5.3.1.6 DS7: Damage to mosques and graveyards

The EIA mentioned that no impact on any religious sites, mosques, or graveyards was expected. The communities that were consulted reported that no religious sites were damaged during construction of the project facilities.

5.4 Additional Impacts Associated with Project Siting and Design

5.4.1.1 DS8: Gender-related impacts

Impact on women due to any construction activities was not mentioned adequately in the EIA. However, the Team identified a potential impact, before the field visit. The Project location included women and associated cultural clashes, particularly since the area is considered extremely conservative. Impacts on women included intrusion of privacy due to the influx of external labor, limited access to areas, and obstruction of access to the tributary for washing and recreational purposes.

During the field visit, community stakeholders reported that according to local culture, women seldom leave their houses for reasons such as washing or recreation, therefore the lives' of women in the area was not significantly affected.

5.5 Impacts Related to Construction Activities Identified in the WAPDA EIA

5.5.1.1 CP1: Construction of access roads

The WAPDA EIA expected damage to the existing infrastructure, dust emissions, and noise and vibrations associated with construction works. The contractor was expected to provide storage lagoons sufficient for the retention of 24 hours of 50 mm of rainfall on disturbed areas, and for water pumped from excavations. The contractor would also control the turbidity or suspended sediment concentration in release of water stored in lagoons.

During the field visit, the Team observed that the storage lagoons had been rehabilitated and the construction camp was decommissioned. No disturbance was reported by the local community and WAPDA staff due to the construction of access roads. However, locals complained that the roads were left damaged, which now leads to excessive dust content in ambient air (Figure 15, Photograph w).

5.5.1.2 CP2: Soil erosion and land disturbance due to cut and fill mechanism

The EIA stated that an associated excavation of 995,000 m^3 was expected for roads covering approximately 47 ha. Additionally, other facilities, including the camp, were expected to occupy a total surface area of 67.6 ha, and require 1,986,500 m^3 of excavation. These would require designated sites for dumping.

During the field visit, WAPDA staff reported that excavation was only carried out at designated sites, but no documentary evidence was available to verify this. Community stakeholders reported no issues regarding the excavation sites.

5.5.1.3 CP3: Disposal of waste and land reclamation

Land disturbance due to disposal of construction waste was expected (see also CP2). Two designated spoil dumps were identified: one on the right bank of the Allai Khwar near the weir; and one on Left bank of the Indus River (see Figure 15, Photograph k). The Team visited the site and found that the construction waste was dumped appropriately at the sites identified in the EIA. Community stakeholders did not report any concerns regarding dumped construction waste.

5.5.1.4 CP4: Supply of materials

Impacts on road safety, ambient air and slope stability were identified due to excavation and transportation of raw materials for construction. The EIA stated that 56 lorries per day would pass through 8.8 km of road to transport material from the quarry above Ghanamranga passing through Bana. Road safety was an issue between this quarry and Telus village. Excavations from the quarry at Landai Mora (200,000 m^3) would involve 32 lorry journeys per day, but over a short distance and over a black top road.

The Team observed no physical impacts due to transportation of raw materials. Local communities did not report any concern regarding road safety, dust emissions, exhaust emissions, or slope instability due to the supply of materials to the construction site.

5.5.1.5 CP5: Flammable materials and explosives

Excessive noise, vibration, slope instability and possible chemical contamination due to blasting activities were areas of concern highlighted in the EIA.

WAPDA staff on site reported that blasting activities were strictly controlled to make sure that their impacts on the environment and local communities were minimal. The local communities did not express any concern regarding blasting activities during construction.

5.5.1.6 CP6: Dust impact

Dust impact was identified due to general construction activities at the AKHP weir and powerhouse sites.

The local communities and Project staff reported that no dust-related issues were faced during the construction period at the powerhouse and the weir. No evidence or dust monitoring data was available for the Project Team to review.

5.5.1.7 CP7: Soil and groundwater contamination due to fuel storage

The total capacity of all the generators on site was expected to be 1.3 MW, with a corresponding fuel consumption of 250,000 liters/month. A month's fuel supply was expected to be stored in underground storage tanks.

Field staff reported that the generator facility installed was per the initial design. The fuel storage tank was inspected, and no signs of leaks or contamination were observed. However, no soil or groundwater monitoring was carried out. Therefore, no evidence was available to verify this information. Appropriate monitoring is recommended to detect any potential leaks in the tanks (see Section 7).

5.5.1.8 CP8: Noise impact due to various construction activities

The EIA assumed that that the principal sources of noise during the land preparation and construction stages would arise from use of construction machinery and associated traffic, and from blasting activities for excavation.

The Team observed that noise from construction activities was not expected to cause any major impact, since the settlements of Allai and Telus are at a considerable distance from the construction sites. Communities living around the weir and powerhouse did not report any excessive noise during construction activities. However, no information was available on monitoring of noise. Since blasting and major construction, activities have been completed and the communities are located at a distance from the construction sites. No further significant impact is expected.

5.5.1.9 CP9: Vibration

The EIA mentioned that excessive vibration may not lead to damage to the environment during construction activities.

During the physical inspection of the adjoining areas to project facilities, the Team noted that that the environment was not affected significantly due to vibration. Community stakeholders did not report any concern regarding vibration damage during the construction of AKHP.

5.5.1.10 CP10: Limited supply of water and release of wastewater

The EIA assumed limited availability of water to the local population, and contamination due to untreated waste being disposed. The total requirement of water was expected to be 200 m^3/day, pumped from filter beds close to the AKHP and Indus River channels and stored in surface storage tanks. Wastewater would be disposed using septic tanks and soak-aways.

During the field visit, local communities did not report any shortage of water. Wastewater from construction camps was disposed of in septic tanks, and no evidence of untreated waste disposal or water contamination was found.

5.5.1.11 CP11: Soil contamination due to solid waste disposal

The EIA highlighted impacts such as soil contamination and toxicity due to solid waste produced on the construction site and from construction camps. The mitigation measures provided in the EIA suggested that the contents of septic tanks and domestic refuse be buried under layers of rocks and soil in spoil dumps. It was proposed that industrial waste be collected at each site and incinerated.

Site staff and locals reported that the solid waste generated from the construction camps was dumped in spoil dumps, and no environmental impacts were reported or observed. Information on incineration of industrial waste was not available. However, during the field visit, improperly disposed waste was not present at any of the construction sites.

5.5.1.12 CP12: Contamination of surface water quality

The EIA assumed that water quality might be affected due to the disturbance of land, through excavation, aggregates processing, spoil dumps and other construction, potential bacteria from wastewater, landfill, and oil spills.

WAPDA staff reported that surface water quality is monitored by WAPDA's Surface Water Hydrology Department, but the monitoring data was not provided to the Team. The local communities reported that there was no difference in surface water quality after the construction of the project facilities.

5.5.1.13 CS1: Health impact on workers

During the field visit, the Team interviewed the Chief Site Engineer present during the construction period. He reported that strict occupational health and safety measures were adopted during construction. However, no documentary evidence was available for the Team to verify this, and the Health, Safety and Environment (HSE) officer could not be contacted as he had relocated back to China.

5.5.1.14 CS2: Public health and safety

The EIA identified an impact on health and safety of local people due to infections from the additional workforce and construction activities. The EIA noted that due to the risk of communicable diseases, preference would be given to local labor, and external labor would be used only where local skills were not available.

During the field visit, local communities in the area reported that employment was given to the local population on a priority basis at the weir and powerhouse construction sites. Communities also reported that no disease outbreaks or health-related impacts were observed during the construction period.

5.5.1.15 CS3: Local culture, institutions and traditional authority

The EIA identified a negative impact on local culture and traditional authority. Community stakeholders reported that traditional authorities were not consulted before construction. There were misunderstandings among the local populations regarding the purpose of the tunnels, and rumors such as tunnels being dug to store nuclear weapons were common. However, local tribal leaders did not report any concerns or any impacts on their authority due to the project.

5.5.1.16 CS4: Cultural impact due to external workforce

The EIA identified an adverse impact on the local culture due to the influx of an external workforce. During consultations, the local community reported that the foreign workers were kind and respected the local customs. No conflict between the local populations and the workers was reported.

5.5.1.17 CS5: Increase in price index due to foreign workers

The EIA identified a potential socioeconomic impact associated with an expected increase in prices in local markets. This was expected, since the influx of foreign workers would decrease availability and increase the demand for products.

During consultations with the local population, they reported that during the construction phase, the local price index fell because the construction workers from China preferred the cheapest prices. This triggered competition in the local markets, and the local communities benefited from the lower price index.

5.6 Additional Impacts Related to Construction Activities

5.6.1.1 CP13: Impact on ambient air quality due to vehicular exhaust emissions

The Team identified a potential impact on ambient air quality from exhaust emissions of construction machinery and vehicles. Local communities did not report any issues regarding poor ambient air quality during the construction period. No monitoring data was available to check if the current emission levels complied with the National Environmental Quality Standards (NEQS).

5.7 Impacts Related to Operation Activities

5.7.1.1 OP1: Reservoir leakage and spring flows

The EIA reported that no impacts were expected due to reservoir leakage from reservoir. The Team observed no signs of reservoir leakage that would impact the Project during the weir site inspection. Nevertheless, some seepage was expected and WAPDA staff did not report any signs of excess seepage from the reservoir.

5.7.1.2 OP2: Landslips and rock falls

The EIA identified that during the operation phase, land slips could be expected along sections of new and improved roads and construction sites. Clearance of side materials normally add to scree, and can damage arable land, grazing land or buildings.

WAPDA staff deployed at the powerhouse reported that cases of landslides were common. They mentioned that slope strengthening measures and retaining walls had been constructed to protect the powerhouse (see Figure 15, Photograph d). No damage to grazing or agricultural land due to scree was reported by locals.

5.7.1.3 OP3: Reservoir induced seismicity

The EIA reported that increase in earthquakes due to the reservoir had insignificant risk. No evidence or monitoring data was available to the Team to establish any reservoir induced seismicity.

5.7.1.4 OP4: Reservoir water quality

The EIA assumed contamination of water and spread of diseases due to the poor quality of reservoir water. Allai Khwar is polluted with human and animal waste. When impounded, bacteria and other disease organisms will be concentrated upstream at the Telus end of the reservoir. This could have caused issues particularly in the dry season, and when the river is used for recreational purposes.

During physical inspection, contamination was observed on the surface of the reservoir (Figure15, Photograph q), which may result in the spread of diseases for people living in the area.

5.7.1.5 OP5: Seepage flows

The EIA identified a possible impact due to an unusual rise in the water table due to the reservoir, but the risk associated was insignificant. WAPDA officials and communities consulted did not report any unusual rise in the water table after the dam construction.

5.7.1.6 OP6: Sediment scouring flows

According to the EIA, the slope of the downstream channel to the Indus River is steep enough to transport most of the suspended sediment and much of the bed load directly into the river. Some aggradation may be expected in short reaches of much lower channel slopes. Local tributary flows, especially from the Natai Khwar and Sakargah combined with spill flows from Allai Khwar HEPP dam are likely to remobilize and reduce any such deposits.

Physical inspection of the Allai Khwar bed did not indicate any significant sediment deposited. The bed consisted of big rocks and boulders, and the locals reported that they were carried by the 2010 floods from upstream mountains.

5.7.1.7 OP7: Spillway flows

The EIA stated that most of the spillway flows during normal operation will carry little or no bed load, and only some suspended sediment. WAPDA staff at the weir and local communities reported that there were no problems concerning bed load transported from the spillway.

5.7.1.8 OP8: Tailrace and Indus River

An impact assessment on the Indus River at the powerhouse was carried out in the EIA due to the disturbance of flow due to an additional 20 m^3/s of flow from the tailrace. The EIA stated that the reduction in the Indus River's flow from the Allai Khwar confluence to the Jambera powerhouse (13 km), and the restoration of flows at Jambera via the tailrace, would not have any significant impacts on the river's fisheries. This is because the Allai Khwar's flow represents only 0.5% of mean and minimum Indus River flows. The Team inspected the area where the tailrace discharges into the Indus River, and observed no major issues (Figure 15, Photograph f).

5.7.1.9 OP9: Reservoir operation and flushing

The EIA assumed that damage to the tributary bed due to flushing of sediment at the weir was expected. The high annual volume of suspended sediment load requires flushing operations during high discharge periods. No impact on sediment flushing was observed or is expected.

5.8 Additional Impacts Related to Operation Activities

5.8.1.1 OS2: Environmental flow

The EIA included a provision for an environmental flow of 0.42 m^3/s released from Allai's weir from November 15 – March 15.[48] It is important that the section of the Allai Khwar (Figure 15, Photograph t) from the weir to the confluence of the Allai Khwar and Indus Rivers receive minimum ecological flow for vegetation to survive during winter months. It is also important for downstream water requirements for irrigation, livestock, and domestic animals that minimum environmental flow is released from the weir. During stakeholder consultation sessions, the communities did not have any issues regarding the availability of water.

5.8.1.2 OS3: Dam break emergency plan

A Safety and Emergency Procedures Plan[49] has been prepared for the AKHP construction phase. It contains the safety management system and responsibilities for each department in relation to construction activities. However, the plan does not cover dam safety monitoring and procedures for operations.

AKHP's weir height is 32.50 m, which falls under the category of "large dams" according to the International Committee on Large Dams' (ICOLD) classification, and the Operational Policy (OP 4.37) Safety of Dams Guidelines issued by the World Bank. A dam safety plan should be developed as part of operational management procedures to ensure protection of the downstream community in case of dam failure.

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[48] Assessment of Environmental Flows from Weir Site downstream of Allai, Khan and Duber Khwar Projects, May 2010, Director General (Environment) WAPDA Environment Cell (WEC), Sunny View Estates, Lahore.

[49] WAPDA, Allai Khwar Hydropower Project Safety Plan and Emergency Procedure, May 2004

5.9 Beneficial Social and Environmental Impacts

5.9.1.1 DS4: Employment opportunities

The Team believes that due to the location of the project in the Allai region, the people from local communities would gain employment.

The field visit confirmed that construction activities associated with the Project provided employment opportunities for a large number of people. A number of people interviewed during the field visit were unskilled and unemployed before Project commenced, but now possess basic construction and related skills; and have been successful in gaining work as daily wage laborers elsewhere.

5.9.1.2 OS1: Economic Impact

At full generation capacity, AKHP adds 121 MW to the national grid, contributing positively to the country's economy. Pakistan currently faces a large energy shortfall, and projects such as AKHP help mitigate this. AKHP generates electricity from water resources, making it a cleaner energy project with a smaller carbon footprint compared to other major sources of energy in Pakistan, such as coal-powered power plants and gas-powered power plants.

5.10 Impacts on Ecological Resources

WAPDA discusses ecological impact of AKHP in the EIA, but the discussion and impact assessment was not adequate. A detailed ecological impact assessment due to AKHP's construction is given in following sections.

5.10.1 Design Impacts on Ecological Resources

This section comments on the impacts of the Project's design on the aquatic and terrestrial ecological resources at the Project site and in its vicinity.

