

**PRELIMINARY ENGINEERING REPORT**  
**FOR THE**  
**DRINKING WATER SYSTEM**  
**IN**  
**BUFFALO GAP, SOUTH DAKOTA**

**Project Number: A-7515**

**September 2021**  
**February 2022**

I hereby certify that this report was prepared by me or under my direct supervision and that I am a duly Registered Professional Engineer under the laws of the State of South Dakota.

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## **LIST OF ABBREVIATIONS**

Fps	feet per second
gpcd	gallons per capita per day
gpm	gallons per minute
HGL	hydraulic grade line
Hp	horsepower
MG	million gallons
MGD	million gallons per day
Psi	pounds per square inch
Rpm	revolutions per minute
VFD	variable frequency drive
GST	ground storage tank/reservoir
FRWUD	Fall River Water Users District
DWSRF	Drinking Water State Revolving Fund

# **1 INTRODUCTION**

## **1.1 PURPOSE**

The Town of Buffalo Gap has contracted with the engineering firm of Helms and Associates to complete an investigation of its existing water storage and distribution system. The intent of the study is to identify and quantify problems that exist within this system.

The results of the completed investigation are presented in this Facility Plan. The Facility Plan contains the information on which the Town Board of Buffalo Gap can base cost-effective decisions relating to the necessary improvements to its water system. The Town Board will, after appropriate public input, determine the best options to make any needed improvements that are identified in the Facility Plan.

Loan and grant funding will undoubtedly be desired to make any of the improvements that are recommended herein. This Facility Plan will be a valuable tool for the community to pursue the funding necessary in its efforts to make needed public improvements.

## **1.2 SCOPE OF WORK**

The scope of work for this Water Evaluation and Study includes:

- 1) Completion of an analysis of requirements of governmental authorities having jurisdiction to approve the design of the project and participation in consultations with such authorities.
- 2) Completion of an analysis of the existing water distribution system relating to storage, water losses in the system, identification of system age, evaluation of current water pressures and fire flow capacities and evaluation of current and future needs.
- 3) Completion of a general economic analysis and comparison of various alternatives.
- 4) Preparation of a written report, with maps and sketches, setting forth the findings and recommendations of the Preliminary Study, providing The Town of Buffalo

Gap with ten (10) copies of said report and meeting with The Town of Buffalo Gap to review said report.

- 5) Assistance in the presentation of the findings and recommendations of the Preliminary Study at not more than one (1) public hearing.

### **1.3 AUTHORIZATION**

The firm of Helms and Associates was authorized as per a Letter of Agreement dated November 4<sup>th</sup>, 2019, by the governing body of the Town of Buffalo Gap to proceed with the evaluation of the Town of Buffalo Gap's water storage and distribution system. The following report presents the findings and conclusions resulting from the authorized study.

## 2 COMMUNITY DESCRIPTION

### 2.1 GENERAL INFORMATION

The Town of Buffalo Gap is a small rural community founded in 1877. According to the 2010 US Census, the population of Buffalo Gap was 126. The community is located at the southern edge of Custer County, South Dakota. Buffalo Gap's center is located in Section 29, Township 6 South, Range 7 East. Its primary access is via South Dakota State Highway 79 approximately 13 miles east of Hot Springs, SD as indicated in Figure 2.1.



**Figure 2.1-1: Location Map of the Town of Buffalo Gap**

It has an aldermanic government consisting of a two-member board with an elected mayor. A part-time water/sewer superintendent is employed by the Board. This individual provides the necessary public utility maintenance within the community. The town also employs a finance officer to assist the board with financial matters.

Buffalo Gap is primarily a residential community, with limited services available. Most residents are employed in the agricultural and tourism sectors or a related service industry. Retail trade is

generally related to goods and services associated with agricultural and tourism activities in the area.

Custer County is in the southwestern corner of South Dakota. The county had a 2010 population of 8,216 and includes a total surface area of approximately 998,000 acres. Communities located within the county include Custer (county seat), Fairburn, Hermosa, Pringle, and Buffalo Gap.

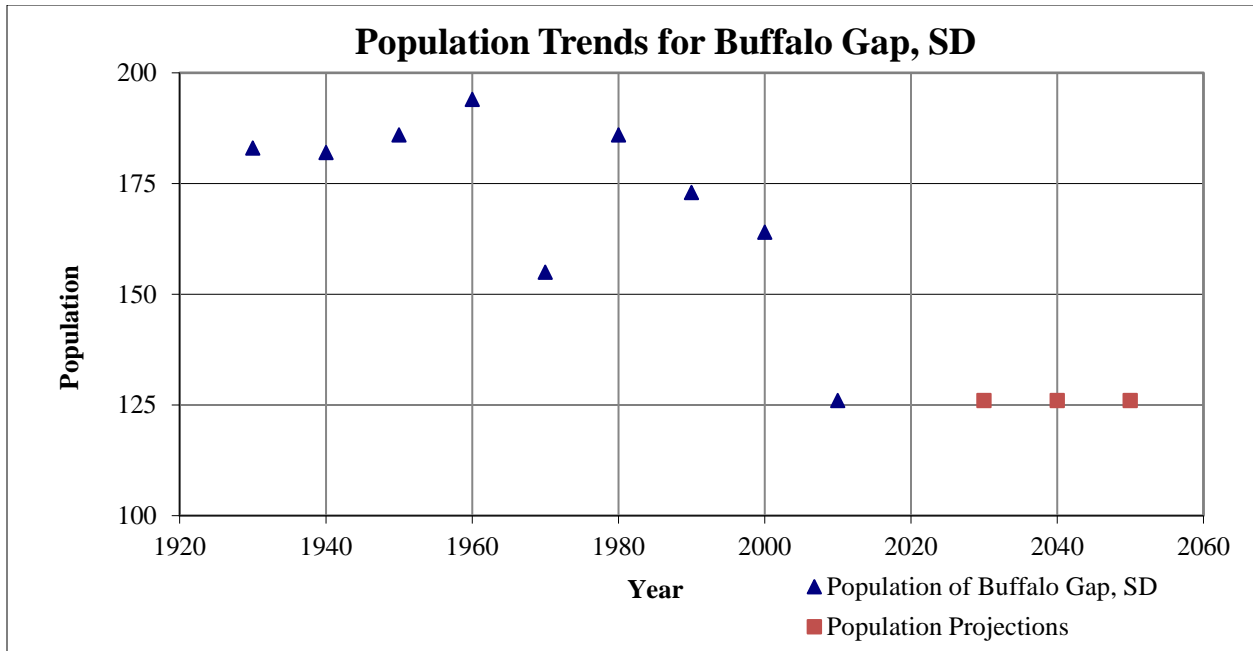
## **2.2 POPULATION CHARACTERISTICS**

The Town of Buffalo Gap's population is 126, according to the 2010 census. The most recent Census Bureau data available indicates that the community's median age of 53 is older compared to the South Dakota's median age of 36.9. Additionally, 24.6% of Buffalo Gap's population was over the age of 65, compared to 16% for South Dakota. Census data also indicates that the county's median household income of \$46,743 was about \$9,778 lower than the state's median household income of \$56,521, with 4.3% of the families living in Custer County having incomes at or below poverty level.

## **2.3 SYSTEM POPULATION PROJECTIONS**

Figure 2.3-1 indicates Census Bureau population data from 1920 to 2010. In general, the population has been declining since 1960. The decrease in recent years is a typical trend for rural communities such as Buffalo Gap.

As with all communities of similar size, there are always efforts to entice new industrial and commercial enterprises to be located in Buffalo Gap. Even though this possibility exists, it is not anticipated that these would have a significant impact on the projected water flows. As a result, the 2010 census population of 126 will be utilized in determining the current and projected water usage.



**Figure 2.3-1: Historic Population**

## 2.4 CLIMATE

The area’s climate is generally described as a continental climate. Winters are relatively long and cold while summers are fair and hot. Most of the precipitation occurs during the warm period of late spring and early summer. Normal precipitation for the area is 19.22 inches annually.

## 2.5 ENVIRONMENTAL REVIEW INFORMATION

As part of the environmental assessment requirement for the facility planning process, the project sponsor is required to contact various state and federal agencies. Environmental assessment letters have been sent to the agencies identified in the subsequent paragraphs. It is expected that no adverse environmental impacts will occur due to construction taking place on previously disturbed areas.

### 2.5.1 Historic and Archaeological Sites

The Archeological Research Center was solicited for a Level 1 Archeological Records Search identifying historical or archeological sites, surveys, and eligibility status of those items within the proposed project area and within a one-mile radius. Correspondence related to this contact will be placed in Appendix A upon receipt. If the Town applies for state or federal funding, then

the State Historical Preservation Office (SHPO) will need to be contacted for the purpose of soliciting input on the proposed improvements. The funding agency will need to contact the State Historical Preservation Office because the office cannot make a determination until funding sources are finalized. Known historical sites are not expected to be adversely impacted. Correspondence related to this request can be found in Appendix A upon receipt.

### **2.5.2 Floodplains and Wetlands**

The US Fish and Wildlife Service, the US Army Corps of Engineers and the South Dakota Department of Game, Fish and Parks were contacted for input related to the proposed improvements. It is anticipated that no floodplains or wetlands in the area are expected to be involved in the project. No permits required by the Clean Water Act are anticipated to be required. Correspondence related to these contacts is located in Appendix A. Shown in Figure 2.5.2-1 is the current wetland map as recorded in the National Wetlands Inventory by U.S. Fish and Wildlife Service.

### **2.5.1 Agricultural Lands**

The local NRCS contact for the US Department of Agriculture was contacted for input on the proposed improvements. No prime or important farmland is anticipated to be affected by any of the proposed projects. Correspondence related to this contact is located in Appendix A.

### **2.5.1 Wild and Scenic Rivers**

Research indicates that there are no designated wild and scenic rivers in the area. Therefore, the proposed improvements will have no impact on this resource.

