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November 15, 2017

Jesse Christianson
Systems Operations Specialist
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I met with Jesse Christianson at the Brookings – Deuel Rural Water System Office located along SD Hwy 28 three miles west of Toronto, SD. Jesse is a Systems Operations Specialist and is familiar with discussions with Otter Tail Power Company regarding water supply at the Astoria station. He provided a map of the area showing the sizes and locations of water lines located around the Astoria Station site. (that map is attached) He cautioned that size of pipe does not always indicate the amount of water flow available through that pipe. Flow restrictions and pressure loss are prevalent at this site. The line most likely to be utilized to connect to the Astoria Station, even if just for potable water for the office, would be the four-inch line located one and one-half miles north of the site. It was his opinion that this line could supply approximately 45 gallons per minute on a continuing basis.

We discussed the deep well that Otter Tail had dug at the site. He was not aware of any other wells in close proximity that would be affected by pumping from the deep aquifer. He was aware of the high mineral content of area water and stated that this is why most of the farms and residences in the area are connected to the rural water system.

Jesse also serves on the Astoria Volunteer Fire Department. He provided the name and telephone number of Jason Landmark, 605-690-0923, as Chief. He stated that they have a full complement of firefighters, are working toward a Class A rating, and would like to construct a new fire station in Astoria. We discussed ambulance service. Jesse stated that 911 is answered at Watertown and they often dispatch the Clear Lake Ambulance. Hendricks is much closer to the Astoria Station site and would probably be the preferred ambulance if available. Hendricks has only one ambulance so if it is busy Clear Lake would be the backup. I mentioned that Otter Tail, and their contractors, will probably host a meeting of emergency services providers prior to work commencing on the site. Jesse felt that this meeting would be extremely important to foster communication and coordination for emergency services during construction and operation of the Astoria Station.

Jesse also serves as Clerk of Scandinavia Township where the Astoria Station will be located. He strongly encouraged Otter Tail Power Company to re-construct the half mile of 482 Avenue from SD Hwy 28 north to the project site. This would provide the most direct access to the project during construction and operation. Scandinavia Township contracts with Deuel County for snow removal services. Jesse felt that the County, which clears the road to Astoria as a priority, could also clear this half mile of road at the same time assuring early snow removal for the site.



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November 15, 2017

Jamie Hintz
Deuel County Highway Superintendent
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At 1:30 PM I met with Deuel County Highway Superintendent Jamie Hintz in his office just north of Clear Lake. He was very aware of the Astoria Station project and drew some comparisons to the wind tower projects in southern Deuel County. The wind projects had resulted in damage to county roads and he had been diligent in getting reparations. Mr. Hintz strongly encouraged Ottertail to re-construct the half mile of 482 Avenue from SD Hwy 28 north to the site. This would allow access during construction directly from a state highway constructed to standards that would handle the loaded trucks present during project construction. Any other access to the site would be over county and township roads for a distance of two and one-half miles. These roads are not capable of handling the loads and would require upgrading, maintenance and repair that may come at a higher cost than a half mile of road construction. He was cognizant of the fact that much of the half mile of 482 Avenue is a slough that may require special permitting and a substantial amount of fill material to construct a proper access road.

In his opinion, Deuel County would not be interested in adding this to the county highway system as it would provide access only to the Ottertail Power Company generating station. However, he stated that Deuel County provides snow removal services for Scandinavia Township and, since they are in the area clearing the highway to Astoria, this section of township road could have priority snow removal.



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Corey Borg, Acting Sheriff
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I met with Corey Borg, Acting Sheriff of Deuel County, at 3 PM at his office on the first floor of the Deuel County Courthouse in Clear Lake, SD. He has only been in Deuel County for three years so he was not there when the Deer Creek Station was constructed by Basin Electric. He stated that the Sheriff's Office provides law enforcement services to all towns in Deuel County.

