

## **Efficiency Business Case for East SD Hwy 50 Lift Stations**

### **Green Project Reserve Type**

The City of Yankton, South Dakota is proposing to replace two dry pit, wet well sanitary sewer lift stations on the east side of Yankton with one dry pit, wet well sanitary sewer lift station. The proposed lift station will provide a peak pumping capacity of 2,000 gallons per minute (gpm). The new lift station will be constructed with variable frequency drives (VFD) on the two 60 horsepower pumps within the lift station. These VFD's will enable the City to adjust the flow rate at which the pumps operate to better match the wastewater influent flow rate. Operating pumps at a slower speed enables the City to save energy during operation of the pumps. Premium efficiency motors will be installed on the pumps to further maximize energy efficiency in pump operation.

The pumps were selected based on a design pumping rate of 2,000 gpm with a pump efficiency of 80.6% or better. This is a very good efficiency for this type of pumping application. The proposed pumps have a best efficiency point of 80.8%, which indicates that the pump is a good selection for the design pumping point.

The consultant for the City of Yankton has calculated the anticipated energy savings for the proposed lift station versus keeping the two existing lift stations in operation through the year 2025. For the purpose of comparison each of the two alternatives were calculated on a kilowatt hour year basis. Existing and future estimated average daily design flows from Tables 4, 10, and 12 in the original report were used for this calculation. As can be seen in Table 1A below, it is estimated that an energy savings of 6.50 percent for the term stated in the table could be realized with the proposed lift station.

The calculated anticipated cost savings for the project is based on an energy charge rate of \$0.05180 per kilowatt hour for all energy used through the year 2025. As seen in supplementary table to 1A, it is estimated that an overall cost savings would then equate to \$2,887 for the proposed project.

### **Documents submitted and reviewed by the State:**

1. East Highway 50 Wastewater System Improvements Facilities Plan, City of Yankton, South Dakota December 2011
2. Table 1A: Estimated Energy Usage for existing Dale and Chesterman Lift Stations and Proposed Estimated Usage for east Yankton Lift Station
3. South Dakota Electric Rate Schedule, Northwestern Public Service Company, Huron, South Dakota
4. Supplementary Table to Table 1A: Total Estimated Cost of Power Consumption

**List of eligible Green Project Reserve components:**

1. East Yankton Lift Station: \$1,846,073 (refer to attached cost breakdown)
2. Total Project Cost: \$3,681,266 (Engineer's Estimate)
3. Total project cost eligible for Green Project Reserve: \$1,846,073

**Green Project Reserve – Business Case Evaluation:**

As stated in the USEPA March 2, 2009 Memorandum, for traditional projects that are not categorically green, for the project, or components of the project, to be counted towards the Green project Reserve requirement, the State project files must contain documentation that a clear business case for the project (or portion) investment includes achievement of identifiable and substantial benefits that qualify as Green Project benefits. The documentation should reference to a preliminary engineering or other planning document that makes clear that the basis upon which the project (or portion) was undertaken included identifiable and substantial benefits qualifying for the Green Project Reserve. The March 12, 2009 USEPA webcast slides 20 and 21 state that two components, the technical component and financial component, must be provided in the Business Case.

**Green Project Reserve Type:**

This project is an energy efficiency project based on a business case.

**Technical Component Evaluation:**

The consultant for the City of Yankton has calculated the energy requirements and savings for the existing two lift stations versus the proposed Hwy 50 Lift Station.

The consultant has provided a table of estimated flow for each lift station and the estimated power consumption for years 2010 through 2025 in order to identify the overall estimated percent of power consumption savings from the construction of this project.

**Financial Component Evaluation:**

As you can see from the attached supplementary table to 1A; the total estimated energy savings for the project comes out to be a financial savings of \$2,887 over the life of the project. This reflects a 6.50% average total energy savings.

$$(857,000 \text{ kW hrs/year} - 802,067 \text{ kW hrs/year}) / (857,000 \text{ kW hrs/year}) = 6.5\%$$

**Green Project Reserve – Evaluation Conclusion:**

Base on the attached information, the State has determined that replacing the two dry pit, wet well sanitary sewer lift stations with one dry pit, wet well sanitary sewer lift station provides technical and financial benefits in the form of energy savings. The State has identified 100 percent of the \$3,716,266 loan as green project reserve, pending EPA approval.

