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OHM Advancing Communities

Oakland Township Southwest Water System Storage & Treatment

May 12, 2014

Introduction

This memorandum provides the cost opinions for design and construction of water treatment (iron removal) and storage improvements for the Southwest Water System in Oakland Township. Three different system conditions were reviewed for phasing the construction (existing, 20-year and ultimate development). The existing condition is derived from the 2012 billing data and the peaking factors for the maximum day in July. The 20-year condition was determined as part of the Water Reliability Study, January 2014. This 20-year population and demand are for the existing water service boundary. The ultimate design condition considers expanding the service area to allow for future development in the Southwest portion of the Township. These cost opinions are being provided for use in determining anticipated annual bond payments.

System Sizing

The 2012 billing data and peaking factors were used to determine the existing average day and maximum day demand. These values were used to calculate the size of the storage tank which is approximately equal to one average day volume in the Southwest Water System. The required treatment capacity is equal to the maximum day demand because storage will be provided to service the system during peak hour and fire protection.

Table 1: Water System Requirements

Southwest Water System									
Condition	Population	REUs	Demand				Required Storage (gallons)	Treatment	
			Average Day		Maximum Day				
			(gpm)	(MGD)	(gpm)	(MGD)		(gpm)	(MGD)
Existing	5,037	1,835	754	1.1	2537	3.7	1,100,000	2600	3.7
20 Year	5,860	2,096	877	1.3	2952	4.3	1,250,000	3000	4.3
Ultimate	8,218	3,000	1230	1.8	4139	6.0	1,750,000	4200	6.0

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The Southwest Water System's maximum day peaking factor is higher than other comparable communities. This has a large impact on the cost of treatment. A graph of the data used to develop the peaking factor is provided in Figure 1. This graph shows that the high usage was seen for several days and is therefore not an overly conservative estimate. The high maximum day peaking factor is attributed to lawn watering.

