City of Enid
401 W. Owen K. Garriott
P.O. Box 1768
Enid, Oklahoma 73702
580-234-0400

June 6, 2012

Water Quality Division
Attn: Eddie Rhandour, E.I.
Drinking Water State Revolving Fund Section
Oklahoma Department of Environmental Quality
707 N. Robinson
Oklahoma City, OK 73102

Re: Green Business Case
DWSRF P40-2002412-02

Dear Mr. Rhandour:

Attached please find revised Green business case for City of Enid's Elevated Water Storage Tanks Project, Project no DWSRF P40-2002412-02 for your review and approval.

If you have any question please feel free to contact me at 580-616-7236 or mkatta@enid.org

Respectfully,

Murali Katta,
Project Engineer

Oklahoma Drinking Water State Revolving Fund

DWSRF: P40-2002412-02

City project no: W-0820A & 0821A

Green Project Reserve – City of Enid
Elevated Water Storage Tanks Case

Robert Hitt
Director of Engineering Services

REGISTERED PROFESSIONAL ENGINEER
ROBERT S. HITT
13111
OKLAHOMA

June 2012

Elevated Water Tank

Summary

The City of Enid Oklahoma's water distribution system is located within Garfield County and supplies water to the City of Enid including Vance Air Force Base and neighboring communities such as Waukomis, as needed. Enid is heavily reliant on groundwater; it has more wells than any other City in Oklahoma. The City's water system produces 4.74 billion gallons annually and is directly pressurized using pumps. During power outages these pumps fail and are immediately restarted using generators which creates large fluctuations in the pressure system, which often results in broken water pipelines. When the pumps fail, water pressure in the distribution system is lost. The proposed booster pump station and composite elevated water towers will provide for continuous pressure, despite power outages, and reduce maintenance cost associated with pipe replacement while improving residential and commercial water service and fire flow.

- Construction of two (2) elevated water tanks in Enid, Oklahoma located near;
  - 30th Street and E. Chestnut Road Water tower has a 1 million gallon capacity.
    - Latitude 36° 22' 33.24" N Longitude 97°53'46.38" W.
  - The Rupe Avenue at Van Buren Street Water tower has a 0.75 million gallon capacity.
    - Latitude 36°24' 20.41"N Longitude 97°50'6.35" W.
- Construction of a new high efficiency Booster Pump Station on the Rupe Ave. tower.
  - Optimal Pump Design Capacity has a minimum efficiency of at least 80%1[1]
- Oklahoma Drinking Water State Revolving Fund Loan amount is $6,080,000.00.
- Water savings and Green element of the loan is $500,000.00.
- Annual cost of electricity saved is $10,000.00.
- Elevated Water Tank provides increased water pressure and capacity.

Background

The City of Enid's current water system consists of 116 active water wells, 2 water distribution plants, 352.7 miles of water distribution pipelines, 1 elevated water tank, and 2 booster pump stations. Enid's current storage capacity is 23 million gallons of water. The current water system requires constant pumping to maintain pressure and has no compensation for power failure or spikes in usage. Enid's water capacity does not exceed peak demand and as a result spikes in demand, including fires or other emergencies during

[1] Flowtronex Section 11200 – Horizontal Prefabricated Pumping System 2012 MVE-740/1500-4/1SL-26/15

peak usage, place a strain on the City's ability to provide sufficient water. The current system will be further strained to meet expected annual increase in water usage resulting from commercial and residential growth.

- Current system includes:
  - 116 Wells.
  - 2 Water Distribution Plants.
  - 1 Elevated Water Tank.
  - 2 Booster Pump Stations.

- Energy audits reveal that booster pump stations with energy efficient units will yield energy savings over their service life.
  - Existing pumps are approximately 28 years old and operate a lower efficiency than the proposed replacement system.

- Total water system production in Enid was 4.74 billion gallons in 2011, up 16% from previous year
  - 4.07 billion gallons in 2010 up 8% from previous year.
  - 3.77 billion gallons in 2009 up 9% from 2008.
  - 3.47 billion gallons in 2008.
  - Water usage has increased an average 11% annually since 2008.

- The current water system places extreme demand on the infrastructure to allow for adequate pressure during peak usage.
  - Average daily usage ranges from 12 – 17 million gallons of water.
  - Average residential daily usage is 125 gallons per person each day.
  - Average commercial and industrial daily usage is 5.2 million gallons.

- Current water storage capacity is 22 million gallons of ground storage, and 1 million gallons of elevated storage of water.
  - Water tank project increases elevated storage capacity by 1.75 million gallons.

Results

The City of Enid's Elevated Water Tower Project is outlined in its Final Water System Master Plan (October 2009) prepared by C.H. Guernsey and Associates after performing a water system evaluation. The Master Plan identifies that Enid's distribution system operates solely on pressure provided by high service pumps because no elevated water storage is located in the east pressure zone which creates problems including limited emergency and fire flow, and ability to meet future water demands. The elevated water tower project's environmental information document created by Professional Engineering Consultants, P.A. (March 2010) outlines potential solutions and recommends construction of Enid's Elevated Water Tower Project.

