Environmental Assessment Report

Initial Environmental Examination
Project Number: 42094
October 2008

Proposed Multitranche Financing Facility and Administration of Grant from the Japan Fund for Poverty Reduction
Islamic Republic of Afghanistan: Energy Sector Development Investment Program

Baharak Mini-Hydropower Project

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Asian Development Bank

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Abbreviations

ADB	-	Asian Development Bank	MEW	-	Ministry of Energy and Water
AMSL	-	Above Mean Sea Level	MOI	-	Ministry of Interior
BOD	-	Biological Oxygen Demand	NEPA	-	National Environmental Protection Agency
CO	-	Carbon Monoxide	NGO	-	Nongovernmental Organization
CO_2	-	Carbon Dioxide			
COD	-	Chemical Oxygen Demand	NO_x	-	Nitrogen Oxides
CSC	-	Construction Supervision Consultant	pH	-	Negative Logarithm of Hydrogen Ion Concentration
DABS	-	Da Afghanistan Breshna Sherkat	PIU	-	Project Implementation Unit
EHSM		Environmental Health and Safety Manager	PM	-	Particulate Matter
EIA	-	Environmental Impact Assessment	PPTA	-	Project Preparatory Technical Assistance
EMP	-	Environmental Management Plan	RAP	-	Reclaimed asphalt pavement
ESSU	-	Environment and Social Safeguard Unit	REA	-	Rapid Environmental Assessment
GDP	-	Gross Domestic Product	ROW	-	Right-of-Way
GHG	-	Greenhouse Gas	TOC	-	Total Organic Carbon
GNP	-	Gross National Product	SEIA	-	Summary Environmental Impact Assessment
HC	-	Hydrocarbon	SIEE	-	Summary Initial Environmental Examination
IEE	-	Initial Environmental Examination	SO_2	-	Sulfur Dioxide
IEIA	-	Initial Environmental Impact Assessment	TA	-	Technical Assistance
MM	-	Man month	TOR	-	Terms of Reference

UNITS

cm	-	Centimeter	KW	-	Kilo watt
^oC	-	Degree Celsius	m	-	Meter
Col	-	Coliform concentration	mg/L	-	Milligram per liter
dB	-	'A' decibel	mm	-	Milli meter
GWh	-	Gega watt hour	m^3/s	-	Cubic meters per second
Kg	-	Kilogram	MW	:	Mega watt
km	-	Kilometer	ppm	-	Parts per million
KV	-	Kilo volt	µS/cm		Micro Siemens per centimeter

CURRENCY

US $	-	US Dollar	AFG	-	Afghanistan Afghani
1 USD $	=	AFG 50	1 AFG	=	$0.02

1. Introduction

1.1 Background

1. The Islamic Republic of Afghanistan's Ministry of Energy and Water (DABS) has requested the Asian Development Bank (ADB) to provide a multi-tranche financing facility (MFF) to facilitate investments to the energy sector. The first tranche of this MFF include a small to medium-sized hydropower development project located on the Warduj River in the District of Baharak, Badakhshan Province, in the Afghan Turkestan region.

2. This Initial Environmental Examination (IEE) presents the environmental assessments of the construction and operation of the proposed hydropower plant. This IEE has been prepared on the basis of field investigations, stakeholder consultation, data analysis, and review of other hydropower project reports in other Asian countries.

3. The environmental impact was considered for physical, environmental, ecological, social and cultural resources within the project facilities during construction, rehabilitation and operation phases.

1.2 Environmental Clearance Requirements

4. This IEE has been carried out to ensure that the potential adverse environmental impacts are appropriately addressed in line with ADB's Environmental Policy (2002) and Environmental Assessment Guidelines (2003). This IEE has also been prepared to meet the requirements of the Islamic Republic of Afghanistan for environmental assessment.

1.2.1 Government Environmental Laws, Regulations and Guidelines

5. The Government's regulation on environmental impact assessment is based on the Environmental Act of Islamic Republic of Afghanistan (Gazette No. 873), dated 29 Jadi, 1384 (19 January, 2006). The National Environmental Protection Agency (NEPA), as an independent institutional entity, is responsible for coordinating and monitoring conservation and rehabilitation of the environment, and for implementing this act. Article 16 and 17 of Chapter 3 of Environmental Act describes the process of preparing a preliminary assessment, an environmental impact statement and a comprehensive mitigation plan to be conducted by the proponent of each project. Article 21 mentions public consultation is required for all the projects. Article 18 describes the approval procedure of environmental impact assessment. The NEPA will appoint an EIA Board of Experts to review, assess and consider applications and documents submitted by the proponent. Acting on the advice of the EIA Board of Experts, NEPA shall either grant or refuse to a grant permit in respect of the project. A permit granted will lapse in the event that the proponent fails to implement the project within three years of the date of which

the permit was granted.Article 19 describes the appeal procedure. Any person may within thirty (30) days of the granting or refusal of a permit, appeal the decision to the Director-General of the NEPA. The Director-General shall review the appeal application and thereafter make an appropriate decision. Should the appellant wish to appeal the Director-General's final decision, the matter shall be referred to the relevant court.

6. Chapter 6 of the Environmental Act of the government describes national biodiversity strategy and protected areas management. The NEPA will prepare a national biodiversity strategy and action plan within two years of the entry into force of the Environmental Act. The NEPA will also develop a comprehensive plan for the national protected areas system.

1.2.2 ADB Environmental Requirements

7. Under ADB's Environmental Assessment Guidelines (2003) the proposed subproject has been categorised as "B' for environmental purposes and an IEE has been prepared accordingly.

2. Description of the project

2.1 Overview

8. Afghanistan has one of the lowest per capita consumption ratios of electricity in the world. Approximately 10% of the population of Afghanistan is connected to public power supply and most of the population lives in rural areas not served by electricity. The development of the hydropower power plant in the Badakhstan Province will help elevate the environmental and living standards of the people, especially in rural areas. ADB is facilitating the GoA in the process of preparing a project proposal for the development of a small to medium sized hydropower project under the MFF.

2.2 Type of Project

9. The proposed Baharak Hydropower Project is a 2.1 MW new hydropower development in a remote mountainous province, Badakhstan Province, on the Warduj River. The proposed intake for the plant is located about 1.5 km upstream from the town of Baharak and is estimated to generate 17.5 GWh of electricity.

2.3 Need for Project

10. Almost all the population in Baharak District is rural. It has been estimated that 81% of the total population is living below the poverty line, defined as having income below 1 US Dollar per day per person. Various other indicators, i.e., type of dewlling, availability of water and sanitation facilities, sources of energy, indebtness and land ownership, also highlight the nature and extent of poverty in the area surrounding the project site. With respect to these indicators, it has been assessed that the living standard of people in Baharak is very bad. The project will directly contribute to economic growth and reduce poverty, by lowering household energy costs and by removing energy constraints to enterprises that offer employment opportunities for the poor, due to the link between electrification, higher income levels, improved health status, and educational achievements.

2.4 Location

11. The site for the the hydropower project is in Baharak District, Badakhshan Province, in the north eastern corner of the country (Annex A). The site is approximately 160 km from Kunduz and 50 km from Fayzabad at N 36° 57’ 51.2” E 70° 56’ 53.8” at 1,486 metres altitude.

2.5 Project Description

12. The proposed hydropower site at Baharak has an available head of 46.5metres, a design discharge of 6m³/s and annual energy generation 17.5GWh. The proposed hydraulic structures and electromechanical equipment are:
    - River diversion facilities including diversion weir, undersluice and settling basin, to divert water and filter sediments for power generation.
    - 3.1 km long headrace canal leading to a forebay of 25 X 10m and 3m depth to act as balancing reservoir
    - 1.5 m diameter, 12 mm thick, 120 m long mild steel penstock pipe.
    - Short tailrace canal discharging water back to the river
    - Two 1,050 kW Francis turbines.
    - Local distribution network comprising of a switchyard at powerhouse and pole mounted lines and transformers

2.6 Proposed Schedule for Implementation

13. The Project is scheduled to commence in early 2009 and is forecasted to be completed within 2 years.

2.7 General Environmental Profile of the Project Site

14. The proposed hydroplant is on the Warduj River in Badakhstan. The intake would be located 300m downstream of Dashtak village and 1.5km upstream from Baharak town. Dashtak and Yardar are the two villages located close to the project site and, about 13 villages are located around 10km radius of the project with a population of 20,290. The Warduj River is the tributary of the Kokcha River, originating at the confluence of several streams originating from the glacier covered Khushdara and Lalibazgi mountains. These streams originate at an altitude of 4500m and above. The Warduj is also called the Wazling in its upper reaches. The river flows southward and loses height very quickly. After the confluence of the left bank tributary, called the Singlech, the Warduj completely changes its direction of flow. Hereafter, the river generally flows in a northernly direction. In the lower reaches, the Warduj takes up a northwesterly direction for about 30km above its junction. The Zerdew is another important tributary of the Kokcha, which joins the Warduj on the right bank. The catchment area of the Warduj River at Baharak is 4,495 km2. The total length of the Warduj River up to its confluence with the Kokcha is 113km. The site is abutted by hills on both sites.

15. River water is the major source of irrigation while rainfed irrigation is also found on the uphill areas. In the immediate vicinity of the project site approximtely 40 hectares of land on the upstream side and 100 hectares of land on the downstream side are being irrigated through river water. Wheat, rice, maize, potatoes, beans are the major crops grown in this area. None of these villages are connected to electricity and kerosene lamps are the major sources of lighting. Azagcha village, located about 10 km from the project site has some small and insignificant forest.

3. Description of the Environment

3.1 Physical Resources in Project Area

3.1.1 Topography

16. The project site is located in the ranges that run south-westwards from the Hindu Kush Mountains at an altitude of approximately 1,500 m above mean sea level. The Hindu Kush Mountains traverse the centre of the country, running generally in a northeast southwest direction. The mountain ranges in Hindu Kush system include the Koh-i Baba, Salang, Paghman, Safed Koh, Salt, Suleiman, Khwaja Amran, Siah Koh, Doshak, and Paropamisus (also referred to as Safid Kuh).

17. The general topography of the project site at intake is a narrow valley flanked by a steep hill slope on the right bank and steep to moderate hill slope on the left. The Kunduz Khanabad River basin comprises substantial mountainous portions rising up to over 3500 m in elevation, including the northern slopes of the Hindu Kush. The intake in Mana Gai is located in a narrow valley flanked by steep hill slopes on both sides. The Ghowr subproject is located along the canyon of Koh-i Baba Mountains.

3.1.2 Soil Characteristics

18. Soils in the project site primarily consist of sediments eroded from the mountains and comprise alternating layers of gravels, sands, silts and clays. Adjacent to the mountains, the sediments are dominated by coarse deposits such as gravels and pebbles, deposited by the runoff water from the mountains. Further away from the mountains, the deposits would be expected to become increasingly dominated by finer sediments such as fine sands/silts. The average thickness of soil at the project site varies from 5 to 20 m. Soils in the mountains are rubble and loam or rubble and sandy loam 0.5 to 5m thick and underlain by rock.

19. The riverbed material is mainly comprised of large boulders of granite and gneissic granite, and gravel and pebbles of the same rock type. The forebay area comprises quartzite with fine to medium silica grains on the mountainside, and colluvium comprising of angular fragments of quartzite, and granite in a matrix of coarse to fine sand and silt. The penstock area is composed of colluvium comprising angular fragments of quartzite and granite in a

matrix of coarse to fine sand and silt. The colluvium thickness over the slope is expected to be in the range of 0.5 to 1m.

3.1.3 Geology

20. The mountain ridges are dominantly composed of hard (lithified) rocks of pre-Palaeogene age, dominated by metasediments (sandstones, slates, metaconglomerates, limestone, metabreccias, phyllites, slates, schists etc.), with some igneous rocks such as granites. The rocks are faulted, folded and deformed. The plains surrounding the mountain range and the valleys between the mountain ridges are filled with Neogene and Quaternary (Pleistocene) sediments, which are the products of erosion of the mountains.