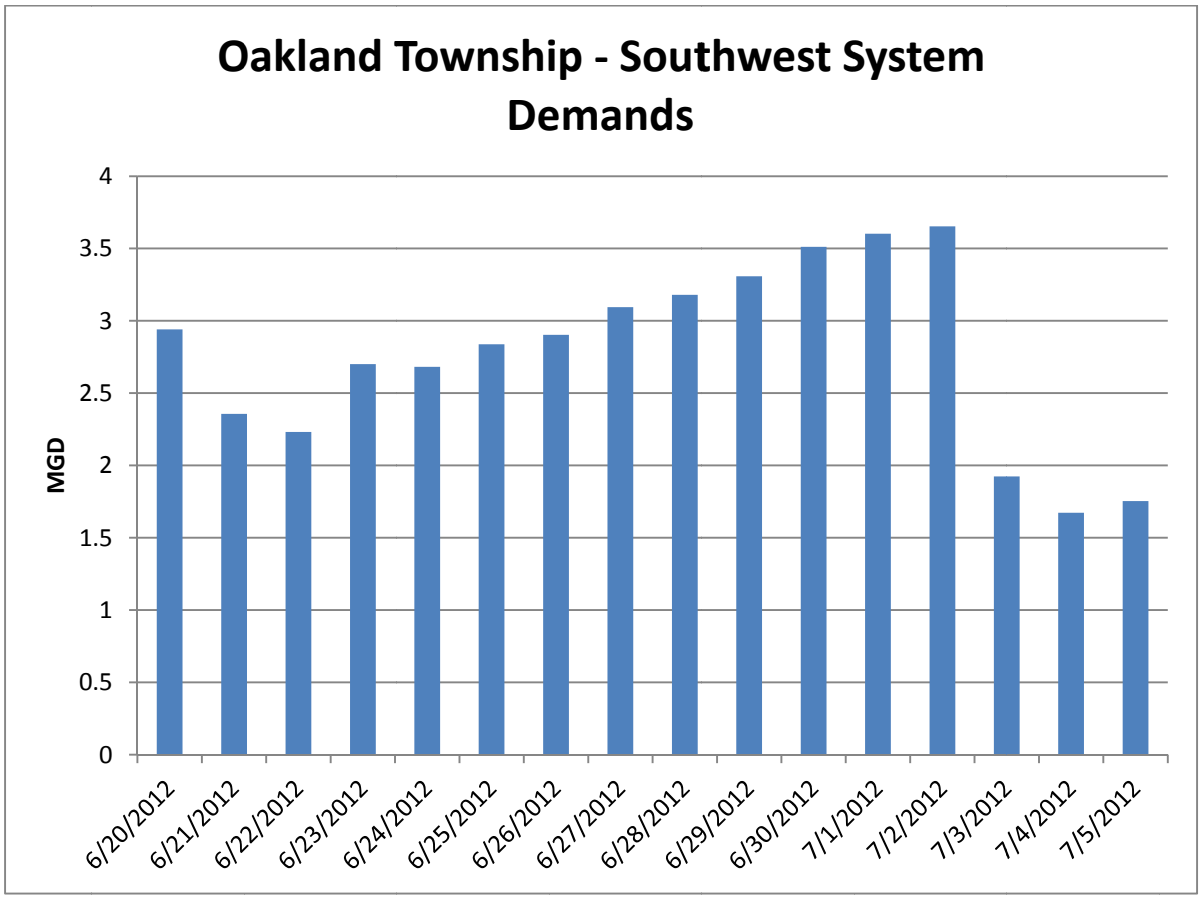

Figure 1

The average day demand for the year 2012 based on billing records is 1.09 MGD. OHM reviewed daily demand for 16 days in 2012 in order to determine the maximum day peaking factor. Table 2 summarizes the observed data. As shown in Table 2 four days had a maximum day peaking factor greater than 3.0. The highest was 3.37 seen on July 2, 2012. This was the peaking factor used for the maximum day calculations in Table 1.

Table 2 Maximum Day Peaking Factors

Date	Daily Use		Peaking Factor
	(gpm)	(MGD)	
6/20/2012	2042	2.94	2.71
6/21/2012	1636	2.36	2.17
6/22/2012	1550	2.23	2.06
6/23/2012	1875	2.70	2.49
6/24/2012	1862	2.68	2.47
6/25/2012	1971	2.84	2.61
6/26/2012	2016	2.90	2.67
6/27/2012	2149	3.09	2.85
6/28/2012	2208	3.18	2.93
6/29/2012	2297	3.31	3.05
6/30/2012	2439	3.51	3.24
7/1/2012	2502	3.60	3.32
7/2/2012	2537	3.65	3.37
7/3/2012	1336	1.92	1.77
7/4/2012	1162	1.67	1.54
7/5/2012	1217	1.75	1.62

Costs

The construction cost opinions were prepared to allow for possible phasing of improvements. There is very little cost differential between existing conditions and 20 year existing system boundary demands and costs. There is a noticeable increase in demand when the water system boundaries are expanded to allow for future development in this area. Table 3 is a summary of the Southwest Water System improvement costs.

Table 3 Southwest Water System Improvement Costs

Condition	REUs	Storage	Treatment	Total Annual Bond Payment	Annual Bond Payment / REU
Existing	**1,835**	**$7,740,000**	**$10,588,000**	**$1,203,631**	**$656**
20 Year	**2,096**	**$7,740,000**	**$10,853,000**	**$1,221,034**	**$583**
Ultimate	**3,000**	**$9,187,000**	**$12,752,000**	**$1,440,772**	**$480**

Appendix A
Water Treatment Cost Opinions

Project Summary
Engineer's Opinion of Probable Project Costs

Owner:	Oakland County Water Resources Commissioner's Office	**Date:**	4/18/2014
Project:		**Project No.**	0105-13-0091
Work:	Existing: 2,600 gpm (3.7 MGD) Iron Removal Treament Plant to serve the Southwest	**Prepared By:**	S. Wright
	Service Area in Oakland Township. Install Raw Water Transmission Main	**Reviewer:**	V. Putala
	from Country Creek Well Houses to Water Treatment Facility.	**Current ENR:**	9749.51

