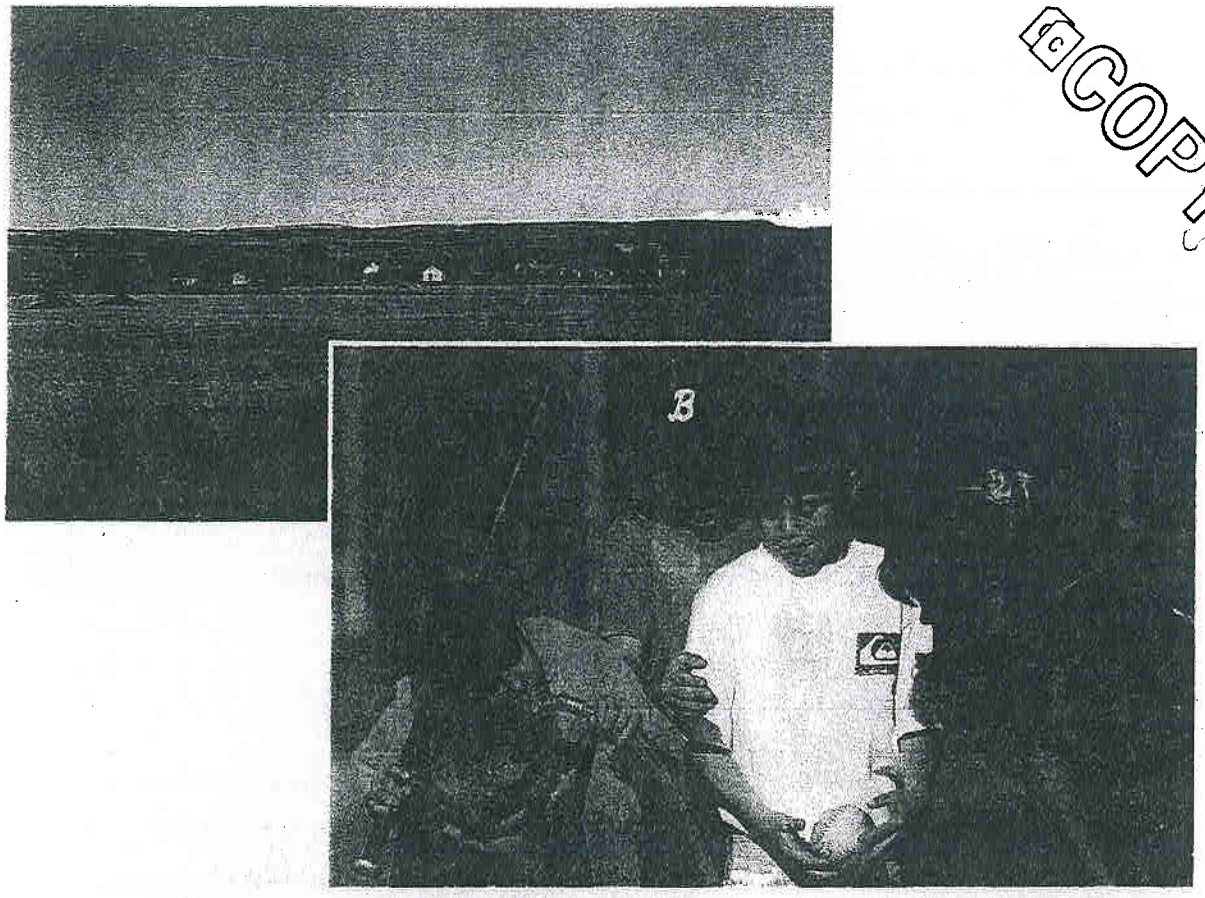

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North Dakota State Water Commission and the Garrison Diversion Conservancy District

Northwest Area Water Supply Project Electric Service Evaluation

February 2005

DRAFT

HOUSTON ENGINEERING, INC.
MWH

February 23, 2005

Mr. Jim Lennington, Project Manager
North Dakota State Water Commission
State Office Building
900 East Boulevard
Bismarck, ND 58505

Subject: Electrical Service Evaluation, Specific Authorization No. 15

Dear Mr. Lennington:

This draft letter report summarizes the evaluation of the electrical service considerations on the pretreated water distribution system from Lake Sakakawea to the Minot Water Treatment Plant.

The report specifically evaluates the electrical service options for the intake alternatives, including the use of the Snake Creek Pumping Plant and the estimated power requirements and costs for the Booster Pump Station located at Max, North Dakota. Electrical loads for all of the pretreated water delivery system have been identified, including major new improvements at the Minot WTP.

The documentation presented in this report has been used to develop the basis of the O&M cost evaluation for the intake alternatives. If additional considerations, and as treatment options at Lake Sakakawea are to be considered, additional analysis and modifications to this report may be warranted. This could include an additional pump station at the Lake and the inclusion of various options of treatment at the source.

If you have any questions regarding this report, please contact us.

Respectfully submitted,

MWH Americas, Inc.

William G. Lynard

Houston Engineering, Inc.

Roger C. Hagen

/db

INTRODUCTION

This letter report summarizes the electrical power service evaluation for the NAWS load centers on the pretreated raw water supply system and the Minot WTP upgrades. Water supply facilities include the Intake Pump Station, Max Booster Pump Station/Pretreatment Facilities, Pretreated Water Storage Reservoir, the Pressure Reducing Station (PRS), the automatic line isolation valve vaults, and the cathodic protection system. This report identifies the anticipated loads at each NAWS facility, and evaluates the electrical power consumption evaluation at the intake pump stations and the booster pump station.

