

# **CEEn-2020 CPST - 016**

## **Rancho de los Niños Orphanage**

### **Constructed Wetland: Waste Water Treatment & Water Reclamation System**

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# Introduction

Our team, in collaboration with A Child's Hope Foundation, was tasked with the design of a sustainable wastewater treatment system for the Rancho de Los Niños Orphanage in Baja California, Mexico, to replace the current failing system of septic tanks.

## Current Problems:

- overflowing septic tanks
- use of blackwater for irrigation
- insufficient capacity



## Project Tasks and Deliverables

We aim to provide:

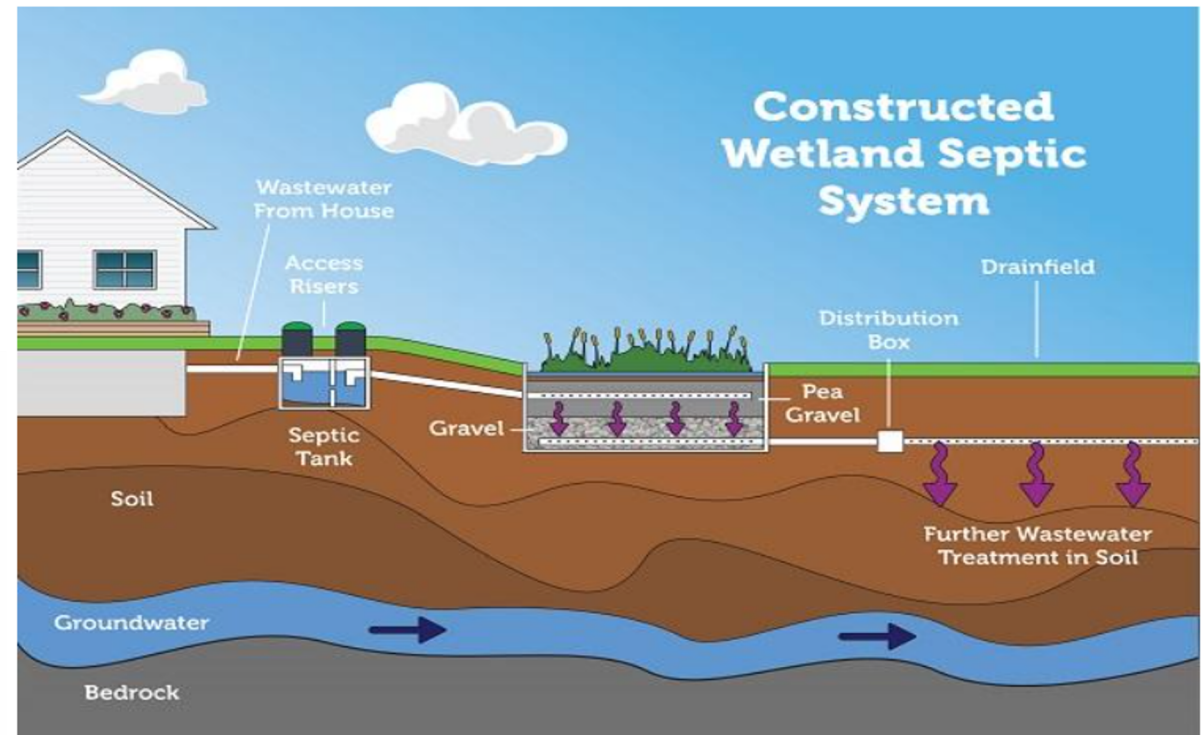
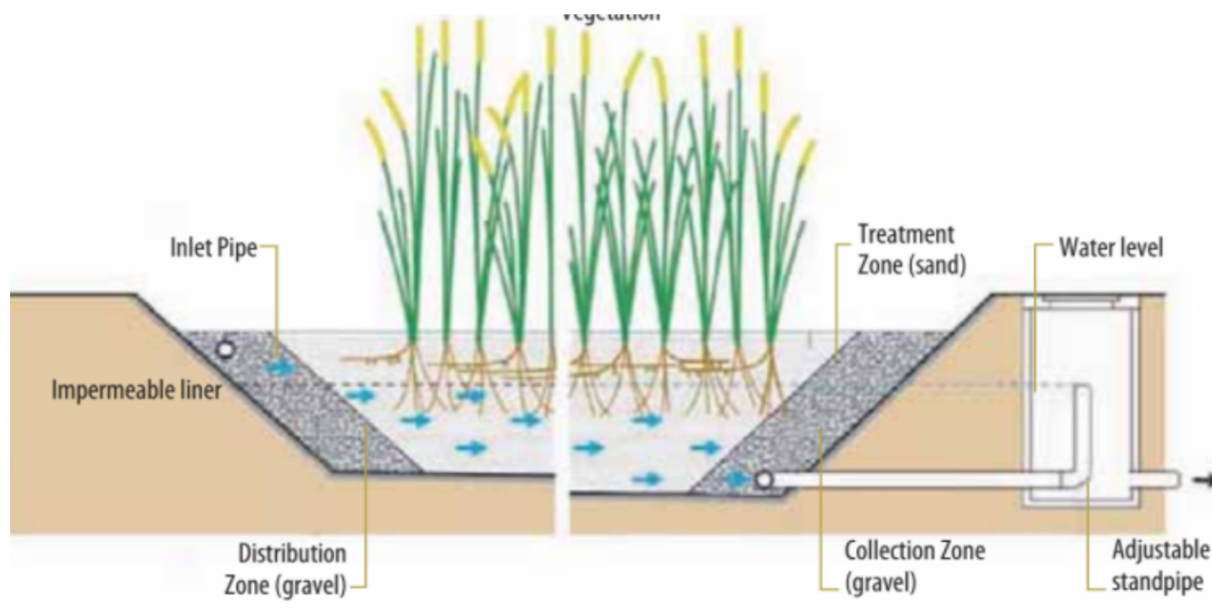
- Proper treatment of wastewater
- Adequate drainage of treated wastewater
- Repurposed wastewater for agricultural use
- Self-sufficient system



