Summerville Borough Water Treatment

REDBANK CREEK ENGINEERING, INC.

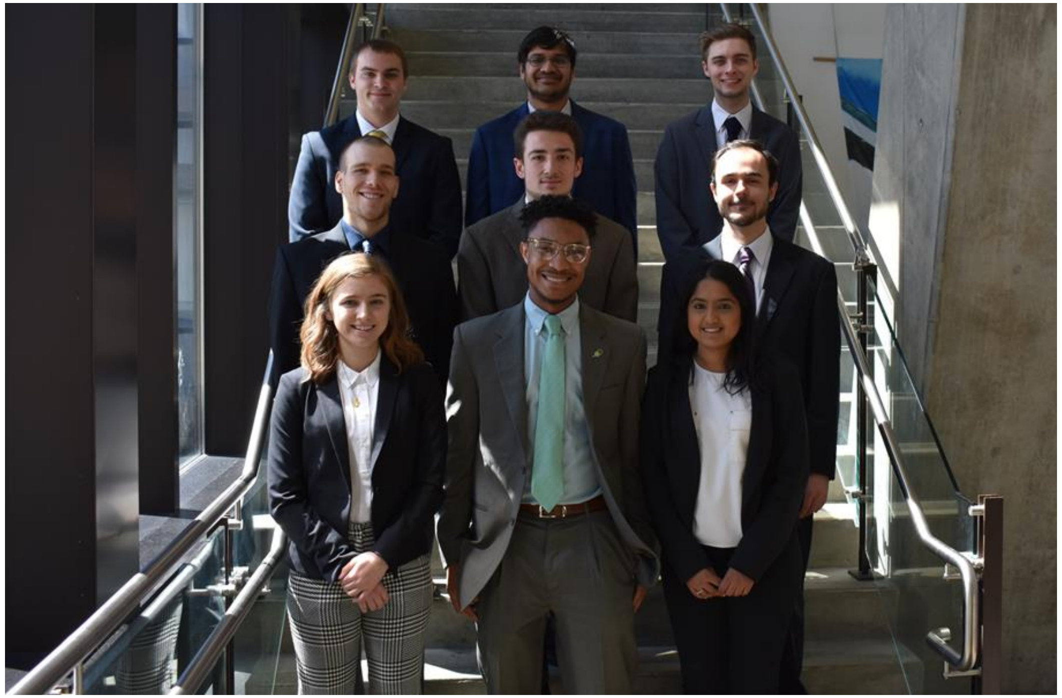
Meet Our Team!

Construction Management

- David Samulevich
- Austin Matase

Sustainability

- Joe Zappitelli
- Isaiah Spencer



Environmental

- Sandya Rajan
- Shannon Kronz
- Patrick Kane
- Alex Jadlowiec

Structural

- Rahul Ramanna

Presentation Outline

Overview

- Introduction/Background
- Existing Facilities/ Need for Project
- Project Goals
- Analysis Criteria
- Design Alternatives
- Summary
- Proposed Design

Introduction/Background

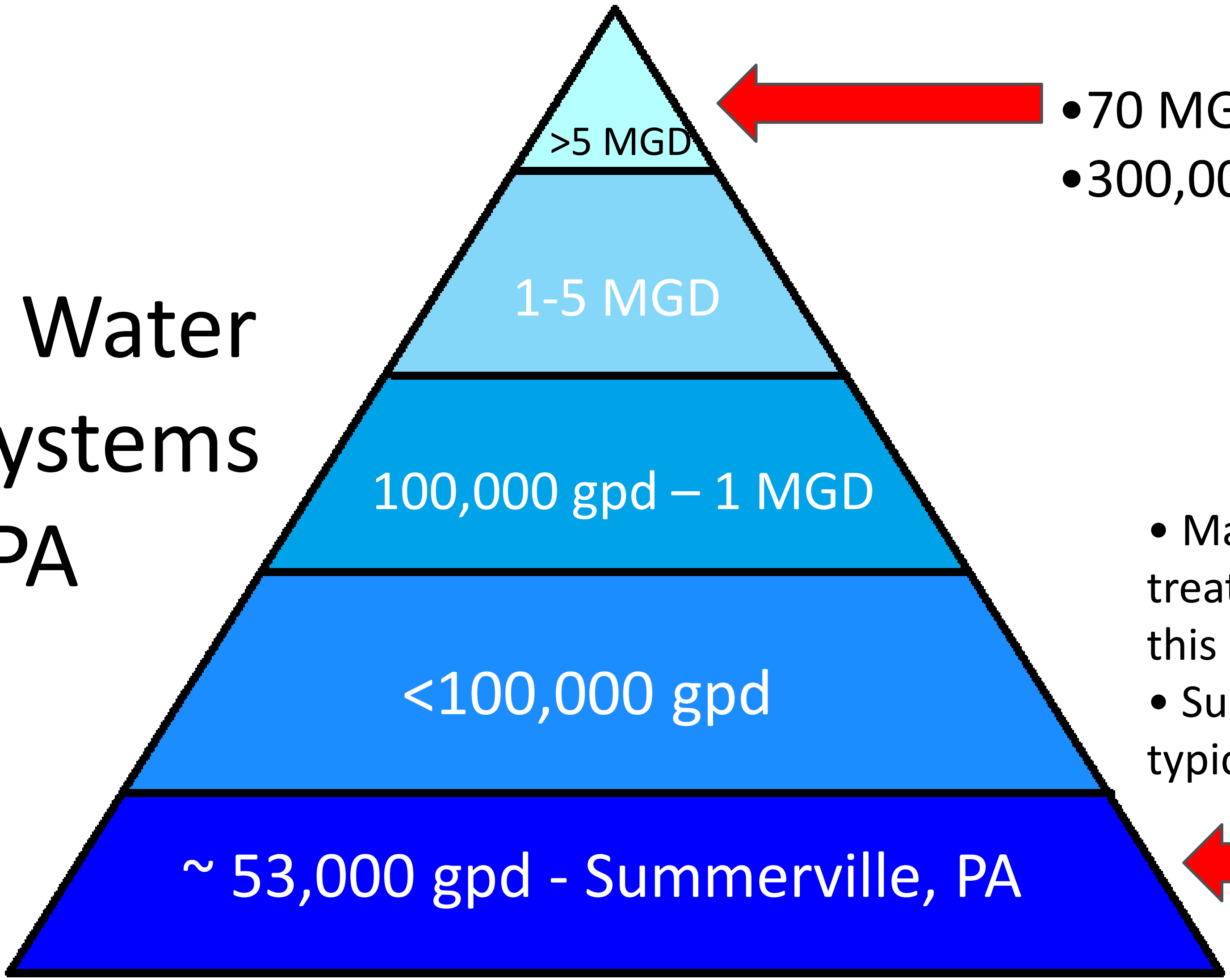
Project Location: Summerville, PA

- 90 minutes northeast of Pittsburgh
- Population (2014): 522
- Low income community
- Median household income: $38,874

Project Location: Summerville, PA

- Jefferson County, PA
- Redbank Creek runs through center of town
- Main Road: PA State Route 28

Overview of Water Treatment Systems Across PA



PWSA

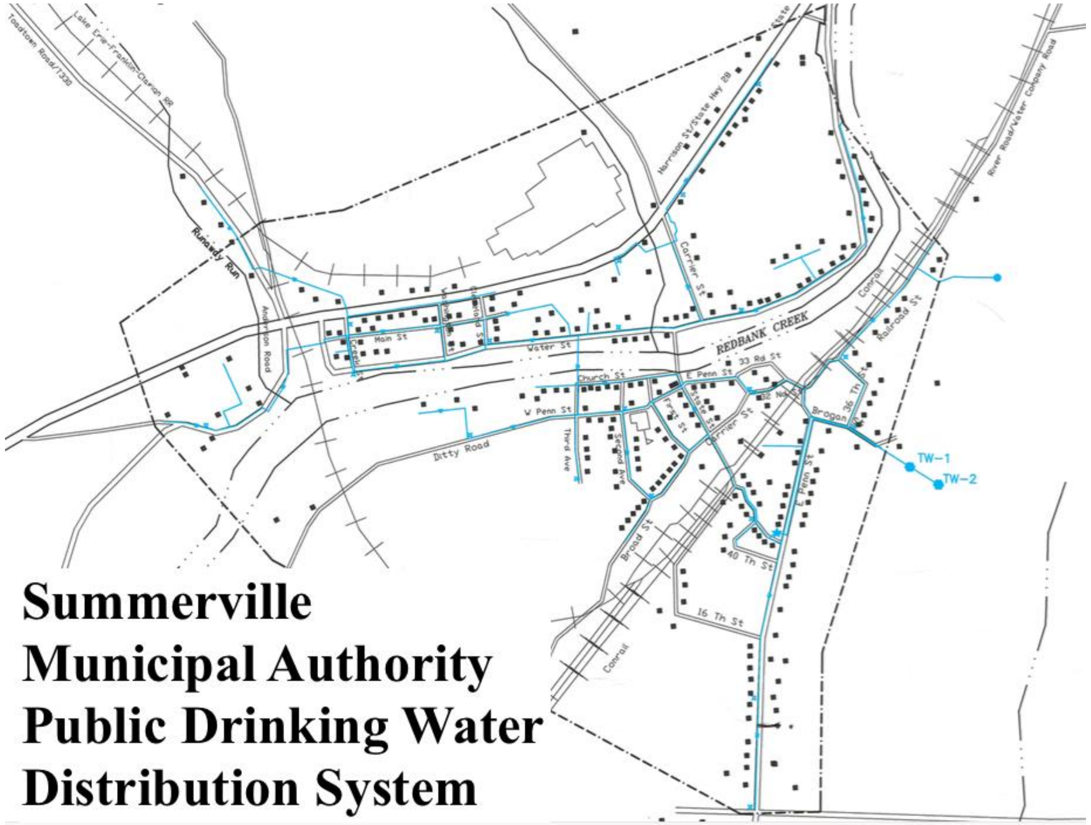
- 70 MGD
- 300,000 customers

Summerville

- Majority of treatment plants are of this size
- Sustainability not typically included

Our Client: Summerville Borough Municipal Authority

- Services 210 connections
- The only industrial customer is Glen-Gery Brick company
- Raw water source is two springs
- Summerville's drinking water demand: 53,000 GPD
- Residential Customers – 20,000 GPD
- Glen Gery Brick Factory – 33,000 GPD



Summerville Municipal Authority Public Drinking Water Distribution System

Summerville's Challenges

- Springs are depleted during the summer months and cannot meet 53,000 GPD demand for residents + industrial use
- Current well is unusable because of high levels of barium, iron, and manganese

Summerville's Challenges

- Glen-Gery brick factory is the keystone of Summerville's economy so water demand for industrial use must be met
  - Factory puts high stress on the water supply by using more than half of the town's daily use

Project Goals/ Objectives

- The goal of this project is to engineer a dependable source of drinking water for Summerville Borough that is:
  - 1. Affordable
  - 2. Resilient
  - 3. Sustainable
- Objective: to design and evaluate 3 alternatives

Design Alternatives

Alternative 1: Groundwater Source

- Treat well water for distribution
- Drill an additional well

Alternative 2: Surface Water Source

- Source water from Redbank Creek and treat for distribution

Alternative 3: Recycled Wastewater

- Recycle effluent from WWTP to Brick Factory for industrial use only
- Storage tank will be built to hold excess water from WWTP

Sustainability Initiatives

- Sustainable infrastructure is important in protecting natural resources and the environment, but in some cases can be a more effective use of financial resources
- Criteria and certifications for sustainability have become more popular like:
  - LEED (Benedum Hall is LEED Gold!)
  - Net Zero Energy
  - Envision
- For this project, Envision Criteria was used to assess sustainability

Envision

ENVISION™

- Framework to assess sustainability of infrastructure projects
  - Established in 2012 by ISI
- American Infrastructure Protection Act 2018
- Total projects in US: ~60
  - 3 verified projects concerning water treatment

Envision: Example Questions

Criteria	What does it measure?	Example Question	# of Points Available
Quality of Life	Community, social health, and wellbeing	Are relevant community needs, goals and issues being addressed?	181
Leadership	Traditional sustainability actions + collaborative leadership	Will the plan cover all aspects of long-term monitoring and maintenance?	121
Resource Allocation	Quantity, source, and characteristics of resource materials	Will the project design monitor water performance during operations?	182
Natural World	Understand and minimize negative impacts, explore synergy with world	Will the project maintain or enhance water quality?	203
Climate and Resilience	Minimize emissions and ensure resilience	Will the project team develop a Climate Impact Assessment and Adaptation Plan?	122

Alternative 1

Treat well water for distribution and drill an additional well

Overview

- Groundwater Contaminants
- Analyze Treatment Options
- New Well for Additional Supply
- Layout/Design
- Supply Impact
- Cost