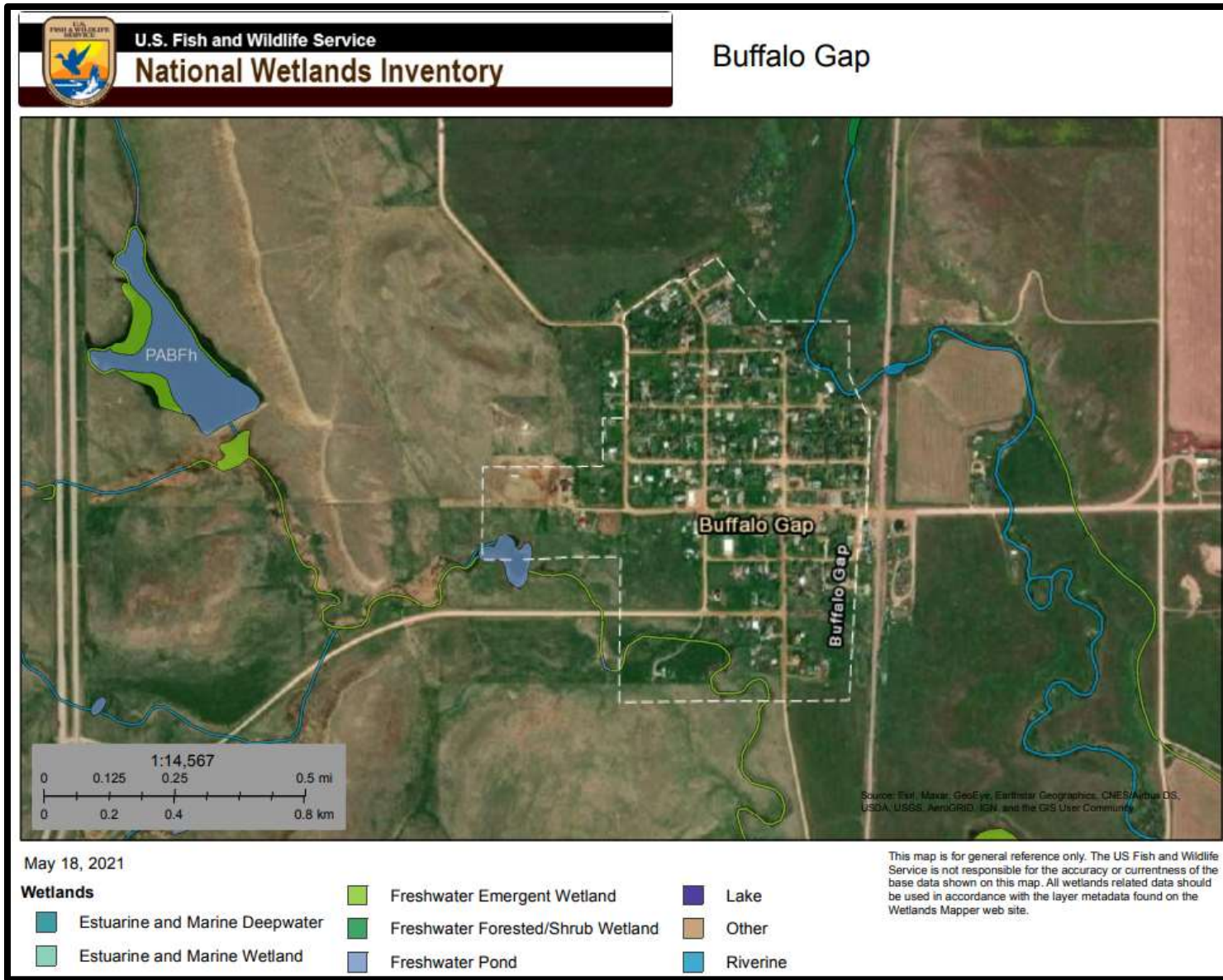


Figure 2.5.2-1 National Wetland Inventory

### **2.5.2 Surface Water Quality**

The South Dakota Department of Agriculture and Natural Resources was contacted for input on the proposed improvements. No adverse effects on surface water quality are expected due to the projects. Correspondence related to this contact is located in Appendix A.

### **2.5.3 Fish and Wildlife Protection**

The United States Department of Interior was contacted for comments on the proposed project limits in regards to fish and wildlife protection. Correspondence related to this contact will be located in Appendix A upon receipt.

### **2.5.4 Direct and Indirect Impacts**

Soil erosion, noise pollution, traffic obstruction, and increased surface runoff due to dewatering operations sometimes impact the environment during this type of project. However, these impacts are temporary and will not influence the environment over the long term. Enhanced human health and safety and more efficient treatment and delivery of drinking water are positive impacts to the environment that will have long-lasting value.

## **2.6 MITIGATING ADVERSE IMPACTS**

Adverse impacts will be minimized to the greatest extent possible by the implementation of accepted cautionary measures. Temporary and permanent erosion control will be included in construction contracts. Protection of public health, safety and welfare will also be incorporated into the specifications and contract documents. Appropriate permits will be obtained before discharging any trench or storm waters. Additionally, should any permanent adverse impacts result from the project, mitigating measures will be followed to the satisfaction of the appropriate review agency.

### **3 EVALUATION OF EXISTING WATER SYSTEM**

#### **3.1 GENERAL INFORMATION**

The Town of Buffalo Gap provides water and sewer service to approximately 126 residents on 88 connections.

The Town currently uses a well drilled in 1963 to supply water to the town. Water is pumped from the well and then stored in either the 50,000-gallon underground or 88,000-gallon above-ground storage tanks. Both tanks are located on top of a hill to the west of town. The water is then distributed to users through the distribution mains located throughout town. Each of these aspects will be further discussed later in this report.

According to information available, the distribution system is comprised of 4” and 6” Cast Iron (CIP), and 4” and 6” Poly Vinyl Chloride (PVC) piping. The water distribution system is discussed in Section 3.6 and the approximate distribution system layout is shown in Figure 3.6-1.

During the spring of 2021 personnel from Helms and Associates visited Buffalo Gap and conducted a series of pressure and flow tests around town. Results from this testing revealed adequate static pressures, but hydrant flow rates and residual pressures recorded were below recommended levels. Additionally, after hydrants were opened to test flow rates, the water become discolored. Figure 3.1 and 3.2 provides a visual representation of the quality of water that was discovered while conducting field testing, in both cases the hydrants had been opened for about 5 minutes before the pictures were taken. Results from field testing will be further discussed in Section 3.6.4 of this report.



**Figure 3.1-1: Hydrant near Intersection of Cedar St and 2<sup>nd</sup> St**



**Figure 3.1-2: Hydrant near Intersection of Elm and 4<sup>th</sup> St**

## **3.2 WATER DEMAND**

To evaluate the Town of Buffalo Gap's ability to meet the needs of the future, a review of past water usage records was completed. The process used to estimate future water demand included a determination of the current average per capita demand, combined with a projection of the future population. Limited water usage records were available but billing statements from January 2019 to January 2020 were obtained and utilized to create Table 3.2-1.

The sources and methods used to develop the information presented in Table 3.2-1 are described by the following:

- Water usage billed per month is based on data provided by the Town of Buffalo Gap.
- Per capita water usage is determined by dividing the total water used by the population.

Water meters play a critical role in determining water demand, determining high water users and accounting for them in future design. The Town has replaced all of the residential water meters in the past year. Data from these meters is not yet complete but water usage data will now be more accurate and correct.

Water meters play an important role in determining peak usage rates. If these meters do not read accurately, the water records can be skewed. The reading of meters is also important in determining water demand, if meters are not read accurately, the data represented becomes unreliable. The previous meter reading system in Buffalo Gap did not read well. This is the reason for only one year of data and also, likely, fairly inaccurate information.

**Table 3.2-1: Buffalo Gap Water Use Record**

2019				
Month	Well Water Pumped (Gal)	Billed (Gal)	Precip (In)	Billed (gpcpd)
January		139,100	0.34	36
February		104,000	0.69	29
March		179,200	1.14	46
April		116,900	1.88	31
May		124,100	5.07	32
June	Data Not Available	139,200	1.52	37
July		151,800	3.10	39
August		155,500	2.27	40
September		161,660	2.09	43
October		118,040	1.11	30
November		156,800	0.81	41
December		88,400	0.64	23
Total	0	1,634,700	20.66	35
Average Day	0	4,479		
Average (gpcpd)	0	36		
Average Unacc %		NA		

**Table 3.2-2: Buffalo Gap Water Record Summary**

Average Water Supplied per Year =	--	Gal
Average Water Billed per Year =	1,634,700	Gal
Average Per Capita Usage per Month (Billed) =	133,585	gpcpm
Average Per Capita Usage (Billed) =	36	gpcpd
Average Percentage of Unaccounted-for Water =	--	
Maximum Billed per Month =	179,200	Gal
Average Day Supplied =	--	gal
Average Day Billed =	4,479	gal

Table 3.2-1 indicated that the billed water usages from January 2019 through January 2020 range from 23 gallon per capita per day (gpcpd) in December to 46 gpcpd in March. The average per capita water demand for data period was determined to be 35 gallons. Typically, rural communities in South Dakota see an average daily per capita usage of around 75 gpcpd. The lower usages in Buffalo Gap are likely due to unreliable data from the conditions of both the meters and pumps within the town’s water system. For the purpose of this report, 75 gpcpd will be used as the average daily water usage.

Water losses within the system were unable to be determined with the information that was available. While the town has water meters installed at each service, and reads and sends out billing statements to users monthly, the condition of the wells and pumps are so poor that there is no way for the Town to record an accurate amount of water that is pumped from its wells. While the exact amount of water loss is unknown, the Town has mentioned that they believe the loss to be significant within the system. The cast iron pipe that comprises parts of the town's pipe system is very susceptible to corrosion and leaks after a period of time. This, along with unmetered water use, improperly functioning, and poorly read meters all contribute to the water loss within town's system. A document discussing the possible switching of water sources from the wells to the local rural water district provided by the town for this report, states that improvements to the distribution system must be made before the town can be switched to rural water due to the amount of water loss that is currently occurring. The current state of the water system is likely costing Buffalo Gap thousands of dollars a year in lost revenue.

### **3.3 PROJECTION OF WATER DEMAND**

Future water demand projections are the basis for establishing the capacity and storage of the water distribution system. These projections are based on historical data of per capita water flows, and population projections. This data is used to determine peak daily and hourly demands to ensure that the system is capable of meeting the future demands of the Town. The population of Buffalo Gap is currently 126 residents, and according to Section 2.3 is not projected to grow significantly in the future. The population size used for determining the projected water demand will be 126. If the population varies significantly from the projections, then this section will need to be revised to reflect actual population size. Using the average daily demand of 75 gpcpd determined in paragraph 3.2, with 15% added for water loss in the system (It should be known that actual water loss for the current system is unknown, however 15% is on the higher end of an acceptable amount for communities such as Buffalo Gap) the projected average future daily demand is 10,870 gallons in 2060 ( $75 \text{ gpcpd} \times 126 \text{ residents} \times 1.15 \text{ (water loss)}$ ).