Table 1A: Estimated Energy Usage for existing Dale and Chesterman Lift Stations and Proposed Estimated Energy Usage for East Yankton Lift Station

Year	Estimated Flow for Dale Lift Station [gallons per day]	Estimated Dale Lift Station Power Consumption [kW Hr / year]	Estimated Flow for Chesterman Lift Station [gallons per day]	Estimated Chesterman Lift Station Power Consumption [kW Hr / year]	Total Estimated Power Consumption by Two Lift Stations [kW Hr / year]	Projected Flow for East Yankton Lift Station [gallons per day]	Projected East Yankton Lift Station Power Consumption @ pumping rate #1 [kW Hr / year]	Assumed pumping rate for Dale Lift Station	gallons per minute	@	15.41	kW motor power
								Assumed pumping rate for Chesterman Lift Station	gallons per minute	@	3.90	kW motor power
								Assumed pumping rate for East Yankton Lift Station #1	gallons per minute	@	16.54	kW motor power
2010	388,037	28,199	137,371	12,299	40,497	525,408	38,549					
2011	396,071	28,782	150,383	13,464	42,246	546,453	40,093					
2012	404,104	29,366	163,394	14,628	43,995	567,498	41,637					
2013	412,138	29,950	176,406	15,793	45,743	588,544	43,181					
2014	420,171	30,534	189,418	16,958	47,492	609,589	44,725					
2015	428,205	31,118	202,429	18,123	49,241	630,634	46,269					
2016	436,238	31,701	215,441	19,288	50,989	651,679	47,813					
2017	444,272	32,285	228,453	20,453	52,738	672,724	49,357					
2018	452,305	32,869	241,464	21,618	54,487	693,770	50,901					
2019	460,339	33,453	254,476	22,783	56,236	714,815	52,445					
2020	468,372	34,037	267,488	23,948	57,984	735,860	53,989					
2021	476,406	34,620	280,499	25,113	59,733	756,905	55,533					
2022	484,439	35,204	293,511	26,278	61,482	777,950	57,077					
2023	492,473	35,788	306,523	27,442	63,230	798,996	58,622					
2024	500,506	36,372	319,534	28,607	64,979	820,041	60,166					
2025	508,540	36,956	332,546	29,772	66,728	841,086	61,710					
					<b>Total kW Hr for 2010 through 2025</b>	<b>857,800</b>	<b>802,067</b>					

Overall Estimated Percent Power Consumption Savings after construction of Proposed East Yankton Lift Station

6.50%

Supplementary Table to 1A: Estimated Energy Usage for existing Dale and Chesterman Lift Stations and Proposed Estimated Usage for East Yankton Lift Station

Year	Total Estimated Power Consumption by Dale and Chesterman Lift Stations		Projected East Yankton Lift Station Power Consumption @ pumping rate #1		Yearly Power Consumption Savings Percent	Total Estimated Cost of Power Consumption by Proposed East hwy 50 Lift Station		Yearly Estimated Cost Savings
	Stations (kW Hr / year)	Dale and Chesterman Lift Stations	Consumption @	(kW Hr / Year)		Proposed East hwy 50 Lift Station	Estimated Cost	
2010	40,497	\$2,098	38,549	4.81%	\$1,997	\$101		
2011	42,246	\$2,188	40,093	5.10%	\$2,077	\$112		
2012	43,995	\$2,279	41,637	5.36%	\$2,157	\$122		
2013	45,743	\$2,369	43,181	5.60%	\$2,237	\$133		
2014	47,492	\$2,460	44,725	5.83%	\$2,317	\$143		
2015	49,241	\$2,551	46,269	6.04%	\$2,397	\$154		
2016	50,989	\$2,641	47,813	6.23%	\$2,477	\$165		
2017	52,738	\$2,732	49,357	6.41%	\$2,557	\$175		
2018	54,487	\$2,822	50,901	6.58%	\$2,637	\$186		
2019	56,236	\$2,913	52,445	6.74%	\$2,717	\$196		
2020	57,984	\$3,004	53,989	6.89%	\$2,797	\$207		
2021	59,733	\$3,094	55,533	7.03%	\$2,877	\$218		
2022	61,482	\$3,185	57,077	7.16%	\$2,957	\$228		
2023	63,230	\$3,275	58,622	7.29%	\$3,037	\$239		
2024	64,979	\$3,366	60,166	7.41%	\$3,117	\$249		
2025	66,728	\$3,457	61,710	7.52%	\$3,197	\$260		
Total kw Hr for 2010 through 2025		857,800	802,067					
Total		\$44,434			\$41,547	\$2,887		
Overall Estimated Power Consumption Savings after construction of proposed East Yankton Lift Station						6.50%		
Energy charge per kilowatt hour for all energy used						0.0518		