- Enid's current water system is strained to provide adequate capacity or pressure for emergency and fire flow during peak demand.
- Enid's current water system does not allow for future demand. U.S. Census data predicts significant population growth by 2030.
- The east pressure zone servicing Vance Air Force Base, in addition to thousands of Enid residents, is directly pressurized by continuous pumping and experiences untimely loss of pressure during power outages.
- Due to variance in operating pressures caused by a direct pumping system the City has an ongoing repair and maintenance expense associated with pipe replacement.
- Strategically placed water towers will increase and equalize pressure throughout the system.
- The proposed new pumps will have a rated efficiency of 80%1[1].
- The proposed new motors have 93% efficiency.[1]
- The proposed new motors use 127,328 kWh less energy annually than the existing motors.[1]

Calculated Energy Efficiency Improvements:

Existing System:

Pump	Qty	Flow (GPM)	TDH (Ft)	Power (Hp)	Power (kW)	Pump Eff	Motor Eff	Wire to Water	Run time (hr)	Annual Consumption (kWh)
Vance -1	1	580	133	19.5	14.5	72%	85%	61.2%	6570	156004.54
Vance -2	1	580	133	19.5	14.5	72%	85%	61.2%	4380	104003.02
Roope Booster PS	1	350	60	5.3	4.0	72%	85%	61.2%	8760	56625.97
Roope Booster PS	1	350	60	5.3	4.0	72%	85%	61.2%	4380	28312.98
Roope Booster PS	1	350	60	5.3	4.0	72%	85%	61.2%	2555	16515.91
										361462.41

Per Murali Katta These Pumps are backup Only

Proposed System:

Pump	Qty	Flow (GPM)	TDH (Ft)	Power (HP)	Power (kW)	Pump Eff	Motor Eff	Wire to Water	Run time (hr)	Annual Consumption (kWh)
Duty (Vance AFB)	2	750	85	16.1	12.0	80.0%	92.4%	73.9%	8760	142320.01
Jockey (Meadowlake)	1	50	85	1.1	0.8	55.0%	86.5%	47.6%	8760	14742.05
High Flow (Meadowlake)	2	1500	85	32.2	24.0	80.0%	93.0%	74.4%		
Duty (Meadowlake)	1	375	85	8.0	6.0	75.0%	91.0%	68.3%	8760	77071.76
										234133.83

Conclusions

The proposed Elevated Water Tower Project is the most efficient and sustainable solution for increased water capacity and pressure for the City of Enid. It is outlined in Enid's Final Water System Master Plan. The project addresses short comings in the current system with solutions that resolve them as well as projected future water needs. The benefits that the project will deliver are expressed in measurable terms against the situation as it currently exists. Benefits are both qualitative and quantitative and are in-line with City planning.

- Increased efficiency and reduced environmental strain in three (3) areas;
  - reduction in electrical power,
  - reduced maintenance cost for waterline repairs,
  - increased efficiency of the pump system.
- At 0.08 cents per kWh, the energy reduction from the new pumps and motors will save up to $10,000 annually and up to $500,000 over the project life.
- Elimination of water main breaks resulting from fluctuation in pressure from electrical failure resulting in an estimate savings of $36,000 annually, and up to $1,800,000 of the project life.
- 1.75 million gallons of increased water capacity results from the proposed project.
- Elevated towers will provide adequate water capacity and pressure for emergency and fire flow during peak demand.
- Allowance for increase in future demand from residential, commercial and industrial growth is provided by the proposed project.

- The project replaces 28 year old antiquated pump system equipment installed in 1945 and 1983 with newer, energy efficient, higher capacity booster pump equipment for energy conservation. The value of the new pump system is estimated at $700,000.

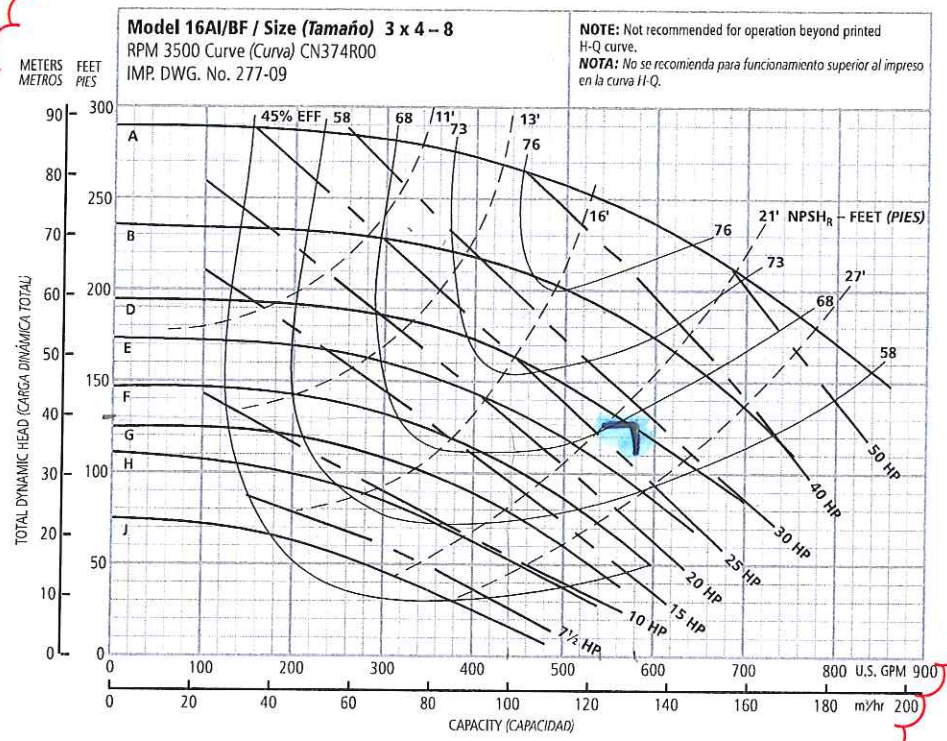
- The proposed pump system increases efficiency by approximately 35% and saves 127,328 kilowatts of energy annually.[1]

- The proposed system will reduce 87.8 metric tons of CO_2 emissions per year (based on EPA 6.8956×10^{-4} metric tons CO_2 /kWh)