ELECTRIC SERVICE SUPPLIERS

Several electrical suppliers provide service for various parts of the NAWS system. These suppliers have been contacted and have provided information, rates and proposed facilities to connect the various NAWS components with reliable service.

Two alternatives are being considered at the NAWS Intake Pump Station. One of the alternatives involves modification for the Snake Creek Pumping Plant (SCPP) which uses power supplied by Western Area Power Administration (WAPA). The Bureau of Reclamation owns the substation transformers and electrical feed system to the pump facilities. Use of the existing facilities to the SCPP would fall under published WAPA rate schedules. However, maintenance of the power feed facilities is a responsibility of Reclamation. Options for emergency service have been investigated should the Reclamation equipment suffer a malfunction or outage. The other alternative involves a stand-alone intake pump station which would be supplied with power from the local power supplier.

The electric service suppliers and their area of responsibility include:

McLean Electric Cooperative, Inc.

McLean Electric Cooperative Inc. (MEC) would provide service to the stand-alone intake at Lake Sakakawea, the Booster Pump Station located at Max, ND, and any minor loads located along the pipeline between these two facilities. The contact information for MEC is as follows:

McLean Electric Cooperative, Inc.
Mr. Reginal R. Rudolph, General Manager
4031 Highway 37 Bypass, NW
P.O. Box 399
Garrison, ND 58540-0399
Phone: (701) 463-2291

Verendrye Electric Cooperative

Verendrye Electric Cooperative provides power service north of Max, ND along the pipeline route to Minot, ND. NAWS facilities that would use this service supplier include the pretreated storage reservoir, the pressure reducing station, the three automated pipeline isolation valve

vaults and the cathodic protection rectifiers. The contact information for Verendrye Electric Cooperative is as follows:

Verendrye Electric Cooperative
Mr. Brian Johnson
615 Highway 52, West
Velva, ND 58790-7417
Phone: (701) 338-2855

Xcel Energy

Xcel Energy supplies power to the Minot WTP. The new facilities planned for the treatment plant would represent new loads for this service supplier. The contact information for this supplier is as follows:

Xcel Energy
Mr. Don Trueblood
300 16th Street SW
P.O. Box 788
Minot, ND 58702
Phone: (701) 839-8177

FACILITY ELECTRICAL LOADS

An evaluation of electrical loads for the NAWS pretreated water system and the proposed upgrades to the Minot WTP was prepared to identify the potential transformer size and the characteristics of service to be provided at each facility. The primary load centers on the pretreated water pipeline include the intake and booster pumping stations. A detailed evaluation of these facilities is described in the next section.

Electrical loads are developed for each pumping facility and for both total connected and firm capacity horsepower. Other minor loads and electric equipment are also identified. This includes compressors, chemical feed pumps, miscellaneous motors, lighting and HVAC systems. A number of the minor equipment and associated loads will be operated intermittently.

The following summarizes the estimated loads for each NAWS facility. The intake pump station loads were developed for the two alternatives. This includes Alternative 1 – NAWS Stand-Alone Intake Pump Station and Alternative 2 – Snake Creek Pumping Plant (SCPP) utilization.

Intake Pump Stations Alternatives

Alternative 1: Stand-alone intake pump station adjacent to existing Snake Creek Pumping Plant. Pump power supply will be 4,160 volts.

• 3 - 9mgd pumps @ 1,250 hp ea. (constant speed)	3,750 hp
• 2 - 5 mgd pumps @ 700 hp ea. (2 VFD's)	1,400 hp
• Total connected pump load	5,150 hp
• Pump firm capacity	3,900 hp
• 1 - Air burst compressor	20 hp
• 1 - Surge tank compressor	15 hp
• Misc. hp for sump pumps, chemical feed pump	30-35 hp
• Bridge Crane to lift pumps, valves etc	15 hp
• Electric unit heaters	20 kW
• Air conditioning in Electrical Room	10 kW
• Lighting, etc.	10 kW

Alternative 2: Snake Creek Pumping Station Plant Utilization. Pump power supply will be the existing 6,000-volt supply.

• 3 – 2,000 hp pumps with 2 VFDs	6,000 hp
• Total connected pump load	6,000 hp
• Pump firm capacity	4,000 hp
• Air Compressor	15 hp
• Misc.	15 hp
• Other electrical is part of existing SCPP facility and is handled through the agreement with Reclamation.	

Booster Pump Station/Pretreatment Facility.

The Booster Pump Station/Pretreatment Facility is located at Max, ND and will use a 4,160-volt supply for the major pumping equipment.

• 3 - 800 hp constant speed pumps	2,400 hp
• 2 - 500 hp pumps with 2 VFDs	1,000 hp
• Total connected pump load	3,400 hp
• Pump firm capacity	2,600 hp
• Bridge crane	15 hp
• Air compressor	15 hp
• Chlorine scrubber	40 hp
• Monorail (chlorine cylinders)	4 hp
• Chemical metering pumps	<1 hp
• Sump pumps	15 hp
• Electric unit heaters	20 kW
• A/C in electrical room	10 kW
• Lighting etc.	10 kW
• Hot water heater	9 kW

Pretreated Raw Water Storage Reservoir

• Transfer Pumps	1 @ 2hp 1 @ 7.5 hp
• Sump Pumps	4 @ 2 hp (8 hp total)
• Total connected pump hp	17.5 hp
• Misc. For Valves, fan	6 hp
• Electric unit heater	20 kW
• Auxiliary loads	20 kW
• Hot water heater	9 kW