Acting Sheriff Borg suggested that a meeting of emergency service providers should be held before construction begins at the Astoria Station. Watertown is the 911 service provider for Deuel County. There is limited cell phone service in the area of the Astoria Station so a 911 call may be answered by Watertown, Brookings or Hendricks, MN. Brookings immediately transfers the call to Watertown so that is not a problem. With Hendricks it may be handled differently.

When Fire Departments are paged in the area of the Astoria Station Watertown 911 will dispatch both Toronto and Astoria each time.

The main complaint received by the Sheriff's office in the area is speeding through Toronto on SD Hwy 28 which is Main Street. Acting Sheriff Borg expects that the construction of the project may exacerbate the problem and his staff may spend additional time in the area.



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November 17, 2017

Marty Stanwick, Sheriff
Brookings County
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I met with Sheriff Stanwick at his office next to the Brookings County Courthouse in Brookings, SD at 10:30 AM. He was Sheriff during the construction of the Deer Creek Station and is familiar with what went on during that time.

Since Deer Creek has gone into operation, Basin Electric holds an annual emergency services meeting for all fire, ambulance and law enforcement agencies to keep them up to date on Deer Creek operations. Basin Electric has also been very involved with the emergency services community. They have made substantial donations for equipment such as AED units and fire department rescue equipment.

During construction, Deer Creek had a safety officer and a nurse on site. Sheriff Stanwick remembers only one medical call for service during that time at the Deer Creek Station site. There were complaints of speeding and dust on local gravel roads. His officers did spend time dealing with that and he personally addressed the construction crew at one time to try to limit the complaints.

Sheriff Stanwick does not anticipate any problems in Brookings County from the Astoria Station construction or operation. Since there is only one-half mile of township road with no houses along the road he expects that dust and speeding complaints will be minimal near the site. He expects no traffic problems in Brookings County. He does encourage Ottertail Power Company and their construction contractor to hold regular emergency services meetings to keep everyone cognizant on safety issues. The first meeting should be prior to construction startup.



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November 15, 2017

Jodie Theisen
Deuel Zoning Officer
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I met with Jodie Theisen, Deuel County Zoning Officer, at 2:30 PM in her office on the third floor of the Deuel County Courthouse. She was familiar with the Astoria Station Project and has discussed it with representatives of Ottertail Power Company.

Under Section 1102 of the Zoning Ordinance *Public and Private Utilities* are allowed as a special exception. To utilize this approach, Ottertail would have to apply to rezone the property to Commercial. If this property would be rezoned to Commercial, Ottertail could then apply for a special exception for a Private Utility.

An alternative to that procedure would be to change the Deuel County Zoning Ordinance to add a Special Exception for Public and Private Utilities to the Agriculture Zone. The Zoning Officer stated, that in her consultations with the County Attorney, she had been encouraged to recommend to Ottertail that they rezone the site to Commercial and request a Special Exception.



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Joan B. Sacrison
Executive Director
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605-210-0575 cell
605-874-8038 office

I met with Joan Sacrison, Executive Director of Deuel Area Development, Inc., at 4 PM in her office in the First Bank and Trust Building on SD Hwy 28 in Toronto, SD. We discussed workforce and housing availability in Deuel County. She noted that SD Partners in Clear Lake had been down in employees, but was now ramping back up.

She was very aware of the Astoria Station project. She and her group were very sure that it would provide a short term economic boost to the area during construction and that it would, during operation, provide property tax revenues to Scandinavia Township and Deuel County along with job opportunities for three to five individuals who may already live in the area or may move in bringing families.

Deuel Area Development has developed Wildlife Acres on the west side of Clear Lake. They have fourteen single family housing lots and four multi-family lots available with all utilities and a paved, curbed and guttered street already in place. These lots are available at a reasonable price should any of the operations employees choose to construct a home in Clear Lake.

Mrs. Sacrison gave me the name of the Clear Lake Finance Officer (Ellen Schmahl) and told me that she could add information about temporary housing and travel trailer sites.