To meet the peak day water usage that may occur in the future, a peaking factor is generally determined. Smaller cities have a greater fluctuation than larger cities, but these fluctuations generally occur over a shorter period. As shown in Figure 3.5.1-3, the water used in a town like Buffalo Gap which does not have any significant commercial or industrial use is highly

dependent on the amount of lawn watering or other high water using summer activities. Our experience has shown that the ratio of average day usage to peak day usage ranges from 2 to 3 times the average day water usage for communities in South Dakota. It is of our opinion that the peaking factor for the daily peak water demand not be less than 2.5 times the average daily demand to cover lawn watering and other summertime uses. This number can be justified by taking the average daily metered demand of the peak month which is approximately 5,796 gpd. Knowing the average daily demand will likely vary from 1.25 to 1 and estimated day peak of 7,245 gpd ( $5,796 \times 1.25$ ) is calculated. Dividing 7,245 gpd by the average daily demand of 4,479 (average daily usage for study period) results in the peak day to average day ratio of 1.62. Since the data available at the time of the study is limited at best, utilizing the higher value of 2.5 times the average day water usage is justified in our opinion. The result is a peak day water demand of 27,170 gpd ( $126 \text{ residents} \times 75 \text{ gpcpd} \times 2.5 \text{ (peak factor)} \times 1.15 \text{ (water loss)}$ ). It is also noted that the water supply data is utilized and not the water billed data to ensure enough water is available while still accounting for the expected losses.

The Town of Buffalo Gap does not have any high use businesses. This number: 27,170 gpd will be used for the remainder of this report.

### **3.4 WATER SOURCE**

The Town of Buffalo Gap has two sources of water available for their water system. The town currently utilizes a well, which was drilled in 1963, to supply drinking water to users. The other source of drinking water available, is water from the Fall River Water User District (FRWUD).

#### **3.4.1 Wells**

The drinking water used in Buffalo Gap is currently being sourced from one of the two wells the town has water rights to. The well currently supplying water to the community (Well #1), is included under SD DENR Water Rights Permit No. 794-2, and is located near the existing storage tanks to the west of town. This well was drilled in 1963, and supplies an average of 75 gpm of water. The second well (Well #2), covered under Permit No. 2351-1, is located in the SW corner of town near the intersection of Oak and 3<sup>rd</sup> St. This well was drilled in 1997 and when completed, was used to supply water to the town. However, residents complained of strong odors and solids in the water from this well, because of this, the town switched back to

Well #1 and Well #2 has not been returned to use since. Both wells draw water from the Inyan Kara formation. The well water is disinfected before being pumped into the ground storage tanks and then distributed to town. The water is tested and meets the requirements set forth by the SDDANR. A copy of the 2019 and 2020 drinking water reports are included in Appendix B of this report. Currently the water from the well meets all requirements to be considered safe for public consumption. However, the amount of Uranium present in the water is dangerously close to the limits allowable. If in the future the Uranium levels continue to climb, the Town may have to consider other possible water sources.



**Figure 3.4.1-1: Well #2 (Not in Use)**

### **3.4.2 Fall River Water Users District**

The Fall River Water Users District (FRWUD) is a rural water district that serves portions of Fall River, Custer, and Shannon counties. Currently the Town of Buffalo Gap does not have a contract with the FRWUD. Should the Town decide to switch the source of their drinking water from wells to the FRWUD it would give the town a reliable high-quality source of drinking water for their residents. The town has reached out to the FRWUD to discuss the possibility of a switch in water source, but the current amount of water loss within the Town’s distribution system would prove too costly. Improvements to the water system must be made in order for the transfer of water sources to become plausible.

### 3.5 STORAGE

The water storage facilities for Buffalo Gap consist of an 88,000-gallon above ground storage tank, and a 50,000 gallon underground concrete reservoir. Both tanks are located at the top of a hill to the west of town. It is unknown when the tanks were constructed, but both tanks appear to be in relatively good condition. Both tanks were recently inspected and the complete reports can be found in Appendix D. The corrective actions on both tanks were repairing screens, discharges and monitoring.

Both storage tanks are situated on a hill overlooking the town. The elevations of the tanks are approximately 100' higher than the ground elevations in town. This elevation change allows the storage tanks to function as an elevated storage tank (Water Tower) by using gravity to help pressurize the Town's distribution lines. Using gravity to pressurize the lines helps minimize the effects a power outage or mechanical failure have on the system.



**Figure 3.5-1: Ground Storage Tank Overlooking Town**



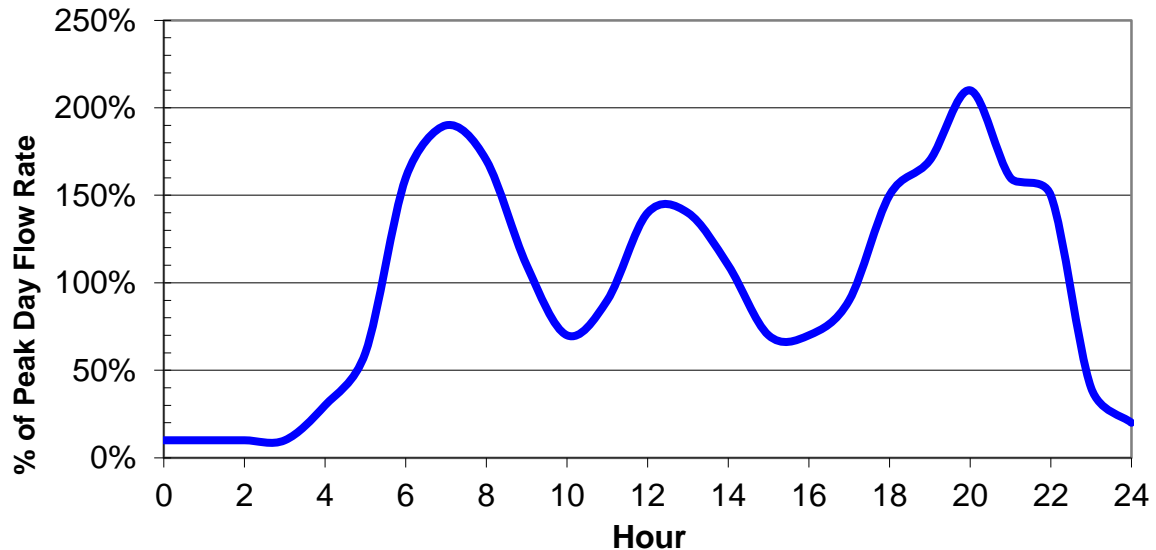
**Figure 3.5-2: Underground Storage Tank**

The water storage tanks provide a means for equalizing operating pressures during high demand periods, provide emergency storage to temporarily offset the effects of downtime for well repairs, pipeline repairs and power outages; and provide fire protection.

There is not a defined method for determining the required volume of storage for water distribution systems. Standards such as the Ten State Standards say that if fire flow is to be provided, the flow guidelines established by the International Standards Organization (ISO) should be met. Thus, at 500 gpm, a two-hour fire event requires 60,000 gallons of water storage.

Equalization and emergency storage are the other factors in determining the volume of water required or desired. Equalization storage is required to supply the varying demands throughout each day. Figure 3.5-3 illustrates a typical variation of water demand over a peak day. During those times that the water usage is shown to be over 100% of the supply rate, the system's storage must provide the additional water to meet the demands. Storage for equalization with constant rate pumps typically ranges from 10% to 25% of the peak day water demand (Mays 2000). The higher end of the range is for communities with high ratios of average day to peak day water usage. It is felt that 20% is a comfortable margin for the desired equalization storage.

The current peak day water demand is estimated at 27,170 gallons and results in an equalization storage volume of approximately 5,434 gallons (27,170 x 20%) for current use and projected future use.



**Figure 3.5-3: Water Demand Pattern Used in Model**

Emergency storage is essentially the storage that a community feels comfortable with based on the reliability of the power supply and its water system in general. Emergency storage equal to two days of the average daily usage is commonly used for the emergency storage volume and is utilized in this report. The current and projected emergency storage is 21,735 gallons (2 x 126 people \* 75 gpcpd \* 1.15).

The total required water storage for a community is generally considered to be the equalization storage plus the larger of fire or emergency storage (Mays 2000). The total fire storage generally considered as needed for a community would then be about 66,000 gallons (60,000 + 5,434). With a combined storage capacity of 120,000 gallons Buffalo Gap's current water storage meets these requirements.

Another storage volume requirement that is sometimes used is for a water system to have sufficient storage to satisfy two consecutive peak day usages. With an estimated peak usage of 27,170 gpd Buffalo Gap would require 54,340 gallons (2 x 27,170) of storage. The current storage capacity of 120,000 gallons exceeds this requirement.

It is recommended that steps be taken to ensure the integrity of the storage tanks by regularly scheduling cleanings and inspections. A three-year inspection cycle is typically recommended.

One of the newer aspects of technology available to water systems is a Supervisory Control and Data Acquisition (SCADA) system. SCADA systems are becoming essential tools for operators and cities alike. SCADA systems assist the operator by tracking data and remotely controlling equipment. When it comes to the data capabilities, SCADA is an excellent tool for tracking when the high use is, how often pumps run (i.e. what time of day and for how long) and for monitoring the storage tank level to be able to see when you may run low and pinpoint areas of concern. It can help track flows that the pumps provide to help identify when they may need maintenance or replacement. The SCADA will log and plot data over long periods of time to assist the operator in planning for the future and help identify when areas may need improvement or capacity may need to be increased. SCADA systems can be a wealth of knowledge, especially during turnover in water operator personnel where knowledge can be lost, allowing the town to be able to go back years to see what the flows and tendencies of their system where.

### 3.6 DISTRIBUTION SYSTEM

Buffalo Gap’s water distribution system consists of approximately 18,500 feet of water main pipe. The approximate total length of each size and type of pipe in the Town’s water distribution system is listed below.

