

Group C2.01 – Elevated Storage Tank

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Project Sponsor: Freese and Nichols

Project Overview

The team was tasked with designing a 2.5 MG elevated potable water storage tank (EST) and a corresponding transition main at 8616 Southwest Parkway, Austin, TX, 78735, and transmission main to Old Bee Caves Rd.

Design Considerations

Existing Utilities

- Sanitary sewer at roadway crossings: increase boring depth by 2ft at applicable locations.
- Gas, electric, sanitary, and storm at connection: must perform a survey to determine where to avoid utility breaks.

Pipe Diameter Based on Pressure and Velocity

Hazen Williams for head loss in water mains:

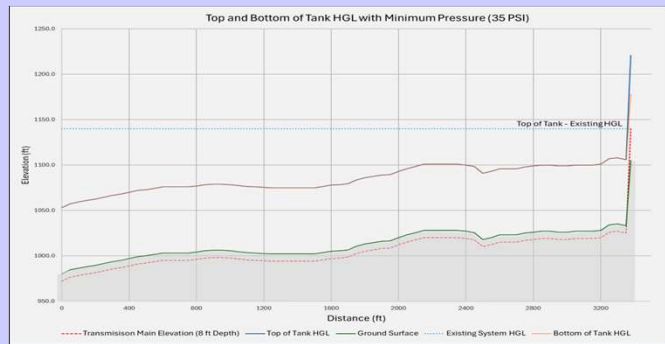
$$hf = (10.67) \frac{LQ^{1.852}}{C^{1.852}D^{4.871}}$$

- Used: C=150; Q=21.6 MGD;
- hf = hf allowable = 64.5ft; L= 3380ft
- Diameter Requirement Velocity: 36"
- Diameter Requirement Pressure: 24.84"
- Selected Diameter size: 36"

Environmental Factors

- Prevent runoff leading to Edwards Aquifer recharge zones
- Control erosion and sediment to preserve land and soil

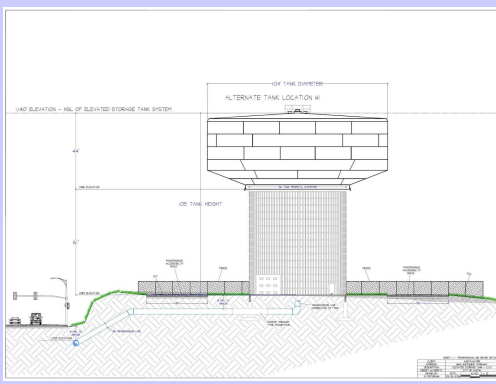
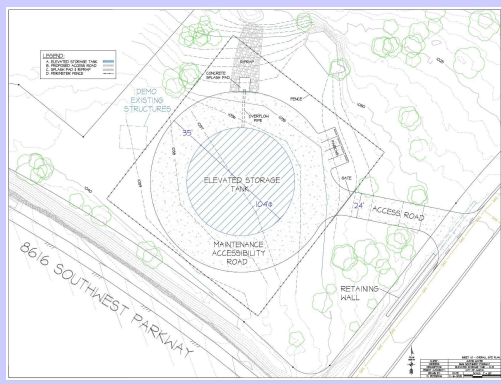
HGL Profile



Horizontal Alignment



Site Development



Team Members



Capital Cost & Life Cycle Cost

Opinion of Probable Construction Costs (OPCC)					
Items	Unit	Quantity	Per Unit Price	Total Unit Cost	Total Unit Cost + 35% Contingency
36" Ductile Iron Pipe	LF	66	\$ 431.80	\$ 28,500.00	\$ 34,975.80
36" PVC Pipe	LF	3400	\$ 123.30	\$ 419,620.00	\$ 566,860.10
48" Corrosion Steel Casing	LF	180	\$ 531.84	\$ 95,731.20	\$ 125,237.12
Elevated Storage Tank	N/A	1	\$ 8,050,000.00	\$ 8,050,000.00	\$ 11,277,500.00
Concrete Pavement	CY	235	\$ 122.95	\$ 28,893.25	\$ 39,005.89
Boring	LF	180	\$ 1,418.04	\$ 254,887.20	\$ 344,097.72
Rig Rep	CY	10	\$ 27.00	\$ 270.00	\$ 364.77
Geotextile Fabric	CY	17	\$ 1.91	\$ 32.47	\$ 43.63
Earth Work Fill	CY	85	\$ 17.78	\$ 1,511.30	\$ 2,040.26
Earth Work Cut	CY	145	\$ 17.78	\$ 2,578.10	\$ 3,480.44
Building Demolition	SF	3,204	\$ 6,113.98	\$ 19,589.88	\$ 26,959.33
Fencing	LF	800	\$ 43.95	\$ 35,160.00	\$ 47,466.00
Gate	N/A	1	\$ 3,026.53	\$ 3,026.53	\$ 4,085.82
Interior Epoxy Coating OCS1	SF	24,900	\$ 6.00	\$ 149,400.00	\$ 201,896.00
Exterior Paint	GAL	288	\$ 150.00	\$ 43,200.00	\$ 48,170.00
Total:				\$ 9,709,237.83	\$ 13,110,000.00

100 year Life-Cycle Cost Analysis (LCAA)						
Item	Initial Cost	Replacement Interval	Cost per Occurrence	Year(s)	Discount Rate	PC
36" PVC Pipe	\$ 419,620.00	50	\$ 419,620.00	50	6%	\$ 442,301.38
36" Ductile Iron Pipe	\$ 28,500.00	75	\$ 25,000.00	75	6%	\$ 26,236.71
Exterior Paint OCS1	\$ 48,170.00	15	\$ 48,170.00	15,30,45,60,75,90	6%	\$ 79,055.36
Interior Epoxy Coating	\$ 201,896.00	15	\$ 201,896.00	15,30,45,60,75,90	6%	\$ 345,847.08
Tank Cleaning	\$ 67,500.00	4	\$ 67,500.00	4,8,12,16	6%	\$ 256,208.57
Concrete Pavement	\$ 28,893.25	20	\$ 28,893.25	20,40,60,80,90	6%	\$ 34,892.04
O&M	\$ 54,816.00	N/A	\$ 54,816.00	Annually	6%	\$910,907.41
OPCC Cost	\$ 13,110,000.00	N/A	N/A	N/A	0%	\$ 13,110,000.00
Total PC:						\$ 14,500,000.00

Using a 100-year analysis period the total life cycle cost including the OPPC cost is estimated to be \$14.5 Million.

Constraints & Standards

- UCM §2.9.2 – Water Systems
- COA Land Development Code- Environment
- COA Standard Product List (SPL WW-27)
- COA SPL – Steel Pipe Coating/Lining Requirements
- ECM §3.5.4 – Urban Forest Mitigation
- TCEQ – Public Water System Design Standards
- TWWA – Elevated Storage Tank Standards
- EPA – Water Storage Tank Guidelines