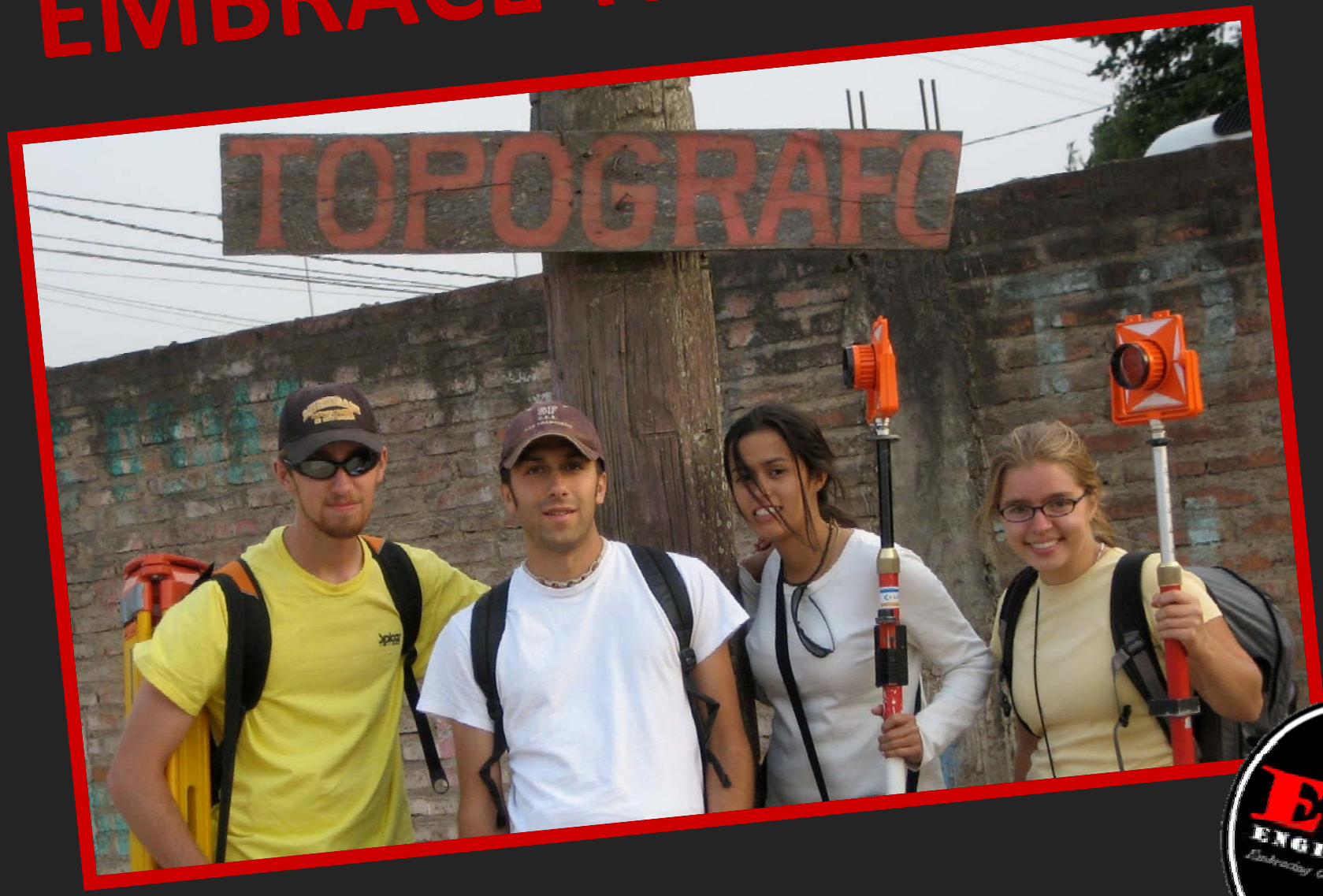
EMBRACE THE CHANGE



ETC
ENGINEERING
Embracing the Change since 2007

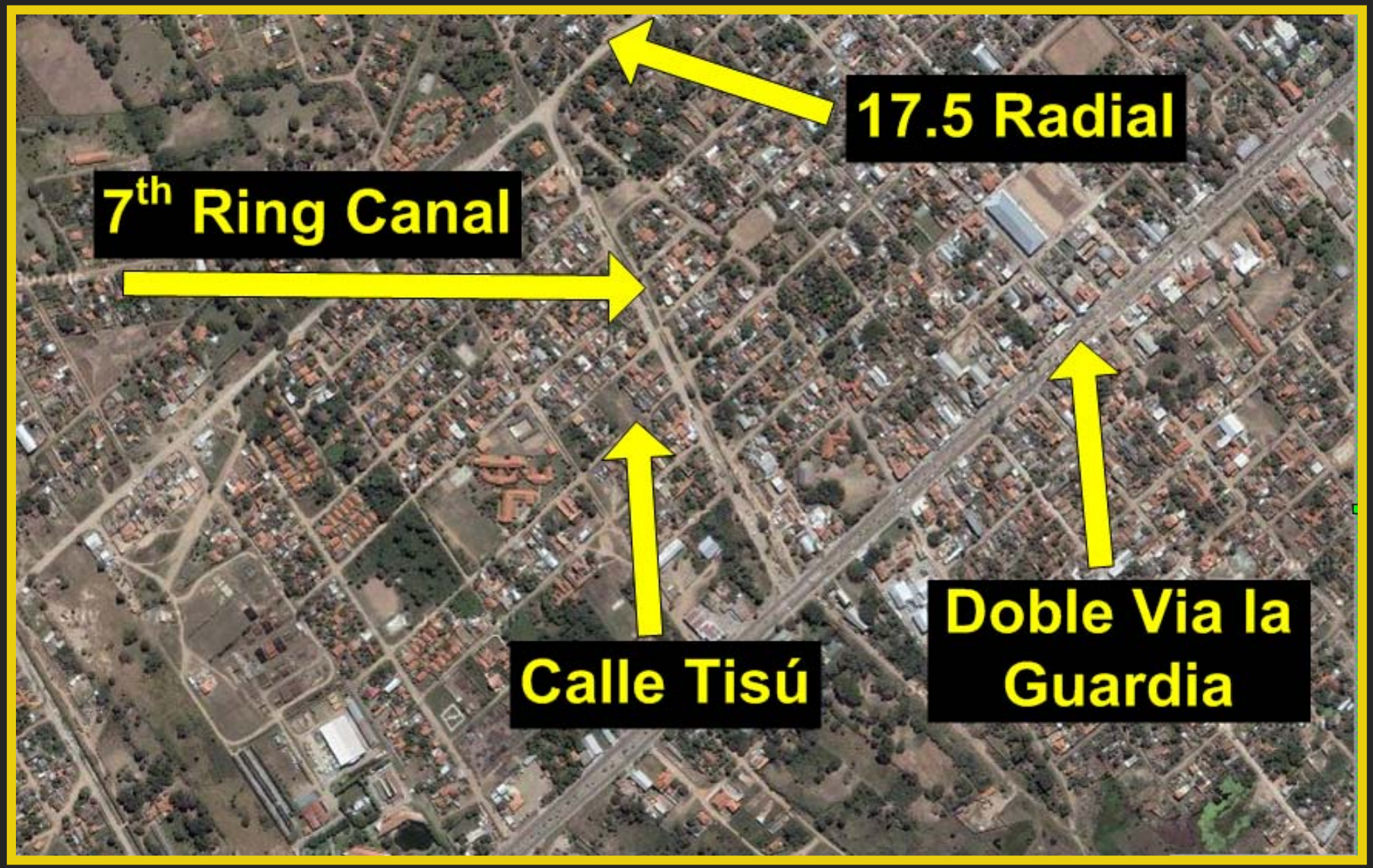
Outline

- Introduction
- Project Overview
- Existing Conditions
- Methods
- Design Options
- Conclusion
- Questions

¡ ¡ ¡ Hola Bolivia ! ! !

