Roots of Peace

Paktya Watershed Study

Zurmat District Water Source Survey Report

ADT Paktya; CERP Project # 20110423-083025; Initial Requisition # CERPRCE1K733ZZ
12/9/2011

Paktya Watershed Study

Funded by US Department of Defense,
Agriculture Development Team (ADT) Paktya
Implemented by Roots of Peace

December 9, 2011

Brief

The US Army ADT based in FOB Gardez, working in conjunction with USDA, would like to focus their development activities in Paktya Province on a watershed-based approach. This more holistic approach is strongly supported by Roots of Peace, who is currently implementing development programs in forestry, orchard and vineyard development, and gender based agriculture programs in Paktya Province. This strategic approach will provide a framework for development activities in the watershed and will ultimately build to a more sustainable environment for agriculture and improved living conditions. The implementation of this approach will leverage information gained from the USACE Southeast Afghanistan Water resources Assessment, US Army, USDA, ROP and GPFA experience in this province.

CERP Project #	2011 0423-083025
Contract Recipient	Roots of Peace
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Agreement Officer	LTC James B. Arnold
ROP Chief of Party	Ferenc “Francisco” Sandor, Francisco@rootsofpeace.org
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Letter from the Director of Agriculture Irrigation & Livestock in Paktya Province to MAIL

دافغانستان اسلامی جمهوریت
جمهوری اسلامی افغانستان
دکرهنی،اوبولګولواومالداری وزارت
وزارت زراعت آبیاری ومالداری
Islamic Republic of Afghanistan
Ministry of Agriculture Irrigation and Livestock
ولایت پکتیا
ریاست زراعت ابیاری ومالداری
مدیریت عمومی اداری ومالی
مدیریت محاسبه

شماره ۴۸۵
تاریخ 1390 / ۹/۱۳

بمقام محترم وزارت زراعت ابیاری و مالداری!

قابل توجه ریاست محترم دفتر انمقام

چنانچه شما نیز اگاهی دارید درتشکیل سالهای ماضی وفعلی یکنفرمدیرابیاری بست(5) و یکنفر مامور ابیاری (6) گنجانیده شد غرض استخدام اشخاص فنی و مسلکی چندین مراتب از طریق رقابت ازاد به اعلان از طریق رسانهای خبری ره سانیده شده اما متاسفانه نسبت کمی معاش تااکنون هیچ کسی حاضر نگردیده تا در تقرارن اقدام صورت گیرد. نیازمندی وتقاضای تمام اهالی و دهاقین به سطح ولایت د رمورد ایجاد همین نهاد میباشد .

بنا از این ناحیه اینریاست بامشکلات مواجه میباشد . دراین اواخیرموسسه بنام نری والی انکشافی موسسه (Roots of Peace(ROP در ولسوالی زرمت ، سیدکرم و مرکز گردیز فعالیت دارد که فعالیت شان قابل قدرمیباشد وتلاش دارد تا تمام ساحات ولایت پکتیا را تحت پوشش خویش قرار دهند زیرا تطبیق و انتخاب پروژه ها نیز از طریق شورای محلی صورت میگرد.

روی همین ملحوظ از مقام محترم رجامندیم تا به موسسه متذکره اجازه همکاری همه جانبه را درهمه ساحات ولایت پکتیا د رهمین عرصه با این اداره اعطا فرموده تا مشکلات اهالی اینولا مرفوع گردد.

با احترام

الحاج نیاز محمد " لعلی حدران "

رئیس زراعت آبیاری ومالدرای

کاپی به دفتر ROP

mis.paktia@mail.gov.af

Translation of Letter from the DAIL Director

To: Ministry of Agriculture Irrigation and Livestock
Attn: Directorate of the MAIL

As you may know for a long time we have been attempting to recruit an Irrigation Manager and an Irrigation clerk but have not been able to fill the position. We have posted the positions in the media but due to the low salary offered no one has apply for the positions..
The provincial residents and the farmers are requesting that these positions are filled as soon as possible.

Currently, an organization called ROOTS OF PEACE is working in Zurmat, Sayed Karam and the center of Paktya (Gardez). We highly appreciate the efforts of this organization. We encourage MAIL to extend their services to cover all of Paktya. The implementation and selection of the services used from Roots of Peace would be made through the local council.

We hereby request the general directorate of MAIL to extend their project services to all of Paktya province. This will help to eradicate the existing problems of the province with water and irrigation.

With regards

Alhaj Neyaz Muhammad (Lali Zadran)
Director of Agriculture Irrigation & livestock
Mis.paktia@mail.gov.af

Table of content

1 Acronyms

ADT	US Military Agriculture Development Team
ANA	Afghan National Army
ANP	Afghan National Police
COIN	Counter-insurgency Strategy
COP	Chief of Party
CDC	Community Development Council
DDA	District Development Assemblies
DAIL	Directorate of Agriculture, Irrigation and Livestock
DST	District Stabilization Teams
GIRoA	Government of the Islamic Republic of Afghanistan
IED	Improvised Explosive Device
IPM	Integrated Pest Management
ISAF	International Security Assistance Forces
LOE	Level of Effort
MAIL	Ministry of Agriculture, Irrigation and Livestock
M&E	Monitoring and Evaluation
MOE	Ministry of Economics
MOU	Memorandum of Understanding
MRRD	Ministry of Rural Rehabilitation and Development
P2K	The provinces of Paktika, Paktya and Khost
PRT	Provincial Reconstruction Team
ROP	Roots of Peace

2 Background

Afghanistan's climate is unique. There are a limited number of regions in the world where you can grow perennial crops with such positive results in yields, flavor and plant health. The region is an epicenter for origin for many fruits and nuts. You can find native stands of pistachio, walnut and pine nuts in the mountains. There are 62 varieties of grapes, 30 varieties of pomegranate and dozens of almond varieties. Afghanistan is not blessed with many riches in resources, but perennial crops and the hard working Afghan farmers are a superior resource that can compete internationally and win. Afghanistan's agriculture is the employment engine of the country. Some 84% of the country's population is either directly involved in or related to farming. There are around 275,000 grape farmers; but it is almonds that are Afghanistan's top horticultural crop.

In Afghanistan the main source for income comes from the agriculture and livestock sector. Therefore, the use of the natural water sources plays a primary role in the household economy. This has an important effect on the country water source development. The most common irrigation scheme in the country consists of a diversion structure in a watercourse with canals and laterals leading water to field's downslope.

Diversion structures are typically made from rock, soil and wooden pilings and placed nearly parallel to the current flow offering minimum resistance to the main channel flow. Seasonal floods often wash them away. Cross-stream diversion structures are built after spring flood crests have passed and must be completely reconstructed annually. Canals are hand-dug and exhibit various cross-sections. The high gradients often cause scouring and bank erosion. Ditches are following a serpentine path through the terrain from the river to cropland and sections that are crossing gullies and rills are swept away during the rainy season.

ROP wholeheartedly supports and will continue to implement the U.S. Agriculture Assistance Strategy for Afghanistan to mobilize support for the Afghan government and the Ministry of Agriculture, Irrigation, and Livestock (MAIL) and the private sector to revitalize Afghanistan's agricultural economy and increase income and jobs. The goal of our project is to focus the development activities in Paktya Province on a watershed and natural resources based approach. The achievement of this goal will result in the creation of short-term jobs as the rural population respond to the short-term stimulus provided the project and the creation of long-term jobs in response to the long-term demand from the established and expanding natural resource management enterprises impacted by the project.
Collaboration, Capacity Building and Support Mobilization for MAIL

In past and current projects, ROP has followed a procedure designed to assure that we have MAIL support for our activities and, to the extent possible within our contractual obligations to the project funding agency, that we follow MAIL advice and directions for project implementation. This procedure includes the development of a Memorandum of Understanding guiding the implementation of the project, the development and involvement of a Project Steering Committee. Project implementation in the field is begun through a letter of introduction from MAIL to the Directors of MAIL (DAIL) in the

project areas, followed by discussions between the DAIL and ROP on methods and means for cooperation. ROP has generally made arrangements with the DAIL to provide on-the-job training to DAIL extension agents by providing them with per diem support that allows them to serve as full-time members of our extension staff. This activity and our standard procedure of having DAIL officials present our work to the local population (for example, in public meetings relating to the project) support the USAID strategy of mobilizing Afghan support for the MAIL and the GIRoA.

Program scope

The program will consist of two major components, (1) upgrade and/or establish physical measurements in order to protect water-ways and land, (2) develop agroforestry in order to protect the soil and decrease erosion.

3 Introduction

The climate of Afghanistan is arid or semiarid continental climate. The daily temperature range is wide. Precipitation usually occurs in the winter and spring seasons. Because of its continental climate and seasonal clear skies, Afghanistan receives a large share of solar radiation. This fact has important implication for its hydrological system. Most of the precipitation accumulate as snow caps in the highland areas and is released during the spring and summer. Additional precipitation occurs during the monsoon period in summer, but the amount of these rainfalls is quite unpredictable and variable in amounts. Snowmelt and monsoon precipitation are the two main factors causing seasonal fluctuations simultaneously throughout the province.

The natural water resource development of the country is typically characterized by its water balance. A simplified water balance formula is described below:

$W_P+W_I+W_{CW}+W_{RI} = W_E+W_{TR}+W_D+W_{RO}\pm\Delta W$;
Where:

W_P = Volume of precipitation
W_I = Volume of irrigation water
W_{CW} = Volume of capillary water lifted up in the soil
W_{RI} = Volume of run in water received from neighboring areas
W_E = Volume of evaporation
W_{TR} = Volume of transpiration
W_D = Volume of drainage water
W_{RO} = Volume of run off
ΔW = Fluctuation in the volume of the area's water resource

In Afghanistan, according to the results of the water balance, there are two classes of water balances, which are dominant throughout the country:

- Run off type water balance, this characterized by huge amount of water loss through run off accompanied with high soil erosion activities.
- Evaporation type water balance. In this case the water is located near to the surface and the water movement in the soil dominantly point to upward.

In Afghanistan the main source for income is from the agriculture and livestock sector. Therefore, the use of the natural water sources plays a primary role in the household economy. The most common irrigation scheme in the country consists of a diversion structure in a watercourse with canals and laterals leading water to field's downslope. When the water reaches the fields, almost always the practice is basin irrigation. Distribution is gravity powered from the gradients built into the ditches. The overly steep ditches result in substantial amounts of potentially irrigable land being left above the ditch and lost to cultivation.

Diversion structures are typically made from rock, soil and wooden pilings and placed nearly parallel to the current flow offering minimum resistance to the main channel flow. Seasonal floods often wash them away. Cross-stream diversion structures are built after spring flood crests have passed and must

be completely reconstructed annually. Canals are hand-dug and exhibit various cross-sections. The high gradients are often causes scouring and bank erosion. Ditches are following a serpentine path through the terrain from the river to cropland, and sections, which are crossing gullies and rills, are swept away during the rainy season.

Seepage losses are a significant factor reducing the quantity of available water. The seepage losses of the canals are around 25% and approximately 15% for laterals. Evaporation losses are also high, particularly in the longer canals and from impounded bodies of water. These losses are approximately 2,400-3,000mm per year. The reasons for this high evaporation rate may be found in the high solar energy inputs mentioned earlier, the extremely low prevailing humidity and the strong, steady winds which blow across large sections of the province, (locally named the “120 days wind”). The problem of high evaporation rates and the perhaps more serious problem of siltation are serious deterrents to the construction of water storage facilities in many parts of the country. High stream gradients and the absence of vegetative cover on hilly watersheds add large silt loads to the runoff that rapidly fill impoundment structures.

The focus point of this study is focused on three watersheds in Paktya Province: Dawlatzi, Ghunday and Dam watershed. The hydrologic system is comprised of 9 (earlier 10) river systems flowing into five basins. From the nine river systems only the Kabul river system ends into the sea. The rest are entirely inland systems. Many rivers in the country debauch into desert wastes or swampy areas or dry up entirely during the summer months. Their typical characteristics are the steep gradients except the lower reaches, and transport of large silt loads during heavy runoff from rain and snowmelt. The five main river basins in Afghanistan are:

- Northern River Basin
- North Eastern River Basin
- Eastern River Basin (Kabul)
- Helmand River Basin
- Western River Basin

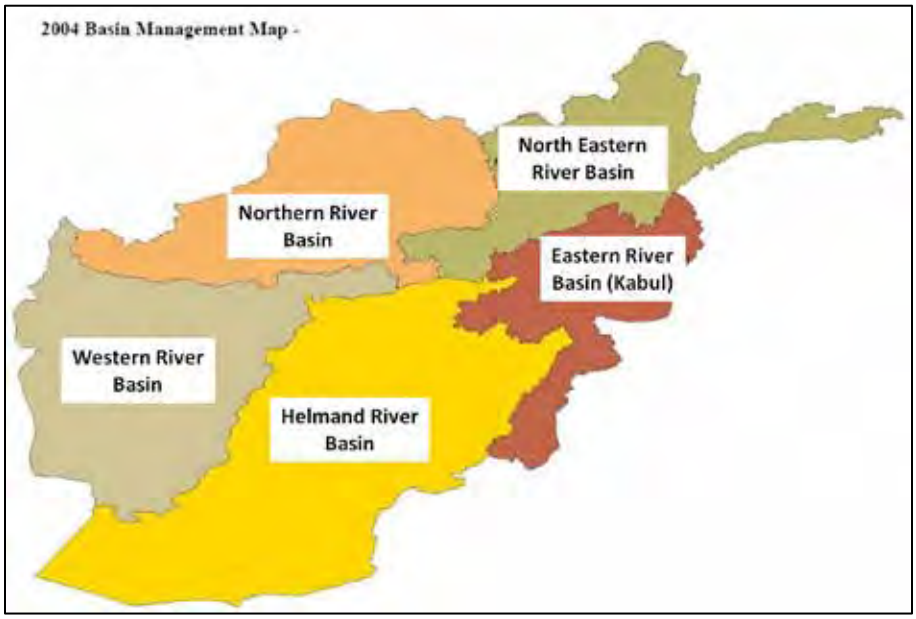


Figure 1 River basin system in Afghanistan

Each of these basins is divided into sub-basins or main watershed. Paktya Province belongs to the Upper Ghazni Sub-basin (Sardih wa Ghazni Rod) that is part of the Helmand River Basin.

Figure 2 The location of the Upper Ghazni Sub-basin

The Helmand River Basin contains 15 sub-basins or watersheds and its extent is around 262,341 Km^2. It contributes 40.62% of the country's hydrologic system. From this amount the Upper Ghazni Sub-basin occupies 17,252 Km^2 area with 2.67%.

River Basin	Watershed	Main River Name	Area (Ha)	Area (km^2)	%
Helmand	Upper Helmand	Helmand	4,688,198	46,882	7.26
Helmand	Farah Rod	Farah Rod	3,280,911	32,809	5.08
Helmand	Khash Rod	Khash Rod	2,183,992	21,840	3.38
Helmand	Sistan-Helmand	Helmand	2,157,453	21,575	3.34
Helmand	Adraskan Rod	Adraskan Rod	2,126,571	21,266	3.29
Helmand	Arghistan Rod	Arghistan	2,021,861	20,219	3.13
Helmand	**Sardih wa Ghazni Rod**	**Sardih wa Ghazni Rod**	**1,725,200**	**17,252**	**2.67**
Helmand	Middle Helmand	Musa Qula Rod	1,644,127	16,441	2.55
Helmand	Lower Helmand	Helmand	1,414,679	14,147	2.19
Helmand	Upper Arghandab	Arghandab	1,316,972	13,170	2.04
Helmand	Khuspa Rod	Khuspa Rod	942,802	9,428	1.46
Helmand	Chagay	Chagay	931,885	9,319	1.44
Helmand	Tarnak Rod	Tarnak Rod	907,639	9,076	1.41
Helmand	Lower Arghandab	Arghandab	730,017	7,300	1.13
Helmand	Dasht-i Nawur	Nawur Lake	161,830	1,618	0.25
		Helmand Total	**26,234,136**	**262,341**	**40.62**

Table 1 Sub-basin system of Helmand River Basin

Figure 3 Hydrological map of the Upper Ghazni Sub-basin

The Upper Ghazni Sub-basin drains water from Paktya Province, Gardez River and several districts of Ghazni province and Ghazni Rod River. It is divided into two watersheds at the Sardeh Dam. The Sardeh River drains water from numerous torrents originating from the extension of the Spin Ghar Mountains in the district of Sayid Karam in Paktya and flows through Gardez and Zurmat districts before filling the Band-i Sardeh dam. The Ghazni Rod and Sardeh Rod meet in Giro district and flows into the Ab-i Istada salty lake. Another small river, the Nahara Rod has its sources in Omna and Zarghun Shahr districts of Ghazni (in spring) the water drains into the Lora Rod River (Arghistan watershed) that contributes to the Helmand River, which is the reason because the Upper Ghazni Sub-basin is part of the Helmand River Basin. The Gardez River (referred to in some publications as the Jilga River) at Mechalghu gauge has an annual discharge of 0.66 m^3/s with a flow of 0.4 m^3/s in September. The stream gage at Gardez city has a flow of 0.12 m^3/s during the same time period. The Gardez city gage has a mean annual discharge of 1.25 m^3/s with an annual water budget of 39.6 M-m^3.

River Basin	Watershed	Area (km^2)	Settlements (No.)	%	Settled Population	%	Population Density (km^2)
Helmand	Upper Ghazni Sub-basin	17,252	1,922	6.15	1,868,342	9.03	108.3

Year: 2004

River Basin	Watershed	Area (km^2)	Snow Cover (km^2)	%	Water Bodies (km^2)	%	Marsh-lands (km^2)	%
Helmand	Upper Ghazni Sub-basin	17,252	0.00	0.00	146.2	5.89	30.0	0.72

River Basin	Watershed	Irrigated land (km^2)	%	Intermittently Cultivated (km^2)	%	Rainfed Land (km^2)	%	Rangeland (km^2)	%	Forest Cover (km^2)	%
Helmand	Upper Ghazni Sub-basin	1,065	6.83	1,196	7.25	337	0.75	11,791	4.04	35	0.27

Table 2 Principal data of the Upper Ghazni Sub-basin

The Upper Ghazni Sub-basin is characterized by rangeland and bare soil. Irrigated land represents 6.83% of the watershed surface and 7.25% is intermittently cultivated. The sub-basin contains large areas of shrub/grassland interrupted by large areas of barren rock surrounded and areas of extensive irrigated agriculture.

LANDCOVER	Area (Ha)	Area (km^2)	% Watershed
Rangeland (grassland/forbs/low shrubs)	1,179,059	11,790.6	68.34
Rock Outcrop / Bare Soil	263,893	2,638.9	15.30
Irrigated			
Irrigated: Intermittently Cultivated	119,575	1,195.8	6.93
Irrigated: Intensively Cultivated (1 Crop/Year)	105,835	1,058.3	6.13
Irrigated: Intensively Cultivated (2 Crops/year)	665	6.7	0.04
Rain-fed Crops			
Rain-fed Crops (flat lying areas)	31,299	313.0	1.81
Rain-fed Crops (sloping areas)	2,362	23.6	0.14
Water Bodies	14,619	146.2	0.85
Marshland Permanently inundated	2,999	30.0	0.17
Natural Forest			
Natural Forest (open cover)	2,510	25.1	0.15
Natural Forest (closed cover)	3	0.0	0.00
Degenerate Forest/High Shrubs	960	9.6	0.06
Fruit Trees	927	9.3	0.05
Settlements	495	5.0	0.03
Total	**1,725,200**	**17,252.0**	**100.00**

Table 3 Land cover data of the Upper Ghazni Sub-basin

Geologically, it is largely unconsolidated sediments ranging from gravel to loess, with some weathered sandstone, siltstone, and some acid intrusive rocks. Slopes are generally low (less than 10%) with hills on either side of the watershed ranging above 30%. The unconsolidated deposits from the Quaternary and Neocene Age can be found in the areas along the river valleys. The consolidated bedrock units are built up from sedimentary rocks and partially from crystalline and igneous rocks during the Paleocene Age.

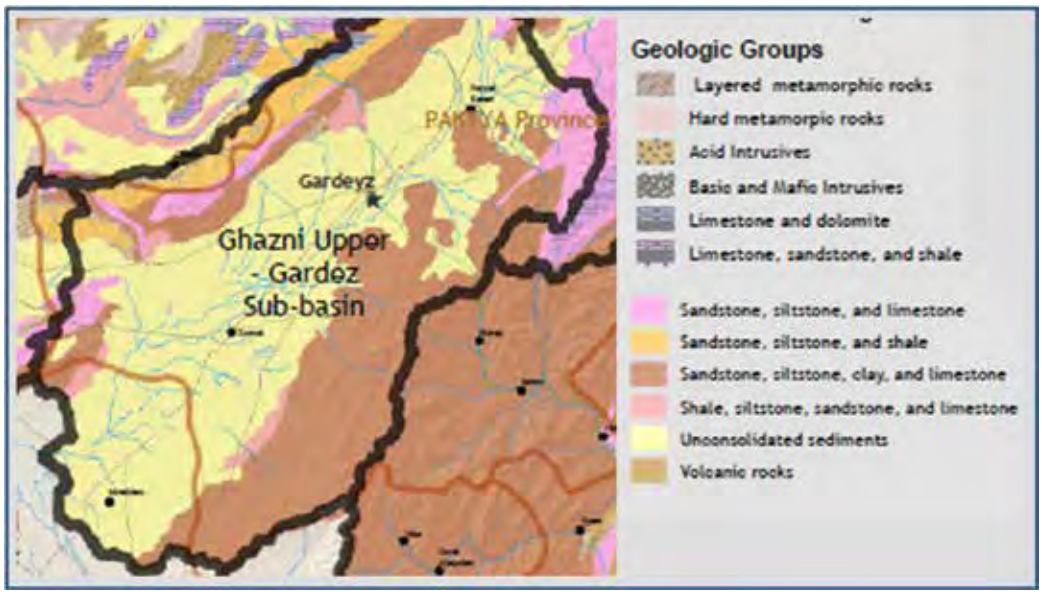


Figure 4 Geological features of the Upper Ghazni Sub-basin

The Upper Ghazni Sub-basin also includes the Gardez Valley. A complex network of canals and diversions along the Gardez River heavily irrigates the Gardez Valley. The irrigated area of approximately 10,500 Ha from groundwater sources create a demand of 80Mm^3/year water annually.

Springs	4,680 Ha
Karezees	5,860 Ha
Shallow wells	70 Ha
Total:	**10,610 Ha**

Table 4 Irrigated areas from groundwater sources in the Upper Ghazni Sub-basin

Considering an average annual precipitation range between 300 mm and 400 mm and a recharge rate of 10% for unconsolidated plus 5% for consolidated aquifer, the potential water resource for withdrawals is almost double than the existing demand, around 140Mm^3/year. This recharge capacity represents a major potential for irrigated agriculture development in Paktya Province.

Geologic unit	**Area (km2)**	**Precipitation**	**Annual Recharge (Mm^3/year)**
Consolidated	15,000	5% of 350mm	260
Unconsolidated	4,000	10% of 350mm	140
Total	**19,000**		**400**

Table 5 Recharge capacity of the Upper Ghazni Sub-basin (Vincent V. UHL, 2003)

However, the average annual precipitation shows a wide range of fluctuation, which can vary between 141.0 mm and 521.0 mm per year. Another three climatic factors also contribute significantly into the potential water loss and/or water deficit. The average wind speed in Paktya Province shows a range between 1.7 and 3.1 m/s. The evapotranspiration varies around 3.35 and 3.78 mm per day. Finally, the radiation rate fluctuates between 15.6 and 18.1 MJ/m^2/day.

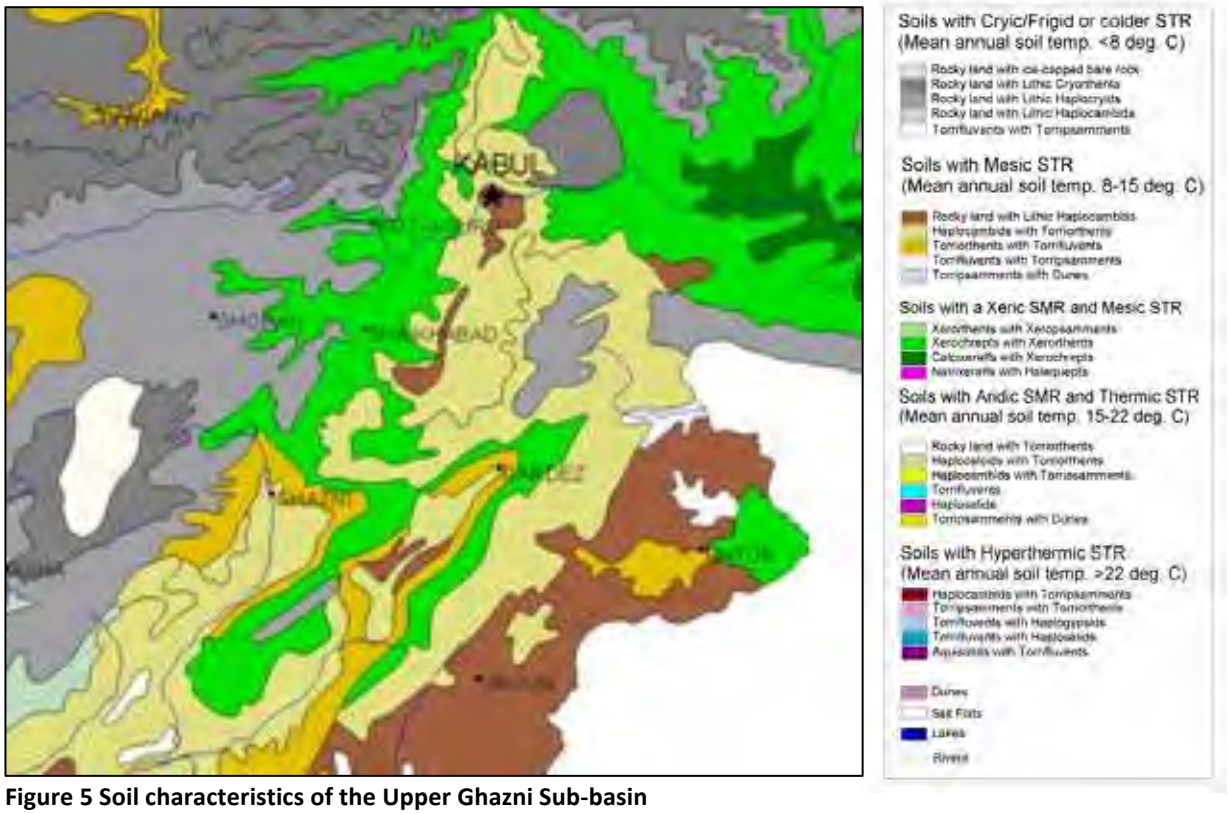


Figure 5 Soil characteristics of the Upper Ghazni Sub-basin

4 Zurmat District, Paktya Province

Zurmat (also spelled as Zormat) District is one of the less studied areas in Paktya Province. Partly, because the high risk of upland erosion, sedimentation and low water storage potential (what some report say) does not make it worthy for investment. Although, this latter opinion is questionable, Zurmat district is the largest water collection area of the province. On the other hand, the security situation in Zurmat is volatile; therefore it is a very difficult task to work in this district.

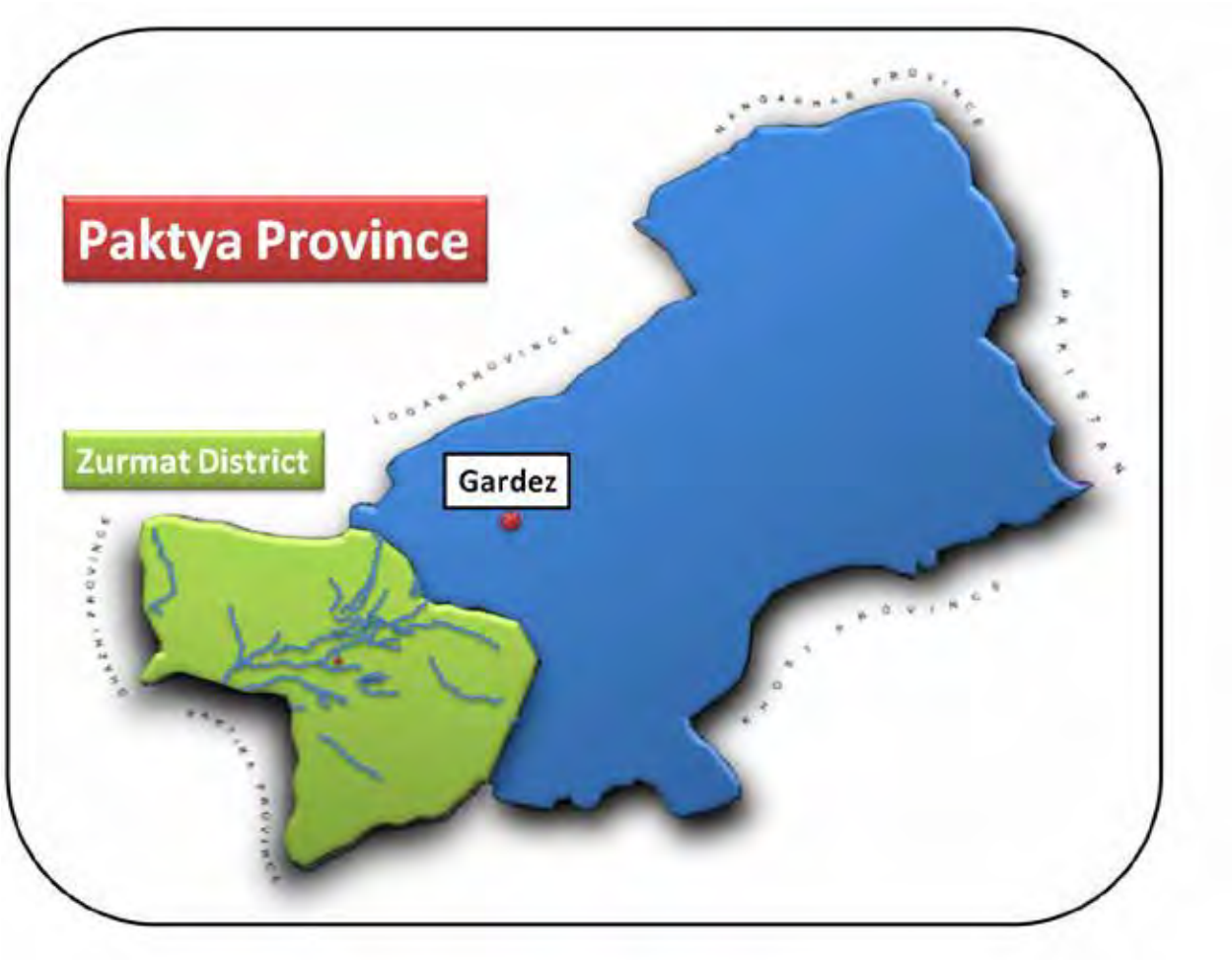


Figure 6 Paktya Province

The area receives water from four different major entry points. The North-West entry zone is a mountain area. During the time of annual flood the melted snow flows from this upland toward the lowland area. The same process happens in the South-East mountain area, which locks the Zurmat plain from the opposite side. The third entry zone (North-East) is the Gardez valley itself. Zurmat plain is the continuity and/or part of the Gardez valley divided in the middle by the Jilga (Gardez) river. The main volume of the annual flood flows through the valley ending in the lowland of Zurmat. The upper part of the valley collects the water from the mountainous areas of the province and from upper end of the

sub-basin (Sardih Wa Ghazni Rod). The last entry zone (East) is the Dawlatzi watershed, which delivers part of its excess water to the Zurmat lowland.

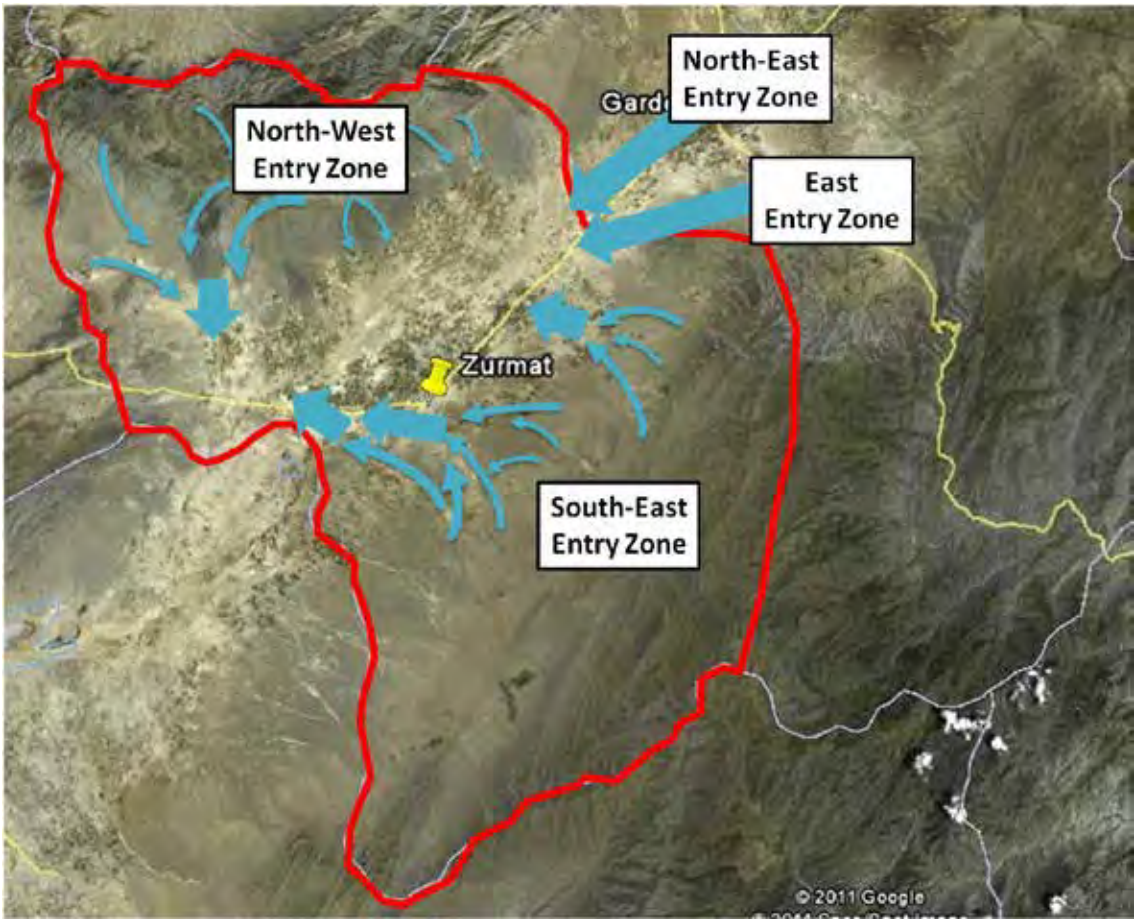


Figure 7 Water entry zones to the lowland of Zurmat

4.1 Topography and Climate

Like in the rest of Afghanistan, no exact population numbers are available. However, the estimated data is around 86,600, which includes the 90% of Pashtun and 8% of Tajik population. The main source of household income comes from agriculture and livestock production. From the farmer's point of view, the most important area is the Gardez valley the only lowland, therefore the most suitable for agriculture, in Zurmat district. The climate, such as in most part of Afghanistan, is arid-semiarid continental climate. The main part of the rainfall reduced to three months, from February to April. Some additional precipitation may occur during the monsoon time in July. According to these characteristics, high elevation and low precipitation, the temperature and the time period of sunshine is high during summer time. The large difference in temperature between winter and summer is also a typical condition of the continental climate. The radiation is one the highest in worldwide, which can be explained with fact that the elevation is high but the area is exposed directly to the radiation from the sun.

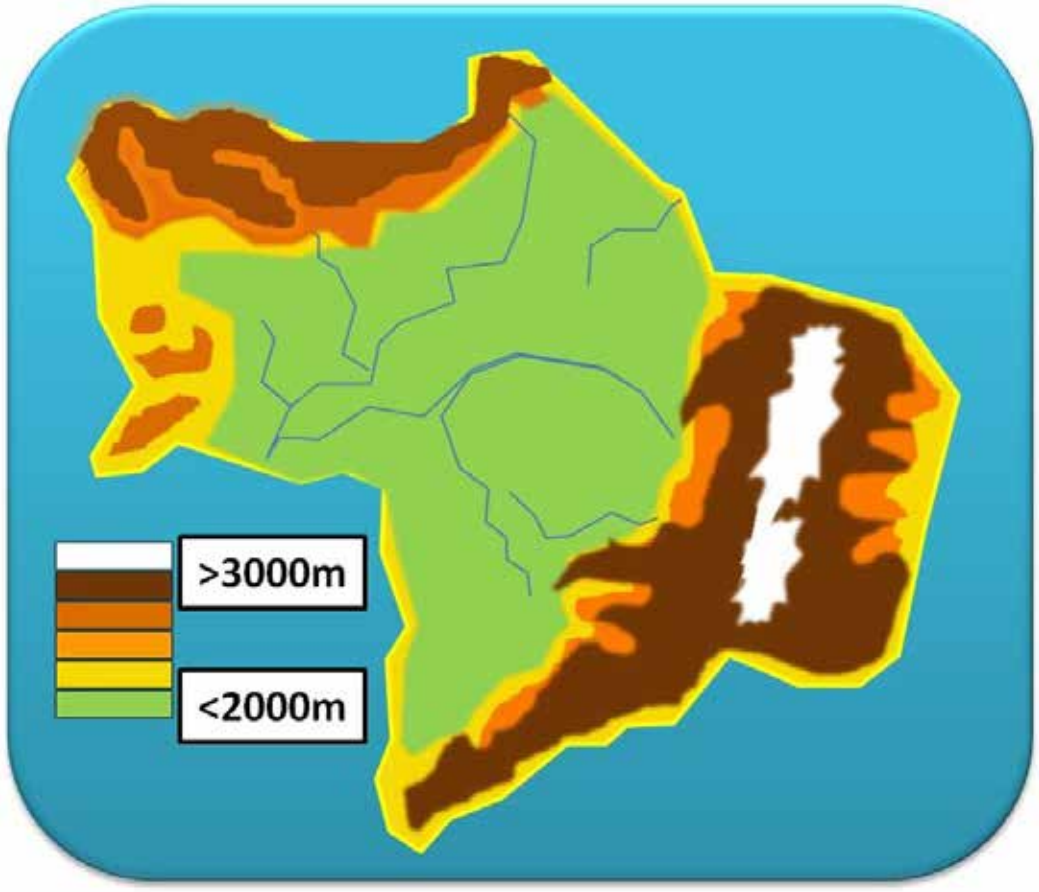


Figure 8 Elevation characteristics of Zurmat district

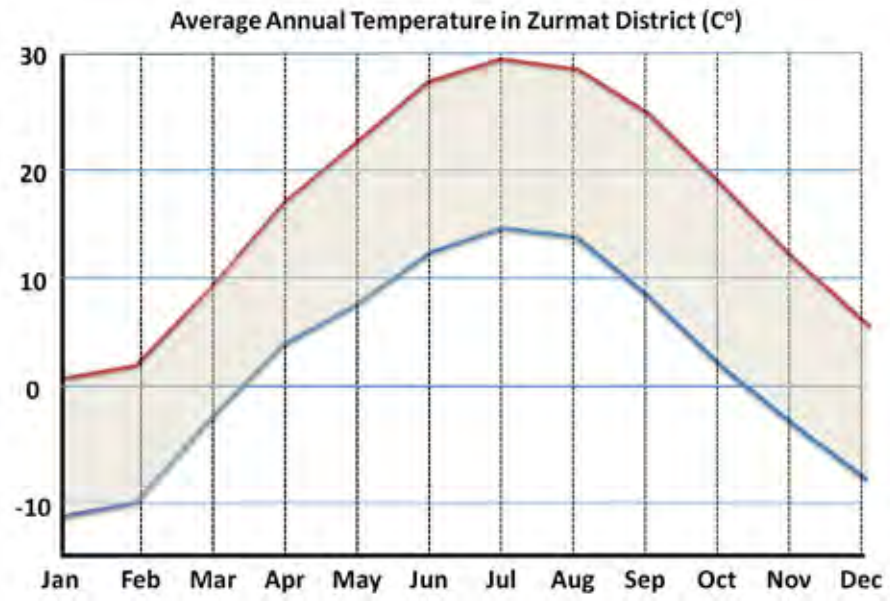


Figure 9 Average annual temperature in Zurmat

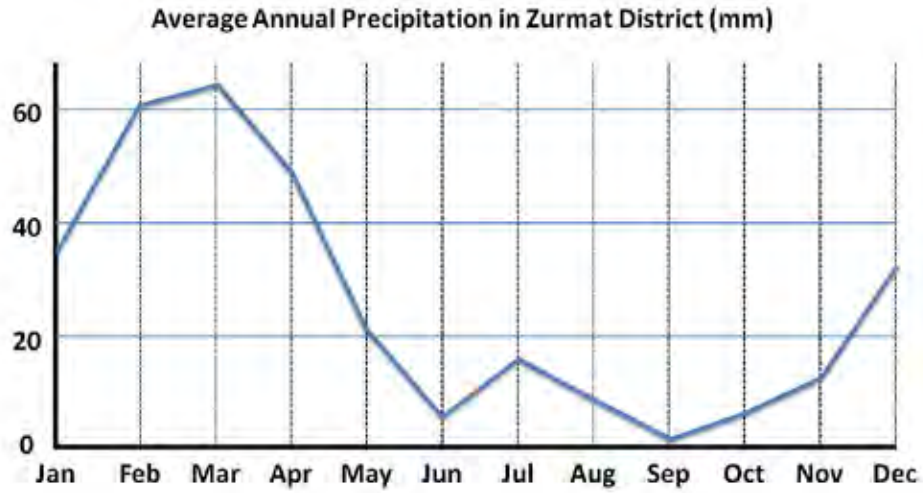


Figure 10 Average annual rainfall in Zurmat

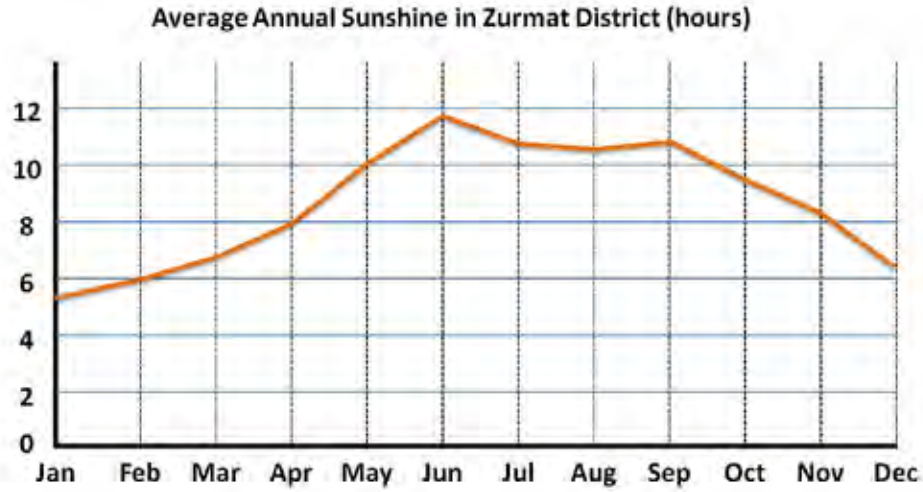


Figure 11 Average annual sunshine in Zurmat

4.2 Hydrological Conditions

Paktya province is part of two major basins, the Helmand and the South-Eastern water basins. Zurmat district belongs to the Upper Ghazni Sub-basin, which is the upper part of the Helmand basin. There are several rivers, streams and water washes in the area. The most important is the Jilga River, which is also known as Gardez River. The Jilga River and all the other water washes are land locked, they do not reach the sea. They deliver the water directly into the underground aquifers. This is a very important fact, which means that the role of the forest in the hydrologic cycle, originally, strongly determined the rainfall conditions in the region and generally it played a major role in the climate's development. The fact, that naturally developed forests are absent in 90% of the area, has long-term effect on the climatic conditions of the district. One of these effects is the breakdown of the hydrologic cycle. In simple terms, the water is continuously leaking from the region.

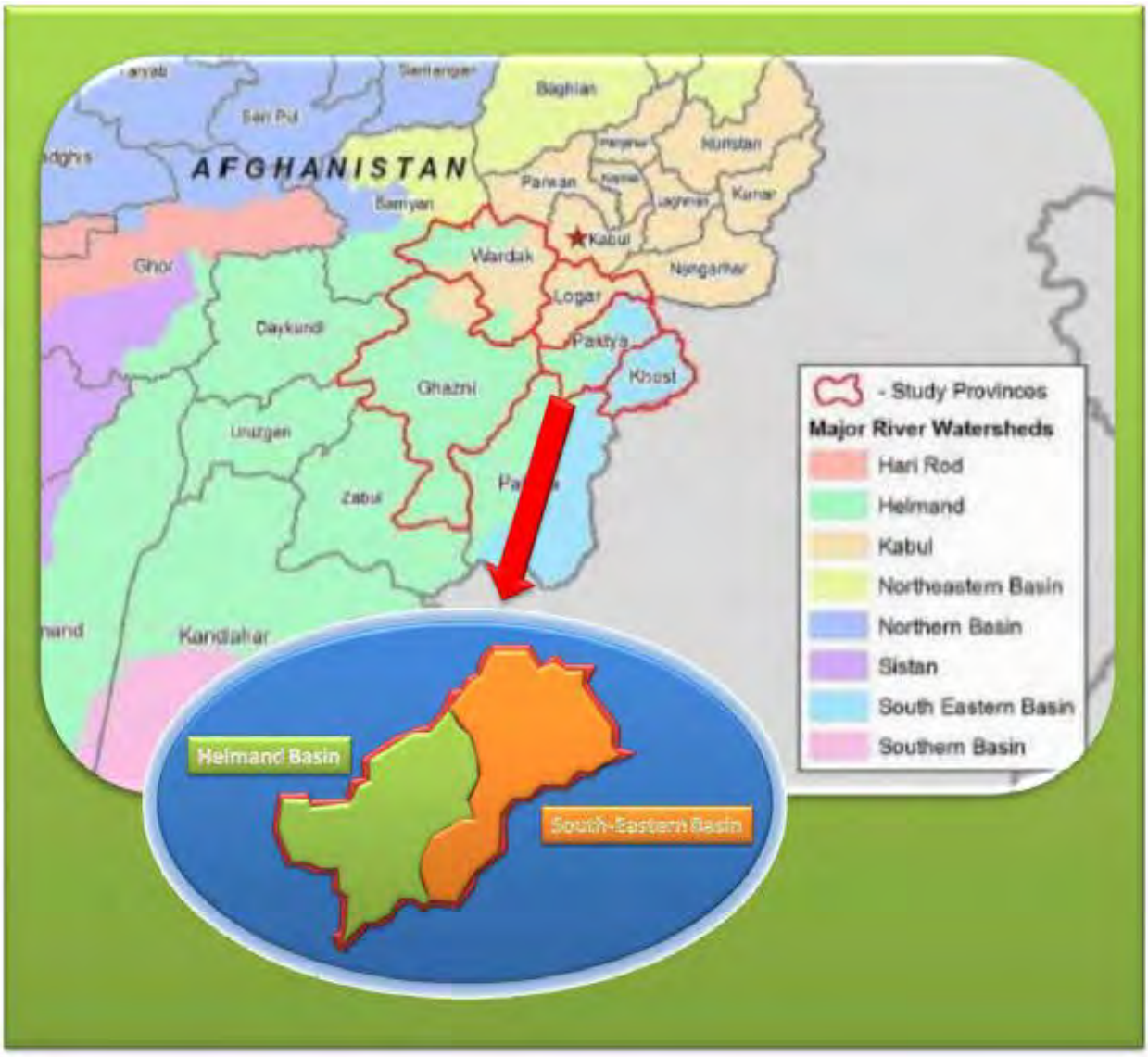


Figure 12 The areas, which belong to the two major water basins in Paktya province

The forests are being cut down unsustainably to provide wood for fuel and construction. The land being used by poor agricultural practices and grazing patterns have changed. These practices had been followed by soil degradation, floods, erosion and siltation. Actually, the water table levels have dropped by as much as 22 meters. If the annual rainfall and snow-fall prevail constant, which is not the case right now and it year by year more unpredictable, several years are needed to recharge water table for the level that was in 1988. Rain fed crop production faces serious trouble, if the unpredictability of the annual rainfall increases.

As the forests had been cut down and biodiversity decreased, erosion, flood and sedimentation changed the face of Zurmat. The upper land characterized by sediment rock (Around 50% of the total area), while the lowland is covered by coarse and fine sediments. Therefore, the dominant soil class is the variations

of fluvisol soil, which are weekly developed, often structure less loose or dense soils depending from the particle size and silt/sand/clay content. This type of soil degradation causes further increase in erosion and sedimentation processes.

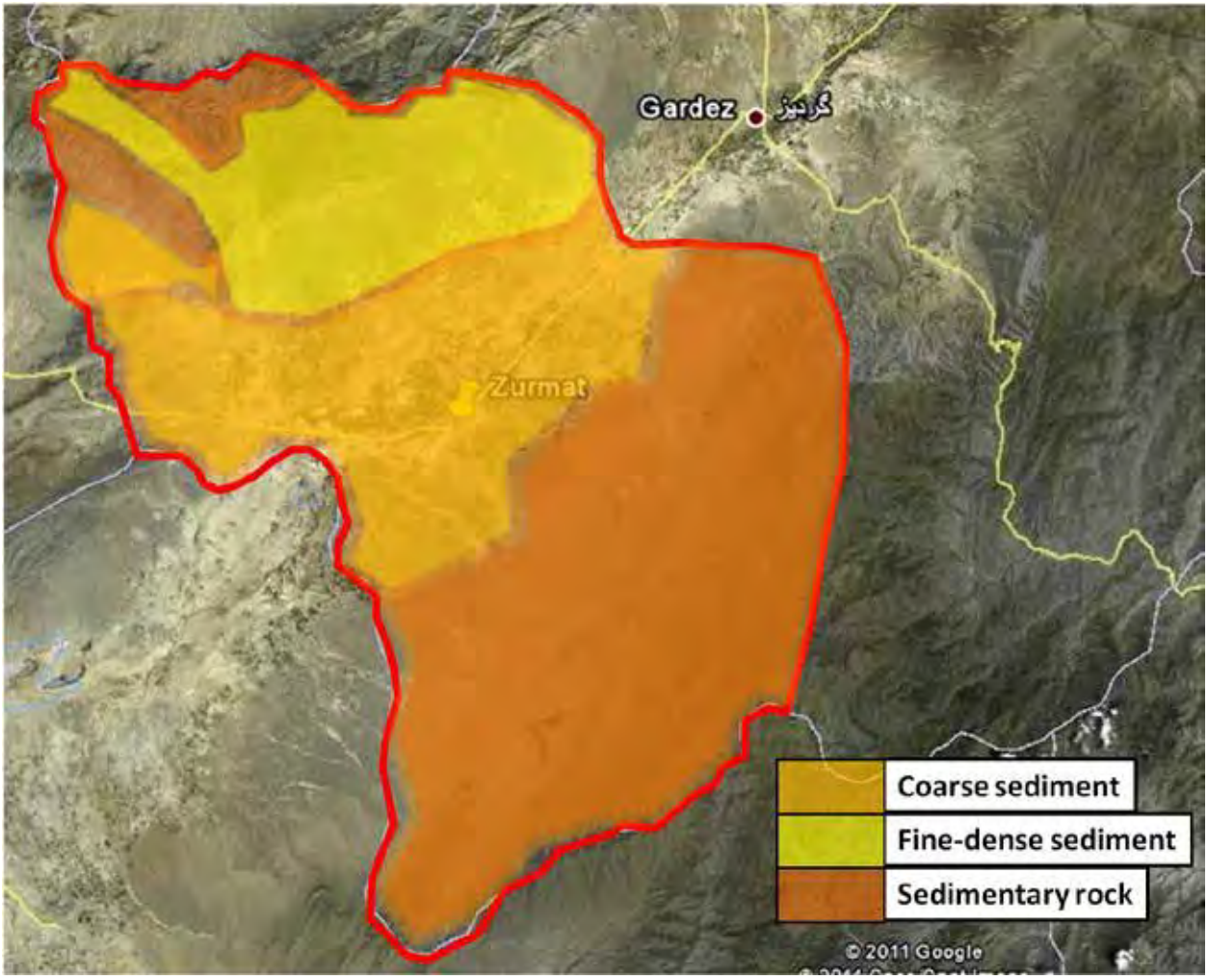


Figure 13 Land cover conditions in Zurmat district

These above mentioned processes are causing the effect that some area is lacking water, while another is under water. The water is no longer retained by the natural vegetation and literally over run the area. There is no time to infiltrate into the aquifer or keeping it in the top horizons of the soil profile as moisture content. The water, in a relatively short period, withdraws from the area in high speed carrying sediments from upland to the lowland. On the other hand, the lowest area of the region has not the capacity to absorb such a high volume of water in a short time period and becomes waterlogged. This unequal water balance clearly indicates that the hydrologic cycle is broken and replaced by desertification processes.

It was mentioned before that the most important river in the region is the Jilga (Gardez) River, which has an annual water budget of 39.6 M-m^3. The stream has a flow rate of 0.12 m^3/second during September.

A part of the Jilga River several other streams and canals build up a network in the plain of Zurmat. The most important streams are the following:

- Andar wash
- Faqir Mohammad stream
- Kalpati wash
- Adinkhel wash
- Baraki wash
- Panjlaki wash
- Omerkhel canal and aqueducts

The major part of the existing streams in Zurmat is under the category of unstable and braided system (if active) or dispersed system. The braided system, which is the common and dominant in the district, is an un-vegetated, multi-channel flood plain with the indication of the presence of water or commonly watered conditions. The dispersed stream system has evidence of previously occurred channel development, but no active flow indication. It is common in the areas, which are in the stage of desertification.

Figure 14 The major permanent and temporary streams/washes in Zurmat district

In many areas the commonly used water source is the karezee. Kareze is a traditional practice to catch water in Afghanistan. It consists of a series of wells connected underground by a tunnel that gently leads the water from the uppermost well in the series to a point down slope where it can be reached by a ditch dug downward from the surface. The gravity-powered water is then led onto the fields. The wells provide access during construction and cleaning operations to the tunnel that serve as an infiltration gallery. The most important karezees in Zurmat are the following:

- Jadran kareze
- Mazar kareze
- Bakhtiar kareze
- Landi kareze
- Khabri kareze
- Khanmadi kareze
- Luway kareze
- Sheni kareze

Figure 15 The location of karezees, streams/canals and aqueducts in Zurmat and the landforms where they can be found

4.3 Vegetation Cover

Naturally developed forest area is almost non-existent in Zurmat. Its total area is less than 10%. In most of the plain rock outcrop/bare soil alternates with low shrubs, forbs and grasses (rangeland). The irrigated land is a relatively small part of the plain (20-25%) indicating two things. First, the major part of the annual rainfall and flood is not used. Second, the district has not sufficient water storage capacity.

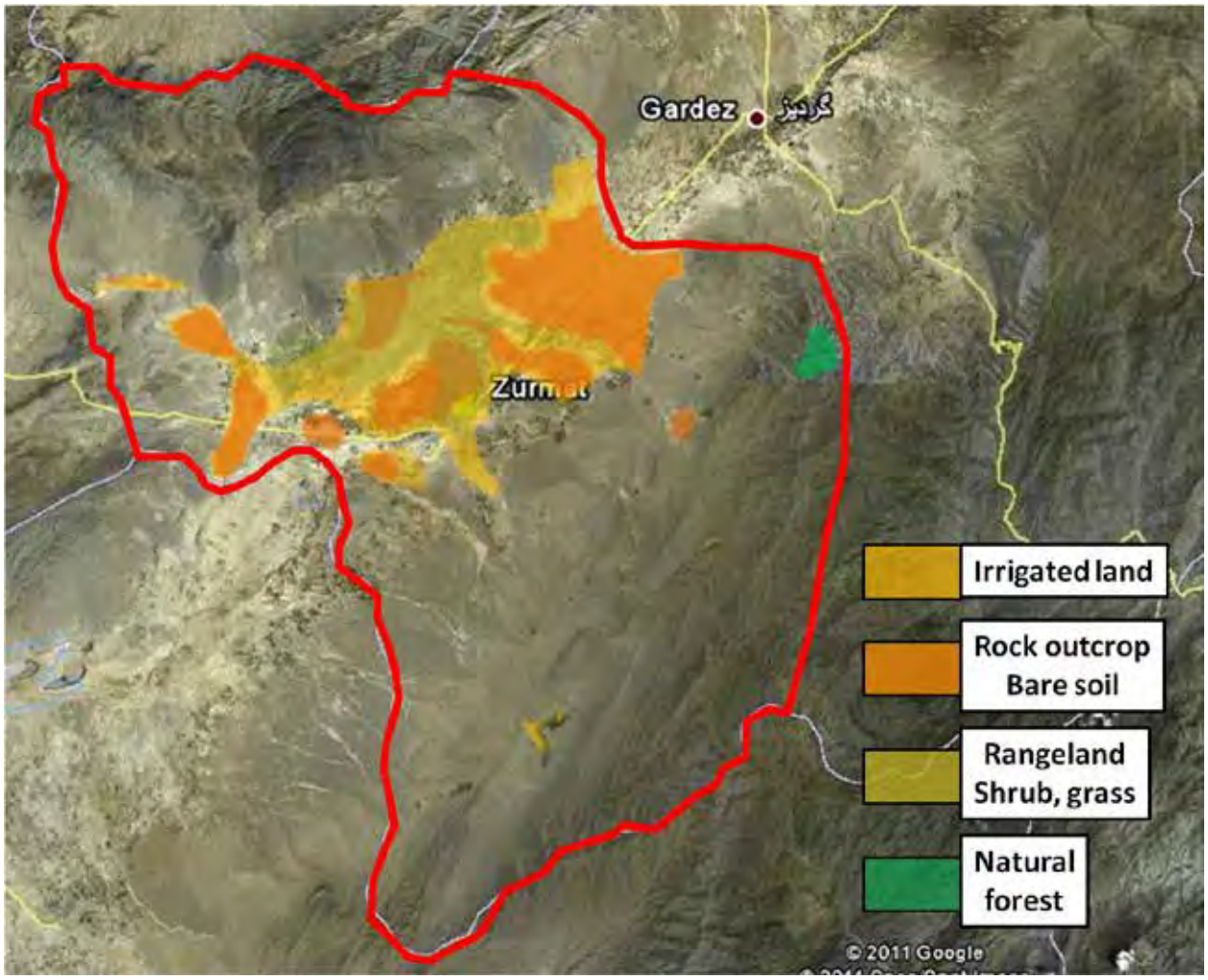


Figure 16 Vegetation land cover in Zurmat district

5 Survey Results

5.1 Topography of the Surveyed Areas

The survey was conducted and focused on the lowland and low hill area where the main agricultural activities are taking place, the density of the population is high and where the main hydrological activities occur. This area is surrounded with mountains in the North and South. The area fits into the landscape classification of “Mountain” because it rises high above the base and generally has steep slopes and has a relatively small summit area. In Zurmat, the mountains are arranged in parallel systems. Successions of mountains are closely related in position, orientation and geological features. They are elevated, rugged, and deeply dissected portion of land characterized by significantly greater height in relation to the lower surrounding areas.