Item No.	Item Description	Est. Quantity	Unit	Unit Price	Total Cost
1	Masonary Block Building	4,100	SF	$200.00	$820,000.00
2	Well Pump Bowl Assembly Modification	4	EA	$28,000.00	$112,000.00
3	Induced Draft Aeration (2,600 gpm)	1	LS	$135,000.00	$135,000.00
4	Concrete Cast-in-Place Detention Tank (85,000 gallons)	500	CY	$650.00	$325,000.00
5	High Service Pumps (1300 gpm)	3	EA	$77,000.00	$231,000.00
6	Variable Speed Drives for High Service Pumps	3	EA	$27,000.00	$81,000.00
7	Horizontal Pressure Filters (4 units @ 10 ft dia x 30' Long 1020 gpm)	1	LS	$1,275,000.00	$1,275,000.00
8	Backwash Water Tank	1	LS	$148,000.00	$148,000.00
9	Effluent Metering	1	LS	$11,000.00	$11,000.00
10	Chemical Feed Facilities	1	LS	$97,000.00	$97,000.00
11	Process Piping	1	LS	$200,000.00	$200,000.00
12	Valves	40	EA	$6,500.00	$260,000.00
13	Standby Emergency Power	1	LS	$149,000.00	$149,000.00
14	Mechanical Systems (5%)	1	LS	$151,000.00	$151,000.00
15	Electrical Systems (10%)	1	LS	$318,000.00	$318,000.00
16	Instrumentation (7%)	1	LS	$245,000.00	$245,000.00
17	Site Work (5%)	1	LS	$228,000.00	$228,000.00
18	16-inch Raw Water Transmission Main	4,400	LF	$250.00	$1,100,000.00
19	Isolation Valves	12	EA	$6,000.00	$72,000.00
20	Site Water Main Modifications	1	LS	$75,000.00	$75,000.00
				TRADES SUBTOTAL	**$6,033,000.00**
	CONTRACTUAL REQUIREMENTS				
	General Conditions	10%			$603,300.00
	General Requirements	5%			$301,650.00
	Contingencies	20%			$1,206,600.00
				TOTAL CONSTRUCTION COST:	**$8,144,550.00**
	PROJECT COSTS				
	Engineering	25%			$2,036,140.00
	Finance and Legal	5%			$407,230.00
	ENGINEER'S OPINION OF PROJECT COST				**$10,588,000.00**

Project Summary
Engineer's Opinion of Probable Project Costs

Owner:	Oakland County Water Resources Commissioner's Office	**Date:**	4/17/2014
Project:		**Project No.**	0105-13-0091
Work:	20-year: 3,000 gpm (4.3 MGD) Iron Removal Treament Plant to serve the Southwest	**Prepared By:**	S. Wright
	Service Area in Oakland Township. Install Raw Water Transmission Main	**Reviewer:**	V. Putala
	from Country Creek Well Houses to Water Treatment Facility.	**Current ENR:**	9749.51

Item No.	Item Description	Est. Quantity	Unit	Unit Price	Total Cost
1	Masonary Block Building	4,100	SF	$200.00	$820,000.00
2	Well Pump Bowl Assembly Modification	4	EA	$28,000.00	$112,000.00
3	Induced Draft Aeration (3,000 gpm)	1	LS	$150,000.00	$150,000.00
4	Concrete Cast-in-Place Detention Tank (85,000 gallons)	500	CY	$650.00	$325,000.00
5	High Service Pumps (1500 gpm)	3	EA	$86,000.00	$258,000.00
6	Variable Speed Drives for High Service Pumps	3	EA	$27,000.00	$81,000.00
7	Horizontal Pressure Filters (4 units @ 10 ft dia x 34' Long 1020 gpm)	1	LS	$1,350,000.00	$1,350,000.00
8	Backwash Water Tank	1	LS	$148,000.00	$148,000.00
9	Effluent Metering	1	LS	$11,000.00	$11,000.00
10	Chemical Feed Facilities	1	LS	$97,000.00	$97,000.00
11	Process Piping	1	LS	$200,000.00	$200,000.00
12	Valves	40	EA	$6,500.00	$260,000.00
13	Standby Emergency Power	1	LS	$149,000.00	$149,000.00
14	Mechanical Systems (5%)	1	LS	$157,000.00	$157,000.00
15	Electrical Systems (10%)	1	LS	$330,000.00	$330,000.00
16	Instrumentation (7%)	1	LS	$254,000.00	$254,000.00
17	Site Work (5%)	1	LS	$235,000.00	$235,000.00
18	16-inch Raw Water Transmission Main	4,400	LF	$250.00	$1,100,000.00
19	Isolation Valves	12	EA	$6,000.00	$72,000.00
20	Site Water Main Modifications	1	LS	$75,000.00	$75,000.00
				TRADES SUBTOTAL	**$6,184,000.00**
	CONTRACTUAL REQUIREMENTS				
	General Conditions	10%			$618,400.00
	General Requirements	5%			$309,200.00
	Contingencies	20%			$1,236,800.00
				TOTAL CONSTRUCTION COST:	**$8,348,400.00**
	PROJECT COSTS				
	Engineering	25%			$2,087,100.00
	Finance and Legal	5%			$417,420.00
	ENGINEER'S OPINION OF PROJECT COST				**$10,853,000.00**