Line Isolation valve vaults (3 vaults)

• Electric unit heater	2 kW
• Sump pump	1 hp
• 1 – electric valve operator	1/3 hp
• Lights, misc.	2 kW

Cathodic Protection Rectifiers

A number of cathodic protection rectifiers are installed or will be installed along the pretreated water pipeline alignment. These facilities are served by an electrical service drop at each rectifier location. Siting of the rectifiers was developed based in current requirements of the pipeline and the proximity to existing power service. The rectifiers are based on a single-phase 240 VAC, 60 Hz service. The DC voltage and amperage for each planned or installed rectifier is summarized in the following:

Station Location	Rectifier Rating
330 + 50	24 V; 35 amps
595 + 00	24 V; 35 amps
867 + 40	24 V; 35 amps
1062 + 60	24 V; 35 amps
1504 + 00	24 V; 35 amps
1764 + 00	60 V; 45 amps
2091 + 80	60 V; 45 amps
2270 + 00	60 V; 45 amps
2515 + 00	60 V; 45 amps

Pressure Reducing System

The Pressure Reducing System is served by a 120/240 V, single-phase service through a 100-amp breaker. The following electrical loads are associated with this facility:

• Bridge crane/hoist	2 hp
• Electric unit heaters	7.5 kW
• Exhaust fan and louvers	1 kW
• Lighting and misc.	1.5 kW

Minot Water Treatment Plant

Estimates of electrical loads for the proposed new facilities at the Minot Water Treatment Plant have been developed for the influent flow control and clarifier facility, and the new reservoir/high service pump station/UV complex. It is assumed that these new loads will require new service transformers at each site. The loads are summarized as follows:

Influent Flow Control and Clarifier Facility

• Pumps	
– Clarifier Reactor	30 hp
– Scrapper	1 hp
– Sludge Pumps - 3 @ 15 hp ea.	45 hp total (30 hp firm capacity)
• Influent Valve	1 hp
• Chemical feed pumps (assume)	1 hp
• Lime conveyors - 2 @ 3 hp	6 hp total
• Dust collectors - 2 @ 2 hp	4 hp total
• Slaker Mixer - 2 @ 5 hp	10 hp total
• Slurry tank mixer - 2 @ 1 hp	2 hp total
• Slurry pump - 2 @ 7.5 hp	15 hp total, 7.5 firm
• Lime silo unit heater - 2 @ 5 kW	10 kW
• Lime silo exhaust fans	2 kW
• Misc. lime panel	1 kW
• Electric unit heaters	15 kW
• Lights	15 kW
• Air conditioning	10 kW

New Reservoir/HSPS and UV Facility

• NAWS high service pumps	
– 13 MGD @ 150 psi, firm	1,300 hp
– 16 MGD @ 150 psi, connected	1,600 hp
• City high service pumps	
– 13 MGD @ 150 psi, firm	800hp
– 16 MGD @ 150 psi, connected	1,000 hp
• UV – medium pressure	75 kW, 150 kW total
• Valve actuators	4 hp
• Bridge crane	15 hp
• Surge tank compressor - 2 @ 15 hp	30 hp total
• Electric unit heaters	20 kW
• Lights panel	20 kW
• Air conditioning in electrical room	10 kW

ELECTRICAL SERVICE EVALUATION

An evaluation of the electrical service feasibility for the intake pump station alternatives and the Max Booster Pump Station was developed to identify supply options.

The evaluation assesses the type of power, reliability, power service costs for the major pumping facilities, and estimates of electrical charges expected on an annual basis for each facility. The estimates for annual power costs were developed on a monthly estimate of water demands which were translated into kilowatt usage for each of the pumping facilities. The average of the monthly flows is equivalent to the future average annual demand of 10.5 mgd.

Two alternatives were considered for the intake pump station on Lake Sakakawea. Alternative 1 involves construction of a new intake and pump station to provide water to NAWS at a peak day flow rate of 26 mgd. This alternative would require a new electrical service and substation. Alternative 2 involves the use of and reconstruction of one of the three existing pumps in the Snake Creek Pumping Plant. Under this alternative, the NAWS pumping facilities would utilize the existing 6,600-volt electrical service to the Snake Creek facilities.

For this analysis, we have worked with McLean Electric Cooperative, Inc. to provide information, preliminary rate structures and costs for electrical service.

Design Criteria

An estimate of the average monthly flow rates expected for the NAWS system were developed and were used as the basis for estimating average electrical loads for the NAWS pumping facilities. The future annual average demand for the NAWS system is estimated at 10.5 mgd. Based on this average use rate, monthly average flow rate design criteria was developed. Minot Water Treatment Plant flow data were used to establish monthly/annual use allocation that were applied to the expected future NAWS annual demand. The expected average monthly flows for the NAWS system are presented in Table 1.

This criteria was used to compute pumping horsepower and kilowatt demand for each of the pumping facilities based on the total dynamic head each facility would experience at the monthly average flow rate.

NAWS Intake Pump Station. The estimated horsepower and kilowatt consumption on a monthly basis for the intake pump station is presented in Table 2. This estimate is based on a pump efficiency of 78 percent and a motor efficiency of 90 percent.

Max Booster Pump Station

The estimated horsepower and kilowatt consumption on a monthly basis for the Max Booster Pump Station is presented in Table 3. The motor and pump efficiencies are the same as used for the intake pump station. The total dynamic head used for this pump station is based on the average monthly flow, pumped to the water surface elevation of the Max NE Hydraulic Control Structure. From this facility, the water flows by gravity to the storage reservoir.

