Evaluation of Selected RAMP Irrigation Projects

by
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Summary

At the request of USAID, I traveled to Parwan and Herat Provinces in May and June, respectively to conduct site inspections of representative RAMP irrigation infrastructure projects. In Herat, I also met with the Water User Association formed under this program.

General observations are as follows and are based solely on a visual inspection during the site visits. Photographs and additional documentation of the problems noted are included in this report, as well as a section summarizing some of the issues related to project design. Eight (8) recommendations for future projects are provided.

Parwan

1. The projects in Parwan Province had problems with design, material selection and workmanship.
2. In three of the Parwan projects, these problems are serious enough to threaten their continued viability.
3. The locals interviewed during the site visits were very happy with these projects. They stated that the irrigation diversion projects have improved crop production by about 20% and that the canal dredging and rehabilitation project had greatly improved domestic water supply in the villages affected.

Heart

1. The projects in Herat Province had better workmanship and material selection than I saw in Parwan.
2. Five (5) of the Herat projects were still under construction (with significant amount of work to be completed before the termination of the program on June 30), so their design and performance could not be observed.
3. One large siphon under construction appeared too small which may result in serious overflow in the upstream canal.
4. A canal inlet structure had design and workmanship problems.
5. One bridge had workmanship problems at a critical area in the structure.
6. One bridge/aqueduct combination which had large, leaking cracks that are undermining the structural integrity.
7. The remaining bridges and small aqueducts appeared to be adequately designed and constructed.

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8. The locals were very happy about the rehabilitation of the Injil Canal and stated that there is about 20% more water flowing in the canal and that the water now reaches the end of the canal, restoring irrigation to downstream land.

Water User Association

1. The association conducted its first election just three months prior to my visit and had not yet implemented polices or assessed fees.
2. The locals seem pleased with the organizational structure of the association and the election process. They were positive and optimistic about the future benefits and effectiveness of the association.
3. They requested a building and equipment for canal maintenance and repair.
4. The association appears too small to be economically viable.

Design Issues

I did not have access to documentation on the design and approval process. RAMP project managers in Herat stated that the contractors were responsible for the designs, except for the larger water works which were done by staff at Chemonics' Kabul offices. In Herat, all projects were submitted to the Provincial Irrigation Department for approval. I was told by an USAID contract officer that this was the standard practice under RAMP.

I have no information on the extent which the Provincial Irrigation Departments checked the designs and calculations. If no payment was provided for the review, then it is likely that a check was only cursory or not done at all as apart of the approval process. The other problem is that most Provincial Irrigation Departments have very little capacity or experience in project design.

The lack of capacity and equipment is an on-going problem in Afghanistan. To my knowledge, there is no regular training program in water works design currently offered in Afghanistan, so technical staff have no opportunity for professional development.

Standard designs do exist. Within Afghanistan, FAO (Food and Agriculture Organization of the United States) design guides are available in a library at the Ministry of Energy and Water. However, even when using a standard design, the engineer must check calculations and determine dimensions based on the characteristics of the site. Government engineers and some contractors often lack the equipment needed for proper design, particularly survey instruments and stream flow measurement equipment.

In Parwan, several retaining walls had very large vertical cracks. The exact cause cannot be determined by simple observation. The problem may be related to poor design of the foundation, or a result of poor construction and improper selection of materials. For example, use of silty river water in mortar or dirty gravel when mixing concrete can significantly weaken the structure.

Recommendations

1. Irrigation infrastructure projects implemented under RAMP should be inspected and repaired as needed to prevent failure.

2. Projects that were completed at the end of June should be inspected for possible problems created by the rush to meet this deadline.
- Repairs should be completed as necessary.

3. Standards on design and the selection of materials should be developed for future projects and published.
- Those developed by the FAO (Food and Agriculture Organization of the UN) as a can serve as the basis for these standards.
- Workshops or other training should be provided on use of the standards by designers and contractors.

4. All water diversion, and in-river and channel structures should be designed and constructed to accommodate future water measurement.

5. A more complete and rigorous work progress and site inspection system should be implemented using the EIRP (Emergency Irrigation Rehabilitation Program) inspection manual and forms as a basis.
- In order to build capacity in the government, personnel from Provincial Departments of Rural Development, Agricultural and Irrigation should be contracted to assist with the inspection process.