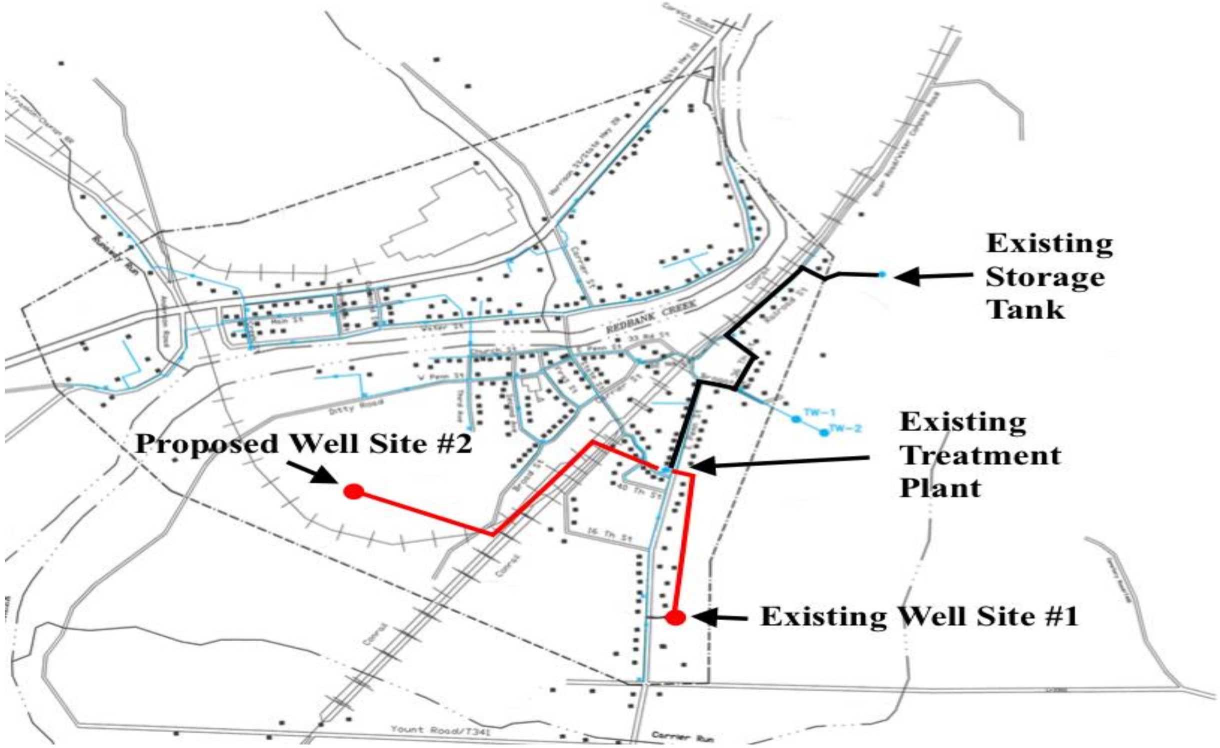
Alternative 1: Groundwater Contaminants

Contaminate	Concentration	EPA Maximum Contaminate Level
Iron	4.80 mg/L	0.3 mg/L
Manganese	0.87 mg/L	0.05 mg/L
Barium	3.4 mg/L	2 mg/L

*Testing data from Moody and Associates and Chemical Solutions

Alternative 1: Groundwater Source

- Existing well will be treated for Iron, Manganese and Barium
- Additional well will be drilled to provide resilience for the system



Alternative 1: Treatment Options

- Treatments for Iron & Manganese:
  - Aeration
  - Chlorine
  - Ozone
  - **Potassium Permanganate & Green Sand**
- Treatments for Barium:
  - Lime Softening
  - Reverse Osmosis
  - **Ion Exchange**

Alternative 1: Iron & Manganese Treatment

$$3Fe^{2+} + KMnO_4 + 7H_2O \rightarrow 3Fe(OH)_{3(s)} + MnO_{2(s)} + K^+ + 5H^+$$

Potassium permanganate dose for oxidation: 0.94 mg/mg Iron [EPA]

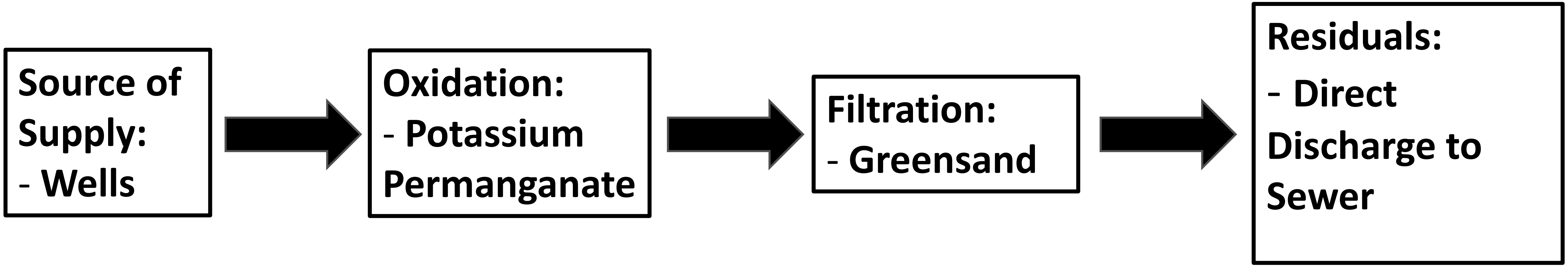
Dosage: (0.94 mg/mg Iron)*(4.80 Iron mg/L) = 4.5 mg/L

$$3Mn^{2+} + 2KMnO_4 + 2H_2O \rightarrow 5MnO_{2(s)} + 2K^+ + 4H^+$$

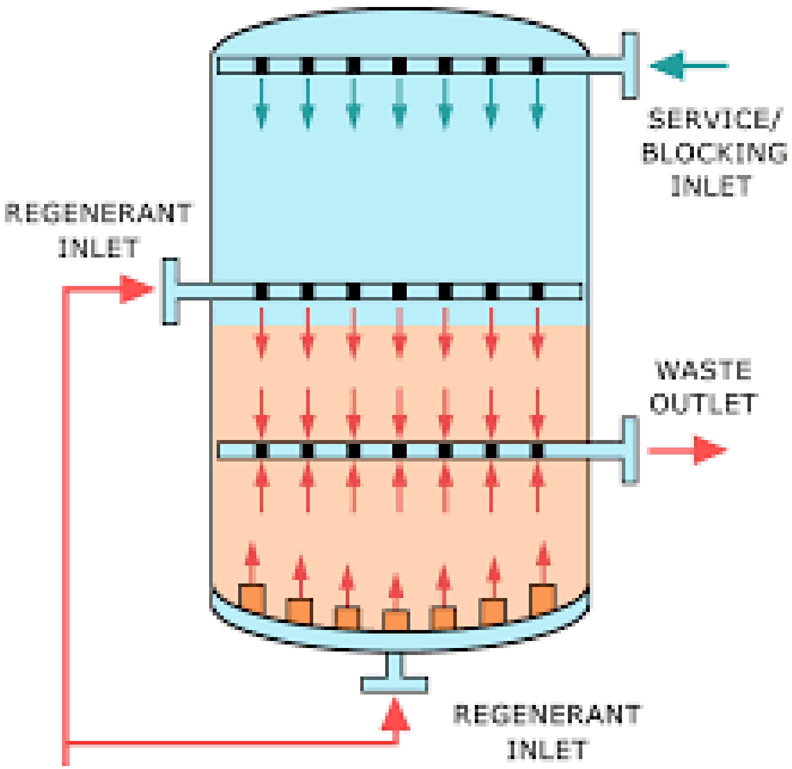
Potassium Permanganate dose for oxidation: 1.92 mg/mg Manganese [EPA]

Dosage: (1.92 mg/mg Manganese)*(0.87 Manganese mg/L) = 1.7 mg/L ~ 2.0 mg/L

Alternative 1: Iron & Manganese Treatment



Alternative 1: Barium Treatment



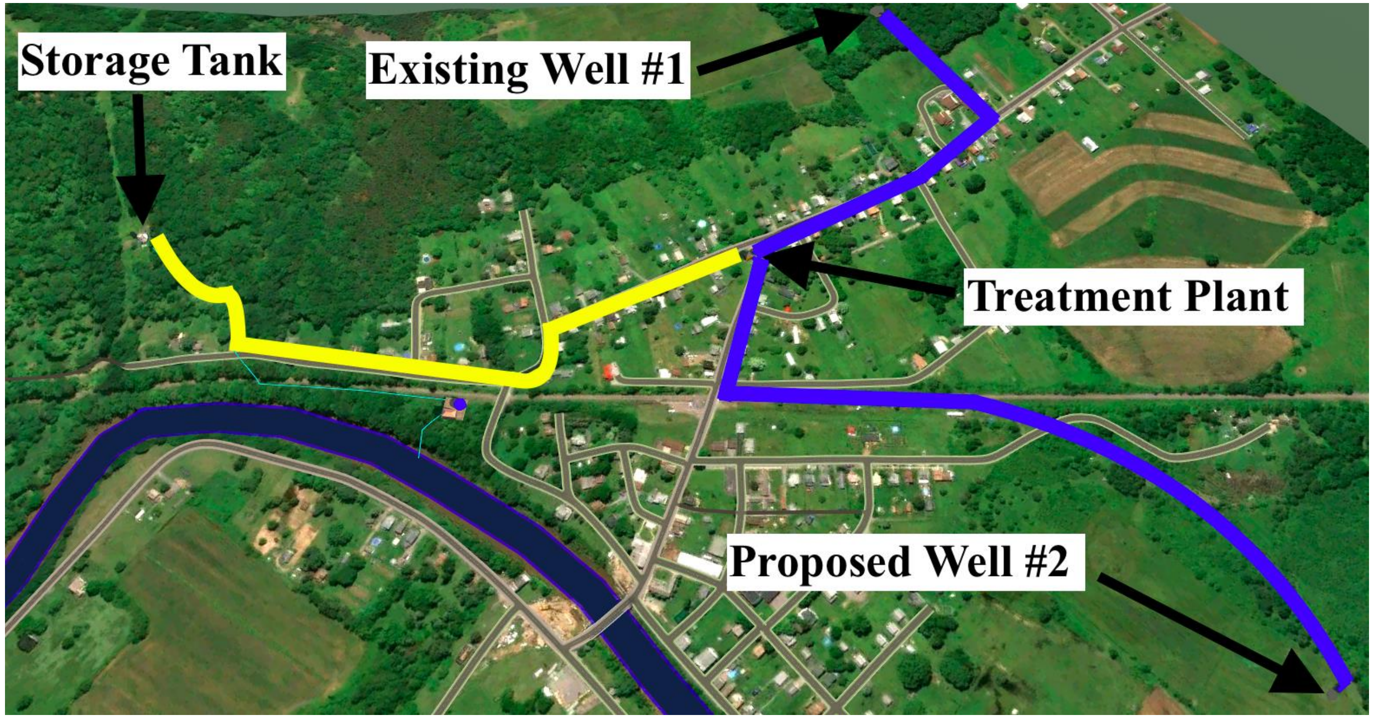
- Ion exchange – Use of Strong Acid Cation resin (Water Softener) to precipitate Barium
- Potassium Chloride used as water softener
- Regenerate brine with NaCl

Alternative 1:
Existing Well

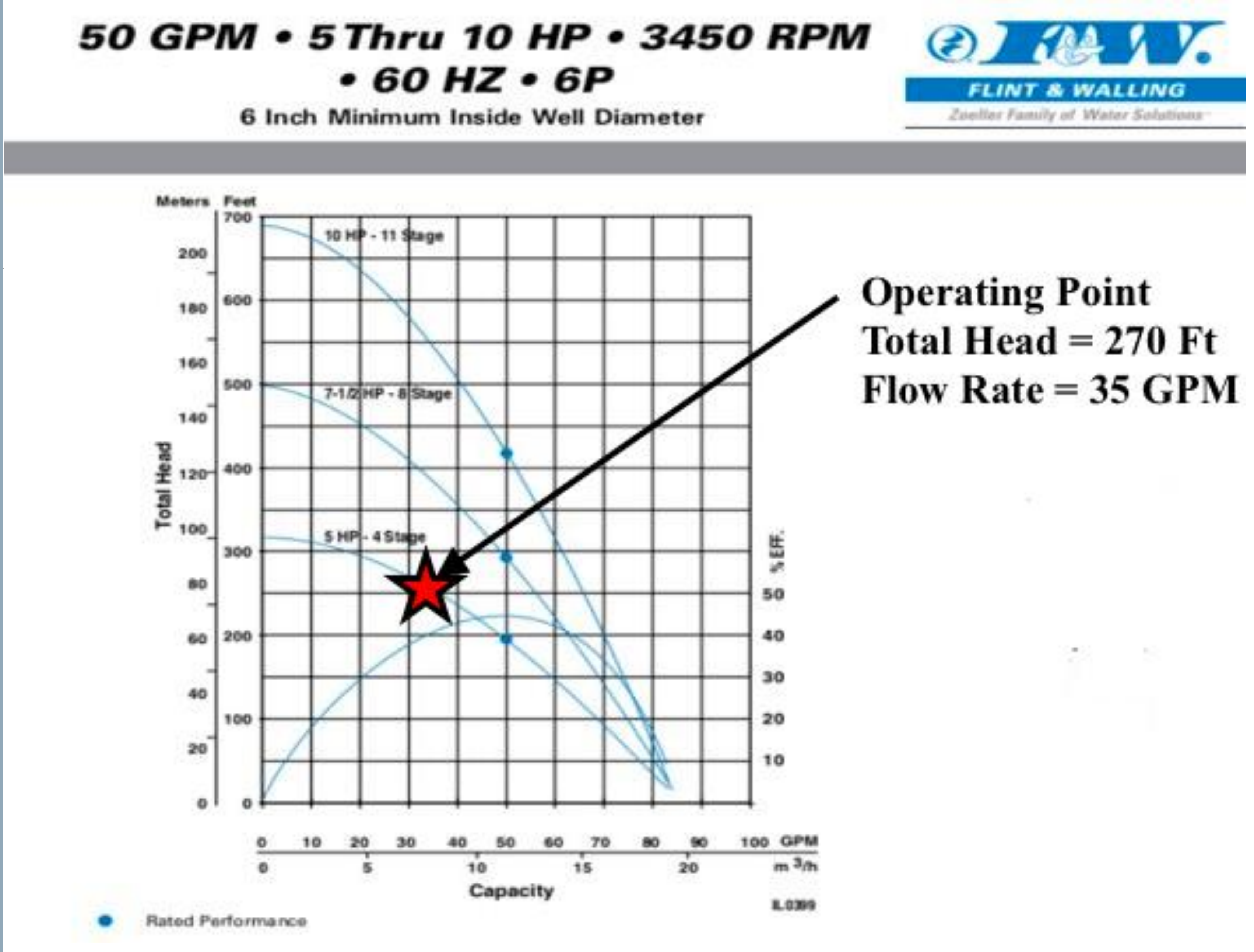
Alternative 1:
Proposed Well

Alternative 1: Pipe Network

- **Length and Size of Additional Pipe**: 3,000 ft of 4 in. Pipe
- **Design Flow**: 50,000 gal/day
- **Total Dynamic Head from groundwater level**: 270 ft
- **Pump Recommendation:** 4 Stage Flint & Walling Pump at each well

