

WATER PERMIT NO. 3427A-3

Name of Applicant: City of Aberdeen

Address: 123 S Lincoln, Aberdeen SD 57401

Phone: 605 626-7017

Amount of Water Claimed:

Total Acres: na

Source of Water Supply: Elm Aquifer

Water to be used for: future use - municipal

County: Brown

Type of Waste Disposal System:

Location: 5 miles northeast of Aberdeen

PRIORITY

Date Received: 8-4-2003

Application/License Fee: \$50

Corrected Application Received:

Period of Annual Use: January 1 – December 31

Remarks: increase the area reserved for future use by the City

Future Use Area: S ½ Sec 4; S ½ NW ¼ Sec 5; N ½
Sec 6; Sec 8; E ½ Sec 9; W ½ Sec 15 and NE ¼
Sec 16; all in T124N-R63W

Land to be Irrigated: NA

Depth of Well:

Well Driller :

Remarks:

Type of Map: plat

Prepared by: David C Odens

Reviewed and the Number Assigned on: 8-4-2003

By: Karen Schlaak

Notice of Hearing - date to intervene: _____

(type or print)

(office use only)

No. 3427A-3 Hydrologic Unit 10160005
Basin James River
Newspaper American News Aberdeen

**WATER RIGHTS
PROGRAM**

Check use(s) of water:

Description of amendment/correction: (i.e. change diversion point(s), add diversion point(s), change use, etc.) Add Section 8,
T124N, R63W to Permit No. 3427-3.

Com. Exp. 3/28/06

SOUTH DAKOTA
FUTURE USE PERMIT NO. 3427A-3

Date of first receipt of application August 4, 2003.

The Chief Engineer, on behalf of the Water Management Board, issues Future Use Permit No. 3427A-3 to City of Aberdeen, 123 S Lincoln, Aberdeen SD 57401 subject to the following limitations, conditions and qualifications:

1. Future Use Permit No. 3427A-3 amends Future Use Permit No. 3427-3 by expanding the area reserved for future use. Permit No. 3427-3 reserves 4,344 acre-feet annually from the Elm Aquifer located in the S ½ Section 4; S ½ and NW ¼ Section 5; N ½ Section 6; NE ¼ Section 8; E ½ Section 9; W ½ Section 15 and NE ¼ Section 16; all in T124N-R63W. This permit authorizes including all of Section 8-T124N-R63W to the future use area with no increase in the amount of water reserved for future use by No. 3427-3.
2. The water appropriated shall be used for the purpose of municipal use and may not exceed the amount of water needed for beneficial use.
3. The water is to be used during the following described annual period: January 1 – December 31.
4. The date of approval of Permit No. 3427A-3 is October 27, 2003.
5. The date from which applicant may claim right is December 30, 1976 (established by No. 3427-3).
6. Water rights obtained in compliance with the laws of the State of South Dakota may not be unlawfully impaired by this appropriation.

QUALIFICATIONS

1. Permit Nos. 3427-3 and 3427A-3 reserves 4,344 acre feet of water annually.
2. That Future Use Permit Nos. 3427-3 and 3427A-3 are approved with the stipulation that the Permit to appropriate water is subject to review by the Water Management Board as to accomplishment thereunder upon expiration of seven (7) years.
3. At such time as definite plans are made to construct works and put the water reserved by this permit to beneficial use, specific application for all or any part of the reserved water must be submitted prior to construction of facilities pursuant to SDCL 46-5-38.1.
4. This Permit is approved for groundwater from the Elm Aquifer.

WATER MANAGEMENT BOARD

By: Garland Erbele
Garland Erbele, Chief Engineer
Water Rights Program
Department of Environment and Natural Resources

DEC 10 2003
date



RECEIPT

WATER RIGHTS PROGRAM

South Dakota Department of Environment and Natural Resources

Date August 4, 2003

RECEIVED OF City of Aberdeen, 123 S Lincoln St., Aberdeen SD 57401-4215

The following amount in fees for services rendered as provided for by law:

Fee for Application for Permit No. <u>34274-3</u> to Appropriate Water, to construct and to put water to beneficial use	50	00
Fee for Application for Permit No. _____ to Appropriate Water for Future use		
Fee to retain Future Use Permit No. _____ after period of seven years.		
Fee for Inspecting Constructed Works, confirming beneficial use and issuing Water License No. _____		
Fee for Filing Transfer Form _____		
Fee for _____		
Fee for Issuing New Well Driller's License No. _____ for C.Y. _____		
Fee for Renewal of Well Driller's License No. _____ for C.Y. _____		
Fee for Issuing Well Pump Installer's License No. _____ for C.Y. _____		
Fee for Renewal of Well Pump Installer's License No. _____ for C.Y. _____		
(Any Other Work Provided by Law)	TOTAL	50.00

No.

00005

By

Darlene Ebel
Chief Engineer
gm

FACILITY PLAN

**ABERDEEN WATER SUPPLY AND
TREATMENT IMPROVEMENTS - 2003
ABERDEEN, SOUTH DAKOTA**

Prepared For

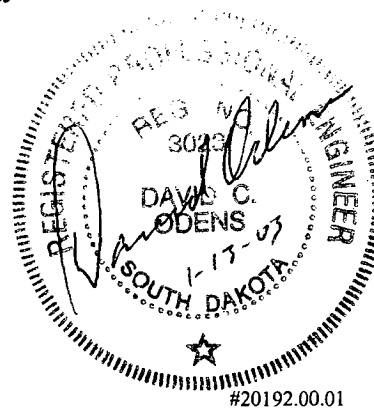
CITY OF ABERDEEN

Prepared By

BANNER ASSOCIATES, INC.

*Consulting Engineers and Architects
Brookings, South Dakota*

JANUARY, 2003



ABERDEEN WATER SUPPLY AND
TREATMENT IMPROVEMENTS - 2003
FACILITY PLAN

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SECTION 1: INTRODUCTION, AUTHORIZATION, PURPOSE AND ORGANIZATION

1.1 INTRODUCTION

The Aberdeen water supply system is a public water system located in Brown County, South Dakota. The water treatment plant is located on the Elm River approximately seven miles north of the City of Aberdeen near Ordway, South Dakota. This system has been in operation at the current location since 1934. As the City has grown, facilities and equipment have aged, regulations have changed, and improvements have become necessary at the treatment plant. In January 2001 the City of Aberdeen accepted a preliminary engineering report outlining the improvements to be included in Phase 3 of a multi-phase project. Specific areas to be addressed in the Phase 3 improvements are:

- Disinfection, including meeting appropriate chlorine contact times,
- Taste and odor control,
- Hydraulics throughout the water treatment facilities,
- Process facilities condition and operational capabilities, and
- Control systems for various pieces of equipment as well as overall treatment plant control and communications with remote sites.

Each of these areas of improvements will be addressed in this facility plan.

1.2 AUTHORIZATION

This study was authorized under an engineering services agreement between Banner Associates, Inc. and the Aberdeen City Commission.

1.3 PURPOSE

The purpose of this report is to:

- Document the City of Aberdeen's need for improvements;
- Identify alternatives and scope of improvements to be considered;
- Identify the impact of a "No-action" alternative;
- Present an estimate of the probable costs for those improvements;
- Provide an implementation plan for the design and construction of those improvements; and

- Provide an Environmental Review of the proposed project suitable for use by the SD Department of Environment and Natural Resources for preparation of an Environmental Assessment.

1.4 ORGANIZATION OF THE REPORT

This report is organized into a total of four sections. The topics covered in each of the sections are summarized as follows:

SECTION 1 INTRODUCTION, AUTHORIZATION, PURPOSE, AND
ORGANIZATION

SECTION 2 SUMMARY OF PRESENT CONDITIONS

SECTION 3 DESCRIPTION OF ALTERNATIVES CONSIDERED

SECTION 4 ENVIRONMENTAL ASSESSMENT

SECTION 5 IMPLEMENTATION PLAN AND SCHEDULE

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SECTION 2: SUMMARY OF PRESENT CONDITIONS

2.1 SUMMARY OF CURRENT AND PROJECTED WATER DEMANDS

2.1.1 Summary of Water Demands and Pumping Records: The pumping records provided by the Aberdeen Water Treatment Facilities and the water billing records provided by the Municipal Finance Office were used as a basis for the water demand projections for the Aberdeen water supply system. The raw water pumping records used represent data for 1988, 1994, 1999, 2000 and 2001. In 1999 the average daily flow was 3.05 MGD, which is lower than the data obtained for the years 1988 through 1994. The lower values for 1999-2001 could be the result of above average rainfall in those years. Because the values obtained from the 1995 Aberdeen Water System Study are probably more representative of normal year conditions, those values will be used for this report.

Table 2.1: Summary of Pumping Records¹

Year	Annual Average Raw Water Flow (MGD)	Maximum Monthly Raw Water Flow (MGD)	Maximum Daily Raw Water Flow (MGD)
1988	4.0	6.7	9.4
1994	3.2	6.2	8.0
1999	3.1	4.5	8.9
2000	2.8	4.2	6.5
2001	3.0	5.0	6.5

Water sales records maintained by the City of Aberdeen provide data indicating monthly water use by commercial accounts and quarterly water use by residential accounts. A summary of the water sales by billing account category is presented in Table 2.2: Summary of Water Sales Records. These records were reviewed to determine what portion of the total water demand is used by each category of billing account.

¹ *Aberdeen Water System Study*. Banner Associates, Inc. (BAI#7716). November, 1995.

Table 2.2: Summary of Water Sales Records¹

Year	1990	1991	1992	1993	1994	1999	2000	2001
Average Day Sales – MGD								
Residential	1.753	1.746	1.794	1.601	1.835			
Commercial	0.586	0.608	0.609	0.596	0.652			
Total	2.339	2.354	2.403	2.197	2.487	2.492	2.581	2.627
Maximum Qtr. Sales – MGD								
Residential	2.26	2.22	2.13	1.74	2.29			
Commercial	0.74	0.84	0.69	0.71	0.82			
Total	3.00	3.06	2.82	2.45	3.11			

In addition to the regular billing accounts, the Water Meter Department maintains records on water used by contractors, city parks and recreation facilities, municipal wastewater treatment facilities, and miscellaneous uses. The records for these uses in 1994, 1999, 2000, and 2001 are summarized in Table 2.3: Summary of Water Uses. The records maintained by the Water Meter Department permit a calculation of metered sales, metered use by accounts not billed, and unaccounted for water demands.

Table 2.3: Summary of Water Uses

Category of Use	1994	1999	2000	2001
Metered Sales Total (Res. & Comm) – gallons	875,988,724	909,553,527	941,954,132	958,994,759
Metered Water Use by City – gallons	46,410,850	45,656,590	61,929,152	70,698,520
Un-metered Water Use by City (Est.) – gallons	14,584,864	44,613,441	40,810,785	48,067,251
“Unaccounted For” Water – gallons	234,960,562	29,532,442	9,525,931	35,209,470
TOTAL WATER USE – gallons	1,171,946,994	1,029,356,000	1,054,220,000	1,112,970,000
Annual Average Day Use – MGD	3,210,814	2,820,153	2,888,274	3,049,233
Percent “Unaccounted For” Water	20%	2.9%	0.9%	3.2%

The data presented indicates the difference between average water production and metered water sales has been greatly reduced, partially due to better metering as

the water leaves the water treatment plant. The data indicates a reduction from 20% "unaccounted for" water to less than 5% "unaccounted for" water. This improvement can be attributed to a number of factors including:

- Reduction of Metering error in the raw water production meter system,
- Reduction Error in Metering of metered water sales,
- Leak detection and repair program to minimize water losses due to leakage at reservoirs and pump stations,
- Metering of water used by the City for various municipal uses, and
- Minimizing water losses due to leakage in the distribution system through leak detection and main replacement programs.

2.1.2 Projections of Future Water Demands: The projected population for the City of Aberdeen is presented in Table 2.4: Population Projections.

Table 2.4: Population Projections

Year	Population Records	Population Projection,
1920	14,737	
1930	16,465	
1940	17,015	
1950	21,051	
1960	23,073	
1970	26,476	
1980	25,956	
1990	24,927	
2000	24,658	
2010		26,000
2020		27,100
2030		28,400

Three methods were used for to determine the population projections for Aberdeen. The first method is a Graphical Method which assumes a straight rate of growth from the first recorded census data point to the most recent data point and assumes

that this growth rate will continue until 2030. The second method is Arithmetic Progression which places a best fit line through the data points, which are the percent increase from each normal census year. This line is then used to predict the percent of change in the population for each decade. The third method is geometric progression which places a line of best fit to data based off of historical census data using a compound interest equation.

Probable future water demands were evaluated on the basis of population projections. The projected water production rates required to meet the needs are based on the current water production rates required to meet the needs of the City. A summary of the projections is provided in Table 2.5: Projections of Future Water Demands.

Table 2.5: Projections of Future Water Demands

	1999	2000	2010	2020	2030
Population	24,685	24,658	26000	27,100	28,400
Average Water Sales (MGD)	2.49	2.58	2.82	2.95	3.09
Metered City Use (MGD)	0.13	0.17	0.17	0.18	0.19
Un-Metered City Use (est. – MGD)	0.12	0.11	0.07	0.07	0.07
“Unaccounted For” Water (MGD)	0.08	0.03	0.07	0.08	0.08
Average Day Use (MGD)	2.82	2.89	3.13	3.28	3.43
Maximum Month Production (MGD)*	4.7	4.8	5.2	5.5	5.7
Maximum Day Production (MGD)**	8.9	8.4	9.1	9.6	10.0
Treatment Plant Capacity Required (MGD)	9.8	9.3	10.0	10.5	11.0

*Future Maximum Month Production was calculated using a multiplier of 1.67 between average day use and maximum month production (the maximum for 1999,2000,2001).

**Future Maximum Day Production was calculated using a multiplier of 2.92 between average day use and maximum day production (the maximum for 1999,2000,2001).

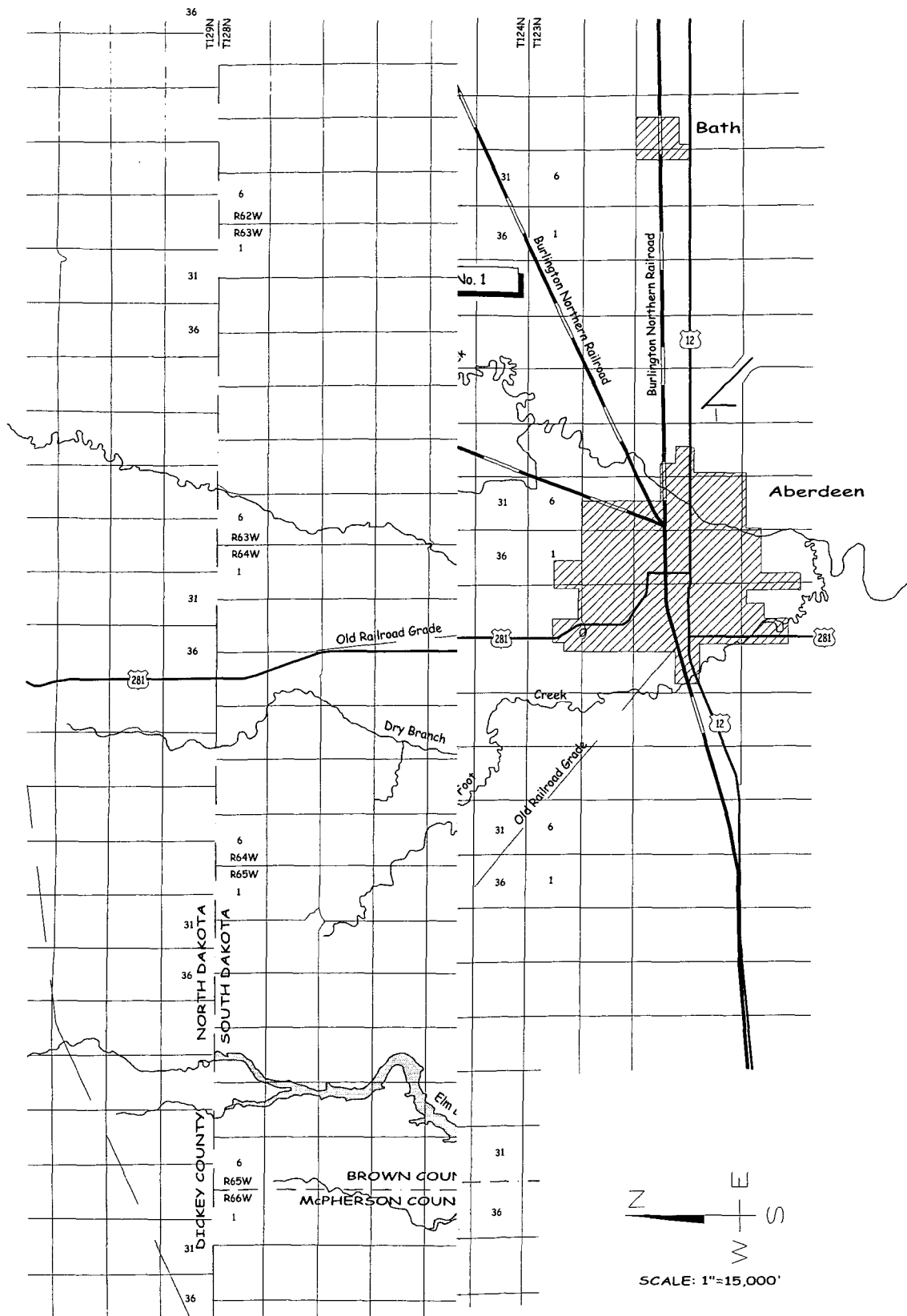
Historical trends of the data provided indicate water demands in the City of Aberdeen are likely to increase over the next twenty years. Population declines in the last two census periods will be reversed if the City is successful in attracting some additional industrial and commercial accounts. The proposed design plant capacity of 11.0 MGD would allow for a population of approximately 28,400 and a modest growth in commercial water use assuming that the flow per capita would remain similar to the current demands.

2.2 SUMMARY OF WATER SOURCES

The City of Aberdeen Water Treatment Facilities obtains the majority of its raw water from the Elm River and its tributaries. The surface water supply system consists of a series of five (5) dams located on the Elm River and one (1) on Willow Creek (a tributary to the Elm River). These dams and approximate locations are shown on Figure 2.1: Location Map. All of these dams were built in the 1930's. Dam Nos. 1 through 5 are ogee crest concrete dams with a crest width of 100 feet. Willow Creek Dam and Elm Lake Dam are both earthen dams with concrete chute spillways. Dam No. 3 (not shown) failed and is no longer in service.

The plant also treats raw water from the Eyestone gravel pit and well. The locations of these sources are shown on Figure 2.2: Eyestone Well Field and Transmission Piping Map. The Eyestone Well Field consists of one well on the north side of the Elm River and a pumphouse containing three raw water pumps on the south side. This raw water source is used in the spring when runoff is occurring and the turbidity in the Elm River is high. It can also be used in the winter when warmer water is necessary for use in the water plant.

The City of Aberdeen holds both appropriated rights and future use rights to water resources in the Aberdeen area. Appropriated rights are those water rights which the City is currently using as their water supply. Future use rights are rights the City holds to water supplies that have not yet been developed. These rights are contingent on development of a means to pump the water and availability of water in the natural drainage basin. A summary of the water rights currently held by the City of Aberdeen is presented in Table 2.6: Summary of Appropriated Water Rights and Table 2.7: Summary of Future Water Rights.

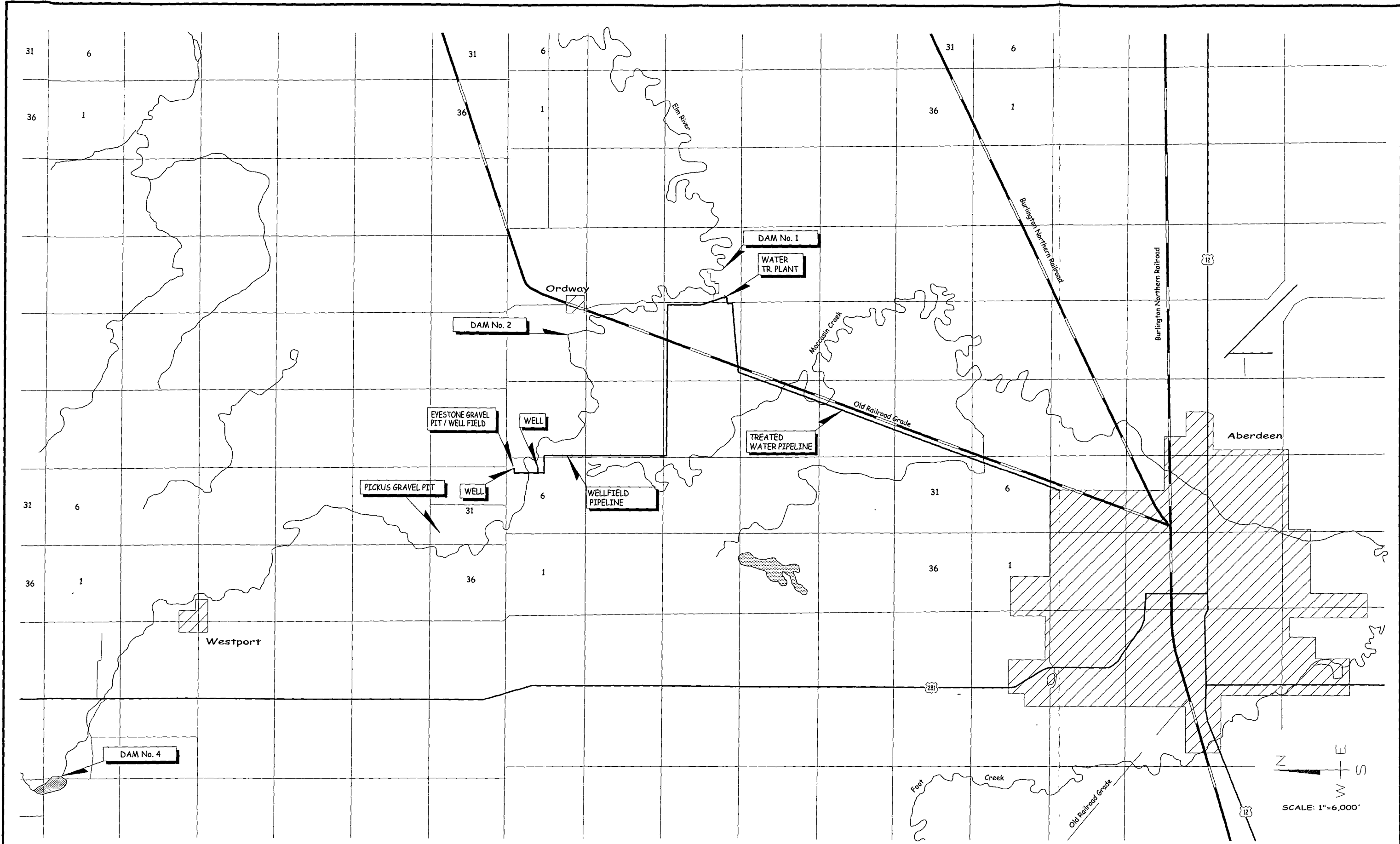


DRAWN BY: R.A.R.	REVIEWED _____ DATE: _____ FOR _____
DESIGNED BY: K.L.B.	REVIEWED _____ DATE: _____ FOR BANNER ASSOCIATES, INC.
CHECKED BY: D.G.O.	

Apply & Treatment Improvements
Aberdeen South Dakota
UTILITY PLAN
BANNER ASSOCIATES, INC.
409 22nd Ave.
LOCATION MAP

SCALE: None	JOB NO: 20192.00.01	DATE: Jan.03
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Figure No. 2.1



DRAWN BY: R.A.R.
DESIGNED BY: K.L.B.
CHECKED BY: D.C.O.

REVIEWED _____ FOR _____
DATE: _____

REVIEWED _____ FOR BANNER ASSOCIATES, INC.
DATE: _____

BANNER
BANNER ASSOCIATES, INC. • CONSULTING ENGINEERS & ARCHITECTS
409 22nd Av S • P.O. Box 298 - Brookings, SD 57006 • (605)692-6342

REVISION	DATE	DESCRIPTION	BY	CK'D

Aberdeen Water Supply & Treatment Improvements
Aberdeen South Dakota
FACILITY PLAN
EYESTONE WELL FIELD & TRANSMISSION PIPING MAP

SCALE: None
JOB NO: 20192.00.01
DATE: Jan.03

Figure No. 2.2

Table 2.6: Summary of Appropriated Water Rights

Permit No.	3009-3		5476-3	5571-3	TOTAL
Amount Reserved					
CFS	12	5	2.22	12.7	31.92
MG/yr	2,830	1,180	525	2,996	7,531
MGD	7.75	3.23	1.43	8.20	20.6
Description of Facility	Surface Water Intake at Plant	Well #1 for GW along Elm River	Well #2	Elm River Intake	
Priority Date	1933,1937,1957, 1974 & 1976		May, 1956	Various ¹	
Comments	Consolidation of 5 permits, consolidated permit dated Aug., 1976			Appropriates water held by Future Use #3428-3	

NOTE: 1 - Priority date for water right depends on which reservoir water is released.

Table 2.7: Summary of Future Use Water Rights

Permit No.	192-3		3427-3		3428-3		TOTALS	
	Orig.	Remain.	Orig.	Remain.	Orig.	Remain.	Orig.	Remain.
Amount Reserved								
Ac-Ft/Yr ¹	4,778	3,823	4,344	4,344	10,426	0	19,548	8,167
MG/yr	1,557	1,245	1,415	1,415	3,397	0	6,369	2,660
MGD (ave)	4.27	3.41	3.88	3.88	9.31	0	17.46	7.29
Description of Facility	Groundwater in Pickus and Eyestone Pits		Groundwater adjacent Elm River		Permit to use impounded water at Dam #5			
Priority Date	May, 1956		Dec., 1976		Dec., 1976			
Comments	2.22 cfs appropriated by Permit #5476-3				Appropriated by Permit #5571-3			

NOTE: 1 - Acre-feet of water reserved calculated as 60% of cfs rating of original permit.

The City of Aberdeen has appropriated water rights in excess of 20 MGD. The water rights are contingent on availability of water in the impoundments and aquifer from which the right has been granted. The present water rights appear to be sufficient to meet the projected water demands of the City assuming the impoundments contain the water necessary to fulfill the capacity allotted to the treatment plant.

Water Right 3427-3 is a future use water right for the groundwater in the alluvial aquifer associated with the Elm River and is a future use right available for appropriation by the City of Aberdeen. This future use right can be converted to an appropriation at the time the city develops wells in the alluvial aquifer adjacent to the Elm River.

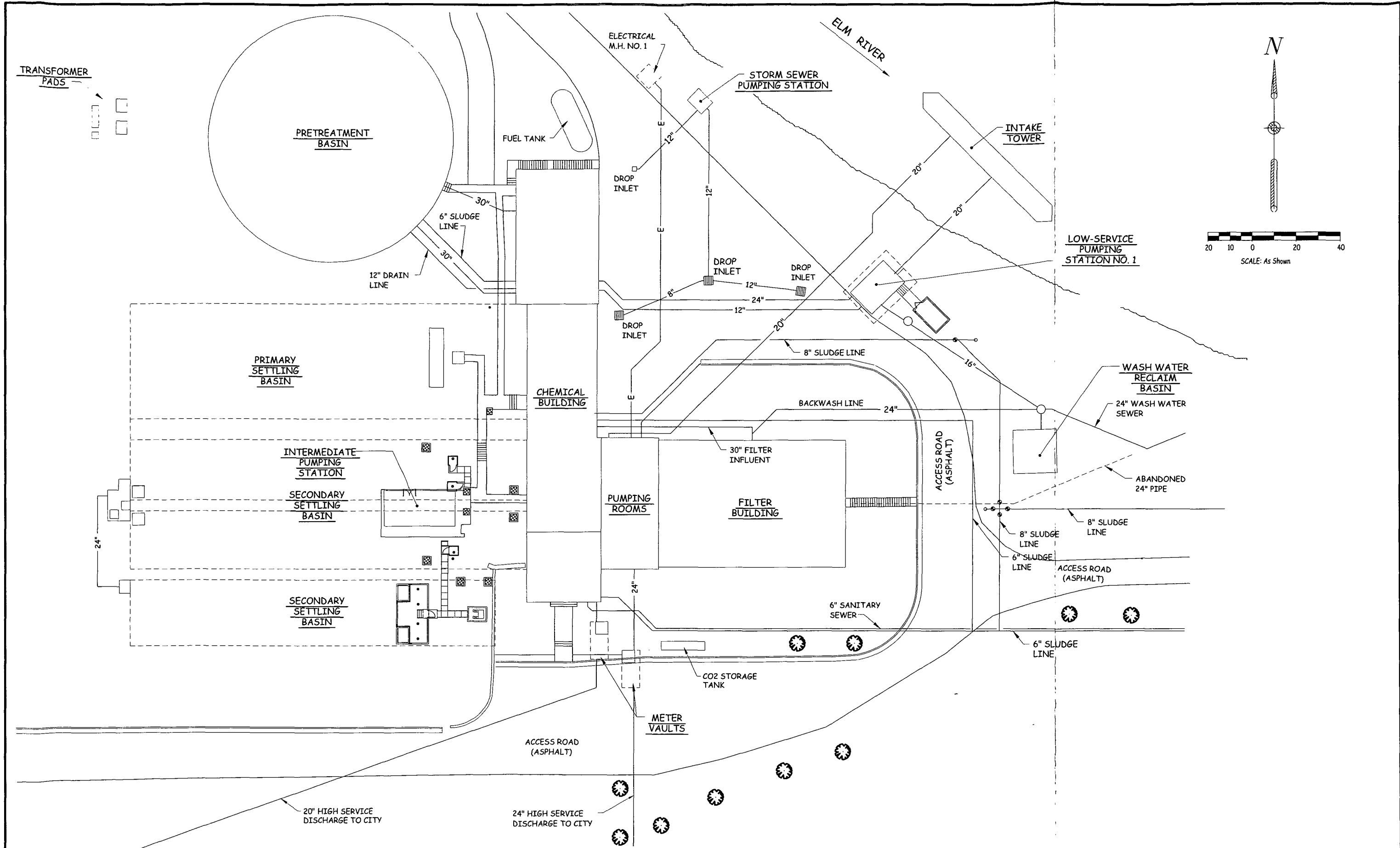
The surface water intake from the Elm River is located on the water plant site. The general location is shown on Figure 2.3: Existing Site Plan. The Elm River intake is the primary water source for the facility. Water quality data presented represent water from the Elm River and a blend of water from the Elm River and the Eystone gravel pits. The raw and treated water qualities are listed in Table 2.8: Present Water Quality.

Table 2.8: Present Water Quality

Parameter	Raw Water 4/10/99	Raw Water 11/1/99	Range of Raw Water Values	Range of Treated Water Values
pH (pH units)	7.88	8.63	7.9 - 8.9	
"M" Alkalinity (mg/l CaCO ₃)	306	312	248 - 396	36 - 128
"P" Alkalinity (mg/l CaCO ₃)	0	10	0 - 16	0 - 36
Temperature (°C)	11	10	3.4 - 12.8	
Calcium (mg/l CaCO ₃)	330	332	260 - 380	84 - 304
Magnesium (mg/l CaCO ₃)	130	292	172 - 340	0 - 196
Total Hardness (mg/l CaCO ₃)	460	624	440 - 700	154 - 396
Raw Water Turbidity (NTU)	19.2	14.1	3.4 - 20.6	

2.3 WATER QUALITY CHARACTERISTICS

2.3.1 Raw and Treated Water Characteristics: The City of Aberdeen utilizes lime and soda ash as the in the softening process at the water treatment plant. The objective of the lime softening process is to remove a portion of the calcium and magnesium carbonate hardness that is in the water. The soda ash is added for the removal of any non-carbonate hardness. Alum is added to assist in the coagulation within the flocculation and sedimentation processes.



DRAWN BY:	REVIEWED _____
R.A.R.	DATE: _____ FOR _____
DESIGNED BY:	REVIEWED _____
K.L.B.	DATE: _____ FOR BANNER ASSOCIATES, INC.
CHECKED BY:	
D.G.O.	

BANNER

CONSULTING ENGINEERS & ARCHITECTS

BANNER ASSOCIATES, INC.
409 22nd Av S • P.O. Box 298 - Brookings, SD 57006 • (605)692-6342

REVISION	DATE	DESCRIPTION	BY	CK'D

Aberdeen Water Supply & Treatment Improvements
Aberdeen South Dakota
FACILITY PLAN
EXISTING SITE PLAN

SCALE: None	JOB NO: 20192.00.01	DATE: Jan.03
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Figure No. 2.3

Data for calendar year 1999 are representative of the raw and treated water quality for the City of Aberdeen. These data are summarized in Table 2.9: Raw and Treated Water Quality Characteristics. The raw water data reveal the expected seasonal variations in alkalinity and hardness concentrations. Calcium and magnesium carbonate hardness and magnesium non-carbonate hardness are the hypothetical hardness constituents present in the water.

Table 2.9: Raw and Treated Water Quality Characteristics

Raw Water Data						
<u>Month</u>	<u>Alk.</u> <u>Mg/l CaCO₃</u>	<u>Total Hard.</u> <u>mg/l CaCO₃</u>	<u>Ca Hard.</u> <u>mg/l CaCO₃</u>	<u>Mg Hard.</u> <u>mg/l CaCO₃</u>	<u>Non-Carb. Hard.</u> <u>mg/l CaCO₃</u>	
Jan	415	688	376	312	276	
Feb	366	624	372	252	258	
Mar	258	384	285	99	122	
Apr	294	456	310	146	163	
May	238	382	249	133	169	
Jun	305	490	304	186	175	
Jul	264	396	212	184	140	
Aug	317	431	228	203	124	
Sep	270	416	217	199	150	
Oct	299	492	267	225	201	
Nov	336	570	308	262	242	
Dec	354	584	315	269	232	
Treated Water Data						
<u>Month</u>	<u>Alk.</u> <u>mg/l CaCO₃</u>	<u>Total Hard</u> <u>Mg/l CaCO₃</u>	<u>Ca Hard</u> <u>mg/l CaCO₃</u>	<u>Mg Hard</u> <u>mg/l CaCO₃</u>	<u>Non Carb Hard</u> <u>mg/l CaCO₃</u>	<u>Non-Carb. Rem.</u> <u>mg/l CaCO₃</u>
Jan	68	318	191	127	252	24
Feb	46	215	140	75	171	87
Mar	68	193	107	86	128	-6
Apr	73	233	185	48	167	-4
May	74	235	195	40	166	3
Jun	74	242	185	57	171	4
Jul	85	209	164	45	134	6
Aug	83	195	128	67	119	5
Sep	89	239	159	80	153	-3
Oct	70	262	185	77	194	7
Nov	81	305	201	104	225	17
Dec	81	324	190	134	245	-13

The softening process is operated at pH levels designed for magnesium hydroxide precipitation. Research has shown that magnesium hydroxide precipitation is an effective means for removal of some organic carbon compounds. Total Organic

Carbon (TOC) reduction data for the treatment process indicates some TOC removal occurs in the clarifiers. TOC removal is a requirement of the proposed disinfection byproducts rules discussed later in this report. It is essential that the treatment process provide at least 30% reduction of TOC's. Unless a combination of lower pH softening and coagulant addition which accomplishes good turbidity removal and TOC removal is found, continued use of the magnesium hydroxide precipitation process is recommended. In order to use the process, it is necessary to provide both the lime feed systems necessary to raise the pH to approximately 11.3 and the soda ash necessary to provide the carbonate for precipitation of the calcium added as a part of the excess lime dosage.

The softening process in the prior treatment units produces a high pH, unstable, softened water. Carbon dioxide (recarbonation) is added to bring the pH back down to acceptable levels, thus, stabilizing the water and preventing further formation of calcium carbonate.

2.3.2 Taste and Odor Control: The taste and odor problems occurring at the Aberdeen Water Treatment Plant have been characterized as a musty taste and odor in most complaints received. Two of the most common causes of this type of taste and odor are decomposing aquatic plants and algae. Taste and odor problems of this nature are relatively common in surface water supplies where the water storage reservoirs are shallow and carry high levels of turbidity.

Testing for *Cryptosporidium*, *Giardia*, and types of algae was conducted in June, 1995. The report was based on evaluation of water samples collected on June 13, 1995. Results of the microscopic particulate report are summarized in Table 2.10: Particulate Analysis Report. This report indicates heavy concentrations of green algae and diatoms present in the water. Green algae and diatoms will both cause taste and odor problems.

Table 2.10: Particulate Analysis Report

Description	Raw Water	Treated Water
Giardia cysts present	0/100 gal	0/100 gal
Cryptosporidium oocysts	0/100 gal	0/100 gal
Total volume of sediment	35 ml/580 gal	0.4 ml/1580 gal
Sediment composition	15% algae	32% algae
Characterization of algae present	Green algae – M Diatoms – EH Blue Green – NF	Green algae – EH Diatoms – H Blue Green – R
Turbidity of Sample	18.3 NTU	0.1 NTU

EH – Extremely Heavy
R – Rare

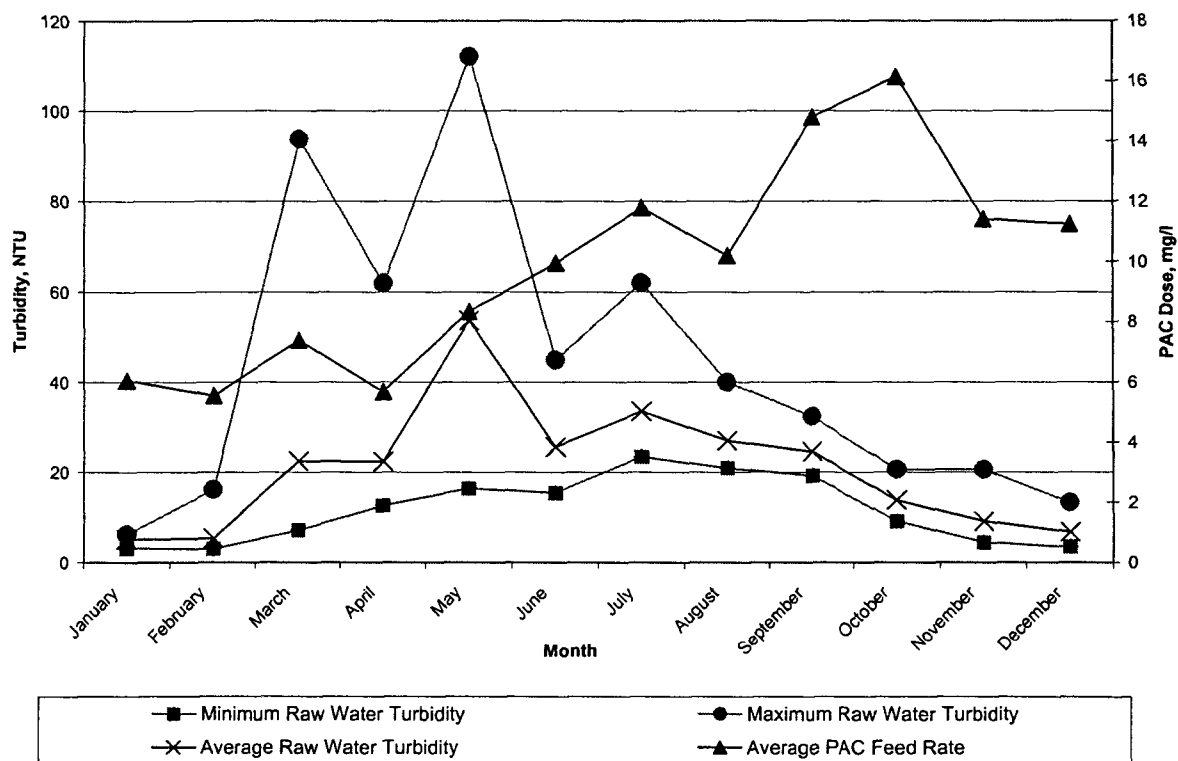
H – Heavy
NF None Found

M – Moderate

Taste and odor problems at the Aberdeen Water Treatment Plant vary seasonally and with the water supply used. Variations in the level of taste and odor in the water are reflected in the PAC dosages used at the treatment plant. Figure 2.4: Turbidity and PAC Doses illustrate the variations in raw water quality and PAC doses used. The highest dosages of PAC were used when there was ice cover on the surface water supply. Musty odors occurring under these conditions are likely

due to decaying plant and algae materials in the water. The taste and odor levels increase during this time in part because the gases released during decomposition are trapped under the ice and remain in the water.

Figure 2.4: Turbidity and PAC Doses



The doses used during peak runoff period in April and May do not necessarily reflect better water quality in the surface water since water from the Eystone pits is blended with the surface water during this time. One of the reasons for blending is to limit problems with taste and odor in the finished water. If 80 to 100% of the water used during the spring runoff period were surface water, it is likely that PAC doses would be substantially higher than those recorded. The spring runoff typically carries relatively large amounts of dead plant and animal matter with it and these materials have the potential for causing tastes and odors.

The typical algae cycle of surface water is to move from a predominance of green algae to a predominance of diatoms followed by a predominance of blue-green algae. Presence of a high concentration of blue-green algae can cause toxicity to

small fish in the impoundment. Fish toxicity will contribute different tastes and odors, likely a "fishy" taste and odor best controlled by a strong oxidant such as chlorine dioxide, ozone, or permanganate. At the time samples were collected in June, 1995, the predominant microorganism was green algae, but significant populations of diatoms were also present. Later in the summer it is expected that more blue-green algae would be present causing a different set of tastes and odors. Changes in control strategies will be necessary as the seasons change and the types of algae change.

Taste and odor problems at the Aberdeen Water Treatment Plant are present to some degree most months of the year. The taste and odor levels are highest during the winter months when there is ice cover on the surface water impoundments. Raw water temperature is low when taste and odor levels are highest. As the water is warmed in the customers plumbing system, entrained gases are released, increasing the level of taste and odor in the water. Taste and odor complaints during the spring runoff period are minimized by blending the surface water with water from the wells at the Eystone pits.

The water treatment process includes systems for feeding PAC, potassium permanganate, and chlorine dioxide for control of taste and odor in the water. The chemicals are all fed prior to the pretreatment basin in the treatment plant. Contact time for chlorine dioxide and permanganate is very limited prior to the introduction of PAC to the water.

There are several issues related to the taste and odor control strategies utilized at the Aberdeen Water Treatment Plant. The issues are addressed in the following paragraphs.

1. *Potential for competitive reactions between chemicals used:* Chlorine dioxide and potassium permanganate are strong oxidants used for destruction of organic compounds that contribute to taste and odor

problems. If both chemicals are fed, a competitive reaction is likely to occur, limiting the effectiveness of both chemicals.

Chlorine dioxide and permanganate are adsorbed by the powdered activated carbon (PAC). PAC is also a weak reducing agent, which will tend to neutralize the oxidation potential of the chlorine dioxide and permanganate. Observations indicate the effectiveness of both permanganate and chlorine dioxide will be significantly reduced when the PAC is added.

2. *Requirements for contact time for reactions to occur:* Contact time requirements for the chemicals used for taste and odor control will vary with the water quality, temperature conditions, and the compounds to be removed. Adsorption of chemicals on the surface of PAC is virtually immediate, however, it may be necessary to have mixing and contact time to assure time for contact between the carbon particles and the compounds in the water. Oxidation reactions associated with permanganate and chlorine dioxide will vary with the chemical compounds in the water and other water quality parameters. Recommendations received from various sources are summarized in Table 2.11: Contact Time Recommendations for T&O Control.

Table 2.11: Contact Time Recommendations for T&O Control¹

Chemical	Contact Time (min)
Chlorine Dioxide	5 minutes*
Potassium Permanganate	Varies, 3-10 minutes
Ozone	5-10 minutes
Chlorine	60 minutes
Powdered Activated Carbon	30 minutes

* Based on contact time required for inactivation of Giardia cysts, disinfection criteria for 6<pH<9 and temperature of 5°C.

3. *Method for selection of the chemical to use under various conditions:* Selection of the taste and odor control strategy and chemical to be used

will vary seasonally and with changes in water quality. General guidelines for use in selection of a method of T&O control are summarized as follows:

- Characterize the taste or odor
- Evaluate the effectiveness of various doses of PAC using bench scale assessments of TON.
- Evaluate the effectiveness of various doses of permanganate using bench scale assessments of TON.
- In general, PAC adsorption will be more effective than oxidation with either permanganate or chlorine dioxide if the odor is a musty or earth odor.
- If a fishy odor occurs, oxidation with ozone or chlorine dioxide may be an effective means for reducing odor.

Implementation of a control strategy will require a repeatable test for characterization of taste and odor problems in the water. Taste and odor problems are difficult to quantify and the test procedures are dependent on the sensory perceptions of the persons performing the test. A test procedure that is repeatable is important for development of records. It is recommended that the evaluations be performed on water that has been warmed to a temperature above room temperature. The testing temperature and method of warming should be consistent. The methods are standardized and repeated each time the test is performed. Results should be reported using a scale to permit tabulation of data and comparison of results of multiple tests. AWWA Flavor Profile Analysis procedures provides some techniques for assigning relative values to the severity of taste and odor in the water.

4. Method for control of chemical dosage: Dosage control of chemicals used for reduction of taste and odor is an art as well as a science. Dosage is generally increased until the tastes and odor levels are no longer objectionable. Dosage will vary with varying water quality conditions, different temperature conditions, and different compounds causing the taste and odor. There is no known practical method for using a particular water quality parameter as a predictor of dosage requirements for chemicals used for T&O control. The best and most reliable sensor is still

the human senses of taste and smell. It is recommended that a regular procedure for estimating odor numbers or flavor profile of the raw and finished water be established and records be maintained. Establishment of a track record correlating chemicals fed and dosages with the type and intensity of odors occurring will provide the best means for predicting the dosages needed for taste and odor control.

Seasonal variations in the type of algae present indicate PAC and permanganate is more likely to be effective in the spring and early summer. In later summer chlorine dioxide and PAC may be more effective. The timing of the switchover will vary every year and there will be some years in which the permanganate and PAC feed systems will be capable of adequate control throughout the summer.

5. *Regulatory limits on dosages of chemicals used for Taste and Odor control:* Chlorine dioxide, one of the chemicals used for taste and odor control at the Aberdeen Water Treatment Plant is regulated in the D/DBP Rule portion of the Safe Drinking Water Act. The Stage 1 D/DBP Rule limits chlorine dioxide to 0.8 mg/l (as ClO_2) and Chlorite to 1.0 mg/l. Future rules will require some reduction in maximum dosage used.

6. *Effectiveness on various control strategies:* Research sponsored by the AWWA Research Foundation reviewed several T&O control strategies including chemical oxidation, removal using PAC, and removal using coagulation and flocculation. General conclusions from that research are listed as follows:

- Tastes and odors caused by aromatic amines can be reduced by oxidation with chlorine or chloramine. Taste and odor associated with aromatic amines are often described as a "fishy" taste.
- Ozone is effective in removing many tastes and odors including the "musty" taste and odor typical of that reported at Aberdeen. Use of ozone can produce other tastes and odors described as "sweet" or "fruity".
- Chlorine is generally not effective in reducing the "musty" or "earthy" type of tastes and odors. Chlorine can cause an increase in this type of taste and odor.