Project Summary
Engineer's Opinion of Probable Project Costs

Owner:	Oakland County Water Resources Commissioner's Office	**Date:**	4/17/2014
Project:		**Project No.**	0105-13-0091
Work:	Ultimate Development: 4,200 gpm (6.0 MGD) Iron Removal Treament Plant to serve the Southwest Service Area in Oakland Township. Install Raw Water Transmission Main from Country Creek Well Houses to Water Treatment Facility.	**Prepared By:**	S. Wright
		Reviewer:	V. Putala
		Current ENR:	9749.51

Item No.	Item Description	Est. Quantity	Unit	Unit Price	Total Cost
1	Masonary Block Building	5,000	SF	$200.00	$1,000,000.00
2	Well Pump Bowl Assembly Modification	4	EA	$28,000.00	$112,000.00
3	New 500 gpm submersible well and pump	1	EA	$150,000.00	$150,000.00
4	Induced Draft Aeration (2,100 gpm)	1	LS	$225,000.00	$225,000.00
5	Concrete Cast-in-Place Detention Tank (85,000 gallons)	500	CY	$650.00	$325,000.00
6	High Service Pumps (1400 gpm)	4	EA	$10,500.00	$42,000.00
7	Variable Speed Drives for High Service Pumps	4	EA	$27,000.00	$108,000.00
8	Horizontal Pressure Filters (6 units @ 10 ft dia x 28' Long 840 gpm)	1	LS	$1,875,000.00	$1,875,000.00
9	Backwash Water Tank	1	LS	$110,000.00	$110,000.00
10	Effluent Metering	1	LS	$11,000.00	$11,000.00
11	Chemical Feed Facilities	1	LS	$97,000.00	$97,000.00
12	Process Piping	1	LS	$300,000.00	$300,000.00
13	Valves	50	EA	$6,500.00	$325,000.00
14	Standby Emergency Power	1	LS	$149,000.00	$149,000.00
15	Mechanical Systems (5%)	1	LS	$191,000.00	$191,000.00
16	Electrical Systems (10%)	1	LS	$402,000.00	$402,000.00
17	Instrumentation (7%)	1	LS	$310,000.00	$310,000.00
18	Site Work (5%)	1	LS	$287,000.00	$287,000.00
19	16-inch Raw Water Transmission Main	4,400	LF	$250.00	$1,100,000.00
20	Isolation Valves	12	EA	$6,000.00	$72,000.00
21	Site Water Main Modifications	1	LS	$75,000.00	$75,000.00
				TRADES SUBTOTAL	**$7,266,000.00**
	CONTRACTUAL REQUIREMENTS				
	General Conditions	10%			$726,600.00
	General Requirements	5%			$363,300.00
	Contingencies	20%			$1,453,200.00
				TOTAL CONSTRUCTION COST:	**$9,809,100.00**
	PROJECT COSTS				
	Engineering	25%			$2,452,280.00
	Finance and Legal	5%			$490,460.00
	ENGINEER'S OPINION OF PROJECT COST				**$12,752,000.00**

Appendix B
Water Storage Cost Opinions

Project Summary
Engineer's Opinion of Probable Project Costs

Owner:	Oakland County Water Resources Commissioner's Office	**Date:**	4/17/2014
Project:		**Project No.**	0105-13-0091
Work:	Existing and 20-year: 500,000 gallons of storage at water treatment	**Prepared By:**	J. Patterson
	and 750,000 gallons of storage in distribution system	**Reviewer:**	V. Putala
		Current ENR:	9749.51