5.10.1.1 DE1: Impact of Project Design on Terrestrial Ecological Resources

Site clearance and construction of Project infrastructure, such as the power house, weir, inlet, and outlet of the power tunnel results in immediate and direct modification of land in the Project infrastructure, and a 200 m zone around the boundary of the Project facilities. A 1.3 km long reservoir with a surface area of 1,800 hectares was created by Project operations. The creation of the reservoir submerged terrestrial habitat upstream of the weir. This habitat loss in the areas occupied by the Project infrastructure and reservoir (zone of habitat loss) led to detrimental negative impacts on the abundance and diversity of flora and fauna.

The EIA states that there is no continuous canopy of forests at the weir site or powerhouse. The weir site and reservoir are located on settled, cultivated or grazed land. The forests are located at a higher elevation, and are not likely to be directly impacted by Project construction. A review of literature and the site visit in April 2014 reveals that this information is correct. No threatened or rare flora or faunal species has been reported in this area. Moreover, no Critical Habitat, threatened, or unique ecosystem is present. The habitats are homogenous and widespread, and hold no significance for the survival of endemic or restricted range species. Therefore, the magnitude of impact caused by habitat loss on terrestrial ecological resources is considered minor.

Even though the Project infrastructure and new roads that have been constructed were not located in a forest habitat, these roads may facilitate greater access to forest areas for Project staff, contractors and locals. As a consequence, they may cut trees from these forests for use in construction and as fuel wood. The EIA states that as a mitigation measure, contract documents will prohibit or strictly control the use of local timber for construction. This provision will be monitored by EMU, the Forest Department and local communities.

5.10.1.2 DE2: Impact of Project Design on Aquatic Ecological Resources

Peaking in hydropower generation is defined as an operating mode, in which water from the weir is released for the part of the day that corresponds to peak demand for power in the system. A peaking operation, however, can be detrimental to the ecology downstream of the weir. With non-peaking operations, low flows normally occur in the section of the river/nullah, starting just below the weir, and extending to the point where water is added back into the river/nullah at the outlet of the tailrace tunnel of the powerhouse. However, with a peaking operation, low flows are extended downstream of the powerhouse during the period the powerhouse is shut down to accumulate water in the reservoir upstream. The river/nullah ecology, which has adapted to the normal daily and seasonal variations in flows, is impacted by the daily long dry spells.

As expected in daily storage hydropower projects with peaking operations, the fish fauna have suffered a decline in abundance and diversity in the Allai Khwar. The Allai Khwar provides breeding grounds for some of the fish species of the Indus River. However, almost all the fish species found in Allai Khwar are also found in the Indus River, and there are several other nullahs/tributaries, which are used by fish for breeding. Moreover, there are no threatened or endangered fish species in the Allai Khwar, and there is very little subsistence, recreational or commercial fishing in the area. Therefore, even though individual receptors are likely to suffer harm, the overall impact on fish is not considered significant.

To compensate for detrimental impacts downstream of the weir, the Team recommends that an environmental flow rate of 0.420 m^3/sec be released by the Project downstream of the weir.[50] Although detailed analysis of the downstream flow is beyond the scope of this assessment, the Team's professional opinion is that the proposed environmental flow is likely to be insufficient to protect the aquatic ecology in the Allai Khwar. However, considering that the Project impact on aquatic ecological resources is of low significance, and that any additional release of flow will be at the expense of power generation which is of critical economic importance for the country, the Team does not recommend a revision of the environmental flow, and no additional mitigation measures for protecting aquatic ecology are proposed.

5.10.2 Construction Impacts on Ecological Resources

This section comments on the impact of Project construction on the aquatic and terrestrial ecological resources at the Project site and its vicinity.

5.10.2.1 CE1: Impact of Construction Activities on Terrestrial Ecological Resources

Construction of Project infrastructure, such as the powerhouse, weir, and power tunnel resulted in disturbance to floral and faunal species due to blasting, noise, vibrations, illumination, air pollution and dust. Habitat loss, habitat fragmentation, and sensory disturbances usually result in a decrease in species abundance, and possibly change in species' diversity within a zone of impact identified as within 500 m of the boundary of the Project infrastructure.

As correctly identified in the EIA, the impact of Project construction on the terrestrial ecological resources was not likely to be significant. This is because the Project site is located on settled, cultivated or grazed land. There are no threatened or endemic floral or faunal species present in the zone of impact. The nearby forests are at a higher elevation, and not likely to be directly impacted by Project construction provided Project staff and contractors do not utilize wood from these forests for construction or fuel wood. The EIA states that land that is not occupied by Project infrastructure will be reclaimed and reforested with technical assistance from the Forestry Department, and the afforestation schemes will be encouraged.

There are reports of large mammals of conservation importance in the forests and hills located a few kilometers away from the Project. These include the Snow Leopard *Panthera uncia,* Markhor *Capra falconeri* and the Himalayan Musk Deer *Moschus chrysogaster*, as well as the Common Leopard

[50] Assessment of Environmental Flows from Weir Site downstream of Allai, Khan and Duber Khwar Projects, May 2010, Director General (Environment) WAPDA Environment Cell (WEC), Sunny View Estates, Lahore.

Panthera Pardus, and the Asiatic Black Bear *Ursus Thibetanus*. Even though these animals are found at high elevations and not likely to be directly impacted by Project construction activities, improved access to the forests as a result of the Project may indirectly increase the incidence of poaching. The hunting and trapping of bird species such as Snow Partridge *Lerwa lerwa*, Snow Cock *Tetraogallus himalayensis*, Monal Pheasant *Lophophorus impejanus*, Tragopan *Melanocephalus*, and Koklass Pheasant *Pucrasia macrolopha* may also increase due to this improved access.

5.10.2.2 CE 2: Impact of Construction Activities on Aquatic Ecological Resources

The EIA mentions that the construction of the cofferdam and the diversion tunnel will destroy some fish habitat and halt the upstream migration of fish in the Allai Khwar. This is correct. Impacts of construction are similar to those of operations, since a barrier is created for the upstream migration of fish. Moreover, fish fauna upstream and downstream of the cofferdam and diversion tunnel face population isolation. See OE2 for further details.

5.10.3 Operation Impacts on Ecological Resources

This section comments on the impact of Project operations on the aquatic and terrestrial ecological resources at the site and in the surrounding areas.

5.10.3.1 OE 1: Impact of Project Operations on Terrestrial Ecological Resources

The EIA does not identify any impacts from Project operations on the terrestrial flora and fauna. However, the operation of the hydropower plant will result in some potential disturbances to species, which may exacerbate the effects of habitat loss and decreased species abundance. These disturbances include noise and light during Project operations. However, considering the fact that no threatened ecosystem or species has been reported from the zone of impact (identified as being within 500 m of the Project infrastructure), this impact is not likely to be significant.

An influx of Project staff and contractors during the operations phase of the Project may increase encroachment into pristine areas, and increase the incidence of wood cutting and poaching.

Inadequate management and disposal of solid waste from the camping locations can lead to deterioration of soil and habitat quality, with consequent negative impacts on the flora and fauna. In addition, the biodiversity may be disturbed due to loss of soil productivity caused by uncontrolled discharge of wastewater.

5.10.3.2 OE 2: Impact of Project Operations on Aquatic Ecological Resources

The EIA identifies the potential impacts of Projects operations under the following headings:

- Impact on fish fauna due to the creation of a reservoir;
- Cessation of upstream fish migration;
- Fisheries in the downstream channel and tributaries; and
- Biodiversity and cumulative loss of fish stock;

This is a generic list, and the EIA does not specify the impacts on particular fish species reported in the Allai Khwar and the Indus River. These predicted impacts on the fish fauna are outlined below.

As outlined in Section 7, Overview of Baseline Conditions, a total of eight fish species have been reported from the Allai Khwar and the adjacent reaches of the Indus River[51] [52]. Some of these fish species have been reported both from the Indus River and Allai Khwar. These include Alwan Snow Trout *Schizothorax plagistomus richardsonii,* Tibetan Catfish *Glyptosterrnum reticulatum,* Naseer's' Loach *Schistura naseeri,* Swat Loach *Schistura alepidota* and Gangetic Latia *Crossocheilus latius*. In addition to these species, three fish species have been reported from the main Indus River but have

[51] Rafique, M 2000. Fish Diversity and Distribution in Indus River and its Drainage system. Pakistan J. Zool., 32(4): 321-332.

[52] Rafique, M 2001. Fish fauna of the Himalaya in Pakistan with comments on the origin and dispersal of its High Asian Elements. Pakistan J. Zool., 33(4): 279-288.

not been recorded in Allai Khwar. These include Kunar Snowtrout *Racoma labiate,* Chitral Loach *Triplophysa choprai,* Nazir's Catfish *Glyptothorax naziri*.

The Alwan Snow Trout *Schizothorax plagiostomus* is primarily a river fish that used the Allai Khwar for breeding before Project construction. The Project weir presents a barrier to the upstream migration of Alwan Snow Trout *Schizothorax plagiostomus*, and a decline in its population abundance in the Allai Khwar is likely to have occurred since Project operations began. However, this is a common fish in the upper reaches of River Indus and the fish can use other tributaries for breeding including Natai Khwar. Similarly, the other fish species *Glyptosternum reticulatum, Crossocheilus latius,Schistura naseeri* and *Schistura alepidota* are found in both the Allai Khwar and the Indus River. The impact of Project operation on the population abundance of these species in the Indus River is not likely to be significant though the species upstream and downstream of the weir are likely to have faced population isolation in Allai Khwar. There are no threatened or endangered fish species in Allai Khwar, and there is almost no subsistence, recreational or commercial fishing in the area. Therefore, even though individual receptors are likely to suffer harm, the overall impact on the fish species is not considered significant.

The species Kunar Snowtrout *Racoma labiate,* Chitral Loach *Triplophysa choprai,* and Nazir's Catfish *Glyptothorax naziri* have been reported in the Indus River, but have not been recorded in Allai Khwar. They are not likely to be affected by Project operations.

The EIA proposes as a mitigation measure that EMU will ensure that fish are caught and trucked upstream for release upstream of the weir. A visit to the Project site and discussion with WAPDA officials revealed that this measure has not been put in to practice. However, considering the low significance of the impact of Project operations on the regional fish fauna, this mitigation measure is not considered necessary.

5.11 Social Assessment for AKHP

The methodology used for collecting social information included group discussions, consultations held on site and interviews with key community and institutional stakeholders. The overall acceptability of the project was low among the community stakeholders around the powerhouse and the weir. This perception was mainly due to long hours of load shedding carried out in the region and a low level of communication with the communities by WAPDA. The mechanism of information sharing with the local communities and keeping them informed was almost non-existent, and local inhabitants complained of "not being heard" by WAPDA.

The labor class in the region of Telus and Allai benefited from the Project due to increased employment opportunities, particularly during the construction period. People working in the transport sector also benefited from the Project's construction activities. Tribal leaders and local inhabitants who owned land that was inundated by the reservoir also benefited in the form of compensation for their land. Additionally, the local populations benefited from better infrastructure and access facilities due to the construction of roads in their area. No pending resettlement, land take, legal claims or compensation issues were identified during meetings with the locals and WAPDA officials. No particular social group that had an adverse impact due to the project was identified. Although the flow in Allai Khwar downstream of Allai weir decreased significantly, locals did not complain, but had concerns of the unalarmed release of large flows from the weir during flood season. Due to future operations of the project, no vulnerable groups that might be affected were identified.

Details on additional and related potential social impacts related to health, safety, culture and tribal authorities is provided in Sections 5.3 to 5.10.

5.12 Current EHS, Mitigation and Monitoring, and Supervision on Site

This section summarizes the current status of Environment Health and Safety (EHS), mitigation, monitoring and supervision on site. Details from the previous EHS, mitigation, monitoring and supervision on site are provided in Sections 5 and 7.

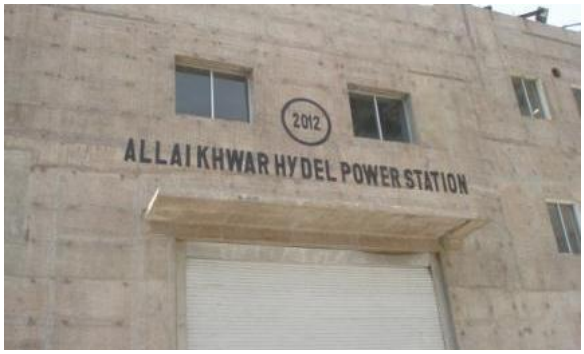
5.12.1 Weir

AKHP commenced operations in 2013, therefore when the Team visited the weir site in April 2014, construction work was already complete. At the weir, two guards were deployed for security purposes, and their job was to mainly monitor the reservoir levels and report the values to the control room in the powerhouse. No evidence, physical or documentary, regarding EHS mitigation and monitoring was observed at the weir site.

5.12.2 Powerhouse

The Team visited the powerhouse and all the adjoining Project facilities during the field visit. At the powerhouse, health and safety signs were observed, and WAPDA staff reported that strict health and safety policies are enforced at the power house. No accidents have been reported at the powerhouse since the Project commenced operations. A health and safety officer was not present at the powerhouse.

Figure 15: Pictures of Allai weir, powerhouse and consultations

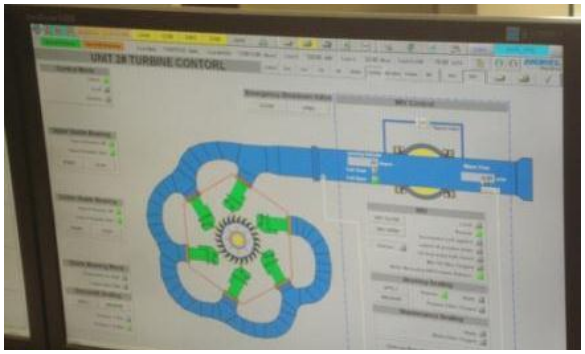


a. AKHP's powerhouse

b. Turbine room at the powerhouse

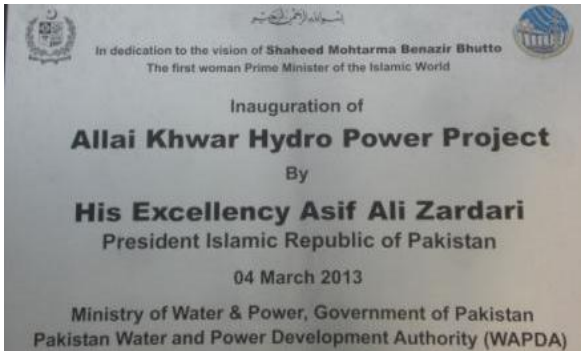
c. Monitoring room

d. Slope stabilization uphill of the powerhouse



e. Turbine information

f. Release of 20 cumecs at full generation of 121 MW



g. Project inaugurated on March 4, 2013

h. Safety sign at the powerhouse

i. Safety sign in the powerhouse

j. Safety sign in the powerhouse

k. Landscape around the powerhouse

l. Firefighting equipment at the powerhouse

m. Left bank of the Indus River

n. The Indus River

o. Communities around the Project area

p. Communities around Allai's weir

q. Allai Khwar bed

r. AKHP's reservoir

s. Water contamination in AKHP's reservoir

t. Downstream of Allai's weir

u. Workshop used during construction work

v. Construction camp area

w. Access road to Allai's weir

x. Access road

y. Consultation with tribal leaders

z. Consultation with local communities

aa. Consultation with WAPDA officials

bb. Consultation with construction contractor's Chief Engineer

6. Security Assessment of Allai Khwar Hydropower Project

6.1 Information Source

An independent security assessment of the region around AKHP was carried out by the Team. The primary source of information for this assessment was obtained by a quick survey of the surrounding area, interviews with the communities in the adjoining areas of the project facilities, and feedback from concerned persons regarding the security situation of the area. Meetings with local political representatives and tribal chiefs were also carried out to consider their views. Furthermore, meetings with officials at WAPDA in their Besham office and with their employees at the Allai Khwar powerhouse and weir sites were also carried out to record past security-related incidents.