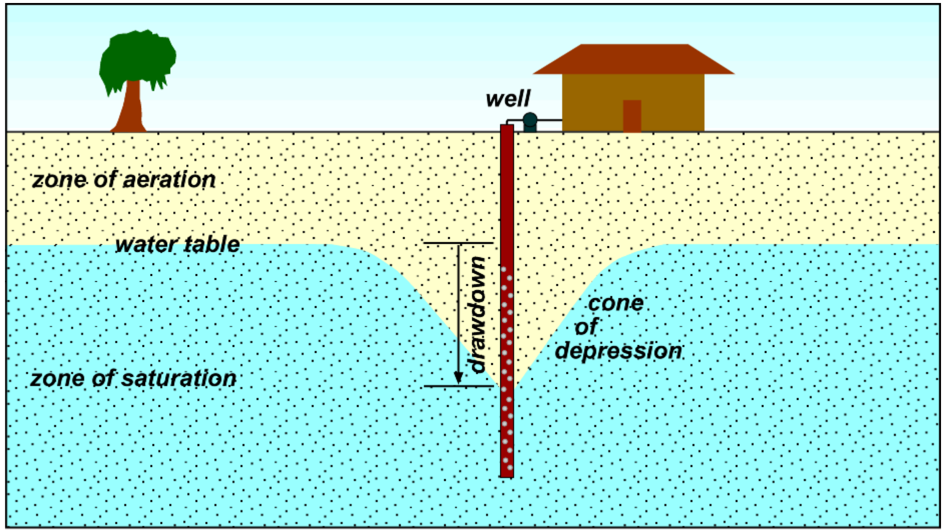


Pump Curve


50 GPM • 5 Thru 10 HP • 3450 RPM • 60 HZ • 6P
6 Inch Minimum Inside Well Diameter
F&W. FLINT & WALLING
Zoeller Family of Water Solutions
Meters
Feet
Total Head
10 HP - 11 Stage
7-1/2 HP - 8 Stage
5 HP - 4 Stage
% EFF.
Capacity
GPM
m 3/h
Rated Performance
Operating Point
Total Head = 270 Ft
Flow Rate = 35 GPM

Alternative 1: Supply Impact

- Each day an average of 53,000 gallons of ground water will be pulled from the well
- The new well will relieve stress on the current well and the springs
- Wells are a more reliable source of water



Alternative 1: Construction Cost

Component	Cost
Waterline Installation	$42,000
Well Drilling	$16,000
Ion Removal (Ba, Fe, Mn)	$77,000
Well Pumps	$7,000
Total Cost	**$142,000**

Alternative 2

Source water from Redbank Creek and treat for distribution

Overview

- Surface Water Contaminants
- Treatment Plant Design Options
- Traditional vs. Modular
- Layout/Design
- Supply Impact
- Cost

Alternative 2: Redbank Creek Water Quality

- Tested for primary and secondary contaminant levels
  - **Primary (required by EPA)** – risk to human health
  - **Secondary (recommended by EPA)** – taste, odor and color

- Manganese and Mercury levels are above EPA standards
- pH = 7.61

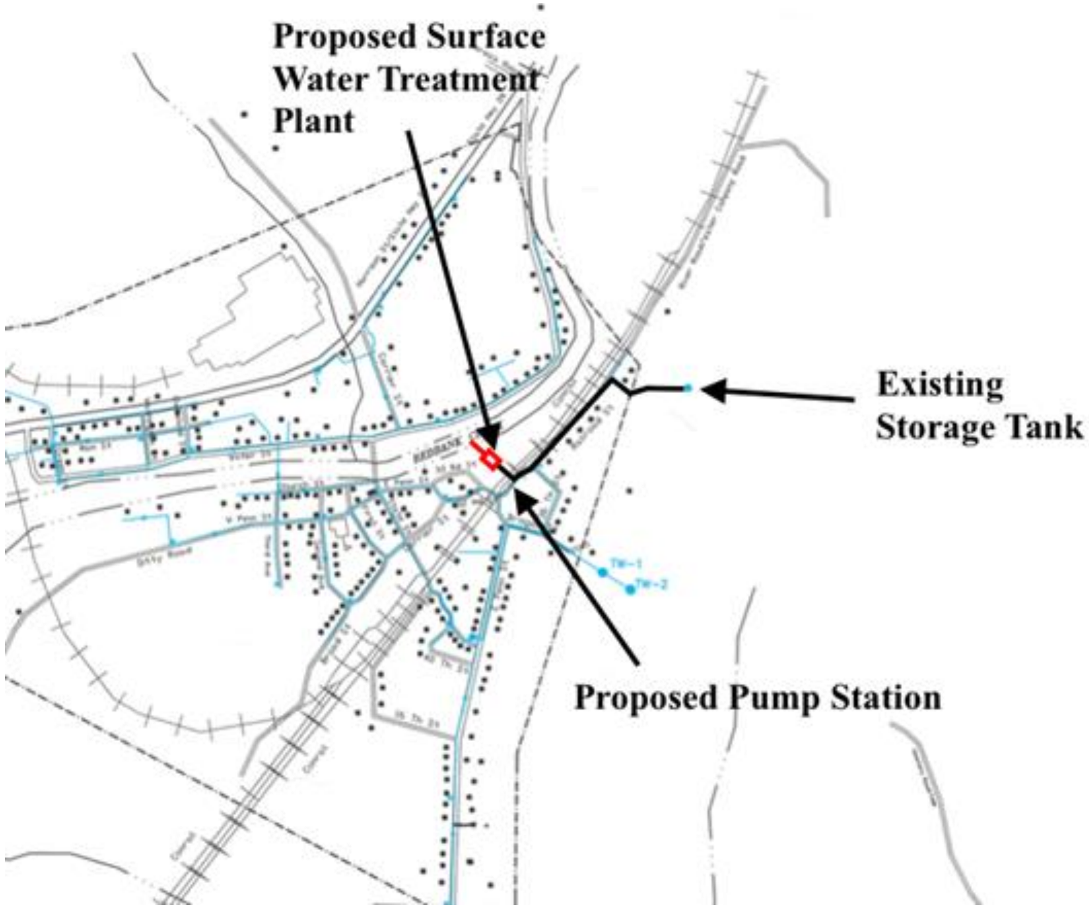
Contaminant	EPA MCL or SMCL (mg/L)	Redbank Creek (mg/L)
Barium (Primary)	2.00	0.65
Iron (Secondary)	0.30	0.20
Manganese (Secondary)	**0.05**	**0.31**
Mercury (Primary)	**0.002**	**6.84**
Lead (Primary)	0.015	0.00

Alternative 2: Source Water from Redbank Creek

- Treatment System Design Options:

  1. **Traditional Design**: Screens, Rapid Mix, Flocculation, Sedimentation, Filtration, Disinfection

  2. **Proprietary modular treatment system**



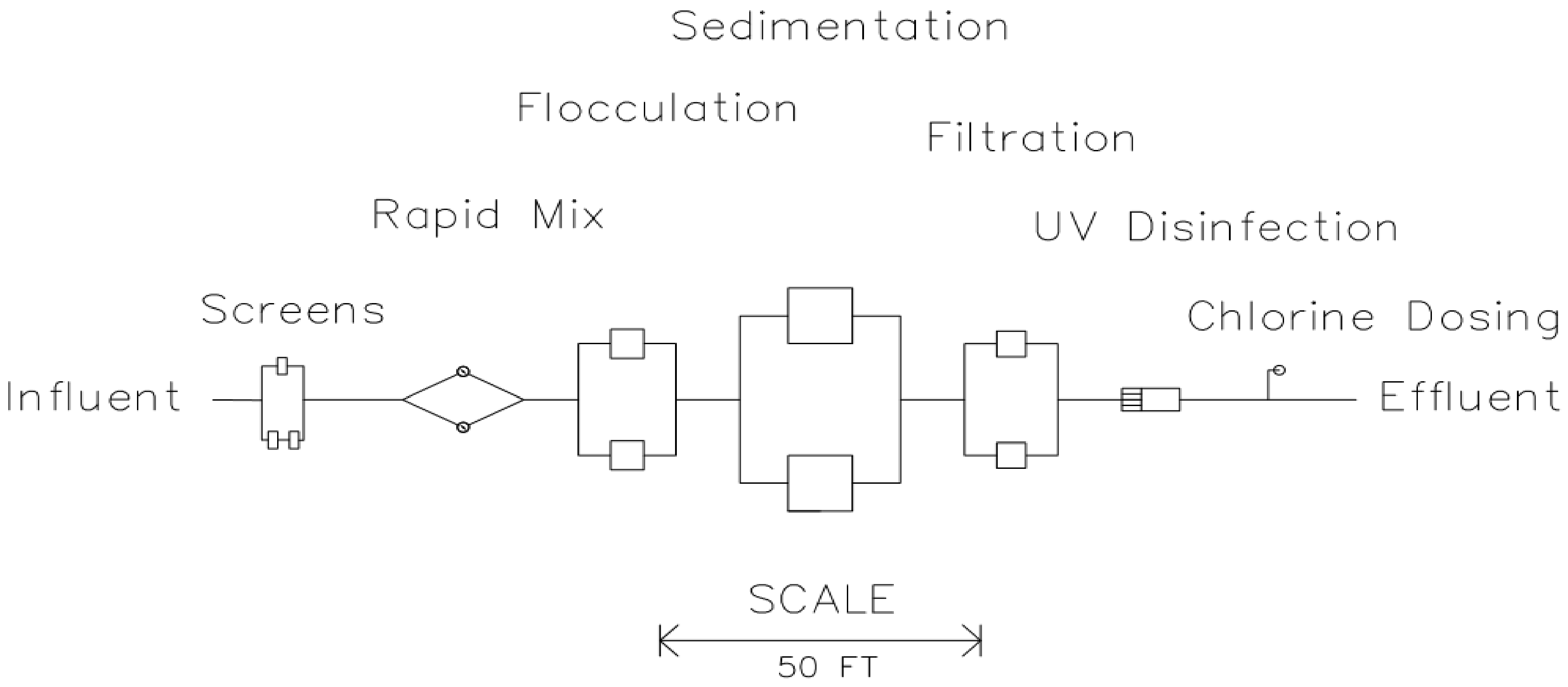
Alternative 2: Traditional Surface Water Plant

Process	Number	Area/Volume	Detention Time
Screen (40mm)	2	1.5 ft x 1.5 ft	n/a
Screen (20mm)	1	1.5 ft x 1.5 ft	n/a
Rapid Mixing Chamber	2	2.5 ft^3	25 s, G= 800 fps/ft
Flocculation Basin	2	140 ft^3	25 minutes
Sedimentation	2	1000 ft^3	3 hours
Rapid Dual Media Filtration	2	11 ft^2 x 10 ft	n/a

Disinfection

- UV System – 21.6 mJ/cm^2 dose will achieve a 4-Log reduction in microorganisms
- Chlorine Residual – Metering Pump at 1 mg per liter of effluent

Alternative 2: Traditional Surface Water Plant



Alternative 2: Traditional Surface Water Plant

- Lime/Soda Ash and Ferric Chloride will be added in the rapid mix chambers
  - Lime/Soda Ash: adjust pH
  - Ferric Chloride: Begins process of attracting particles too small to be filtered
- Flocculation basin slows down velocity of water and allows time for larger, heavier particles to form
- Sedimentation basin allows for heavier particles to settle while clean water filters out of the top
  - Impurities at the bottom of the basin are collected by mechanical sweeps
- Rapid Dual Media Filtration removes remaining solid impurities
- UV Disinfection will kill viruses and pathogens
  - Alters their DNA no longer allowing them to reproduce
- Chlorine dosing required by EPA for residual in distribution system