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November 15, 2017

Ellen Schmahl
Finance Officer
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I met with Ellen Schmahl at 4:30 in her office in the Municipal Building in Clear Lake. She was very aware of the Astoria Station Project and stated that the City had forwarded a resolution of support earlier this year.

I asked her about short-term housing and long-term travel trailer camping sites. She stated that the City has developed six camping spots on Clear Lake that may be occupied by long term travel trailers. Also, the City has allowed a mobile home park owned by Allen Austreim (Shady Maple Trailer Park -- CARR Properties of Brookings) to rent out spots for travel trailers such as those that will probably be used by workers coming into the county for work on the Astoria Station Project. She also mentioned that Buffalo Ridge at Gary, SD has travel trailer sites and hotel rooms that may be available to construction workers.

She also noted that there is one motel in Clear Lake and she is aware that the motel has made rental agreements with construction employees in the past.



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November 14, 2017

Banner Associates, Inc.
Engineers and Architects
409 22nd Ave. S.
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Kristin Bisgard, PE

I met with Kristin Bisgard at 9 AM at her office. She had been the Engineer of Record for the water supply investigation requested by Ottertail Power Company. An Executive Summary of the report was submitted by Ottertail Power Company in Appendix C to the SD PUC.

Kristen explained that Banner did a search for water in the area with some test wells. Finally, on the southeast corner of the Astoria Station site, a well was dug to a depth of 679 feet. The well was test pumped at 65 gallons per minute and reached a static water elevation of 270 feet below grade.

The water quality was quite poor. It will require significant treatment for use in the generating plant and for use as a domestic potable water supply.



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EXECUTIVE SUMMARY

TO	Otter Tail Power Company	
DATE	September 6 th , 2017	
SUBJECT	Executive Summary	
PROJECT	Production Well – Astoria Site	BAI No. 22392.00.30

Otter Tail Power Company is an investor-owned electric utility based out of Fergus Falls, Minnesota. Otter Tail Power is proposing to develop a natural gas-fired energy conversion facility in the vicinity of Astoria, South Dakota. Property has been secured for the facility and the intent was to install a production well on the property to provide water for the process and for 3 to 5 plant employees. On May 12, 2017 the SD DENR authorized Their Well to install a test well on the property. This test well is now proposed to be used as a production well.

A site was selected in the southeast corner of the property for Their to drill a well. Their maintained drilling logs throughout the drilling process and the aquifer formation was determined by collecting samples throughout. This log is included in Appendix A of this report and is summarized in the following table.



Table 1: Test Bore

Geological Material	From	To	Geological Material	From	To
Top Soil	0	3	Clay	418	436
Clay	3	51	Sandy Clay	436	440
Sand Med	51	52	Clay w/ Sand Layers	440	451
Clay	52	58	Sand w/ Clay Layers	451	461
Sand Med	58	61	Clay	461	465
Clay	61	64	Sand	465	467
Gravel Course Med	64	67	Clay	467	471
Rock	67	73	Sand w/ Clay Layers	471	473
Clay	73	103	Clay	473	506
Gravel	103	106	Clay w/ Sand	506	526
Sandy Clay	106	177	Shale	526	556
Clay	177	186	Clay	556	561
Clay/Sand Layers	186	192	Shale	561	572
Sand Med	192	196	Clay	572	615
Clay/Few Sand	196	251	Sand	615	617
Sand Med	251	255	Clay	617	618
Clay/Sandy Soft	255	296	Sand	618	619
Sand	296	298	Clay	619	621
Clay	298	307	Sand	621	623
Sand/Rock	307	315	Clay	623	625
Clay/Sandy	315	336	Sandstone w/ Sand	625	646
Gravel	336	340	Sand Med/Fine	646	672
Clay w/ Sand &	340	416	Clay	672	678
Gravel Fine	416	418	Sandstone	678	679

As indicated on the bore log, a good layer of sand/gravel was found from 625 feet to 678 feet, providing 53 feet of good water bearing material. They reamed out the bore hole and installed a 5-inch casing, including 60 feet of well screen, and gravel pack. A cross section of the Otter Tail Power production well is illustrated in Figure 3.