Santa Cruz, Bolivia

Getting closer…



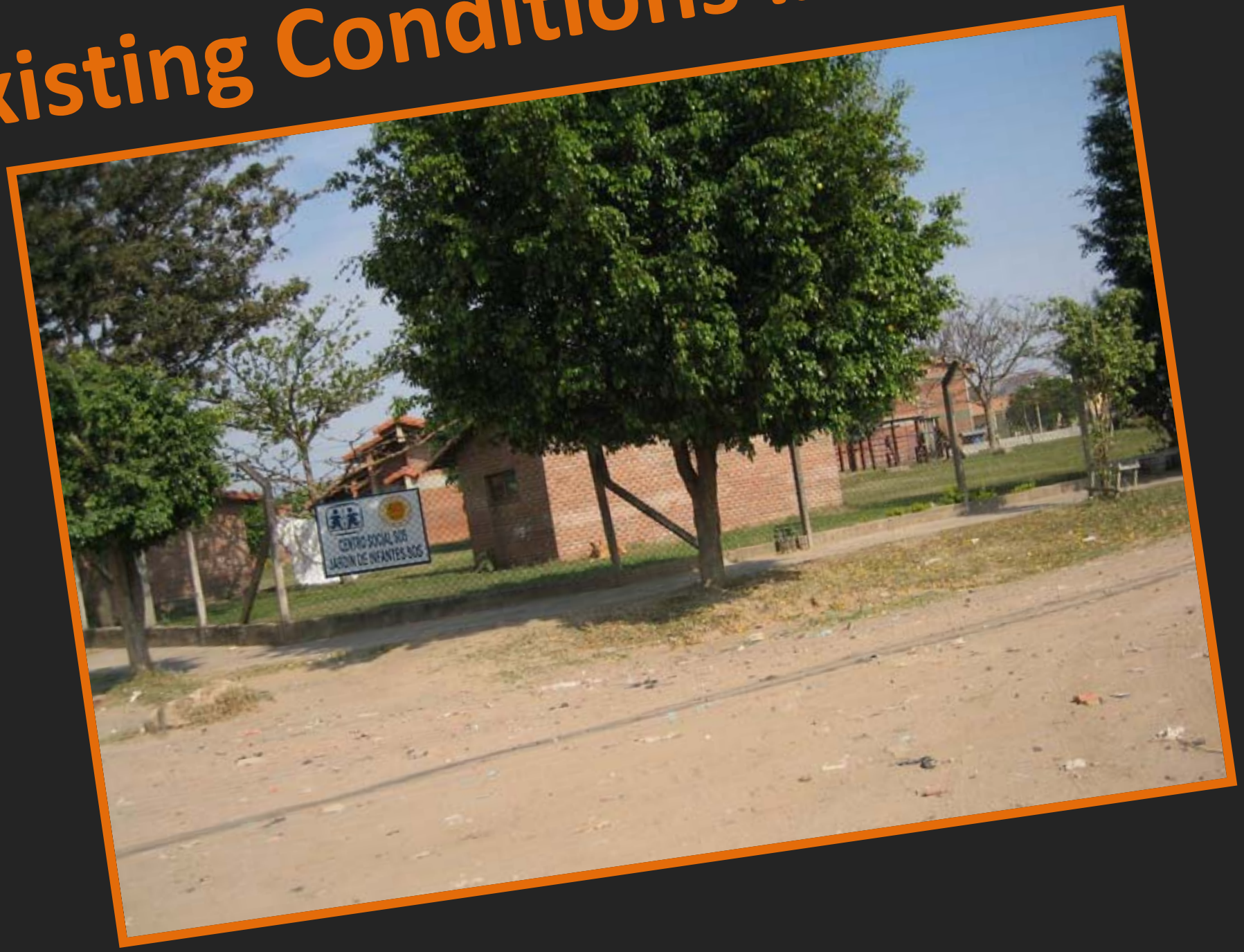
Project Overview

Site Visit

…with City Engineers

Let's talk about this…

Existing Conditions …



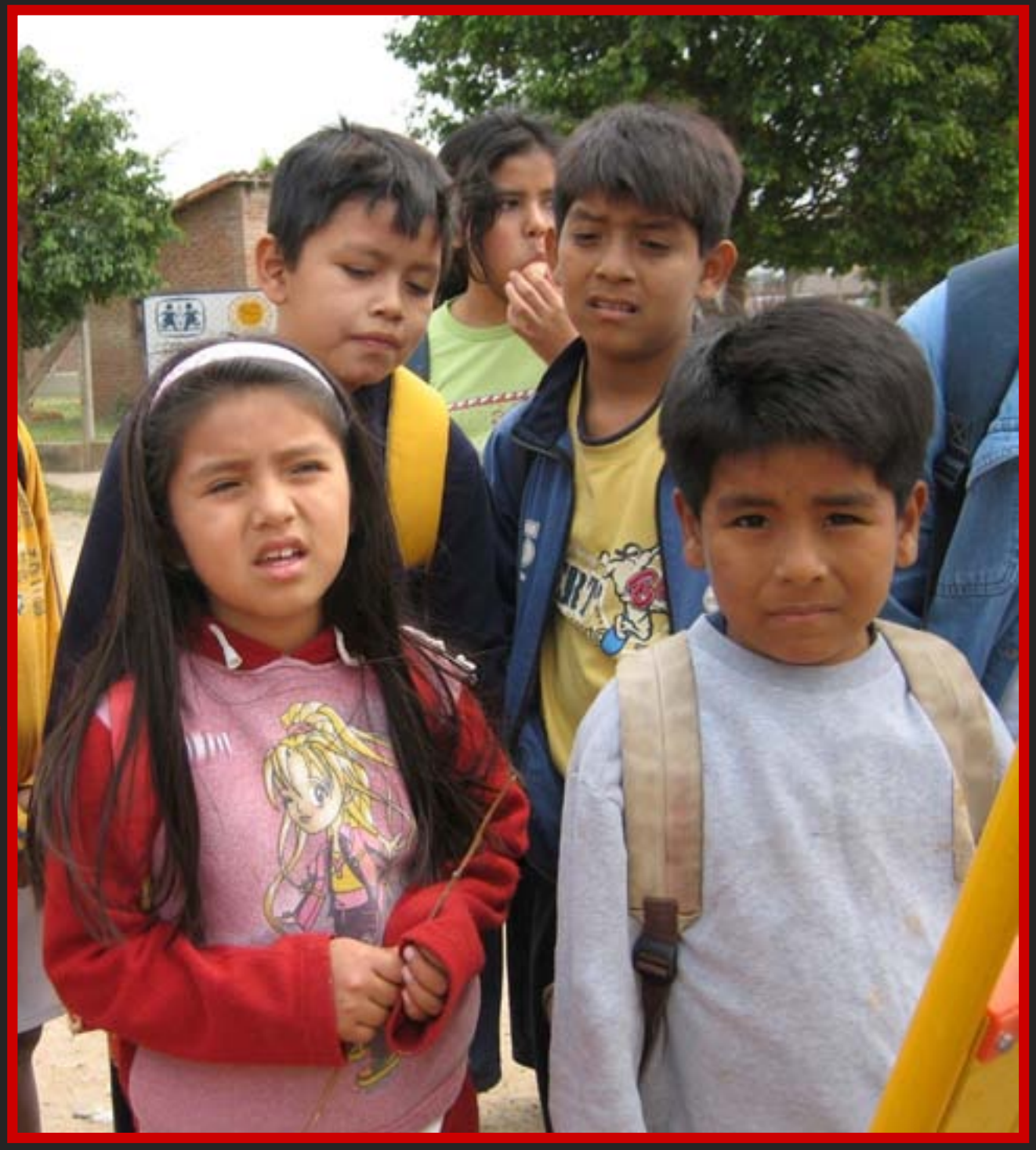
Existing Conditions…

Existing Conditions…

Benefactors

It is time to…

Gather information!