The information collected from the field served as a tool for the analysis of the security situation in the area. The community consultations were mainly conducted at the following locations:

- Shop owners in nearby areas;
- Residents in nearby areas;
- Local Member of Provincial Assembly (MPA) and local influential people;
- Communities downstream of Allai weir; and
- Communities upstream of Allai weir.

The locations of communities consulted are shown in Figure 14 in Section 5.

6.2 Potential Security Issues in the Area

The field assessment revealed that the security situation in the area is of concern. The primary source of the security threat is perceived or real grievances of the community against the Project, and the ability of Project Management to address them. However, it was observed that the powerhouse and other facilities are secure, and there is limited possibility for a breach of security. During consultations in the adjoining areas, it was noted that no potential grievances among the locals regarding the powerhouse existed that may lead to a possible serious security situation. However, the community complained about long load shedding hours and demanded provision of free or subsidized uninterrupted supply of electricity. A junior engineer working on the powerhouse reported that during high flow season in 2013, the community protested outside the powerhouse. The reason behind these protests was the opening of the weirs without notice, and consequent deaths of livestock and damage to downstream agricultural fields from the gushing water. The local security guard at the powerhouse reported that incidents of road blockages by the locals were common, and they mainly demanded free or subsidized electricity.

At the weir, the local population complained about the provision of free or subsidized electricity, and jobs at the powerhouse and the weir. They complained that WAPDA had no community liaison officer, and that promises made before the construction of the project were not met. The local tribal chief of Allai reported that they had an agreement with WAPDA, which had the following clauses:

- None of the religious areas such as mosques or graveyards would be affected by the project in any way;
- Free or subsidized, uninterrupted supply of electricity would be provided to the locals; and
- Priority will be given to the local population for jobs during construction and operations of AKHP

The local communities reported that the first commitment regarding the effect on religious areas was kept, but the other two clauses were not. Locals complained that jobs were provided to the locals during the construction phase, but adequate employment was not provided for the operations phase of the project. Local shop owners and residents of Allai reported that the roads were heavily damaged by the contractor vehicles, and they demanded that the contractor should carry out remedial works to leave the roads in the condition they were in before construction. The main demand of protests, demonstrations and road blockages by the locals was for the provision of uninterrupted supply of electricity.

Local communities were very hospitable to the foreign Chinese workers who were engaged in the construction activities. The main complaints were targeted towards WAPDA employees, because the community believed that the provision of electricity was WAPDA's responsibility, and the Chinese contractors had no authority to supply electricity.

It is unlikely that the situation will escalate to a serious conflict. However, there is the possibility of low-level threats such as damage to infrastructure, harassment of Project staff, and potential damage to Project vehicles and installations exists.

6.3 Security-related Incidents

The following-security related incidents have taken place near the Project site:

- Several road blocks at multiple locations were reported by the local population and WAPDA officials;
- Explosions effecting two transmission towers (220 kV) around Mansehra were reported in February 2014. They were carried out by the people of Oogi due to the termination of electricity provided initially;
- During the second week of April 2014, people from Besham and the surrounding area threatened to blow up the power house for not providing adequate electricity to local inhabitants;
- Demonstrations in Kohistan against WAPDA for not complying with the promises allegedly made to local inhabitants before and after commencement of the Project;
- An alliance has been formed between people from Allai, Besham and Koshistan to jointly struggle for the fulfillment of the written commitments and promises made by WAPDA; and
- Detention of Project vehicles on many occasions by local inhabitants from Duber and Pattan over compensation, jobs and the provision of electricity.

Not all of the incidents reported above relate to this project. There are three other hydropower projects in and around Besham. It is often difficult to separate the issues associated with one project from another.

6.4 Community Perceptions

Local communities reported that they regret allowing such projects in their area, which they say has significantly affected their lifestyle (socially and environmentally). The local population demanded free or subsidized uninterrupted supply of electricity and jobs at the Project facilities that were committed to before construction commenced. They also demanded a reasonable share in royalties from the Project located in their area. Local communities also demanded mitigation measures (biological engineering/protection walls/retaining/breast) against damage caused by poor cut and fill mechanisms during the construction of roads by the contractors. The local road network was damaged due to heavy use by construction machinery, and locals demanded repair of the roads in their area to restore them to their original condition. Locals also want WAPDA to establish a cadet college and quality education facilities in Allai.

6.5 Evaluation of Options for Security Arrangements

WAPDA should initiate community engagement and consultations by trained, qualified community relations personnel on a priority basis. Efforts should be made to maximize dialogue and negotiations with locals and tribal leaders at all levels. Use of force is not recommended, as it will create contention between the local population and WAPDA. The WAPDA Community Relations Officer should maintain a community complaint management register at all weir sites and powerhouses. The mechanism for addressing complaints and concerns must be transparent and communicated to the local population. The complaint management registers should be placed at convenient or frequently-visited locations to ensure easy access.

6.6 Role of Community in Security Arrangements

The local population should be involved in safeguarding the project sites. Such an arrangement will increase their sense of ownership, and provide a means of employment and subsistence. The local community complained about not being given enough employment opportunities at AKHP facilities. Recruiting them for securing the project facilities will reduce this sentiment.

6.7 Roles Played by Community Leaders

- Although the population of the region is egalitarian in nature, some Khans and Maliks enjoy suzerainty and political power. They are often observed misusing this power for their personal gain.
- While Allai is relatively more affluent in terms of agricultural potential compared to Duber, the Khans own most of the land and a sizeable percentage of the population works as tenants and share croppers on their land, which lends the Khans unchallenged power. The valley of Allai is divided between two politically and tribally influential Khans known as the Khan of Biari and the Khan of Telus. The Khans of Allai are educated compared to the tribal chiefs of Duber. Hence, their way of dealing with the local populace and project proponents is much softer. While their conduct is soft, they are shrewd and intelligent in obtaining maximum benefits for themselves.

7. Environmental Mitigation and Monitoring Plan

This section includes the Environmental Mitigation and Monitoring Plan (EMMP) based on the REA for the design and construction phases. As the scope of the USAID's involvement does not extend to the operation phase, an EMMP for this phase is not provided. However, recommendations for an EMMP are provided in Section 8.6.

The EMMP provides the mitigation and monitoring plans, institutional arrangement and strengthening requirements, training requirements, occupational safety measures, and environmental and social audits to ensure that the following necessary measures are taken by WAPDA to:

- avoid potentially adverse effects and maximize potential benefits for the Project; and
- operate in conformance with applicable laws and regulations of Khyber Pakhtunkhwa (KP), as well as with the policies of international donor and financial organizations such as the ADB, IFC and USAID.

The Environmental Mitigation and Monitoring Plan (EMMP) is a component of the overall environmental management with respect to the Rapid Environmental Analysis (REA). The REA presents WAPDA'ss commitments to address the impacts identified by the impact assessment process. The EMMP is a USAID requirement per the IEE (OPA Tracking #: OPA-14-JAN-PAK-0017).

The EMMP is based on the baseline conditions and the REA described in previous sections, plus the results of discussions with stakeholders. The EMMP is prepared for all the identified environmental impacts during the construction phase of the Project.

The methodology followed for preparing the EMMP consists of the following:

- deriving mitigation/protection measures for identified impacts using impact evaluation methodology;
- rationalizing and combining series of mitigation, compensation and enhancement measures from each identified impacts and risks to prepare overall measures;
- developing a mechanism for monitoring the proposed mitigation measures to ensure project completion and ongoing operations and maintenance and incorporation of these into project design;
- estimating budget requirements for implementation, mitigation and monitoring measures; and
- identifying responsibilities of various agencies involved in the Project for implementation and monitoring of mitigation measures

The environmental management plan is the "synthesis of all proposed mitigative and monitoring actions, set to a timeline with specific responsibility assigned and follow-up actions defined."[53] It is generally recognized as the most important output of the environmental assessments. Through this tool, the mitigation measures identified in the assessments are implemented. The EMMP may be considered as a separate, stand-alone section within the suite of documents that are prepared as part of the REA for this Project.

This EMMP, due to its nature and applicability, will be further used for contractual purposes; and will be included as a part of the bid documents for the EPC contractor who must abide by it along with the regulatory requirements. The strict implementation of the EMMP and Project Management's strict enforcement of adequate construction practices and standards will greatly reduce negative impacts.

[53] The World Bank, http://go.worldbank.org/UC9PIUINF0, Accessed April 2013.

A key point in the previous "Mitigation Measures and Their Implementation" section in the Feasibility Study of the Allai Khwar Hydropower Project (Environmental Impact Assessment) is that in some cases, other relevant agencies (e.g. a Project NGO, Public Health Department) will have the primary responsibility for monitoring. In addition, during construction, it is implied that monitoring is the responsibility of Pakistan's EPA. However, under the Pakistan Environmental Protection Act 1997 (PEPA 1997), which applied when construction began and the EIA was carried out, this is WAPDA's responsibility.

Additionally, fish monitoring is quoted as being the responsibility of the NWFP (now KP) Fisheries Department. Legally, under PEPA 1997, this is the responsibility of the proponent (i.e. WAPDA). Where it is agreed that Pakistan's EPA, Fisheries Department, Wildlife Department, will carry out monitoring on behalf of WAPDA, an NOC should be obtained and the terms properly documented.

Monitoring and mitigation are the responsibilities of the proponent (WAPDA). Since the 18th Constitutional Amendment and the devolution of powers to the Provincial Governments, the KP EPA has the final say on environmental matters for KP, and not the Federal Government. KP's environmental protection legislation is yet to be passed. WAPDA should be aware of these changes, and take appropriate action, under the law, to ensure compliance with requirements of the KP Provincial Government.

Changes to the Project institutional structure are proposed to ensure that the proponent (WAPDA) can meet its legal obligations (see Section 7.5).

7.1 Environmental Mitigation Plan for Design and Construction Phases

The mitigation plan prepared in accordance with the above framework is presented below. The key components of the plan are discussed in the following sections.

The mitigation plan (see Table 13) and monitoring plan (see Table 14) include the following important format specifications from the IEE (OPA Tracking #: OPA-14-JAN-PAK-0017:

- **Project Activity/Phase –** indicating the project phase/activity associated with the impact.
- **Impact Reference** – this specifies the impact(s) which according to the impact assessment methodology followed for the project has potential influence either negative or positive, and needs to be mitigated by the proposed management measure influences as discussed in earlier sections.
- **Mitigation/Management Measure** – a description of the action, which will be clear, concise and specific enough to enable execution of the action. Where relevant, targets, indicators, trigger points and/or threshold levels will be incorporated into the management measure. If a set of management actions is required to meet the objective, the EMMP will be simplified by making a commitment to develop an appropriate supporting document in which the details will be provided.
- **Monitoring Indicators** – a description of the indicator used to monitor the mitigation measure and determine if it is successful.
- **Monitoring and Reporting Frequencies** – the frequency at which monitoring should be carried out and the frequency of reporting (linking Table 13 to Table 14)
- **Institutional Responsibilities/Party Responsible** – an indication of the roles and responsibilities for the concise implementation of the proposed management measures.
- **Indicative Budget** – budget considerations linked to Section 7.8.

Table 13: Environmental Mitigation and Management Measures for Design and Construction

Project Activity/ Phase	Impact Reference	Environmental Aspect	Mitigation/Management Measures	Monitoring Indicator(s)	Monitoring and Reporting Frequencies	Institutional Responsibility and Party Responsible	Indicative Budget
Design	DS3	Socioeconomic	Compensation issues should be investigated further by the CLO (see Section 7.3.2) and a reasonable agreement should be made with the local community with traditional grazing lands if these lands were privately owned and if these lands did not belong to the forestry department.	Indicator 13 (see Table 14)	Indicator 13 (see Table 14)	WAPDA	Cost associated with hiring CLO and hiring to carry out monitoring responsibilities (see Table 15).
Design	DS8	Socioeconomic	n/a; no further mitigation or management required; however the proposed CLO (see Section 7.3.2) should note any community concerns in this area and follow up with management, staff and contractors on addressing appropriately.	Indicator 13 (see Table 14)	Indicator 13 (see Table 14)	WAPDA	Cost associated with hiring CLO and hiring to carry out monitoring responsibilities (see Table 15).
Construction	CE1	Ecological	Tree plantation to be carried out in a protected or reserve forest area to offset impact.	Indicator 1 (see Table 14)	Indicator 1 (see Table 14)	WAPDA and WAPDA EHS manager to ensure plantation of trees is carried out in consultation with Forestry Department staff. The Forestry Department staff are responsible for subsequent protection of the planted trees.	PKR 100,000 for replantation and cost associated with hiring to carry out monitoring responsibilities (see Table 15).

Project Activity/ Phase	Impact Reference	Environmental Aspect	Mitigation/Management Measures	Monitoring Indicator(s)	Monitoring and Reporting Frequencies	Institutional Responsibility and Party Responsible	Indicative Budget
Construction	CP1	Physical	Dust control measures through daily watering using sprinklers, particularly on days when Project related traffic is high.	Indicator 6 (see Table 14)	Indicator 6 (see Table 14)	WAPDA to carry out daily sprinkling to reduce dust emissions.	PKR 5,000 per day for dust suppression and cost associated with hiring to carry out monitoring responsibilities (see Table 15).
Construction	CP10	Physical	Appropriate monitoring to be carried out (see Section 7.2).	Indicator 4 and 5 (see Table 14)	Indicator 4 and 5 (see Table 14)	WAPDA to ensure monitoring is carried out.	Cost associated with hiring to carry out monitoring responsibilities (see Table 15).
Construction	CP2	Physical	While cleanup of spoil dumps near the beds is not possible, it is important to ensure that all road construction contractors are aware of spoil dump locations, and that they are not to dump spoil anywhere else.	Indicator 1, 2, 3 and 15 (see Table 14)	Indicator 1, 2, 3 and 15 (see Table 14)	Contractors to be legally obligated, by WAPDA.to ensure compliance with EIA and EMMP	Cost associated with hiring to carry out monitoring responsibilities (see Table 15).
Construction	CP6	Physical	During construction activity and road use, sprinklers will need to be utilized.	Indicator 6 (see Table 14)	Indicator 6 (see Table 14)	WAPDA	PKR 5,000 per day for dust suppression and cost associated with hiring to carry out monitoring responsibilities (see Table 15).
Construction	CP7	Physical	Monitoring of inflows, outflows and storage in tanks is critical to detect losses and identify potential leaks. An inventory of fuel use and stored should be used to identify any losses.	Indicator 8 (see Table 14)	Indicator 8 (see Table 14)	WAPDA	Cost associated with hiring to carry out monitoring responsibilities (see Table 15).