TABLE 1

PROJECTED NAWS MONTHLY AVERAGE FLOWS

Month	Estimate Flow Rates	
	mgd	gpm
January	7.9	5,486
February	8.0	5,555
March	8.3	5,764
April	9.3	6,458
May	10.4	7,222
June	15.2	10,555
July	15.5	10,763
August	15.5	10,763
September	11.0	7,638
October	9.0	6,250
November	8.1	5,625
December	7.8	5,416
Average	**10.5**	**7,291**

TABLE 2

ESTIMATED MONTHLY KILOWATTS AND KILOWATT HOUR DEMAND FOR THE INTAKE PUMP STATION

	Average Monthly Flow, gpm	Estimated TDH, ft	Estimated Pump, hp	Estimated Motor, hp	Estimated kW	Estimated kWh/mo.
January	5,486	364	646	718	536	399,099
February	5,555	364	655	728	544	365,541
March	5,764	366	683	758	567	421,495
April	6,458	371	776	862	644	463,540
May	7,222	377	882	980	732	544,742
June	10,555	411	1,404	1,560	1,165	838,889
July	10,763	413	1,440	1,600	1,195	889,340
August	10,763	413	1,440	1,600	1,195	889,340
September	7,638	381	942	1,047	782	562,904
October	6,250	3670	748	831	621	461,666
November	5,625	365	664	738	551	396,982
December	5,416	363	636	707	528	392,964
Average	7,291				**Total**	**6,626,502**

TABLE 3

ESTIMATED MONTLY KILOWATTS AND KILOWATT-HOURS DEMAND FOR THE MAX BOOSTER PUMP STATION

	Average Monthly Flow, gpm	Estimated TDH, ft	Estimated Pump, hp	Estimated Motor, hp	Estimated kW	Estimated kWh/mo.
January	5,486	165.2	293	326	244	181,179
February	5,555	165.5	298	331	247	166,018
March	5,764	166.6	311	345	258	191,966
April	6,458	170.5	356	396	296	213,029
May	7,222	175.3	410	455	340	253,097
June	10,555	203.4	695	772	577	415,360
July	10,763	205.3	715	795	594	441,765
August	10,763	205.3	715	795	594	441,765
September	7,638	178.1	440	489	366	263,201
October	6,250	169.3	343	381	284	211,529
November	5,625	165.9	302	336	251	180,535
December	5,416	164.8	289	321	240	178,453
Average/Total	7,291					3,137,897

Power Service Evaluation. Power quality and reliability information was received from McLean Electric Cooperative, Inc. (Appendix A), for both the 115 kV and 41.6 kV service provided by Control Power Electric Cooperative, Inc. at the intake and the Max Booster Pump Station sites. The data indicates that the 115 kV service has a superior record in terms of interrupts, days and permanent outages. The Garrison 1462 service had no interrupts or outages over the 5-year period from 1998 through 2002. The Garrison 1262 service averaged about one interrupt and one permanent outage per year over the same period. By comparison, the 41.6 kV service options are far less reliable with interrupts ranging from 10 to 30 per year.

The concept of providing standby/emergency power at the key NAWS facilities was addressed for use of the less reliable 41.6 kV service. Given the loads at the intake and the booster pump stations (up to 4,000 hp), the capacity of standby generation requirements would be too large and expensive, compared to the cost of facilities for the 115 kV service. For example, the estimated difference in cost for 115 kV and 41.6 kV service at the intake would be approximately $220,000 (Option 1T vs. Option 2T, Appendix A). This difference would roughly be similar to just the equipment cost for a 1,000 kW diesel generator. This generator capacity could not meet average day capacity at intake during the summer. It is recommended that the NAWS facilities utilize the 115 kV service for both the intake and the Max Booster Pump Station.

Snake Creek Pumping Plant Service

The electrical service for the existing Snake Creek Pumping Plant facilities consists of a dedicated substation with a tap on the Garrison 115 kV line. The substation feeds each of the three pump motors with a 3-phase, 60-hertz, 6,600-volt supply. The main breaker for each pump motor is located in the switchyard at the substation.

Utilization of one of the pump bays to install NAWS pumping equipment would anticipate using the existing electrical service (6,600-volt service). Therefore, additional step-down transformers would not be required. A separate metering facility would be required to measure the power consumed by the NAWS pumping facilities.

Electrical Service Transmission Facilities

Based on information and cost estimates provided by McLean Electric Cooperative, Inc., and Central Power Electric Cooperative, Inc., estimates to construct the electric service transmission facilities to the Max Booster Pump Station and the NAWS stand-alone intake were evaluated.

Construction costs alternatives were provided for the various locations and types of power available (155 kV and 41.6 kV supplies), as indicated in Appendix A.

Intake Pump Station Supply. The recommended supply option for the stand-alone NAWS Intake Pump Station uses a tap on the Garrison 115 kV supply at the Snake Creek Substation (Option 1T). A separate substation would be constructed together with a 4,160-volt transmission feed to the NAWS facilities. The estimated costs to construct the electrical service transmission facilities is $600,000.

Booster Pump Station Supply. The initial estimate to construct the electrical service transmission facilities to provide power to the Max Booster Pump Station was $855,000 (Option 1B). The facilities included a tap on the Garrison-Max-Mallard 115 kV line at $125,000; construction of 1.5 miles of 115 kV line to the Booster Substation at $180,000 and construction of a substation to provide 4,160 volt service to the Booster Pump Station at $550,000.