- Chlorination is an effective means for eliminating “fishy” tastes and odors however; it is recommended that it be used only on the treated water. Use at other locations in the process may contribute to other problems.
- PAC is generally effective at reducing most tastes and odors and is considered the most viable first course of action for taste and odor control.
- PAC removes the organic compounds contributing to taste and odor through adsorption. Chlorine will limit adsorption effectiveness.
- Feeding permanganate with the PAC can reduce the PAC dose required.
- Granular activated carbon (GAC) media in the filters has proven to be an effective means for “polishing” the treated water for removal of taste and odor.

7. Potential benefits achieved by coagulation in the pretreatment basin:

According to the microscopic particulate analysis results, Aberdeen only removes 2 logs of algae, and a significant concentration of algae pass through the plant. Tastes and odors associated with these algal particles are likely to pass into the distribution system. Algae can be removed through the coagulation process and in the filtration process. Due to the low specific gravity of the algal cells, the sweep floc mechanism must be accomplished for removal by clarification. Metal coagulants and cationic polymers have most commonly been used to accomplish coagulation. Algal extracellular organic matter (EOM) has a significant impact on the required dose, and different algae exhibit different EOM. For example, EOM from blue-green algae has a charge concentration three times as high as EOM from green algae, indicating that, if cationic polymers are used to affect algal coagulation, the type of algae will impact the required dosage. Additionally, oxidation by chlorine causes release of EOM, which can cause flocculation of algal cells.

Given the above discussion, adding a flocculant to enhance algal cell removal in the pretreatment basin has merit, especially for tastes and odors associated with algal growths. Coagulants to remove the PAC are also used to coagulate TOC.

Therefore, both TOC and odor removal could be enhanced by adding coagulants in pretreatment and coagulation tests should evaluate these treatment options concurrently. Possible parameters to measure the success of coagulation and removal of algae during pretreatment are color, turbidity, absorbance at an optimum wavelength specific to the algal suspension, and particle counts (best for spherical algae like Chlorella). Taste and odor tests should be conducted to determine the beneficial effect; the TOC should be conducted to obtain information relative to potential effects on DBP production.

With a 30-minute detention time in the pretreatment basin flocculation zone at 8 MGD, flocculating and settling the PAC is feasible. Contact time with the PAC is important, since adsorption is a time-related phenomena. If PAC is settled in the clarifier, clarifier detention time is no longer available for PAC contact. If adequate time is available to adsorb the taste and odor causing compounds, research shows that there is little difference in removal of Tri-Chlorinated-Phenol (an indicator parameter) by PAC when coagulated PAC is compared to uncoagulated PAC. Most removal occurs in the first 25 to 50 minutes of contact. Loss of adsorption is likely compensated by additional coagulation of organics provided by the coagulant. It is likely that the PAC dosage may be reduced because of organics removal achieved by the coagulant addition.

Other than the benefit that may be realized by additional detention time, there is no real benefit to removing PAC in the primary clarifiers (softening unit), since the high pH is detrimental to adsorption, and the softening precipitates blind the PAC adsorption sites.

2.3.3 Disinfection: Disinfection at the Aberdeen Water Treatment Plant is accomplished using combined residual chlorination. Chlorine and ammonia are fed to the water prior to pumping the water to the treated water storage reservoirs in the City of Aberdeen. Filters are also periodically shock chlorinated with sodium hypochlorite as a routine filter maintenance procedure. This treatment is

used while the filter is out of service. The filters are backwashed until the chlorine residual has dissipated before being returned to service.

The point of application of chlorine in the treatment process is in the clearwell below the filters. The chlorine solution is fed through an open channel diffuser. The diffuser is located in the opening between the portion of the clearwell that is under the filters and the portion of the clearwell that serves as a wetwell for the high service pumps.

Disinfection byproducts have been monitored during the past few years. The results of that monitoring are summarized in Table 2.12: Disinfection Byproduct Concentrations.

Table 2.12: Disinfection Byproduct Concentrations

Date	TTHM ¹ Concentration (ug/l)	Comments
2/16/00	20.09	Elm River
12/1/99	20.09	Elm River
6/14/99	73.96	Elm River and Eyestone Well
3/22/99	7.93	Elm River and Eyestone Well
12/9/98	11.70	Elm River

1 – TTHM indicates Total Tri-Halomethane, a disinfection byproduct formed when organic compounds react with chlorine.

The present limit for TTHM in the finished water is 100 ug/l. With the Stage 1 Disinfectant/Disinfection Byproduct Rule the limit is set at 80 ug/l, Aberdeen must be in compliance with this rule by December 16, 2001. A final rule for the Stage 2 D/DBPR is expected by May, 2002, this will require a location running annual average (i.e., each compliance monitoring sampling location has to comply with the MCL on a running annual average) and compliance is expected by May, 2005. Aberdeen's present treatment process may be able to meet the requirements of the Stage 1 Rule, but the Stage 2 Rule may be much more difficult to meet.

The present operation of the water treatment facilities utilizes combined residual chlorination at the water treatment plant without subsequent chlorination in the distribution system. The chlorine concentrations necessary to maintain an adequate residual in the distribution system are summarized in Table 2.13: Disinfectant Dosages and Residual Concentrations.

Table 2.13: Disinfectant Dosages and Residual Concentrations

Month	Chlorine Dosage (mg/l)		Average Chlorine Residual Concentration ¹ (mg/l)	
	1998	1999	1998	1999
January	7.7	5.4	5.38	3.88
February	7.1	5.1	5.30	3.75
March	6.9	5.2	5.16	3.82
April	6.9	5.2	5.17	3.99
May	7.0	4.1	5.58	3.62
June	6.4	5.8	5.29	2.08
July	6.0	5.6	4.67	2.75
August	5.5	5.8	4.27	2.42
September	5.7	6.4	3.93	2.77
October	5.6	6.4	3.30	2.56
November	5.4	6.3	3.55	2.78
December	5.4	6.0	3.60	3.60
AVERAGE	6.3	5.6	4.6	3.2

NOTE: 1 – Chlorine residual concentration is measured in the distribution systems as total chlorine.

When the operating data is compared with the proposed maximum disinfectant dosage goal of 4 mg/l, it is evident that it will become necessary to modify operations in terms of disinfectant doses and concentrations in the treated water. The dosages used provide a disinfection (CT) value that meets the disinfection requirements for surface water with a high pH and a combined residual chlorine dosage. The doses used also provide chlorine concentrations adequate to maintain a residual throughout the distribution system. If the dosage levels are reduced or the form of the disinfectant is changed, the chlorine contact time requirements will change and there may be problems with adequate chlorine residuals in the distribution system. A reduction in combined chlorine concentrations will

increase the contact time required. A change to free residual chlorine disinfection will reduce the contact time required but is likely to cause an increase in the level of disinfection byproducts present in the water. Use of free residual chlorine as a sole means for disinfection may require additional disinfection within the distribution system in order to maintain required chlorine residual concentrations.

It is important to note that the TTHM concentrations in the treated water at Aberdeen are well below the limits established by the Safe Drinking Water Act. The current practice of combined residual chlorination is an effective means for disinfection and provides acceptable levels of disinfection byproducts. Changes to the disinfection process in order to comply with the maximum chlorine dosage recommendation of 4 mg/l could result in higher levels of disinfection byproducts. Bench-scale and pilot-scale testing may be required to identify a new optimum disinfection strategy which will minimize byproduct formation while continuing to provide the necessary chlorine residual to prevent microbial regrowth in the distribution system.

One of the reasons for the relatively high chlorine residual concentrations in the treated water is a history of periodic problems with lower than desirable chlorine residuals in areas of the system. The location of these low chlorine residual occurrences varies and is not consistent. The low chlorine residual occurrences may be associated with larger than normal changes in water levels in water storage reservoirs. The City of Aberdeen has relatively large storage reservoirs providing up to 3 days storage under annual average demand conditions. Two of the reservoirs are un-baffled ground storage reservoirs. There is a potential for short-circuiting in these reservoirs under constant flow conditions. When demands change significantly, "old" water from the reservoirs may be delivered to the system, causing concerns with low chlorine residual concentrations.

2.4 DESCRIPTION OF WATER SYSTEM

2.4.1 General: The water sources for the City consist of surface water impoundments that feed the Elm River, impoundments on the Elm River, and the Eyestone Gravel pits. The treatment plant is located approximately six miles north of US Highway 12 near Ordway, South Dakota. Portions of the treatment facility were constructed in the 1930's. The last physical expansion of the facilities was completed in the early 1980's. A more complete description of each of the major components of the Aberdeen water supply and treatment system is presented in the following paragraphs.

2.4.1.1 *Eyestone Wells:* The City of Aberdeen is primarily a surface water treatment facility treating water from the Elm River, however, in the spring when runoff is occurring and the suspended solids in the river are high, the City will use a wellfield at the Eyestone Gravel pits as a supplemental source of water. Water from the Eyestone Wellfield is pumped to the low service pump station wetwell and mixed with surface water and filter backwash water at that point.

The Eyestone Wellfield includes two pump houses, one (referred to by Aberdeen personnel as Well 1) which contains a wetwell and three raw water pumps (Pump No. 1, 2, and 3) and the other (referred to by Aberdeen personnel as Well 2) contains one well (Pump No. 4). Pumps 1, 2, and 3 are identical pumps. The capacity ratings of the pumps at the Eyestone Wellfield are summarized in Table 2.14: Eyestone Wellfield Pump Summary.

Table 2.14: Eyestone Wellfield Pump Summary

Well No.	Pump No.	Capacity (gpm)	Head (ft)	Motor HP	Type
1	1	1650	59	30	Vertical turbine
	2	1650	59	30	Vertical turbine
	3	1650	59	30	Vertical turbine
2	4	1000	74	25	Submersible turbine

The pumps at the Eyestone Wellfield are capable of delivering approximately 6.2 MGD to the low service pump station wetwell when two of the pumphouse pumps and the well pump are running.

2.4.1.2 *Elm and Willow Reservoirs:* Two major reservoir impoundments serve as the water supply reservoirs for the Aberdeen water system, the Elm Lake impoundment located in the northwest corner of Township 128N, Range 65W, and the Will Creek Lake located in Township 126N, Range 64 West. The Elm Lake Reservoir has two branches, one branch is approximately 6 miles long and extends to the North Dakota Border. The other is approximately 2 ½ miles long and extends into the eastern edge of McPherson County. The total surface area of the Elm Lake Reservoir is over 1200 acres at normal operating levels. The Willow Creek Lake is approximately 1 ½ miles long and provides in excess of 160 acres of water surface at normal operating levels. The City of Aberdeen operates the reservoirs to release water to the Elm river and maintain a flow at Dam #1, the intake for the water plant.

There are no telemetry controls at any of the dams except for a telephone dialer in the pump station at Dam No. 5. The water treatment plant operator is required to drive to each of the structures on a periodic basis, dependant upon the flow conditions, to manually adjust the water levels by opening or closing a valve at each of the dams.

2.4.1.3 *Raw Water Pumping Systems:* All of the raw water to the Aberdeen Water Treatment Plant must first be pumped through either the low service pump station adjacent to the Elm River or the raw water pump station in the water treatment plant. The low service pump station is located on the plant site next to the Elm River as shown in Figure 2.3: Water Treatment Plant Site Plan. There is a 20" diameter pipe from the intake structure to the wetwell. The 20" pipe discharges into a wetwell

common to the washwater reclaim basin discharge. Three vertical turbine pumps are provided to pump the raw water through the raw water meter and into the rapid mix chamber No. 1 prior to the pretreatment basin. The low service pumps are identified as Pumps 4, 5, and 6.

The original construction of the water treatment plant included a raw water pump station in the treatment plant structure. The pump station is located in the same room as the high service pumps used to pump treated water to the reservoirs in the City. This pump station is still operable however; the pumps must be vacuum primed in order to operate. The pump discharge piping is a problem in that the piping is arranged in such a way that air binding occurs, limiting the capacity of the pumps.

Capacity ratings of each of the raw water pumps are listed in Table 2.15: Raw Water Pump Types and Ratings.

Table 2.15: Raw Water Pump Types and Ratings

Pump No.	Capacity (gpm)	Head (ft)	Motor HP	Type
1	1400	30.5	20	Horizontal split case, Centr.
2	1400	30.5	20	Horizontal split case, Centr.
3	1400	30.5	20	Horizontal split case, Centr.
4	2840	24.5	25	Vertical turbine
5	2840	24.5	25	Vertical turbine
6	5600	34	75	Vertical turbine

The vertical turbine pumps in the low service pump station are capable of delivering approximately 16.0 million gallons per day (MGD) at the required head conditions to the treatment process. The raw water pumps in the low service pump station are oil-lubricated, variable speed drive pumps.

2.4.1.4 *Raw Water Flow Measurement and Control:* Raw water flow measurement consists of a flow tube with differential pressure transmitter.

The flow tube is located on the lower floor of the water treatment plant. The flow tube is installed in the raw water line ahead of the tee used to either bypass the pretreatment basin or route raw water to the pretreatment basin. The raw water flow meter is sized to handle a peak flow of 12 MGD. The meter system includes a remote display of flow rate on the main operating floor, two floors above the meter.

2.4.1.5 Pretreatment Process: The pretreatment basin at the Aberdeen Water Treatment Plant is a circular clarifier. The location of this process basin can be seen on Figure 2.3 as presented previously in this report. The basin is normally used for powdered activated carbon (PAC), potassium permanganate, and/or chlorine dioxide treatment. Some flocculation and settling also occurs in the basin when used as a pretreatment basin. In normal operations, there are no flocculation aids fed to the water in the basin. The basin can be used for lime softening if the primary clarifier is out of service.

The pretreatment clarifier is equipped with an aluminum dome to limit the accumulation of wind-blown materials, reduce algae growth, and eliminate the effect of wind on the surface which will hinder the performance of the water treatment process. The clarifier is equipped with four vertical shaft flocculating mixers with variable speed drives and a sludge collection and removal system. Tables 2.16 and 2.17 show the design factors and operating factors affecting the performance of the pretreatment basin.

Table 2.16: Design Factors Affecting Performance

Factor	10 State Standard Design Recommendation	Unit Size at Aberdeen WTP	Capacity Rating ¹
Basin Dimensions: - Rapid Mix - Clarifier		5'x5'x11' 110' Dia. 14' SWD	
Detention Time	3 hours		8 MGD
Surface Loading Rate		0.6 gpm/sf @ 8.0 MGD	
Length of Weir ²		345 ft	
Weir Loading Rate	20,000 gpd/ft (when operated as a clarifier)	23,200 gpd/ft @ 8.0 MGD	6.9 MGD
Sludge Removal	Mechanical sludge removal is required	Sludge removal system is provided	
Bypass and Backup Capacity	Bypass capability is required	Bypass is provided	

NOTE: 1 – Capacity rated on basis of 10 States Standards Design Recommendation

2 – The effluent weirs are 90 degree V-notch weirs, 2" deep, 8" center-center. The V-notches will flood at flows greater than 9.4 MGD.

Table 2.17: Operability Factors Affecting Performance

Factor	Description of Unit at Aberdeen WTP	Factors Limiting Performance
Process Equipment Description	Four mechanically adjusted variable speed vertical shaft flocculators and a circular clarifier sludge scraper mechanism	Mechanical failure of vertical shaft flocculator drives
Age of Process Unit	Unit was placed in service in 1981	
Chemicals Fed	Permanganate, chlorine dioxide, and powdered activated carbon (PAC)	Competitive reactions and interference among chemicals fed
Lab Tests Used	pH, alkalinity, hardness (total and calcium), turbidity, temperature	
Sampling Locations	Raw water ahead of rapid mix unit, Effluent trough of clarifier unit	
Process accessibility	Clarifier unit is accessible through outside entrance	Snow and ice build-up make access difficult in winter
Equipment accessibility	Flocculator drives and clarifier scraper drives are accessible from equipment bridge on the basin	
Alarms on Unit	Clarifier scraper mechanism is equipped with a torque overload alarm	

NOTE: Basin is covered with an aluminum dome that protects the surface from wind effect and eliminates most wind carried foreign materials.

2.4.1.6 *Softening and Clarification Process:* The softening and clarification process at the Aberdeen Water Treatment Plant consists of a primary clarifier, three secondary clarifiers, a recarbonation basin, an intermediate pump station to handle high flow rates, and chemical feed systems for lime, soda ash, polymer, carbon dioxide, and alum. A brief description of each of the process units associated with the process is presented in the following paragraphs.

2.4.1.6.1 Primary Clarifier: The primary clarifier consists of a rapid mix basin, flocculation chamber and a settling basin. Chemicals are added to the water and mixed using high energy mixing at the rapid mix basin. The flocculation chamber provides a low energy mixing zone for chemical contact and the formation of larger, more settleable, floc particles. The flocculating mixers keep these particles suspended through the chamber.

The settling basin portion of the primary clarifier provides space for separation of the solids from the water. The settling area provides a sedimentation period of approximately 1.5 hours at a flow of 12.0 MGD.

The sedimentation chamber is equipped with a chain and flight sludge scraping systems. These sludge removal systems move the settled solids to a hopper at the east end of the basin. The sludge is pumped from the hopper to the sludge lagoons. Tables 2.18 and 2.19 show the design factors and operating factors affecting the performance of the primary clarifier.

Table 2.18: Design Factors Affecting Performance

Factor	10 State Standard Design Recommendation	Unit Size at Aberdeen WTP	Capacity Rating ¹
Basin Dimensions: - Rapid Mix - Flocculation - Sedimentation		6'x6'x9'9" 32'10"x50'x13'3" 148'x50'x13'3"	
Detention Time: - Rapid Mix - Flocculation - Sedimentation	30 sec. 30 min. 4 hrs.		7.6 MGD 7.8 MGD 4.4 MGD
Flow Through Velocity - Flocculation - Sedimentation	0.5<Vel.<1.5fpm Vel.<0.5fpm		10.7 MGD 3.6 MGD
Length of Weir ²		400 ft	
Weir Loading Rate	20,000 gpd/ft	20,000 gpd/ft @ 8.0 MGD	8.0 MGD
Sludge Removal	Mechanical sludge removal is required	Sludge removal system is provided	
Bypass and Backup Capacity	Bypass capability is required	Bypass is provided	

NOTE: 1 – Capacity rated on basis of 10 States Standards Design Recommendation

Table 2.19: Operability Factors Affecting Performance

Factor	Description of Unit at Aberdeen WTP	Factors Limiting Performance
Process Equipment Description	Two horizontal shaft flocculators, one variable speed belt drive, one variable frequency drive, three chain and flight scraper mechanisms, and cross collector mechanism	Lack of ability to adjust speed of flocculator
Age of Process Unit	Unit was placed in service in 1934	
Chemicals Fed	Lime, soda ash, alum and provisions have been made to feed polymer	
Lab Tests Used	pH, alkalinity, calcium hardness, turbidity	
Sampling Locations	Rapid mix basin ahead of clarifier, clarifier effluent trough, after primary recarb., flocculation zone, 8' into clarifier zone	Clarifier effluent troughs are not easily accessible
Process accessibility	Surface of flocculation and sedimentation areas are not accessible	
Equipment accessibility	Flocculator drives are accessible from pipe gallery in treatment plant. Scraper drives are housed in metal shelter above clarifier	
Alarms on Units	Clarifier scraper mechanism is equipped with a torque overload alarm	

From the primary clarifier, the water enters a basin between the primary clarifier and the secondary clarifiers. Within this basin, the operators have the option of adding carbon dioxide to the water.

2.4.1.6.2 Secondary Clarifiers: The treatment process includes three (3) secondary clarifier systems, each consisting of a rapid mix basin, flocculation chamber, sedimentation chamber, and effluent launder system.

Each basin has a rapid mix chamber. The flow split to the rapid mix chambers is not controlled and is not measured; thus the rate of flow to individual clarifiers may vary. Chemicals are normally fed at the rapid mix for the primary clarifier. The secondary clarifiers provide additional flocculation and settling time. Tables 2.20 through Table 2.23 show the design factors and operating factors affecting the performance of the secondary clarifiers.

The north (No. 1) secondary and center (No. 2) secondary clarifiers were built at the same time and are identical in design. The south (No. 3) secondary clarifier basin was installed in 1981.

SECONDARY CLARIFIERS 1 & 2

Table 2.20: Design Factors Affecting Performance

Factor	10 State Standard Design Recommendation	Unit Size at Aberdeen WTP	Capacity Rating ¹
Basin Dimensions: - Rapid Mix - Flocculation - Sedimentation		5'x5'x8'6" (ea) 30'x24'9"x12'(ea) 151'x24'9"x12'(ea)	
Detention Time: - Rapid Mix - Flocculation - Sedimentation	30 sec. 30 min. 4 hrs.		9.1 MGD 6.4 MGD 4.0 MGD
Flow Through Velocity - Flocculation - Sedimentation	0.5<Vel.<1.5fpm Vel.<0.5fpm		9.6 MGD 3.2 MGD
Length of Weir ²		244 ft(ea)	
Weir Loading Rate	20,000 gpd/ft	8,200 gpd/ft @ 2.0 MGD/unit	9.76 MGD
Sludge Removal	Mechanical sludge removal is required	Sludge removal system is provided	
Bypass and Backup Capacity	Bypass capability is required	Bypass is provided	

NOTE: 1 – Capacity rated on basis of 10 States Standards Design Recommendation

Table 2.21: Operability Factors Affecting Performance

Factor	Description of Unit at Aberdeen WTP	Factors Limiting Performance
Process Equipment Description	Two horizontal shaft flocculators, constant speed, and two chain and flight scraper mechanisms per clarifier	Lack of ability to adjust speed of flocculator
Age of Process Unit	Unit was placed in service in 1934	
Chemicals Fed	None at present	
Process accessibility	Surface of flocculation and sedimentation areas are not accessible	
Equipment accessibility	Flocculator drives are accessible from metal enclosure on clarifier deck. Scraper drives are housed in metal shelter above clarifier	
Alarms on Units	Clarifier scraper mechanism is equipped with a torque overload alarm	

SECONDARY CLARIFIER 3

Table 2.22: Design Factors Affecting Performance

Factor	10 State Standard Design Recommendation	Unit Size at Aberdeen WTP	Capacity Rating ¹
Basin Dimensions: - Rapid Mix - Flocculation - Sedimentation		5'x5'x8'6" 30'x28'x13' 132'x28'x13'	
Detention Time: - Rapid Mix - Flocculation - Sedimentation	30 sec. 30 min. 2 hrs.		4.6 MGD 3.9 MGD 4.3 MGD
Flow Through Velocity - Flocculation - Sedimentation	0.5<Vel.<1.5fpm Vel.<0.5fpm		5.9 MGD 2.0 MGD
Length of Weir		284 ft	
Weir Loading Rate	20,000 gpd/ft	15,140 gpd/ft @ 4.3 MGD/unit	5.68 MGD
Sludge Removal	Mechanical sludge removal is required	Sludge removal system is provided	
Bypass and Backup Capacity	Bypass capability is required	Bypass is provided	

NOTE: 1 – Capacity rated on basis of 10 States Standards Design Recommendation

Table 2.23: Operability Factors Affecting Performance

Factor	Description of Unit at Aberdeen WTP	Factors Limiting Performance
Process Equipment Description	Two horizontal shaft flocculators, constant speed, and two chain and flight scraper mechanisms	Lack of ability to adjust speed of flocculator
Age of Process Unit	Unit was placed in service in 1981	
Chemicals Fed	None at present	
Lab Tests Used		
Sampling Locations		
Process accessibility	Surface of flocculation and sedimentation areas are not accessible	
Equipment accessibility	Flocculator drives are accessible from metal enclosure on clarifier deck. Scraper drives are housed in metal shelter above clarifier	
Alarms on Units	Clarifier scraper mechanism is equipped with a torque overload alarm	

2.4.1.6.3 Recarbonation: Water from the secondary clarifiers is collected in a common basin for recarbonation. This basin is a long

narrow chamber located between the north secondary and center secondary clarifiers. Table 2.24 and Table 2.25 show the design factors and operating factors affecting the performance of the recarbonation basin.

Table 2.24: Design Factors Affecting Performance

Factor	10 State Standard Design Recommendation	Unit Size at Aberdeen WTP	Capacity Rating ¹
Basin Dimensions: - Mixing Zone - Reaction Zone		NA 131'x5'x8'10"	
Detention Time: - Mixing Zone - Reaction Zone	3 min. 20 min.		3.1 MGD
Sludge Removal		No sludge removal system is provided, basin cannot be drained, must be pumped	
Bypass and Backup Capacity		No practical ways to bypass	

NOTE: 1 – Capacity rated on basis of 10 States Standards Design Recommendation

Table 2.25: Operability Factors Affecting Performance

Factor	Description of Unit at Aberdeen WTP	Factors Limiting Performance
Age of Process Unit	Unit was placed in service in 1934	
Chemicals Fed	Carbon dioxide solution	
Lab Tests Used	pH, alkalinity	
Sampling Locations	Filter effluent channel	
Process accessibility	Surface of recarbonation basin is not accessible except through MH opening	

2.4.1.6.4 Transfer Pump Systems: The intermediate transfer pump station consists of two pumps located in the secondary recarbonation basin. The pumps are vertical turbine pumps. The motors for the pumps are located in a steel enclosure constructed over the secondary clarifier recarbonation basin. The approximate location of this pump station can be seen in Figure 2.3: Water Treatment Plant Site Plan, as discussed previously in this section.

The transfer pumps are intended for use under high water demand conditions. The configuration of the piping between the secondary recarbonation basin and the filters combined with the basin elevations restrict the amount of water that can pass through by gravity. Under high water demand conditions, the transfer pumps are capable of being used to transfer water from the secondary recarbonation basin to the filters. The pump capacity and horsepower ratings for the transfer pumps are identical and are as follows: Pump 1 & 2, 8300 gpm at 5 ft of head, 30 HP, Single Stage Vertical turbine pump.

A valve on the discharge of the pumps returns a portion of the flow to the recarbonation basin to maintain a constant level in the recarbonation basin.

Water demands in recent years have not exceeded the capacity of the gravity operation of the treatment process. As a result, it has not been necessary to operate the transfer pumps.

2.4.1.6.5 Chemical Feed System: The age, capacity, and general condition of the feed systems are summarized in the following paragraphs. The Aberdeen Water Treatment Plant includes chemical feed systems for:

- powdered activated carbon,
- potassium permanganate,
- pebble lime,
- soda ash,
- polymer,
- aluminum sulfate (alum),
- carbon dioxide,
- chlorine dioxide,
- chlorine,
- ammonium sulfate,

- fluoride, and
- phosphate.

1. Powdered Activated Carbon Feed System: The treatment plant is equipped with two PAC feed systems. One of the systems was installed in 1994; the other system has been in service since 1980. Modifications to both feed systems are scheduled to be made by the summer of 2000. These modifications include improvements to the ventilation system, a new dust collection system and new bag hoppers. The PAC feeding and handling system consists of a pallet truck and hopper system. The PAC is delivered to the site in palletized bags. PAC bags are emptied into a hopper and PAC is gravity fed to the volumetric feeder. PAC slurry is fed to the raw water line ahead of the pretreatment basin rapid mix through a small diameter feed line. The point of application of PAC should be modified to permit some contact time for permanganate or chlorine dioxide prior to application of the PAC. The PAC feed point should be relocated to the line downstream of the rapid mix basin.

Feed rates are manually adjusted at the feeder. Recommendations for improvements are:

- Install a silo storage system and purchase PAC in bulk quantities, and
- Install flow paced chemical feed controls.

2. Potassium Permanganate Feed System: The potassium permanganate feed system at the water treatment plant consists of a dry chemical storage facility for the permanganate crystals, a volumetric feed system, and a solution tank for the mixed chemical. The current system was installed in 1981. The chemical feed rate is manually adjusted. In order to supply greater detention

time for treatment, a feed line should be routed to the low service pump station.

3. Pebble Lime Feed System: The lime feed system consists of two lime silos for storage of pebble lime (north silo = 140 ton, south silo = 60 ton), two gravimetric feeders (4000 lb/hr and 2000 lb/hr), two slakers, and a lime slurry trough system to deliver lime slurry to the rapid mix tanks for the pretreatment basin and the primary clarifier. The piping system allows the pretreatment rapid mix to be fed by one slaker only. The chemical feed rate is manually adjusted to respond to changes in water quality and flow rate. There are limitations in the use of one of the slakers when the primary clarifier is bypassed. The slakers were installed in 1980 (4000 lb/hr) and 1993 (2000 lb/hr). The large slaker was modified to feed a maximum rate of 1000 lb/hr. Replacement of both slakers should be scheduled in the capital improvements and replacement program.

4. Soda Ash Feed System: The water treatment plant is equipped with a soda ash feed system consisting of a volumetric feeder and slurry tank. The feed system was installed in approximately 1959 and has reached the end of its useful life. The feed rate is manually controlled. Flow paced control is recommended. The soda ash is currently purchased in bags that are emptied into the day bin for the feeder. Problems with moisture in the bulk soda ash storage silo have made it impractical to use the silo.

A gravimetric feeder with a 350-gallon solution tank was installed in 1980. The weighbelt feeder was damaged by moisture in the silo and is no longer operable. The mixer for the solution tank vibrates. The vibration damages the relays in the weighbelt feeder,

making it impractical to use the system. It is recommended that the gravimetric feeder be replaced after a system for control of moisture in the soda ash silo is implemented. The mixer for the slurry tank should also be replaced with a system that is structurally independent of the support stand for the feeder.

Due to the large amount of soda ash that is fed (up to 20 tons per month), the present system of bag handling is untenable. Improvements should include a new silo bulk storage system within the new water treatment facility and new chemical feed equipment.

5. Polymer Feed System: The treatment plant is equipped with solution feed pumps suitable for feeding liquid polymer. The polymer feed system presently in use consists of bulk tank and chemical metering pumps. The chemical metering pumps are scheduled to be replaced in the summer of 2000. The new metering pumps will be flow paced and will be paced on the basis of the raw water flow signal. Polymers are generally fed to the clarifiers to enhance flocculation and settling for removal of the precipitation products from the softening reaction.

6. Aluminum Sulfate (Alum) Feed System: Alum is fed to the treatment process ahead of the secondary clarifiers. The alum feed system consists of a volumetric feeder for dry chemical. The dry chemical is mixed with water in a solution tank and flows by gravity from the solution tank to the rapid mix basin for the clarifier. Chemical feed rates are manually adjusted. Provisions for liquid alum feeders and storage should be scheduled in the capital improvements and replacement program

7. Carbon Dioxide Feed System: The carbon dioxide (CO₂) feed system consists of an existing 24-ton bulk liquid CO₂ storage tank and a vacuum operated automatic CO₂ feeder scheduled to be installed in the summer of 2000. Once the improvements to the CO₂ feed system are completed, solution will be delivered to two locations, the recarbonation basin and the primary clarifier effluent.

8. Chlorine Dioxide Feed System: The chlorine dioxide feed system was installed in 1993. The system is a self-contained package furnished and owned by Drew Chemical Corporation. The feed system includes controls for mixing the sodium chlorite and chlorine gas necessary for formation of chlorine dioxide. The operator manually adjusts the dosage rate. The operating conditions for production of chlorine dioxide are controlled automatically by the chemical feed system. Dosage rates are set manually by the operators for the flow rate entering the treatment plant.

9. Chlorine Feed System: Chlorine is fed to the water using a vacuum operated gas chlorination system. Solution distribution panels permit proportionate flow of chlorine solution to various points of application in the treatment process. Overall feed rates are manually adjusted using the 2 chlorinators. The chlorine feed system originally installed in 1980 was upgraded to an all vacuum system in 1994.

10: Ammonium Sulfate Feed System: Ammonium sulfate is purchased as a dry chemical and fed as a solution using a volumetric feeder and a solution distributor in the clearwell. A new volumetric feeder, support stand, solution tank and hopper are

scheduled to be installed in the summer of 2000. Feed rates will be automatically adjusted on the basis of flow rates.

11. Fluoride Feed System: Fluoride is purchased as sodium silica fluoride in bags and fed with a volumetric feeder. Feed rates are manually adjusted. The system was installed in 1980. New chemical feeders should be scheduled in the capital improvements and replacement program

12. Phosphate Feed System: Tetrapyrophosphate is purchased in bags and fed using a volumetric feeder/solution tank system. The feeder is a surplus feeder purchased from the WEB water system. The hopper is 1934 vintage. Feed rates are manually adjusted. New chemical feeders based on flow rate should be scheduled in the capital improvements and replacement program

2.4.1.7 Filter System: The filtration system consists of eight (8) gravity filters. These filter cells are each 18'8" x 18'8" for a total filtration surface area of approximately 348 square feet (sf) per filter cell. These filters are dual media filters with sand and anthracite media, a filter block underdrain collection system, a surface wash system to assist in the backwashing process, washwater collection troughs, and appurtenant piping. Filter improvements were made in 1999 that included the installation of individual filter control panels located near each filter cell. The new controls are capable of operating the filters from a remote location and the filters are now capable of automatic backwash. The filters are operated as constant rate, variable head filters. Filter effluent valves control filtration rates.

Table 2.26 and Table 2.27 show the design factors and operating factors affecting the performance of the filters.

Table 2.26: Design Factors Affecting Performance

Factor	10 State Standard Design Recommendation	Unit Size at Aberdeen WTP	Capacity Rating ¹
Basin Dimensions: - Each Filter Cell - Overflow Box		18'8"x18'8"x8'6" 10'x4'6"x6'	
Filtration Rate: - 7 cells operating - 8 cells operating - 7 cells operating		3.0 gpm/sf 3.0 gpm/sf 3.4 gpm/sf	10.5 MGD 12 MGD 12 MGD
Filter Media: - Anthracite - Sand - Support Gravel	24" min. media 12" min. 15" min.		
Wash Trough Spacing		6'1" c-c	
Washwater Removal		20" Diam. Pipe	

NOTE: 1 – Capacity rated on basis of 10 States Standards Design Recommendation

Table 2.27: Operability Factors Affecting Performance

Factor	Description of Unit at Aberdeen WTP	Factors Limiting Performance
Age of Process Unit	Four units were placed in service in 1934, four units were placed in service in 1959	
Chemicals Fed		
Lab Tests Used	Turbidity	
Sampling Locations	Filter surface and filter effluent lines	

NOTE: *Filter backwash water is reclaimed from the washwater recalcim basin by gravity flow to the influent pump station wetwell. The rate of return is uncontrolled and causes process upsets to the chemical treatment processes.

2.4.1.8 *Disinfection System:* The City of Aberdeen utilizes chlorine gas as the primary disinfectant. Ammonium sulfate is added to produce a combined residual at the water treatment facilities. The chlorine feed system was converted to an all vacuum system in 1994. Ammonium sulfate is purchased as a dry chemical and fed using a volumetric feed and solution tank.

2.4.1.9 *Clearwell and High Service Water Pumps:* The clearwell is located below the filters and high service pump station. The clearwell has an approximate capacity of 150,000 gallons with 7'0" water depth. Table 2.28 and Table 2.29 show the design factors and operating factors affecting the performance of the clearwell.

Table 2.28: Design Factors Affecting Performance

Factor	10 State Standard Design Recommendation	Unit Size at Aberdeen WTP	Capacity Rating ¹
Basin Dimensions: - Each Filter Cell - Overflow Box	Min. of two (2) compartments	38'4"x55'7"x7' 24'8"x28'2"x7'	147,900 gal
Detention Time		81 min.	12 MGD
Bypass and Backup Capability		None provided	

NOTE: 1 – Capacity rated on basis of 10 States Standards Design Recommendation

Table 2.29: Operability Factors Affecting Performance

Factor	Description of Unit at Aberdeen WTP	Factors Limiting Performance
Age of Process Unit	Unit was placed in service in 1934.	Size of clearwell is small for size of pumps present
Chemicals Fed	Chlorine, ammonia, fluoride	Changes in level affect treated water pH and chlorine residual
Lab Tests Used	pH, chlorine residual, turbidity	
Sampling Locations	Discharge header of treated water pumps	
Process accessibility	Only accessible through a small hatch in the filter piping gallery	
Alarms on Units	Low level, high level	

NOTE: *Normal operating range is 5.4' to 5.7'. Wide range is 3.7' to 6.4'.

**As clearwell level drops, low level alarm sounds at 3.7'. High service pumps cut out at 3'.

***As clearwell level rises, high level alarm sounds at 6.5'. At 7.0' clearwell level controls filters and water backs up through entire plant. At 8.0' the low service pumps cut out.

The high service pump area houses four (4) high service pumps which discharge into parallel 24" transmission lines to the ground storage reservoirs

in the City of Aberdeen. The capacities and motor horsepower ratings for each of the pumps are listed in Table 2.30: High Service Pump Ratings.

Table 2.30: High Service Pump Ratings

Pump No.	Capacity (gpm)	Head (ft)	Motor HP	Electrical Service
1	8400	180	500	4160 V 3 Phase
2	8400	180	500	4160 V 3 Phase
3 – Low	2300	60	125	480 V
3 – High	3500	100		3 Phase
4 – Low	2300	60	125	480 V
4 – High	3500	100		3 Phase

The high service pumping system at the treatment plant is capable of delivering approximately 22.3 MGD through the transmission piping to the 3.0 and 5.0 MG ground storage reservoirs located in town.

High service pumps 1 and 2 are generally not used due to their capacity and minimum submergence requirements. The minimum submergence of pumps 1 and 2 is 3.5 feet. The maximum operating depth in the clearwell is 9.6 feet. Capacity available between the high and low operating levels is approximately 95,000 gallons. At a pumping rate of 8,400 gpm, the clearwell will permit one pump to operate for approximately 11 minutes before reaching the low water cutoff. In order for the pumps to continue to operate, the raw water pumping rate must be matched very closely to the treated water pumping rate.

2.4.1.10 *Treated Water Reservoirs:* The City is also equipped to handle any sudden changes in the water demands by utilizing water storage reservoirs and elevated towers throughout the City. Treated water storage facilities include:

- 3.0 MG ground storage reservoir on east side of City,

- 5.0 MG ground storage reservoir on east side of City,
- 1.0 MG Fairgrounds elevated storage tank,
- 1.0 MG Westside elevated storage tank, and
- 0.5 MG College elevated storage tank.

These water storage reservoirs provide a treated water capacity of approximately 10.5 million gallons. This volume is used as a buffer to permit the water treatment plant to operate at a constant production rate even though the water demands by the City change throughout the day.

2.4.2 Operating Concerns and Limitations: Several factors have been identified which limit process performance efficiency and operability. These include:

- Enclosed clarifiers make it virtually impossible for the operators to observe operating conditions in the clarifiers,
- Uncontrolled splitting of flows between secondary clarifiers,
- Clarifier effluent launders are difficult to enter for cleaning, and
- Clarifier effluent launders in the primary clarifier are not arranged in a manner to achieve optimum performance of the clarifier.

SECTION 3: DESCRIPTION OF ALTERNATIVES FOR IMPROVEMENTS

3.1 GENERAL

This section describes the alternatives considered for both the water source and the means for treating the water for the City of Aberdeen. The sources considered were the present sources; Elm River and associated reservoirs and Eyestone Gravel pits, alluvial aquifers adjacent to the Elm River, and the WEB water district. The treatment methods considered are: conventional lime softening water treatment plant using solids contact units followed by membrane filtration, conventional lime softening water treatment plant using solids contact units followed by dual media gravity filters, and membrane pretreatment followed by membrane softening/filtration units. This section presents a detailed description of each of these alternatives. An on-site pilot investigation was conducted during the summer of 2001; the results of this pilot study will also be discussed in this section.

3.2 WATER SOURCE AND SUPPLY ALTERNATIVES

3.2.1 General. The evaluation of alternatives for improvements included an evaluation of both the source of water to be used by the City and the means for treatment of that water. The characteristics of the water source are an important consideration in the selection of the treatment process. If the water source is a surface water supply, the requirements of the enhanced surface water treatment rule must be met. If the source is a treated water source such as WEB, the portion of the water from that source may be blended with water treated on site. If a portion of the source is groundwater to be blended with surface water, surface water treatment technologies must still be used however the groundwater blend will stabilize temperature and offer an opportunity for an alternate source at times when surface water is difficult to treat due color, high turbidity, or taste and odor concerns.

This section addresses each of the water sources considered in the process of developing this facility plan and plan for improvements to the Aberdeen water supply and treatment system.

3.2.2 Elm River Reservoirs and Eyestone Pits. The City of Aberdeen currently obtains all of its water from the Elm River and associated impoundments (Willow and Elm Lake Reservoirs) and the Eyestone Gravel pits. The city holds valid water rights for water quantities sufficient to meet the needs of the City if the water is available in the system. The Elm River and associated reservoirs and the Eyestone gravel pits are shallow surface water supplies vulnerable to drought conditions, water quality excursions due to runoff events and snow melts, and taste, odor and color problems common in shallow reservoirs and relatively small prairie streams. The Elm River impoundment at the treatment plant site was recently dredged to increase storage capacity and remove some of the silt deposits in the vicinity of the intake. The intake facilities and dam are in sufficiently good repair to provide service into the future if maintenance continues as is the present practice. It is intended that the Elm River and associated impoundments continue to be used as a part of the overall water supply for the City of Aberdeen.

The Eyestone gravel pits are shallow ponds created by the excavation of gravel from the gravel pits. The water in the pits is infiltration of groundwater and water from the Elm River adjacent to the pits. The Eyestone pits are used as a supplemental source of water during high turbidity or high taste, odor, or color periods in the Elm River. The total capacity of the supply from the Eyestone gravel pits is limited by the rate of infiltration. Pumping rates in excess of 3 MGD tend to draw the levels down to the pump shutoff level in a relatively short period of time. It is intended that the City of Aberdeen will continue to use the Eyestone gravel pits as a part of their overall water supply for the future.

3.2.3 Well Field in alluvial aquifer adjacent to Elm River. The City of Aberdeen currently holds future use water rights for groundwater from the

alluvial aquifer adjacent to the Elm River in the vicinity of the Eyestone Gravel pits. One of the alternatives considered for improving the water supply for the city was development of wells in the aquifer. Wells in the aquifer would provide a means for access to the water stored in the sand and gravel formations adjacent to the river. Water from this source would have a more consistent temperature, would be low in turbidity, is not likely to have taste, odor, and color problems, and would have chemical characteristics similar to the water from the Elm River and the Eyestone gravel pits. Blending of water from the wells with water from the river will provide the benefits of more consistent water temperature, lower levels of turbidity and color in the water during poor water quality periods, and more consistent water quality in terms of hardness and alkalinity which affect the chemical dosage rates required for the lime softening process.

The aquifer is relatively shallow having saturated thicknesses in the range of 20-40 feet. It is expected that wells in the aquifer would be relatively low capacity, probably in the 200-400 gpm range. Multiple wells would be required in order to develop capacity equal at least 50% of the average day water demand for the city. Development of the well field will require the construction of multiple shallow wells, probably 4-6 wells in the initial configuration, and construction of connecting piping to connect the wells to the existing raw water transmission line from the Eyestone gravel pits well pump stations. Figure 5 in the Appendix shows the location of the proposed well field and the existing raw water transmission line that can be used to convey the water from the wells to the water treatment plant site.

3.2.4 WEB Water District. The WEB water district was also considered as a potential source of water for the City of Aberdeen. Several options were explored with the WEB water district including;

- WEB providing approximately 25% of the water required by the City (a reserved capacity of 2.5 to 3 MGD and city and WEB providing a consistent blend of water under various demand conditions),
- WEB providing all of the water required by the City under average day demand conditions and the City treating and providing the balance from the present sources when required (WEB capacity would have been a baseline flow of 3 MGD, City make up difference to meet demand)
- WEB providing all the water required by the City of Aberdeen. Under this alternative it would have been necessary for WEB to assume responsibility for the operation and maintenance of the Aberdeen water supply and treatment system since the present capacity of the WEB system is not large enough to handle the summer demands and peak day demands of the City. Under this arrangement, the City would have received Missouri River water from the WEB water treatment plant at the rates WEB had available and WEB staff would have operated the Aberdeen plant to provide the water to meet the balance of the water demand. Under this arrangement, WEB would commit to a long term plan of increasing the capacity of the water treatment plant at Mobridge and the transmission, pumping and storage facilities necessary to deliver water to Aberdeen at the rates required to meet the water demands of the City.

The City of Aberdeen and the WEB water development district held a series of meetings and negotiating sessions to explore possible options for a water service agreement that would enable WEB to furnish water to the City of Aberdeen. All the options listed above were explored at length. During the period of discussion and negotiation, the WEB water development district also had the opportunity to sign water service contracts with two ethanol plants in the rural area near Aberdeen. The WEB water system also experienced historical high water demands from their present customers during the summer of 2002. The

combination of these circumstances resulted in an effective withdrawal of an offer to provide water to the City of Aberdeen.

3.3 TREATMENT ALTERNATIVE 1 – CONVENTIONAL LIME SOFTENING WATER TREATMENT PLANT USING CLARIFICATION FOLLOWED BY GRAVITY FILTERS

3.3.1 General: Treatment Alternative 1 – a conventional lime softening treatment process will involve construction of new clarification and softening basins and conversion of some portions of the existing treatment facility to new uses. A description of each of the process areas, both new and remodeled, is presented in the following paragraphs.

3.3.2 Pretreatment: Raw water will be pumped from the Elm River or the well field to the existing pretreatment basin. The clarifier is equipped with four vertical shaft flocculating mixers with variable speed drives and a sludge collection and removal system. Inside the pretreatment basin, powdered activated carbon will be added for taste and odor removal. Water from the pretreatment basin will be collected and piped to the Actiflo unit for primary clarification; sludge from the pretreatment basin will be collected and pumped to the existing sludge lagoons. The pretreatment basin will provide detention time for contact with the Powdered Activated Carbon (PAC) and chlorine dioxide when used. The facilities will be arranged to permit routing of the flow around the pretreatment basin when that treatment process is not required for adequate treatment of the water. The pretreatment basin will provide a detention time of approximately 8 hours at an average flow rate of 3 MGD and a detention time of 2 hours at a peak hydraulic loading rate of 11 MGD. The primary function of the basin will be to provide contact time for the pretreatment chemicals prior to the Actiflow process, thus weir loading rates for clarification are of secondary importance. The clarifier weir loading rate will exceed normally accepted

standards at flows in excess of 7 MGD however the clarification function will be handled by the Actiflow process unit and not the pretreatment basin.

3.3.3 Clarification: Two two-stage treatment trains are included in this alternative. Primary clarification consists of two Actiflo units for chemical precipitation of organic matter and turbidity using alum, potassium permanganate, and powdered activated carbon followed by secondary clarification consisting of two solids contact clarifiers for lime and soda ash softening. Multiple clarifier units and an appropriate means for controlling the split of flow between the units are necessary for efficient, reliable operation over a wide range of flows. The configuration of the existing facilities does not lend itself to the construction of additional clarifiers to be used in parallel with the existing units. If optimum performance over a wider range of flows is to be achieved and conventional lime softening is the method of treatment selected, construction of a new clarification system will be necessary.

3.3.4 Chemical Feeding and Handling Systems: If new clarification units are constructed at the Aberdeen Water Treatment Plant, it will be necessary to install new chemical feed systems. All existing chemical feed systems will remain in operation in the existing treatment plant during construction of the new facility. The new facility will house new lime slakers/feeders and storage/transfer system, soda ash feeders and storage/transfer system, alum feeders and storage/handling system, permanganate feeders and storage tank, powdered activated carbon feeders and storage/transfer system, and carbon dioxide feed system and storage tank. The polymer pumps installed in the Phase 2 improvements would be moved from the existing facility to the new facility as needed. The existing facility will continue to house powdered activated carbon, ammonium, fluoride, phosphate, chlorine dioxide and chlorine. The existing PAC feed system will remain in the existing water plant for delivery of PAC into the pretreatment basin, the system will require some improvements to eliminate handling of bags of PAC. A new ammonium feeder and storage/handling system (to operate in conjunction with the

new feeder installed in the Phase 2 improvements), fluoride feeders and storage/handling systems, and new phosphate feeders and storage/handling systems would be installed in the existing facility. If the City chooses to continue with the present disinfection practice, the chlorine feed system will require minor improvements. The system was upgraded to an all vacuum system in 1994; therefore, the only changes that may need to be made are additional points of application for the chlorine solution. A detailed breakdown of equipment and costs are included in Appendix B.