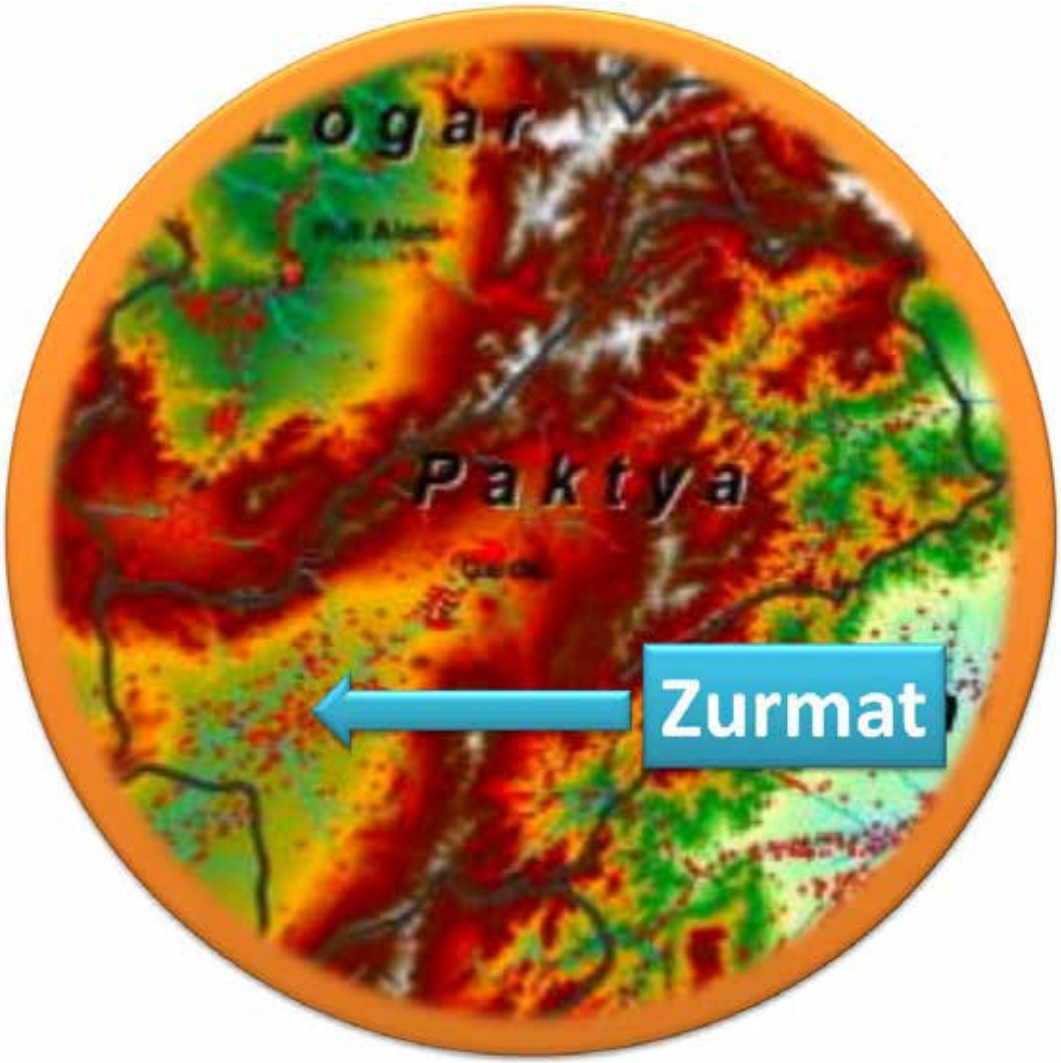
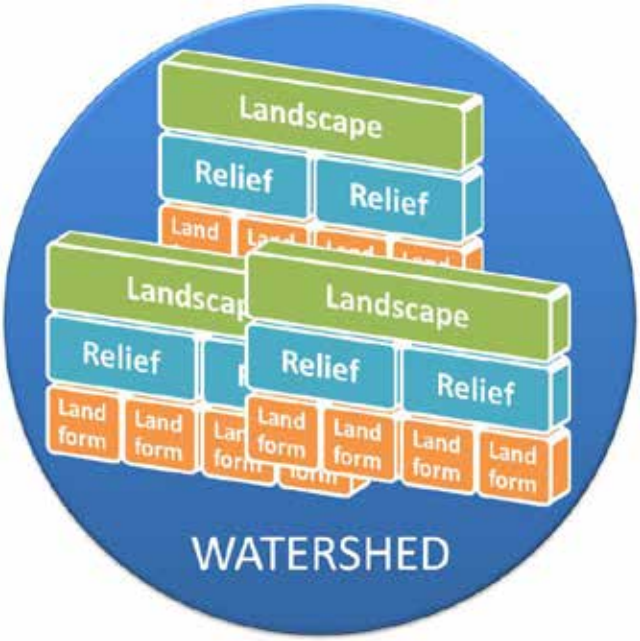


Figure 17 The topographic conditions in Zurmat (River plain area surrounded by mountains)

5.2 Schematics for Survey Approach

The surveying approach used by the team was to identify and divide the watershed into landscapes, reliefs and landforms, such as illustrated in the schematics below:



Three main categories may be distinguished:

- LANDSCAPE
  First order terrain class, represents the biggest hierarchical unit: The Landscape, or first-order terrain class, is defined as a large area characterized either by a repetition of similar relief-types or an association of dissimilar types. Landscapes are greatly influenced by distribution of the main geological units and tectonics.
- RELIEF
  Second order terrain class, represents the middle hierarchical unit: The Relief, or second-order terrain class, represents the morphology of the Earths' surface as determined by a combination of geological structure (lithology and tectonics), morphogenetic processes and specific morpho-climatic conditions.
- LANDFORM
  Third order terrain class represents the smallest hierarchical unit: The Landform, or third-order terrain class, represents features of the Earth's surface determined more by morphogenetic and climatic processes than geology. They are the smallest landscape unit/s and examples might include the different parts of a slope (summit, shoulder, back slope, foot slope, toe-slope), or erosional/depositional features such as rills, gullies, back swamps and coastal dunes.

5.3 Landscape PZ01

The landscape is located between the main Zurmat road and the mountain area from Zurmat toward the South. It is characterized by a series of karezees in the area, which are the main water source for irrigation water.

Figure 18 The PZ01 landscape

It belongs to the landscape category of Piedmont, where the sloping surface is at the foot of more elevated surface such as the plateaus, hills and mountains. It also has an area of gentle slopes and low relief flanking an upland area. It is an assemblages of planar alluvial surfaces flanking an area of mountains and rocky desert uplands.

5.3.1 Relief PZ01/R01

This relief is categorized as the Denudational Slope. It is a sloping area on which there is clear evidence of erosion through active canalized running water and through landslides and creeps.

5.3.1.1 Landforms of the PZ01/R01 Relief

There are four major landforms in the area, which had been identified and studied by the survey team. All four landforms are classified as Floodplain. Floodplain is a relatively flat alluvial form, constructed generally by a river flow regime and subject to flooding. Floodplains are commonly flanked by a clearly defined channel/stream/wash, but it can occur in valleys without channels while channels form downstream. In the PZ01/R01 relief area both processes had been observed. As usually happens in floodplain areas, sedimentation and erosion are on-going processes at an increasing rate. Alongside with the cultivated farmland the area shows clear evidence of climate change, which is represented by symptoms of desertification. These areas are almost or completely deforested with a decreasing number of species belonging to the natural flora and fauna.

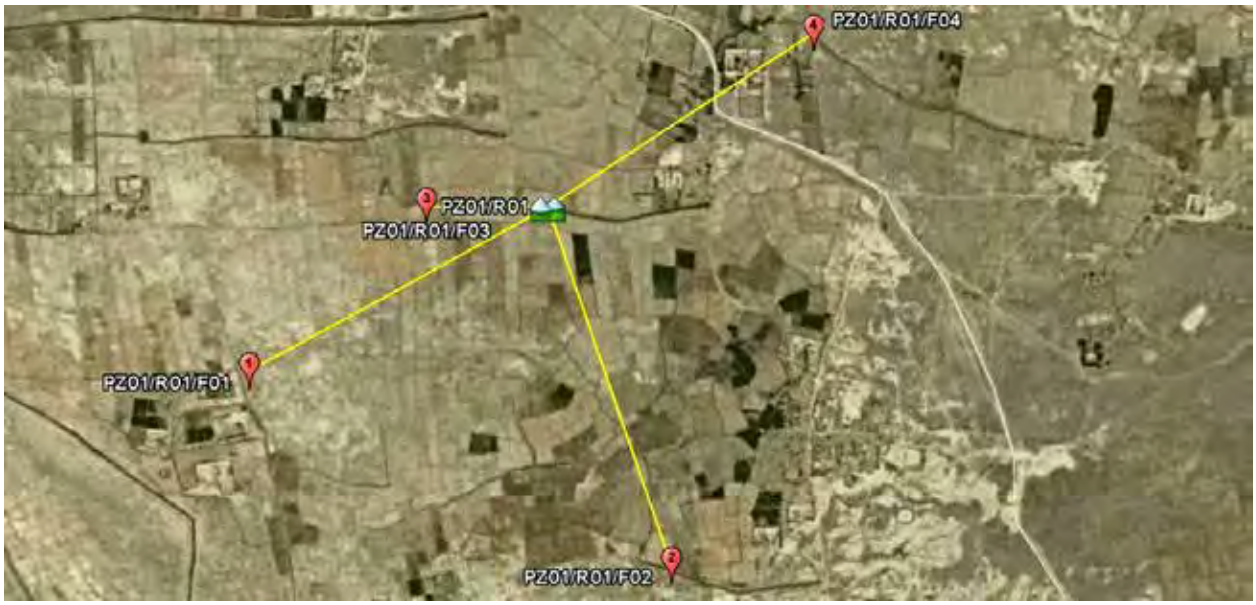


Figure 19 The landforms of the PZ01/R01 relief

5.3.2 Relief PZ01/R02

The prominent feature of the PZ01/R02 relief is the Meandering River Plain. This is a plain area, where a sinuous winding river/water wash flows.

5.3.2.1 Landforms of the PZ01/R02 Relief

Four landforms had been subjects of the survey. The PZ01/R02/F03 landform is a typical River Levee. It is a broad, long crested ridge, which running alongside of the floodplain stream composed by coarse sand and silt sediments deposited by the flood. The other three landforms are typical floodplains.

Figure 20 The landforms of the PZ01/R02 relief

5.3.3 Relief PZ01/R03

This landform can be described as a Denudational Surface. It is very similar to the Denudational slope except that it is an almost flat surface. These types of reliefs also show clear evidence of water erosion effects.

5.3.3.1 Landforms of the PZ01/R03 Relief

This relief had been divided into seven landforms, where five from them is floodplain. Two landforms (PZ01/R03/F02 and PZ01/R03/F03) are Depression class landforms. These two landforms area are a kind of land surface, which is lower than the surroundings due to fluvial erosion. They have an elliptical shape and a well developed drainage network.

Figure 21 The landforms of the PZ01/R03 relief

5.3.4 Relief PZ01/R04

PZ01/R04 relief is a Hill Complex characterized by a series of complex of adjoining hills. The hills are well defined landforms with a gently undulating summit, gently inclined to precipitous slopes. The hill complex has two types of drainage network. One of them is a fixed, shallow erosion stream channel and the other one is a very wide spaced water wash. The erosion by wash and creep occurs continuously on the slopes. Their relief intensity is less than 300m.

5.3.4.1 Landforms of the PZ01/R04 Relief

This landform has three floodplain and one depression class landforms.

Figure 22 The landforms of the PZ01/R04 relief

5.4 Landscape PZ02

This area is located from Zurmat to on the East alongside to Zurmat-Gardez road on the West. Its landscape class is Alluvial Plain, which means that the plain is formed through fluvial activity and is characterized by extensive alluvial deposits. The plain does not have a well developed drainage network. It has very low slopes, which are between 100-1,000 meters wide.

Figure 23 The PZ02 landscape

5.4.1 Relief PZ02/R01

This relief area is a Planation Surface class. It is a flattish plain resulting from erosion. Its very gently sloping surface incised by water streams and fractures.

5.4.1.1 Landforms of the PZ02/R01 Relief

The relief had been divided into four land forms, three of the landforms are within the Depression class (previously explained). The forth one is a Middle Pediment class. This means that it is the middle section of a pediment, recognizable by the presence of an abrupt change in slope between the upslope upper pediment and the downslope lower pediment.

Figure 24 The landforms of the PZ02/R01 relief

5.4.2 Relief PZ02/R02

The PZ02/R02 relief is a Denudational Surface with the typical almost flat surface and with clear signs of erosion caused by active canalized running water and or landslides/creeps, etc.

5.4.2.1 Landforms of the PZ02/R02 Relief

Two of the five landforms (F01 and F04) are typical Depression class. The F05 landform is the middle part of a pediment (Middle Pediment class) and the remaining two landforms (F02 and F03) belongs to the Rill class landform. Rill is a small ephemeral channel, often forming in sub-parallel sets on sloping agricultural land in response to intense run-off events. They are also common on steep and unprotected surfaces such as road and other earth embankments. Rills may be a few cm in width and depth, but rill lengths may reach hundreds of meters.

The landforms of the PZ02/R02 relief

5.5 Landscape PZ03

The third landscape of the Zurmat area is an Alluvial Plain class landscape and the studied area contained one relief of Planation Surface type and one typical floodplain landform nearby to Sahebzadah Qala village.

Figure 25 The landscape PZ03

The following table shows the summary results of the topographic survey:

Survey unit	Code	Classification	Code
Landscape	**PZ01**	**Piedmont**	**Pie**
Relief	**PZ01/R01**	**Denudational slope**	**S33**
Landform	PZ01/R01/F01	Floodplain	F06
	PZ01/R01/F02	Floodplain	F06
	PZ01/R01/F03	Floodplain	F06
	PZ01/R01/F04	Floodplain	F06
Relief	**PZ01/R02**	**Meandering river plain**	**F05**
Landform	PZ01/R02/F01	Floodplain	F06
	PZ01/R02/F02	Floodplain	F06
	PZ01/R02/F03	River levee	F05
	PZ01/R02/F04	Floodplain	F06
Relief	**PZ01/R03**	**Denudational surface**	**S35**
Landform	PZ01/R03/F01	Floodplain	F06
	PZ01/R03/F02	Depression	F09
	PZ01/R03/F03	Depression	F09
	PZ01/R03/F04	Floodplain	F06
	PZ01/R03/F05	Floodplain	F06
	PZ01/R03/F06	Floodplain	F06
	PZ01/R03/F07	Floodplain	F06
Relief	**PZ01/R04**	**Hill complex**	**S29**

Survey unit	Code	Classification	Code
Landscape	**PZ01**	**Piedmont**	**Pie**
Landform	PZ01/R04/F01	Depression	F09
	PZ01/R04/F02	Floodplain	F06
	PZ01/R04/F03	Floodplain	F06
	PZ01/R04/F04	Floodplain	F06
Landscape	**PZ02**	**Alluvial plain**	**Pia**
Relief	**PZ02/R01**	**Planation surface**	**S32**
Landform	PZ02/R01/F01	Depression	F09
	PZ02/R01/F02	Depression	F09
	PZ02/R01/F03	Middle pediment	F03
	PZ02/R01/F04	Depression	F09
Relief	**PZ02/R02**	**Denudational surface**	**S35**
Landform	PZ02/R02/F01	Depression	F09
	PZ02/R02/F02	Rill	F02
	PZ02/R02/F03	Rill	F02
	PZ02/R02/F04	Depression	F09
	PZ02/R02/F05	Middle pediment	F03
Landscape	**PZ03**	**Alluvial plain**	**Pia**
Relief	**PZ03/R01**	**Planation surface**	**S32**
Landform	PZ03/R01/F01	Floodplain	F06

Table 6 Summary result of the survey

5.6 Land Use

All farmers (100%) make good use of the annual rainfall in the studied areas. 67% of the farmers actually practice irrigated agriculture in some extent, however, only 30% of them are able to cultivate the main crop exclusively under irrigation. Around 28% of the farmers do not have access to any water source except the annual rainfall. 33% of the Farms with capacity to irrigate use water supplied from shallow wells, 17% from streams and rivers and 22% from established irrigation canals. The survey found that the irrigated farms uses water 67% from shallow wells, 33% from stream/river and 44% form irrigation canals. In addition to the agriculture production 33% of the farmers practice agro pastoralism and all farmers (100%) involved in grazing and wood collection activities.

Description	% of farmers
Type of agriculture	
Irrigated agriculture	30%
Rain fed agriculture	100%
Agro-pastoralism	33%
Grazing & wood collection	100%

Water Source	Irrigated farms	Access to water
River		
Borehole		
Shallow well	67%	33%
Lake		
Stream	33%	17%
Irrigation canal	44%	22%
Reservoir		
Small pond		
No access to water (100% rain fed)		28%

Table 7 Summary of the agriculture practices

Approximately 22% of farms have a productive area over 10 jeribs. Mechanization on the farms consists the basic machinery such as tractor, plough and cultivator. However, farmers are carefully trying to protect their fields with graded and contour boundaries against flood and erosion.

Description	% of farmers
Land improvement	
Wells	100%
Graded bounding	65%
Contour bounding	35%
Input level	
Medium input	100%
Mechanization	
Type: Tractor	100%
Management/Protection	
No	100%
Average Farm Size	
1-2 Jerib	22%
2-5 Jerib	22%
5-10 Jerib	33%
>10 Jerib	22%

Table 8 Farm's characteristics in Zurmat district

The dominant main annual crop is wheat. Basically all farmers produce wheat in rotation with other crops. Considering the crop rotation calendar around 21% of the farmer produces wheat each year in the district. From the group of secondary crops the most important is the clover, which takes 24% of the secondary crop production in each year. A total of 15 different crops are cultivated in the farms. The harvest is used for consumption and for sales purposes. From perennial crops the most important are the apple, apricots and grape production. Peach and cherry production also can be found in smaller proportion.

Description	Annual production	% of farmer produces	Description	Annual production	% of farmer produces
Main Annual Crop			**Secondary crop**		
Wheat	21%	100%	Clover	24%	100%
Barley	12%	56%	Alfalfa	19%	78%
Corn	14%	67%	Turnip	8%	33%
Rice	14%	67%	Spinach	14%	56%
Bean	7%	33%	Onion	16%	67%
Carrot	17%	78%	Garlic	11%	44%
Radish	2%	11%	Mint	8%	33%
Soya	12%	56%			

Crop Calendar												
Crop	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wheat		5				6			1	2	3	
Corn					1	2-3	5		6			
Barley			1	2-3	5			6				
Rice		5				6				1-2	3	
Bean				1-2	3	5			6			
Soya				1-2	3	5			6			
Radish				1-2	3	5			6			
Carrot			1	2	3	5			6			
Clover		5			6				1	2	3	
Alfalfa				1-2	3		5			6		
Turnip				1-2	3	5			6			
Spinach				1-2	3		5		6			
Onion			1-2	3		5			6			
Garlic			1-2	3				6				
Mint			1-2	3	5				6			
Land preparation				**1**								
Planting				**2**								
Growing season				**3**								
Pruning				**4**								
Fertilizer application				**5**								
Harvesting				**6**								

Table 9 Crop calendar and annual crops in Zurmat district

The livestock production involves primarily sheep, goats and cattle. It is quite common to find camels on the farms. Around 40% of the farms have 5-10 animals per farm. Another 40% of the farms have between 10 and 20 animals, while 20% of the farmers own a number of animals over 20 animals.

Average number of livestock	
5-10	40%
10-20	40%
20-30	20%

Table 10 Average number of livestock per farmer

Deforestation has reached an alarming level in the region. Everywhere the population practices wood collection on regular bases. The wood is used as firewood in the households. Around 80% of the households collect woods on a daily bases. The commonly used practice is to cut down medium size live trees. Most of these trees are young trees. Reforestation activities and forestry management is nonexistent in the area.

Description	% of farmer
Forest use	
Wood collection	100%
Firewood purposes	100%
Collection period	
Daily bases	80%
Weekly bases	20%
Wood type	
Alive trees	100%
Dead trees	60%
Small (<2m)	
Medium (2-5m)	100%
Big trees (>5m)	
Young trees	80%
Old trees	20%
Reforestation	
No	100%

Table 11Wood collection practices and use in Zurmat district

5.7 Land Cover

The result of the land cover survey clearly indicates that Zurmat area is subject to the desertification processes. A total of 77% of the landforms contains non-vegetated areas at different levels. From the total surveyed area 30% is non-vegetated. Nowhere did the team find farmland occupying the biggest part of the area. This clearly indicates that the farmland area is a smaller proportion of total area, which potentially can be used for farming purposes. The 30% bare areas contain both, consolidated and unconsolidated areas. In all landforms the team found the two types of bare areas built up with bare rocks, gravels and stones and in case of the unconsolidated areas bare soil and loosen sand.

Land cover type	% of landforms	% of total area
Vegetated area		
Vegetated bigger area	56%	21%
Vegetated smaller area	33%	13%
Vegetated smallest area	0%	0%
Non vegetated area		
Non vegetated bigger area	33%	13%
Non vegetated smaller area	33%	13%
Non vegetated smallest area	11%	4%
Agri/Infrastructure area		
Agri/Infrastructure bigger area	0%	0%

Bare areas	% of landforms
Consolidated	
Bare rock	100%
Gravel, stone, boulders	100%
Hardpan	0%
Not stony	100%
Stony	0%
Very stony	0%
Unconsolidated	
Bare soil	100%
Loose/shifting sand	100%

Land cover type	% of landforms	% of total area
Agri/Infrastructure smaller area	22%	8%
Agri/Infrastructure smallest area	67%	25%

Bare areas	% of landforms
Not stony	0%
Stony	0%
Very stony	0%

Table 12 Land cover result in Zurmat district

5.8 Vegetation Cover

The number of plant species and their presence in the landforms are low and many of them are the results of perennial horticulture activities. This indicates that biodiversity in the area is poor and decreasing.

Table 13 Vegetation cover in Zurmat district

Scientific name	No. of landform	Scientific name	No. of landform
Amygdalus bucharica	6	Eleusine indica	1
Morus alba	4	Ipomoea spp.	2
Platanus orientalis	5	Tribulus terrestris	5
Populus alba	7	Artemisia diffusa	1
Pyrus malus	7	Agropiron repense	1
Prunus persica	4	Chenopodium album	3
Prunus armanica	5	Portulaca oleracea	2
Prunus avium	2	Taraxacum offinale	1
Vitis vinifera	5	Cyperus esculentus	1
Thuja orientalis	6	Echinochloa colonum	1
Eleangus angustifolia	7	Echinochloa crus-galli	2
Rosa webbiana	6	Plantago major	3
Alhagi camelurum	1	Sorghum halepense	1
Ambrosia artemisiifolia	3		

The data indicates the number of landforms from 10, where the species presence is observed

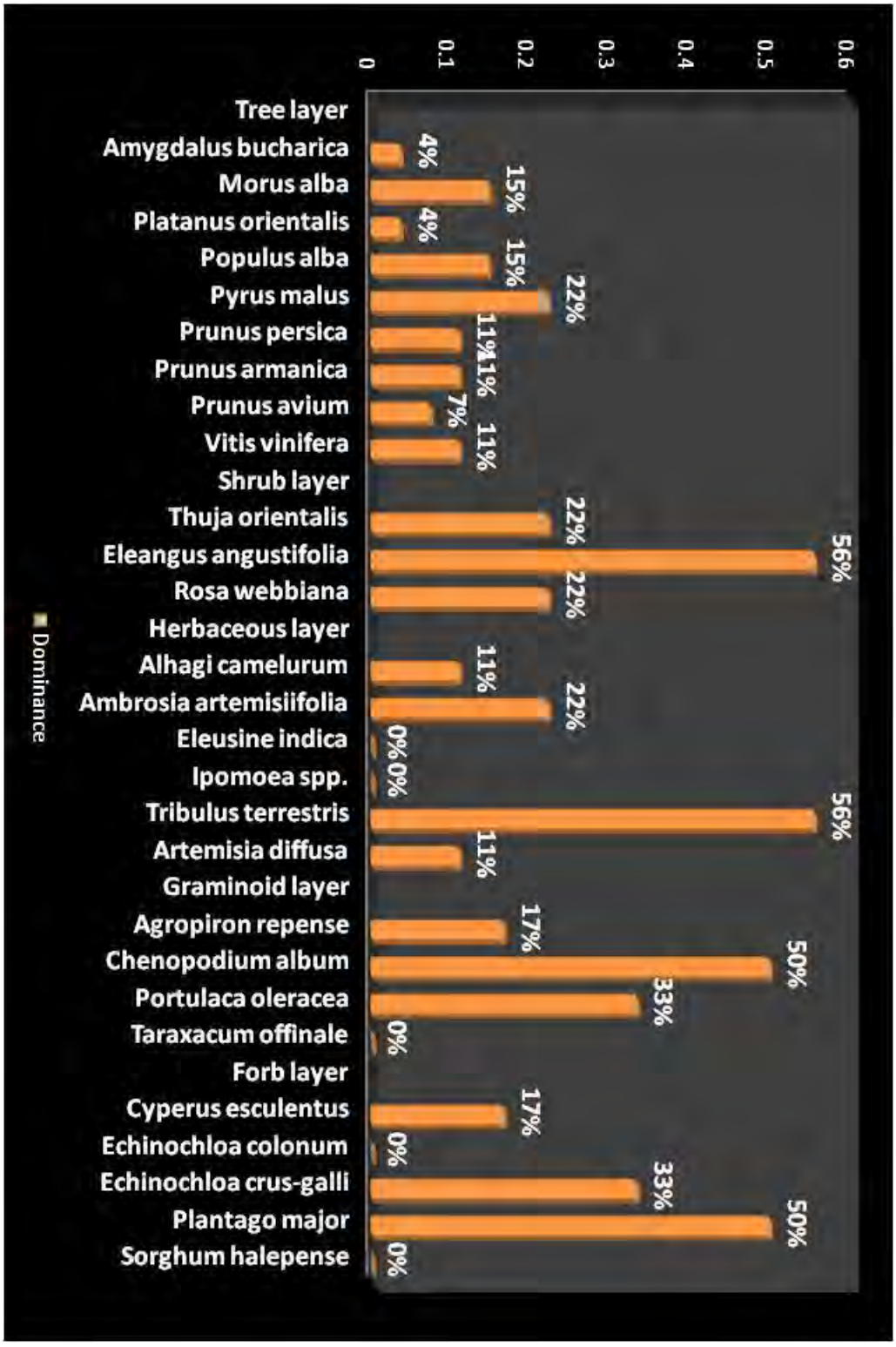


Figure 26 The occurrence of dominant species of each vegetation layer in the surveyed landforms

6 Summary Analysis of Results

The area of Zurmat is characterized by plain with clear evidence of advanced erosion. The area is surrounded by mountains in the North and South, which are receiving the major share of the annual precipitation in the form of snow. During summer, the snow melts and during a short period of time floods the plains below. The flood causes a severe erosion problem in the region. The pale color of the soil indicates a well or excessively drained type of soil. Because of the large volume of water during the flooding there is a short period of time that the soil is saturated.,

The primary cause of soil degradation is water erosion developing rill surface area. There is evidence of the partial and/or complete removal of surface horizons. Another major problem is the sedimentation. Both, erosion and sedimentation prevent the stabilization of the riverbanks, streams and waterways and causes the large overflow of the water on the land surface. The floodplain of the rivers is large comparing to the relatively narrow riverbank, which is subject to continuous erosion. The unconsolidated sediment is alternating with consolidated surface layer built up with rock, stones and gravels.

The dominant soil class is Fluvisol. In this aspect the Zurmat area show similar characteristics of the Dawlatzi watershed. Both areas are characterized by Alluvial plain, which explains the similar soil and topographical conditions. (Fluvisols are the equivalent groups of the Regosoils in the Canadian classification system and the Entisols in the US soil taxonomy system).Fluvisols have no profile development except a shallow marginal A horizon. Many recent river floodplains, volcanic ash deposits, unconsolidated deposits with horizons eroded away, and sands are Entisols. The little difference between the horizons and the absence of E horizon also indicates the young age and poorly structured soil. The high content of fine size sand particles with silt and clay content makes the soil compact and poorly ventilated. There is no visible sign of a well-developed E horizon. The dominant clay minerals in the soil are 2:1 type Montmorrillonit and Smektit.

In term of the physiognomic aspect, the dominant layers are the graminoid and forbs layers (the two sub-classes of the Herbaceous layer). The uppermost canopy layer is important only in the cultivated fruit orchard area. The cultivated fields are classified as “Scattered clustered” (Percentage of fields is between 17-28%). The qualification for vegetation coverage is “Open trees with closed to open herbaceous layer” (this is the same as found in the Dawlatzi area). Bare areas, consolidated and unconsolidated, are occupy large proportions of the Zurmat area and indicates and advanced stage of desertification.

The medium input farming system is the dominant type of agriculture in the area. The average farm size varies between 2-5 and 5-10 jeribs. The main annual crop is wheat. The relatively large number of produced crops indicates a more developed agriculture sector than in the area of the Dawlatzi watershed. This also appears in the perennial horticulture production areas. Beside the traditionally produced apple and apricot, peach, cherry and grape production is also significant in the area. Many

farmers have access to water sources such as wells, streams and canals; significant irrigated agriculture is only 30% of the total farmland. This indicates water scarcity problems on a large scale.

Almost every household has about 5-10 livestock, mainly sheep, goats and cattle. They are overgrazing the available pastureland and expose the soil to rill and sheet erosion during the period of annual flood.

The extent of deforested area is alarming. Wood collection for firewood purposes is daily activity in 80% of the households. Therefore, the dominant vegetation cover is the herbaceous layer. The deforestation is the main cause of the problems caused by erosion and sedimentation. It also explains the desertification process, which affects basically the whole Zurmat district area.

Water scarcity problems due to varying precipitation are frequent, but severe distress is confined to those areas in which cultivation depends completely on the rainfall production. The lack of water catchments and retaining physical measurements does not allow a reserve or recharge. The main volume of annual water supply for recharge is available only for a short time period of the year and in many places it causes more erosion in the area than good.

Though water scarcity is present during two-third part of the year, the remaining 3-4 months is characterized by the damage of excess water. During the annual floods the water invades the farmland, causing erosion, sedimentation and saturation of large areas of land. The absence of an adequate drainage system causes the destruction of the crops and the area becomes waterlogged for several months.

7 Constraints and Assumptions

The problems and risks found in the area of Zurmat care the following:

- Unstable waterways, catchment areas and annual flood
- Increased degree of water erosion
- Incorrect use of natural resources, especially in regards to deforestation and grazing practices
- On-going desertification process in the region
- Temporary water scarcity in the productive areas
- Lack of adequate drainage system and temporary excess water in farmland areas

7.1 Unstable Waterways, Catchment Areas and Floods

The main cause of this problem is the sedimentation. The heavy seasonal rains wash down the slope in the mountain areas. The force of the runoff carries the surface soil layer from these areas toward the plains below. When reaching the plain the water flow slows down and deposits the sediments creating alluvial plains.

7.2 Increased Degree of Water Erosion

The main cause of the erosion problem is the annual flooding, which causes the water erosion from the mountain side. This erosion is increased by the wide spread deforestation and over-grazing.

7.3 Incorrect Use of Natural Resources, Especially in Regards to Deforestation and Grazing Practices

Grazing and forest management do not exist in the area. The agro pastoralist practices in the available land caused serious soil degradation problems. The dominant species for livestock are sheep and goats, which are known for damaging pastures.

Deforestation through wood collection from live trees and without reforestation practices is the most serious issue in Zurmat. Deforestation breaks the hydrological cycle and causes desertification. Unfortunately, 80% percent of the households are involved in wood collection on daily bases.

7.4 On-going Desertification Process in the Region

Desertification process shows an increasing tendency in Zurmat. Deforestation and grazing practices has left the area without vegetation cover. Many of the consolidated bare areas have already crossed the “point of return”, this is where the natural state of the soil cannot recover from the soil degradation. These areas will require 50-60 years of treatment to improve soil conditions. The absence of the forest in the region does not allow the natural hydrologic cycle to occur. This is further intensified by the decreasing and unpredictability of annual rainfall.

7.5 Temporary Water Scarcity in the Productive Areas

The climate of the surveyed area is arid-semiarid. Precipitation usually occurs in the winter and spring. Most of the precipitation is received as snow in the mountain areas. It is released throughout the summer in a short period of time flowing over the alluvial plain. But it also withdraws from the plain in a

short period of time. The lack of diversion structures, buffer dams and canals does not allow the regulation of the water distribution during the year.

7.6 Lack of Adequate Drainage System and Temporary Excess Water in Farmland Areas

This problem has to be addressed and managed together with the water scarcity problem. Both are the result of inappropriate water distribution and the absence of proper drainage, water canals, buffer dams and diversion structures. Further, the small farms usually do not have developed secondary drainage canals. Experiences show that major primary drainage systems are not effective if the farms do not have a proper secondary drainage network. This happens when farmer lacks the necessary knowledge and skills to understand and prevent the problem.

8 Recommendations and Proposed Interventions

Previous reports have stated that the Upper Ghazni Sub-basin does not hold a good potential for irrigation storage dams. Although the Jilga River is too wide and flat to be feasible for a dam and the streams that discharge into the Gardez valley has steep slopes over 5%, the Northern valley (Dara Drang valley) of Zurmat district (between the mountain hills) provides a suitable site for dam. Around five tributary water ways discharge into this valley. Obviously, the valley dam can serve as water reserve, but its most important purpose would be to regulate water discharge during most part of the year. However, dam sites of the Upper Ghazni Sub-basin show symptoms of reservoir sedimentation resulting from the upland erosion. Therefore, any stream, kareze rehabilitation or dam construction should consider physical measurements for sedimentation control.

8.1 Water Source (Stream Canal Network and Kareze) Rehabilitation

The survey's results indicated that one of the critical interventions for the restoration of the hydrologic cycle is to rehabilitate the stream/canal network and the commonly used karezes. This intervention has the following purposes:

- Prevention and reduction of land degradation
- Reclamation of land in stage of desertification
- Reduction of soil erosion and sedimentation

Location				Landscape			
Province		District		Code	Latitude	Longitude	Elevation
Paktya		Zurmat		PZ01	33.413665	69.049408	2163.9
Relief				Landform			
Code	Place	Type	Activity	Code	Latitude	Longitude	Elevation
PZ01/R01	Jadran	Kareze	Rehabilitate	PZ01/R01/F01	33.411630	69.050075	2,168.4
	Mazar	Kareze	Rehabilitate	PZ01/R01/F02	33.410827	69.059895	2,193.1
	Bakhtiar	Kareze	Rehabilitate	PZ01/R01/F03	33.410992	69.062532	2,189.0
	Landi	Kareze	Rehabilitate	PZ01/R01/F04	33.416753	69.054273	2,182.2
PZ01/R02	Khabri	Kareze	Rehabilitate	PZ01/R02/F01	33.416973	69.061112	2,175.6
	Khanmadi	Kareze	Rehabilitate	PZ01/R02/F02	33.422015	69.055375	2,158.8
	Luway	Kareze	Rehabilitate	PZ01/R02/F03	33.438407	69.063968	2,166.5
	Sheni	Kareze	Rehabilitate	PZ01/R02/F04	33.430077	69.079960	2,189.2
PZ01/R03	Andar	Stream	Rehabilitate	PZ01/R03/F01	33.413410	68.990172	2,141.5
	Faqirmoh	Stream	Rehabilitate	PZ01/R03/F02	33.410600	69.019668	2,161.8
	Kalpati	Stream	Rehabilitate	PZ01/R03/F03	33.419667	69.033092	2,162.0
	Adinkhel	Stream	Rehabilitate	PZ01/R03/F04	33.457453	69.085707	2,180.2
	Baraki	Stream	Rehabilitate	PZ01/R03/F05	33.447797	69.06257	2,168.6
	Panjlaki	Stream	Rehabilitate	PZ01/R03/F06	33.469085	69.070037	2,179.3
	Omer khel	Aqueduct	Divide	PZ01/R03/F07	33.47525	69.079460	2,173.8

Table 14 Location of important karezees and water ways in Zurmat district

Figure 27 The PZ01/R01 and PZ01/R02 reliefs where the karezees were found

Figure 28 Location of karezees for rehabilitation in Zurmat district

Figure 29 The PZ01/R03 relief where is the stream canals location

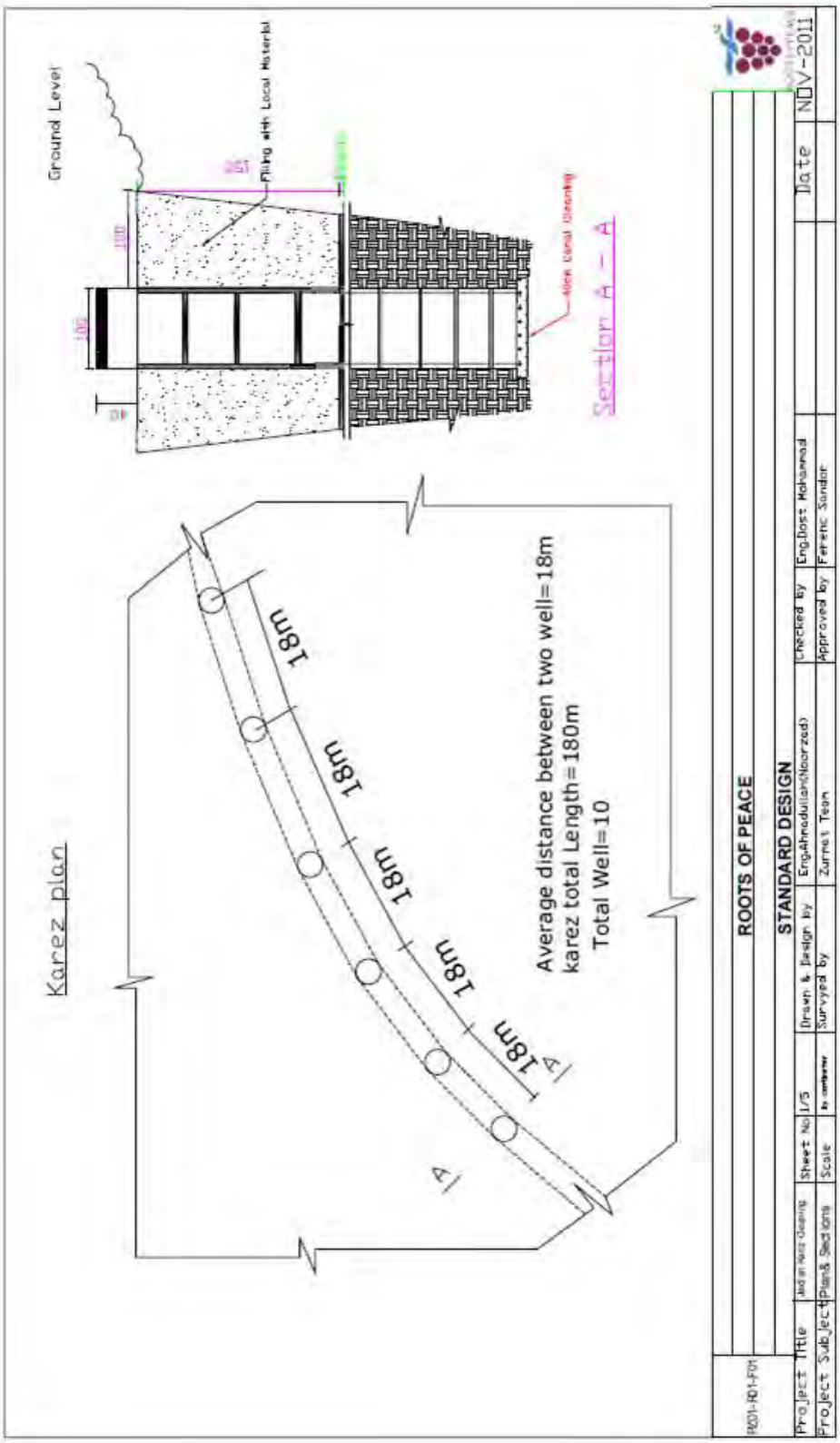
Figure 30 Location of stream canals for rehabilitation in Zurmat district

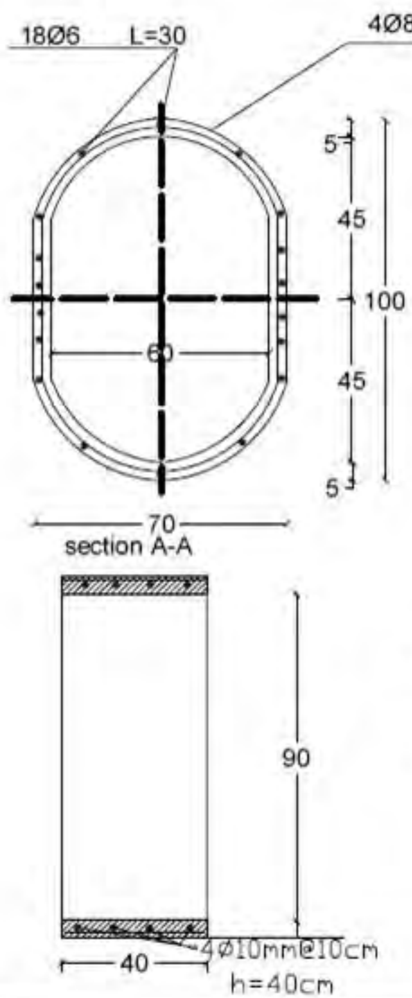
8.1.1 Jadran Kareze Rehabilitation

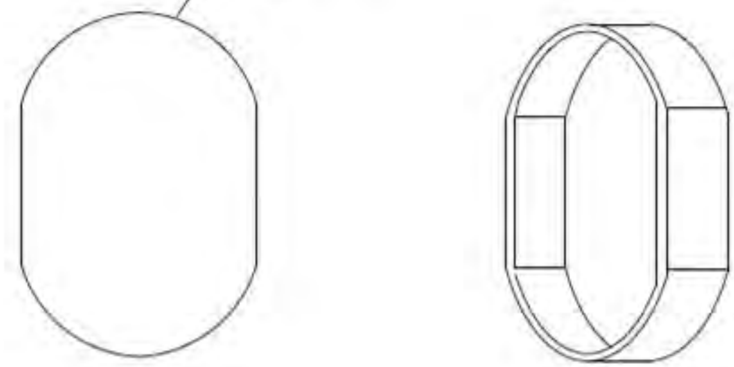
Figure 31 The PZ01/R01/F01 landform

Figure 32 The Jadran kareze area

8.1.1.1 Implementation Design







Total well Ring=38

Total Ring Cover=10

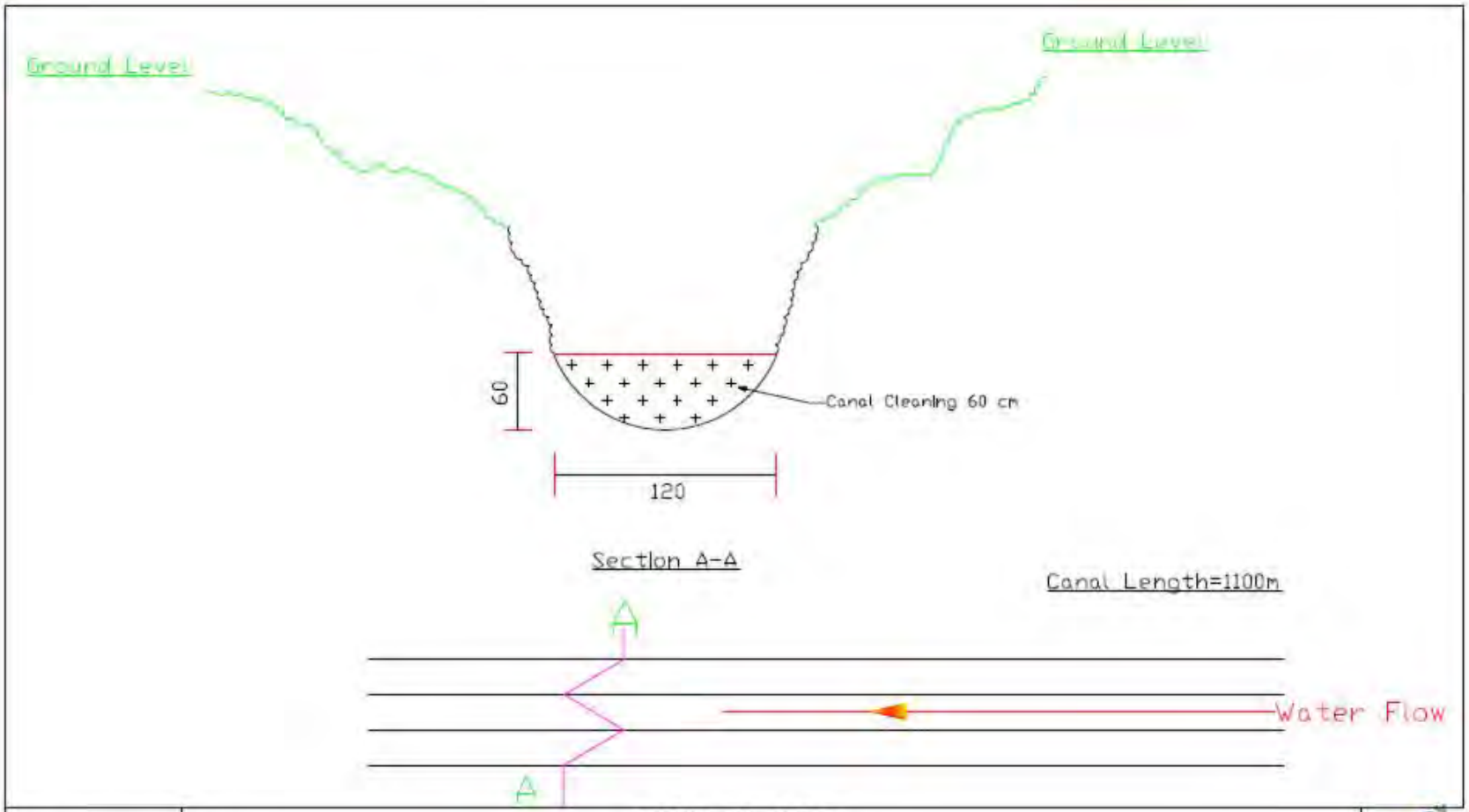
S/N	Type of work	Unit	Quantity
1	RCC	m3	0.058
2	Formwork	m2	2.3
3	Steel	kg	3.150

Quantity table for One Unit

ROOTS OF PEACE

STANDARD DESIGN

Project Title	Jadron KAREZ			Checked by		Date	2011-NOV
Project Subject				Approved by			



PZ01-R01-F01	ROOTS OF PEACE STANDARD DESIGN							
Project Tital	Jadran Canal	Sheet No	1/5	Drawn& Design by	Eng.Ahmadullah	Checked by	Eng.Dost Mohammad	Date
Project Subject	Detail	Scal	by Cm	Surveyed by	Zurmat Team	Approved by	Ferenc Sandor	2011-NOV

8.1.1.2 Implementation Cost

Bill of Quantity(BoQ)

Code: PZ01-R01-F01
Province: Paktya
District: Zurmat
Village: Ahmadzia Jadran
Project: Kareze and Canal cleaning
Date: November-11

Title	No.	Norm./ Unit	Item	Qty	Unit	Unit cost $USD	Total cost $USD
A1	**1.00**		**Site preparation**	**74.20**	m^2		
	1.01	0.04	Unskilled Labor	3.00	md	7.00	21.00
A2	**2.00**		**Kareze & canal cleaning**	**812.00**	m^3		
	2.01	1.10	Unskilled labor	**894.00**	md	7.00	**6,258.00**
A3	**3.00**		**Filling-Compaction**	**21.00**	**m^3**		
	3.01	1.00	Soil	21.00	m^3	6.00	126.00
	3.02	0.33	Unskilled labor	7.00	md	7.00	49.00
A4	**4.00**		**Equipment**				
	4.01		Spool	2.00	Unit	70.00	140.00
	4.02		Bucket	6.00	Unit	13.00	78.00
	4.03		Oil	75.00	lit	2.00	150.00
	4.04		Hand Cart	5.00	Unit	65.00	325.00
	4.05		Rope	230.00	m	2.00	460.00
	4.06		Beams(0.12*0.16*2.5) m	50.00	m	20.00	1,000.00
	4.07		Spade	22.00	Unit	5.00	110.00
	4.08		Weel Ring	38.00	Unit	20.00	760.00
	4.09		Ring Cover	10.00	Unit	22.00	220.00
	4.10		Pike axe	12.00	Unit	5.00	60.00
A5	**5.00**		**Personal**				
	5.01	2.00	Foreman	120.00	md	10.00	1,200.00
	5.02	1.00	Storekeeper	60.00	md	7.00	420.00
	5.03	4.00	Guard	240.00	md	10.00	2,400.00
A6	**6.00**		**Tools, transport**	**1.00**	**Ls**	**4,500.00**	4,500.00
						Grand total	**18,277.00**

Prepared by: Eng. Ahmadullah Noorzad

8.1.1.3 Implementation Time Table

Code:	PZ01-R01-F01	**Time Table**							
Province:	Paktya								
District:	Zurmat								
Village:	Ahmadzia Jadran								
Project:	Jadran kareze								
Duration:	Two Months								
No	**Descripton**	**Weeks**							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1	Purchase material								
2	Site preparation								
3	Kareze and canal cleaning								
4	Filling and compaction								
5	M&E								
6	Closing Ceremony								

8.1.2 Mazarkhel Kareze Rehabilitation

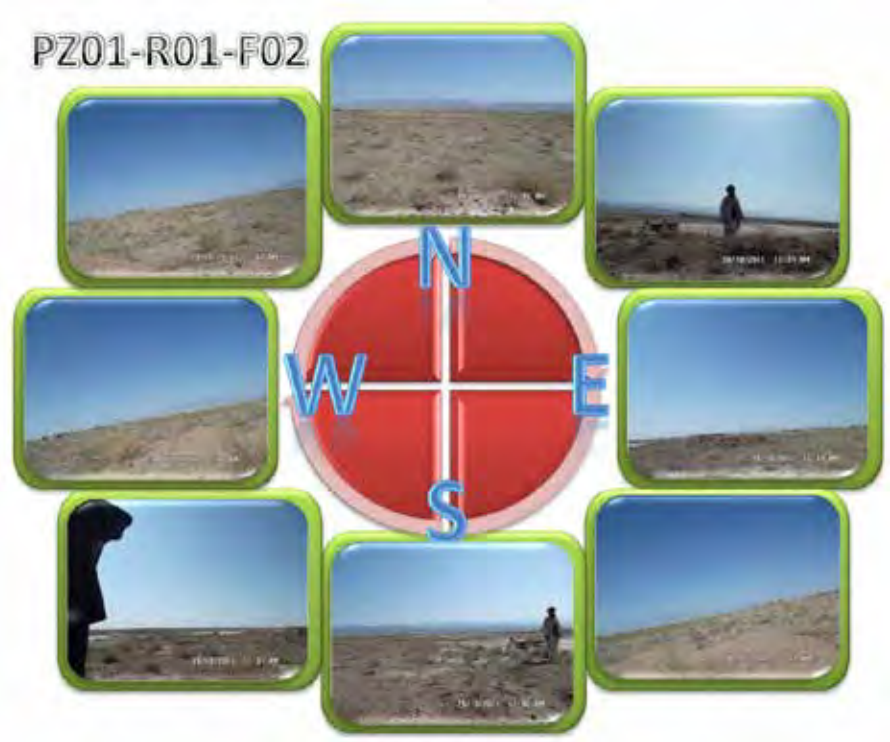
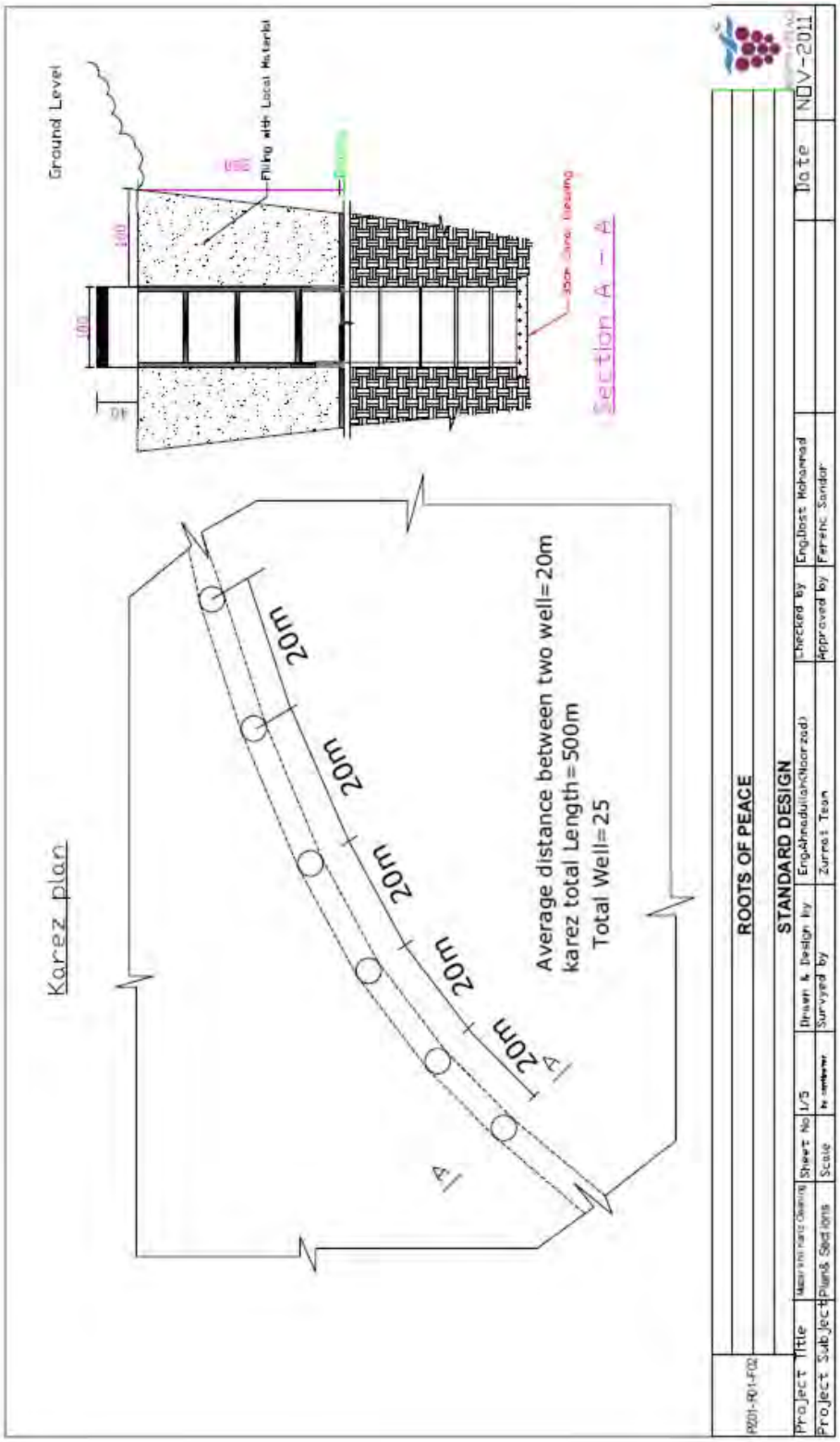
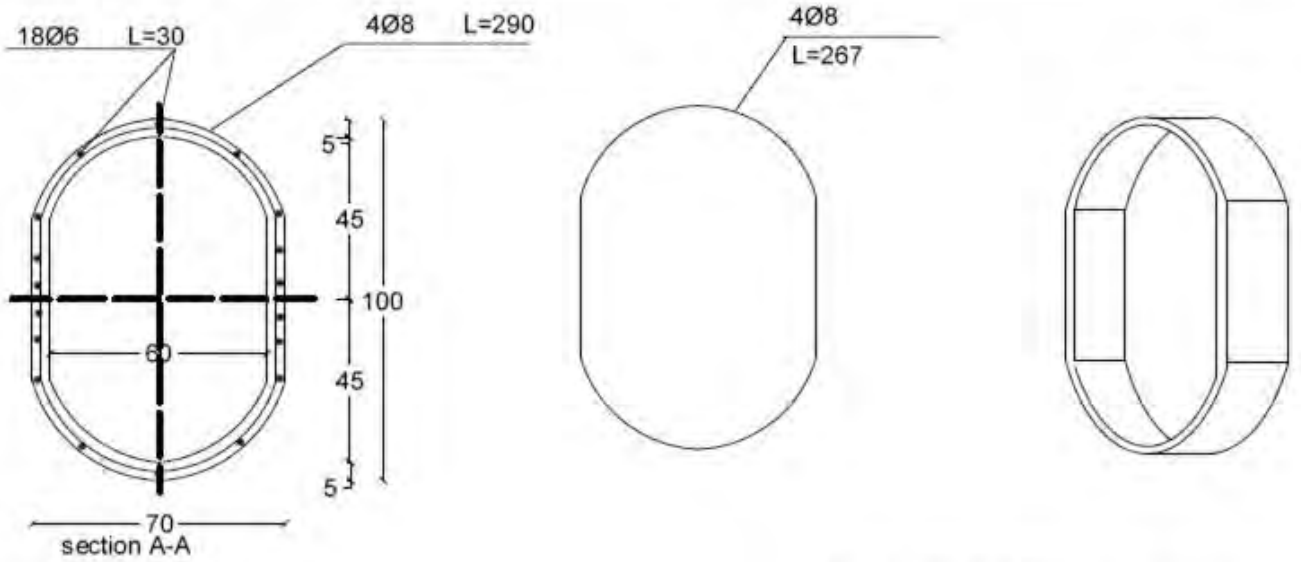


Figure 33 The PZ01/R01/F02 landform

Figure 34 The Mazarkhel kareze area

8.1.2.1 Implementation Design





Total well Ring=125

Total Ring Cover=25

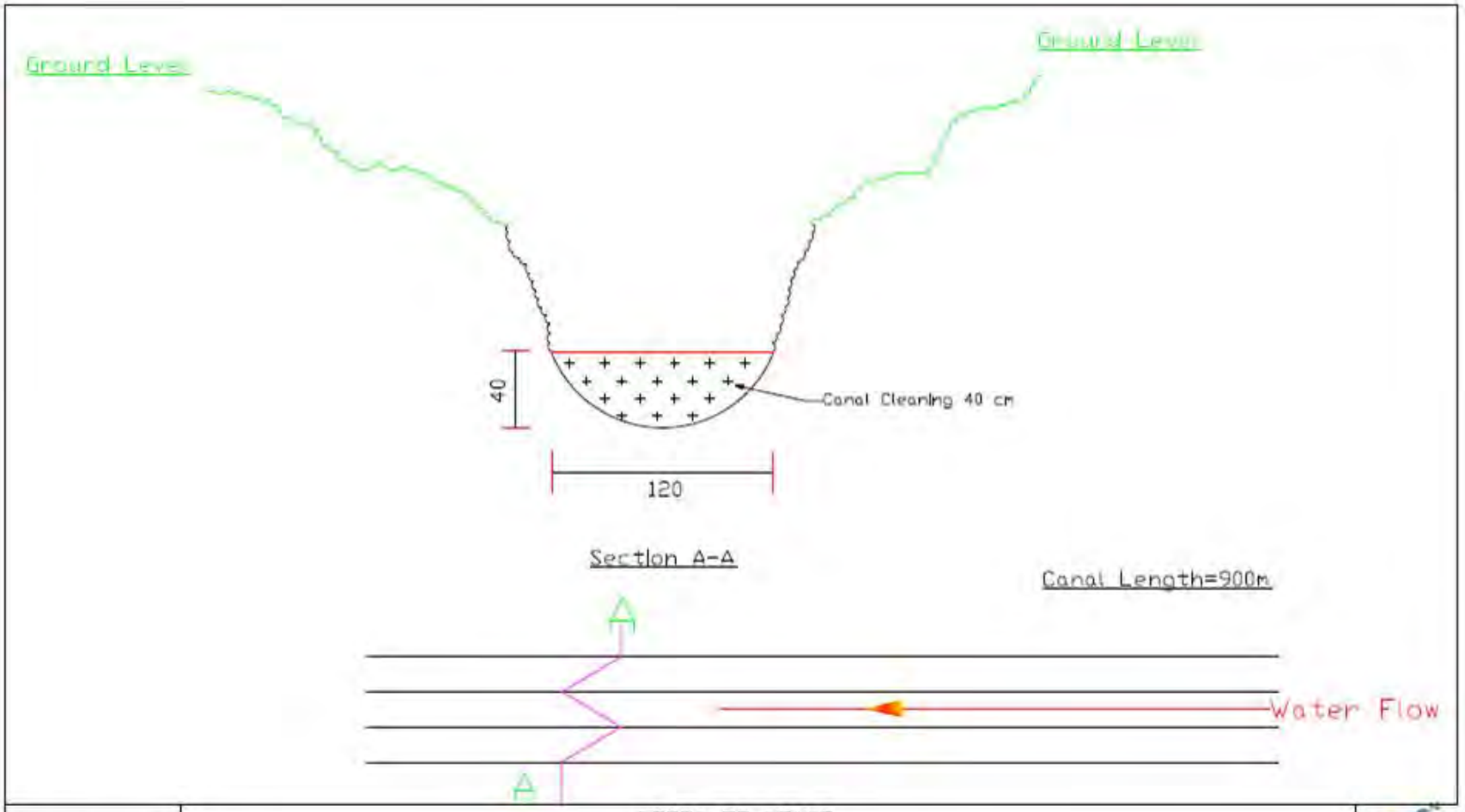
S/N	Type of work	Unit	Quantity
1	RCC	m3	0.058
2	Formwork	m2	2.3
3	Steel	kg	3.150

Quantity table for One Unit

ROOTS OF PEACE

STANDARD DESIGN

Project Title	Pezar khil KAREZ	Sheet No	1/1	Designed by	Eng.Ahmadullah(Noorzad)		Checked by	Eng.Dost mohammad		Date	2011-NOV
Project Subject	Typical Cross Section	Scale	By Centimeter	Surveyed by	Zirmat Team		Approved by	Farand Bandar			



PZ01-R01-F02	ROOTS OF PEACE STANDARD DESIGN							
Project Tital	[illegible]	Sheet No	1/5	Drawn& Design by	Eng.Ahmadullah	Checked by	Eng.Dost Mohammad	Date
Project Subjectl	Detail	Scal	by Cm	Surveyed by	Zurmat Team	Approved by	Ferenc Sandor	2011-NOV

8.1.2.2 Implementation Cost

Bill of Quantity(BoQ)