6. In order to build capacity within the government, engineers from the Provincial Departments of Rural Development and Irrigation should be contracted to do the project designs with oversight from appropriate qualified engineers at the Ministry level.
- USAID or its contractors should assist with and certify the designs, as well as provide feedback to government engineers as is appropriate.

7. A specific and uniform level of cost-share requirements should be implemented for villages and persons benefiting from future water works projects, such as a percentage of the total project costs.

8. As planned, USAID should continue the Water User Association program in future projects.
- The Water User Association concept should be expanded to create a “Federation” parent organization to share equipment and other resources among local associations in order to make the associations finically viable.

Site Visit Arrangements and Scheduling

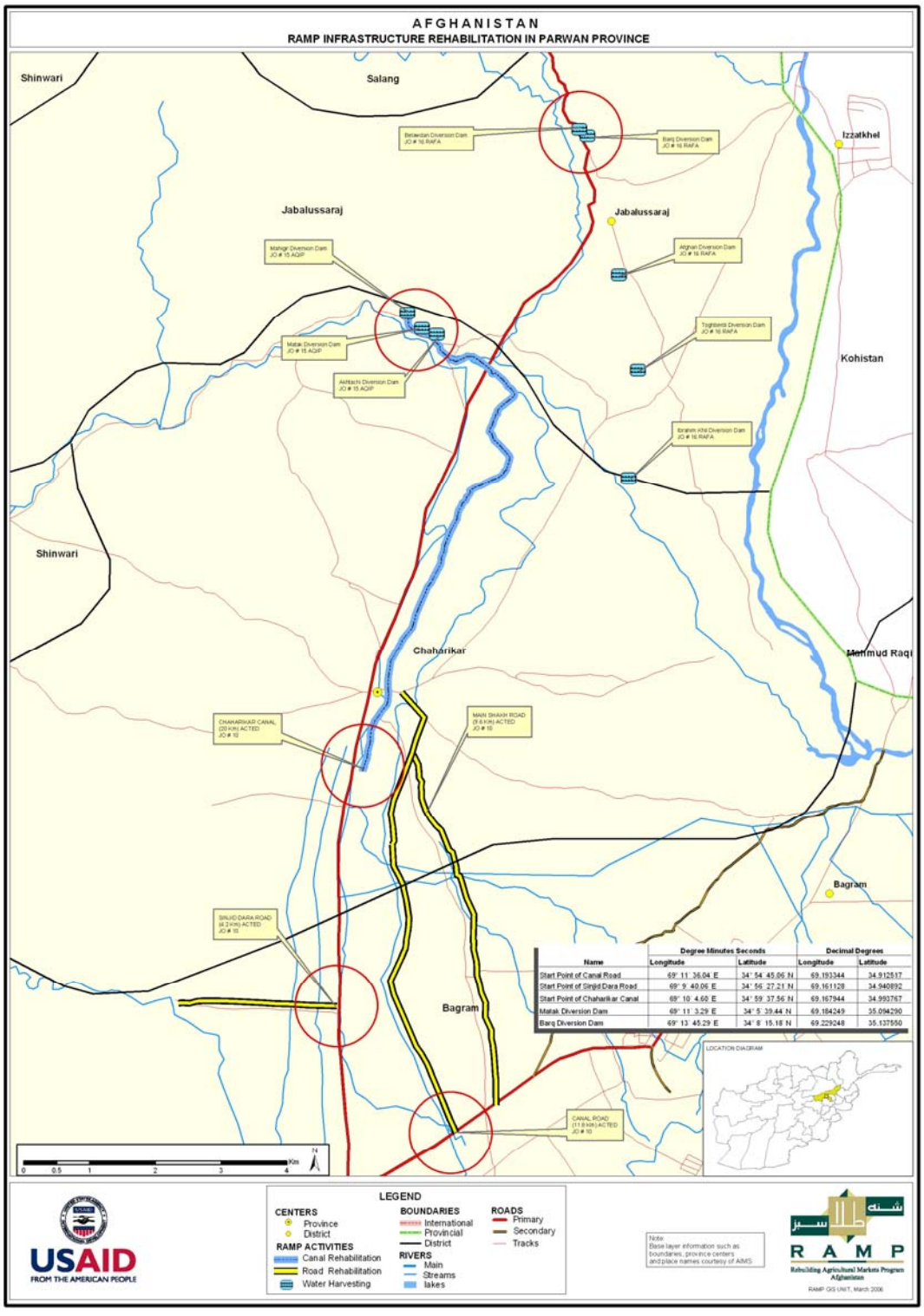
The projects were selected by USAID RAMP officers, and the Public Information Officer of Chemonics developed the site visit schedules (see Table 1 and the attached maps). The projects were implemented by various subcontractors, and are reportedly representative of the type of those which may be included in the upcoming ASAP (Accelerated Sustainable Agricultural Program). Local RAMP project managers provided escort to the project sites and were available to answer questions.