# Design and Analysis

## Constructed Wetland

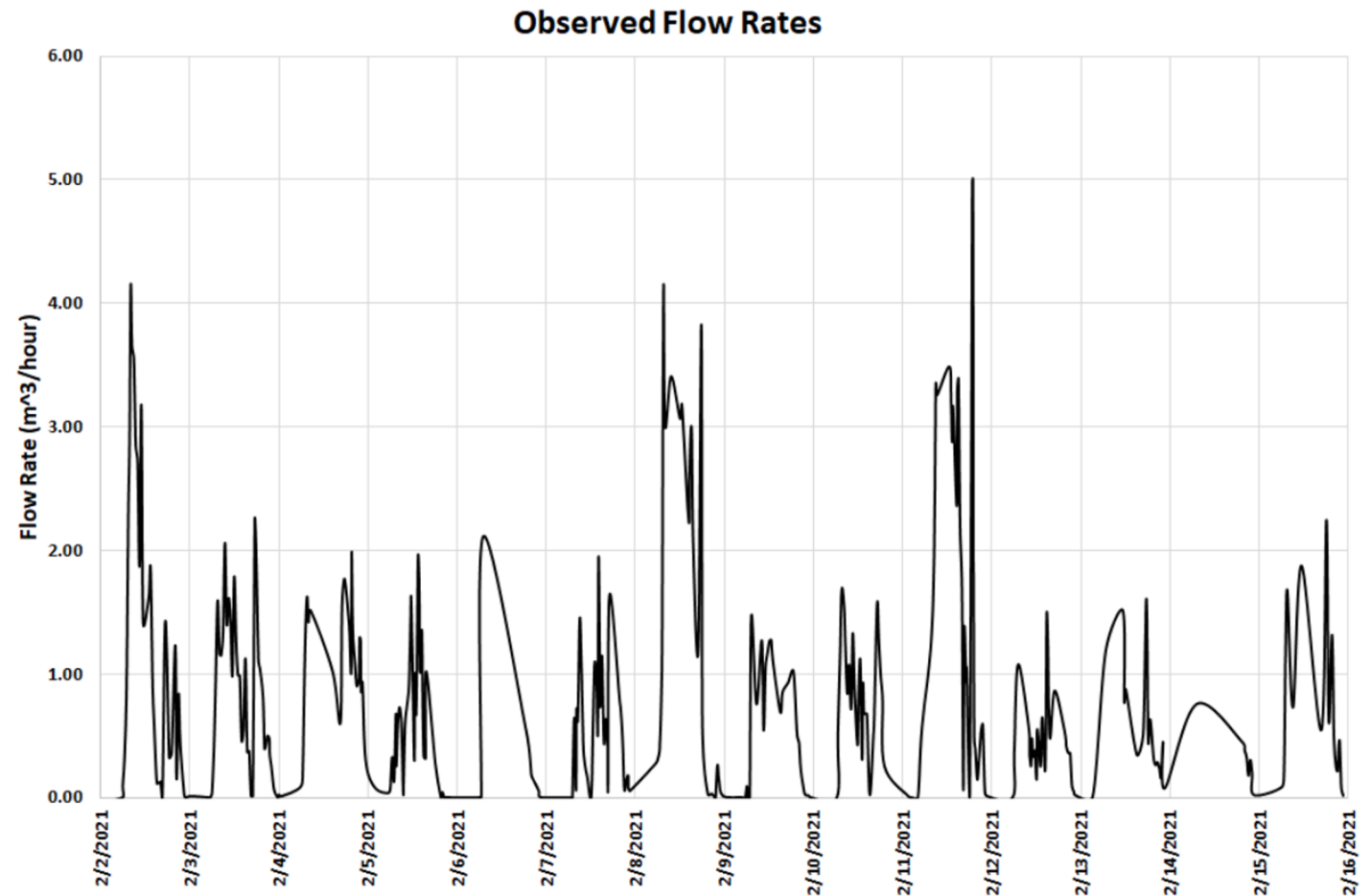
- horizontal sub-surface flow
- self-sufficient
- aesthetically pleasing



