Taquiña Torrentera
- 900 meters of the Taquiña Torrentera
- Turbulent flows during rainy season
- Sediment transported and deposited

Taquiña Project
Puente Jesus Maestro and Hydraulic System
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Methods and Procedures

The following section provides an overview of the methods used to collect information at the project site in Bolivia and the procedures used to analyze and organize the data collected.

Soil Testing:
- Dynamic Cone Penetrometer
- Sieve Analysis
- Soil Classification using USCS
- Moisture Content

Surveying: US 41 surveyed over 300 points, covering 17.5 acres.

CAD: All survey points were uploaded into AutoCAD Civil 3D, and drawings were drafted in AutoCAD 2009.

Project Meetings: US 41 met with city officials, local engineers, and citizens close to the project site.

Design Calculations: Considering the material cost of concrete and steel, US 41 found an optimum cross section for the lowest cost.

Flow Calculations: The following were the results determined from flow calculations:
- 10-year Design Storm
- Runoff
- Unit Hydrograph
- Design Hydrograph

The 10-year design storm peak flow is approximately 40 m³/s.

Existing Conditions

1. Jesus Maestro School
- Kindergarten through 12th grade
- Located in Villa Satellite with 500 students
- 300 students must cross torrentera to attend school

2. Villa Satélite & Villa Porvenir
- River bed is 45 meters wide
- Joins roads on either side
- Children cross in front of school and families cross to trade goods

3. Villa Porvenir
- Log crossing
- 2 logs span 20 meters
- Rainbow across crossing
- Logs secured with strand of Jesse wire

4. Proposed Bridge Location
- Built in 2007 without hydraulic protection
- Gabion spillway constructed upstream in 2008
- Gabions failing and bridge foundations susceptible to future failure

5. Downstream Gabion Spillway with Log Crossing
- 2 logs span 20 meters
- Rainbow across crossing
- Logs secured with strand of Jesse wire

6. Puente Taquiña
- Built in 2007 without hydraulic protection
- Gabion spillway constructed upstream in 2008
- Gabions failing and bridge foundations susceptible to future failure

7. Existing Upstream Gabion Spillways
- Three gabion spillways upstream
- Constructed of wire mesh boxes filled with rocks
- First spillway (7A) has major structural problems

8. Aggregate Sifting
- Sediment must be cleared each year
- Aggregate used for construction

9. Alternative Flow Paths
- River curves out alternative flow paths

Design Options

System Components:
An appropriate design must include a system of hydraulic components paired with a cost effective bridge. The design system includes a retention basin, spillway, channel, and bridge.

Materials were evaluated for each component.

Three design systems were reviewed based on design and material constraints.

Final Recommendation

After review, options 2 and 3 were eliminated because the cons outweigh the pros, leaving option 1 as US 41’s final recommendation.

Benefits:
- Children can cross to and from school during the rainy season
- Children can cross at night with lower risk of sexual predators
- Future erosion and infrastructure will be protected
- Appropriate design for location
- According to the Municipality of Taquiña, the bridge will allow for profitable and productive development