21. The project site is located near the Signan fault, which has basement intrusions of mainly acidic and basic to intermediate intrusions of Protozoic to Teritary. Massive to thickly banded granite to gneissic granites are exposed on both sides of the intake site. The rock bands are dipping towards the east in general. The schistosity of the rock is not very well defined due to low level of metamorphism in the granite. The riverbed material is mainly comprised of large boulders of granite and gneissic granite, and gravel and pebbles of the same rock type. Pockets of coarse sand with high mica content are found at several locations along the riverbed. The headrace canal runs partly over rock comprising of gneissic granite with porphyroblasts and partly over the slope wash comprising of disintegrated material of this rock. Near the forebay area, the rock type changes to quartize, which is thinly to thickly banded. Calcite fillings in the bedding and joint partings are observed. The quartize has medium to fine silica grains and is suitable for coarse and fine aggregate production. The forebay area comprises of quartzite with fine to medium silica grains on the mountains, and colluvium cmprising of angular fragments of quartzite, and granite in a matrix of coarse to fine sand and silt. The quartzites dip towards the northeast to east at an angle of 30^{o} to 35^{o}. Due to the dip, the soil cover is generally thin. The penstock area slope comprises of colluvium angular fragments of quartize and granite in a matrix of coarse to fine sand and silt. The bedrock is thin to thick, bedded quartize, dipping towards the valley. The colluvium thickness over the slope is expected to be in the range of 0.5 to 1m. However, it will increase to several meters at the bottom of the hill. The powerhouse and tailrace are located within the floodplain junction of the Warduj and Kokcha Rivers. The foundation material is composed of coarse to fine sand and silt with boulders, gravel and pebbles of granite and quartzite. The flood plain material has consolidated over time and the bearing capacity at the founding level, which is about 2 to 2 meters from the ground level, is expected to range from 30 to 45 T/m^3.

3.1.4 Seismicity

22. The project site is located near the Signana fault on the west, which is branch of the main fault line of Badakhashan Markazi. This fault is a branch of the main fault line of Badakhstan Markazi. It has basement intrusions of mainly acidic and basic to intermediate intrusions of Protozoic to Tertiary. These faults are considered to be active, so the area lies in a high probability seismic hazard area. The peak ground acceleration is 4.8 m/s2.

3.1.5 Climate

23. Afghanistan's climate is arid to semi-arid, with erratic rainfall over the years and temperatures ranging from 30^{o}C in summer to -20^{o}C in winter. The huge Hindu Kush Mountains form a barrier between the northern provinces and the rest of the country. The climate comprises of four distinct seasons with winter in December to February, spring from March to April, summer from May to September and autumn from October to November. Rainfall varies from a low of 75 mm in Farah to 1170 mm in south Salang, occurs mostly in the winter months and particularly in the February-April period. The long-term average climatic data of the hydrometeorological stations close to the project sites are given in Table 1.

Table 1: Hydro-meteorological Data

Station	Precipitation (yearly), mm			Temperature, °C	
	Max.	Average	Min	Min	Max
Fayzabad	791.0	501.3	300.1	0.3	26.5
Jabul Suraj	739.2	465.2	110.3	1.7	27.0
Jalalabad	408.1	171.2	42.5	8.4	32.9
Kunduz	560.8	336.0	193.0	2.1	31.3

(Source: Watershed ATLAS of Afghanistan, 2004)

3.1.6 Water Resources, Hydrology and Water Quality

24. Afghanistan is divided into five major river basins, which comprise 41 watersheds. The major river basins are (i) the Amu Darya River Basin, which contributes 57 percent of the total river flow in Afghanistan, (ii) The Northern River Basin, (iii) The Harirud-Murghab River Basin, and (iv) The Kabul (Indus) River basin. The project site is located on the Warduz River, which is a tributary of the Kokcha watershed feeding the Amu Darya River Basin.

25. The proposed hydropower plant is on Warduj River which is the tributary of Kokcha River, originated and formed by the confluence of several streams originating from the glacier covered Khushdara and Lalibazgi mountains. The catchment area of the Warduj River at Baharak is 4495 km2 and the total length of the Warduj River up to its confluence with the Kokcha is 113 km.

26. The river flow depends on the annual rainfall and snowfall. The snow begins to melt in late winter and spring increasing the flow in the river. The rivers in Afghanistan generally have a peak flow at the end of the winter and in spring, and a minimum flow in summer and autumn. Several rivers in Afghanistan flow from the high altitudes of the Pamir or Nuristan areas, where sizeable glaciers exist. Peaks above 5,550 m are permanently snow-covered. In many instances, at times of minimum precipitation a river reduces to a series of isolated pools in the streambed in summer and autumn/early winter but in the northeastern mountains, sufficient snow is still available in May and June to sustain river flow throughout the summer. Hence the rivers, namely the Amu Darya, the Kokcha, the Kunar sustain a good flow of water in summer months due to melting glaciers during the hot season. (see Figure 1, Warduj Rivers of the Amu Darya River Basin).

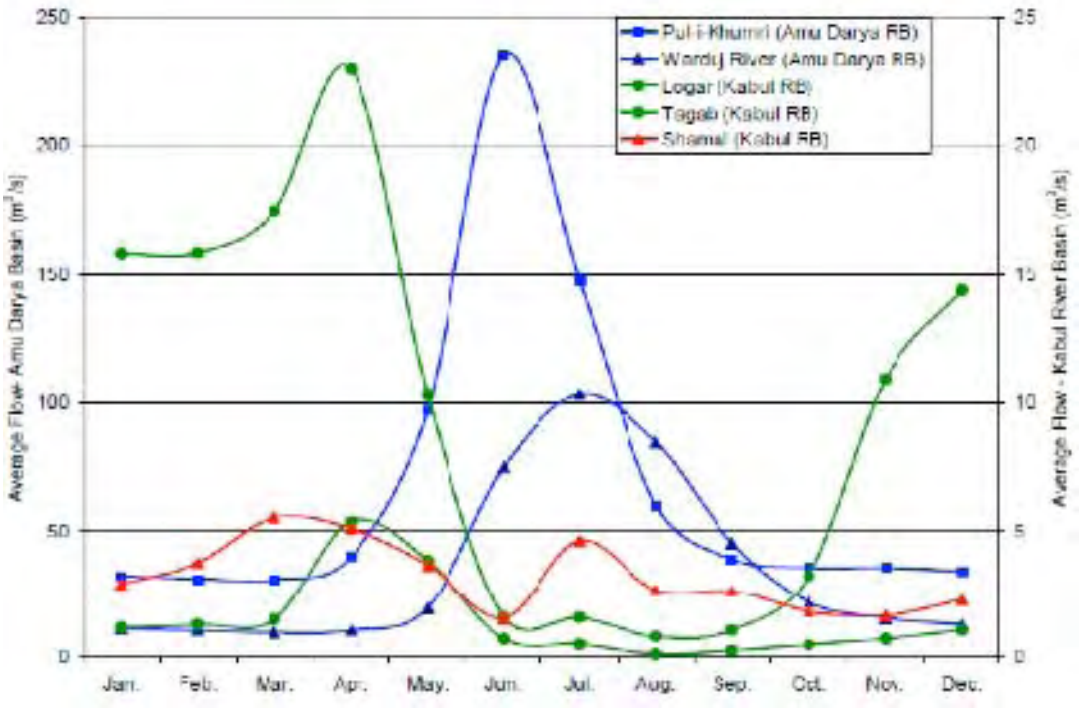


Figure 1: Stream flow hydrographs of Rivers in Afghanistan[1]

27. For the project site the mean monthly discharge varies from 9.5m3/s in month of March to a maximum of 103 m3/s in the summer month of July, making the Warduj river more of snowmelt fed river. Table 2 shows the long-term mean monthly flow at the proposed intake site.

28. The Warduj river water is used for irrigating around 40 hectares of land on upstream side and 100 hectares of land on downstream side. The demand for irrigation follows the natural cycle of the river, i.e. demands are higher during the spring and summer months which is also the period of peak flow and reduced demands in winter months when the flow is also less.

29. Water quality of rivers is generally good with an average pH of 7 and total dissolved solids ranging from 222 to 233 mg/L. Groundwater quality is also good at the project site and generally varies from place to place. In lower reaches of river valleys, groundwater is frequently saline or brackish and not usable for either drinking or irrigation purposes.

[1] Supplementary Appendix A1 - Baharak Feasibility Study, ADB and DABS, April 2007

Table 2: Average Monthly River Flow at Project Site

Month	Flow (m^3/s)
January	11.2
February	10.5
March	9.5
April	10.5
May	19.3
June	74.8
July	103.2
August	84.5
September	45.2
October	21.6
November	15.4
December	12.8

(Source: Hydrological yearbooks of Amu Darya, Harirud-Murghab, and Kabul River Basins (Published by DABS))

3.1.7 Irrigation

30. Agriculture has been the mainstay of the Afghan economy and irrigation traditionally provides 85% of all crop production. Since 1978, the irrigable area has declined by about 60% turning a country that was approaching self-sufficiency in crop production into a major importer of food grains, fruit and vegetables. Rivers, canals and springs are the major sources of irrigation in the project area. According to the 1980 yearbook of statistics of the Government of Afghanistan, (for data compiled during 1967-68) 84.6 percent of irrigation water comes from rivers and balance requirement comes from groundwater through wells and springs. Table 3 gives the details of irrigated area by surface water and groundwater in Badakhshan province.

Table 3: Details of Irrigated Land in the Badakhstan Province

Areas irrigating by various sources in 1000 ha			
Surface water	Springs	Wells	Total Irrigated area
57.83	3.84	0.09	61.76

(Source: Guideline for sustainable use of groundwater in Afghanistan, Norwegian Church Aid – Afghanistan Program, 2001)

3.1.8 Air Quality and Noise

31. The major factors affecting the air quality in the project area are dust and emissions from fuel combustion. Dust from the unpaved roads is the major source of air pollution in rural areas. Increased use of generators and kerosene lamps for lighting, and wood for cooking are likely to further affect the air quality. During late autumn and winter, air quality is reportedly worsened by domestic emissions arising from increased use of ovens, stoves

and open fires. The project site is located in a river valley and surrounded by high mountains away from human settlements. Although no noise monitoring is available for the proposed site, it is expected that the region will have low levels of background noise typical of undeveloped rural areas.

3.2 Ecological Resources in Project Area

3.2.1 Protected Areas

32. Forest and Range Management Department of the Ministry of Agriculture, in 1973, has identified twelve sites and additional three cultural heritage sites as potential components of Afghanistan's protected areas system. In Badakhstan province such a protected area has been identified and details of the area and distances from the subproject area are given in Table 4.

Table 4: Details of the Protected Area in Badakhstan Province

Name	Distance from the subproject (km)	Area (ha)	Year	Designation	IUCN Category
Pamir-i-Buzurg	130	67938	1978	Wild Life Reserve	IV

3.2.2 Land Use

33. The Kokcha watershed is nearly 60 percent rangeland and rain-fed crops are dominant (21 percent). Intensively cultivated lands can be found in river valley areas. The land cover classification of watershed is given in Table 5.

3.2.3 Flora

34. The natural vegetation mainly consists of grasses and trees that dry out in summer and sparse shrubs. Overgrazing combined with an increasing population and corresponding demands for fuel wood over recent decades have resulted in extensive decline in these woodlands. Woody plants in the mountainous areas comprise sparse wild pistachio (Pistachia), almond (Amygdalis) and juniper woodland with tree heights of 4-10 meters. In cultivated districts the major trees seen are mulberry, willow, poplar, ash and occasionally the plane. Vineyards and orchards grow near towns.