Alternative 2: Modular Surface Water Plant

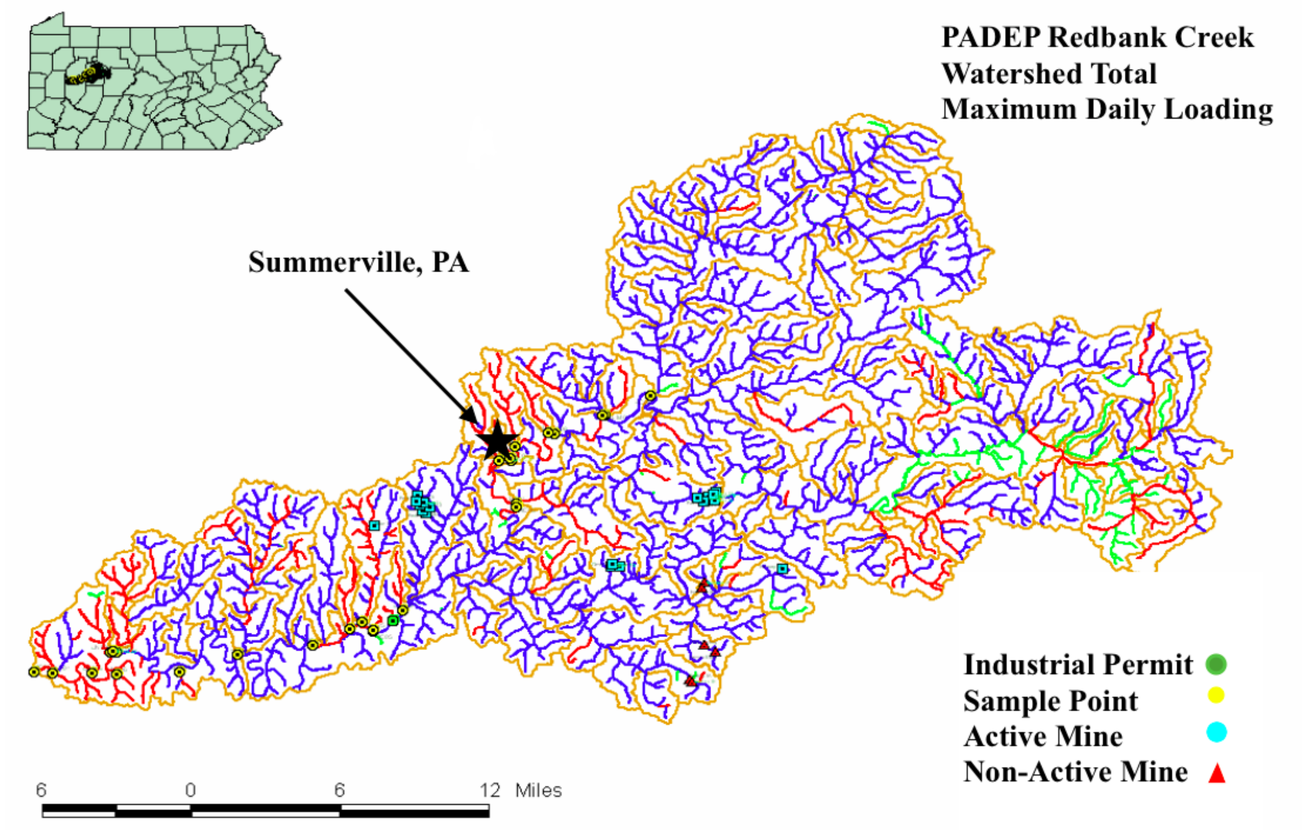
- Fluence Nirobox Fresh Water
  - Compact, decentralized Surface Water Treatment
  - Operational training and installation provided by Fluence
  - Pressurized unit processes allow unit to be housed in a 40 ft trailer
    - Coagulation and chlorination
    - Hydro-cyclone (Retains solid particles up to 70 um)
    - Disc filtration (Retains solid particles up to 55 um)
    - Ultrafiltration membranes
    - Automatic backwashing

Alternative 2: Additional Considerations

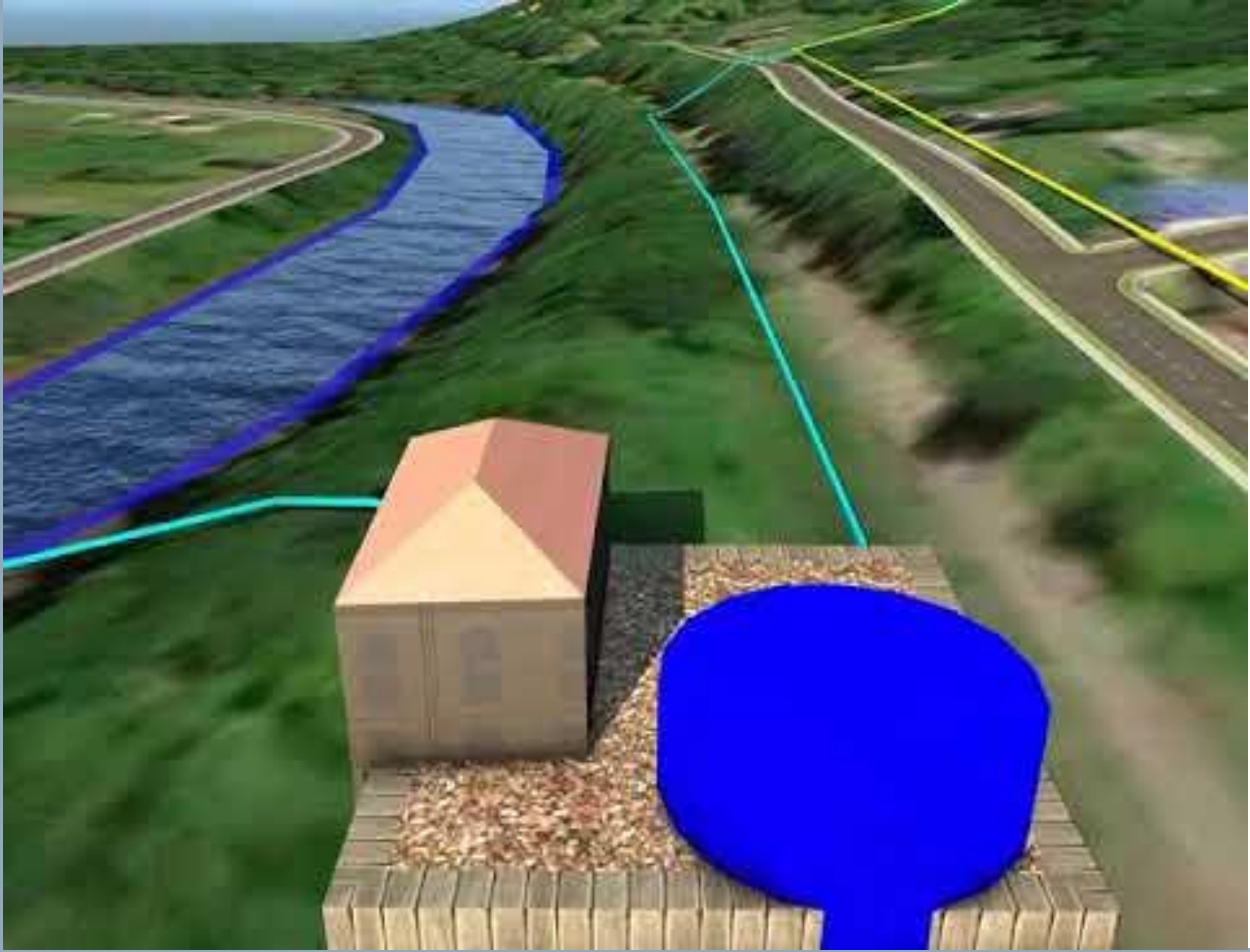
- Testing needs to be continued on the water quality of Redbank Creek, especially for Mercury
- If mercury continues to test significantly higher than PMCL, we will:
  - Add nanofiltration to both the traditional treatment plant design and modular treatment plant
  - Perform pilot tests to ensure that mercury levels will be in accordance with EPA Standards
- If Total Dissolved Solids is > 2000 mg/L:
  - Pretreatment would be required for the modular surface water treatment plant

Alternative 2: Additional Considerations

- Redbank Creek is listed as impaired by the PADEP because of Acid Mine Drainage and Industrial Use
- PADEP TMDL Study
    - Found significant variance in pH (4.0 - 8.0) and heavy metal concentrations (Alum, Iron, Manganese)
- Water quality of Redbank Creek seems to be unpredictable

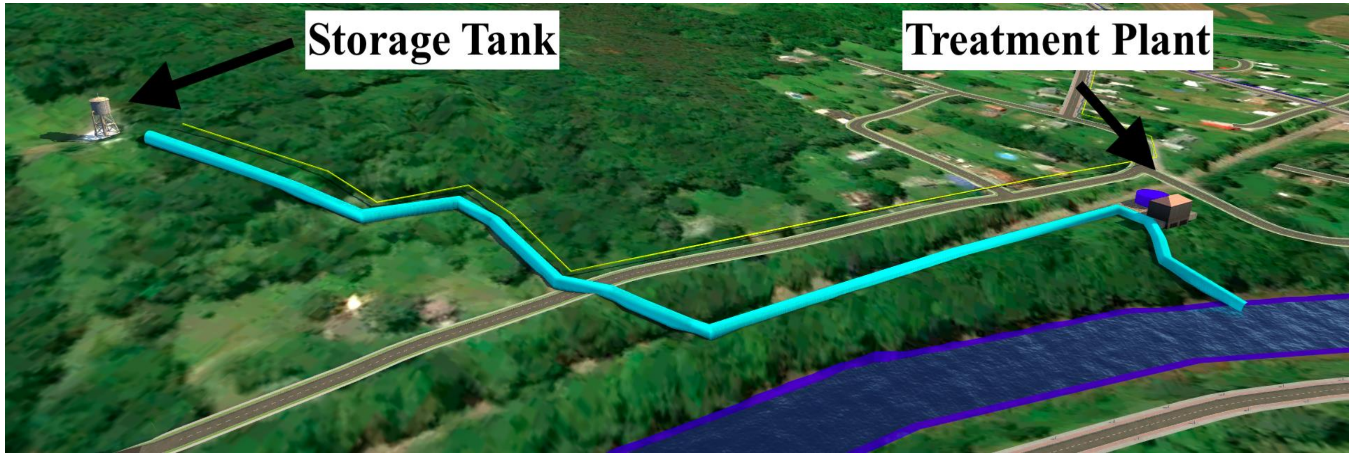


Alternative 2:
System Layout

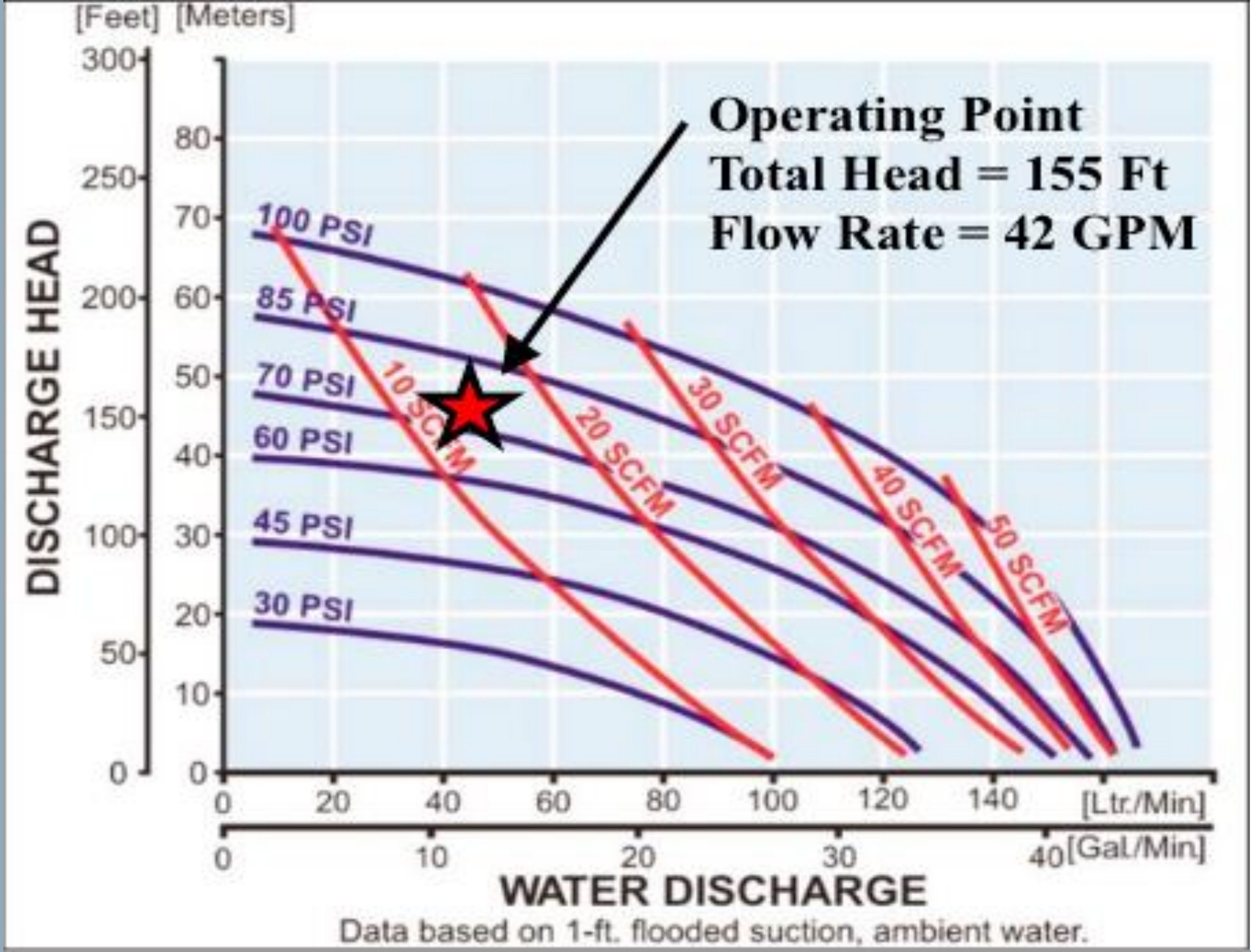


Alternative 2: Layout/Design

- **Length:** 1500 ft of pipe
- **Diameter:** 4 in.
- Placed 18 in. under water surface
- **Total Dynamic Head** of 155 feet
- **Pump Recommendation:** 2 (Yamada DP-25BPH) Pumps in series to meet required TDH and Flow



Pump Curve



[Feet] [Meters]
DISCHARGE HEAD
300
250
200
150
100
50
0
80
70
60
50
40
30
20
10
0
100 PSI
85 PSI
70 PSI
60 PSI
45 PSI
30 PSI
10 SCFM
20 SCFM
30 SCFM
40 SCFM
50 SCFM
Operating Point
Total Head = 155 Ft
Flow Rate = 42 GPM
0 20 40 60 80 100 120 140 [Ltr./Min]
0 10 20 30 40 [Gal./Min]
WATER DISCHARGE
Data based on 1-ft. flooded suction, ambient water.

