

Field Project Design Review and Quantity Estimation: Watershed Restoration in the
Sultak Watershed, Paktya Province
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For the Tennessee Agri-Business Development Team (TN-ADT)

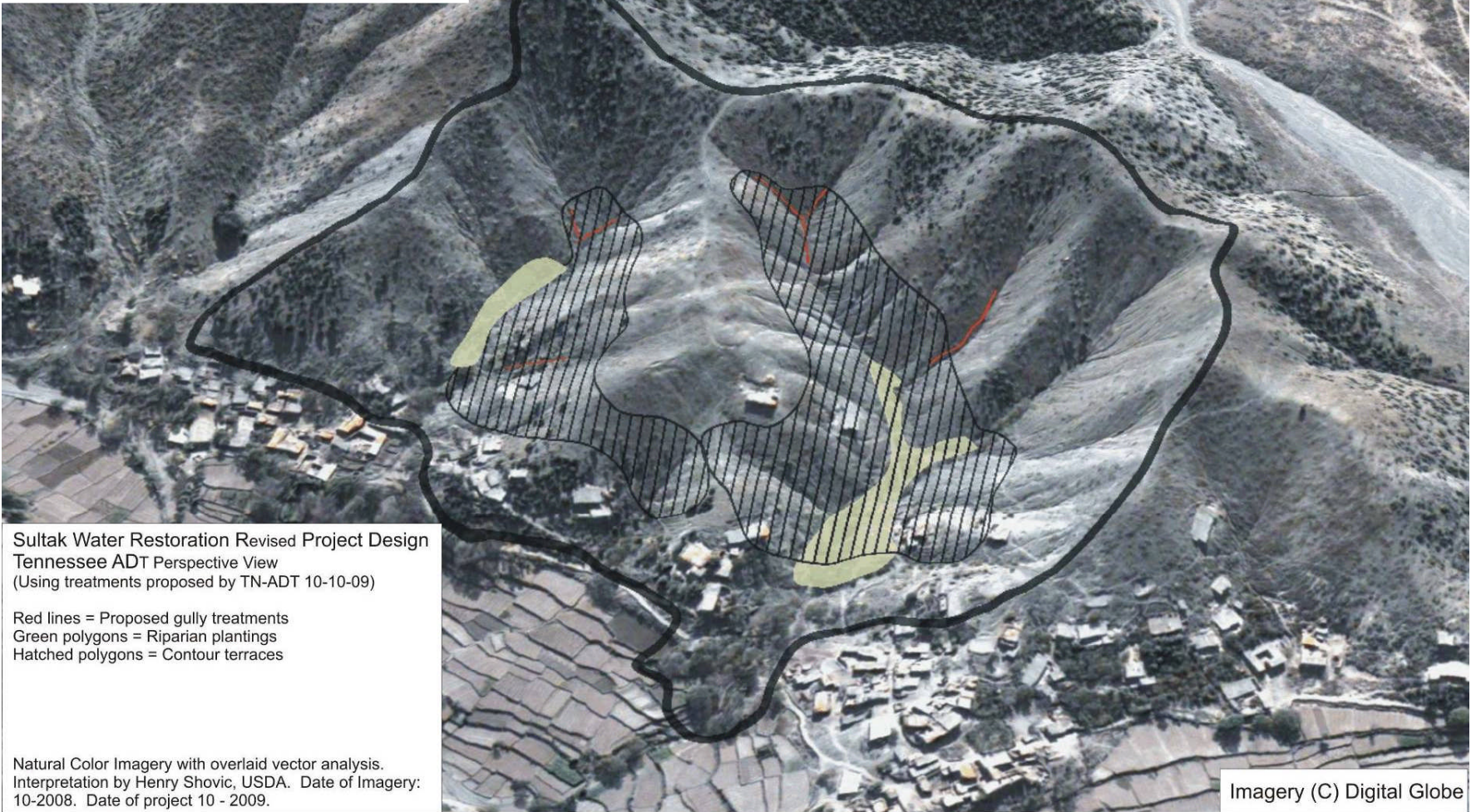
The objective of this report is to provide a review of a proposed field design for a small-scale watershed restoration project in Afghanistan. It was completed using remote satellite imagery and GIS data from the SE Afghanistan Water Resources Assessment. Field project proposals were provided by the TN-ADT. It is designed to help facilitate project design by providing estimated quantities for submission as a project proposal for funding and implementation. See previous reports for additional maps.