Project Activity/ Phase	Impact Reference	Environmental Aspect	Mitigation/Management Measures	Monitoring Indicator(s)	Monitoring and Reporting Frequencies	Institutional Responsibility and Party Responsible	Indicative Budget
Construction	CS1	Socioeconomic	Requires OHS plan, regular OHS meetings, monitoring and audits; and appropriately addressing issues identified (see Section 7.5.2 and 7.7).	Indicator 12 and 13 (see Table 14)	Indicator 12 and 13 (see Table 14)	WAPDA	Cost associated with hiring to carry out monitoring responsibilities (see Table 15).
Construction	CP13	Physical	Monitoring recommended.	Indicator 7 (see Table 14)	Indicator 7 (see Table 14)	Contractor responsibility to be monitored and ensured by WAPDA	Cost associated with hiring to carry out monitoring responsibilities (see Table 15).
Construction	CS4	Socioeconomic	A Community Liaison Officer (CLO) to be appointed to engage the community, keep a record of incidents and grievances (also see Section 7.3.2)	Indicator 10, 11, 14 (see Table 14)	Indicator 10, 11, 14 (see Table 14)	WAPDA to hire CLO.	Cost associated with hiring to carry out monitoring responsibilities (see Table 15).
Construction	CS5	Socioeconomic	A Community Liaison Officer (CLO) to be appointed to engage the community, keep a record of incidents and grievances (also see Section 7.3.2)	Indicator 10, 11, 14 (see Table 14)	Indicator 10, 11, 14 (see Table 14)	WAPDA to hire CLO.	Cost associated with hiring to carry out monitoring responsibilities (see Table 15).
Construction	CE1	Ecological	n/a; no mitigation required; however monitoring is recommended.	Indicator 9 (see Table 14)	Indicator 9 (see Table 14)	WAPDA	See lab cost (Section 7.8) and cost associated with hiring to carry out monitoring responsibilities (see Table 15).
Construction	CE2	Ecological	n/a; no mitigation required; however monitoring is recommended.	Indicator 4 (see Table 14)	Indicator 4 (see Table 14)	WAPDA	Cost associated with hiring to carry out monitoring responsibilities (see Table 15).

7.2 Environmental Monitoring Plan for Construction

The environmental monitoring plan for the construction phases is provided in Table 14. The environmental monitoring program is based on information presented within the baseline, the REA, including observations from the field visit, and the EIA.

The recommended type of monitoring, frequency, location, recording and reporting is also provided. The monitoring is to be carried out by appropriately-appointed field staff or an environmental consultant. Ensuring that monitoring is carried out and a review of monitoring information is the responsibility of the proposed EHS manager (see Section 7.5).

Table 14: Environmental Monitoring Program

Aspect	Monitoring Indicator Number	Type of monitoring/indicator	Units	Monitoring Frequency	Location/s	Records and Reporting	Reporting Frequency	Cost Type
Land disturbance	1	Footprint area disturbed and/or rehabilitated	m^2	Monthly during construction and then as needed when land disturbed or rehabilitated	Alongside the weir and power house area	Log	Monthly report during construction Annual report during operation	On-going cost
	2	Visual inspections for signs of erosion or wind deposition	None	Quarterly or on receipt of grievance	Construction sites, rehabilitated areas and water release points	Log	Annual report with non-conformances handled	On-going cost
	3	Visual inspection of road condition	None	Quarterly or on receipt of grievance	Bypass roads around fenced Project facilities	Log	Annual report with non-conformances handled	On-going cost
Water	4	Quantity and quality of water supply in accordance with the NEQS	mg/l or other units as appropriate	Quarterly	Upstream and downstream of weir	Database	Quarterly report	Lab cost
	5	Volume of water used for dust control	m^3/d	When water trucks filled	Truck filling points	Database	Monthly report of volume	On-going cost
Air	6	Dust deposition and horizontal dust flux	$mg/d/m^2$	Quarterly	Near roads and weir	Database	Quarterly report of results and long term trends	On-going cost

Aspect	Monitoring Indicator Number	Type of monitoring/indicator	Units	Monitoring Frequency	Location/s	Records and Reporting	Reporting Frequency	Cost Type
Vehicle and Equipment	7	Records of vehicle and equipment maintenance	None	As per manufacturer's instructions	Construction truck shop and equipment workshop	Log	Annual report	On-going cost
Fuel Tanks	8	Inventory of fuel to detect any losses of fuel to the subsurface	Liter	When fuel is added or taken from storage, record amount of fuel added and the volume of fuel within the tank before adding or removing fuel.	At all fuel tanks	Log	Quarterly report	On-going cost
Ambient noise	9	Record of noise levels in the nearby settlements	dBA	Once a month during peak construction period	Nearest settlements	Log	Monthly reports	On-going cost
Employment	10	Domicile, age, qualifications and salary of all employees in management, technical, skilled and unskilled category		Quarterly	All hiring undertaken directly by WAPDA or its contractors	Log	Monthly reporting during construction	On-going cost
Socioeconomic conditions	11	Socioeconomic parameters		As required	Project Site and areas around it	Log		On-going cost
Vocational Training and Skill Development	12	Number of persons trained		Once a year	Project Site and areas around it	Log	Annual reporting during construction	On-going cost

Aspect	Monitoring Indicator Number	Type of monitoring/indicator	Units	Monitoring Frequency	Location/s	Records and Reporting	Reporting Frequency	Cost Type
Stakeholder Engagement	13	Conflicts, social ills reported by community, NGO initiatives in community, people's concerns regarding socioeconomic conditions in area		Monthly	Project Site	Log	Monthly reporting during construction	On-going cost
Occupational Health and Safety	14	Report on any OHS incidents and on-going monitoring of compliance with OHS guidelines.		On-going with immediate report of incidents	All locations	Log	Quarterly reports	On-going cost
Waste Management	15	Locations and quantity of all construction and rehabilitation related waste generated and disposed	GIS co-ordinates and m^3	Monthly	All locations	Log	Quarterly report with locations, volume generated and volume disposed, including off-site disposal	On-going cost

7.3 Institutional Arrangement and Strengthening

Effective implementation of the EMMP depends on adequate human and financial resources, clearly defined responsibilities for environmental management, appropriate training, and good communication. An outline of how these features will be managed for the Project is presented in this section.

As part of this, the Team proposes hiring an Environmental, Health and Safety (EHS) and Social Manager to work under the WAPDA Chief Engineer (WCE) and WAPDA Executive Engineer (XEN). Additionally, a Community Liaison Officer (CLO) and an Environmental, Health and Safety Officer (EHSO) should also be hired.

7.3.1 Management Commitment

To be effective, this EMMP must be viewed as a tool reflecting the contractor's and subcontractor's overall commitment to environmental protection. This must start at the most senior levels in the organization. Contractor management must provide strong and visible leadership to promote a culture in which all employees share a commitment to environmental awareness and protection.

The following commitments should be made by WAPDA:

- putting environmental matters high on the agenda of meetings;
- highlighting the importance of environmental issues related to the Health, Safety and Environment in business decisions and communication with stakeholders;
- evaluating environmental aspects before final decisions are reached;
- maintaining full awareness of the main environmental hazards associated with contractor and subcontractor activities. and the systems, procedures and field practices in place to manage these hazards;
- responding immediately and being involved in investigating incidents or other abnormal events related to environmental, health and safety issues; and
- seeking internal and external views on environmental issues, and recognizing their impacts.

The proposed organizational diagram for environmental monitoring and mitigation of the proponent (WAPDA) is provided in Figure 16.

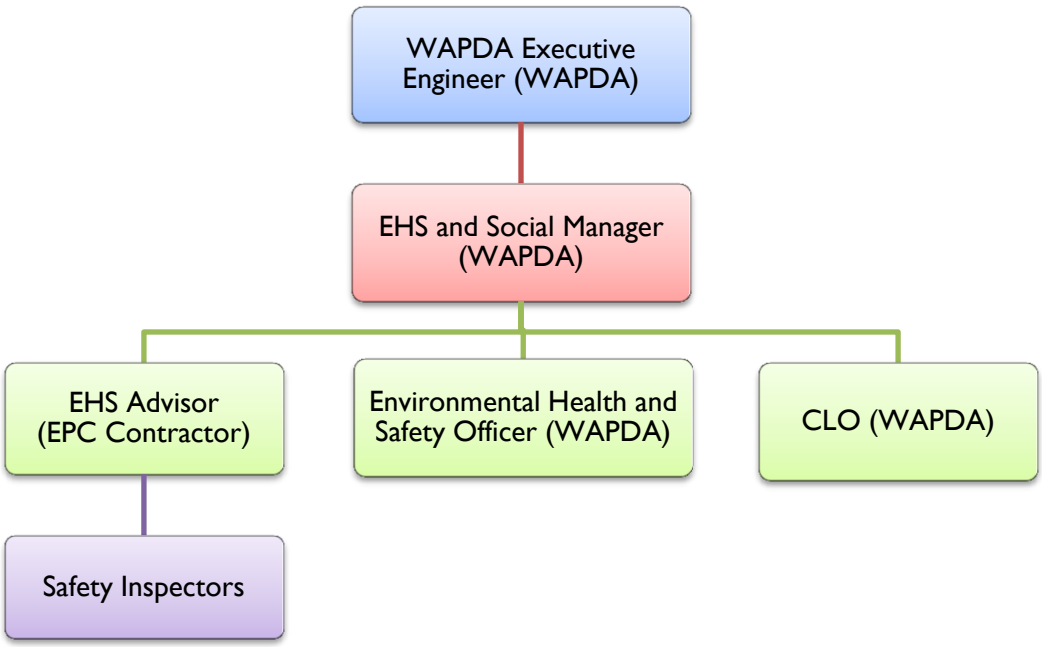


Figure 16: Proposed Setup for WAPDA Environmental Unit

7.3.2 Roles and Responsibilities

7.3.2.1 WAPDA

With overall responsibility for the Project, WAPDA will:

- Appoint responsible contractors who will comply with the EIA and this REA.
- Approve environmental safe materials for use on site in accordance with the EIA and this REA.
- Ensure all relevant parties receive a copy of the approved EIA and REA and that it is incorporated into all contractual documentation.
- Obtain the relevant environmental permits, consents and authorizations prior to commencing site works.
- Comply with all requirements of KP EPA and obtain NOCs related to the Project.
- Ensure and comply with USAID requirements and provide monthly reports on compliance based on monitoring (see Table 15) to the Energy Policy Program (EPP). EPP will subsequently share this information with USAID (at least once every three months).

7.3.2.2 Contractors

The Contractor's general responsibilities will be to:

- Ensure the implementation of the EIA/EMMP throughout construction works by all contractor personnel and subcontractors.
- Ensure that adequate resources are available to implement the requirements of this EMMP.
- Undertake quarterly environmental audits and report to WAPDA on regular basis.
- To coordinate with WAPDA for all correspondence to KP EPA.
- Prepare a comprehensive legislation list and ensure compliance to these legislations.

7.3.2.3 Subcontractors

Any subcontractor hired directly or indirectly by the contractor to carry out Project-related tasks is designated as a subcontractor. It is the responsibility of those sub-contractors, whose activities have at least one interface with identified key environmental aspects, to comply with the EIA and EMMP at all times. They must also designate sufficient competent resources to ensure all subcontractor personnel receive the required training.

Subcontractors directly in charge of activities shall be registered and approved. Registration documentation should be provided to the Client prior to commencement of any activities. Subcontractors are expected to demonstrate a proactive behavior towards environmental concerns. It is their responsibility to provide information requested by the Client with regard to their scope of activities and to demonstrate compliance with the applicable environmental requirements.

7.3.2.4 Personnel

WAPDA Chief Engineer (WCE)

The WAPDA Chief Engineer (WCE) manages and superintends all head office and site activities for the implementation of the Project. In relation to the REA and implementation of EMMP, the WCE's responsibilities, as related to the environment, will include:

- Overall responsibility for ensuring implementation of the EMMP in compliance of all legal matters regarding the Project.
- The development and establishment of adequate Environmental, Safety and Quality Management teams, who will ensure the development, communication and implementation of the EIA and this EMMP across the entire project, including all activities being undertaken by subcontractors and suppliers working on the site, and all personnel visiting the site.
- Ensure that an environmental representative is available on the Subcontractor part to address environmental requirements in accordance with the EIA.
- To develop and establish an organization structure adequate to oversee the whole of the works, including overseeing the appointment of an appropriate qualified EHS Manager.

- Ensure that adequate resources are available to implement the requirements of the EIA and EMMP.
- Ensure the WAPDA EIA, REA and EMMP are reviewed regularly (see Section 7.6 and 7.7) to correspond with on-going construction activities.
- Coordinate with government agencies and bodies regularly to discuss the Project's construction environmental issues and requirements.
- Attend regular meetings with the Construction Managers (contractors) and EHS Advisor in order to discuss the site's environmental issues and requirements.

WAPDA Executive Engineer (XEN)

Responsibilities include

- Taking primary responsibility for all activities on site, including those undertaken by direct or indirectly employed personnel or agencies.
- Ensuring the issue of suitable procedures for the definition of working methods and site regulations that take into consideration the requirements within the EIA, REA and EMMP.
- Ensuring that construction and erection works are performed in respect of the EIA, REA and EMMP requirements.
- Attending regular meetings in order to discuss the site's environmental issues and requirements.

EHS and Social Manager

The EHS and Social Manager will supervise the Project activities relating to health, safety, environment and corporate social responsibility. Specifically, the Manager will be responsible for:

- The overall responsibility for the development and implementation of the Project HSE (Health, Safety and Environment) policy and philosophy.
- Coordinating weekly HSE meetings, during which any environmental issues will be discussed and minuted.
- Reviewing and ensuring the implementation of Contingency and Emergency Response Procedure.
- Providing specialized HSE input into engineering, construction and contracts, ensuring requirements are properly integrated into project planning, design criteria, construction plans and specifications and contracts
- Supporting / leading incident investigations as per project procedure and report to all concerned. Follow up and review the corrective and preventive action taken, and close-out the incidences.
- Conducting HSE inspections of project construction activities and monitoring compliance with requirements including contractual commitments, permits and projects HSE plan and other applicable HSE requirements and ensure that the Project HSE inspection plan is implemented.
- Ensuring that all internal as well as external incidents and complaints are appropriately resolved with all applicable forms and records duly filled and maintained.
- Coordinating and organizing regular meetings with the Project Director, Construction Manager and Environmental Manager in order to discuss the site's HSE issues and requirements.
- Coordinating the environmental activities with the higher management time to time.
- Coordinating with the KP EPA, other regulatory authorities and stakeholders on environmental issues related to construction of the Project.
- Monitoring construction activities and performance to ensure compliance with the EIA and this EMMP and evaluate effectiveness of control measures adopted.
- Ensuring that no works are carried out outside the construction corridor as defined in the EIA/EMMP, especially within the protected areas (e.g. forests).
- Ensuring the issue and updating of the project's environmental plans.
- Coordinating Project document review activities from an environmental standpoint, assuring that the execution of these activities is compatible with development of the Project and reporting any discrepancies between the environmental requirements and other Project objectives to the Head Hydro Power and CEO.