## Design and Analysis Cont'd

### EPA Manual Design Inputs

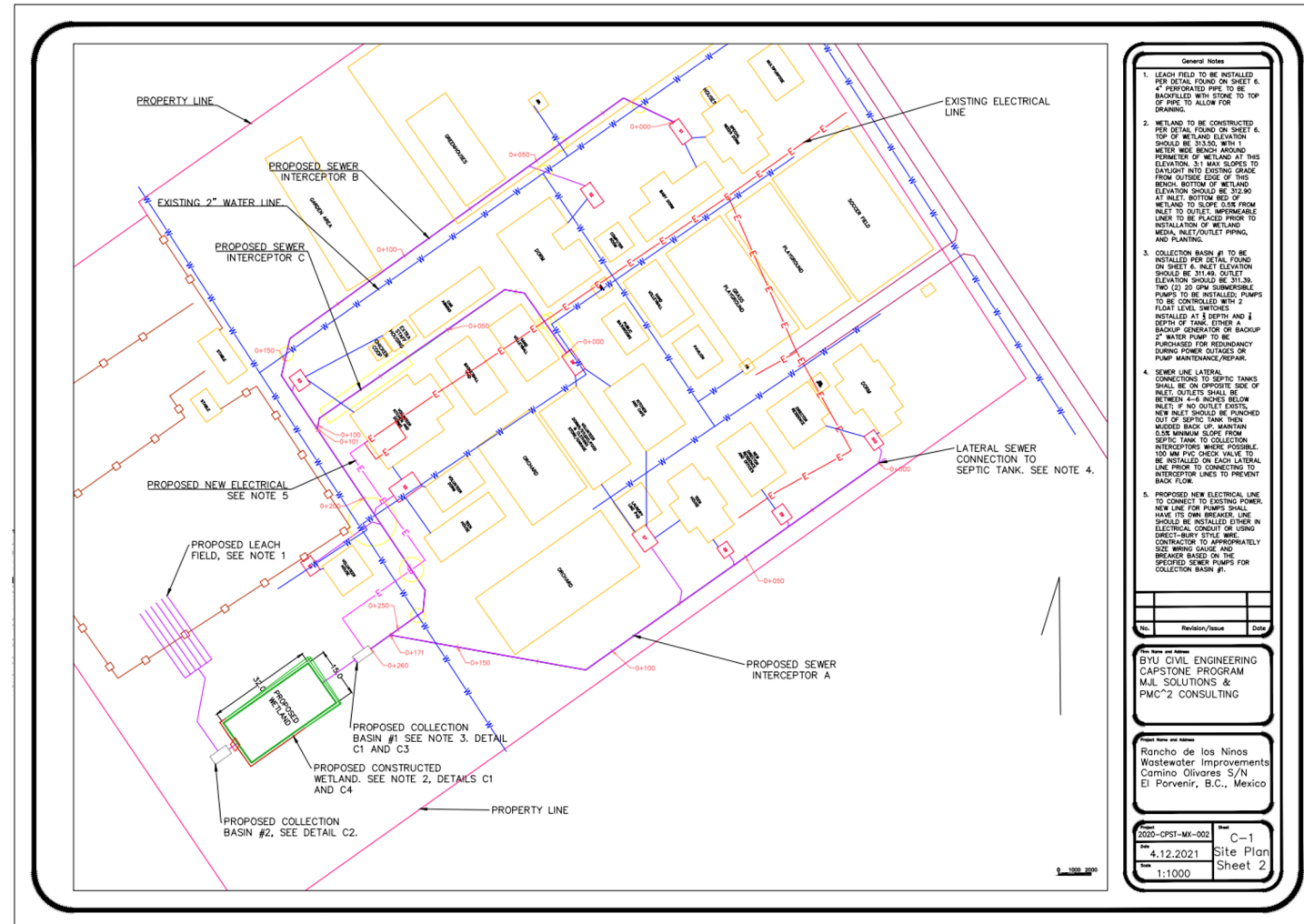
- assumed standard values of BOD and TSS
- live feed video camera monitoring flow rates 24/7 for roughly 3 weeks
- characterized flows based on trends found in data