Soil Sampling

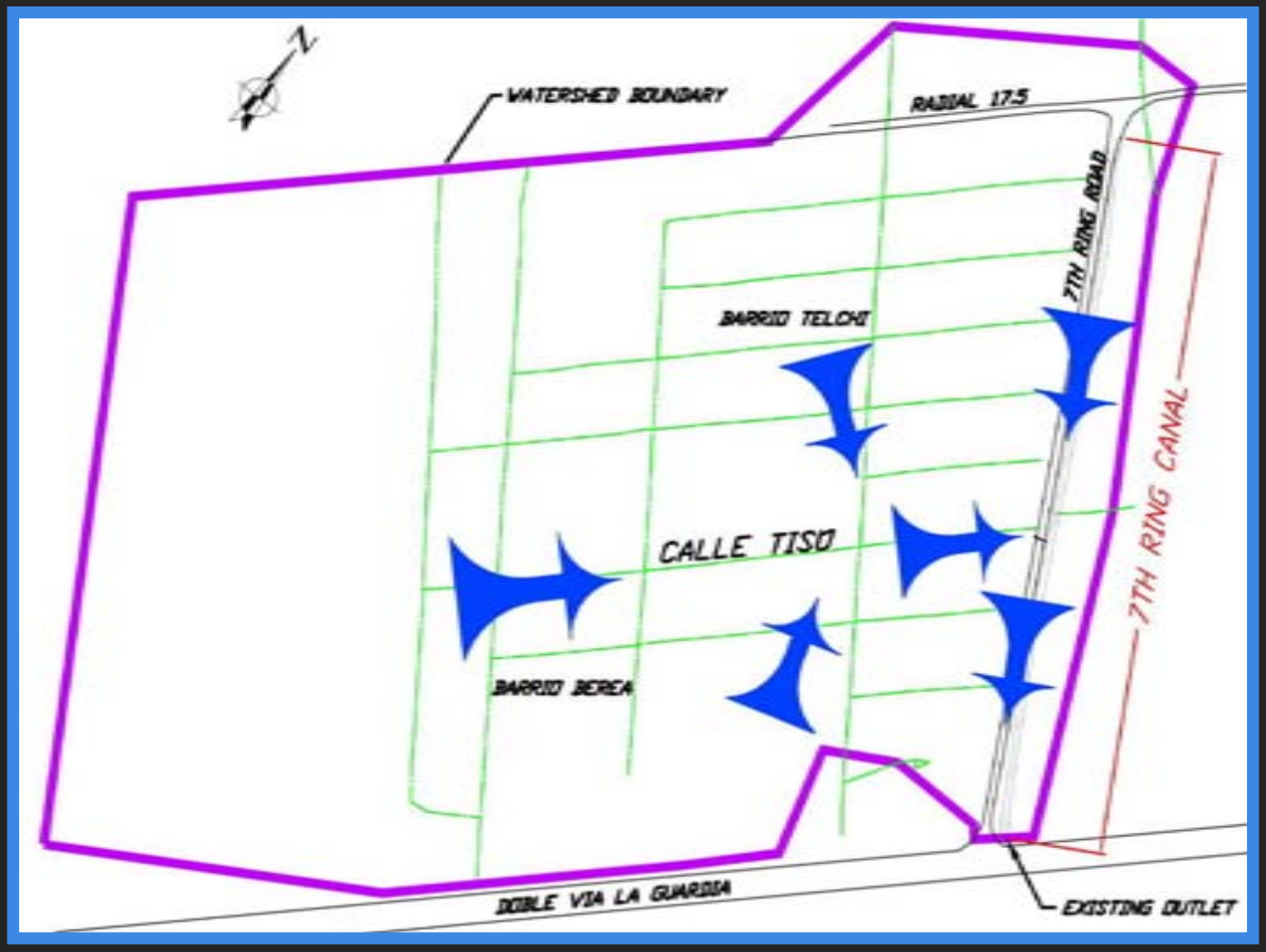
Surveying

More…

Getting down to the point…

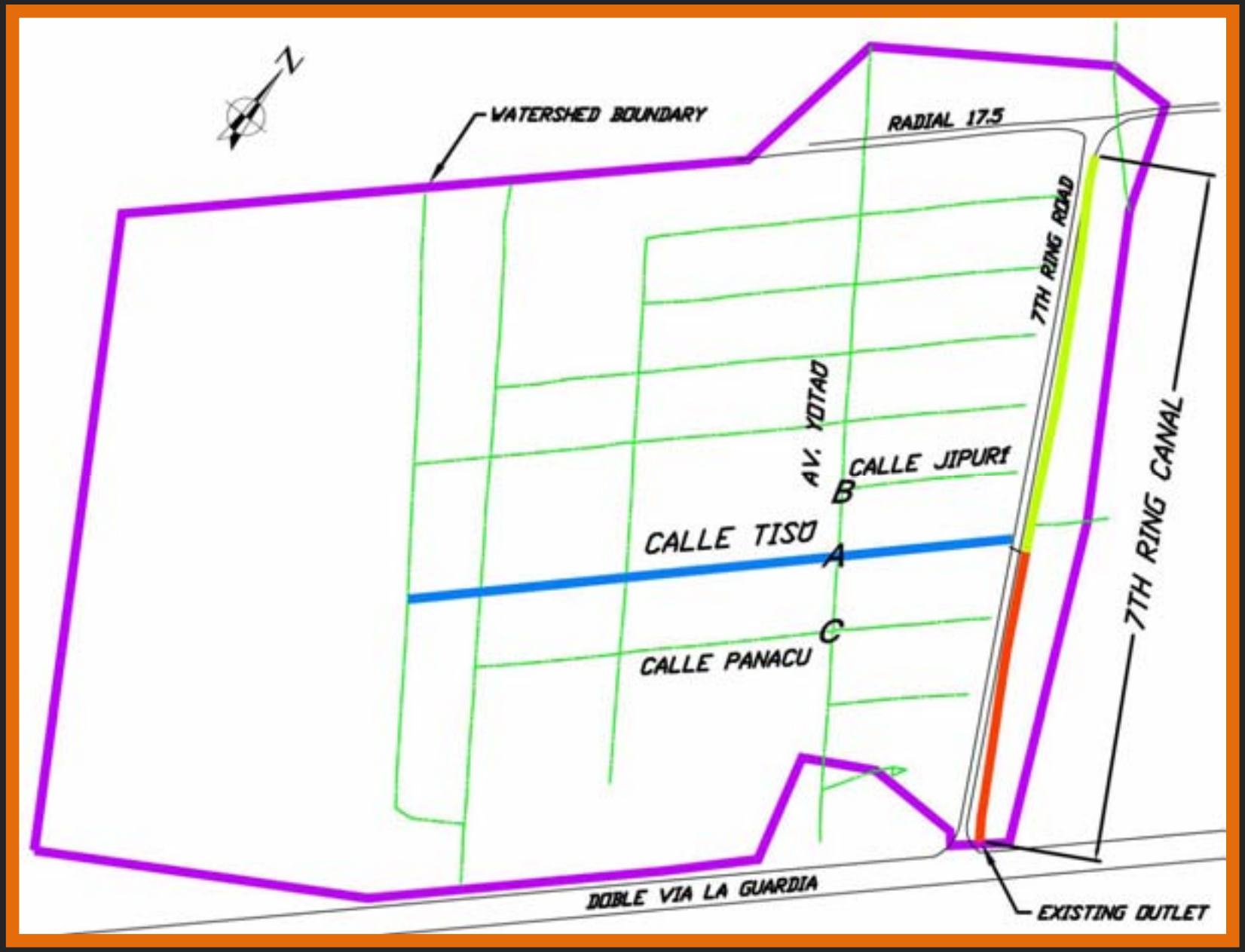
- Flat Topography
- High Water Table
- Substantial Rainfall
- Flooded intersections