MEC revised the transmission cost estimate (Appendix B), placing the substation at the tap on the 115 kV line and running lower voltage underground line to the booster pump station. The estimate provided by MEC was for two miles of line (assuming the Booster Pump Station location was 3 miles south of Highway 53). The proposed location of the pump station is on Highway 53, therefore the costs of the transmission line was prorated to reflect only 1.5 miles of construction. This change will result in a transmission line cost of $105,000. The total revised cost for this service is estimated at $780,000.

Electrical Service Financing Options

Financing options were presented by MEC for the construction of the electrical service transmission facilities to the intake pump station and the Max Booster Pump Station. One option

involved the payment by the State Water Commission of the construction costs upfront. This option would require the costs to be included in the project capital costs.

The other option involved financing the cost of construction through MEC over a 10-year term (120 monthly payments) at an interest rate of 7 percent per year. Under this option, the monthly payments would represent a base charge included in the monthly power billing. Using the costs for construction for power service and the proposed terms by MEC, the base charge for each facility would be as follows:

- Stand-Alone Intake Pump Station $6,967/mo.
- Max Booster Pump Station $9,056/mo.

The opportunity may exist to seek alternative financing or possibly negotiate interest rates with the electric utility. Financing through bonding or possible the state revolving loan fund may yield competitive rates or optional terms. For example, at an estimated current financing rate of 4 percent per year, the monthly costs for the electric service options over a ten-year repayment period would be approximately:

- Intake Pump Station - $6,075/month
- Max Booster Pump Station - $7,898/month

The State Water Commission has subsequently elected to pay for the construction of the electrical service facilities as a part of the capital cost of the project. Therefore, monthly base costs will not be included in the power rate analysis.

Power Rate Analysis

McLean Electric has provided preliminary rate criteria for service at the intake and at the Max Booster pump station site (Appendix C). The rates include a monthly service charge of $250.00, a maximum demand charge at $10.79/kw and an energy charge of $0.025179/kwh.

Demand Charge. Discussions were held with McLean Electric to clarify the basis of metering and charging the demand component of the rate structure. The NAWS service for the intake pump station and the Max Booster Pump Station will be rated as a substation. As such, demand polling at the substation will occur as coincident with the power supplier at specific dates and times. Charges, therefore, will be made on the demand (in kilowatts) in use at the time.

The demand charge evaluation, therefore, is developed using the expected average demand for each month of the year. This assumes that on the average, the electrical demand will be reflective of the average monthly pumping rate (See Table 1) at any one time, converted to kilowatts. It is also recognized that at any point in time the pumping rate could be higher or lower than the average monthly rate (for example, peak day flow or reduced pumping during the night). However, with the operation of the pretreated water system and the amount of pretreated water storage, it is estimated that the average monthly values would be representative of the power demands. The annual demand costs are the sum of the individual monthly values.

Stand-Alone Intake Pump Station Annual Power Costs

Using the data presented in Table 2 for average monthly kilowatt demand and energy use, and the proposed rate structure from McLean Electric, the estimated annual power costs are approximately $267,600. Table 4 presents the monthly projected power costs for the intake pump station.

TABLE 4

INTAKE PUMP STATION ESTIMATED POWER COSTS
FUTURE DEMANDS

Month	Service Charge	Demand Charge	Energy Charge	Est. Mo. Power Cost
January	$250	$5,788	$10,049	**$16,087**
February	$250	$5,869	$9,204	**$15,323**
March	$250	$6,113	$10,613	**$16,976**
April	$250	$6,947	$11,671	**$18,868**
May	$250	$7,900	$13,716	**$21,866**
June	$250	$12,572	$21,122	**$33,944**
July	$250	$12,898	$22,393	**$35,541**
August	$250	$12,898	$22,393	**$35,541**
September	$250	$8,436	$14,173	**$22,859**
October	$250	$6,695	$11,624	**$18,570**
November	$250	$5,949	$9,996	**$16,195**
December	$250	$5,699	$9,894	**$15,843**
TOTAL	$3000	$97,764	$166,848	**$267,613**

NAWS Snake Creek Pumping Plant Power Costs

Use of the Snake Creek Pumping Plant electrical service under the option of modifying one of the pump bays for NAWS pumping equipment would involve use of WAPA rates for estimating power costs. Proposed firm electric rates were published in the Federal Register for the Western Area Power Administration (Vol. 68, No. 114, Friday June 13, 2003). The rates are $9.57 mills/kWh and demand charge of $3.70/kw month.

The demand charge is assumed to reflect a monthly peak demand using a demand meter. Estimates of monthly peak demand were developed by applying a peaking factor of 1.68 to the average monthly estimated kW demands. This peaking factor results in a maximum pumping demand for each month that could be used (up to 26 mgd in the months of July and August). Table 5 presents the monthly projected power costs for the SCPP intake alternative. The estimated annual power costs for this option is $119,854.

TABLE 5

NAWS SCPP INTAKE PUMP STATION ESTIMATED POWER COSTS

Month	Demand Charge	Energy Charge	Est. Mo. Power Cost
January	$3,337	$3,823	7,161
February	$3,384	$3,502	$6,886
March	$3,525	$4,038	$7,563
April	$4,006	$4,441	$8,446
May	$4,555	$5,219	$9,774
June	$7,249	$8,037	$15,286
July	$7,437	$8,520	$15,957
August	$7,437	$8,520	$15,957
September	$4,864	$5,393	$10,257
October	$3,861	$4,423	$8,283
November	$3,430	$3,803	$7,233
December	$3,286	$3,765	$7,051
TOTAL	**$56,372**	**$63,482**	**$119,854**

Max Booster Pump Station Annual Power Costs

Estimates of power costs for the Max Booster Pump Station are presented in Table 6. The estimated annual power cost for this facility is approximately $128,300 and was developed using MEC's rate structure as previously presented.