Item No.	Item Description	Est. Quantity	Unit	Unit Price	Total Cost
1	Storage Tank located in distribution System	750,000	GAL	$1.00	$750,000.00
2	Storage Tank located adjacent to Water Treatment Phase I	500,000	GAL	$1.00	$500,000.00
3	Cathodic Protection	2	EA	$30,000.00	$60,000.00
4	Decorative Façade for Storage	12,000	SF	$25.00	$300,000.00
5	Site Piping and Valves	1	LS	$250,000.00	$250,000.00
6	Altitude Valve	2	EA	$75,000.00	$150,000.00
7	Booster Station	2	EA	$800,000.00	$1,600,000.00
8	Onsite Backup Generator	2	EA	$100,000.00	$200,000.00
9	Site Improvements	1	LS	$150,000.00	$150,000.00
10	Electrical Improvements	1	LS	$250,000.00	$250,000.00
11	System Controls	1	LS	$150,000.00	$150,000.00
12	Land Acquisition	1	LS	$50,000.00	$50,000.00
				TRADES SUBTOTAL	**$4,410,000.00**
	CONTRACTUAL REQUIREMENTS				
	General Conditions	10%			$441,000.00
	General Requirements	5%			$220,500.00
	Contingencies	20%			$882,000.00
				TOTAL CONSTRUCTION COST:	**$5,953,500.00**
	PROJECT COSTS				
	Engineering	25%			$1,488,380.00
	Finance and Legal	5%			$297,680.00
	ENGINEER'S OPINION OF PROJECT COST				**$7,740,000.00**

Project Summary
Engineer's Opinion of Probable Project Costs

Owner:	Oakland County Water Resources Commissioner's Office	**Date:**	4/17/2014
Project:		**Project No.**	0105-13-0091
Work:	Ultimate Development: 1,000,000 gallons of storage at the water treatment plant and 750,000 gallons of storage in distribution system	**Prepared By:**	J. Patterson
		Reviewer:	V. Putala
		Current ENR:	9749.51

Item No.	Item Description	Est. Quantity	Unit	Unit Price	Total Cost
1	Storage Tank located in distribution System	750,000	GAL	$1.00	$750,000.00
2	Storage Tank located adjacent to Water Treatment Phase I	1,000,000	GAL	$1.00	$1,000,000.00
3	Mixing System	1	LS	$150,000.00	$150,000.00
4	Cathodic Protection	2	EA	$30,000.00	$60,000.00
5	Decorative Façade for Storage	15,000	SF	$25.00	$375,000.00
6	Site Piping and Valves	1	LS	$300,000.00	$300,000.00
7	Altitude Valve	2	EA	$75,000.00	$150,000.00
8	Booster Station	2	EA	$800,000.00	$1,600,000.00
9	Onsite Backup Generator	2	EA	$100,000.00	$200,000.00
10	Site Improvements	1	LS	$200,000.00	$200,000.00
11	Electrical Improvements	1	LS	$250,000.00	$250,000.00
12	System Controls	1	LS	$150,000.00	$150,000.00
13	Land Acquisition	1	LS	$50,000.00	$50,000.00
				TRADES SUBTOTAL	**$5,235,000.00**
	CONTRACTUAL REQUIREMENTS				
	General Conditions	10%			$523,500.00
	General Requirements	5%			$261,750.00
	Contingencies	20%			$1,047,000.00
				TOTAL CONSTRUCTION COST:	**$7,067,250.00**
	PROJECT COSTS				
	Engineering	25%			$1,766,810.00
	Finance and Legal	5%			$353,360.00
	ENGINEER'S OPINION OF PROJECT COST				**$9,187,000.00**

Appendix C
Annual Bond Payment

WCWRC - Southwest District Water System User Costs
April 21th, 2014

Interest Rate (%)	2.75%
Loan Duration (years)	20

User Cost Determination

Project No.	(P) Amount Financed ($)	i (%)	n (years)	(1+i)^n	A i*(1+i)^n	B (1+i)^n-1	A/B	P*(A/B) Annual Debt ($/yr)	Number of REUs	Annual Bond Payment per REU ($/REU)	Total Annual Bond Payment per REU ($/REU)
Existing Demand											
Water Treatment/Raw Transmission	$10,588,000	2.75%	20	1.72043	0.04731	0.72043	0.06567	$695,332.28	1,835	$378.93	
Water Storage	$7,740,000	2.75%	20	1.72043	0.04731	0.72043	0.06567	$508,299.19	1,835	$277.00	$655.93
20- Year Demand											
Water Treatment/Raw Transmission	$10,853,000	2.75%	20	1.72043	0.04731	0.72043	0.06567	$712,735.29	2,096	$340.05	
Water Storage	$7,740,000	2.75%	20	1.72043	0.04731	0.72043	0.06567	$508,299	2,096	$242.51	$582.55
Ultimate Demand											
Water Treatment/Raw Transmission	$12,752,000	2.75%	20	1.72043	0.04731	0.72043	0.06567	$837,446	3,000	$279.15	
Water Storage	$9,187,000	2.75%	20	1.72043	0.04731	0.72043	0.06567	$603,326	3,000	$201.11	$480.26