Code: **PZ01-R01-F02**

Province: **Paktya**

District: **Zurmat**

Village: **Sra Qala**

Project: **Kareze and Canal cleaning**

Date: **November-11**

Title	No.	Norm./ Unit	Item	Qty	Unit	Unit cost	Total cost
						$USD	$USD
A1	**1.00**		**Site preparation**	**110.00**	m^2		
	1.01	0.04	Unskilled labor	5.00	md	7.00	35.00
A2	**2.00**		**Kareze & canal cleaning**	**627.00**	m^3		
	2.01	1.10	Unskilled labor	**690.00**	md	7.00	**4,830.00**
A3	**3.00**		**Filling-Compaction**	**100.00**	**m^3**		
	3.01	1.00	Soil	100.00	m^3	6.00	600.00
	3.02	0.33	Unskilled labor	33.00	md	7.00	231.00
A4	**4.00**		**Equipment**				
	4.01		Spool	4.00	Unit	70.00	280.00
	4.02		Bucket	10.00	Unit	13.00	130.00
	4.03		Oil	100.00	lit	2.00	200.00
	4.04		Hand cart	5.00	Unit	65.00	325.00
	4.05		Rope	280.00	m	2.00	560.00
	4.06		Beams(0.12*0.16*2.5) m	125.00	m	20.00	2,500.00
	4.07		Spade	45.00	Unit	5.00	225.00
	4.08		Wheel ring	125.00	Unit	20.00	2,500.00
	4.09		Ring cover	25.00	Unit	22.00	550.00
	4.10		Pike axe	22.00	Unit	5.00	110.00
A5	**5.00**		**Personal**				
	5.01	2.00	Foreman	120.00	md	10.00	1,200.00
	5.02	1.00	Storekeeper	60.00	md	7.00	420.00
	5.03	2.00	Guard	120.00	md	10.00	1,200.00
A6	**6.00**		**Tools, transport**	**1.00**	**Ls**	**4,500.00**	4,500.00
						Grand total	**20,396.00**

Prepared by: Eng. Ahmadullah Noorzad

8.1.2.3 Implementation Time Table

Code:	PZ01-R01-F02	**Time Table**							
Province:	Paktya								
District:	Zurmat								
Village:	Sra Qala								
Project:	Mazarkhel kareze								
Duration:	Two Months								
No	**Description**	**Weeks**							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1	Purchase material								
2	Site preparation								
3	Kareze and canal cleaning								
4	Filling and compaction								
5	M&E								
6	Closing Ceremony								

8.1.3 Bakhtiar Kareze Rehabilitation

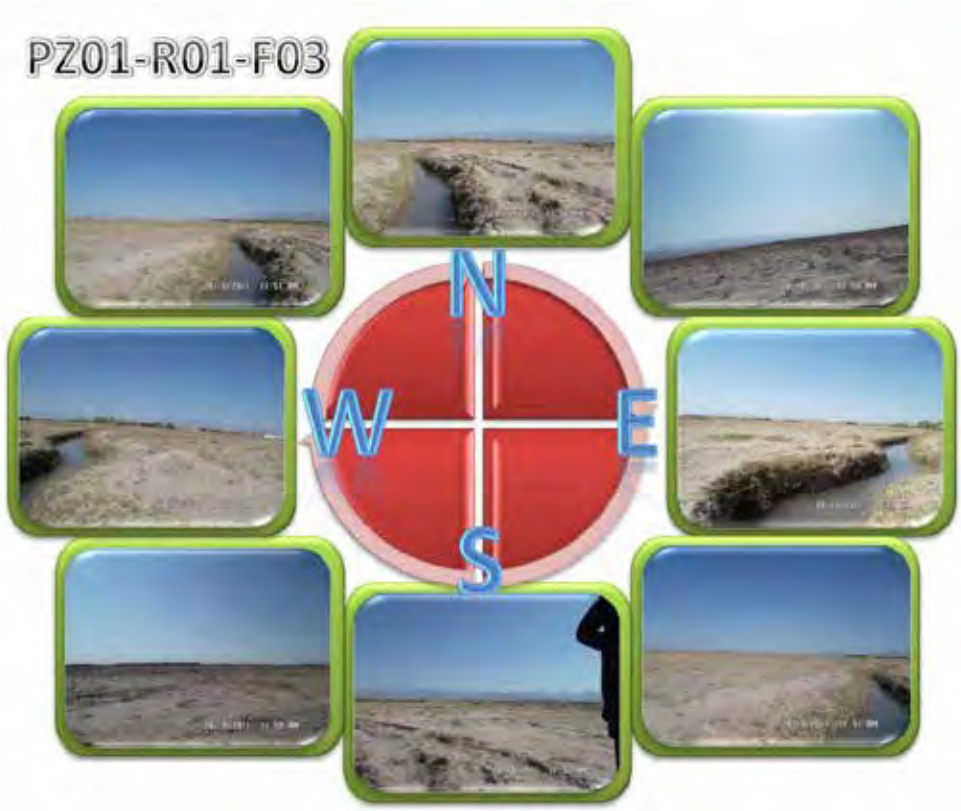
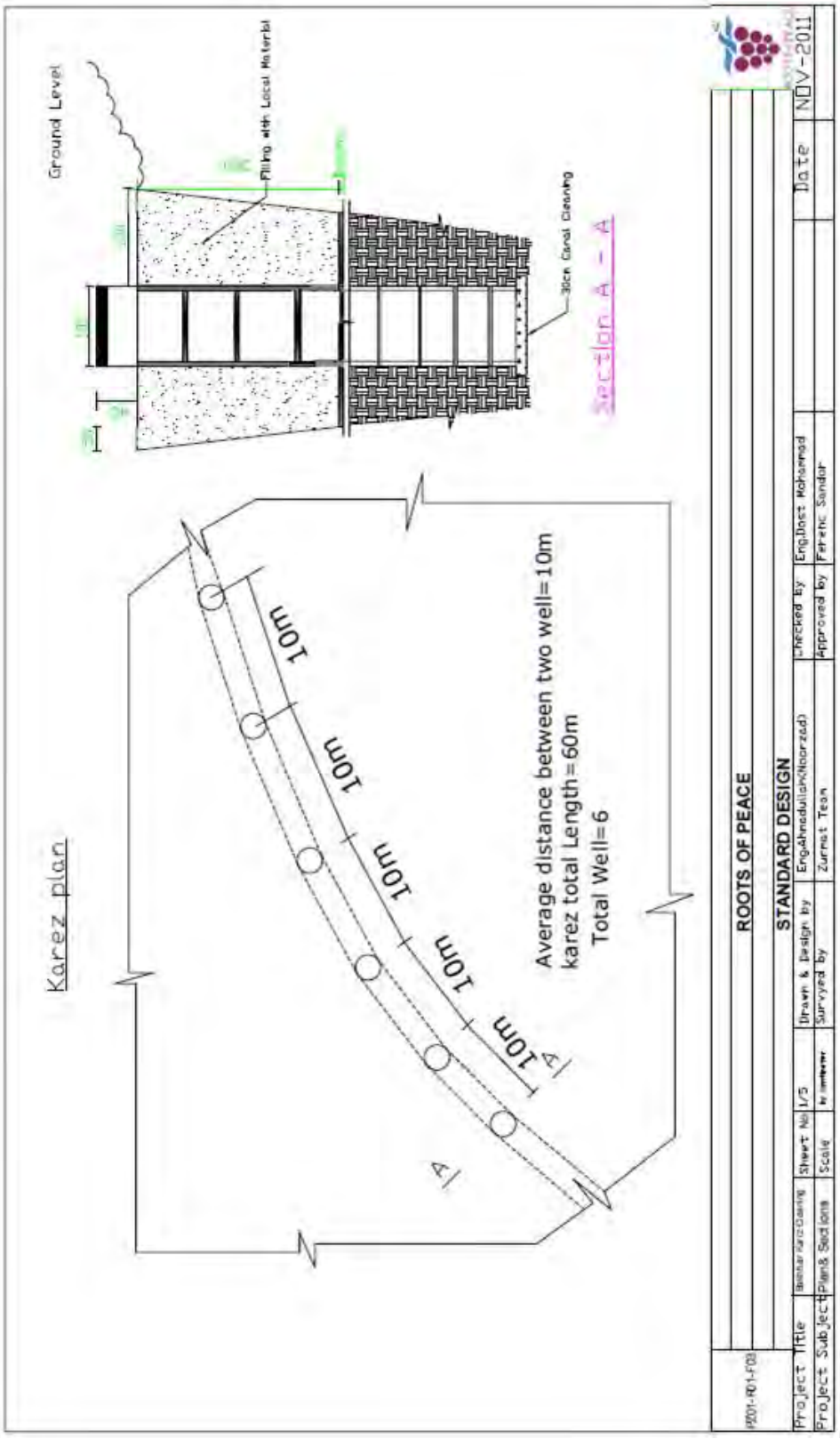
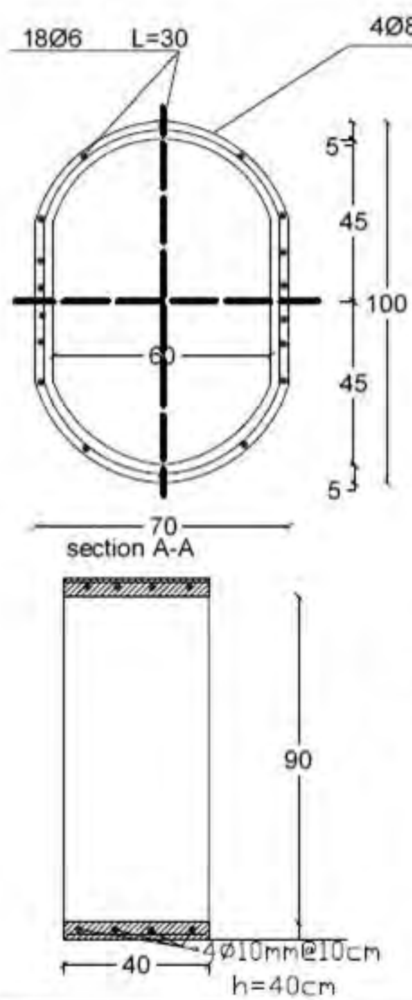


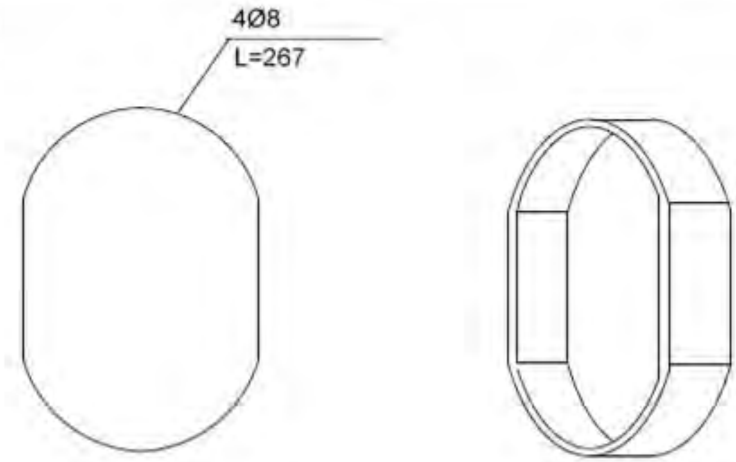
Figure 35 The PZ01/R01/F03 landform

Figure 36 The Bakhtiar kareze area

8.1.3.1 Implementation Design







Total well Ring=48

Total Ring Cover=6

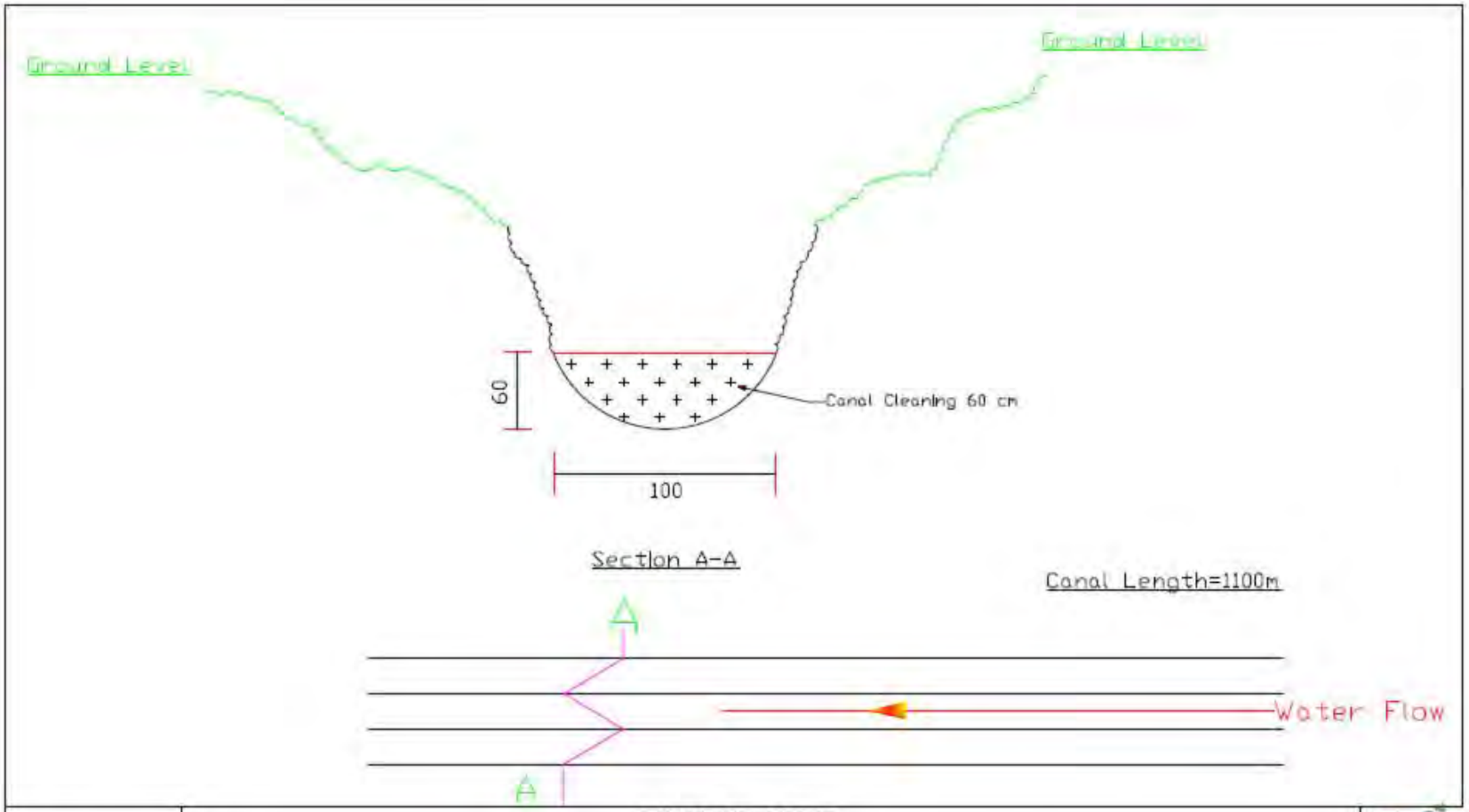
S/N	Type of work	Unit	Quantity
1	RCC	m3	0.058
2	Formwork	m2	2.3
3	Steel	kg	3.150

Quantity table for One Unit

ROOTS OF PEACE

STANDARD DESIGN

Project Title		Sheet No.	Checked by		Date	2011-NOV
Project Subject		Scale	Approved by			



PZ01-R01-F03	ROOTS OF PEACE STANDARD DESIGN							
Project Tital	Bakhtar Canal	Sheet No	1/5	Drawn& Design by	Eng.Ahmadullah	Checked by	Eng.Dost Mohammad	Date
Project Subject	Detail	Scal	by Cm	Surveyed by	Zurmat Team	Approved by	Ferenc Sandor	2011-NOV

8.1.3.2 Implementation Cost

Bill of Quantity (BoQ)

Code: PZ01-R01-F03
Province: Paktya
District: Zurmat
Village: Minzi Qala
Project: Kareze and Canal Cleaning
Date: November-11

Title	No.	Norm./ Unit	Item	Qty	Unit	Unit cost	Total cost
						$USD	$USD
A1	**1.00**		**Site preparation**	60.00	m^2		
	1.01	0.04	Unskilled labor	3.00	md	7.00	21.00
A2	**2.00**		**Kareze & canal cleaning**	**798.00**	m^3		
	2.01	1.10	Unskilled labor	**888.00**	md	7.00	**6,216.00**
A3	**3.00**		**Filling-Compaction**	**36.00**	**m^3**		
	3.01	1.00	Soil	36.00	m^3	6.00	216.00
	3.02	0.33	Unskilled labor	12.00	md	7.00	84.00
A4	**4.00**		**Equipment**				
	4.01		Spool	2.00	Unit	70.00	140.00
	4.02		Bucket	8.00	Unit	13.00	104.00
	4.03		Oil	60.00	lit	2.00	120.00
	4.04		Hand Cart	8.00	Unit	65.00	520.00
	4.05		Rope	220.00	m	2.00	440.00
	4.06		Beams(0.12*0.16*2.5) m	30.00	m	20.00	600.00
	4.07		Spade	30.00	Unit	5.00	150.00
	4.08		Wheel ring	48.00	Unit	20.00	960.00
	4.09		Ring Cover	6.00	Unit	22.00	132.00
	4.10		Pike axe	20.00	Unit	5.00	100.00
A5	**5.00**		**Personal**				
	5.01	2.00	Foreman	120.00	md	10.00	1,200.00
	5.02	1.00	Storekeeper	60.00	md	7.00	420.00
	5.03	2.00	Guard	120.00	md	10.00	1,200.00
A6	**6.00**		**Tools, transport**	**1.00**	**Ls**	**4,000.00**	4,000.00
						Grand total	**16,623.00**

Prepared by: Eng. Ahmadullah Noorzad

8.1.3.3 Implementation Time Table

Code:	PZ01-R01-F03	**Time Table**							
Province:	Paktya								
District:	Zurmat								
Village:	Minizi Qala								
Project:	Bakhtiar Kareze								
Duration:	Two Months								
No	**Description**	**Weeks**							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1	Purchase material								
2	Site preparation								
3	Kareze and canal cleaning								
4	Filling and compaction								
5	M&E								
6	Closing Ceremony								

8.1.4 Landi Kareze Rehabilitation

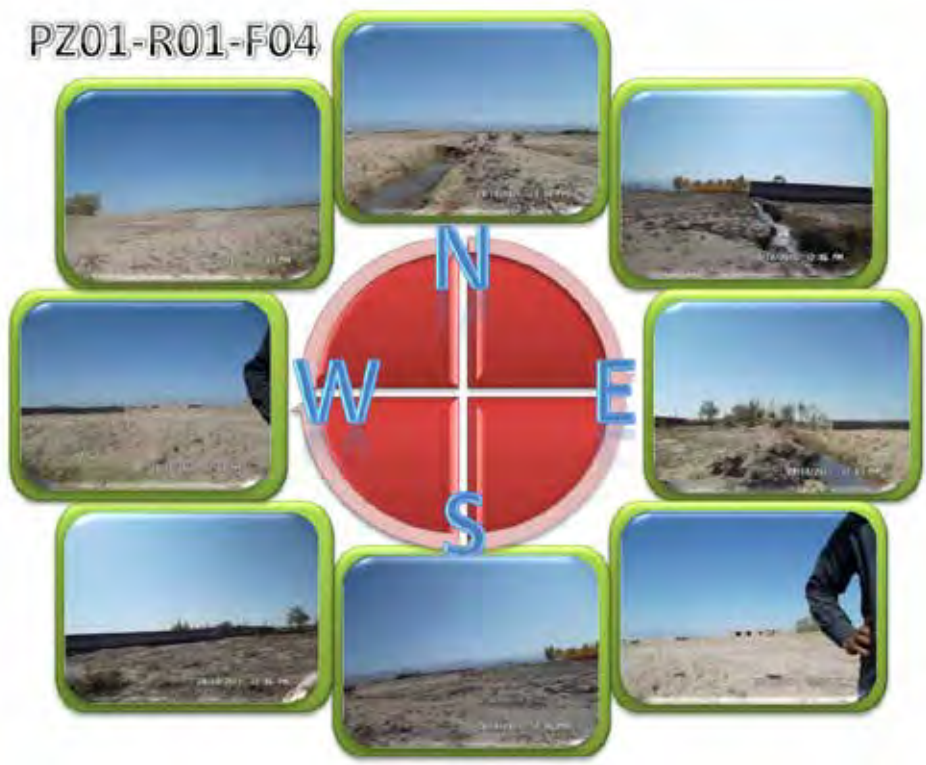
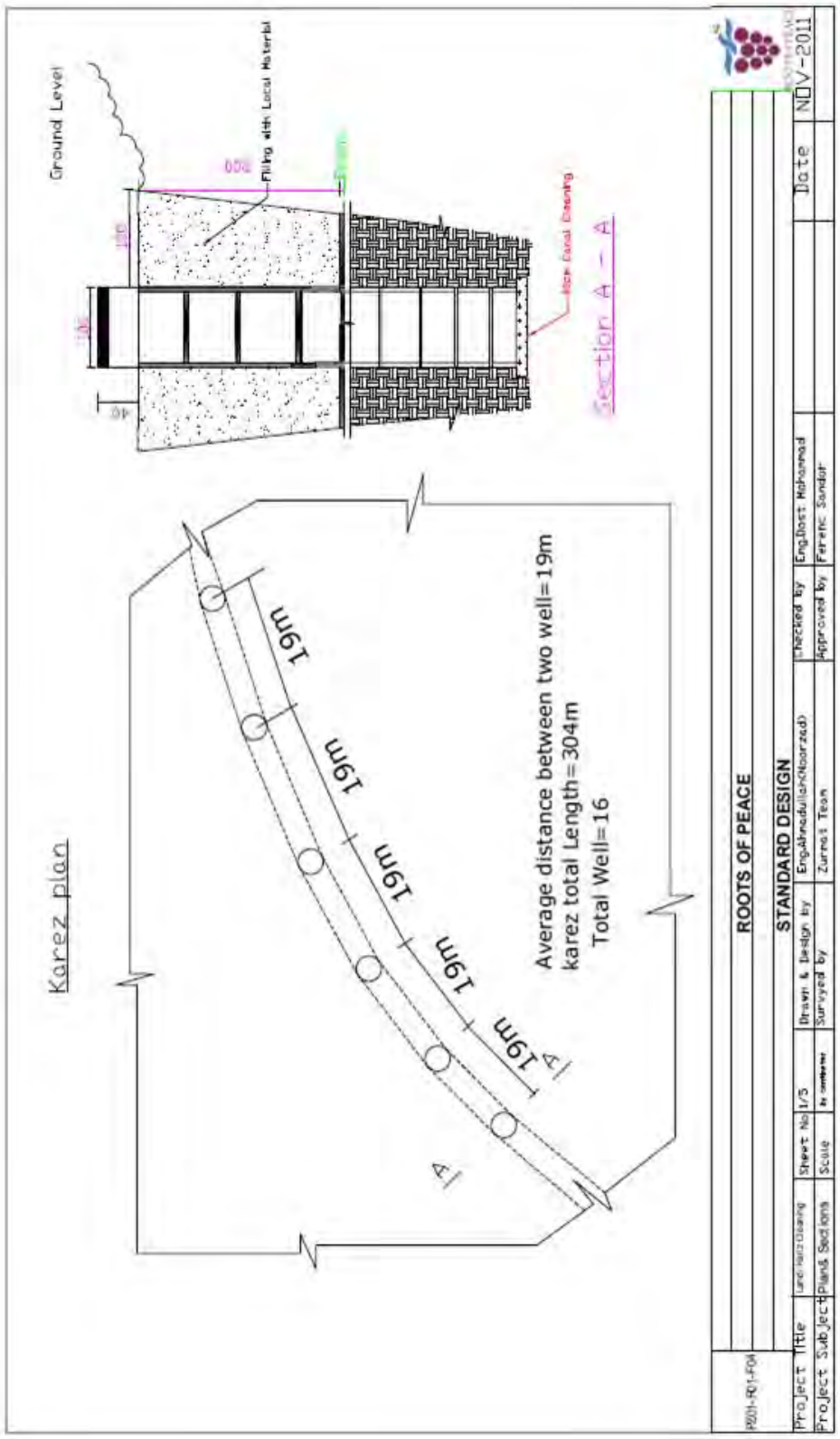


Figure 37 The PZ01/R01/F04 landform

Figure 38 The Landi kareze area

8.1.4.1 Implementation Design



8.1.4.2 Implementation Cost

Bill of Quantity (BoQ)

Code: PZ01-R01-F04
Province: Paktya
District: Zurmat
Village: Bawli
Project: Kareze and Canal Cleaning
Date: November-11

Title	No.	Norm./ Unit	Item	Qty	Unit	Unit cost $USD	Total cost $USD
A1	**1.00**		**Site preparation**	**100.00**	m^2		
	1.01	0.04	Unskilled labor	4.00	md	7.00	28.00
A2	**2.00**		**Kareze & canal cleaning**	**664.20**	m^3		
	2.01	1.10	Unskilled labor	**731.00**	md	7.00	**5,117.00**
A3	**3.00**		**Filling-Compaction**	**64.00**	**m^3**		
	3.01	1.00	Soil	64.00	m^3	6.00	384.00
	3.02	0.33	Unskilled labor	22.00	md	7.00	154.00
A4	**4.00**		**Equipment**				
	4.01		Spool	2.00	Unit	70.00	140.00
	4.02		Bucket	8.00	Unit	13.00	104.00
	4.03		Oil	80.00	lit	2.00	160.00
	4.04		Hand Cart	6.00	Unit	65.00	390.00
	4.05		Rope	250.00	m	2.00	500.00
	4.06		Beams(0.12*0.16*2.5) m	80.00	m	20.00	1,600.00
	4.07		Spade	40.00	Unit	5.00	200.00
	4.08		Wheel ring	80.00	Unit	20.00	1,600.00
	4.09		Ring cover	16.00	Unit	22.00	352.00
	4.10		Pike axe	20.00	Unit	5.00	100.00
A5	**5.00**		**Personal**				
	5.01	2.00	Foreman	120.00	md	10.00	1,200.00
	5.02	1.00	Storekeeper	60.00	md	7.00	420.00
	5.03	2.00	Guard	120.00	md	10.00	1,200.00
A6	**6.00**		**Tools, transport**	**1.00**	**Ls**	**3,800.00**	3,800.00
						Grand total	**17,449.00**

Prepared by: Eng. Ahmadullah Noorzad

8.1.4.3 Implementation Time Table

Code:	PZ01-R01-F04	**Time Table**							
Province:	Paktya								
District:	Zurmat								
Village:	Babwli								
Project:	Landi Kareze								
Duration:	Two Months								
No	**Description**	**Weeks**							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1	Purchase material								
2	Site preparation								
3	Kareze and canal cleaning								
4	Filling and compaction								
5	M&E								
6	Closing Ceremony								

8.1.5 Khabri Kareze Rehabilitation

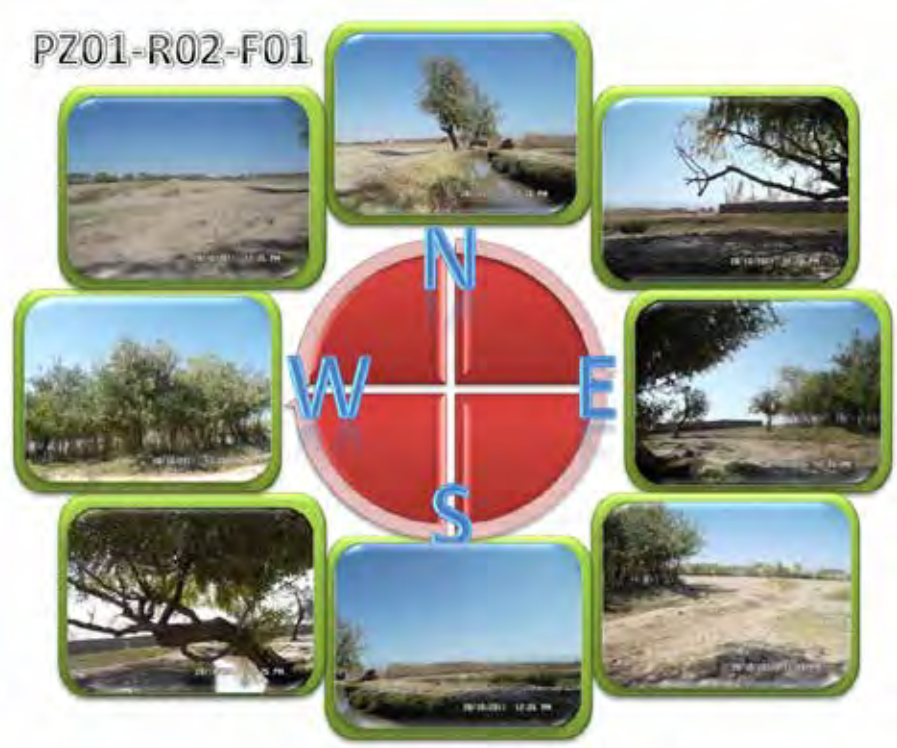
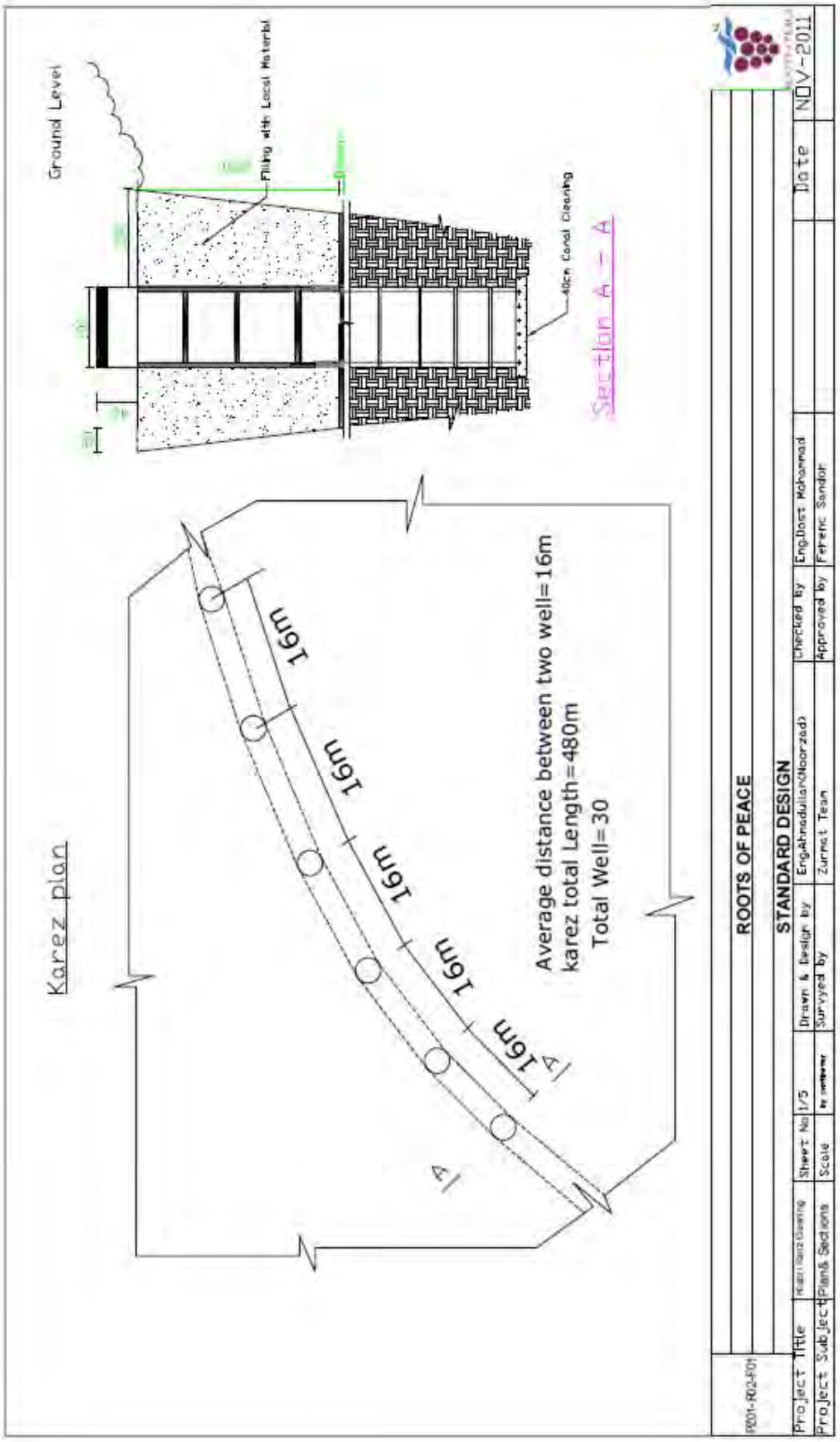
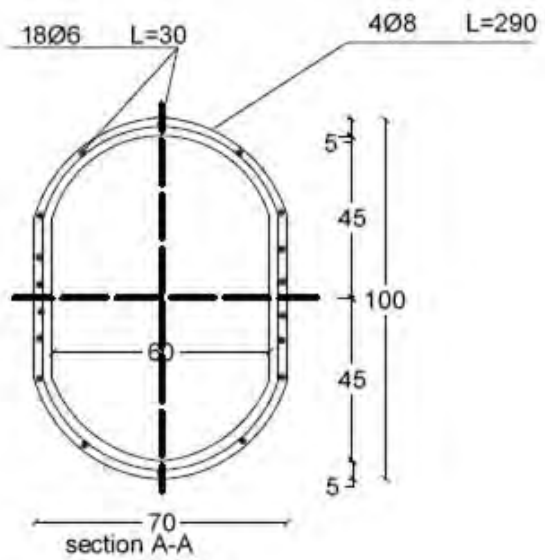


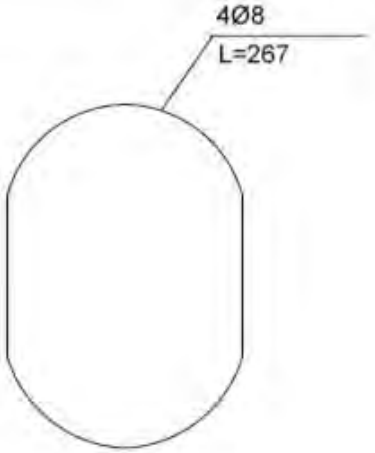
Figure 39 The PZ01/R02/F01 landform

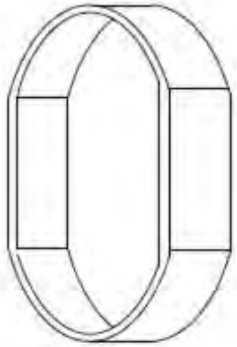
Figure 40 The Khabri kareze area

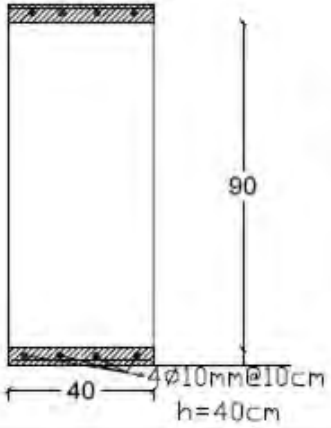
8.1.5.1 Implementation Design











Total well Ring=188

Total Ring Cover=30

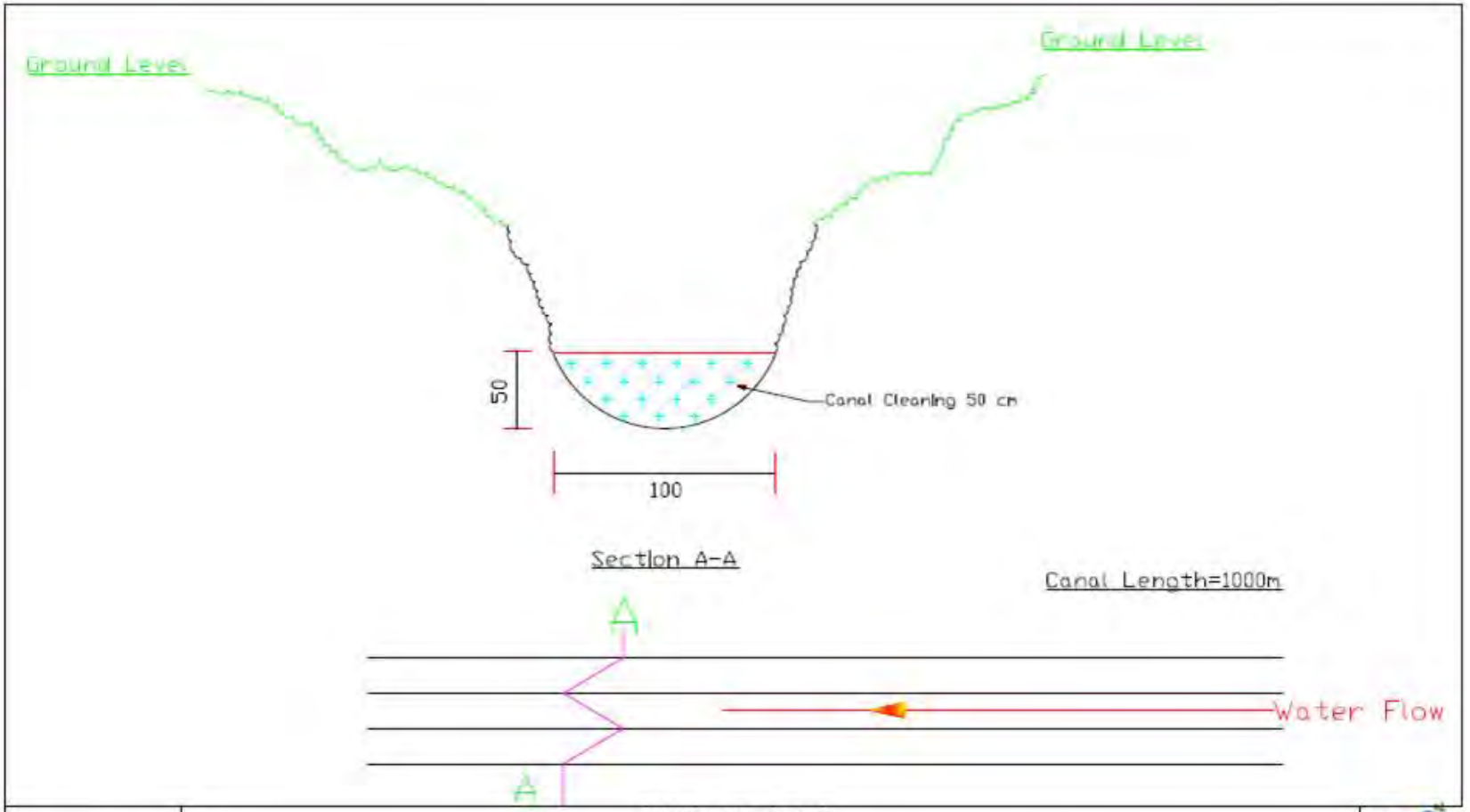
S/N	Type of work	Unit	Quantity
1	RCC	m3	0.058
2	Formwork	m2	2.3
3	Steel	kg	3.150

Quantity table for One Unit

ROOTS OF PEACE

STANDARD DESIGN

Project Title	Khabri KAREZ	Sheet No	1/1		Eng.Ahmadullah Nooz ab		Checked by	Eng.Dost mohammad		Date	2011-NOV
Project Subject		Scale	By Centimeter	Surveyed by	Zumal Team		Approved by	Ferooz Bandoi			



PZ01-R02-F01	ROOTS OF PEACE STANDARD DESIGN							
Project Tital	Khaberi Canal	Sheet No	1/5	Drawn& Design by	Eng.Ahmadullah	Checked by	Eng.Dost Mohammad	Date
Project Subjectl	Detail	Scal	by Cm	Surveyed by	Zurmat Team	Approved by	Ferenc Sandor	2011-NOV

8.1.5.2 Implementation Cost

Bill of Quantity (BoQ)

Code: PZ01-R02-F01
Province: Paktya
District: Zurmat
Village: Billy Qala
Project: Kareze and Canal Cleaning
Date: November-11

Title	No.	Norm./ Unit	Item	Qty	Unit	Unit cost	Total cost
						$USD	$USD
A1	**1.00**		**Site preparation**	**133.00**	m^2		
	1.01	0.04	Unskilled labor	6.00	md	7.00	42.00
A2	**2.00**		**Kareze & canal cleaning**	**975.00**	m^3		
	2.01	1.10	Unskilled labor	**1,073.00**	md	7.00	**7,511.00**
A3	**3.00**		**Filling-Compaction**	**150.00**	**m^3**		
	3.01	1.00	Soil	150.00	m^3	6.00	900.00
	3.02	0.33	Unskilled labor	50.00	md	7.00	350.00
A4	**4.00**		**Equipment**				
	4.01		Spool	3.00	Unit	70.00	210.00
	4.02		Bucket	12.00	Unit	13.00	156.00
	4.03		Oil	110.00	lit	2.00	220.00
	4.04		Hand Cart	4.00	Unit	65.00	260.00
	4.05		Rope	250.00	m	2.00	500.00
	4.06		Beams(0.12*0.16*2.5) m	150.00	m	20.00	3,000.00
	4.07		Spade	45.00	Unit	5.00	225.00
	4.08		Wheel ring	188.00	Unit	20.00	3,760.00
	4.09		Ring Cover	30.00	Unit	22.00	660.00
	4.10		Pike axe	20.00	Unit	5.00	100.00
A5	**5.00**		**Personal**				
	5.01	2.00	Foreman	120.00	md	10.00	1,200.00
	5.02	1.00	Storekeeper	60.00	md	7.00	420.00
	5.03	4.00	Guard	240.00	md	10.00	2,400.00
A6	**6.00**		**Tools, transport**	**1.00**	**Ls**	**5,000.00**	5,000.00
						Grand total	**26,914.00**

Prepared by: Eng. Ahmadullah Noorzad

8.1.5.3 Implementation Time Table

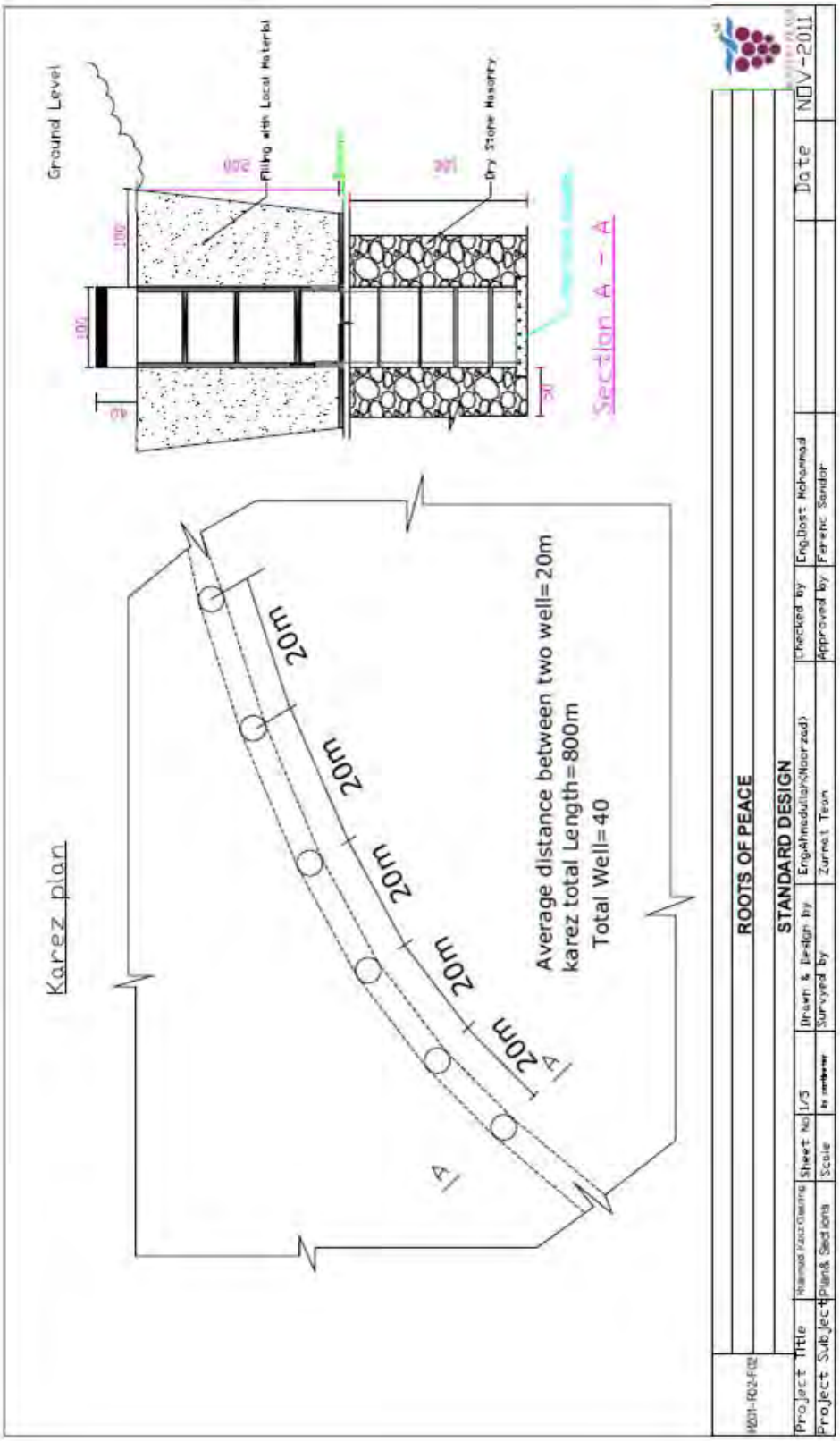
Code:	PZ01-R02-F01	**Time Table**							
Province:	Paktya								
District:	Zurmat								
Village:	Billywall								
Project:	Khabri Kareze								
Duration:	Two Months								
No	**Description**	**Weeks**							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1	Purchase material								
2	Site preparation								
3	Kareze and canal cleaning								
4	Filling and compaction								
5	M&E								
6	Closing Ceremony								

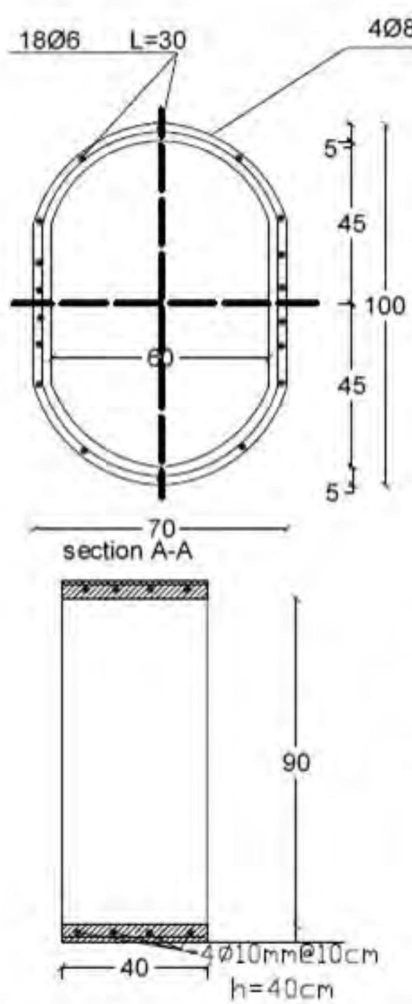
8.1.6 Khanmadi Kareze Rehabilitation

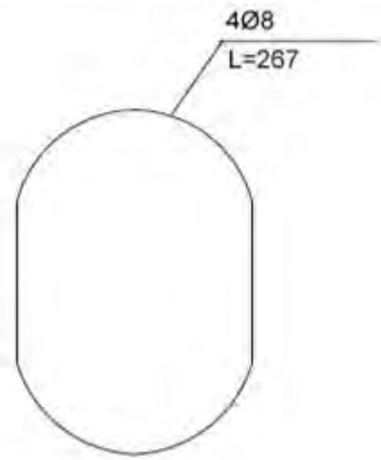
Figure 41 The PZ01/R02/F02 landform

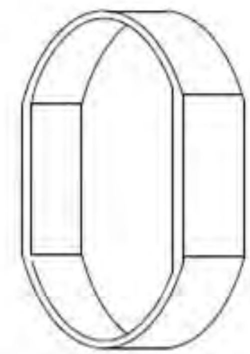
Figure 42 The Khanmadi karezee area

8.1.6.1 Implementation Design









Total well Ring=200

Total Ring Cover=40

S/N	Type of work	Unit	Quantity
1	RCC	m3	0.058
2	Formwork	m2	2.3
3	Steel	kg	3.150

Quantity table for One Unit

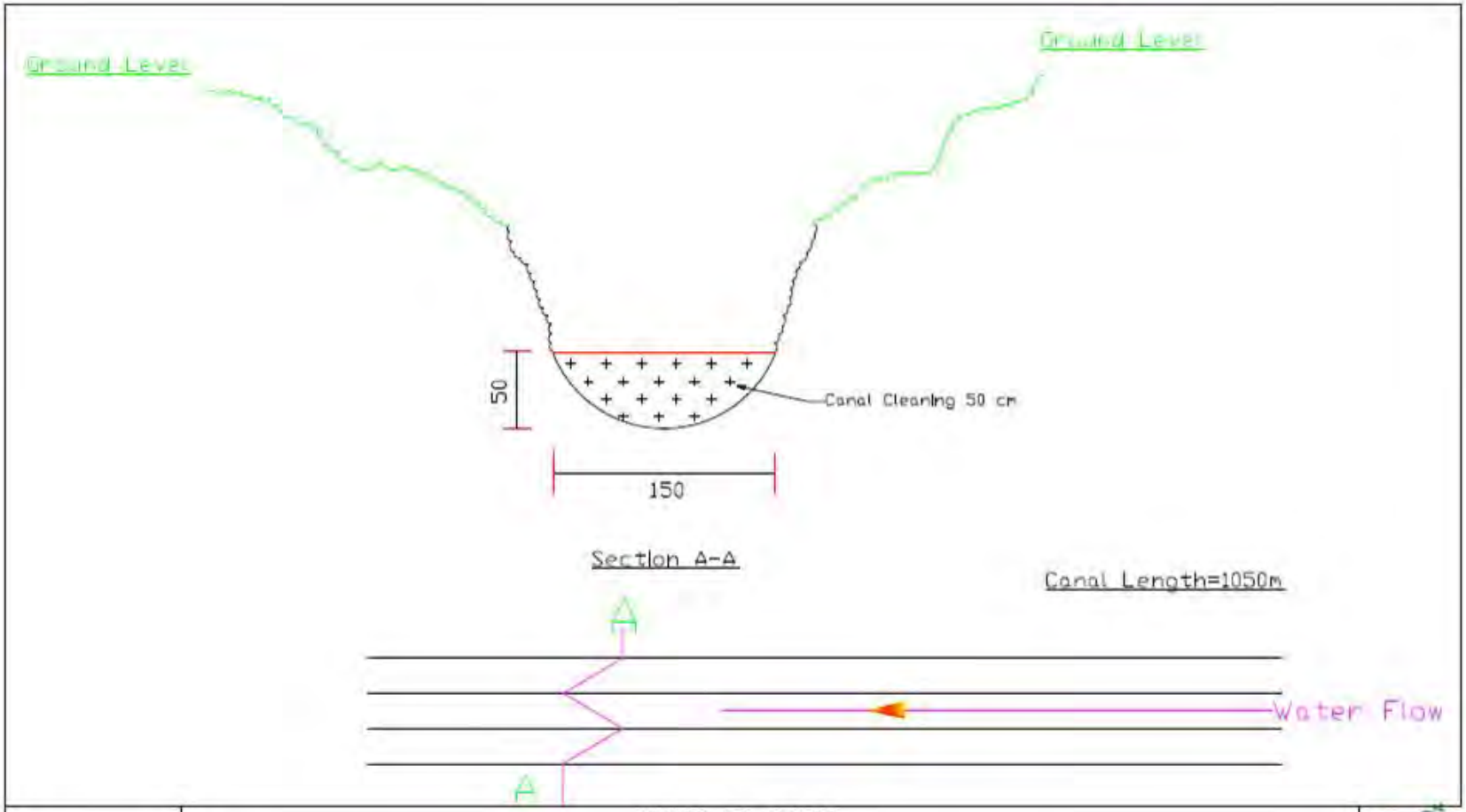
ROOTS OF PEACE

STANDARD DESIGN

Project Title

Project Subject

Date 2011-NOV



PZ01-R02-F02	ROOTS OF PEACE							
	STANDARD DESIGN							
Project Tital	Land Canal	Sheet No	1/5	Drawn& Design by	Eng.Ahmadullah	Checked by	Eng.Dost Mohammad	Date
Project Subject	Detail	Scal	by Cm	Surveyed by	Zurmat Team	Approved by	Ferenc Sandor	2011-NOV

8.1.6.2 Implementation Cost

Bill of Quantity (BoQ)

Code: PZ01-R02-F02
Province: Paktya
District: Zurmat
Village: Ahmadzia Jadran
Project: Kareze and Canal Cleaning
Date: November-11

Title	No.	Norm./ Unit	Item	Qty	Unit	Unit cost	Total cost
						$USD	$USD
A1	**1.00**		**Site preparation**	**173.20**	m^2		
	1.01	0.04	Unskilled labor	7.00	md	7.00	49.00
A2	**2.00**		**Kareze & canal cleaning**	**807.50**	m^3		
	2.01	1.10	Unskilled labor	**888.00**	md	7.00	**6,216.00**
A3	**3.00**		**Filling-Compaction**	**160.00**	**m^3**		
	3.01	1.00	Soil	160.00	m^3	6.00	960.00
	3.02	0.33	Unskilled labor	93.00	md	7.00	651.00
A4	**4.00**			**400.00**			
	4.01	1.10	Stone and transportation	440.00		20.00	8,800.00
	4.02	1.00	Skilled labor	400.00		14.00	5,600.00
	4.03	0.50	Un Skilled labor	200.00		7.00	1,400.00
A5	**5.00**		**Equipment**				
	5.01		Spool	4.00	Unit	70.00	280.00
	5.02		Bucket	12.00	Unit	13.00	156.00
	5.03		Oil	110.00	lit	2.00	220.00
	5.04		Hand Cart	8.00	Unit	65.00	520.00
	5.05		Rope	300.00	m	2.00	600.00
	5.06		Beams(0.12*0.16*2.5) m	200.00	m	20.00	4,000.00
	5.07		Spade	40.00	Unit	5.00	200.00
	5.08		Wheel ring	200.00	Unit	20.00	4,000.00
	5.09		Ring cover	40.00	Unit	22.00	880.00
	5.10		Pike axe	20.00	Unit	5.00	100.00
A6	**6.00**		**Personal**				
	6.01	2.00	Foreman	180.00	md	10.00	1,800.00
	6.02	1.00	Storekeeper	90.00	md	7.00	630.00
	6.03	4.00	Guard	360.00	md	10.00	3,600.00
A7	**7.00**		**Tools, transport**	**1.00**	**Ls**	**4,500.00**	4,500.00
						Grand total	**45,162.00**

Prepared by: Eng. Ahmadullah Noorzad

8.1.6.3 Implementation Time Table

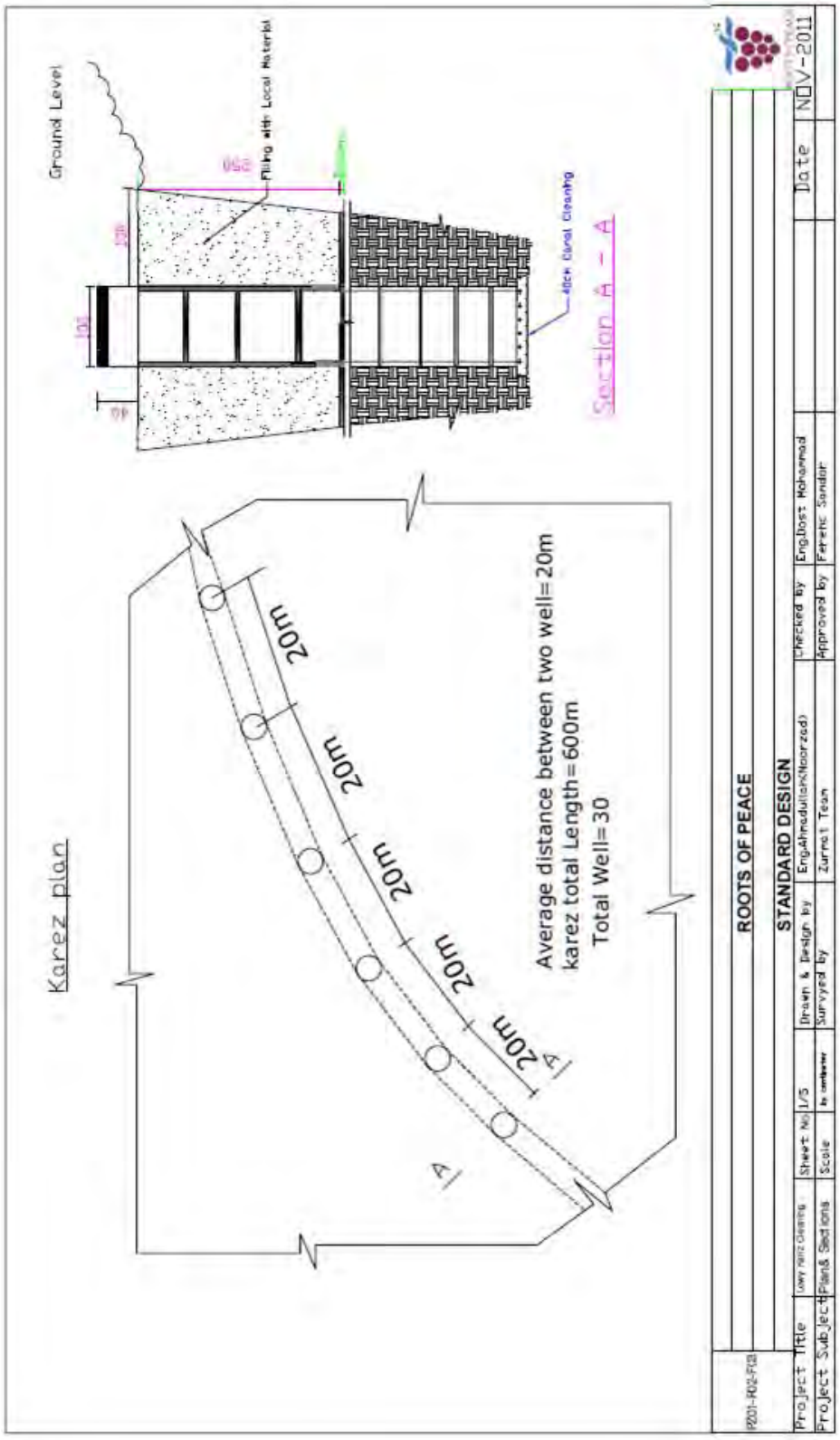
Code:	PZ01-R02-F02	**Time Table**											
Province:	Paktya												
District:	Zurmat												
Village:	Sra Qala												
Project:	Khanmadi Kareze												
Duration:	Two Months												
No	**Description**	**Weeks**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
1	Purchase material												
2	Site preparation												
3	Kareze and canal cleaning												
4	Stone work												
5	Filling and compaction												
6	M&E												
7	Closing Ceremony												