3.3.5 Filtration: The City of Aberdeen has a couple of options to consider for future filtration improvements, dual media gravity filters or microfiltration membranes. The pretreatment and softening processes would be used to reduce taste and odor problems, high TOC's, and hardness, and the filtration system would be used after the solids contact units to remove *Cryptosporidium* and *Giardia* from the water. Any viruses that may still remain in the water after filtration would be killed by disinfection. Each of the filtration systems is described in the following paragraphs.

3.3.5.1 *Dual Media Gravity Filters:* Dual media gravity filters are what the City of Aberdeen currently used for filtration. The filters would consist of sand and anthracite media, a filter block underdrain collection system, an air wash system (to supply air simultaneous with the backwash water to assist in the backwashing process), washwater collection troughs, and appurtenant piping.

3.3.5.2 *Microfiltration:* An alternative for the City of Aberdeen to consider for future filtration improvements would be microfiltration membranes instead of conventional media filters. The amount of water wasted through the microfiltration process would be equivalent to the amount of water that is wasted due to backwashing.

3.3.6 Filter Backwash Recycle System: The initial phase of construction would not replace the existing media filtration system and the filters would remain in service. The existing washwater reclaim system is too small for the volumes of water to be handled by the facilities. If a conventional treatment process is selected, the Aberdeen Water Treatment Plant improvements would include a washwater reclaim basin large enough to contain the volume of one backwash cycle for each of the eight filters. After the turbidity of the backwash water has settled from the water, the water would be returned to the treatment process before clarification. It is recommended that the settled backwash water be returned at a rate of less than 10 percent of the raw water flowrate entering the treatment facility.¹ Filtered backwash water should not be recycled when the raw water contains excessive algae, when finished water taste and odor problems are encountered, or when trihalomethane levels in the distribution system may exceed allowable levels. The reclaim basin will also be sized large enough to contain the volume of one of the solid contact units; therefore, in the event of an upset, the water could be reclaimed instead of wasted.

The reclaim basin will be provided by converting the use of the existing primary clarifier basin to a washwater reclaim basin. All water to be reclaimed will be wasted to the existing reclaim basin, which will operate as a wet well. Pumps will be set in an enclosure on top of the existing reclaim basin and the water to be reclaimed back to the beginning of the water treatment process will be pumped from that point to the existing rapid mix basin at the head of the existing primary clarifier. The existing primary clarifier will have all of its mechanical equipment for clarification and sludge removal and the basin will be used for reclaimed water sedimentation. The settled water will be collected at the west end of the basin and pumped to either the plant influent or the filter influent. The sludge that accumulates in the reclaim basin would be pumped to the sludge lagoons using

¹ *Recommended Standards for Water Works*. Great Lakes Upper Mississippi River Board of State Public Health and Environmental Managers. 1997.

existing sludge pumps and piping. A detailed breakdown of equipment and costs are shown in Appendix B.

3.3.7 Treated Water Reservoir and New Treated Water Pumps (Conversion of Clarifier and Additional Pump Station): The south secondary clarifier has the capacity to hold approximately 450,000 gallons of water. Presently, the clarifier contains a rapid mix zone, a flocculation zone, and a sedimentation zone, each zone equipped with the necessary equipment. For the proposed improvements, the flocculation and clarification equipment would be removed from within the clarifier and the clarifier would be utilized as an on-site ground storage reservoir. The existing clearwell would continue to be used as it presently is, water would go from the filters to the existing clearwell. From the existing clearwell, 2 pumps (located in the existing high service pump area) would be used to pump the water from the clearwell to the new ground storage reservoir. New high service pumps would be installed on top of the ground storage reservoir so that water could then be pumped to the distribution system on an as-needed basis. The enclosure installed on top of the south secondary clarifier, as part of the Phase 2 improvements, would house the new high service pumps. This enclosure was designed for easy assembly and disassembly for such a reason. Before the secondary clarifier would be used as a ground storage reservoir, a membrane roofing system would be installed to ensure no leakage through the ceiling and a leak test would be performed on the concrete structure to ensure that no water would leak into or out of the basin. A detailed breakdown of equipment and costs are shown in Appendix B.

3.4 TREATMENT ALTERNATIVE 2 - MEMBRANE TREATMENT PROCESSES

3.4.1 General: The second water treatment process evaluated was membrane treatment. Membrane treatment technologies can be combined to provide clarification, softening, and filtration of the water. The combination considered as an alternative to conventional treatment consists of microfiltration membranes

followed by nanofiltration membranes as an alternative to conventional clarification.

There are four types membrane systems used for municipal water treatment applications, they are: microfiltration (MF), ultrafiltration (UF), nanofiltration (NF) and reverse osmosis (RO). The main differences between the filtration systems are their pore size and the type of contaminants they are capable of removing. The different filtration systems and the materials that they remove are shown in Figure 3.1: Size Ranges of Suspended Material in Water and Corresponding Membrane Processes.

Figure 3.1: Size Ranges of Suspended Material in Water and Corresponding Membrane Processes²

SIZE, MICRONS	IONIC RANGE		MOLECULAR RANGE		MACRO MOLECULAR RANGE	MICRO PARTICLE RANGE	MACRO PARTICLE RANGE	
	0.001		0.01		0.1	1.0	10	100
APPROXIMATE MOLECULAR WEIGHT	100	200	1000	10,000	20,000	100,000	500,000	
RELATIVE SIZE OF VARIOUS MATERIALS IN WATER	AQUEOUS SALTS		VIRUSES			BACTERIA	ALGAE	
	METAL IONS		HUMIC ACIDS			CLAYS	CYSTS	SAND
						ASBESTOS FIBERS	SILT	
SEPARATION PROCESS	REVERSE OSMOSIS				MICROFILTRATION			
			NANOFILTRATION		ULTRAFILTRATION		CONVENTIONAL FILTRATION PROCESSES	

The following paragraphs describe the differences between the membrane filtration systems.

1. *Microfiltration:* The purpose of a microfiltration membrane is to remove rather large particles from the water, generally particles over 0.5 microns in diameter. MF membranes have a nominal pore size of 0.1 to 0.2 microns; this can provide complete removal of Giardia cysts (generally 7 to 12 microns) and Cryptosporidium (generally 4 to 6

² Kawamura, Susumu. *Integrated Design of Water Treatment Facilities*. John Wiley & Sons, Inc. New York, New York. 1991. Page 559.

microns).³ Virus particles that are associated with larger particles may be removed, but most are 10 times smaller in size than the MF membrane pores; therefore, they are not removed.

2. *Ultrafiltration:* Ultrafiltration is capable of removing colloids, bacteria, viruses, and some organic compounds. The pore size of an UF system is about 0.03 to 0.05 microns or less, this will provide an absolute barrier to Giardia, Cryptosporidium, and most viruses.² UF systems operate the same way as a MF membrane system. Again this membrane filtration system is pressure driven and has the capabilities of backwashing the same way the MF membrane system does. The pressure system for the UF operates at a higher pressure than the MF membrane system. The feed pressure commonly used for UF is 20 to 75 psi.³
3. *Nanofiltration:* Nanofiltration is capable of removing everything that can be removed by microfiltration and ultrafiltration plus divalent ions, larger monovalent ions, color, and odor. NF operates at a higher pressure than MF or UF, 135 - 230 psi.
4. *Reverse Osmosis:* Reverse Osmosis removes everything that nanofiltration removes plus all monovalent ions. The process of osmosis is when pure water flows through a semi-permeable membrane separating the two waters into water with a high salt content, the water level in the salted water compartment rises until the osmotic pressures on either side of the membrane are equalized. In reverse osmosis, an osmotic pressure greater than that of the salted water is applied to the salted water compartment, this then forces pure water to flow back across the membrane. The pressure needed to achieve this is usually greater than 300 psi, depending on the salt concentration.²

³ Bergman, Robert A. "Overview of Membrane Filtration for Municipal Water Treatment". AWWA Membrane Technology Conference. Long Beach, California. February 28, 1999 – March 3, 1999.

3.4.2 Clarification and Filtration: For this alternative, the turbidity and particulate materials would be removed using vacuum operated ultrafiltration (UF) modules in an open basin followed by a nanofiltration (NF) unit for softening and reduction of organic carbon. NF is capable of removing colloids, bacteria, viruses, most organic compounds, divalent ions, larger monovalent ions, color, and odor. A NF membrane system is comparable to a conventional lime-soda ash softening water treatment process. NF systems are generally pressure-driven processes where the pressurized feed water enters the membrane unit and the product water (filtrate) passes through the membrane barrier. NF systems generally operate at a higher pressure, 135-230 psi.⁴ All rejected substances are collected in a concentrate flow. The concentrate will then proceed to the next train of membranes. A skid of membranes usually consists of three trains of membranes, each train sized to account for the reduction of flow from one train to the next. An example of this would be a skid of sixteen units: train 1 – 8 units, train 2 – 5 units, and train 3 – 3 units. Through each of the three trains, the flow will be reduced because of the permeate being collected. An anti-scalant may be used; this would prevent any foulant build-up on the membranes during operation. Membrane performance will eventually deteriorate to where replacement of the membrane will be necessary. The estimated membrane life will be five years or more, depending on site conditions and operational performance. The disadvantage of using a membrane for water treatment is the recovery ratio. The recovery ratio is the ratio of the permeate flow (effluent) to the feed flow (influent), usually expressed as a percentage. The recovery ratio is typically about 80%, meaning 80% of the feed flow is collected for distribution, and the remaining 20% is concentrate flow. The water that is wasted can either be treated through its own treatment train or then returned to the main treatment process or it can be wasted to a lagoon or sanitary sewer. Another disadvantage of using the nanofiltration system with surface water is the algae in the water. Algae, if not removed in pretreatment, will plug up the filters making the nanofiltration system

⁴ Gould, Charles. "Treating Industrial Water with Membrane Technology." Separation and Filtration Systems Report. March 1, 1995.

very uneconomical. In order to make the NF membrane system work efficiently and effectively, the influent turbidity must be less than 1 NTU; therefore, pretreatment is necessary.

There are several advantages to using membrane filtration in lieu of conventional lime softening. One of the advantages of using a NF membrane system is the lower cost for chemicals, chemical feed equipment, and maintenance needed to soften water as compared to conventional water softening treatment process. Another advantage to using a NF membrane system is there would be no need for conventional media filters, the NF permeate water would go directly to the clearwell for disinfection. The disadvantages of the process are the larger volumes of raw water required and the need for a permit to dispose of the reject water from the process.

3.4.3 Disposal of reject water from NF treatment process. If a nano-filtration process is used for softening and TOC removal, the process will have a waste stream consisting of the reject water from the membrane treatment process. The volume of reject water is typically 20-25% of the volume of untreated water entering the process. For a treated water volume of 3 million gallons per day, 4 million gallons per day would be applied to the membrane and 1 million gallons per day would be reject water. This volume is more than can be handled with the current lagoon system for treatment process residuals and sludge, thus it would be necessary to obtain a permit for discharge of the reject water. Two receiving bodies of water were considered for the discharge, the Elm River downstream of Dam #1 and the Moccasin Creek. Preliminary discussions with the DENR indicated the permit limits for TDS and conductivity would be in the range of 1000 mg/l for discharge to the Elm River since it is classified as a water supply. A permit limit at this level could not be met by the process waste stream. The permit limits for the Moccasin Creek would most likely be in the range of 2000 to 2500 mg/l of TDS. The process waste stream would most likely be able to comply with this limit during periods of time with relatively good influent water

quality. There will be periods when influent water quality TDS will exceed 1200 mg/l, resulting in a reject water TDS concentration in the range of 4000 to 5000 mg/l. This water quality would not meet the requirements for discharge. In recognition of this limitation on the discharge of the reject water, the nanofiltration (NF) treatment process was not selected for implementation in the Aberdeen water treatment plant.

3.5 ALTERNATIVES FOR DISINFECTION

3.5.1 Combined Residual Chlorination in New Configuration: This alternative would utilize free residual chlorination for disinfection and apply the ammonia for formation of the combined residual after the chlorine contact time requirements have been met. Free residual chlorination can meet the disinfection requirements for disinfection contact time (CT requirements) at lower disinfectant doses. The ammonia would be added to the water prior to pumping it to the City in order to form the combined chlorine residual. Water delivered to the City would have combined chlorine residual concentrations not to exceed 4 mg/l. This alternative could be achieved by converting the existing secondary basins into additional clearwell space. The contact time needed for the free chlorine to disinfect can be achieved within the clearwell. As the water is leaving the clearwell, ammonia will be added to the water to convert the free chlorine to combined chlorine (chloramines) before it enters the distribution system.

3.5.2 Alternative Disinfectants: Two options for alternate disinfectants were also evaluated for compliance with the proposed limits to be implemented under the Safe Drinking Water Act.

3.5.2.1 Mixed Oxidants: This alternative involves using mixed oxidants as the primary disinfectant for the Aberdeen Water Treatment Plant. On-site mixed oxidant generators are used to produce a solution of chlor-oxygen oxidants which are used for disinfection and oxidation purposes. The generator's electrolytic reactor cell uses sodium chloride salt, water,

and electricity to generate the oxidant solution, which is then collected in a tank and injected into water at rates appropriate to meet treatment objectives.

The mixed oxidant solution provides disinfection power similar to chlorine dioxide, but will leave a free chlorine residual in the treated water. Mixed oxidant solution-disinfected water containing chlorine residuals as high as 4 mg/l has no chlorine taste. The distinctive, objectionable chlorine taste characteristic of tap water in many large cities is due to chloramines formed at the treatment plant to maintain a chlorine residual. Field experience to date has shown that a detectable disinfection residual is maintained for at least 48 hours using the mixed oxidant solution without resorting to chloramines to maintain the residual.

3.5.2.2 UV Disinfection: Another alternative for disinfection is the use of ultra-violet (UV) light for inactivation of cryptosporidium oocysts and giardia cysts. UV disinfection involves the use of light bulbs operated to produce ultra violet light inserted into the flow stream of the water. UV disinfection does not provide a residual disinfectant so it would be necessary to follow it with chlorination to safeguard water quality in the distribution system. UV disinfection would provide some additional protection from the possibility of Cryptosporidium breakthrough if conventional treatment and granular media filters were used. If micro filtration is used, the MF unit provides a barrier for the oocysts and UV disinfection may not be applicable for the process.

3.6 IMPACT OF A NO-ACTION ALTERNATIVE

A No-Action alternative would maintain the status quo for water supply and treatment facilities for the City of Aberdeen. The result of selecting this alternative would be continued deterioration of the water treatment facilities due to age and corresponding difficulty in meeting water quality requirements. The

existing clarifier systems have frequent mechanical problems requiring them to be removed from service for extended periods of time, resulting in more difficult and less effective treatment process operations.

The existing washwater reclaim basin is too small to handle the volume of backwash water from the existing filter system. If the system is not upgraded, the excess backwash water will continue to be discharged to the impoundment behind dam #1 on the Elm River and the rate of return of backwash water will not be controlled. This situation is a regulatory compliance concern.

The treated water pumping system currently does not have a standby pump that is in operating condition and the clearwell capacity is inadequate for the flows normally produced at the treatment plant. Pumping equipment problems would cause a serious operating situation for the City if the problems occurred during the warm weather demand period when one pump could not meet the water demand of the City.

If no action is taken to improve the treatment process at this time, the costs for the improvements that are necessary will be more expensive at a later date. The costs of operation of the existing facility will continue to escalate as the frequency and scope of equipment repairs increases as the equipment continues to age and deteriorate.

3.7 RESULTS OF PILOT TESTING

Over the past several years water quality standards have become more stringent and process performance has been affected by age of equipment, making it necessary to consider improvements to the Aberdeen Water Treatment Plant. The City Commission authorized a pilot plant study so that two different treatment technologies could be evaluated and compared over an extended period of time. Two different treatment trains were set up, side by side, and operated simultaneously during the time of year when water quality is historically at it

worst, the spring right after the ice melts from the river. Pilot Plant #1 consisted of a solids contact unit for pretreatment for taste, odor and color removal followed by a solids contact unit for lime softening and then microfiltration for filtration. The second treatment train, Pilot Plant #2, consisted of an ultrafiltration membrane process (pretreatment) followed by nanofiltration for softening and filtration. Both pilot plants required some chemical feed points. Analysis of the water at different points throughout the treatment processes was necessary in order to compare the two different treatment techniques; therefore, sampling points throughout both treatment trains were necessary. The pilot study was conducted during the spring and summer of 2001.

Pilot Plant #1, the solids contact units in series followed by microfiltration, was successful in removal of taste, odor, and color once the treatment processes were optimized and the optimum chemical mix was established. SCU#1 was able to obtain the best color removal when feeding a mix of powdered activated carbon and alum; SCU#2 was able to obtain additional color removal when the lime caused an increase in the pH to pH greater than 10.5. Alum and ferric chloride both did an adequate job of turbidity and TOC removal through the solids contact units. The solids contact units also did an excellent job of hardness removal; less lime was used than the full-scale plant to obtain approximately the same effluent hardness. The microfiltration unit did an excellent job of removing turbidity from the water; but irreversible damage was done to the membranes, apparently from calcium carbonate encrustation; therefore, microfiltration is not recommended as the filter mechanism when following lime softening clarifiers.

Pilot Plant #2, ultrafiltration followed by nanofiltration, was not successful in consistently removing color and TOC without using very high dosages of ferric chloride (60-65 mg/l). The ultrafiltration unit did an excellent job of removing turbidity from the raw water, consistently producing an effluent water with a turbidity of 0.20 or less. The effluent from the ultrafiltration unit was split 50/50, 50% going to the nanofiltration for further treatment and the remaining 50% by-

passing the nanofiltration unit and getting blended with the nanofiltration effluent. The nanofiltration unit removed hardness from the water, from an average raw water hardness of 561 mg/l to 128 mg/ in the nanofiltration effluent. The nanofiltration reject water has a TDS of approximately 3,310 mg/l, too high to discharge to any available surface water source; therefore, a full-scale nanofiltration unit would not be recommended because of the limitations on disposal of the reject water.

3.8 SUMMARY

The evaluation of both pilot plant processes was achieved during the 16-week study. The estimate of probable capital costs for either of the options for full-scale treatment or connecting and purchasing all of the water from WEB is presented in Table 3.2: Estimate of Capital Costs. A complete listing of the probable capital costs may be seen in Appendix B. Annual operation and maintenance costs are summarized in Table 3.3: Estimated Annual Operation and Maintenance Costs. The annual operation and maintenance costs for conventional treatment are similar to the present costs of operation. A complete listing of the costs for O&M may be seen in Appendix C. Modifications have been made for staffing recommendations and other operating recommendations.

Table 3.2: Estimate of Capital Costs

Description	WEB*	Membrane Treatment	Conventional Treatment
Division 1 – General Conditions		\$380,000	\$275,000
Division 2 – Site Construction		\$676,570	\$2,433,350
Division 3 – Concrete		\$643,760	\$3,023,545
Division 4 – Masonry		\$59,750	\$233,680
Division 5 – Metals		\$27,600	\$104,930
Division 6 – Wood and Plastics		\$7,500	\$97,000
Division 7 – Thermal and Moisture Protection		\$133,120	\$199,530
Division 8 – Doors and Windows		\$55,500	\$265,630
Division 9 – Finishes		\$25,000	\$170,000
Division 10 – Specialties		\$20,000	\$137,000
Division 11 – Equipment		\$14,011,150	\$4,225,320
Division 13 – Metal Building Systems		\$0	\$45,000
Division 14 – Conveying Systems		\$7,000	\$130,000
Division 15 – Mechanical, HVAC, Plumbing		\$1,140,000	\$820,000
Division 16 – Electrical		\$1,520,000	\$1,100,000
Division 17 – Controls and Telemetry		\$300,000	\$500,000
Probable Construction Costs =		\$19,006,950	\$13,759,985
Phase 1-1: Dredging of Elm River		\$338,000	\$338,000
Phase 1-2: Water Treatment Plant Improvements			\$762,600
Phase 2: Water Treatment Plant Improvements			\$919,750
Engineering, Administration, and Contingencies =		\$4,751,700	\$2,841,000
TOTAL PROJECT COST =	\$58,626,165	\$23,758,650	\$18,621,335

*Capital costs for WEB were determined by calculating the present value using the Monthly Minimum of \$45/gpm for 11 MGD of water reserved, an interest rate of 3.5% and a 20-yr term.

Table 3.3: Estimated Annual Operation and Maintenance Costs*

Description	WEB	Membrane	Conventional
Treatment Process Chemicals	\$0	\$359,320	\$343,370
Power Costs/Heating Costs	\$34,900	\$246,600	\$179,100
Fuels, Lubricants, and Vehicles	\$7,200	\$15,000	\$15,000
Labor, Personnel Services	\$70,000	\$210,000	\$245,000
Membrane Replacement	\$0	\$379,390	\$0
Laboratory Fees	\$5,000	\$10,000	\$10,000
Supplies and Miscellaneous Expenses	\$36,000	\$75,000	\$75,000
Administrative and General Expenses	\$10,000	\$20,000	\$20,000
Cost to Purchase Water	\$1,405,250	\$0	\$0
SUB-TOTAL ANNUAL OPERATIONS AND MAINTENANCE BUDGET	\$1,568,350	\$1,315,310	\$887,470
Debt Service (assuming \$2,000,000 Grant and \$0 Local Funds) =	\$4,165,020	\$1,530,915	\$1,013,200
TOTAL ANNUAL OPERATIONS AND MAINTENANCE BUDGET	\$5,733,370	\$2,846,225	\$1,900,670
Cost/1000 Gallons Treated	\$4.49	\$2.23	\$1.49

*Assuming that the Aberdeen WTP treats an average of 3.5 MGD.

It is recommended that the City of Aberdeen pursue plans to build a full scale conventional lime softening plant using solids contact units.

3.9 PRELIMINARY PLANS

A preliminary layout of a conventional lime softening water treatment plant has been prepared. It is envisioned that the existing pretreatment basin would continue to be used followed by a new facility containing new clarifiers for additional clarification and softening. The new clarifiers would provide a two-stage clarification process, primary and secondary treatment. Taste and odor removal and turbidity removal would be accomplished in the primary clarification process and softening would be accomplished in the secondary clarifiers. Variable head, declining rate filters would be considered for future improvements. The existing south secondary basin would be converted to a clearwell for additional treated water space on-site. The clarification process would include piping necessary to connect the new solids contact clarifiers to the existing filter system in order to permit continued operation of the existing filters. Laboratory, chemical storage and handling area, and support facilities for the treatment plant

would be incorporated into the completed project. The facilities would be constructed at elevations to protect from flooding in the event of record high water levels or a dike failure. Appendix D contains plans for the site layout, the office/administration area, the treatment area, and the chemical storage/handling area for a conventional lime softening water treatment plant. The initial phase of construction for the conventional treatment alternative would involve the construction of the new clarification process, chemical feed areas, support facilities and associated site work. The water would be routed from the new clarifiers to the existing sand filters for filtration and disinfection. A future second phase of construction would involve the construction of new media filters.

SECTION 4 – ENVIRONMENTAL ASSESSMENT

4.1 GENERAL DESCRIPTION OF PROPOSED IMPROVEMENTS IN AFFECTED AREA

The proposed improvements to the Aberdeen Water Treatment Facility include the construction of a series of wells in the alluvial aquifer adjacent to the Elm River and a new two-stage clarification process at the treatment plant site. Taste and odor removal and turbidity removal would be accomplished in the primary clarifiers and softening would be accomplished in the secondary clarifiers. The existing pretreatment basin would continue to be used for pretreatment. The existing south secondary clarification basin would be converted to a clearwell for additional treated water space on-site and the existing north primary clarification basin would be converted to a reclaim basin. The clarification system would include piping necessary to connect the new clarifiers to the existing filter system in order to permit continued operation of the existing filters. Laboratory, chemical storage and handling area, and support facilities for the treatment plant would be incorporated into the new facility. The facilities would be constructed at elevations to protect from flooding in the event of record high water levels or a dike failure.

4.2 HISTORICAL, CULTURAL AND ARCHAEOLOGICAL RESOURCES

Construction of the wells and connecting pipeline will occur in the area near the Elm River. This area may have been used by native American cultures and cultures predating settlement by people of European ancestry. It is recommended that a Class 1 literature search be completed for the proposed project area and, if necessary, a pedestrian survey of the proposed well sites. The area for the proposed project activity has some likelihood of having had prior use as a hunting site due to the proximity to a water source. The area proposed for well field development is currently used for production agriculture and is tilled land. No major archaeological finds are likely to be discovered however some scattered artifacts may be discovered.

The proposed water treatment plant improvements are planned to be constructed on the existing water treatment plant site. The area proposed for construction is

adjacent to the location of the house for the water superintendent. This house has been demolished and removed from the site. Some artifacts of that use of the site may be discovered during construction of the new facility. Due to the nature and location of the construction and improvements, no adverse impacts to cultural and archaeological resources are expected to occur as a result of the construction activities associated with the treatment plant improvements.

4.3 FLOODPLAINS AND WETLANDS

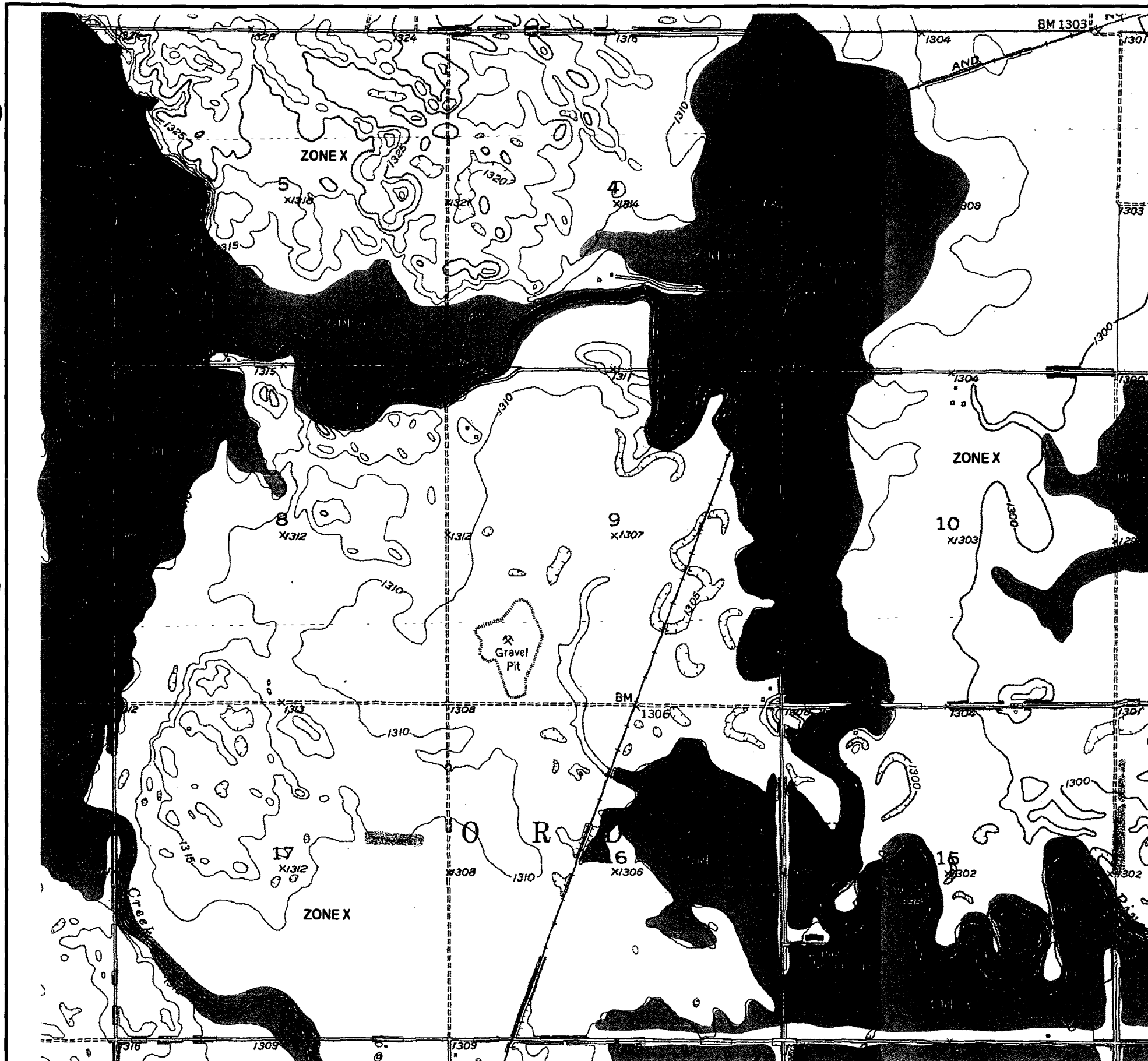
4.3.1 Flood Plain: A small portion of the proposed well field is located within the 100-yr flood plain. Any wells constructed in this location will be mounded up to one foot above the 100-yr flood boundary. The improvements to the new water treatment facility will be located within the 100-yr flood plain. The site for the water treatment plant will be built up so the main operating floor of the water treatment plant will be located one foot above the 100-yr flood elevation. A map of the 100-yr flood boundary is shown in Figure 4.1: Flood Plain Map. This construction project will not significantly change the 100-yr flood boundaries.

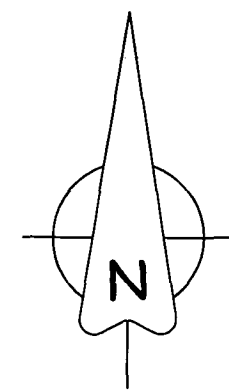
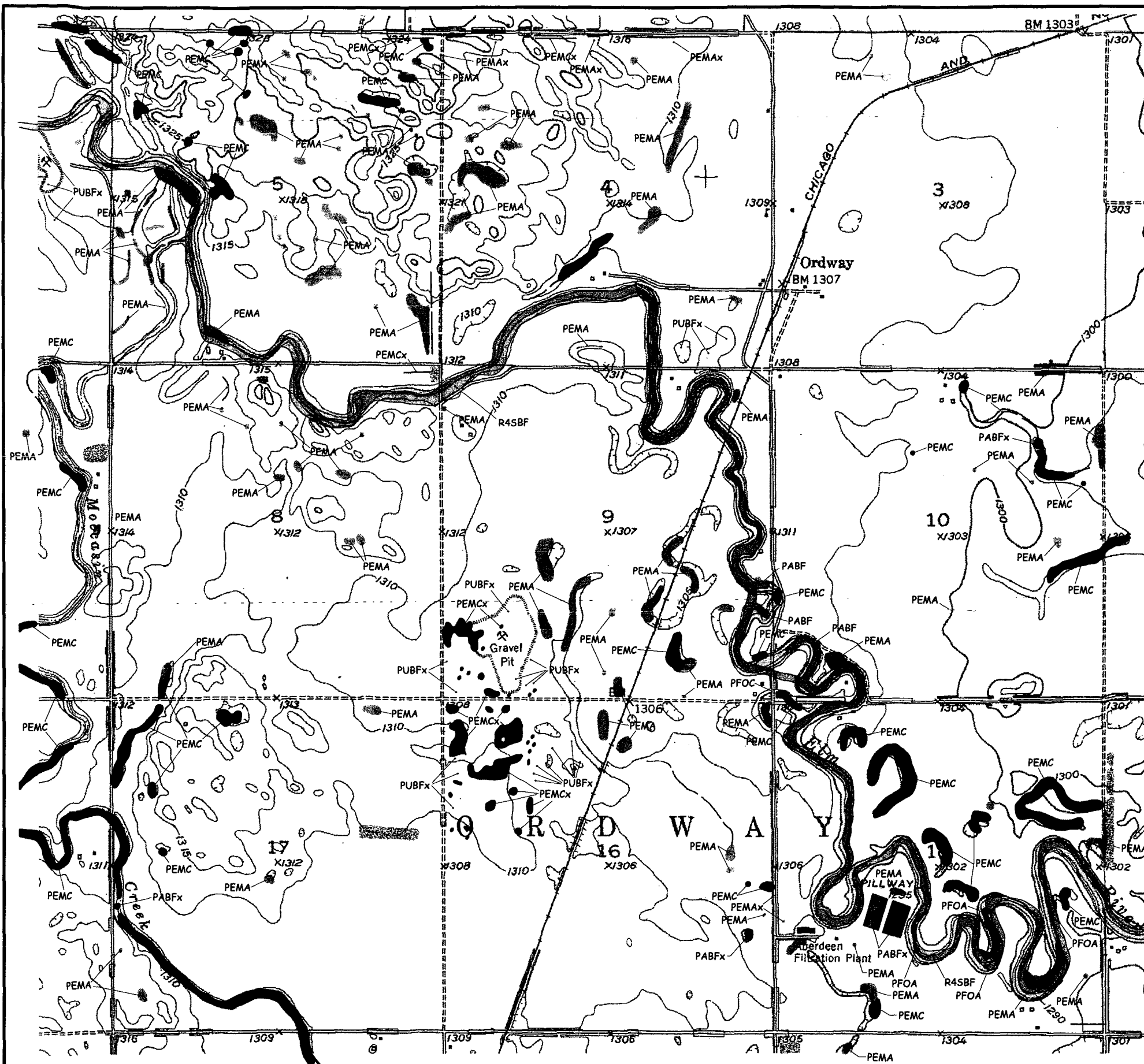
4.3.2 Wetland: It is anticipated that the additions to the well field and water treatment plant will not significantly impact any natural wetland as defined by the National Wetlands Inventory (NWI). Figure 4.2: Wetland Map shows a layout of the NWI wetlands in the proposed project area.

4.4 AGRICULTURAL LANDS

The location of the proposed well field is on agricultural land. It is assumed that each of the six (6) wells will need one (1) acre of land; therefore, six acres of agricultural land will be taken out of production.

The location of the water plant improvements is on city property. No adverse impacts to agricultural lands are expected to occur as a result of the construction activities associated with this project.





APPROX. SCALE: 3" = 1 MILE

NOTE:
 INFORMATION OBTAINED FROM THE NATIONAL WETLANDS INVENTORY
 U.S. DEPARTMENT OF INTERIOR/FISH AND WILDLIFE SERVICE - 1989
 ORDWAY, SD PANEL

WETLANDS LEGEND

- PABF - PALUSTRINE/AQUATIC BED/SEMPERMANENTLY FLOODED
- PABFx - PALUSTRINE/AQUATIC BED/SEMPERMANENTLY FLOODED/EXCAVATED
- PEMA - PALUSTRINE/EMERGENT/TEMPORARILY FLOODED
- PEMAx - PALUSTRINE/EMERGENT/TEMPORARILY FLOODED/EXCAVATED
- PEMC - PALUSTRINE/EMERGENT/SEASONALLY FLOODED
- PEMCx - PALUSTRINE/EMERGENT/SEASONALLY FLOODED/EXCAVATED
- PFOA - PALUSTRINE/FORESTED/TEMPORARILY FLOODED
- PFOC - PALUSTRINE/FORESTED/SEASONALLY FLOODED
- PUBFx - PALUSTRINE/UNCONSOLIDATED BOTTOM/SEMPERMANENTLY FLOODED/EXCAVATED
- R4SBF - RIVERINE/INTERMITTENT/STREAMBED/SEMPERMANENTLY FLOODED

DRAWN BY: R.A.R.
 DESIGNED BY: K.L.B.
 CHECKED BY: D.C.O.

REVIEWED: _____ FOR _____
 DATE: _____

REVIEWED: _____ FOR BANNER ASSOCIATES, INC.
 DATE: _____

BANNER
 BANNER ASSOCIATES, INC. • CONSULTING ENGINEERS & ARCHITECTS
 409 22nd Av S • P.O. Box 298 - Brookings, SD 57006 • (605)692-6342

REVISION	DATE	DESCRIPTION	BY	CK'D

Aberdeen Water Supply & Treatment Improvements
 Aberdeen South Dakota
FACILITY PLAN
WETLAND MAP

SCALE: None JOB NO: 20192.00.01 DATE: Jan.03

Figure No. 4.2

4.5 RECREATIONAL RIVERS

The proposed well field is not located along the banks of the Elm River, a recreational river popular with fishermen; therefore it should have little, if any, impact of the recreational area. The proposed water treatment plant improvements are located near the Elm River. The proposed construction will not directly impact the use of the recreational area.

4.6 THREATENED AND ENDANGERED SPECIES

The proposed water treatment plant construction will take place within the confines of the existing water treatment plant site. No adverse impacts to threatened and endangered species are expected to occur as a result of the construction activities associated with this project. The proposed well field construction will take place on agricultural lands approximately 3 miles from the water treatment plant location. Possible federally endangered species are listed in Table 4-2, Endangered Species of South Dakota. Persons at South Dakota State University, Brookings, SD cited for their comments related to these species are Gary Johnson, part of the Herbarium Collection, and Paul Johnson, area of expertise is insects.

Table 4-2: Summary of Federally Endangered Species of South Dakota

Name of Endangered Specie	Status	Comments
American burying beetle	LE	
Regal Fritillary		
Dakota Skipper		
Scaleshell	LE	
Pallid Sturgeon	LE	Not an issue, found on the Missouri River
Topeka shiner	LE	Located in semi-permanent and intermittent streams during spawning season
Bald Eagle	LT	Not an issue
Eskimo curlew	LE	
Interior least tern	LE	
Mountain plover	PT	
Piping plover	LT	
Whooping crane	LE	
Black-tailed prairie dog	C	Not an issue, found west of the Missouri River
Black-footed ferret	LE	Not an issue
Gray wolf	LE	
Western prairie fringed orchid	LT	

4.7 WILDLIFE AND FISHERIES RESOURCES

The proposed water treatment plant construction will take place within the confines of the existing water treatment plant site. No adverse impacts to fish and wildlife resources are expected to occur as a result of the construction activities associated with this project. Any chlorinated water used for disinfection and testing of the pipeline and/or treatment units will be de-chlorinated prior to discharge. No long term impact to fish and wildlife is expected as a result of this construction.

4.8 DIRECT, INDIRECT AND MITIGATING ADVERSE IMPACTS

Previous portions of this section have addressed the impact of the proposed project on water quality, fish and wildlife, historical and archaeological sites. The remainder of this section addresses other impacts of the proposed project and mitigation measures that may be necessary to limit adverse impacts.

4.8.1 Land Resources: Construction of the proposed water treatment plant and well field improvements will require excavation, leveling, and site grading work. Potential adverse environmental impacts during construction include short-term localized erosion and airborne dust from the construction site through wind action and heavy equipment use. Erosion and sediment control practices include both temporary measures such as erosion control barriers and watering and long-term measures such as seeding and grading of properly sloped drainage ways.

4.8.2 Air Resources: Air quality may be locally degraded by increased particulate levels during excavation and site grading associated with construction of the proposed improvements. Temporary increases in construction equipment emissions are not expected to be significant. Measures that can be taken during construction to control excessive airborne dust are listed below.

- Watering and/or the use of dust retardants before and during construction.
- Stabilizing temporary and permanent access roads to prevent erosion.
- Proper placement and compaction of stockpiled soil and excavated material to reduce particulates.

- Limiting construction activities during periods of high winds.

4.8.3 Cultural Resources: The improvements to the water treatment plant and well field are not expected to have any significant adverse short or long-term impact on cultural resources of the area. The only apparent potential impact may be the unearthing or covering up of historic or archaeological resources during construction excavation. An archaeological investigation and clearance will be completed at the site before any construction is to begin. In the event that archaeological or historic resources are unearthed during construction excavation, the immediate stoppage of work is dictated by a required condition in the contract specifications.

Construction should bring a slight economic boost to the area through the hiring of local labor, retail trade by construction employees, and purchase of miscellaneous building supplies and fuel.

SECTION 5 - CONCLUSIONS AND RECOMMENDATIONS

5.1 DESCRIPTION OF SELECTED PLAN

5.1.1 General: The water distribution system improvements identified are those improvements needed to provide additional water supply and treatment capacity to meet the increased water demand of the City of Aberdeen.

The scope of the project will include the following items:

1. Up to six additional wells in the alluvial aquifer adjacent to the Elm River. The wells will provide water from current water rights and future use water rights held by the City of Aberdeen;
2. Water line as necessary to deliver water from the wells to the water treatment plant;
3. Water clarification process and all associated piping;
4. Chemical feed equipment, storage facilities, and all necessary appurtenances;
5. Office/Administration building; and
6. Renovations and improvements to existing structures and facilities.

5.1.2 New Wells: It is expected that at least six (6) new wells will be constructed in the alluvial aquifer adjacent to the Elm River. The wells will provide a supplemental groundwater supply for the water treatment plant. The wells will be located along the route of the existing raw water transmission line used to convey water from the Eyestone gravel pits to the water treatment plant.

5.1.3 Water Treatment Plant Improvements: The water treatment plant improvements will consist of new Actiflo process units for turbidity removal and clarification, new solids contact clarifiers that would provide chemical treatment for hardness removal, TOC reduction, and additional turbidity removal. Taste and odor control will be accomplished in various steps in the process including the pretreatment basin, the Actiflo process, and the softening process in the solids contact clarifiers. Variable head, declining rate filters would be considered for

future improvements. The existing south secondary basin would be converted to a clearwell for additional treated water storage at the site. The solids contact clarification process would include piping necessary to connect the new solids contact clarifiers to the existing filter system in order to permit continued operation of the existing filters. Laboratory, chemical storage and handling area, and support facilities for the treatment plant would be incorporated into the completed project.

Table 5.1: Cost Estimate, Water Treatment Plant and Well Field Expansion

DESCRIPTION	TOTAL COST
Production Wells and Raw Water Transmission	\$980,000
Water Treatment Plant	\$12,779,985
OPINION OF PROBABLE PROJECT COST	\$13,759,985

5.2 FINANCIAL PLAN AND IMPACT ON USER RATES

5.2.1 Revenue Requirements and Probable Impact on Water Rates: It was assumed for purposes of rate calculations that the project will be financed with a combination of grants and loans. Grant funding awarded by the State of South Dakota has been included in the project budget projections and estimates of impacts to user rates. It is assumed that Aberdeen will be eligible for a State Revolving Fund (SRF) loan with a 20-yr term at 3.5% interest. Table 5.3: Financing Plan and Impact on Water Rates Using SRF Loan contains a breakdown of costs associated with the proposed project. A contingencies allowance of 10% is included in the project budget as an allowance for inflation and an allowance for small changes in project scope that may occur as the project moves from the planning phase to the final design phase.

The number of water meters for the City of Aberdeen are shown in Table 5.2: Meter Equivalents.

Table 5.2: Meter Equivalents

Meter Size	# of Active Accounts	¾" Equivalent	Account Equivalents
5/8"	3612	0.83	3010
3/4"	3400	1.00	3400
1"	719	1.33	959
1-1/4"	189	1.67	315
1-1/2"	17	2.00	34
2"	182	2.67	486
3"	37	4.00	148
4"	22	5.33	118
6"	4	8.00	32
7"	1	9.33	10
8"	1	10.67	11
TOTAL	8,185		8,523

Table 5.3: Financing Plan

Opinion of Probable Construction Costs	\$13,759,985
Engineering, Administration, and Contingencies	\$2,640,700
Opinion of Probable Project Costs	\$16,400,685
Grant	\$2,000,000
Local Share	\$685
State Revolving Loan Amount	\$14,400,000
Debt Retirement (3.5%, 20 years)	\$1,013,200
Number of Account Equivalents	8523
Cost/Month/Account Equivalent for Debt Service	\$9.90
Present Monthly Minimum	\$10.00
Operation and Maintenance – Water Treatment Plant	\$888,000
Operation and Maintenance – Water Distribution	\$725,000
Depreciation	\$470,000
Cost/1000 gallons Treated	\$1.63
Cost/1000 gallons Metered Sales	\$1.85
Present Cost Per 1000 gallons/ Future Cost Per 1000 gallons (March 2003)	\$1.55/\$2.00

*Assuming an average day demand of 3.5 MGD.

5.3 PROJECT SCHEDULE

5.3.1 Regulatory Schedules: The Aberdeen Water Treatment Plant is presently in compliance with the requirements of the Surface Water Treatment Rule and the Disinfectants/Disinfection By-products Rules of the Safe Drinking Water Act. Rule changes proposed for implementation within the next five years will require changes to the Aberdeen treatment process. The D/DBP Rule will impose more restrictive limits on disinfection byproducts and total organic carbon in the water. Stage 1 of the D/DBP Rule must be met on or before December 16, 2001 and the Stage 2 D/DBP Rule is expected to have an effective date of May, 2005.

The final rule for the Filter Backwash Rule requires treatment facilities to submit a compliance plan by December of 2003 and complete construction of the required improvements by June 8, 2006. The FBWR requires utilities to treat reclaim water or blend the reclaim water with raw water at a limited flowrate. The purpose of the FBWR is to control the re-entry of pathogens and other contaminants into the drinking water process.

5.3.2 Design and Construction Time Requirements: It is recommended that the City replace the treatment process units and size them to provide the capacity to meet the projected water demands for the next twenty years. It is also recommended that the new facilities be constructed above the 100-yr flood elevation. A preliminary schedule for constructing a new water treatment plant is presented in Table 5.4: Implementation Schedule.

Table 5.4: Implementation Schedule

DESCRIPTION OF TASK	TIME SCHEDULE
State Water Plan Application Due	January, 2003
DENR Approve SRF Loan	April, 2003
Finish Project Design	May, 2003
Submit Plans and Specifications for Review to Owner and DENR	May, 2003
Open Bids for Construction	June, 2003
Start Construction	July, 2003
Substantial Completion of New Water Treatment Plant	December, 2004
Final Completion of New Water Treatment Plant	May, 2005
Complete One-Year Warranty on New Water Treatment Plant	May, 2006

The schedule suggested in Table 5.4 must be met in order to begin construction in July, 2003. Any slippage will result in postponement of all subsequent dates.

5.3.3 State Water Planning Process and Schedule: If the City wishes to qualify for grant assistance through the Consolidated Water Facilities Construction Fund program or the Community Development Block Grant program, it is necessary to enter the project on the State Water Plan. Opportunities to enter the project into the State Water Plan occur in September, November, January, and June. The project will be eligible to compete for funding in the quarter following the one in which it was added to the State Water Plan.

5.3.4 Public Input Process: A public hearing will be scheduled in order to solicit comments and suggestions from the public regarding the proposed water treatment plant improvements. The Public Hearing is scheduled as a part of a regularly scheduled meeting of the City Commission on Monday January 13, 2003. The notice of the hearing was published on December 20, 2002 and December 27, 2002.