EMERGENCY SERVICE AVAILABLITY

Discussions have been held with MEC to determine the willingness and availability of MEC to provide emergency service to the NAWS SCPP intake alternative electrical equipment. This service is being investigated to provide a quick response time for potential repairs to the electrical system should the system experience a malfunction or disruption of electrical service.

MEC has indicated the possibility of providing a standby electrician for a charge of $35/day, or approximately $12,775 per year. If actual service is required the service call would be billed at normal policy rate schedules. MEC currently bills at $45 per hour including a 2-hour minimum service call. MEC is proposing a three-year maintenance agreement with the State Water Commission.

TABLE 6

MAX BOOSTER PUMP STATION ESTIMATED ANNUAL POWER COSTS FUTURE DEMANDS

Month	Service Charge	Demand Charge	Energy Charge	Est. Mo. Power Cost
January	$250	$2,628	$4,562	**$7,439**
February	$250	$2,666	$4,180	**$7,096**
March	$250	$2,784	$4,834	**$7,868**
April	$250	$3,192	$5,364	**$8,806**
May	$250	$3,671	$6,373	**$10,293**
June	$250	$6,225	$10,458	**$16,933**
July	$250	$6,407	$11,123	**$17,780**
August	$250	$6,407	$11,123	**$17,780**
September	$250	$3,944	$6,627	**$10,821**
October	$250	$3,068	$5,326	**$8,644**
November	$250	$2,706	$4,546	**$7,501**
December	$250	$2,588	$4,493	**$7,331**
TOTAL	$3000	$46,284	$79,009	**$128,293**

Appendix A

MWH

MEC
McLean Electric Cooperative, Inc.
Your Touchstone Energy® Partner
The power of human connections®

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P.O. Box 399
Garrison, ND 58540-0399

January 20, 2003

RECEIVED
JAN 22 2003
HOUSTON ENGINEERING
BISMARCK, ND

Kevin E. Martin, PE
Houston Engineering, Inc.
304 East Rosser Avenue, Suite 220
Bismarck, ND 58501-4012

Dear Mr. Martin,

McLean Electric Cooperative and Central Power Electric Cooperative have assembled the attached data to assist your development of the NAWS water project. Per our earlier discussions the variables in this project are very broad, but at least provide a framework.

Purchased power costs will be the long-term project driver. Currently, McLean Electric Cooperative is projecting purchased power costs to decline annually through approximately 2008 and begin to increase incrementally. Since the NAWS project does not have a definite start date McLean is only able to provide today's demand and energy costs. As of today the *"not to exceed"* rates are as follows:

Demand $10.00/kW (on CPEC's coincident)
Energy 20.00 mills/kWh

In addition to demand and energy costs, would be the required electrical infrastructure construction. Tom Meland of Central Power has provided various options for Houston Engineering to review. Below are some additional insights provided by Central Power.

> *Regarding required facility additions, we have identified several alternatives to provide service to the intake facility and the booster station. We have enclosed a one-line diagram of the proposed facility addition alternatives. The primary distinctions between the options include reliability, quality of service, and motor starting capabilities. We have included historic outage and momentary interruption (breaker operations) statistics for the existing facilities. In general, the 115kV alternatives provide the best performance for all considerations but at the expense of the highest capital cost. Although the project electrical characteristics, requirements, and specific locations are not very detailed at this time, we attempted to put together and enclosed our best opinion of probable costs for the various options based on two preliminary locations for the intake facility and three locations for the booster station. The estimates for the 41.6kV alternatives are based on the assumption we can serve this load from the 41.6kV without creating power quality problems for other loads. The line construction estimates should be considered very preliminary as no detailed routing effort has been made at this time. As you are aware, routing constraints and right-of-way costs could impact the transmission line cost*

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e-mail: info@mcleanelectric.com

significantly. We have based our estimates on the assumption that we would be required to furnish a single 41.6kV service at each location and that the NAWS project would furnish step-down transformation to other voltages.

Central would require the NAWS project to pay actual final construction costs. However, we would be willing to refine our estimates based on determination of project details. Because of internal cost considerations, Central Power would likely not require 100% up-front aid-to-construction for the 115kV options. The percentage would depend on actual load levels and facility costs.

Another consideration is that the 115kV options have the possibility of taking longer for required interconnection approval as the Western Area Power Administration can take up to 18 months under their interconnection guidelines. We will start this process at the earliest possible date to identify any technical issues.

As we have discussed earlier the NAWS project would also have the option of interruptible service under our load management program. This option would be beneficial to control demand charges on the project. Finally with a project this large, contractual agreements would be required prior to construction that outline repayment terms, rate calculations, and other administrative details that are pertinent to the service.

In conclusion, McLean Electric and Central Power are cooperative partners in delivering electric service to the NAWS project. It is our desire to provide Houston Engineering with the best information available to us at this time. As the project develops and timelines become clear we are ready, willing and able to proceed with the subsequent steps to complete the project.

Sincerely

Reginal Rudolph
General Manager

Attach:

Central Power Electric Cooperative, Inc.