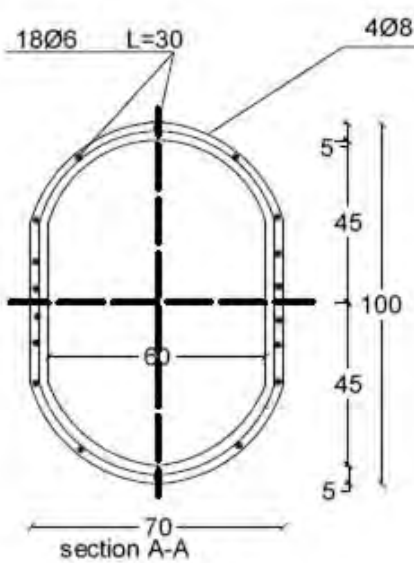
8.1.7 Luway Kareze Rehabilitation

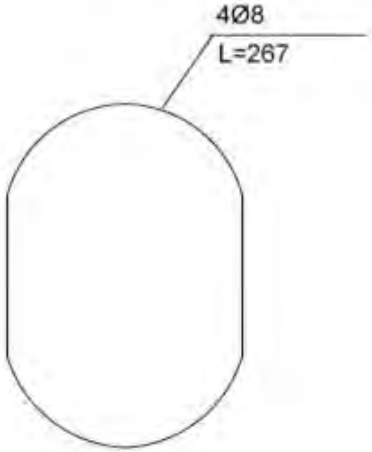
Figure 43 The PZ01/R02/F03 landform

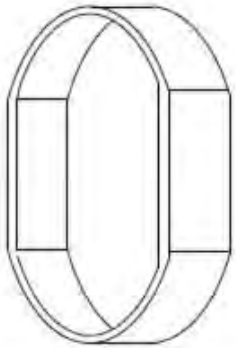
Figure 44 The Luway kareze area

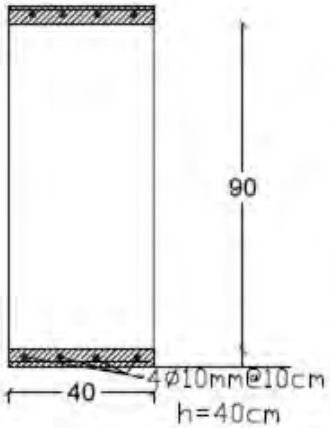
8.1.7.1 Implementation Design











Total well Ring=188

Total Ring Cover=30

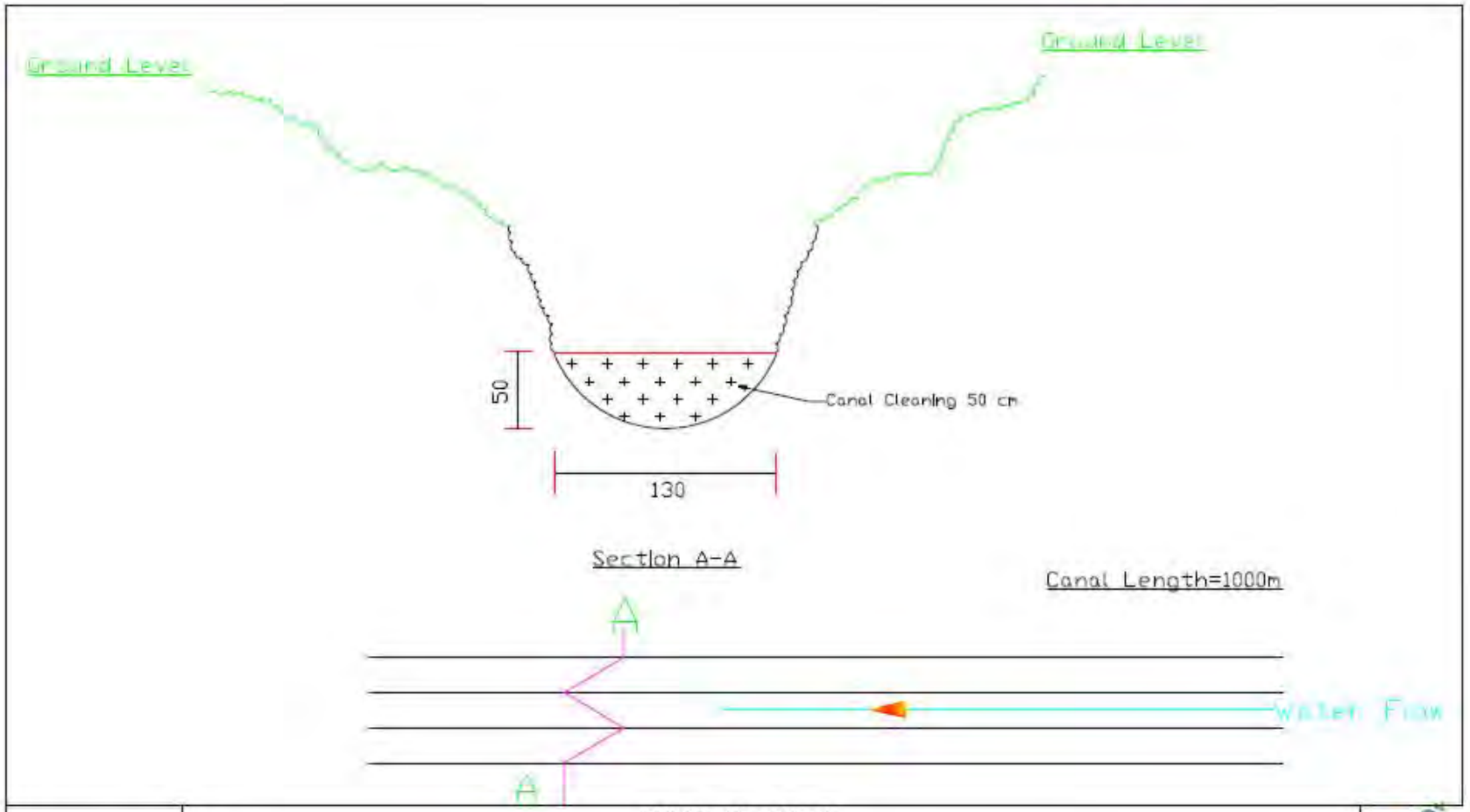
S/N	Type of work	Unit	Quantity
1	RCC	m3	0.058
2	Formwork	m2	2.3
3	Steel	kg	3.150

Quantity table for One Unit

ROOTS OF PEACE

STANDARD DESIGN

Project Title	Lowy KAREZ	Sheet No	1/1		Eng.Ahmadullah Noorzai		Checked by	Eng.Dost mohammad		Date	2011-NOV
Project Subject	Typical Cross Section	Scale	by Centimeter	Surveyed by	Zumal Team		Approved by	Ferenc Bandy			



PZ01-R02-F03	ROOTS OF PEACE STANDARD DESIGN							
Project Tital	Lower Darwat	Sheet No	1/5	Drawn& Design by	Eng.Ahmadullah	Checked by	Eng.Dost Mohammad	Date
Project Subject	Detail	Scal	by Cm	Surveyed by	Zurmat Team	Approved by	Ferenc Sandor	2011-NOV

8.1.7.2 Implementation Cost

Bill of Quantity (BoQ)

Code: PZ01-R02-F03
Province: Paktya
District: Zurmat
Village: Bigwal
Project: Kareze and Canal Cleaning
Date: November-11

Title	No.	Norm./ Unit	Item	Qty	Unit	Unit cost $USD	Total cost $USD
A1	**1.00**		**Site preparation**	**88.56**	m^2		
	1.01	0.04	Unskilled labor	4.00	md	7.00	28.00
A2	**2.00**		**Kareze & canal cleaning**	**1,025.00**	m^3		
	2.01	1.10	Unskilled labor	**1,128.00**	md	7.00	**7,896.00**
A3	**3.00**		**Filling-Compaction**	**150.00**	**m^3**		
	3.01	1.00	Soil	150.00	m^3	6.00	900.00
	3.02	0.33	Unskilled labor	50.00	md	7.00	350.00
A4	**4.00**		**Equipment**				
	4.01		Spool	3.00	Unit	70.00	210.00
	4.02		Bucket	6.00	Unit	13.00	78.00
	4.03		Oil	90.00	lit	2.00	180.00
	4.04		Hand Cart	4.00	Unit	65.00	260.00
	4.05		Rope	300.00	m	2.00	600.00
	4.06		Beams(0.12*0.16*2.5) m	150.00	m	20.00	3,000.00
	4.07		Spade	18.00	Unit	5.00	90.00
	4.08		Wheel ring	188.00	Unit	20.00	3,760.00
	4.09		Ring cover	30.00	Unit	22.00	660.00
	4.10		Pike axe	15.00	Unit	5.00	75.00
A5	**5.00**		**Personal**				
	5.01	2.00	Foreman	120.00	md	10.00	1,200.00
	5.02	1.00	Storekeeper	60.00	md	7.00	420.00
	5.03	4.00	Guard	240.00	md	10.00	2,400.00
A6	**6.00**		**Tools, transport**	**1.00**	**Ls**	**4,500.00**	4,500.00
						Grand total	**26,607.00**

Prepared by: Eng. Ahmadullah Noorzad

8.1.7.3 Implementation Time Table

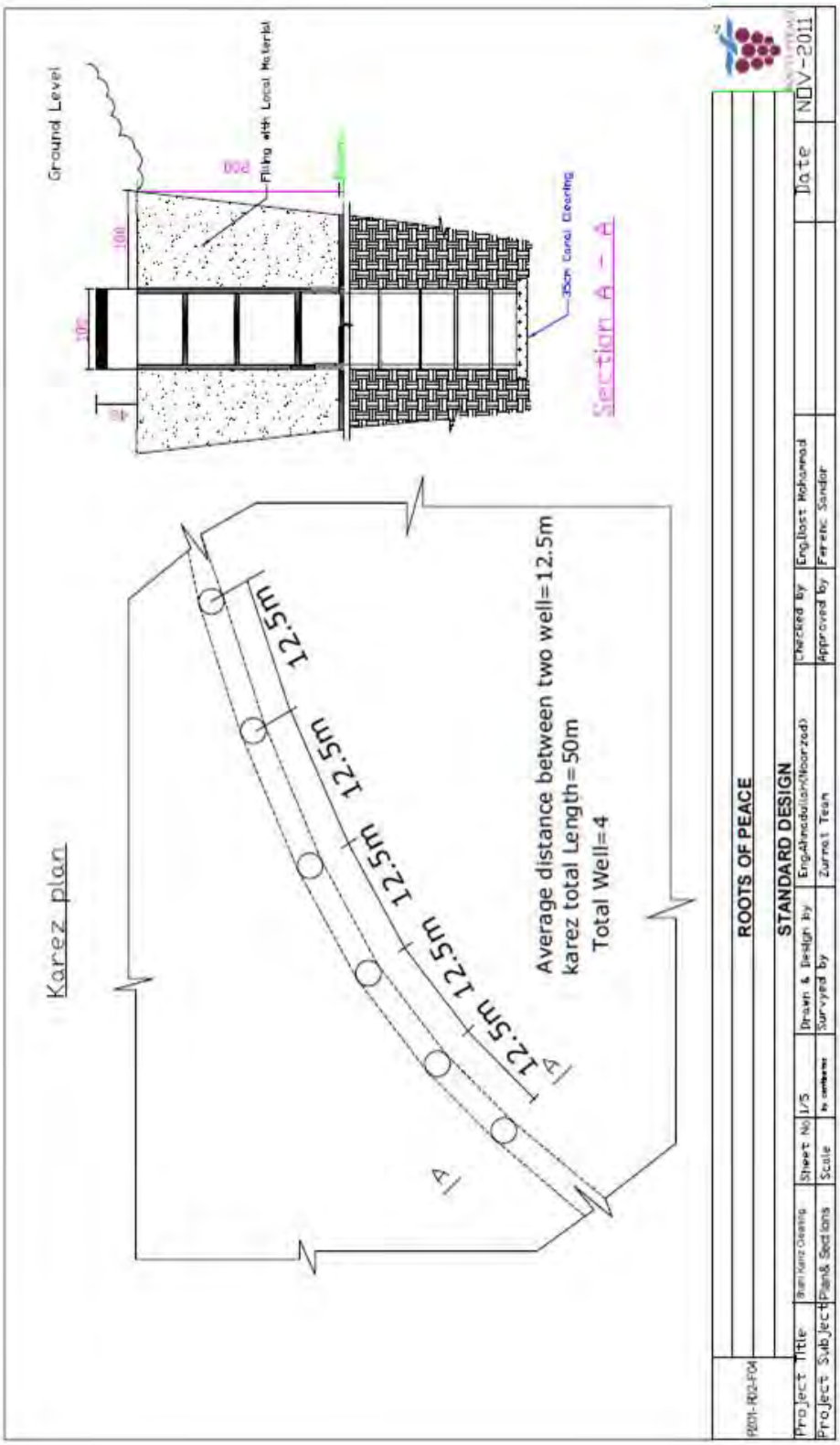
Code:	PZ01-R02-F03	**Time Table**							
Province:	Paktya								
District:	Zurmat								
Village:	Bigwall								
Project:	Lowi Kareze								
Duration:	Two Months								
No	**Description**	**Weeks**							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1	Purchase material								
2	Site preparation								
3	Kareze and canal cleaning								
4	Filling and compaction								
5	M&E								
6	Closing Ceremony								

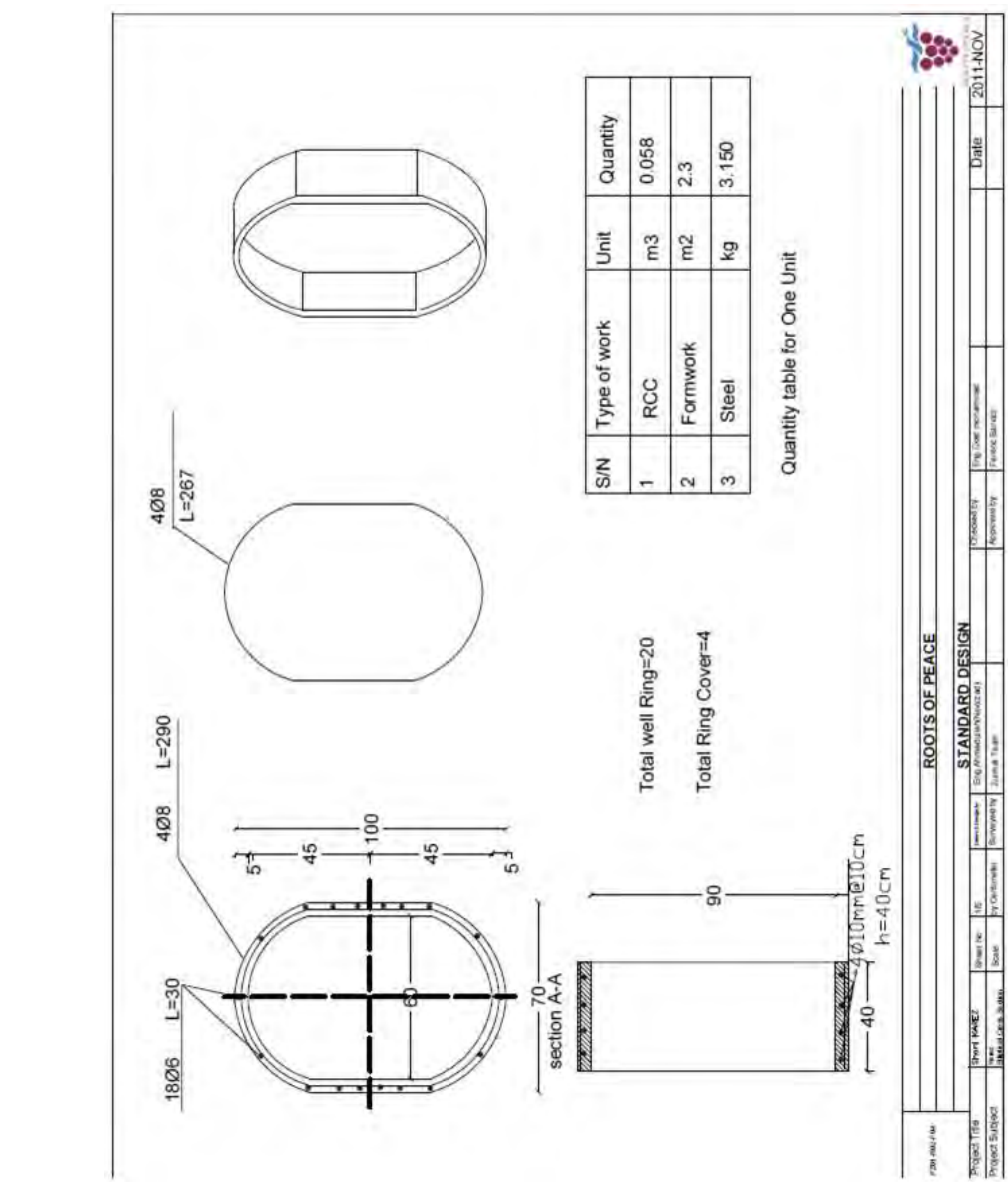
8.1.8 Sheni Kareze Rehabilitation

Figure 45 The PZ01/R02/F04 landform

Figure 46 The Sheni kareze area

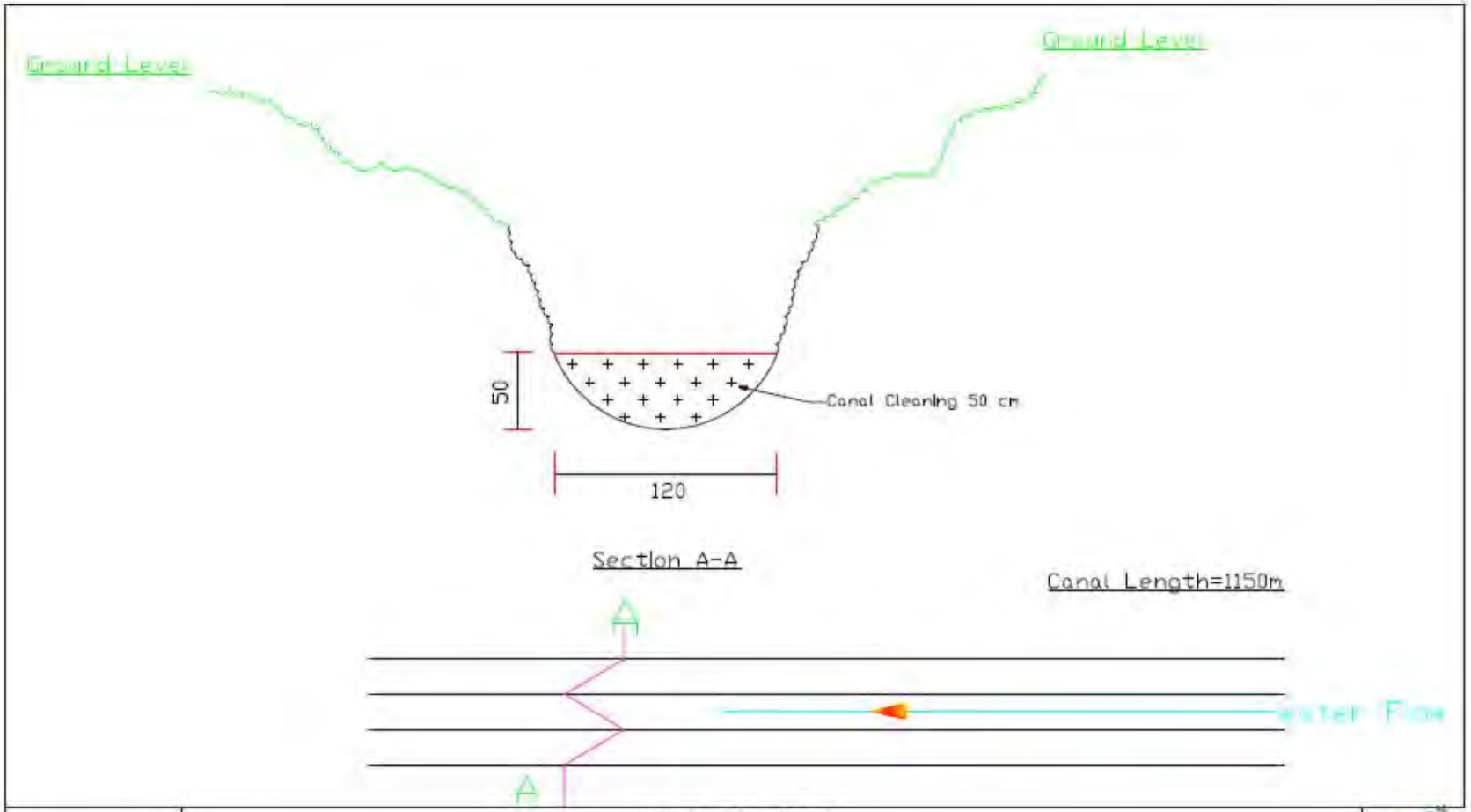
8.1.8.1 Implementation Design





Quantity table for One Unit

S/N	Type of work	Unit	Quantity
1	RCC	m3	0.058
2	Formwork	m2	2.3
3	Steel	kg	3.150



PZ01-R02-F04	ROOTS OF PEACE STANDARD DESIGN							
Project Tital	Sheet Name	Sheet No	1/5	Drawn& Design by	Eng.Ahmadullah	Checked by	Eng.Dost Mohammad	Date
Project Subject	Detail	Scal	by Cm	Surveyed by	Zurmat Team	Approved by	Ferenc Sandor	2011-NOV

8.1.8.2 Implementation Cost

Bill of Quantity (BoQ)

Code: PZ01-R02-F04
Province: Paktya
District: Zurmat
Village: Bigwal
Project: Kareze and Canal Cleaning
Date: November-11

Title	No.	Norm./ Unit	Item	Qty	Unit	Unit cost	Total cost
						$USD	$USD
A1	**1.00**		**Site preparation**	**50.24**	m^2		
	1.01	0.04	Unskilled labor	2.00	md	7.00	14.00
A2	**2.00**		**Kareze & canal cleaning**	**920.75**	m^3		
	2.01	1.10	Unskilled labor	**1,013.00**	md	7.00	**7,091.00**
A3	**3.00**		**Filling-Compaction**	**16.00**	**m^3**		
	3.01	1.00	Soil	16.00	m^3	6.00	96.00
	3.02	0.33	Unskilled labor	6.00	md	7.00	42.00
A4	**4.00**		**Equipment**				
	4.01		Spool	1.00	Unit	70.00	70.00
	4.02		Bucket	4.00	Unit	13.00	52.00
	4.03		Oil	50.00	lit	2.00	100.00
	4.04		Hand Cart	3.00	Unit	65.00	195.00
	4.05		Rope	100.00	m	2.00	200.00
	4.06		Beams(0.12*0.16*2.5) m	20.00	m	20.00	400.00
	4.07		Spade	15.00	Unit	5.00	75.00
	4.08		Wheel ring	20.00	Unit	20.00	400.00
	4.09		Ring cover	4.00	Unit	22.00	88.00
	4.10		Pike axe	12.00	Unit	5.00	60.00
A5	**5.00**		**Personal**				
	5.01	2.00	Foreman	120.00	md	10.00	1,200.00
	5.02	1.00	Storekeeper	60.00	md	7.00	420.00
	5.03	2.00	Guard	120.00	md	10.00	1,200.00
A6	**6.00**		**Tools, transport**	**1.00**	**Ls**	**4,500.00**	4,500.00
						Grand total	**16,203.00**

Prepared by: Eng. Ahmadullah Noorzad

8.1.8.3 Implementation Time Table

Code:	PZ01-R02-F04	**Time Table**							
Province:	Paktya								
District:	Zurmat								
Village:	Bigwall								
Project:	Shani Kareze								
Duration:	Two Months								
No	**Description**	**Weeks**							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1	Purchase material								
2	Site preparation								
3	Kareze and canal cleaning								
4	Filling and compaction								
5	M&E								
6	Closing Ceremony								

8.1.9 Andar Stream Rehabilitation

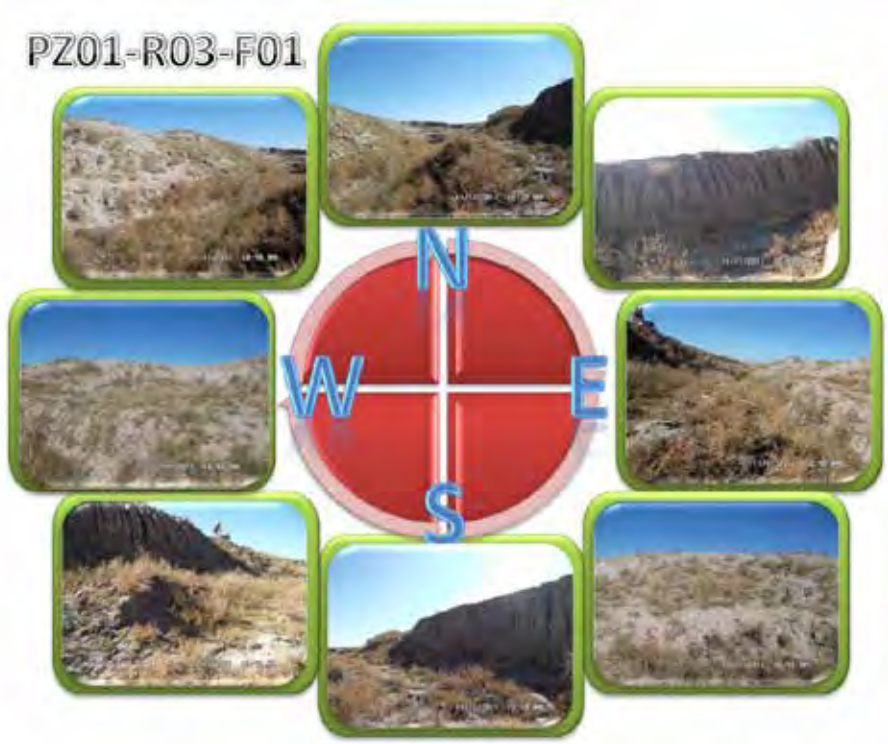
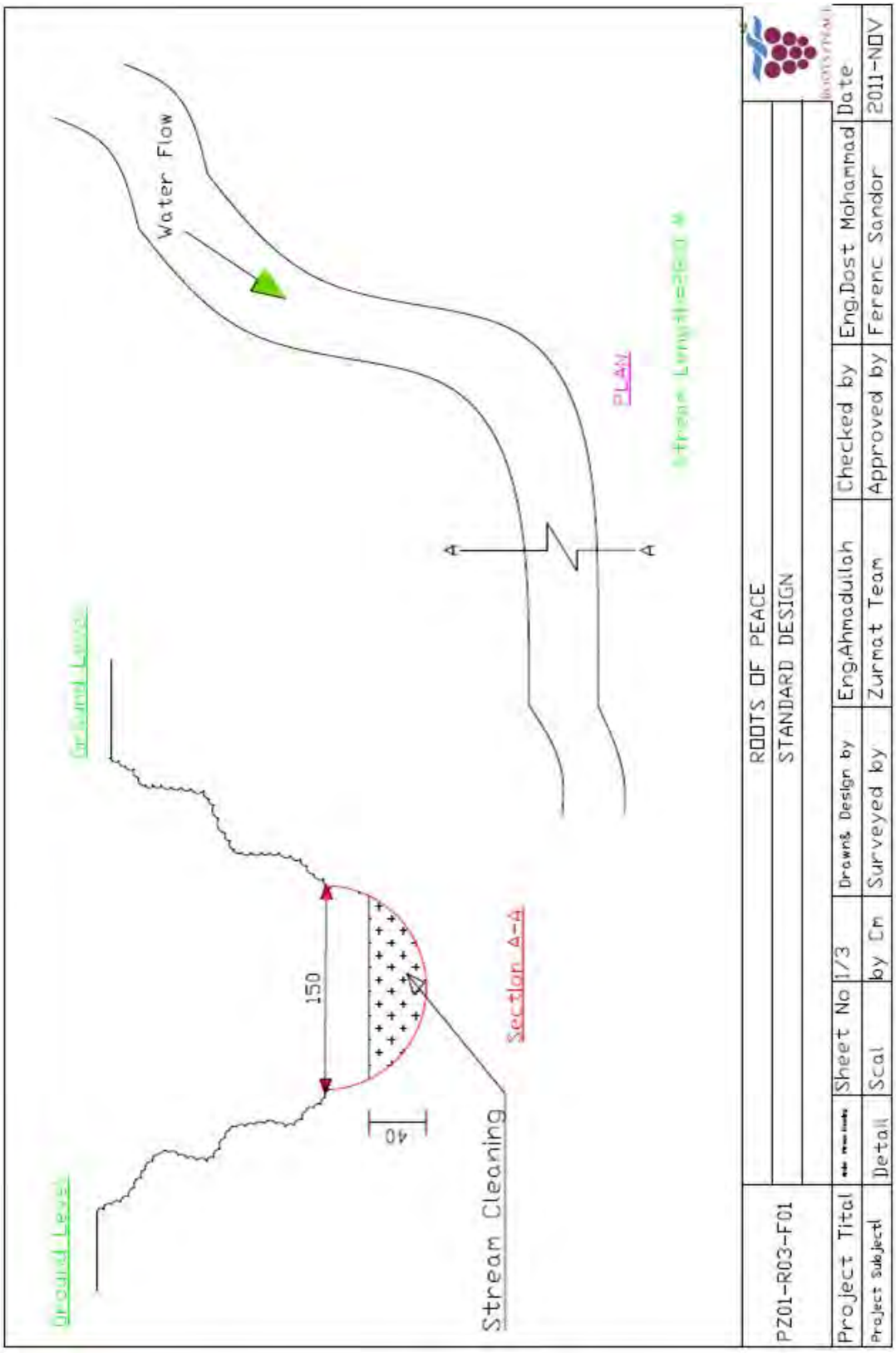


Figure 47 The PZ01/R03/F01 landform

Figure 48 The Andar stream area

8.1.9.1 Implementation Design



8.1.9.2 Implementation Cost

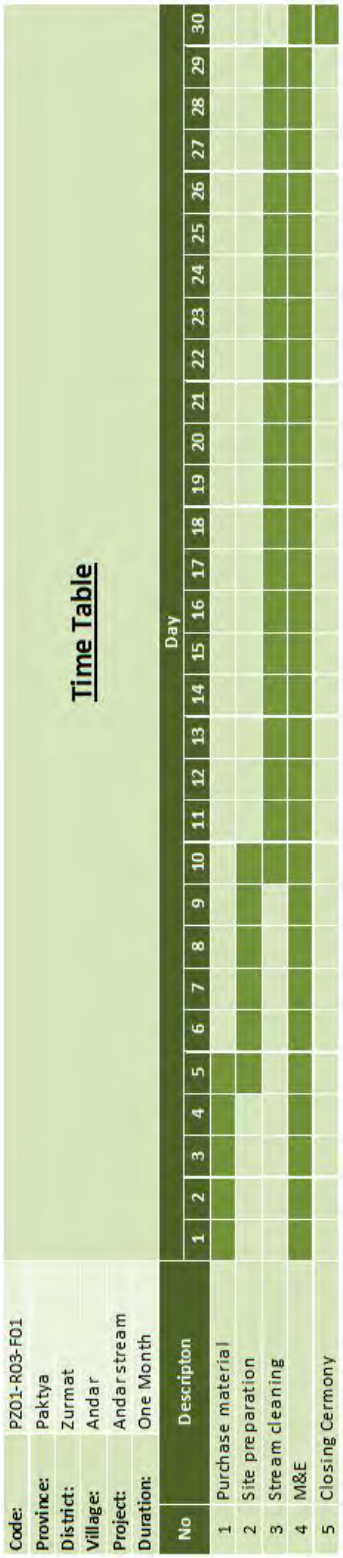
Bill of Quantity (BoQ)

Code: PZ01-R03-F01
Province: Paktya
District: Zurmat
Village: Andar
Project: Stream Cleaning
Date: November-11

Title	No.	Norm./ Unit	Item	Qty	Unit	Unit cost	Total cost
						$USD	$USD
A1	**1.00**		**Site preparation**	**4,200.00**	m^2		
	1.01	0.01	Unskilled labor	42.00	md	7.00	294.00
A2	**2.00**		**Stream cleaning**	**1,406.72**	m^3		
	2.01	1.00	Unskilled labor	**1,407.00**	md	7.00	**9,849.00**
A3	**3.00**		**Equipment**				
	3.01		Hand Cart	8.00	Unit	65.00	520.00
	3.02		Axe	15.00	Unit	12.00	180.00
	3.03		Spade	30.00	Unit	5.00	150.00
	3.04		Pike axe	10.00	Unit	5.00	50.00
	3.05		Water color	7.00	Unit	8.00	56.00
	3.06		Glasses	14.00	Unit	1.00	14.00
A4	**4.00**		**Personal**				
	4.01	2.00	Foreman	60.00	md	10.00	600.00
	4.02	1.00	Team leader	30.00	md	15.00	450.00
	4.03	1.00	Storekeeper	30.00	md	7.00	210.00
	4.04	4.00	Guard	120.00	md	10.00	1,200.00
A5	**5.00**		**Tools, transport**	**1.00**	**Ls**	**2,500.00**	2,500.00
						Grand total	**16,073.00**

Prepared by: Eng. Ahmadullah Noorzad

8.1.9.3 Implementation Time Table



Time Table

Code:	PZ01-R03-F01
Province:	Paktya
District:	Zurmat
Village:	Andar
Project:	Andar stream
Duration:	One Month

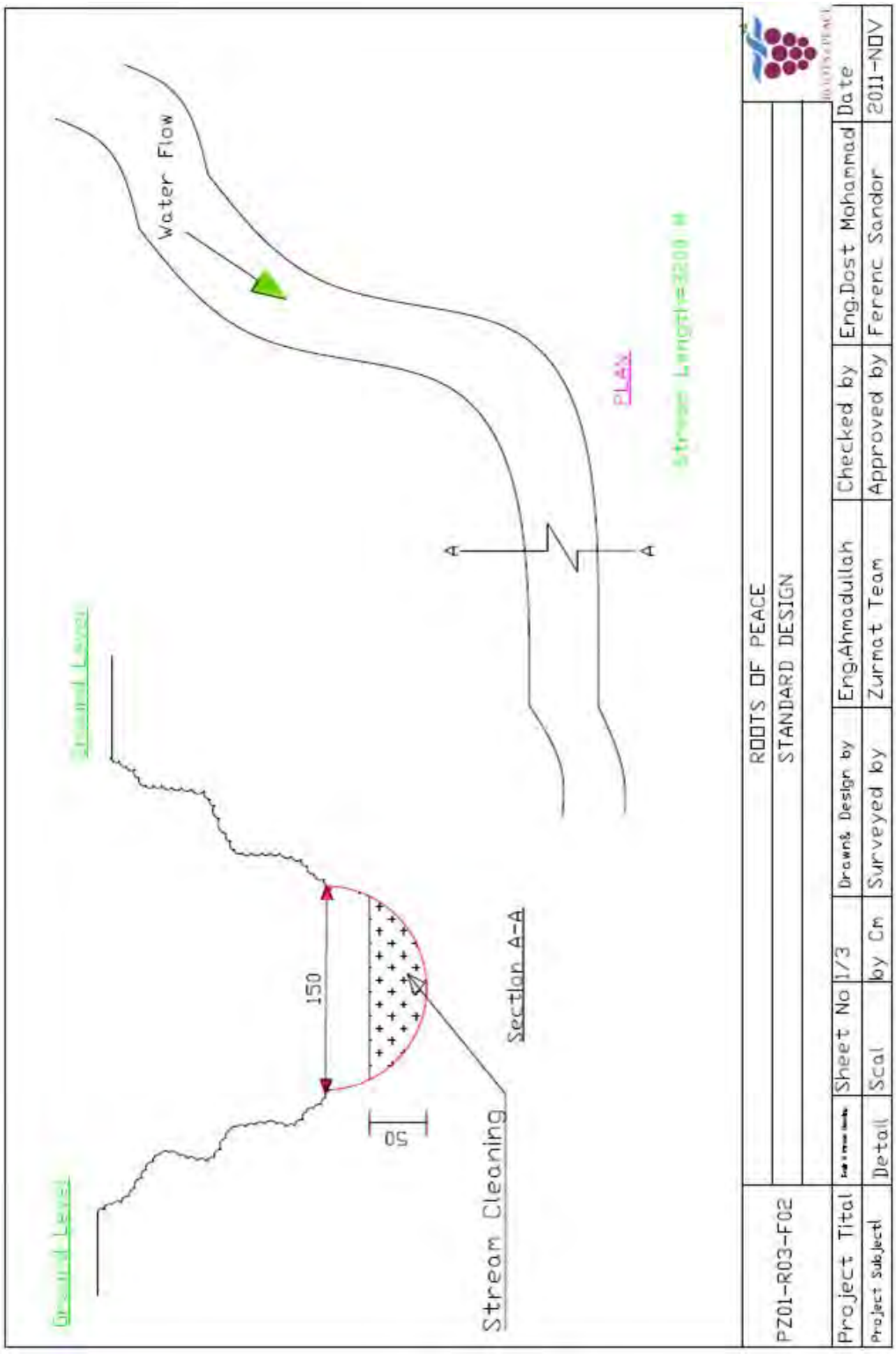
No	Description	Day																												
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	Purchase material																														
2	Site preparation																														
3	Stream cleaning																														
4	M&E																														
5	Closing Cermony																														

8.1.10 Faqir Mohammad Stream Rehabilitation

Figure 49 The PZ01/R03/F02 landform

Figure 50 The Faqir Mohammad stream area

8.1.10.1 Implementation Design



8.1.10.2 Implementation Cost

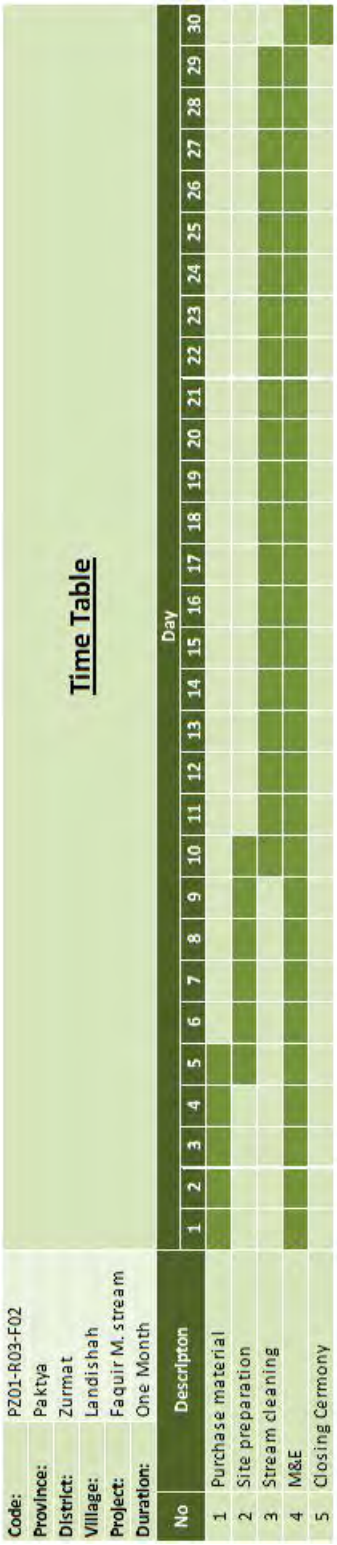
Bill of Quantity(BoQ)

Code: PZ01-R03-F02
Province: Paktya
District: Zurmat
Village: Landhishah
Project: Stream cleaning
Date: November-11

Title	No.	Norm./ Unit	Item	Qty	Unit	Unit cost	Total cost
						$USD	$USD
A1	**1.00**		**Site preparation**	**4,800.00**	m^2		
	1.01	0.01	Unskilled labor	48.00	md	7.00	336.00
A2	**2.00**		**Stream cleaning**	**2,512.00**	m^3		
	2.01	1.00	Unskilled labor	**2,512.00**	md	7.00	**17,584.00**
A3	**3.00**		**Equipment**				
	3.01		Hand cart	8.00	Unit	65.00	520.00
	3.02		Axe	10.00	Unit	12.00	120.00
	3.03		Spade	35.00	Unit	5.00	175.00
	3.04		Pike axe	15.00	Unit	5.00	75.00
	3.05		Water color	10.00	Unit	8.00	80.00
	3.06		Glasses	20.00	Unit	1.00	20.00
A4	**4.00**		**Personal**				
	4.01	2.00	Foreman	60.00	md	10.00	600.00
	4.02	1.00	Team leader	30.00	md	15.00	450.00
	4.03	1.00	Storekeeper	30.00	md	7.00	210.00
	4.04	4.00	Guard	120.00	md	10.00	1,200.00
A5	**5.00**		**Tools, transport**	**1.00**	**Ls**	**2,500.00**	2,500.00
						Grand total	**23,870.00**

Prepared by: Eng Ahmadullah Noorzad

8.1.10.3 Implementation Time Table



Time Table

Code:	PZ01-R03-F02
Province:	Paktya
District:	Zurmat
Village:	Landishah
Project:	Faquir M. stream
Duration:	One Month

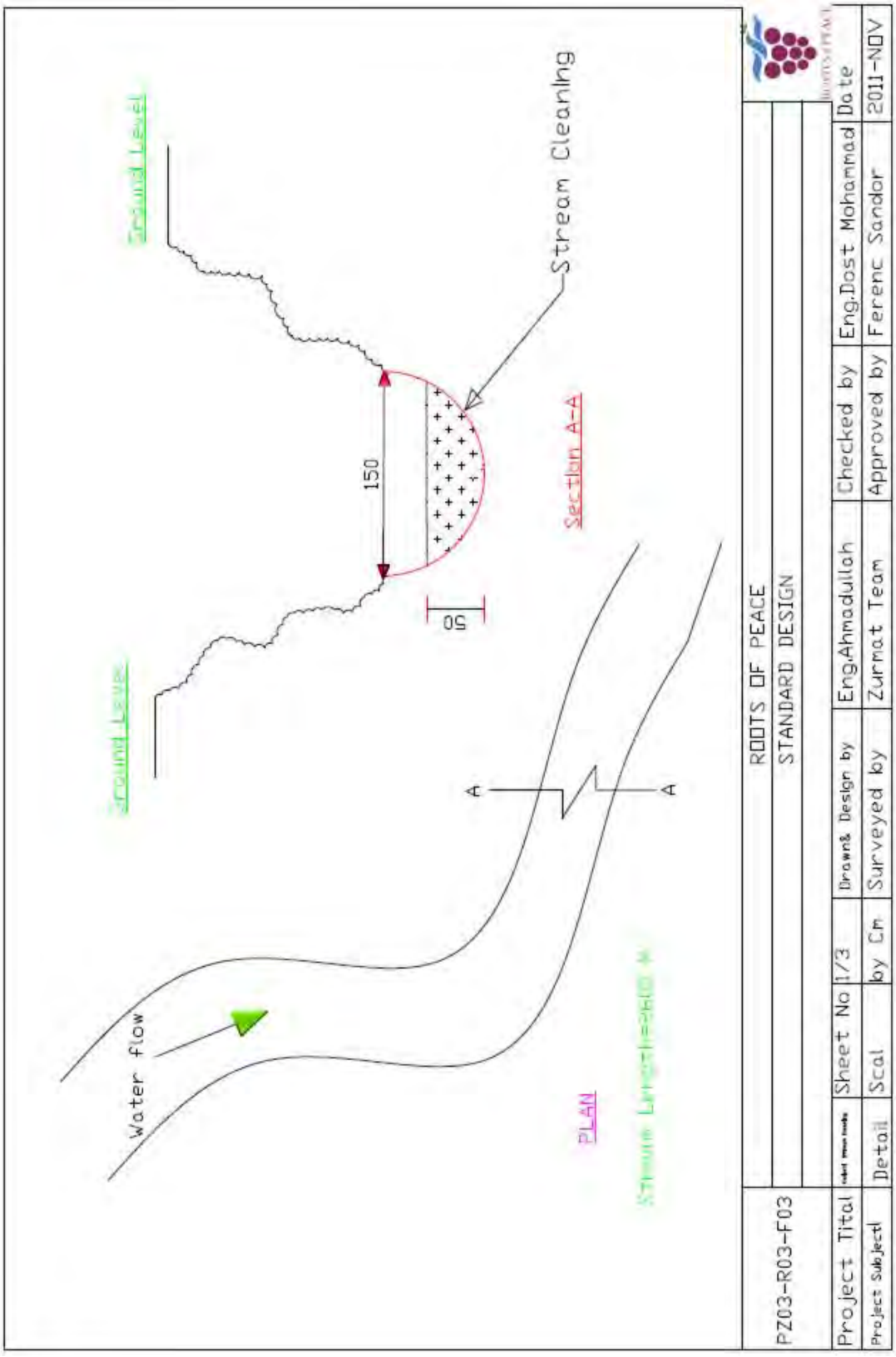
No	Description	Day																												
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	Purchase material																														
2	Site preparation																														
3	Stream cleaning																														
4	M&E																														
5	Closing Cermony																														

8.1.11 Calbati Qala Stream Rehabilitation

Figure 51 The PZ01/R03/F03

Figure 52 The Calbati Qala stream area

8.1.11.1 Implementation Design



8.1.11.2 Implementation Cost

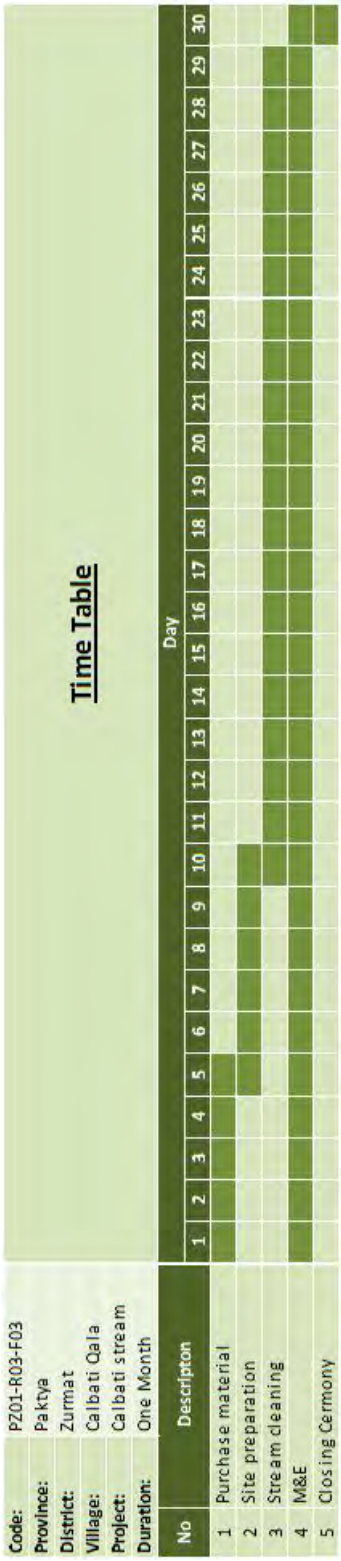
Bill of Quantity (BoQ)

Code: PZ01-R03-F01
Province: Paktya
District: Zurmat
Village: Andar
Project: Stream cleaning
Date: November-11

Title	No.	Norm./ Unit	Item	Qty	Unit	Unit cost	Total cost
						$USD	$USD
A1	**1.00**		**Site preparation**	**3,900.00**	m^2		
	1.01	0.01	Unskilled labor	39.00	md	7.00	273.00
A2	**2.00**		**Stream cleaning**	**2,041.00**	m^3		
	2.01	1.00	Unskilled labor	**1,837.00**	md	7.00	**12,859.00**
A3	**3.00**		**Equipment**				
	3.01		Hand cart	10.00	Unit	65.00	650.00
	3.02		Axe	12.00	Unit	12.00	144.00
	3.03		Spade	32.00	Unit	5.00	160.00
	3.04		Pike axe	8.00	Unit	5.00	40.00
	3.05		Water color	8.00	Unit	8.00	64.00
	3.06		Glasses	16.00	Unit	1.00	16.00
A4	**4.00**		**Personal**				
	4.01	2.00	Foreman	60.00	md	10.00	600.00
	4.02	1.00	Team leader	30.00	md	15.00	450.00
	4.03	1.00	Storekeeper	30.00	md	7.00	210.00
	4.04	4.00	Guard	120.00	md	10.00	1,200.00
A5	**5.00**		**Tools, transport**	**1.00**	**Ls**	**2,500.00**	2,500.00
						Grand total	**19,166.00**

Prepared by: Eng Ahmadullah Noorzad

8.1.11.3 Implementation Time Table



Time Table

Code:	PZ01-R03-F03
Province:	Paktya
District:	Zurmat
Village:	Calbati Qala
Project:	Calbati stream
Duration:	One Month

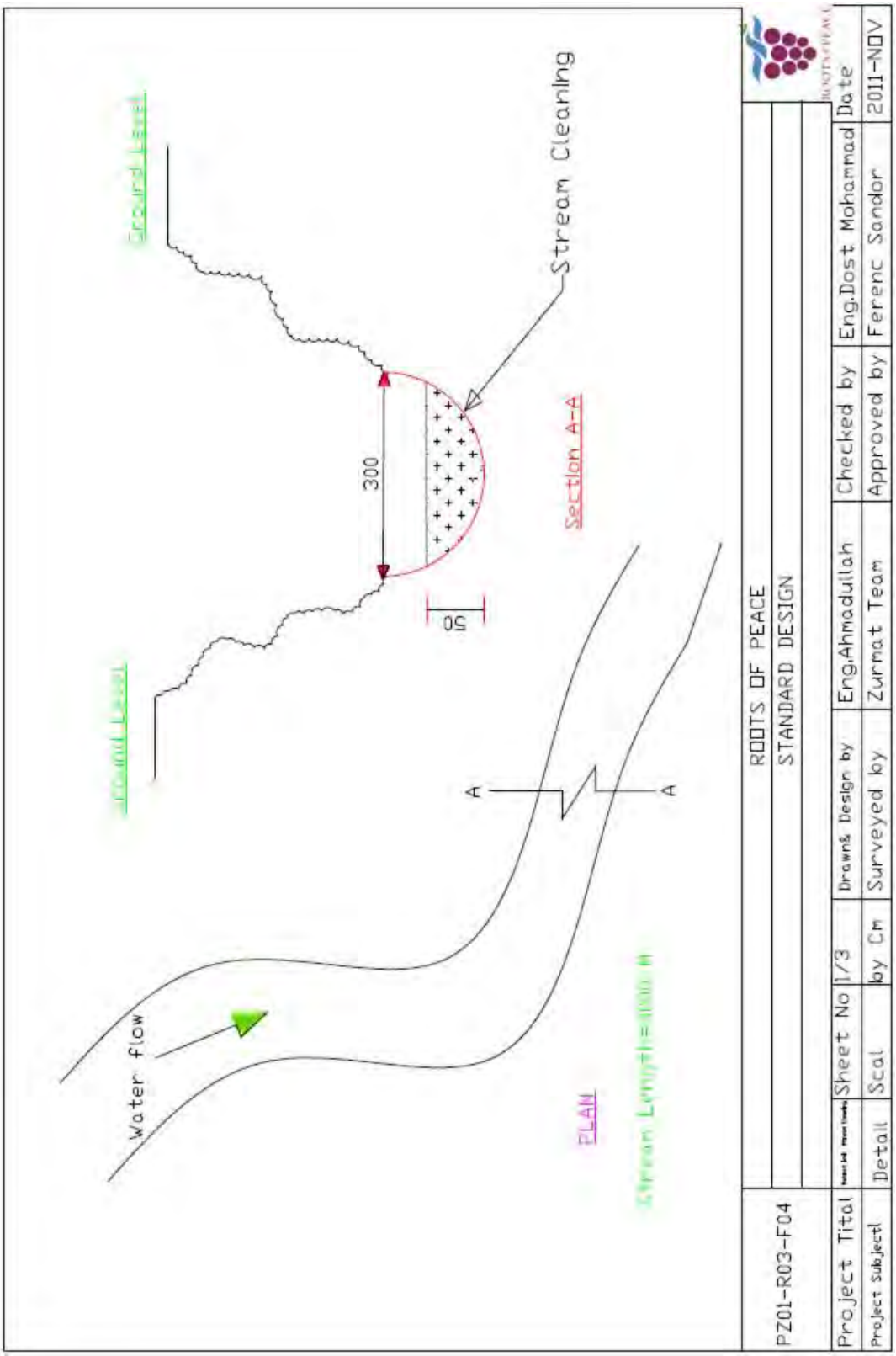
No	Description	Day																												
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	Purchase material																														
2	Site preparation																														
3	Stream cleaning																														
4	M&E																														
5	Closing Cermony																														

8.1.12 Rahmatkhel Stream Rehabilitation

Figure 53 The PZ01/R03/F04 landform

Figure 54 The Rahmatkhel stream area

8.1.12.1 Implementation Design



8.1.12.2 Implementation Cost

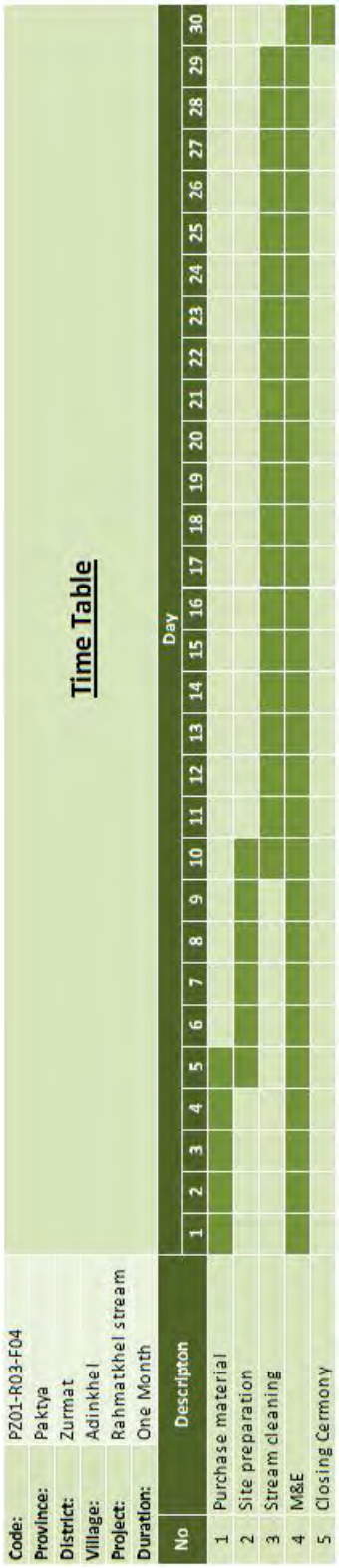
Bill of Quantity(BoQ)

Code: **PZ01-R03-F04**
Province: **Paktya**
District: **Zurmat**
Village: **Adinkhel**
Project: **Stream cleaning**
Date: **November-11**

Title	No.	Norm./ Unit	Item	Qty	Unit	Unit cost	Total cost
						$USD	$USD
A1	**1.00**		**Site preparation**	**9,000.00**	m^2		
	1.01	0.01	Unskilled labor	90.00	md	7.00	630.00
A2	**2.00**		**Stream cleaning**	**2,355.00**	m^3		
	2.01	1.00	Unskilled labor	**2,355.00**	md	7.00	**16,485.00**
A3	**3.00**		**Equipment**				
	3.01		Hand cart	8.00	Unit	65.00	520.00
	3.02		Axe	20.00	Unit	12.00	240.00
	3.03		Spade	40.00	Unit	5.00	200.00
	3.04		Pike axe	12.00	Unit	5.00	60.00
	3.05		Water color	8.00	Unit	8.00	64.00
	3.06		Glasses	16.00	Unit	1.00	16.00
A4	**4.00**		**Personal**				
	4.01	2.00	Foreman	60.00	md	10.00	600.00
	4.02	1.00	Team leader	30.00	md	15.00	450.00
	4.03	1.00	Storekeeper	30.00	md	7.00	210.00
	4.04	4.00	Guard	120.00	md	10.00	1,200.00
A5	**5.00**		**Tools, transport**	**1.00**	**Ls**	**2,500.00**	2,500.00
						Grand total	**23,175.00**

Prepared by: Eng Ahmadullah Noorzad

8.1.12.3 Implementation Time Table



Time Table

Code:	PZ01-R03-F04
Province:	Paktya
District:	Zurmat
Village:	Adinkhel
Project:	Rahmatkhel stream
Duration:	One Month

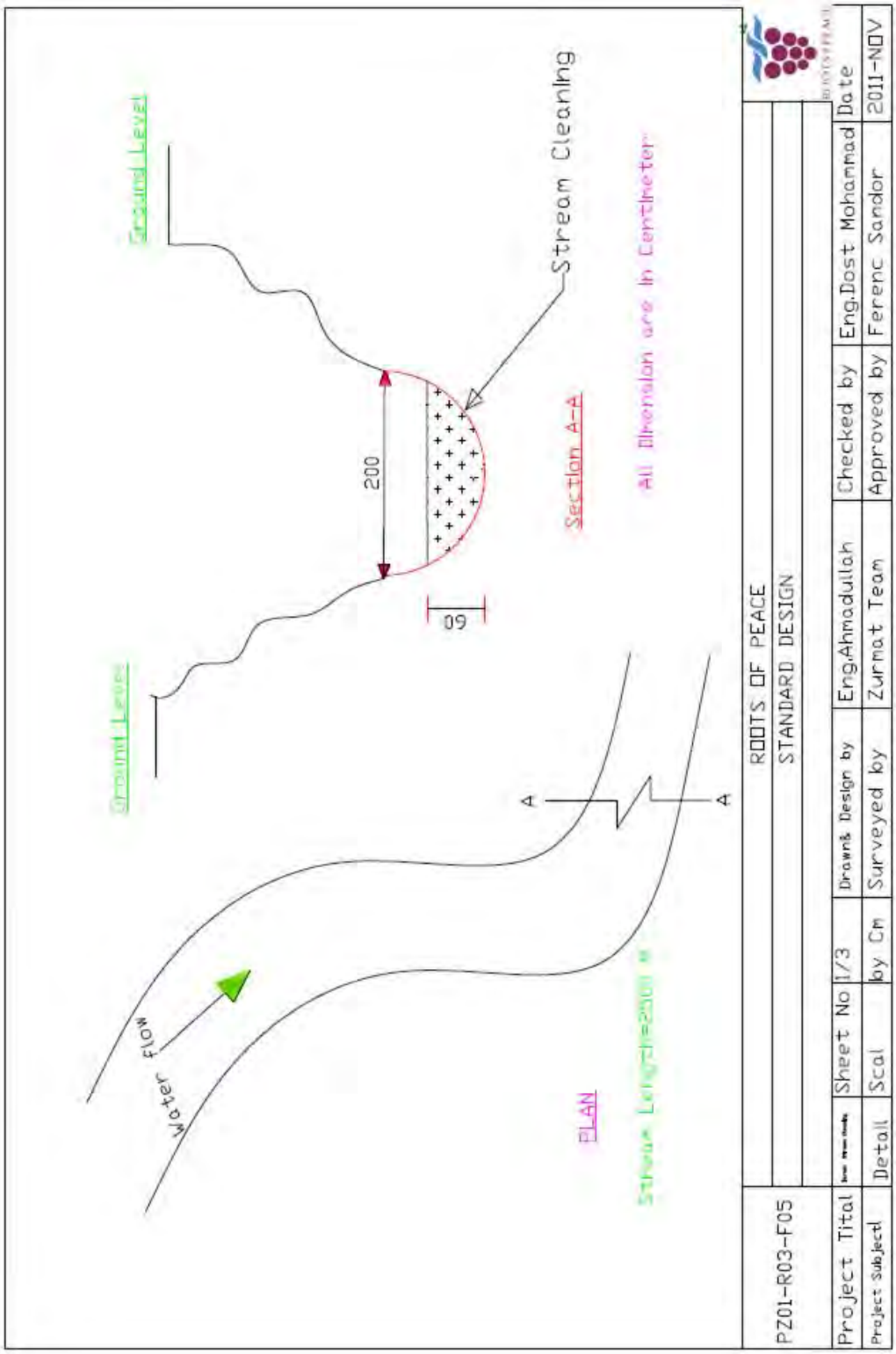
No	Description	Day																												
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	Purchase material																														
2	Site preparation																														
3	Stream cleaning																														
4	M&E																														
5	Closing Cermony																														

8.1.13 Baraki Stream Rehabilitation

Figure 55 The PZ01/R03/F05 landform

Figure 56 The Baraki stream area

8.1.13.1 Implementation Design



8.1.13.2 Implementation Cost

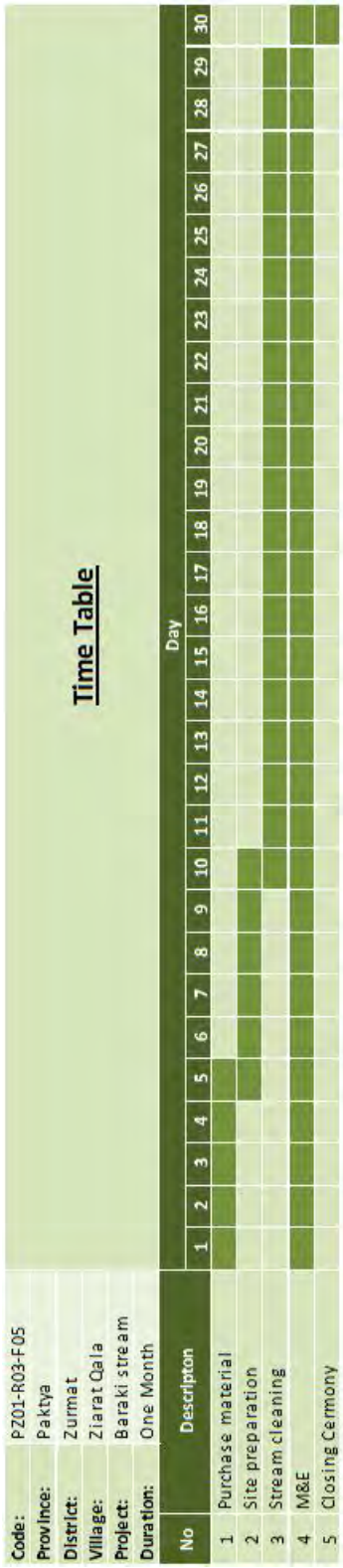
Bill of Quantity(BoQ)

Code: **PZ01-R03-F05**
Province: **Paktya**
District: **Zurmat**
Village: **Ziarat Qala**
Project: **Stream cleaning**
Date: **November-11**

Title	No.	Norm./ Unit	Item	Qty	Unit	Unit cost	Total cost
						$USD	$USD
A1	**1.00**		**Site preparation**	**5,000.00**	m^2		
	1.01	0.01	Unskilled labor	50.00	md	7.00	350.00
A2	**2.00**		**Stream cleaning**	**2,826.00**	m^3		
	2.01	1.00	Unskilled labor	**2,544.00**	md	7.00	**17,808.00**
A3	**3.00**		**Equipment**				
	3.01		Hand cart	12.00	Unit	65.00	780.00
	3.02		Axe	15.00	Unit	12.00	180.00
	3.03		Spade	36.00	Unit	5.00	180.00
	3.04		Pike axe	10.00	Unit	5.00	50.00
	3.05		Water color	9.00	Unit	8.00	72.00
	3.06		Glasses	18.00	Unit	1.00	18.00
A4	**4.00**		**Personal**				
	4.01	2.00	Foreman	60.00	md	10.00	600.00
	4.02	1.00	Team leader	30.00	md	15.00	450.00
	4.03	1.00	Storekeeper	30.00	md	7.00	210.00
	4.04	4.00	Guard	120.00	md	10.00	1,200.00
A5	**5.00**		**Tools, transport**	**1.00**	**Ls**	**2,500.00**	2,500.00
						Grand total	**24,398.00**

Prepared by: Eng Ahmadullah Noorzad

8.1.13.3 Implementation Time Table



Time Table

Code:	PZ01-R03-F05
Province:	Paktya
District:	Zurmat
Village:	Ziarat Qala
Project:	Baraki stream
Duration:	One Month