[1] Flowtronex Section 11200 – Horizontal Prefabricated Pumping System 2012 MVE-740/1500-4/1SL-26/15

Vance Boosted Pump station

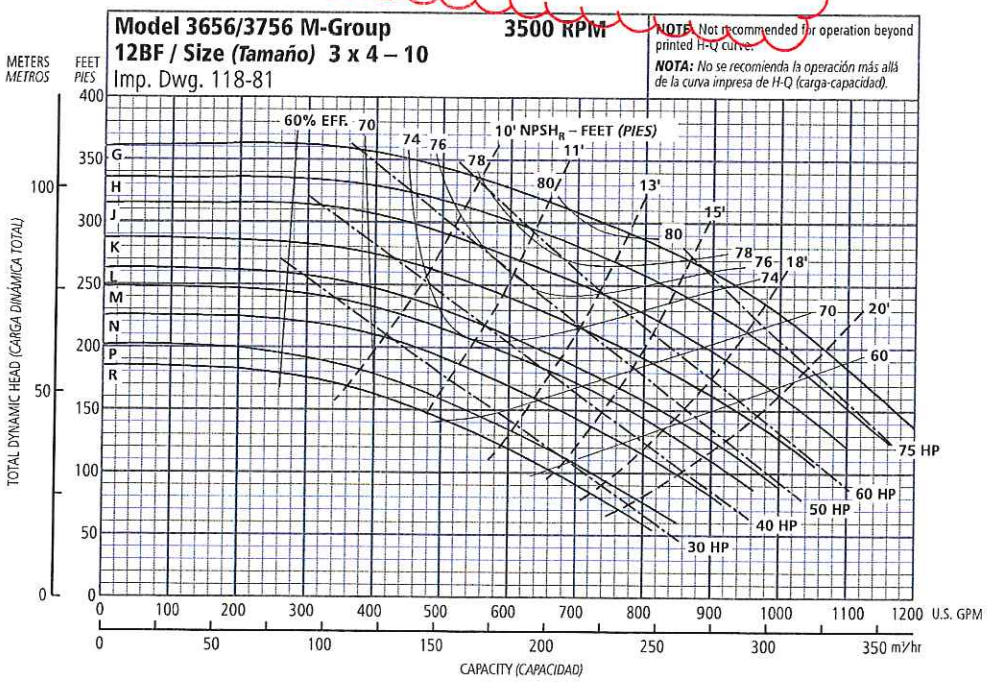
Performance Curves – 60 Hz, 3500 RPM
Curvas de desempeño – 60 Hz, 3500 RPM



Optional Impeller *Impulsor optativo*	
Ordering Code *Código de pedido*	**Dia.** *Diá.*
A	8 1/16"
B	7 7/16
D	6 3/4
E	6 3/8
F	5 15/16
G	5 1/2
H	5 1/8
J	4 5/8

NOTE: Pump will pass a sphere to 3/8" diameter.

NOTA: *La bomba dejará pasar una esfera de hasta 3/8 de pulgada de diámetro.*



Optional Impeller *Impulsor optativo*	
Ordering Code *Código de pedido*	**Dia.** *Diá.*
G	9 1/8"
H	8 3/4
J	8 9/16
K	8 1/8
L	7 3/4
M	7 5/8
N	7 1/4
P	7 1/16
R	6 3/4

NOTE: Pump will pass a sphere to 1/2" diameter.

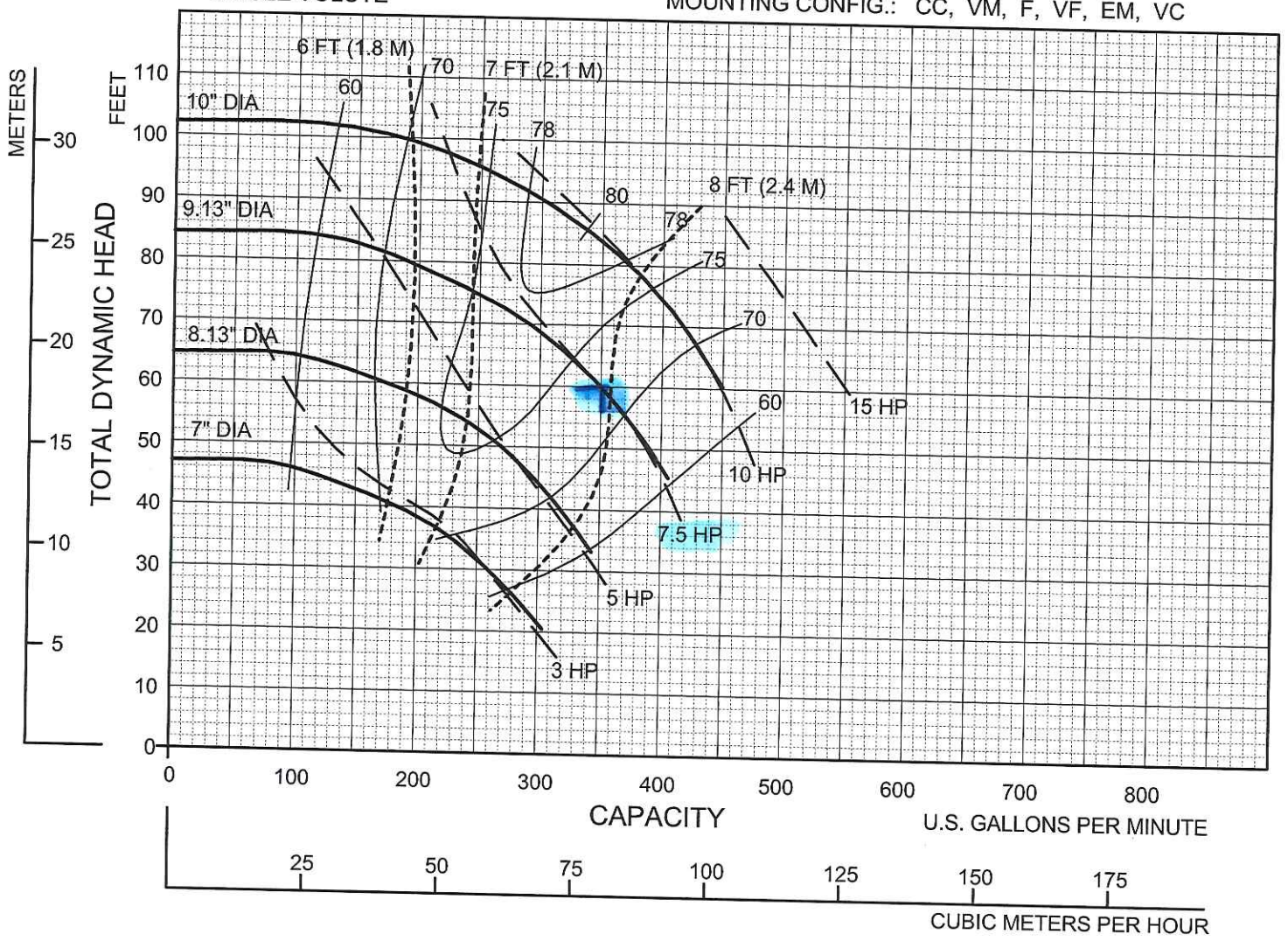
NOTA: *La bomba dejará pasar una esfera de hasta 1/2 de pulgada de diámetro.*