Map 1 shows the overall project area, looking west, showing the project design as submitted by TN-ADT.

Map 2 shows a plan view of the draft proposal, digitized from project data supplied by TN ADT after field review. This map was submitted by TN-ADT, and is used below to estimate quantities for project submittal.

Map 3 (Image Four) is the original plan submitted by TN-ADT with proposed treatments.

South-East Afghanistan Water Resources Assessment



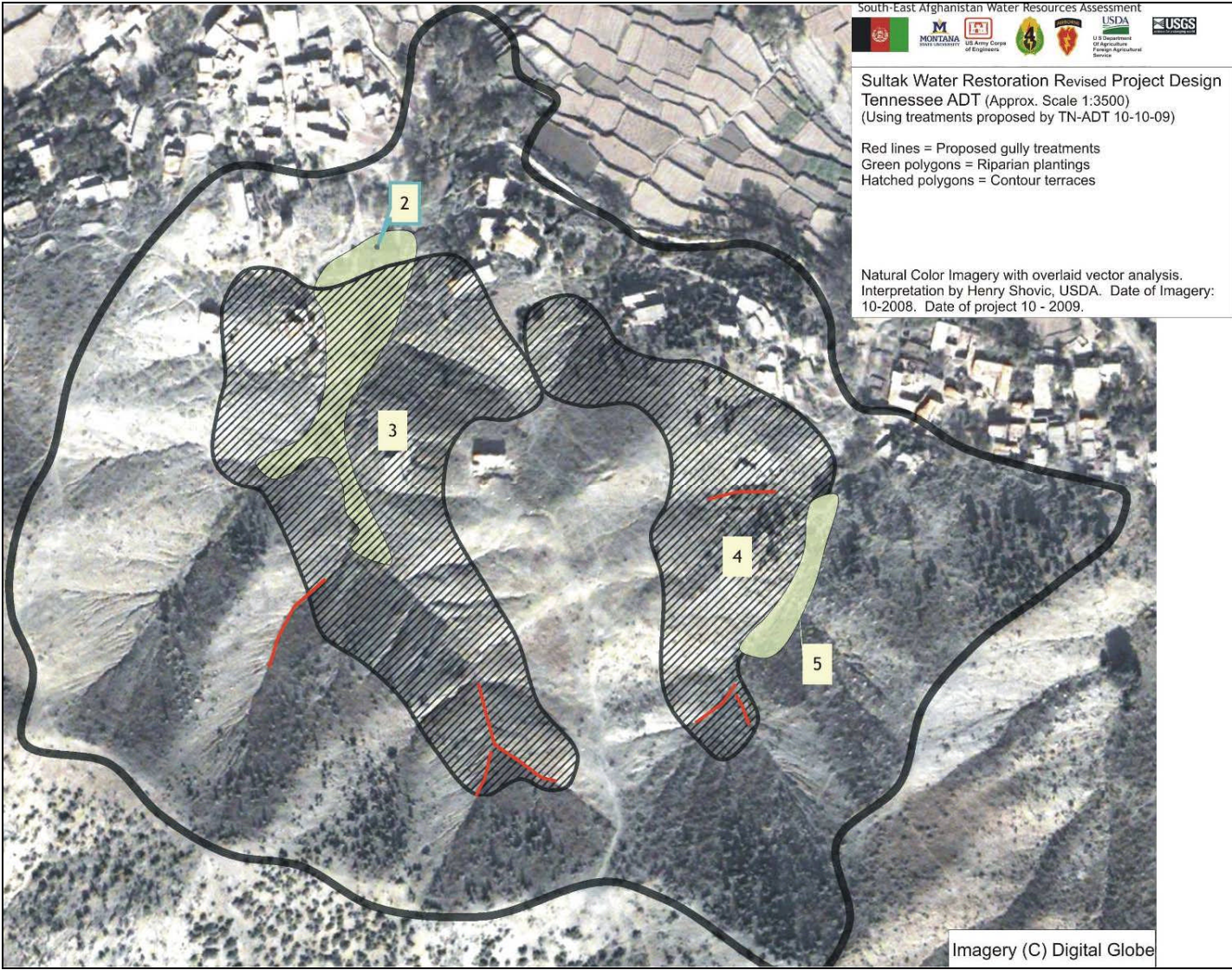
Sultak Water Restoration Revised Project Design
Tennessee ADT Perspective View
(Using treatments proposed by TN-ADT 10-10-09)

Red lines = Proposed gully treatments
Green polygons = Riparian plantings
Hatched polygons = Contour terraces

Natural Color Imagery with overlaid vector analysis.
Interpretation by Henry Shovic, USDA. Date of Imagery:
10-2008. Date of project 10 - 2009.