Table 5: Land Cover Classification in the Kokcha Watersheds

Land Cover	Percentage of watershed area
Degenerated forests/High Shrubs	0.03
Fruit trees	0.19
Irrigated : intensively cultivated (1 crop/year)	2.05
Irrigated : intensively cultivated (2 crops/year)	0.57

Irrigated: intermittently cultivated	0.46
Marshland : Permanently inundated	0.05
Natural Forests (closed cover)	0.06
Natural Forests (open cover)	
Permanent Snow	12.71
Rainfed crops (flat-lying areas)	2.42
Rainfed crops (mountain slopes)	18.31
Rangeland (grassland/forbs/low shrubs)	59.87
Rock outcrop/Bare soil	3.22
Vine yards	0.01
Water Bodies	0.03
Watershed area (sq.km)	22367.3

(Source: Watershed Atlas of Afghanistan, 2004)

3.2.4 Fauna

35. The Wakhan Corridor of Amu Darya River Basin contains healthy populations of endangered snow leopards (Panthera uncial) and other mammals, including Marco Polo sheep2. However, active hunting is occurring in many regions of the country for fur has declined the indigenous fauna of the country. The other important animals found in Mountains of Hindu Kush are leopard (Panthera pardus), lynx (Felis lynx), wolf (Canis lupus) and Jackal (Canis aureus).

3.2.5 Fisheries

36. Fishing in rivers and streams at the proposed project site is very limited, and information on the number of fisherman, fish species captures, yields and total catch does not exist. It is observed that fish do not contribute much to the economy of the country and therefore not much attention is paid aquatic resources. No fish species in Afghanistan are classified as endangered. The National Environmental Protection Agency of Afghanistan, in consultation with relevant ministries is planning to prepare a national biodiversity strategy and action plan by 2008. List of fish species found in the rivers of the project site are given in Table 12.

[2] UNEP. 'Afghanistan Post-Conflict Environment Assessment', 2002. www.undp.org

Table 6: The List of Fishes Available at Project Site

Family/Species	Localities
Oncorhynchus mykiss	Salang and Panjshir
Salmo trutta	Upper Amu Darya; Panj; Bamiyan
Alburnoides taeniatus	Amu Darya above Termez; Qunduz; Khanabad
Barbus capito	Amu Darya up to Faizabadkala on the Panj; Qunduz River at Qunduz; Andarab River;
Capoetobrama kuschakewitschi	Amu Darya to the Panj; Surkhan; Kafirnigan; Qunduz; Khanabad;
Cyprinus carpio	Amu Darya up to Panj; Murgab; Tedzhen, Lake Gusar; Qunduz, Khanabad
Nemacheilus (Paracobitis)	Tedzhen and Murgab drainages, Khanabad
Glyptostermum akhtari	Bamiyan River

(Source; Coad, B.W. 1981. Fishes of Afghanistan, an annotated check-list. Publications in Zoology, No. 14. National Museum of Canada, Ottawa)

3.3 Socioeconomic Resources in Project Area

3.3.1 Population

37. The population demographic of Baharak district is given in Table 7. The population in this district is 24,900 with almost equal male female ratio. Literacy rates are 6 percent in Badakhshan province.

3.3.2 Socioeconomic Infrastructure

38. The available infrastructure facilities in Baharak district are given in Table 8. The Majority of the population don't have access to the safe drinking water facilities like wells, hand pumps and piped water supply schemes. More than 80 percent of the population drink raw water from streams and unprotected springs. Though usage of toilets is common in Baharak district, they are all of traditional type. Electricity facilities are very limited. The major sources of lighting in the houses are kerosene lamps. Major sources of cooking are Ping or bushes and animal dung. Major sources of heating in winter are stoves burning straw, Ping or manure and firewood. Charcoal is also being extensively used in the urban districts for heating in winter.

Table 7: Population of Baharak District

Population ('000)	Male	Female	Urban	Rural	Poor	Per Capita monthly income (Afs)	Agricultural dependent households
24.9	50.2%	49.8%	0.0%	100.0%	81.4%	902	70.0%

Table 8: Infrastructure Facilities in the Baharak District

Safe Drinking Water	Toilets	Electricity
16.42%	9.39%	5.88%

3.3.3 Agriculture

39. Eighty percent of Afghanistan population depends on farming, herding or both. Decades of civil war resulted in degradation of rangeland and damaged irrigation systems. Large parts of Afghanistan have been suffering drought conditions for the last ten years. This has resulted in the reduction of crop production by 50 percent and heavy depletion of livestock herds. Land cultivation is concentrated in river valleys and livestock breeding is generally nomadic in character. Wheat is the main crop cultivated on both irrigated and rainfed land throughout the country. Cropping and rotational systems show considerable regional variation depending on climate, precipitation and the availability of irrigation water and altitude. Traditional crop rotations are practiced in many places including a combination of cereal crops with a variety of pulses and fodder crops. Wheat is the staple crop, accounting for about 83% of total cereal consumption in Afghanistan. Other grains include rice, maize, barley, and pulses. A wide variety of vegetables including onions and potatoes are cultivated for subsistence and as commercial crops. Other high value crops such as cumin, sesame, linseed and sugarcane are cultivated where appropriate. Afghanistan is also noted for many kinds of fruit (including apricots, apples, pomegranates and grapes) and nuts (almonds, walnuts and wild pistachios). In the 1970s dried fruit, raisins and nuts contributed more than 40% of the country's foreign exchange earnings. The years of conflict resulted in a loss of production and former market niches however, rapid expansion of orchard plantations and the adoption of modern systems and varieties occurred between 1989 and 1999.

Table 9: Agriculture dependent Families in the Baharak District and other sources of income

S. No.	Particulars	Proportion of total households having this as important source of income
1	Crop production for home consumption	43%
2	Livestock product production for home consumption	27%
3	Production & sales of livestock & products	11%
4	Agricultural wage labour (Non Opium)	3%
5	Shepherding	2%
6	Other wage labour	2%
7	Skilled labour	2%
8	Salary/Government job	2%
9	Small business	3%
10	Petty trade	2%

11	Taxi/transport	3%
	Total	100%

40. The details of agricultural dependent families and other sources of major incomes in the project districts are given in Table 9. Agriculture including livestock rearing is the major source of income.

3.3.4 Industry and Mining

41. Small-scale industries exist in the main centres, primarily producing goods for domestic consumption e.g. wheat, flour, bread, meat, preserved fruits, sugar, slat, plastic bags, toilet paper, etc.

4. Screening Environmental Impacts and Mitigation Measures

42. The proposed new hydropower project is run-of-river mode, which will not require impounding flows into a reservoir. The project will generate electricity using the available hydro potential and serve the isolated communities of the region. The development of hydropower project will play key role in improving the economy of the nearby areas and remote and off-grid areas by offering power at affordable price. The project will also support the rehabilitation and growth of Afgan power sector, will specifically benefit the poor and vulnerable groups, among them women, by providing access to electricity primarily for household activities, which will help in reducing the use of poor quality fuel for cooking, environmental degradation and health risks. The Project will enhance the standard of life of the poor through its direct, indirect and induced positive impacts. The potential direct and indirect environmental impacts associated with the proposed project are relatively minor in comparison with resulting benefits. Environmental impacts from the Project can broadly be classified as those taking place during construction and during operation. The environmental impacts during construction will result from (i) the temporary use of land immediately adjacent to the streams, canals, some local removal of vegetation, eutrophication in the reservoir bed, reduction in sediment load downstream, temporary land-take for the siting of contractor's yard and as well as the extraction and the transport of construction material from existing borrow sites, (ii) obstruction of the river flow by the construction activities and the construction of the intercept weir, (iii) the contractors' work practices, especially those related to the storage of construction materials and cleanliness of the work sites; (iv) cooperation by the local authorities with the contractor in terms of traffic management and use of public space and utilities;. The impacts arising during construction will be managed by strict enforcement of the correct construction practices and standards; and the incorporation of the mitigation measures identified in the IEE into the bid documents and specifications.

4.1 Physical Environment

4.1.1 Soils and Materials

43. **Construction Period:** The main impacts on land during construction are from (i) excavation of soils for construction of weir, canals, forebay, access roads, settling tanks for construction purposes, powerhouse, power poles, and the substation, (ii) dredging of silts from existing canals and settling tanks (iii) extraction of fill materials from cut section, and/or borrow pits; (iv) conversion of the existing land uses such as agriculture and grassland to stockpiles of materials; (v) soil erosion in mountainous slope, side slope, borrow pits and un-compacted embankments; and (vi) soil contamination from hazardous and toxic chemicals and construction material spillage.

44. The contractors will source construction materials under their own arrangements. Uncontrolled sourcing of materials could lead to environmental impacts such as the loss of

topsoil or the disfigurements of the landscape from borrow pits. Earthen embankments and material stockpiles will be susceptible to erosion, particularly during the rains and re-suspension of dust during the dry seasons. Local roads will be damaged during transportation of borrow materials and by the construction equipment.

45. The excavated soil materials will be used in constructing the embankments of head race, tail race canal and settling tanks. Soil erosion will be minimized by proper compaction, regarding slopes to reduce erosion; replanting grass, shrubs, and trees; installing sediment runoff control devices, and providing ongoing erosion monitoring.

46. In order to reduce impact contractors will be required to minimize usage of productive agricultural land and restore and areas used to their original state after completion of civil works. Embankments should be monitored during construction for signs of erosion; long-term material stockpiles will be covered or planted to prevent wind erosion. The contractor must use excess cut in the fill section and prepare a spoil plan to identify the location of fills of excess cut that will be used for the embankments and other use and submit to PIU for approval, which will ensure that the plan is implemented. The spoil plan should show the location of any borrow pits to be used and fill location for excess cut and the measures to be taken to rehabilitate these pits and cuts upon finalization of the Project. PIU will approve and monitor implementation of the plan.

47. **Operational Period:** During operation, potential impact to soil could occur from localised spillage of hazardous wastes and materials lubricating oil, fuel or solvents at the powerhouse, and from localized scour at the water discharge outlet.. All hazardous materials, like lubricating oil, solvents and fuels, will be stored within concrete or brick buildings. Oil spill clean-up materials (sorbent pads, loose sorbent material, etc.) will be made available. Plant Turbine operators and Power house staff will be trained in good house keeping practices, including how to clean up oil/fuel spills and dispose of contaminated sorbent material. However the volumes stored will be small and any spill is unlikely to have any effect outside of the powerhouse.

48. Scour at the water outlet will be minimized through appropriate engineering design, such as placement of erosion protection gabion mattresses. During operation, periodic monitoring of silts and sediments will be maintained.

49. Post the construction of hydro plant the stream diverted to the plant will loose its sediments in the settling basin and hence reducing the overall loading in the river water. Normally river sediments get deposited on the banks and nearby land area during the flooding events and the land becomes enriched by new sediments and nutrients. The reduction in sediment loading may have a negative impact on the fertility of land downstream. The settling basin near the uptake site will need maintenance dredging.

4.1.2 Water and Wastewater

50. **Construction Period:** The construction work in the river could affect the runoff flow pattern and increase silt load. Embankments and construction materials (fill, sand, and gravel) are subject to wash out with rainwater. There is the potential for hydrocarbon leakage and spills from storage and concrete mixing plants; discharge of sewerage from

work camps to the water resources; or percolation through seepage and contamination of the local water table.

51. To mitigate this, (i) installations of small drainage systems are recommended in the engineering design to divert the water in the stream at the construction sites. In sections along the river and the irrigation channel earth and stones will be disposed of properly so that they do not block the river and channel; (ii) exposed surfaces will be planted with grasses and creepers to reduce erosion, (iii) hydrocarbons will be stored in secure, impermeable, and bounded compounds away from surface waters and all contaminated soil will be properly handled according to NEPA or other acceptable standards. As a minimum, these areas will be contained such that any spills can be immediately contained and cleaned up. Prior to initiating the work, the contractor will meet with the PIU to determine the proper sitting of mixing areas and the handling and management of any such spills; (iv) construction and work sites will be equipped with sanitary latrines that do not pollute surface waters. Contractors will submit a simple sewage management plan to PIU; (v) discharge of sediment-laden construction water (e.g., from areas containing dredged spoil) directly into surface watercourses will be forbidden. Sediment laden construction water will be discharged into settling lagoons or tanks prior to final discharge; and (vi) irrigation canals and drainage ditches will be periodically cleared so as to ensure adequate storm water flow. Local community groups under contract from DABS will be responsible for cleaning the canals especially clearing the clogging of canals, cutting of grasses, and clearing shrubs, etc.

