Alternative Septic System Update 2

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Project Background

- Located at 1955 North Echo Canyon Rd. Page Springs, AZ
- Alternative septic system design selection
- Irrigation design for vineyard
- Water quality analysis of well water
- 1-ft topographic map of property

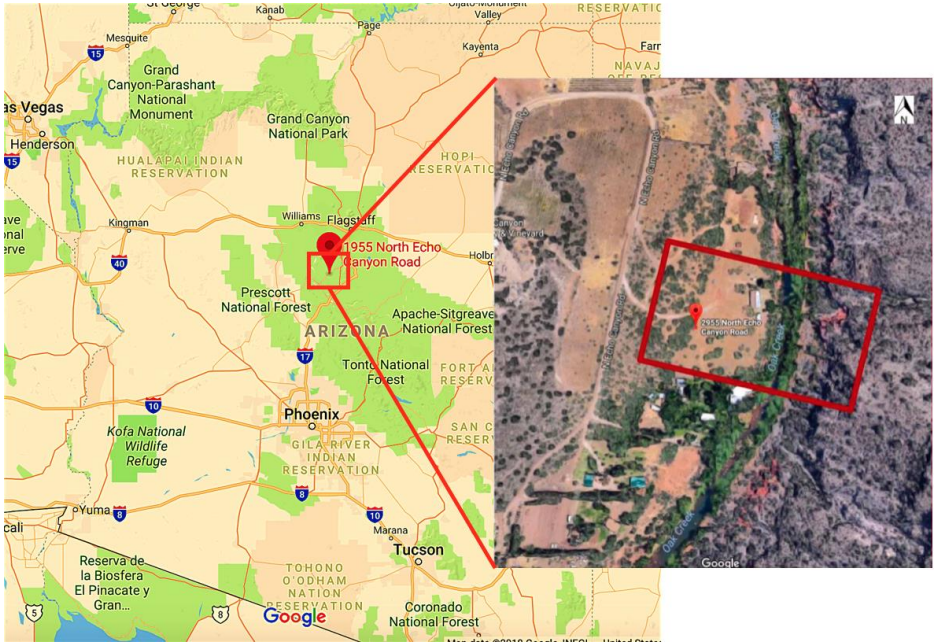

Figure 1, Site Location [1]

Schedule

Table 1, Team Schedule

Task No.	Task	Start Date	End Date
1.0	**Site Investigation**	**2/3/2018**	**2/3/2018**
2.0	**Off-site Technical Analysis**	**2/3/2018**	**2/5/2018**
3.0	**Alt Septic System Design Evaluation**	**2/5/18**	**3/25/18**
3.1	Compliant Systems	2/5/2018	2/22/2018
3.2	Technical Requirements	2/23/2018	3/18/2018
3.3	Evaluation of systems	3/19/2018	3/25/2018
4.0	**Irrigation System Design Evaluation**	**2/5/2018**	**3/25/2018**
4.1	Operations	2/5/2018	2/17/2018
4.2	Evaluation of systems	2/13/2018	3/4/2018
4.3	System Analysis	2/24/2018	3/25/2018

Water Quality Analysis

- Total Nitrogen is a concern because of Nitrate
- Potentially indicate health risks
- Issues with our testing method
- Re-tested blanks to improve our method
- Going to take more samples to retest and backup data.

Table 2, Total Nitrogen Test Results

Source	Total Nitrogen Test 1	Total Nitrogen Test 2
Blank (mg/L)	0	0
Well (mg/L)	-0.6	-0.2
Tap (mg/L)	1	0.1
Creek (mg/L)	-0.2	N/A

Water Quality Analysis

- 2 Total Nitrogen tests done for both the well and tap
- 2 Nitrate tests done, 1 for each the well and tap
- 3 Fecal Coliform tests done, 2 from the well and 1 from the tap
- Secondary Maximum Contaminant level (SMCL)
- pH - Taste issues
- Nitrate - Health issues

Table 3, Average Water Quality Analysis Data and EPA Standards

	Average Tap	Average Well	EPA Standards [2]	Methods Used
Total Nitrogen (mg/L)	0.55	-0.4	N/A	HACH 10071
Nitrate (mg/L)	0.1	0.3	10	HACH 8039
Fecal Coliform (number of colonies)	0	0	0	HACH 8074
pH	7.14	N/A	6.5-8.5 (SMCL)	Hanna Meter

Topographic Map

Key:

- Test Site A
- Test Site B
- Test Site C
- Well Location

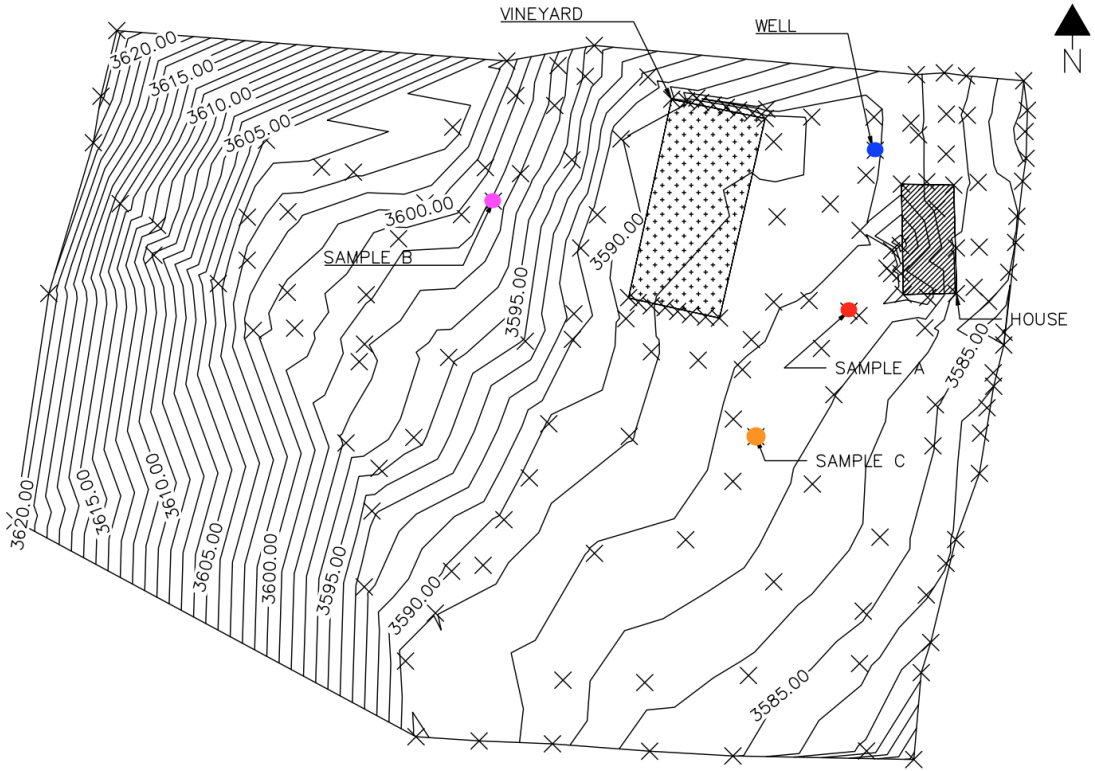

Figure 2, Site Topographic Map

Percolation Test & Leach Field

- Minutes Per Inch (MPI)
- Soil Absorption Rate (SAR) was found to be 0.93 gal/day/ft^2
- According to R18-9-A312 of Arizona Administrative Code an Adjusted Soil Absorption Rate (SAR_a) will need to be found
- This requires knowing the Total Suspended Solids (TSS) and the 5-day Biochemical Oxygen Demand of the effluent (BOD_5)

$$SAR_a = \left[\left(\frac{11.39}{\sqrt[3]{TSS + BOD_5}} - 1.87\right) SAR^{1.13} + 1\right] SAR$$

Table 4, Percolation Test Data

Test	Time for water Absorption (min)	Percolation Rate (MPI)
A	10:31	0.876
B	17:52	1.489
C	18:57	1.579

Water Demand & Rights

- 12.5 Acre-feet per year from creek
- 2 acre vineyard area
- Client would like 1,500 plants per acre
- Client would like two parallel water storage tanks at the high end of the property

Figure 3, Red Wine Grapes [3]

Irrigation

- Drip
  - Water runs through pipes slightly above the ground and drips almost directly onto the crops and roots.
- Subsurface Drip
  - Drip lines are installed below the soil's surface, typically at a depth of 20-40 cm.
- Low Elevation Spray
  - Suspends sprinkler spray heads close to the soil surface, typically less than 12 inches above the ground.

Figure 4, Drip Irrigation [4]

Compliant Systems

Table 5, Possible Compliant Systems Descriptions and Performance Goals

System	Reference	Description	Performance
Aerobic System with Subsurface Disposal	R18-9-E315.4.15	Highly treated wastewater; can be used when a standard system can not	TSS of 30 mg/L BOD_5 of 30 mg/L
Sequencing Batch Reactor	R18-9-E321.4.21	Enhanced biochemical processing; can be used when a standard system can not	TSS of 30 mg/L BOD_5 of 30 mg/L
Wisconsin Mound	R18-9-E308.4.08	Above grade bed system, utilizes a dosing chamber; further treats wastewater from a septic tank	TSS of 20 mg/L BOD_5 of 20 mg/L

References:

[1] Google Maps. [Online]. Available: https://www.google.com/maps/search/1955 N Echo Canyon Rd. Page springs AZ/@34.7765732,-111.9062815,13.87z. [Accessed: 22-Feb-2018].

[2] “National Primary Drinking Water Regulations,” *EPA*, 11-Jul-2017. [Online]. Available: https://www.epa.gov/ground-water-and-drinking-water/national-primary-drinking-water-regulations. [Accessed: 22-Feb-2018].

[3] “Red Wine Grapes,” *Altitude Brewing & Supply*. [Online]. Available: https://www.altitudebrew.com/products/wine-grapes. [Accessed: 26-Feb-2018].

[4] Fintrac Inc., "Introducing Drip Irrigation Technologies to Smallholder Farmers," [Online]. Available: https://agrilinks.org/blog/introducing-drip-irrigation-technologies-smallholder-farmers.

Questions?