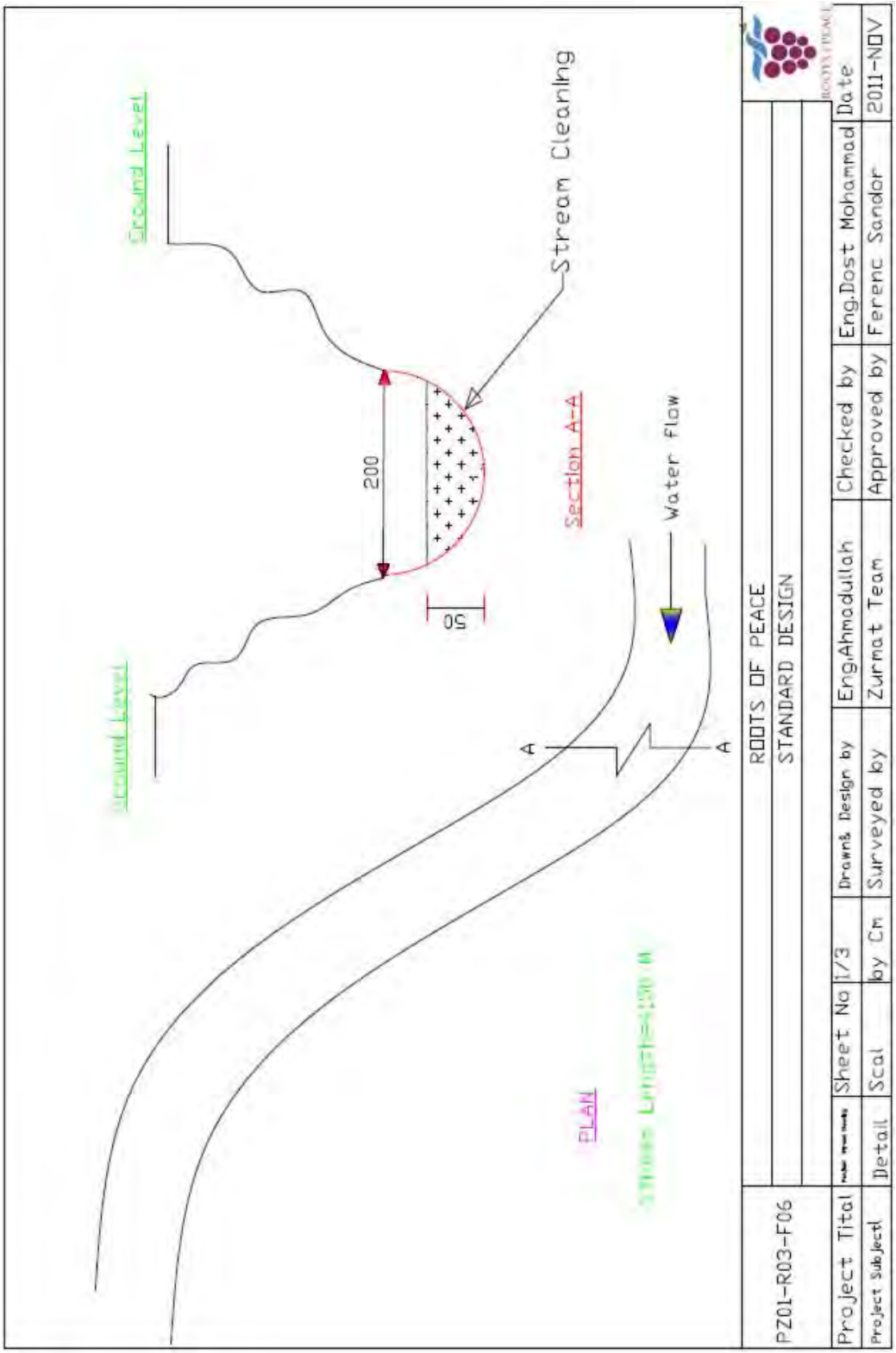
No	Description	Day																												
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	Purchase material																														
2	Site preparation																														
3	Stream cleaning																														
4	M&E																														
5	Closing Ceremony																														

8.1.14 Panjlaki Stream Rehabilitation

Figure 57 The PZ01/R03/F06 landform

Figure 58 The Panjlaki stream area

8.1.14.1 Implementation Design



8.1.14.2 Implementation Cost

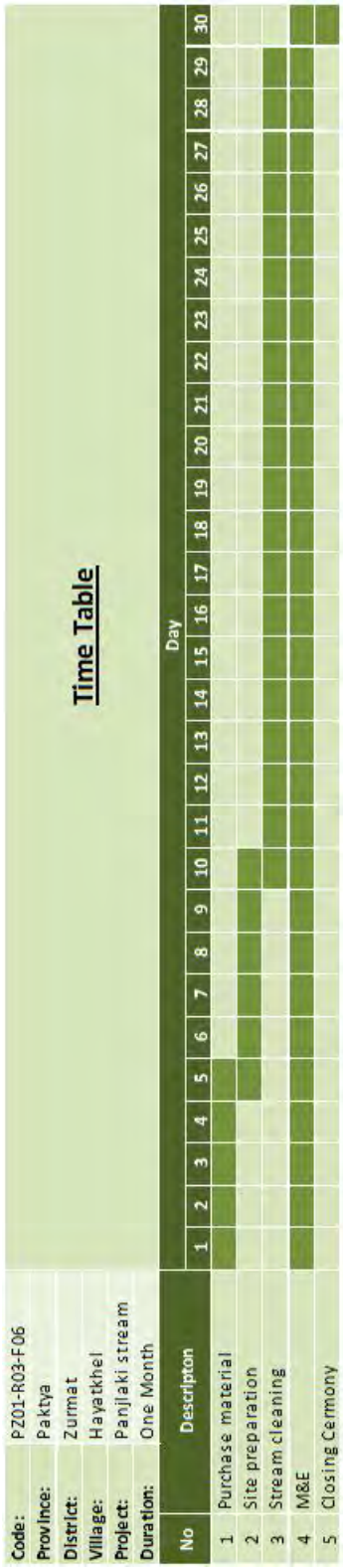
Bill of Quantity(BoQ)

Code: **PZ01-R03-F06**
Province: **Paktya**
District: **Zurmat**
Village: **Hajatkhel**
Project: **Stream cleaning**
Date: **November-11**

Title	No.	Norm./ Unit	Item	Qty	Unit	Unit cost	Total cost
						$USD	$USD
A1	**1.00**		**Site preparation**	**8,300.00**	m^2		
	1.01	0.01	Unskilled labor	83.00	md	7.00	581.00
A2	**2.00**		**Stream cleaning**	**3,257.75**	m^3		
	2.01	1.00	Unskilled labor	**3,258.00**	md	7.00	**22,806.00**
A3	**3.00**		**Equipment**				
	3.01		Hand cart	15.00	Unit	65.00	975.00
	3.02		Axe	20.00	Unit	12.00	240.00
	3.03		Spade	45.00	Unit	5.00	225.00
	3.04		Pike axe	15.00	Unit	5.00	75.00
	3.05		Water color	10.00	Unit	8.00	80.00
	3.06		Glasses	20.00	Unit	1.00	20.00
A4	**4.00**		**Personal**				
	4.01	2.00	Foreman	60.00	md	10.00	600.00
	4.02	1.00	Team leader	30.00	md	15.00	450.00
	4.03	1.00	Storekeeper	30.00	md	7.00	210.00
	4.04	4.00	Guard	120.00	md	10.00	1,200.00
A5	**5.00**		**Tools, transport**	**1.00**	**Ls**	**2,500.00**	2,500.00
						Grand total	**29,962.00**

Prepared by: Eng Ahmadullah Noorzad

8.1.14.3 Implementation Time Table



Time Table

Code:	PZ01-R03-F06
Province:	Paktya
District:	Zurmat
Village:	Hayatkhel
Project:	Panjlaki stream
Duration:	One Month

No	Description	Day																												
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	Purchase material																														
2	Site preparation																														
3	Stream cleaning																														
4	M&E																														
5	Closing Cermony																														

8.1.15 Omarkhel Aqueduct and Canal Rehabilitation

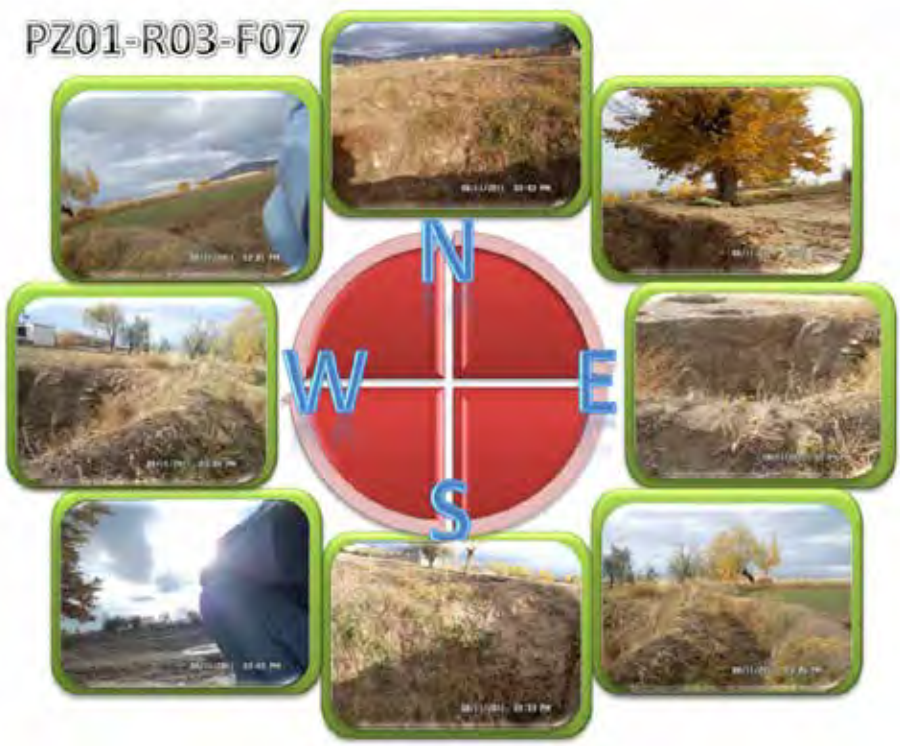
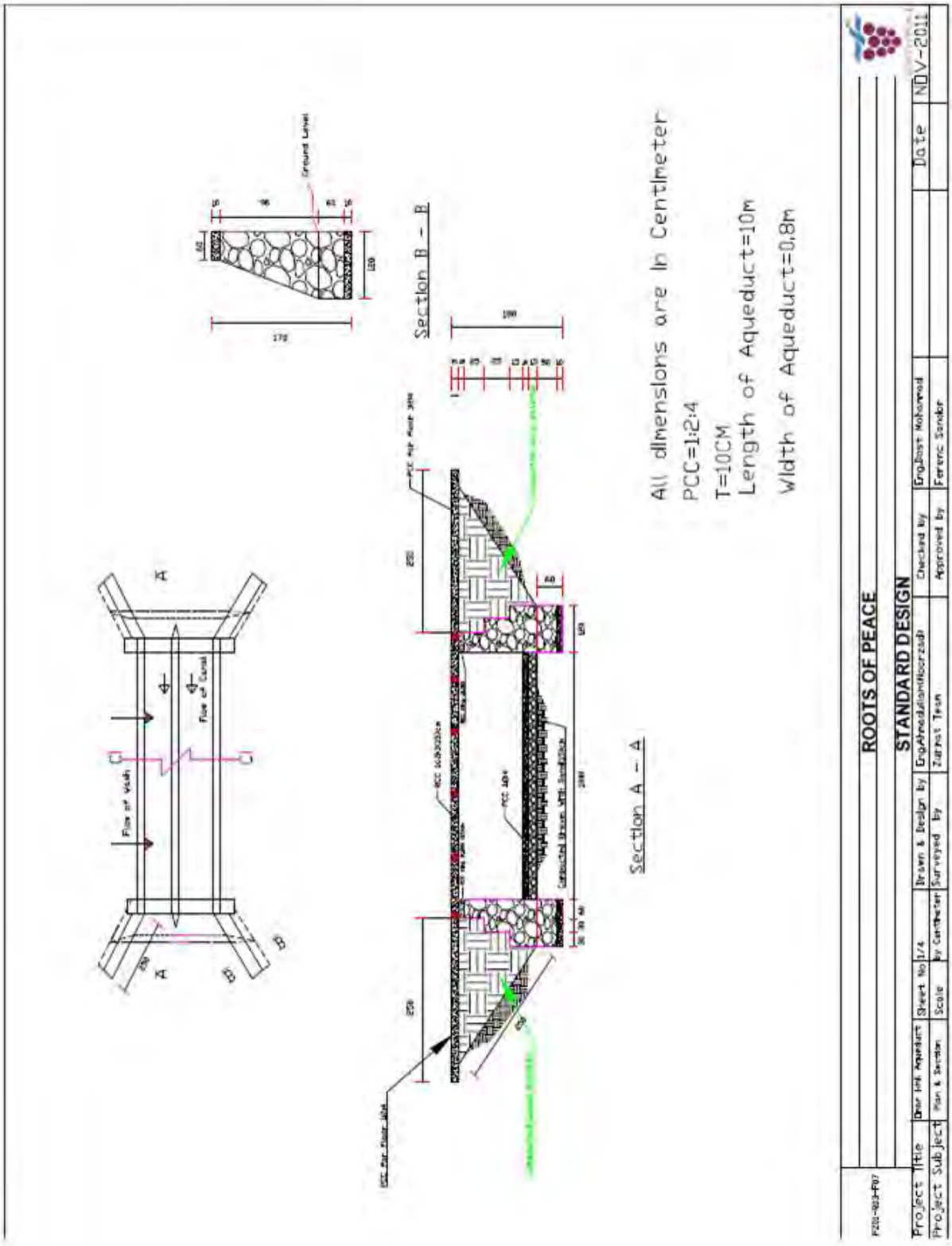
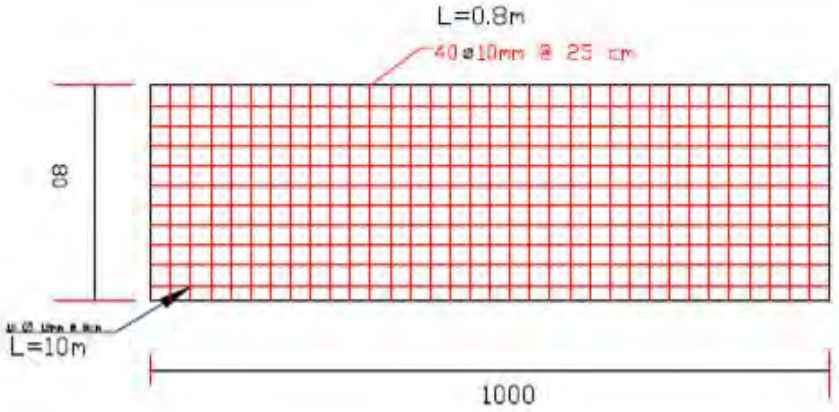


Figure 59 The PZ01/R03/F07 landform

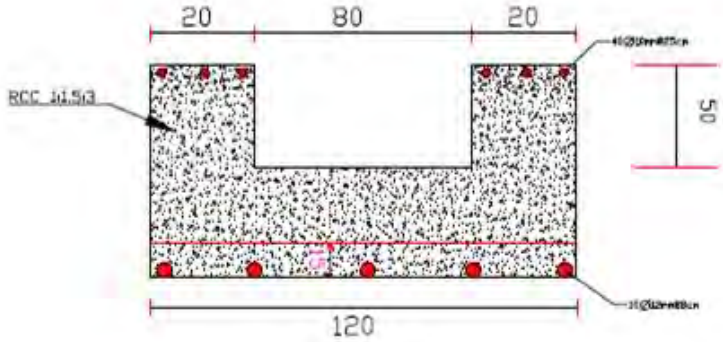
Figure 60 The Omarkhel aqueduct and canal area

8.1.15.1 Implementation Design





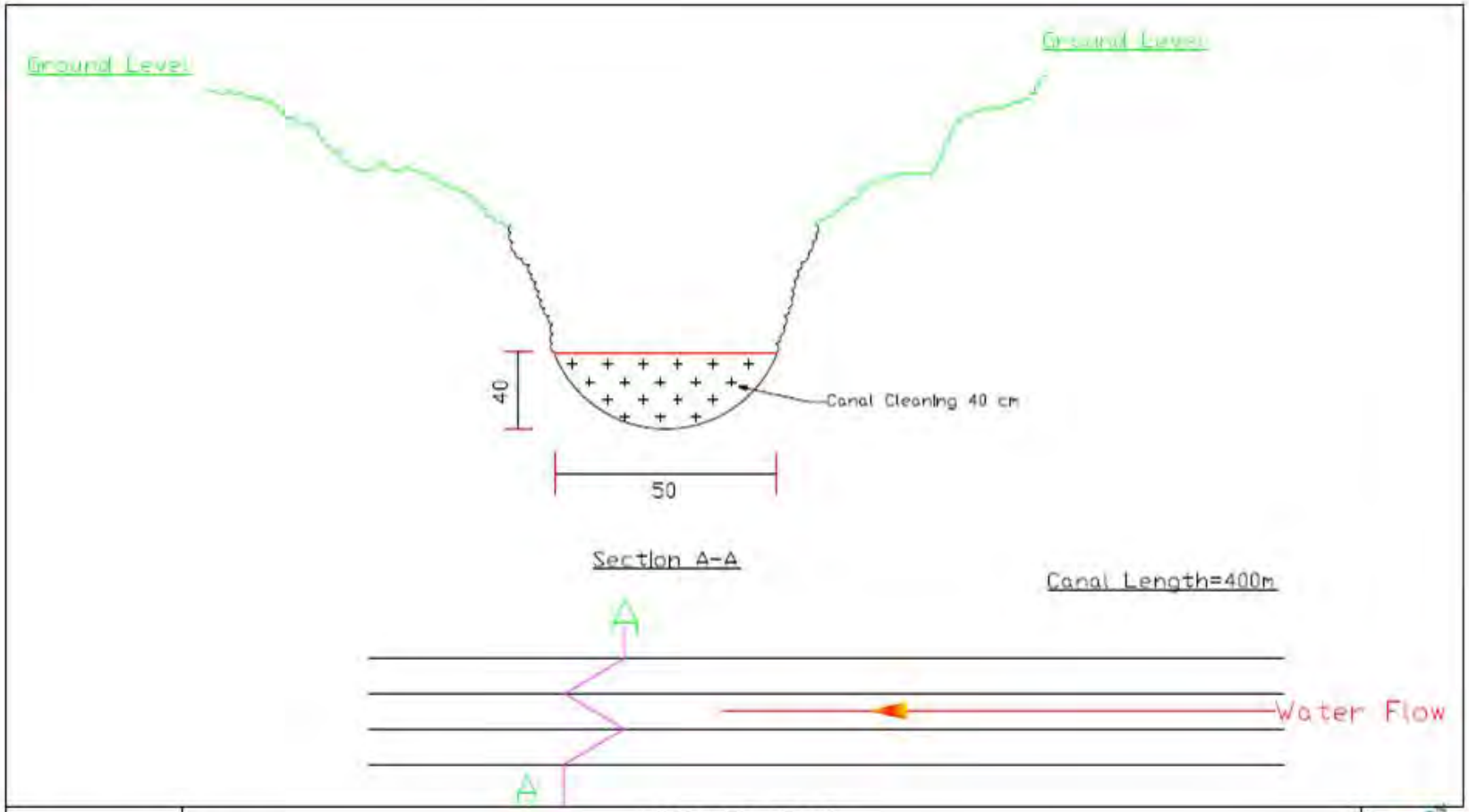
Steel Detail



Section C-C

All dimensions are in Centimeter

P203-R03-F07	ROOTS OF PEACE										
	STANDARD DESIGN										
Project Title	Dwar Wadi Aqueduct	Sheet No	1/4	Drawn & Design by	Eng.Ahmadullah Noorzad	Checked by	Eng.Dost Mohamad		Date	NOV-2011	
Project Subject	Plan & Section	Scale	by Centimeter	Surveyed by	Zurmat Team	Approved by	Ferenc Sandor				



PZ01-R03-F07	ROOTS OF PEACE STANDARD DESIGN							
Project Tital	Ghar khil Canal	Sheet No	1/5	Drawn& Design by	Eng.Ahmadullah	Checked by	Eng.Dost Mohammad	Date
Project Subject	Detail	Scal	by Cm	Surveyed by	Zurmat Team	Approved by	Ferenc Sandor	2011-NOV

8.1.15.2 Implementation Cost

Bill of Quantity (BoQ)

Code: PZ01-R03-F07

Province: Paktya

District: Zurmat

Village: Omarkhel

Project: Kareze and Canal Cleaning

Date: November-11

Title	No.	Norm./ Unit	Item	Qty	Unit	Unit cost	Total cost
						$USD	$USD
A1	**1.00**		**Site preparation**	**20.00**	m^2		
	1.01	0.08	Unskilled labor	2.00	md	7.00	14.00
A2	**2.00**		**Excavation**	**14.12**	m^3		
	2.01	1.00	Unskilled labor	15.00	md	7.00	105.00
A3	**3.00**		**Stone Masonry**	**22.24**			
	3.01	1.10	Stone & Transport	24.46		20.00	489.20
	3.02	0.39	Sand	8.64		25.00	216.00
	3.03	0.50	Skilled labor	12.00		14.00	168.00
	3.04	1.00	Unskilled labor	23.00		7.00	161.00
A4	**4.00**		**Filling-Compaction**	**19.10**	**m^3**		
	4.01	1.00	Soil	19.00	m^3	6.00	114.00
	4.02	0.33	Unskilled labor	7.00	md	7.00	49.00
A5	**5.00**		**PCC**	**4.50**			
	5.01	1.06	Sandy gravel	4.74	Unit	25.00	118.50
	5.02	250.00	Cement (M:120, 1:6)	23.00	Unit	7.00	161.00
	5.03	0.65	Skilled labor on site	3.00	lit	14.00	42.00
	5.04	3.25	Unskilled labor on site	15.00	Unit	7.00	105.00
A6	**6.00**		**RCC**	**3.66**	m	150.00	549.00
A7	**7.00**		**Pointing**	**25.00**	m		
	7.01	0.01	Sand	0.25	Unit	25.00	6.25
	7.02	250.00	Cement (M: 200, 1:3)	2.00	Unit	7.00	14.00
	7.03	0.17	Skilled labor on site	5.00	Unit	14.00	70.00
	7.04	0.05	Unskilled labor on site	2.00	Unit	7.00	14.00
A8	**8.00**		**Personal**				
	8.01	2.00	Foreman	120.00	md	10.00	1,200.00
	8.02	1.00	Team Leader	60.00		15.00	900.00
	8.03	2.00	Storekeeper	120.00	md	10.00	1,200.00
	8.04	4.00	Guard	240.00	md	10.00	2,400.00
A9	**9.00**		**Tools, transport**	**1.00**	**Ls**	4,000.00	4,000.00
						Grand total	**12,095.95**

Prepared by: Eng. Ahmadullah Noorzad

Bill of Quantity (BoQ)

Code: PZ01-R03-F07

Province: Paktya

District: Zurmat

Village: Omarkhel

Project: Stream Cleaning

Date: November-11

Title	No.	Norm./ Unit	Item	Qty	Unit	Unit cost	Total cost
						$USD	$USD
A1	**1.00**		**Site preparation**	**200.00**	m^2		
	1.01	0.01	Unskilled labor	8.00	md	7.00	56.00
A2	**2.00**		**Stream cleaning**	**200.96**	m^3		
	2.01	1.00	Unskilled labor	**181.00**	md	7.00	**1,267.00**
A3	**3.00**		**Equipment**				
	3.01		Hand cart	4.00	Unit	65.00	260.00
	3.02		Axe	8.00	Unit	12.00	96.00
	3.03		Spade	20.00	Unit	5.00	100.00
	3.04		Pike axe	10.00	Unit	5.00	50.00
	3.05		Water color	6.00	Unit	8.00	48.00
	3.06		Glasses	12.00	Unit	1.00	12.00
A4	**4.00**		**Personal**				
	4.01	2.00	Foreman	60.00	md	10.00	600.00
	4.02	1.00	Team leader	30.00	md	15.00	450.00
	4.03	1.00	Storekeeper	30.00	md	7.00	210.00
	4.04	4.00	Guard	120.00	md	10.00	1,200.00
A5	**5.00**		**Tools, transport**	**1.00**	**Ls**	**3,000.00**	3,000.00
						Grand total	**7,349.00**

Prepared by: Eng. Ahmadullah Noorzad

Code:	PZ01-R03-F07
Province:	Paktya
District:	Zurmat
Village:	Omarkhel
Project:	Omarkhel stream
Duration:	One Month

Time Table

No	Descripton	Day																											
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	Purchase material																														
2	Site preparation																														
3	Stream cleaning																														
4	M&E																														
5	Closing Cermony																														

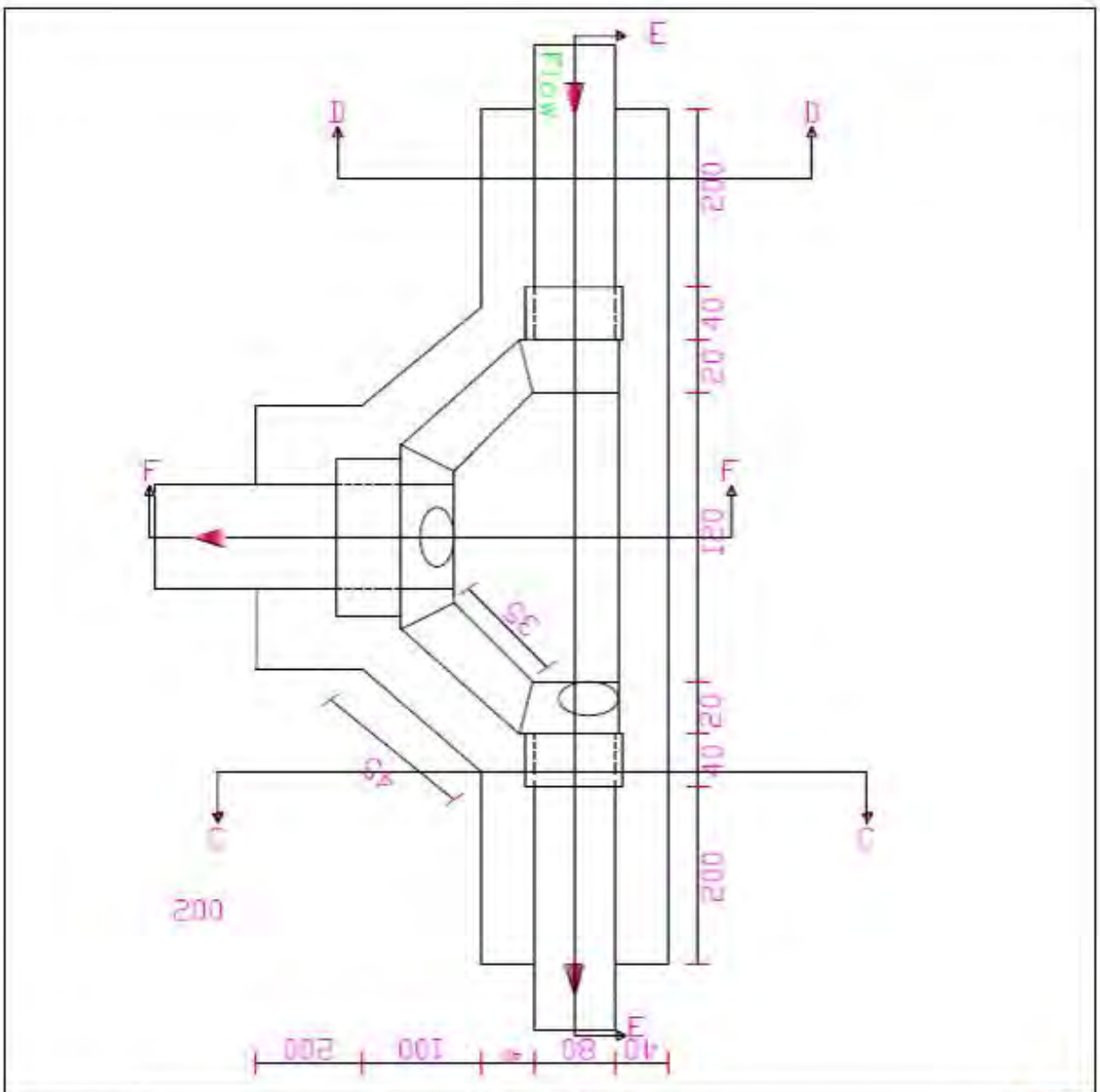
Code:	PZ01-R03-F07
Province:	Paktya
District:	Zurmat
Village:	Omarkhel
Project:	Aquaeduct
Duration:	Two Months

Time Table

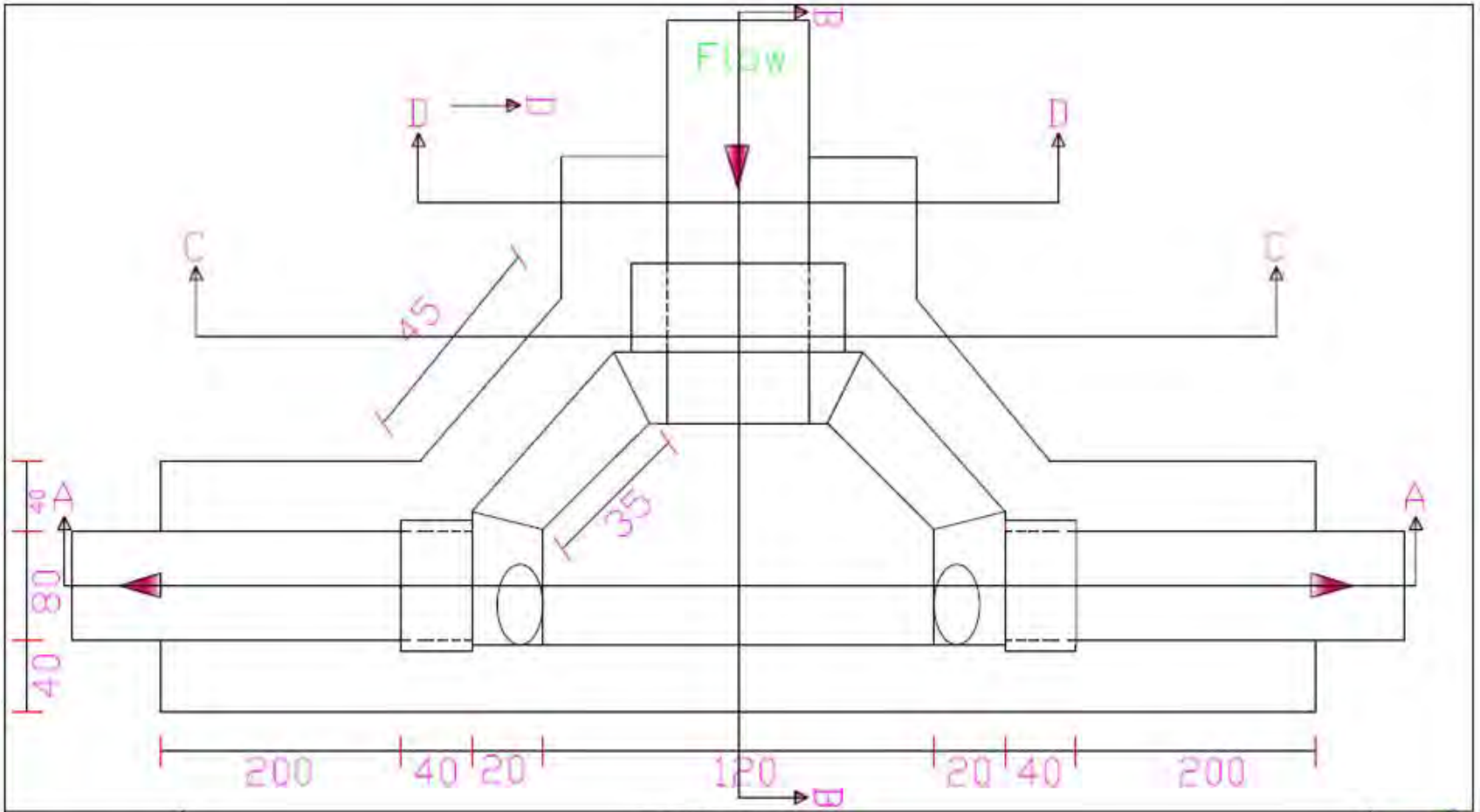
No	Descripton	Weeks							
		1	2	3	4	5	6	7	8
1	Purchase material								
2	Site preparation								
3	Excavation								
4	Stone masonary								
5	RCC work								
6	PCC work								
7	Pointing								
8	M&E								
9	Closing Cermony								

8.1.16 Omarkhel Diversion Structure Construction

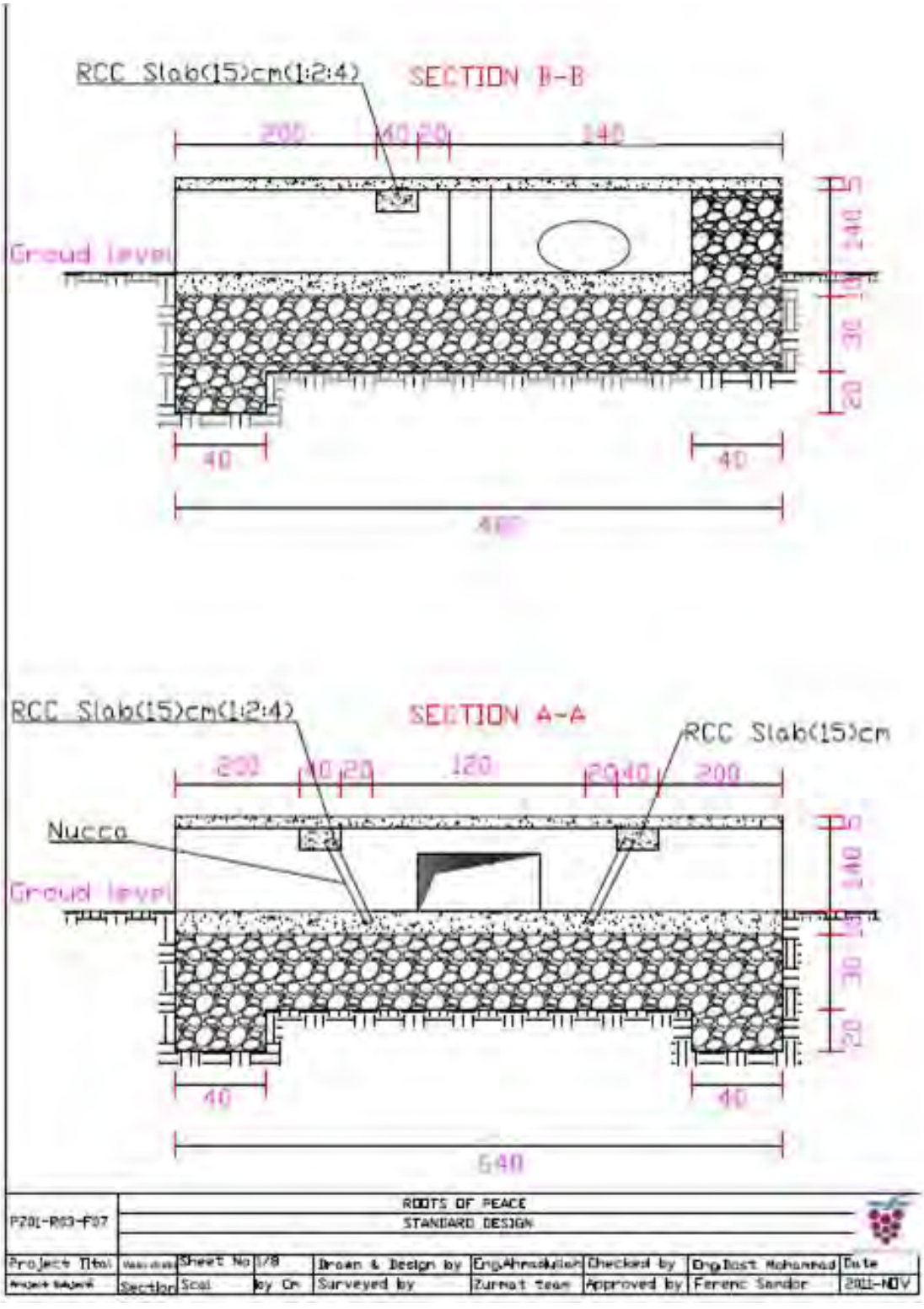
8.1.16.1 Implementation Design

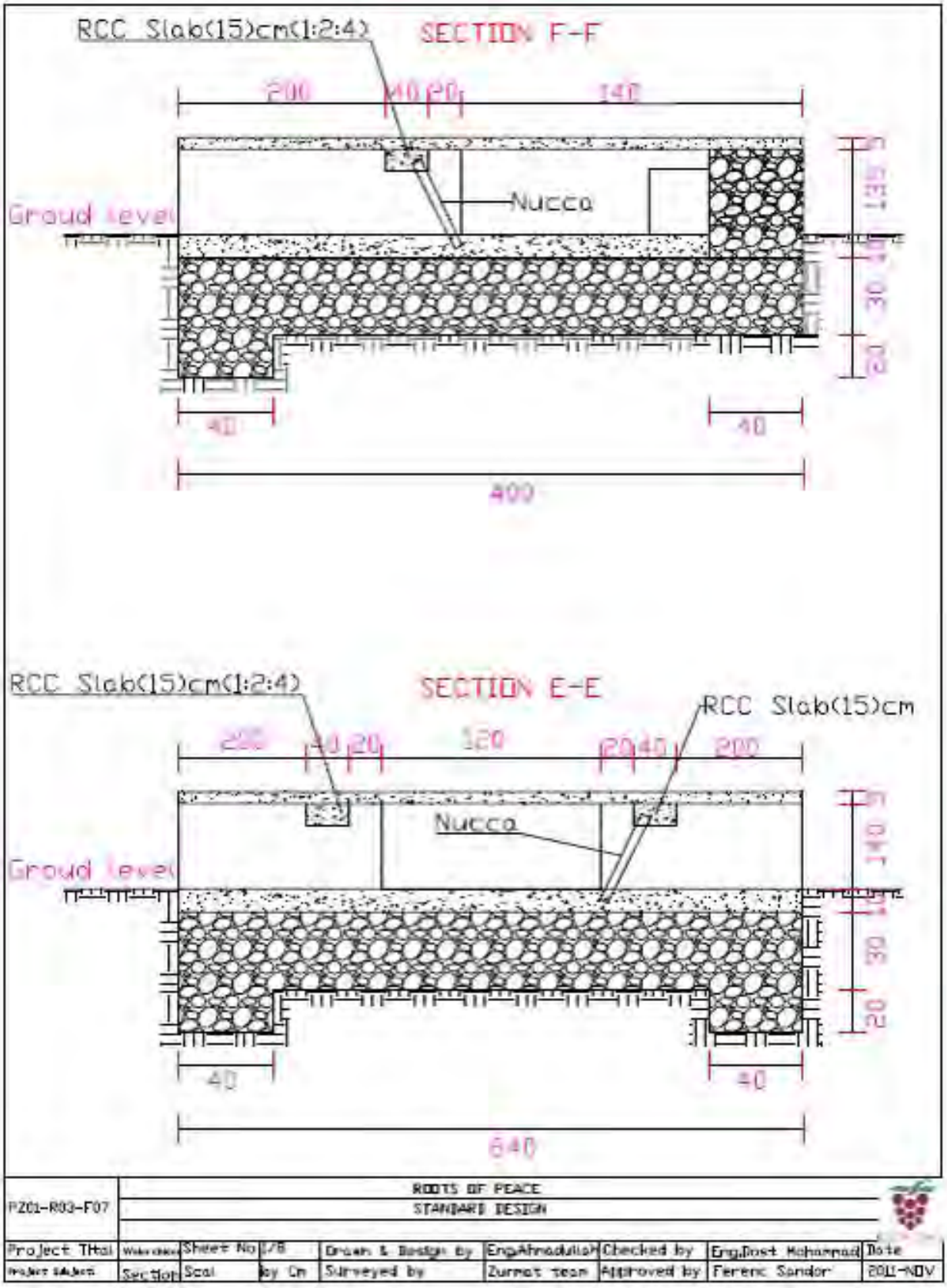


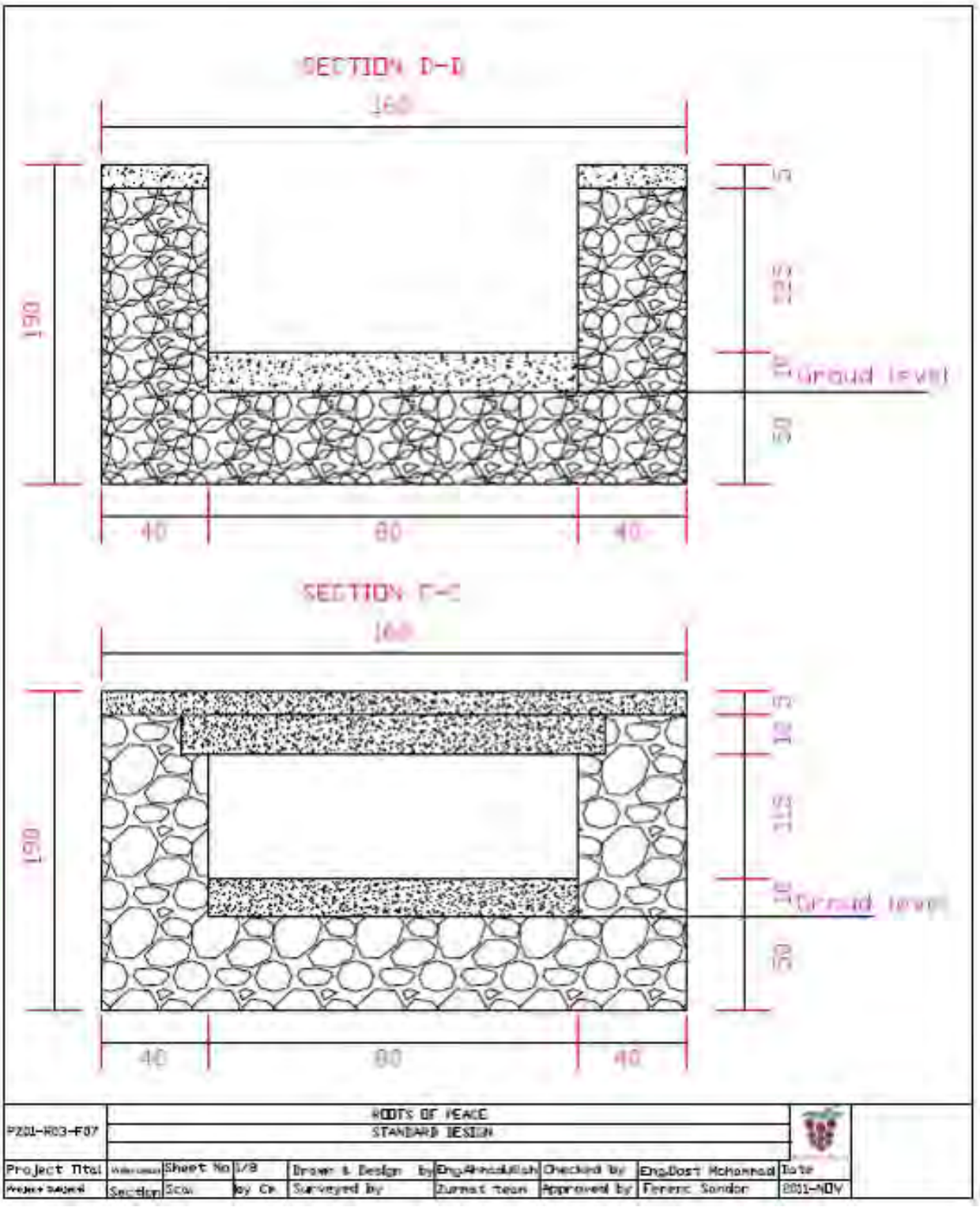
PZ01-R03-F07	ROOTS OF PEACE STANDARD DESIGN							
Project Titel	Water division	Sheet No	I/B	Drawn & Design by	Eng.Ahmadullah(Noorzad)	Checked by	Eng.Dost Mohammad	Date
Project Subject	PLAN	Scal	by Cm	Surveyed by	Zurmat team	Approved by	Ferenc Sandor	2011-NOV



PZ01-R03-F07	ROOTS OF PEACE STANDARD DESIGN							
Project Tital	Water divider	Sheet No	1/8	Drawn & Design by	Eng.Ahmadullah	Checked by	Eng.Dost Mohammad	Date
Project Subject	PLAN	Scal	by Cm	Surveyed by	Zurmat team	Approved by	Ferenc Sandor	2011-NOV


RCC Slab(15)cm(1:2:4)
SECTION B-B
200
40
20
140
Groud level
150
140
30
20
40
40
540
RCC Slab(15)cm(1:2:4)
SECTION A-A
RCC Slab(15)cm
200
40
20
120
20
40
200
Nucca
Groud level
150
140
30
20
40
40
540
P20I-R03-F07
ROOTS OF PEACE
STANDARD DESIGN
Project Title
Sheet No 1/8
Drawn & Design by Eng.Ahmadullah
Checked by Eng.Basit Mohammad
Date
Section
Scal
by Cm
Surveyed by Zurmat Team
Approved by Ferenc Sandor
2011-NOV


RCC Slab(15)cm(1:2:4)
SECTION F-F
200
40
20
140
Nucca
Groud level
135
40
30
20
40
40
400
RCC Slab(15)cm(1:2:4)
SECTION E-E
RCC Slab(15)cm
200
40
20
120
20
40
200
Nucca
Groud level
140
40
30
20
40
40
640
PZ01-R03-F07
ROOTS OF PEACE
STANDARD DESIGN
Project Thai
Sheet No 1/8
Drawn & Design by Eng.Ahmadullah
Checked by Eng.Dost Mohammad
Date
Section
Scal by Cm
Surveyed by Zurmat Jean
Approved by Ferenc Sandor
2011-NOV


SECTION D-D
160
150
Ground level
40
80
40
SECTION C-C
160
150
Ground level
40
80
40
ROOTS OF PEACE
STANDARD DESIGN
PZDL-R03-F07
Project Ttal
Sheet No
1/8
Drawn & Design by
Checked by
Eng.Dost Mohammad
Date
Section
Scale
by Cr
Surveyed by
Approved by
Ferenc Sandor
2021-NOV

RCC SLAB DETAIL

PZ01-R03-F07	ROOTS OF PEACE							
	STANDARD DESIGN							
Project Tital	Water divider	Sheet No	1/8	Drawn & Design by	Eng.Ahmadullah	Checked by	Eng.Dost Mohammad	Date
Project Subject	Slab detail	Scal	by Cm	Surveyed by	Zurmat team	Approved by	Ferenc Sandor	2011-NOV

8.1.16.2 Implementation Cost

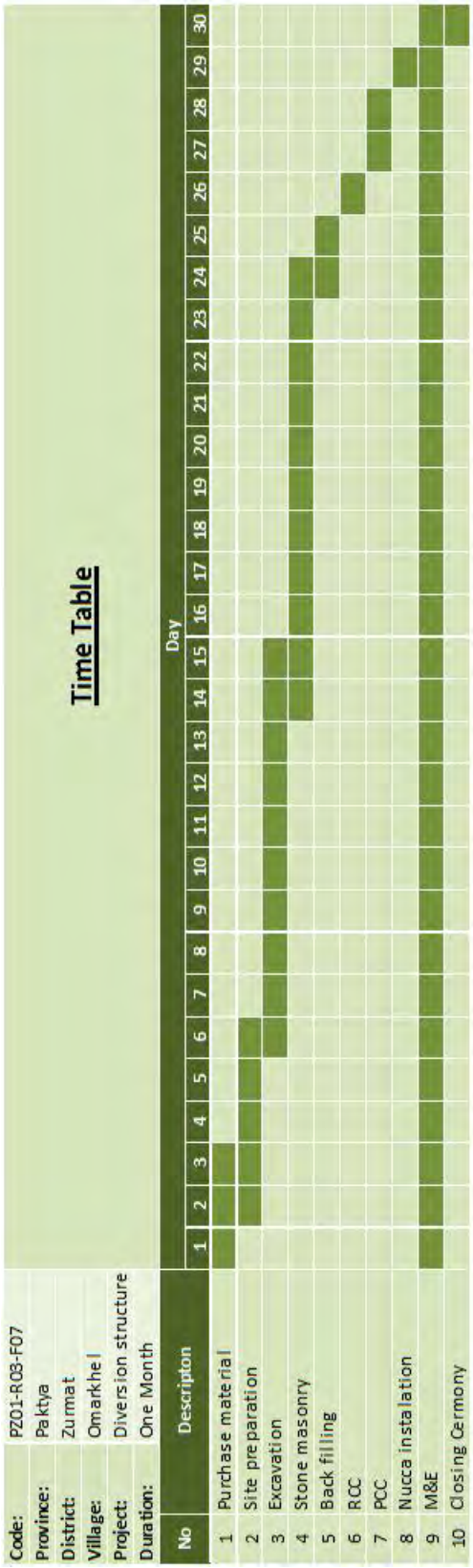
Bill of Quantity (BoQ)

Code: PZ01-R03-F07
Province: Paktya
District: Zurmat
Village: Omarkhel
Project: Diversion structure
Date: November-11

Title	No.	Norm./ Unit	Item	Qty	Unit	Unit cost	Total cost
						$USD	$USD
A1	**1.00**		**Site preparation**	**40.00**	m^2		
	1.01	0.04	Unskilled labor	2.00	md	7.00	14.00
A2	**2.00**		**Excavation**	**42.10**	m^3		
	2.01	1.00	Unskilled labor	**43.00**	md	7.00	**301.00**
A3	**3.00**		**Stone Masonry**	**53.40**	m^3		
	3.01	1.10	Stone & transport	58.74	m^3	6.00	352.44
	3.02	77.70	Cement	83.00	Bag	7.00	581.00
	3.03	0.50	Skilled labor	27.00	md	14.00	378.00
	3.04	1.00	Unskilled labor	54.00	md	7.00	378.00
A4	**4.00**		**Back filling**	**10.90**	**m^3**		
	4.01	1.00	Soil	10.90	m^3	6.00	65.40
	4.02	0.33	Unskilled labor	4.00	md	7.00	28.00
A5	**5.00**		**PCC (1:2:4)**	**0.19**	m^3	150.00	28.50
	6.00		**PCC (1:3:6)**	**4.33**	m^3		
	6.01	1.06	Sandy gravel	4.59	m^3	25.00	114.75
	6.02	250.00	Cement	22.00	Bag	7.00	154.00
	6.03	0.65	Skilled labor on site	3.00	md	14.00	42.00
	6.04	3.25	Unskilled labor on site	15.00	md	7.00	105.00
A6	**7.00**		**Pointing**	**30.00**	m^2		
A7	7.01	0.01	Sand	0.30	m^3	25.00	7.50
	7.02	250.00	Cement (M: 200, 1:3)	3.00	Bag	7.00	21.00
	7.03	0.17	Skilled labor on site	5.00	md	14.00	70.00
	7.04	0.05	Unskilled labor on site	2.00	md	7.00	14.00
	8.00		Nucca (Dia. 10 inch)	4.00	Nos	6.00	24.00
A8	**9.00**		**Personal**				
	9.01	1.00	Foreman	30.00	md	10.00	300.00
	9.03	1.00	Storekeeper	30.00	md	7.00	210.00
	9.04	2.00	Guard	60.00	md	10.00	600.00
A9	**10.00**		**Tools, transport**	**1.00**	**Ls**	**1,000.00**	1,000.00
						Grand total	**4,788.59**

Prepared by: Eng. Ahmadullah Noorzad

8.1.16.3 Implementation Time Table



Code:	PZ01-R03-F07
Province:	Paktya
District:	Zurmat
Village:	Omarkhel
Project:	Diversion structure
Duration:	One Month

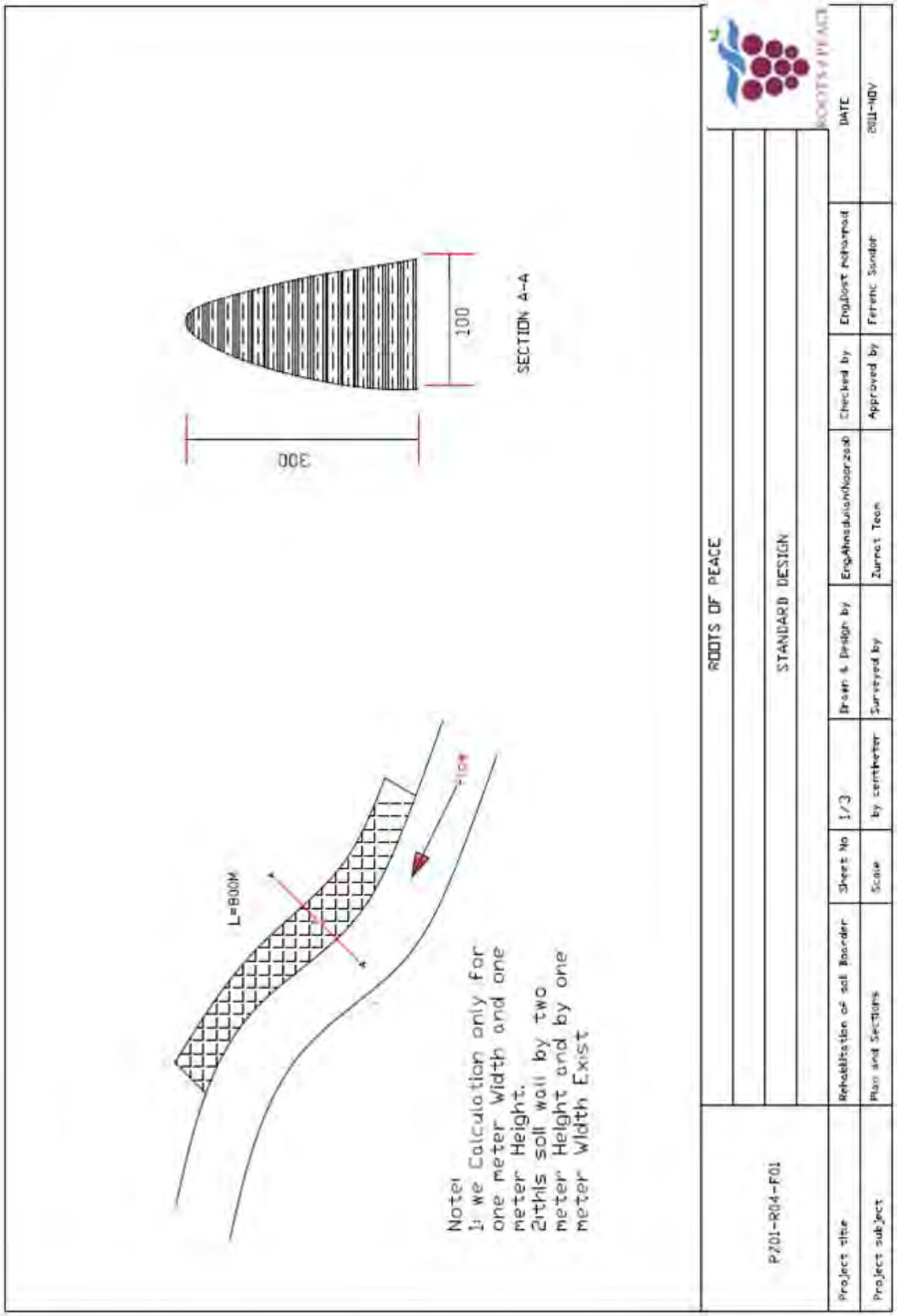
Time Table

No	Description	Day																												
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	Purchase material																														
2	Site preparation																														
3	Excavation																														
4	Stone masonry																														
5	Back filling																														
6	RCC																														
7	PCC																														
8	Nucca instalation																														
9	M&E																														
10	Closing Cermony																														

8.1.17 Shomshad Stream Bank Rehabilitation

Figure 61 The Shomshad stream bank

8.1.17.1 Implementation Design



8.1.17.2 Implementation Cost

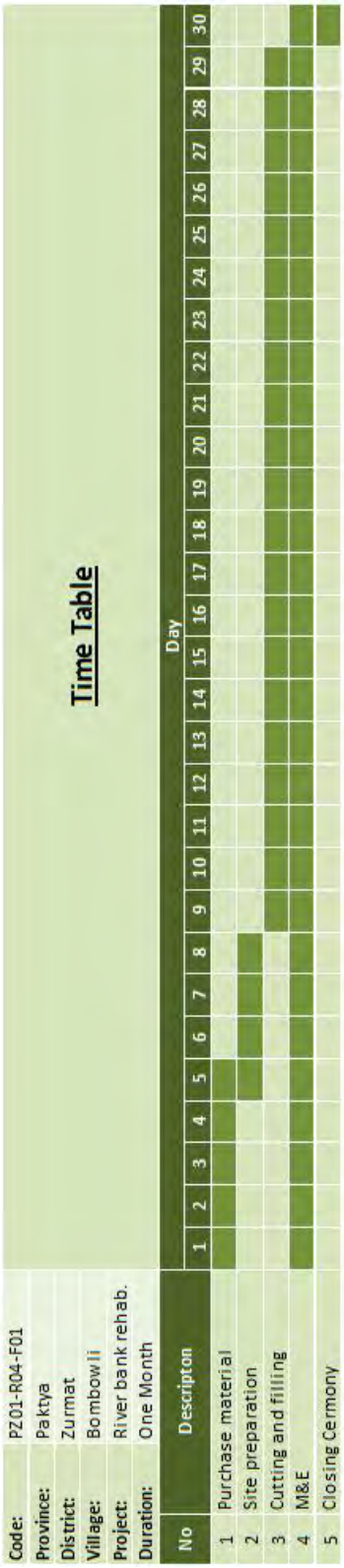
Bill of Quantity(BoQ)

Code: **PZ01-R04-F01**
Province: **Paktya**
District: **Zurmat**
Village: **Bombowli**
Project: **River Bank Rehabilitation**
Date: **November-11**

Title	No.	Norm./ Unit	Item	Qty	Unit	Unit cost	Total cost
						$USD	$USD
A1	**1.00**		**Site preparation**	800.00	m^2		
	1.01	0.01	Unskilled labor	8.00	md	7.00	56.00
A2	**2.00**		**Cutting and filling**	1,600.00	m^3		
	2.01	1.10	Unskilled labor	1,760.00	md	7.00	12,320.00
A3	**3.00**		**Equipment**				
	3.01		Spade	30.00	Unit	5.00	150.00
	3.02		Pike axe	10.00	Unit	5.00	50.00
	3.03		Hand cart	8.00	Unit	65.00	520.00
	3.04		Axe	4.00	Unit	10.00	40.00
	3.05		Water color	6.00	Unit	8.00	48.00
	3.06		Glasses	12.00	Unit	2.00	24.00
A8	**4.00**		**Personal**				
	4.01	2.00	Foreman	60.00	md	10.00	600.00
	4.02	1.00	Team leader	30.00	md	15.00	450.00
	4.03	1.00	Storekeeper	30.00	md	7.00	210.00
	4.04	2.00	Guard	60.00	md	10.00	600.00
A9	**5.00**		**Tools, transport**	**1.00**	**Ls**	**1,000.00**	1,000.00
						Grand total	**16,068.00**

Prepared by: Eng. Ahmadullah Noorzad

8.1.17.3 Implementation Time Table



Code:	PZ01-R04-F01
Province:	Paktya
District:	Zurmat
Village:	Bombowli
Project:	River bank rehab.
Duration:	One Month

Time Table

No	Descripton	Day																												
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	Purchase material																														
2	Site preparation																														
3	Cutting and filling																														
4	M&E																														
5	Closing Cermony																														

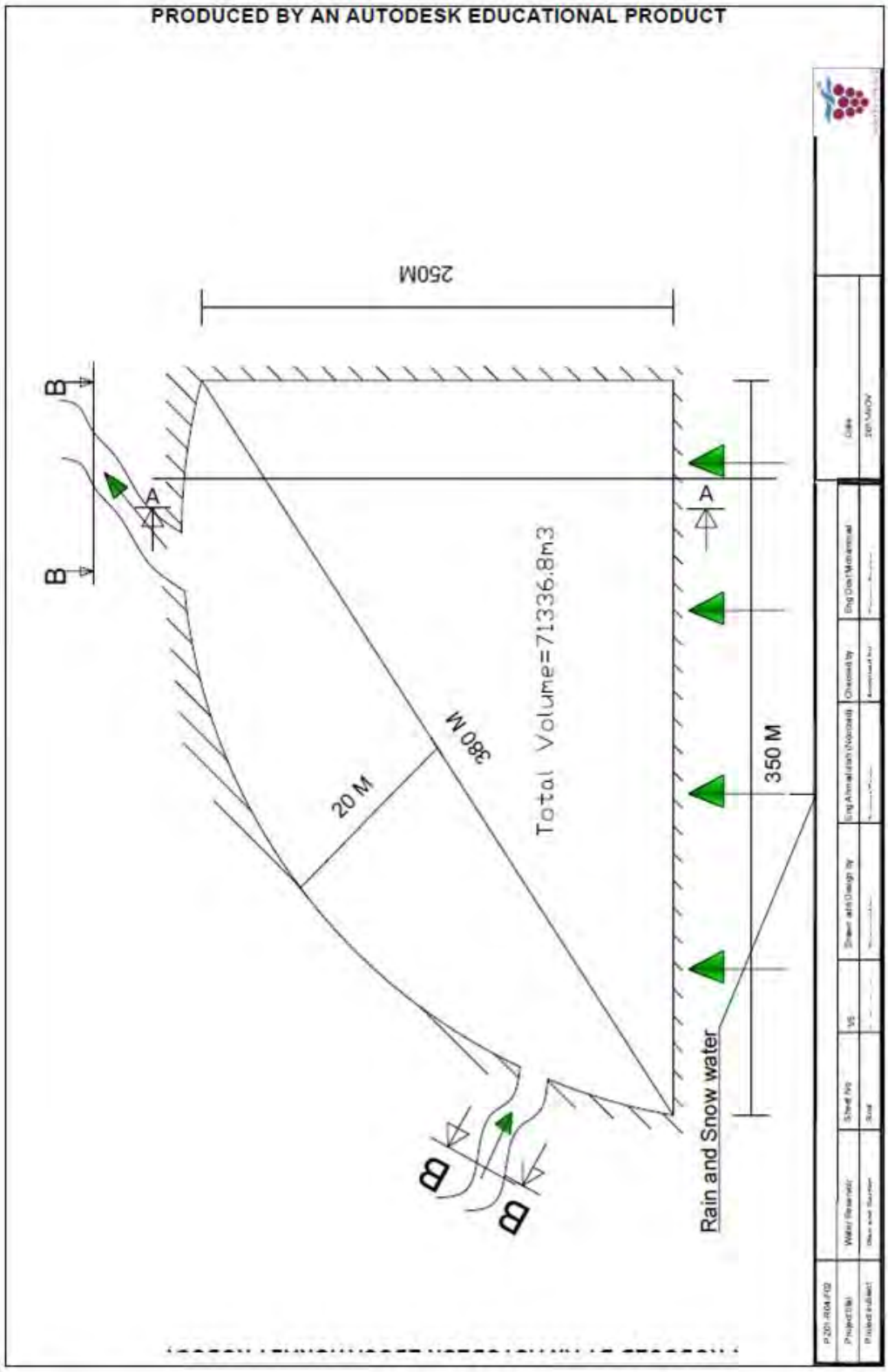
8.2 Water Dam Construction

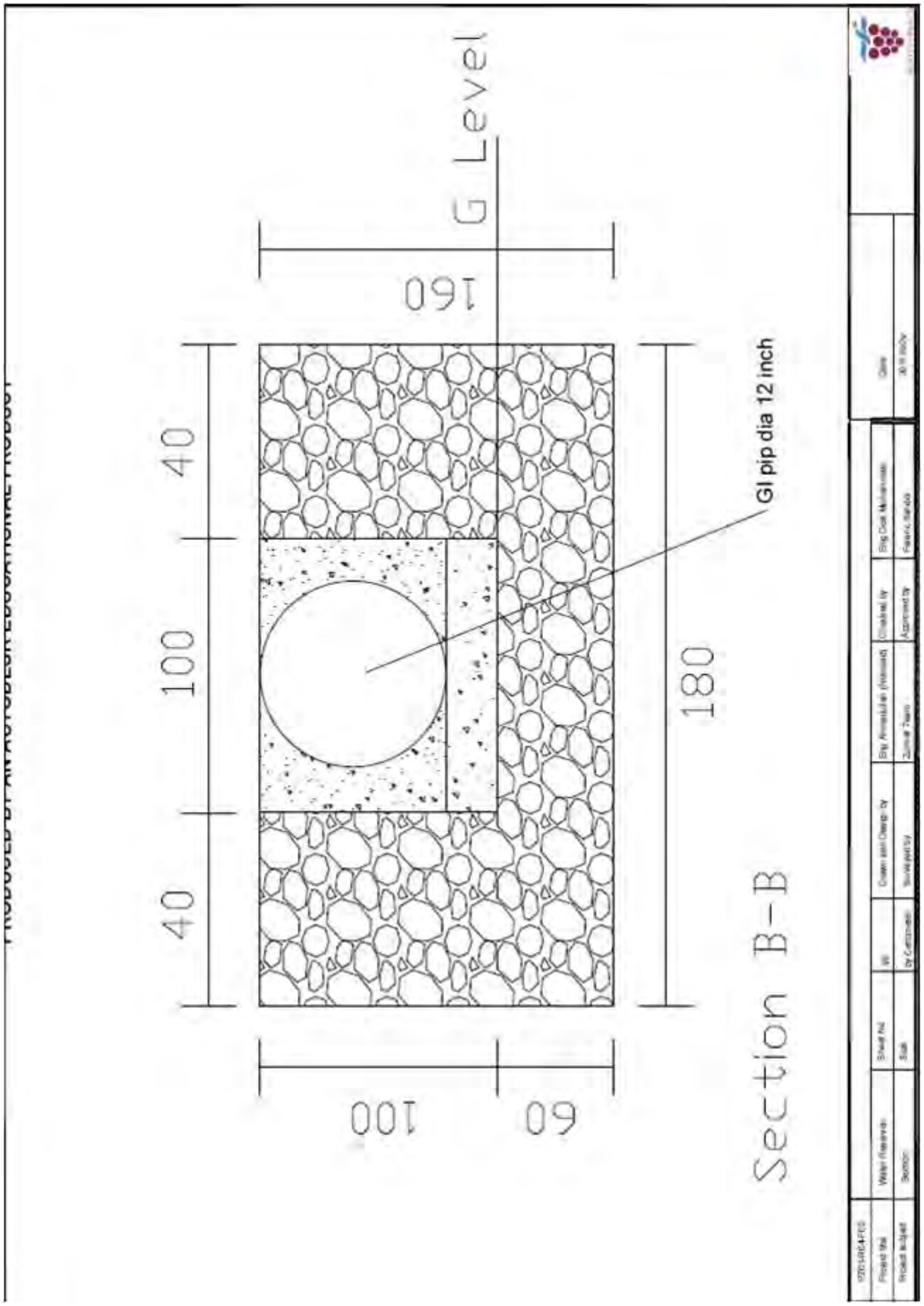
Connected to the stream canal network, the survey team recommended the construction of several small water reservoirs. The function of reservoirs would serve for multi purposes. They obviously will expand the time period when water will be available for irrigation purposes. They also will perform as water buffer reservoir. During flood time the buffer reservoirs will able to absorb part of the excess water protecting the farmland. Their outlet diversion structure will also distribute water in the area. Finally they will able to take the drainage water from the farmland.