SOUTH DAKOTA ELECTRIC RATE SCHEDULE

NORTHWESTERN PUBLIC SERVICE COMPANY  
HURON  
SOUTH DAKOTA

Section No. 3  
Sheet No. 23  
Canceling 10<sup>th</sup> Revised  
9<sup>th</sup> Revised Sheet No. 23

CLASS OF SERVICE: Municipal Pumping Service

RATE NO. 41

APPLICABILITY

This schedule is available for municipal water pumping service.

TERRITORY

Company's Assigned Service Area.

RATE

	Per Meter <u>Per Month</u>
Customer Charge .....	\$9.50
Energy Charge ( to be added to the Customer Charge ) :	
Per Kilowatt Hour for all energy used .....	\$0.05180
Minimum Charge .....	\$9.50

Adjustment Clauses

- a. Adjustment Clause shall apply.
- b. Tax Adjustment Clause shall apply.
- c. Bill Crediting Program shall apply.

(N)

OTHER PROVISIONS

Service will be furnished under the Company's General Terms and Conditions.

Date Filed: December 5, 2000

Service on or after  
Effective Date: January 5, 2001

R. F. Levendecker  
Issued by: Vice President-Finance & Regulatory Affairs

## ATTACHMENT E - PROJECT COST ESTIMATE

### Schedule #1: East Yankton Lift Station

NO.	DESCRIPTION	Quantity	Unit	Unit Cost	Total Cost
1.	Mobilization	1	L.S.	\$ 140,000.00	\$ 140,000.00
2.	Lift Station Building and Site Work	1	L.S.	\$ 500,000.00	\$ 500,000.00
3.	Lift Station Pumps, Piping, Valves & Appurtenances	1	L.S.	\$ 220,000.00	\$ 220,000.00
4.	Lift Station Mechanical and Electrical Work	1	L.S.	\$ 165,000.00	\$ 165,000.00
5.	Lift Station Supervisory Controls	1	L.S.	\$ 55,000.00	\$ 55,000.00
6.	Wastewater Treatment Plant Supervisory Controls	1	L.S.	\$ 65,000.00	\$ 65,000.00
7.	Dewatering for Lift Station & Temporary Power	1	L.S.	\$ 100,000.00	\$ 100,000.00
8.	Removal of Existing Lift Stations	1	L.S.	\$ 50,000.00	\$ 50,000.00
9.	Emergency Power Generator & Automatic Transfer Switch	1	L.S.	\$ 120,000.00	\$ 120,000.00
10.	Clearing Trees, Brush & Bushes	1	L.S.	\$ 5,000.00	\$ 5,000.00
11.	Temporary Water Service due to Dewatering	1	L.S.	\$ 20,000.00	\$ 20,000.00
12.	Seeding and Mulching	2	Acre	\$ 2,000.00	\$ 4,000.00
13.	Silt Fence	1,000	L.F.	\$ 4.50	\$ 4,500.00
<b>Schedule #1 Construction Cost Estimate</b>					<b>\$ 1,448,500.00</b>