5.3.5 Agency Review Process: Copies of the draft Facility Plan were distributed to the following agencies for review and comment in January, 2003. A copy of the transmittal letters and the response letters received from each agency will be a part of the appendix to the final Facility Plan report. Agencies receiving copies for comment are listed below:

United States Department of Interior
Fish and Wildlife Service
420 S. Garfield Avenue
Pierre, SD 57501-5408
Attn: Donald Gober, Field Supervisor

South Dakota Dept. of Game, Fish and Parks
Division of Wildlife
523 E. Capitol Avenue
Pierre, SD 57501-3181
Attn: John Kirk, Interagency Coordinator

United States Department of Agriculture
Natural Resources Conservation Service
Federal Building
Huron, SD 57350-2475
Attn: Jerry Schaar

U.S. Army Corps of Engineers, Omaha District
Planning Division
215 North 17th Street
Omaha, NE 68102-4978
Attn: Candace M. Gorton

State Historic Preservation Center
Department of Education and Cultural Affairs
900 Governors Drive
Pierre, SD 57501-2217
Attn: Jay Vogt, State Historic Preservation Officer

APPENDIX A:

REGULATORY SUMMARY

SAFE DRINKING WATER ACT REQUIREMENTS

The Safe Drinking Water Act has several rules governing methods of treatment and disinfection of public water supplies. These include:

- The Disinfectants/Disinfection By-Products Rules (Stage 1 and Stage 2) which establish maximum contaminant levels for disinfection byproducts.
- Surface Water Treatment Rule requirements relative to disinfection of surface water supplies and groundwater under the direct influence of surface water.
- Volatile Organic Chemicals establishes a maximum contaminant level for VOC's that may cause human health effects.
- Taste, Odor, and Color control is necessary because they are objectionable from an aesthetic perspective and may be an indicator of other water quality concerns.
- Filter Backwash Rule would control the re-entry of pathogens and other contaminants into the drinking water process.

Disinfectant/Disinfection Byproducts: The Disinfectant and Disinfection By-products Rule (Stage 1 D/DBPR) was published in the Federal Register on December 16, 1998 concurrently with the Interim Enhanced Surface Water Treatment Rule (IESWTR). The Stage 1 D/DBPR reduces the allowable level of total trihalomethanes (TTHMs) and sets new limits for the sum of five haloacetic acids (HAA5s) for all community and nontransient/noncommunity systems that disinfect. Large surface water systems (serving more than 10,000 people) must comply with the new rule by December 16, 2001. Smaller surface water systems (serving less than 10,000 people), and all affected groundwater systems, must comply by December 16, 2003.¹ (Copy of Reference No. 3 is shown in Appendix A)

The use of chemicals that are effective as disinfectants creates the possibility of creation of disinfection byproducts. The byproducts are generally formed by reactions between organic compounds and the disinfectant. The most common byproducts are compounds formed between methane and halogens such as chlorine. The general term for these compounds is trihalomethanes. The current Safe Drinking Water Act includes maximum contaminant level (MCL's) for the common disinfection byproducts. The parameters regulated as disinfection byproducts are TTHM's and HAA5.¹ The Stage 1 limits on these parameters are:

Table 1: Stage 1 – Disinfectant/Disinfection By-products Rule

DISINFECTION BYPRODUCT	MCL ³ (ug/l)
TTHM ¹	80
HAA5 ²	60
DISINFECTANTS	MRDL ⁴ (mg/l)
Chlorine	4.0 (as Cl ₂)
Chloramines	4.0 (as Cl ₂)
Chlorine Dioxide	0.8 (as ClO ₂)

Note: 1 – Sum of chloroform, dichlorobromomethane, dibromochloromethane, and bromoform.

2 – Sum of trichloroacetic acid, dichloroacetic acid, monochloroacetic acid, monobromoacetic acid, and dibromoacetic acid.

3 – MCL = Maximum Contaminant Level.

4 – MRDL = Maximum Residual Disinfectant Level.

The disinfectant and disinfection byproducts rule was proposed September 22, 1989, to satisfy requirements of the 1986 SDWA amendments to regulate 25 additional contaminants every 3 years beginning in 1991. Disinfectants and disinfection by-products are included as contaminants to be regulated in accordance with the Drinking Water Priority List (DWPL). Because the D-DBP Rule and the Surface Water Treatment Rule address many complex and interrelated issues, the Regulation Negotiation (Reg-Neg) Advisory Committee agreed that the rule would be developed in stages. In the D/DBPs Rule, the MCL for TTHMs is set at 80 µg/L (or 0.08 mg/l). MCLs are also set for two inorganic

¹ American Water Works Association Website (www.awwa.org). April 7, 2000.

DBPs - bromate and chlorite. Bromate, a by-product of ozonation, is set at 0.010 mg/L. Chlorite, a degradation product of chlorine dioxide, is set at 1.0 mg/L.¹

For meeting Stage 1 MCLs for disinfection by-products the Best Available Treatment (BAT) is enhanced coagulation (or enhanced softening) or granular activated carbon. The BAT technology for controlling MCLs for bromate and chlorite is controlling ozonation and chlorine dioxide application rates. BAT for meeting maximum residual disinfectant levels for chlorine (4.0 mg/L), monochloramine (4.0 mg/L) and chlorine dioxide (0.8 mg/L) is to maintain accurate control of the disinfection process. USEPA has conceded that in order to address specific water quality problems, such as control of microbial regrowth, it may be necessary to increase the residual disinfectant above the MRDL for a short period of time.

Since measurement of disinfection by-products precursors concentration by direct measurement is not feasible, total organic carbon (TOC) concentration is used as a surrogate measurement. Treatment effectiveness is measured in terms of TOC reduction prior to disinfection. Treatment systems employing coagulation, flocculation, sedimentation and filtration will be required to remove precursors through enhanced coagulation or enhanced softening. TOC removal requirements will be based on source water alkalinity as given in Table 2: TOC Removal Requirements.

Table 2: TOC Removal Requirements

Source Water TOC, mg/l	Source Water Alkalinity, mg/l		
	0-60	>60-120	>120*
>2-4	35%	25%	15%
>4-8	45%	35%	25%
>8	50%	40%	30%

* Systems practicing softening must meet TOC removal requirements in this column.

The Aberdeen Water Treatment Plant utilizes the softening process, therefore, the applicable TOC removal requirements are those in the column headed "Source

Water Alkalinity, mg/l >120". Data collected by the City of Aberdeen is presented in Table 3: TOC in Raw and Finished Water, Aberdeen, SD.

Table 3: TOC in Raw and Finished Water
Aberdeen, South Dakota

DATE	RAW WATER TOC	FINISHED WATER TOC	REMOVAL PROVIDED	REMOVAL REQUIRED
3/22/00	9.98	6.16	38.3%	30%
3/15/00	9.98	-	-	30%
3/20/00	20.9	-	-	30%

The data collected to date indicate the Aberdeen water supply has a TOC content in the raw water > 8 mg/l. Since softening is used, the TOC removal efficiency requirement is 30% removal. The treatment process provided at the present time met this requirement when samples were collected.

The Stage 2 Disinfectant/Disinfection By-products Rule is expected to be promulgated with the Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR). The Stage 2 D/DBR will still have the MCLs for TTHM and HAA5 of 80 ug/l and 60 ug/l respectively, but instead of averaging all of the sampling locations together, the municipality must keep a running annual average for each sampling location. Each sampling location must then meet the Stage 2 D/DBP Rule requirements. The Stage 2 D/DBR has the same schedule as the LT2ESWTR, the final rule is expected by May 2002 with an effective date of May 2005.

Surface Water Treatment Rule and Enhanced Surface Water Treatment Rule: The Interim Enhanced Surface Water Treatment Rule (IESWTR) was published in the Federal Register on December 16, 1998 concurrently with the Stage 1 Disinfectant/Disinfection By-products Rule. The primary purposes of this rule are to: 1) improve control of microbial pathogens in drinking water, particularly for *Cryptosporidium*, and 2) to guard against significant increases in microbial risk that

might otherwise occur when systems implement the Stage 1 Disinfectants/Disinfection By-products Rule.¹ The IESWTR applies to public water systems (PWSs) that use surface water or ground water under the direct influence of surface water (GWUDI) and serve 10,000 or more people. Required level of treatment will be determined by source water quality.

Surface water systems serving 10,000 or more people that are required to filter under the SWTR are required to achieve at least 2-log (99%) removal of *Cryptosporidium*. Systems that use conventional or direct filtration automatically meet this requirement if they comply with IESWTR turbidity performance standards for combined filter effluent and the current requirements under the SWTR.

The IESWTR requires that all surface water or GWUDI systems that serve 10,000 or more people must monitor turbidity. Conventional and direct filtration systems must measure combined filter effluent turbidity at least every four hours and continuously monitor turbidity of each individual filter. The combined filter effluent (CFE) turbidity must be less than or equal to 0.3 NTU in at least 95 percent of measurements taken each month. The maximum CFE turbidity must not exceed 1.0 NTU. Compliance with both of these standards is based on measurements of the CFE at four-hour intervals. All PWSs serving 10,000 or more people must be in compliance with this rule by January 1, 2002 (assuming technical corrections go through).²

Disinfection benchmarking and profiling is required by the IESWTR if any significant modifications are made to the disinfection practice. Significant modifications include: changes to the point of disinfection, changes to disinfectants used in the water treatment process, changes to the disinfection process, or modifications identified by the State. Benchmarking is a three-step process: 1) determine if the system must develop a profile, 2) develop a profile, and 3)

² "Optimizing Treatment Systems To Meet The D/DBP and IESWTR Rules" Seminar. Sponsored by South Dakota Department of Natural Resources and South Dakota Section of American Water Works Association. Presented by Dr. Delvin DeBoer and Mr. Tim Stefanich. February 3, 2000.

calculate the benchmark and consult the State. The first step for the utility to determine is if it necessary for them to develop a profile. If they do, then they must move on to the second step, developing a disinfection profile. There are three options for developing a profile: one-year profile (all new data), two years of acceptable grandparented data plus one year new data, or three years of acceptable grandparented data. The new data is obtained by computing the daily Giardia log inactivations over a period of one year based on daily measurements of operational data. The third, and final step, is to calculate the disinfection benchmark and consult the state. The disinfection benchmark is the lowest monthly average inactivation level in the disinfection profile (or average of lowest months in each year for multi-year profiles). Once the utility has developed a disinfection profile and then decides to make a significant change to its disinfection practice, it must calculate a disinfection benchmark and consult the State (DENR).

The Long Term 1 Enhanced Surface Water Treatment Rule (LT1ESWTR) is a simplified form of the IESWTR with the same basic standards, the LT1ESWTR applies to water systems serving less than 10,000 people. The LT1ESWTR will not affect the Aberdeen Water Treatment Plant.

The Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) is expected to be promulgated along with the Stage 2 D/DBR. The LT2ESWTR may require systems to monitor their source water for Giardia and Cryptosporidium to determine the necessary levels of treatment. If necessary, proportional treatment levels or watershed-based treatment levels may be needed depending on source water quality. The EPA is presently working on new methods for protozoan analysis for this monitoring. The LT2ESWTR final rule is expected by May 2002 with an effective date of May 2005.

Volatile Organic Chemicals: Presently, the Safe Drinking Water Act regulates 21 volatile organic chemicals (VOC's). Monitoring for VOC's is very important because the chemicals being monitored by this rule are known or suspected human

carcinogens via digestion. These contaminants have the potential to cause serious human health implications. Original monitoring required four quarterly samples during the first three years. If no detects after the first three years, then the municipality can begin monitoring annually. Monitoring can be further reduced if no detects are found after three years of annual monitoring, then a municipality can monitor once every three years. Monitoring may be reduced based upon results of vulnerability assessment, USEPA issued guidelines for alternative monitoring in August 1997. After completion of source water assessments in 2003, primary agencies will be allowed to develop alternative monitoring requirements.

Vulnerability assessments affect repeat monitoring requirements. Several factors are used by the state to assess the vulnerability of each water system. These factors include: previous monitoring results; number of people served by the water system; proximity of the system to commercial or industrial use, disposal, or storage of VOC's; and the level of protection given to the source water.³

Taste, Odor and Color: The occurrence of taste, odor, and color in a public water supply is objectionable from an aesthetic perspective and may be an indicator of other water quality concerns. Tastes, odors, and colors can be caused by a wide variety of compounds. Tastes, odors and colors are somewhat subjective in definition. What may be considered objectionable to some will not be detected by others. Taste, odor and color can be imparted to the water at chemical concentrations that occur at or below the lower detection limits for organic compounds. For these reasons, the Safe Drinking Water Act has not implemented maximum contaminant level (MCL) limits for taste, odor and color in drinking water.

The SDWA also includes a series of non-binding limits referred to as "Secondary Standards". A secondary standard for odor has been established at a Threshold

³ Pontius, Frederick W. *SDWA Advisor – Regulatory Update Service*. American Water Works Association. 1994.

Odor Number (TON) of 3 for public water supplies.⁴ A TON of 3 indicates a water sample would have a detectable odor after diluting 70 ml of a water sample to a total volume of 200 ml using odor free water. TON determination requires a series of dilutions of the water sample and a panel of individuals to determine at what dilution the odor is no longer detectable. Due to the procedures involved, TON testing is not a routine procedure used in water quality analysis. The American Water Works Association (AWWA) Research Foundation has proposed modifications for taste, odor and color analysis – now called the flavor profile. Extensive literature describing the flavor profile analysis is available from AWWA.

The SDWA also regulates taste, odor and color indirectly through regulations on permissible doses of chemicals frequently used for taste, odor and color control. The chemicals used for taste, odor and color control are often strong oxidants and they have the potential to form byproducts that can include carcinogens.

Filter Backwash Rule: The Environmental Protection Agency (EPA) was mandated to develop the Filter Backwash Rule (FBWR) by the 1996 SDWA amendments. A proposal was formed in November, 1999 and a Final Rule is expected early in 2001. The purpose of the FBWR is to control the re-entry of pathogens and other contaminants into the drinking water process. The backwash water recycle can impact the treated water quality by returning high concentrations of pathogens to the plant and, where prechlorination is practiced, it can introduce already-formed DBPs to upstream processes. Three strategies are under consideration for treatment of the filter backwash water, they are: 1) do nothing, 2) "Passive Treatment" – mandate storage or hydraulic controls, and 3) "Active Treatment" – mandate physical and/or chemical treatment of the recycle water. The "do nothing" strategy means no filter backwash water treatment will be required, low-likelihood that the "do nothing" strategy will result. The

⁴ *National Secondary Drinking Water Regulations, Final Rule*. Federal Register 44:140:42195. July 19, 1979.

“passive treatment” strategy focuses on improving water quality by taking advantage of blending opportunities. Passive treatment could be implemented by limiting the flowrate (or blending ratio) of recycle to plant streams. Also, the passive treatment method could require that the recycle flow be returned to a point before coagulation, which could result in the need for a source water blending tank. The “active treatment” strategy focuses on treatment of the backwash water. Treatment could be accomplished by: chemically unaided sedimentation, chemically aided sedimentation, inactivation, or sedimentation and inactivation requirements.⁵

Compliance for the FBWR is expected to be in August, 2003.

⁵ “Interim Enhanced Surface Water Treatment Rule” Seminar. Sponsored by South Dakota Department of Environment and Natural Resources and South Dakota Section of American Water Works Association. Presented by Dr. Delvin DeBoer and Mr. Tim Stefanich. July 28, 1999.

APPENDIX B:

COST ESTIMATES

Aberdeen Water Treatment Plant Improvements
Aberdeen, South Dakota
BAI No. 20192.00.01

WELL FIELD EXPANSION AND 11 MGD CONVENTIONAL WATER TREATMENT PLANT
Actiflo Units followed by Conventional SCU's for Softening Located Southeast of Existing Water Treatment Plant

SPEC. REF. NO.	DESCRIPTION OF WORK AND MATERIALS	QUAN.	UNIT	UNIT PRICE	TOTAL
Div. 1	GENERAL CONDITIONS	1	LS	\$275,000	\$275,000
Div. 2	SITE CONSTRUCTION				
02070	Demolition				
	- Renov. of Secondary Clarifier to Clearwell	1	LS	\$40,000	\$40,000
	- Renov. of Primary Clarifier to Reclaim	1	LS	\$30,000	\$30,000
	- Renov. of Washwater Reclaim to Intermediate	1	LS	\$5,000	\$5,000
	- Demolition of Existing Meter Vaults	2	LS	\$5,000	\$10,000
	- Improvements to Existing Pretreatment Basin	1	LS	\$60,000	\$60,000
	- Miscellaneous Demolition	1	LS	\$10,000	\$10,000
02140	Dewatering	1	LS	\$30,000	\$30,000
02200	Earthwork and Utilities				
	- Excavation	24,700	CY	\$5	\$123,500
	- Embankment	5,100	CY	\$3	\$15,300
	- Engineered Fill	20,300	CY	\$15	\$304,500
	- Granular Fill below slab on grade	700	CY	\$15	\$10,500
02511	Bituminous Surfacing	2,700	Ton	\$40	\$108,000
	- Base Coarse	4,900	Ton	\$8	\$39,200
02700	Site Piping				
	- 30" Ductile Iron Pipe	2,800	LF	\$80	\$224,000
	- 30" 90° Bend	12	Each	\$10,190	\$122,280
	- 30" 45° Bend	3	Each	\$8,430	\$25,290
	- 30" x 30" x 30" Tee	2	Each	\$15,870	\$31,740
	- 30" x 30" x 30" Wye	1	Each	\$15,870	\$15,870
	- 30" x 24" Reducer	1	Each	\$6,320	\$6,320
	- 30" Transition Couplings	3	Each	\$6,660	\$19,980
	- 30" Gate Valve	2	Each	\$20,000	\$40,000
	- 24" Ductile Iron Pipe	285	LF	\$70	\$19,950
	- 24" 90° Bend	2	Each	\$3,400	\$6,800
	- 24" 45° Bend	2	Each	\$2,610	\$5,220
	- 24" x 24" x 24" Wye	2	Each	\$11,400	\$22,800
	- 24" x 12" Reducer	1	Each	\$2,000	\$2,000
	- 24" Transition Couplings	8	Each	\$2,840	\$22,720
	- 12" PVC Pipe	1,110	LF	\$30	\$33,300
	- 12" 90° Bend	3	Each	\$410	\$1,230
	- 12" 45° Bend	5	Each	\$350	\$1,750
	- 12" x 12" x 12" Tee	5	Each	\$510	\$2,550
	- 12" Gate Valves	4	Each	\$2,200	\$8,800
	- 12" Cap	1	Each	\$160	\$160
	- 6" PVC Pipe	160	Each	\$10	\$1,600
	- 6" 90° Bend	1	Each	\$150	\$150
	- 6" 45° Bend	2	Each	\$140	\$280
	- 6" Transition Coupling	2	Each	\$150	\$300
	- Miscellaneous Site Piping	1	LS	\$92,260	\$92,260
02900	Seeding and Landscaping	1	LS	\$10,000	\$10,000
	- Retaining Wall	0	SF	\$15	\$0
02950	Production Wells	6	Each	\$120,000	\$720,000
	- 8" Pipe: Connection to Main Transmission Line	10,000	LF	\$10	\$100,000
	- Wells: Land Acquisition and Easements	6	Each	\$10,000	\$60,000
	- Pipeline: Land Acquisition and Easements	1	LS	\$50,000	\$50,000
Div. 3	CONCRETE				
03300	Cast-in-Place Concrete				

Aberdeen Water Treatment Plant Improvements
Aberdeen, South Dakota
BAI No. 20192.00.01

WELL FIELD EXPANSION AND 11 MGD CONVENTIONAL WATER TREATMENT PLANT
Actiflo Units followed by Conventional SCU's for Softening Located Southeast of Existing Water Treatment Plant

SPEC. REF. NO.	DESCRIPTION OF WORK AND MATERIALS	QUAN.	UNIT	UNIT PRICE	TOTAL
	- Concrete curb & gutter	135	LF	\$12	\$1,620
	- Concrete sidewalks	1,225	SF	\$5	\$6,125
	- Concrete for stoops	20	CY	\$350	\$7,000
	- Concrete slabs	700	CY	\$350	\$245,000
	- Vapor Barrier below slab	5,600	SF	\$1	\$5,600
	- SCU Area Concrete	3,650	CY	\$350	\$1,277,500
	- SCU Concrete Fill	1	LS	\$10,000	\$10,000
	- Actiflo Area Concrete	450	CY	\$350	\$157,500
	- Water stops (4" wide)	1,450	LF	\$6	\$8,700
	- Water stops (6" wide)	950	LF	\$9	\$8,550
	- Concrete for steps/stairs	25	CY	\$350	\$8,750
	- Concrete foundation walls and footings	450	CY	\$350	\$157,500
	- Concrete Topping on Corefloor	11,850	SF	\$2	\$23,700
03410	Structural Precast Concrete				
	- 8" Corefloor units	11,850	SF	\$7	\$82,950
	- 24" Double Tee Roof Units	15,050	SF	\$9	\$135,450
	- 32" Double Tee Roof Units	18,400	SF	\$9	\$165,600
03450	Architectural Precast Concrete				
	- Insulated Wall Panels	40,000	SF	\$18	\$720,000
	- Concrete splash blocks	10	Each	\$200	\$2,000
Div. 4	MASONRY				
	- Chemical Feed Area Interior Walls (8")	1,400	SF	\$8	\$11,200
	- Office Area Interior Load Brg. Walls (8")	15,000	SF	\$8	\$120,000
	- Exterior Walls (8"-2"-4"-V.R.)	4,440	SF	\$22	\$97,680
	- Exterior Screen Walls (8")	600	SF	\$8	\$4,800
Div. 5	METALS				
	- Miscellaneous metals	1	LS	\$20,000	\$20,000
05500	Aluminum Ladder	2	Each	\$1,200	\$2,400
05120	Structural Steel				
	- Stair & Elevator Framing	8,600	Lbs.	\$1.50	\$12,900
	- Second Floor Support	3,000	Lbs.	\$1.50	\$4,500
05300	Metal Floor Deck				
	- Stair Landing floor deck	150	SF	\$2.00	\$300
05511	- Metal Stairs				
	- Exit stairs	3	Each	\$7,350.00	\$22,050
	- Atrium stair	1	Each	\$10,500.00	\$10,500
05521	- Pipe & Tube Railing				
	- Handrail	180	LF	\$21.00	\$3,780
	- Guardrail (3 rail) with kickplate	570	LF	\$50.00	\$28,500
Div. 6	WOOD AND PLASTICS				
- 06105	- Miscellaneous Carpentry				
	- Wood nailers & blocking	2,000	LF	\$3	\$6,000
-06200	- Finish Carpentry	1	LS	\$10,000	\$10,000
-06402	- Interior Architectural Woodwork				
	- Casework (upper & lower)	270	LF	\$300	\$81,000
Div. 7	THERMAL AND MOISTURE PROTECTION				
07190	- Concrete hardener & Water repellant	11,200	SF	\$1	\$8,960
07210	- Building Insulation				
	- Perimeter Insulation	720	SF	\$1	\$922
	- Sound Batt Insulation (3 1/2" SAFB)	12,400	SF	\$1	\$6,448
07530	Roofing Insulation	34,100	SF	\$5	\$170,500
07720	Roof Hatches - aluminum	2	EA	\$850	\$1,700

Aberdeen Water Treatment Plant Improvements
Aberdeen, South Dakota
BAI No. 20192.00.01

WELL FIELD EXPANSION AND 11 MGD CONVENTIONAL WATER TREATMENT PLANT
Actiflo Units followed by Conventional SCU's for Softening Located Southeast of Existing Water Treatment Plant

SPEC. REF. NO.	DESCRIPTION OF WORK AND MATERIALS	QUAN.	UNIT	UNIT PRICE	TOTAL
07620	Roof & Wall Flashing	1,500	SF	\$4	\$6,000
07920	- Joint Sealants	1	LS	\$5,000	\$5,000
Div. 8	DOORS AND WINDOWS				
08311	Floor access doors	4	EA	\$1,500	\$6,000
08360	Overhead Doors and Appurtenances	3	Each	\$4,400	\$13,200
08410	Doors and Appurtenances	68	Each	\$2,000	\$136,000
	- Aluminum entrance doors	2	EA	\$2,500	\$5,000
08520	Windows and Appurtenances (alum. awning)	22	Each	\$800	\$17,600
	- Alum. Window frames (fixed)	405	SF	\$21	\$8,505
08800	- glazing	405	SF	\$25	\$10,125
08911	Curtainwall System	865	SF	\$80	\$69,200
Div. 9	FINISHES	1	LS	\$170,000	\$170,000
Div. 10	SPECIALTIES				
	- Paint Booth	1	LS	\$75,000	\$75,000
	- Miscellaneous/Furnishings	1	LS	\$62,000	\$62,000
Div. 11	EQUIPMENT				
	- Meter Relocation	2	Each	\$5,000	\$10,000
11210	Solids Contact Clarifiers				
	- Actiflo Units	2	Each	\$580,250	\$1,160,500
	- 72' Square	2	Each	\$318,500	\$637,000
11230	Chemical Feed Equipment				
	- Lime Storage Silo (Including Pneumatic Lime Transfer System and Day Bin)	2	Each	\$195,000	\$390,000
	- Lime Slaker and Gravimetric Feeder	2	Each	\$93,600	\$187,200
	- Soda Ash Silo	1	Each	\$182,000	\$182,000
	- Soda Ash Feed System	2	Each	\$26,000	\$52,000
	- Dry Ammonium Storage/Handling System	1	Each	\$10,000	\$10,000
	- Ammonium Feeder	1	Each	\$28,600	\$28,600
	- Liquid Alum Storage/Handling System	1	Each	\$16,250	\$16,250
	- Alum Feeder - pumps	2	Each	\$9,100	\$18,200
	- Potassium Permanganate Bulk Mixing Tank	1	Each	\$10,000	\$10,000
	- Potassium Permanganate Feed System (pumps)	2	Each	\$13,000	\$26,000
	- PAC Silo and Transfer	1	Each	\$182,000	\$182,000
	- PAC Feed System	2	Each	\$35,100	\$70,200
	- Improvements to Existing PAC Feed System	1	LS	\$60,000	\$60,000
	- Carbon Dioxide Storage System	1	Each	\$83,200	\$83,200
	- Carbon Dioxide Feed System	1	Each	\$27,300	\$27,300
	- Chemical Feed Water Pump Package	1	LS	\$5,000	\$5,000
	- Fluoride Storage and Feed System	1	Each	\$26,000	\$26,000
	- Phosphate Storage/Handling System	1	Each	\$10,000	\$10,000
	- Phosphate Feeders	2	Each	\$26,000	\$52,000
	- Chlorine Application Points	1	LS	\$5,000	\$5,000
11510	Interior Piping, Fittings and Valves				
	- 30" Ductile Iron Pipe	85	LF	\$350	\$29,750
	- 30" 90° Bend	3	Each	\$8,000	\$24,000
	- 30" Butterfly Valve	2	Each	\$30,000	\$60,000
	- 20" Ductile Iron Pipe	475	LF	\$200	\$95,000
	- 20" 90° Bend	18	Each	\$3,400	\$61,200
	- 20" x 20" x 20" Tee	6	Each	\$4,800	\$28,800
	- 20" Butterfly Valve	14	Each	\$6,000	\$84,000
	- 12" Ductile Iron Pipe	390	LF	\$140	\$54,600
	- 12" 90° Bend	4	Each	\$700	\$2,800

Aberdeen Water Treatment Plant Improvements
Aberdeen, South Dakota
BAI No. 20192.00.01

WELL FIELD EXPANSION AND 11 MGD CONVENTIONAL WATER TREATMENT PLANT
Actiflo Units followed by Conventional SCU's for Softening Located Southeast of Existing Water Treatment Plant

SPEC. REF. NO.	DESCRIPTION OF WORK AND MATERIALS	QUAN.	UNIT	UNIT PRICE	TOTAL
	- 12" x 12" x 12" Tee	2	Each	\$800	\$1,600
	- 8" Ductile Iron Pipe	140	LF	\$90	\$12,600
	- 8" x 8" x 8" Tee	1	Each	\$500	\$500
	- 8" 90° Bend	2	Each	\$300	\$600
	- 8" Mud Valves	2	Each	\$1,000	\$2,000
	- 6" Ductile Iron Pipe	300	LF	\$70	\$21,000
	- 6" 90° Bend	12	Each	\$160	\$1,920
	- 6" 45° Bend	4	Each	\$160	\$640
	- 6" x 6" x 6" Tee	6	Each	\$240	\$1,440
	- 6" x 6" x 6" x 6" Cross	1	Each	\$420	\$420
	- 6" Plug Valve	8	Each	\$2,000	\$16,000
	- 6" Plug Valve with Pnuematic Operator	4	Each	\$5,000	\$20,000
	- 6" Check Valve	2	Each	\$2,000	\$4,000
	- Miscellaneous Piping	1	LS	\$79,000	\$79,000
11520	Pumps				
	- High Service Pumps	4	Each	\$50,000	\$200,000
	- Variable Frequency Drives	2	Each	\$10,000	\$20,000
	- Transfer Pumps Between Clearwells	2	Each	\$20,000	\$40,000
	- Intermediate Pumps	2	Each	\$15,000	\$30,000
	- Reclaim Pump	2	Each	\$15,000	\$30,000
	- Sludge Pumps	4	Each	\$10,000	\$40,000
11615	Laboratory Equipment	1	LS	\$15,000	\$15,000
Div. 13	METAL BUILDING SYSTEMS				
13100	Modular Buildings				
	- New Intermediate Pump Station Enclosure	1	Each	\$20,000	\$20,000
	- Reclaim Pump Enclosure	1	Each	\$25,000	\$25,000
Div. 14	CONVEYING SYSTEMS				
14240	Hydraulic Elevator	1	Each	\$130,000	\$130,000
Div. 15	MECHANICAL, HVAC AND PLUMBING	1	LS	\$820,000	\$820,000
Div. 16	ELECTRICAL	1	LS	\$1,100,000	\$1,100,000
Div. 17	CONTROLS, TELEMETRY, AND INSTRUMENTATI	1	LS	\$500,000	\$500,000

Probable Construction Costs = \$13,759,985
Engineering Design and Bidding = \$738,300
Construction Administration and Resident Engineering = \$592,400
Contingencies = \$1,310,000
TOTAL PROJECT COST = \$16,400,685

Evaluation of City of Aberdeen Connecting With WEB Water
Aberdeen, South Dakota
BAI No. 20040.00.00

MEMBRANE WATER TREATMENT PLANT

SPEC. REF. NO.	DESCRIPTION OF WORK AND MATERIALS	QUAN.	UNIT	UNIT PRICE	TOTAL
Div. 1	GENERAL CONDITIONS	1	LS	\$380,000	\$380,000
Div. 2	SITE CONSTRUCTION				
02070	Demolition				
	- Renov. of Secondary Clarifier to Clearwell	1	LS	\$40,000	\$40,000
	- Demolition of Existing Meter Vaults	1	LS	\$5,000	\$5,000
	- Miscellaneous Demolition	1	LS	\$10,000	\$10,000
02140	Dewatering	1	LS	\$7,500	\$7,500
02200	Earthwork and Utilities	1	LS	\$15,000	\$15,000
02511	Bituminous Surfacing	1,850	Ton	\$40	\$74,000
	- Base Coarse	3,300	Ton	\$8	\$26,400
02700	Site Piping				
	- 36" Pipe	1,100	LF	\$150	\$165,000
	- 36" 90° Bend	2	Each	\$11,740	\$23,480
	- 36" 45° Bend	3	Each	\$9,790	\$29,370
	- 36" x 36" x 36" Wye	1	Each	\$20,000	\$20,000
	- 24" Pipe	225	LF	\$90	\$20,250
	- 24" 90° Bend	2	Each	\$6,000	\$12,000
	- 24" 45° Bend	1	Each	\$5,000	\$5,000
	- 24" Transition Couplings	6	Each	\$1,400	\$8,400
	- 6" Pipe	825	Each	\$20	\$16,500
	- 6" 90° Bend	1	Each	\$150	\$150
	- 6" 45° Bend	6	Each	\$120	\$720
	- 6" Transition Coupling	2	Each	\$110	\$220
	Concentrate Piping (14" pipe)*	10,560	LF	\$18	\$190,080
02900	Seeding and Landscaping	1	LS	\$7,500	\$7,500
Div. 3	CONCRETE				
03300	Cast-in-Place Concrete				
	- Membrane Area	300	CY	\$350	\$105,000
	- Housekeeping Pads	70	CY	\$350	\$24,500
	- Basins for Zenon Units	220	CY	\$350	\$77,000
	- Chemical Feed Area	40	CY	\$350	\$14,000
	- Office Area Concrete	50	CY	\$350	\$17,500
03410	Structural Precast Concrete				
	- Water Treatment Plant Precast Wall Panels	7,200	SF	\$16	\$115,200
	- Office Area Precast Wall Panels	3,360	SF	\$16	\$53,760
	- Chemical Area Precast Wall Panels	2,600	SF	\$16	\$41,600
	- Meter Vaults	2	Each	\$12,000	\$24,000
	- Office Area Core Floor with 2" Concrete Topping	3,600	SF	\$12	\$43,200
	- Water Treatment Plant Precast Double Tees	16,000	SF	\$8	\$128,000
Div. 4	MASONRY				
	- Office Area Interior Walls (8")	6,900	SF	\$8	\$51,750
	- Chemical Feed Area Interior Walls (8")	1,000	SF	\$8	\$8,000
Div. 5	METALS				
	- Chemical Feed Area Metal Decking and Bar Joist	2,000	SF	\$5	\$10,000
	- Office Area Metal Decking and Bar Joist	3,520	SF	\$5	\$17,600
Div. 6	WOOD AND PLASTICS	1	LS	\$7,500	\$7,500
Div. 7	THERMAL AND MOISTURE PROTECTION				
07530	Roofing Insulation	21,520	SF	\$6	\$129,120
07620	Roof Flashing	1,000	SF	\$4	\$4,000
Div. 8	DOORS AND WINDOWS				
08360	Overhead Doors and Appurt.	1	Each	\$3,000	\$3,000
08410	Doors and Appurt.	30	Each	\$1,250	\$37,500
08520	Windows and Appurt.	15	Each	\$1,000	\$15,000

Evaluation of City of Aberdeen Connecting With WEB Water
Aberdeen, South Dakota
BAI No. 20040.00.00

MEMBRANE WATER TREATMENT PLANT

SPEC. REF. NO.	DESCRIPTION OF WORK AND MATERIALS	QUAN.	UNIT	UNIT PRICE	TOTAL
Div. 9	FINISHES	1	LS	\$25,000	\$25,000
Div. 10	SPECIALTIES				
	- Miscellaneous/Furnishings	1	LS	\$20,000	\$20,000
Div. 11	EQUIPMENT				
	- Meter Relocation	2	Each	\$5,000	\$10,000
	- Zenon Filtration System	1	LS	\$8,435,100	\$8,435,100
	- Nanofiltration System**	1	LS	\$3,973,000	\$3,973,000
11230	Chemical Feed Equipment				
	- Dry Ammonium Storage/Handling System	1	Each	\$10,000	\$10,000
	- Ammonium Feeder	1	Each	\$26,000	\$26,000
	- Liquid Alum Storage/Handling System	1	Each	\$16,250	\$16,250
	- Alum Feeder - pumps	2	Each	\$16,250	\$32,500
	- Permanganate Bulk Mixing Tank	1	Each	\$10,000	\$10,000
	- Permanganate Feed System (pumps)	2	Each	\$10,000	\$20,000
	- PAC Silo and Transfer	1	Each	\$182,000	\$182,000
	- PAC Feed System	2	Each	\$32,500	\$65,000
	- Chemical Feed Water Pump Package	1	LS	\$5,000	\$5,000
	- Fluoride Storage/Handling System	1	Each	\$10,000	\$10,000
	- Fluoride Feeders	2	Each	\$26,000	\$52,000
	- Phosphate Storage/Handling System	1	Each	\$10,000	\$10,000
	- Phosphate Feeders	2	Each	\$26,000	\$52,000
	- Chlorine Application Points	1	LS	\$5,000	\$5,000
11510	Interior Piping and Valves	1	LS	\$792,300	\$792,300
11520	Pumps				
	- High Service Pumps	4	Each	\$50,000	\$200,000
	- Variable Frequency Drives	2	Each	\$10,000	\$20,000
	- Transfer Pumps Between Clearwells	2	Each	\$20,000	\$40,000
	- Concentrate Pumps	3	Each	\$10,000	\$30,000
11615	Laboratory Equipment	1	LS	\$15,000	\$15,000
Div. 14	CONVEYING SYSTEMS				
14610	Overhead Crane System	1	Each	\$7,000	\$7,000
Div. 15	MECHANICAL, HVAC AND PLUMBING	1	LS	\$1,140,000	\$1,140,000
Div. 16	ELECTRICAL	1	LS	\$1,520,000	\$1,520,000
Div. 17	CONTROLS AND TELEMETRY	1	LS	\$300,000	\$300,000

Probable Construction Costs = \$19,006,950
Engineering, Administration, and Contingencies = \$4,751,700
TOTAL PROJECT COST = \$23,758,650

*Assume concentrate is being discharged into Moccasin Creek (approximately 2 miles away).

**Cost of NF membrane filters includes: the membrane skids, housings, pre-filters, high pressure pumps, controls, all piping on the skids, all chemical feed systems, and electrical needed to wire pumps.

		Depreciation
Building	\$2,677,630	\$53,553
Equipment	\$16,329,320	\$816,466
	\$19,006,950	\$870,019

APPENDIX C:

OPERATION AND MAINTENANCE COSTS

WATER TREATMENT ALTERNATIVES STUDY
 ABERDEEN, SOUTH DAKOTA
 PROBABLE O&M COSTS
 BAI #20040.00.00

SUMMARY OF OPERATION AND MAINTENANCE FOR DIFFERENT ALTERNATIVES

Item	Description	100 % WEB 11 MGD	Conventional 11 MGD	Membrane 11 MGD
1	Chemical Costs	\$0	\$343,370	\$359,320
2	Power Costs	\$34,900	\$103,500	\$225,000
3	Heating Costs	\$0	\$75,600	\$21,600
4	Fuels, Lubricants, & Vehicles	\$7,200	\$15,000	\$15,000
5	Labor Costs	\$70,000	\$245,000	\$210,000
6	Membrane Replacement	\$0	\$0	\$198,000
7	Cartridge Replacement	\$0	\$0	\$51,840
8	Zenon Membrane Replacement	\$0	\$0	\$129,550
9	Laboratory Fees	\$5,000	\$10,000	\$10,000
10	Supplies and Misc. Expenses	\$36,000	\$75,000	\$75,000
11	Administrative and General Expense	\$10,000	\$20,000	\$20,000
12	Cost of Purchased Water	\$1,405,250	\$0	\$0
Total O&M =		\$1,568,350	\$887,470	\$1,315,310
Cost/1000 Gallons Metered Sales =		\$1.23	\$0.69	\$1.03
13	Debt Service	\$4,165,021	\$1,013,199	\$1,530,914
Total O&M Including Debt Service =		\$5,733,371	\$1,900,669	\$2,846,224
Cost/1000 Gallons Metered Sales =		\$4.49	\$1.49	\$2.23

WATER TREATMENT ALTERNATIVES STUDY
ABREDEEN, SOUTH DAKOTA
PROBABLE O&M COSTS
BAI #20040.00.00

BANNER ASSOCIATES, INC.
 409 22nd Avenue South * P.O. Box 298
 Brookings, South Dakota 57006-0298
 (605) 692-6342 FAX: (605) 692-5714

OPINION OF PROBABLE O&M COSTS
Purchase All Water From WEB

Item	Description	Dose mg/l	Annual Avg. Vol. Trtd. MGD	Monthly Use	Unit Price	Monthly Cost	Subtotal
1	Chemical Costs						
	-Lime		3.50	0	\$0.04	\$0	
	-Soda Ash (6 months/year)		3.50	0	\$0.09	\$0	
	-Carbon Dioxide		3.50	0	\$0.05	\$0	
	-Alum		3.50	0	\$0.15	\$0	
	-Potassium Permanganate		3.50	0	\$1.35	\$0	
	-Polymer		3.50	0	\$1.50	\$0	
	-Fluoride		3.50	0	\$0.31	\$0	
	-Ammonia		3.50	0	\$0.17	\$0	
	-Phosphate		3.50	0	\$0.60	\$0	
	-Powdered Activated Carbon		3.50	0	\$0.80	\$0	
	-Polyphosphate		3.50	0	\$0.60	\$0	
	-Chlorine		3.50	0	\$0.30	\$0	
	-Chlorite (3 months/year)		3.50	0	\$2.00	\$0	
	Subtotal						\$0.00
2	Power Costs (Assuming that the first 80% is at a rate of \$0.016/kw-hr (power cost + demand rate) and that the remaining 20% is at a rat						
	-Lights - New Plant		kw-hr/month	\$0.008/\$0.08	/kw-hr		
	-Lights - Existing Plant		kw-hr/month	\$0.008/\$0.08	/kw-hr		
	-Well Pumps		kw-hr/month	\$0.008/\$0.08	/kw-hr		
	-Low Service Pumps		kw-hr/month	\$0.008/\$0.08	/kw-hr		
	-High Service Pumps		kw-hr/month	\$0.008/\$0.08	/kw-hr		
	-Booster Station	100,800	kw-hr/month	\$0.008/\$0.08	/kw-hr		
	-Equipment		kw-hr/month	\$0.008/\$0.08	/kw-hr		
	Sub-total	100,800	kw-hr/month	\$0.008/\$0.08	/kw-hr	\$34,836	\$34,900
3	Heating Costs - New Plant		sf	\$1.00	/sf*yr	\$0	\$0
	Heating Costs - Existing Plant		sf	\$1.00	/sf*yr	\$0	\$0
4	Fuels, Lubricants, & Vehicles			1	Lump Sum	\$7,200	\$7,200.00
5	Labor Costs	2	employees @	\$35,000.00	yr/employee	\$70,000	\$70,000.00
6	Membrane Replacement	0	Membranes	\$550	\$/membrane	\$0	\$0.00
7	Cartridge Replacement	0	Cartridges	\$10	\$/cartridge/mo.	\$0	\$0.00
8	Zenon Membrane Replacement			1	Lump Sum	\$0	\$0.00
9	Laboratory Fees			1	Lump Sum	\$5,000	\$5,000.00
10	Supplies and Misc. Expenses			1	Lump Sum	\$36,000	\$36,000.00
11	Administrative and General Expense			1	Lump Sum	\$10,000	\$10,000.00
12	Cost to Purchase Water			\$1.10	/1000 gallons	\$1,405,250	\$1,405,250.00
							\$1,568,350.00
12	Debt Service				\$4,165,021 / yr		\$4,165,021.38
					Annual Total O&M=		\$5,733,371

1. Depreciation is calculated for the water treatment facility, the wells, and the piping for the raw water.
 It is assumed that the equipment depreciates over 20 years and the building depreciates over 50 years.

WATER TREATMENT ALTERNATIVES STUDY
ABREDEEN, SOUTH DAKOTA
PROBABLE O&M COSTS
BAI #20040.00.00

BANNER ASSOCIATES, INC.
409 22nd Avenue South * P.O. Box 298
Brookings, South Dakota 57006-0298
(605) 692-6342 FAX: (605) 692-5714

OPINION OF PROBABLE O&M COSTS
SOLIDS CONTACT UNITS WITH EXISTING FILTERS

Item	Description	Dose mg/l	Annual Avg. Vol. Trtd. MGD	Monthly Use	Unit Price	Annual Cost	Subtotal
1	Chemical Costs						
	-Lime	250	3.50	218,925	\$0.035	\$91,949	
	-Soda Ash (6 months/year)	6	3.50	5,254	\$0.09	\$2,837	
	-Carbon Dioxide	40	3.50	35,028	\$0.05	\$21,017	
	-Alum	15	3.50	13,136	\$0.15	\$23,644	
	-Potassium Permanganate	1.5	3.50	1,314	\$1.35	\$21,280	
	-Polymer	2.5	3.50	2,189	\$1.50	\$39,407	
	-Fluoride	2	3.50	1,751	\$0.31	\$6,515	
	-Ammonia	3	3.50	2,627	\$0.17	\$5,359	
	-Phosphate	1.5	3.50	1,314	\$0.60	\$9,458	
	-Powdered Activated Carbon	10	3.50	8,757	\$0.80	\$84,067	
	-Polyphosphate	1.5	3.50	1,314	\$0.60	\$9,458	
	-Chlorine	4	3.50	3,503	\$0.30	\$12,610	
	-Chlorite (3 months/year)	3	3.50	2,627	\$2.00	\$15,763	
	Subtotal						\$343,370
2	Power Costs (Assuming that the first 80% is at a rate of \$0.016/kw-hr (power cost + demand rate) and that the remaining 20% is at a rate						
	-Lights - New Plant	24600	kw-hr/month	\$0.008/\$0.08	/kw-hr		
	-Lights - Existing Plant	7200	kw-hr/month	\$0.008/\$0.08	/kw-hr		
	-Well Pumps	21,480	kw-hr/month	\$0.008/\$0.08	/kw-hr		
	-Low Service Pumps	16,890	kw-hr/month	\$0.008/\$0.08	/kw-hr		
	-High Service Pumps	42,960	kw-hr/month	\$0.008/\$0.08	/kw-hr		
	-Booster Station	100,800	kw-hr/month	\$0.008/\$0.08	/kw-hr		
	-Equipment	85,290	kw-hr/month	\$0.008/\$0.08	/kw-hr		
	Sub-total	299,220	kw-hr/month	\$0.008/\$0.08	/kw-hr	\$103,410	\$103,500
3	Heating Costs - New Plant	45,520	sf	\$1.00	/sf*yr	\$45,600	\$45,600
	Heating Costs - Existing Plant	30,000	sf	\$1.00	/sf*yr	\$30,000	\$30,000
4	Fuels, Lubricants, & Vehicles			1	Lump Sum	\$15,000	\$15,000
5	Labor Costs	7	employees @	\$35,000	yr/employee	\$245,000	\$245,000
6	Membrane Replacement	0	Membranes	\$550	\$/membrane	\$0	\$0
7	Cartridge Replacement	0	Cartridges	\$10	\$/cartridge/mo.	\$0	\$0
8	Zenon Membrane Replacement			0	Lump Sum	\$151,854	\$0
9	Laboratory Fees			1	Lump Sum	\$10,000	\$10,000
10	Supplies and Misc. Expenses			1	Lump Sum	\$75,000	\$75,000
11	Administrative and General Expense			1	Lump Sum	\$20,000	\$20,000
							\$887,470
12	Debt Service				\$1,013,199 / yr		\$1,013,199
					Annual Total O&M=		\$1,900,669

1. Depreciation is calculated for the water treatment facility, the wells, and the piping for the raw water.
It is assumed that the equipment depreciates over 20 years and the building depreciates over 50 years.