- Supplying essential information for the preparation of the environmental control plan for construction.
- Updating KP EPA regularly on construction information.
- Coordinate the development of environmental monitoring data relevant to construction activities.
- Performing environmental checks and monthly internal audits of onsite activities, in coordination with the HSE Manager.
- Supporting the higher management in relations with the governmental agencies and with the KP EPA on environmental matters.
- Implementing the environmental requirements of the project management system including inspection and reporting.
- Monitoring construction activities and performance to ensure compliance with the CEMP and effectiveness of control measures adopted.
- Developing and implementing of the environmental training programme.
- Conducting staff environmental training, inductions and Tool Box Talks (TBT).
- Advising the Project Manager, or in his absence the relevant Construction Manager, to stop work which could, or is, causing unacceptable environmental impacts.
- Communicating with internal and external parties as required.
- Coordinating daily and weekly site inspections and approving the associated environmental inspection report.
- Reviewing daily and weekly checklists to ensure that appropriate recording of site activities and observations.
- Preparing of the monthly environmental reports, quarterly performance reports and incident reports.
- Reporting of any environmental incidents to the higher management.
- Ensuring that major environmental incidents are reported to KP EPA within a maximum of 3 days.
- Participating in environmental management reviews.
- Reviewing environmental monitoring data.
- Raising non-conformance and issue CAPs reports in coordination with the HSE Manager / coordinator(s).
- Ascertaining that effective measures and relevant actions are undertaken to avoid or minimize adverse environmental impacts.
- Attending regular meetings with the CEO, Head Hydro Power, PM, Construction Manager and EHS Manager in order to discuss the site's environmental issues and requirements.
- Ensuring that all internal as well as external environmental incidents, emergencies and complaints are appropriately resolved with all applicable forms and records duly filled and maintained.
- Reviewing of environmental plans and procedures to assess compliance and recommend revisions regularly, where required.
- Reviewing quarterly audit reports and submit to KPK EPA with the quarterly performance reports.

Community Liaison Officer (CLO) (proposed), to engage with the community and NGOs; and provide a monthly report on conflicts, social ills reported by community, NGO initiatives in community, and people's concerns regarding socioeconomic conditions in area.

Environment, Health and Safety Officer (EHSO) (proposed), to carry out monitoring and reporting tasks under the supervision and as required by the EHS Manager.

7.4 Training Requirements

The training and induction requirements identified are:

- Occupational Health and Safety (OHS) induction (for all employees and contractors).

- Training on environmental monitoring for appropriate staff.

The induction for contractor staff may be carried out by the contractor. However, WAPDA needs to monitor and ensure that the contractors are inducted and trained properly and ensure that this is stipulated.

7.5 Occupational Health and Safety Measures

Occupational Health and Safety measures (OHS) need to be identified for all personal and contractors as part of an OHS Plan. A detailed OHS Plan should be formulated for construction and operations.

7.5.1 Personal Protection Equipment

Based on the jobs and exposure to different hazards for employees and contracting staff, PPE is listed below:

- **Shoes:** appropriate footwear that is effective for preventing injury to employees that are exposed to conditions that may cause or cause foot injuries.
- **Safety Glasses and Goggles:** appropriate eye protection be provided and worn by employees whose jobs expose them to eye hazards.
- **Gloves:** protection for hands and arms from chemicals, temperature extremes and abrasions, including the proper selection of the glove based on its ability to protect the hand of the employee and contractors based on their jobs.
- **Ear Plugs and Muffs:** hearing protectors, including ear plugs and ear muffs, to be worn by construction workers and employees who are exposed to noise.
- **Hard Hats:** head protection should be worn by construction workers and employees who may be exposed to anything that may fall, hit the head, and cause injury.

The PPE list in the OHS plan and the Emergency Procedures Manual should be augmented when required to add any safety measures required for specific and specialized roles.

7.5.2 Occupational Safety Audit

Formal audits will be undertaken at planned intervals in accordance with the requirements of WAPDA and regulatory authorities. Procedures for audits will be established, implemented and maintained. These will cover the audit criteria, scope, frequency and methods, and will address the responsibilities and requirements for planning and conducting audits, reporting results and retaining associated records.

Any negative findings from an audit will be treated as an incident, and dealt with in accordance with the non-conformance and incident procedure. Results from audits and evaluations of compliance with legal requirements will be reported to site and senior management, and subject to management reviews. Customarily, environmental regulatory authorities require a quarterly audit report for large scale projects.

7.6 Environmental and Social Audit

Formal environmental and social audits will be carried out on a yearly basis.

The Energy Policy Program will carry out the following:

- Review the EMMP
- Review monitoring data and reports (see Section 7.2)
- Review socioeconomic data and reports (see Section 7.2)
- Carry out a consultation with staff and community
- Carry out independent monitoring (e.g. water quality, water quantity, environmental flow, etc.)

The result of the audit will include recommendations to update the EMMP, including recommendations on impact mitigation and monitoring. Additionally, the audit will independently verify the environmental and socioeconomic data and reports to a reasonable degree, and highlight any evident non-compliance with the EMMP.

Any negative findings arising from an audit will be treated as incidents, and dealt with in accordance with the non-conformance and incident procedure. Results from audits and evaluations of compliance with legal requirements will be reported to site and senior management, and subject to management reviews. Usually environmental regulatory authorities also require a quarterly audit report for large scale projects.

Comments and feedback on the external audit by Energy Policy Program and AEAI will be incorporated into suggestions for modifying or refining the EMMP if required.

7.7 Reporting Requirements

The reporting and feedback mechanism will comply with the EMMP for all aspects of the environment. The reporting requirements for monitoring are provided in Table 14.

During construction, the EPC Contractor, through the environmental specialist on the team, will prepare periodic (at least once every three months) status reports on the EMP implementation (including measures for mitigations of impacts on biological resources). Such reports will carry information on the main types of activities carried out within the reporting period, status of any clearances/permits/licenses which are required for carrying out such activities, mitigation measures applied, and any environmental issues emerging. These will also include monitoring reports as specified in Table 15.

The EPC Contractor will prepare a Construction Management Plan (CMP) demonstrating the manner in which they will comply with the requirements of mitigation measures proposed in the EMP. After completion of the EPC Contractor's contract, WAPDA will be in charge of the operation and maintenance of the Project and will be responsible for compliance with the monitoring plan during operations.

The independent external monitor will do periodic reviews to ensure that monitoring requirements are being met.

7.7.1.1 Regular Reporting to USAID's Energy Policy Program and AEAI

All documentation mentioned as part of the reporting requirements, including monitoring related reports from Table 15, will be compiled and shared in the form of a "Compliance Report" with the Energy Policy Program (EPP) on a monthly basis. EPP will share this information with other relevant stakeholders, such as USAID, on a regular basis (at least once every three months). Consolidated comments and feedback on the compliance reports from EPP will be incorporated into suggestions for modifying or refining the EMMP if required.

7.8 Budget for Environmental Mitigation and Monitoring Plan

Cost considerations are provided for mitigation and monitoring in Table 15. These relate to the mitigation and monitoring identified in Table 13 and Table 14.

Table 15: Estimated Budget

Item	Indicative Cost	Budget Per Quarter
Environmental Health and Safety Manager	PKR 70,000/month	PKR 210,000
Environmental Officer	PKR 30,000/month	PKR 90,000
Community Liaison Officer	PKR 30,000/month	PKR 90,000
Monitoring - Lab Costs (water quality testing)	PKR 10,000/sample (i.e. per quarter)	PKR 10,000
Mitigation - Dust Suppression	PKR 5,000/day	PKR 475,000
Tree plantation	PKR 100,000	-
Total Budget – Capital cost		**PKR 100,000**
Total Budget – On-going cost (per quarter)		**PKR 875,000**

7.9 Environmental Management Recommendations for the Operation Phase

Some impacts associated with the operation phase were identified in Section 5. Compliance with the EMMP during operations is not a USAID requirement because the agency does not fund this phase. WAPDA should, however, follow the EMMP's recommendation during the operation phase. With respect to operations, the recommended measures for mitigation and management are provided in Table 16. The environmental monitoring recommendations for the operation phase are provided in Table 17. The environmental monitoring program is based on information presented within the baseline, the REA, observations from the field visit, and the EIA.

The recommended type of monitoring, frequency, location, recording and reporting is also provided. The monitoring should be carried out by appropriately-appointed field staff or an environmental consultant.

Table 16: Environmental Mitigation and Management Measures for Operation

Impact Reference	Environmental Aspect	Project Phase	Mitigation/Management Measures	Cost	Institutional Responsibility
OP1	Physical	Operation	n/a; no mitigation required.	n/a	n/a
OP2	Physical	Operation	Works Department to continue road clearing. It is expected frequency of landslides will decrease with time.	n/a	Works Department.
OP3	Physical	Operation	n/a; no mitigation or management required.	n/a	n/a
OP4	Physical	Operation	Continue daily flushing; and EHS manager to engage with community to reduce pollution in the reservoir.	Operational cost associated with hiring (see Section 7.8)	n/a
OP5	Physical	Operation	n/a; no mitigation or management required.	n/a	n/a
OP6	Physical	Operation	n/a; no mitigation or management required.	n/a	n/a
OP7	Physical	Operation	n/a; no mitigation or management required.	n/a	n/a
OP8	Physical	Operation	n/a; no mitigation or management required.	n/a	n/a
OP9	Physical	Operation	n/a; no mitigation or management required.	n/a	n/a
OS1	Socioeconomic	Operation	n/a; no mitigation or management required.	n/a	n/a
OS2	Socioeconomic	Operation	WAPDA to ensure that it also is a contractual obligation, other than legal, that Project staff and contractors cannot cut wood or poach from nearby forests.	n/a	WAPDA
OS3	Socioeconomic/Physical	Operation	WAPDA's Dam Safety Organization (http://www.wapda.gov.pk/htmls/anexiidso.htm) will prepare a dam safety plan to ensure procedures are in place in case of dam failure.	n/a	WAPDA
OE 1	Ecological	Operation	WAPDA to ensure that it also is a contractual obligation, other than legal, that Project staff and contractors cannot cut wood or poach from nearby forests.	n/a	WAPDA
OE 2	Ecological	Operation	Release of environmental flow	n/a	WAPDA

Table 17: Proposed Environmental Monitoring Program for Operations

Aspect	Type of monitoring	Units	Frequency	Location/s	Records	Reporting	Cost Type
Water	Quality of water supply in accordance with the NEQS	mg/l or other units as appropriate	Quarterly	Upstream and downstream of weir	Database	Quarterly report	Lab cost
Vehicle and Equipment	Records of vehicle and equipment maintenance	None	As per manufacturer's instructions	Equipment workshop	Log	Annual report	On-going cost
Fuel Tanks	Inventory of fuel to detect any losses of fuel to the subsurface	Liter	When fuel is added or taken from storage, record amount of fuel added and the volume of fuel within the tank before adding or removing fuel.	At all fuel tanks	Log	Quarterly report	On-going cost
Ambient noise	Record of noise levels in the nearby settlements	dBA	Once a month during peak construction period	Nearest settlements	Log	Monthly reports	On-going cost
Employment	Domicile, age, qualifications and salary of all employees in management, technical, skilled and unskilled category		Quarterly	All hiring undertaken directly by WAPDA or its contractors	Log	Monthly reporting during construction	On-going cost
Socioeconomic conditions	Socioeconomic parameters		As required	Project Site and areas around it	Log		On-going cost
Vocational Training and Skill Development	Number of persons trained		Once a year	Project Site and areas around it	Log	Annual reporting during construction	On-going cost
Stakeholder Engagement Plan	Conflicts, social ills reported by community, NGO initiatives in community, people's concerns regarding socioeconomic conditions in area		Monthly	Project Site	Log	Monthly reporting during construction	On-going cost
Occupational Health and Safety	Report on any OHS incidents and on-going monitoring of compliance with OHS guidelines.		On-going with immediate report of incidents	All locations	Log	Quarterly reports	On-going cost

8. Conclusions

The Project has been designed and constructed in compliance with national and environmental laws (Section 2)[54]. Additionally, no major environmental liabilities were identified as part of the REA. Construction over-runs associated with the Project are associated with the 2005 earthquake and the 2010 floods. The earthquake and floods caused delays in construction and the associated with cost over-runs. The 2005 earthquake necessitated a change in design parameters to increase the Project's resistance to earthquakes (Section 3.8).

While no major non-conformance issues were identified against national law, there are certain aspects that need to be addressed to ensure conformance with international best practices. These aspects, or gaps, include following:

- The WAPDA EIA does not provide detailed mitigation and monitoring plans.
- During the Project's construction phase, evidence of full compliance with the mitigation measures was not available, mainly due to a lack of monitoring and documentation.
- WAPDA's communication and community outreach with the local population has been poor (Section 5).

One of the objectives of the REA was to identify additional impacts that are not covered in the WAPDA EIA. These impacts have been identified, and corresponding mitigation measures have been proposed. To address the issue of monitoring noncompliance, WAPDAs conformance with the EMMP developed as part of this study is required (Section 7). To promote better communication with the local community, the proposed environmental management unit in the WAPDA EIA should be strengthened and its structure changed by hiring the following proposed positions (see Section 7):

- EHS and Social Manager
- Community Liaison Officer
- Environmental, Health and Safety Officer

When the Environmental Management Unit can carry out its responsibilities and the EMMP is strictly followed, the Project will be completed in a socially and environmentally-responsible manner.

[54] Assuming that WAPDA's assertion that the approval of the EIA was obtained from KP EPA is correct.

9. References

2005 Earthquake: Voice of Allai, The Express Tribune Blogs, October 9, 2011, http://blogs.tribune.com.pk/story/8373/2005-earthquake-voice-of-allai/, accessed June 2014.

Director General (Environment) WAPDA Environment Cell (WEC), *Assessment of Environmental Flows from Weir Site downstream of Allai, Khan and Duber Khwar Projects*, May 2010, , Sunny View Estates, Lahore.

Feasibility Study of Allai Khwar Hydropower Project, Daily Storage Alternative, Appendix 6, Environmental Impact Assessment, May 2000. Programme for National Hydropower Development, Government of Pakistan, Ministry of Water and Power in collaboration with GTZ, German Agency for Technical Co-operation.