52. **Operational Period:** The quality and the quantity of the water will be modified post the construction of the hydro power project. A flow of 6.5m3/s is proposed to be diverted to the forebay area for power generation and irrigation purposes. Even in the dry period after diverting the required flow, the River will have an average of 7m3/s, which is about 20% of the Mean Annual Flow (MAF), of flow left in it, while in the wet period the river will have flow as high as 50m3/s, 142% of MAF (Table 10). Hence the project will not have any major impact on the River flow regime. Through out the year the flow regimes will vary from a good to optimum condition.

Table 10: Stream Hydrology Calculation (Montana Method)

Month	Mean Flow Pre Project (m3/s)	Flow usage (power generation = 6, irrigation = 0.5) (m3/s)	Mean Flow Post Project (m3/s)	Seasonal Mean Flow (m3/s)	% of MAF	Narrative Description of general condition of flow (Montana Method)	Aquatic habitat condition
Oct	21.60	6.5	15.10	7.00	20.07	**Good**	**Fair**
Nov	15.40	6.5	8.90				
Dec	12.80	6.5	6.30				
Jan	11.20	6.5	4.70				
Feb	10.50	6.5	4.00				
Mar	9.50	6.5	3.00				
Apr	10.50	6.5	4.00	49.75	142.65	**Optimum to Flushing**	**Excellent**
May	19.30	6.5	12.80				

Jun	74.80	6.5	68.30
Jul	103.20	6.5	96.70
Aug	84.50	6.5	78.00
Sep	45.20	6.5	38.70
Mean Annual Flow	34.88		

4.1.3 Solid Waste

53. The other major source of solid waste that will arise during construction, is domestic refuse generated from the construction camps. Small quantities of domestic refuse from construction camps will be collected and disposed of in an appropriate manner. The waste management practice will be according to a brief and basic waste management plan prepared by the contractor and approved by PIU, prior to the commencement of civil works.

4.1.4 Air Quality

54. During construction, air quality is likely to be degraded by exhaust emissions from the operation of construction machinery; fugitive emissions from aggregate, and concrete mixing plants; and dust generated from earth works, approach roads, exposed soils and material stock piles. Air quality is not impacted by any activity during operations.

55. In order to mitigate these, the following will be implemented: (i) Construction equipment will be maintained to a good standard and idling of engines discouraged. Machinery causing excessive pollution (e.g., visible smoke) will be banned from construction sites. (ii) Aggregate and concrete plants will be operated as far away from human settlements as possible. (iii) The contractor will submit a dust suppression program to PIU prior to construction. The plan will detail action to be taken to minimize dust generation (e.g., spraying of roads with water, vegetation cover in borrow sites, covering of transportation vehicles with tarpaulins), and will identify equipment to be used.

4.1.5 Noise and Vibration

56. Operation of heavy machinery can generate high noise levels. To prevent noise and vibration (an issue during construction), work will be restricted to between 0600 to 2100 hours within 500m of settlements and a limit of 70dBA will be set in the close vicinity of the construction site. Strong vibrations, which can damage houses, other structures and in this case minor landslides of loose rocks from mountain slopes, are produced from blasting and by compaction equipment.

4.1.6 Handling of Explosives for Rock Blasting

57. Headrace alignment close to the forebay area requires some rock blasting work. Rock scaling is also required for canal alignments. Blasting will be carried out only with permission of NEPA, using a pre-established schedule. All the statutory laws, regulation, rules etc., pertaining to acquisition, transport, storage, handling and use of explosives will be strictly followed, with blasting taking place preferably during mid-day hours. The timing

will be made available to the local people within 500m of the blasting site in all directions, depending on the total charge used. Where possibleIf required, blasting mats can be used to reduce noise levels when blasting is carried out. There will be no major impact due to rock scaling and blasting because the nearest settlements are more than 500m away from the rock scaling areas.

4.1.7 Environmental Benefits

58. The Project will generate substantial positive environmental benefits as it will replace the need for diesel generators. Reduced air pollution will have associated local and regional impacts from reduced particulate matter, sulfur dioxide, nitrogen oxides, carbon dioxide, and other air pollutants. The system planning and least cost analysis concludes that the next generation alternative would be a coal and gas fired power plant. The avoided air pollution from the implementation of the project has been calculated (Table 10), assuming half of the production levels would displace diesel production from the Kabul NW Gas Turbine and other half of the production would displace imports from Uzbekistan or Tajikistan, probably generated from gas. It is estimated that the Project will avoid annually 14 tons of PM, 283 tons of NOX, 53 tons of SO2, 38 tons of CO, 10 tons of TOC and 68,427 tons of CO2.

Table 11: Avoided Emissions Due to the Project

	Annual Emissions (Tons)
PM	2.44
NO_X	49
SO_2	9
CO	7
TOC	2
CO_2	11769

4.2 Ecological Environment

4.2.1 Flora

59. No forests or protected areas are located near the Project site. Flora degradation is only expected to increase marginally as a result of construction and rehabilitation works due to vegetation (ground cover) at major work sites and ancillary sites. A short-term impact on ecology is likely to occur in and around the quarry sites, material stockpiling areas and worksites during the construction period due to minor vegetation clearance (not trees). There is potential for illegal fuel wood collection by the construction workers. Vegetative cover stripped from the locations described above will be kept for embankment protection. Contractors will be responsible for putting new vegetation in removal sites. Distribution networks will be aligned along existing road corridors and will not encroach into any farmland. Construction vehicles should use temporary roads constructed for the purpose to minimize damage to agricultural land and local access roads. Where local roads are used, they will be repaired to their original condition after the completion of work. Compaction around trees will be performed carefully to avoid the damage of tree “drip-line”. Workers will be also trained regarding nature protection and the need to avoid

felling trees during construction. Contractors will be responsible supplying appropriate fuel in the work camps to prevent fuel-wood collection.

4.2.2 Fauna

60. The potential impacts from construction worker camps are poaching of edible animals and birds of the locality in spite of prohibitions. The contractors' environmental health and safety manager will be responsible for providing adequate knowledge to the workers regarding the protection of fauna.

4.2.3 Fish, Fisheries, and Aquatic Biology

61. The main potential long term impact to aquatic flora and fauna in the watercourses is from the reduced water flow downstream of the power plant. The flow in the dry season will be reduced to around 20% of the MAF, which will reduce the wetted widths but this reduced flow will still be able to support the aquatic life while the flow in flooding season will be sufficient to keep the aquatic life healthy[3]. Other impacts, during the construction, which may affect the aquatic life are increased suspended solids from earthworks erosion, blockage of water flow during civil works and sanitary discharge from work camps and oil spills. Mitigation measures to address these issues are presented in Section IV . Also, Civil works construction will be scheduled in such a way to avoid adverse impact on fishery and aquatic biology. Fishing is not the major economic source in the project area. As the proposed hydropower project is a 'run-of-river' scheme, the Project will not have any major impacts on the aquatic environment.

4.3 Socioeconomic Environment

4.3.1 Compensation Plan

62. The construction works will not require significant land acquisition or permanent resettlement. The proposed hydropower site will require minor land acquisition for sitting powerhouse, transformer, head and tailrace canals, water intake structures, and distribution line. In addition, there will be some temporary disturbances in terms of accessibility, damage of local access roads and setting up temporary work sites. Minor encroachment of private lands may be required for temporary access roads, particularly for installation of power poles. However, the project will select transmission routes carefully to avoid farmland for siting of poles on private land.

4.3.2 Labour Intensive Construction and Use of Local Material

63. The Project design considered a labour intensive approach and thus recommended rock-fill dam over concrete and earthen dams. There will be a significant volume of civil works and locally available rocks from the nearby hillsides will be used as construction material for construction of pump houses, substations and rock-fill dam. Hence it is expected that the

[3] Pyrce, R., *Hydrological Low Flow Indices and Their Uses, Watershed Science Centre*, Trent University, Canada, 2004.

Project will generate a considerable amount of employment in terms of the requirement for both skilled and unskilled labour during construction.

4.3.3 Community impacts

64. Construction worksites may place stresses on resources and infrastructure of nearby communities. This may lead to antagonism between residents and workers. To prevent such problems, the contractor will provide temporary worksite facilities such as healthcare, eating space, and praying places. In addition, a mechanism will be established that allows local people to raise grievances arising from the construction process. Labour intensive construction and the use of local labour during the construction will increase benefits to the local community and resolve such conflicts. Most of the participants during stakeholder consultation strongly suggested employing local people. Increased traffic during construction will be managed through better coordination between the contractor, PIU and the local police. Contractors will communicate to the public through community consultation regarding the scope and schedule of construction, as well as certain construction activities causing disruptions or access restrictions.

4.3.4 Proper Construction Practices

65. Contractors' conformity with contract procedures and specifications during construction will be carefully monitored. During the stakeholder consultations residents showed concern over contractor's intend to use sub contract work without ensuring proper implementation of guidelines Such practices degrade the quality of construction as well as the benefits of the Project. Contractors will be made to follow standard construction practices, monitored and supervised by construction supervision consultants (CSC) employed under the Project.

4.3.5 Health, Safety and Hygiene

66. Construction sites are likely to have public health impacts. Contractors will ensure that no wastewater is discharged to local water bodies and that no site-specific landfills will be established at the construction camps. There will be a potential for diseases to be transmitted, exacerbated by inadequate health and safety practices. Each contractor will therefore be required to recruit an environmental, health, and safety manager to address such concerns in the work sites and liaise/work with the nearby communities. Mitigation measures include:
    - provision of adequate healthcare facilities (first aid stuff) within construction sites;
    - training of all construction workers in basic sanitation and healthcare issues (e.g., how to avoid transmission of sexually transmitted diseases such as HIV/AIDS), general health and safety matters, and on the specific hazards of their work;
    - personal protection equipment for workers, such as safety boots, helmets, gloves, protective clothing, goggles, and ear protection;
    - clean drinking water to all workers;
    - adequate protection to the general public, including safety barriers and marking of hazardous areas;
    - safe access across the construction site to people whose settlements and access are temporarily severed by the construction;

- adequate drainage throughout the camps to ensure that disease vectors such as stagnant water bodies and puddles do not form; and
- septic tank and garbage box will be set up in construction site, which will be periodically cleared by the contractors to prevent outbreak of diseases. Where feasible the contractor will arrange the temporary integration of waste collection from work sites into existing waste collection systems and disposal facilities of nearby communities.

4.4 Induced Impacts

67. The Project will have a number of positive induced impacts. The Project will directly contribute to economic growth and will reduce poverty by lowering household energy costs and by removing energy constrains to enterprises that offer employment opportunities to the poor. The provision of reliable energy services will reduce dependence on fuel wood for cooking and heating purposes and improve the indoor air quality. The project will also assist in establishing the hydropower service industry for the region and increase the local skills levels for development of hydropower projects. This will encourage the regional development of hydropower as an alternative energy supply to diesel or gas fired power generation, with associated relative improvements in air quality. The Project will specifically benefit people living in remote areas through new connections, as well as improved frequency and voltage levels for various uses, which will ultimately result in socio-economic growth. With sustainable power supply and increased infrastructure, the region has great potential for tourism development.

5. Institutional Requirement and Environmental Monitoring Plan

5.1 Institutional Framework for Environmental Management

68. Institutions responsible for executing and monitoring the environmental aspects of this Project are:
    - DABS will be responsible for planning, constructing, operating and maintaining hydropower projects in Afghanistan. The Project Implementation Unit (PIU) will be in charge of project management to ensure that the contract provisions are properly maintained. There is no section or unit in DABS dedicated to environmental safeguard of hydropower projects. The supervision consultants under the PIU are responsible for environmental monitoring and management of project implementation.
    - The DABS and its provincial authorities will undertake routine and random monitoring of specific environmental plans addressed in this IEE.
    - The Project will provide PIU with the assistance of a construction supervision consultant (CSC) to help ensure the implementation of environmental management practices at each stage of the construction.
    - NEPA will be consulted if complicated issues arise during construction and operation stages.