Feet x .305 = Meters
Inches x 25.4 = Millimeters
GPM x .227 = Cubic Meters/Hour
GPM x 3.785 = Liters/Minute
HP x .746 = KW

Speed	Impeller Dia.	Style	Solids Dia.	N_S	Suction	Discharge	No. vanes
1725	VARIOUS	ENCLOSED	.50"	1130	4"	2.5"	6

SINGLE VOLUTE

MOUNTING CONFIG.: CC, VM, F, VF, EM, VC



Performances shown are for cool water, close-coupled electric configuration with packing. Other mounting styles or liquids may require horsepower and/or performance adjustments.

CORNELL
Efficient by Design

Cornell Pump Company • Portland, Oregon

2.5YH - 1800 RPM

1/00

NEW PAGE

Roop Booster Pump station Pumps

25YH18

WATER TOWERS MODELED

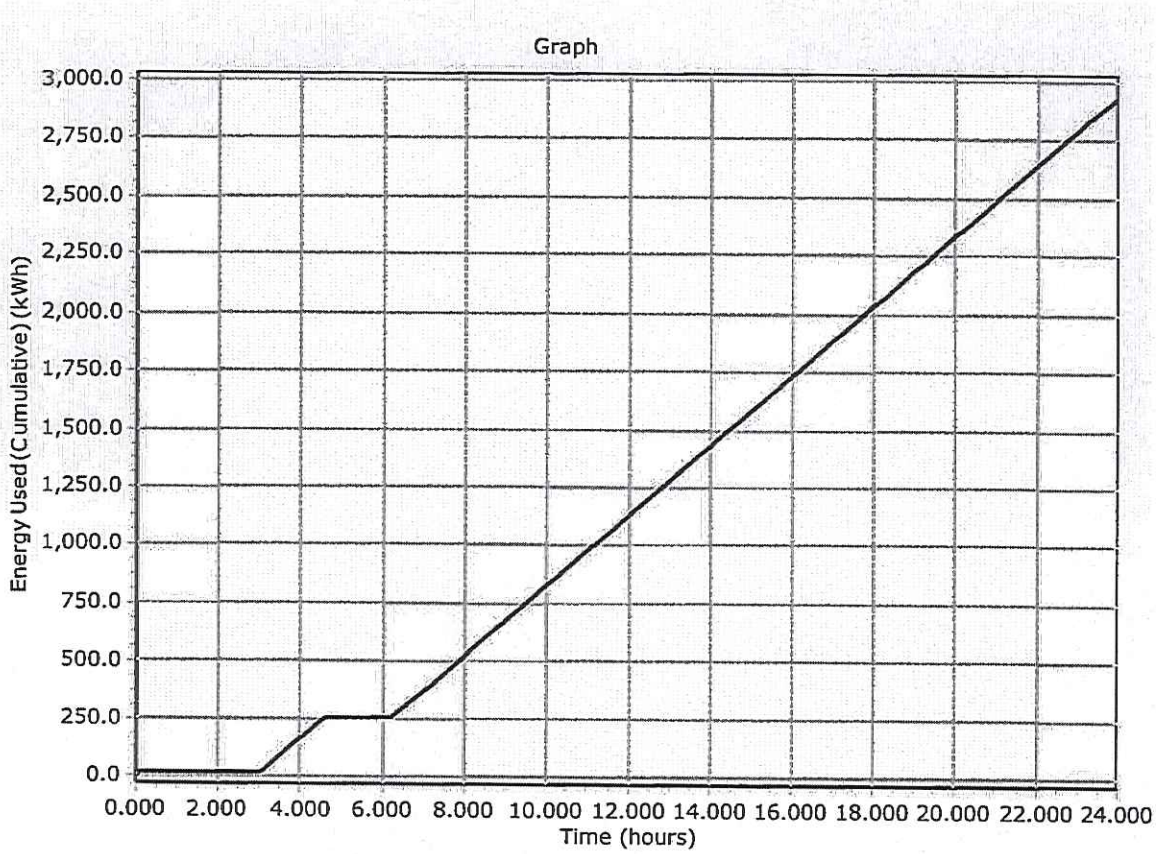
Energy Costs - Time Details Report

Time (hours)	Time Change (hours)	Flow (gpm)	Volume Pumped (Incremental) (MG)	Volume Pumped (Cumulative) (MG)	Wire Power (kW)	Energy Used (Incremental) (kWh)	Energy Used (Cumulative) (kWh)	Energy Cost (Incremental) ($)	Energy Cost (Cumulative) ($)
0.00	0.000	2,612.36	0.00	0.00	133.6	0.0	0.0	0.0	0.0
0.10	0.100	0.00	0.02	0.02	0.0	13.4	13.4	1.1	1.1
0.30	0.204	0.00	0.00	0.02	0.0	0.0	13.4	0.0	1.1
1.00	0.696	0.00	0.00	0.02	0.0	0.0	13.4	0.0	1.1
1.05	0.046	0.00	0.00	0.02	0.0	0.0	13.4	0.0	1.1
2.00	0.954	0.00	0.00	0.02	0.0	0.0	13.4	0.0	1.1
2.06	0.062	0.00	0.00	0.02	0.0	0.0	13.4	0.0	1.1
3.00	0.938	4,464.56	0.00	0.02	150.6	0.0	13.4	0.0	1.1
3.04	0.043	4,461.18	0.01	0.03	150.6	6.4	19.8	0.5	1.6
4.00	0.958	4,413.98	0.26	0.28	150.2	144.2	164.0	11.5	13.1
4.05	0.047	4,411.17	0.01	0.30	150.1	7.1	171.1	0.6	13.7
4.07	0.026	3,668.99	0.01	0.30	144.2	3.9	175.0	0.3	14.0
4.08	0.002	3,660.94	0.00	0.30	144.1	0.3	175.3	0.0	14.0
4.60	0.525	0.00	0.12	0.42	0.0	75.6	250.9	6.0	20.1
4.64	0.041	0.00	0.00	0.42	0.0	0.0	250.9	0.0	20.1
5.00	0.359	0.00	0.00	0.42	0.0	0.0	250.9	0.0	20.1
5.03	0.029	0.00	0.00	0.42	0.0	0.0	250.9	0.0	20.1
6.00	0.971	0.00	0.00	0.42	0.0	0.0	250.9	0.0	20.1
6.11	0.108	0.00	0.00	0.42	0.0	0.0	250.9	0.0	20.1
6.20	0.092	4,528.86	0.00	0.42	151.3	0.0	250.9	0.0	20.1
6.21	0.014	4,527.44	0.00	0.42	151.3	2.1	253.0	0.2	20.2
7.00	0.786	4,541.19	0.21	0.64	151.4	118.9	371.9	9.5	29.8
7.13	0.128	4,540.88	0.03	0.67	151.4	19.4	391.3	1.6	31.3
8.00	0.872	4,544.28	0.24	0.91	151.4	132.0	523.3	10.6	41.9
8.20	0.200	4,544.56	0.05	0.96	151.4	30.3	553.6	2.4	44.3
8.83	0.630	4,548.18	0.17	1.13	151.5	95.4	649.0	7.6	51.9
8.97	0.141	4,548.11	0.04	1.17	151.5	21.4	670.4	1.7	53.6
9.00	0.028	4,533.91	0.01	1.18	151.3	4.3	674.7	0.3	54.0
9.01	0.006	4,532.95	0.00	1.18	151.3	0.9	675.6	0.1	54.1
10.00	0.994	4,520.57	0.27	1.45	151.2	150.4	826.0	12.0	66.1
10.18	0.184	4,518.49	0.05	1.50	151.2	27.9	853.9	2.2	68.3