**Table 3.6-1: Sizes, Types and Lengths of Water Mains**

<b>Pipe Type</b>	<b>Estimated Footage (ft)</b>
4" Cast Iron Pipe (CIP)	5,102
4" PVC Pipe	3,969
6" Cast Iron Pipe (CIP)	2,971
6" PVC Pipe	6,454
<b>TOTAL</b>	<b>18,496</b>

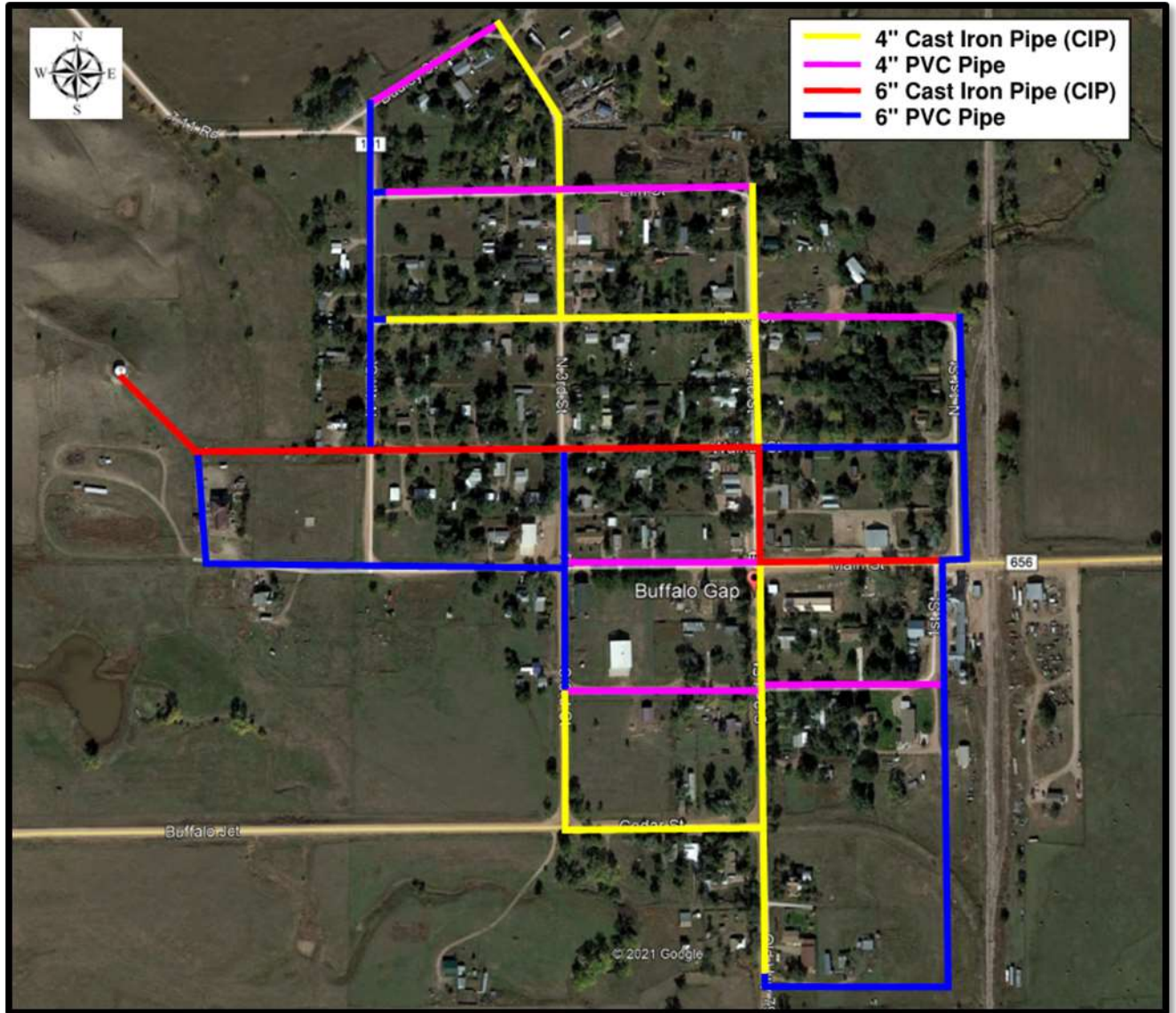
The oldest parts of the distribution system were installed in the early 1960’s concurrently with the drilling of the town’s well. At the time of this study, the town did not have any “Drawings of Construction Record” from past projects to help us determine any information about the system. The only map of the water system the town had was a large laminated map that showed the approximate type and location of the water lines throughout town. This map was made available to us and was utilized in the study. Additionally, the town was able to share an AutoCAD file

with the layout of the system for use in the study as well. This file was useful for allowing us to determine pipe lengths, but did not include labels of size or types pipes. Combining information from both sources an approximate layout of the distribution system was developed. This layout is shown in Figure 3.6-1.

The distribution system in Buffalo Gap consists of two different types of pipe: Cast Iron Pipe (CIP) and PVC. Cast iron pipe has numerous down falls, one of the biggest being corrosion of the pipe. Corrosion of cast iron pipe can cause many problems for a water system. As shown in Figures 3.1-1 and 3.1-2, over time minerals within the water begin to corrode the inside of the pipe causing rust to enter the drinking water. Corrosion also builds up on the inside of the pipe, reducing the effective diameter limiting flows, and residual pressure. Cast iron pipe is also very brittle and is susceptible to breaks and leaks. It is assumed that leaks from the cast iron sections of the distribution system account for a large amount of the water loss within the system.

Throughout the years the town has replaced and added sections of PVC piping to the distribution system. Currently it is believed that the Buffalo Gap distribution system consist of approximately 8,000 ft of CIP and 10,500 ft of PVC pipe.

Based on the drawing provided, the current layout of the distribution system contains no dead-end lines. Dead-end lines are not desirable in water distribution networks as the decreased water usage increases retention times which results poor water quality. By having lines looped together the water within the system can continually flow through the pipe ensure higher quality water for the users.



**Figure 3.6-1 Water Distribution System**

### **3.6.1 Hydrants and Valves**

Based on the AutoCAD layout drawing, it was determined that there are approximately 22 hydrants. The age of the hydrants varies throughout town. Most hydrants are in good working condition, but after talks with town personnel, broken hydrants were identified, most notably the hydrant at the south end of 2<sup>nd</sup> St.

Using the map that was provided, multiple hydrants being fed off of 4” watermains were discovered. It is recommended that should a water project take place; consideration be given for replacing all hydrants from 4” to 6” hydrants. This is done to maintain compliance with the SD DANR requirement that hydrants must be connected to a minimum of a 6” line to prevent collapse when connected to a fire truck.

It is recommended that all hydrants be exercised and flushed on an annual basis to prevent seizing and to flush out any stagnant water. The town stated that while they do periodically flush the hydrants, it is not done regularly. Exercising water valves is also a crucial part in the operation and maintenance of a water system. It is essential that a similar program be developed for exercising the valves in the system. Valves within the system vary in their condition and are largely dependent on their age.

### **3.6.2 Water Services**

The Town has expressed some concerns regarding the water services, and malfunctioning water shut offs, which limit their ability to operate their system. Malfunctioning water shut offs are believed to be associated within the existing CIP watermain. The majority of the water services in town are of normal length.

### **3.6.3 Hydraulic Evaluation**

A hydraulic evaluation of the water system was conducted using the KYPipe 2020 hydraulic computer model. This model utilizes the Hazen-Williams formula and commonly accepted friction factors for the pipeline material being considered, to calculate head loss due to pipe friction and resulting flows and pressures. Two types of hydraulic analyses were performed with the KYPipe 2020 hydraulic program to evaluate the Town of Buffalo Gap’s distribution system. The two types of hydraulic analyses are a general system analysis, which provides a snapshot of

the system at the set parameters and fire flow analysis. All analyses were utilized to obtain a complete picture of the existing distribution system and to allow proper recommendations to be made that will improve the existing conditions.

Any hydraulic evaluation can find the existing water system to be inadequate by simply making the requirements very stringent. In the same manner, generally all systems are adequate to meet the average day demands. Deficiencies in a system are typically not apparent until system demands increase to provide the peak day and peak hour flows. The reason for this is that the flow rate in a pipeline significantly affects the downstream pressures. The friction loss, or the pressure loss, in a pipe is a function of the square of the velocity. Therefore, as the flow rate and corresponding velocity in a pipe increase, the resulting friction increases exponentially. As the flow rate increases above two feet per second, the corresponding friction loss begins to climb rapidly with a velocity of five feet per second, generally considered the maximum desired flow rate. As a result, it is common practice to evaluate the overall system deficiencies in a distribution system based on peak hour and peak day flows.

### 3.6.4 Hydraulic Pressure and Flow Analysis

To check the system for low-pressure: fire hydrants at different locations within the system were tested for static pressure, residual pressure and flow rate. Section 7.3.1 of the Recommended Standards for Water Works by the Committee of the Great Lakes, recommends a minimum working pressure for a water system of 35 psi with normal working pressures of 60 to 80 psi. The minimum desired by many residents is 40 psi, as that pressure is typically required to properly operate lawn sprinkler systems. Based on the references above, the recommended pressures for services are shown in Table 3.6.4-1.