69. Responsibilities for the implementation of the environmental monitoring requirements of this report are summarized in Table 11. Implementation of mitigation measures (Annex A) during the construction stage will be the responsibility of the Contractor. The environmental specialists of CSC will supervise the monitoring of implementing mitigation measures during the construction stage. The domestic environmental specialist will coordinate with the international environmental specialist for resolving complicated issues that arise in the field and to provide continuously updated information in order to submit reports to PIU and ADB.

70. After project completion, DABS will be in charge of the operation and maintenance of the subproject sites. PIU in cooperation with the district/regional administration will undertake routine and random monitoring and analyze samples scheduled in the monitoring plan (Table 12).

71. The following measures will be taken to provide an environmental compliance monitoring program during project implementation:
    - The tender and contract documents will clearly set out the contractor's obligations to undertake environmental mitigation measures set out in the Annex A (appended to Contract Specifications).
    - The recommended environmental mitigation cost should be included as an item in the Bills of Quantities. This will ensure that there is specific environmental mitigation budget and will be implemented as required. During the procurement, contractors will

be required to include these costs in their rates and present the mitigation cost as a line item in the Bills of Quantities. There will be an identified extra payment in the contract to ensure measures are costed and carried out.

- Each contractor will recruit an environmental, health and safety manager, who will be responsible for implementing the contractors' environmental responsibilities, and liaising with PIU. The manager will also be responsible for health and safety aspects of work sites.
- Each EMP will also be reviewed by the CWOD Safeguards Unit until the technical abilities of the local staff are sufficient to undertake the reviews.

Table 12: Responsibilities for Environmental Monitoring Program

Project Stage	Responsible Organization	Responsibilities
Detailed Design	PIU	Incorporation of mitigation measures into engineering design and technical specification.
	PIU and DABS	Review and approve environmental mitigation and management measures.
Construction	Contractor	Implementation of required environmental measures
	PIU/ Construction supervision consultant	Supervise contractor's implementation of environmental measures on a daily basis. Enforce contractual requirements
	Construction supervision consultant	Audit construction phase through environmental inspections and review monitoring data. Submission of quarterly reports. Provision of awareness/training to workers and technology transfer to the contractor.
	PIU/ NEPA	Ensure compliance with Government legal requirements during construction. Review complicated issues arises from the Project.
Operation	PIU	Provide budget to undertake environmental monitoring for 3 years.
	PIU	Undertake environmental monitoring and prepare bi-annual reports for 3 years.
	PIU and DABS	Review monitoring reports

5.2 Establishment of Environmental and Social Management Unit of PIU

72. The Consultant reviewed environmental and social assessment capabilities in PIU/DABS against the future functions and responsibilities of these organizations. It is proposed that an environmental and social management unit be established. This unit would be responsible for the environmental and social safeguard of power projects during construction and operation stages. After consultation with PIU, it is envisaged that a small unit consisting of 3 persons can be formed for environmental and social compliance monitoring during construction. The unit will be headed by a chief with the support of two other professionals, one with environmental management background and one with

social/resettlement background. The project may need special attention from regulatory bodies, such as safeguarding water quality and aquatic ecosystems; and protection of mountain flora and fauna. Some of the equipment procured under this TA can be provided to the new unit for institutional capacity building.

5.3 Environmental Monitoring Program

73. Environmental monitoring is a very important aspect of environmental management during construction and operation stages of the project to safeguard the protection of environment. During construction, environmental monitoring will ensure the protection of embankment from potential soil erosion, borrow pits restoration, quarry activities, sitting of work sties and material storages, sitting of concrete plants, community relations, and safety provisions. During operation, soil erosion, air, noise, and surface water quality monitoring will be important parameter of the monitoring program.

74. In response to the environmental impact identified during the study, an environmental monitoring plan has been developed and is presented in Table 12. The contract documents will contain a list of all required mitigation measures (Annex A) and a time frame for the compliance monitoring of these activities. The monitoring will comprise surveillance to check whether the contractor is meeting the provisions of the contract during construction.

75. The CSC in cooperation with PIU during project implementation will be required to:
    - Develop an environmental auditing protocol for the construction period, and formulate a detailed monitoring and management plan;
    - Supervise the environmental monitoring regularly, and submit quarterly reports based on the monitoring data and laboratory analysis: the main parameters to be monitored are outlined in Annex B; and
    - The contractor will be responsible for subcontracting data collection of environmental monitoring to a recognized organization. The cost for this monitoring is included in the environmental mitigation budget in Table 13.

76. The PIU shall submit the following environmental reporting documentation to ADB:
    - Baseline Monitoring Report: The Baseline Monitoring Report shall be submitted to ADB prior to commencement of civil work and will include a detailed environmental management and monitoring plan (including data collection locations, parameters and frequency), baseline environmental data, relevant standards and data collection responsibilities.
    - Environmental Monitoring Reports: The environmental monitoring reports will include environmental mitigation measures undertaken, environmental monitoring activities undertaken, details of monitoring data collected, analysis of monitoring results, recommended mitigation measures, environmental training conducted, and environmental regulatory violations. The environmental monitoring reports will be submitted to ADB twice annually during the construction period and annually for three years after completion of construction.
    - Project Completion Environmental Monitoring Report: Three years after completion of construction, the EA shall submit a Project Completion Environmental Monitoring Report to ADB which will summarize the overall environmental impacts from the project.

77. A lump sum budget is allocated in the environmental mitigation to cover monitoring cost and environmental reporting requirements in the project (Table 11) PIU will hire a recognized organization for environmental monitoring and ensure that the hydropower plant is monitored regularly for the first three years of its operation.

5.4 Environmental and Social Management Training

78. The DABS has very limited experience and resources for environmental and social/resettlement management and monitoring. It will be very difficult for PIU to efficiently supervise the monitoring of environmental and social safeguard parameters. For a better understanding of power sector related environmental issues, implementation of mitigation measures and subsequent monitoring and capacity building of PIU and regional administration, there is a requirement of environmental and social/resettlement management training of officials at the national and provincial level. Training for the officials is crucial for proper environmental and social/resettlement monitoring addressed in the IEE. Environmental and social/resettlement management training is required for five officials from DABS, 2 from DABM, and 2 from the provincial office. In addition, the contractor will be provided hands-on-training in the construction site by the CSC in association with the contractor's environmental, health and safety manager. The objectives of this training program are (a) to help build up the capacity and procedures of PIU to undertake analyses of environmental and social/resettlement impacts of hydropower projects and to prepare environmental and social/resettlement management plans in accordance with Government regulations and donor guidelines, and (b) to provide training on environmental and social/resettlement management to the PIU. The training TOR is presented in Annex D.

Table 11: Environmental Monitoring and Mitigation Cost

	Environmental Monitoring and Mitigation Costs (in US$)			
Item	Unit	Quantity	Unit Cost	Total
Environmental Costs - Civil Works (included in Contractors civil work package)				
Air Quality and Dust Monitoring	Site	1	1000	1000
Water Quality Monitoring [1]	Site	2	1000	2000
Noise and Vibration Monitoring	Site	1	1000	1000
Chemical Storage Compound [2]	Site	1	1000	1000
Dust Suppresion Measures	Day	540	50	27000
Provision of Health, Safety and Environmental Manager	MM	24	3000	72000
			Subtotal	104000
Environmental Costs - Project Implementation Unit (PIU) Budget				
Environmental Management and Monitoring (during design and construction)				
a. Remuneration and Per diems				
International Environmental Specialist (design)	MM	3	18000	54000
International Environmental Specialist (CS)	MM	3	16000	48000
Domestic Environmental Specialist (design)	MM	6	3500	21000
Domestic Environmental Specialist (CS)	MM	24	3000	72000
b. Travel				
International Travel	Trip	6	2500	15000
Domestic Travel	No	12	500	6000
			Subtotal	216000
Environmental Monitoring of Project (during operation)				
Workers Safety	Site	6	500	3000
Noise and Vibration	Site	6	1000	6000
Water Quality Monitoring [1]	Site	12	2000	24000
Sedimentation Monitoring [3]	No	10	500	5000
Environmental Monitoring Reports (construction & ops)	No	8	1000	8000
Project Completion Environmental Monitoring Reports	No	1	1500	1500
			Subtotal	47500
Environmental and Social Management Training				
a. Remuneration and Per diems				
International Environmental Specialist	MM	1	21000	21000
International Social/Resettlement Specialist	MM	1	21000	21000
Domestic Environmental/Curriculum Specialist	MM	2	3500	7000
Domestic Social/Resettlement Specialist	MM	2	3500	7000
b. International Travel	Trip	2	2500	5000
c. Trainees Allowance [4]	Person	9	180	1620
d. Logistics and Others	No	9	500	4500
			Subtotal	67120
			Total (PIU)	330620
			Grand Total	434620

[1] At intake and downstream for each subproject site

[2] including safe drinking water, proper drainage facilities, solid waste disposal, first aid and other facilities

[3] One in every six months in the upstream reservoir for 5 years

[4] 5 DABS staff from Kabul, 2 DABM staffs, and 2 from province for three days each @ $60/day

6. Stakeholder Consultation and Information Disclosure

79. The IEE process included stakeholder participation and consultation to help DABS achieve public acceptance of the Project. ADB's revised OM20-Environmental Considerations require one consultation for category 'B' projects during the project preparation stage. Stakeholder consultations were performed in a number of small settlements adjacent to the project. Stakeholder consultations were performed at national and district levels. The consultation involved a wide range of participants representing affected people, community leaders, civil society, the NGOs, and central and regional government official of DABS, DABM, donor agencies and development partners. The consultation process followed ADB's Guidelines for Public Consultation and Information Disclosure[4].

80. Community consultation also took place through the social, poverty and resettlement study during April, May, September 2006, which involved public meetings at a number of settlements the project site. The results of this consultation were positive, with people considering that the hydropower plant will bring significant economic benefits to the region. The details of the consultation at the subproject sites are given in Table 12.

Table 12: Highlights of Stakeholder Consultation Performed During the TA

Consultations	Issues of concern	Addressed in the project design and how?	Not addressed and reason
Date: March 10, 2006 Location: DABS, Kabul Participants: 2	- Training on environmental management is required. Awareness on STD and HIV/AIDS is required and a program should be included in the in the project design.	- Environmental management training is included in the IEE. HIV/AIDS is considered in the social and poverty study.	
Date: May 2, 2006 Location: Puli Dashtak, Qala Hateem Big and Rubabi villages, Baharak district, Badakhshan Province Participants :36	Construction vehicles may damage newly built access bridge to the village. Proper compensation rate should be considered for resettlement Want to participate in construction works	All damaged bridges and culverts will be rehabilitated Resettlement plan considers the compensation rate	

[4] Environmental Assessment Guidelines, Asian Development Bank, 2003.

Date: August 27, 2006 Location: Dashtak Village, Baharak District, Badakhshan Province. Participants: 24	- - -	rock fall along canal alignment Loss of 2 houses and agricultural land	- land slide is considered in engineering design Resettlement plan considers the compensation mechanism

7. Findings and Recommendations

81. The present IEE reveals that no major negative environmental impacts are likely to occur due to the construction activities and normal operations after the proposed construction and rehabilitation. Recommendations are made to mitigate expected negative impacts and the provision of adequate fund is provided to cover environmental monitoring and mitigation cost.

82. The major positive impact of the project is the access to electricity in isolated villages and communities benefiting poor and vulnerable, improved standard of life, reduced health risk by providing better indoor quality, enhance the development of small to medium sized enterprises, and increased trade and economic flow in the region.

83. Construction work, including powerhouse, transformer, intake structures, will generate a number of negative impacts on the environment. Many of the impacts during the construction period cannot be assessed at this moment, because sites for temporary work activities have not been identified and/or information concerning the period and the duration of these activities are not available. The temporary construction works could create more impacts than the activities related to the permanent works. For this reason, environmental management and monitoring will be required covering construction and operation stages and is estimated to cost US$ 434,620.00.