General Manager Projects (Northern Areas), WAPDA, Hattian, District Attock, PC-I Proforma for Allai Khwar Hydropower Project (121 MW) (2nd Revision), February 2013

Government of Pakistan, Planning Commission, Planning and Development Division, Islamabad. *Handbook on Planning Commission Government of Pakistan*, May 2008. www.pc.gov.pk/organization/Handbook-Planning%20Commission.pdf. Accessed May 11, 2014

IUCN 2013. *IUCN Red List of Threatened Species. Version 2013.2*. <www.iucnredlist.org>. Downloaded on 22 April 2014

Khan, Mohammad Abid. *Journal of Himalayan Earth Sciences* Vol. 47, no. 01 (2014): pp. 131-140. http://nceg.upesh.edu.pk/GeologicalBulletin/Vol-47(1)-2014/Vol-47(1)-2014-Paper11.pdf Accessed on 7 May 2014)

N.A Raja et al, The birds of Palas Northern-West Frontier Province, Fork tail 15, 1999, 77-85

Personal Communication with Rafaqat Masroor, herpeto-faunal expert, Pakistan Museum of Natural History, Islamabad on 7 May, 2014

Policy on Social and Environmental Sustainability, *Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources*, International Finance Corporation, The World Bank Group, January 2012

Population Census Organization. *District Census Report of Khyber Pakhtunkhwa (DCR KPK)*. Census Report, Islamabad: Government of Pakistan, 1998.

Rafiq, Rubina A., and Nasir, Yasin J. *Wild Flowers of Pakistan*, Oxford University Press, 1995

Rafique, M 2000. Fish Diversity and Distribution in Indus River and its Drainage system. Pakistan J. Zool., 32(4): 321-332.

Rafique, M 2001. *Fish fauna of the Himalaya in Pakistan with comments on the origin and dispersal of its High Asian Elements*. Pakistan J. Zool., 33(4): 279-288.

Rafique, M and Hamid, I, *Fish fauna of Swat and Bunair Valleys*, N.W.F.P., Pakistan. Rec. Zool. Surv. Pakistan, 14: 43-48, 2002

Rafique, M, *Fish Diversity and Distribution in Indus River and its Drainage system, Pakistan* J. Zool., 32(4): 321-332, 2000

Rafique, M, *Fish fauna of the Himalaya in Pakistan with comments on the origin and dispersal of its High Asian Elements, Pakistan* J. Zool., 33(4): 279-288, 2001

Raja N. A., Davidson P., Bean R., Drijvers R., Showler D. A., and Baker C.. *The birds of Palas*, North-West Frontier Province, Pakistan. Forktail (15): 77-85, 1999

Sarfraz Hayat, *Palas Valley Conservation project in Kohistan*, Pakistan , July 2009

Tahirkheli, R.A. Khan . "*The Main Mantle Thrust: Its Score in Metallogeny of Northern Pakistan*." Geological Bulletin Vol. 13, no. 19 (1979): pp 193 - 198. http://nceg.upesh.edu.pk/GeologicalBulletin/Vol-13-1979/Vol-13-1979-Paper21.pdf Acessed on 7 May 2014.)

The World Bank, *Glossary of terms*, http://go.worldbank.org/UC9PIUINF0, Accessed April 2013.

UNEP-WCMC. *UNEP-WCMC Species Database*: CITES-Listed Species, 24 April, 2014.

ANNEXES

Annex I:
Scope of Work

Scope of Work

Technical Assistance on Rapid Environmental Analysis (REA) of Duber Khwar and Allai Khwar Run-of-river Hydroelectric Power Projects

1.0 Background

The U.S. Government's Quick Impact Energy program started in October 2009 to address Pakistan's severe electricity shortages that have created an energy crisis threatening the country's political and economic stability. WAPDA has requested USAID for grant funds to expedite the commissioning of two near-completion on-going run-of-the-river hydroelectric power projects Duber Khwar and Allai Khwar. These projects were originally co-funded by IDB with WAPDA. WAPDA ran short on funds and projects were delayed because Government has not disbursed the funds that were planned and allocated to WAPDA under the Annual Public Sector Development Programs (PSDP).

As part of Phase-II of the Energy Program, the USG through USAID is considering Duber Khwar and Allai Khwar for USG funding. Both projects are under different phases of construction completion and USAID is assessing the remaining work required for commissioning them into operation. For the purpose of projects' due diligence evaluation, USAID has to ensure that the environmental assessments for both the projects are compliant with the local, international best practice and US environmental regulations, i.e. USAID's 22 CFR 216, and implementation has been in accordance with agreed environmental mitigation and monitoring measures.

2.0 Project Brief

2.1 Duber Khwar

It is located in KP's remote district 'Kohistan' on the Duber Khwar river, a right bank tributary of the Indus River. The Project area is accessible by road at a distance of 270 Km from Rawalpindi and 300 Km from Peshawar. The plant's maximum power output is planned at 130 MW. Upon commissioning it will produce an annual energy of approximately 595 Gwh, out of which 187 Gwh will be available during a 4 hour/day period of peaking operation. USAID Consultants estimated a reasonable budget of $25 million, to complete the project.

The Project was approved by ECNEC on 2 September 2002 and a Revised PC I was approved on 20 August 2009. The Project on completion will generate 595 GWh annually and this power from Duber Khawar will be connected to Allai Khawar/Khan Khawar hydro power projects through 46 Km double circuit 132 Kv Line. Allai Khawar project is linked with National grid through 220 Kv double circuits. Expected completion of the project is by March 2014.

2.2 Allai Khawar

It is located in KP's remote district 'Battagram' on the Allai Khwar, a left bank tributary of the Indus River. The Project area is accessible by road and is at a distance of 245 Km from Rawalpindi and 270 Km from Peshawar. The plant's maximum power output is planned at 121 MW. Upon commissioning it will be able to produce an annual energy of approximately 463 gigawatt hours (GWh), out of which 160 GWh will be available during a 4 hour/day period of peaking operation.

The 121 MW Khan Khwar Hydropower Project was approved by ECNEC on 2 September 2002 and a Revised PC I was approved on 20 August 2009. The Project on completion will generate 463 GWh annually and this power from the power station at Besham will be brought by a 220 kV double

circuit National Grid along with Khan Khawar and Duber Khawar. The project was completed in June 2013, and is currently under Defect Liability Period with some remaining works to complete.

Both of these projects were identified by Sarhad Hydel Development Organization (SHYDO) under technical assistance of German Technical Corporation (GIZ) and were ready for implementation in 1999 and 2000 respectively. However, the EA documentation was completed and approved by the relevant Environmental Protection Agency in August 2010.

3.0 Evaluation of Project Issues with Respect to Environmental Impact Potential

Both run of river hydroelectric power projects and their respective activities were identified and addressed by separate Environmental Impact Assessment (EIA) and subsequent respective EMMPs prior to the execution of these projects.

The contents of the respective EIAs were designed to meet the standard guidelines of the Pakistan Environmental Protection Agency (PEPA). Brief information related to the earlier completed environmental studies of the respective projects is described below;

3.1 Duber Khwar Hydroelectric Power Project

Feasibility Report of the 130 MW Duber Khwar project was prepared by GTZ (German Agency for Technical Cooperation). EIA/EMMP was also done by GTZ working with SHYDO in Dec 1999 and made part of feasibility study. Factors such as displacement, biological resources and forest, water usage, disposal of materials and waste were studied. Socio-economic setting, climate change and mitigation of effect on environment were studied as well. Accordingly cost of implementation, including environmental mitigation and monitoring was calculated during study, and subsequently revised during construction. Monitoring of mitigation program was planned out. Land acquisition and land leasing cost, tree compensation, built-up property compensation and resettlement, sewerage and providing power transmission lines to water mills was determined. The cost allocated for these works $3.75 million per the revised PC-I. Approval/NOC of Environmental Impact Assessment was granted by Environmental Protection Agency (EPA) Department of KPK province.

WAPDA is implementing this project. Project Civil works contract was awarded to Sino Hydro of China and E&M works to Andriz of Austria. Lahmayer of Germany in association with NDC of Pakistan was awarded Project Consultant for monitoring of the project. Islamic Development Bank (IDB) has funded cost of civil works and cost of Consultancy Service.

3.2 Allai Khawar Hydroelectric Power Project

Feasibility Report of the project was prepared by GTZ long with SHYDO in 2000. EIA/EMMP (part of feasibility study –Appendix 6); was carried out by GTZ while working with SHYDO in May 2000. Factors affecting environment such as displacement, biological resources and forest, water usage, disposal of materials and waste were investigated. Socio-economic setting, climate and mitigation of effect on environment were studied. This component includes land acquisition and land leasing cost, tree compensation, built-up property compensation and relocation of flourmills and other mitigation cost. NOC of Environmental Impact Assessment of the project was approved by Environmental Protection Agency EIA Department of KPK.

WAPDA is implementing this project. Project Civil works contract was awarded to Donfong of China and E&M works to Andriz of Germany. Lahmayer of Germany in association with NDC of Pakistan was awarded Project Consultant for monitoring of the project. Islamic Development Bank (IDB) has funded cost of civil works and cost of Consultancy Service.

4.0 Period Of Performance

In the above context, USAID through its contractor, Advanced Engineering Associates International (AEAI), is seeking quick assistance from local engineering/environmental firms to carry out an engineering, environmental and social review / survey to verify the costs, designs, environmental and social compliance issues, and economic impact of the projects.

The duration of the assignment is **30-45 Calendar Days (1-1.5 months)** from the signing of the Contract / Purchase Order. The anticipated start date is the first week of March 2014. Contractor staff is authorized to work a six-day work week.

5.0 Specific Technical Requirements

The Contractor shall undertake the following:

- Complete review of the PC-1s as revised and/or amended, feasibility studies and other relevant project documents. Collect secondary data from relevant sources to compare with the information available in current project documents.
- Review of the projects, its objectives, and a statement of economic and social benefits.
- Review the engineering documents and ongoing work to determine cost of the remaining works based on current rates.
- Review of the requirements of the IEE (Tracking #: OAPA-14-Jan-Pak-0017) and 22 CFR 216 as well as required identification of new significant environmental effects detected during the Rapid Assessment
- Review of the safety requirements for the project including worker OHS, dam safety and other provisions related to safety
- Site / Field visits for all the stated requirements, meetings with stakeholders, collection of environmental and social data, collection of designs and cost estimates documents from WAPDA etc.
- Review project siting/design impacts identified in WAPDA IEE and identify any additional impacts associated with project siting/design
- Carry out an engineering, environmental and social review / survey to verify the costs, designs, environmental and social compliance issues, flaws and construction adequacy and economic impact of the projects
- Details of the security situation and identification of local tribal leaders who could serve as contact points for ensuring security arrangements.
- Describe the areas as they currently exist with the ongoing construction of the hydroelectric power projects, transmission lines etc. This task will require onsite assessment in the field and should cover different areas impacting the environment such as physical, biological, climate, water resources, geology and socio-economic. Including any resettlement and land acquisition, cultural heritage, indigenous people, etc. issues
- Review of all EIAs/EAs, EMMPs and other environmental documents, including compliance and performance monitoring reports, prepared and approved in 1999-2010 and conduct an independent rapid environmental due diligence analysis to determine:
  - The main environmental and social effects of the projects, both in the project area and in the surrounding area and the timescale of the impacts, the defined mitigation and monitoring measures and compliance.
  - Environmental mitigations required and the inspection and reporting already done to determine compliance with existing requirements established in the approved EIAs and signed contracts.
  - Evaluating understanding of environmental mitigation and monitoring requirements by the project implementation and construction staff.

  - Evaluation of existing environmental and social problems associated with the development of the hydroelectric power projects that should be resolved because they are resulting in adverse environmental and social impacts.
  - The size and extent of the impacts, both adverse and beneficial, (the effectiveness of the mitigation measures should be based as much as possible on quantitative data rather than qualitative assessments).
  - Any potential impact on human health, social fabric of communities, etc.
  - The impact on any rare species of plant or animal in the area.
  - Appropriateness of construction and operation practices, on-going supervision as well as implementation of environmental mitigation and monitoring measures (and Contractor's capabilities) as proposed in the original approved IEE/EA/EIA.
  - The significance of existing and potential adverse environmental and social impacts due to construction and operation of the hydroelectric power project and associated infrastructure, and update or develop an Environmental Monitoring and Mitigation Plan (EMMP) for each project with budget and responsibilities that should comply with GOP and USAID/ USG environmental regulations and best international practice.
  - Based on above prepare a summary for each project of the environmental issues, positive or negative impacts and proposed mitigations & monitoring (in tabular form) for the scope of activities under both projects in their area of influence. Highlight any changes in the environmental conditions & issues since the existing (original) reports and start-up of construction.

- Conduct an independent social assessment to determine:
  - Those groups that have benefited and those that have been left disadvantaged by the project, with a particular focus on women.
  - Identify any pending resettlement / land-take / legal claims / compensation issues.
- Identify responsibility for ongoing operations and maintenance and provide suggestions on the best approach to ensure them.
- Review and report in the on-going compliance with the environmental monitoring requirements of the existing EAs.
- Identify mitigating measures that may be necessary to ensure project completion and ongoing operations and maintenance, and how they should be incorporated into the project design.
- Draft a monitoring and evaluation scope of work to ensure project is successfully completed, expected impact in attained, mitigating measures are implemented, and future potential issues are avoided.
- Identify further assessments that may be necessary in order to determine project impact and viability.
- Review the comments of USAID Environmental Officers and address all concerns.

6.0 Deliverables

The Contractor shall produce and submit the following:

6.1 Inception Report including Work Plan: Within ten days after signing the Purchase Order the contactor will be required to submit an inception report including work plan. The inception report shall include but not limited to provision of detailed explanation of the available relevant environmental reports, literature, methodology and tools to be used, and findings. The work plan section shall include but not limited to provision of field visits' schedule for all the stated requirements, meetings with stakeholders, collection of environmental and social data, collection of designs and cost estimates documents from WAPDA, desk analysis, submission of draft and final reports. This inception report including the Work Plan shall be written in a range of 20-30 pages.

6.2 Biweekly reports and progress briefing that provide detailed explanation of the work progress against the approved work plan, issues and corrective measures. The report shall be organized by project (Duber Khwar and Allai Khwar), and where applicable, include photos of project activities. The biweekly report shall be in the range of 10-15 pages

6.3 Draft REA Report for Duber Khwar including EMMP (Two hard and two soft copies on CD). The REA report, except annexures, shall not exceed 250 pages.

6.4 Draft REA Report for Allai Khwar including EMMP (Two hard and two soft copies on CD). The REA report, except annexures, shall not exceed 250 pages.