Watershed Analysis

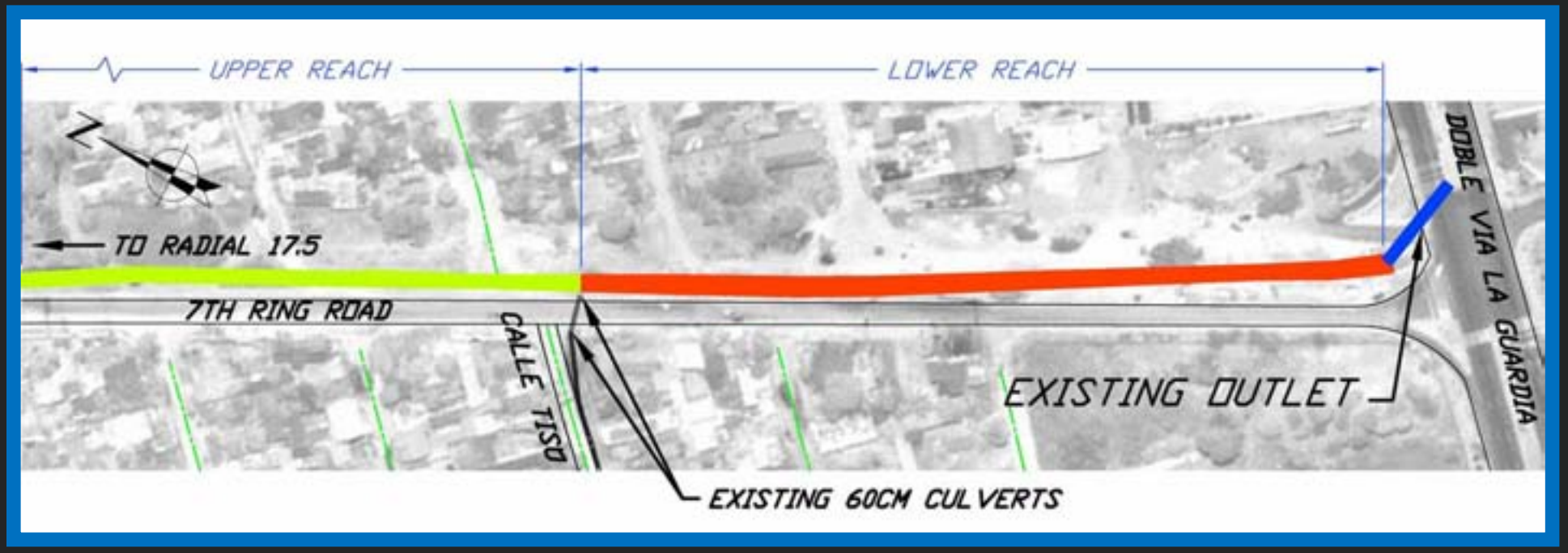


The majority of the watershed (> 80%) drains down Calle Tisú

Site Overview



Division of 7th Ring Canal

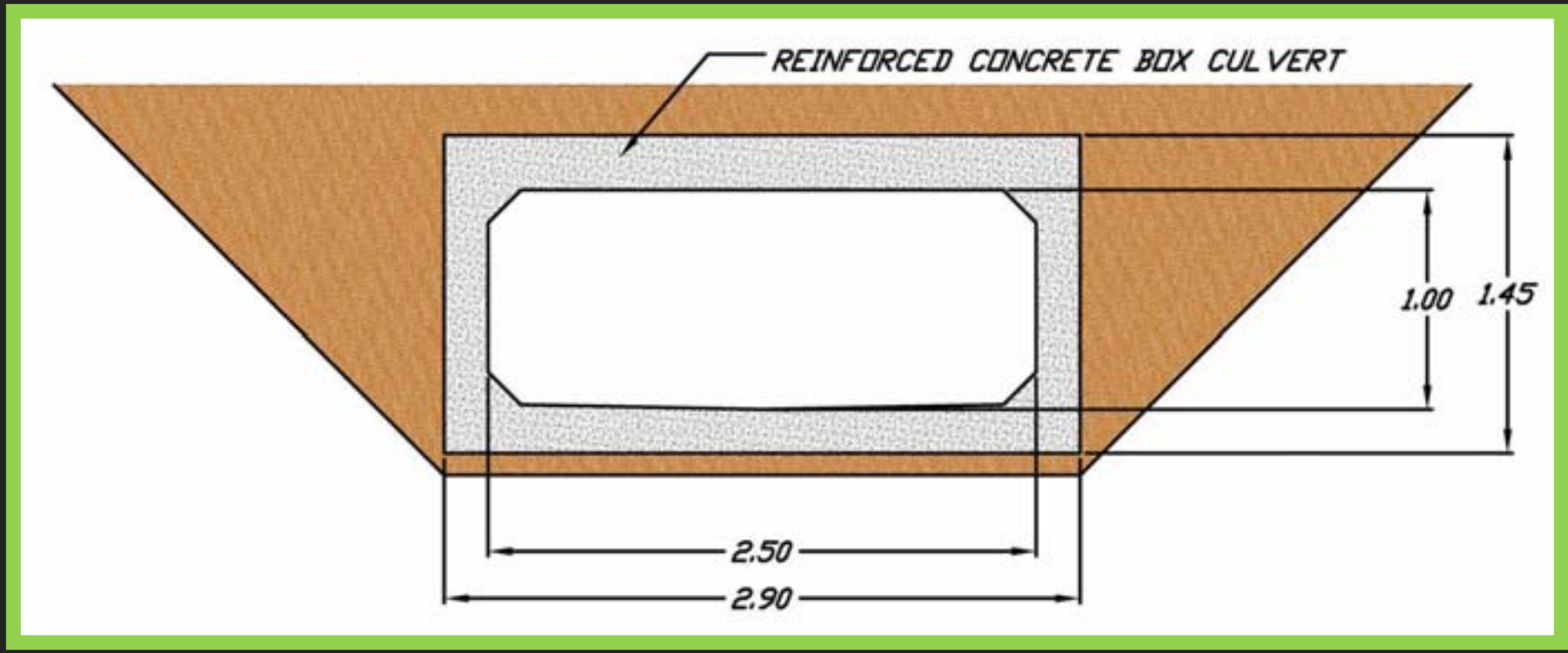


More than 80% of the flow will enter the canal at Calle Tisú

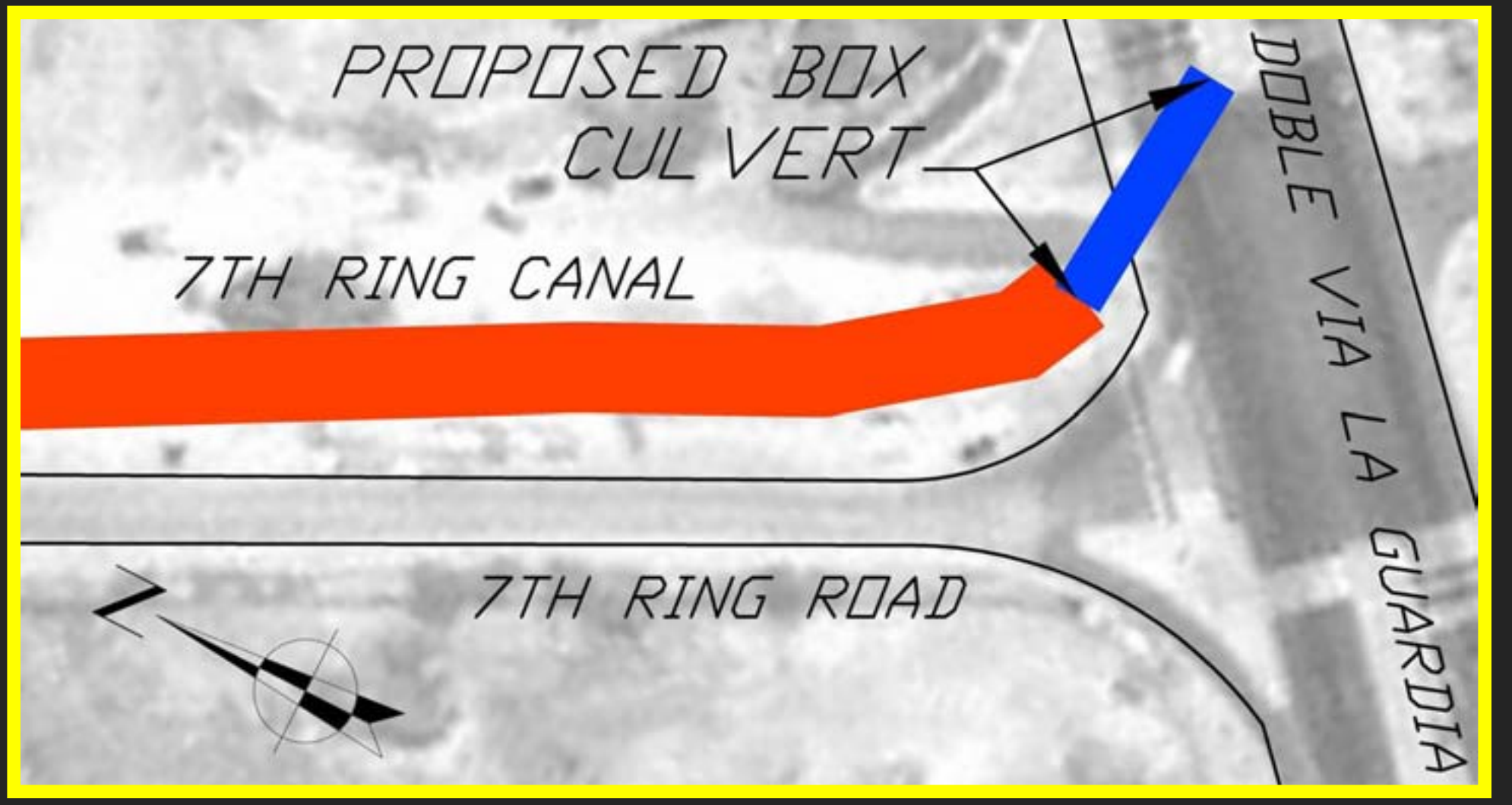
7th Ring Canal Outlet into Doble Via la Guardia

1. Parallel Culverts
2. Box Culvert

Box Culvert



Recommendations



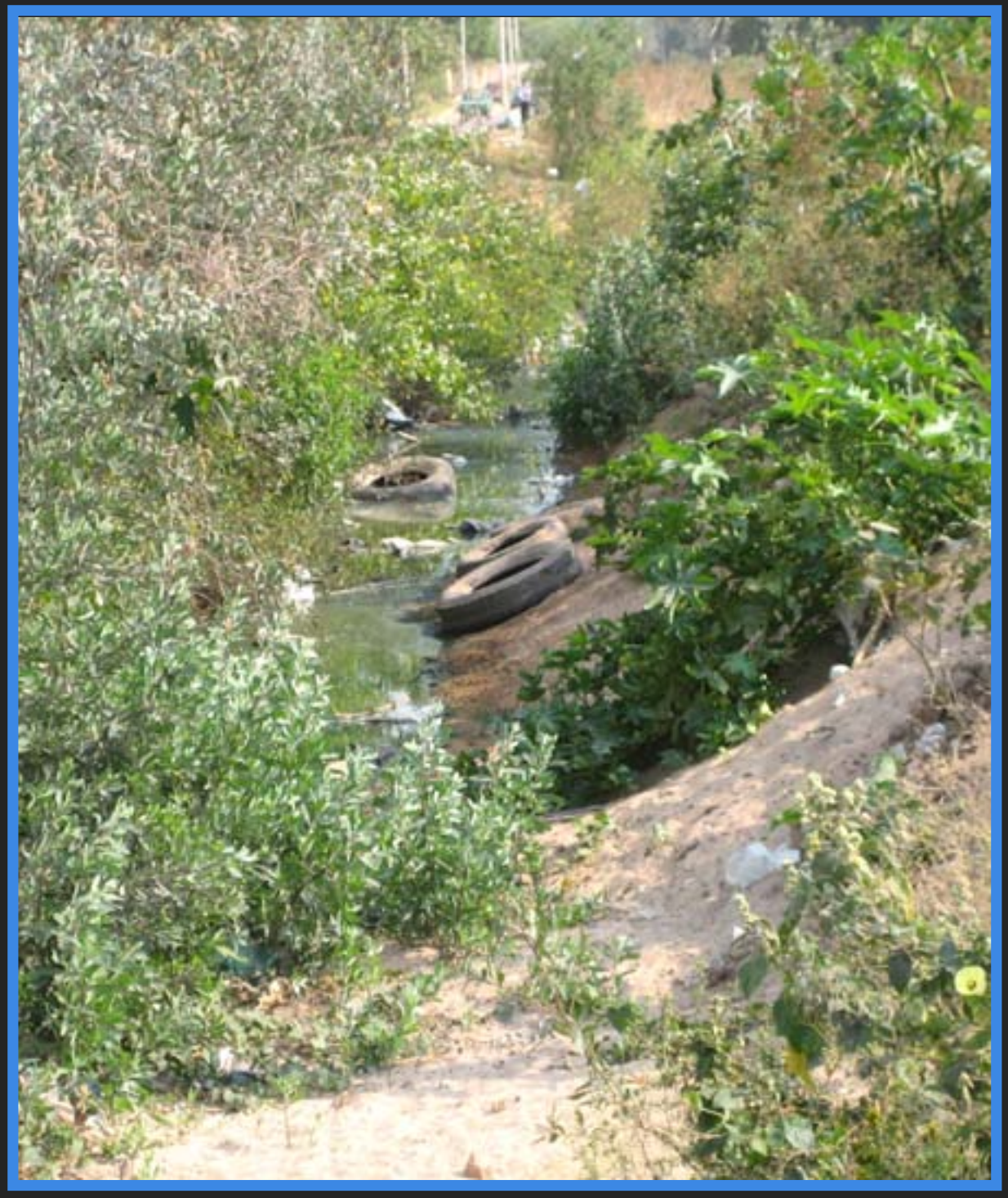
Install a 1m x 2.5m Box Culvert under Doble Via la Guardia