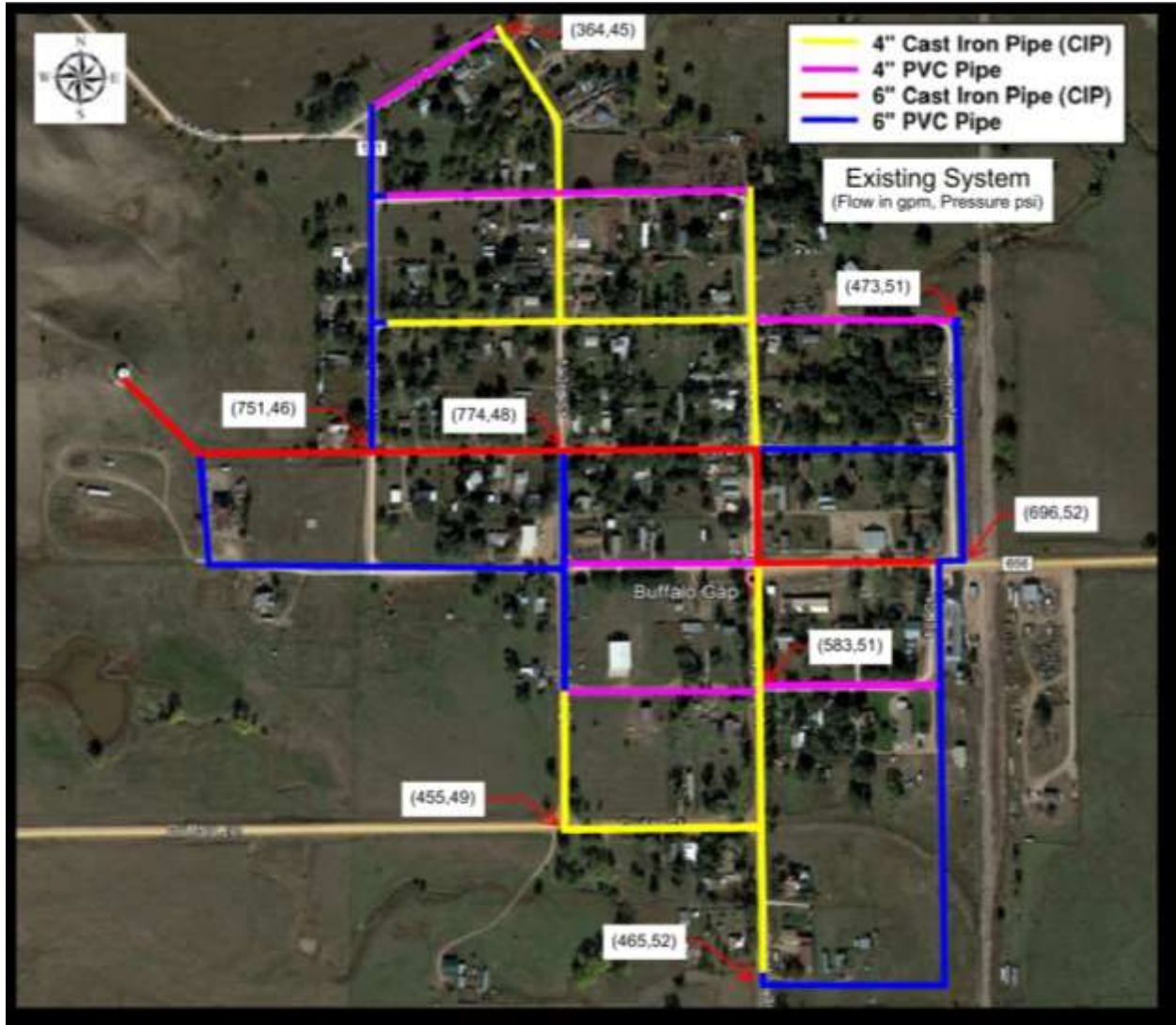
**Table 3.6.4-1 Recommended Pressures**

Condition	Service Pressure Criteria (psi)
Maximum Pressure	60-80
Minimum Pressure During Peak Day	40
Minimum Pressure During Peak Hour	40
Minimum Pressure During Fire Flow	20

The static pressures of the mainlines were recorded on three hydrants at different locations throughout town. Additionally, the pressures at multiple homes and yard spigots were recorded. The highest recorded pressures of 65 – 75 psi were recorded at house and yard spigots in the far south-east corner of town. This corner of town has the greatest elevation difference from the storage tanks, so higher pressures are to be expected. The pressures recorded throughout the rest of town ranged anywhere from 40-52 psi. These pressures fall below the recommended working pressure range of 60-80 psi but still exceed the minimum of 35 psi.

In addition to static pressures, fire flows and residual pressures at different points on the system were recorded. Flow rates from the different hydrants ranged from 425-560 gpm. The flow rates from the hydrants were largely dependent on the size of line the hydrant was on. Two of the hydrants tested were located on 4” lines and produced flow rates of 425 gpm. The 6” hydrant tested resulted in a flow rate of 560 gpm. In all cases that hydrants were open for approximately 5 minutes prior to reading. During this time the flow from the hydrants remained constant and did not begin to diminish after time. Generally, the recommended minimum flow rate required from a hydrant during a fire event is 500 gpm, with a recommended minimum residual working pressure of 20 psi. Along with the flow testing, the residual pressures on the system with an open hydrant were also checked. The residual working pressures recorded in Buffalo Gap ranged from 15-21 psi, or slightly lower than the recommended minimums. The full results from field testing can be found in Appendix C.

Using data from both field testing and the maps, the system was modeled using the KYPipe 2020 program. Figure 3.6.4-1 shows the existing system model with calculated flows and pressures at different hydrants locations. Parameters of the system were altered to model the system to match the field conditions as best as possible. This model will be used to re-analyze the system with proposed improvement alternatives added.



**Figure 3.6.4-1: Existing System Model**

### **3.7 FUTURE CONDITIONS**

Information related to project need and the planning areas are found in Section 3.1 of this report. Specific information on population projections is found in Section 2.3. Land use is not expected to change significantly in the immediate vicinity of the Town. There is some land available for future development and based on the past growth of the community, it is viewed as sufficient to meet community needs.

Due to the importance of conserving water, money and energy, various means for reducing water usage are recommended. By using faucet aerators, reduced flush toilets, and limited flow showerheads, wastewater flow and water use can be reduced and residents should be encouraged to pursue such practices where practicable.

The Town is reminded however, that any projects targeted specifically for future growth will be ineligible for Drinking Water State Revolving Funds. Therefore, should expansion be considered, it can be added to this report but will not be eligible for drinking water funds.

## **4 SAFE DRINKING WATER ACT**

### **4.1 STATE OF THE REGULATIONS**

#### **4.1.1 The SDWA**

The original Safe Drinking Water Act (SDWA) was passed by Congress in 1974 and provided a framework for regulating public water supplies. In 1977, the United States Environmental Protection Agency (EPA) established National Interim Primary Drinking Water Regulations which included federally enforceable Maximum Contaminant Level (MCL) standards for substances known to be hazardous to public health. Secondary Drinking Water Regulations were also established that suggest maximum contaminant levels for selected chemical and physical characteristics which do not directly impact public health, but are known to cause objectionable aesthetic qualities.

The US Congress passed Amendments to the original SDWA in 1986 and 1996 that significantly increased the requirements and have resulted in the promulgation of many new regulations.

Public drinking water must be supplied with a quality which will protect the health and well-being of users. Maintenance of a high standard of living is made possible by the availability of water with the highest quality. However, public health and safety are by no means the only criteria in good water supply management. To be acceptable for public use, water should also have acceptable aesthetic qualities. Potable water is normally appraised by the public on the basis of five water quality factors: taste and odor, appearance, temperature, chemical characteristics and safety. Information for each of the following sections was obtained from the EPA's website.

### **4.2 REGULATION TERMINOLOGY**

Before continuing with this section, it may be beneficial to discuss the terminology EPA utilizes in regulations. Under current regulations, the EPA develops Maximum Contaminant Level Goals (MCLG's), Maximum Contaminant Levels (MCL's), and/or minimum Treatment Technology (TT) requirements. MCLG's are non-enforceable goals that represent the zero-risk level for a given contaminant. MCL's are enforceable standards that take into consideration the

cost of providing treatment and the availability of necessary treatment technology. The implementation of TT may be required when it is not practical to enforce an MCL. The requirement for filtration of surface water supplies is an example of a TT. The SDWA also states that drinking water standards may be established for parameters which adversely affect the odor or appearance of water and consequently may cause a substantial number of people to discontinue using water from the public system.

Public drinking water standards have been grouped according to primary and secondary standards. Primary standards are MCL's or TT requirements intended for public health protection. Secondary standards cover water quality characteristics that may affect the aesthetic quality of the drinking water.

### **4.3 PRIMARY DRINKING WATER STANDARDS**

Tables 4.13-1 through 4.13-4, at the end of this section, summarize primary drinking water standards that are currently in effect. Existing regulations for inorganic compounds (IOC's), volatile organic compounds (VOC's), synthetic organic compounds (SOC's), microbiological contaminants, turbidity and radionuclides are listed. VOC's are lightweight organic compounds which are characterized by their ability to vaporize, or evaporate, easily. SOC's are man-made organic chemicals, many of which have been detected in drinking water. IOC's are chemicals of mineral origin which do not contain carbon in their molecular structure. Current and past samples from the water supply have not shown a violation of any of these parameters.

### **4.4 SECONDARY DRINKING WATER STANDARDS**

Secondary Drinking Water Standards are listed in Table 4.13-5 at the end of this section. Secondary standards pertain to inorganic chemicals and other physical characteristics that are not hazardous to health, but may be objectionable to an appreciable number of persons.

Compliance with secondary standards is not currently mandatory in South Dakota. However, non-compliance with the secondary standards may trigger the DANR to require action sometime in the future. If the DANR receives complaints regarding the aesthetic quality of water, water suppliers may be required to implement a monitoring program to evaluate compliance with secondary standards. If it is determined that physical and/or chemical substances in excess of the secondary drinking water standards are objectionable to an appreciable number of persons and are detrimental to the public

welfare, the DANR may require corrective action to ensure that the public receives the highest quality water practically obtainable.

Overall, the 2019 Drinking Water Report included in Appendix B indicates that Buffalo Gap has a good quality of water.

#### **4.5 DISINFECTANTS/DISINFECTION BY-PRODUCT RULE**

The Disinfectants/Disinfection By-Product Rule (D/DBPR) is being promulgated in two phases in conjunction with the Enhanced Surface Water Treatment Rule. The rule will establish MCL's for disinfectants and disinfection by-products. Disinfection by-products are formed by a reaction between the disinfection and organics that may be in the water.

##### **4.5.1 Stage 1**

The Stage 1 D/DBPR applies to systems of all sizes. The Stage 1 D/DBPR lowered the level of allowable Total Trihalomethanes (TTHM's) from 100 ppb to less than 80 ppb in the finished water, established maximum residual disinfectant level goals (MRDLG's) and maximum residual disinfectant levels (MRDL's) for three chemical disinfectants: chlorine, chloramine and chlorine dioxide. It also established MCLG's and MCL's for TTHM's, haloacetic acids, chlorite and bromate as shown in Table 4.5.1-1.

The final Stage 1 D/DBPR applies to community water systems and non-transient non-community systems, including those serving fewer than 10,000 people, which add a disinfectant to the drinking water during any part of the treatment process.