Energy Costs - Time Details Report

Time (hours)	Time Change (hours)	Flow (gpm)	Volume Pumped (Incremental) (MG)	Volume Pumped (Cumulative) (MG)	Wire Power (kW)	Energy Used (Incremental) (kWh)	Energy Used (Cumulative) (kWh)	Energy Cost (Incremental) ($)	Energy Cost (Cumulative) ($)
11.00	0.816	4,513.66	0.22	1.72	151.1	123.3	977.2	9.9	78.2
11.15	0.148	4,512.58	0.04	1.76	151.1	22.3	999.5	1.8	80.0
12.00	0.852	4,505.67	0.23	1.99	151.0	128.8	1,128.3	10.3	90.3
12.16	0.161	4,504.50	0.04	2.04	151.0	24.3	1,152.6	1.9	92.2
13.00	0.839	4,500.27	0.23	2.27	151.0	126.7	1,279.4	10.1	102.3
13.16	0.156	4,499.48	0.04	2.31	151.0	23.6	1,303.0	1.9	104.2
14.00	0.844	4,503.04	0.23	2.54	151.0	127.4	1,430.3	10.2	114.4
14.16	0.163	4,503.35	0.04	2.58	151.0	24.5	1,454.9	2.0	116.4
15.00	0.838	4,503.92	0.23	2.81	151.0	126.5	1,581.4	10.1	126.5
15.17	0.174	4,504.08	0.05	2.85	151.0	26.2	1,607.6	2.1	128.6
16.00	0.826	4,526.09	0.22	3.08	151.2	124.8	1,732.4	10.0	138.6
16.18	0.176	4,529.11	0.05	3.12	151.3	26.6	1,759.0	2.1	140.7
17.00	0.824	4,561.33	0.22	3.35	151.6	124.6	1,883.7	10.0	150.7
17.22	0.218	4,567.62	0.06	3.41	151.7	33.0	1,916.7	2.6	153.3
18.00	0.782	4,604.79	0.21	3.62	152.0	118.6	2,035.3	9.5	162.8
18.24	0.240	4,613.48	0.07	3.69	152.1	36.5	2,071.8	2.9	165.7
19.00	0.760	4,612.72	0.21	3.90	152.1	115.6	2,187.4	9.2	175.0
19.24	0.239	4,615.32	0.07	3.96	152.1	36.4	2,223.8	2.9	177.9
20.00	0.761	4,594.97	0.21	4.17	151.9	115.8	2,339.5	9.3	187.2
20.18	0.181	4,592.44	0.05	4.22	151.9	27.5	2,367.0	2.2	189.4
21.00	0.819	4,549.67	0.23	4.45	151.5	124.4	2,491.5	10.0	199.3
21.14	0.138	4,544.17	0.04	4.49	151.4	20.8	2,512.3	1.7	201.0
22.00	0.863	4,501.44	0.24	4.72	151.0	130.6	2,642.9	10.4	211.4
22.09	0.094	4,496.99	0.03	4.75	151.0	14.3	2,657.2	1.1	212.6
23.00	0.906	4,443.44	0.24	4.99	150.4	136.7	2,793.9	10.9	223.5
23.09	0.086	4,438.38	0.02	5.02	150.4	12.9	2,806.8	1.0	224.5
23.29	0.201	3,691.25	0.05	5.07	144.3	30.2	2,837.0	2.4	227.0
23.30	0.015	3,682.51	0.00	5.07	144.3	2.2	2,839.1	0.2	227.1
24.00	0.698	3,601.12	0.15	5.23	143.7	100.7	2,939.9	8.1	235.2