7th Ring Canal Design Options

1. Pipe
2. Rehabilitate Existing Canal
3. Concrete Lined Canal
4. Concrete Lined Lower Reach & Rehabilitate Upper Reach

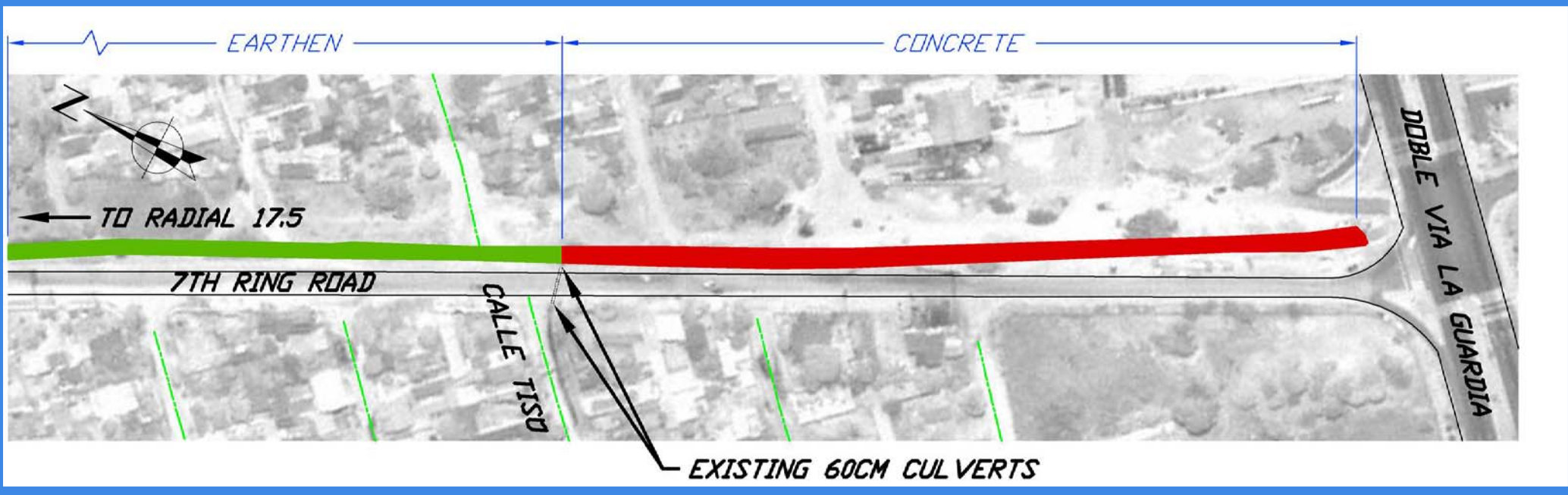
- Remove Debris

- Rehabilitate Existing Canal



Concrete Line Entire Canal

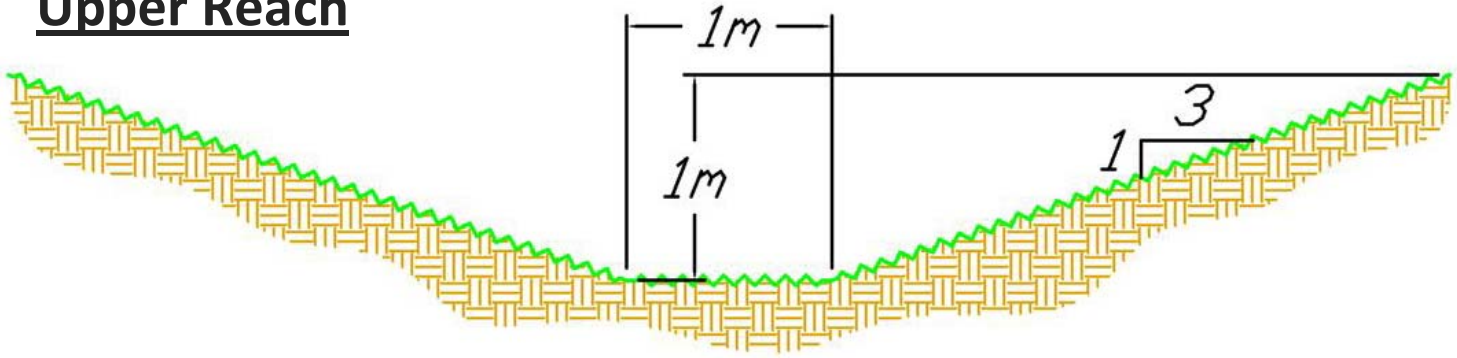
- Concrete Line Lower Reach of Canal



- Rehabilitate Upper Reach

