Town Water Supply Engineering Design

Project Description

The town utility district is currently dealing with a 65,000-gallon water storage tank that is on the edge of failure. The utility district is unable to provide the funds and is seeking a USDA grant for a new emergency water tank to provide growth for the town and handle any fire hazards.

Preliminary Data for the Town

Water demand data

Month	Average Demand (GPD)	Peak Hour Demand (GPH)
January	87904	4900
Feburary	115881	11340
March	92796	5590
April	93523	7220
May	94415	7310
June	89519	6010
July	81617	5860
August	80339	19650

USDA Soil Survey

Map Unit Name	Acres in AOI	Percent of AOI
Alder Silt Loam	42.2	19.50%
Convent Silt Loam	15.4	7.10%
Forestdale Silt Loam	36.5	16.90%
Iberia silty clay loam	63.3	29.20%

Alternative 1: Site Rehabilitation

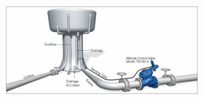
- Highest maintenance cost
- Sheet pile retaining wall and more large rock
- Tank insufficient for population growth
- Sanitary issues

Alternative 2: Standpipe

- Cheaper of the two new renovation options
- Would need additional pumps to reach required head
- Safer for natural disasters in area

Alternative 3: Elevated Storage Tank

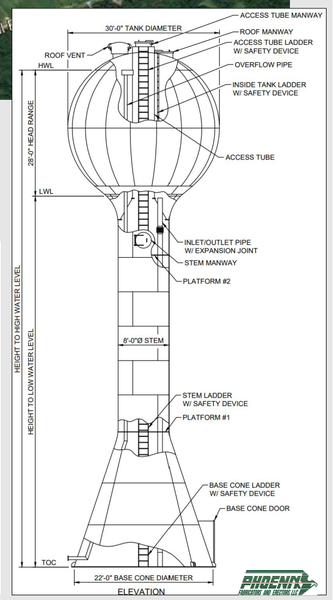
- Most favorable to the public
- Would display town logo
- Lowest long-term operation and maintenance cost
- Easily meets required elevation head



Selected Approach:

135' Single Pedestal Elevated Water Tank

*Each pin represents a fire hydrant in relation to the bars on the graph which display the flow for all connections in proximity to the hydrants.



Hydraulics & Equations

$$TANK\ CAPACITY = AVERAGE\ DAILY\ DEMAND + FIRE\ PROTECTION$$

$$TANK\ CAPACITY = 83,606\ GAL + \left(500\ \frac{GAL}{MIN} \times 20\ MIN\right) = 93,606\ GAL$$

HAZEN WILLIAMS - HEAD LOSS

$$h_f = \frac{10.44 \times L \times Q^{1.85}}{C^{1.85} \times d^{4.8655}}$$

HEIGHT OF TANK

$$TANK\ HEIGHT = (HEAD\ LOSS + HEAD\ RANGE) \times FACTOR\ OF\ SAFETY$$

$$TANK\ HEIGHT = (73\ FT + 28\ FT) \times 1.33 = 135\ FT$$

Sustainability

292 Points overall- Gold Level

-Quality of Life
- Regularly cycle clean water through,the system with the altitude valve
- Will serve as a new waypoint and display the town's mascot

-Leadership
- Brought many teams together to collaborate thoroughly

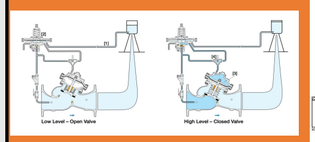
-Resource Allocation
- Support sustainable procurement practices by new water monitoring systems reducing water waste

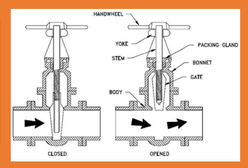
-Natural World
- Restoring old water tank location to its original functional habitat
- Water tower is being placed on already developed land

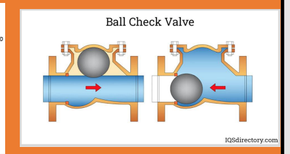
-Climate & Resilience
- The design is based on evaluated risk of an elevated water tank in the area to prevent the imposed risk of collapse

Additional Valves

Altitude Valve | Gate Valve | Check Valve







Cost Estimate	
Demolition of old tank	$20,000
Geotechnical studies	$5,000
350 LF of new 6" ductile iron pipe	$22,000
Altitude, Check, & Gate Valve	$8,000
New Tank and Foundation	$825,000
Miscellaneous	$35,000
Total with 15% Contingency	**$1.05 Million**

Conclusion

The elevated storage tank is the most sustainable solution that improves the quality of life and allows for future economic growth. The town will use this plan to apply for a USDA grant which will provide the funds for the new elevated storage tank.