Energy Costs - Time Details Report

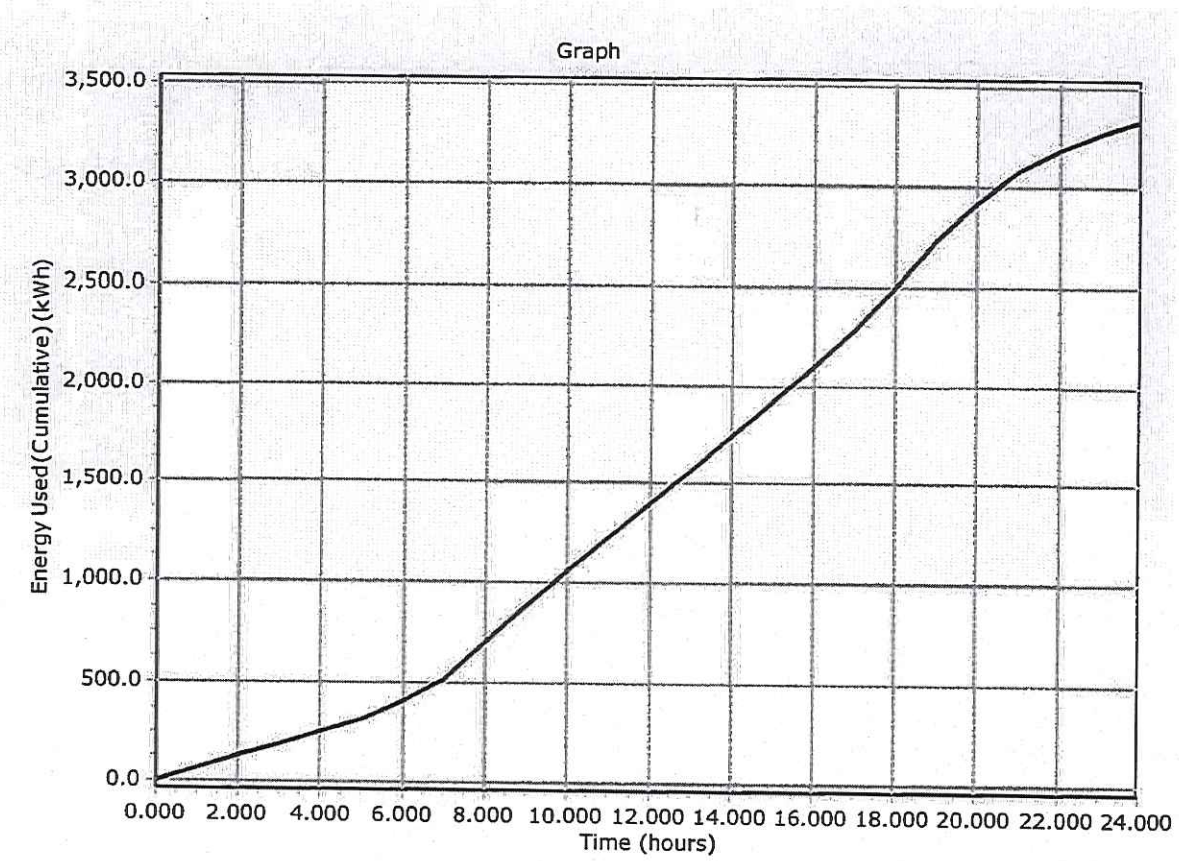


EXISTING SYSTEM

Energy Costs - Time Details Report

Time (hours)	Time Change (hours)	Flow (gpm)	Volume Pumped (Incremental) (MG)	Volume Pumped (Cumulative) (MG)	Wire Power (kW)	Energy Used (Incremental) (kWh)	Energy Used (Cumulative) (kWh)	Energy Cost (Incremental) ($)	Energy Cost (Cumulative) ($)
0.00	0.000	1,692.52	0.00	0.00	65.9	0.0	0.0	0.0	0.0
1.00	1.000	1,692.52	0.10	0.10	65.9	65.9	65.9	5.3	5.3
2.00	1.000	1,177.41	0.10	0.20	57.7	65.9	131.9	5.3	10.6
3.00	1.000	1,250.99	0.07	0.27	58.8	57.7	189.6	4.6	15.2
4.00	1.000	1,986.86	0.08	0.35	71.5	58.8	248.4	4.7	19.9
5.00	1.000	2,612.36	0.12	0.47	85.4	71.5	319.9	5.7	25.6
6.00	1.000	3,605.78	0.16	0.62	114.5	85.4	405.4	6.8	32.4
7.00	1.000	5,077.52	0.22	0.84	157.1	114.5	519.8	9.2	41.6
7.10	0.100	5,077.51	0.03	0.87	185.1	15.7	535.5	1.3	42.8
8.00	0.900	4,930.34	0.27	1.15	182.3	166.6	702.1	13.3	56.2
8.77	0.772	4,930.34	0.23	1.37	182.3	140.7	842.8	11.3	67.4
9.00	0.228	4,231.26	0.07	1.44	172.0	41.6	884.4	3.3	70.8
10.00	1.000	4,084.09	0.25	1.70	170.3	172.0	1,056.4	13.8	84.5
11.00	1.000	4,268.06	0.25	1.94	172.4	170.3	1,226.7	13.6	98.1
12.00	1.000	4,194.48	0.26	2.20	171.6	172.4	1,399.2	13.8	111.9
13.00	1.000	4,268.06	0.25	2.45	172.4	171.6	1,570.7	13.7	125.7
14.00	1.000	4,599.20	0.26	2.70	176.9	172.4	1,743.1	13.8	139.5
15.00	1.000	4,525.61	0.28	2.98	175.8	176.9	1,920.0	14.2	153.6
16.00	1.000	5,408.65	0.27	3.25	192.1	175.8	2,095.8	14.1	167.7
17.00	1.000	6,070.93	0.32	3.58	210.1	192.1	2,287.9	15.4	183.0
18.00	1.000	6,586.04	0.36	3.94	228.4	210.1	2,498.0	16.8	199.8
19.00	1.000	5,261.48	0.40	4.34	188.8	228.4	2,726.4	18.3	218.1
20.00	1.000	3,936.92	0.32	4.65	168.8	188.8	2,915.2	15.1	233.2
21.00	1.000	3,232.92	0.24	4.89	111.8	168.8	3,084.0	13.5	246.7
21.10	0.100	3,220.81	0.02	4.91	102.1	11.2	3,095.2	0.9	247.6
