Background

During July of 2008 the International Senior Design (ISD) program of Michigan Technological University (MTU) traveled to Santa Cruz, Bolivia. Arial Engineering is comprised of four undergraduate civil engineering students including: Charles Hoppesch, Andrea Smeltzer, Matthew Tronnes, and Pamela Wolting.

Recommendation

The final design should allow the canal and roadway to function in high intensity storms during the rainy season, sedimentation buildup, and erosion concerns while providing a construable, cost effective project with minimal maintenance.

A box culvert that is designed by others will transport storm water underground, entering an open, concrete lined, ideal trapezoidal canal, approximately 3.7 Kilometers in length (placed along red and yellow). Where AE survey data ends, the concrete canal will transition to a temporary earth canal (green). In addition, El Terrible (blue) should be studied and sized accordingly.

Design Options

Three design options were considered for Canal Magisterio. Each has their own advantages and disadvantages and will be implemented in the appropriate locations.

- **Concrete Box/Pipe** -
  - Advantages: Safe, Space Efficient
  - Disadvantages: Expensive, Clogging Inlets, High Maintenance

- **Earthen Canal** -
  - Advantages: Low Cost, Short Construction Time
  - Disadvantages: Erosion, High Maintenance, Vegetation Overgrowth

- **Concrete Ideal Trapezoid** -
  - Advantages: Constructability, Optimal Flow, Minimal Material Use
  - Disadvantages: Safety Issues, Sanitation

Impact on Community

Reducing standing flood water in the Canal Magisterio watershed has the following social, environmental, economic, and construction impacts on the community of District 12:

- Thinning breeding ground for mosquitoes, thus reducing mosquito borne diseases such as dengue fever and malaria
- Reduces possibility of storm water mixing with poorly or untreated wastewater since storm water will flow into the canal rather than continue to stand as floodwater around residential homes.
- Decreases health risks to humans and animals that come in contact with contaminated flood water and water borne pathogens due to previous bullets.
- Increase the ability of residents to attend work or school as roadways will be open for safe travel.