# Design and Analysis Cont'd

## Delivered Items

- Developed hydraulic analysis for new piping plan, with flow re-routed to central collection basins
- Sized wetland using design flow and provided material quantity and cost estimates
- Pumping layout and schematics
- Full, near construction-ready plan set



## Discussion of Results

Although we have not yet built the constructed wetland, our design is optimized to meet the needs of the project sponsor.

The proposed design:

- Minimizes site work costs by utilizing pumps to overcome elevation/gravity flow constraints at collection basins
- Identifies potential utility crossing/conflict points
- Includes redundancies to prevent system backups during high flows



## Conclusions

### Summary of Design Considerations

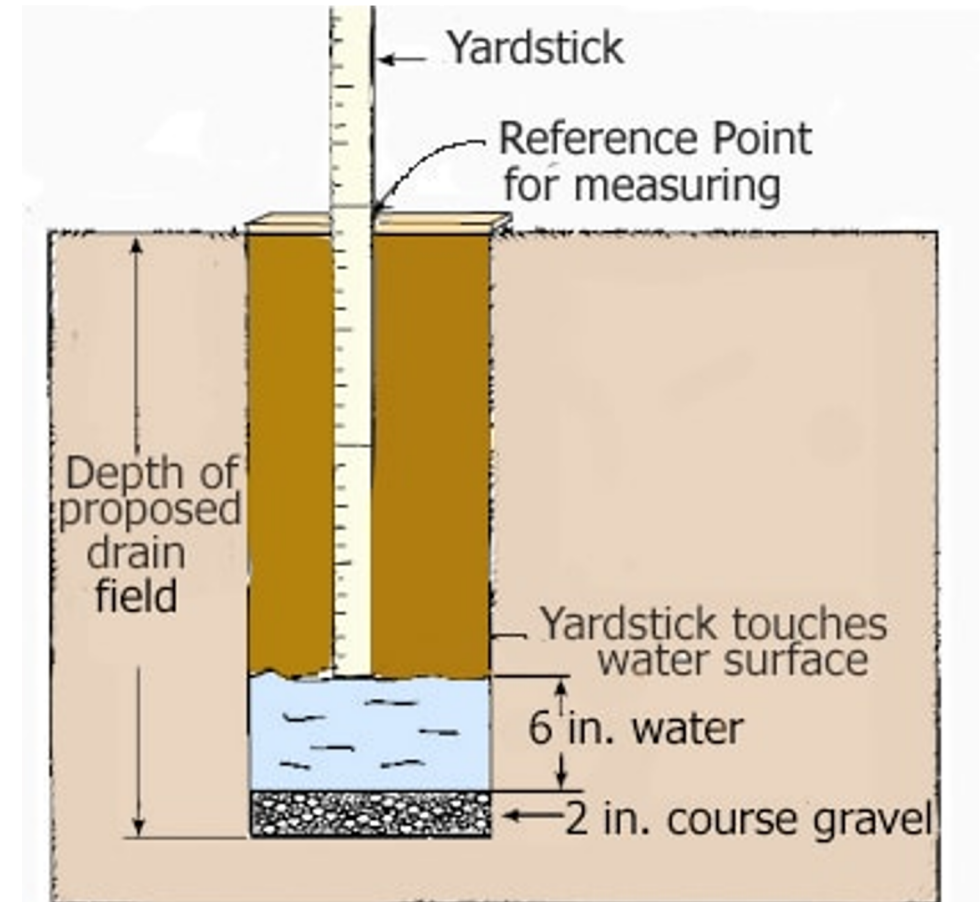
- Wetland was sized using high-precision flow measurements and water use records
- Secondary pumping system in place to support the wetland and reduce excavation costs
- Can be built almost entirely with locally sourced materials