After the casing, screen, and gravel pack were installed, They proceeded to develop the well. They developed the well over a 12-hour period. Upon completion of the well development, They installed a temporary pump so the well could be test pumped to determine drawdown and recharge characteristics



of the aquifer. The well was test pumped for eight (8) hours at 65 gpm and the drawdown and recharge information is summarized in Table 2. The static water elevation was 269.71 feet below grade.

Table 2: Test Pumping

PUMPING TEST					RECOVERY			
Time	Time (min)	Pumping Level	Draw Down	GPM	Time	Time (min)	Water Level	Draw Down
7:31 AM	1	282.71	-13.0	65	3:35 PM	5	270.71	-1
7:35 AM	5	282	-12.29	65	3:45 PM	15	270.33	-0.62
7:40 AM	10	282.41	-12.7	65	5:30 PM	120	270	-0.29
7:45 AM	15	282.58	-12.87	65				
7:50 AM	20	252.62	-12.91	65				
7:55 AM	25	282.62	-12.91	65				
8:00 AM	30	282.66	-12.95	65				
8:15 AM	45	282.91	-13.2	65				
8:30 AM	60	283	-13.29	65				
8:45 AM	75	283	-13.29	65				
9:00 AM	90	283.1	-13.39	65				
9:30 AM	120	283.21	-13.5	65				
10:00 AM	150	283.29	-13.58	65				
10:30 AM	180	283.41	-13.7	65				
11:00 AM	210	283.5	-13.79	65				
11:30 AM	240	283.45	-13.74	65				
12:00 PM	270	283.54	-13.83	65				
12:30 PM	300	283.62	-13.91	65				
1:00 PM	330	283.66	-13.95	65				
1:30 PM	360	283.75	-14.04	65				
2:00 PM	390	283.79	-14.08	65				
2:30 PM	420	283.83	-14.12	65				
3:00 PM	450	283.9	-14.19	65				
3:30 PM	480	283.91	-14.2	65				



As shown in the table, the water level immediately dropped 13 feet upon starting the test pump, but then stabilized to within approximately an additional one foot over the course of the 8-hour pumping period. The stabilization of the water level indicates the aquifer is recharging to maintain the pumping needs. In addition, the aquifer quickly recovered once the pump was turned off, returning to within one foot of static within 5 minutes.

Water samples were grabbed while test pumping and delivered to the Water & Environmental Engineering Research Center at SDSU for analysis. The water quality characteristics are shown in Table 3.



Table 3: Water Quality Analysis

Water Quality Characteristic	Otter Tail	Maximum Contaminant Level	
	Well	Primary Stds ⁺	Secondary Stds ⁺⁺
pH*	7.309	-	-
Temperature (°C)*	14.1	-	-
Alkalinity (mg/l as CaCO ₃)	475	-	-
Nitrate (mg/l as N)	0.153	10	-
Total Suspended Solids (mg/l)	13	-	-
Total Dissolved Solids (mg/l)	1689	-	500
Volatile Suspended Solids (mg/l)	12	-	-
Conductivity (uS/cm)	2270	-	-
E. Coli (mpn/100 ml)	<1	0	-
Chloride (mg/l as Cl)	8.8	-	250
Sulfate (as SO ₄)	1216	-	250
Total Hardness (mg/l as CaCO ₃)	723	-	-
Calcium Hardness (mg/l as CaCO ₃)	415	-	-
Aluminum (mg/l)	not present	-	0.05 -0.2
Barium (mg/l)	0.010	2	-
Boron (mg/l)	1.35	-	-
Cadmium (mg/l)	not present	0.005	-
Calcium (mg/l)	377.1	-	-
Chromium (mg/l)	not present	0.1	-
Copper (mg/l)	not present	1.3	-
Iron (mg/l)	2.51	-	0.3
Lead (mg/l)	not present	0.015	-
Manganese (mg/l)	2.28	-	0.05