6.5 Final Reports (two separate Reports)of Environmental Documentation Form for: 1) Duber Khwar and 2) Allai Khwar: The reports (two hard copies and a soft copy on CD for each) should include at a minimum the following:

1. Executive Summary including findings and recommendations
2. List of Acronyms
3. Conversion Table
4. Introduction
   - 4.1. Background
   - 4.2. Objective and Scope of Assignment
   - 4.3. Project Overview
   - 4.4. Review of the Past Environmental Assessment
   - 4.5. Document Structure
5. Legislative, Regulatory, and Institutional Frameworks
   - 5.1. National Legislative and Regulatory Framework
   - 5.2. Provincial Environmental Legislation
   - 5.3. Environment Guidelines
   - 5.4. Institutional Framework
   - 5.5. USAID Environmental Procedures
6. Project Description
   - 6.1. Project History
   - 6.2. Project Justification
   - 6.3. Project Objectives
   - 6.4. Project Location
   - 6.5. Project Components
   - 6.6. Implementation Arrangements
   - 6.7. Technical Review of Project
7. Overview of Baseline Conditions
   - 7.1. An Overview of Geographical Area (Respective Area of influence i.e. District(s) / Division(s) of KP province)
   - 7.2. Physical Environment
   - 7.3. Biological Environment
   - 7.4. Socioeconomic Environment
   - 7.5. Changes in Site Conditions/Observations Made during Site Visit
   - 7.6. Floods of 2010 and subsequent floods till date
8. Rapid Environmental and Social Assessment
   - 8.1. Impact Assessment Methodology
   - 8.2. Project Siting/Design Impacts Identified in WAPDA IEE
   - 8.3. Additional Impacts Associated with Project Siting/Design
   - 8.4. Impacts Related to Construction Activities

8.5. Impacts Related to Operation and Maintenance Activities
8.6. Beneficial Environmental and Social Impacts
8.7. Current EHS Mitigation and Monitoring, and Supervision on Site

9. Environmental Mitigation and Monitoring Plan
   9.1. Institutional Strengthening
   9.2. Environmental Mitigation and Monitoring Plan Construction and Operation
   9.3. Environmental Monitoring
   9.4. Environmental and Social Audit
   9.5. Budget for Environmental Mitigation, Monitoring and Institutional Strengthening

10. Multiple Project Maps, Design etc.
   10.1. Maps: Location, Land use, Salient design features, Construction material sources, topographic maps, Seismic Map, Sensitivity Map etc.
   10.2. Annexures: List of participants, Public consultations list, Entitlement and compensation matrix, location of sensitive receptors and their distances from proposed project, NEQs, Construction Noise Modeling etc.
   10.3. Tables: Salient Features of project, average monthly temperature, precipitation and relative humidity, floral species, herbs shrubs, grasses mammals, reptiles, birds reported in project area etc. that are affected by the project.

11. Bibliography and References

12. Appendices

Each REA report except annexures shall not exceed 250 pages.

7.0 Timeline for Deliverables

The following table summarizes the deliverables along with its timeframe.

Table 1: List of Deliverables and Timeline

S. No.	Name of deliverable	Timeline
1	Inception Report and Work Plan	Within 10 days of contract / Purchase Order signature
2	Bi-weekly Progress Report	Every alternate Monday
3	Draft Final Reports of EDF for Duber Khwar including EMMP (Two hard and two soft copies on CD)	Within 30 days of contract / purchase order signature
4	Draft Final Reports of EDF for Allai Khwar including EMMP (Two hard and two soft copies on CD)	Within 30 days of contract / purchase order signature
6	Final Reports of EDF including EMMP for Duber Khwar (Two hard and a soft copy on CD for each)	Within 45 days of contract / purchase order signature
7	Final Reports of EDF including EMMP for Allai Khwar (Two hard and a soft copy on CD for each)	Within 45 days of contract / purchase order signature

8.0 Consultant's Qualifications

8.1 Consultant shall demonstrate relevant experience, education, qualifications and capability of the Team Leader: Relevant qualifications, education, experience working in similar studies and assessments, and the ability to manage multidisciplinary team of experts in politically and security sensitive complex environment.

8.2 Technical Experts: Technical advisors (Hydelpower projects, Construction, Transmission Lines, Environment, Sociology) with similar experience in hydel power projects related environmental issues including impact on the local population.

8.3 Sociologists and Anthropologists (Socioeconomics, sociology, land and resettlement, gender and sustainable development) relevant qualifications, education, experience and professional background working in similar projects in Pakistan and abroad.

Proposed key personnel to carry out the Statement of Work in accordance with the following:

9.0 Payment Schedule

Payment is linked to the completion of contract deliverables according to the schedule below:

Table 2: Payment Schedule

Approval of Inception Report and Work Plan	10% of total cost
Submission and acceptance of Draft Final Reports of EDF for Duber Khwar including EMMP (Two hard and two soft copies on CD)	35% of total cost
Submission and acceptance of Draft Final Reports of EDF for Allai Khwar including EMMP (Two hard and two soft copies on CD)	35% of total cost
Submission and acceptance of Final Reports of EDF including EMMP for Duber Khwar (Two hard and a soft copy on CD for each)	10% of total cost
Submission and acceptance of Final Reports of EDF including EMMP for Allai Khwar (Two hard and a soft copy on CD for each)	10% of total cost

A deliverable will be considered completed once written acknowledgement of completion is provided by the COR.

10.0 References (Official Documents & Reports)

10.1 Required Readings

- USAID 22 CFR Part 216 and USAID ADS 204
- Relevant Government of Pakistan laws, regulations and policies
- USAID Initial Environmental Examination (Tracking #: OAPA-14-Jan-Pak-0017)
- Respective Project IEE, EIA, EA, EMMP, Engineering Design Documents/Drawings, Feasibility Studies

10.2 References

- Friends of Democratic Pakistan Report on Water March 2011 at http://www.wapda.gov.pk/pdf/BrochureFODPMarch2011.pdf
- Biological Diversity and tropical forestry Analysis at: http://pdf.usaid.gov/pdf_docs/PNACU858.pdf
- Pakistan Infrastructure Implementation Capacity Assessment (PIICA) World Bank Report No. 41630-PK at: http://siteresources.worldbank.org/SOUTHASIAEXT/Resources/Publications/448813-1202436185914/PIICfull.pdf and http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/SOUTHASIAEXT/0,,contentMDK:21642194~pagePK:146736~piPK:146830~theSitePK:223547,00.html

- Pakistan Water Economy Running Dry at: http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2008/11/17/000333037_20081117005856/Rendered/PDF/464690BRI0Box31tionerNote11Pakistan.pdf
- Pakistan Promoting Rural Growth and Poverty Reduction at: http://siteresources.worldbank.org/PAKISTANEXTN/Resources/293051-1177200597243/ruralgrowthandpovertyreduction.pdf
- Land Cover Assessment and Monitoring at: http://www.rrcap.ait.asia/lc/cd/html/pakistan.html
- Water Sector Capacity Building and Advisory Project at: http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2008/05/02/000076092_20080502165559/Rendered/PDF/Integrated0Saf10Sheet1Concept0Stage.pdf
- Islamic Republic of Pakistan 2008 Country Environmental Analysis ADB Report at: http://www.adb.org/sites/default/files/pub/2008/Country-Environment-Analysis.pdf
- Evaluation of the Agriculture and Natural Resources Management Sector ADB Report at: http://www.adb.org/sites/default/files/agriculture-management-pak.pdf
- New Bong Escape Hydropower Project SEIA at: http://www2.adb.org/Documents/Environment/PAK/bong-hydropower.pdf
- Review and Evaluation of Environmental impact Assessment Process in Pakistan at: http://www2.lwr.kth.se/Publikationer/PDF_Files/LWR_EX_06_24.PDF
- National Operational Strategy on Clean Development mechanism at: http://www.environment.gov.pk/NEP/PakCDM-NatOpelStrgy.pdf
- Climate Change, Poverty and Environmental Crises in the Disaster Prone Areas of Pakistan at: http://policy-practice.oxfam.org.uk/publications/climate-change-poverty-and-environmental-crisis-in-the-disaster-prone-areas-of-111982
- Environmental Stress and Human Security in Northern Pakistan at: http://www.wilsoncenter.org/sites/default/files/ECSP7-featurearticles-2.pdf
- Building Resilience, Integrating Climate and Disaster Risk into Development, http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2013/11/14/000456286_20131114153130/Rendered/PDF/826480WP0v10Bu0130Box37986200OUO090.pdf
- http://www.epa.gov/epawaste/hazard/tsd/pcbs/index.htm
- http://chm.pops.int/Portals/0/flash/popswastetrainingtool/eng/All_technical_guidelines_on_POPs_4.pdf
- http://chm.pops.int/Implementation/TechnicalAssistance/GuidanceandPublications/tabid/2333/Default.aspx
- http://www.chem.unep.ch/Publications/pdf/GuidIdPCB.pdf
- http://www.basel.int/Portals/4/Basel%20Convention/docs/pub/techguid/tg-PCBs.pdf
- http://www.chem.unep.ch/Pops/pcb_activities/PCB_proceeding/pcb_proceeding.htm
- http://www.ifc.org/wps/wcm/connect/Topics_Ext_Content/IFC_External_Corporate_Site/IFC+Sustainability/Sustainability+Framework/Environmental,+Health,+and+Safety+Guidelines/
- http://www.epa.gov/wastes/homeland/docs/pcb-disposal.pdf
- http://www.epa.gov/compliance/resources/publications/assistance/sectors/constructmyer/myer1c_pcb.pdf
- http://www.gpo.gov/fdsys/pkg/CFR-2013-title40-vol32/pdf/CFR-2013-title40-vol32-sec761-61.pdf
- http://www.clu-in.org/download/contaminantfocus/pcb/PCBs-in-bldgs-lit-review.pdf
- http://www.pesco.gov.pk/docs/p1.pdf
- http://www.afghaneic.org/library/feasibility%20studies/4%20Feasibilty%20study%20of%20Development%20of%20a%20Gas%20Fired%20Termal%20Power%20Facility%20in%20Sheberghan%20Volume%204.pdf
- http://www.lesco.gov.pk/images/esa_report/IEE%20Report%20-%20Full.pdf
- http://energy.punjab.gov.pk/downloads/ERF%20Advertisement.pdf
- http://www.epa.gov/tribalcompliance/wmanagement/wmwastedrill.html
- http://www.adb.org/sites/default/files/pub/2013/indus-basin-floods.pdf
- http://www.stimson.org/images/uploads/research-pdfs/connecting_the_drops_stimson.pdf

Annex II:
AKHP Impact Matrix

AKHP Impact Matrix

Impact Reference	Impacted Aspect	Description	Information in EIA	Mitigation in EIA	Monitoring in EIA	Source/ Comment	Stakeholder Comments	Compliance Status	Environmental Aspect	Project Phase
DS1	Land and fixed property owners	Re-settlement and land loss due to the reservoir	The owner of the house in the reservoir area has agreed to move if adequate compensation is provided for him to settle in the same locality. Those who will lose land wish to be compensated in cash	The project will provide compensation for land, property, natural resources and sources of income directly or indirectly lost as a result of the project.		EIA	No issues reported	The owner of the house was interviewed who reported that alternate area for settlement was given to and he was satisfied with the compensation given. His family had relocated further up the slope in the same locality.	Socio-economic	Design
DS2	Tenants and laborers	Loss of livelihood by a laborer working on a field that will be inundated by the reservoir	A single house that will be inundated is owned by a laborer. The standard of living of this family has to be protected and the Khan of Telus has personally undertaken to ensure that this family will be provided land elsewhere on which to make a living.	The owners of arable land acquired compulsorily by the project will be compensated by cash equivalent to the market or replacement value of the land, in addition to a resettlement allowance equivalent to one year's average income from the affected land		EIA	No issues reported	The affected laborer reported that alternate means of livelihood was provided in the form of employment on construction site. The laborer is now skilled in construction work and works as daily wage labor in the local area	Socio-economic	Design
DS3	Livestock owners	Loss of grazing land due to reservoir and project facilities	Cash compensation for the grazing land lost to the project would be fully acceptable to the owners of the land.	All members of the local community with grazing rights in the affected area would be eligible for compensation. Individual compensation entitlements would be calculated on the basis of these rights and the total compensation value divided proportionally. These amounts would be paid in cash. Naturally growing trees and shrubs should be compensated in the same way		EIA	Locals complained that the compensation given to them by WAPDA was not enough.	Payment of compensation was carried out through Revenue Department according to applicable laws and guidelines.	Socio-economic	Design

Impact Reference	Impacted Aspect	Description	Information in EIA	Mitigation in EIA	Monitoring in EIA	Source/ Comment	Stakeholder Comments	Compliance Status	Environmental Aspect	Project Phase
DS4	Wage earners	Employment opportunities available to locals	Positive impact because each family has at least one male member working as semi or unskilled labor outside Allai			EIA	Locals complained that jobs were promised by WAPDA and locals were not given a priority when recruiting for operation of the project. However, many locals benefited from the employment opportunities during construction activities	WAPDA officials reported that during construction most of the labor was employed from the local area. However, it was planned that 140 people will be employed during operation of the project and only 40 were actually employed currently. Only unskilled labor and 2 semi-skilled were employed from the local pool of population.	Socio-economic	Design
DS5	Millers	Loss of livelihood to a mill owner	One active mill on the reservoir right bank.			EIA	No issues reported	The mill owner reported that he was given a job opportunity on the construction site of AKHP.	Socio-economic	Design
DS6	Small scale hydropower generators	Loss of power generation to the locals	This impact will result in total loss to the power generator owner near the settlement of Ghanamranga. Two generators will now have to be compensated in cash to the owner. In addition, 300 m of channel length to the generators will have to be compensated to the owners of the land through which it runs.			EIA	No issues reported	The local tribal leader in Allai reported on April 25th that compensation for small scale hydropower generators was given and no pending claims were reported. The generator owners were not available readily for comment.	Socio-economic	Design
DS7	Religious sites and graveyards	Loss of important structures	No impact			EIA	No issues reported	No impact reported	Socio-economic	Design
DS8	Women	Impact on women related issues	Not discussed			EIA	Local communities reported that no cultural issues were faced by women due to foreign labor force working in the area. Usually women stay in the house in Allai region therefore there were no impacts on them due to the design and construction of the project		Socio-economic	Design
DE1	Impact of Project Design on Terrestrial Ecological Resources	Construction of Project infrastructure and creation of reservoir leading to habitat loss for flora and fauna	Inadequate information in EIA				Stakeholders had no reservations regarding impact on terrestrial flora and fauna	n/a	Ecological	Design
DE2	Impact of Project Design on Aquatic Ecological Resources	Weir presents barrier to upstream migration of fish, the reservoir has disrupted the riverine habitat and insufficient environmental flow (rest water requirements) has dried out areas of Allai Khwar downstream of the weir with consequent loss of fish.	Inadequate information in EIA				Stakeholders had no reservations regarding impact on fish fauna.	The impact is not considered significant considering the baseline.	Ecological	Design