84. Environmental and social management training of Government officials at different stages in the project cycle is required to enable them to carry out environmental monitoring, implement environmental management plans and conduct impact assessment. Environmental and social/resettlement training will require 2MM of international and 4MM of domestic specialists input and will cost about US$67,200.00.

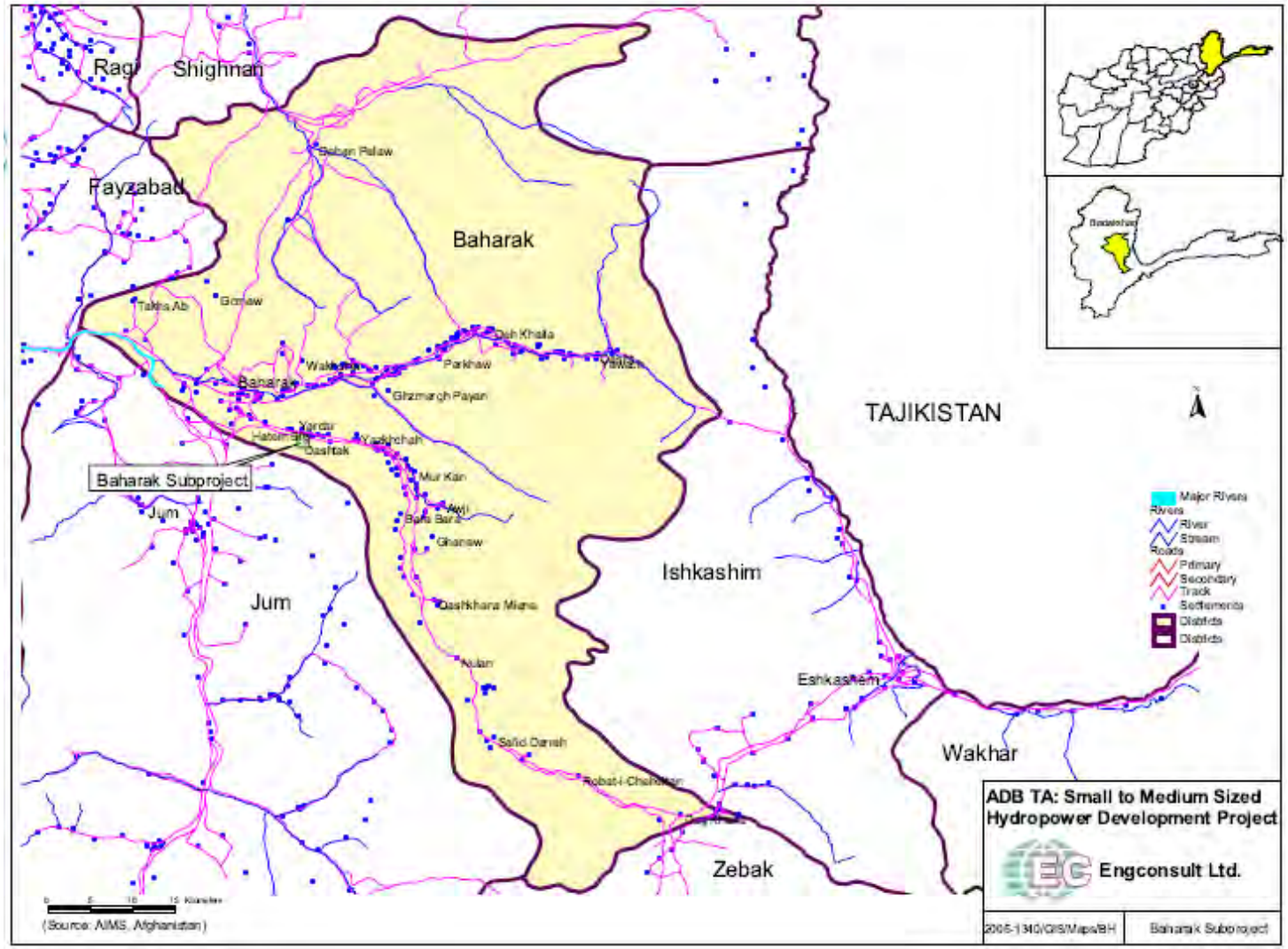
8. Conclusion

76. The Project will have some minor environmental impacts, which will be both positive and negative, including: (a) soil erosion, (b) temporary effect on noise and air quality due to construction activities; (c) increased growth in the economy of the region; (d) substantial income and employment opportunities; (e) better indoor air quality; (f) better life style and improved living conditions; (g) reduced health risk, (h) development of small to medium sized enterprises, (i) reduced poverty; and (j) advanced environmental skills and awareness level among the DABS officials.

77. Implementation of appropriate mitigation measures during the design, construction, and operation phases will minimize the negative impacts of the Project to acceptable levels. To ensure that these mitigation measures are implemented and negative impacts avoided, the measures will be included in the contract specification of the Project. Environmental monitoring of the Project will be undertaken regularly through the first three years of its operation to ensure that the measures are being implemented properly.

78. The Project will have an overall beneficial impact and any negative environmental impacts that will be carefully monitored and mitigated. Therefore, the completion of this IEE fully meets the ADB and government standards and no further environmental study is required for this Project.

ANNEX A: Maps



Map 1: Baharak

Annex B: Environmental Management and Monitoring Plan

Management Plan

Issue	Environmental Impact/Issue	Mitigation measures	Reference in Document	Location	Responsibility	
					Implementation	Supervision
Construction Phase						
Physical Environment						
Soil and Material						
Soil erosion	High suspended solid contents of river, sedimentation, drainage failure, inundation of farm land, and mud flows.	· On hill slopes and other potentially erodible places along the embankment, appropriate vegetation that retards erosion will be planted.	Contract Documents and IEE, Section 4	Intake, headrace and tailrace canal, forebay, irrigation canal, powerhouse	Contractor	PIU and CSC
		· On sections with filling and cutting, the slopes will be protected by mild slope and planted with appropriate vegetation.				
		· Design consideration for erosion: slope and pier protection with retaining structure and gabion.				
		· Incorporating appropriate earth compaction and runoff designs in construction of access roads, dams, coffer dams and along the transmission lines.				
		· Vehicle and construction machinery movement very close to the canal/or river banks will be minimized				

Degradation of borrow areas	Loss of topsoil and disfigurement of landscape	· Borrow pits and quarries will be redeveloped as per standard procedure. In all the borrow pits and quarries, soil cover is thin and vegetation is sparse. Rehabilitation of quarries and borrow sites will be undertaken immediately after excavation to prevent soil erosion. Redevelopment will include: regarding slopes to minimize erosion, replacing stockpiled soil cover, replanting grass, shrubs, and trees, installing sediment runoff control devices, and ensuring ongoing erosion monitoring.	Contract Documents and IEE, Section 4	Borrow pits and quarries	Contractor	PIU and CSC
Excess cut material	Soil dumping: if improperly designed, loss of agricultural land and impaired view.	· All surplus earth and stones will be re-used to a maximum extent in constructing the access road, embankments of head race, tail race canals and settling tank. · Cut and fill managed according to design specifications. Locations, drainage and coverings will be finalized during detailed design stage. · Spoil plan will be developed showing the fill location and rehabilitation of these locations.	Contract Documents and IEE, Section 4	Construction sites like Intake, headrace and tailrace canal, forebay, irrigation canal, powerhouse	Contractor	PIU and NEPA
Topsoil	Loss of topsoil	· Loss of topsoil will be avoided by stripping and storing topsoil prior to construction and reuse it for construction work.	Contract Documents and IEE, Section 4	Construction sites and access roads	Contractor	NEPA and CSC

		· The topsoil (15cm or so) will be kept and refilled after excavation is over to minimize the impact on productive lands. · It may be necessary to construct new access roads to aggregate sites, and place them through agricultural lands. These temporary roads will be made along existing farm tracks so as to avoid losses to agricultural lands. Contractors will be required to present proposed construction road alignments and hauling schedule for approval before construction is to commence.				
Water						
Construction of weir/dam and other structures in rivers	Flood, inundation, mudflow, pollution, and adverse effects on runoff flow pattern, stream regime	· Ensure design includes prevention of flooding during closing of rivers and canals. Side drainage structures will be incorporated in designs to divert the stream water at construction sites. · Earth and stones will be properly disposed of so that they do not block rivers and streams, resulting in adverse impact on water quality and flow regime. · All necessary measures will be taken to prevent impeding cross drainage at rivers / streams and canals or existing irrigation and drainage systems.	Contract Documents and IEE, Section 4	Construction sites and access roads	Contractor	PIU and CSC

Siltation	Adverse effects on channel stability, Damage on river bank	· Increasing coverage of open surface area by planting grass and creepers so that washing away of materials from sloped surfaces would be reduced to a significant extent. · Cofferdams, silt fences, sediment barriers etc., will be included in the design to prevent siltation at powerhouse station construction sites. · Construction materials containing fine particles, e.g. limestone or laterite, should be stored in an enclosure such that sediment laden water does not drain into nearby watercourses, but rather percolates slowly into the soil.	Contract Documents and IEE, Section 5	Construction sites and canals	Contractor	PIU and CSC
Dredged soil	Sedimentation	Sediment laden construction water will be discharged into temporary settling lagoons or tanks prior to final discharge.	Contract Documents and IEE, Section 5	construction sites	Contractor	PIU and CSC
Solid Waste and hazardous material						
Solid waste from contractor's yard and construction camps	Contamination from solid waste	· All construction materials will be reused, recycled and properly disposed of. All worn out parts, equipment and empty containers must be removed from the site to a proper storage location designated by PIU.	Contract Documents and IEE, Section 5	construction sites, camps, yards	Contractor	PIU, NEPA and CSC

		· Solid waste and garbage will be collected in bins and disposed of daily, according to a brief and basic waste management plan prepared by the contractor and approved by PIU, prior to the commencement of civil works. · There will be no site-specific landfills established by the contractors. All solid waste will be collected and removed from the work camps and disposed in local waste disposal sites.				
Sewerage from contractor's yard/ construction camps	Contamination from sewerage	· Prior to initiating work, the contractor will present a simple sewage management plan to the PIU for approval. · Sewage to be discharged into soak pits; construction camps to be located away from rivers. · Septic tank must be provided at each construction campsite and construction field. · Construction materials, including chemicals such as oils and paintings, shall not be stocked near streams and drinking water well. Construction materials shall be covered with enough tarpaulin and looked after by special person, and shall be protected from entering into water body accompanied with rainwater.	Contract Documents and IEE, Section 5	construction sites, camps, yards	Contractor	PIU and CSC

		· The formation of standing water on construction sites often leads to the spread of insect-borne diseases such as malaria. Therefore there must be a vigorous program by the contractor to avoid such standing waters; including removal of old materials such as used tires and storage drums.				
Storage of hydrocarbon, toxic, and explosive chemicals	Contamination from harmful and toxic chemicals (paints, fuel and lubricants, oils and explosives).	· Hydrocarbon, toxic material and explosives will be stored in designated sites. Vehicle maintenance and refuelling will be confined to areas in construction sites designed to contain spilled lubricants and fuels. Spill waste will be disposed to approved disposal site	Contract Documents and IEE, Section 5	Contractor's yard	Contractor	PIU and CSC
Air, Noise, and Vibration	air and noise pollution and discomfort	· Vehicles and machinery used for construction are to be regularly maintained. Idling of engines will be discouraged.	Contract Documents and IEE, Section 5	Construction sites	Contractor	PIU and CSC
Emission from construction vehicles and equipment	Health hazard to workers and close by residents.	· Each vehicle related to the construction has to have valid "Emission form for motor vehicle" during construction · Vehicular traffic through communities will be avoided. Vehicle speeds will be kept low if they should pass through communities.	Contract Documents and IEE, Section 6	Construction sites	Contractor	NEPA/PIU