### Upon completion, this system will provide the following:

- Increased capacity
- Low-maintenance, low-cost system
- Clean effluent available for agricultural needs

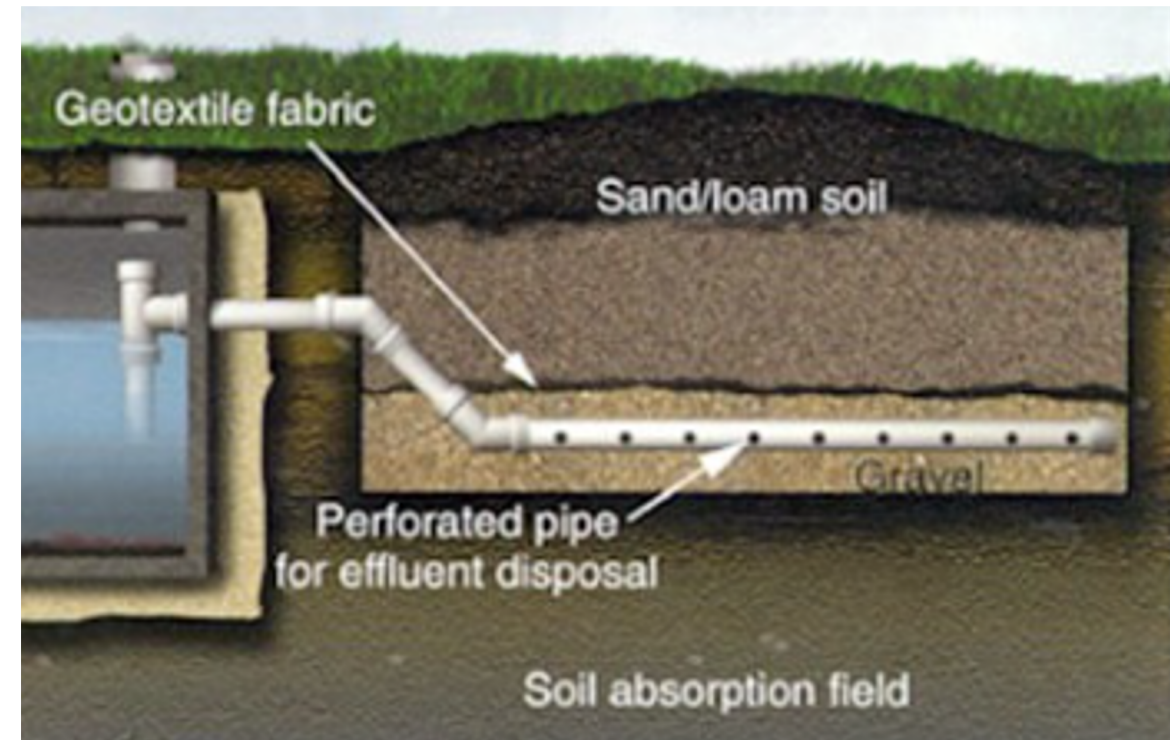
## Recommendations

- Get professional engineer to check design specifications
- Get more flow data
- Confirm assumptions like septic tank location and elevation
- Perform a percolation test for leach field location (see adjacent image)
- Structural analysis for septic tanks and collection tanks



## Recommendations Cont'd

- Test water to confirm no other contaminants of concern such as Fe, Mn, Zn, etc
- Buy gas powered pump for water reclamation in case of power outage
- Ensure proper installation of leach field (current septic tanks were not)
- The reconstruction of septic tank 6 as presently constituted (failed)



**The End**

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**Any Questions?**