### Schedule #2: Sewer Main and Force Main

NO.	DESCRIPTION	Quantity	Unit	Unit Cost	Total Cost
1.	Mobilization	1	L.S.	\$ 130,000.00	\$ 130,000.00
2.	24" Sewer Pipe 20 to 22 feet deep	50	L.F.	\$ 190.00	\$ 9,500.00
3.	18" Sewer Pipe 16 to 18 feet deep	521	L.F.	\$ 125.00	\$ 65,125.00
4.	15" Sewer Pipe 14 to 16 feet deep	1578	L.F.	\$ 76.00	\$ 119,928.00
5.	15" Sewer Pipe 16 to 18 feet deep	761	L.F.	\$ 113.00	\$ 85,993.00
6.	15" Sewer Pipe 18 to 20 feet deep	1120	L.F.	\$ 124.00	\$ 138,880.00
7.	15" Sewer Pipe 20 to 22 feet deep	1036	L.F.	\$ 140.00	\$ 145,040.00
8.	12" Sewer Force Main	3413	L.F.	\$ 21.00	\$ 71,673.00
9.	12" Sewer Force Main by HDD	600	L.F.	\$ 90.00	\$ 54,000.00
10.	12" Resilient Wedge Gate Valve & Box with Accessories	1	Ea.	\$ 2,532.50	\$ 2,532.50
11.	12" 90° Elbow	2	Ea.	\$ 600.00	\$ 1,200.00
12.	Dewatering for Sewer Pipe	5046	L.F.	\$ 50.00	\$ 252,300.00
13.	2" Automatic Air Release Valve Installation	4	Ea.	\$ 6,600.00	\$ 26,400.00
14.	4" Diam. Manhole 14 to 16 feet deep	6	Ea.	\$ 2,980.00	\$ 17,880.00
15.	4" Diam. Manhole 16 to 18 feet deep	3	Ea.	\$ 3,320.00	\$ 9,960.00
16.	4" Diam. Manhole 18 to 20 feet deep	3	Ea.	\$ 3,660.00	\$ 10,980.00
17.	4" Diam. Manhole 20 to 22 feet deep	2	Ea.	\$ 4,000.00	\$ 8,000.00
18.	Drop Manhole Assembly for 18" Sewer Main	1	Ea.	\$ 5,600.00	\$ 5,600.00
19.	Tracer Wire for Force Main	4100	L.F.	\$ 2.00	\$ 8,200.00
20.	15" Sewer Main Cased Highway Crossing	140	L.F.	\$ 200.00	\$ 28,000.00
21.	Connection to Existing Sewer Main	3	Ea.	\$ 2,500.00	\$ 7,500.00
22.	Tie Force Main into Existing Sewer with New Manhole	1	L.S.	\$ 20,000.00	\$ 20,000.00
23.	Gravel Access Road for Sewer Main	1	L.S.	\$ 95,000.00	\$ 95,000.00
24.	Clearing Trees, Brush & Bushes	1	L.S.	\$ 15,000.00	\$ 15,000.00
25.	Traffic Control	500	Unit	\$ 4.00	\$ 2,000.00
26.	Traffic Control, Miscellaneous	1	L.S.	\$ 1,200.00	\$ 1,200.00
27.	Silt Fence	750	L.F.	\$ 4.50	\$ 3,375.00
28.	Seeding and Mulching	11	Acre	\$ 1,500.00	\$ 16,500.00
<b>Schedule #2 Construction Cost Estimate</b>					<b>\$ 1,351,766.50</b>

**Total Construction Cost Estimate** **\$ 2,800,266.50**

#### Engineering Fees

Basic Services	\$ 255,000.00
Construction Inspection @ 5%	\$ 140,000.00
Legal and Administrative @ 3%	\$ 84,000.00
Land Acquisition and Land Surveying @ 4%	\$ 112,000.00
Soil Testing and Engineering	\$ 10,000.00
Contingencies @ 10%	\$ 280,000.00

**Total Estimated Project Cost** **\$ 3,681,266.50**

## Eligible Green Project Reserve Costs Breakdown

### Schedule #1 East Yankton Lift Station

Construction Cost Estimate	\$1,448,500.00
Percentage of Total Construction Cost	51.7%

### Schedule #2: Sewer Main and Force Main

Construction Cost Estimate	\$1,351,766.50
Percentage of Total Construction Cost	48.3%

**Total Construction Cost Estimate** \$2,800,266.50

### Other Costs

	Engineering Fees	
	Basic Services	\$255,000.00
	Construction Inspection	\$140,000.00
	Legal and Administrative	\$84,000.00
<i>ineligible</i>	<i>Land Acquisition and Land Surveying</i>	<i>\$112,000.00</i>
	Soil Testing and Engineering	\$10,000.00
	Contingencies	\$280,000.00
	Sum	\$881,000.00
	less land acquisition and land surveying	\$112,000.00
	Total	\$769,000.00
	at 51.7%	\$397,573.00

### Eligible Green Project Reserve Components

Construction Cost Estimate	\$1,448,500.00
Contingencies at 51.7%	\$397,573.00
<b>Total</b>	<b>\$1,846,073.00</b>