Alternative 2: Supply Impact

- Each day an average of 60,000 gallons of surface water will be treated and distributed from Redbank Creek
- Surface water provides the most resilient source of water
- Flow of Redbank is 323,095,000 gallons per day, surface water plant would reduce flow .01% per day

Alternative 2: Construction Cost

TRADITIONAL SURFACE WATER TREATMENT PLANT

Component	Cost
Traditional Surface Water Plant	$490,000
Waterline Installation	$21,000
Pump with Connection	$14,000
Total Cost	**$525,000**

MODULAR SYSTEM

Component	Cost
Fluence Nirobox FW	$420,000
Waterline Installation	$21,000
Pump with Connection	$14,000
Total Cost	**$455,000**

Alternative 3

Recycle Effluent from WWTP to Brick Factory for Industrial Use Only

Overview

- Effluent Contaminants
- Layout/Design
  - Pipeline
  - Tank
- Cost

Alternative 3: Effluent Contaminants

Measured Results from the WWTP Effluent:

- **TSS** = 0.0063 mg/L < 30 mg/L
- **BOD5**= 11.1 mg/L < 30 mg/L
- **Turbidity** = 8.65 NTU
- **Fecal Coliform**: N/M (expected to be in range due to UV disinfection but more testing required)

Based on these results, the effluent would be classified as **Class C Effluent** and can only be used for industrial use

- The spring water would be able to accommodate for fire flow

Alternative 3: Effluent Recycling Standards

PA DEP Class C Industrial Wastewater Reuse Requirements

Parameter	Treatment Standard		Monitoring Frequency
	Monthly Average	Maximum	
BOD	< 30 mg/L	45 mg/L	Weekly
TSS	< 30 mg/L	45 mg/L	Weekly
Fecal Coliform	< 200/100 mL	800/100 mL	Weekly

PA DEP Class B Industrial Wastewater Reuse Requirements

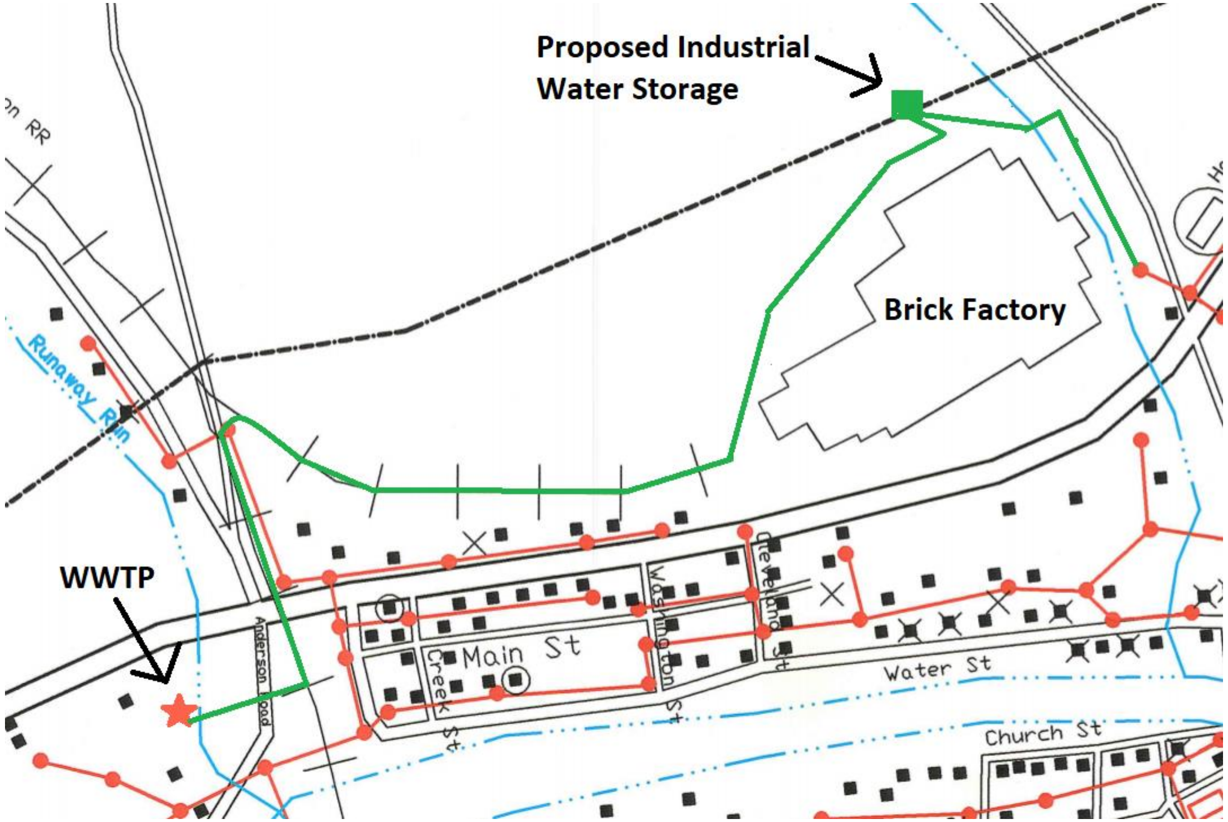
Parameter	Treatment Standard		Monitoring Frequency
	Monthly Average	Maximum	
BOD	**< 10 mg/L**	20 mg/L	Weekly
Turbidity	< 10 NTU	15 NTU	Continuous
Fecal Coliform	< 2.2/100 mL	23/100 mL	2/ Week

Class C: Industrial Use Only

Class B: Industrial + Fire Flow

Alternative 3: Recycle Wastewater to Brick Plant

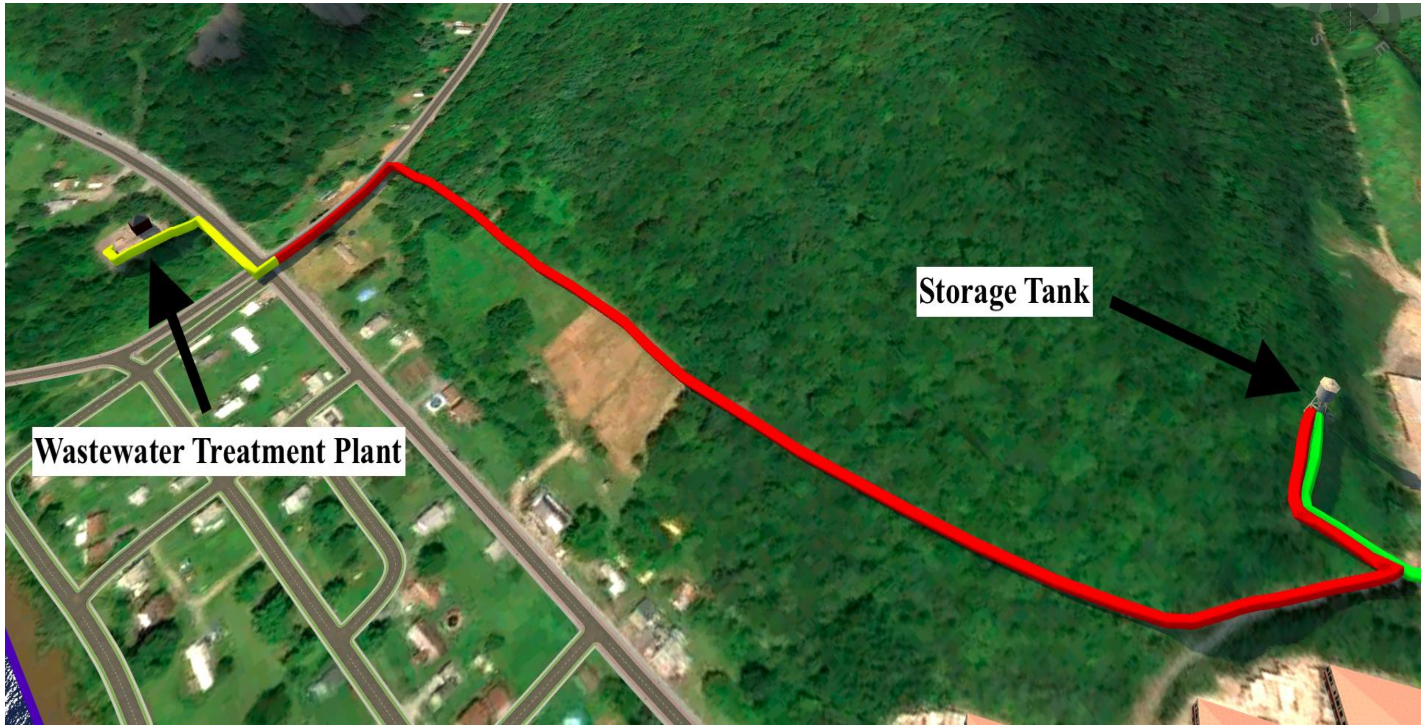
- WWTP Effluent recycled to Glen-Gery Brick Factory for industrial use only
- 100,000 gallon Storage tank will be constructed
- **Supply Impact:** Effluent of WWTP
  - 30,000-40,000 gpd
- Brick Factory Demand: 33,000 gpd
- Spring Supply: 53,000 gpd
  - Not a reliable source of water



Alternative 3
System Layout

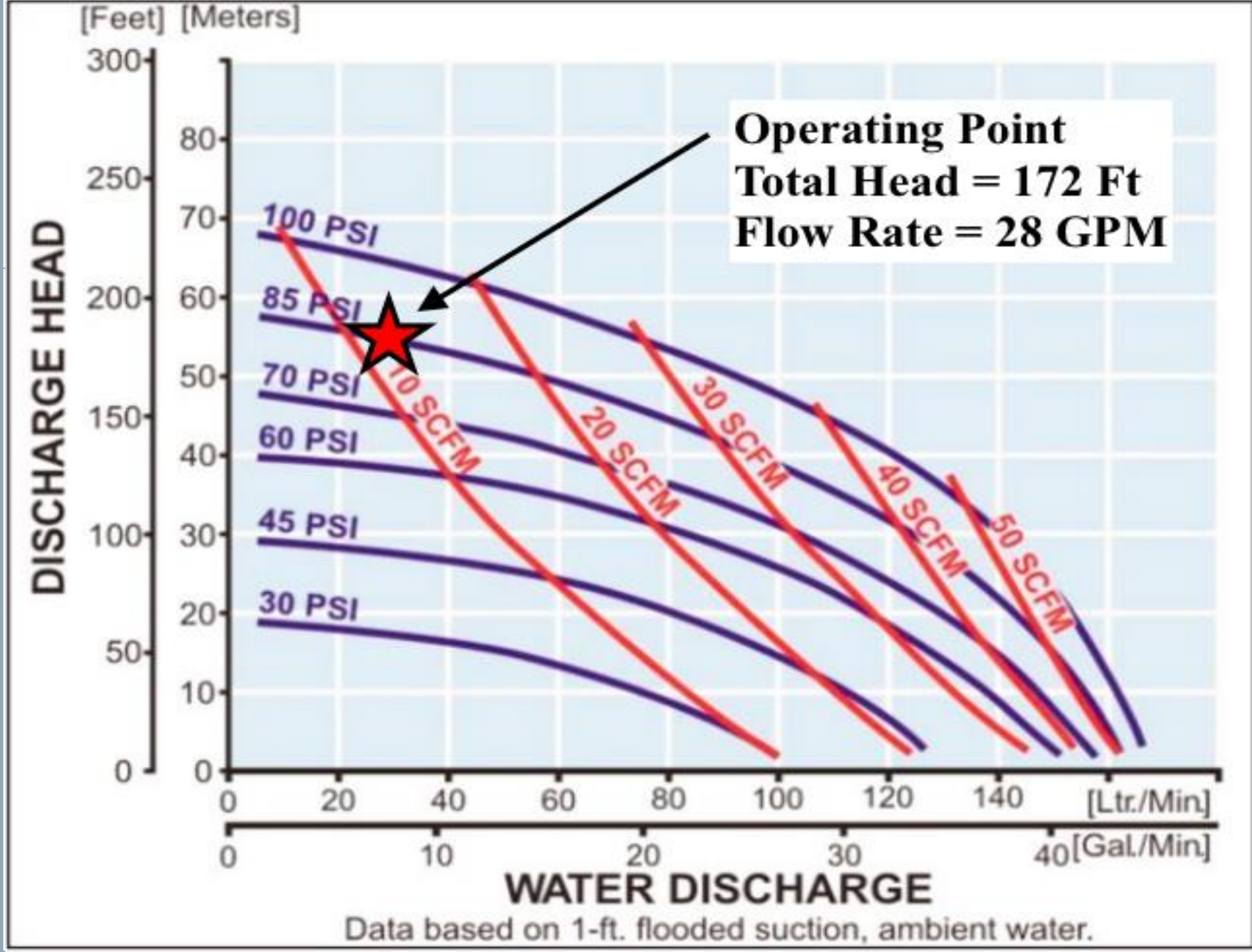
Alternative 3: Pipeline from WWTP to Storage Tank