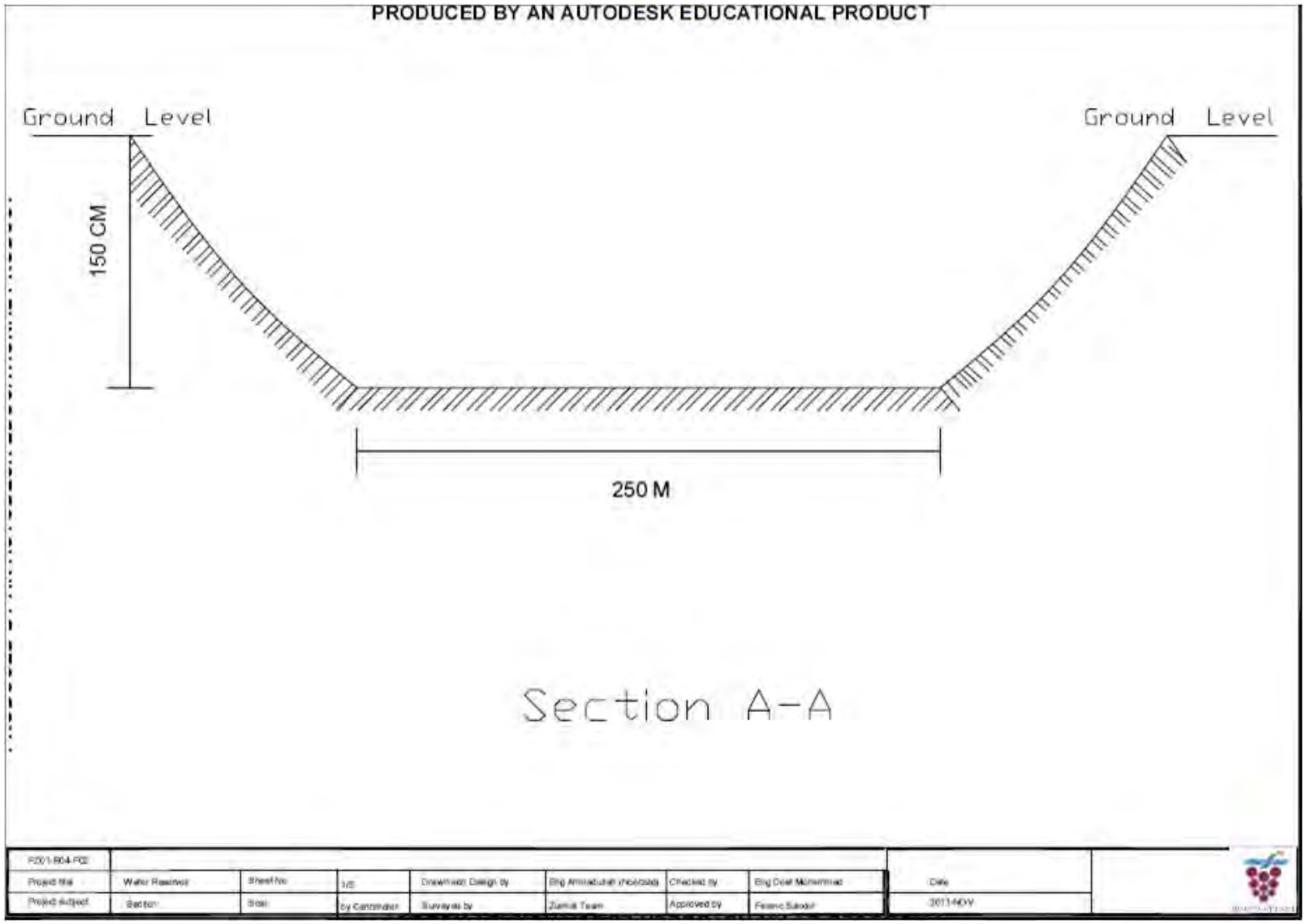
8.2.1 Andar Water Reservoir

Figure 62 The Andar reservoir area

8.2.1.1 Implementation Design




G Level
160
40
100
40
180
GI pip dia 12 inch
100
60
Section B-B


PRODUCED BY AN AUTODESK EDUCATIONAL PRODUCT
Ground Level
Ground Level
150 CM
250 M
Section A-A

8.2.1.2 Implementation Cost

Bill of Quantity (BoQ)

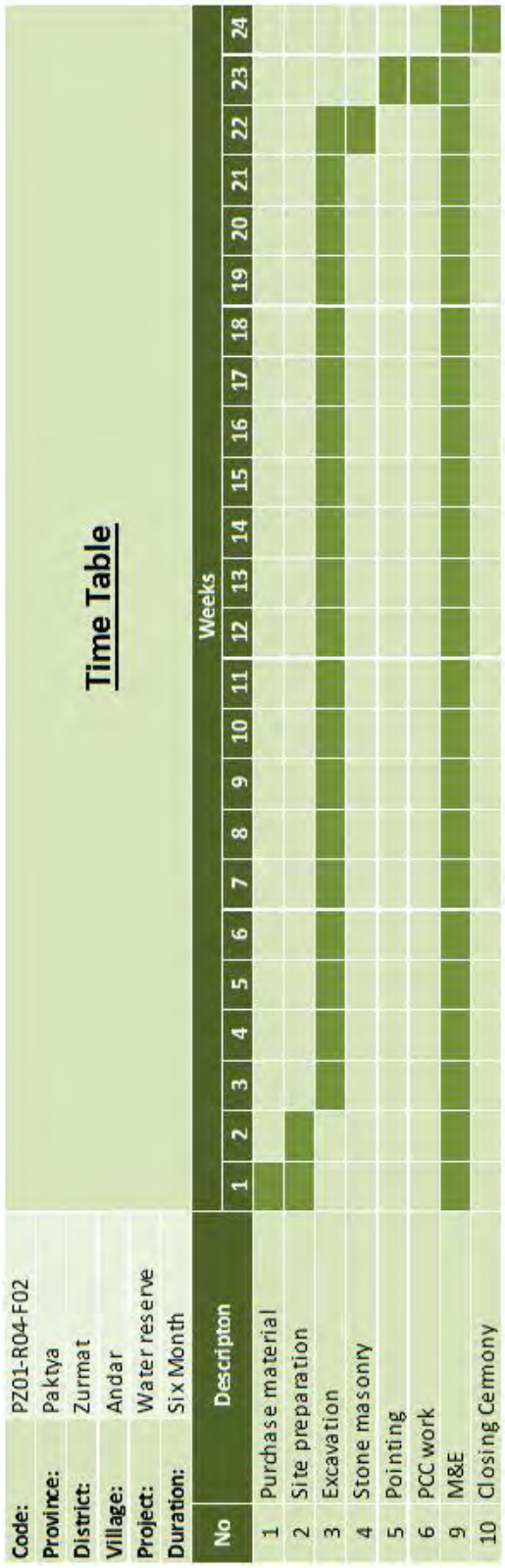
Code: PZ01-R04-F02 **Village:** Andar

Location: Paktya, Zurmat district **Project:** Water Reservoir

Title	No.	Norm./ Unit	Item	Qty	Unit	Unit cost	Total cost
						$USD	$USD
A1	**1.00**		**Site preparation**	**47,557.00**	m^2		
	1.01	0.00	Unskilled labor	190.00	md	7.00	1,330.00
A2	**2.00**		**Excavation**	**71,336.80**	m^3		
	2.01	1.10	Unskilled labor	78,471.00	md	7.00	549,297.00
A3	**3.00**	3.00	**Stone Masonry**	**13.90**	m^3		
	3.01	0.39	Sand	5.40	m^3	25.00	135.00
	3.02	77.70	Cement	22.00	Bag	7.00	154.00
	3.03	0.50	Skilled labor	7.00	md	14.00	98.00
	3.04	1.00	Unskilled labor	14.00	md	7.00	98.00
A4	**4.00**		**Equipment**				
	4.01		Spade	210.00	Unit	5.00	1,050.00
	4.02		Pike axe	80.00	Unit	5.00	400.00
	4.03		Hand Cart	60.00	Unit	65.00	3,900.00
	4.04		Axes	5.00	Unit	10.00	50.00
	4.05		Water color	15.00	Unit	8.00	120.00
	4.06		Glasses	30.00	Unit	2.00	60.00
	4.07		GI Pipe dia. 12 inch	12.00	m	25.00	300.00
A5	**5.00**		**Pointing**	**11.00**	m^3		
	5.01	0.01	Sand	0.11	m^3	25.00	2.75
	5.02	200.00	Cement (M: 200, 1:3)	2.00	Bag	7.00	14.00
	5.03	0.17	Skilled labor on site	2.00	md	14.00	28.00
	5.04	0.05	Unskilled labor on site	1.00	md	7.00	7.00
A6	**6.00**		**PCC**	**3.11**	**m^3**		
	6.01	1.06	Sandy gravel	3.29	m^3	25.00	82.25
	6.02	250.00	Cement	15.00	Bag	7.00	105.00
	6.03	0.65	Skilled labor on site	2.00	Unit	14.00	28.00
	6.04	3.25	Unskilled labor on site	11.00	Unit	7.00	77.00
A7	**7.00**		**Personal**				
	7.01	4.00	Foreman	720.00	md	10.00	7,200.00
	7.02	1.00	Team Leader	180.00		15.00	2,700.00
	7.03	1.00	Storekeeper	180.00	md	7.00	1,260.00
	7.04	4.00	Guard	720.00	md	10.00	7,200.00
A8	**8.00**		**Tools, transport**	1.00	**Ls**	4,000.00	4,000.00
						Grand total	**579,696.00**

Prepared by: Eng. Ahmadullah Noorzad

8.2.1.3 Implementation Time Table



Time Table

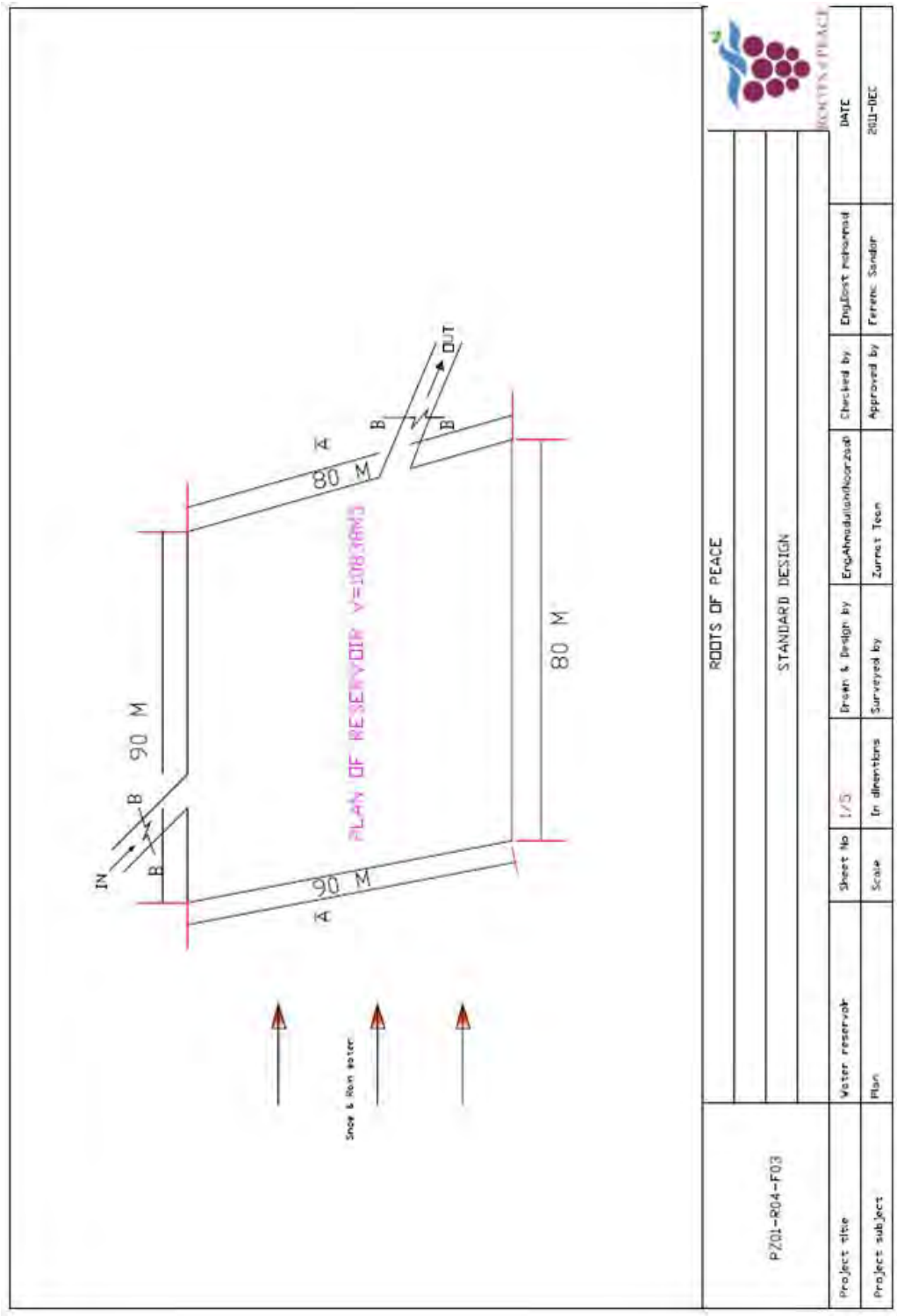
Code:	PZ01-R04-F02
Province:	Paktya
District:	Zurmat
Village:	Andar
Project:	Water reserve
Duration:	Six Month

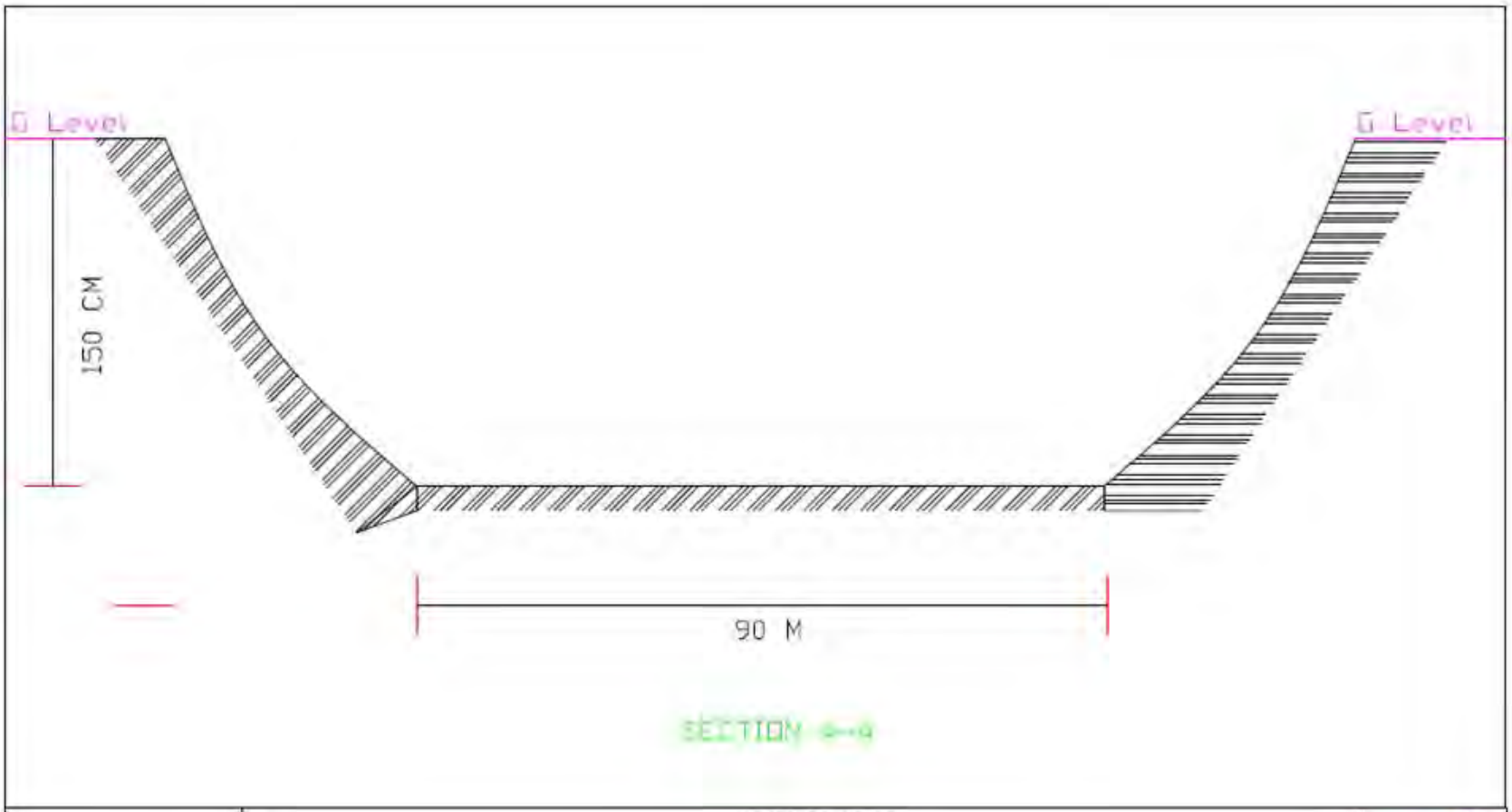
No	Description	Weeks																							
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1	Purchase material																								
2	Site preparation																								
3	Excavation																								
4	Stone masonry																								
5	Pointing																								
6	PCC work																								
9	M&E																								
10	Closing Cemony																								

8.2.2 Galbati Water Reservoir

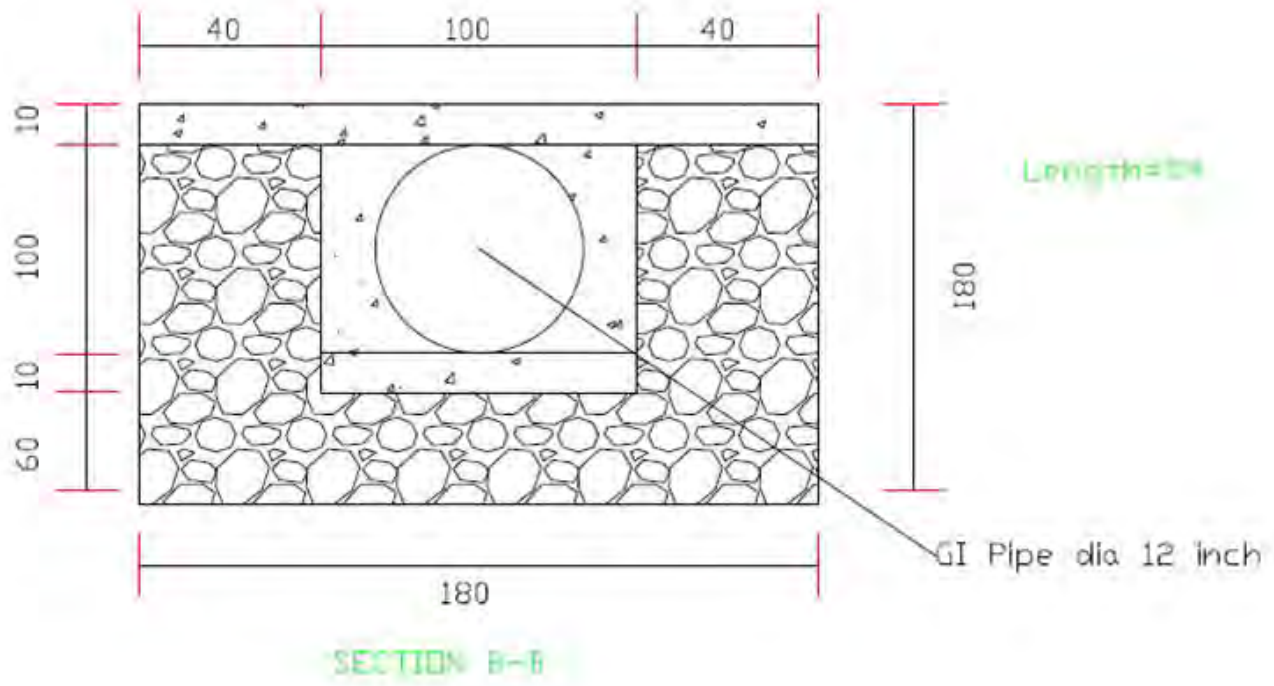
Figure 63 The Galbati reservoir area

8.2.2.1 Implementation Design





PZ01-R04-F03	ROOTS OF PEACE							
	STANDARD DESIGN							
Project title	Water reservoir	Sheet No	1/3	Drawn & Design by	Eng.Ahmadullah/Noorzaib	Checked by	Eng.Dost mohamad	DATE
Project subject	Sections	Scale	In dimentions	Surveyed by	Zurnat Team	Approved by	Ferenc Sandor	2011-DEC



SECTION B-B

PZ01-R04-F03	ROOTS OF PEACE							
	STANDARD DESIGN							
Project title	Water reservoir	Sheet No	1/5	Drawn & Design by	Eng.Ahmadullah/Noorzad	Checked by	Eng.Dost mohammad	DATE
Project subject	Sections	Scale	by Centimeter	Surveyed by	Zurmat Team	Approved by	Ferenc Sandor	2011-DEC

8.2.2.2 *Implementation Cost*

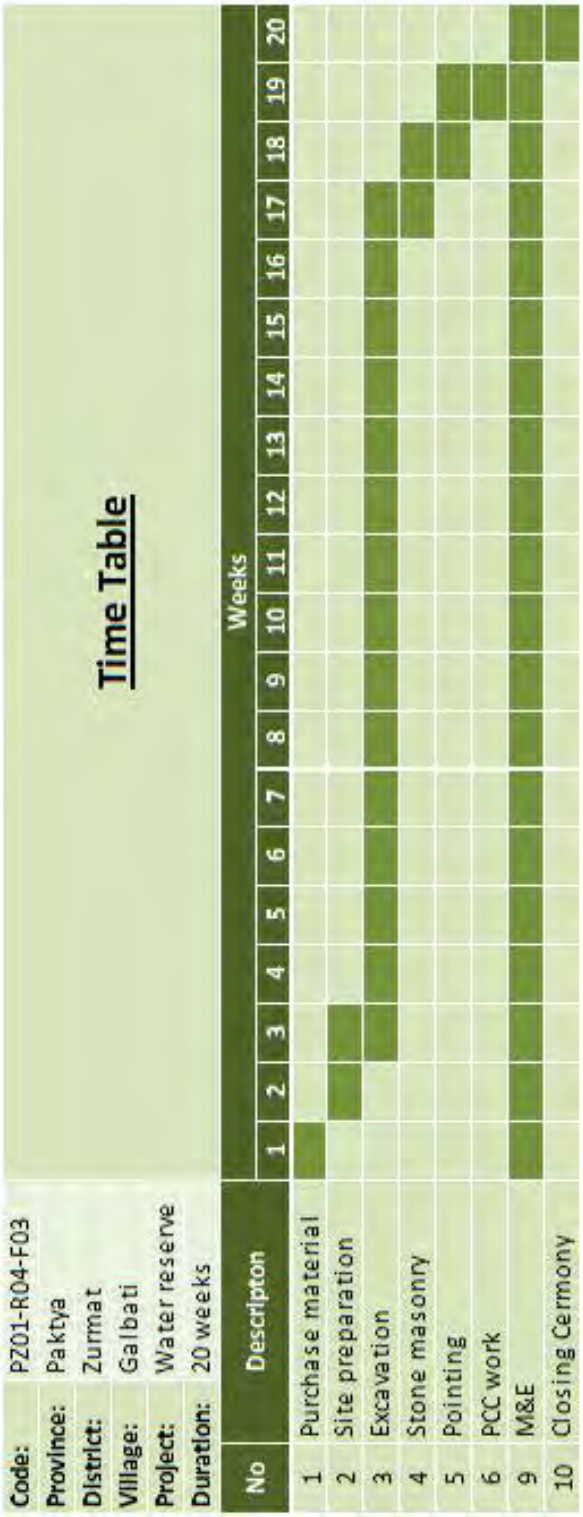
Bill of Quantity (BoQ)

Code:	**PZ01-R04-F03**	**Village:**	**Landi Shah**
Province:	**Paktya**	**Project:**	**Water Reservoir**
District:	**Zurmat**	**Date:**	**November-11**

Title	No.	Norm./ Unit	Item	Qty	Unit	Unit cost	Total cost
						$USD	$USD
A1	**1.00**		**Site preparation**	**7,225.00**	m^2		
	1.01	0.00	Unskilled labor	29.00	md	7.00	203.00
A2	**2.00**		**Excavation**	**10,838.00**	m^3		
	2.01	1.10	Unskilled labor	11,922.00	md	7.00	83,454.00
A3	**3.00**	3.00	**Stone Masonry**	**16.00**	m^3		
	3.01	0.39	Sand	6.21	m^3	25.00	155.25
	3.02	77.70	Cement	24.00	Bag	7.00	168.00
	3.03	0.50	Skilled labor	8.00	md	14.00	112.00
	3.04	1.00	Unskilled labor	16.00	md	7.00	112.00
A4	**4.00**		**Equipment**				
	4.01		Spade	80.00	Unit	5.00	400.00
	4.02		Pike axe	30.00	Unit	5.00	150.00
	4.03		Hand Cart	25.00	Unit	65.00	1,625.00
	4.04		Axes	5.00	Unit	10.00	50.00
	4.05		Water Color	15.00	Unit	8.00	120.00
	4.06		Glasses	30.00	Unit	2.00	60.00
	4.07		GI Pipe dia. 12 inch	10.00	m	25.00	250.00
	4.08		Valve	2.00	Unit	90.00	180.00
A5	**5.00**		**Pointing**	**10.00**	m^3		
	5.01	0.01	Sand	0.10	m^3	25.00	2.50
	5.02	200.00	Cement (M: 200, 1:3)	2.00	Bag	7.00	14.00
	5.03	0.17	Skilled labor on site	2.00	md	14.00	28.00
	5.04	0.05	Unskilled labor on site	1.00	md	7.00	7.00
A6	**6.00**		**PCC**	**4.00**	**m^3**		
	6.01	1.06	Sandy gravel	4.24	m^3	25.00	106.00
	6.02	250.00	Cement	21.00	Bag	7.00	147.00
	6.03	0.65	Skilled labor on site	3.00	Unit	14.00	42.00
	6.04	3.25	Unskilled labor on site	13.00	Unit	7.00	91.00
A7	**7.00**		**Personal**				
	7.01	4.00	Foreman	600.00	md	10.00	6,000.00
	7.02	1.00	Team Leader	150.00		15.00	2,250.00
	7.03	1.00	Storekeeper	150.00	md	7.00	1,050.00
	7.04	4.00	Guard	600.00	md	10.00	6,000.00
A8	**8.00**		**Tools, transport**	1.00	**Ls**	3,500.00	3,500.00
						Grand total	**106,276.75**

Prepared by: Eng. Ahmadullah Noorzad

8.2.2.3 Implementation Time Table



Time Table

Code:	PZ01-R04-F03
Province:	Paktya
District:	Zurmat
Village:	Galbati
Project:	Water reserve
Duration:	20 weeks

No	Description	Weeks																			
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	Purchase material																				
2	Site preparation																				
3	Excavation																				
4	Stone masonry																				
5	Pointing																				
6	PCC work																				
9	M&E																				
10	Closing Cermony																				

8.2.3 Lowy Water Reservoir

Figure 64 The Lowy reservoir area

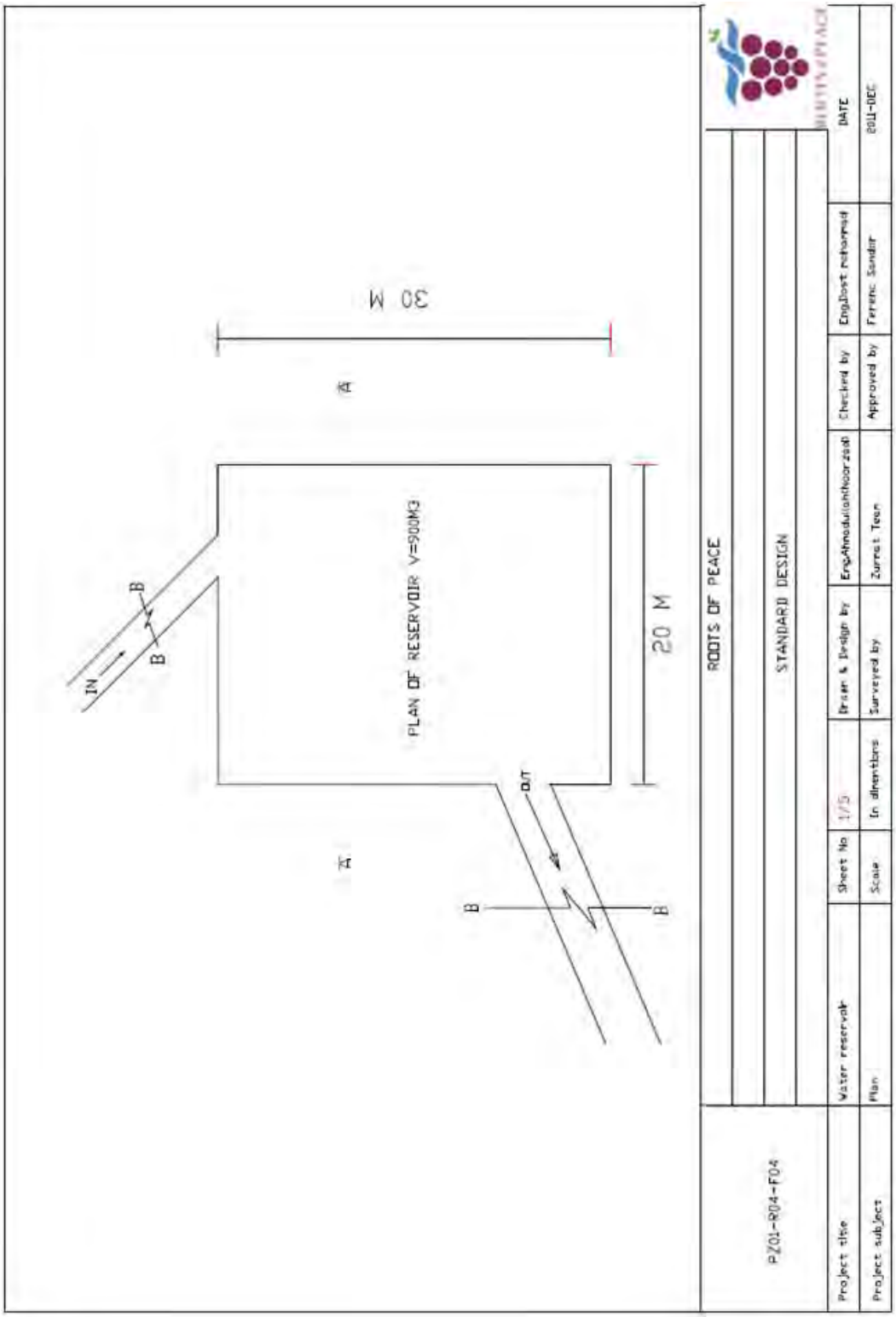
8.2.3.1 Implementation Time Table

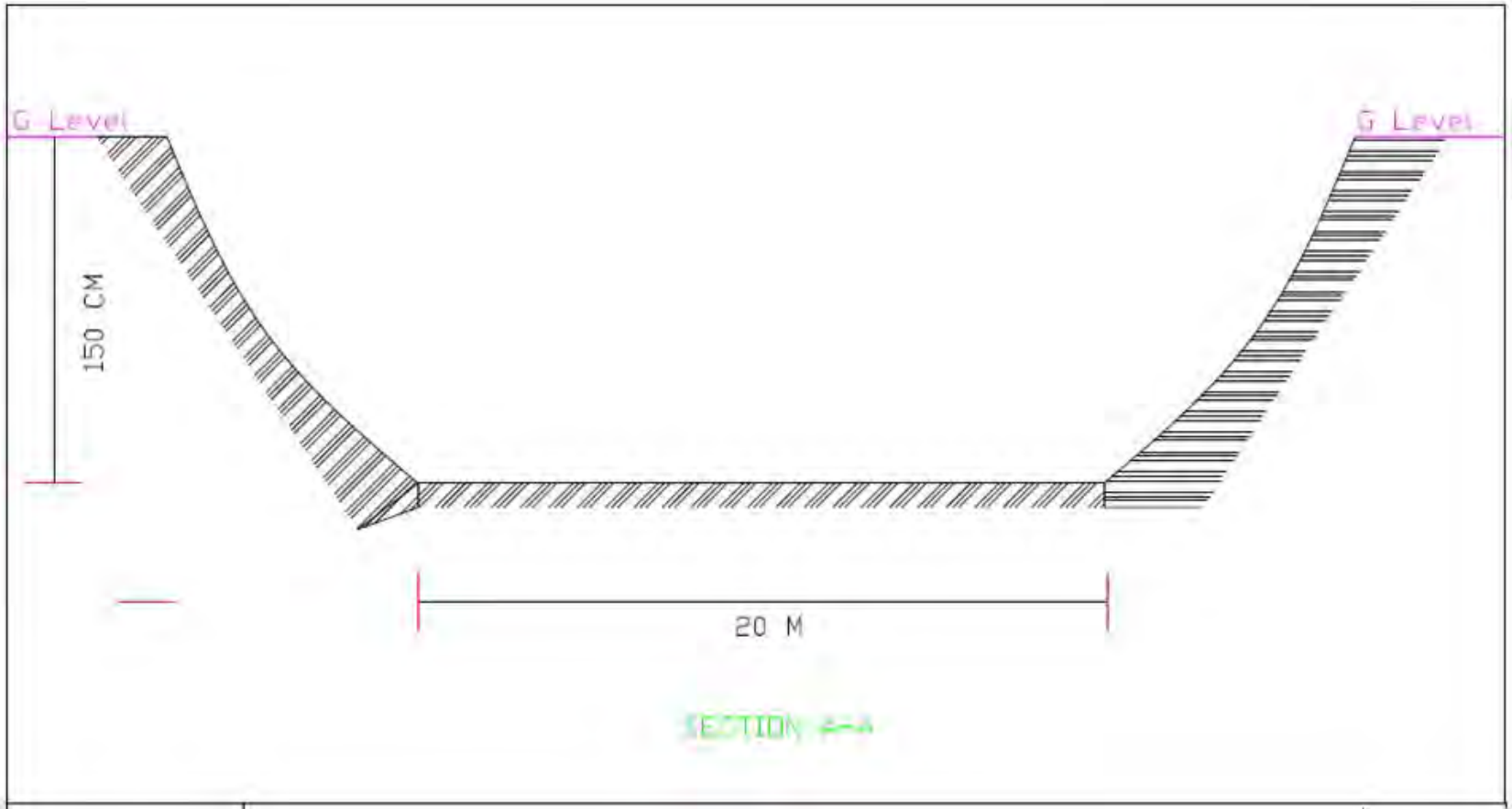
Code:	PZ01-R04-F04
Province:	Paktya
District:	Zurmat
Village:	Lowy
Project:	Water Reserve
Duration:	16 weeks

Time Table

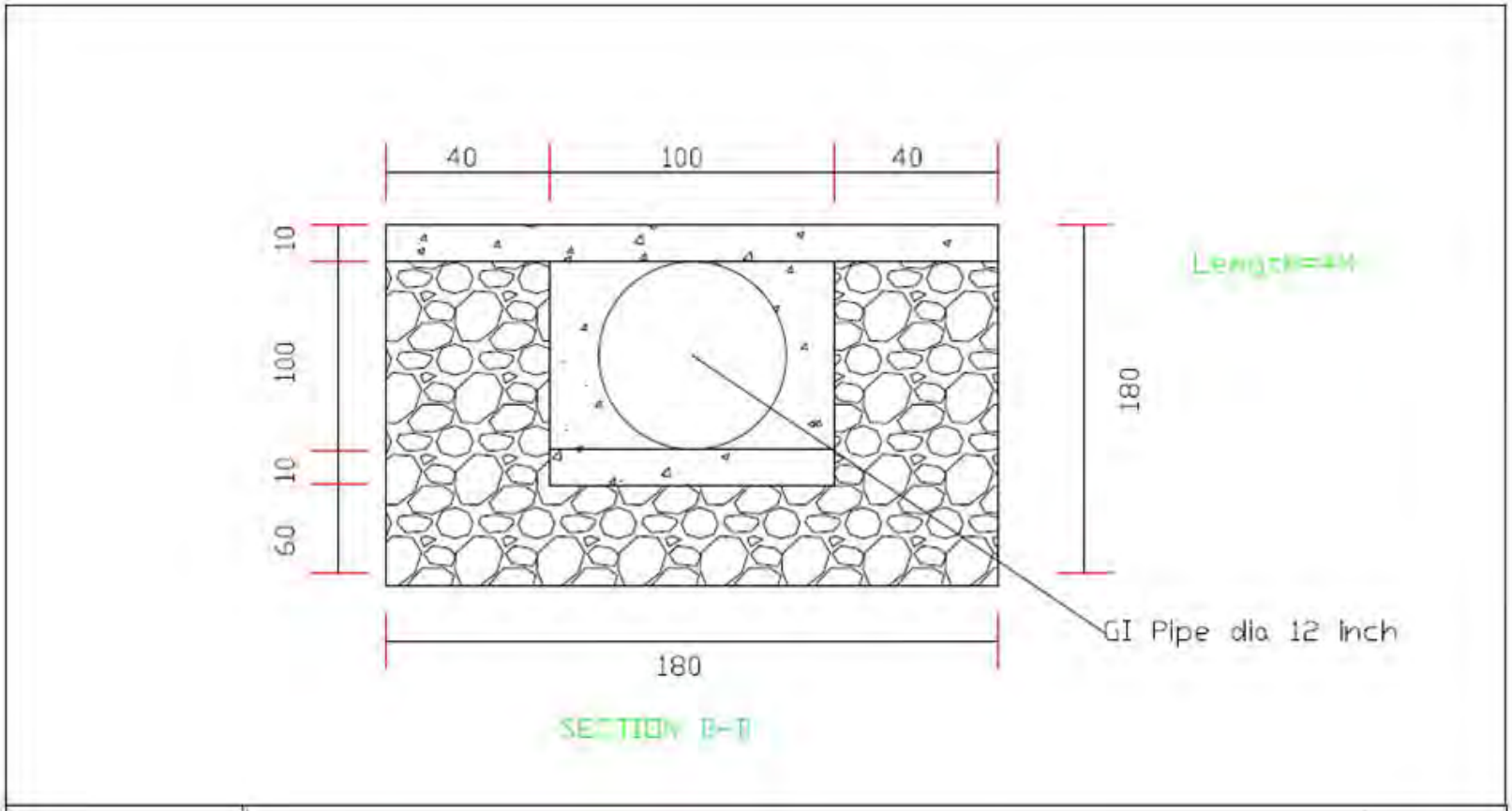
No	Description	Weeks															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	Purchase material																
2	Site preparation																
3	Excavation																
4	Stone masonry																
5	Pointing																
6	PCC work																
9	M&E																
10	Closing Ceremony																

8.2.3.2 Implementation Design





PZ01-R04-F04	ROOTS OF PEACE							
	STANDARD DESIGN							
Project title	Water reservoir	Sheet No	1/5	Drawn & Design by	Eng.Ahmadullah Noorzaab	Checked by	Eng.Dost mohammad	DATE
Project subject	Sections	Scale	In dimentions	Surveyed by	Zurnat Team	Approved by	Ferenc Sandor	2011-DEC



PZ01-R04-F04	ROOTS OF PEACE							
	STANDARD DESIGN							
Project title	Water reservoir	Sheet No	1/3	Drawn & Design by	Eng.Ahmadullah/Noorzaib	Checked by	Eng.Dost mohammad	DATE
Project subject	Sections	Scale	by Centimeter	Surveyed by	Zurmat Team	Approved by	Ferenc Sandor	2011-DEC

8.2.3.3 Implementation Cost

Bill of Quantity (BoQ)

Code:	**PZ01-R04-F04**	**Village:**	**Lowy**
Province:	**Paktya**	**Project:**	**Water Reservoir**
District:	**Zurmat**	**Date:**	**November-11**

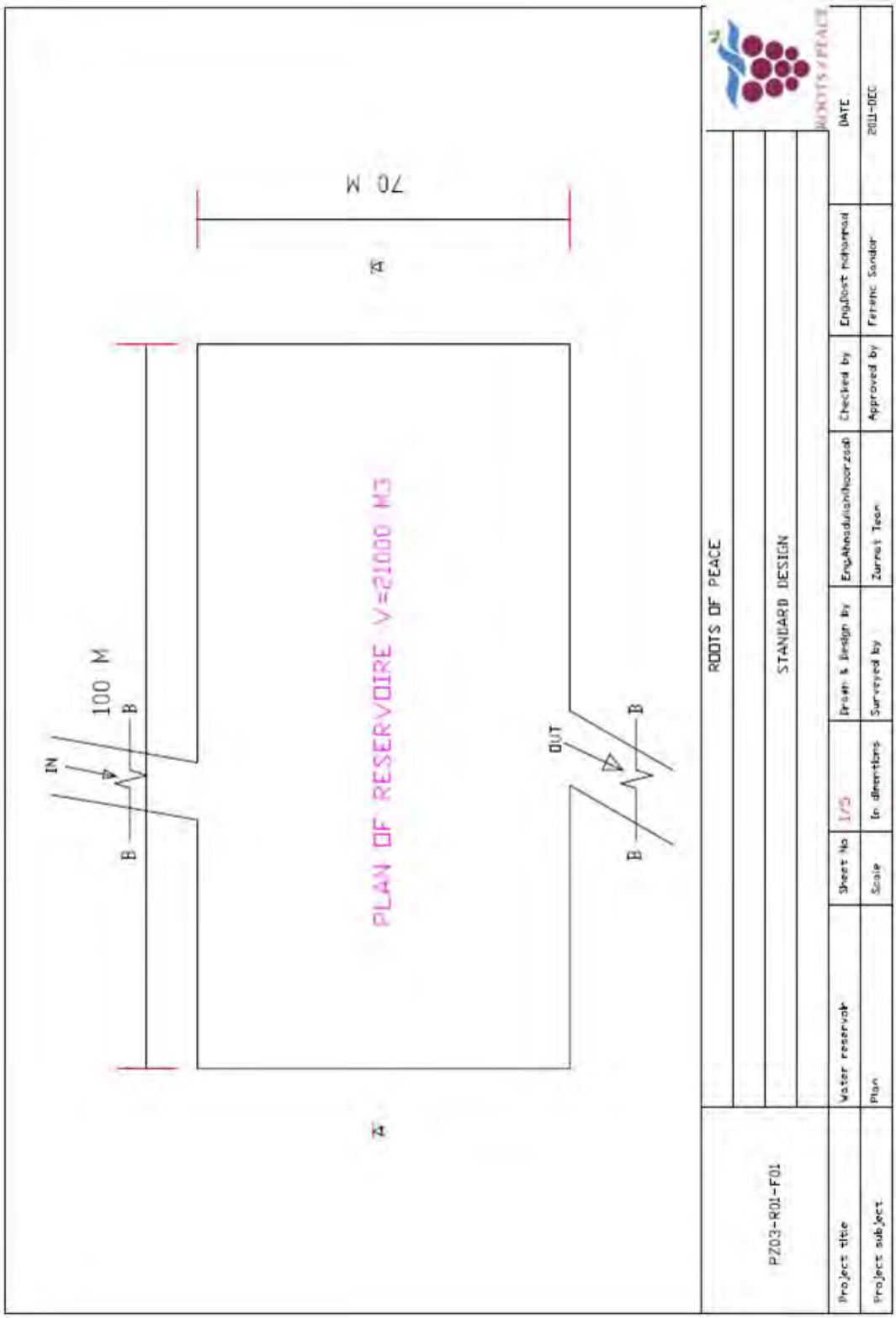
Title	No.	Norm./ Unit	Item	Qty	Unit	Unit cost	Total cost
						$USD	$USD
A1	**1.00**		**Site preparation**	**600.00**	m^2		
	1.01	0.00	Unskilled Labor	6.00	md	7.00	42.00
A2	**2.00**		**Excavation**	**900.00**	m^3		
	2.01	1.10	Unskilled labor	990.00	md	7.00	6,930.00
A3	**3.00**	3.00	**Stone Masonry**	**14.80**	m^3		
	3.01	0.39	Sand	5.74	m^3	25.00	143.50
	3.02	77.70	Cement	23.00	Bag	7.00	161.00
	3.03	0.50	Skilled labor	8.00	md	14.00	112.00
	3.04	1.00	Unskilled labor	15.00	md	7.00	105.00
A4	**4.00**		**Equipment**				
	4.01		Spade	20.00	Unit	5.00	100.00
	4.02		Pike axe	5.00	Unit	5.00	25.00
	4.03		Hand Cart	8.00	Unit	65.00	520.00
	4.04		Axes	3.00	Unit	10.00	30.00
	4.05		Water Color	8.00	Unit	8.00	64.00
	4.06		Glasses	16.00	Unit	2.00	32.00
	4.07		GI Pipe dia. 12 inch	10.00	m	25.00	250.00
	4.08		Valve	2.00	Unit	90.00	180.00
A5	**5.00**		**Pointing**	**18.00**	m^3		
	5.01	0.01	Sand	0.18	m^3	25.00	4.50
	5.02	200.00	Cement (M: 200, 1:3)	3.00	Bag	7.00	21.00
	5.03	0.17	Skilled labor on site	4.00	md	14.00	56.00
	5.04	0.05	Unskilled labor on site	2.00	md	7.00	14.00
A6	**6.00**		**PCC**	**4.00**	**m^3**		
	6.01	1.06	Sandy gravel	4.24	m^3	25.00	106.00
	6.02	250.00	Cement	21.00	Bag	7.00	147.00
	6.03	0.65	Skilled labor on site	3.00	Unit	14.00	42.00
	6.04	3.25	Unskilled labor on site	13.00	Unit	7.00	91.00
A7	**7.00**		**Personal**				
	7.01	4.00	Foreman	240.00	md	10.00	2,400.00
	7.02	1.00	Team Leader	120.00		15.00	1,800.00
	7.03	1.00	Storekeeper	120.00	md	7.00	840.00
	7.04	4.00	Guard	480.00	md	10.00	4,800.00
A8	**8.00**		**Tools, transport**	1.00	**Ls**	3,500.00	3,500.00
						Grand total	**22,516.00**

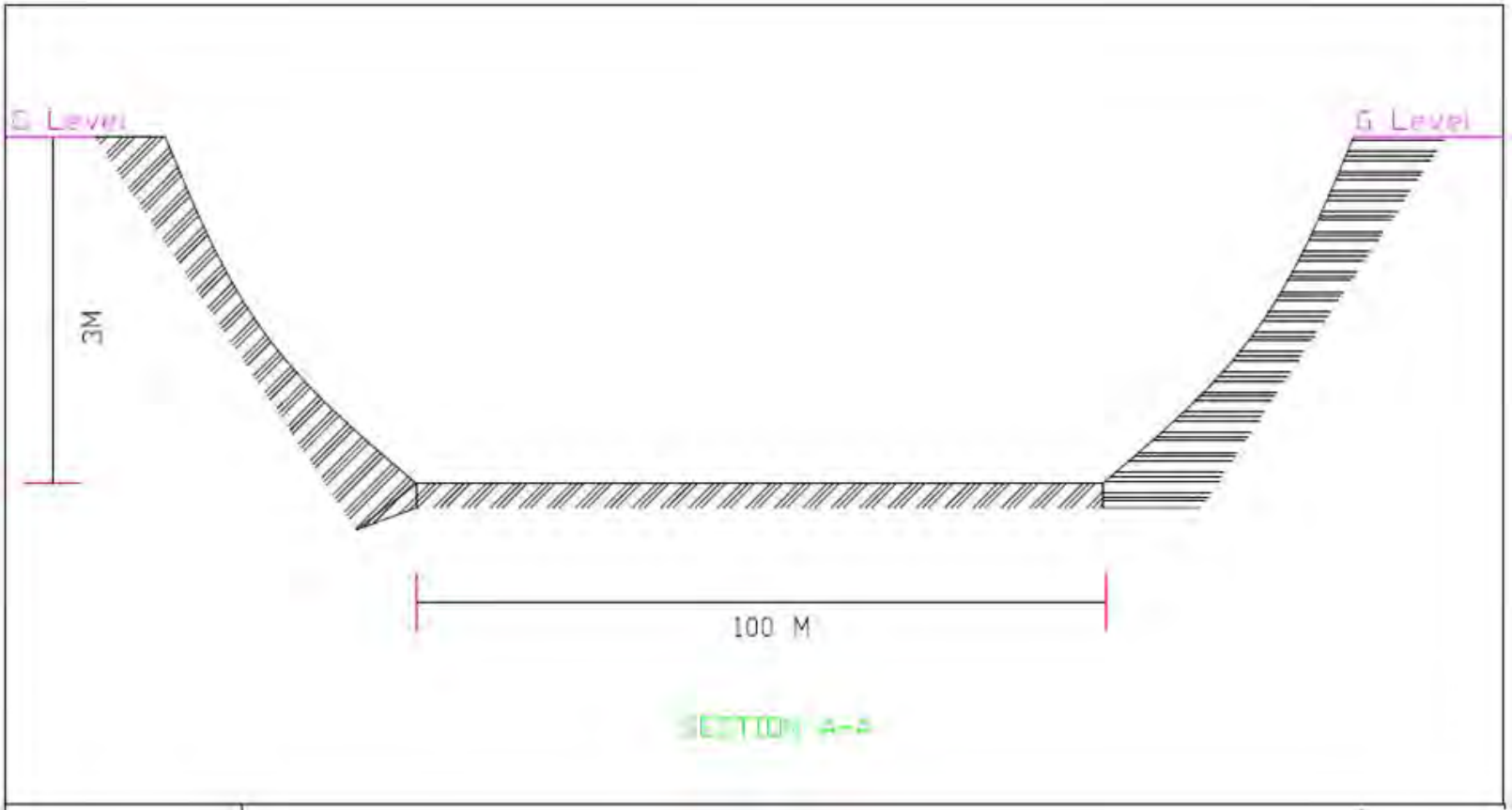
Prepared by: Eng Ahmadullah Noorzad

8.2.4 Niknam Water Reservoir

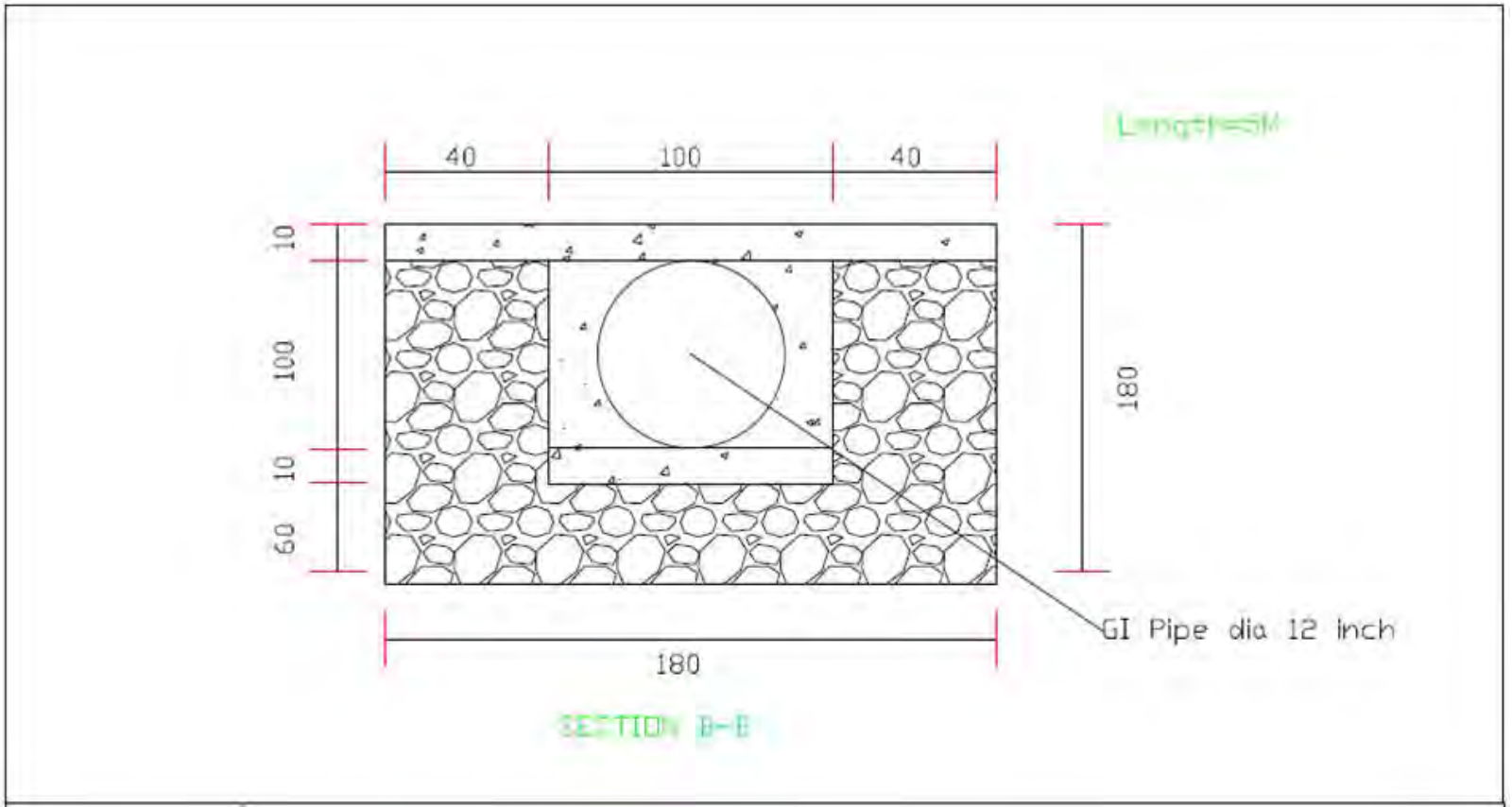
Figure 65 PZ03/R01/F01 Intervention area

8.2.4.1 Implementation Design





PZ03-R01-F01	ROOTS OF PEACE							
	STANDARD DESIGN							
Project title	Water reservoir	Sheet No	1/5	Drawn & Design by	Eng.Ahmadullah Noorzad	Checked by	Eng.Dost mohamad	DATE
Project subject	Sections	Scale	In dimentions	Surveyed by	Zarnet Team	Approved by	Ferenc Sandor	2011-DEC



PZ03-R01-F01	ROOTS OF PEACE							
	STANDARD DESIGN							
Project title	Water reservoir	Sheet No	1/5	Drawn & Design by	EngAhmadullahNoorzai	Checked by	EngDost mohammad	DATE
Project subject	Sections	Scale	by Centimeter	Surveyed by	Zurmat Team	Approved by	Ferenc Sandor	2011-DEC

8.2.4.2 Implementation Cost

Bill of Quantity(BoQ)

Code:	**PZ03-R01-F01**	**Village:**	**Niknam**
Province:	**Paktya**	**Project:**	**Water reservoir**
District:	**Zurmat**	**Date:**	**November-11**