Dust/Odor	Air pollution	· Water will be sprayed during the construction phase in all mixing areas where dry materials are handled and / or crushed. Temporary access roads to aggregate sites must be included in the dust suppression program. A spraying schedule will be prepared by the contractor and will serve as the basis of a dust control program. The PIU will regularly monitor this schedule.	Contract Documents and IEE, Section 7	Construction sites	Contractor	NEPA/PIU with assistance from DABM if required and CSC
		· Vehicles delivering materials to and from the sites will be covered to reduce spills.				
		· Mixing and crushing plants/operations will be equipped with dust suppression devices such as water sprays. Operators will wear dust masks and ear protection.				
		· Dust control by frequent water spraying of construction sites and exposed earth surfaces; use of vehicle covers, vehicle and equipment well maintained.				
		· Fugitive dust (from equipment movement) will be suppressed by water spraying, particularly during hot, dry and windy conditions				

Blasting and scaling of rock	Explosion and Noise	· Blasting will be carried out only with permission of NEPA, using a pre-established schedule. All the statutory laws, regulation, rules etc., pertaining to acquisition, transport, storage, handling and use of explosives will be strictly followed, with blasting taking place preferably during mid-day hours. The timing will be made available to the local people within 500m of the blasting site in all directions, depending on the total charge used.	Contract Documents and IEE, Section 5	Construction sites	Contractor	PIU, NEPA with assistance from DABM if required
		· Where possible blasting mats will be used to reduce noise levels when blasting is carried out.				
Noise from construction activities	Noise pollution	· Noise will be generated from vehicular movements, sand and aggregate processing, concrete mixing, excavation machinery, and blasting operation.	Contract Documents and IEE, Section 5	Construction sites	Contractor	NEPA/PIU with assistance from DABM if required and CSC
		· Construction activities will be late night hours; new and well-maintained equipment and vehicles will be used				
Ecological Environment						
Flora	Minor vegetation loss	· Tree-cutting and replanting scheme will be prepared within the first four months of the start of civil works. Appropriate training will be provided to the workers and penalties for cutting firewood and contractor's incompliance of the provision of heating and cooking fuel in work camps.	Contract Documents and IEE, Section 5	Construction sites, access roads, camping sites	Contractor and NGO	PIU and CSC

	Encroachment into farmland	· Existing tower footings/towers/poles will be used wherever feasible · Farmlands will be avoided for siting of new pole wherever feasible	Contract Documents and IEE, Section 5	Transmission line	Contractor	PIU and CSC
	Impact on tree adjacent to transmission line	· Plan and select pathways that will pass through areas shrubs and grasses avoiding tall trees. · Avoid tall trees during the siting of transmission line. If unavoidable, trim only the top of the trees regularly. Workers will be trained in correct techniques of tree trimming without damage to trunk or roots.	Contract Documents and IEE, Section 5	Transmission line	Contractor	PIU and CSC
	Eutrophication in the reservoir	· Reservoir will be completely cleared before water is stored.	Contract Documents and IEE, Section 5	Reservoir or forebay	Contractor	PIU and CSC
Fauna	Impact on Fauna	· Hunting and fishing will be strictly prohibited. · Stream crossings that are dry during the work period will be kept unobstructed at all times and the channels will not be altered. · Construction will be scheduled in low flow season to avoid adverse impact on fishery, birds and river water quality.	Contract Documents and IEE, Section 5	Construction sites	Contractor	PIU and CSC
Socio-economic Environment						
Local road	Loss of access and damage to local road	· Temporary bypasses will be constructed and maintained (including dust control) during the construction period.	Contract Documents and IEE, Section 5	Local roads	Contractor	PIU and CSC

		· A grievance redress committee will be formed in association with affected population before starting the civil work and advance notice will be given to the community about the construction schedule. · Repair the damaged local roads to their original condition after project completion.				
Compensation for Landuse and trees	Social instability and deforestation	A policy guideline and compensation plan is being prepared by PIU based on the outcome of the TA. This is being defined in the compensation and resettlement fraDABSork outlining who is entitled to compensation, what will be the compensation mechanisms, how much the compensation will be paid according to the type of damages.	Contract Documents and IEE, Section 5	Project sites	Contractor	PIU and CSC
Community involvement	Stresses in the community	· Construction worksites may place stresses on resources and infrastructure of nearby communities. The contractor will provide temporary worksite facilities such as health care, eating space, and praying places. · Construction camp locations will be decided in consultation with the local community. · Establish grievances redress committee. · Labor intensive construction and the use of local labor are recommended.	Contract Documents and IEE, Section 5	Communities near project site	Contractor	PIU CSC

Contract procedures and specifications	Faulty construction	· Contractors' conformity with contract procedures and specifications during construction will be carefully monitored. · Stakeholder consultations indicated that prime contractors tended to use sub contractors without ensuring that they conform to general construction guidelines (good engineering practice and standard good working practices). Such practices degrade the quality of construction as well as the benefits of the Project. · Contractors will be made to follow standard construction practices, monitored and supervised by construction supervision consultants.	Contract Documents and IEE, Section 5	Project	Contractor	PIU and CSC
Worker's health, safety, and hygiene	Health impact	· Make certain that there is good drainage at all construction areas, to avoid creation of stagnant water bodies, including water in old tires especiallyin urban areas. · Provide adequate sanitation and waste disposal at construction sites. · Provide adequate health care for workers · Provide education to construction personnel on preventing contracting the disease, protective measures and disease control	Contract Documents and IEE, Section 5	camps, yards, construction sites	Contractor	PIU and CSC

		· Provide construction personnel with necessary self-protection devices, such as safety helmet, earplug and other safety protection devices. · Set up enclosures at construction site and other dangerous place to prevent the public from trespassing. · Special vigilance shall be taken to transportation and storage of explosion. Explosive work and place shall be under careful and strict management. · In blasting operations, confirm that the quantity of explosives is rational and set safe and warning distances as per quantity of explosives. Good work shall be done in order to ensure safety of residents and buildings. · All work sites will be equipped with latrines. All toilet facilities will be at least 300m from water sources or existing residences. Sanitary wastes will be disposed depending on the size of the work camps including on-site storage and disposal to municipal disposal systems or septic tanks with ground seepage. Any untreated discharge to local watercourses will be prohibited. · Ensure suitable drinking water is made available.				

HIV/AIDS and STD	Spread to the community	· All construction workers will be adequately trained in basic sanitation and health care issues (e.g., how to avoid transmission of sexually transmitted diseases such as HIV/AIDS). · Group consultation will be done to create awareness among the community about these diseases.	Contract Documents and IEE, Section 5	Construction camps, nearby communities	Contractor's EHSM	PIU and CSC
Operational Phase						
Soil and spillage of lubricants	Soil contamination, scouring	· All hazardous wastes and hazardous materials will be stored in properly designed storage facilities · Any spill will be addressed immediately and contaminated soild will be disposed · Scour at the water outlet will be minimized through appropriate engineering design such as placement of erosion protection gabion mattresses	Contract Documents and IEE, Section 5	Storage site, water outlets	DABS/ DABM	PIU
Wastewater disposal	Soil and water contamination	· Wastewater generated from staff quarters and septic wastewater in the hydropower plant will be treated and/or recycled in site.	Contract Documents and IEE, Section 5	Powerhouse, staff quarters	DABS/ DABM	PIU
Noise	Noise pollution	· Operation of electromechanical equipment generates noise. Standard occupational health and safety practices will be adopted to reduce the impact of noise on workers. · Dense layer of plantation will be developed around the powerhouse.	Contract Documents and IEE, Section 5	Powerhouse	DABS/ DABM	PIU

		· Substations sites will be designed to ensure noise will not be a nuisance				
Solid waste disposal	Soil and water contamination	· Domestic and industrial wastes from the hydropower plant and residential areas will be disposed of appropriately. No landfills will be developed on-site. Storage, collection, and disposal of hazardous wastes will be conducted in conformance with relevant government regulations	Contract Documents and IEE, Section 5	Powerhouse, staff quarters	DABS/ DABM	PIU
Silts and sediments	Siltation and sedimentation	· Periodic monitoring and clearing of silts and sediments in the canal and settling tanks. · Reservoir design will be made in such a way that it will allow lowest sedimentation. This will be done by either a simple wash out facility or cascade dam construction so that sedimentation will result a very low load.	Contract Documents and IEE, Section 5	Canals, Settling basin	DABS/ DABM	PIU
Tree adjacent to transmission line	Damage of trees	· Workers will be trained in correct techniques of tree trimming without damage to trunk or roots and retain as much branches as possible.	Contract Documents and IEE, Section 5	transmission line	DABS/ DABM	PIU
Health and safety of technicians	Health and safety hazard	· Operation of transmission lines may impact heath and safety of workers through electric shock hazards, fire explosion hazards and electromagnetic fields. The transmission line facilities will be appropriately designed to minimize these hazards.	Contract Documents and IEE, Section 5	plant operation phase	DABS/ DABM	PIU

		· Security measures such as installing fences around the substations and placement of warning signs will be taken. Barriers will be provided to prevent climbing on/dismantling of transmission towers. · The operators will be adequately trained in operation and maintenance facilities and provide with safety equipment. · A fire emergency action plan will be prepared and training will be given to staff on implementing emergency action plan.				

PIU – Project Implementation Unit
NEPA – National Environmental Protection Agency
DABS – Ministry of Energy and Water
CSC = Construction Supervision Consultant
DABM – Da Afghanistan Breshna Moassessa
NGO – Non-governmental Organization

Monitoring Plan

Parameter	Monitoring	Location	Frequency	Executing unit	Reporting responsibility
Construction Phase					
Quarries	Visual inspection to ensure fill is only obtained from designated quarries as per EMMP	Project alignment	Monthly	CSC	PIU
	Visual inspection to ensure quarry rehabilitation is conducted per EMMP	Quarry Sites	Monthly	CSC	PIU
Material Storage Sites	Visual inspection. Ensure proper storage of materials. Ensure vegetation clearance has been minimized.	Project alignment	Monthly	CSC	PIU
Erosion	Visual inspection of erosion prevention measures per EMMP and occurrence of erosion	Project alignment	Monthly	CSC	PIU
Hydrocarbon and chemical storage	Visual Inspection of storage facilities per EMMP	Construction camps	monthly	CSC	PIU
Waste Management	Visual inspection that solid waste is disposed per EMMP	Construction camps	Monthly	CSC	PIU
Surface Water Quality	Visual inspection of water management per EMMP	Intake and canal	Monthly	CSC	PIU
	DO, BOD, COD, SS, fecal coliforms, conductivity, turbidity, pH, temperature	Directly downstream of pollution event	After pollution event	CSC	PIU
Air Quality	Visual inspection to ensure dust suppression work plan is being implemented	Dust	Monthly	CSC	PIU
Noise	dBA at sensitive areas per EMMP	Sensitive areas	Monthly	CSC	PIU
Vibration	Ensure mitigation measures are being implemented per EMMP	Sensitive areas	Monthly	CSC	PIU

Community	Consult with local government and community groups to monitor environmental concerns	Subproject sites	Ongoing	CSC	PIU
Operational Phase					
Noise	dBA at sensitive areas per EMMP	Sensitive areas	Twice annually for 3 years. After Complaint	Consultants-PIU	PIU
Sedimentation	Silts and sediments per EMMP	Canals and settling tanks	Twice annually for 5 years. After major sedimentation.	Consultants-PIU	PIU
Erosion	Visual assessment of erosion resulting from project	Subproject sites	Twice annually for 3 years	Consultants-PIU	PIU
Water Quality	Visual assessment of increased suspended solids from areas of erosion, if identified	Head race and tail race canals	Twice annually for 3 years	Consultants-PIU	PIU
Workers Safety	Visual assessment of proper workplace health and safety standards	Hydropower Plant	Twice annually for 3 years	Consultants-PIU	PIU

ANNEX C: Suggested Format of Environmental Performance and Environmental Effects Monitoring Reports for Pre-construction, Construction and Operation Phases

Monitoring Report

1. Introduction and Project Overview

Reporting period:	
Last report date:	
Key sub-project activities since last report:	
Report prepared by:	

2. Environmental Performance Monitoring

a. Summary of Compliance with EMMP Requirements (Environmental Performance)

EMMP Requirement	*Compliance Attained (Yes, No, Partial)*	*Comment on Reasons for Non-Compliance*	*Issues for Further Action*
1.			
2.			
3.			

b. Issues for Further Action

Issue	*Cause*	*Required Action*	*Responsibility*	*Timing*	*Resolution*
Old Issues from Previous Reports					
1.					
2.					
New Issues from this Report					
1.					
2.					