22.00	0.900	2,318.01	0.17	5.08	78.5	91.9	3,187.1	7.4	255.0
23.00	1.000	1,839.70	0.14	5.22	68.6	78.5	3,265.6	6.3	261.2
24.00	1.000	1,692.52	0.11	5.33	65.9	68.6	3,334.2	5.5	266.7

Energy Costs - Time Details Report



1016 24th Avenue NW
Norman, OK 73069

TEL 405.329.2555
FAX 405.329.3555

www.GarverUSA.com

April 6, 2012

Mr. Murali Katta
Project Engineer
City of Enid
401 W. Owen K Garriott Rd
Enid, OK 73701

Re: Meadowlake and Chestnut Water Tower Cost Estimates

Dear Mr. Katta:

Please find attached the itemized cost estimates for the Meadowlake (W-0820A) and Chestnut (W-0821A) water tower projects. There were a few key assumptions used to generate these estimates:

1. We were able to familiarize ourselves with the design intent of these projects through examination of the plans and specifications; however, as we were not directly involved in the planning and execution of design, we included a 10% contingency line item to cover any small items or gaps that we may have missed.
2. The packaged booster pump station described in the specifications does not match that described in the plan set. The cost we included in the estimate reflects the pump station identified in the plan set, which is the larger of the two.
3. The estimates for material quantities and excavation for much of the project are conservative estimates, because the actual structural design of the towers will not be completed until after the project is awarded. We based our estimates largely on composite elevated storage tank designs from our prior projects.
4. The water plant SCADA upgrade called for is unknown, so an allowance of $5,000 was included for software configuration.

Please call me if you have any questions.

Sincerely,

GARVER, LLC

Michael Graves
Project Manager

Attachments: Storage Tank Cost Estimates

Project: Enid Water Towers Cost Estimate
0.75 MG Tower W-0820A
Job Number: 12078130