Title	No.	Norm./ Unit	Item	Qty	Unit	Unit cost	Total cost
						$USD	$USD
A1	**1.00**		**Site preparation**	**7,000.00**	m^2		
	1.01	0.004	Unskilled Labor	28.00	md	7.00	196.00
A2	**2.00**		**Excavation**	**21,000.00**	m^3		
	2.01	1.10	Unskilled labor	23,100.00	md	7.00	161,700.00
A3	**3.00**	3.00	**Stone Masonry**	**16.00**	m^3		
	3.01	0.39	Sand	6.21	m^3	25.00	155.25
	3.02	77.70	Cement	22.00	Bag	7.00	154.00
	3.03	0.50	Skilled labor	8.00	md	14.00	112.00
	3.04	1.00	Unskilled labor	16.00	md	7.00	112.00
A4	**4.00**		**Equipment**				
	4.01		Spade	80.00	Unit	5.00	400.00
	4.02		Pike axe	20.00	Unit	5.00	100.00
	4.03		Hand Cart	15.00	Unit	65.00	975.00
	4.04		Axes	5.00	Unit	10.00	50.00
	4.05		Water Color	10.00	Unit	8.00	80.00
	4.06		Glasses	20.00	Unit	2.00	40.00
	4.07		GI Pipe dia 12 inch	10.00	m	25.00	250.00
	4.08		Valve	2.00	Unit	90.00	180.00
A5	**5.00**		**Pointing**	**10.00**	m^3		
	5.01	0.01	Sand	0.10	m^3	25.00	2.50
	5.02	200.00	Cement (M: 200, 1:3)	2.00	Bag	7.00	14.00
	5.03	0.17	Skilled labor on site	2.00	md	14.00	28.00
	5.04	0.05	Unskilled labor on site	1.00	md	7.00	7.00
A6	**6.00**		**PCC**	**4.80**	**m^3**		
	6.01	1.06	Sandy gravel	5.08	m^3	25.00	127.00
	6.02	250.00	Cement	24.00	Bag	7.00	168.00
	6.03	0.65	Skilled labor on site	4.00	Unit	14.00	56.00
	6.04	3.25	Unskilled labor on site	16.00	Unit	7.00	112.00
A7	**7.00**		**Personal**				
	7.01	4.00	Foreman	480.00	md	10.00	4,800.00
	7.02	1.00	Team Leader	120.00		15.00	1,800.00
	7.03	1.00	Storekeeper	120.00	md	7.00	840.00
	7.04	4.00	Guard	480.00	md	10.00	4,800.00
A8	**8.00**		**Tools, transport**	1.00	**Ls**	3,000.00	3,000.00
						Grand total	**180,258.75**

Prepared by: Eng Ahmadullah Noorzad

8.2.4.3 Implementation Time Table

Code:	PZ03-R01-F01
Province:	Paktya
District:	Zurmat
Village:	Niknam
Project:	Water reserve
Duration:	16 weeks

Time Table

No	Descripton	Weeks															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	Purchase material																
2	Site preparation																
3	Excavation																
4	Stone masonry																
5	Pointing																
6	PCC work																
9	M&E																
10	Closing Ceremony																

8.3 Agroforestry Interventions

The agriculture production in Zurmat district is well diversified. Large number of different annual and perennial, high value crops are produced every year. However, yield and quality are affected by water scarcity and annual flood. The deforestation process increases the severity of the problem. Without forest the annual rainfall and the effect of the annual flood is unpredictable. Erosion and sedimentation increase in the affected areas. Agroforestry interventions serve multi purposes to solve these problems. The specific objectives are the following:

- Stabilize and protect water ways, streams and water catchment areas
- Contribute into the reforestation of the region in order to stop further deterioration of the hydrologic cycle
- Stop and reverse the desertification process
- Protect the farmland areas
- Protect the established physical measurements, which had been installed in order to stabilize the watershed

Figure 66 Location of the planned agroforestry activities

8.3.1 PZ02/R01/F01-Apple Orchard Establishment

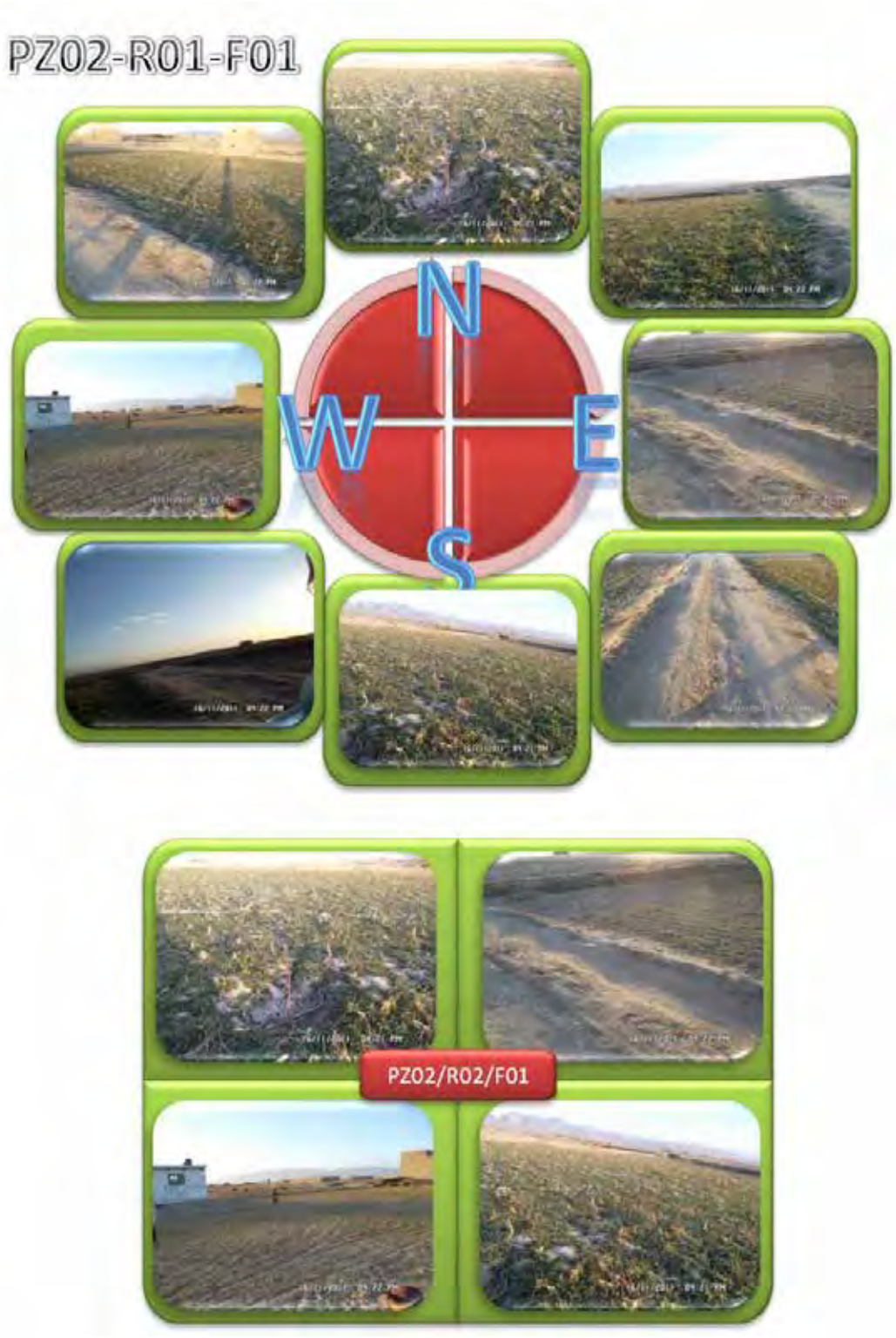
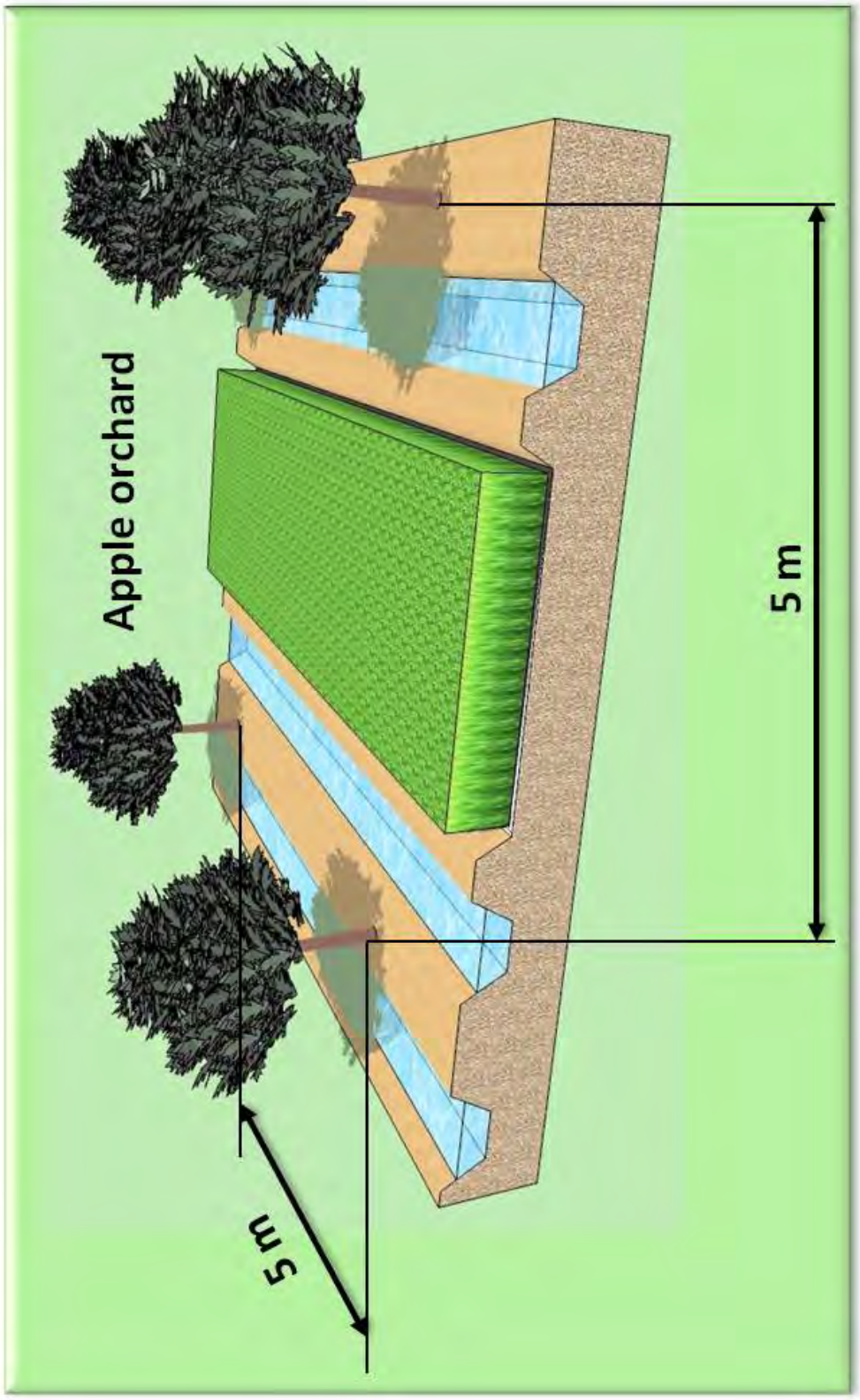


Figure 67 The PZ02/R01/F01 landform

8.3.1.1 Implementation Design



8.3.1.2 Implementation Cost

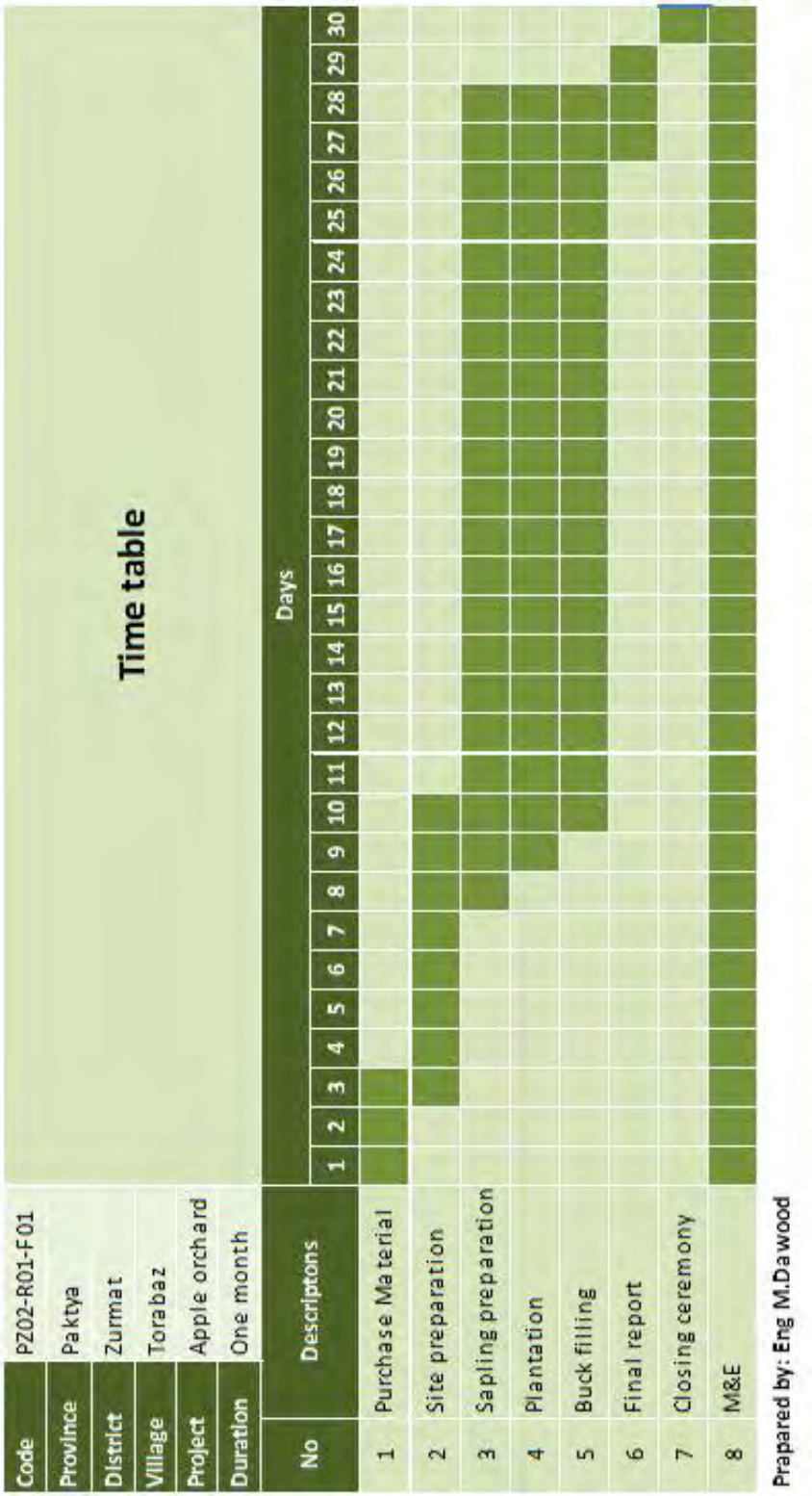
Bill of quantity(BoQ) - Agroforestry

Code:	**PZ02-R01-F01**	**Project :**	**Apple orchard**
Province:	**Paktya**	**Total Area:**	**5,600 m2**
District:	**Zurmat**	**Date:**	**November-11**
Village:	**Torabaz**		

Code	No.	Norm/Unit	Item	Quantity	Unit	Unit cost USD$	Total cost USD$
A1	**1.00**		**Site preparation**	**5,600.00**	**m2**		
	1.01	0.04	Unskilled labor	224.00	md	7.00	1,568.00
A2	**2.00**		**Cutting and Backfilling**	**125.96**	**m^3**		
	2.01	0.50	Unskilled labor	62.98	md	7.00	440.86
A3	**3.00**		**Apple Orchard**	**5,600.00**	**m2**		
	3.01		Apple(Red delicious)	140.00	Nos	2.50	350.00
	3.02		Apple(Golden delicious)	140.00	Nos	2.50	350.00
A4	**4.00**		**Purchasing Material**				
	4.01		Shovel	35.00	Nos	5.00	175.00
	4.02		Pick axe	18.00	Nos	5.00	90.00
	4.03		Wheel barrow	10.00	Nos	60.00	600.00
	4.04		Bucket steel	8.00	Nos	2.00	16.00
	4.05		Axes	6.00	Nos	10.00	60.00
	4.06		Water collar	6.00	Nos	6.00	36.00
	4.07		Glasses	12.00	Nos	1.00	12.00
	4.08		Beam for maintenance	90.00	m	3.00	270.00
	4.09		Wire for maintenance	600.00	m	0.40	240.00
	4.10		Adze	6.00	Nos	10.00	60.00
	4.11		Pruning secateurs	22.00	Nos	35.00	770.00
	4.12		Planting board	6.00	Nos	2.00	12.00
	4.13		Fertilization (DAP)	70.00	kg	1.80	126.00
	4.14		Fertilization (UREA)	140.00	kg	0.90	126.00
A5	**5.00**		**Personal**				
	5.01	2.00	Foreman	60.00	md	14.00	840.00
	5.02	1.00	Team leader	30.00	md	15.00	450.00
	5.03	1.00	Store keeper	30.00	md	7.00	210.00
	5.04	2.00	Guard	60.00	md	10.00	600.00
A6	**6.00**		**Tools, stationary, transport**	**1.00**	**Ls**	**2,000.00**	**2,000.00**
						Grand total	**9,401.86**

Prepared by: Eng. M. Dawood

8.3.1.3 Implementation Time Table



Code	PZ02-R01-F01
Province	Paktya
District	Zurmat
Village	Torabaz
Project	Apple orchard
Duration	One month

Time table

No	Descriptions	Days																											
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	Purchase Material																														
2	Site preparation																														
3	Sapling preparation																														
4	Plantation																														
5	Buck filling																														
6	Final report																														
7	Closing ceremony																														
8	M&E																														

Prepared by: Eng M.Dawood

8.3.2 PZ02/R01/F03-Poplar Forest Establishment

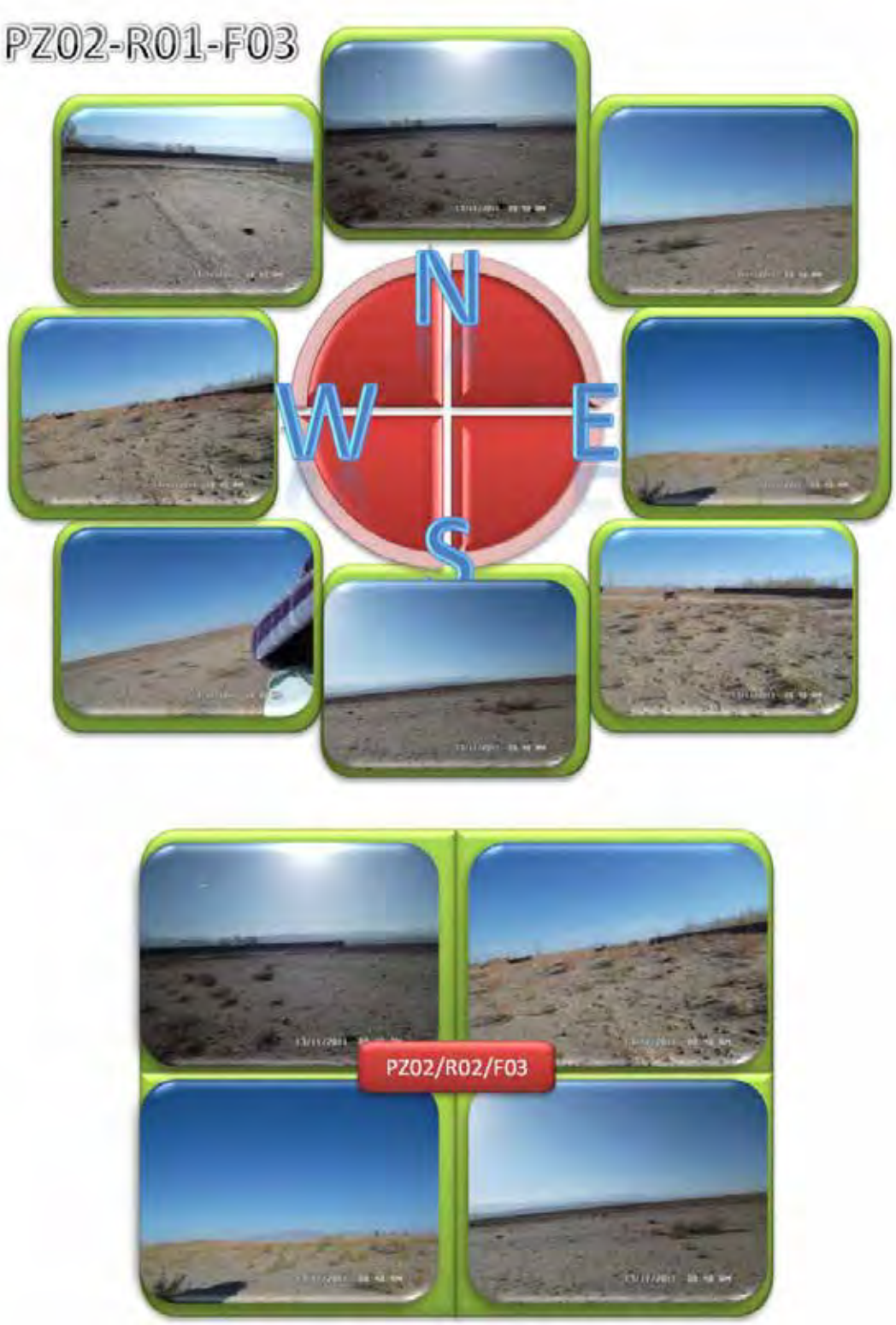
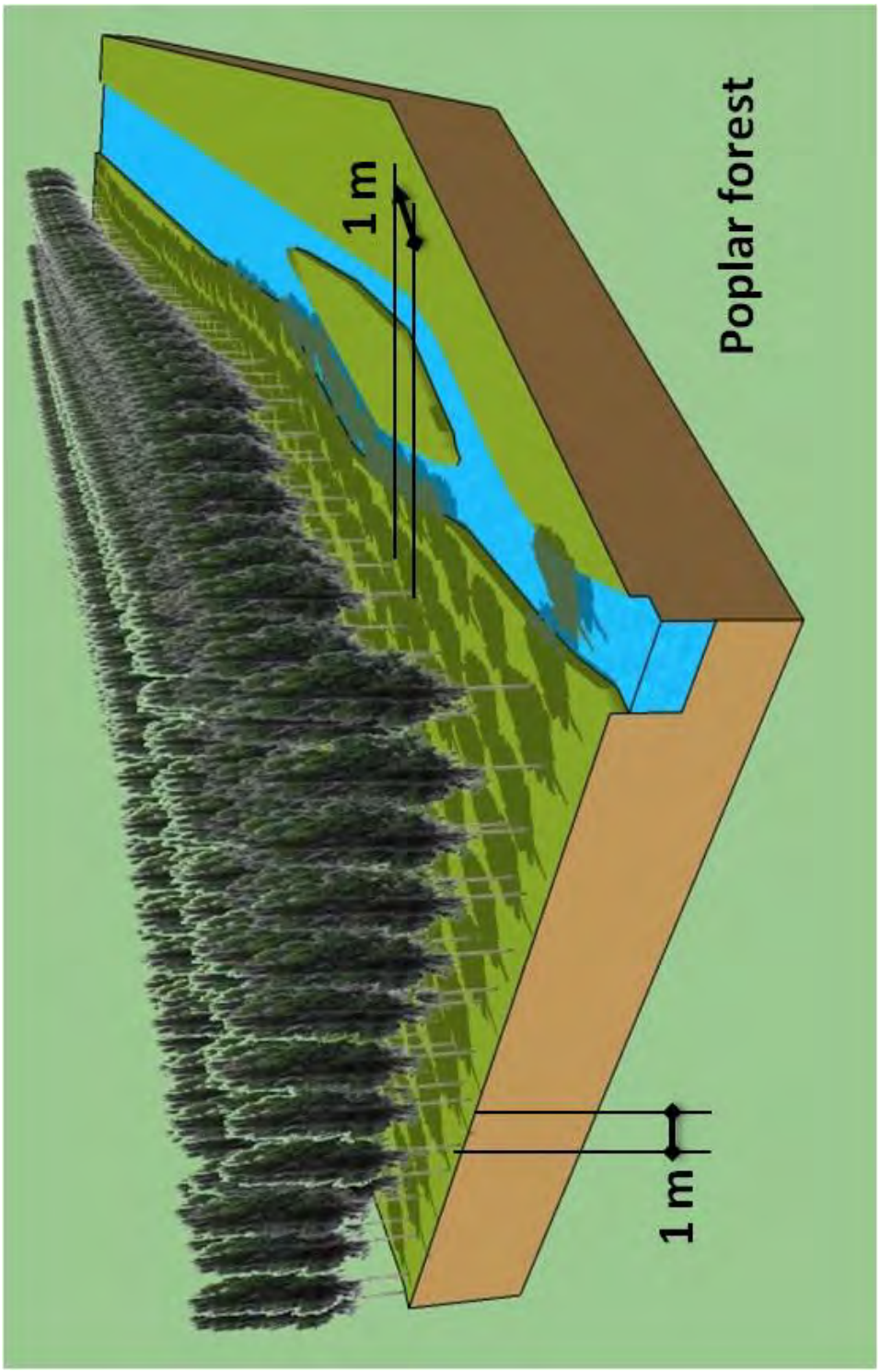


Figure 68 The PZ02/R01/F03 landform

8.3.2.1 Implementation Design



8.3.2.2 Implementation Cost

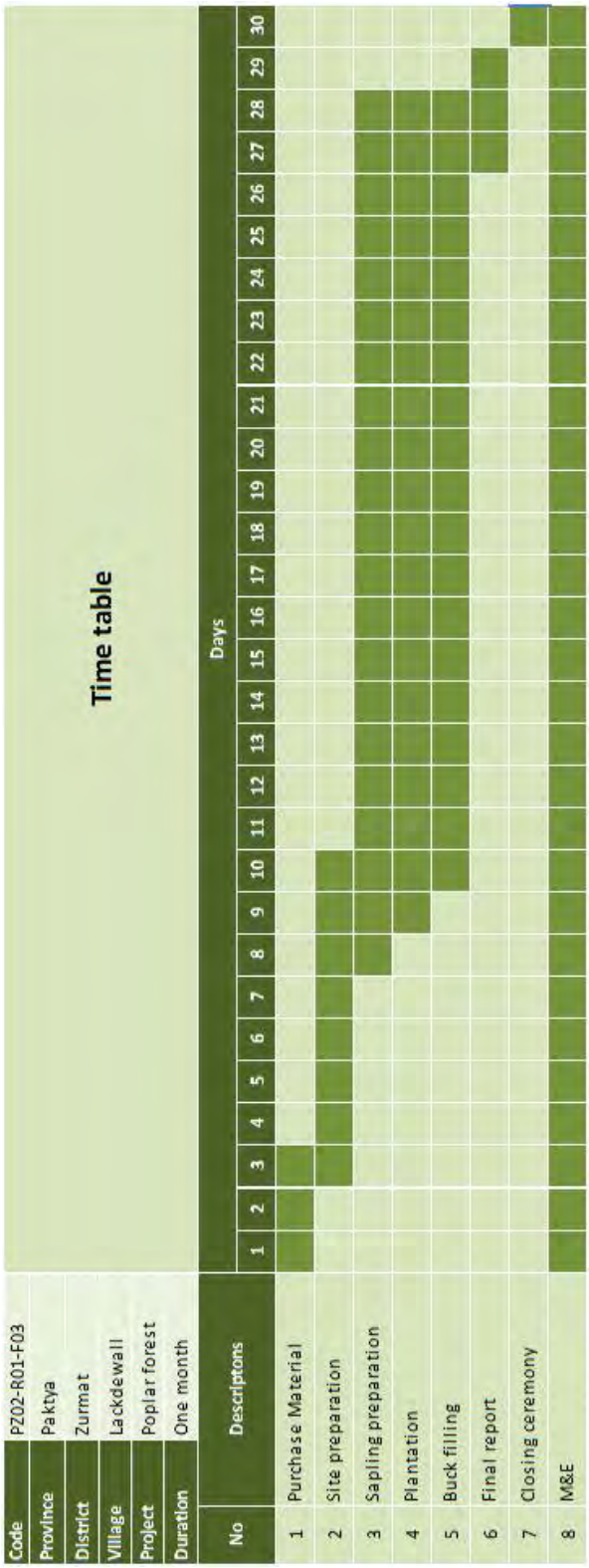
Bill of Quantity (BoQ) - Agroforestry

Code:	**PZ02-R01-F03**	**Project :**	**Poplar forest**
Province:	**Paktya**	**Total Area:**	**5,737 m2**
District:	**Zurmat**	**Date:**	**November-11**
Village:	**Lackdewall**		

Code	No.	Norm/Unit	Item	Quantity	Unit	Unit cost USD$	Total cost USD$
A1	**1.00**		**Site preparation**	**5,737.00**	**m2**		
	1.01	0.03	Unskilled labor	173.00	md	7.00	1,211.00
A2	**2.00**		**Cutting and Backfilling**	**5,737.00**	**m^3**		0.00
	2.01	0.01	Unskilled labor	58.00	md	7.00	406.00
A3	**3.00**		**Poplar forest**	**5,737.00**	**m2**		
	3.01		Poplar (kabuly)	11,474.00	Nos	0.20	2,294.80
	3.02		Poplar (OP-367)	11,474.00	Nos	0.20	2,294.80
A4	**4.00**		**Purchasing Material**				
	4.01		Shovel	40.00	Nos	5.00	200.00
	4.02		Pick axe	20.00	Nos	5.00	100.00
	4.03		Wheel barrow	10.00	Nos	60.00	600.00
	4.04		Bucket steel	10.00	Nos	2.00	20.00
	4.05		Axes	6.00	Nos	10.00	60.00
	4.06		Water collar	7.00	Nos	6.00	42.00
	4.07		Glasses	14.00	Nos	1.00	14.00
	4.08		Beam for maintenance	92.00	m	3.00	276.00
	4.09		Wire for maintenance	610.00	m	0.40	244.00
	4.10		Adze	6.00	Nos	10.00	60.00
	4.11		Pruning secateurs	20.00	Nos	35.00	700.00
	4.12		Planting board	10.00	Nos	2.00	20.00
	4.13		Fertilization (DAP)	72.00	kg	1.80	129.60
	4.14		Fertilization (UREA)	143.00	kg	0.90	128.70
A5	**5.00**		**Personal**				
	5.01	2.00	Foreman	60.00	md	14.00	840.00
	5.02	1.00	Team leader	30.00	md	15.00	450.00
	5.03	1.00	Store keeper	30.00	md	7.00	210.00
	5.04	2.00	Guard	60.00	md	10.00	600.00
A6	**6.00**		**Tools, stationary, transport**	**1.00**	**Ls**	2,000.00	2,000.00
						Grand total	**12,900.90**

Prepared by: Eng. M. Dawood

8.3.2.3 Implementation Time Table



Code	PZ02-R01-F03
Province	Paktya
District	Zurmat
Village	Lackdewall
Project	Poplar forest
Duration	One month

Time table

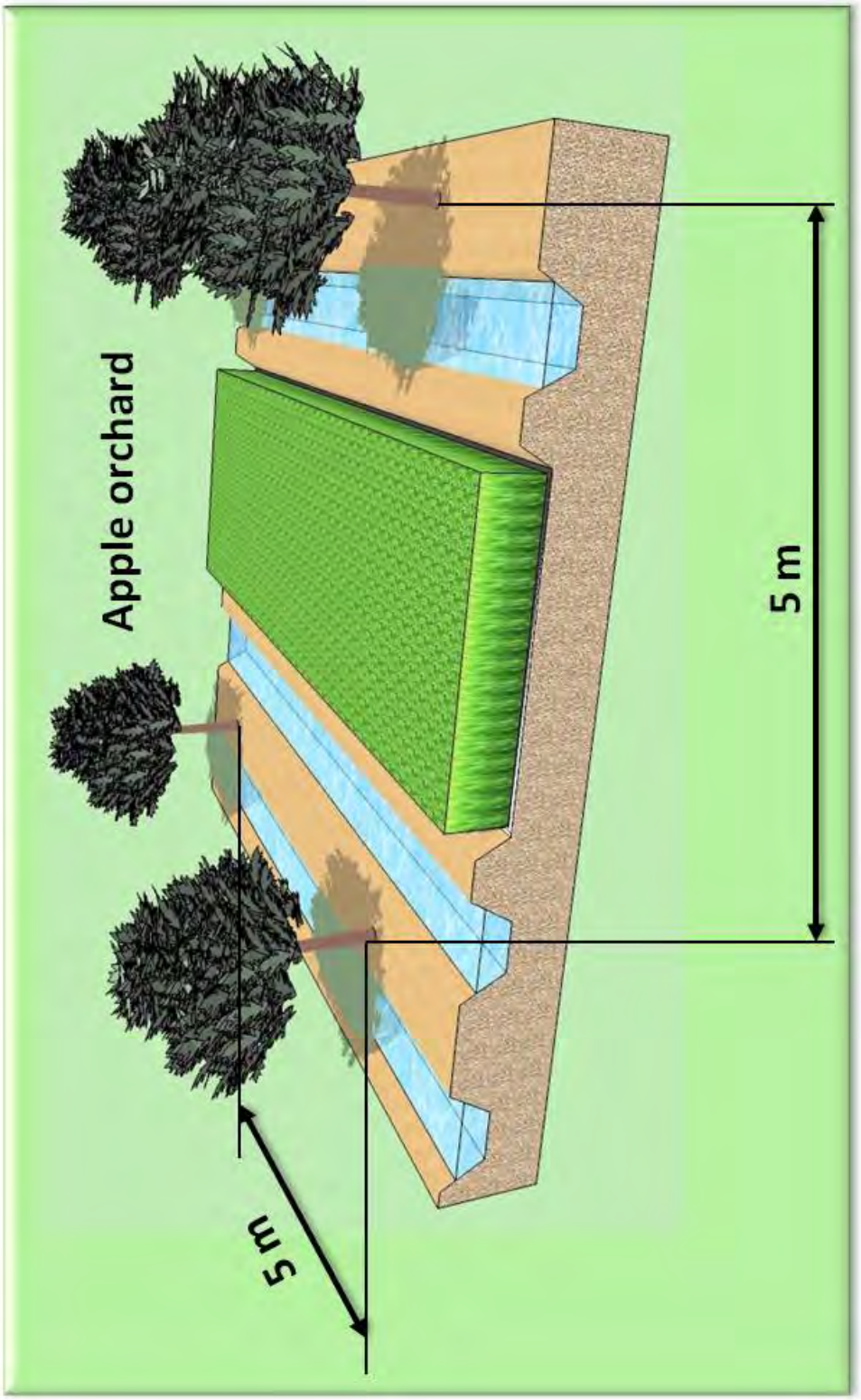
No	Descriptons	Days																											
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	Purchase Material																														
2	Site preparation																														
3	Sapling preparation																														
4	Plantation																														
5	Buck filling																														
6	Final report																														
7	Closing ceremony																														
8	M&E																														

Prepared by: Eng M.Dawood

8.3.3 PZ02/R01/F04-Apple Orchard Establishment

Figure 69 The PZ02/R01/F04 landform

8.3.3.1 Implementation Design



8.3.3.2 Implementation Cost

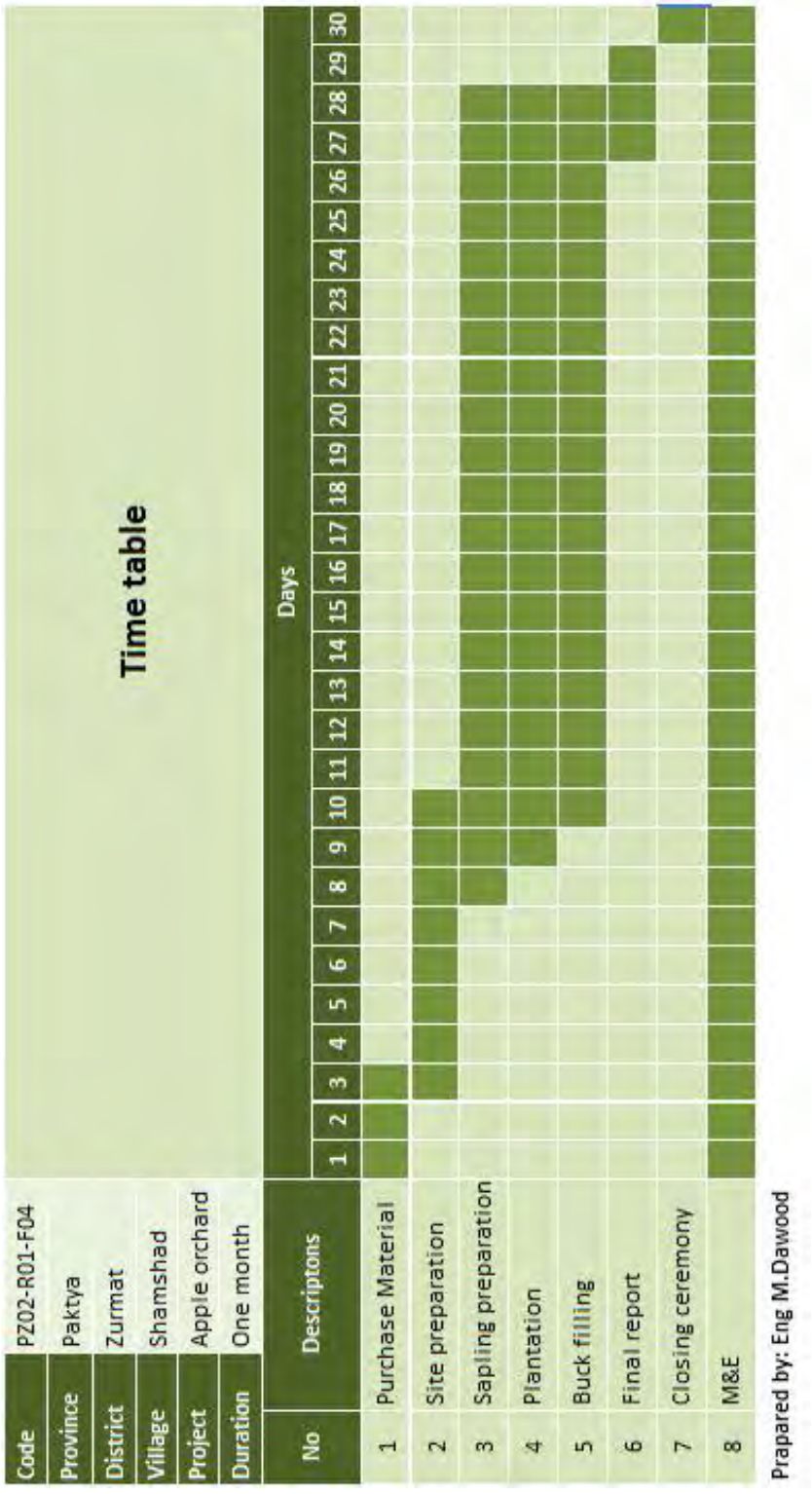
Bill of Quantity (BoQ) - Agroforestry

Code:	**PZ02-R01-F04**	**Project :**	**Apple Orchard**
Province:	**Paktya**	**Total Area:**	**4,400 m2**
District:	**Zurmat**	**Date:**	**November-11**
Village:	**Shamshad**		

Code	No.	Norm/Unit	Item	Quantity	Unit	Unit cost USD$	Total cost USD$
A1	**1.00**		**Site preparation**	**4,400.00**	**m2**		
	1.01	0.03	Unskilled labor	132.00	md	7.00	924.00
A2	**2.00**		**Cutting and Backfilling**	**95.00**	**m^3**		
	2.01	0.50	Unskilled labor	48.00	md	7.00	336.00
A3	**3.00**		**Apple Orchard**	**4,400.00**	**m2**		
	3.01		Apple(Red delicious)	100.00	Nos	2.50	250.00
	3.02		Apple(Golden delicious)	120.00	Nos	2.50	300.00
A4	**4.00**		**Purchasing Material**				
	4.01		Shovel	30.00	Nos	5.00	150.00
	4.02		Pick axe	15.00	Nos	5.00	75.00
	4.03		Wheel barrow	6.00	Nos	60.00	360.00
	4.04		Bucket steel	10.00	Nos	2.00	20.00
	4.05		Axes	4.00	Nos	10.00	40.00
	4.06		Water collar	5.00	Nos	6.00	30.00
	4.07		Glasses	10.00	Nos	1.00	10.00
	4.08		Beam for maintenance	81.00	m	3.00	243.00
	4.09		Wire for maintenance	540.00	m	0.40	216.00
	4.10		Adze	4.00	Nos	10.00	40.00
	4.11		Pruning secateurs	12.00	Nos	35.00	420.00
	4.12		Planting board	8.00	Nos	2.00	16.00
	4.13		Fertilization (DAP)	55.00	kg	1.80	99.00
	4.14		Fertilization (UREA)	110.00	kg	0.90	99.00
A5	**5.00**		**Personal**				
	5.01	2.00	Foreman	60.00	md	14.00	840.00
	5.02	1.00	Team leader	30.00	md	15.00	450.00
	5.03	1.00	Store keeper	30.00	md	7.00	210.00
	5.04	2.00	Guard	60.00	md	10.00	600.00
A6	**6.00**		**Tools, stationary, transport**	**1.00**	**Ls**	**1,800.00**	**1,800.00**
						Grand total	**7,528.00**

Prepared by: Eng. M. Dawood

8.3.3.3 Implementation Time Table



Code	PZ02-R01-F04
Province	Paktya
District	Zurmat
Village	Shamshad
Project	Apple orchard
Duration	One month

Time table

No	Descriptons	Days																												
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	Purchase Material																														
2	Site preparation																														
3	Sapling preparation																														
4	Plantation																														
5	Buck filling																														
6	Final report																														
7	Closing ceremony																														
8	M&E																														

Prapared by: Eng M.Dawood

8.3.4 PZ02/R02/F01-Apricot Orchard Establishment

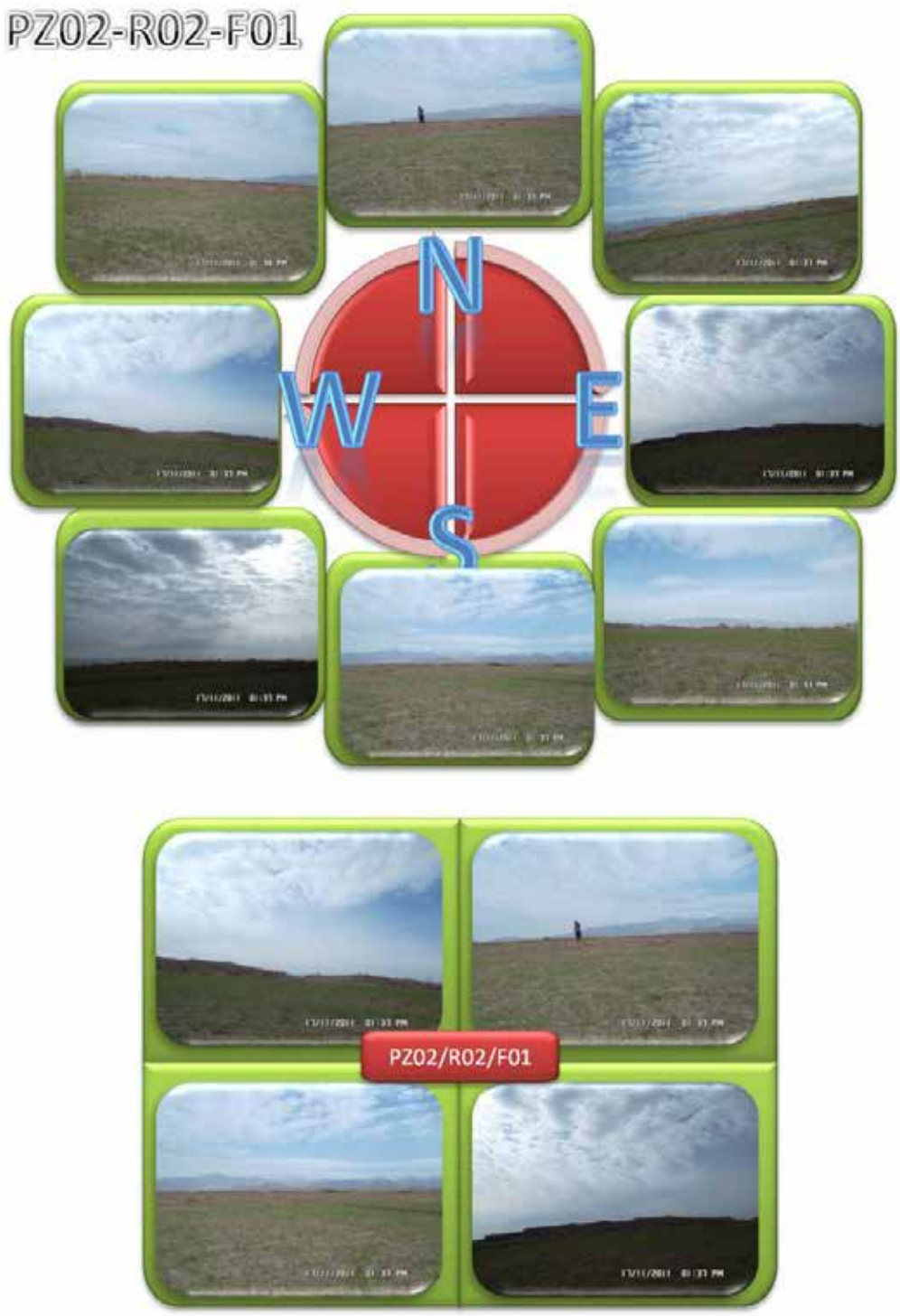
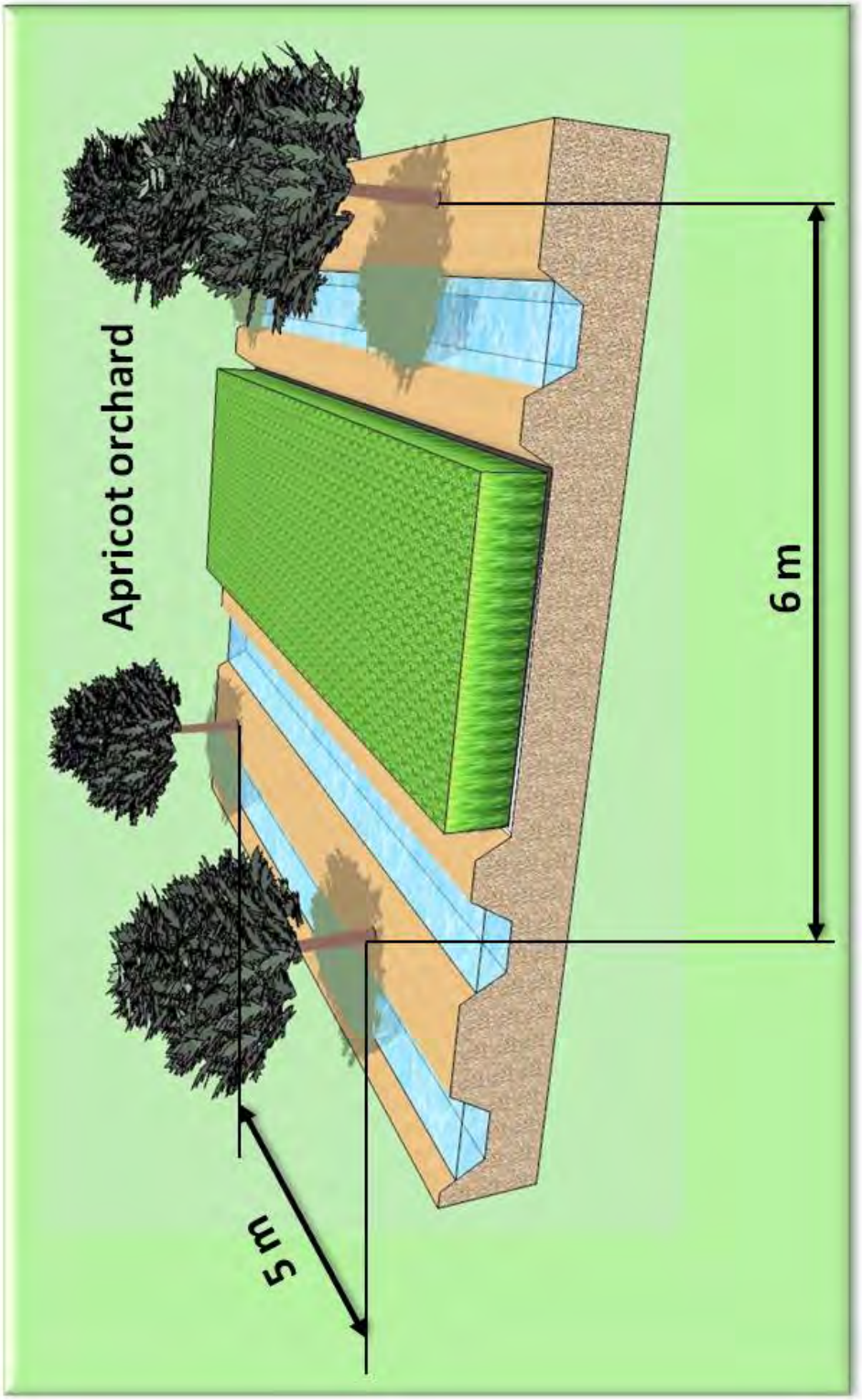


Figure 70 The PZ02/R02/F01 landform

8.3.4.1 Implementation Design



8.3.4.2 Implementation Cost

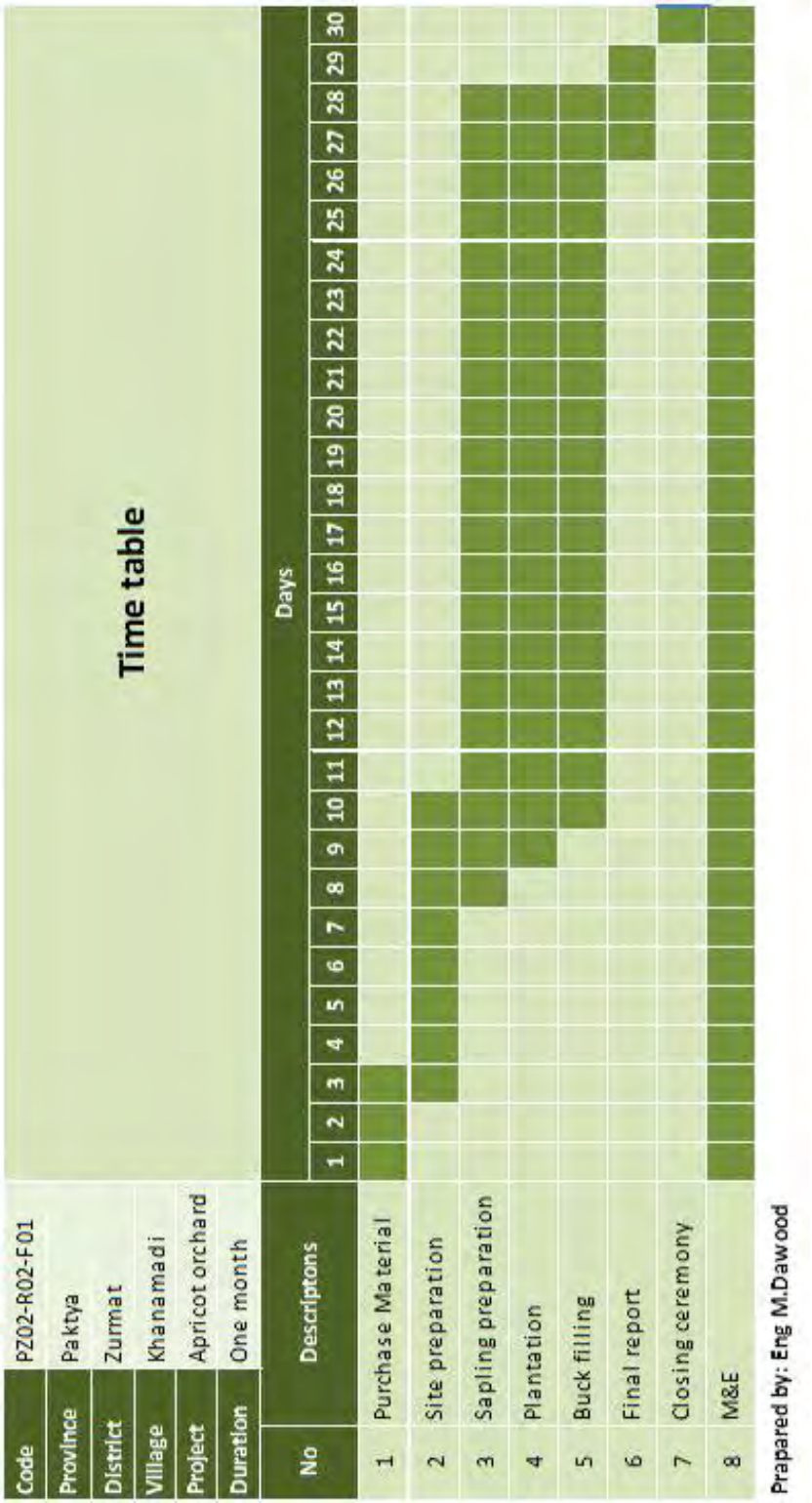
Bill of Quantity (BoQ) - Agroforestry

Code:	**PZ02-R02-F01**	**Project :**	**Apricot Orchard**
Province:	**Paktya**	**Total Area:**	**5,200 m2**
District:	**Zurmat**	**Date:**	**November-11**
Village:	**Khanmadi**		

Code	No.	Norm/Unit	Item	Quantity	Unit	Unit cost USD$	Total cost USD$
A1	**1.00**		**Site preparation**	**5,200.00**	**m2**		
	1.01	0.03	Unskilled labor	156.00	md	7.00	1,092.00
A2	**2.00**		**Cutting and Backfilling**	**89.80**	**m^3**		
	2.01	0.50	Unskilled labor	45.00	md	7.00	315.00
A3	**3.00**		**Apricot Orchard**	**5,200.00**	**m2**		
	3.01		Apricots (Qaisi)	100.00	Nos	2.00	200.00
	3.02		Apricots (Amiri)	108.00	Nos	2.00	216.00
A4	**4.00**		**Purchasing Material**				
	4.01		Shovel	32.00	Nos	5.00	160.00
	4.02		Pick axe	15.00	Nos	5.00	75.00
	4.03		Wheel barrow	6.00	Nos	60.00	360.00
	4.04		Bucket steel	10.00	Nos	2.00	20.00
	4.05		Axes	6.00	Nos	10.00	60.00
	4.06		Water collar	6.00	Nos	6.00	36.00
	4.07		Glasses	12.00	Nos	1.00	12.00
	4.08		Beam for maintenance	81.00	m	3.00	243.00
	4.09		Wire for maintenance	540.00	m	0.40	216.00
	4.10		Adze	5.00	Nos	10.00	50.00
	4.11		Pruning secateurs	12.00	Nos	35.00	420.00
	4.12		Planting board	10.00	Nos	2.00	20.00
	4.13		Fertilization (DAP)	65.00	kg	1.80	117.00
	4.14		Fertilization (UREA)	130.00	kg	0.90	117.00
A5	**5.00**		**Personal**				
	5.01	2.00	Foreman	60.00	md	14.00	840.00
	5.02	1.00	Team leader	30.00	md	15.00	450.00
	5.03	1.00	Store keeper	30.00	md	7.00	210.00
	5.04	2.00	Guard	60.00	md	10.00	600.00
A6	**6.00**		**Tools, stationary, transport**	**1.00**	**Ls**	**2,500.00**	**2,500.00**
						Grand total	**8,329.00**

Prepared by: Eng. M. Dawood

8.3.4.3 Implementation Time Table



Code	PZ02-R02-F01
Province	Paktya
District	Zurmat
Village	Khanamadi
Project	Apricot orchard
Duration	One month

Time table

No	Descriptons	Days																												
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	Purchase Material																														
2	Site preparation																														
3	Sapling preparation																														
4	Plantation																														
5	Buck filling																														
6	Final report																														
7	Closing ceremony																														
8	M&E																														

Prapared by: Eng M.Dawood

8.3.5 PZ02/R02/F02-Vineyard establishment

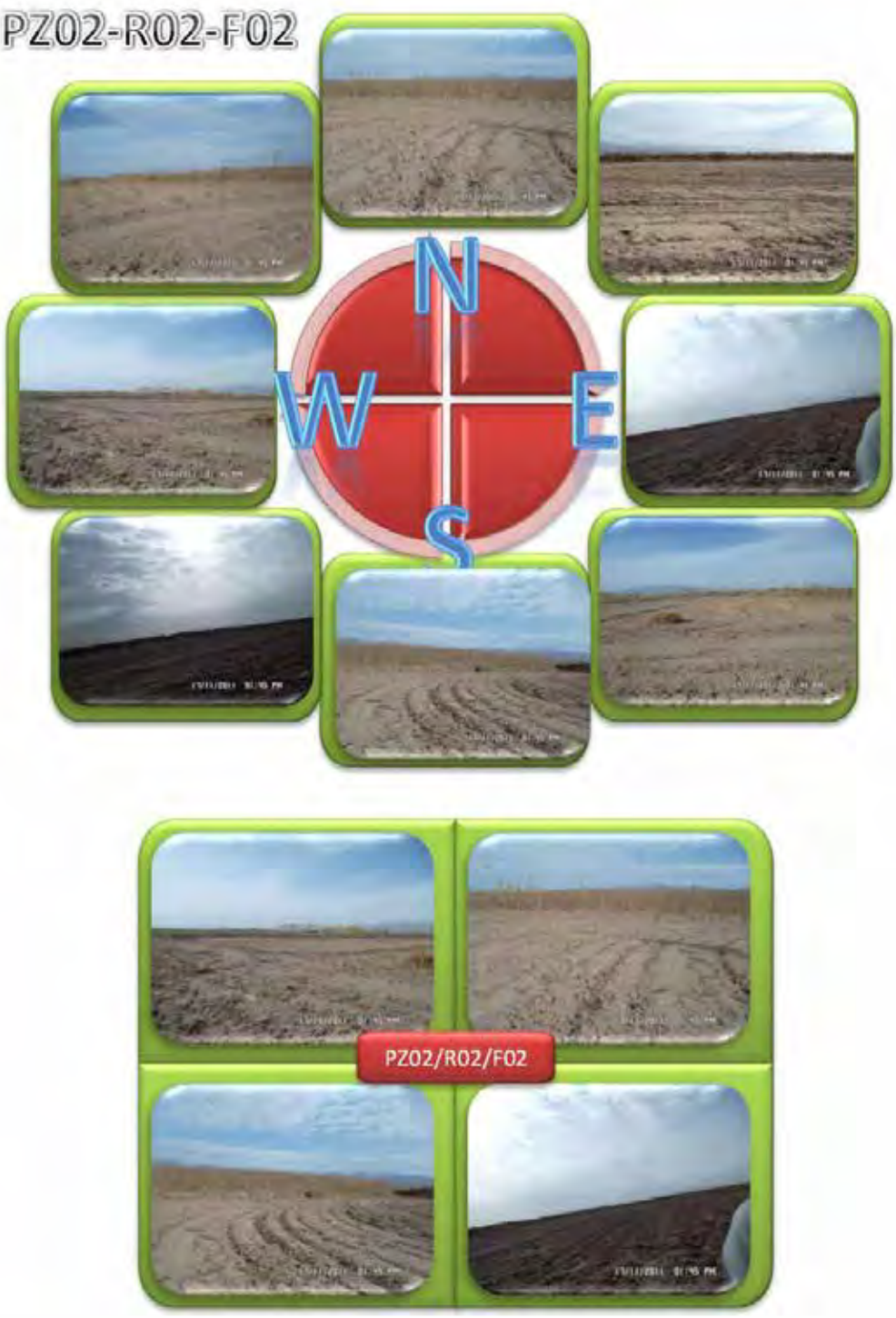
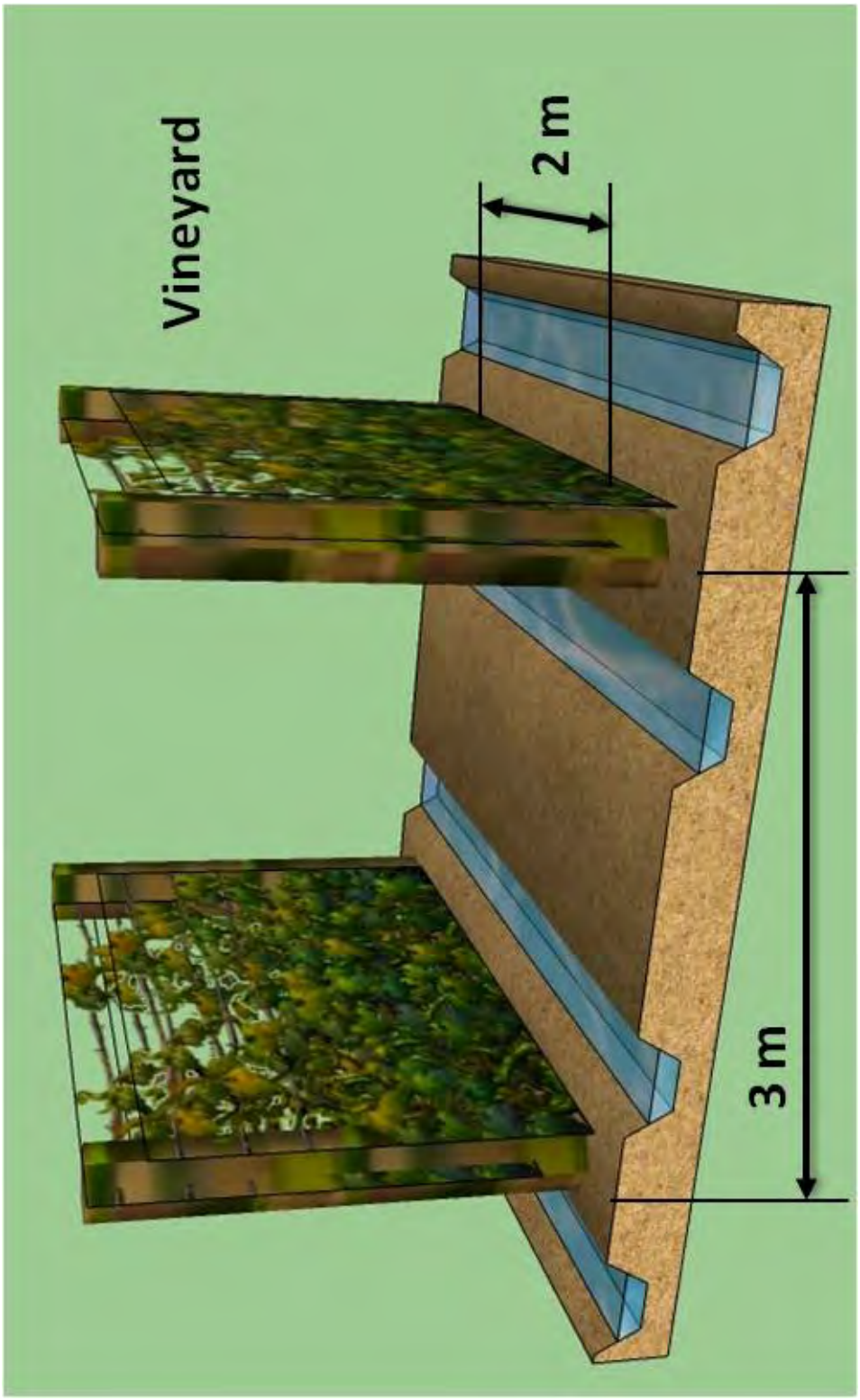