- **Size/ Length**: 3,100 ft of 4 in. Pipe
- **Design Flow**: 40,000 gal/day
- **Total Dynamic Head**: 172 ft
- **Pump Recommendation:** 2 (Yamada DP-25BPH) Pumps in series to achieve TDH and Flow



Follows decommissioned railroad tracks to the brick factory

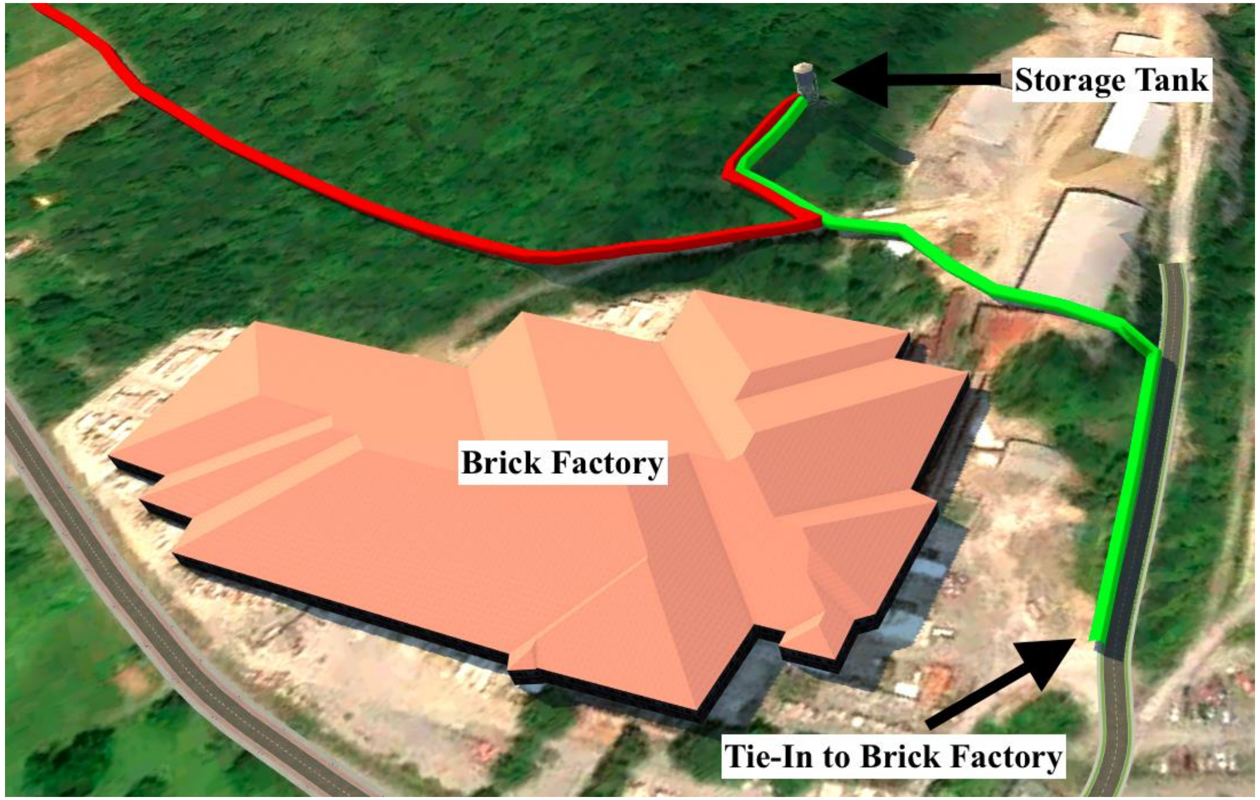
Pump Curve



[Feet] [Meters]
DISCHARGE HEAD
300
250
200
150
100
50
0
80
70
60
50
40
30
20
10
0
100 PSI
85 PSI
70 PSI
60 PSI
45 PSI
30 PSI
10 SCFM
20 SCFM
30 SCFM
40 SCFM
50 SCFM
Operating Point
Total Head = 172 Ft
Flow Rate = 28 GPM
0
20
40
60
80
100
120
140
[Ltr./Min]
0
10
20
30
40
[Gal./Min]
WATER DISCHARGE
Data based on 1-ft. flooded suction, ambient water.

Alternative 3: Pipe from Storage Tank to Factory

- No pump necessary because the major head loss is insignificant compared to elevation head
- **Length:** 1160 ft
- **Size:** 4 in.
- Storage tank will be located on Glen-Gery property



Alternative 3: Storage Tank Design

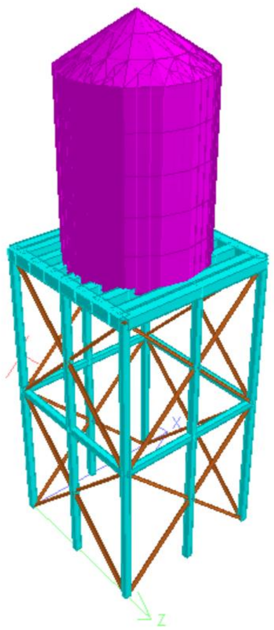
Loads Considered in Compliance with AWWA D100 Section 3.1

- Dead Load: 490 psf steel
- Water Load: 62.4 psf
- Roof Design Load
    - Snow Load disregarded due to roof slope being greater than 30 degrees
    - Live load of 15 psf
- Wind Load: From 12.8 psf at base to 14.8 psf at top of tower
- Seismic Load: S1< 0.04g and Ss< 0.15g
    - Design consideration not required

Alternative 3: Storage Tank Design

Circular Storage Tower

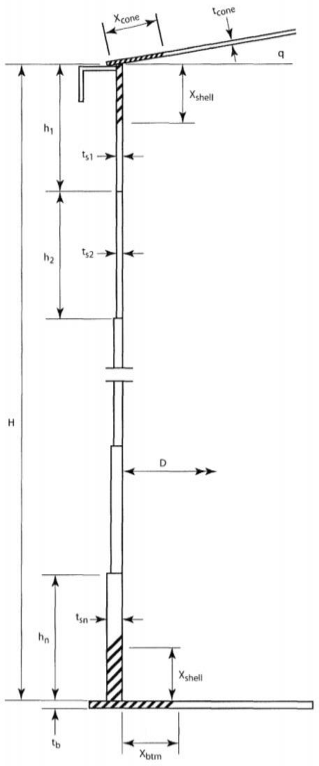
- **Size**: 100,000 gallons
- **Diameter**: 22 ft
- **Height of Tank**: 35 ft
- **Height of Tower:** 50 ft
- TCL: 78 ft
- BCL: 50 ft

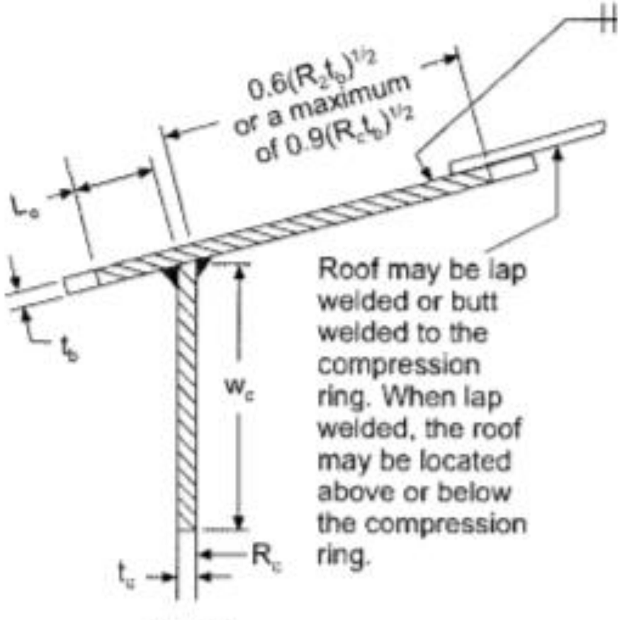


Alternative 3: Storage Tank Design

Member: Tank Roof

- Loading: DL + L_R
- Design: Self-supporting cone roof with half inch thickness
- Connection: Butt weld to the conical section



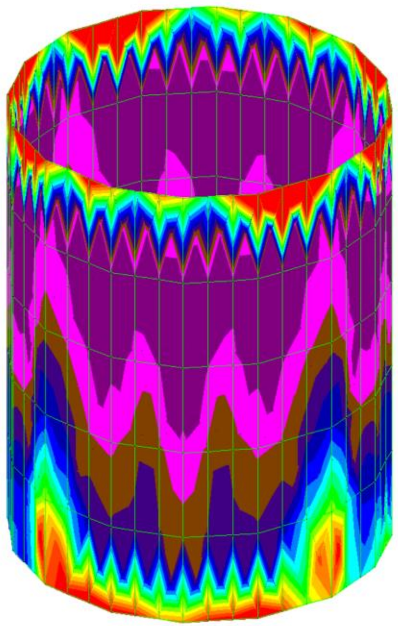


Detail i

Alternative 3: Storage Tank Design

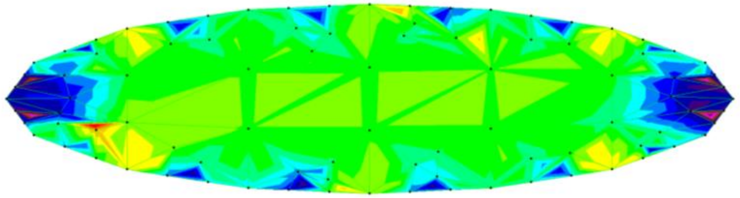
Member: Cylindrical Shell

- Loading: Gravity Loads
- Constraints: Allowable local buckling compressive stress 15000 psi
- Design: Cylindrical shell w/ 1in thickness
- Connection: Butt weld to the base plate



Member: Base Plate

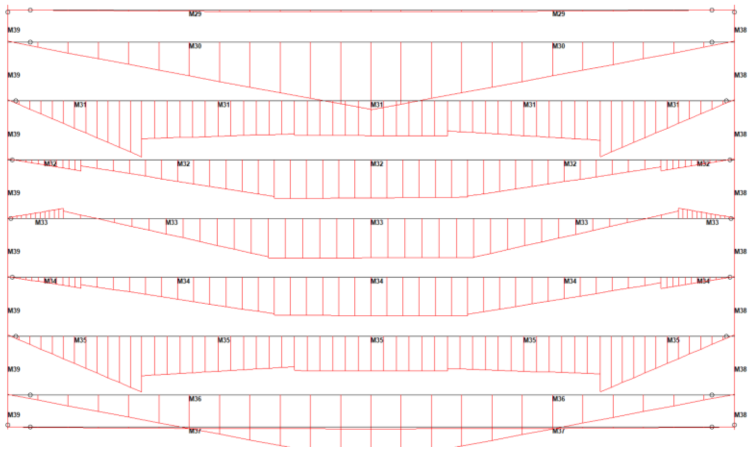
- Loading: Gravity Loads
  - Constraints: Allowable local buckling compressive stress 11000 psi
  - Design: Plate with 6 inch thickness
  - Connection: Anchorage bolts to girders

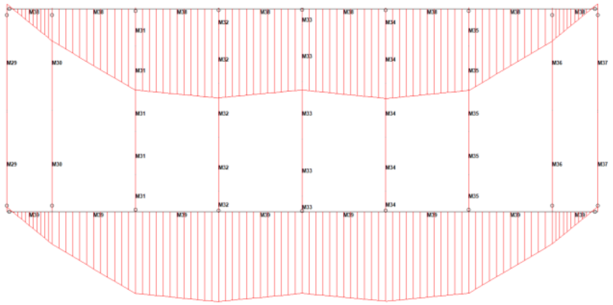


Alternative 3: Storage Tank Design

Member: Flexural Members

- Loading: Gravity Loads
- Constraints: Nominal bending moment and shear
- Design: Beams: HSS 20 x 20 x .75
- Girders: HSS 22x22x.875

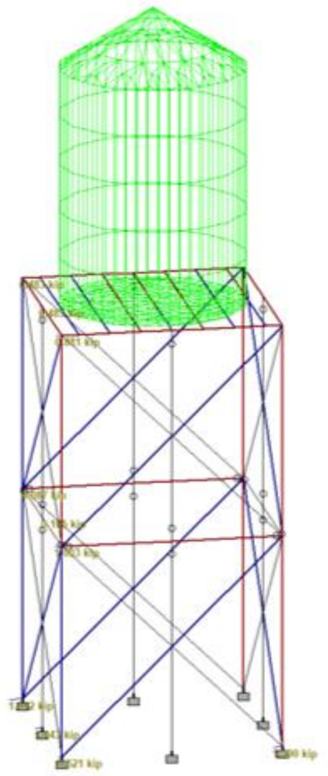




Alternative 3: Storage Tank Design

Member: Columns

- Loading: Gravity + Wind Loads
- Constraints: Axial load and Second Order Moment
- Design: 8 HSS 12x12x.5 columns
- Connection design: Slotted pinned to gusset plates



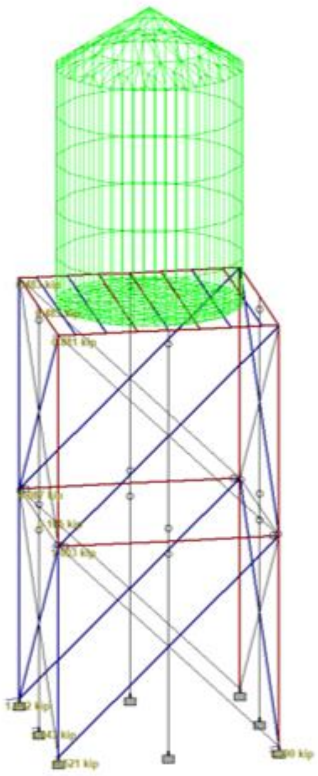
Member: Braces

- Loading: Lateral Loads
- Constraints: Tension only
- Design: L 6"x6"x.5"
- Connections: Bolted to gusset plate