The final Stage 1 D/DBPR includes the following key provisions:

- MRDLG's for chlorine (4 mg/l), chloramines (4 mg/l), and chlorine dioxide (0.8 mg/l);
- Maximum contaminant level goals (MCLG's) for four trihalomethanes: chloroform (zero), bromodichloromethane (zero), dibromochloromethane (0.06 mg/l), and bromoform (zero); two haloacetic acids: dichloroacetic acid (zero) and trichloroacetic acid (0.3 mg/l); bromate (zero); and chlorite (0.8 mg/l);

- Maximum Residual Disinfectant Levels (MRDL's) for three disinfectants: chlorine (4.0 mg/l), chloramines (4.0 mg/l), and chlorine dioxide (0.8 mg/l);
- MCL's for TTHM's - a sum of the four listed above (0.080 mg/l), haloacetic acids (HAA5) (0.060 mg/l)- a sum of the two listed above plus monochloroacetic acid and mono- and dibromoacetic acids, and two inorganic disinfection byproducts (chlorite (1.0 mg/l)) and bromate (0.010 mg/l));
- TT for removal of disinfection by-product precursor material.

The terms MRDLG and MRDL, which are not included in the SDWA, were created during the negotiations to distinguish disinfectants (because of their beneficial use) from contaminants. The final rule includes monitoring, reporting and public notification requirements for these compounds. This final rule also describes the Best Available Technology (BAT) upon which the MRDL's and MCL's are based.

**Table 4.5.1-1: Stage 1 D/DBPR Levels**

<b>Disinfectant Residual</b>	<b>MRDLP (mg/l)</b>	<b>MRDL (mg/l)</b>	<b>Compliance Based On</b>
Chlorine	4 (as Cl <sub>2</sub> )	4.0 (as Cl <sub>2</sub> )	Annual Average
Chloramine	4 (as Cl <sub>2</sub> )	4.0 (as Cl <sub>2</sub> )	Annual Average
Chlorine Dioxide	0.8 (as ClO <sub>2</sub> )	0.8 (as ClO <sub>2</sub> )	Daily Samples
<b>Disinfectant By-Products</b>	<b>MCLG (mg/l)</b>	<b>MCL (mg/l)</b>	<b>Compliance Based On</b>
Total trihalomethanes (TTHM) <sup>1</sup>	N/A	0.08	Annual Average
-Chloroform	0		
-Bromodichloromethane	0		
-Dibromochloromethane	0.06		
-Bromoform	0		
Haloacetic acid (five) (HAA5) <sup>2</sup>	N/A	0.06	Annual Average
-Dichloroacetic acid	0		
-Trichloroacetic acid	0.03		
Chlorite	0.8	1	Monthly Average
Bromate	zero	0.01	

N/A – Not applicable because there are individual MCLG’s to TTHM’s or HAA’s

- 1 TTHM is the sum of the concentrations of chloroform, bromochloromethane, dibromochloromethane, and bromoform.
- 2 HAA5 is the sum of the concentrations of mono-, di-, and trichloroacetic acids and mono- and dibromoacetic acids.

#### **4.6 OPERATOR CERTIFICATION**

The 1996 SDWA Amendments require the EPA, in cooperation with States, to publish guidelines specifying minimum standards for certification and recertification of the operators of community and non-transient, non-community public water systems. Final guidelines were published on February 5, 1999, to provide States with these minimum standards.

Buffalo Gap’s Water and Sewer Operator is certified. The Town is reminded that they are required to have certified operators and continuing education and recertification classes are essential for their operators.

#### **4.7 CONSUMER CONFIDENCE REPORT REGULATIONS**

Another rule recently promulgated is the Consumer Confidence Report (CCR) to require water systems to give consumers an annual report on the quality of their drinking water. In South Dakota, all community water systems must distribute their Annual Water Quality Report and the DANR must receive a copy of this report by July 1 of each year. These reports will include practical information for consumers that will empower them to make informed personal choices about drinking water based on the report's summary of current conditions. The information must include the following:

- The source of the drinking water;
- A brief summary of the susceptibility to contamination the source may have based on assessments the state is completing;
- How to get a copy of the water system's complete source water assessment;
- The level of any contaminant found in the local drinking water and the EPA maximum contaminant level for comparison;
- The potential health effects of any contaminant detected in violation of an EPA health standard and the system actions to restore safe drinking water;
- The water system's compliance with other drinking water related rules;
- Educational information on nitrate, arsenic, or lead in areas where these contaminants are detected; and
- Phone numbers of additional sources of information.

A copy of the 2019 and 2020 Annual Drinking Water Reports are provided in Appendix C.

#### **4.8 CAPACITY DEVELOPMENT GUIDANCE**

The 1996 Amendments to the SDWA create a focus on enhancing and ensuring the technical, financial and managerial capacity of water systems to comply with National Primary Drinking Water Regulations (NPDWR). To avoid reduction in its Drinking Water State Revolving Funds (DWSRF) allotment, each State was required to obtain legal authority or other means to ensure that new systems have adequate capacity and to develop and implement a strategy to assist existing systems in acquiring and maintaining capacity.

South Dakota has put together Capacity Assessment Worksheets for Public Water Systems. These worksheets are to be filled out by systems applying for a Drinking Water State Revolving Loan. Once completed and submitted, the DANR utilizes the information supplied to determine if the system has the technical, managerial and financial capacity to continue owning and operating the water system.

#### **4.9 LEAD AND COPPER RULE REVISIONS**

On January 12, 2000, the EPA published minor revisions to the 1991 Lead and Copper Rule (LCR). These revisions streamline and reduce the monitoring and reporting burden and address implementation problems and issues arising from legal challenges.

The EPA has also developed guidance for states to carry out the rule. In November 2004, the EPA published additional guidance for states and utilities that clarifies several requirements of the regulations. This guidance was developed to respond to issues identified during the EPA's national review of implementation of the rule.

#### **4.10 RADON RULE**

The 1996 SDWA Amendments required the EPA to establish several new, health-based drinking water regulations, including a multimedia approach to address the public health risks from radon. The EPA proposed new regulations to reduce the public health risks from radon on November 2, 1999.

The SDWA Amendments require the EPA to establish an "alternative MCL" (in addition to the MCL) if the MCL is set at a level "more stringent than necessary to reduce the contribution to radon in indoor air from drinking water to a concentration that is equivalent to the national average concentration of radon in outdoor air." The level of the alternative MCL is linked to average outdoor radon levels. If an alternative MCL is established, the EPA must publish guidelines for States to develop multimedia radon mitigation programs. Water systems may comply with the alternative MCL in a State that submits a multimedia radon program that is approved by the EPA.

#### **4.11 RADIONUCLIDES**

The Radon Rule was to be finalized and issued in August 2000, but was delayed. The proposed MCL for radon is 300 pCi/L. An alternative MCL is proposed at 4,000 pCi/L which would apply if the utility has a comprehensive program to lower indoor air radon.

#### **4.12 ARSENIC**

On January 22, 2001, EPA adopted a new standard for arsenic in drinking water at 10 ppb, replacing the old standard of 50 ppb. The rule became effective on February 22, 2002. The date by which systems had to begin compliance with the new 10 ppb standard was January 23, 2006. The Town's tests do not indicate a presence of arsenic.

#### **4.13 GROUND WATER RULE**

The EPA has developed the ground water rule (GWR) which was published in final form on November 8, 2006. The GWR addresses the concern regarding the contamination of drinking water by disease-causing microorganisms. The Ground Water Rule is composed of a risk-based approach with four components:

1. Periodic sanitary surveys should be completed on systems that require the evaluation of a public water system and the identification of significant deficiencies. The evaluation should be made on the following:
  - a. Sources
  - b. Finished water storage
  - c. Treatment
  - d. System management and operation
  - e. Distribution system
  - f. Pumps, pump facilities and controls
  - g. Monitoring, reporting and data verification
  - h. Operator compliance with State requirements
2. Triggered source water monitoring is required when a system identifies a positive sample during its Total Coliform Rule monitoring.
3. The Town shall make corrective action for any system with a significant deficiency or source water fecal contamination.
4. The Town shall monitor the corrective action to ensure that treatment technology installed reliably achieves 99.99 percent (4-log) inactivation and/or removal of viruses.

**Table 4.13-1: Inorganic Chemicals – National Primary Drinking Water Regulations**

Contaminant	Tests (mg/l)	MCLG <sup>1</sup> (mg/l)	MCL <sup>2</sup> (mg/l)	Potential Health Effects <sup>3</sup>
Antimony		0.006	0.006	Increase in blood cholesterol; decrease in blood glucose
Arsenic		0	0.01	Skin damage; circulatory system problems; increased risk of cancer
Asbestos (fiber>10 micrometers)		7 million fibers / l	7 MFL	Increased risk of developing benign intestinal polyps
Barium		2	2	Increase in blood pressure
Beryllium		0.004	0.004	Intestinal lesions
Cadmium		0.005	0.005	Kidney damage
Chromium (total)		.01	0.1	Allergic dermatitis
Copper		1.3	TT	Short term exposure: stomach or intestinal problem; Long term exposure: liver or kidney disease
Cyanide (as free cyanide)		0.2	0.2	Nerve damage or thyroid problems
Fluoride		4.0	4.0	Bone disease (pain and tenderness)
Lead		15	TT	Infants and children: Delays in physical or mental development; slight deficits in attention span and learning abilities; Adults: kidney problems, high blood pressure
Inorganic Mercury		0.002	0.002	Kidney damage
Nitrate (measured as Nitrogen)		10	10	“Blue Baby Syndrome” in infants under six months - <b>Life threatening w/o immediate attn.</b>
Nitrite (measured as Nitrogen)		1	1	“Blue Baby Syndrome” in infants under six months - <b>Life threatening without immediate attention.</b>
Selenium		0.05	0.05	Hair or fingernail loss; numbness in fingers or toes; circulatory problems
Thallium		0.0005	0.002	Hair loss; changes in blood; intestine, or liver problems
Turbidity		NA	TT	Turbidity has no health effects, but can interfere with disinfection and provide a medium for microbial growth. It may indicate the presence of microbes.