WATER TREATMENT ALTERNATIVES STUDY
ABREDEEN, SOUTH DAKOTA
PROBABLE O&M COSTS
BAI #20040.00.00

BANNER ASSOCIATES, INC.
409 22nd Avenue South * P.O. Box 298
- Brookings, South Dakota 57006-0298
(605) 692-6342 FAX: (605) 692-5714

OPINION OF PROBABLE O&M COSTS
ZENON FOLLOWED BY NANOFILTRATION

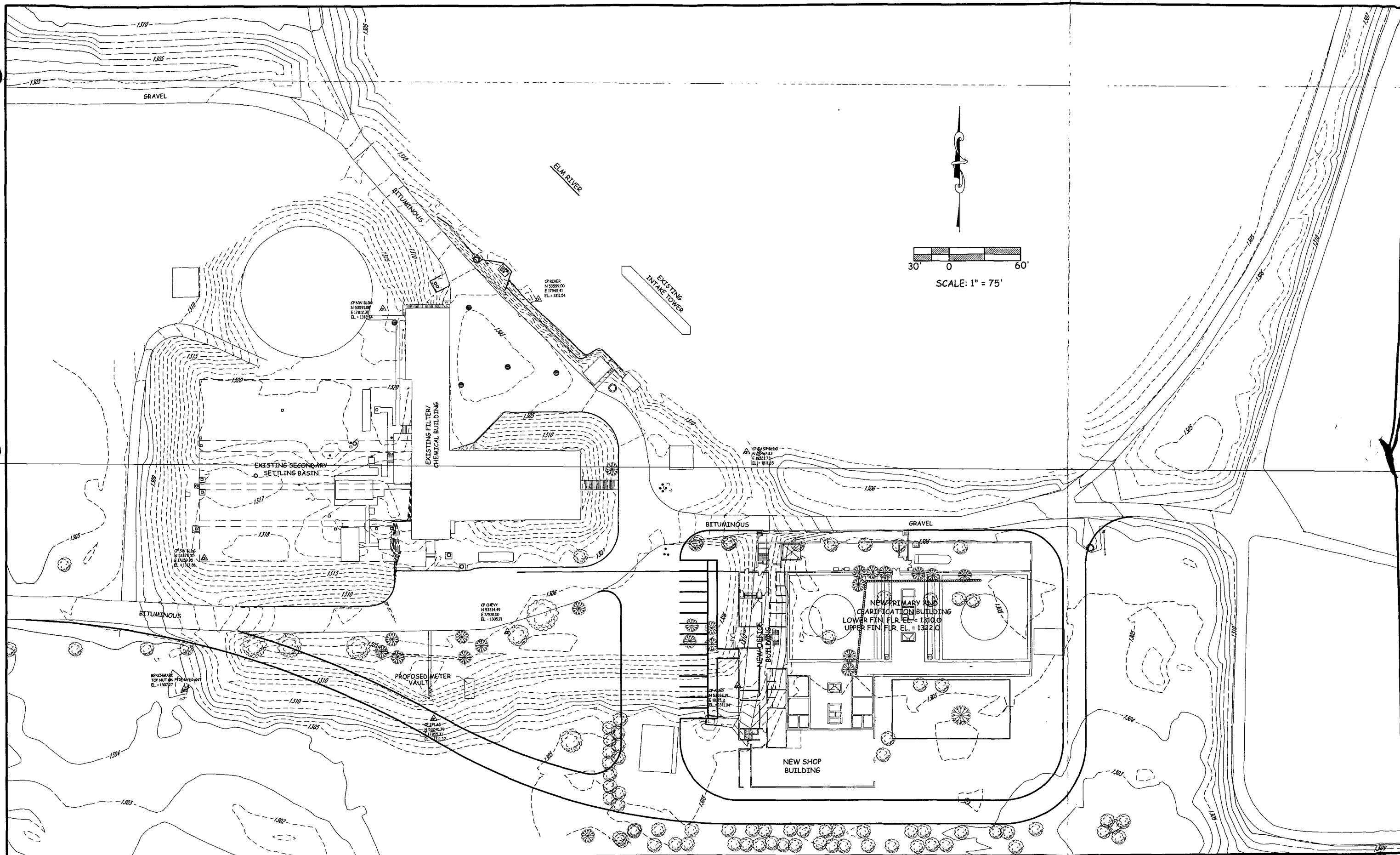
Item	Description	Dose mg/l	Seasonal Ave. Vol. Trtd. MGD ¹	Monthly Use	Unit Price	Annual Cost	Subtotal
1	Chemical Costs						
	-Potassium Permanganate	1.5	4.08	1532	\$1.35	\$24,840	
	-Powdered Activated Carbon	20	4.08	20433	\$0.80	\$196,200	
	-Alum	25	4.08	25541	\$0.15	\$45,960	
	-Caustic Soda	20	2.33	11676	\$0.20	\$28,080	
	-Chlorine (effluent)	4	3.50	3503	\$0.65	\$27,360	
	-Fluoride (effluent)	1	3.50	876	\$0.31	\$3,240	
	-Polyphosphate	1.5	2.92	1095	\$0.60	\$7,920	
	-Membrane Anti-Scalant	1.5	2.92	1095	\$1.80	\$23,640	
	-Acid Detergent for Cleaning Membranes ²	200	lb/cleaning	\$2.60	/lb	\$2,080	
	Subtotal						\$359,320
2	Power Costs (Assuming that the first 80% is at a rate of \$0.016/kw-hr (power cost + demand rate) and that the remaining 20% is at a rate of \$0.008/kw-hr)						
	-Lights	11700	kw-hr/month	\$0.008/\$0.08	/kw-hr		
	-Well Pumps	14,310	kw-hr/month	\$0.008/\$0.08	/kw-hr		
	-Low Service Pumps	10,200	kw-hr/month	\$0.008/\$0.08	/kw-hr		
	-High Service Pumps	21,480	kw-hr/month	\$0.008/\$0.08	/kw-hr		
	-Booster Station	100,800	kw-hr/month	\$0.008/\$0.08	/kw-hr		
	-Equipment	492,300	kw-hr/month	\$0.008/\$0.08	/kw-hr		
	Sub-total	650,790	kw-hr/month	\$0.008/\$0.08	/kw-hr	\$224,913	\$225,000
3	Heating Costs	21,520	sf	\$1.00	/sf*yr	\$21,600	\$21,600
4	Fuels, Lubricants, & Vehicles			1	Lump Sum	\$15,000	\$15,000
5	Labor Costs	6	employees @	\$35,000	yr/employee	\$210,000	\$210,000
6	Membrane Replacement ³	2160	Membranes	\$550	\$/membrane	\$198,000	\$198,000
7	Cartridge Replacement	432	Cartridges	\$10	\$/cartridge/mo.	\$51,840	\$51,840
8	Zenon Membrane Replacement ⁴			1	Lump Sum	\$129,550	\$129,550
9	Laboratory Fees			1	Lump Sum	\$10,000	\$10,000
10	Supplies and Misc. Expenses			1	Lump Sum	\$75,000	\$75,000
11	Administrative and General Expense			1	Lump Sum	\$20,000	\$20,000
Monthly Total O&M =						\$1,315,310	
12	Debt Service				\$1,530,914 / yr		\$1,530,914
Annual Total O&M=							\$2,846,224

NOTES:

1. The flow for the NF system must be high enough to account for the 20% concentrate flow that will be lost.
2. Assume Nano. membranes need an acid wash 1 time per season (season = 4 months).
3. Assume Nano. membrane replacement every 6 years since not all membranes will have continuous operation.
4. Assume Zenon membrane replacement every 10 years.
5. Depreciation is calculated for the water treatment facility, the wells, and the piping for the raw water. It is assumed that the equipment depreciates over 20 years and the building depreciates over 50 years.

APPENDIX D:

**DRAWINGS FOR CONVENTIONAL LIME
SOFTENING WATER TREATMENT PLANT**



DRAWN BY: R.A.R.
 DESIGNED BY: K.L.B.
 CHECKED BY: D.G.O.

REVIEWED: _____ FOR _____
 DATE: _____

REVIEWED: _____ FOR BANNER ASSOCIATES, INC.
 DATE: _____

BANNER

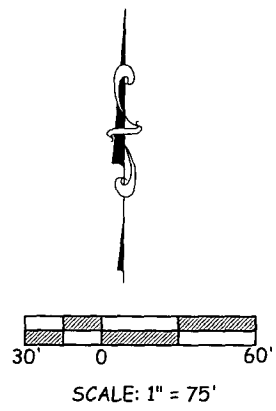
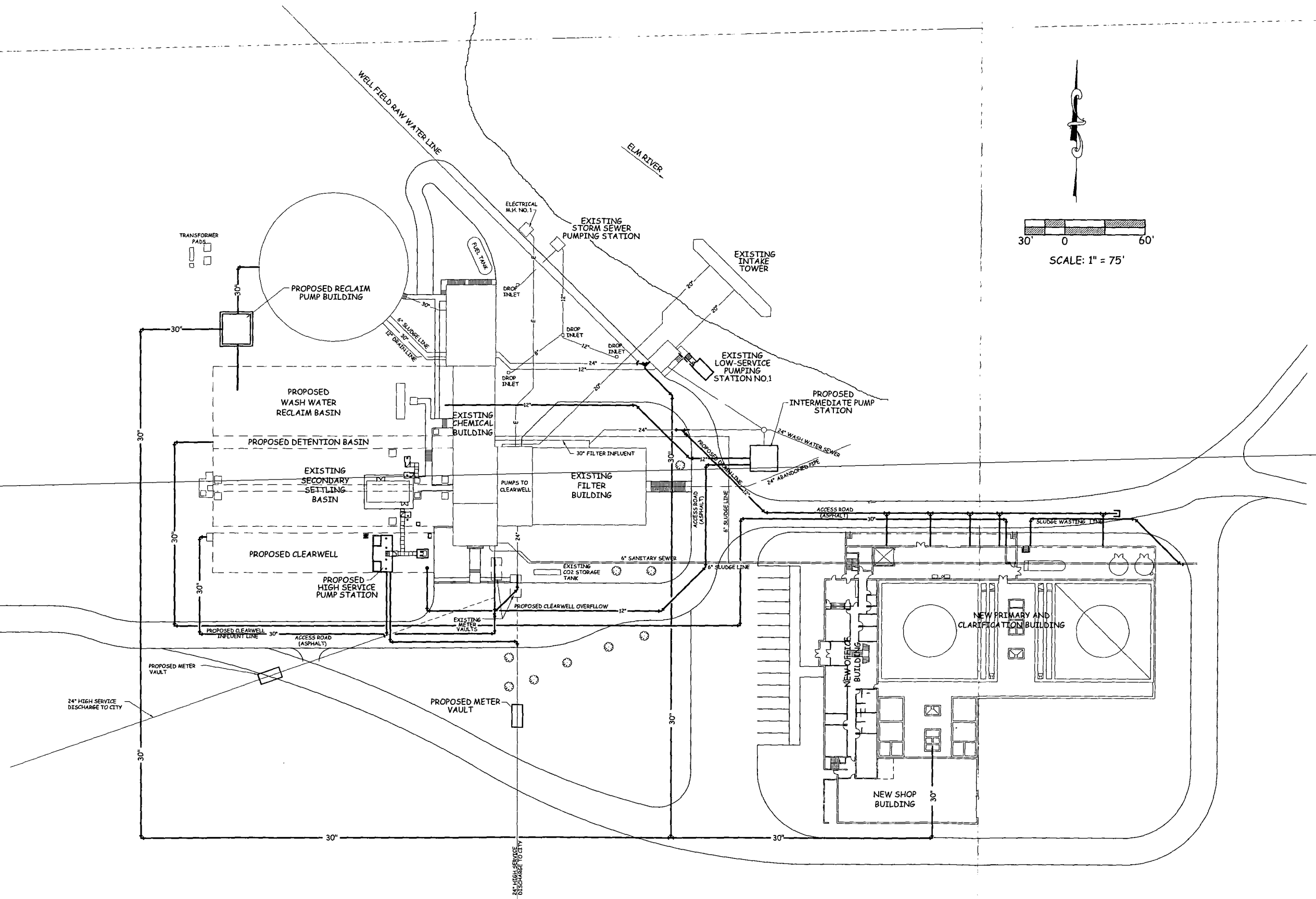
BANNER ASSOCIATES, INC. • CONSULTING ENGINEERS & ARCHITECTS
 409 22nd Av S • P.O. Box 298 - Brookings, SD 57006 • (605)692-6342

REVISION	DATE	DESCRIPTION	BY	CK'D

Aberdeen Water Supply & Treatment Improvements
 Aberdeen, South Dakota
11 MGD WATER TREATMENT PLANT
SITE PLAN

SCALE: As Shown
 JOB NO: 20192.00.01
 DATE: Jan. 03

Figure No.1



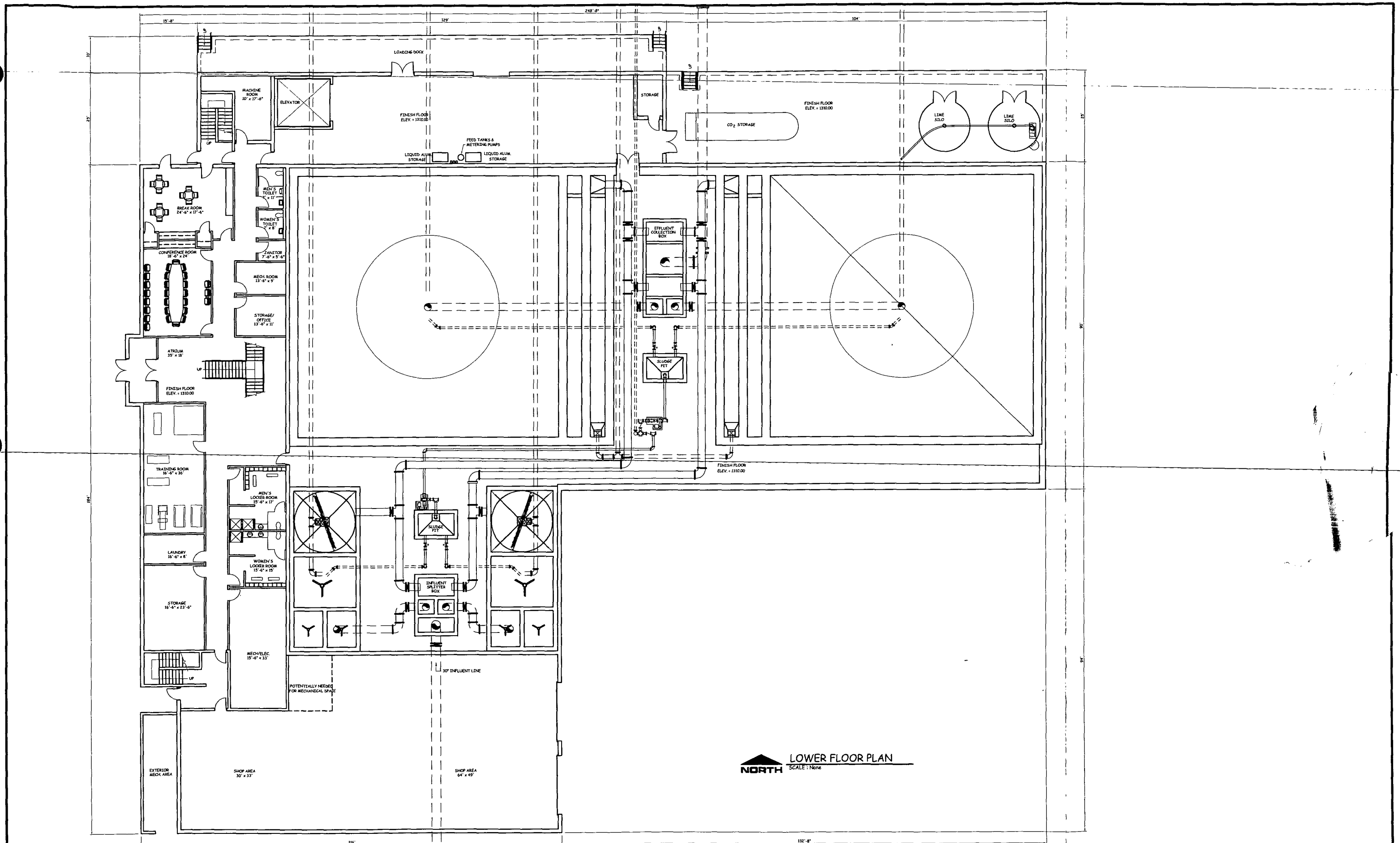
DRAWN BY: R.A.R.
 DESIGNED BY: K.L.B.
 CHECKED BY: D.G.O.
 REVIEWED: _____
 DATE: _____ FOR _____
 REVIEWED: _____
 DATE: _____ FOR BANNER ASSOCIATES, INC.

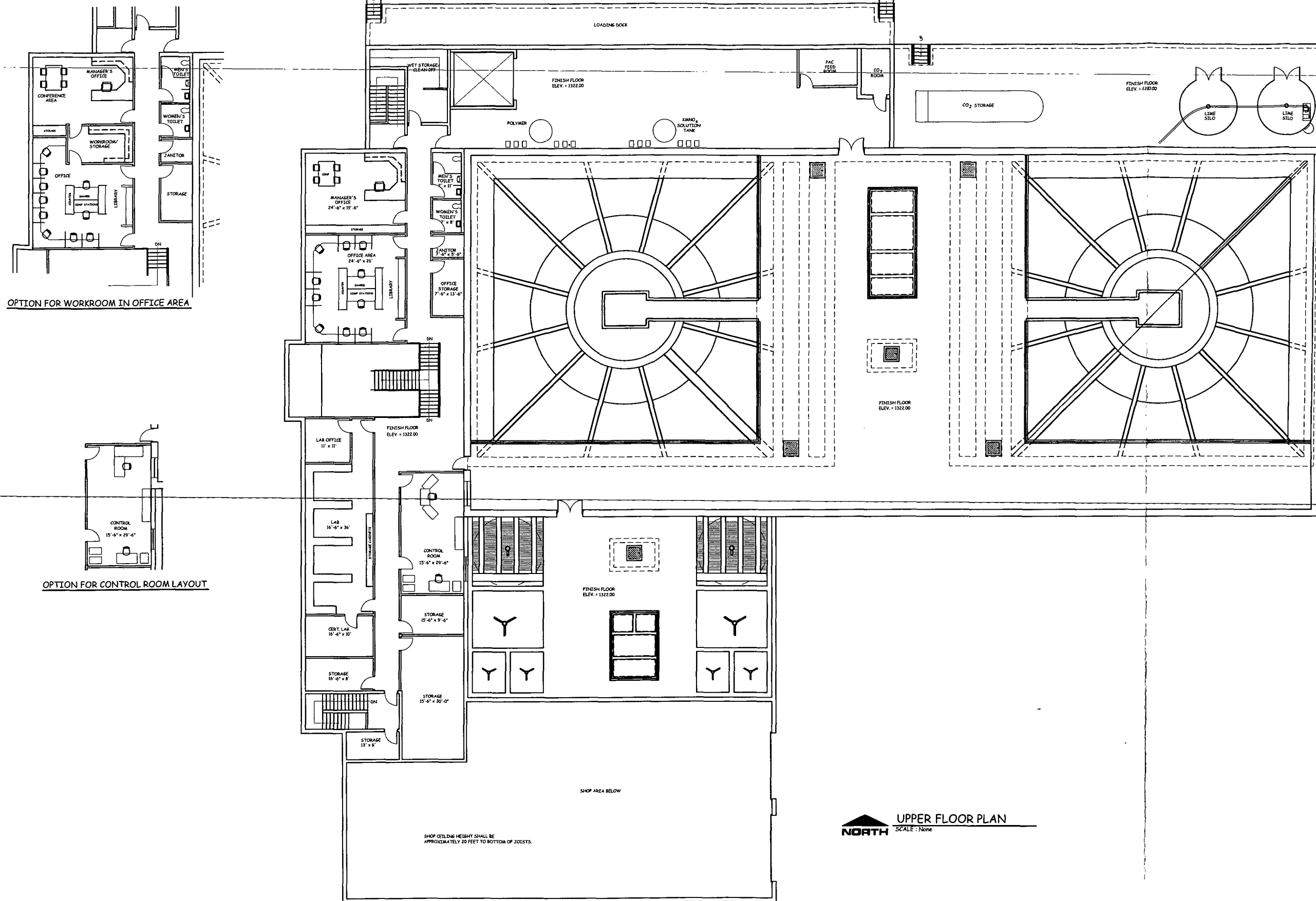
BANNER
 BANNER ASSOCIATES, INC. • CONSULTING ENGINEERS & ARCHITECTS
 409 22nd Av S • P.O. Box 298 - Brookings, SD 57006 • (605)692-6342

REVISION	DATE	DESCRIPTION	BY	CK'D

Aberdeen Water Supply & Treatment Improvements
 Aberdeen, South Dakota
 11 MGD WATER TREATMENT PLANT
 SITE PIPING

SCALE: As Shown
 JOB NO: 20192.00.01
 DATE: Jan, 03
Figure No.2





DRAWN BY: R.A.R.	REVIEWED _____ DATE: _____ FOR _____
DESIGNED BY: K.L.B.	REVIEWED _____ DATE: _____ FOR BANNER ASSOCIATES, INC.
CHECKED BY: D.G.O.	

BANNER
 BANNER ASSOCIATES, INC. • CONSULTING ENGINEERS & ARCHITECTS
 409 22nd Av S • P.O. Box 298 - Brookings, SD 57006 • (605)692-6342

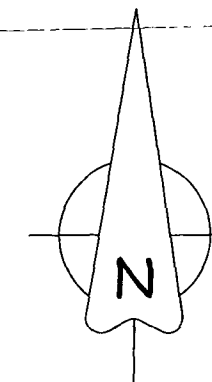
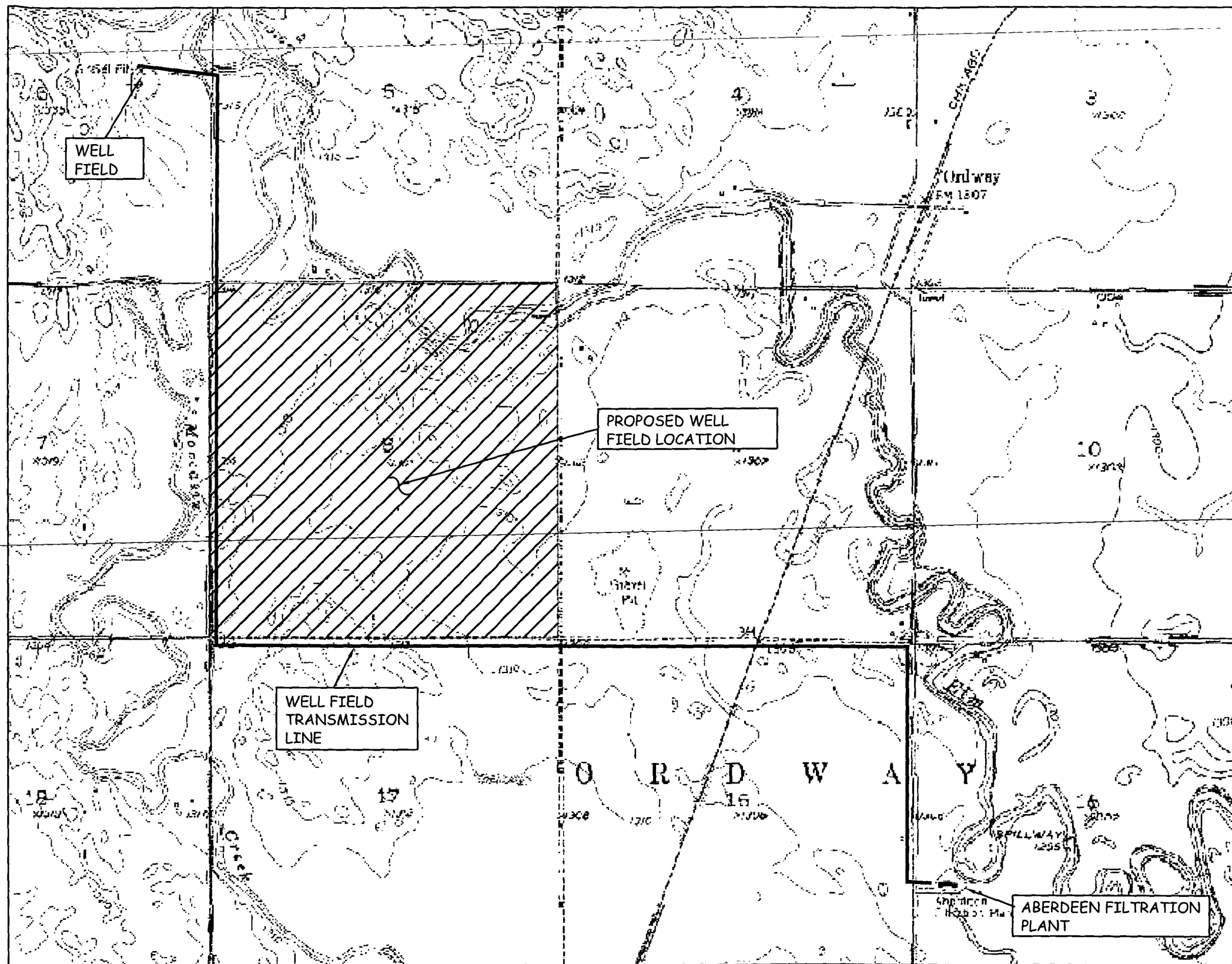
REVISION	DATE	DESCRIPTION	BY	CK'D

Aberdeen Water Supply & Treatment Improvements
 Aberdeen, South Dakota
 11 MGD WATER TREATMENT PLANT
 UPPER FLOOR PLAN

SCALE: As Shown	JOB NO: 20192.00.01	DATE: Jan. 03
Figure No. 4		

APPENDIX E:

**DRAWINGS FOR PROPOSED WELL FIELD
DEVELOPMENT**



APPROX. SCALE: 3" = 1 MILE

DRAWN BY: R.A.R.
DESIGNED BY: K.L.B.
CHECKED BY: D.C.O.

REVIEWED: _____
DATE: _____ FOR _____

REVIEWED: _____
DATE: _____ FOR BANNER ASSOCIATES, INC.

BANNER

BANNER ASSOCIATES, INC. • CONSULTING ENGINEERS & ARCHITECTS
409 22nd Av S • P.O. Box 298 - Brookings, SD 57006 • (605)692-6342

REVISION	DATE	DESCRIPTION	BY	CK'D

Aberdeen Water Supply & Treatment Improvements
Aberdeen South Dakota
FACILITY PLAN
PROPOSED WELL FIELD LOCATION MAP

SCALE: None JOB NO: 20192.00.01 DATE: Jan.03

Figure No. 5

APPENDIX F:

LETTERS TO REVIEW AGENCIES AND RESPONSES

BANNER ASSOCIATES, INC.
409 22nd Avenue South • P.O. Box 298
Brookings, South Dakota 57006-0298
(605) 692-6342
FAX: (605) 692-5714

January 13, 2003

U.S. Army Corps of Engineers, Omaha District
Planning Division
215 North 17th Street
Omaha, NE 68102-4978

Attn: Candace M. Gorton

RE: Aberdeen Water Supply and
Treatment Improvements 2003 -
Facilities Plan
BAI No. 20192.00.01

Dear Ms. Gorton:

The City of Aberdeen, South Dakota has authorized the preparation of a Project Summary Report for the Water Supply and Treatment Improvements. A copy of this report has been prepared and is enclosed for your review and comment. This report is intended to serve as a facility plan for the project.

The facility plan recommends the addition of:

1. Up to six additional wells in the alluvial aquifer adjacent to the Elm River. The wells will provide water from current water rights and future use water rights held by the City of Aberdeen;
2. Water line as necessary to deliver water from the wells to the water treatment plant;
3. Water clarification process and all associated piping;
4. Chemical feed equipment, storage facilities, and all necessary appurtenances;
5. Office/Administration building; and
6. Renovations and improvements to existing structures and facilities.

Site plans, site piping plans, and upper and lower floor plans of the proposed structures for the water treatment plant and a location map of the proposed well field are shown in the appendix of the facility plan.

The improvements to the water supply and treatment system are necessary to assure that the utility department can continue to meet the water demands of the City Aberdeen.

Please provide your review comments to:

Mr. Robin Bobzien, City Engineer
City of Aberdeen
123 South Lincoln
Aberdeen, SD 57401

Please provide a courtesy copy of the review comments to:

Mr. David Odens, Project Manager
Banner Associates, Inc.
PO Box 298
Brookings, SD 57006-0298

There will be a public hearing regarding this project. The date for the hearing is January 13th, 2003 at the regularly scheduled City Commission meeting. Thank you for your timely response to this matter.

If you have any questions, please call either David Odens or Kristin Bisgard at 605-692-6342.

Sincerely,



Kristin Bisgard, PE

Enclosure

Cc: Robin Bobzien, City Engineer, Aberdeen, SD

BANNER ASSOCIATES, INC.
409 22nd Avenue South • P.O. Box 298
Brookings, South Dakota 57006-0298
(605) 692-6342
FAX: (605) 692-5714

January 13, 2003

Office of Water Quality
Department of Environment & Natural Resources
Joe Foss Building
Pierre, S.D. 57501

Attn: Mr. David Ryan

RE: Aberdeen Water Supply and
Treatment Improvements 2003 -
Facilities Plan
BAI No. 20192.00.01

Dear Mr. Ryan:

The City of Aberdeen, South Dakota has authorized the preparation of a Project Summary Report for the Water Supply and Treatment Improvements. A copy of this report has been prepared and is enclosed for your review and comment. This report is intended to serve as a facility plan for the project.

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Aberdeen, SD 57401

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Banner Associates, Inc.
PO Box 298
Brookings, SD 57006-0298

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Sincerely,



Kristin Bisgard, PE

Enclosure

Cc: Robin Bobzien, City Engineer, Aberdeen, SD

BANNER ASSOCIATES, INC.
409 22nd Avenue South • P.O. Box 298
Brookings, South Dakota 57006-0298
(605) 692-6342
FAX: (605) 692-5714

January 13, 2003

United States Department of Interior
Fish and Wildlife Service
420 S. Garfield Avenue
Pierre, SD 57501-5408A

Attn: Donald Gober, Field Supervisor

Re: Aberdeen Water Supply and
Treatment Improvements – 2003
Facility Plan
BAI No. 20192.00.01

Dear Mr. Gober:

The City of Aberdeen, South Dakota has authorized the preparation of a Project Summary Report for the Water Supply and Treatment Improvements. A copy of this report has been prepared and is enclosed for your review and comment. This report is intended to serve as a facility plan for the project.

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Mr. Robin Bobzien, City Engineer
City of Aberdeen
123 South Lincoln
Aberdeen, SD 57401

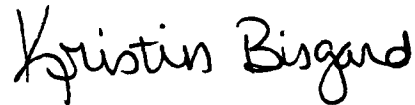
Please provide a courtesy copy of the review comments to:

Mr. David Odens, Project Manager
Banner Associates, Inc.
PO Box 298
Brookings, SD 57006-0298

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If you have any questions, please call either David Odens or Kristin Bisgard at 605-692-6342.

Sincerely,



Kristin Bisgard, PE

Enclosure

Cc: Robin Bobzien, City Engineer, Aberdeen, SD

BANNER ASSOCIATES, INC.
409 22nd Avenue South • P.O. Box 298
Brookings, South Dakota 57006-0298
(605) 692-6342
FAX: (605) 692-5714

January 13, 2003

South Dakota Department of Game, Fish and Parks
Division of Wildlife
Foss Building
523 East Capitol Ave.
Pierre, SD 57501-3181

Attn: John Kirk, Interagency Coordinator

Re: Aberdeen Water Supply and
Treatment Improvements – 2003
Facility Plan
BAI No. 20192.00.01

Dear Mr. Kirk:

The City of Aberdeen, South Dakota has authorized the preparation of a Project Summary Report for the Water Supply and Treatment Improvements. A copy of this report has been prepared and is enclosed for your review and comment. This report is intended to serve as a facility plan for the project.

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Please provide your review comments to:

Mr. Robin Bobzien, City Engineer
City of Aberdeen
123 South Lincoln
Aberdeen, SD 57401

Please provide a courtesy copy of the review comments to:

Mr. David Odens, Project Manager
Banner Associates, Inc.
PO Box 298
Brookings, SD 57006-0298

There will be a public hearing regarding this project. The date for the hearing is January 13th, 2003 at the regularly scheduled City Commission meeting. Thank you for your timely response to this matter.

If you have any questions, please call either David Odens or Kristin Bisgard at 605-692-6342.

Sincerely,



Kristin Bisgard, PE

Enclosure

Cc: Robin Bobzien, City Engineer, Aberdeen, SD

BANNER ASSOCIATES, INC.
409 22nd Avenue South • P.O. Box 298
Brookings, South Dakota 57006-0298
(605) 692-6342
FAX: (605) 692-5714

January 13, 2003

Northeast Council of Governments
P.O. Box 1985
Aberdeen, SD 57402

Attn: Ted Dickey

Re: Aberdeen Water Supply and
Treatment Improvements – 2003
Facility Plan
BAI No. 20192.00.01

Dear Mr. Dickey:

The City of Aberdeen, South Dakota has authorized the preparation of a Project Summary Report for the Water Supply and Treatment Improvements. A copy of this report has been prepared and is enclosed for your review and comment. This report is intended to serve as a facility plan for the project.

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Please provide your review comments to:

Mr. Robin Bobzien, City Engineer
City of Aberdeen
123 South Lincoln
Aberdeen, SD 57401

Please provide a courtesy copy of the review comments to:

Mr. David Odens, Project Manager
Banner Associates, Inc.
PO Box 298
Brookings, SD 57006-0298

There will be a public hearing regarding this project. The date for the hearing is January 13th, 2003 at the regularly scheduled City Commission meeting. Thank you for your timely response to this matter.

If you have any questions, please call either David Odens or Kristin Bisgard at 605-692-6342.

Sincerely,



Kristin Bisgard, PE

Enclosure

Cc: Robin Bobzien, City Engineer, Aberdeen, SD

BANNER ASSOCIATES, INC.
409 22nd Avenue South • P.O. Box 298
Brookings, South Dakota 57006-0298
(605) 692-6342
FAX: (605) 692-5714

January 13, 2003

United States Department of Agriculture
Natural Resources Conservation Service
Federal Building
Huron, SD 57350-2475

Attn: Jerry Schaar

Re: Aberdeen Water Supply and
Treatment Improvements – 2003
Facility Plan
BAI No. 20192.00.01

Dear Mr. Schaar:

The City of Aberdeen, South Dakota has authorized the preparation of a Project Summary Report for the Water Supply and Treatment Improvements. A copy of this report has been prepared and is enclosed for your review and comment. This report is intended to serve as a facility plan for the project.

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Please provide your review comments to:

Mr. Robin Bobzien, City Engineer
City of Aberdeen
123 South Lincoln
Aberdeen, SD 57401

Please provide a courtesy copy of the review comments to:

Mr. David Odens, Project Manager
Banner Associates, Inc.
PO Box 298
Brookings, SD 57006-0298

There will be a public hearing regarding this project. The date for the hearing is January 13th, 2003 at the regularly scheduled City Commission meeting. Thank you for your timely response to this matter.

If you have any questions, please call either David Odens or Kristin Bisgard at 605-692-6342.

Sincerely,



Kristin Bisgard, PE

Enclosure

Cc: Robin Bobzien, City Engineer, Aberdeen, SD

BANNER ASSOCIATES, INC.
409 22nd Avenue South • P.O. Box 298
Brookings, South Dakota 57006-0298
(605) 692-6342
FAX: (605) 692-5714

January 13, 2003

State Historic Preservation Center
Department of Education and Cultural Affairs
900 Governors Drive
Pierre, SD 57501-2217

Attn: Jay Vogt

Re: Aberdeen Water Supply and
Treatment Improvements – 2003
Facility Plan
BAI No. 20192.00.01

Dear Mr. Vogt:

The City of Aberdeen, South Dakota has authorized the preparation of a Project Summary Report for the Water Supply and Treatment Improvements. A copy of this report has been prepared and is enclosed for your review and comment. This report is intended to serve as a facility plan for the project.

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Mr. Robin Bobzien, City Engineer
City of Aberdeen
123 South Lincoln
Aberdeen, SD 57401

Please provide a courtesy copy of the review comments to:

Mr. David Odens, Project Manager
Banner Associates, Inc.
PO Box 298
Brookings, SD 57006-0298

There will be a public hearing regarding this project. The date for the hearing is January 13th, 2003 at the regularly scheduled City Commission meeting. Thank you for your timely response to this matter.

If you have any questions, please call either David Odens or Kristin Bisgard at 605-692-6342.

Sincerely,

Kristin Bisgard

Kristin Bisgard, PE

Enclosure

Cc: Robin Bobzien, City Engineer, Aberdeen, SD

APPENDIX G:

PUBLIC HEARING NOTICE AND MINUTES

December 20, 2002

NOTICE OF PUBLIC HEARING

A public hearing will be held at 6:30 pm on January 13, 2003, at Aberdeen City Hall. The City of Aberdeen is proposing to construct additional water treatment facilities and renovate the existing water treatment plant. The City of Aberdeen is filing application with the South Dakota Department of Environment and Natural Resources for a Drinking Water State Revolving Fund Loan. The City of Aberdeen will be requesting up to \$15,000,000 from the Drinking Water State Revolving Fund Loan. The loan will be for a term of up to 20 years at a rate of 3.5%

Public comments will be taken on this project. Written comments pertaining to the project or funding may be submitted to Karl Alberts, Finance Officer, at 123 S. Lincoln Street, Aberdeen, South Dakota, 57401 by 5:00pm, January 13, 2003.

AGENDA, CITY COMMISSION MEETING, MONDAY, JANUARY 13, 2003, 6:30 P.M.
MUNICIPAL BUILDING, 123 SOUTH LINCOLN, 2ND FLOOR

1. ROLL CALL
2. PLEDGE OF ALLEGIANCE
3. MINUTES, CITY COMMISSION MEETING OF JANUARY 6, 2003
4. EXPLANATION OF PUBLIC NOTICE FOR WATER TREATMENT
5. COMBINED NOTICE OF FINDING OF NO SIGNIFICANT IMPACT AND NOTICE OF INTENT TO REQUEST FUNDS FOR COMMUNITY/HEALTH AND FITNESS CENTER AND CHILDCARE CENTER

APPROVE AND AUTHORIZE THE MAYOR TO SIGN
6. RESIGNATION – LEN SCHERR FROM THE BID BOARD OF DIRECTORS EFFECTIVE IMMEDIATELY

RECEIVE AND PLACE ON FILE
7. APPOINTMENTS:
 - A. SCOTT CUNNINGHAM – HOME RULE TASK FORCE
 - B. JON WEBB – BID BOARD OF DIRECTORS
8. PUBLIC HEARING ON PROPOSED PROJECT AND FUNDING TO CONSTRUCT ADDITIONAL WATER TREATMENT FACILITIES AND THE RENOVATION OF THE EXISTING WATER TREATMENT PLANT
9. ORDINANCE NO. 03-01-02 – “AN ORDINANCE IN REVISION OF THE ORDINANCES OF THE CITY OF ABERDEEN, SOUTH DAKOTA”

POSSIBLE SECOND READING AND FINAL ADOPTION
10. APPLICATIONS FOR ALCOHOLIC BEVERAGE LICENSES:
 - A. SPECIAL ONE-DAY RETAIL ON-OFF SALE MALT BEVERAGE LICENSES
FEBR. 13, 2003 – ABERDEEN AREA CHAMBER OF COMMERCE DBA FLOORING AMERICA, 302 SOUTH 2ND STREET
MAR. 13, 2003 – ABERDEEN AREA CHAMBER OF COMMERCE DBA PRESENTATION COLLEGE STRODE CENTER, 1500 N. MAIN STREET
 - B. SPECIAL ONE-DAY RETAIL ON-OFF SALE MALT BEVERAGE LICENSE
FEBR. 22, 2003 – WHITETAILS UNLIMITED DBA YELDUZ SHRINE MOSQUE, 802 S. MAIN STREET
 - C. NEW RETAIL ON-OFF SALE MALT BEVERAGE LICENSE
SERGIO AGUIRRE DBA MAZATLAN MEXICAN RESTAURANT, 1 SOUTH FIRST STREET
NEW RETAIL ON-SALE WINE LICENSE
SERGIO AGUIRRE DBA MAZATLAN MEXICAN RESTAURANT, 1 SOUTH FIRST STREET
 - D. TRANSFER RETAIL ON-OFF SALE MALT BEVERAGE LICENSE
FROM LONNIE FROST & JEFF ELL DBA JACKPOT CASINO, 1111 SIXTH AVE., SW
TO JEFFLON CORPORATION DBA JACKPOT CASINO, 1111 SIXTH AVE., SW

SET HEARING DATE OF JANUARY 27, 2003 AT 6:30 P.M.
11. ADVERTISEMENTS FOR BIDS:
 - A. ONE NEW MOTOR GRADER FOR PUBLIC WORKS DEPARTMENT/STREET DIVISION
 - B. ONE NEW REFUSE COLLECTION UNIT FOR PUBLIC WORKS DEPARTMENT/SOLID WASTE DIV.
 - C. ONE NEW THREE-WHEEL SELF-PROPELLED STREET SWEEPER

SET BID DATE OF JANUARY 29, 2003 AT 2:00 P.M.
12. CONTRACTS:
 - A. CARBON DIOXIDE – BROIN ENTERPRISES, INC. DBA ETHANOL PRODUCTS CO2
 - B. ALUMINUM SULPHATE LIQUID, CHLORINE, & POTASSIUM PERMANGANATE – DPC INDUSTRIES

APPROVE AND AUTHORIZE THE MAYOR TO SIGN CONTINGENT UPON CITY ATTORNEY'S REVIEW

ABERDEEN WATER SUPPLY AND TREATMENT IMPROVEMENTS

Public Hearing Minutes

Jan. 13, 2003

6:30 PM., Local Time

Dave Odens reviewed the Facility Plan's Executive Summary (see attachment) with the commission.

Commissioner Jackie Omland asked if the summary of costs included the construction of a well field? Dave explained that yes, six (6) wells were to be included in the construction project. Dave explained that a hydrogeologic investigation was going to be conducted in the near future to determine the best location for a well field.

Commissioner Pat Klabo stated that Banners numbers were very accurate with initial cost estimates. She stated that the debt service due to the water supply and treatment improvements would be covered by the \$10.00 service fee the City has already implemented.

Mayor Tom Hopper explained to the commission that this project is a very large project for the City to undertake, but one that is necessary.

General Comments:

- Aberdeen needs to show 110% coverage on the loan.
- The loan starts when construction is complete, but interest starts accruing during construction.

Audience Comments:

- Mr. Podoll explained his concerns regarding the City relying solely on the Elm River and wells.
Commissioner Klabo responded that the City is doing what is best for the future for the community.

Mayor Hopper asks for a motion authorizing his signature on the SRF loan application and approval to submit the application

1st – Commissioner Pat Klabo

2nd – Commissioner Jackie Omland

Commission approves.

Mayor Hopper asks for a motion to approve a contract with Northeast Council of Governments to administer the SRF loan

1st – Commissioner Jule Pfeifer

2nd – Commissioner Pat Klabo

Commission approves.

FACILITY PLAN SUMMARY FOR PUBLIC HEARING
ABERDEEN WATER SYSTEM IMPROVEMENTS
JANUARY 13, 2003

The City of Aberdeen is filing an application for a Drinking Water State Revolving Fund (DWSRF) Loan for improvements to the Aberdeen water supply and treatment systems. The DWSRF program requires the City to complete and submit a Facilities Plan for the water system as documentation of the need and documentation of the process used in evaluation of alternatives for the improvements. This summary handout was prepared to highlight key portions of the Facility Planning Document.

Existing and Future Conditions:

The facilities planning process requires a review of the population changes in the service area for the proposed project and a projections of future population and water needs. The population and population projections are summarized in Table 1: Population Projections. The population projections presented are based on using several different methods. The projected increase is based on the long term population growth of the area. The projections listed represent an average net growth of approximately 0.5% per year or approximately 125 persons per year over the next thirty years.

TABLE 1: POPULATION PROJECTIONS

Year	Population Records	Population Projection,
1920	14,737	
1930	16,465	
1940	17,015	
1950	21,051	
1960	23,073	
1970	26,476	
1980	25,956	
1990	24,927	
2000	24,658	
2010		26,000
2020		27,100
2030		28,400

The water needs for that population were projected based on the water use patterns of the present population and commercial and industrial customers in the City of Aberdeen. The projected water needs for the community are summarized in Table 2: Projections of Future Water Demands.

Table 2: Projections of Future Water Demands

	1999	2000	2010	2020	2030
Population	24,685	24,658	26000	27,100	28,400
Average Water Sales (MGD)	2.49	2.58	2.82	2.95	3.09
Metered City Use (MGD)	0.13	0.17	0.17	0.18	0.19
Un-Metered City Use (est. - MGD)	0.12	0.11	0.07	0.07	0.07
"Unaccounted For" Water (MGD)	0.08	0.03	0.07	0.08	0.08
Average Day Use (MGD)	2.82	2.89	3.13	3.28	3.43
Maximum Month Production (MGD)*	4.7	4.8	5.2	5.5	5.7
Maximum Day Production (MGD)**	8.9	8.4	9.1	9.6	10.0
Treatment Plant Capacity Required (MGD)	9.8	9.3	10.0	10.5	11.0

*Future Maximum Month Production was calculated using a multiplier of 1.67 between average day use and maximum month production (the maximum for 1999, 2000, and 2001).

**Future Maximum Day Production was calculated using a multiplier of 2.92 between average day use and maximum day production (the maximum for 1999, 2000, and 2001).

The water needs of the City of Aberdeen will vary with precipitation. In years with above normal precipitation such as 2000, the water needs will be less than normal. In dry years, the water needs will be higher than average. The projections listed are based on long term average water use on a per capita basis.

ALTERNATIVES CONSIDERED - WATER SOURCE

The City of Aberdeen currently obtains its water supply from the Elm River and the Eyestone gravel pits. The flow in the Elm River is maintained through controlled releases from the main stem impoundments on the Elm River and releases from Elm Lake and Willow Creek Lake. The water from the Eyestone gravel pits is primarily groundwater that reaches the pits through infiltration from the adjacent water bearing formations of sand and gravel. These sources are vulnerable to drought and contamination from surface activities.

At certain times of the year the water has high levels of turbidity and color and periodic problems with taste and odor. In an effort to develop other sources of water to serve as either a supplemental water supply or a replacement water supply, the City of Aberdeen considered the options of developing wells in the alluvial aquifer adjacent to the Elm River and a water service connection to the WEB water system.

Water service from the WEB water system was considered at different levels ranging from approximately 2.5 to 3 million gallons per day to a capacity sufficient to meet all the needs of the City. At the time when initial inquiries were made, the WEB water system estimated they would have 2.5 to 3 million gallons per day of capacity available on a nearly continuous basis and the City worked to negotiation an agreement to secure that source as a supplemental water supply for the city. During the course of those negotiations, the WEB water system was approached by an ethanol plant and another

industrial user with a request for water service that would utilize the majority of the available capacity. That request represented a water need in the WEB service area outside the service area of the City and the WEB system chose to meet that need, making the capacity unavailable to the City of Aberdeen.

The other supplemental source of water available to the City is groundwater from the alluvial aquifer adjacent to the Elm River. The City currently holds future use water rights to this water and has a raw water transmission line in the area that is currently used to transmit water from the Eyestone gravel pits to the water treatment plant. The proposed plan for diversifying the water supply for the City is to develop a series of wells in the aquifer near the Elm River and deliver this water to the water plant using the existing water line from the Eyestone pits. The well water will be used to blend with the water from the Elm River especially during times when the river water is difficult to treat due to high turbidity, color, or taste and odor problems.

ALTERNATIVES CONSIDERED – WATER TREATMENT IMPROVEMENTS

The treatment methods considered are: conventional lime softening water treatment plant using solids contact units followed by membrane filtration, conventional lime softening water treatment plant using solids contact units followed by dual media gravity filters, and membrane pretreatment followed by membrane softening/filtration units. An on-site pilot investigation was conducted during the summer of 2001; the results of this pilot study were used in the selection of the treatment process to be implemented in the treatment plant.