Alternative 3: Storage Tank Design

Member: Compression Struts

- Loading: Lateral Loads
- Constraints: Compression Only
- Design: HSS 12x12x.5
- Connections: Slotted pinned to gusset



Alternative 3: Prefabricated Storage Tank

- Cost and Constructability
- Bolted Steel Tank
  - 25' dia. x 30' h.
  - 100,000 Gallons
  - Concrete Foundation Ring
  - Compacted Soil Inner Foundation
  - Assembled on site

Alternative 3: Construction Cost

Component	Cost
Waterline Installation	$77,000
Pump with Connection	$14,000
Storage Tank	$103,000
Total Cost	**$194,000**

Selection of Alternative

Overview

- Summary of Current Alternatives
  - Overview
  - Cost
  - Envision scores

Alternative Comparison: Envision Sustainability Scorecard

Category	Alternative 1	Alternative 2	Alternative 3
Quality of Life (QL)	15%	15%	15%
Leadership (LD)	10%	9%	22%
Resource Allocation (RA)	31%	12%	29%
Natural World(NW)	18%	15%	26%
Climate and Resilience (CR)	53%	50%	56%
Total	20% (Bronze)	19% (No award)	30% (Silver)

Alternative Comparison:
Envision Highlights

Category	Alternative 1	Alternative 2	Alternative 3
LD 2.1 *Pursue By-Product Synergies*	0	0	Conserving (12/15)
RA 1.3 *Use Recycled Materials*	0	Improved (2/14)	Enhanced (5/14)
RA 1.6 *Reduce Excavated Materials Taken Off Site*	Improved (2/6)	Enhanced (4/6)	Conserving (6/6)
RA 3.1 *Protect Freshwater Availability*	Superior (9/21)	Superior (9/21)	Superior (9/21)
RA 3.2 *Reduce Potable Water Consumption*	0	0	Superior (9/21)
NW 1.7 *Preserve Greenfields*	0	Enhanced (6/23)	Superior (10/23)

Summary of Alternatives

Alternative	Description	Cost	Envision Score	Quantity of Water Produced
1	Source water from wells with Iron, Manganese, and Barium Removal	$142,000	20% - Bronze	**100,000 GPD**
2	Source water from Redbank Creek through surface water treatment	$455,000	19% - No Award	**60,000 GPD**
3	Recycle WWTP effluent and construct a storage tank to supplement the springs	$194,000	30% - Silver	**86,000 GPD**

Proposed Design

Overview

- Description of design
- Layout
- Envision
- Schedule
- Cost
- Funding
- Financial Impact

Proposed Design

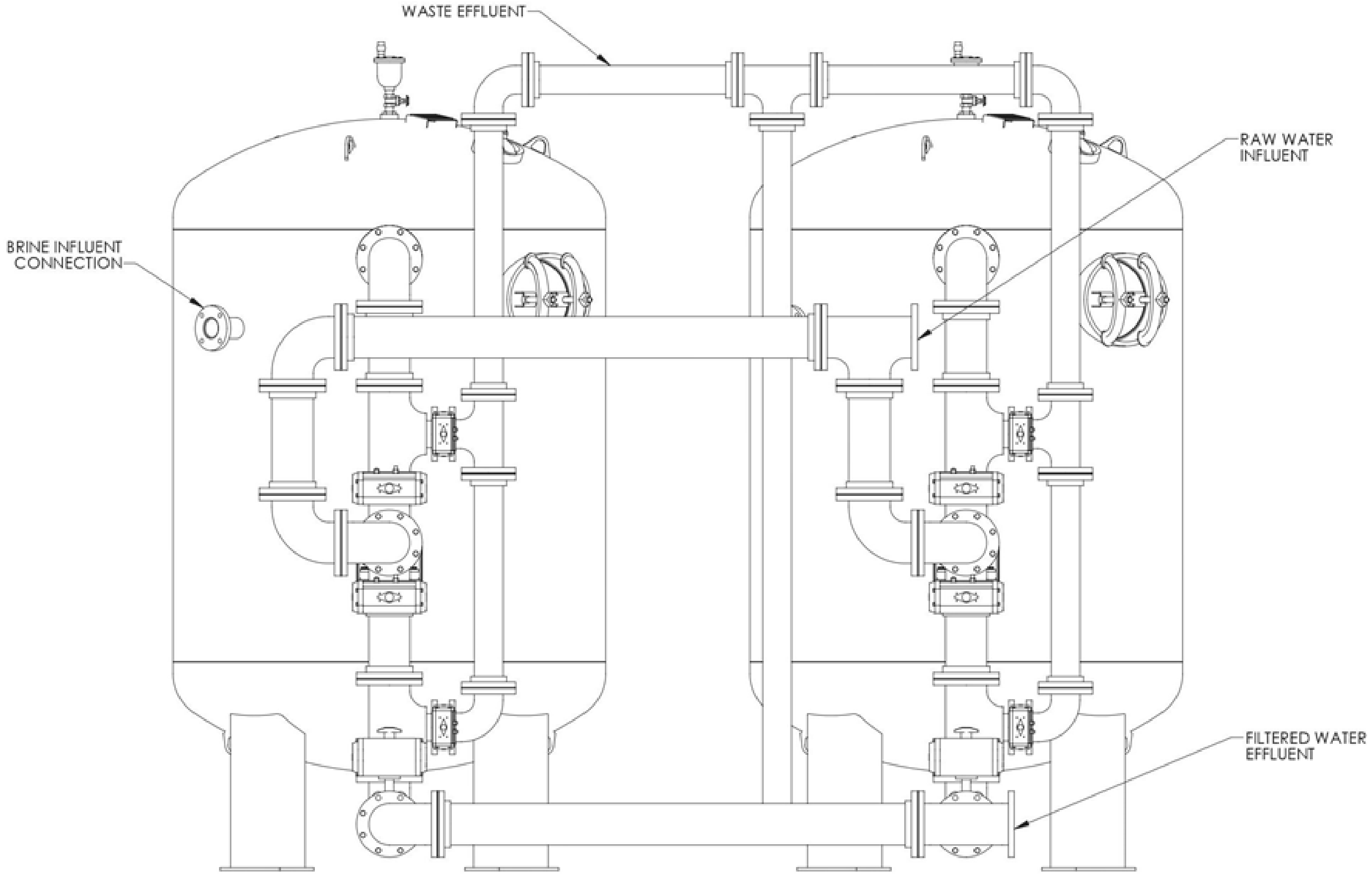
- Combination of Groundwater and Recycled Wastewater
  - The springs will be supplemented during the summertime using groundwater from an existing well
    - Groundwater will be treated for Barium, Iron and Manganese
  - Effluent from the WWTP will be recycled to the brick factory for industrial use only
    - Recycling the wastewater will decrease stress put on the wells and springs

Proposed Design: Recycled Wastewater

Proposed Design: Ba, Fe, and Mn Removal

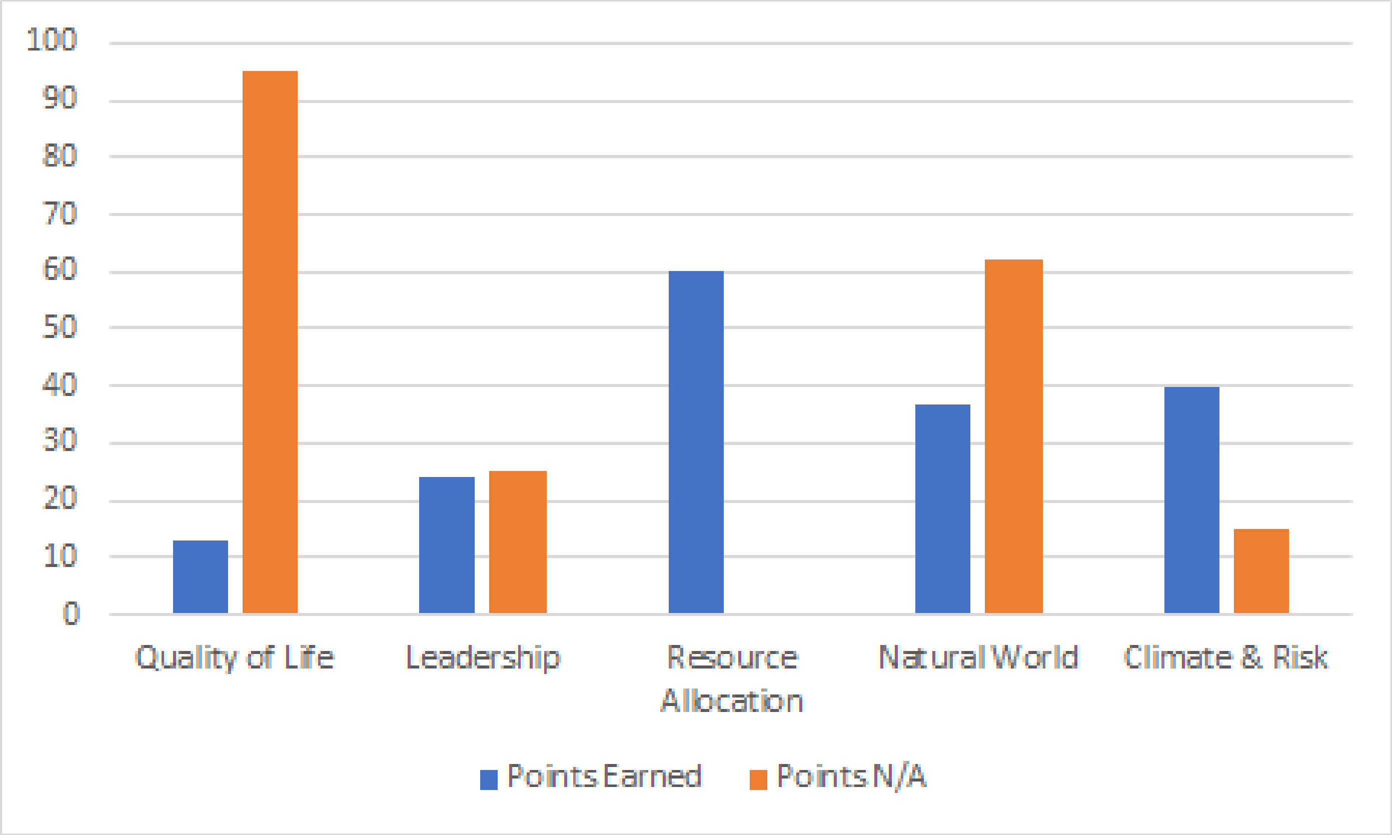
2" Greensand Filter

- Flow Rate
  - Peak: 55 GPM
  - Backwash: 55 GPM
- Tank Size: 30' x 72'
- Media
  - Greensand: 15 cu ft
  - Gravel: 350 lbs
- Pipe Size
  - Inlet 2"
  - Outlet 2"
  - Drain 2"



Proposed Design: Envision Scorecard

Category	% Earned
Quality of Life (QL)	15
Leadership (LD)	25
Resource Allocation (RA)	33
Natural World (NW)	26
Climate and Resilience (CR)	37



28% of Applicable Credits Earned: Envision Bronze

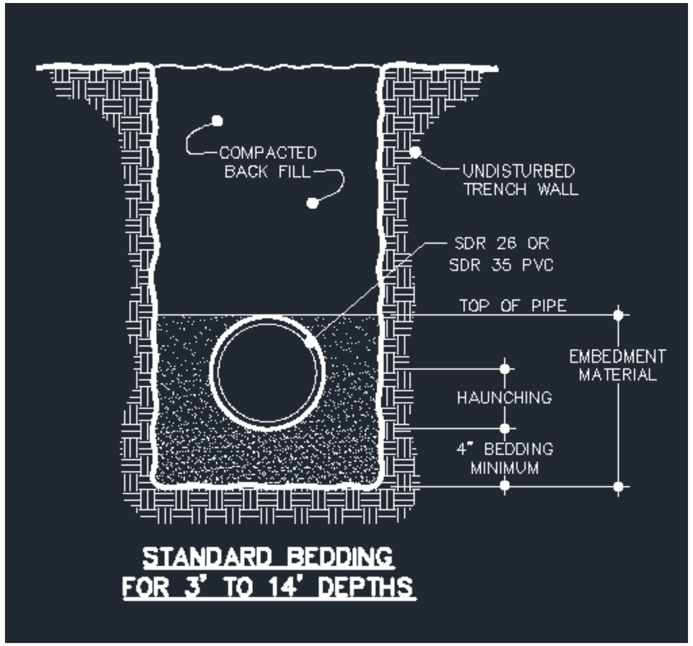
Proposed Design: Envision Highlights

- **Recycling wastewater to Glen-Gery brick factory**
  - LD 2.1 *Pursue By-Product synergies*
  - RA 3.1 *Protect Freshwater Availability*
  - RA 3.2 *Reduce Potable Water Consumption*
- **Material sourcing**
  - RA 1.3 *Use recycled materials*
  - RA 1.4 *Use regional materials*
  - RA 1.6 *Reduce excavated materials taken off site*
- **Intentional site selection for water storage tank**
  - NW 1.1 *Preserve prime habitat*
- **Climate and Risk Assessments**
  - CR 2.1-2.5 *Climate & Resilience*