1 Maximum contaminant level goal

2 Maximum contaminant level. TT indicates treatment technique requirement rather than contaminant level.

3 Based on EPA ODW Publication 4607, June 1998

**Table 4.13-2: VOC'S – National Primary Drinking Water Regulations**

<b>Contaminant</b>	<b>Tests (mg/l)</b>	<b>MCLG<sup>1</sup> (mg/l)</b>	<b>MCL<sup>2</sup> (mg/l)</b>	<b>Potential Health Effects<sup>3</sup></b>
Benzene		0	0.005	Anemia; decrease in blood platelets; increased risk of cancer
Carbon tetrachloride		0	0.005	Liver problems; increased risk of cancer
Chlorobenzene		0.1	0.1	Liver or kidney problems
o-Dichlorobenzene		0.6	0.6	Liver, kidney, or circulatory system prob.
p-Dichlorobenzene		0.075	0.075	Anemia; liver, kidney, or spleen damage; changes in blood
1,2-Dichloroethane		0	0.005	Increased risk of cancer
1,1-Dichloroethylene		0.007	0.007	Liver problems
cis-1,2-Dichloroethylene		0.07	0.07	Immune system problems
trans-1,2-Dichloroethylene		0.1	0.1	Liver or immune system problems
Dichloromethane		0	0.005	Liver problems; increased risk of cancer
1,2-Dichloropropane		0	0.005	Increased risk of cancer
Ethylbenzene		0.7	0.7	Liver or kidney problems
Styrene		0.1	0.1	Liver, kidney, and blood problems
Tetrachloroethylene		0	0.005	Liver problems; increased risk of cancer
Toluene		1	1	Nervous system, kidney, or liver problems
TTHM (Total Trihalomethanes)		0	0.08	Liver, kidney, or central nervous system problems; increased risk of cancer
1,2,4-Trichlorobenzene		0.07	0.07	Changes in adrenal glands
1,1,1-Trichloroethane		0.20	0.2	Liver, nervous system, or circulatory prob.
1,1,2-Trichloroethane		0.003	0.005	Liver, kidney, or immune system problems
Trichloroethylene		0	0.005	Liver problems; increased risk of cancer
Vinyl chloride		0	0.002	Increased risk of cancer
Xylenes (total)		10	10	Nervous system damage

**Table 4.13-3: SOC'S - National Primary Drinking Water Regulations**

Contaminant	Tests (mg/l)	MCLG <sup>1</sup> (mg/l)	MCL <sup>2</sup> (mg/l)	Potential Health Effects <sup>3</sup>
Acrylamide		0	TT	Nervous system or blood problems; increased risk of cancer
Alachlor		0	0.002	Eye, liver, kidney, or spleen problems; anemia; increased risk of cancer
Atrazine		0.003	0.003	Weight loss; cardiovascular system problems; reproductive difficulties
Benzo(a)pyrene		0	0.005	Reproductive difficulties; increased risk of cancer
Carbofuran		0.04	0.04	Problems with blood, nervous system, or reproductive system
Chlordane		0	0.002	Blood or nervous system problems; increased risk of cancer
2,4-D		0.07	0.07	Kidney, liver, or adrenal gland problems
Dalapon		0.2	0.2	Minor kidney changes
1,2-Dibromo-3-chloropropane (DBCP)		0	0.0002	Reproductive problems; increased risk of cancer
Di(2-ethylhexyl)adipate		0.4	0.4	General toxic or reproductive difficulties
Di(2-ethylhexyl)phthalate		0	0.006	Adverse reproductive effects; increased risk of cancer
Dinoseb		0.007	0.007	Reproductive difficulties
Dioxin (2,3,7,8-TCDD)		0	0.00000003	Reproductive difficulties; increased risk of cancer
Diquat		0.02	0.02	Cataracts
Endothall		0.1	0.1	Stomach and intestinal problems
Endrin		0.002	0.002	Nervous system effects; convulsions
Epichlorohydrin		0	TT	Stomach problems; increased risk of cancer
Ethylene dibromide		0	0.00005	Stomach, kidney, or reproductive system problems; increased risk of cancer
Glyphosate		0.7	0.7	Kidney problems; adverse reproductive effects
Heptachlor		0	0.0004	Liver damage; increased risk of cancer
Heptachlor epoxide		0	0.0002	Liver damage; increased risk of cancer

**Table 4.13-3, Continued:**

Contaminant	Tests (mg/l)	MCLG <sup>1</sup> (mg/l)	MCL <sup>2</sup> (mg/l)	Potential Health Effects <sup>3</sup>
Hexachlorobenzene		0	0.001	Liver or kidney problems; adverse reproductive effects; increased risk of cancer
hexachlorocyclopentadiene		0.05	0.05	Kidney problems
Lindane		0.0002	0.0002	Liver or kidney problems; increased risk of cancer
Methoxychlor		0.04	0.04	Reproductive difficulties
Oxamyl (vydate)		0.2	0.2	Slight nervous system effects
Polychlorinated biphenyls (PCBs)		0	0.0005	Skin changes; thymus gland problems; immune deficiencies; reproductive or nervous system difficulties; increased risk of cancer
Pentachlorophenol		0	0.001	Liver or kidney problems; increased risk of cancer
Picloram		0.5	0.5	Liver problems
Simazine		0.004	0.004	Problems with blood
Toxaphene		0	0.003	Kidney, liver, or thyroid problems; increased risk of cancer
2,4,5-TP (Silvex)		0.05	0.05	Liver problems

**Table 4.13-4: Radionuclides - National Primary Drinking Water Regulations**

Contaminant	Tests (mg/l)	MCLG <sup>1</sup> (mg/l)	MCL <sup>2</sup> (mg/l)	Potential Health Effects <sup>3</sup>
Beta particles and photon emitters		0	4 millirems per year	Increased risk of cancer
Gross alpha particle activity		0	15 pCi/L	Increased risk of cancer
Radium 226 & Radium 228 (combined)		0	5 pCi/L	Increased risk of cancer

Note: pCi/L - picocuries per Liter

**Table 4.13-5: National Secondary Drinking Water Regulations**

<b>Contaminants</b>	<b>Tests (mg/l)</b>	<b>Standards</b>
Aluminum		0.05 - 0.2 mg/l
Chloride		250 mg/l
Color		15 (color units)
Copper		1.0 mg/l
Corrosivity		non-corrosive
Fluoride		2.0 mg/l
Foaming Agents		0.5 mg/l
Iron		0.3 mg/l
Manganese		0.05 mg/l
Odor		3 threshold odor number
pH		6.5 - 8.5
Silver		0.10 mg/l
Sulfate		250 mg/l
Total Dissolved Solids (TDS)		500 mg/l
Zinc		5 mg/l

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## **5 DEVELOPMENT AND EVALUATION OF WATER ALTERNATIVES**

The alternatives developed for the Town of Buffalo Gap were composed to demonstrate some options available to fix the identified deficiencies in the water system.

### **5.1 CAUTIONARY NOTES CONCERNING COST ESTIMATES**

The opinions of probable cost provided with the following alternatives reflect the anticipated costs for administration, engineering design, construction, contingencies, construction observation, and other costs related to completion of the project. The costs, as presented, are based on an analysis and comparison of projects of similar size and scope. The actual construction and project costs will vary on an individual project basis. The actual bid cost will reflect the bidder's evaluation of construction problems, weather, soils and difficulty of work. Thus, the engineer cannot be held responsible for the accuracy of the estimates made in this report, as the engineer has no control over the contractors' bid costs.

Changes in materials, equipment and energy costs, as well as availability of other construction work at the time of the bid opening, could substantially influence actual project cost.

Construction costs will also vary somewhat based on the quantity of items necessary to construct the project. The quantities and costs contained in this report are preliminary estimates based on our best judgment without field measurements. Final quantities and opinions of probable cost and final construction costs must be based upon final design.

Different funding sources have different requirements for some non-construction items. Therefore, actual costs of non-construction items should be considered tentative at this time and subject to later modifications and adjustments as current situations and funding sources dictate. Further, inasmuch as the period of construction cannot be accurately predicted, the costs as presented in this report have not been adjusted to reflect projected inflation factors. Therefore, it is important that the estimate of costs as presented be reviewed and updated periodically to reflect construction cost trends.

### **5.2 EQUIVALENT UNIFORM ANNUAL COST**

The alternatives relating to Buffalo Gap's water system that were evaluated are described in the following sections. In addition to an opinion of cost for each alternative discussed in this section, a breakdown of the estimated equivalent uniform annual cost (EUAC) is also given. The

EUAC not only takes the capital costs into account when evaluating the options but also looks at the salvage value of the components and the expected annual operation and maintenance costs. The result is a comparison of the alternatives on an overall basis throughout a design life of 30 years. As a result, the EUAC may show that the lowest capital cost alternative is not the lowest cost alternative. This situation would occur when options have a low capital cost but high operation and maintenance costs. The terms and values utilized in performing the EUAC are given in Table 5.2-1.

**Table 5.2-1 EUAC**

<b>Term</b>	<b>Definition</b>	<b>Value Used</b>
Interest = I	Annual interest rate	2.50%
Salvage Value = SV	Value of component at end of 20-year design life	0% or 50%
Present Worth = PW	Present worth (equal to opinion of cost for that item)	Variable
Net Present Worth of Salvage Value = PWSV	Present worth of salvage value	47.7%
Net Present Worth of Capital Costs = NPW	Present worth less the present worth of the salvage value	Variable
Net Present Worth of Annual Costs	Present worth of annual costs over the 20-year design life	2090%
Equivalent Uniform Annual Costs = EUAC	Annual cost of total present worth of capital and annual costs	4.78%
Design Life	Length of time facilities are projected to operate and/or meet design parameters	30 years

### **5.3 WATER SOURCE**

As discussed in Section 3.1, the Town of Buffalo Gap has two sources available for public drinking water. The town currently receives its water from one of two Town owned wells located near the ground storage tank. Another source of drinking water that is available is the Fall River Water User District (FRWUD). A copy of the annual drinking water report can be found in Appendix B

### **5.3.1 Water Source Alternative 1: Do Nothing**

The first alternative for water source improvements is to do nothing. This alternative is not recommended. Either the current wells need some maintenance or a new source of water is needed. Both of these alternatives will be evaluated further in the next sections. As a result, the “Do Nothing” alternative is not considered as an acceptable alternative.

### **5.3.2 Water Source Alternative 2: Treatment Improvements**

The second alternative would be to consider updating the current wells and using them to supply the town with water. If the town were to decide to utilize the wells, an updated treatment system would likely be needed to treat the water to an acceptable state. This alternative would require updates, annual maintenance and upkeep to an already functioning system. This could also include the treatment of Uranium in the water. The most common method of treatment is reverse osmosis. Reverse osmosis is a purification that is used to remove the majority of contaminants from the water. This is accomplished by pushing the water, under pressure, through a semi-permeable membrane. This alternative would allow the town to continue to operate their system and improve water quality. This does come at a high cost. Municipal applications for reverse osmosis systems come in many sizes and configurations. A very basic system will likely cost over \$200,000 and require maintenance. Given the size of the town and needs of the community, this alternative is not the best alternative for the future of Buffalo Gap.