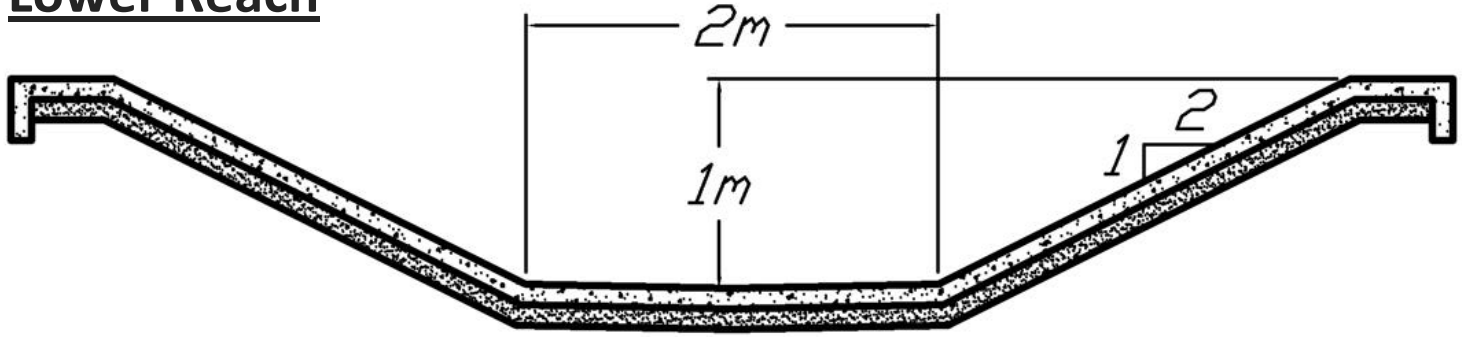
Recommendations

Upper Reach



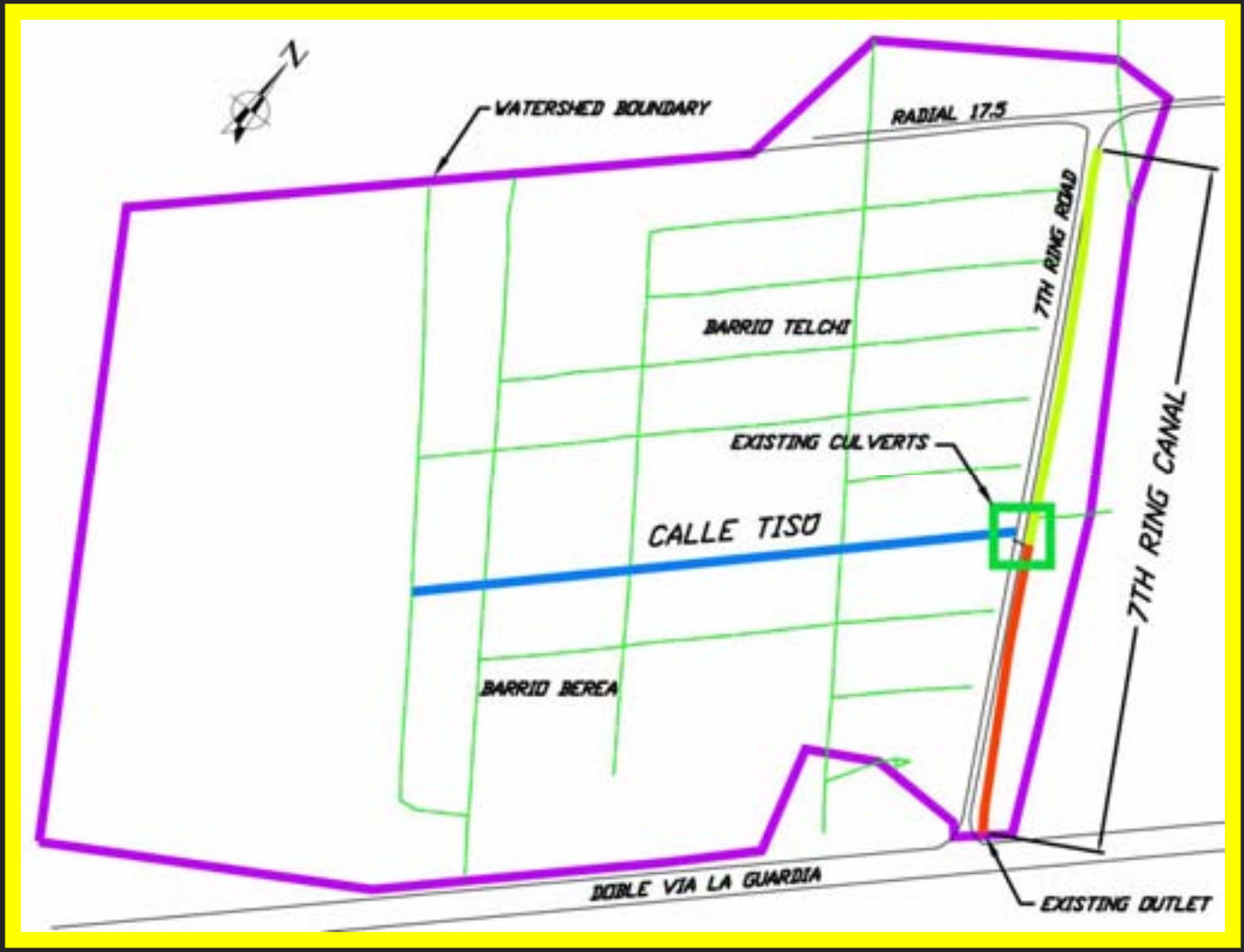
Earthen Canal Cross-Section

Lower Reach



Concrete Lined Canal Cross-Section

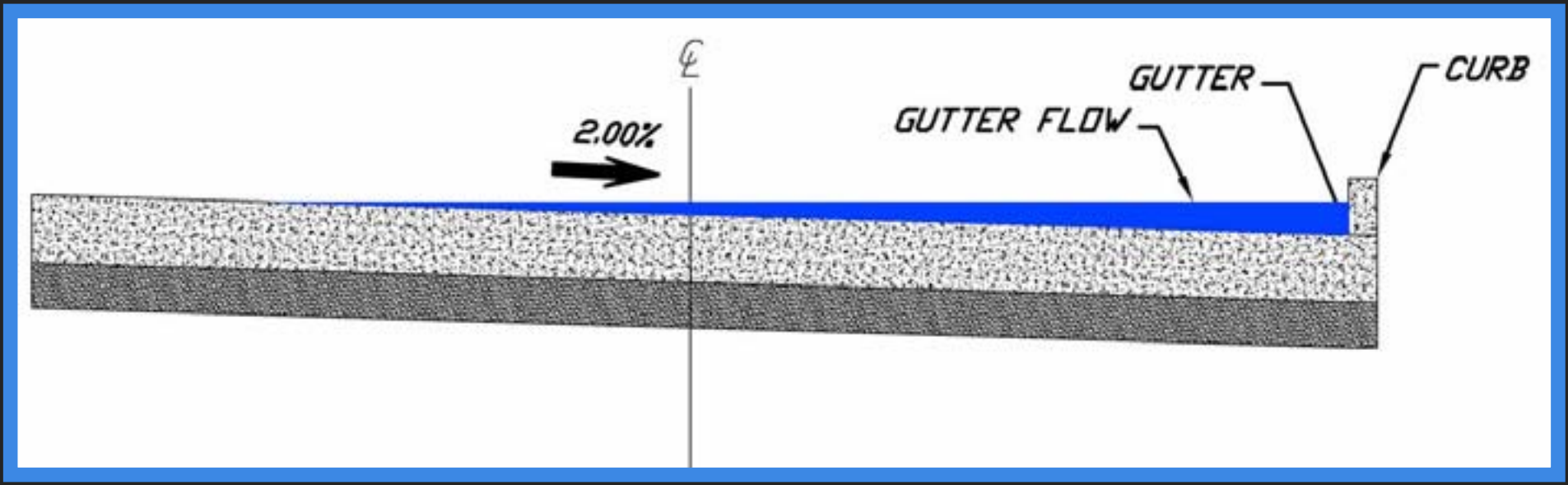
Calle Tisú Design Options



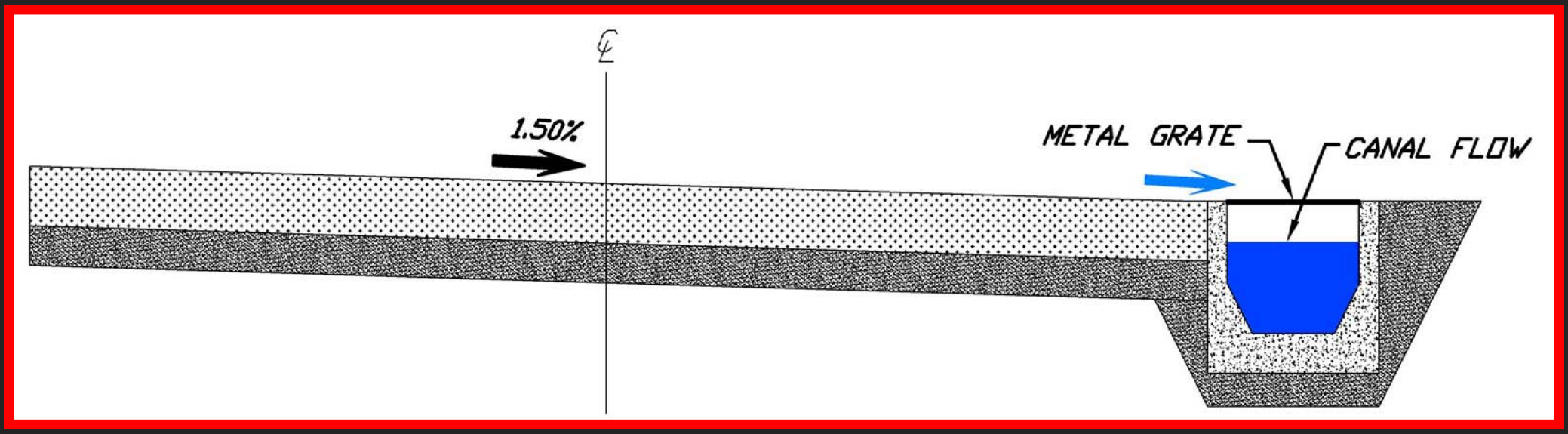
1. Pipe
2. Road Conveyance
3. Roadside Canal
4. Road Conveyance and Roadside Canal