Impact Reference	Impacted Aspect	Description	Information in EIA	Mitigation in EIA	Monitoring in EIA	Source/ Comment	Stakeholder Comments	Compliance Status	Environmental Aspect	Project Phase
CP1	Construction of access roads	Damage to the existing infrastructure, dust emissions, noise and vibrations due to construction works	The project will involve 12.5 km of new roads and 34.5 km of road improvements. The width is expected to be 7.5 m; but an average affected width of some 10 m is expected.			EIA	Since the road network was upgraded, the community had access to a better road and this was a positive impact.	No major environmental impacts due to construction of access roads were reported or observed.	Physical	Construction
CP2	Excavation and spoil quantities and location	Loss of soil and land disturbance due to cut and fill mechanism for construction works	47 ha of land are expected to be affected by road construction corresponding to excavated volume of 995,000 m^3 and total surface area to be affected due to construction activities are expected to be 67.6 ha and excavated volume 1,986,500 m^3	The two project spoil dumps will be formed on sloping land but which is less steep than surrounding areas. Following compaction, slopes are expected to be covered with conserved top soil from the sites and planted with shrub and tree species as recommended by Forestry Department		EIA	Stakeholders had no issues regarding the sites where the construction waste was dumped.	Physical inspection revealed that most of the excavation waste was dumped at designated sites. However, there were signs of some excavation waste dumped on Allai tributary bed downstream of the weir.	Physical	Construction
CP3	Disposal of waste and land reclamation	Land disturbance due to dumping of construction waste	1 million m^3, approximately 2/3 of the excavated volume is expected to be used in construction activities. Two spoil dumps will be used, one on the right bank (Allai Khwar) near the dam and one on the left bank (Indus) between the new access road and the ridge in the power house area.			EIA	No issues	The waste sites used during and after construction were physically inspected and were as identified in the EMMP.	Physical	Construction
CP4	Supply of materials	Impact on road safety, dust emissions, vehicular exhaust emissions and slope instability during transportation of raw materials for construction	56 lorries per day will pass through 8.8 km road to transport material from the quarry above Ghanamranga passing through Bana. Road safety will be an issue between this quarry and Telus village. Excavations from quarry at Landai Mora (200000 m^3) will involve 32 lorry journeys per day but over a short distance and over a black top road.			EIA	No issues regarding road safety during construction	No major road accidents were reported by the locals or WAPDA officials during construction works due to movement of lorries and machinery	Physical	Construction
CP5	Flammable materials and explosives	Noise, vibration, slope instability and possible chemical contamination due to blasting activities	1000 tons of explosives are expected to be used for excavation and road construction activities. Regulations on use of explosives in the Mining Labor Code will be required to be followed.			EIA	Vibrations and noise due to blasting was not an issue for the locals and no noise disturbance during construction activities was reported.	Physical inspection did not indicate any evidence of over or improper use of explosives for excavation	Physical	Construction
CP6	Activities spreading dust	Dust emissions due to movement of construction machinery	Particular attention needed to suppress dust along single roads especially from quarry above Ghanamranga via Bana to Telus.			EIA	Stakeholders complained of excessive dust in the air during construction activities. They mentioned no dust reducing measures were taken by the contractors.	WAPDA officials and local communities reported that dust reduction activities such as sprinkling were not carried out.	Physical	Construction

Impact Reference	Impacted Aspect	Description	Information in EIA	Mitigation in EIA	Monitoring in EIA	Source/ Comment	Stakeholder Comments	Compliance Status	Environmental Aspect	Project Phase
CP7	Electrification plan	Soil and groundwater contamination due to storage of fuel in underground tanks	The total capacity of all the generators to be used on site is expected to be in the order of 1.3 MW and with a corresponding fuel consumption of 250,000 liters/month. A month's fuel supply is expected to be stored in underground storage tanks.	Suitable flooring to avoid soil and water pollution and fire protection measures will be required specification for contractors.	EMU will monitor provision for controlling oil pollution	EIA	No issues reported	No major environmental impact was reported due to generator operation or fuel storage.	Physical	Construction
CP8	Noise	Excessive noise due to various construction activities	The chief sources of noise during land preparation and construction stages will arise from use of construction plant, associated traffic and from blasting activities in carrying out excavations.	Noise generating construction activity will be limited to daytime hours, and the project promoter and EMU will ensure that the contractor maintains heavy duty machinery in good working condition.		EIA	No issues reported.	Locals reported that noise from construction activities did not cause any major impact since the settlements of Allai are at considerable distance from the construction sites. However, no noise level monitoring was carried out at key receptors during construction activities.	Physical	Construction
CP9	Vibration	Vibrations due to construction activities	No major impacts envisaged			EIA	No issues reported.	No major impacts observed.	Physical	Construction
CP10	Water supply and wastewater	Limited availability of water to the locals and impact due to untreated waste being disposed.	The total requirement of water is expected to be 200 m^3/day and is expected to be pumped from filter beds close to Allai Khwar and Indus river channels to surface storage tanks. Wastewater generated is expected to be disposed off using septic tanks and soak ways.	It is expected that the contractor would need to provide storage lagoons sufficient for retention of 24 hours of 50 mm of rainfall falling on disturbed areas and for water pumped from excavations. It is also expected that a contractor would control the turbidity or suspended sediment concentration in release of water stored in lagoons	Two sets of separate records would be maintained by the contractor and the resident engineer. Both sets would be regularly collated by EMU and included in EMU reports to be distributed to project owner, EPA Peshawar, donor agencies and made available to the public at large.	EIA	No issues reported	Usage of water by construction contractors did not affect the supply of water to locals in anyway. The waste water was dumped properly in septic tanks and no issues were observed.	Physical	Construction
CP11	Solid waste	Impacts such as soil contamination and toxicity due to solid waste produced on construction site and from construction camps.	The contents of septic tanks and domestic refuse are proposed to be buried under layers of rocks and soil in spoil dumps. Industrial waste will be collected at each site and incinerated.			EIA		On visual inspection, no overflows in the septic tanks were noted. The distance of the septic tanks from the water way was sufficient to ensure minimal contamination of waterways occur through sub surface pathways.	Physical	Construction

Impact Reference	Impacted Aspect	Description	Information in EIA	Mitigation in EIA	Monitoring in EIA	Source/ Comment	Stakeholder Comments	Compliance Status	Environmental Aspect	Project Phase
CP12	Water quality	Contamination of surface water quality due to various construction activities	Water quality may be affected by increased surface water turbidity from all land disturbances through excavation, aggregates, processing, spoil dumps and other construction and drainage by potential bacteriological pollution from wastewater and landfill and by potential oil pollution,	Sanitary waste is expected to be treated in septic tanks at main camp sites and wastewater will be discharged through soakaways.		EIA	No issues reported	No major changes in quality of water in the river was reported by the local communities or WAPDA officials. No water quality monitoring data was available for HBP team to review.	Physical	Construction
CP13	Vehicular exhaust emissions	Harmful emissions from construction machinery				Not mentioned in the EIA			Physical	Construction
CS1	Health perceptions and safety	Employee health and safety management				EIA		Health and safety registers at the powerhouse were inspected. It was observed that general good practice measures with regards to employee health and safety were adopted at the powerhouse and the weir	Socio-economic	Construction
CS2	Public health and safety	Impact on health and safety of local people due to infections from additional workforce and construction activities	A risk of communicable diseases spread is present therefore preference will be given to local labor and external labor will be used only where local skills are not available			EIA	No issues reported	WAPDA officials reported that during construction, priority was given to local population for employment. Local communities or WAPDA officials did not report any disease outbreaks during construction of the project.	Socio-economic	Construction
CS3	Local culture, institutions and traditional authority	Impact on tribal authorities and local values				EIA		Traditional authorities or communities were not consulted before construction. There were misunderstandings among the locals regarding the purpose of the tunnels and myths such as tunnels being dug to store nuclear weapons were common.	Socio-economic	Construction

Impact Reference	Impacted Aspect	Description	Information in EIA	Mitigation in EIA	Monitoring in EIA	Source/ Comment	Stakeholder Comments	Compliance Status	Environmental Aspect	Project Phase
CS4	The workforce	Cultural impact on local people due to external workforce				EIA	Locals reported that the foreign workers were kind and respected the local customs. No issue of any conflict between the locals and the workers was reported and the life of locals was not disturbed in any way. However, several cases of conflicts between WAPDA staff and local tribal leaders were reported over compensation issues, jobs on the project and free/subsidized uninterrupted electricity. Cases of demonstrations, road blockages and violent protests were common.	Local communities did not report any negative impact to the local culture due to the influx of the foreign workforce.	Socio-economic	Construction
CS5	Accommodation and infrastructure for construction workers	Increase of price index and shortage of food stuff in the local market due to the influx of construction workers.	The incremental demand for the work force in resident camps will be moderate, as a large number will return to their homes every day. The current shortage of foodstuffs in the Allai valley means that the local consumers will need to be protected from any price inflation likely to be caused by the project.			EIA	Price index in the Allai market fell because the Chinese workers preferred low prices. This created competition in the local markets resulting in reduced prices. The local population reported that this resulted in a positive impact in their lives.	WAPDA officials reported that accommodation was not a problem because most of the construction workers were locals and returned to their homes. The Chinese workers were based in their dedicated construction camps made up of re-usable containers.	Socio-economic	Construction
CE1	Impact of Construction Activities on Terrestrial Ecological Resources	Blasting, noise, vibrations, illumination, air pollution and dust during construction negatively impacted the flora and fauna. Increased encroachment into pristine areas may have increase the incidence of wood cutting and poaching.	Inadequate information in EIA				Stakeholders had no reservations regarding impact on terrestrial flora and fauna.	No issues reported or impact observed.	Ecological	Construction
CE 2	Impact of Construction Activities on Aquatic Ecological Resources	Construction of coffer dam and diversion tunnel may have destroyed the fish habitat and halted upstream migration of fish	Inadequate information in EIA				Stakeholders had no reservations regarding impact on fish fauna.	According to WAPDA officials, the minimum flow decided in Environmental flow studies carried out in 2010 were being released from the weir from November 15th to March 15th.	Ecological	Construction
OP1	Reservoir leakage and spring flows	Seepage from reservoir	No major impacts envisaged			EIA	No issues reported	No impacts observed.	Physical	Operation

Impact Reference	Impacted Aspect	Description	Information in EIA	Mitigation in EIA	Monitoring in EIA	Source/ Comment	Stakeholder Comments	Compliance Status	Environmental Aspect	Project Phase
OP2	Landslips and rock falls	Slope instability and increase in landslides	Construction of roads on steep slopes and other engineering excavations typically increases their frequency. Land slips may therefore be expected along sections of new and improved roads. Clearance of slide materials normally adds to scree and can damage arable land, grazing land or buildings.			EIA	No impacts reported	Many landslide cases have been reported after the road construction works, especially during rainfall. It was observed that excavated waste during road construction was dumped down the slopes damaging vegetation and increasing risk of landslides. The Works Department is responsible for road clearing.	Physical	Operation
OP3	Reservoir induced seismicity	Increase in earthquakes due to the reservoir	No specific actions are proposed as any risk is not expected to significantly alter the situation			EIA			Physical	Operation
OP4	Reservoir water quality	Contamination of water and spread of diseases due to poor quality of reservoir water	Allai Khwar is bacterially polluted with human and animal wastes. When impounded, bacteria and other disease organisms will be concentrated upstream at the Telus end of the reservoir, particularly in the dry season when the river is used for recreational purposes			EIA	Locals reported that the reservoir is not being used for recreational purposes due to difficulty of access and constant changes in the level of the reservoir. Pollution in the reservoir was also a factor for the locals not using it for recreational purposes	Considerable waste was observed on the surface of the reservoir especially near the weir and the banks. The reservoir was being operated on daily flushing peaking operation but still stagnant water at the surface was observed to be polluted.	Physical	Operation
OP5	Seepage flows	Unusual rise in the water table	Insignificant risk			EIA	No issues reported	No impacts observed	Physical	Operation
OP6	Sediment scouring flows		The slope of the downstream channel to the Indus River is steep enough to transport most of the suspended sediment and much of the bed load directly into the Indus river. Little aggradation may be expected in short reaches of much lower channel slopes. Local tributary flows, especially from the Natai Khwar and Sakargah combined with spill flows from Allai Khwar HEPP dam are likely to remobilize and reduce any such deposits.			EIA		No impacts observed	Physical	Operation
OP7	Spillway flows		Most of the spillway flows will carry no bed load and only some suspended sediment.			EIA	No issue reported	No impacts observed	Physical	Operation
OP8	Tailrace and Indus river	Disturbance of flow in Indus due to additional 20 cumecs of flow from the tail race	The reduction in Indus river flow from the Allai Khwar confluence to the Jambera powerhouse (13 km) and restoration of flows at Jambera via the tailrace is considered not likely to have any significant impacts on Indus river fisheries because the Allai Khwar flows represents only 0.5% of mean and minimum Indus River flows.			EIA		It was observed that the impact of restoration of flow near the power house was not significant.	Physical	Operation

Impact Reference	Impacted Aspect	Description	Information in EIA	Mitigation in EIA	Monitoring in EIA	Source/ Comment	Stakeholder Comments	Compliance Status	Environmental Aspect	Project Phase
OP9	Reservoir operation	Damage to the tributary bed due to flushing of sediment	The high annual volume of suspended sediment load requires flushing operations during high discharge periods			EIA		No visible damage was observed during the site visit. Community stakeholders did not report any issues regarding sediment flushing from the weir.	Physical	Operation
OS1	Economic impact	Positive impact on the economy due to the contribution in power generation					The generation of electricity in AKHP power house was at full capacity and 121 MW was being added to the national grid		Socio-economic	Operation
OS2	Environmental Flow	Negative impact on the locals downstream due to low flow	Inadequate information	Mitigation measures proposed are warning notices, and information campaign, sirens/audible warning system 20 minute prior to routine and exceptional opening of the weir gates		Eflow study conducted in 2010 recommended 0.42 cumecs release during dry season	Locals did not report any issues regarding flow in Allai Khwar downstream of the weir. However, locals did complain about unalarmed release of large flows from the weir during flood season. WAPDA officials reported that they had appointed the local police for alarming the public regarding flow releases.		Socio-economic	Operation
OS3	Dam safety	Dam safety plan to ensure precedures are in place for dam failure	No information	-	-		-	Dam Safety Plan in case of a dam failure does not exist	Socioeconomic/ Physical	Operation
OE 1	Impact of Project Operations on Terrestrial Ecological Resources	Disturbances include noise and light during Project operations negatively impacted terrestrial flora and fauna. Increased encroachment into pristine areas may have increased the incidence of wood cutting and poaching.	Inadequate information in EIA				Stakeholders had no reservations regarding impact on terrestrial flora and fauna	Significant impacts not expected as there will be very little activity that causes this disturbance during operations. Additionally, compared to baseline, the area is already quite degraded.	Ecological	Operation
OE 2	Impact of Project Operations on Aquatic Ecological Resources	Weir presents barrier to upstream migration of fish, the reservoir has disrupted the riverine habitat and insufficient environmental flow (rest water requirements) has dried out areas of Allai Khwar downstream of the weir with consequent loss of fish	Inadequate information in EIA				Stakeholders reported that fish upstream of the weir have declined. But fish in River Indus and downstream tributaries such as Natai Khwar have not suffered much impact due to Project operations		Ecological	Operation

Energy Policy Program
House 4, Street 88, G-6/3, Islamabad, Pakistan
Tel: +92 51 835 7072, Fax: +92 51 835 7071
www.ep-ep.com.pk