Figure 71 The PZ02/R02/F02 landform

8.3.5.1 Implementation Design



8.3.5.2 Implementation Cost

Bill of Quantity (BoQ) - Agroforestry

Code:	**PZ02-R02-F02**	**Project :**	**Vineyard**
Province:	**Paktya**	**Total Area:**	**3,500 m2**
District:	**Zurmat**	**Date:**	**November-11**
Village:	**Khanmadi**		

Code	No.	Norm/Unit	Item	Quantity	Unit	Unit cost USD$	Total cost USD$
A1	**1.00**		**Site preparation**	**3,500.00**	**m2**		
	1.01	0.03	Unskilled labor	105.00	md	7.00	735.00
A2	**2.00**		**Cutting and Backfilling**	**1,000.00**	**m^3**		
	2.01	0.50	Unskilled labor	500.00	md	7.00	3,500.00
A3	**3.00**		**Vineyard**	**3,500.00**	**m2**		
	3.01		Rooted vine	584.00	Nos	2.40	1,401.60
A4	**4.00**		**Purchasing Material**				
	4.01		Shovel	45.00	Nos	5.00	225.00
	4.02		Pick axe	22.00	Nos	5.00	110.00
	4.03		Wheel barrow	5.00	Nos	60.00	300.00
	4.04		Bucket steel	10.00	Nos	2.00	20.00
	4.05		Axes	4.00	Nos	10.00	40.00
	4.06		Water collar	6.00	Nos	6.00	36.00
	4.07		Glasses	12.00	Nos	1.00	12.00
	4.08		Beam for maintenance	72.00	m	3.00	216.00
	4.09		Wire for maintenance	480.00	m	0.40	192.00
	4.10		Adze	4.00	Nos	10.00	40.00
	4.11		Pruning secateurs	10.00	Nos	35.00	350.00
	4.12		Planting board	8.00	Nos	2.00	16.00
	4.13		Fertilization (DAP)	43.75	kg	1.80	78.75
	4.14		Fertilization (UREA)	87.50	kg	0.90	78.75
A5	**5.00**		**Personal**				
	5.01	2.00	Foreman	60.00	md	14.00	840.00
	5.02	1.00	Team leader	30.00	md	15.00	450.00
	5.03	1.00	Store keeper	30.00	md	7.00	210.00
	5.04	2.00	Guard	60.00	md	10.00	600.00
A6	**6.00**		**Tools, stationary, transport**	**1.00**	**Ls**	**2,000.00**	**2,000.00**
						Grand total	**11,451.10**

Prepared by: Eng. M. Dawood

Code	PZ02-R02-F02
Province	Paktya
District	Zurmat
Village	Khanamadi
Project	Vineyard
Duration	One month

Time table

No	Descriptons	Days																												
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	Purchase Material																														
2	Site preparation																														
3	Sapling preparation																														
4	Plantation																														
5	Buck filling																														
6	Final report																														
7	Closing ceremony																														
8	M&E																														

Prapared by: Eng M.Dawood

8.3.6 PZ02/R02/F03-Peach Orchard Establishment

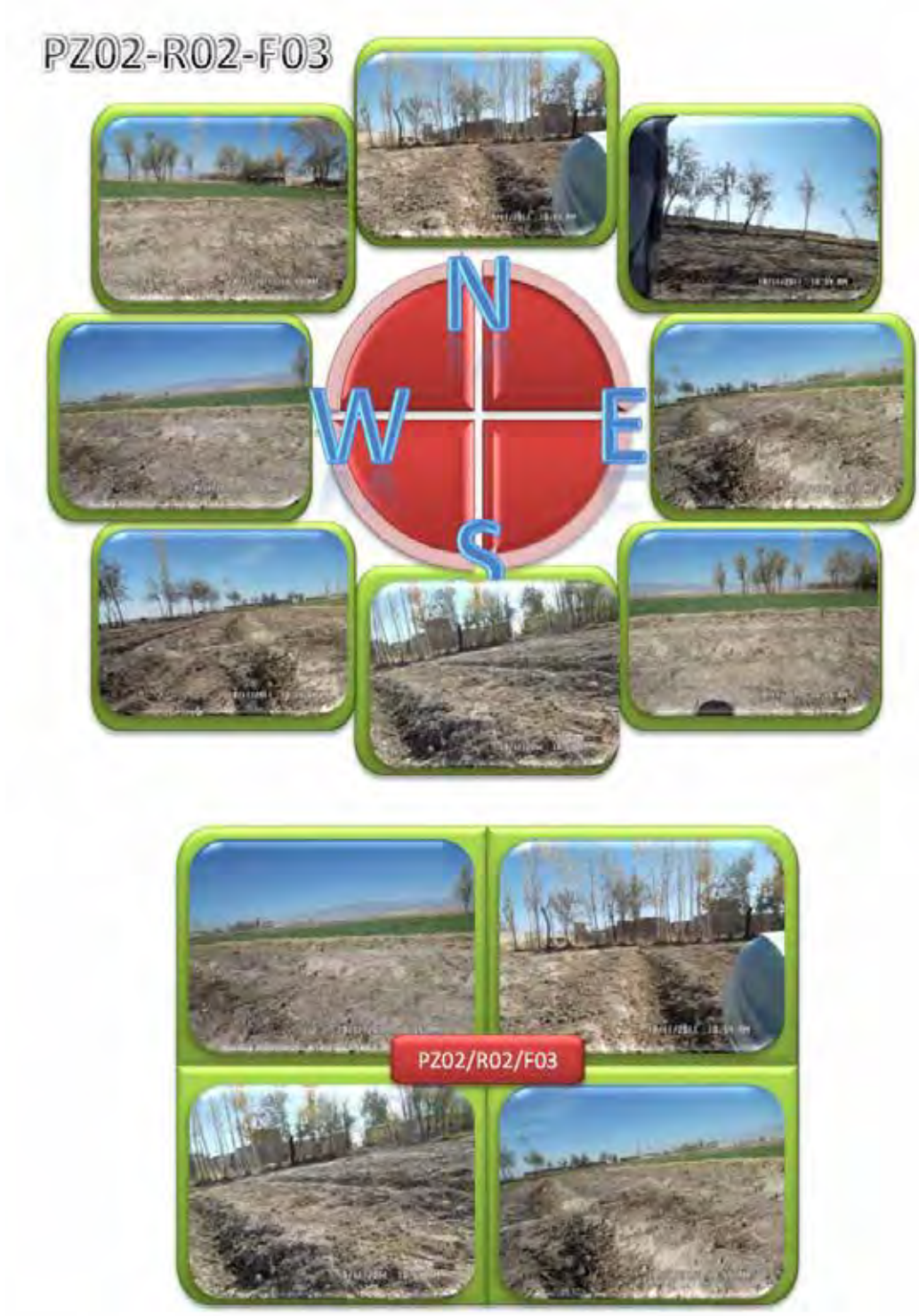
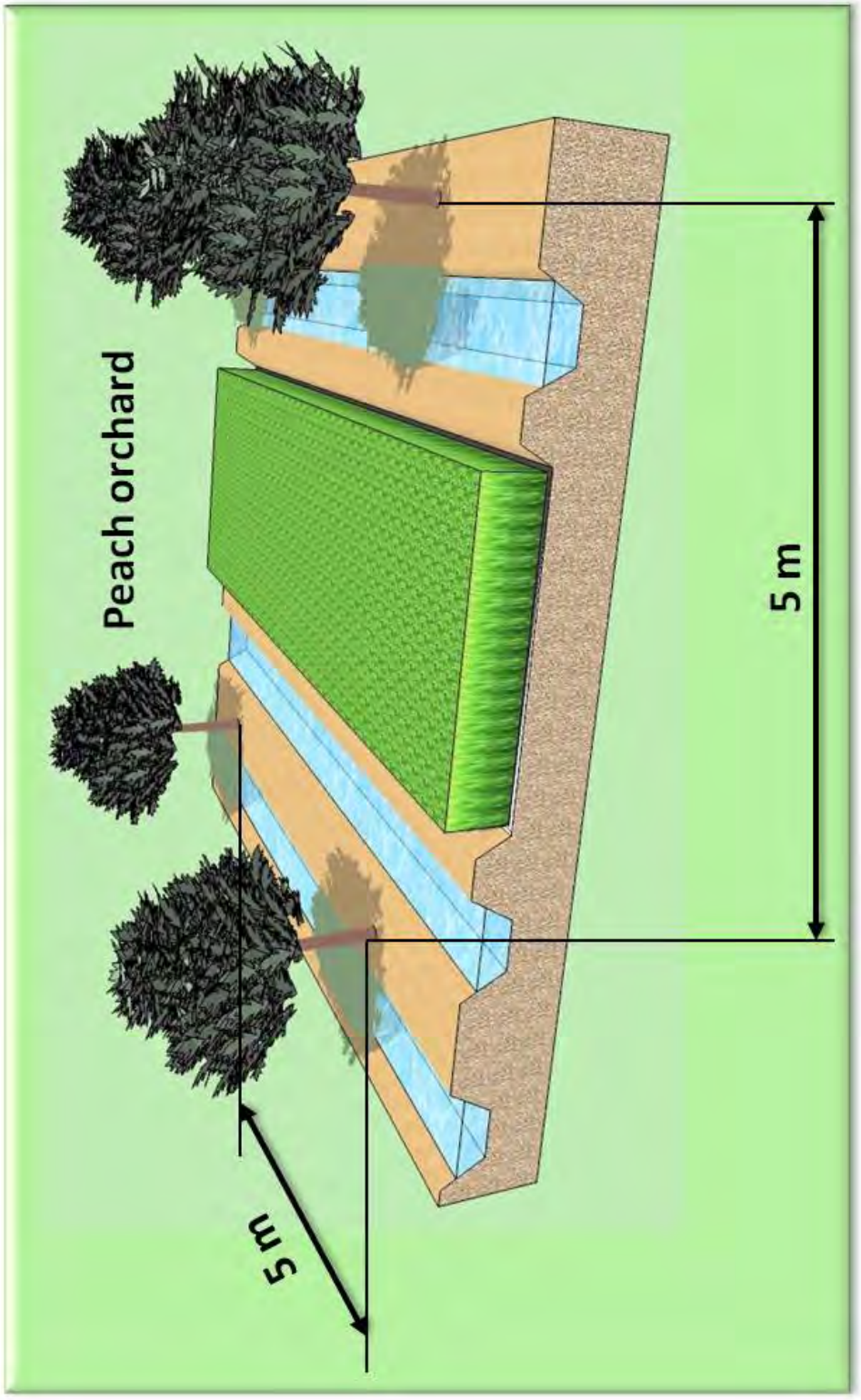


Figure 72 The PZ02/R02/F03 landform

8.3.6.1 Implementation Design



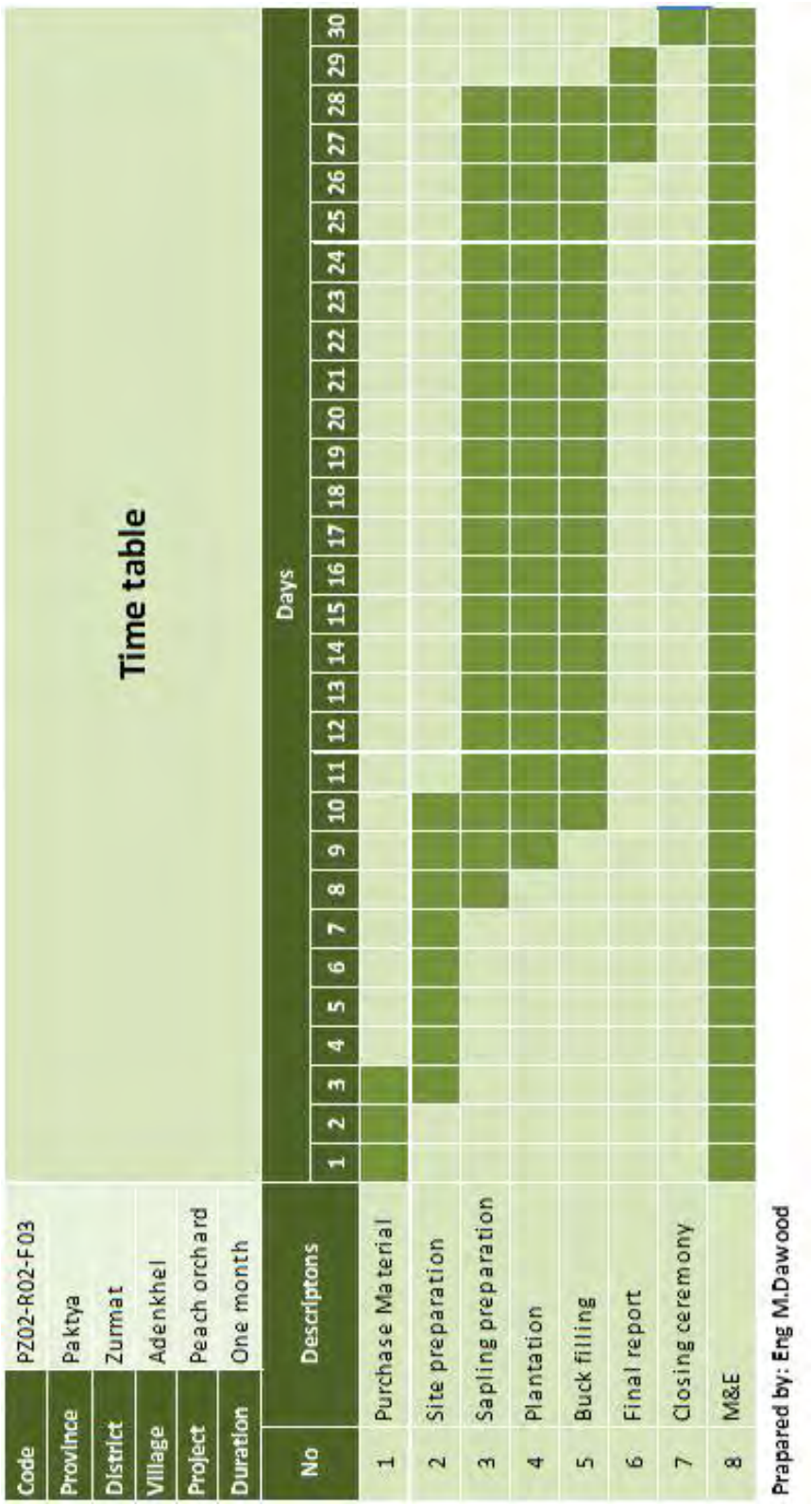
8.3.6.2 Implementation Cost

Bill of Quantity (BoQ) - Agroforestry

Code:	**PZ02-R02-F03**	**Project :**	**Peach Orchard**
Province:	**Paktya**	**Total Area:**	**3,750 m2**
District:	**Zurmat**	**Date:**	**November-11**
Village:	**Adenkhel**		

Code	No.	Norm/Unit	Item	Quantity	Unit	Unit cost USD$	Total cost USD$
A1	**1.00**		**Site preparation**	**3,750.00**	**m2**		
	1.01	0.03	Unskilled labor	113.00	md	7.00	791.00
A2	**2.00**		**Cutting and Backfilling**	**81.00**	**m^3**		
	2.01	0.05	Unskilled labor	41.00	md	7.00	287.00
A3	**3.00**		**Peach Orchard**	**3,750.00**	**m2**		
	3.01		Peach sampling	188.00	Nos	2.00	376.00
A4	**4.00**		**Purchasing Material**				
	4.01		Shovel	30.00	Nos	5.00	150.00
	4.02		Pick axe	15.00	Nos	5.00	75.00
	4.03		Wheel barrow	5.00	Nos	60.00	300.00
	4.04		Bucket steel	8.00	Nos	2.00	16.00
	4.05		Axes	5.00	Nos	10.00	50.00
	4.06		Water collar	6.00	Nos	6.00	36.00
	4.07		Glasses	12.00	Nos	1.00	12.00
	4.08		Beam for maintenance	75.00	m	3.00	225.00
	4.09		Wire for maintenance	500.00	m	0.40	200.00
	4.10		Adze	4.00	Nos	10.00	40.00
	4.11		Pruning secateurs	10.00	Nos	35.00	350.00
	4.12		Planting board	8.00	Nos	2.00	16.00
	4.13		Fertilization (DAP)	46.70	kg	1.80	84.06
	4.14		Fertilization (UREA)	93.50	kg	0.90	84.15
A5	**5.00**		**Personal**				
	5.01	2.00	Foreman	60.00	md	14.00	840.00
	5.02	1.00	Team leader	30.00	md	15.00	450.00
	5.03	1.00	Store keeper	30.00	md	7.00	210.00
	5.04	2.00	Guard	60.00	md	10.00	600.00
A6	**6.00**		**Tools, stationary, transport**	**1.00**	**Ls**	**1,800.00**	**1,800.00**
						Grand total	**6,992.21**

8.3.6.3 Implementation Time Table



Code	PZ02-R02-F03
Province	Paktya
District	Zurmat
Village	Adenkhel
Project	Peach orchard
Duration	One month

Time table

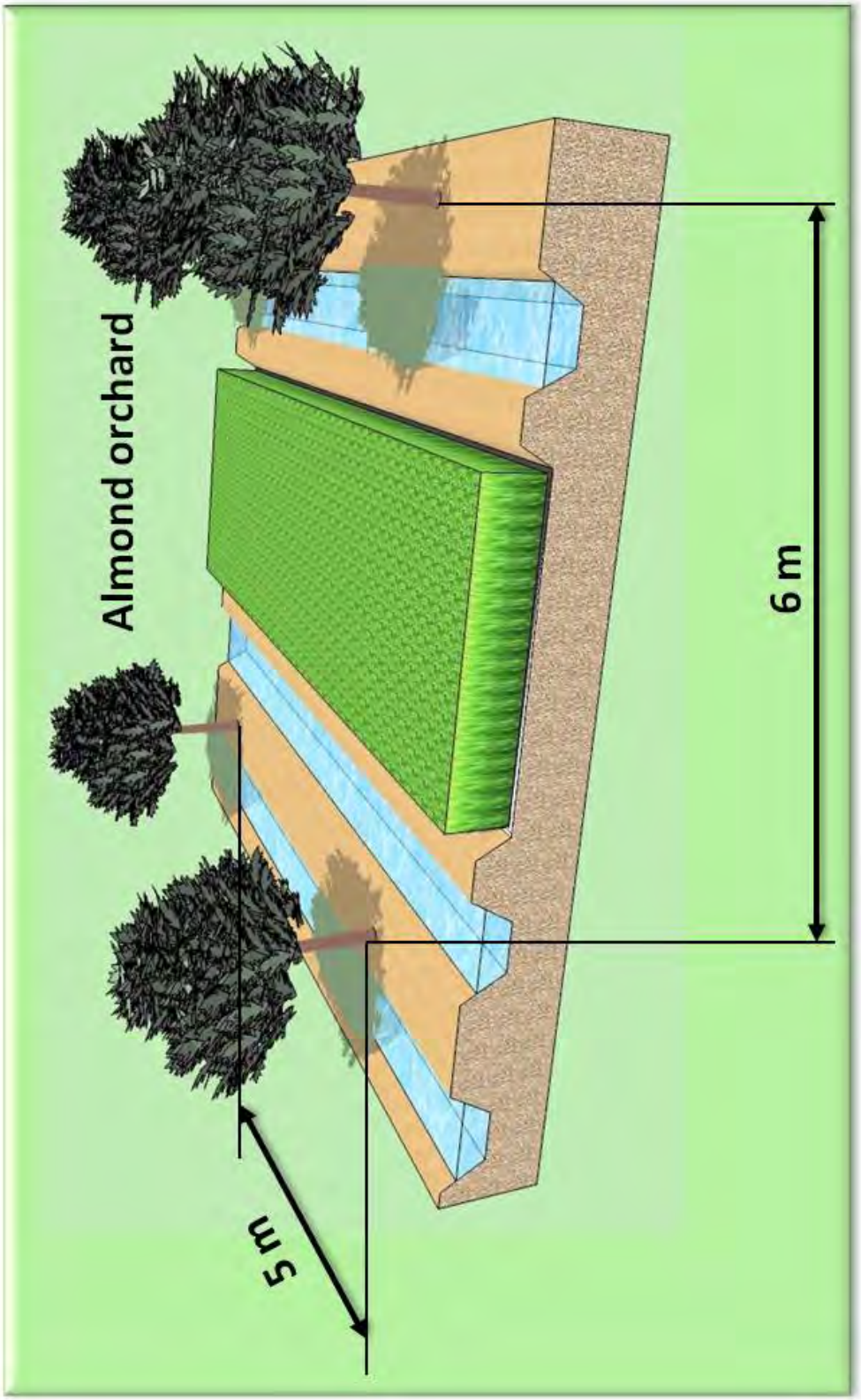
No	Descriptons	Days																											
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	Purchase Material																														
2	Site preparation																														
3	Sapling preparation																														
4	Plantation																														
5	Buck filling																														
6	Final report																														
7	Closing ceremony																														
8	M&E																														

Prapared by: Eng M.Dawood

8.3.7 PZ02/R02/F04-Almond Orchards Establishment

Figure 73 The PZ02/R02/F04 landform

8.3.7.1 Implementation Design



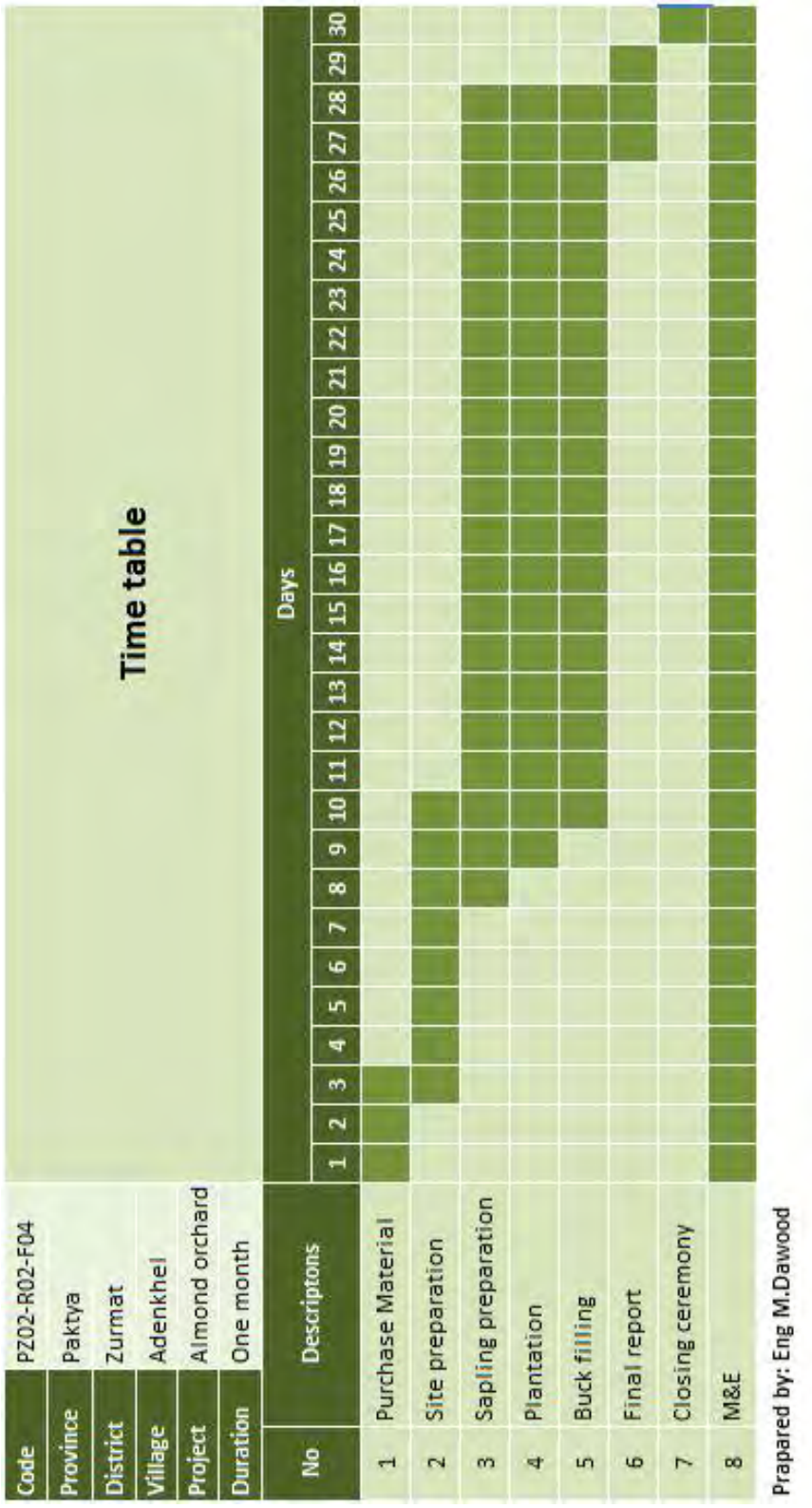
8.3.7.2 Implementation Cost

Bill of Quantity (BoQ) - Agroforestry

Code:	**PZ02-R02-F04**	**Project :**	**Almond Orchard**
Province:	**Paktya**	**Total Area:**	**5,200 m2**
District:	**Zurmat**	**Date:**	**November-11**
Village:	**Adenkhel**		

Code	No.	Norm/Unit	Item	Quantity	Unit	Unit cost USD$	Total cost USD$
A1	**1.00**		**Site preparation**	**5,200.00**	**m2**		
	1.01	0.03	Unskilled labor	156.00	md	7.00	1,092.00
A2	**2.00**		**Cutting and Backfilling**	**180.00**	**m^3**		
	2.01	0.50	Unskilled labor	90.00	md	7.00	630.00
A3	**3.00**		**Almond Orchard**	**5,200.00**	**m2**		
	3.01		Almond (starbai)	200.00	Nos	2.00	400.00
	3.02		Almond (Kaghazi)	234.00	Nos	2.00	468.00
A4	**4.00**		**Purchasing Material**				
	4.01		Shovel	25.00	Nos	5.00	125.00
	4.02		Pick axe	10.00	Nos	5.00	50.00
	4.03		Wheel barrow	4.00	Nos	60.00	240.00
	4.04		Bucket steel	8.00	Nos	2.00	16.00
	4.05		Axes	5.00	Nos	10.00	50.00
	4.06		Water collar	5.00	Nos	6.00	30.00
	4.07		Glasses	10.00	Nos	1.00	10.00
	4.08		Beam for maintenance	87.00	m	3.00	261.00
	4.09		Wire for maintenance	580.00	m	0.40	232.00
	4.10		Adze	4.00	Nos	10.00	40.00
	4.11		Pruning secateurs	8.00	Nos	35.00	280.00
	4.12		Planting board	7.00	Nos	2.00	14.00
	4.13		Fertilization (DAP)	65.00	kg	1.80	117.00
	4.14		Fertilization (UREA)	130.00	kg	0.90	117.00
A5	**5.00**		**Personal**				
	5.01	2.00	Foreman	60.00	md	14.00	840.00
	5.02	1.00	Team leader	30.00	md	15.00	450.00
	5.03	1.00	Store keeper	30.00	md	7.00	210.00
	5.04	2.00	Guard	60.00	md	10.00	600.00
A6	**6.00**		**Tools, stationary, transport**	**1.00**	**Ls**	**1,500.00**	**1,500.00**
						Grand total	**7,772.00**

8.3.7.3 Implementation Time Table



Code	PZ02-R02-F04
Province	Paktya
District	Zurmat
Village	Adenkhel
Project	Almond orchard
Duration	One month

Time table

No	Descriptons	Days																											
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	Purchase Material																														
2	Site preparation																														
3	Sapling preparation																														
4	Plantation																														
5	Buck filling																														
6	Final report																														
7	Closing ceremony																														
8	M&E																														

Prapared by: Eng M.Dawood

8.3.8 PZ02/R02/F05-Poplar Forest Establishment

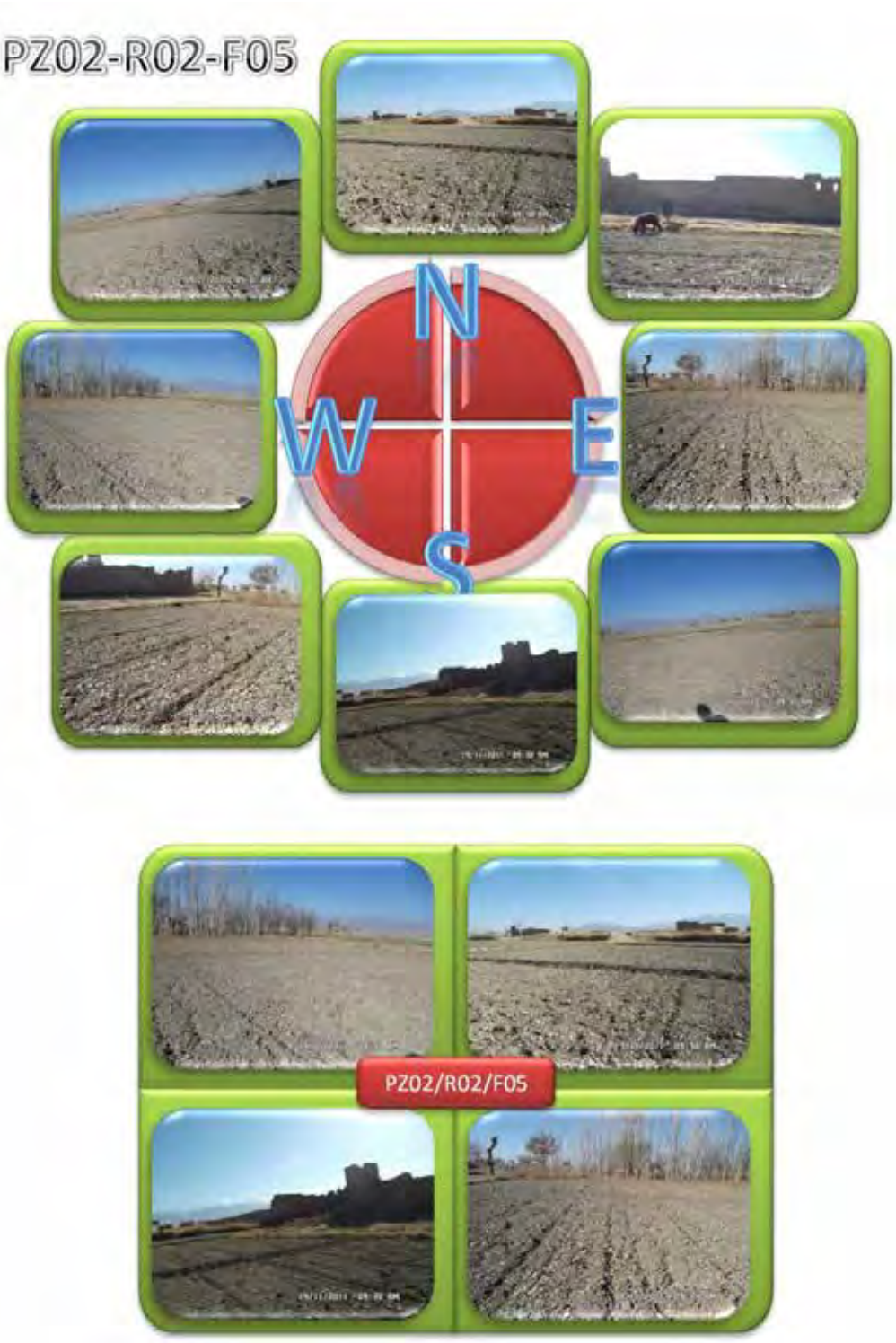
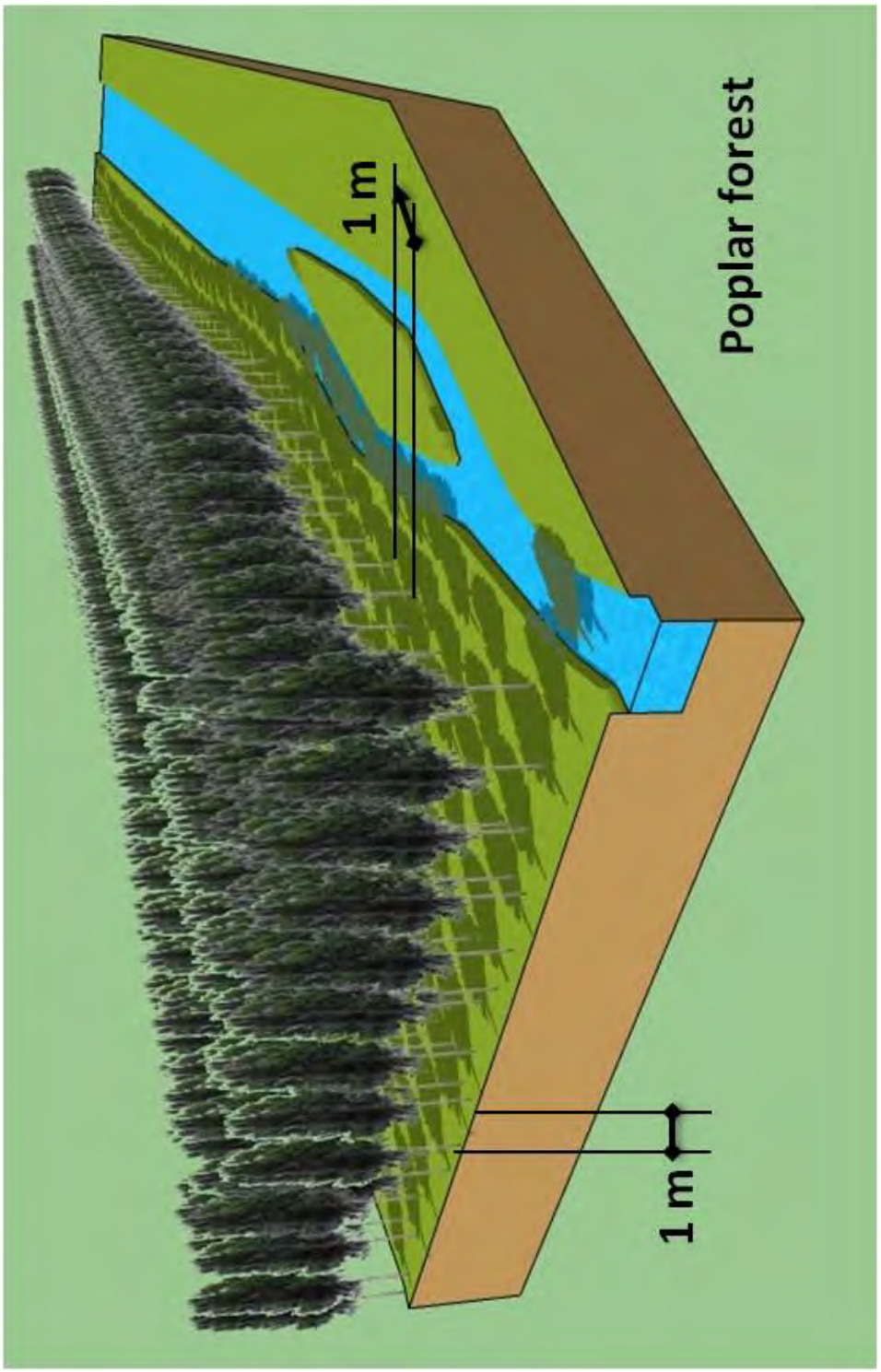


Figure 74 The PZ02/R02/F05 landform

8.3.8.1 Implementation Design



8.3.8.2 Implementation Cost

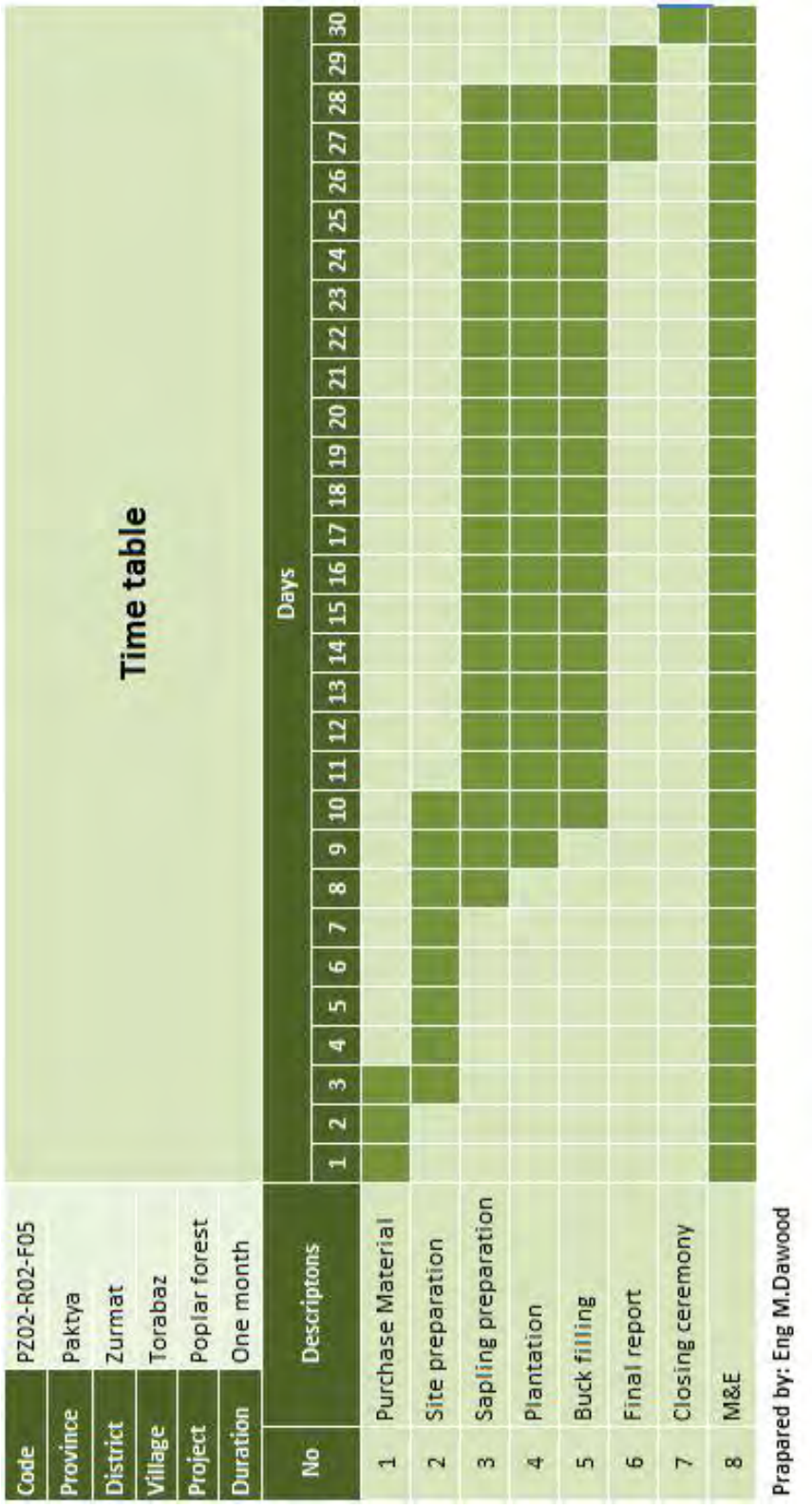
Bill of Quantity (BoQ) - Agroforestry

Code:	**PZ02-R02-F05**	**Project :**	**Poplar Forest**
Province:	**Paktya**	**Total Area:**	**6,300 m2**
District:	**Zurmat**	**Date:**	**November-11**
Village:	**Torabaz**		

Code	No.	Norm/Unit	Item	Quantity	Unit	Unit cost USD$	Total cost USD$
A1	**1.00**		**Site preparation**	**6,300.00**	**m2**		
	1.01	0.03	Unskilled labor	189.00	md	7.00	1,323.00
A2	**2.00**		**Cutting and Backfilling**	**6,300.00**	**m^3**		0.00
	2.01	0.01	Unskilled labor	63.00	md	7.00	441.00
A3	**3.00**		**Poplar**	**6,300.00**	**m2**		
	3.01		Poplar (kabuly)	12,600.00	Nos	0.20	2,520.00
	3.02		Poplar (DN-70)	12,600.00	Nos	0.20	2,520.00
A4	**4.00**		**Purchasing Material**				
	4.01		Shovel	40.00	Nos	5.00	200.00
	4.02		Pick axe	20.00	Nos	5.00	100.00
	4.03		Wheel barrow	8.00	Nos	60.00	480.00
	4.04		Bucket steel	8.00	Nos	2.00	16.00
	4.05		Axes	6.00	Nos	10.00	60.00
	4.06		Water collar	7.00	Nos	6.00	42.00
	4.07		Glasses	14.00	Nos	1.00	14.00
	4.08		Beam for maintenance	96.00	m	3.00	288.00
	4.09		Wire for maintenance	640.00	m	0.40	256.00
	4.10		Adze	6.00	Nos	10.00	60.00
	4.11		Pruning secateurs	20.00	Nos	35.00	700.00
	4.12		Planting board	12.00	Nos	2.00	24.00
	4.13		Fertilization (DAP)	78.75	kg	1.80	141.75
	4.14		Fertilization (UREA)	157.50	kg	0.90	141.75
A5	**5.00**		**Personal**				
	5.01	2.00	Foreman	60.00	md	14.00	840.00
	5.02	1.00	Team leader	30.00	md	15.00	450.00
	5.03	1.00	Store keeper	30.00	md	7.00	210.00
	5.04	2.00	Guard	60.00	md	10.00	600.00
A6	**6.00**		**Tools, stationary, transport**	**1.00**	**Ls**	**2,200.00**	2,200.00
						Grand total	**13,627.50**

Prepared by: Eng. M. Dawood

8.3.8.3 Implementation Time Table



Code	PZ02-R02-F05
Province	Paktya
District	Zurmat
Village	Torabaz
Project	Poplar forest
Duration	One month

Time table

No	Descriptions	Days																											
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	Purchase Material																														
2	Site preparation																														
3	Sapling preparation																														
4	Plantation																														
5	Buck filling																														
6	Final report																														
7	Closing ceremony																														
8	M&E																														

Prapared by: Eng M.Dawood

9 Zurmat Water Availability Program

This proposal outlines a program that would focus on water sources, water availability and land husbandry, the strengths of Afghanistan and an agricultural sector targeted for priority development by the Afghan government. The program is directed at reducing water scarcity, water drainage and soil erosion problems in rural areas. It would accomplish this by dramatically increasing the protection of the water sources and the conversion of bare lands and fields to reforested areas. The program is immediate and sustainable. In all activities of the program, the rural population will receive increased income through the "cash for work" approach. The impact will be immediate, because the farmers would have access to water for irrigation and erosion risk will decrease. This impact will increase yields and product quality as well.

Proposed duration of the program is three years.

9.1 Program summary

These costs are only the costs for the specific program inputs, not the project team salaries, allowances, equipment and other direct costs, or indirect costs.

Zurmat district - Summary cost of infrastructure			
N/S	Intervention	Cost	
1	Jadran kareze and canal rehabilitation	$	18,277.00
2	Mazarkhel kareze and canal rehabilitation	$	20,396.00
3	Bakhtiar kareze and canal rehabilitation	$	16,623.00
4	Landi kareze and canal rehabilitation	$	17,449.00
5	Khabri kareze and canal rehabilitation	$	26,914.00
6	Khanmadi kareze and canal rehabilitation	$	45,162.00
7	Lowy kareze and canal rehabilitation	$	26,607.00
8	Bigwall kareze and canal rehabilitation	$	16,203.00
9	Andar stream cleaning	$	16,073.00
10	Faqir M. stream cleaning	$	23,870.00
11	Calbati Qala stream cleaning	$	19,166.00
12	Rahmatkhel stream cleaning	$	23,175.00
13	Baraki stream cleaning	$	24,398.00
14	Panjlaki stream cleaning	$	29,962.00
15	Omarkhel canal cleaning	$	7,349.00
16	Omarkhel aqueduct rehabilitation	$	12,095.95
17	Omerkhel diversion structure	$	4,788.59
18	Shamshad river bank rehabilitation	$	16,068.00
19	Andar water reservoir	$	579,696.00
20	Gulbati water reservoir	$	106,276.75
21	Iwoy water reservoir	$	22,516.00
22	Niknom kareze water reservoir	$	180,258.75
	Total	**$**	**1,253,324.04**

Zurmat district - Summary cost of agroforestry			
N/S	Intervention	Cost	
1	PZ02/R01/F01 - Apple orchard	$	9,401.86
2	PZ02/R01/F03 - Poplar forest	$	12,900.90
3	PZ02/R01/F04 - Apple orchard	$	7,528.00
4	PZ02/R02/F01 - Apricot orchard	$	8,329.00
5	PZ02/R02/F02 - Vineyard	$	11,451.10
6	PZ02/R02/F03 - Peach orchard	$	6,992.21
7	PZ02/R02/F04 - Almond orchard	$	7,772.00
8	PZ02/R02/F05 - Poplar forest	$	13,627.50
	Subtotal	**$**	**78,002.57**
9	Reforestation (1,500Ha)	$	9,685,000.00
	Subtotal	**$**	**9,685,000.00**
	Total	**$**	**9,763,002.57**

9.2 Budget Summary

Here is the summary of the budget.

Zurmat Water Availability Project			
I.	Salaries	$	1,469,680.00
II	Fringe	$	193,403.02
III.	Allowances	$	392,000.00
IV.	Travel and Per Diem	$	68,100.00
V.	Program inputs & supplies	$	11,116,325.61
VI.	Other Direct Costs	$	718,700.00
VII.	Equipment, Vehicles, and Freight	$	101,500.00
	SUBTOTAL	**$**	**14,059,708.63**
ROP Overhead		$	2,464,666.92
	TOTAL BUDGET	**$**	**16,524,375.55**

9.3 Impact on Job Opportunity

Protective measurements such as intakes, karezes, canals, etc. and agroforestry activities have high demand for labor during installation. The required labor can be directly linked to the project. The following table shows our estimates of the number of labor-man days that will be created by the project.

Zurmat district - Unskilled labor for infrastructure				
N/S	Intervention	Cost		Man day
1	Jadran kareze and canal rehabilitation	$	6,328.00	904
2	Mazarkhel kareze and canal rehabilitation	$	5,096.00	728
3	Bakhtiar kareze and canal rehabilitation	$	6,321.00	903
4	Landi kareze and canal rehabilitation	$	5,299.00	757
5	Khabri kareze and canal rehabilitation	$	7,903.00	1,129

Zurmat district - Unskilled labor for infrastructure				
N/S	Intervention	Cost		Man day
6	Khanmadi kareze and canal rehabilitation	$	6,916.00	988
7	Lowy kareze and canal rehabilitation	$	8,274.00	1,182
8	Bigwall kareze and canal rehabilitation	$	7,147.00	1,021
9	Andar stream cleaning	$	10,143.00	1,449
10	Faqir M. stream cleaning	$	17,920.00	2,560
11	Calbati Qala stream cleaning	$	13,132.00	1,876
12	Rahmatkhel stream cleaning	$	17,115.00	2,445
13	Baraki stream cleaning	$	18,158.00	2,594
14	Panjlaki stream cleaning	$	23,387.00	3,341
15	Omarkhel canal cleaning	$	1,323.00	189
16	Omarkhel aqueaduct rehabilitation	$	448.00	64
17	Omerkhel diversion structure	$	840.00	120
18	Shamshad river bank rehabilitation	$	12,376.00	1,768
19	Andar water reservoir	$	550,809.00	78,687
20	Gulbati water reservoir	$	83,867.00	11,981
21	Iwoy water reservoir	$	1,026.00	7,182
22	Niknom kareze water reservoir	$	162,127.00	23,161
	Total	**$**	**965,955.00**	**145,029**

Zurmat district - Unskilled labor for agroforestry				
N/S	Intervention	Cost		Man day
1	PZ02/R01/F01 - Apple orchard	$	2,008.86	287
2	PZ02/R01/F03 - Poplar forest	$	1,617.00	231
3	PZ02/R01/F04 - Apple orchard	$	1,260.00	180
4	PZ02/R02/F01 - Apricot orchard	$	1,407.00	201
5	PZ02/R02/F02 - Vineyard	$	4,235.00	605
6	PZ02/R02/F03 - Peach orchard	$	1,078.00	154
7	PZ02/R02/F04 - Almond orchard	$	1,722.00	246
8	PZ02/R02/F05 - Poplar forest	$	1,764.00	252
	Subtotal	**$**	**15,091.86**	**2,156**
9	Reforestation (1,500Ha)	$	2,695,000.00	385,000
	Subtotal	**$**	**2,695,000.00**	**385,000**
	Total	**$**	**2,710,091.86**	**387,156**

9.4 Physical Measurements

The planned interventions do not cover all necessary actions to be taken. The selection criteria were based upon the identification of the top priorities. The program would address the main problems in the watershed area. Part of the selection process was to focus on the DAIL's request. These physical measurements will give an example in the future for watershed rehabilitation programs. This clearly establishes the central position of irrigated production in the Afghan agricultural economy, and justifies the government's position in naming self-sufficiency in irrigated agriculture its number one priority. This, of course, means not only reaching parity with present demand, but achieving a long-term program in water and natural resource management. The detailed designs for the selected interventions are in the attached Zurmat Survey Report and Recommendations.

9.5 Measurements for Agroforestry

The agroforestry interventions of the program are divided into two categories. First, there are planned interventions, which were selected to protect the infrastructures constructed by the program and the surrounding areas. The second group consist reforestation, where erosion problems reached a critical level. The detailed designs for the selected interventions are in the attached Zurmat Survey Report and Recommendations. The recommended interventions are examples to create demonstration plots for the rural population. A part of the demonstration plots, the project includes the reforestation of 1,500 ha bare land area in the region.

Location		Landscape			
Province	District	Code	Latitude	Longitude	Elevation
Paktya	Zurmat	PZ01	33.413665	69.049408	2163.9

Relief				Landform			
Code	Place	Type	Activity	Code	Latitude	Longitude	Elevation
PZ01/R01	Jadran	Kareze	Rehabilitate	PZ01/R01/F01	33.411630	69.050075	2,168.4
	Mazar	Kareze	Rehabilitate	PZ01/R01/F02	33.410827	69.059895	2,193.1
	Bakhtiar	Kareze	Rehabilitate	PZ01/R01/F03	33.410992	69.062532	2,189.0
	Landi	Kareze	Rehabilitate	PZ01/R01/F04	33.416753	69.054273	2,182.2
PZ01/R02	Khabri	Kareze	Rehabilitate	PZ01/R02/F01	33.416973	69.061112	2,175.6
	Khanmadi	Kareze	Rehabilitate	PZ01/R02/F02	33.422015	69.055375	2,158.8
	Luway	Kareze	Rehabilitate	PZ01/R02/F03	33.438407	69.063968	2,166.5
	Sheni	Kareze	Rehabilitate	PZ01/R02/F04	33.430077	69.079960	2,189.2
PZ01/R03	Andar	Stream	Rehabilitate	PZ01/R03/F01	33.413410	68.990172	2,141.5
	Faqirmoh	Stream	Rehabilitate	PZ01/R03/F02	33.410600	69.019668	2,161.8
	Kalpati	Stream	Rehabilitate	PZ01/R03/F03	33.419667	69.033092	2,162.0
	Adinkhel	Stream	Rehabilitate	PZ01/R03/F04	33.457453	69.085707	2,180.2
	Baraki	Stream	Rehabilitate	PZ01/R03/F05	33.447797	69.06257	2,168.6
	Panjlaki	Stream	Rehabilitate	PZ01/R03/F06	33.469085	69.070037	2,179.3
	Omer khel	Aqueduct	Divide	PZ01/R03/F07	33.47525	69.079460	2,173.8
PZ01/R04	Shamshad	River bank	Construction	PZ01/R04/F01	33.42775	69.09655	2,192.4
	Andar	Water reserve	Construction	PZ01/R04/F02	33.416623	68.98990	2,142.4
	Gulbati	Water reserve	Construction	PZ01/R04/F03	33.413853	69.003962	2,152.5
	lwoy	Kareze reserve	Rehabilitation	PZ01/R04/F04	33.425405	69.067885	2,165.9
PZ02/R01	Torabaz	Apple orchard	Establishment	PZ02/R01/F01	33.47594	69.11722	2,193.0
	Lakdewal	Vineyard	Establishment	PZ02/R01/F02	33.42899	69.0969	2,177.0
	lakdewal	Poplar forest	Establishment	PZ02/R01/F03	33.4282	69.09627	2,184.0
	Shamshad	Apple orchard	Establishment	PZ02/R01/F04	33.42544	69.05685	2,182.0
PZ02/R02	Khanmadi	Apricot orchard	Establishment	PZ02/R02/F01	33.42592	69.0515	2,160.0
	Khanmadi	Vineyard	Establishment	PZ02/R02/F02	33.42068	69.07365	2,168.0
	Adenkhil	Peach orchard	Establishment	PZ02/R02/F03	33.4222	69.07503	2,167.0
	Adenkhil	Almond orchard	Establishment	PZ02/R02/F04	33.45115	69.06791	2,159.0
	Torabaz	Poplar forest	Establishment	PZ02/R02/F05	33.47923	69.11353	2,193.0
PZ03/R01	Niknom	Water reserve	Construction	PZ03/R01/F01	33.50548	69.100332	2,205.0
PZ01-PZ03	Zurmat	Reforestation	Establishment				

9.6 Performance Management and Impact Evaluation

PMIE will be handled by ROP in close cooperation with the MAIL and DAIL. This approach will provide an independent review of project progress and support capacity building within the DAIL. In addition to the MAIL M&E system, ROP will establish an internal system for monitoring progress and for assuring the quality of our project activities.

9.7 Cooperation with DAIL

ROP plans to integrate the DAIL extension service into our project implementation using an approach we have used in previous projects. Although DAIL has extension agents throughout the region, most of these agents do not have sufficient technical capacity, experience nor the specific knowledge and skills required to support the targeted interventions. From our experience in previous projects, ROP has established training programs, materials and processes that will be used to upgrade the DAIL extension agents to handle effectively the extension tasks required for successful implementation of this project. ROP will integrate the DAIL extension agents into the project to utilize their training.

9.8 Cooperation with the Rural Communities

ROP staff will work closely with the Shuras and Shura councils. The success and sustainability of the program focus on two critical approach. One of them is to generate job and income opportunities for the community members. This approach will be realized through "cash for work". If a population cannot get any direct benefit from the program, the people will not take care of the established measurements. Therefore the communities will do the implementation. This is also true for the second approach. The Shuras and the Shura council should manage the maintenance of the measurements with the technical assistance of the DAIL extension service. The intervention in the future (especially forests) will generate income for the Shuras and DAIL to support financially the activities for maintenance.

9.9 Project's linkage to the US Foreign Assistance for Afghanistan

Rebuilding Afghanistan's agricultural sector is one of the USG's top priorities. There are two frameworks, which provide the strategies for these efforts:

- USG Agriculture Assistance Strategy for Afghanistan (October 2009)
- Afghanistan and Pakistan Regional Stabilization Strategy (February 2010)

The approach to accomplish the objectives of these strategies focuses on the implementation of activities to support Assistance Objective 5.0: A Sustainable, Thriving Agricultural Economy. Under this objective there are three Intermediate Results. One of them is the Intermediate Result 5.2 – Improved Natural Resource Management. Efforts to achieve this IR concentrate on three things: (1) watershed rehabilitation, (2) conservation of biodiversity and (3) environmental compliances. In order to accomplish these priorities the project's centerpiece will be a new large scale watershed rehabilitation and management strategy utilizing an integrated water resource management approach at the community level.

9.10 Project's linkage to the RC-E CIV-MIL Stabilization Strategy

The stabilization strategy focuses on three areas: GIRoA, Population focused stabilization and long-term development. It synchronizes the objectives of a RC-E Population Centric CIV-MIL Stabilization Strategy in key terrain districts to the long-term development. Its main objective is to identify and solve the sources of instability. The efforts to accomplish this strategic vision focus on two specific objectives:

- To design activities that specifically address instability at local level
- To utilize other USAID and CERP resources to implement projects directly impacting stability that DDP not intending to undertake

The project proposal clearly addresses both objectives. Water scarcity, annual flood and the degradation of biodiversity (including the deforestation and on-going desertification in the region) is undermining USG's efforts to achieve the goals of AO 5.0. These problems attack directly the economic-financial stability of the rural households. They have an immediate and long-term negative impact on the quality of life among rural population. The assessment and project proposal (developed under CERP contract) will address the root causes of these problems, which are clearly qualify under the criteria of source of instability.

9.11 Impact Table

IMPACT TABLE
Consistency with US Government Strategy
Assistance Objective 5.: A sustainable Thriving Agricultural Economy
Intermediate Result 5.2: Effort to achieve will concentrate on 1) rehabilitating watersheds; 2) environmental compliance; 3) Conservation of biodiversity through community based natural resource management
Sub-Intermediate Result 5.2.1.: Improved integrated water management
Sub-Intermediate Result 5.2.2.: Improved environmental compliance
Sub-Intermediate Result 5.2.3.: Biodiversity conserved in selected area
Overall Impact
The overall impact is to protect and rehabilitate the watershed in order to protect farmlands and natural vegetation and decrease the water scarcity in the area
Main Outcomes
1- Production quality and quantity will increase
2- Soil depletion and degradation will decrease
3- Water ways and catchment areas will stabilize
4- Farmland and natural vegetation areas will be protected against the annual flood and monsoon
5- The period when water is available will increase allowing longer period for irrigated agriculture production
6- Through cash for work approach and increased agriculture production job opportunity will be created for the rural population
7- New areas can be used for agriculture and livestock production
8- Adequate drainage system will protect the farmland against flood

Outcomes and Outputs					
N/S	Problem	Cause	Intervention	Output	Impact
1	Intensive stream canal erosion, Intensive soil erosion of the plain, Sheet erosion, Rill erosion, Soil loss	High rate of water flow, Run off effect, Over grazing land, Annual flood, Unstable water way	Buffer dam establishment, Canal network rehabilitation, Kareze rehabilitation, Riverbank protection	Water slow down and regulated, River bank protected, Stream bank is stabilizing, Water way regulated, Decreased level of run off	River bank erosion will stop, Lower level area is protected, Rill development stop, Soil erosion decrease, Sheet erosion stopped
2	Soil degradation, Biodiversity loss, Deforested area, Soil loss, Large bare land and rocky areas	Wood collection, Over grazed land, High rate of water flow, Desertification	Reforestation, Improved forest management, Agroforestry measurements	Vegetation land cover increase, Bare land area decrease, Flood effect decrease, Erosion decrease, Sedimentation decrease, Upper layer canopy is restored	Desertification stop, Biodiversity increase, Soil formation restart, Soil moisture content retained, Drainage capacity increase, Job opportunity created
3	Water scarcity, Unpredictable rainfall, Unstable water catchment area, Waterlogged farmland	Irregular water distribution during the year, Hydrologic cycle broken, Sedimentation, Annual flood, Absence of drainage system	Regulate riverbank, Rehabilitate canals, Reforestation, Rehabilitate karezes	Farmland area protected against flow, Water availability period elongated, Waterlogged effect decrease	Fruit yield and quality improves, Rainfall predictable and increase, Water distribution regulated, Job opportunity created

10 Tables and Figures

10.1 Index of Tables

10.2 Index of Figures

Kabul, Afghanistan
2011