On Site Sewage Facility - JTP Water Solutions

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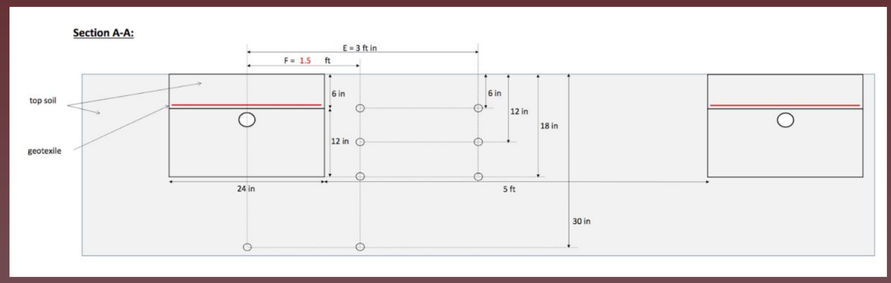
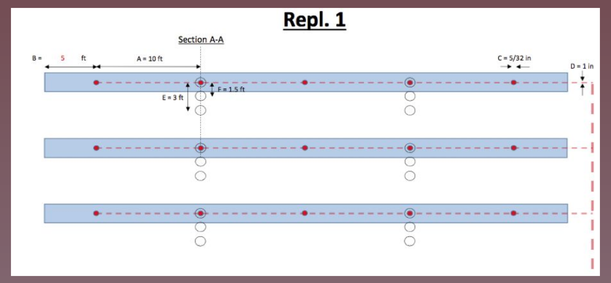
Introduction

The overall concept of this project is an on site sewage treatment facility with 3 different subprojects: Effects of different dosing methods on Aerobic Treatment Units, Low Pressure Dosing systems, and On-Site effluent clarification for reuse. Figuring out a more efficient and useful way to use the effluent in on site facilities is the main concern of this research facility.

A focus of the first subproject is to analyze how different dosing methods affect Aerobic Treatment Units. The second is testing various configurations of low pressure dosing systems to use effluent in a more efficient way on the grass. The third project will work on clarifying the effluent from an OSSF enough to be reused in the home.

The overview of our solution consists of a design for a plumbing system that connects composite samplers to sample sites throughout the on-site wastewater training site. It also includes the code used for the samplers, and locations for soil moisture sensors and low-pressure dosing monitors.





Subproject 1: Standard vs Equalized Dosing

This project will determine if using a higher strength recipe will keep the effluent within acceptable NSF standards and observe if equalized dosing improves performance for each recipe (low strength vs high strength). A high strength recipe would increase BOD and TSS levels without substantially increasing the flow rate.

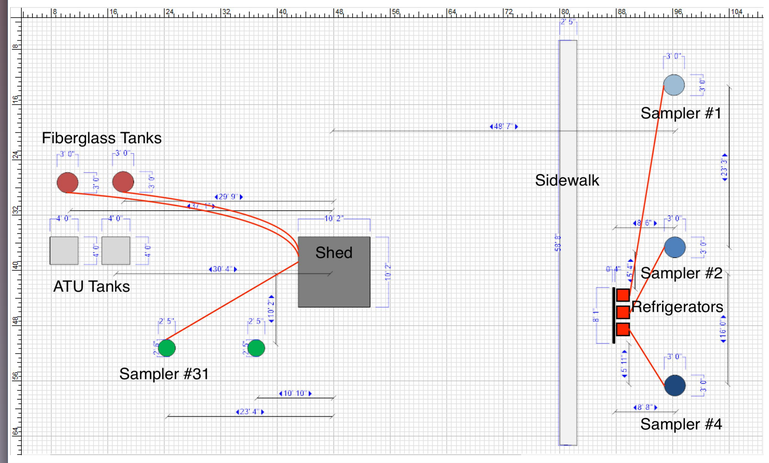
Subproject 3: Effluent Reuse

Two treatment technologies, BioBarrier® MBR (NSF-350) and Clearstream (NSF-40), will be used under normal and high strength conditions to determine if E-coli and TSS levels are acceptable for reuse.

Subproject 2: LPD Soil Moisture

A plumbing design will be proposed for connecting the existing sewage systems to the composite sampler and new soil moisture sensor locations will be suggested. The composite samples will be monitored weekly for soil moisture, effluent distributions and pressure, while the TSS and BOD_5 will be monitored monthly.

Map and Sampler Placement



Cost Analysis

Table 1. Initial Costs for the Plumbing System

Initial Purchases	Quantity/Length	Cost
Refrigerated Samplers*	4	$6000/each
Refrigerators*	3	$90-500
Black Irrigation Pipe	~128 ft	$25/100ft
Non-Refrigerated Samplers*	3	$0
Moisture Sensors*	48	$12,000
Fiberglass Tanks	2	$600
Construction	8 hours	$250
Total (overall)	___	$36,302-38,982
Total (to be purchased)	___	**$12,302-14,982**

Table 2. Operational Cost for the Plumbing System

Operation/Maintenance	Cost
Fiberglass tanks	$0.30-0.40 per gallon per 2 years for Pumping
Concrete tanks	$0.30-0.40 per gallon per 2 years for Pumping Repairs - TBD

*The utilities and operational cost of the samplers, sensors, and refrigerators are a minor cost that has not been calculated and will be determined by the client.

Design Objective

Subproject 1:
Automated sampler placement will be determined along with a plumbing design for the sampler piping. These designs will be added to an existing OSSF site AutoCAD file as a new layer. A code for the automated samplers will be programmed to take composite samples over one day.
Subproject 2:
Sampler type and placement will be determined to provide the most cost and time efficient solution. A plumbing design for the tubing between these sample sites and samplers will also be designed and added to the existing AutoCAD file of the OSSF site.
Subproject 3:
Create a cost analysis including the moisture sensors needed for this research.

Final Design Recommendation

ATU Samplers:
Existing fiberglass tanks will be used and piping leading into the tanks will allow for direct sampling. Cost for new tanks were accounted for in the cost analysis if the tanks need to be replaced.
Placement of Samplers for Water Reuse System:
Non-refrigerated samplers will be placed in purchased refrigerators to ensure the integrity of the samples and minimize costs. Holes will be drilled in the side of the fridge to allow piping from the sampler to the tanks.
Sampler Tube Piping:
Fours refrigerated samplers will be placed in the locked large shed on the OSSF site. To protect the clear tubing that comes with the samplers, the tubing with be contained in 1” irrigation polyethylene pipe leading.
Code for Automated Samplers:
Each sampler will take a 100 mL sample every hour for 24 hours. The samplers will be programmed to perform composite sampling, so one bottle will fill with the total 2400 mL per sample site per day.

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