Power Quality/Reliability Data
for
Northwest Area Water Supply

		1998			1999			2000			2001			2002		
		Total Interupts	Days	Perm. Outages	Total Interupts	Days	Perm. Outages	Total Interupts	Days	Perm. Outages	Total Interupts	Days	Perm. Outages	Total Interupts	Days	Perm. Outages
Garrison	1462	0	0		0	0		0	0	0	0	0	0	0	0	0
Garrison	1262	0	0		1	1		3	3	2	1	1	1	0	0	0
Mallard	5T9	0	0		0	0		2	2	2	1	1	1	0	0	0
Neal	225	26	10		15	10		12	9	0	4	4	0	28	14	6
Max	325	27	10		26	13		26	12	1	11	7	1	37	15	4
	335	22	13		10	7		25	25	0	7	7	0	22	13	0
	345	16	6		19	9		8	8	0	0	0	0	1	1	0
Underwood	625	22	13		53	25		8	4	0	12	6	2	11	8	1

Miscellaneous Notes:

[1] Permanent outage data not readily available prior to 2000.
[2] Total interruptions on line breakers include upstream devices except Max breakers which are fed from Garrison 1262-Mallard 5T9.
[3] Garrison 1262 - Mallard 5T9 are operated looped. There was a tornado south of Minot in 1999 and 2000.
[4] Neal 225 - Max 325 operated looped since 8/2001.
[5] Max 345 exposure reduced on 8/2002.

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Central Power Electric Cooperative, Inc.

APPENDIX A

Budgetary Cost Estimates
for
Northwest Area Water Supply

INTAKE NEAR SNAKE CREEK

		Cost ($1,000)
Option 1T - 115kV		
Construct Tap on 115kV line from Snake Creek Substation		$50
Construct 115-4.16kV, 3.75/5.25 MVA substation		$550
(3) 546/612 Amp Regulators, (1) ACR		
	Total	$600
Option 2T - 41.6kV OCB 345		
Tap 41.6kV line 345		$30
Construct 41.6-4.16kV, 3.75/5.25 MVA substation		$350
(3) 546/612 Amp Regulators, (1) ACR		
	Total	$380
Option 3T - 41.6kV OCB 345		
Tap 41.6kV line 345		$30
Construct 3 miles of 41.6kV		$240
Construct 41.6-4.16kV, 3.75/5.25 MVA substation		$350
(3) 546/612 Amp Regulators, (1) ACR		
	Total	$620

INTAKE STRAIGHT SOUTH OF GARRISON CORNER

		Cost ($1,000)
Option 1T - 115kV		
Construct 1.5 miles 115kV line from Snake Creek Substation		$180
Construct 115-4.16kV, 3.75/5.25 MVA substation		$550
(3) 546/612 Amp Regulators, (1) ACR		
	Total	$730
Option 2T - 41.6kV OCB 345		
Tap 41.6kV line 345		$30
Construct 1.5 miles of 41.6kV line		$120
Construct 41.6-4.16kV, 3.75/5.25 MVA substation		$350
(3) 546/612 Amp Regulators, (1) ACR		
	Total	$500
Option 3T - 41.6kV OCB 345		
Tap 41.6kV line 345		$30
Construct 2.5 miles of 41.6kV line		$200
Construct 41.6-4.16kV, 3.75/5.25 MVA substation		$350
(3) 546/612 Amp Regulators, (1) ACR		
	Total	$580

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Central Power Electric Cooperative, Inc.

Budgetary Cost Estimates
for
Northwest Area Water Supply

BOOSTER STATION ALONG HWY 83 AND 3 MILES SOUTH OF HWY 53

Option 1B - 115kV		
Tap Garrison-Max-Mallard 115kV line w/ (1) Vacuum Interrupter		$125
Construct 2 miles 115kV line from Tap to Booster Substation		$240
Construct 115-4.16kV, 3.75/5.25 MVA substation		$550
(3) 546/612 Amp Regulators, (1) ACR		
	Total	$915
Option 2B - 41.6kV OCB 325		
Tap 41.6kV line 325		$30
Construct 41.6-4.16kV, 3.75/5.25 MVA substation		$350
(3) 546/612 Amp Regulators, (1) ACR		
	Total	$380
Option 3B - 41.6kV OCB 345		
Tap 41.6kV line 345		$30
Construct 5 miles of 41.6kV line		$400
Construct 41.6-4.16kV, 3.75/5.25 MVA substation		$350
(3) 546/612 Amp Regulators, (1) ACR		
	Total	$780

BOOSTER STATION 0.5 MILES EAST OF HWY 83 ON HWY 53

Option 1B - 115kV		
Tap Garrison-Max-Mallard 115kV line w/ (1) Vacuum Interrupter		$125
Construct 1.5 miles 115kV line from Tap to Booster Substation		$180
Construct 115-4.16kV, 3.75/5.25 MVA substation		$550
(3) 546/612 Amp Regulators, (1) ACR		
	Total	$855
Option 2B - 41.6kV OCB 325		
Tap 41.6kV line 325		$30
Construct 41.6-4.16kV, 3.75/5.25 MVA substation		$350
(3) 546/612 Amp Regulators, (1) ACR		
	Total	$380
Option 3B - 41.6kV OCB 345		
Tap 41.6kV line 345		$30
Construct 7.5 miles of 41.6kV line		$600
Construct 41.6-4.16kV, 3.75/5.25 MVA substation		$350
(3) 546/612 Amp Regulators, (1) ACR		
	Total	$980