3. Environmental Effects Monitoring

a. Environmental Inspection and Monitoring Results

Monitoring Parameter	*Comparison to Relevant Standard / Criteria*	*Comment on Incidences of Exceedance*	*Issues for Further Action*
1.			
2.			
3.			

b. Issues for Further Action

Issue	*Cause*	*Required Action*	*Responsibility*	*Timing*	*Resolution*

Old Issues from Previous Reports					
1.					
2.					
New Issues from this Report					
1.					
2.					

4. **Appendices**
    a. **Correspondence**
    b. **Monitoring Results**
    c. **Etc.**

ANNEX D: Outline Term of Reference for Consulting Services for Strengthening Capabilities in Environmental and Social Management

A. Objectives

1. The objective of the services are (a) to help build up the capacity and procedures of the Environmental and Social Safeguard Unit (ESSU) of DABS and provincial DABM (PDABM) to undertake analyses of environmental and social impacts of hydropower and to prepare environmental impact management plans, land acquisition and resettlement impacts and social monitoring in accordance with Government regulations and donor guidelines, and (b) to provide hands-on-training on environmental management and social monitoring to the ESSU, DABS, and the contractor. This will be done through a program of technical assistance and training over a period of 2 months.

B. Scope of Work

2. The consultant's scope of work will include the following tasks:

- reviewing prevailing government regulations and donor guidelines governing the assessment and management of environmental and social impacts of power infrastructure projects;
- identifying the procedures and tasks required to be performed by ESSU and PDABM to meet the requirements of these regulations and guidelines;
- reviewing the skills of ESSU and PDABM official and assessing the need for training to establish the capability to meet environmental and social management and monitoring requirements;
- preparing a short-term staff training plan and associated materials to meet immediate needs;
- undertaking the training through a combination of hands-on assistance, on-the-job training, and training workshops;
- evaluating the effectiveness of the training provided by other agencies measuring improvements in attitudes and skills achieved;
- preparing outline proposals for the longer-term development of ESSU's organization and capabilities.

C. Organization and Staffing

3. The services is expected to be provided over a two-month period by a small team comprising one international environmental specialist/team leader, one domestic environmental and curriculum development specialist.

4. 5. Experts	6. I o	7. To tal MM
8. International Environmental Specialist/ Team Leader	9. :	10. 1
11. International Social and Resettlement Specialist	12. :	13. 1

14. Domestic Environmental and curriculum Specialist	15. 16. 2
17. Domestic Social and Resettlement Specialist	18. 19. 2

20. The international environmental specialist will be the training organizer with a minimum of 10 years experience in environmental assessment and management of infrastructure projects and must possess a relevant post-graduate degree preferably doctorate in civil /environmental engineering. The international social/resettlement specialist will have a minimum of 10 years experience in social monitoring and resettlement planning of infrastructure projects and must possess a relevant post-graduate degree in social science. The domestic specialists will have similar education and experience.

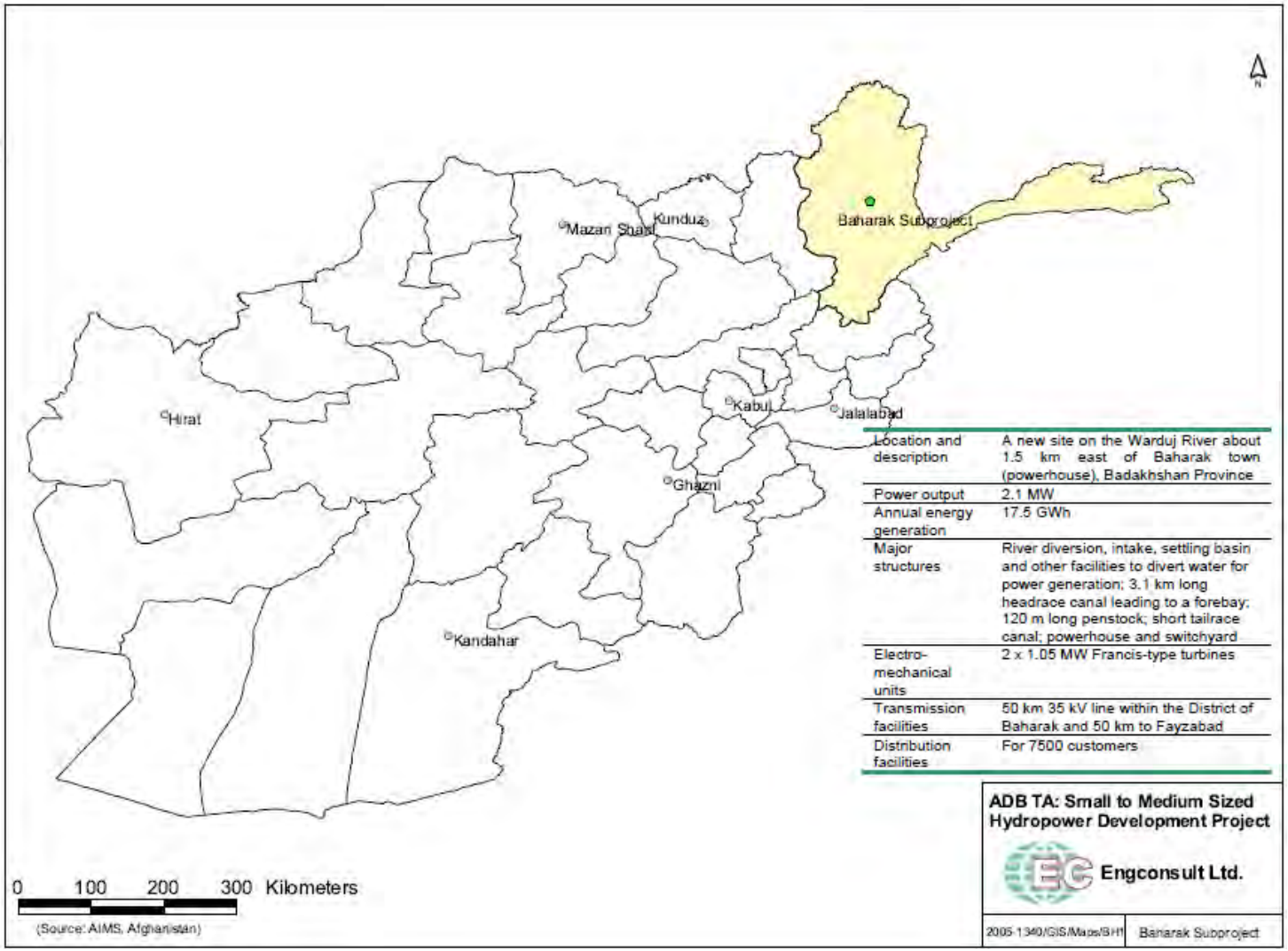
D. Supervision

21. The team will work in association with the PIU, reporting to the project director of the PIU on a day-to-day basis. Overall supervision will be by the Steering Committee established under DABS chairmanship to supervise implementation of the proposed project as a whole.

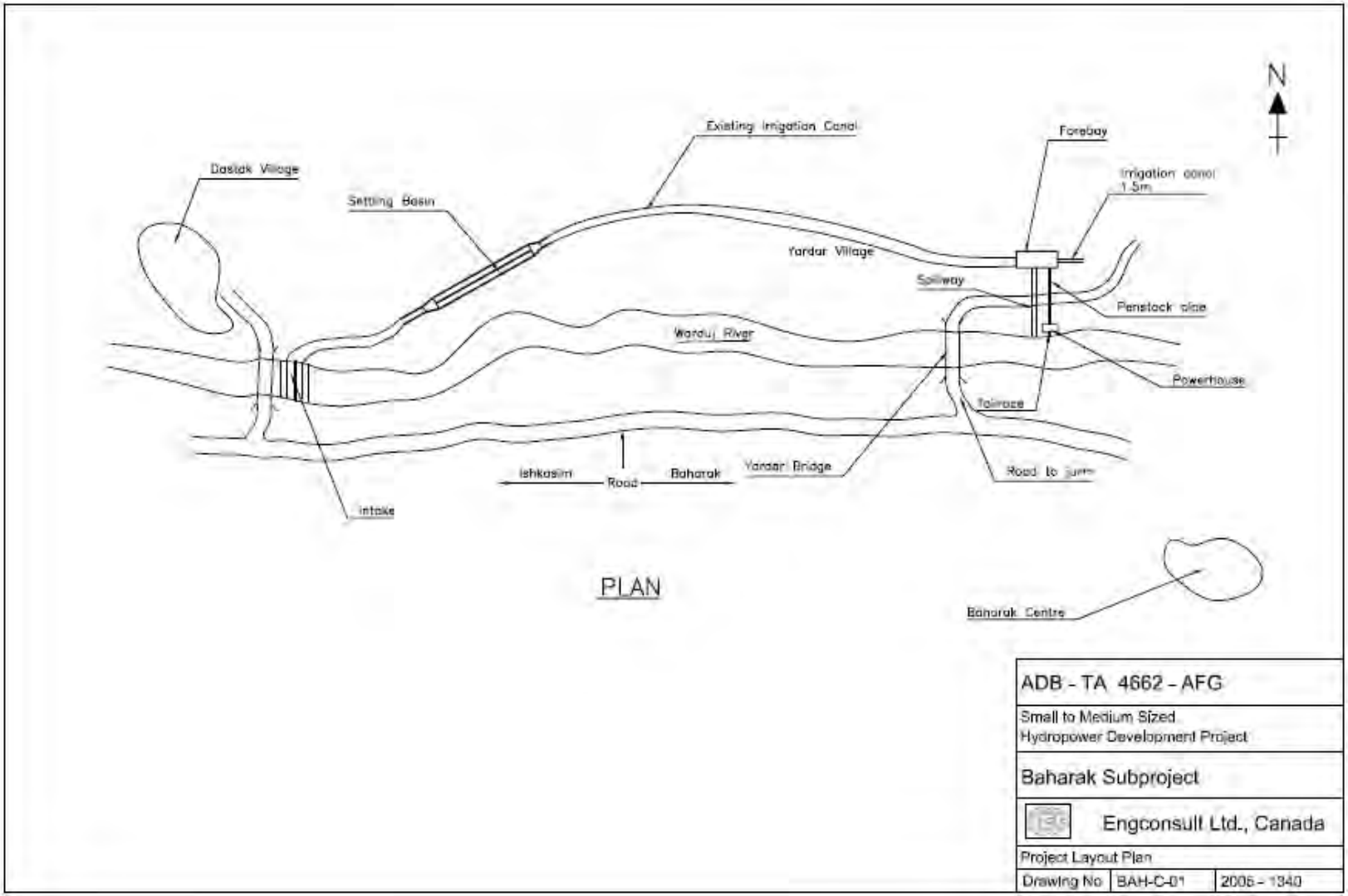
E. Outputs

22. The team's outputs will include: (i) an inception report after month 1, reviewing the proposed ESSU and DABS officials' skills and training needs and setting out detailed proposals for training under the consultancy, and details of materials developed and training provided to date, and (iii) a draft final report after 8 weeks, containing a description of achievements, details of the training services provided, including all materials, an assessment of their effectiveness in meeting objectives, and recommendations for further training assistance.

ANNEX E: Project Drawings and Details



1. Location Map and Project Details



2. Conceptual Plan

ANNEX F: Site Pictures

1. Intake Location

2. Headrace Alignment

3. Forebay and Initial Penstock Alignment

4. Powerhouse site