The pilot study showed the conventional treatment process using a two stage process for clarification and softening to be more effective and more reliable. Two alternatives for the first stage of the clarification process were evaluated; a conventional solids contact clarifier and a ballasted floc system known as the Actiflo system. The Actiflo system provides superior performance for turbidity removal in a smaller space. The Actiflo system also has shorter detention time, reducing the effectiveness of the PAC treatment. After consideration of both cost and performance, the Actiflo system was selected and the existing pretreatment basin will be maintained for additional contact time for the PAC during those times when color in the water is a problem.

The estimates of construction costs and operation and maintenance costs for the alternatives considered are summarized as follows:

Description	Membrane Treatment	Conventional Treatment
Probable Construction Costs =	\$19,006,950	\$13,699,985
Phase 1-1: Dredging of Elm River	\$338,000	\$338,000
Phase 1-2: Water Treatment Plant Improvements		\$762,600
Phase 2: Water Treatment Plant Improvements		\$919,750
Engineering, Administration, and Contingencies =	\$4,751,700	\$2,901,000
TOTAL PROJECT COST =	\$23,758,650	\$18,621,335

RECOMMENDED PLAN AND IMPLEMENTATION SCHEDULE

The recommended plan includes only those portions of the work not yet completed. Dredging and filter control work completed in previous projects are not included in the financing plan for this report. The estimated costs for the work remaining to be completed and the financing plan for that work are summarized as follows:

Opinion of Probable Construction Costs	\$13,699,985
Engineering, Administration, and Contingencies	\$2,700,700
Opinion of Probable Project Costs	\$16,400,685
Grant	\$2,000,000
Local Share	\$685
State Revolving Loan Amount	\$14,400,000
Debt Retirement (3.5%, 20 years)	\$1,013,200
Number of Account Equivalents	8523
Cost/Month/Account Equivalent for Debt Service	\$9.90
Present Monthly minimum for capital improvements	\$10.00
Operation and Maintenance – Water Treatment Plant	\$888,000
Operation and Maintenance – Water Distribution	\$725,000
Depreciation	
Cost/1000 gallons Treated*	\$1.26
Estimated Cost/1000 gallons of metered sales	\$1.45
Present Rate/proposed future rate	\$1.55/\$2.00

*Assuming an average day demand of 3.5 MGD.

A preliminary schedule for constructing the improvements to the water treatment plant is presented in the Implementation Schedule.

Implementation Schedule

DESCRIPTION OF TASK	TIME SCHEDULE
State Water Plan Application Due	January, 2003
DENR Approve SRF Loan	April, 2003
Finish Project Design	May, 2003
Submit Plans and Specifications for Review to Owner and DENR	May, 2003
Open Bids for Construction	June, 2003
Start Construction	July, 2003
Substantial Completion of New Water Treatment Plant	December, 2004
Final Completion of New Water Treatment Plant	May, 2005
Complete One-Year Warranty on New Water Treatment Plant	May, 2006

ABERDEEN WATER SUPPLY AND
TREATMENT IMPROVEMENTS
ATTENDANCE ROSTER

Public Hearing

Jan. 13, 2003

6:30 PM., Local Time

1. David Odens Banner Associates, Inc. 605-692-6342
2. Kristin Bisgard Banner Assoc. Inc. 605-692-6342
3. Jamul R. Ellinger Water Works 605-626-7074
4. Stephen R. Sawyer 605-225-8487
5. Elissa Gossell American News 622-2301
6. Erling Fjell Resident 229-0334
7. Philip H. Hake Resident/Planning & Zoning Director 605-626-7012 (w)
8. Rick B. Mahlen Aberdeen Water 605-626-7074
9. ROBIN BOBZIEN CITY ENGINEER 605-626-7017
10. Mark A. Anderson City Attorney 605-225-9203 (w)
11. Karl Alberts City Finance Officer 605-626-7045
12. Thomas P. Happer Mayor 605-626-7025
13. Julie J. Zuger City Commissioner 605-626-7023

14. *Pat Klado, City Commissioner Water - Wastewater Depts. 626-7011*

15. *Pat Kipsatant - City Commissioner 626-7010*

16. *Jacqueline L. Orland City Commissioner 686-7058*

17. _____

18. _____

19. _____

20. _____

21. _____

22. _____

23. _____

24. _____

25. _____

26. _____

27. _____

28. _____

REPORT ON WATER PERMIT APPLICATION NO. 3427A-3
For the City of Aberdeen
September 9, 2003

Application No. 3427A-3 proposes to amend Future Use Permit No. 3427-3 by expanding the area reserved for future use. Permit No. 3437-3 reserves 4,344 acre-feet annually from the Elm Aquifer located in the S $\frac{1}{2}$ of section 4; S $\frac{1}{2}$ and NW $\frac{1}{4}$ of section 5; N $\frac{1}{2}$ of section 6; NE $\frac{1}{4}$ of section 8; E $\frac{1}{2}$ of section 9; W $\frac{1}{2}$ of section 15 and the NE $\frac{1}{4}$ of section 16; all in T124N R63W in Brown County. This application requests including all of section 8 in T124N R63W to the future use area with no increase in the amount of water reserved for future use by No. 3427-3. The water is for municipal use by the City of Aberdeen.

AQUIFER – ELM NORTHERN BROWN (E-NB)

The Elm Northern Brown can be either under confined or water table conditions and in the area of this application is a surficial outwash (sand and gravel) which is under water table conditions. The aquifer underlies 187,200 acres and contains an estimated 702,000 acre-feet of recoverable water in storage in Brown County (Hedges, 1982). The aquifer extends into North Dakota to the north, blends into the Elm Southern Brown aquifer to the south and appears to be hydraulically connected to the Middle James aquifer over portions of the area (Koch, 1976).

The area of this application has been tested and reported on. Test drilling and actual pump testing has been conducted for the City of Aberdeen by the USGS. The USGS reported a hydraulic conductivity of 600 ft/day, a storage coefficient of 0.05, and a transmissivity of 24,000 ft²/day (Schaap, 2000).

The Water Rights Program monitors five observation wells within a five mile radius of this application. These are observation wells BN-77L, BN-82E, BN-82K, BN-82F and BN-77V. Water levels for these wells show good response to climatic conditions, that is, rising water levels during wet years (recharge) and gradually declining water levels during dry years. In general, the water level record indicates that the aquifer is capable of sustaining additional withdrawals (Water Rights, 2003). Hydrographs for BN-82F and BN-77L are included with this report.

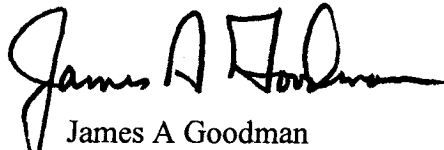
REVIEW OF EXISTING WATER PERMITS/RIGHTS

There are no other water rights in this area which will be affected by this application. This is only an expansion of the future use area. The City will be required to file an application to actually put water to beneficial use.

CONCLUSIONS

1. Water is available from the Elm Northern Brown aquifer.

2. The aquifer is under water table conditions in this area. Drawdown will be created when water is actually put to beneficial use. Interference is not expected to be a concern. The City will space production wells to minimize any potential impacts upon their own wells.
3. This is simply an expansion of a future use permit. The City of Aberdeen will be required to file an application to put water to beneficial use.

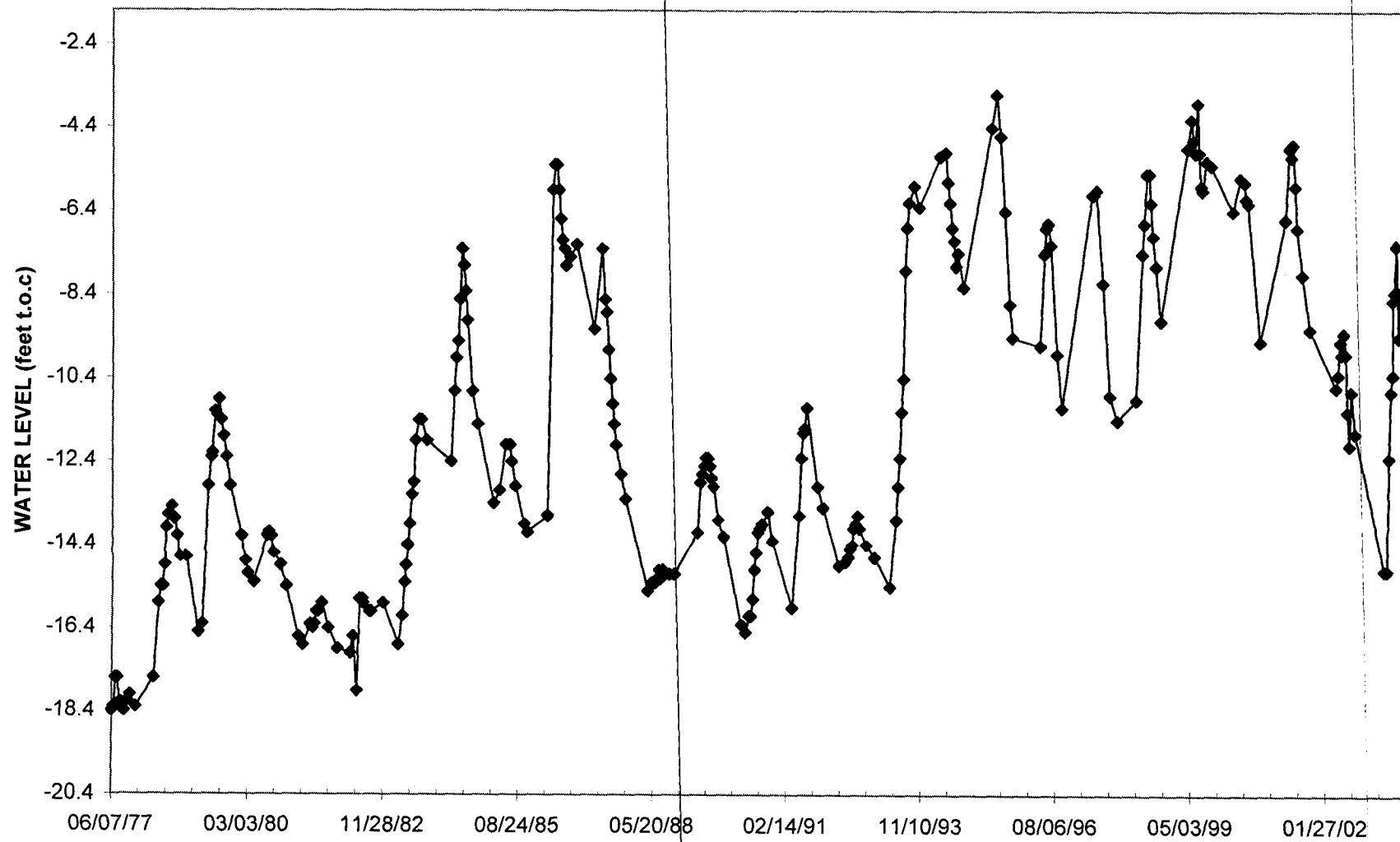


James A Goodman
Natural Resources Engineer

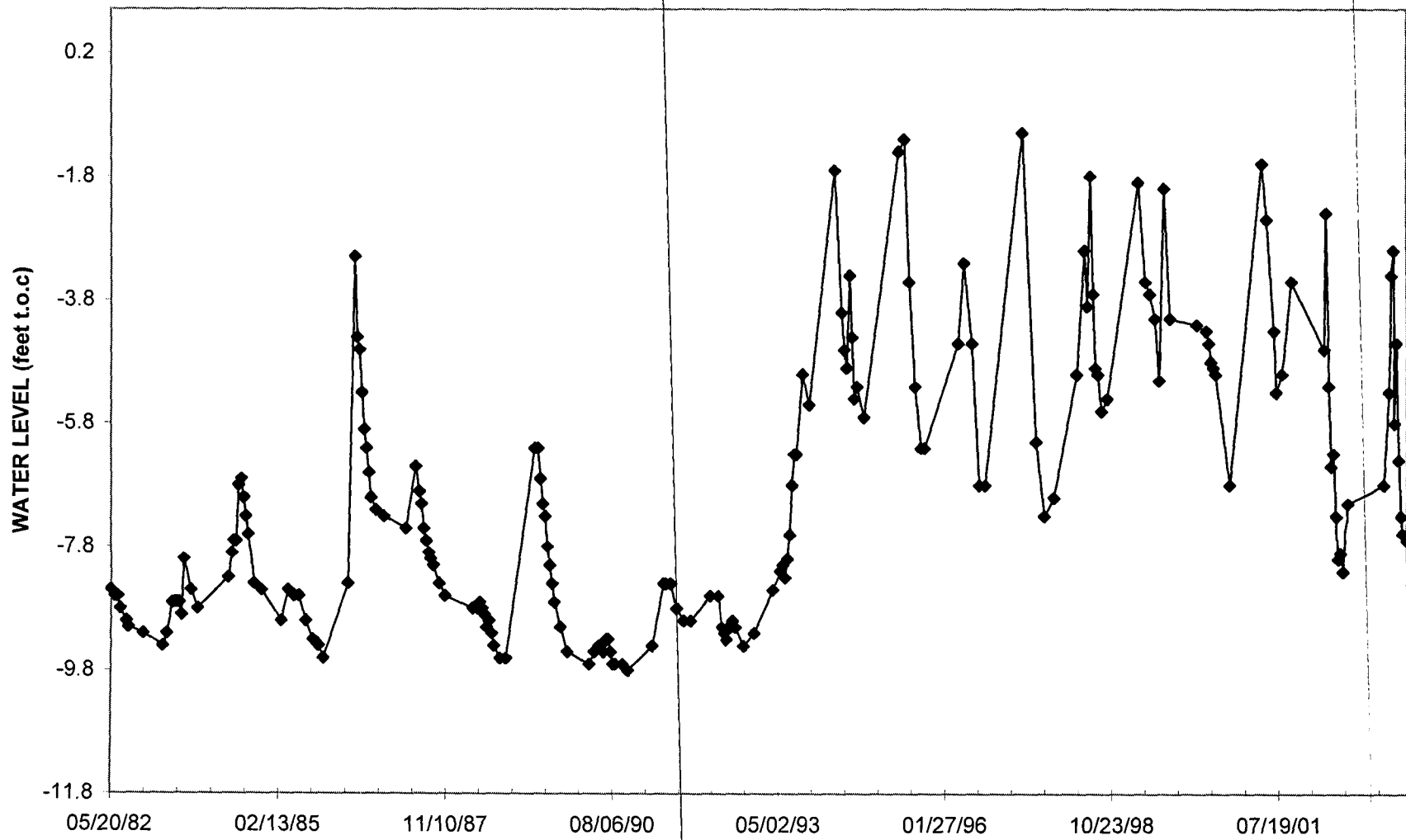
BIBLIOGRAPHY

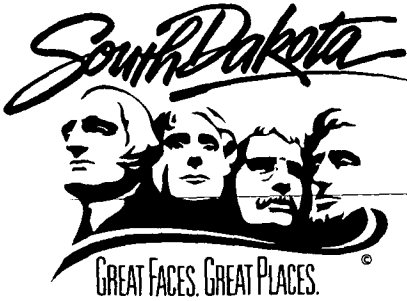
- Hedges, L.S., and others, 1982, Evaluation of Ground-Water Resources Eastern South Dakota and Upper Big Sioux River South Dakota and Iowa, for US Army Corps of Engineers, SD DENR, SDGS, Vermillion, SD, 57069.
- Koch, N.C., 1976, Geology and Water Resources of Brown County, South Dakota, Bulletin 25, Part II, Water Resources, SD DENR, SDGS, Vermillion, SD, 57069.
- Schaap, B.D., 2000, Aquifer Test to Determine Hydraulic Properties of the Elm Aquifer near Aberdeen, South Dakota, Water Resources Investigations Report 00-4264, USGS, Rapid City, SD, 57702.
- Water Rights, 2003, Unpublished Observation Well Data for Brown County, SD DENR, DES, Water Rights Program, Pierre, SD, 57501.

WATER RIGHTS' OBSERVATION WELL
BN-77L



**WATER RIGHTS' OBSERVATION WELL
BN-82F**





**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

PMB 2020
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PIERRE, SOUTH DAKOTA 57501-3182
www.state.sd.us/denr

**RECOMMENDATION OF CHIEF ENGINEER FOR FUTURE USE WATER PERMIT
APPLICATION NO. 3427A-3, City of Aberdeen**

Pursuant to SDCL 46-2A-2, the following is the recommendation of the Chief Engineer, Water Rights Program, Department of Environment and Natural Resources to amend the future use area of Future Use Water Permit No. 3427-3, City of Aberdeen, c/o Mayor Thomas L. Hopper, 123 Lincoln, Aberdeen SD 57501.

The Chief Engineer is recommending APPROVAL of Application No. 3427A-3 because 2) the City of Aberdeen has demonstrated a reasonable need for the water reserved, 3) the proposed use is a beneficial use and 4) it is in the public interest with the following qualifications:

1. Permit Nos. 3427-3 and 3427A-3 reserves 4,344 acre feet of water annually.
2. That Future Use Permit Nos. 3427-3 and 3427A-3 are approved with the stipulation that the ~~Permit to appropriate water is subject to review by the Water Management Board as to accomplishment thereunder upon expiration of seven (7) years.~~
3. At such time as definite plans are made to construct works and put the water reserved by this permit to beneficial use, specific application for all or any part of the reserved water must be submitted prior to construction of facilities pursuant to SDCL 46-5-38.1.
4. This Permit is approved for groundwater from the Elm Aquifer.

See report on application for additional information.

Garland Erbele, Chief Engineer
September 30, 2003



**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

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PIERRE, SOUTH DAKOTA 57501-3182

www.state.sd.us/denr

**NOTE: TO BE SURE OF PUBLICATION ON
THE CORRECT DATES, CONTACT
THE NEWSPAPER RIGHT AWAY.**

October 2, 2003

City of Aberdeen
Thomas L Hopper Mayor
123 S Lincoln
Aberdeen SD 57401

Dear Mayor Hopper:

Water Permit Application No. 3427A-3 for future use - municipal use has been examined and found to comply with the South Dakota Water Laws and applicable rules. A notice of hearing has been sent to the Publisher of the American News printed at Aberdeen, SD (Ph # 605-225-4100). You will need to contact the newspaper and authorize publication of this notice. For your information, a copy of the notice, the recommendation of the Chief Engineer and a report on the application are enclosed. Please review the notice prior to publication and notify this office, if you have any corrections or questions.

Be sure to contact the above newspaper to authorize publication of your Notice of Hearing and to arrange for payment. Early contact with the paper can eliminate delays. Upon receiving authorization, the publisher has been instructed to publish your notice once each week for two consecutive weeks with the last publication to occur twenty days before the board meeting. The newspaper has also been instructed to send us the Proof of Publication. We must receive Proof of Publication before action can be taken on the application.

Sincerely,

Eric Gronlund
Natural Resources Engineer
(605) 773-3352

enclosures

cc: Robin Bobzien, Public Works Director, City of Aberdeen, 123 S Lincoln St., Aberdeen SD 57401
Dave Odens, Banner & Associates, PO Box 298, Brookings SD 57006

NOTE: If you plan to contest any part of the Chief Engineer's recommendation, you must file a petition pursuant to the procedures outlined in the attached notice of hearing. The Water Management Board will then consider your concerns during a hearing on the application.



DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES

PMB 2020
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523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182
www.state.sd.us/denr

October 2, 2003

American News
PO Box 4430
Aberdeen SD 57402-4430

ATTENTION: Legal Public Notice

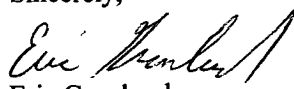
Enclosed is a Notice of Hearing on Application No. 3427A-3 to Appropriate Water to be published twice. Please publish the first notice on October 9, 2003 with the second publication 7 days later.

The applicant must verify to you that the notice is to be published, before you make the first publication. **Please BILL the APPLICANT for the cost of publication.** The APPLICANT is City of Aberdeen, Thomas L Hopper, Mayor, 123 S. Lincoln, Aberdeen, SD 57401 (Ph # 605-626-7017).

Please send the Water Rights Program the first publication immediately. The publication is checked for accuracy so any corrections can be made in the second publication. You may use the form below or fax a copy of the first publication. Any fax should be sent to the attention of Karen Schlaak at (605) 773-4068. Publication errors can invalidate the public notice.

After the second publication, please send us an affidavit or use the enclosed Proof of Publication form. The applicant pays the cost of publication, but the Water Rights Program records require an affidavit or Proof of Publication. Delays in receiving the affidavit can be costly to the applicant.

Sincerely,


Eric Gronlund
Natural Resources Engineer
605 773-3352

enclosures

CUT HERE

TO: Eric Gronlund
Water Rights Program
Joe Foss Building
Pierre SD 57501-3181

No. 3427A-3

Date _____

We are in receipt of your letter of October 2, 2003 enclosing Notice of Hearing to Appropriate Water by Application No. 3427A-3 which was first published in our issue of _____. ENCLOSED IS A COPY OF THIS FIRST PUBLICATION.

Name _____

Newspaper _____

Instruction to Newspaper - Publish first Notice on October 9, 2003 with the second publication 7 days later. The applicant is responsible for payment.

NOTICE OF APPLICATION NO. 3427A-3 to Amend Future Use Permit No. 3427-3

Notice is given that the City of Aberdeen, Thomas L Hopper, Mayor, 123 S. Lincoln, Aberdeen SD 57401 has filed an application for a water permit to amend Future Use Permit No. 3427-3 by expanding the area reserved for future use. Permit No. 3437-3 reserves 4,344 acre-feet annually from the Elm Aquifer located in the S ½ Section 4; S ½ and NW ¼ Section 5; N ½ Section 6; NE ¼ Section 8; E ½ Section 9; W ½ Section 15 and NE ¼ Section 16; all in T124N-R63W. This application requests including all of Section 8-T124N-R63W to the future use area with no increase in the amount of water reserved for future use by No. 3427-3. The water is for municipal use by the City of Aberdeen.

Pursuant to SDCL 46-2A-2, the Chief Engineer recommends APPROVAL of Application No. 3427A-3 because 1) existing rights will not be unlawfully impaired, 2) it is a beneficial use of water, and 3) it is in the public interest. In accordance with SDCL 46-2A-23, the Chief Engineer will act on the application, as recommended, unless a petition is filed opposing the application or the applicant files a petition contesting the Chief Engineer's recommendation. If a petition opposing the application or contesting the recommendation is filed, then a hearing will be scheduled and the Water Management Board will consider the application. Notice of the hearing will be given to the applicant and any person filing a petition.

Any person interested in opposing or supporting this application or recommendation must file a written petition with BOTH the applicant and Chief Engineer. The applicant must file a petition if contesting the Chief Engineer's recommendation. The Chief Engineer's address is "Water Rights Program, Foss Building, 523 E Capitol, Pierre SD 57501 (605 773-3352)" and the applicant's mailing address is given above. A petition filed by either an interested person or the applicant must be filed by October 27, 2003.

The petition may be informal, but must include a statement describing the petitioner's interest in the application, the petitioner's reasons for opposing or supporting the application, and the signature and mailing address of the petitioner or the petitioner's legal counsel, if legal counsel is obtained. Contact Eric Gronlund at the above Water Rights Program address to request copies of information pertaining to this application. Steven M. Pirner, Secretary, Department of Environment and Natural Resources.

AFFIDAVIT OF PUBLICATION

STATE OF SOUTH DAKOTA}

§

COUNTY OF BROWN}

Alice Rents being duly sworn, on his/her oath says: That the AMERICAN NEWS is a daily newspaper of general circulation, printed and published in Aberdeen, Brown County, South Dakota, by the Aberdeen News Company, a corporation, and has been such a newspaper during the times hereinafter mentioned; That affiant is an employee and principal clerk of said publisher and has personal knowledge of all facts stated in this affidavit; That the advertisement headed:

Notice of Application
Legal # 998992

a printed copy of which is hereunto attached, was printed and published in the regular and entire issue of said newspaper, and not in a supplement thereof, once each

Week for 2 successive Weeks.
The first publication being made on the 9 day of Oct, 2003.
The second publication being made on the 16 day of Oct, 2003.
The third publication being made on the _____ day of _____, 2003.
The fourth publication being made on the _____ day of _____, 2003.
The fifth publication being made on the _____ day of _____, 2003.
The sixth publication being made on the _____ day of _____, 2003;

That said newspaper is a legal newspaper published five days or more each week; with a bona fide circulation of more than two hundred copies daily; published in the English language within the said county of Brown for more than one year prior to the first publication of said notice; and printed in whole in an office maintained at the place of publication of said newspaper; That the whole amount of the fee paid for the publication of the annexed notice is \$ 82.20, which insures solely to the benefit of said publisher; That no agreement or understanding for a division thereof had been made with any other person; and That no part thereof has been agreed to be paid to any person whomsoever.

Alice Rents

Subscribed and sworn to before me this 16 day of Oct, 2003.

Daily Circulation 18,000

Don Valbrank

Notary Public, Brown County, SD.

My commission expires

March 20, 2007

(No. 998992)
(Oct. 9, 16, 2003 - 2T)
NOTICE OF APPLICATION NO. 3427A-3
to Amend Future
Use Permit No. 3427-3

Notice is given that the City of Aberdeen, Thomas L. Hopper, Mayor, 123 S. Lincoln, Aberdeen SD 57401 has filed an application for a water permit to amend Future Use Permit No. 3427-3 by expanding the area reserved for future use. Permit No. 3427-3 reserves 4,344 acre-feet annually from the Elm Aquifer located in the S1/2 Section 4; S1/2 and NW 1/4 Section 5; N1/2 Section 6; NE1/4 Section 8; E1/2 Section 9; W1/2 Section 15 and NE 1/4 Section 16; all in T124N-R63W. This application requests including all of Section 8-T124N-R63W to the future use area with no increase in the amount of water reserved for future use by No. 3427-3. The water is for municipal use by the City of Aberdeen.

Pursuant to SDCL 46-2A-2, the Chief Engineer recommends APPROVAL of Application No. 3427A-3 because 1) existing rights will not be unlawfully impaired, 2) it is a beneficial use of water, and 3) it is in the public interest. In accordance with SDCL 46-2A-23, the Chief Engineer will act on the application, as recommended, unless a petition is filed opposing the application or the applicant files a petition contesting the Chief Engineer's recommendation. If a petition opposing the application or contesting the recommendation is filed, then a hearing will be scheduled and the Water Management Board will consider the application. Notice of the hearing will be given to the applicant and any person filing a petition.

Any person interested in opposing or supporting this application or recommendation must file a written petition with BOTH the applicant and the Chief Engineer. The applicant must file a petition if contesting the Chief Engineer's recommendation. The Chief Engineer's address is "Water Rights Program, Foss Building, 523 E Capitol, Pierre SD 57501 (605-773-3352)" and the applicant's mailing address is given above. A petition filed by either an interested person or the applicant must be filed by October 27, 2003.

The petition may be informal, but must include a statement describing the petitioner's interest in the application, the petitioner's reasons for opposing or supporting the application, and the signature and mailing address of the petitioner or the petitioner's legal counsel, if legal counsel is obtained. Contact Eric Gronlund at the above Water Rights Program address to request copies of information pertaining to this application. Steven M. Pirner, Secretary, Department of Environment and Natural Resources.

SEAL

RECEIVED

OCT 20 2003

WATER RIGHTS
PROGRAM



**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

PMB 2020
JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182
www.state.sd.us/denr

DEC 10 2003

Robin Bobzien, Public Works Director
City of Aberdeen
123 S Lincoln
Aberdeen SD 57401

Dear Mr. Bobzien:

Enclosed is Future Use Permit No. 3427A-3, as approved by the Water Management Board.

When plans for facilities are prepared to put any portion of the water granted in the future use permits to beneficial use, an application covering such facilities and water use should be submitted to this office before construction is initiated.

Sincerely,

Garland Erbele, Chief Engineer
Water Rights Program
(605) 773-3352

enclosure

**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182
www.state.sd.us/denr

December 8, 2004

Robin Bobzien, City Engineer
City of Aberdeen
123 S Lincoln
Aberdeen SD 57401

Dear Mr. Bobzien:

I am writing in regard to the seven year review of Future Use Water Permit No. 192-3 from ground-water from alluvium along the Elm River and Permit No. 3427A-3 from groundwater (Elm:North Brown Aquifer) which are held by the City of Aberdeen. By law, all future use permits are to be reviewed by the Water Management Board every seven years to determine whether a reasonable need exists for the reserved water. The permits reserve water for future water supply needs for the city.

Currently, our records show that 3,823 acre-feet remains in reserve under Future Use Permit No. 192-3. Future Use Permit No. 3427A-3 has 4,344 acre-feet remaining in effect. However, pending Application No. 6546-3 is proposing to develop 2,520 acre-feet of this amount. Application No. 6546-3, if approved, will reduce the amount remaining in reserve under Future Use Permit No. 3427A-3 to 1,824 acre-feet of water annually.

Please respond in writing by January 15, 2005, regarding the city's intention for the future use permit. If the city plans to retain the permit, then the response should outline a reasonable need for retaining the future use permit, including an estimate of future needs and any annual pumping records for the past three years.

Permit Nos. 192-3 and 3427A-3 will then be public noticed at the city's expense and scheduled for review before the Water Management Board pursuant to SDCL 46-5-38.1. Notice will be given of the hearing time and place at a future date. The purpose of this review is to determine if a reasonable need exists for retaining the permits. A fee will be charged if the Board allows the permits to remain in effect after the hearing. The fee to be assessed will be dependent upon the amount of water allowed to remain in reserve.

Please contact Eric Gronlund, if you have any questions.

Sincerely,

Karen Schlaak
Environmental Scientist
Water Rights Program
605 773-3352
karen.schlaak@state.sd.us



CITY OF ABERDEEN

12668 391 Ave.
Aberdeen, SD 57401-4215

WATER TREATMENT

(605) 626-7010

January 13, 2005

Karen Schlaak
Water Rights Program
SDDENR
Joe Foss Building
523 East Capitol
Pierre, SD 57501-3181

RECEIVED

JAN 18 2005

WATER RIGHTS
PROGRAM

RE: Future Use Permit 192-3 & Permit 3427A-3

Dear Ms. Schlaak:

Thank you for the reminder of the upcoming review of our groundwater Future Use Water Permits. As with all water providers, the City of Aberdeen attempts to anticipate the needs of the community. The ever-changing weather patterns that affect our surface water supply and the ever-increasing EPA regulations dictate that the City of Aberdeen request we be allowed to retain permits 192-3 and 3427A-3.

Justification for the continuation of these permits is the maximum water treatment plant production, expected future growth of the community and increasingly stringent EPA regulations of surface water.

Our Beneficial Water Use Application 6546-3, if granted, will provide a daily total of 2.25 MGD or three quarters of the average water used daily by the citizens of Aberdeen. If the quantity or quality of the water available from the Elm River, which is our main source of water, should change we will require additional ground water to meet the current minimum daily demand.

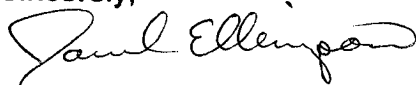
In addition the EPA, in the not to distant future, will require monitoring of influent water for Cryptosporidium which may, for us, be the deciding factor as to how much groundwater we blend with surface water. Our process up-grade will provide enhanced treatment but any new requirements will be based on untreated water and treatment options may be limited. Having water held in reserve through the Future Use Permits will insure the availability of a safe and secure water supply for the citizens of Aberdeen.

The upgrade of our treatment facility will give us the capability of producing 12 MGD with room for expansion up to 18 MGD. Our current operation plan is to use groundwater for $\frac{1}{3}$ - $\frac{1}{2}$ of our total daily flow. At a flow of 12 MGD we would require 4 - 6 MGD from wells resulting in the need for an additional 1.75 - 3.75 MGD to be converted to beneficial use. Allowing for no adjustments of our blend formula we would

need to convert 3.75 MGD from future use to beneficial use, which would leave us a minimum of 1.293 MGD or 1448 acre-feet in Future Use in reserve for a plant expansion.

It is the City of Aberdeen's respectful request that the Water Management Board of the State of South Dakota extend Future Use Permits 192-3 and 3427A-3. The water reserved by these permits provides a vital component in providing the Aberdeen community a consistent and constant quality water.

Sincerely,

A handwritten signature in black ink, appearing to read "Janel Ellingson". The signature is fluid and cursive, with the first name "Janel" written in a larger, more prominent script than the last name "Ellingson".

Janel Ellingson
Temporary Superintendent
Aberdeen Water Works

attachment (1): Pumping Records 2002 -2004

pc: Mayor Levsen
Commissioner Forkel
Robin Bobzien

CITY OF ABERDEEN
WATER WORKS
3-YEAR PUMPING RECORDS

TOTAL EFFLUENT

	MG 2004	MG 2003	MG 2002
December	74.38	75.15	62.59
November	74.52	71.21	64.12
October	87.53	80.18	69.78
September	110.30	122.45	115.70
August	137.45	170.81	111.59
July	123.50	143.99	165.13
June	99.34	95.86	164.69
May	101.14	79.45	101.69
April	86.53	61.33	72.77
March	71.94	61.33	69.92
February	69.62	54.16	59.75
January	73.85	60.07	67.77
Year Total	1110.10	1076.00	1125.49
Daily Avg	3.04	2.95	3.08

MAX DIALY TOTAL

	MGD 2004	MGD 2003	MGD 2002
December	2.67	2.58	2.74
November	3.02	3.06	3.31
October	4.53	4.00	2.60
September	4.96	5.93	5.49
August	5.53	6.42	5.29
July	5.33	5.77	7.49
June	4.63	4.63	7.69
May	5.04	4.01	5.65
April	4.61	2.10	3.10
March	2.60	2.10	2.53
February	3.08	2.06	2.64
January	3.01	2.08	2.77
Max Avg	4.08	3.73	4.28

Prepared 1/13/05 by

Janel Ellingson

Janel Ellingson, Temporary Superintendent

4570 AF

4178 AF

4794 AF

AFFIDAVIT OF PUBLICATION

STATE OF SOUTH DAKOTA}

§

COUNTY OF BROWN}

Mary Bastin being duly sworn, on his/her oath says: That the AMERICAN NEWS is a daily newspaper of general circulation, printed and published in Aberdeen, Brown County, South Dakota, by the Aberdeen News Company, a corporation, and has been such a newspaper during the times hereinafter mentioned; That affiant is an employee and principal clerk of said publisher and has personal knowledge of all facts stated in this affidavit; That the advertisement headed:

Legal Notice A 1176295

a printed copy of which is hereunto attached, was printed and published in the regular and entire issue of said newspaper, and not in a supplement thereof, once each

Week for 2 successive weeks.
The first publication being made on the 27 day of Jan, 2005.
The second publication being made on the 4 day of Feb, 2005.
The third publication being made on the _____ day of _____, 2005.
The fourth publication being made on the _____ day of _____, 2005.
The fifth publication being made on the _____ day of _____, 2005.
The sixth publication being made on the _____ day of _____, 2005;

That said newspaper is a legal newspaper published five days or more each week; with a bona fide circulation of more than two hundred copies daily; published in the English language within the said county of Brown for more than one year prior to the first publication of said notice; and printed in whole in an office maintained at the place of publication of said newspaper; That the whole amount of the fee paid for the publication of the annexed notice is \$ 73.98, which insures solely to the benefit of said publisher; That no agreement or understanding for a division thereof had been made with any other person; and That no part thereof has been agreed to be paid to any person whomsoever.

Mary Bastin
Subscribed and sworn to before me this 4 day of Feb, 2005.

Daily Circulation 18,000

Don Salfer Notary Public, Brown County, SD.

My commission expires March 20, 2007

written request of the permit owner or any person who has filed a petition to oppose or support continuance of the Future Use Permits. The request for a delay must be filed with the Chief Engineer by February 18, 2005.
Steven M. Primer,
Secretary,
Department of Environment and Natural Resources.

74:02:01:25.03 and contested case procedures contained in SDCL 1-26.
These hearings may be an adversarial proceeding. The permit owner or any person, after filing a petition, has the right to be present or to be represented by a lawyer. These and other due process rights will be forfeited if they are not exercised. Decisions of the Board may be appealed to the Circuit Court and State Supreme Court as provided by law.
Any person wishing a copy of the Chief Engineer's recommendations, further information on the permits, to assure access to the hearing by the handicapped or obtain an interpreter for the hearing impaired may contact Eric Gronlund, Water Rights Program, (605 773-3352) by February 18, 2005. The time of the hearing will be automatically delayed for at least 20 days upon written request of the permit owner and the Chief Engineer by February 18, 2005. The Chief Engineer's address is "Water Rights Program", Joe Foss Building, 523 E Capitol Ave, Pierre SD 57501 (605 773-3352) and the permit holders mailing address is given above. The petition may be informal, but it must include a statement describing the petitioner's interest in the future use permits, the reasons for petitioner's opposition to or support of continuing the future use permits, and the signature and mailing address of the petitioner or his legal counsel if legal counsel is obtained. The permit owner need not file a petition.
The hearing to review Future Use Permit Nos. 192-3 and 3427A-3 will be conducted pursuant to the provisions of SDCL 46-1-14, 46-2-5, 46-2-9, 46-2-11, 46-5-38.1; Board Rules ARSD 11, 46-5-38.1; Board Rules ARSD 74:02:01:25.01 thru 74:02:01:25.03 and contested case procedures contained in SDCL 1-26.
The Chief Engineer will conduct the hearing to review Future Use Permit Nos. 192-3 and 3427A-3 at 10:00 am, March 2, 2005, Floyd Matthew Training Center, Joe Foss Bldg, 523 E Capitol, Pierre SD.
The recommendations of the Chief Engineer is not final or binding upon the Board and the Board is authorized to 1) allow the permits to remain in effect, 2) amend the permits by adding qualifications, 3) cancel the permits for no development or no planned future development, or 4) take no action after it reaches a conclusion based upon facts presented at the public hearing. Any interested person who may be affected by a Board decision and who intends to participate in the hearing before the Board and present evidence or cross-examine witnesses according to SDCL 1-26, must file a written petition with BOTH the permit

alluvium along the Elm River located between Section 19-1125N-R63W and Section 15-1124N-R63W for municipal use. Permit No. 3427A-3 was approved in 1974 and currently reserves 1,824 acre-feet from the Elm Aquifer located in the S 1/2 Section 4; S 1/2 and NW 1/4 Section 5; N 1/2 Section 6; Section 8; E 1/2 Section 9; W 1/2 Section 15 and NE 1/4 Section 16; all in T124N-R63W for municipal use. Pursuant to SDCL 46-2A-2 the Chief Engineer of the Water Rights Program recommends that PERMIT NOS. 192-3 and 3427A-3 REMAIN IN EFFECT for 3,823 acre-feet annually and 1,824 acre-feet annually because 1) the reserved water may be developed, 2) there is need for the reserved water, 3) the proposed use will be a beneficial use and 4) it is in the public interest. The Water Management Board reserves 3,823 acre-feet from

(No. 1176295)
(Jan. 27, Feb. 4, 2005 - 2T)
NOTICE OF HEARING TO REVIEW FUTURE USE WATER PERMIT NOS. 192-3 and 3427A-3
Notice is given that the Water Management Board will review Future Use Permit Nos. 192-3 and 3427A-3 held by the City of Aberdeen, 123 S Lincoln, Aberdeen SD 57401 for progress made in the development of the water reserved by the Permits and future plans for development of the water reserved by Permit Nos. 192-3 and 3427A-3.
Permit No. 192-3 was approved in 1956 and currently reserves 3,823 acre-feet from

SEAL



**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182
www.state.sd.us/denr

**RECOMMENDATION OF CHIEF ENGINEER FOR FUTURE USE WATER PERMIT
NO. 3427A-3, City of Aberdeen SD.**

Pursuant to SDCL 46-2A-2, the following is the recommendation of the Chief Engineer, Water Rights Program, Department of Environment and Natural Resources concerning Future Use Water Permit No. 3227A-3, City of Aberdeen, 123 S Lincoln, Aberdeen SD.

The Chief Engineer is recommending that Future Use Permit No. 3427A-3 REMAIN in EFFECT for 1,824 acre-feet annually because 1) there is reasonable probability that there may be development of the water reserved under Permit No. 3427A-3, 2) the city has demonstrated a reasonable need for the water reserved by Permit No. 3427A-3, 3) the proposed use will be a beneficial use and 4) it is in the public interest.

Maintaining the effectiveness of Future Use Permit No. 3427A-3 is subject to payment of the \$57.50 fee pursuant to SDCL 46-2-13(2) within 60 days of notice to the city after the Board hearing.

Garland Erbele, Chief Engineer
January 18, 2005



DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182
www.state.sd.us/denr

January 19, 2005

NOTE: TO BE SURE OF PUBLICATION ON
THE CORRECT DATES, CONTACT
THE NEWSPAPER RIGHT AWAY.

Robin Bobzien, City Engineer
City of Aberdeen
123 S Lincoln
Aberdeen SD 57401

Dear Mr. Bobzien:

Future Use Permit Nos. 192-3 and 3427A-3 will be reviewed for progress in the development and future plans for use of the water reserved. Water rights law requires publication of a notice in the county where water will be diverted or used. The notice of this review has been sent to the Publisher of the American News (Phone #605 225-4100). For your information, a copy of the recommendations of the Chief Engineer are enclosed. Please review this notice prior to publication and notify this office, if you have any corrections or questions.

BE SURE TO CONTACT THE ABOVE NEWSPAPER IMMEDIATELY TO AUTHORIZE PUBLICATION OF THE NOTICE OF HEARING AND TO ARRANGE FOR PAYMENT. Early contact with the paper can eliminate delays. The publisher has been instructed to publish the notice once each week for two consecutive weeks with the last publication to occur at least twenty days before the board meeting. We must receive Proof of Publication before the future use review can be considered by the Water Management Board.

Sincerely,

Eric Gronlund
Natural Resources Engineer
605 773-3352

enclosures

cc: Janel Ellingson, Temporary Superintendent



DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182
www.state.sd.us/denr

January 19, 2005

American News
PO Box 4430
Aberdeen SD 57402-4100

Dear Sir:

Enclosed is a Notice of Hearing to Review Future Use Water Permit Nos. 192-3 and 3427A-3 to be published twice. Please publish the first notice on January 27, 2005 with the second publication 7 days later. The text of the notice can be e-mailed to your paper by contacting Karen Schlaak at 605 773-3352.

The applicant must verify to you that the notice is to be published, before you make the first publication. **Please BILL the APPLICANT for the cost of publication.** The APPLICANT is the City of Aberdeen, Robin Bobzien, City Engineer, 123 S Lincoln, Aberdeen SD 57401.

Please send the Water Rights Program the first publication immediately. The publication is checked for accuracy so any corrections can be made in the second publication. You may use the form below or fax a copy of the first publication. Any fax should be sent to the attention of Karen Schlaak at 605 773-4068. Publication errors can invalidate the public notice.

After the second publication, **please send us an affidavit or use the enclosed Proof of Publication form.** The applicant pays the cost of publication, but the Water Rights Program records require an affidavit or Proof of Publication. Delays in receiving the affidavit can be costly to the applicant.

Sincerely,


Eric Gronlund
Natural Resources Engineer
605 773-3352

enclosures

-----CUT HERE-----

Date _____

TO: Water Rights Program
Joe Foss Building
523 E Capitol
Pierre SD 57501-3181

We are in receipt of your letter of January 19, 2005 enclosing Notice of Hearing to Review Future Use Water Permit Nos. 192-3 and 3427A-3 which was first published in our issue of _____.
ENCLOSED IS A COPY OF THIS FIRST PUBLICATION.

Name

Newspaper

NOTICE OF HEARING TO REVIEW FUTURE USE WATER PERMIT NOS. 192-3 and 3427A-3

Notice is given that the Water Management Board will review Future Use Permit Nos. 192-3 and 3427A-3 held by the City of Aberdeen, 123 S Lincoln, Aberdeen SD 57401 for progress made in the development of the water reserved by the Permits and future plans for development of the water reserved by Permit Nos. 192-3 and 3427A-3.

Permit No. 192-3 was approved in 1956 and currently reserves 3,823 acre-feet from alluvium along the Elm River located between Section 19-T125N-R63W and Section 15-T124N-R63W for municipal use.

Permit No. 3427A-3 was approved in 1974 and currently reserves 1,824 acre-feet from the Elm Aquifer located in the S $\frac{1}{2}$ Section 4; S $\frac{1}{2}$ and NW $\frac{1}{4}$ Section 5; N $\frac{1}{2}$ Section 6; Section 8; E $\frac{1}{2}$ Section 9; W $\frac{1}{2}$ Section 15 and NE $\frac{1}{4}$ Section 16; all in T124N-R63W for municipal use.

Pursuant to SDCL 46-2A-2 the Chief Engineer of the Water Rights Program recommends that Permit Nos. 192-3 and 3427A-3 REMAIN in EFFECT for 3,823 acre-feet annually and 1,824 acre-feet annually because 1) the reserved water may be developed, 2) there is need for the reserved water 3) the proposed use will be a beneficial use and 4) it is in the public interest.

The Water Management Board will conduct the hearing to review Future Use Permit Nos. 192-3 and 3427A-3 at 10:00 am, March 2, 2005, Floyd Mathew Training Center, Joe Foss Bldg, 523 E Capitol, Pierre SD.

The recommendations of the Chief Engineer is not final or binding upon the Board and the Board is authorized to 1) allow the permits to remain in effect, 2) amend the permits by adding qualifications, 3) cancel the permits for no development or no planned future development, or 4) take no action after it reaches a conclusion based upon facts presented at the public hearing. Any interested person who may be affected by a Board decision and who intends to participate in the hearing before the Board and present evidence or cross-examine witnesses according to SDCL 1-26, must file a written petition with BOTH the permit owner and the Chief Engineer by February 18, 2005. The Chief Engineer's address is "Water Rights Program", Joe Foss Building, 523 E Capitol Ave, Pierre SD 57501 (605 773-3352) and the permit holders mailing address is given above. The petition may be informal, but it must include a statement describing the petitioners interest in the future use permits, the reasons for petitioner's opposition to or support of continuing the future use permits, and the signature and mailing address of the petitioner or his legal counsel if legal counsel is obtained. The permit owner need not file a petition.

The hearing to review Future Use Permit Nos. 192-3 and 3427A-3 will be conducted pursuant to the provisions of SDCL 46-1-14, 46-2-5, 46-2-9, 46-2-11, 46-5-38.1; Board Rules ARSD 74:02:01:25.01 thru 74:02:01:25.03 and contested case procedures contained in SDCL 1-26.

These hearings may be an adversarial proceeding. The permit owner or any person, after filing a petition, has the right to be present or to be represented by a lawyer. These and other due process rights will be forfeited if they are not exercised. Decisions of the Board may be appealed to the Circuit Court and State Supreme Court as provided by law.

Any person wishing a copy of the Chief Engineer's recommendations, further information on the permits, to assure access to the hearing by the handicapped or obtain an interpreter for the hearing impaired may contact Eric Gronlund, Water Rights Program, (605 773-3352) by February 18, 2005. The time of the hearing will be automatically delayed for at least 20 days upon written request of the permit owner or any person who has filed a petition to oppose or support continuance of the Future Use Permits. The request for a delay must be filed with the Chief Engineer by February 18, 2005. Steven M. Pirner, Secretary, Department of Environment and Natural Resources.



DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182
www.state.sd.us/denr

March 3, 2005

NOTICE

Robin Bobzien, City Engineer
City of Aberdeen
123 S Lincoln
Aberdeen SD 57401

Dear Mr. Bobzien:

I am writing in response to action taken by the Water Management Board at the hearing on March 2, 2005 to review Future Use Permit Nos. 192-3 and 3427A-3. The Board allowed the permits to remain in effect for 1,824 and 3,823 acre-feet of water annually. Future Use Permit Nos. 192-3 and 3427A-3 are subject to another review in seven years.

The fee for maintaining the effectiveness of Future Use Permit No. 192-3 is \$97.50 and for Future Use Permit No. 3427A-3 is \$57.50 pursuant to SDCL 46-2-13(2). Please remit a total fee of \$155.00 within 60 days.

Please contact Eric Gronlund, staff engineer, if you have any questions.

Sincerely,

Garland Erbele, Chief Engineer
Water Rights Program
605 773-3352

CERTIFICATION

I hereby certify that on March 3, 2005, I have personally deposited with the United States mail at Pierre, South Dakota, first class postage, prepaid envelopes containing a Notice dated March 3, 2005 regarding Notice of Review Future Use Permit Nos. 4927-3, 1780-2, 192-3 & 3427A-3, 135-3 & 5003-3, 217-3 & 1598-3, 448-3 & 2042-3, 524-3, 549-3, 1218-3 & 2107-3 addressed as stated below:

1218-3 & 2107-3
Jeff DeVille Water Superintendent
Watertown Municipal Utilities Dept
901 4th Ave SW
Watertown SD 57201

549-3
Denise Peschong Finance Officer
City of Milbank
401 S Main St
Milbank SD 57252

524-3
Gary Wolkow Mayor
City of DeSmet
PO Drawer 70
DeSmet SD 57231-0070

448-3 & 2042-3
Randy Janssen Water Superintendent
City of Sioux Falls
224 W 9th St
Sioux Falls SD 57104-6407

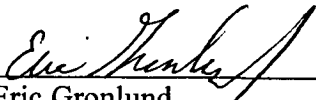
217-3 & 1598-3
Craig Osvog
Brookings Municipal Utilites
PO Box 588
Brookings SD 57006

135-3 & 5003-3
Bradley E Palmer
City of Pierre
PO Box 1253
Pierre SD 57501

192-3 & 3427A-3
Robin Bobzien City Engineer
City of Aberdeen
123 S Lincoln
Aberdeen SD 57401

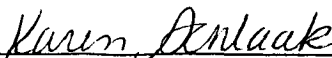
1780-2
Greg A Hall, Public Works Director
City of New Underwood
PO Box 278
New Underwood SD 57761-0278

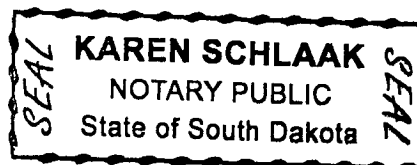
4927-3
Duane C Stokes Mgr
Clark Rural Water System
PO Box 162
Clark SD 57225


Eric Gronlund
Natural Resource Engineer
Water Rights

STATE OF SOUTH DAKOTA)
) SS
COUNTY OF HUGHES)

Sworn to, before me, this 3rd day of March, 2004.


Karen Schlaak
Notary Public
My Commission expires April 1, 2007



RECEIPT

WATER RIGHTS PROGRAM

South Dakota Department of Environment and Natural Resources

Date March 16, 2005

RECEIVED OF City of Aberdeen, 123 S Lincoln St., Aberdeen SD 57401

The following amount in fees for services rendered as provided for by law:

Fee for Application for Permit No. _____ and to put water to beneficial use	_____ to Appropriate Water, to construct	57	50
Fee for Application for Permit No. _____	_____ to Appropriate Water for Future use		
Fee to retain Future Use Permit No. <u>3427A-3</u>	_____ after period of seven years.		
Fee for Inspecting Constructed Works, confirming beneficial use and issuing Water License No. _____			
Fee for Filing Transfer Form _____			
Fee for _____			
Fee for Issuing New Well Driller's License No. _____	_____ for C.Y. _____		
Fee for Renewal of Well Driller's License No. _____	_____ for C.Y. _____		
Fee for Issuing Well Pump Installer's License No. _____	_____ for C.Y. _____		
Fee for Renewal of Well Pump Installer's License No. _____	_____ for C.Y. _____		
(Any Other Work Provided by Law)	TOTAL	57.590	

No.

001831

By Darland Ebluke
Chief Engineer gm



3427A-3
**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

PMB 2020
JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182
www.state.sd.us/denr

December 8, 2011

City of Aberdeen
Robin Bobzien, Public Works Director
123 S Lincoln St.
Aberdeen SD 57401

Dear Mr. Bobzien:

I am writing in regard to the seven year review of Future Use Water Permit No. 192-3 from groundwater from alluvium along the Elm River and Permit No. 3427A-3 from groundwater (Elm:North Brown Aquifer) which are held by the City of Aberdeen. By law, all future use permits are to be reviewed by the Water Management Board every seven years to determine whether a reasonable need exists for the reserved water. The permit reserves water for future water supply needs for the city.

Currently, our records show that 3,823 acre-feet remain in reserve under Permit No. 192-3 and 1,824 acre-feet remain in reserve under Permit No. 3427A-3. Both future use permits were last reviewed in 2005.

Please respond in writing by January 1, 2012, regarding the city's intention for the future use permit. If the city plans to retain the permits, then the response should outline a reasonable need for retaining the future use permits, including an estimate of future needs.

The future use permits will then be public noticed at the city's expense and scheduled for review before the Water Management Board pursuant to SDCL 46-5-38.1. Notice will be given of the hearing time and place at a future date. The purpose of this review is to determine if a reasonable need exists for retaining the permits. A fee will be charged if the Board allows the permits to remain in effect after the hearing. The fee to be assessed will be dependent upon the amount of water allowed to remain in reserve. If the entire acre-feet amounts remain in reserve on each permit, the total fee will be \$590.00.

Please contact Eric Gronlund, if you have any questions.

Sincerely,

Karen Schlaak

Karen Schlaak
Environmental Scientist
Water Rights Program
605 773-3352
karen.schlaak@state.sd.us



CITY OF ABERDEEN

12668 391 Ave.
Aberdeen, SD 57401-4215

WATER TREATMENT

(605) 626-7010

December 20, 2011

Karen Schlaak
SDDENR Water Rights Program
523 East Capitol
Pierre, SD 57501-3181

RECEIVED

DEC 22 2011

**WATER RIGHTS
PROGRAM**

RE: Future Use Permit 192-3 & Permit 3427A-3

Dear Ms. Schlaak:

Thank you for the reminder of the upcoming review of our groundwater Future Use Water Permits. As with all water providers, the City of Aberdeen attempts to anticipate the needs of the community. Due to the ever-changing weather patterns that affect our surface water supply, changes to EPA regulations and the possibility of contamination the City of Aberdeen request to retain permits 192-3 and 3427A-3.

Justification for the continuation of these permits is maximum water treatment plant production, expected future growth of the community, stringent EPA regulations of surface water and the risk of contamination.

Water License No. 6546-3 allows for a daily total of 2.25 MGD or about three quarters of the average water used daily by the citizens of Aberdeen. If the quantity or quality of the water available from our main source, the Elm River, should change we will require additional ground water to meet the current minimum daily demand.

The 2006 process up-grade provided enhanced treatment and should see us well into the future; however, new regulatory mandates based on untreated water could cause source changes. Water held in reserve through the Future Use Permits will insure the availability of a safe and secure water supply for the citizens of Aberdeen.

Our treatment facility capability is 12 MGD with room for expansion up to 18 MGD. Our current operation uses groundwater for $\frac{1}{4}$ - $\frac{1}{3}$ of our total daily flow. A flow of 4 - 6 MGD from wells would be required to maintain that blend resulting in an additional 1.75 or 3.75 MGD to be converted to beneficial use. If we make no adjustments to our blend formula the conversion of 3.75 MGD from future use to beneficial use would be required resulting in a minimum of 1.293 MGD or 1448 acre-feet in Future Use in reserve.

It is the City of Aberdeen's respectful request that the Water Management Board of the State of South Dakota extend Future Use Permits 192-3 and 3427A-3. The water reserved by these permits provides a vital component in providing the Aberdeen community a continuous and constant quality water.

Sincerely,

Janel Ellingson
Superintendent
Aberdeen Water Works

attachment (1): Pumping Records 2005 -2010

pc: City Manager Lynn Lander
Robin Bobzien

CITY OF ABERDEEN
WATER WORKS

7-YEAR PUMPING RECORDS
TOTAL EFFLUENT

	MG 2010	MG 2009	MG 2008	MG 2007	MG 2006	MG 2005	MG 2004
December	61	61	59	61	55	79	74
November	61	62	62	60	62	78	75
October	80	67	67	78	82	94	88
September	91	91	94	107	108	125	110
August	153	124	124	144	168	153	137
July	123	122	165	177	206	160	124
June	86	104	116	94	158	103	99
May	78	101	65	83	110	102	101
April	73	61	97	69	84	85	87
March	68	64	64	69	77	73	72
February	62	58	64	58	70	67	70
January	72	61	65	66	73	77	74
Year Total	1007	977	1042	1065	1255	1196	1110
Daily Avg	2.76	2.68	2.85	2.92	3.44	3.28	3.04

MAX DIALY TOTAL

Highest
2nd highest

	MGD 2010	MGD 2009	MGD 2008	MGD 2007	MGD 2006	MGD 2005	MGD 2004
December	2.70	2.63	2.35	2.19	2.75	3.26	2.67
November	2.71	2.72	2.57	2.00	2.71	4.93	3.02
October	3.00	2.68	3.02	3.41	3.65	4.29	4.53
September	5.02	4.84	4.19	4.70	4.84	5.86	4.96
August	5.91	4.95	5.23	5.85	7.39	6.62	5.53
July	5.31	5.35	7.15	5.67	7.43	7.23	5.33
June	3.69	5.19	5.24	4.40	6.60	5.35	4.63
May	3.36	4.95	3.55	2.93	5.61	5.29	5.04
April	4.00	2.45	2.26	2.50	4.29	4.71	4.61
March	3.06	3.11	2.38	2.99	2.82	2.90	2.60
February	3.56	2.32	2.39	2.01	2.76	2.72	3.08
January	3.92	2.37	3.33	2.20	3.10	3.29	3.01
Max Avg	3.85	3.63	3.64	3.40	4.50	4.70	4.08



**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

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**RECOMMENDATION OF CHIEF ENGINEER FOR FUTURE USE WATER PERMIT
NO. 3427A-3, City of Aberdeen**

Pursuant to SDCL 46-2A-2, the following is the recommendation of the Chief Engineer, Water Rights Program, Department of Environment and Natural Resources concerning Future Use Water Permit No. 3427A-3, City of Aberdeen, 123 S Lincoln, Aberdeen SD 57401.

The Chief Engineer is recommending that Future Use Permit No. 3427A-3 REMAIN in EFFECT for 1,824 acre-feet annually because 1) there is reasonable probability that there may be development of the water reserved under Permit No. 3427A-3, 2) the city has demonstrated a reasonable need for the water reserved by Permit No. 3427A-3, 3) the proposed use will be a beneficial use and 4) it is in the public interest.

Maintaining the effectiveness of Future Use Permit No. 3427A-3 is subject to payment of the \$215.00 fee pursuant to SDCL 46-2-13(2) within 60 days of notice to the city after the Board hearing.

Garland Erbele, Chief Engineer
January 20, 2012



**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

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**RECOMMENDATION OF CHIEF ENGINEER FOR FUTURE USE WATER PERMIT
NO. 192-3, City of Aberdeen**

Pursuant to SDCL 46-2A-2, the following is the recommendation of the Chief Engineer, Water Rights Program, Department of Environment and Natural Resources concerning Future Use Water Permit No. 192-3, City of Aberdeen, 123 S Lincoln, Aberdeen SD 57401.

The Chief Engineer is recommending that Future Use Permit No. 192-3 REMAIN in EFFECT for 3,823 acre-feet annually because 1) there is reasonable probability that there may be development of the water reserved under Permit No. 192-3, 2) the city has demonstrated a reasonable need for the water reserved by Permit No. 192-3, 3) the proposed use will be a beneficial use and 4) it is in the public interest.

Maintaining the effectiveness of Future Use Permit No. 192-3 is subject to payment of the \$375.00 fee pursuant to SDCL 46-2-13(2) within 60 days of notice to the city after the Board hearing.

Garland Erbele, Chief Engineer
January 20, 2012



**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

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January 20, 2012

NOTE: TO BE SURE OF PUBLICATION ON
THE CORRECT DATES, CONTACT
THE NEWSPAPER RIGHT AWAY.

City of Aberdeen
Janel Ellingson, Supt, Aberdeen Water Works
123 S Lincoln
Aberdeen SD 57401

Dear Ms. Ellingson:

Future Use Permit Nos. 192-3 and 3427A-3 will be reviewed for progress in the development and future plans for use of the water reserved. Water rights law requires publication of a notice in the county where water will be diverted or used. The notice of this review has been sent to the Publisher of the American News (Phone #605 225-4100). For your information, a copy of the Chief Engineer's recommendations are enclosed. Please review this notice prior to publication and notify this office, if you have any corrections or questions.

BE SURE TO CONTACT THE ABOVE NEWSPAPER IMMEDIATELY TO AUTHORIZE PUBLICATION OF THE NOTICE OF HEARING AND TO ARRANGE FOR PAYMENT. Early contact with the paper can eliminate delays. The publisher has been instructed to publish the notice once each week for two consecutive weeks with the last publication to occur at least twenty days before the board meeting. We must receive Proof of Publication before the future use review can be considered by the Water Management Board.

Sincerely,

Eric Gronlund
Natural Resources Engineer
605 773-3352

enclosures



DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES

PMB 2020
JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182
denr.sd.gov

January 20, 2012

American News
PO Box 4430
Aberdeen SD 57401

Dear Sir:

Enclosed is a Notice of Hearing to Review Future Use Water Permit Nos. 192-3 and 3427A-3 to be published twice. Please publish the first notice on February 1, 2012 with the second publication 7 days later. The text of the notice can be e-mailed to your paper by contacting Karen Schlaak at 605 773-3352 or email karen.schlaak@state.sd.us

The applicant must verify to you that the notice is to be published, before you make the first publication. **Please BILL the APPLICANT for the cost of publication.** The APPLICANT is the City of Aberdeen, Janel Ellingson, Supt. Aberdeen Water Works, 123 S Lincoln, Aberdeen SD 57401.

Please send the Water Rights Program the first publication immediately. The publication is checked for accuracy so any corrections can be made in the second publication. You may use the form below or fax a copy of the first publication. Any fax should be sent to the attention of Karen Schlaak at 605 773-4068. Publication errors can invalidate the public notice.

After the second publication, **please send us an affidavit or use the enclosed Proof of Publication form.** The applicant pays the cost of publication, but the Water Rights Program records require an affidavit or Proof of Publication. Delays in receiving the affidavit can be costly to the applicant.

Sincerely,


Eric Gronlund
Natural Resources Engineer
605 773-3352

enclosures

-----CUT HERE-----

Date _____

TO: Water Rights Program
Joe Foss Building
523 E Capitol
Pierre SD 57501-3181

We are in receipt of your letter of January 20, 2012 enclosing Notice of Hearing to Review Future Use Water Permit Nos. 192-3 and 3427A-3 which was first published in our issue of _____.
ENCLOSED IS A COPY OF THIS FIRST PUBLICATION.

Name

Newspaper

Instruction to Newspaper-Publish first publication of the following Notice on February 1, 2012 with 2nd publication 7 days later. The permit owner is responsible for payment. The text of the notice can be e-mailed to your paper by contacting Karen Schlaak at (605) 773-3352 or email: Karen.schlaak@state.sd.us.

NOTICE OF HEARING TO REVIEW FUTURE USE WATER PERMIT NOS. 192-3 and 3427A-3

Notice is given that the Water Management Board will review Future Use Permit Nos. 192-3 and 3427A-3 held by the City of Aberdeen, c/o Janel Ellingson, Supt. Aberdeen Water Works, 123 S Lincoln St, Aberdeen SD 57401 for progress made in the development of the water reserved by the permits and future plans for development of the water reserved.

Permit No. 192-3 was approved in 1956 and currently reserves 3,823 acre-feet from alluvium along the Elm River located between Section 19-T125N-R63W and Section 15-T124N-R63W for municipal use.

Permit No. 3427A-3 was approved in 1974 and currently reserves 1,824 acre-feet from the Elm Aquifer located in the S $\frac{1}{2}$ Section 4; S $\frac{1}{2}$ and NW $\frac{1}{4}$ Section 5; N $\frac{1}{2}$ Section 6; Section 8; E $\frac{1}{2}$ Section 9; W $\frac{1}{2}$ Section 15 and NE $\frac{1}{4}$ Section 16; all in T124N-R63W for municipal use.

Pursuant to SDCL 46-2A-2 the Chief Engineer of the Water Rights Program recommends that Permit No. 192-3 REMAIN in EFFECT for 3,823 acre-feet annually and Permit No. 3427A-3 REMAIN in EFFECT for 1,824 acre-feet annually because 1) the reserved water may be developed, 2) there is need for the reserved water 3) the proposed use will be a beneficial use and 4) it is in the public interest.

The Water Management Board will conduct the hearing to review Future Use Permit Nos. 192-3 and 3427A-3 at 10:00 am on March 7, 2012 at the Floyd Mathew Training Center, Joe Foss Bldg, 523 E Capitol, Pierre SD.

The recommendations of the Chief Engineer is not final or binding upon the Board and the Board is authorized to 1) allow the permits to remain in effect, 2) amend the permits by adding qualifications, 3) cancel the permits for no development or no planned future development, or 4) take no action after it reaches a conclusion based upon facts presented at the public hearing. Any interested person who may be affected by a Board decision and who intends to participate in the hearing before the Board and present evidence or cross-examine witnesses according to SDCL 1-26, must file a written petition with BOTH the permit owner and the Chief Engineer by February 27, 2012. The Chief Engineer's address is "Water Rights Program", Joe Foss Building, 523 E Capitol Ave, Pierre SD 57501 (605 773-3352) and the permit holders mailing address is given above. The petition may be informal, but it must include a statement describing the petitioners interest in the future use permits, the reasons for petitioner's opposition to or support of continuing the future use permist, and the signature and mailing address of the petitioner or his legal counsel if legal counsel is obtained. The permit owner need not file a petition.

The hearing to review Future Use Permit Nos. 192-3 and 3427A-3 will be conducted pursuant to the provisions of SDCL 46-1-14, 46-2-5, 46-2-9, 46-2-11, 46-5-38.1; Board Rules ARSD 74:02:01:25.01 thru 74:02:01:25.03 and contested case procedures contained in SDCL 1-26.

This hearing may be an adversarial proceeding. The permit owner or any person, after filing a petition, has the right to be present or to be represented by a lawyer. These and other due process rights will be forfeited if they are not exercised. Decisions of the Board may be appealed to the Circuit Court and State Supreme Court as provided by law.

Any person wishing a copy of the Chief Engineer's recommendations, further information on these permits, to assure access to the hearing by the handicapped or obtain an interpreter for the hearing impaired may contact Eric Gronlund, Water Rights Program, (605 773-3352) by February 27, 2012. The time of the hearing will be automatically delayed for at least 20 days upon written request of the permit owner or any person who has filed a petition to oppose or support continuance of the Future Use Permits. The request for a delay must be filed with the Chief Engineer by February 27, 2012. Steven M. Pirner, Secretary, Department of Environment and Natural Resources.

Published twice at the total approximate cost of_____.

AFFIDAVIT OF PUBLICATION

STATE OF SOUTH DAKOTA)

§

COUNTY OF BROWN)

M. J. Bass being duly sworn, on his/her oath says: That the AMERICAN NEWS is a daily newspaper of general circulation, printed and published in Aberdeen, Brown County, South Dakota, by the Aberdeen News Company, a corporation, and has been such a newspaper during the times hereinafter mentioned; That affiant is an employee and principal clerk of said publisher and has personal knowledge of all facts stated in this affidavit; That the advertisement headed:

Sept 14/30 8107

a printed copy of which is hereunto attached, was printed and published in the regular and entire issue of said newspaper, and not in a supplement thereof, once each week for 2 successive weeks.

The first publication being made on the 1 day of Feb, 2012

The second publication being made on the 8 day of Feb, 2012

The third publication being made on the _____ day of _____, 2012

The fourth publication being made on the _____ day of _____, 2012

The fifth publication being made on the _____ day of _____, 2012

The sixth publication being made on the _____ day of _____, 2012

That said newspaper is a legal newspaper published five days or more each week; with a bona fide circulation of more than two hundred copies daily; published in the English language within the said county of Brown for more than one year prior to the first publication of said notice; and printed in whole in an office maintained at the place of publication of said newspaper; That the whole amount of the fee paid for the publication of the annexed notice is \$ 139.44, which insures solely to the benefit of said publisher; That no agreement or understanding for a division thereof had been made with any other person; and That no part thereof has been agreed to be paid to any person whomsoever.

M. J. Bass
Subscribed and sworn to before me this 8 day of Feb, 2012

Daily Circulation 14000

Eric Gronlund

Notary Public, Brown County, S

My commission expires March 20, 2013

(No. 1308107)
(Feb. 1, 8, 2012 - 2T)

NOTICE OF HEARING TO REVIEW FUTURE USE WATER PERMIT NOS. 192-3 and 3427A-3

Notice is given that the Water Management Board will review Future Use Permit Nos. 192-3 and 3427A-3 held by the City of Aberdeen, c/o Janel Ellingson, Supt. Aberdeen Water Works, 123 S Lincoln St. Aberdeen SD 57401 for progress made in the development of the water reserved by the permits and future plans for development of the water reserved.

Permit No. 192-3 was approved in 1956 and currently reserves 3,823 acre-feet from alluvium along the Elm River located between Section 19-T125N-R63W and Section 15-T124N-R63W for municipal use.

Permit No. 3427A-3 was approved in 1974 and currently reserves 1,824 acre-feet from the Elm Aquifer located in the S 1/2 Section 4; S 1/2 and NW 1/4 Section 5; N 1/2 Section 6; Section 8; E 1/2 Section 9; W 1/2 Section 15 and NE 1/4 Section 16; all in T124N-R63W for municipal use.

Pursuant to SDCL 46-2A-2 the Chief Engineer of the Water Rights Program recommends that Permit No. 192-3 REMAIN IN EFFECT for 3,823 acre-feet annually and Permit No. 3427A-3 REMAIN IN EFFECT for 1,824 acre-feet annually because 1) the reserved water may be developed, 2) there is need for the reserved water 3) the proposed use will be a beneficial use and, 4) it is in the public interest.

The Water Management Board will conduct the hearing to review Future Use Permit Nos. 192-3 and 3427A-3 at 10:00 am on March 7, 2012 at the Floyd Mathew Training Center, Joe Foss Bldg, 523 E Capitol, Pierre SD.

The recommendations of the Chief Engineer is not final or binding upon the Board, and the Board is authorized to 1) allow the permits to remain in effect, 2) amend the permits by adding qualifications, 3) cancel the permits for no development or no planned future development, or 4) take no action after it reaches a conclusion based upon facts presented at the public hearing. Any interested person who may be affected by a Board decision and who intends to participate in the hearing before the Board and present evidence or cross-examine witnesses according to SDCL 1-26, must file a written petition, with BOTH the permit owner and the Chief Engineer by February 27, 2012. The Chief Engineer's address is "Water Rights Program", Joe Foss Building, 523 E Capitol Ave, Pierre SD 57501 (605 773-3352) and the permit holders mailing address is given above. The petition may be informal, but it must include a statement describing the petitioner's interest in the future use permits, the reasons for petitioner's opposition to or support of continuing the future use permit, and the signature and mailing address of the petitioner or his legal counsel if legal counsel is obtained. The permit owner need not file a petition.

The hearing to review Future Use Permit Nos. 192-3 and 3427A-3 will be conducted pursuant to the provisions of SDCL 46-1-14, 46-2-5, 46-2-9, 46-2-11, 46-5-38.1; Board Rules ARSD 74:02:01:25.01 thru 74:02:01:25.03 and contested case procedures contained in SDCL 1-26.

This hearing may be an adversarial proceeding. The permit owner or any person, after filing a petition, has the right to be present or to be represented by a lawyer. These and other due process rights will be forfeited if they are not exercised. Decisions of the Board may be appealed to the Circuit Court and State Supreme Court as provided by law.

Any person wishing a copy of the Chief Engineer's recommendations, further information on these permits, to assure access to the hearing by the handicapped or obtain an interpreter for the hearing impaired may contact Eric Gronlund, Water Rights Program, (605 773-3352) by February 27, 2012. The time of the hearing will be automatically delayed for at least 20 days upon written request of the permit owner or any person who has filed a petition to oppose or support continuance of the Future Use Permits. The request for a delay must be filed with the Chief Engineer by February 27, 2012. Steven M. Pimer, Secretary, Department of Environment and Natural Resources, Published twice at the total approximate cost of \$139.44



**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

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denr.sd.gov

February 29, 2012

City of Aberdeen
Janel Ellingson, Supt, Aberdeen Water Works
123 S Lincoln
Aberdeen SD 57401

Dear Ms. Ellingson:

The City of Aberdeen holds Future Use Permit Nos. 192-3 and 3427A-3 reserving water for future development. These permits are scheduled for a seven year review before the Water Management Board as required by state law. The review has been public noticed for hearing before the Board at 10:00 AM on March 7, 2012. No petitions opposing the future use permits remaining in effect have been received.

This letter is to inform you that the Water Management Board will conduct its March 7, 2012 meeting by telephone conference call. The agenda for the March 7th meeting is attached.

Being this matter is not contested, DENR does not foresee questions or concerns that necessitate you traveling to Pierre on March 7th. There are a limited number of conference call lines available if you have testimony regarding the future use permit to provide to the Board. Please let me know if you want to participate and DENR will try to accommodate everyone up to the number of conference call lines available.

Please contact me if you have any questions.

Sincerely,

A handwritten signature in black ink, appearing to read "Eric Gronlund".

Eric Gronlund
Water Rights Program, DENR
605 773-3352
eric.gronlund@state.sd.us

enclosure



**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

PMB 2020
JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182
denr.sd.gov

March 8, 2012

NOTICE

City of Aberdeen
Janel Ellingson, Supt, Aberdeen Water Works
123 S Lincoln
Aberdeen SD 57401

Dear Ms. Ellingson:

I am writing in response to action taken by the Water Management Board at the hearing on March 7, 2012 to review Future Use Permit Nos. 192-3 and 3427A-3. The Board allowed the permits to remain in effect for 3,823 acre-feet and 1,824 acre-feet of water annually. Future Use Permit Nos. 192-3 and 3427A-3 are subject to another review in seven years.

The fee for maintaining the effectiveness of Future Use Permit No. 192-3 is \$375.00 and Permit No. 3427A-3 is \$215.00 pursuant to SDCL 46-2-13(2). Please remit the total fee of \$590.00 within 60 days.

Please contact Eric Gronlund, staff engineer, if you have any questions.

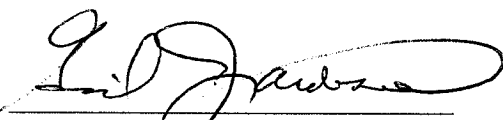
Sincerely,

Garland Erbele, Chief Engineer
Water Rights Program
605 773-3352

CERTIFICATION

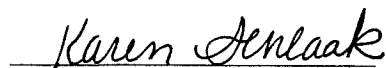
I hereby certify that on March 8, 2012, I have personally deposited with the United States mail at Pierre, South Dakota, first class postage, prepaid envelope(s) containing a Notice dated March 8, 2012 regarding Future Use Permits addressed as stated below:

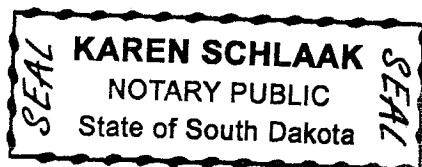
Clark Rural Water System, D Stokes, PO Box 162, Cark SD 57225
Watertown Municipal Utilities, J DeVille, 901 4th Ave SW, Watertown SD 57201
City of Milbank, J Kettwig, 1001 E 4th Ave # 301 Milbank SD 57252
City of Sioux Falls, G Anderson 2100 N Minnesota Ave, Sioux Falls SD 57104
Brookings Municipal Utilities, S Meyer, PO Box 588, Brookings SD 57006
City of Aberdeen, J Ellingson, 123 S Lincoln, Aberdeen SD 57401
City of New Underwood, J Bale, PO Box 278, New Underwood SD 57761
City of Pierre, Brad Palmer, PO Box 1253, Pierre SD 57501


Gail Jacobson
Secretary/Water Rights

STATE OF SOUTH DAKOTA)
) SS
COUNTY OF HUGHES)

Sworn to, before me, this 8th day of March, 20 12.


Karen Schlaak
Notary Public
My Commission expires April 1, 2013



RECEIPT

WATER RIGHTS PROGRAM

South Dakota Department of Environment and Natural Resources

Date 3/29, 2012

RECEIVED OF City of Aberdeen 123 E Lincoln St Aberdeen SD 57401

The following amount in fees for services rendered as provided for by law:

Fee for Application for Permit No. _____ to Appropriate Water, to construct and to put water to beneficial use	215	00
Fee for Application for Permit No. _____ to Appropriate Water for Future use		
Fee to retain Future Use Permit No. <u>3427A-3</u> after period of seven years.		
Fee for Inspecting Constructed Works, confirming beneficial use and issuing Water License No. _____		
Fee for Filing Transfer Form _____		
Fee for _____		
Fee for Issuing New Well Driller's License No. _____ for C.Y. _____		
Fee for Renewal of Well Driller's License No. _____ for C.Y. _____		
Fee for Issuing Well Pump Installer's License No. _____ for C.Y. _____		
Fee for Renewal of Well Pump Installer's License No. _____ for C.Y. _____		
(Any Other Work Provided by Law)	TOTAL	215 00

No. **05394**

By *David Erbeley*
Chief Engineer



DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE SOUTH DAKOTA 57501-3182
<http://denr.sd.gov>

November 7, 2018

City of Aberdeen
Robert Braun, Water Superintendent
123 S Lincoln St
Aberdeen SD 57401

Dear Mr. Braun:

I am writing in regard to the seven year review of Future Use Water Permit No. 192-3 from alluvium along the Elm River and Permit No. 3427A-3 from the Elm:North Brown Aquifer which are held by the City of Aberdeen. By law, all future use permits are to be reviewed by the Water Management Board every seven years to determine whether a reasonable need exists for the reserved water. The permits reserve water for future water supply needs for the city.

Currently, our records show that 3,823 acre-feet remain in reserve under Permit No. 192-3 and 1,824 acre-feet remain in reserve under Permit No. 3427A-3. Both future use permits were last reviewed in 2012.

Please respond in writing by January 15, 2019 regarding the city's intention for the future use permit. If the city plans to retain the permits, then the response should outline a reasonable need for retaining the future use permits, including an estimate of future needs.

The future use permits will then be public noticed at the city's expense and scheduled for review before the Water Management Board pursuant to SDCL 46-5-38.1. Notice will be given of the hearing time and place at a future date. The purpose of this review is to determine if a reasonable need exists for retaining the permits. A fee will be charged if the Board allows the permits to remain in effect after the hearing. The fee to be assessed will be dependent upon the amount of water allowed to remain in reserve. If the entire acre-feet amounts remain in reserve on each permit, the total fee will be \$590.00.

Please contact Eric Gronlund, if you have any questions.

Sincerely,

Karen Schlaak

Karen Schlaak
Water Rights Program
605 773-3352
karen.schlaak@state.sd.us



CITY OF ABERDEEN

12668 391 Ave
Aberdeen, South Dakota 57401-4215

Aberdeen Water Works
PHONE: (605) 626-7011
FAX: (605) 626-3507

December 28, 2018

Karen Schlaak
SDDENR Water Rights Program
523 East Capitol
Pierre, SD 57501-3181

RECEIVED

JAN 04 2019

**WATER RIGHTS
PROGRAM**

RE: Future Use Permit 192-3 & Permit 3427A-3

Dear Ms. Schlaak:

The City of Aberdeen attempts to anticipate the needs of the community. Due to the ever-changing weather patterns that affect our surface water supply, changes to EPA regulations and the possibility of contamination, the City of Aberdeen requests retention of permits 192-3 and 3427A-3.

Justification for the continuation of these permits includes maximum water treatment plant production, expected future growth of the community, stringent EPA regulations of surface water, and the risk of contamination.

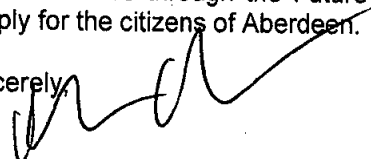
Water License No. 6546-3 allows for a daily total of 2.25 MGD or about three quarters of the average water used daily by the citizens of Aberdeen. If the quantity or quality of the water available from our main source, the Elm River, should change, we will require additional ground water to meet the current minimum daily demand.

Our treatment facility capability is 12 MGD with room for expansion up to 18 MGD. Our current operation uses groundwater for $\frac{1}{4}$ - $\frac{1}{3}$ of our total daily flow. A flow of 4 - 6 MGD from wells would be required to maintain that blend resulting in an additional 1.75 or 3.75 MGD to be converted to beneficial use. If we make no adjustments to our blend formula, the conversion of 3.75 MGD from future use to beneficial use would be required resulting in a minimum of 1.293 MGD, or 1448 acre-feet, in Future Use in reserve.

The City of Aberdeen and USGS recently completed a revised groundwater-Flow Model. The City has been working with Wenck engineering to evaluate the current supplies and identify where we should look to develop future wells. In 2013 and 2017 the City nearly drained the Willow Reservoir to meet demand due to dry conditions and the trend is calling for increased demands for drinking water. With continued population & industrial growth, the City of Aberdeen will continue to need increasing amounts of water that these future use permits will help to satisfy.

It is the City of Aberdeen's respectful request that the Water Management Board of the State of South Dakota extend Future Use Permits 192-3 and 3427A-3. The water reserved by these permits provides a vital component in providing the Aberdeen community a continuous and constant quality water. Water held in reserve through the Future Use Permits will insure the availability of a safe and secure water supply for the citizens of Aberdeen.

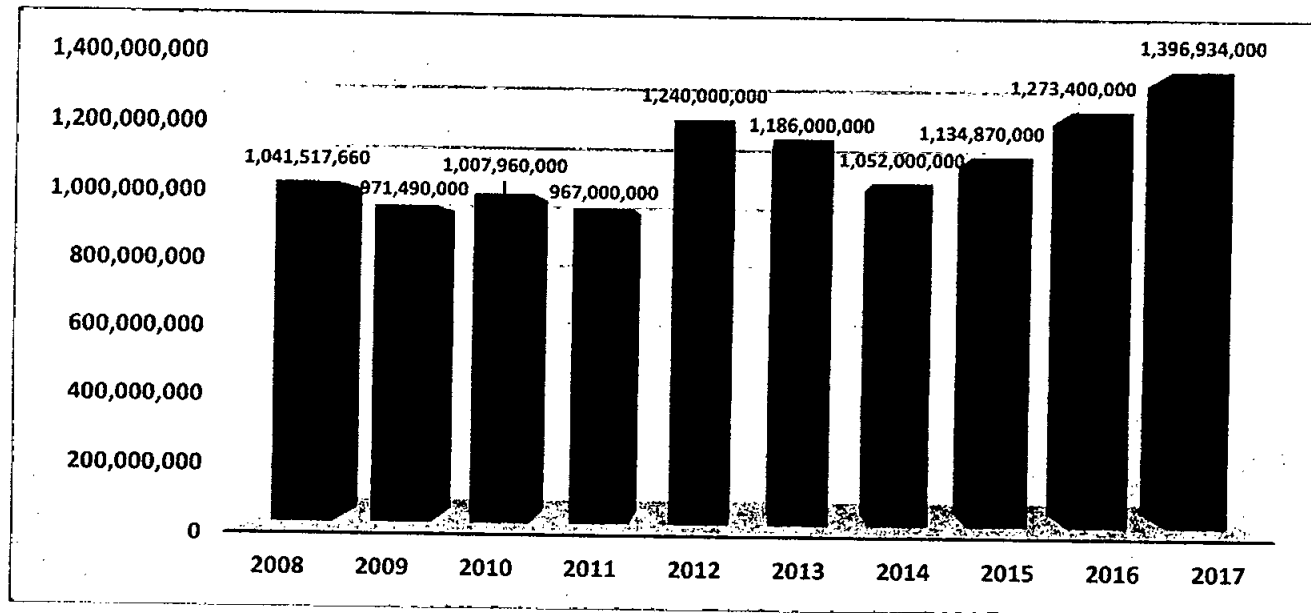
Sincerely,


Robert Braun
Superintendent
Aberdeen Water Works

attachment (1): Pumping Records 2008 -2017

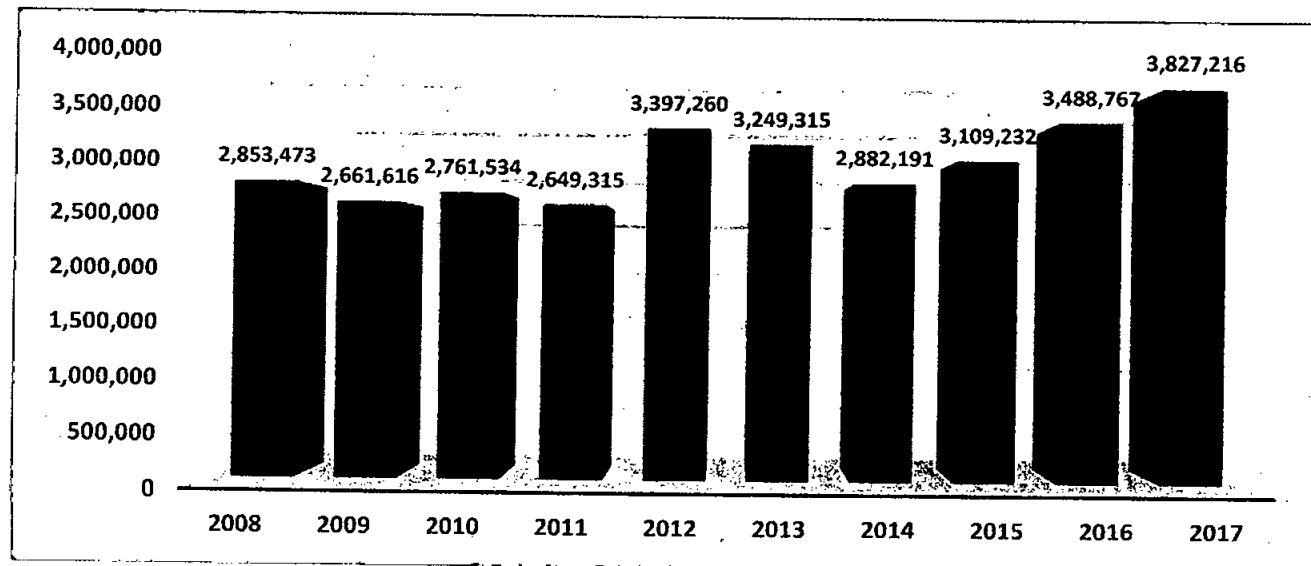
Annual Gallons of Water Pumped from Water Treatment Plant

2008	1,041,517,660
2009	971,490,000
2010	1,007,960,000
2011	967,000,000
2012	1,240,000,000
2013	1,186,000,000
2014	1,052,000,000
2015	1,134,870,000
2016	1,273,400,000
2017	1,396,934,000



Average Daily Gallons of Water Pumped From Water Treatment Plant

2008	2,853,473
2009	2,661,616
2010	2,761,534
2011	2,649,315
2012	3,397,260
2013	3,249,315
2014	2,882,191
2015	3,109,232
2016	3,488,767
2017	3,827,216



City of Aberdeen: WATER TREATMENT

Performance Measures	Actual 2012	Actual 2013	Actual 2014	Actual 2015	Actual 2016	Actual 2017
	Gallons of Water	Gallons of Water	Gallons of Water	Gallons of Water	Gallons of Water	Gallons of Water
Treated (Raw)	1,470,000,000	1,398,000,000	1,270,000,000	1,349,140,000	1,506,700,000	1,663,400,000
Effluent (Produced)	1,240,000,000	1,186,000,000	1,052,000,000	1,134,870,000	1,273,400,000	1,396,934,000
Sludge (Produced)	229,740,000	211,830,000	218,091,000	214,270,000	233,300,000	266,466,000
River	1,177,000,000	1,201,000,000	1,056,000,000	1,087,780,000	1,226,190,000	1,361,650,000
Wells	281,000,000	197,000,000	218,000,000	178,930,000	195,684,000	213,384,000
Reclaim	71,000,000	85,000,000	80,000,000	82,430,000	84,847,000	86,864,000
Manual Discharge from Lakes	588,000,000	711,000,000	179,000,000	298,020,000	280,000,000	1,098,000,000
Maple Diversion Pumped into Willow			475,000,000			

Schlaak, Karen

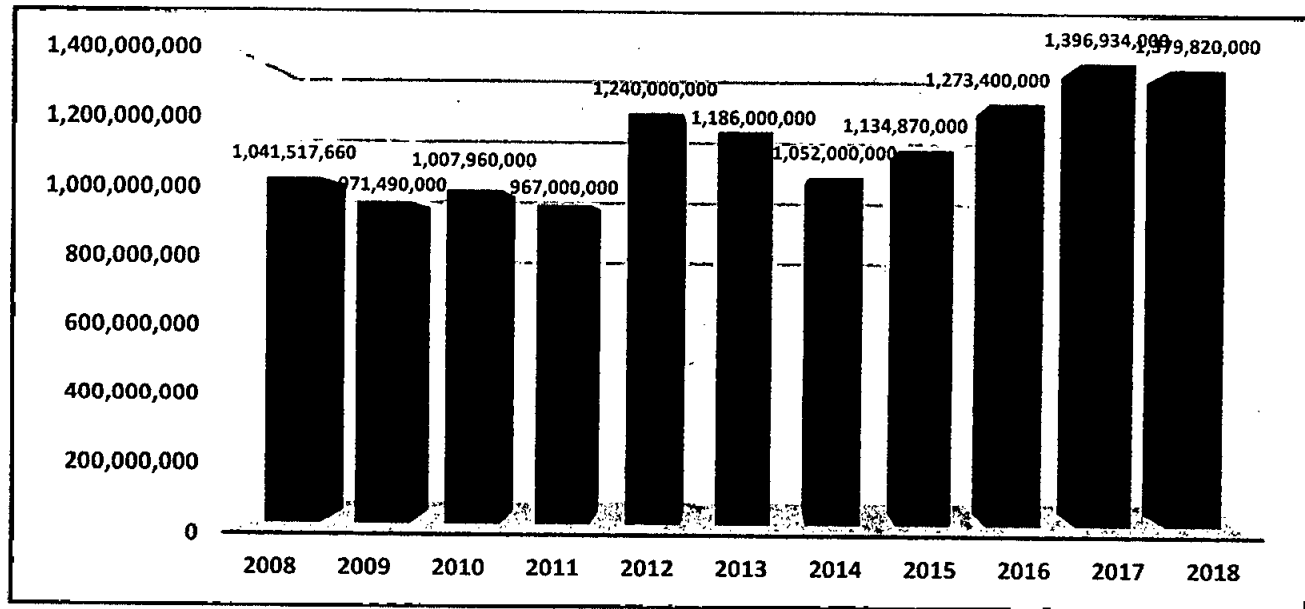
From: Bob Braun <bob.braun@aberdeensd.us>
Sent: Friday, January 11, 2019 3:30 PM
To: Schlaak, Karen
Subject: [EXT] Water rights update
Attachments: 2018 water pumped records.doc; Copy of Annual Daily Gallons of Water Pumped from Water Treatment Plant (00031949xDCD92).xlsx

I have attached the updated water reports, the date I mailed the other letter 2018 wasn't completed yet. I am new to all this so let me know what else I need to do.

Bob Braun
Superintendent
Aberdeen Water Treatment Plant
bob.braun@aberdeensd.us
605-626-7074

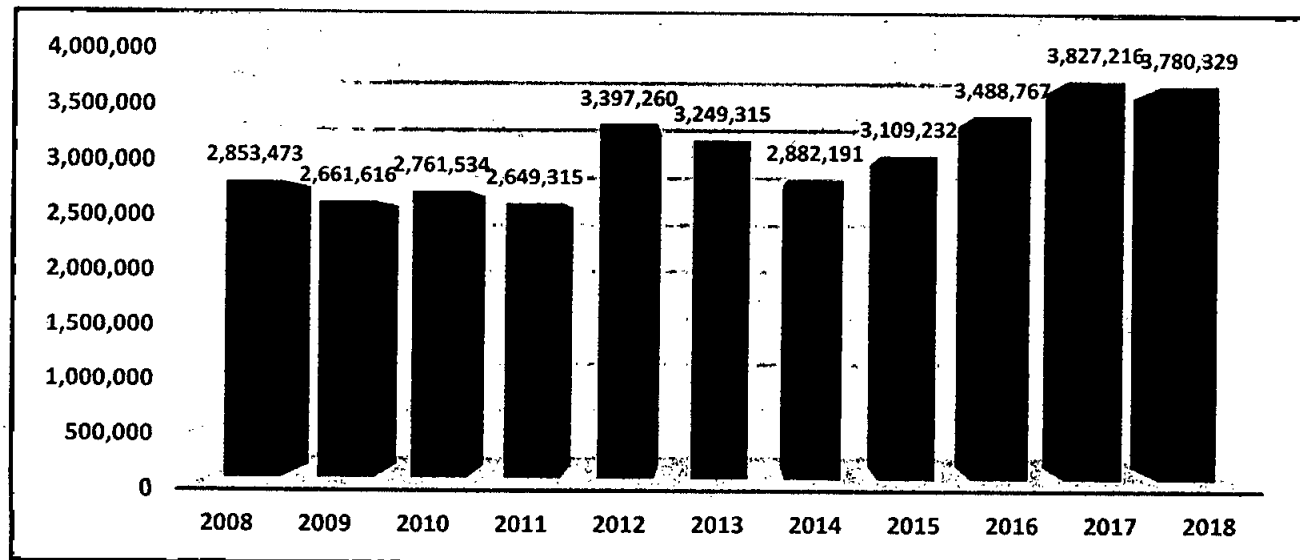
Annual Gallons of Water Pumped from Water Treatment Plant

2008	1,041,517,660
2009	971,490,000
2010	1,007,960,000
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2012	1,240,000,000
2013	1,186,000,000
2014	1,052,000,000
2015	1,134,870,000
2016	1,273,400,000
2017	1,396,934,000
2018	1,379,820,000



Average Daily Gallons of Water Pumped From Water Treatment Plant

2008	2,853,473
2009	2,661,616
2010	2,761,534
2011	2,649,315
2012	3,397,260
2013	3,249,315
2014	2,882,191
2015	3,109,232
2016	3,488,767
2017	3,827,216
2018	3,780,329



City of Aberdeen WATER TREATMENT

Performance Measures	Actual 2012	Actual 2013	Actual 2014	Actual 2015	Actual 2016	Actual 2017	Actual 2018
	Gallons of Water	Gallons of Water	Gallons of Water	Gallons of Water	Gallons of Water	Gallons of Water	Gallons of Water
Treated (Raw)	1,470,000,000	1,398,000,000	1,270,000,000	1,349,140,000	1,506,700,000	1,663,400,000	1,627,000,000
Effluent (Produced)	1,240,000,000	1,186,000,000	1,052,000,000	1,134,870,000	1,273,400,000	1,396,934,000	1,379,820,000
Sludge	229,740,000	211,830,000	218,091,000	214,270,000	233,300,000	266,466,000	247,180,000
River	1,177,000,000	1,201,000,000	1,056,000,000	1,087,780,000	1,226,190,000	1,361,650,000	1,162,000,000
Wells	281,000,000	197,000,000	218,000,000	178,930,000	195,684,000	213,384,000	391,179,000
Reclaim	71,000,000	85,000,000	80,000,000	82,430,000	84,847,000	86,864,000	72,835,500
Manual Discharge from Lakes	588,000,000	711,000,000	179,000,000	298,020,000	280,000,000	1,098,000,000	292,566,667
Maple Diversion Pumped into Willow			475,000,000				312,120,000 Not final



DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE SOUTH DAKOTA 57501-3182
<http://denr.sd.gov>

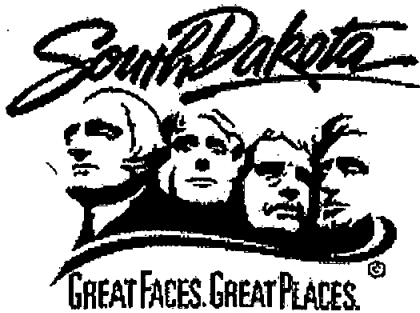
RECOMMENDATION OF CHIEF ENGINEER FOR FUTURE USE WATER PERMIT
NO. 192-3, City of Aberdeen

Pursuant to SDCL 46-2A-2, the following is the recommendation of the Chief Engineer, Water Rights Program, Department of Environment and Natural Resources concerning Future Use Water Permit No. 192-3, City of Aberdeen, 123 Lincoln St, Aberdeen SD 57401

The Chief Engineer is recommending that Future Use Permit No. 192-3 REMAIN in EFFECT for 3,823 acre-feet annually because 1) there is reasonable probability that there may be development of the water reserved under Permit No. 192-3, 2) the city has demonstrated a reasonable need for the water reserved by Permit No. 192-3, 3) the proposed use will be a beneficial use and 4) it is in the public interest.