Table 3: Water Quality Analysis (continued)

Water Quality Characteristic	Otter Tail	Maximum Contaminant Level	
	Well	Primary Stds ⁺	Secondary Stds ⁺⁺
Magnesium (mg/l)	200	-	-
Molybdenum (mg/l)	not present	-	-
Nickel (mg/l)	not present	-	-
Phosphorus (mg/l)	0.486	-	-
Potassium (mg/l)	36.5	-	-
Sodium (mg/l)	745	-	-
Silver (mg/l)	not present	-	0.10
Vanadium (mg/l)	0.016239	-	-
Zinc (mg/l)	0.000612	-	5
Tin (mg/l)	0.152	-	-
Strontium (mg/l)	3.40	-	-
Thallium (mg/l)	1.08	0.002	-
Cobalt (mg/l)	0.30	-	-
Lithium (mg/l)	0.02	-	-

*pH and temperature were completed on-site by a Banner staff engineer.

*National Primary Drinking Water Regulations (NPDWR) are legally enforceable primary standards and treatment techniques that apply to public water systems. Primary standards and treatment techniques protect public health by limiting the levels of contaminants in drinking water by listing a maximum contaminant level (MCL).

**National Secondary Drinking Water Regulations (NSDWR) are non-enforceable guidelines regulating contaminants that may cause cosmetic effects (such as skin or tooth discoloration) or aesthetic effects (such as taste, odor, or color) in drinking water. EPA recommends secondary standards to water systems but does not require systems to comply with the standard. However, states may choose to adopt them as enforceable standards.

PREPARED BY Kristin Bisgard, P.E. – Project Manager



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November 27, 2017

William Swanson, PE
Astoria Station Project Manager
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I met Bill Swanson at 6 PM at the Toronto school before the SD PUC public hearing. We discussed the draft report that had been sent by email. We also discussed the process for getting the LRC approval for the Final Report.

Bill and Gary Jaeger discussed how to get final approval from the LRC. They determined that the Consultant should finalize the report and send it out for review by the LRC for comment. When any comments received are incorporated into the report we will circulate the signature page for each member to sign. Then, the Consultant will submit the Final Report to the SD PUC and to Ottertail Power Company for their publication as necessary.



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November 27, 2017

Gary Jaeger
Chairperson
Deuel County Commission
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Clear Lake, SD 57226

Gary Jaeger attended the SD PUC public hearing in Toronto. Gary, Bill Swanson and I had a long discussion about the Astoria Station project. He had reviewed the draft report sent out by email and agreed with the findings. He and Mr. Swanson planned to meet in the next few weeks with the township and county to discuss how to get the half mile of 482nd Avenue re-constructed.

Gary signed the Consultant services contract and I gave a copy to Mr. Swanson for his records. Mr. Jaeger directed me to complete the report and send it out for a final review by the LRC. Once reviewed, we will get signatures from the LRC members and the Consultant will submit the report to the PUC by PDF. Mr. Swanson will make necessary printed copies as he feels necessary.



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November 27, 2017

David Iverson
President
Deubrook School District 05-6
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White, SD 57276

David Iverson attended the SD PUC public hearing held at Toronto. He and I discussed the draft report that had been sent out by email. He felt that the findings were consistent with his thoughts on the project. He knows that the taxes paid will not directly benefit the school district. However, he feels that the area will be greatly benefited during construction and operation of the Astoria Station. It was his thought that 482nd Avenue should be the route to the site and that Otter Tail Power should work out an agreement with Scandinavia Township to get the road re-constructed at the expense of this project.



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November 27, 2017

Brad Knutson
Mayor
Town of Toronto
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Brad Knutson attended the SD PUC hearing at Toronto but was only able to stay for a short time as he had to attend the Toronto City Council Meeting to be held at the same time. He stated that he had reviewed the draft report that had been sent by email and concurred in the findings. He suggested that the consultant go ahead and complete the report with the findings and send it out to the LRC for a final review.