Culverts to 7th Ring

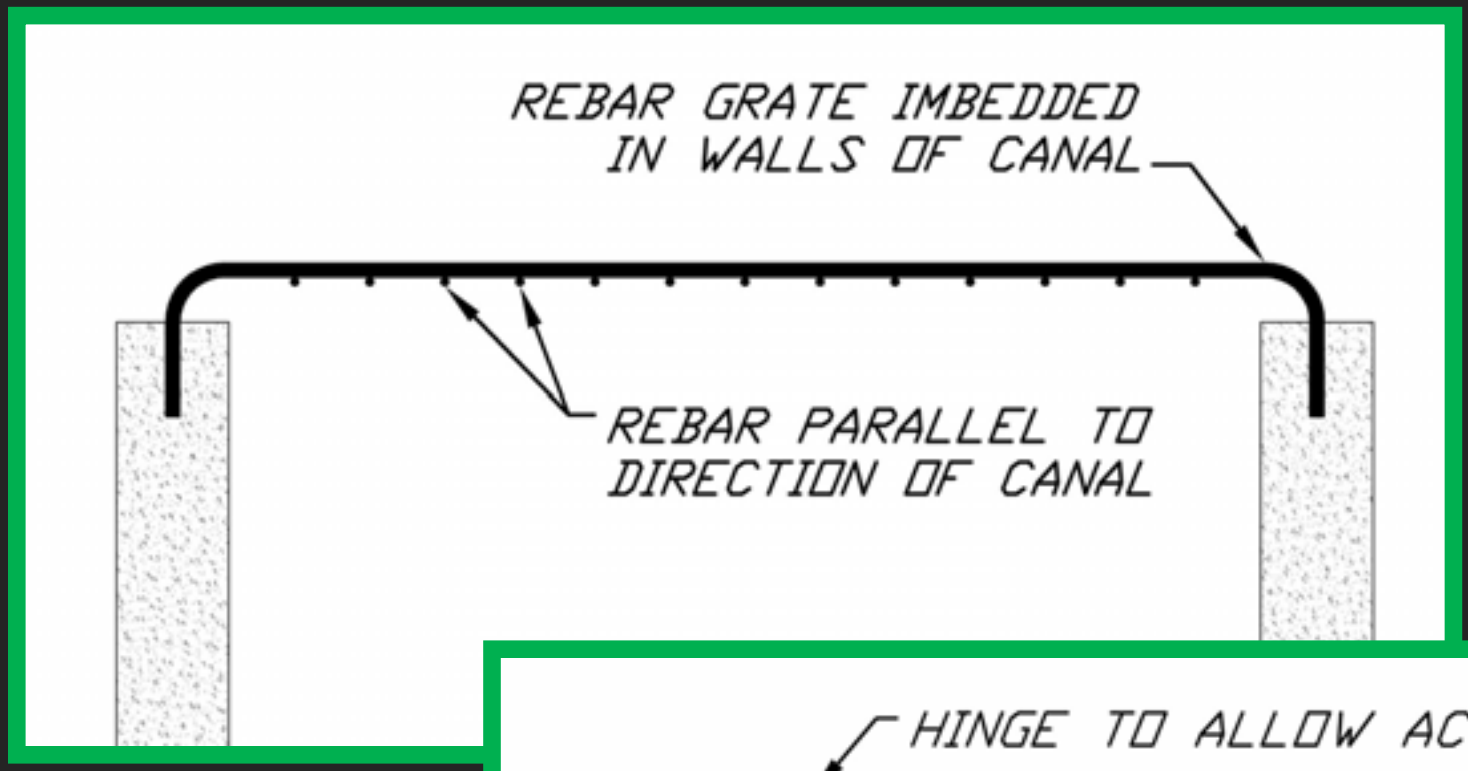
Road Conveyance of Storm Water

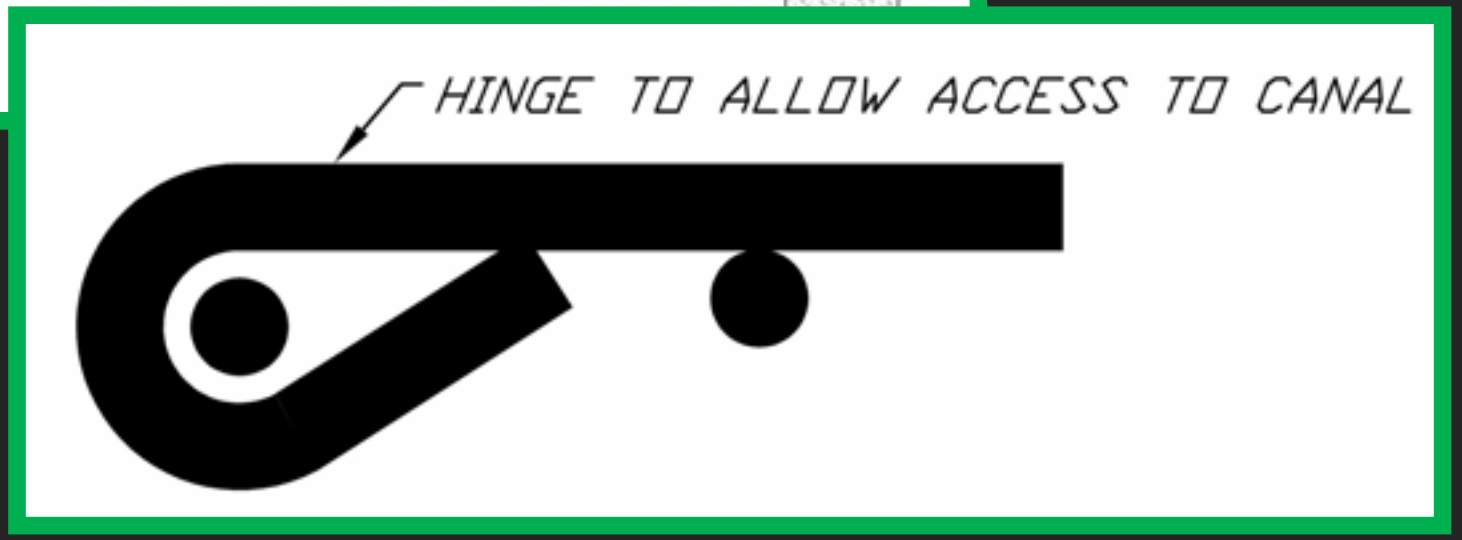


Roadside Canal

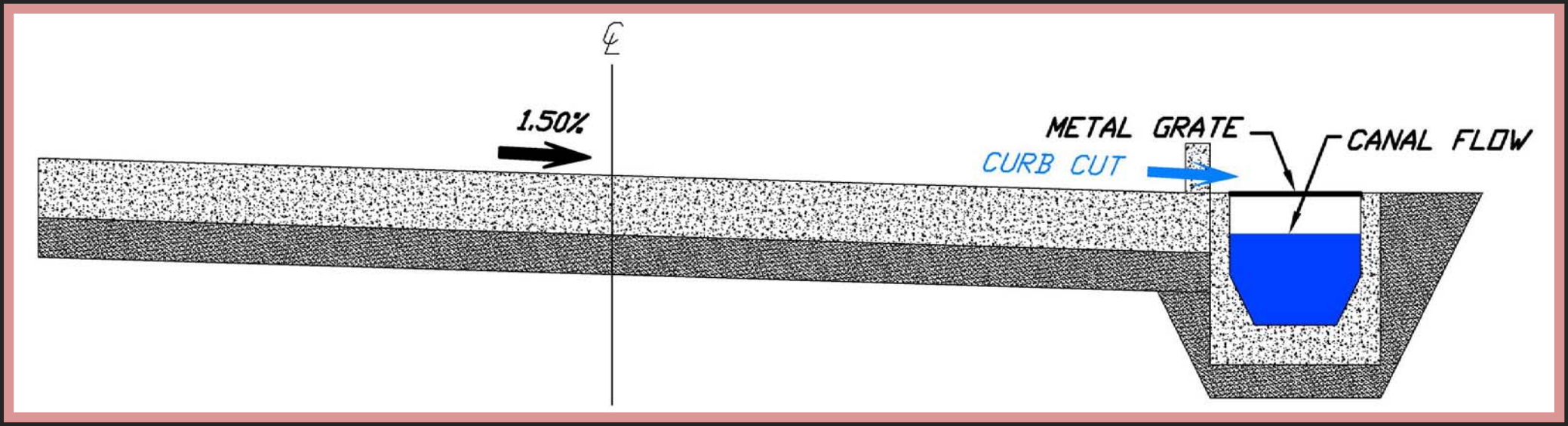


Grating

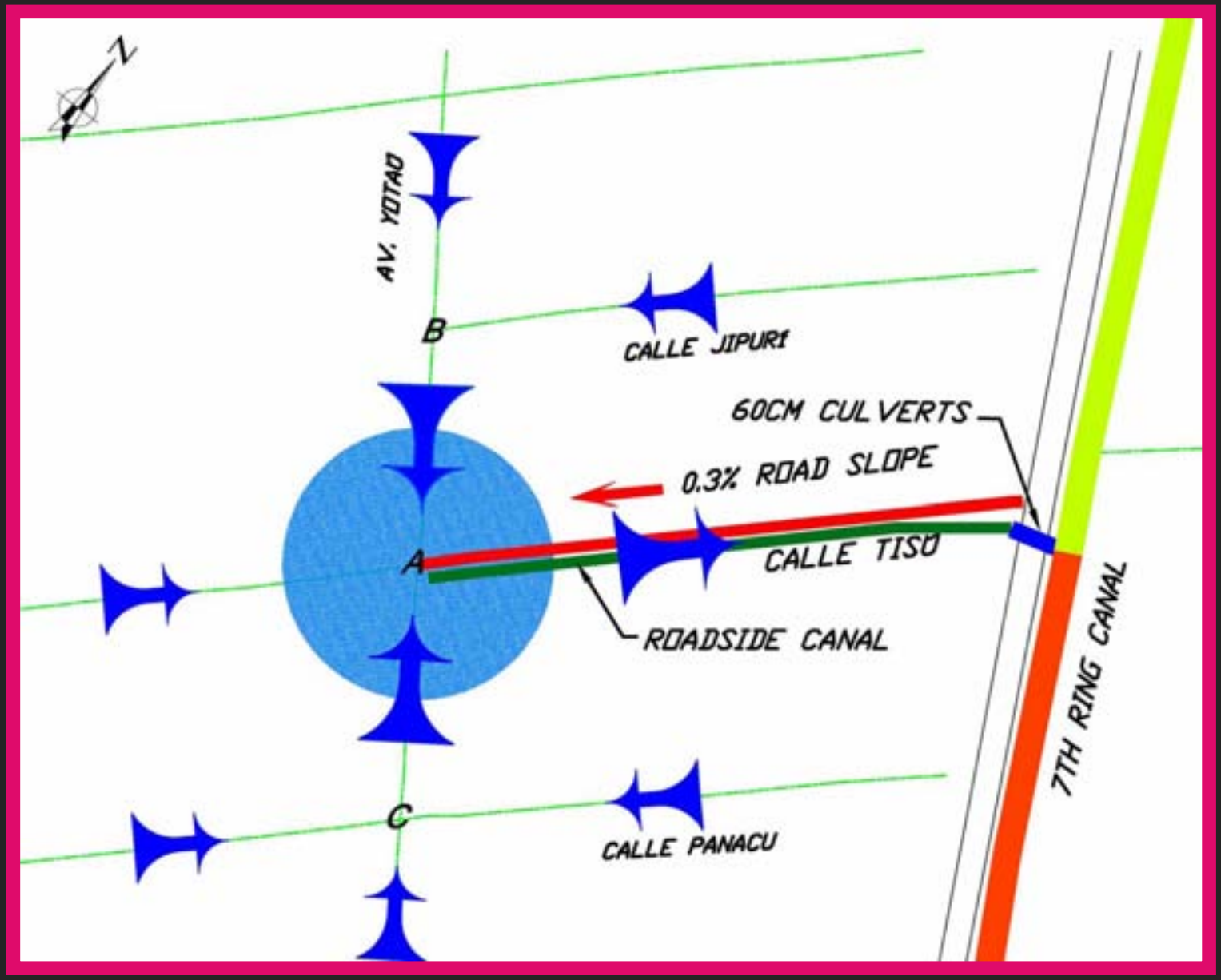

REBAR GRATE IMBEDDED
IN WALLS OF CANAL
REBAR PARALLEL TO
DIRECTION OF CANAL


HINGE TO ALLOW ACCESS TO CANAL

Road Conveyance and Roadside Canal