BOOSTER STATION ALONG HWY 83 AND 2 MILES NORTH OF HWY 53

Option 1B - 115kV		
Tap Garrison-Max-Mallard 115kV line w/ (1) Vacuum Interrupter		$125
Construct 2 miles 115kV line from Tap to Booster Substation		$240
Construct 115-4.16kV, 3.75/5.25 MVA substation		$550
(3) 546/612 Amp Regulators, (1) ACR		
	Total	$915
Option 2B - 41.6kV OCB 325		
Tap 41.6kV line 325		$30
Construct 41.6-4.16kV, 3.75/5.25 MVA substation		$350
(3) 546/612 Amp Regulators, (1) ACR		
	Total	$380
Option 3B - 41.6kV OCB 345		
Tap 41.6kV line 345		$30
Construct 9 miles of 41.6kV line		$720
Construct 41.6-4.16kV, 3.75/5.25 MVA substation		$350
(3) 546/612 Amp Regulators, (1) ACR		
	Total	$1,100

Appendix B

MWH

February 5, 2004

To: NAWS Engineering Group

Fr: Reg Rudolph

Re: 12.47 Cost Estimate

Although putting together this estimate has taken significantly longer than we expected, it isn't a voltage we work with so we asked our outside consulting engineer to help put the costs together.

McLean Electric Cooperative, Inc. has calculated the estimated cost of installation of two miles of 12.47 at $139,771.30 to include the following;

1. (1) 2500 KVA 3-phase pad-mounted transformer 12470GRDY7200 to 480Y/277V, dead front, loop feed, 600A 1-piece bushings, 10 hole spade secondary, taps, high-current bayonet fusing.
2. (1) VWE/Nova recloser
3. (32,500') 4/0 URD Power Cable, stranded aluminum conductor, 260 mil TRXLPE insulation, 1/3 copper neutral, jacketed
4. (5) Sectionalizing cabinets
5. (5) Grounding sleeves
6. (15) 3-way deadbreak junctions
7. (33) 15 KV 4/0 deadbreak elbows

The breakdown down of material to labor is; $116,831.30 material and $22,940.00 labor. It is assumed that metering will take place at the point of delivery from the 115 KV transmission level. If primary metering is required that would need to be figured in to this proposal.

The initial proposal of constructing 115 KV from the substation was at a cost of $240,000 so this will definitely be an advantage financially. Plus easement issues are simplified with the underground construction alternative.

If you have any questions regarding this correspondence please let me know at your earliest convenience.

Appendix C

MWH

Approved: January 1, 20XX
Effective:

McLEAN ELECTRIC COOPERATIVE, INC.

RATE CLASS XX

Availability:

The service is available to the Northwest Area Water Supply for substation service to the water pumping stations. Supplying electric service to another party is prohibited. Service is subject to the established rules and regulations of the Cooperative.

Type of Service:

Three phase, 60 hertz, at 115 kilovolts.

Monthly Rate:

Service Charge:	$250.00
Demand Charge:	
Maximum Demand	$10.79/KW
Energy Charge:	.025179/KWH
Base Charge:	$17,590.43

Billing Demand:

The Maximum Demand shall be the maximum kilowatt demand (subject to power factor adjustment) established by the customer for any interval of 30 consecutive minutes during the period for which the bill is rendered, as indicated or recorded by a demand meter.

Date

Greg DeBois, PE
MWH Global

Dear Mr. DeBois:

Thank you for your patience as McLean Electric has worked on the NAWS proposal. Included in this proposal is a breakdown of the capital expenditures and a draft rate class.

Based on a similar rate class that exists at the cooperative, McLean has determined that this format is a good working model to begin with. As discussed in earlier conversations, all proposals are "not to exceed" figures based on today's power costs and information known of the project.

When analyzing capital costs of this project, Options 1T and 1B were utilized for a project total of $1,515,000. Central Power has historically allowed for either a 100% contribution up front; or amortized the cost over ten years at 7% interest. For this assumption it is expected the NAWS project will finance 100% of the capital costs. Therefore, McLean Electric will add the amortization cost as a base charge to the bill. This charge will expire after the 120th payment.

Based on previous discussions it appears that 115 KV will provide the best service, however at a greater cost. McLean can offer its interruptible rate if the load can be controlled! In this case the cooperative needs to be able to positively control the load, this option can be discussed as we proceed.

Due to time frames required for interconnection agreements and designs to be worked out, it would be in all parties best interest to get the ball rolling. I have also enclosed a membership agreement to begin the formal process. The next step in a project is to enter into a contractual agreement that obligates McLean to the service, construction and rate formulation.

It is my hope this correspondence assists in your planning.

Sincerely,

Reginal R. Rudolph,
General Manager

RRR/raf

McLEAN ELECTRIC COOPERATIVE, INC.

RATE CLASS XX

POWER FACTOR

The consumer agrees to maintain unity power factor as nearly as practicable. The Seller reserves the right to measure such power factor at any time. Should such measurements indicate that the power factor is less than 90 percent, the demand for the billing purposes shall be the demand as indicated or recorded by the demand meter multiplied by 90 percent and divided by the percent power factor.

MINIMUM BILLING

The minimum monthly billing shall not be less than the Base Charge plus the Maximum Demand during the preceding 11 months multiplied by $1.10 per KW of demand or the amount stipulated in the Customer Service Agreement.

TAXES

The rates set forth are based on taxes as of 20XX; and the amount of any increase in existing or new taxes on the transmission, distribution, or sale of electricity allocable to sales hereunder shall be added to the rates as appropriate to be paid by the customer.

TERMS OF PAYMENT

The preceding rates are net, the gross rates being 5 percent higher. In the event the current monthly bill is not paid within ten days from the established monthly meter reading date the gross rates shall apply.