The US Embassy provided force protection and transportation for the day trip to Parwan Province. In Herat, I stayed at the Italian PRT which also provided transportation and force protection for the site visits. RAMP project security personnel were present at the Kale Mahala Aqueduct and followed the PRT vehicles to the Khaje Noor Aqueduct due to an on-going water conflict between upstream and downstream water users on the Guzara Canal.

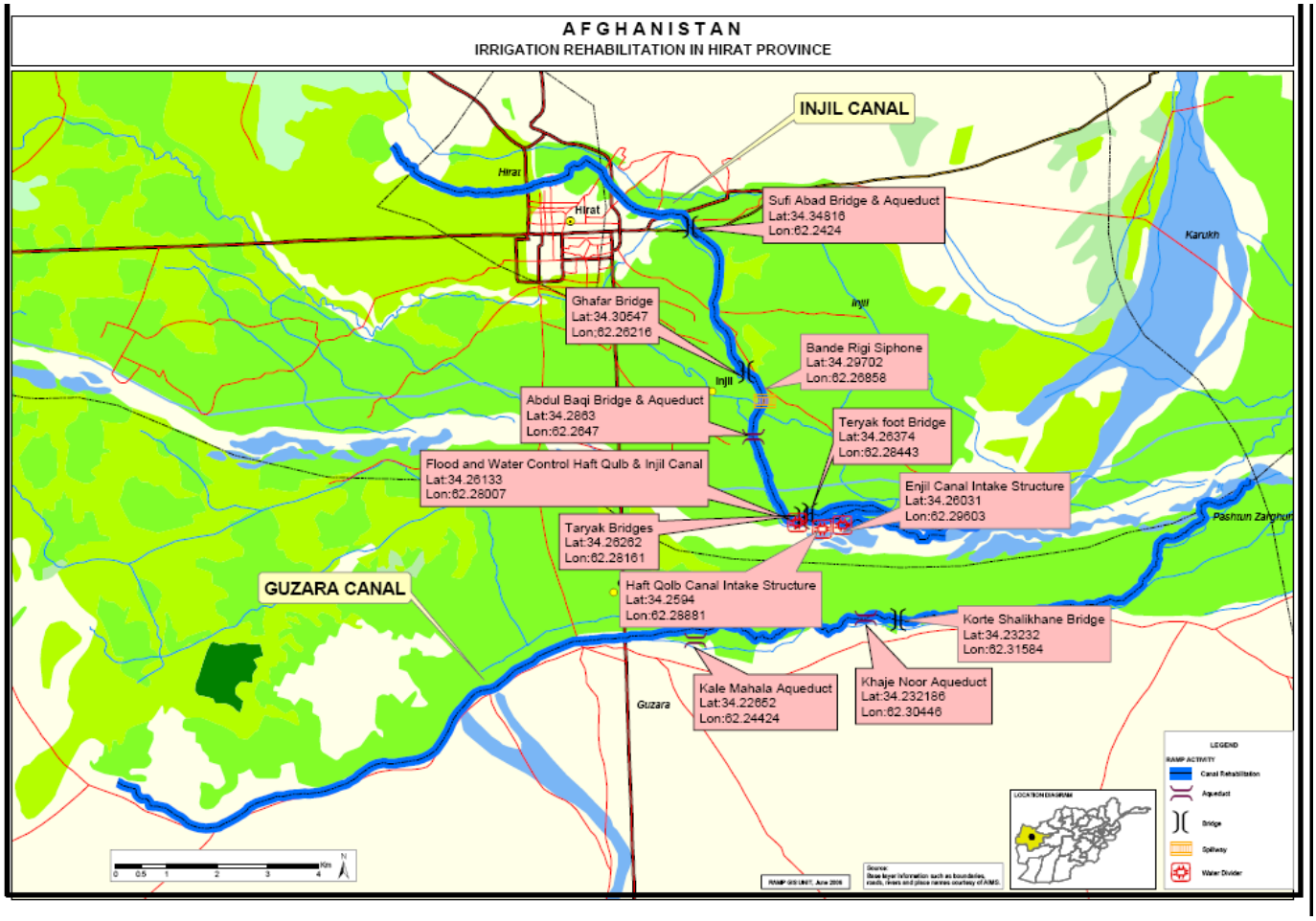
The purpose of my site visits was to complete a visual inspection of each project and note any obvious problems. I did not have access to the design calculations and could only deduce design adequacy by observing the performance of the projects on the day I was at the site. At the sites under construction in Herat, local contractors were available to answer questions, and I was able to thumb through the design plans they had with them.