Description		Quantity	Units	Unit Cost	Cost
Site Civil/Mechanical					
	16" SS Overflow Pipe	175	LF	$ 315	$ 55,100
	16" DIP Waterline and Fittings	490	LF	$ 82	$ 40,200
	10" Tapping Sleeve and Valve	1	EA	$ 3,500	$ 3,500
	8" PCC Paving	524	SY	$ 170	$ 89,100
	Rock Rip Rap	39	TONS	$ 50	$ 2,000
	Fire Hydrant Assembly	1	EA	$ 3,000	$ 3,000
	Erosion Control	450	LF	$ 8	$ 3,600
	Site Clearing and Restoration	0.614	AC	$ 5,000	$ 3,100
	Packaged Booster Pump Station	1	LS	$ 253,794	$ 253,800
	Site Excavation	850	CY	$ 20	$ 17,000
	Perimeter Fencing	570	LF	$ 40	$ 22,800
	Outfall Structure w/ Check Valve	1	LS	$ 3,000	$ 3,000
	6" PVC Drain Line	60	LF	$ 40	$ 2,400
	Pressure Testing and Disinfection	1	LS	$ 12,000	$ 12,000
Structural					
	Auger Piles	34	EA	$ 3,100	$ 105,400
	Foundation Concrete (plus Misc concrete)	150	CY	$ 600	$ 90,000
	Pedestal Wall Concrete	390	CY	$ 1,100	$ 429,000
	Ring & Dome Concrete	60	CY	$ 1,500	$ 90,000
	Steel Beams	300	LF	$ 50	$ 15,000
	22 Gauge Decking- Galvanized	710	SF	$ 2	$ 1,400
	Roof Hatches	3	EA	$ 750	$ 2,300
	Guardrail	80	LF	$ 70	$ 5,600
	Ladder w/ Safety Harness	150	VLF	$ 100	$ 15,000
	Grating	180	SF	$ 50	$ 9,000
	10' x 12' OHD	1	EA	$ 3,000	$ 3,000
	3' x 7' HM Door	1	EA	$ 650	$ 700
	Painting- Exterior	18,850	SF	$ 5	$ 94,300
	Coatings- Interior	19,000	SF	$ 3	$ 57,000
	Steel Tank (Fab and Construction)	1	LS	$ 380,000	$ 380,000
Electrical					
	Power Distribution	1	LS	$ 43,500	$ 43,500
	Lighting	1	LS	$ 5,500	$ 5,500
	Cathodic Protection	1	LS	$ 4,000	$ 4,000
	Obstacle Lighting	1	LS	$ 4,200	$ 4,200
	SCADA Upgrade	1	LS	$ 5,000	$ 5,000
	Control, Telemetry System, Programming	1	LS	$ 35,000	$ 35,000
	Instruments	2	EA	$ 1,000	$ 2,000
Subtotal					$ 1,907,500
Contingency (10%)					$ 190,800
Contractor OH&P (15%)					$ 314,800
Engineering/Drafting/Design - Foundation					$ 37,200
Engineering/Drafting/Design - Pedestal					$ 37,200
Engineering/Drafting/Design - Tank					$ 37,200
Fabricated Material Delivery					$ 510,900
Mobilization					$ 102,100
Bonds and Insurance					$ 31,400
Total Estimated Direct Cost					**$ 3,169,100**

Project: Enid Water Towers Cost Estimate
1.0 MG Tower W-0821A
Job Number: 12078130

Description		Quantity	Units	Unit Cost	Cost
Site Civil/Mechanical					
	10" SS Overflow Pipe	200	LF	$ 175	$ 35,000
	20" DIP Waterline and Fittings	87	LF	$ 92	$ 8,000
	20" Tapping Sleeve and Valve	1	EA	$ 20,250	$ 20,300
	8" PCC Paving	244	SY	$ 170	$ 41,600
	Rock Rip Rap	34	TONS	$ 50	$ 1,700
	Fire Hydrant Assembly	1	EA	$ 3,000	$ 3,000
	Erosion Control	293	LF	$ 8	$ 2,300
	Site Clearing and Restoration	0.419	AC	$ 5,000	$ 2,100
	Roadway Boring w/ 32" Steel Casing	28	LF	$ 260	$ 7,300
	Site Excavation	1,004	CY	$ 20	$ 20,100
	Perimeter Fencing	543	LF	$ 40	$ 21,700
	Outfall Structure w/ Check Valve	1	LS	$ 3,000	$ 3,000
	6" PVC Drain Line	25	LF	$ 40	$ 1,000
	Pressure Testing and Disinfection	1	LS	$ 10,000	$ 10,000
Structural					
	Auger Piles	40	EA	$ 3,100	$ 124,000
	Foundation Concrete (plus Misc concrete)	125	CY	$ 600	$ 75,000
	Pedestal Wall Concrete	600	CY	$ 1,100	$ 660,000
	Ring & Dome Concrete	60	CY	$ 1,500	$ 90,000
	Masonry	1	LS	$ 6,000	$ 6,000
	Steel Beams	100	LF	$ 50	$ 5,000
	Roof Hatches	1	EA	$ 750	$ 800
	Guardrail	85	LF	$ 70	$ 6,000
	Ladder w/ Safety Harness	190	VLF	$ 100	$ 19,000
	Grating	260	SF	$ 50	$ 13,000
	10' x 12' OHD	1	EA	$ 3,000	$ 3,000
	3' x 7' HM Door	1	EA	$ 650	$ 700
	6' x 7' HM Door	1	EA	$ 1,200	$ 1,200
	Painting - Exterior	27,600	SF	$ 5	$ 138,000
	Coatings - Interior	28,000	SF	$ 3	$ 84,000
	Steel Tank (Fab and Construction)	1	LS	$ 507,000	$ 507,000
Electrical					
	Power Distribution	1	LS	$ 7,000	$ 7,000
	Lighting	1	LS	$ 5,500	$ 5,500
	Cathodic Protection	1	LS	$ 4,000	$ 4,000
	Obstacle Lighting	1	LS	$ 4,200	$ 4,200
	Control, Telemetry System, Programming	1	LS	$ 28,000	$ 28,000
	Instruments	2	EA	$ 1,000	$ 2,000
Subtotal					$ 1,960,500
Contingency (10%)					$ 196,100
Contractor OH&P (15%)					$ 323,500
Engineering/Drafting/Design - Foundation					$ 49,600
Engineering/Drafting/Design - Pedestal					$ 49,600
Engineering/Drafting/Design - Tank					$ 49,600
Fabricated Material Delivery					$ 681,200
Mobilization					$ 110,400
Bonds and Insurance					$ 34,300
Total Direct Cost					**$ 3,420,500**