Imagery (C) Digital Globe

Map 1



Map 2






-  = riparian buffer plantings
-  = contour terracing
-  = check dams

Image Four

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Recommendation Summary:

Terrace area, gully lengths and all feature slopes were measured from the plan map with slope values generated using a 5m resolution digital elevation model using ARCGIS®. Perspective views were generated with ARCGLOBE®. The following are estimates to formulate budgets and scope of work. They are not designed to be site-specific locations for implementation. See the Appendix for details of estimation.

Contour Terraces: Where slopes are in an appropriate slope range, install contour terraces to reduce rill erosion and overland flow, and increase infiltration. Approximate area recommended for terraces (within slope range) is 3.3 ha. At 8 m spacing for 25-40% slope, this is **3,976 m of contour terrace by length**. Actual contour locations must be made on the ground. Install contour terraces only on average slopes below 40%.

Check Dams in Gullies: Where slopes are appropriate, install check dams as recommended for 75 m of treatable gullies for a total of **9 rock check dams**. This will reduce gully development and stabilize moderate slopes. This is about 29% of the entire gully system. The remainder is too steep for this kind of restoration.

Bank Protection for Streams: Riparian Plantings are recommended for **7,800 sq. m. or 0.78 Ha**. This will reduce erosion and increase infiltration. Though a large area is shown the map, riparian plantings should be limited to areas where there is evidence of groundwater close to the surface, or should be irrigated for at least two growing seasons.

Appendix: Calculations

All terrace polygons have evidence of gully erosion visible on 1:1000 imagery. Polygons for terraces and riparian plantings, and polylines for gully control were digitized from a map provided by TN-ADT (10-9-1009). Areas and length calculations are from GIS, modified by the following:

- 10% area added for planimetric correction for sloping lands on ortho-rectified imagery.
- Proposed treated area for terracing was reduced by 45% to account for slopes over 40% in the proposed treated areas. Terraces are not recommended on slopes over 40%.
- Proposed treated gullies are reduced by 71% to account for steep channel slopes. Check dams are not recommended on channel slopes over 20%.

Initial Area of Polygons

Label	Name #	Area (sq. m.)	Final Area (sq. m.)
2	Riparian Buffer Plantings	5,518	6,069
3	Contour Terracing	35,668	21,579
4	Contour Terracing	19,256	10,590
5	Riparian Buffer Plantings	1,572	1,729

Riparian Buffer Plantings:

Total initial area of Riparian Buffer Plantings: 7,090 sq. m.

Final total area is $7,090 \times 1.10$ or **7,800 sq. m.**

Contour Terracing:

Total initial area of Contour Terracing: 54,924 sq. m.

Final area is $54,924 \times 0.55 \times 1.10$ or 33,169 sq. m.

Contour terrace length estimated from two 3:1 rectangles with the area measured above and 8m slope spacing

Polygon 3: 10.5 terraces at 254 m length = 2,667 m of terrace

Polygon 5: 7.4 terraces at 177 m length = 1,309 m of terrace

Total is 3,976 m of terrace.

Check Dams:

Total length of gullies proposed for check dam installation: 261 m. Total length of gullies proposed for check dam installation with channel slopes <21%: 75 m. This is 29 percent of the total.

So total practical m of channel recommended for check dams is $.29 * 261 = 75$ m.

Measured slope average of gully channels (less than 21% slope) is 15%. These gullies appear on imagery to average 2 m wide, and are probably at least that deep. At an average of 15% channel slope and 1 m high, check dam spacing is 9 m. For 75 m of gully within slope constraints, that is $75/9$ or 9 check dams. These should be an average of 2 m wide + 3 m key depth or 5 m total width.