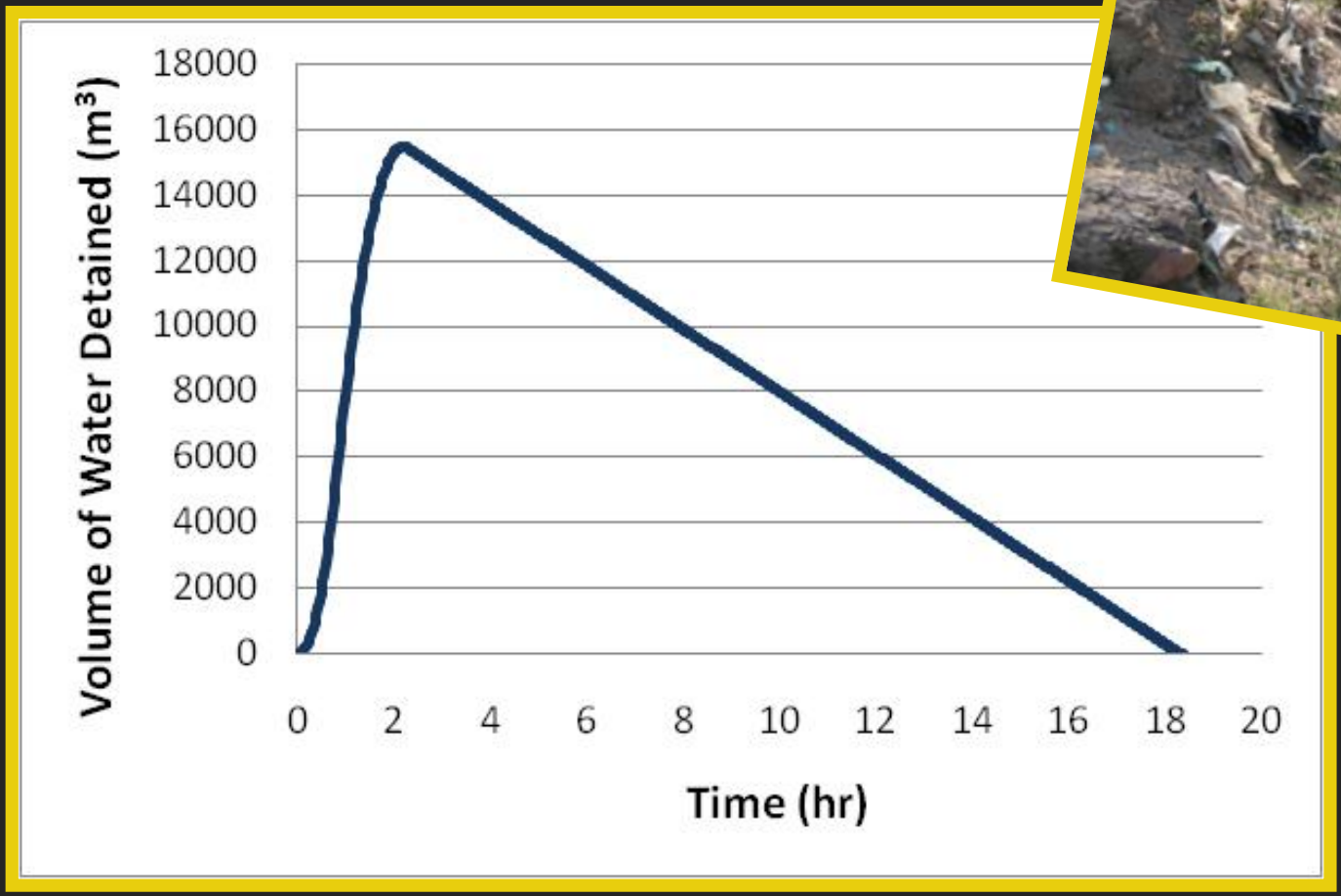


Recommendations



Final Recommendations

Existing culverts limit flow: decrease flood time to 18 hours



Final Recommendations

7th Ring Canal Outlet

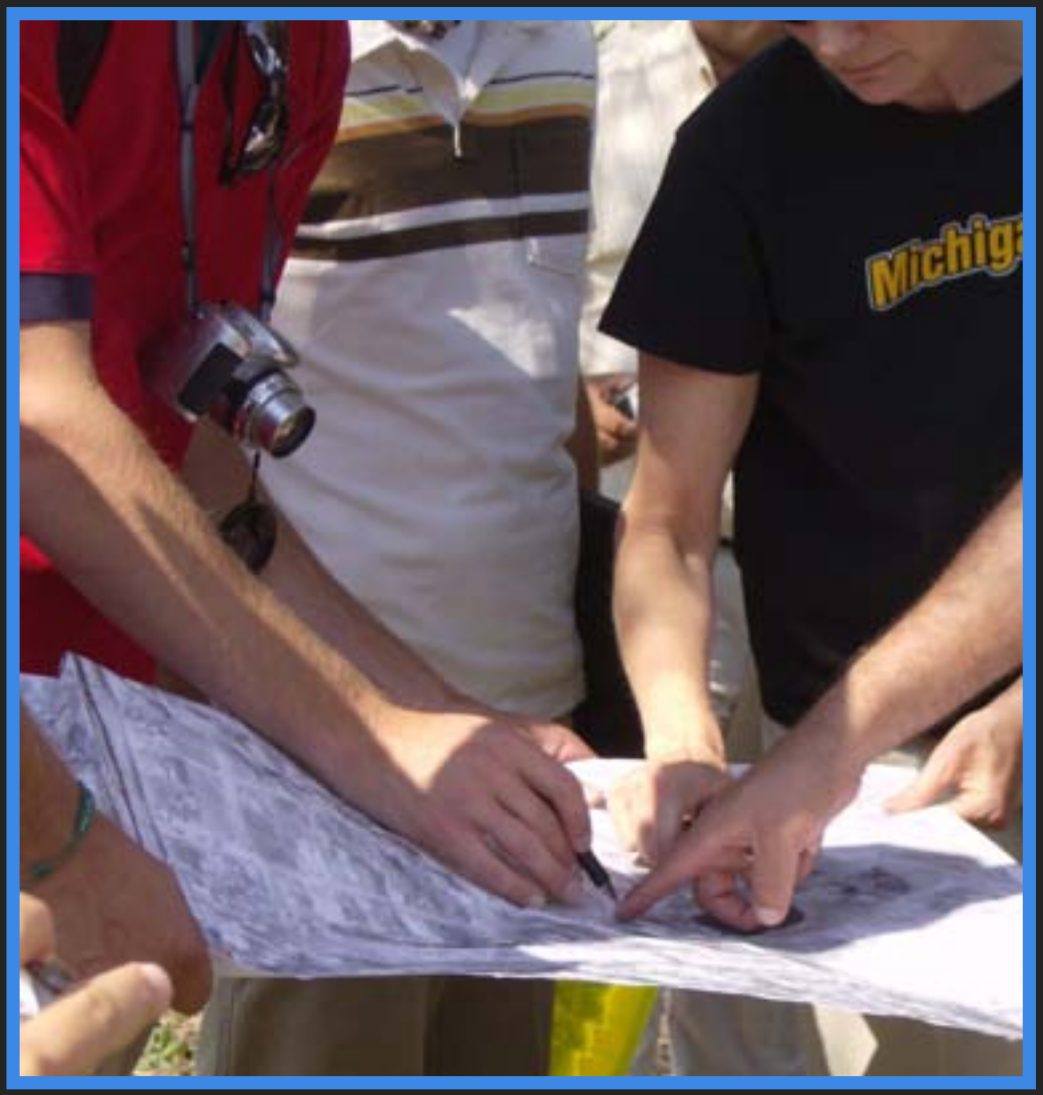
- New 1m x 2.5m box culvert

7th Ring Canal

- Concrete line lower reach
- Rehabilitate upper reach

Calle Tisú

- Pave Calle Tisú
- Construct canal



Driving Force

Questions


THANK YOU