Maintaining the effectiveness of Future Use Permit No. 192-3 is subject to payment of the \$375.00 fee pursuant to SDCL 46-2-13(2) within 60 days of notice to the city after the Board hearing.

Jeanne Goodman, Chief Engineer
January 11, 2019



DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES

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523 EAST CAPITOL
PIERRE SOUTH DAKOTA 57501-3182
<http://denr.sd.gov>

RECOMMENDATION OF CHIEF ENGINEER FOR FUTURE USE WATER PERMIT
NO. 3427A-3, City of Aberdeen

Pursuant to SDCL 46-2A-2, the following is the recommendation of the Chief Engineer, Water Rights Program, Department of Environment and Natural Resources concerning Future Use Water Permit No. 3427A-3, City of Aberdeen, 123 Lincoln St, Aberdeen SD 57401

The Chief Engineer is recommending that Future Use Permit No. 3427A-3 REMAIN in EFFECT for 1,824 acre-feet annually because 1) there is reasonable probability that there may be development of the water reserved under Permit No. 3427A-3, 2) the city has demonstrated a reasonable need for the water reserved by Permit No. 3427A-3, 3) the proposed use will be a beneficial use and 4) it is in the public interest.

Maintaining the effectiveness of Future Use Permit No. 3427A-3 is subject to payment of the \$215.00 fee pursuant to SDCL 46-2-13(2) within 60 days of notice to the city after the Board hearing.

Jeanne Goodman, Chief Engineer
January 11, 2019



DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE SOUTH DAKOTA 57501-3182
<http://denr.sd.gov>

January 14, 2019

NOTE: TO BE SURE OF PUBLICATION ON
THE CORRECT DATE, CONTACT
THE NEWSPAPER RIGHT AWAY.

City of Aberdeen
Robert Braun, Aberdeen Water Works
123 Lincoln St
Aberdeen SD 57401

Dear Mr. Braun:

Future Use Permit Nos. 192-3 and 3427A-3 will be reviewed for progress in the development and future plans for use of the water reserved. Water rights law requires publication of a notice in the county where water will be diverted or used. Notice of this review has been sent to the Aberdeen American News (225-4100). For your information, copies of the Chief Engineer's recommendations are enclosed. Please review this notice prior to publication and notify this office, if you have any corrections or questions.

BE SURE TO CONTACT THE ABOVE NEWSPAPER IMMEDIATELY TO AUTHORIZE PUBLICATION OF THE NOTICE OF HEARING AND TO ARRANGE FOR PAYMENT. Early contact with the paper can eliminate delays. The publisher has been instructed to publish this notice on January 23, 2019. We must receive Proof of Publication before the future use reviews can be considered by the Water Management Board.

Sincerely,

Eric Gronlund
Natural Resources Engineer
605 773-3352

enclosures

AFFIDAVIT OF PUBLICATION RECEIVED

STATE OF SOUTH DAKOTA}

FEB 11 2019

COUNTY OF BROWN}

§

WATER RIGHTS
PROGRAM

Carla Romberg being duly sworn, on his/her oath says: That the AMERICAN NEWS is a daily newspaper of general circulation, printed and published in Aberdeen, Brown County, South Dakota, by the Aberdeen News Company, a corporation, and has been such a newspaper during the times hereinafter mentioned; That affiant is an employee and principal clerk of said publisher and has personal knowledge of all facts stated in this affidavit; That the advertisement headed

Legal # 609186

Notice of Hearing to Review

a printed copy of which is hereunto attached, was printed and published in the regular and entire issue of said newspaper, and not in a supplement thereof, once each

Day for 1 successive day
The first publication being made on the 23rd day of Jan., 2019.
The second publication being made on the day of , 2019.
The third publication being made on the day of , 2019.
The fourth publication being made on the day of , 2019.
The fifth publication being made on the day of , 2019.
The sixth publication being made on the day of , 2019;

That said newspaper is a legal newspaper published five days or more each week; with a bona fide circulation of more than two hundred copies daily; published in the English language within the said county of Brown for more than one year prior to the first publication of said notice; and printed in whole in an office maintained at the place of publication of said newspaper; That the whole amount of the fee paid for the publication of the annexed notice is \$ 80.94, which insures solely to the benefit of said publisher; That no agreement or understanding for a division thereof had been made with any other person; and That no part thereof has been agreed to be paid to any person whomsoever.

Carla Romberg

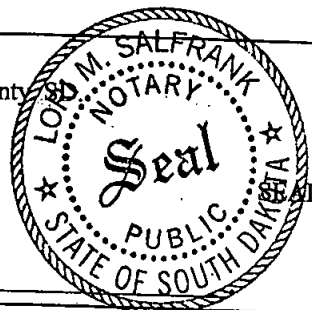
Subscribed and sworn to before me this 23rd day of Jan., 2019.

Daily Circulation 10,000

Amick

Notary Public, Brown County

My commission expires March 20, 2019



(No. 609186)
(January 23, 2019 - 1T)

NOTICE OF HEARING TO REVIEW FUTURE USE WATER PERMIT NO. 192-3 and 3427A-3

Notice is given that the Water Management Board will review Future Use Permit No. 192-3 and 3427A-3 held by the City of Aberdeen, c/o Robert Braun, Supt, Aberdeen Water Works, 123 S Lincoln St, Aberdeen SD 57401 for progress made in the development of the water reserved by the permits and future plans for development of the water reserved.

Permit No. 192-3 was approved in 1956 and currently reserves 3,823 acre-feet from alluvium along the Elm River located between Section 19-T125N-R63W and Section 15-T124N-R63W for municipal use.

Permit No. 3427A-3 was approved in 1974 and currently reserves 1,824 acre-feet from the Elm Aquifer located in the S 1/2 Section 4; S 1/2 and NW 1/4 Section 5; N 1/2 Section 6; Section 8; E 1/2 Section 9; W 1/2 Section 15 and NE 1/4 Section 16; all in T124N-R63W for municipal use.

Pursuant to SDCL 46-2A-2 the Chief Engineer of the Water Rights Program recommends that Permit Nos. 192-3 and 3427A-3 REMAIN in EFFECT for 3,823 acre-feet annually and Permit No. 3427A-3 REMAIN in EFFECT for 1,824 acre-feet annually because 1) the reserved water may be developed, 2) there is need for the reserved water 3) the proposed use will be a beneficial use and 4) it is in the public interest.

The Water Management Board will conduct the hearing to review Future Use Permit Nos. 192-3 and 3427A-3 at 10:30 am on March 6, 2019 at Floyd Mathew Training Center, Joe Foss Bldg, 523 E Capitol, Pierre SD.

The recommendation of the Chief Engineer is not final or binding upon the Board and the Board is authorized to 1) allow the permits to remain in effect, 2) amend the permits by adding qualifications, 3) cancel the permits for no development or no planned future development, or 4) take no action after it reaches a conclusion based upon facts presented at the public hearing.

Schlaak, Karen

From: Schlaak, Karen
Sent: Monday, January 14, 2019 9:54 AM
To: Aberdeen News Legals (aan-legals@aberdeennews.com)
Subject: 192-3, City of Aberdeen
Attachments: 192-3fu.doc; FORM8.FRM.doc

Attached is a notice to be published on January 23, 2019.

City of Aberdeen, c/o Robert Braun, Aberdeen Water Works, 123 Lincoln St, Aberdeen SD 57401 (605 626-7011) has been notified to contact you to authorize publication and arrange for payment.

Please send the affidavit or return the attached Proof of Publication form ASAP to the Water Rights Program, 523 E Capitol, Pierre SD 57501.

Let me know if you have questions. Please acknowledge receipt of this email.

Karen Schlaak
SD DENR, Water Rights Program
(605) 773-3352



Instruction to Newspaper - Publish the following Notice on January 23, 2019. The City of Aberdeen is responsible for payment.

NOTICE OF HEARING TO REVIEW FUTURE USE WATER PERMIT NO. 192-3 and 3427A-3

Notice is given that the Water Management Board will review Future Use Permit No. 192-3 and 3427A-3 held by the City of Aberdeen, c/o Robert Braun, Supt, Aberdeen Water Works, 123 S Lincoln St, Aberdeen SD 57401 for progress made in the development of the water reserved by the permits and future plans for development of the water reserved.

Permit No. 192-3 was approved in 1956 and currently reserves 3,823 acre-feet from alluvium along the Elm River located between Section 19-T125N-R63W and Section 15-T124N-R63W for municipal use.

Permit No. 3427A-3 was approved in 1974 and currently reserves 1,824 acre-feet from the Elm Aquifer located in the S 1/2 Section 4; S 1/2 and NW 1/4 Section 5; N 1/2 Section 6; Section 8; E 1/2 Section 9; W 1/2 Section 15 and NE 1/4 Section 16; all in T124N-R63W for municipal use.

Pursuant to SDCL 46-2A-2 the Chief Engineer of the Water Rights Program recommends that Permit Nos. 192-3 and 3427A-3 REMAIN in EFFECT for 3,823 acre-feet annually and Permit No. 3427A-3 REMAIN in EFFECT for 1,824 acre-feet annually because 1) the reserved water may be developed, 2) there is need for the reserved water 3) the proposed use will be a beneficial use and 4) it is in the public interest.

The Water Management Board will conduct the hearing to review Future Use Permit Nos. 192-3 and 3427A-3 at 10:30 am on March 6, 2019 at Floyd Mathew Training Center, Joe Foss Bldg, 523 E Capitol, Pierre SD.

The recommendation of the Chief Engineer is not final or binding upon the Board and the Board is authorized to 1) allow the permits to remain in effect, 2) amend the permits by adding qualifications, 3) cancel the permits for no development or no planned future development, or 4) take no action after it reaches a conclusion based upon facts presented at the public hearing.

Any interested person who may be affected by a Board decision and who intends to participate in the hearing before the Board and present evidence or cross-examine witnesses according to SDCL 1-26, must file a written petition with BOTH the permit owner and the Chief Engineer by February 22, 2019. The Chief Engineer's address is "Water Rights Program", Joe Foss Building, 523 E Capitol Ave, Pierre SD 57501 (605 773-3352) and the permit holder's mailing address is given above. The petition may be informal, but it must include a statement describing the petitioner's interest in the future use permits, the reasons for petitioner's opposition to or support of continuing the future use permits, and the signature and mailing address of the petitioner or his legal counsel if legal counsel is obtained. The permit owner need not file a petition.

The hearing to review Future Use Permit No. 192-3 and 3427A-3 will be conducted pursuant to the provisions of SDCL 46-1-14, 46-2-5, 46-2-9, 46-2-11, 46-5-38.1; Board Rules ARSD 74:02:01:25.01 thru 74:02:01:25.03 and contested case procedures contained in SDCL 1-26.

This hearing is an adversary proceeding. The permit owner or any person, after filing a petition, has the right to be present or to be represented by a lawyer. These and other due process rights will be forfeited if they are not exercised. Decisions of the Board may be appealed to the Circuit Court and State Supreme Court as provided by law.

Any person wishing a copy of the Chief Engineer's recommendation, further information on the permits, to assure access to the hearing by the handicapped or obtain an interpreter for the hearing impaired may contact Eric Gronlund, Water Rights Program, (605 773-3352) by February 22, 2019. The time of the hearing will be automatically delayed for at least 20 days upon written request of the permit owner or any person who has filed a petition to oppose or support continuance of the Future Use Permits. The request for a delay must be filed with the Chief Engineer by February 22, 2019.

According to SDCL 1-26-18.3, parties to a contested case may use the Office of Hearing Examiners to conduct a hearing if either a property right is being terminated or the dollar amount in controversy exceeds \$2,500.00. If any party chooses to use the Office of Hearing Examiners rather than the hearing procedure described above, then you need to notify the Chief Engineer (Water Rights Program 523 E Capitol Ave, Pierre SD) by February 4, 2019. Steven M. Pirner, Secretary, Department of Environment and Natural Resources.

Published once at the approximate cost of _____.



**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE SOUTH DAKOTA 57501-3182
<http://denr.sd.gov>

March 7, 2019

NOTICE OF ENTRY OF ORDER

City of Aberdeen
Robert Braun, Water Superintendent
123 S Lincoln St
Aberdeen SD 57401

Dear Mr. Braun:

I am writing in response to action taken by the Water Management Board at the hearing on March 6, 2019 to review Future Use Permit Nos. 192-3 and 3427A-3. The Board allowed Permit No. 192-3 to remain in effect for 3,823 acre-feet of water annually and Permit No. 3427A-3 to remain in effect for 1,824 acre-feet annually. The future use permits are subject to another review in seven years.

The fee for maintaining the effectiveness of Future Use Permit No. 192-3 is \$375.00 and for No. 3427A-3 is \$215.00 pursuant to SDCL 46-2-13(2). Please remit the total fee of \$590.00 within 60 days.

Please contact Eric Gronlund, staff engineer, if you have any questions.

Sincerely,

Jeanne Goodman, Chief Engineer
Water Rights Program
605 773-3352

CERTIFICATION

I hereby certify that on March 7, 2019, I have personally deposited with the United States mail at Pierre, South Dakota, first class postage, prepaid envelope(s) containing a Notice dated March 7, 2019 regarding Notice of 1780-2, 192-3, 3427A-3, 217-3, 1598-3, 448-3, 2042-3, 549-3, 1218-3, 2107-3, 4927-3, 6988-3 and 6988A-3 addressed as stated below:

City of New Underwood, Tim Hall, Public Works Director, PO Box 278, New Underwood, SD 57761

City of Aberdeen, Robert Braun, Water Superintendent, 123 S Lincoln St., Aberdeen, SD 57401

Brookings Municipal Utilities, Eric Witt, Water/Wastewater & Engineering Manager, PO Box 588, Brookings, SD 57006-0588

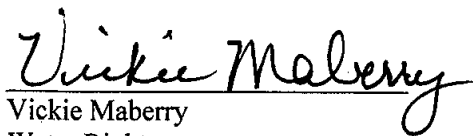
City of Sioux Falls, Greg Anderson, Water Superintendent, PO Box 7402, Sioux Falls, SD 57117-7402

City of Milbank, John C Forman, City Administrator, 1001 E 4th Ave, #301, Milbank, SD 57552

Watertown Municipal Utilities, Jeff Deville, Water Superintendent, 901 4th Ave SW, Watertown, SD 57201

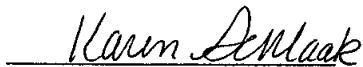
Clark Rural Water System, Terry Kaufman, Manager, PO Box 162, Clark, SD 57225

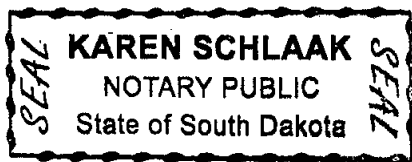
Joint Well Field, Inc. Gene Wilts, Manager, PO Box 340, Toronto, SD 57268


Vickie Maberry
Water Rights

STATE OF SOUTH DAKOTA)
) SS
COUNTY OF HUGHES)

Sworn to, before me, this 7th day of March, 20 19.


Karen Schlaak
Notary Public
My Commission expires April 1, 2019



RECEIPT

WATER RIGHTS PROGRAM

South Dakota Department of Environment and Natural Resources

Date March 21, 20 19

RECEIVED OF City of Aberdeen 123 S Lincoln St Aberdeen SD 57401-4215

The following amount in fees for services rendered as provided for by law:

Fee for Application for Permit No. _____ to Appropriate Water, to construct and to put water to beneficial use	215	00
Fee for Application for Permit No. _____ to Appropriate Water for Future use		
Fee to retain Future Use Permit No. <u>3427A-3</u> after period of seven years.		
Fee for Inspecting Constructed Works, confirming beneficial use and issuing Water License No. _____		
Fee for Filing Transfer Form _____		
Fee for _____		
Fee for Issuing New Well Driller's License No. _____ for C.Y. _____		
Fee for Renewal of Well Driller's License No. _____ for C.Y. _____		
Fee for Issuing Well Pump Installer's License No. _____ for C.Y. _____	215	00
Fee for Renewal of Well Pump Installer's License No. _____ for C.Y. _____		
(Any Other Work Provided by Law)	TOTAL	

No. **09099**

By

Jeannie Hoodman
Chief Engineer

27m



**DEPARTMENT of AGRICULTURE
and NATURAL RESOURCES**

JOE FOSS BUILDING
523 E. CAPITOL AVE
PIERRE SD 57501-3182
danr.sd.gov

December 2, 2025

City of Aberdeen
c/o Jordan McQuillen
123 S Lincoln Street
Aberdeen SD 57401

Dear Mr. McQuillen,

I am writing regarding the seven-year review of Future Use Water Permit No. 192-3 from the alluvium along the Elm River and Permit No. 3427A-3 from the Elm: North Brown Aquifer which are held by the City of Aberdeen. By law, all future use permits are to be reviewed by the Water Management Board every seven years to determine whether a reasonable need exists for the reserved water. The permits reserve water for future water supply needs for the city. Currently, our records show that 3,823 acre-feet remain in reserve under Permit No. 192-3 and 1,824 acre-feet remain in reserve under Permit No. 3427A-3. Both future use permits were last reviewed in 2018.

Please respond in writing by January 15, 2026, regarding the city's intention for the future use permits. If the city plans to retain the permits, then the response should outline a reasonable need for retaining the future use permits, including an estimate of future needs.

The future use permits will then be public noticed at the city's expense and scheduled for review before the Water Management Board pursuant to SDCL 46-5-38.1. Notice will be given of the hearing time and place at a future date. The purpose of this review is to determine if a reasonable need exists for retaining the permits. A fee will be charged if the Board allows the permits to remain in effect after the hearing. The fee to be assessed will be dependent upon the amount of water allowed to remain in reserve. If the entire acre-feet amounts remain in reserve on each permit, the total fee will be \$590.00.

Please contact Ron Duvall or me, if you have any questions.

Sincerely,

Rachel Rodriguez

Rachel Rodriguez
Water Rights Program
605 773-3352
rachel.rodriguez@state.sd.us

Rodriguez, Rachel

From: Stu Nelson <stu.nelson@aberndeen.sd.us>
Sent: Tuesday, January 13, 2026 4:51 PM
To: Rodriguez, Rachel
Subject: [EXT] Future Water Use Permits 192-3 & 3427A-3
Attachments: FUTURE WATER USE PERMIT EXTENSION LETTER SDDANR.docx

Dear Rachel,

Please see the attached letter. Thank you.



Stuart Nelson, PE, CFM

Public Works Director/City Engineer | City of Aberdeen

Office 605-626-7011

Web www.aberndeen.sd.us Email stu.nelson@aberndeen.sd.us

123 South Lincoln Street, Aberdeen, SD 57401



City of
ABERDEEN
PUBLIC WORKS DEPARTMENT
STUART NELSON, PE, CFM

123 South Lincoln Street
Aberdeen, SD 57401
Office 605-626-7011
stu.nelson@aberndeen.sd.us
www.aberndeen.sd.us

January 13, 2026

Rachel Rodriquez
SD Department of Agriculture and Natural Resources
Water Rights Program
523 E Capitol Ave
Pierre, SD 57501-3182

Re: Future Water Use Permits 192-3 and 3427A-3 held by the City of Aberdeen, SD

Dear Ms. Rodriquez:

Currently the City of Aberdeen holds the above-referenced future Water Use Permits for water held in reserve to help meet the City's growing water supply needs. It is the purpose of this letter to state the City's intent to retain these permits. The reasons the City would retain the permits are outlined as follows:

Aberdeen has recently conducted two studies, the 2020 Water Treatment Plant Facility Plan from HR Green, Inc; and the 2021 Bartlett and West Transmission Supply Project Engineering Report. Both of these documents indicate the City of Aberdeen needs a stable water supply that can grow to meet the needs of a growing population and for purposes of economic expansion. The City has also seen increasing year-over-year demand for water based on production records from the water treatment plant. The City is actively participating in the Water Infrastructure in Northern South Dakota partnership (WINS) to bring Missouri River water to the region, but connection to this system is a minimum of five years in the future. Additionally, Aberdeen's population is projected to grow by approximately 7000 people by 2045. Based on these factors, Aberdeen's water needs are projected to see a 6.5 MGD increase over the next 20 years.

Therefore, Aberdeen requests future Water Use Permits 193-3 and 3427A-3 continue to be retained by the City.

Please feel free to reach out if you need additional information. Thank you for your consideration.

Sincerely,

Stuart Nelson, PE, CFM
Public Works Director/City Engineer



**DEPARTMENT of AGRICULTURE
and NATURAL RESOURCES**

JOE FOSS BUILDING
523 E. CAPITOL AVE
PIERRE SD 57501-3182
danr.sd.gov

**RECOMMENDATION OF CHIEF ENGINEER FOR FUTURE USE WATER PERMIT
NO. 192-3, City of Aberdeen**

Pursuant to SDCL 46-2A-2, the following is the recommendation of the Acting Chief Engineer, Water Rights Program, Department of Agriculture and Natural Resources concerning Future Use Water Permit No. 192-3, City of Aberdeen, 123 South Lincoln Street, Aberdeen SD 57401.

The Acting Chief Engineer is recommending that Future Use Permit No. 192-3 REMAIN in EFFECT for 3,823 acre-feet annually because 1) there is reasonable probability that there may be development of the water reserved under Permit No. 192-3, 2) the city has demonstrated a reasonable need for the water reserved by Permit No. 192-3, 3) the proposed use will be a beneficial use and 4) it is in the public interest.

Maintaining the effectiveness of Future Use Permit No. 192-3 is subject to payment of the \$ 375.00 fee pursuant to SDCL 46-2-13(2) within 60 days of notice to the city after the Board hearing.

Mark Mayer, PE
Director of Office of Water
January 20, 2026



**DEPARTMENT of AGRICULTURE
and NATURAL RESOURCES**

JOE FOSS BUILDING
523 E. CAPITOL AVE
PIERRE SD 57501-3182
danr.sd.gov

**RECOMMENDATION OF CHIEF ENGINEER FOR FUTURE USE WATER PERMIT
NO. 3427A-3, City of Aberdeen**

Pursuant to SDCL 46-2A-2, the following is the recommendation of the Acting Chief Engineer, Water Rights Program, Department of Agriculture and Natural Resources concerning Future Use Water Permit No. 3427A-3, City of Aberdeen, 123 South Lincoln Street, Aberdeen SD 57401.

The Acting Chief Engineer is recommending that Future Use Permit No. 3427A-3 REMAIN in EFFECT for 1,824 acre-feet annually because 1) there is reasonable probability that there may be development of the water reserved under Permit No. 3427A-3, 2) the city has demonstrated a reasonable need for the water reserved by Permit No. 3427A-3, 3) the proposed use will be a beneficial use and 4) it is in the public interest.

Maintaining the effectiveness of Future Use Permit No. 3427A-3 is subject to payment of the \$ 215.00 fee pursuant to SDCL 46-2-13(2) within 60 days of notice to the city after the Board hearing.

Mark Mayer, PE
Director of Office of Water
January 20, 2026



**DEPARTMENT of AGRICULTURE
and NATURAL RESOURCES**

JOE FOSS BUILDING
523 E. CAPITOL AVE
PIERRE SD 57501-3182
danr.sd.gov

January 23, 2026

NOTE: TO BE SURE OF PUBLICATION ON
THE CORRECT DATE, CONTACT
THE NEWSPAPERS RIGHT AWAY.

City of Aberdeen
c/o Stuart Nelson
123 South Lincoln Street
Aberdeen SD 57401

Dear Mr. Nelson:

Future Use Permit Nos. 192-3 and 3427A-3 will be reviewed for progress in the development and future plans for use of the water reserved. Water rights law requires publication of a notice in the county where water will be diverted or used. Notice of these reviews have been sent to the Aberdeen American News. For your information, a copy of the Acting Chief Engineer's recommendation is enclosed. Please review this notice prior to publication and notify this office if you have any corrections or questions.

BE SURE TO CONTACT THE ABOVE NEWSPAPER(S) IMMEDIATELY TO AUTHORIZE PUBLICATION OF THE NOTICE OF HEARING AND TO ARRANGE FOR PAYMENT. Early contact with the papers can eliminate delays. The publishers have been instructed to publish this notice on January 29, 2026. We must receive Proof of Publication before the future use review can be considered by the Water Management Board.

Sincerely,

Rachel Rodriguez

Rachel Rodriguez
Water Rights Program
605 773-3352
rachel.rodriguez@state.sd.us

enclosures

Instruction to Newspaper - Publish the following Notice on January 29, 2026. The City of Aberdeen is responsible for payment.

NOTICE OF HEARING TO REVIEW FUTURE USE WATER PERMIT NOS. 192-3 and 3427A-3

Notice is given that the Water Management Board will review Future Use Permit Nos. 192-3 and 3427A-3 held by the City of Aberdeen, 123 South Lincoln Street, Aberdeen SD 57401 for progress made in the development of the water reserved by the permits and future plans for development of the water reserved.

Permit No. 192-3 was approved in 1956 and currently reserves 3,823 acre-feet from alluvium along the Elm River located between Section 19-T125N-R63W and Section 15-T124N-R63W for municipal use.

Permit No. 3427A-3 was approved in 1974 and currently reserves 1,824 acre-feet from the Elm Aquifer located in the S 1/2 Section 4; S 1/2 and NW 1/4 Section 5; N 1/2 Section 6; Section 8; E 1/2 Section 9; W 1/2 Section 15 and NE 1/4 Section 16; all in T124N-R63W for municipal use.

Pursuant to SDCL 46-2A-2 the Acting Chief Engineer of the Water Rights Program recommends that Permit No. 192-3 REMAIN in EFFECT for 3,823 acre-feet annually and Permit No. 3427A-3 REMAIN in EFFECT for 1,824 acre-feet annually because 1) the reserved water may be developed, 2) there is need for the reserved water 3) the proposed use will be a beneficial use and 4) it is in the public interest. The Acting Chief Engineer's recommendation with qualifications is available at <https://danr.sd.gov/public> or contact Ron Duvall for this information, or other information, at the Water Rights Program address provided below.

The Water Management Board will conduct the hearing to review Future Use Permit Nos. 192-3 and 3427A-3 on March 4, 2026, at 9:30 AM (Central Time), Floyd Matthew Training Center, Joe Foss Bldg, 523 E Capitol Ave., Pierre SD.

The recommendation of the Acting Chief Engineer is not final or binding upon the Board and the Board is authorized to 1) allow the permit to remain in effect, 2) amend the permit by adding qualifications, 3) cancel the permit for no development or no planned future development, or 4) take no action after it reaches a conclusion based upon facts presented at the public hearing.

Any person who intends to participate in the hearing before the Board and present evidence or cross-examine witnesses according to SDCL 1-26, shall allege that the renewal of the future use permit, upon approval, will cause injury to the person that is unique from any injury suffered by the public in general. The injury must concern a matter either within the regulatory authority found in SDCL 46-2A-9 for approval or denial of the renewal, or other matter concerning the renewal within the regulatory authority of the board to act upon as defined by SDCL 46-2-9 and 46-2-11, or both. Any person meeting the petitioner requirements and wishing to be a party of record in a contested case hearing shall file a written petition with BOTH the permit owner and the Acting Chief Engineer. A petition opposing the renewal shall be filed on a form provided by the Acting Chief Engineer. The petition form is available online at <https://danr.sd.gov/public> or by contacting the Acting Chief Engineer. The Acting Chief Engineer's address is "Water Rights Program", Joe Foss Building, 523 E Capitol Ave, Pierre SD 57501" or call (605) 773-3352. The permit holder's mailing address is given above. If contesting the Acting Chief Engineer's recommendation, the permit owner shall also file a petition. A petition filed by either an interested person or the permit owner must be filed by February 9, 2026.

The petition shall be in writing and shall include a statement describing the unique injury upon renewal of the future use permit on the petitioner, the reasons for petitioner's opposition to renewal of the future use permit, and the name and mailing address of the petitioner or his legal counsel if legal counsel is obtained. The hearing to review Future Use Permit Nos. 192-3 and 3427A-3 will be conducted pursuant to the provisions of SDCL 46-1-14, 46-2-5, 46-2-9, 46-2-11, 46-5-38.1; Board Rules ARSD 74:02:01:25.01 thru 74:02:01:25.03; and contested case procedures contained in SDCL 1-26. This hearing is an adversary proceeding. The permit owner or any person, after filing a petition, has the right to be present or to be represented by a lawyer. These and other due process

rights will be forfeited if they are not exercised. Decisions of the Board may be appealed to the Circuit Court and State Supreme Court as provided by law.

The time of the hearing will be automatically delayed for at least 20 days upon written request of the permit owner or any person who has filed a petition to oppose renewal of the Future Use Permit. The request for a delay must be filed with the Acting Chief Engineer by February 9, 2026.

Any interested person may file a comment on the future use permit renewal with the Acting Chief Engineer. The comment shall be filed on a form provided by the Acting Chief Engineer and is available online at <https://danr.sd.gov/public> or by calling (605) 773-3352 or writing the Acting Chief Engineer at the address provided above. Filing a comment does not make the commenter a party of record or a participant in any hearing that may be held. Any comment must be filed by February 9, 2026.

Notice is given to individuals with disabilities that the meeting is being held in a physically accessible location. Individuals requiring assistive technology or other services in order to participate in the meeting or materials in an alternate format should contact Brian Walsh, Nondiscrimination Coordinator, by calling (605) 773-5559 or by email at Brian.Walsh@state.sd.us as soon as possible but no later than two business days prior to the meeting in order to ensure accommodations are available.

Under SDCL 1-26-17(7) notices must state that "if the amount in controversy exceeds \$2,500.00 or if a property right may be terminated, any party to the contested case may require the agency to use the Office of Hearing Examiners by giving notice of the request to the agency no later than ten days after service of a notice of hearing issued pursuant to SDCL 1-26-17." This is a Notice of Hearing, service is being provided by publication, and the applicable date to give notice to the Acting Chief Engineer is February 9, 2026. However, since this particular matter is a future use permit renewal and not a monetary controversy in excess of \$2,500.00 or termination of a property right the Acting Chief Engineer disputes the applicability of this provision and maintains that the hearing must be conducted by the Board.

Published once at the approximate cost of_____.

LOCALiQ

Aberdeen News
Watertown Public Opinion

PO Box 630567 Cincinnati, OH 45263-0567

AFFIDAVIT OF PUBLICATION

Water Rights Program
Water Rights Program
523 E Capitol AVE
Pierre SD 57501-3182

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FEB 03 2026

OFFICE OF
WATER

STATE OF SOUTH DAKOTA, COUNTY OF BROWN

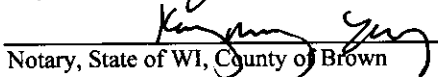
The AMERICAN NEWS is a daily newspaper of general circulation, printed and published in Aberdeen, Brown County, South Dakota, and has been such a newspaper during the times hereinafter mentioned; and personal knowledge of the facts herein state that the notice hereto annexed was Published in said newspapers in the issue dated:

01/29/2026

That said newspaper is a legal newspaper published five days or more each week; with a bona fide circulation of more than two hundred copies daily; published in the English language within the said county of Brown for more than one year prior to the first publication of said notice; and printed in whole in an office maintained at the place of publication of said newspaper.
Sworn to and subscribed before on 01/29/2026



Legal Clerk



Notary, State of WI, County of Brown

6-3-29

My commission expires

Publication Cost:	\$88.40	
Tax Amount:	\$0.00	
Payment Cost:	\$88.40	
Order No:	12024559	# of Copies:
Customer No:	556228	1
PO #:		

THIS IS NOT AN INVOICE!

Please do not use this form for payment remittance.

KONGMENG YANG
Notary Public
State of Wisconsin

**NOTICE OF HEARING TO
REVIEW FUTURE USE
WATER PERMIT NOS. 192-
3 and 3427A-3**

Notice is given that the Water Management Board will review Future Use Permit Nos. 192-3 and 3427A-3 held by the City of Aberdeen, 123 South Lincoln Street, Aberdeen SD 57401 for progress made in the development of the water reserved by the permits and future plans for development of the water reserved.

Permit No. 192-3 was approved in 1956 and currently reserves 3,823 acre-feet from alluvium along the Elm River located between Section 19-T125N-R63W and Section 15-T124N-R63W for municipal use.

Permit No. 3427A-3 was approved in 1974 and currently reserves 1,824 acre-feet from the Elm Aquifer located in the S 1/2 Section 4; S 1/2 and NW 1/4 Section 5; N 1/2 Section 6; Section 8; E 1/2 Section 9; W 1/2 Section 15 and NE 1/4 Section 16; all in T124N-R63W for municipal use.

Pursuant to SDCL 46-2A-2 the Acting Chief Engineer of the Water Rights Program recommends that Permit No. 192-3 REMAIN in EFFECT for 3,823 acre-feet annually and Permit No. 3427A-3 REMAIN in EFFECT for 1,824 acre-feet annually because 1) the reserved water may be developed, 2) there is need for the reserved water 3) the proposed use will be a beneficial use and 4) it is in the public interest. The Acting Chief Engineer's recommendation with qualifications is available at <https://danr.sd.gov/public> or contact Ron Duvall for this information, or other information, at the Water Rights Program address provided below.

The Water Management Board will conduct the hearing to review Future Use Permit Nos. 192-3 and 3427A-3 on March 4, 2026, at 9:30 AM (Central Time), Floyd Matthew Training Center, Joe Foss Bldg, 523 E Capitol Ave., Pierre SD.

The recommendation of the Acting Chief Engineer is not final or binding upon the Board and the Board is authorized to 1) allow the permit to remain in effect, 2) amend the permit by adding qualifications, 3) cancel the permit for no development or no planned future development, or 4) take no action after it reaches a conclusion based upon facts presented at the public hearing.

Any person who intends to participate in the hearing before the Board and present evidence or cross-examine witnesses according to SDCL 1-26, shall allege that the renewal of the future use permit, upon approval, will cause injury to the person that is unique from any injury suffered by the public in general. The

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OFFICE OF
WATER

injury must concern a matter either within the regulatory authority found in SDCL 46-2A-9 for approval or denial of the renewal, or other matter concerning the renewal within the regulatory authority of the board to act upon as defined by SDCL 46-2-9 and 46-2-11, or both. Any person meeting the petitioner requirements and wishing to be a party of record in a contested case hearing shall file a written petition with BOTH the permit owner and the Acting Chief Engineer. A petition opposing the renewal shall be filed on a form provided by the Acting Chief Engineer. The petition form is available online at <https://danr.sd.gov/public> or by contacting the Acting Chief Engineer. The Acting Chief Engineer's address is "Water Rights Program", Joe Foss Building, 523 E Capitol Ave, Pierre SD 57501" or call (605) 773-3352. The permit holder's mailing address is given above. If contesting the Acting Chief Engineer's recommendation, the permit owner shall also file a petition. A petition filed by either an interested person or the permit owner must be filed by February 9, 2026. The petition shall be in writing and shall include a statement describing the unique injury upon renewal of the future use permit on the petitioner, the reasons for petitioner's opposition to renewal of the future use permit, and the name and mailing address of the petitioner or his legal counsel if legal counsel is obtained. The hearing to review Future Use Permit Nos. 192-3 and 3427A-3 will be conducted pursuant to the provisions of SDCL 46-1-14, 46-2-5, 46-2-9, 46-2-11, 46-5-38.1; Board Rules ARSD 74:02:01:25.01 thru 74:02:01:25.03; and contested case procedures contained in SDCL 1-26. This hearing is an adversary proceeding. The permit owner or any person, after filing a petition, has the right to be present or to be represented by a lawyer. These and other due process rights will be forfeited if they are not exercised. Decisions of the Board may be appealed to the Circuit Court and State Supreme Court as provided by law. The time of the hearing will be automatically delayed for at least 20 days upon written request of the permit owner or any person who has filed a petition to oppose renewal of the Future Use Permit. The request for a delay must be filed with the Acting Chief Engineer by February 9, 2026. Any interested person may file a comment on the future use permit renewal with the Acting Chief

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WATER

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as soon as possible but no later than two business days prior to the meeting in order to ensure accommodations are available.

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Published Jan 29, 2026 at the total approximate cost of \$88.40 and may be viewed free of charge at www.sdpublicnotices.com

RECEIVED

FEB 03 2026

OFFICE OF
WATER

Rodriguez, Rachel

From: Gannett Legals Public Notices 4 <ganlegpubnotices4@gannett.com>
Sent: Thursday, January 22, 2026 1:10 PM
To: Rodriguez, Rachel
Subject: RE: [EXT] 12024559 192-3 & 3427A-3 City of Aberdeen - Public Notice
Attachments: 12024559.pdf

Good Afternoon,

Please find your order confirmation and proof of ad attached.

Your ad is set to run in the American News on January 29. The order cost is \$88.40 which includes an affidavit, that will be mailed to you 7-10 business days after the last day of the ad printing. Please reply by 8:00 AM on Tuesday with any changes.

Your notice is scheduled to run per your request and will publish unless you reply to this email requesting changes or to cancel.

Our invoicing is done on a monthly basis.

You will receive an invoice for this ad after the close of the month.

All orders are subject to a non-refundable 3.99% service fee. As an incentive for customers, we provide a discount off the order cost equal to the 3.99% service fee if you pay by ACH. Pay by ACH and Save! Final order cost provided at time of payment and via a receipt.

Thank you!

Brittany Grady
Public Notice Representative

USA TODAY CO.



844-254-5287

National voice. Local strength. Subscribe TODAY.

#TeamUSATODAY

Tell my boss I rock [HERE!](#)

From: Rodriguez, Rachel <Rachel.Rodriguez@state.sd.us>
Sent: Thursday, January 22, 2026 12:55 PM
To: SD-Aberdeen Legals <aan-legals@aberdeennews.com>
Subject: 12024559 192-3 & 3427A-3 City of Aberdeen - Public Notice

Attached is a notice to be published on January 29, 2026.

City of Aberdeen, c/o Stuart Nelson, 123 South Lincoln Street, Aberdeen SD 57401,
stu.nelson@aberdeensd.us has been notified to contact you to authorize publication and arrange for payment.

Please send the affidavit or return the attached Proof of Publication form ASAP to the Water Rights Program, Attn Rachel Rodriguez, 523 E Capitol Ave, Pierre SD 57501.

Let me know if you have questions. Please confirm receipt of this email.

Thank you,

Rachel Rodriguez
DANR | Program Assistant
Rachel.Rodriguez@state.sd.us



Order Confirmation
Not an Invoice

Account Number:	556228
Customer Name:	Aberdeen City Auditor-Legals
Customer Address:	Aberdeen City Auditor-Legals 123 S Lincoln St ABERDEEN SD 57401-4215
Contact Name:	Aberdeen City Auditor-Legals
Contact Phone:	6056267012
Contact Email:	
PO Number:	

Date:	01/22/2026
Order Number:	12024559
Prepayment Amount:	\$ 0.00

Column Count:	1.0000
Line Count:	278.0000
Height in Inches:	30.6800

Print

Product	#Insertions	Start - End	Category
ABD The American News	1	01/29/2026 - 01/29/2026	Govt Public Notices
ABD aberdeennews.com	1	01/29/2026 - 01/29/2026	Govt Public Notices

As an incentive for customers, we provide a discount off the total order cost equal to the 3.99% service fee if you pay with Cash/Check/ACH. Pay by Cash/Check/ACH and save!

Total Cash Order Confirmation Amount Due	\$88.40
Tax Amount	\$0.00
Service Fee 3.99%	\$3.53
Cash/Check/ACH Discount	-\$3.53
Payment Amount by Cash/Check/ACH	\$88.40
Payment Amount by Credit Card	\$91.93

Order Confirmation Amount
\$88.40

Rodriguez, Rachel

From: Rodriguez, Rachel
Sent: Friday, January 23, 2026 8:39 AM
To: stu.nelson@aberndeen.sd.us
Subject: 192-3 & 3427A-3 City of Aberdeen - Public Notice
Attachments: 192-3 & 3427A-3 Rec.pdf; 192-3&3427A-3 Ltr.pdf; 192-3&3427A-3 PubNotice.pdf; Aberdeen News Info.pdf

Good morning,

Attached is a copy of the acting chief engineer's recommendation, and information regarding the public notice for the future use review permits. As stated in the letter, please contact the paper as soon as possible to authorize publication and arrange for payment. This information is also being mailed to you today.

Let me know if you have questions. Please confirm receipt of this email.

Thank you,

Rachel Rodriguez
DANR | Program Assistant
Rachel.Rodriguez@state.sd.us





**DEPARTMENT of AGRICULTURE
and NATURAL RESOURCES**

JOE FOSS BUILDING
523 E. CAPITOL AVE
PIERRE SD 57501-3182
danr.sd.gov

NOTICE OF ENTRY OF ORDER

March 5, 2026

City of Aberdeen
c/o Stuart Nelson
123 South Lincoln Street
Aberdeen SD 57401

Dear Mr. Nelson,

I am writing in response to action taken by the Water Management Board at the hearing on March 4, 2026, to review Future Use Permit Nos. 192-3 and 3427A-3. The Board allowed Permit No. 192-3 to remain in effect for 3,823 acre-feet of water annually and Permit No. 3427A-3 to remain in effect for 1,824 acre-feet of water annually. The future use permits are subject to another review in seven years.

The fee for maintaining the effectiveness of Future Use Permit No. 192-3 is \$375.00 and for No. 3427A-3 is \$215.00 pursuant to SDCL 46-2-13(2). Please make the check payable to the Water Rights Program and remit the total fee of \$590.00 within 60 days.

Please contact Rachel Rodriguez if you have any questions.

Sincerely,

Adam Mathiowetz, PE
Acting Chief Engineer
Water Rights Program

CERTIFICATION

The undersigned hereby certifies under the penalty of perjury that I have personally deposited a true and correct NOTICE OF ENTRY OF ORDER dated March 5, 2026, into the United States Mail in Pierre, South Dakota, first class postage prepaid to the following Future Use Permit holders on March 5, 2026.

FU Nos. 192-3 & 3427A-3

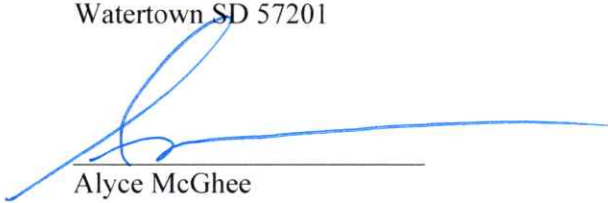
City of Aberdeen
c/o Stuart Nelson
123 S Lincoln St
Aberdeen SD 57401

FU No. 1833-2

Weston Heights HOA
c/o Katheryn Patterson
6410 Jennifer St
Rapid City SD 57701

FU Nos. 1218-3 & 2107-3

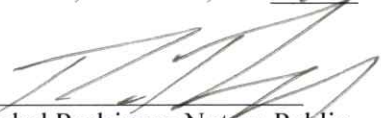
Watertown Municipal Utilities
c/o Wayne Lovelis
901 4th Ave SW
Watertown SD 57201



Alyce McGhee
Senior Secretary-Water Rights

STATE OF SOUTH DAKOTA)
) SS
COUNTY OF HUGHES)

Sworn to, before me, this 5th day of March, 2026.



Rachel Rodriguez Notary Public
My Commission expires May 16, 2029





**DEPARTMENT of AGRICULTURE
and NATURAL RESOURCES**

JOE FOSS BUILDING
523 E. CAPITOL AVE
PIERRE SD 57501-3182
danr.sd.gov

STATE OF SOUTH DAKOTA)
) SS
COUNTY OF HUGHES)

**Affidavit of Public Notice
Posting on DANR Website**

Pursuant to SDCL § 46-2A-4, public notice of the following application was posted on the DANR web site at <https://danr.sd.gov/public>. The posted public notice is the same notice as published in the pertinent newspaper(s) and a copy of the public notice is maintained in the application file. If the application is contested, the posting is moved to the DANR contested case website at <https://danr.sd.gov/public/ContestedCase.aspx> until final action is taken on the application pursuant to SDCL § 46-2A-4.

Application No.: 3427A-3

Name of Applicant: City of Aberdeen, Stuart Nelson

Date of Posting: 1/26/2026

Date of Removal: 3/5/2026

Amanda Dewell, Permitting Administrator

4/14/2026

Date

Subscribed and sworn to before me, a notary public, this 14th day of April, 2026.

Notary Public - South Dakota

My commission expires: **Rachel Rodriguez**
My Commission Expires
May 16, 2029

(SEAL)



RECEIPT

WATER RIGHTS PROGRAM

South Dakota Department of Agriculture and Natural Resources

Date April 13, 2026

RECEIVED OF c/o Stuart Nelson 123 South Lincoln Street Aberdeen SD 57401

The following amount in fees for services rendered as provided for by law:

Fee for Application for Permit No. _____ to Appropriate Water, to construct and to put water to beneficial use	\$ _____
Fee for Application for Permit No. _____ to Appropriate Water for Future use	\$ _____
Fee to retain Future Use Permit No. <u>3427A-3</u> after period of seven years.	<u>\$215.00</u>
Fee for Inspecting Constructed Works, confirming beneficial use and issuing Water License No. _____	\$ _____
Fee for Filing Transfer Form _____	\$ _____
Fee for _____	\$ _____
Fee for Issuing New Well Driller's License No. _____	\$ _____
Fee for Renewal of Well Driller's License No. _____	\$ _____
Fee for Issuing Well Pump Installer's License No. _____	\$ _____
Fee for Renewal of Well Pump Installer's License No. _____	\$ _____
(Any Other Work Provided by Law)	
TOTAL	<u>\$215.00</u>

By Adam Matkowsky
Chief Engineer