Proposed Design: Envision Areas for Improvement

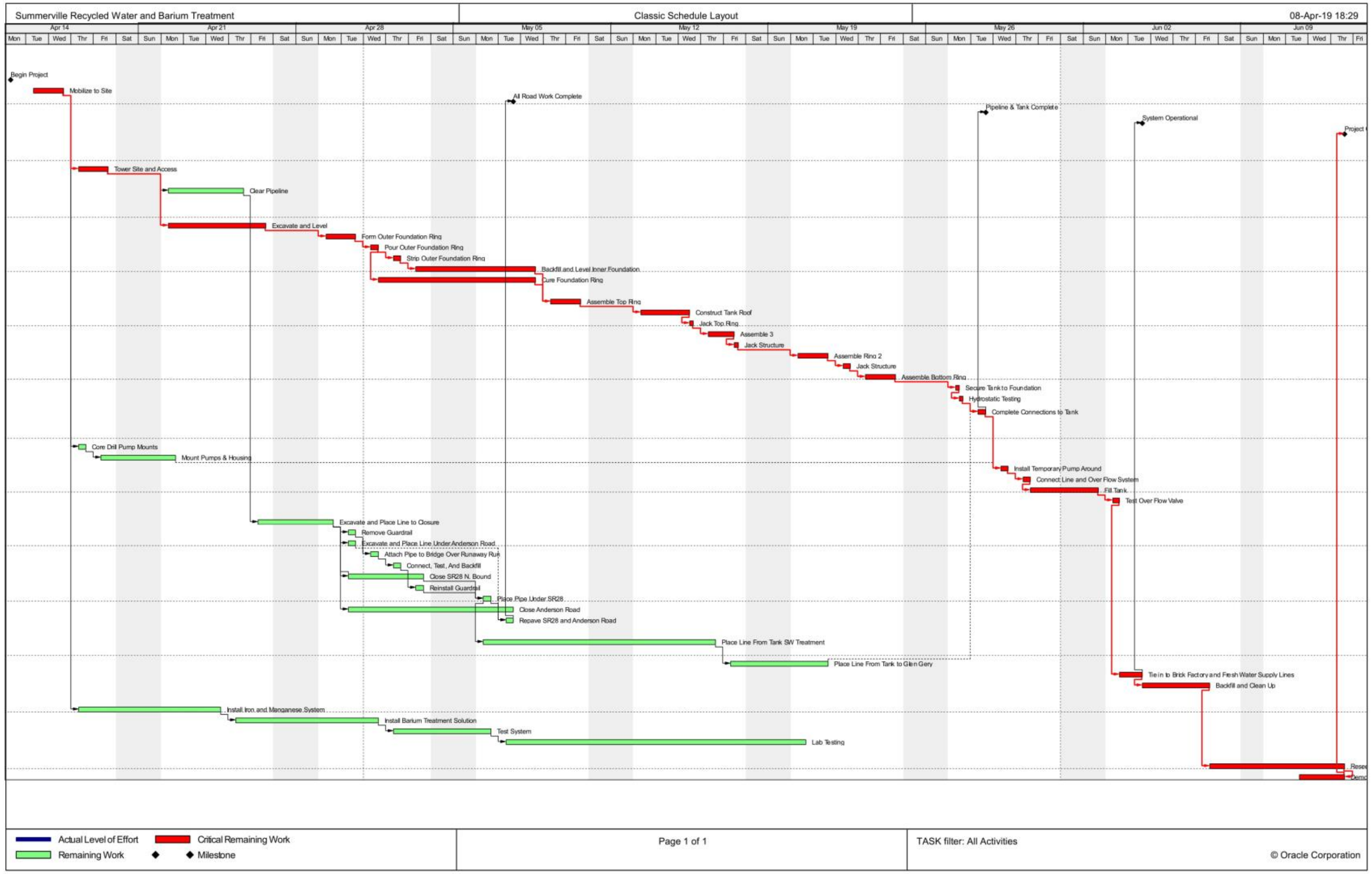
- **Explore opportunities to use renewable energy**
  - RA2.2 *Use renewable energy*
  - CR 1.1 *Reduce greenhouse gas emissions*
- **Life cycle assessment and Life-cycle costing**
  - RA 1.1 *Reduce net embodied energy*
  - CR 1.1 *Reduce greenhouse gas emissions*
- **Monitoring water and energy systems**
  - LD 3.1 *Plan for long-term monitoring and maintenance*
  - LD 3.3 *Extend useful life*
  - RA 2.3 *Commission and monitor energy systems*
  - RA 3.3 *Monitor water systems*

Proposed Design: Construction



- Pipe
  - 4 inch PVC
  - 40-42 inches below grade (frost)
- Trench
  - 48"d x 16"w
  - Utilize trenching machine
  - Approximately 4500 lf
  - 700 ft/day production rate

Proposed Design: Schedule



Proposed Design: Construction Cost

- Final Cost: **$271,000**
  - Existing well will be used to decrease cost of construction

Component	Cost
Recycled Wastewater	$194,000
Groundwater Treatment System (Only Iron, Manganese and Barium Treatment for Existing Well)	$77,000
Total Cost	**$271,000**

Proposed Design: Financing

- Estimated 50% of the project will be covered by grants
  - USDA Rural Development
  - US Department of Community and Economic Development
  - US Department of Commerce- Economic Development Administration
  - Appalachian Regional Commission
- Based on past project in Summerville
  - Remaining costs will be covered by a 20 year loan at 1% Interest

Proposed Design: Financial Impact

- Loans will need to be repaid by the customers of Summerville Municipal Authority
- Each customer will pay an additional $3 per month for 20 years

Summary of Presentation

- Summerville, PA has a water source of two springs that are depleted during the summertime and cannot meet residential + industrial demand
- 3 alternatives were examined to supplement or replace the two springs:
    - Groundwater source treating for contaminants
    - Surface water source from Redbank Creek
    - Recycling wastewater from WWTP to Glen-Gery
- Proposed design consisted of treating the existing well for contaminants and recycling the wastewater
    - Well will supplement springs
    - Recycling wastewater will take pressure off springs and well
    - This is the most dependable, affordable, resilient and sustainable solution

Thank You!

We would like to thank our professors, advisors, and partners for their help on this project:

- Professor Sebastian
- Dr. Oyler
- Dr. Casson
- Dr. Vidic
- Dr. Sanchez
- Dr. Khanna
- Dr. Bilec
- Dr. Malehorn
- Rob Herring
- Dan Slagle
- Summerville Municipal Authority

Any Questions?

Redbank Creek

REDBANK CREEK ENGINEERING INC

CURRENT ESTIMATE

[redacted]

Contract Number 2-95

Contract Date: June 23, 1997

Base Contract Price: $22,735.00

Contract for

Waterline Installation Project

Contract Period

Starting Date: June 30, 1997
Time for Completion: 45 Consecutive Calendar Days
Completion Date: August 13, 1997

(1) Item No.	(2) Description and Unit	(3) Contract Quantity	(4) Contract Unit Price	(5) Estimated Cost	(6) Work Accepted	(7) Amount Due (4) x (6)
1	Mobilization and Close Out	L.S.	$2,500.00	$ 2,500.00	100%	$ 2,500.00
2	Water Main, 2-inch PVC, w/push-on jts	0 L.F.	9.54	0.00	0	0.00
3a	Fittings, PVC w/push on jts.	20 Lb.	10.00	200.00	0	0.00
3b	Fittings w/mechanical jts.	0 Lb.	10.00	0.00	118	1,180.00
4	Gate Valves & Valve Box, 3-inch w/mech jts.	1 EA	250.00	250.00	1	250.00
5	Select Backfill, 2RC Aggregate tamped in place	50 C.Y.	12.00	600.00	0	0.00
6a	Borough Road Restoration	14 S.Y.	25.00	350.00	0	0.00
6b	PADOT Shoulder Restoration	200 S.Y.	2.00	400.00	0	0.00
6c	Asphalt Driveway Restoration	25 S.Y.	23.00	575.00	18.72	430.56
6d	Stone Driveway Restoration	25 S.Y.	3.00	75.00	0	0.00
6e	Concrete Driveway Restoration	0 S.Y.	6.00	0.00	0	0.00
7	Road Crossing	37 L.F.	25.00	925.00	0	0.00
8	Miscellaneous Concrete	3 C.Y.	100.00	300.00	1	100.00
CO #1	Water Main, 4-inch PVC [illegible]	1,500 L.F.	11.04	16,560.00	1,512	16,692.48
	TOTAL	XXXXXXXX	XXXXXXXX	$ 22,[illegible]		$21,153.04

[redacted]

Total due on contract items	$21,153.04
Value of material accepted, but not incorporated in...	0.00

We hereby certify the foregoing to be a true and correct estimate of the amount and value of work...

[redacted]

Estimate

Date	Estimate #
4/3/2019	885

Name / Address
Lilly Borough Water Department 421 Main Street Lilly, PA 15938

Project

Description	Qty	Cost	Total
Goulds 160L20 20 hp. 6" pump end		4,662.00	4,662.00
20 hp. 6" dual voltage motor		4,436.00	4,436.00
200' of 3" galvanized pipe		4,366.00	4,366.00
200' of 4-3 pump cable		962.00	962.00
fittings		1,000.00	1,000.00
labor	6	150.00	900.00

due to rising cost of materials, prices are subject to change without notice, ESTIMATE ONLY

Subtotal	$16,326.00
Sales Tax (6.0%)	$0.00
Total	$16,326.00

control panel, $5,000

Ion Exchange system				
1		$ 30,000.00	ea	$ 30,000.00
piping		$ 22,500.00		
total		$ 52,500.00		
Green Sand Filter				
1		$ 15,000.00		
Piping		$ 10,000.00		
		$ 77,500.00		

Alternative 3

Trenching			Production	700	lf/day		
Foreman	0.25	$ 84.00	Number of Days	8			
Operator	1	$ 430.00					
Trencher	1	$ 1,957.00					
		$ 2,471.00	Total Cost	$ 19,768.00	$ 4.39		
Pipe			Production	380	lf/day		
Foreman	1	$ 334.80	Number of Days	15			
Laborer	1	$ 318.80					
Plumber	1	$ 497.00					
Plumber Apprentice	1	$ 397.00					
Pipe (lf)	5500	$ 2.78					
		$ 1,547.60	Total Cost	$ 38,504.00	$ 8.56		
				Total	Total + Uncertainty	Total + O&P	
				$ 58,272.00	$ 67,012.80	$ 77,064.72	$ 17.13
Water Tank							
100,000 gallon							
Bolted Steel							
Cost per Ea	$ 60,000.00	(Michigan State Study plus Inflation)					
Foundation							
Foundation					Cost		
Concrete Ring	4	CY	$ 100.00	/cy	$ 400.00		
Steel	56	lb/cy	1.12	/lb	$ 62.72		
Carpenter foreman	1		$ 52.70	/day	$ 210.80		
carpenters	3		$ 50.70	/day	$ 608.40		
rodman	1		$ 54.65	/day	$ 218.60		
Laborers	2		$ 39.85	/day	$ 318.80		
finisher	1		$ 47.55	/day	$ 190.20		
conc vibrator	1		$ 25.60	/day	$ 25.60		
					$ 2,035.12		

Alternative 3

Remove soil inner ring	125	cy	1 week		
1 laborer	$ 448.80	day	$ 2,244.00		
1 operator	$ 318.80	day	$ 1,594.00		
1 1 cy	$ 742.00	day	$ 3,710.00		
			$ 7,548.00		
Place compacted foundation	125	cy			
2 laborers	$ 320.00	$ 3,200.00			
1 operator	$ 320.00	$ 1,600.00			
walking compactor	$ 100.00	$ 500.00			
		$ 5,300.00			
			Total	Total + Uncertainty	Total w/ O&P
			$ 74,883.12	$ 86,115.59	$ 103,338.71
Mob & Closeout			$ 18,040.34		
Alternative 3 Total			**Total w/ O&P**		
			$ 198,443.77	$ 165,969.57	$ 110,646.38
		360			
			$ 2.62	$ 2.20	$ 307.35
Total Proj	$ 275,943.77		Hopeful grants	$ 150,000.00	
	Cost per person w/ 20 year loan @1%			$ 2.52	

REDBANK CREEK ENGINEERING INC

Diameter: 25 Floor: CONCRETE Roof: AOS Type: POTABLE

Height	Capacity	Price	Cost/Gal
15	54,000	$52,600	$0.97
19	71,000	$56,300	$0.79
24	88,000	$60,200	$0.68
28	105,000	$63,600	$0.61
33	122,000	$68,900	$0.57
38	142,000	$86,500	$0.61
43	159,000	$91,400	$0.57
47	176,000	$97,300	$0.55
52	193,000	$103,400	$0.54
57	210,000	$112,700	$0.54
61	227,000	$114,800	$0.51
66	244,000	$123,000	$0.50
70	261,000	$136,500	$0.52
75	278,000	$145,300	$0.52
79	296,000	$153,700	$0.52
84	313,000	$162,100	$0.52
89	330,000	$167,200	$0.51
93	346,000	$174,900	$0.51
98	364,000	$185,300	$0.51
102	375,000	$195,700	$0.52

Diameter: 25 Floor: GLASS Roof: AOS Type: POTABLE

Height	Capacity	Price	Cost/Gal
15	57,000	$60,[illegible]00	$1.06
20	74,000	$64,500	$0.87
25	91,000	$68,300	$0.75
29	108,000	$72,700	$0.67
34	125,000	$77,100	$0.62
38	142,000	$81,700	$0.58
43	159,000	$87,600	$0.55
47	176,000	$92,500	$0.53
52	193,000	$102,100	$0.53
57	210,000	$112,000	$0.53
61	227,000	$115,500	$0.51
66	244,000	$123,000	$0.50
70	261,000	$133,400	$0.51
75	278,000	$142,800	$0.51
79	296,000	$151,800	$0.51
84	313,000	$161,200	$0.52
89	330,000	$165,400	$0.50