Table 1. RAMP Projects Listed by Date and Order of Visit

Parwan Province	**Heart Province**	
5/15/06	**6/19/06**	**6/20/06**
Belawadan Diversion	Sufi Adab Bridge and Aqueduct	Kale Mahala Aqueduct
Barq Diversion	Ghafar Bridge	Kahje Noor Aqueduct
Antachi Diversion	Abdul Baqi Bridge and Aqueduct	Korte Shalikhane Bridge
Matak Diversion	Haft Qulb – Injil Canal Water Constrol Structures	
Charikar Canal	Taryak Bridges	
	Teryak Foot Bridge	
	Haft Qolb Canal Structures	
	Injil Canal Water User Association	
	Injil Intake Structure	
	Bande Rigi Siphone	



Map 1. Location of RAMP Infrastructure Projects in Parwan Province.



Map 2. RAMP Infrastructure Projects Visited in Herat Province. The Injil Canal projects and the Guzara Canal projects were visited on day 1 and day 2, respectively.

Water Users Association

I met with members of the Injil Canal Water User Association in a shade structure set up adjacent to the Haft Qulb – Injil Canal Project site. The association had its first elections three months earlier. They plan to continue the tradition system of water management through the Mirab for the remainder of the year, then institute a new management structure starting next year, details of which have not been decided.

One of the more significant changes will be that instead of paying the Mirab with a portion of their crops, farmers will have to pay the association money. The Association members at the meeting were confident that the collection of the fees (cash) instead of payment with crops would not be a problem. The members repetitively requested a building for the association, and equipment for cleaning out of canals and for system maintenance and repair.

Examples of Problems Observed – Parwan Province

Poor workmanship

Rusting weld

Water leaking through structure

An island with vegetation in spillway

Eroding rock and mortar construction

Improper design of structure: inadequate or no accommodation of the hydraulic jump

Hydraulic jump and water washing over retaining walls put the structure in jeopardy

Erosion of spillway and retaining walls, questionable use of rock and mortar construction at this critical location

Workmanship problems - spoil not removed: now diverting water along wall and undermining retaining wall foundation.

Expanding crack in same retaining wall

Large crack in retaining wall, evidence of likely structure failure in the next few years

Poor workmanship

Erosion of structure at critical location

Non-vertical grove, impossible to insert gate

Examples of Problems Observed – Herat Province

Bridge/aqueduct combination – two large leaking cracks at the base of the aqueduct are undermining structural integrity

Uneconomical design

Poor workmanship and quality control – creates weak spots at a critical area in structure

Sloppy and rusting welds

Inlet structure significant lower than gabion and dike (not shown); water can flow around structure (through gabion) and undermine structure; no gates or other method to control flow

Poor quality control on size of rock-fill material in gabion

Siphon appears significantly undersized and may reduce water flow downstream of structure; upstream - may cause water to back up and overtop canal