Outline

- Introduction
- Experiences in Country
- Community Background
- Design Requirements
- Data Collection
- Bridge Design
- Cost Estimate
- Construction Schedule
- Summary
- Questions
Timeline of Trip

- Arrived in Panama City, Panama (PTY)
- Stayed in City of Knowledge
- Traveled to our community
- Collected data from proposed bridge location
- Experienced community culture
- Traveled back to the City of Knowledge
- Departed Panama City, Panama
Quebrada Caracol
Mission Statement

“Lucia Associates aims to present a practical, economical, and sustainable design to the community which they can then implement and take ownership of. The designs will aim to ensure the safety of every one of its users. Each design will take into careful consideration the finances, resources and values of the community.”
Community Background

- PCV: Leigh Miller
- Quebrada Caracol, located in Comarca Ngabe-Bugle
- No road access, electricity, little running water, and few latrines
- Houses in the community are relatively far apart
- People travel by foot or horse on steep muddy trails that can get slippery
Community Background

- Subsistence farming in community, many people find work outside of the community
- 233 community population, 103 people living out of the community
- Long hikes required to get to school, few children continue after middle school
Personal Experiences
Personal Experiences
Personal Experiences
Design Requirements

- Current suspension bridge is unreliable
- The bridge is required so children can cross the river and travel to school safely
Site Conditions
Site Conditions
Data Collection

- Topography data
- River Flow rates
- Cross sections and Slope of the river
- Soil type and soil layers were observed
- Recorded GPS coordinates
Proposed Bridge Location
Site Hydrology

- Methods to calculate and analyze flood flow rate and high water level
  - Scale from historic flood flow rates $Q = 1,770 \text{ ft}^3/\text{s}$
  - RCN method $Q = 3,033 \text{ ft}^3/\text{s}$
Topographic Map of Site

Plan View: Suspension Bridge
Bridge Design

- 128-ft Span
- 20-ft Steel Towers
- High Strength Suspension Cables
- Wood Deck
Design Loads

- Dead Load
- Pedestrian Live Load
- Equestrian Live Load
- Earthquake Load
- Wind Uplift Load

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Detailed Drawings

- Anchor Details
- Foundation Details
- Deck Details
- Tower Details
Anchor Details
Foundation Details

Profile: Foundation

- BASE PLATE
- GROUT/LEVELING PLATE (IF NEEDED)
- TOWERS (2)
- TYP. ANGLE CONNECTORS
- THREADED RODS AND BOLTS
- TYP. SQUARE FOOTING

Plan: Foundation

- 10.0' x 12.0'

Scale: 1:2

Scale: 1:4
Deck Details

1. SECTION: BRIDGE DECKING
   - Scale: 1" = 1'
   - 2" x 8" decking
   - Eye bolt 3/8" x 3-1/2"
   - Wood plank 4.0' TYP.
   - Chainlink fence guardrail
   - Bolt 6" x 1-1/2"
   - Steel plate 3/8" x 8" x 4"
   - Support beam 2L3 x 3" x 3/4"

2. PROFILE: BRIDGE DECKING
   - Scale: 1" = 1'

3. DETAIL: 2" WIRE CLIP
   - Scale: 1" = 1'
   - Guardrail connection (3' above deck)
   - 2" DIA.
   - 5.81" 3.38"

4. DETAIL: HANGER ASSEMBLY
   - Scale: 1" = 1'
   - Right way for maximum rope strength
Tower Details

3. **DETAIL: TOWER ANCHORAGE**
   SCALE: 1" = 1'-0"

4. **DETAIL: BRACING CONNECTION**
   SCALE: 1" = 1'-0"
Cost Estimate

- Costs were estimated using U.S. material costs
  - Towers - $12,400
  - Anchor Blocks - $24,600
  - Walkway - $11,800
  - Cables - $24,600
  - Tower Foundation - $10,700
  - Total Estimate - $85,900
Construction Schedule

- Construction will begin after road is completed
- Construction to be completed in the dry season (January–May)
- Estimate of about 124 work days to complete the project

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<th>Task Name</th>
<th>Duration</th>
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<td>Bridge Maintenance</td>
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Bridge Maintenance

- Paint towers to prevent rusting
- Check:
  - Cables for stretching or rust spots
  - Bolts
  - Deck boards for rotting
  - Possible erosion around foundations
Summary

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Acknowledgments

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References


Questions