### **5.3.3 Water Source Alternative 3: Turn Water System Over to Fall River Water Users District**

This alternative would change the source of water from their existing wells over to FRWUD. This alternative would eliminate the town’s water revenue. Before FRWUD would take over the system, it would be recommended that the suggested alternatives in this study be completed. After a discussion with FRWUD, the system would not likely be accepted without the recommended alternatives being completed.

### **5.3.4 Water Source Alternative 4: Buy Water from Fall River Water Users District as a Bulk Consumer**

This alternative would change the source of water from their existing wells over to FRWUD.

This alternative would not eliminate the town's water revenue. The Town of Buffalo Gap would purchase the water as a bulk rate user and distribute the water to its residents. This alternative has the potential to benefit both the town and the district. FRWUD would be able to sell more water and also use the ground storage for pressure in the system. The Town would be able to sell the bulk water to its residents while keeping the revenue. FRWUD does not currently have a bulk rate but may be interested in the possibility. They said that the cost of water is \$3.00/1,000 gallons.

## **5.4 WATER STORAGE**

The following deficiencies have been identified regarding the existing water storage facilities:

- Ground Storage
  - Relatively good exterior condition
    - Repairs recommended: install corrosion resistant mesh on overflow, correct the discharge to a height of 12"-24" above splash plate, monitor/ repair of both the roof vent and corrosion.
  - Would benefit having a SCADA system.
- Underground Storage
  - Unknown condition
    - Repairs recommended: install corrosion resistant mesh on overflow, correct the discharge to a height of 12"-24" above rip rap, weather stripping around access hatch which is not 24" above ground level and has the wrong lid type, monitor/ repair of corrosion.
  - Would benefit having a SCADA system
- Miscellaneous
  - Secondary containment for chlorine
  - Uranium disinfection is needed
  - Master pump needs calibration and monitoring

The existing storage tanks need to be on a regular cleaning and inspection schedule.

#### **5.4.1 Water Storage Alternative 1: Do Nothing**

It is important that the Town maintain their water storage facilities in order to mitigate any severe and costly repairs. Do Nothing Alternative is a viable option at this time based on visual observations and maintenance records, however, should inspection indicate the need for additional repairs or ultimately, replacement of one or both of the storage tanks, this alternative should be revisited.

#### **5.4.2 Water Storage Alternative 2: Ground Storage Miscellaneous Improvements.**

As discussed earlier in the report, the existing ground storage is in relatively good condition. As noted in the last inspection, there are a few minor upgrades that should be taken care of. These are minimal improvements that can be easily corrected by the Town.

#### **5.4.3 Water Storage Alternative 3: Below Grade Storage Miscellaneous Improvements**

As discussed earlier in the report, the existing below grade storage is in relatively good condition. As noted in the last inspection, there are a few minor upgrades that should be taken care of. These are minimal improvements that can be easily corrected by the Town. Both of these structures should be cleaned and inspected every 3 years.

### **5.5 WATER DISTRIBUTION SYSTEM**

The negative characteristics of the Town's water distribution system are summarized below:

- The system is comprised of CIP that was installed in the 1960's. This pipe has outlived its design life expectancy and has become brittle and very susceptible to breaks due to frost movement and water leaks. The CIP pipe is also likely to have deposits along the pipe making the actual size much less. The 4" CIP is likely necked down much less than the nominal inside diameter.
- The 4" watermain's decreased inside diameter greatly reduce the overall flow rates throughout the system and are susceptible to possible vacuum collapse if fire hydrants are used improperly.
- The existing hydrants are original to the system and some are non-repairable and in poor working condition.

### **5.5.1 Water Distribution Alternative 1: Do Nothing**

The first water distribution alternative that was considered is the “Do Nothing” alternative. As the watermain remains in use past its design life, additional blocks will continue to have catastrophic failures resulting in budgetary challenges, as watermain is repaired and replaced on an emergency basis. In addition the 4” CIP watermain reduces flow and water quality. For this reason this “Do Nothing” alternative is not considered as an acceptable alternative.

### **5.5.2 Water Distribution Alternative 2: Cast Iron Pipe Replacement**

This alternative will address the known deficiencies within the system as related to the existing CIP watermain. This will provide a boost to the water system flows and assist in the future integrity of the system. The estimated project cost and EUAC are shown in Tables 5.5.2-1 and 5.5.2-2 respectively. Also included is Figure 5.5.2-1 which shows the calculated flow rate after the proposed system upgrades.



**Figure 5.5.2-1: Cast Iron Replacement System Model**

**Table 5.5.2-1: Water Distribution System Alternative 2: Opinion of Project Cost**

<b>Item</b>	<b>Description</b>	<b>Quantity</b>		<b>Unit Price</b>	<b>Total Cost</b>
1	Mobilization	1	LS	\$153,300.00	\$153,300.00
2	Remove, Stockpile and Relay Street Surfacing	16,200	SqYd	\$12.00	\$194,400.00
3	6" PVC Watermain	8,500	Ft	\$65.00	\$552,500.00
4	6" Gate Valve	30	Each	\$2,000.00	\$60,000.00
5	DI Fitting	30	Each	\$1,500.00	\$45,000.00
6	Connect to Existing Watermain	20	Each	\$2,000.00	\$40,000.00
7	Fire Hydrant w/ Steamer	20	Each	\$5,000.00	\$100,000.00
8	1" PE Water Service Pipe	2,400	Ft	\$50.00	\$120,000.00
9	Saddle w/ 1" Corporation Stop	60	Each	\$700.00	\$42,000.00
10	1" Curbstop w/ Box	60	Each	\$700.00	\$42,000.00
11	Connect to Existing Water Service	60	Each	\$600.00	\$36,000.00
12	Bedding Material	1800	Tons	\$18.00	\$32,400.00
13	Gravel Base Course (10")	9,100	Tons	\$24.00	\$218,400.00
14	Traffic Control	1	LS	\$20,000.00	\$20,000.00
15	Storm Water Pollution Prevention Plan	1	LS	\$8,000.00	\$8,000.00
16	Exploratory Excavation/Potholing	20	Hours	\$500.00	\$10,000.00
17	Topsoil, Seed, Fertilize & Mulch	2.0	Acres	\$6,000.00	\$12,000.00
Construction Subtotal					\$1,686,000.00
Contingencies (15%)					\$253,000.00
Construction Total					\$1,939,000.00
Design Engineering					\$131,500.00
Bidding and Contract Documents					\$15,000.00
Construction Engineering					\$164,400.00
Administration & Legal					\$20,000.00
<b>Total Project Cost</b>					<b>\$2,269,900.00</b>

**Table 5.5.2-2 Water Distribution Alternative 2: EUAC**

<b>Item</b>	<b>Cost</b>	<b>SV</b>	<b>PW SV</b>	<b>NPW</b>
Mobilization	\$153,300.00	\$0.00	\$0.00	\$153,300.00
Remove, Stockpile and Relay	\$194,400.00	\$0.00	\$0.00	\$194,400.00
Street Surfacing				
6" PVC Watermain	\$552,500.00	\$331,500.00	\$126,993.57	\$425,506.43
6" Gate Valve	\$60,000.00	\$36,000.00	\$13,791.16	\$46,208.84
DI Fitting	\$45,000.00	\$27,000.00	\$10,343.37	\$34,656.63
Connect to Existing Watermain	\$40,000.00	\$0.00	\$0.00	\$40,000.00
Fire Hydrant w/ Steamer	\$100,000.00	\$60,000.00	\$22,985.26	\$77,014.74
1" PE Water Service Pipe	\$120,000.00	\$72,000.00	\$27,582.31	\$92,417.69
Saddle w/ 1" Corporation Stop	\$42,000.00	\$25,200.00	\$9,653.81	\$32,346.19
1" Curbstop w/ Box	\$42,000.00	\$25,200.00	\$9,653.81	\$32,346.19
Connect to Existing Water Servic	\$36,000.00	\$0.00	\$0.00	\$36,000.00
Bedding Material	\$32,400.00	\$19,440.00	\$7,447.22	\$24,952.78
Gravel Base Course (10")	\$218,400.00	\$131,040.00	\$50,199.81	\$168,200.19
Traffic Control	\$20,000.00	\$0.00	\$0.00	\$20,000.00
Storm Water Pollution Prevention Plan	\$8,000.00	\$0.00	\$0.00	\$8,000.00
Exploratory Excavation/Potholing	\$10,000.00	\$0.00	\$0.00	\$10,000.00
Topsoil, Seed, Fertilize & Mulch	\$12,000.00	\$0.00	\$0.00	\$12,000.00
Capital Costs	\$583,900.00	\$350,340.00	\$134,210.94	\$449,689.06
<b>Total Construction Cost</b>	<b>\$2,269,900.00</b>	<b>\$1,077,720.00</b>	<b>\$412,861.26</b>	<b>\$1,857,038.74</b>

**B. Operation and Maintenance Costs for Proposed Construction**

<b>Item</b>	<b>Annual Cost</b>	<b>NPW</b>
Labor	\$10,000.00	\$189,819.17
Materials	\$5,000.00	\$94,909.59
Miscellaneous	\$1,500.00	\$28,472.88
<b>Subtotal</b>	<b>\$16,500.00</b>	<b>\$313,201.64</b>

**C. Equivalent Uniform Annual Cost**

NPW Construction Cost	\$1,857,038.74
NPW of O & M Costs	\$313,201.64
<b>Total Net Present Worth</b>	<b>\$2,170,240.38</b>
<b>Equivalent Uniform Annual Cost</b>	<b>\$114,331.99</b>

**5.5.3 Water Distribution Alternative 3: Cast Iron and 4" PVC Pipe Replacement**

This alternative will address the known deficiencies within the system as related to the existing CIP watermain and 4" PVC watermains. This will provide a further boost to the water system

flows and assist in the future integrity of the system. This will give the town the availability to pump off the 6” hydrants in the event of a fire. The estimated project cost and EUAC are shown in Tables 5.5.3-1 and 5.5.3-2 respectively. Also included is Figure 5.5.3-1 which shows the calculated flow rate after the proposed system upgrades.



**Figure 5.5.3-1: Proposed Watermain Improvements**

**Table 5.5.3-1: Water Distribution System Alternative 3: Opinion of Project Cost**

<b>Item</b>	<b>Description</b>	<b>Quantity</b>	<b>Unit Price</b>	<b>Total Cost</b>
1	Mobilization	1	LS	\$216,100.00
2	Remove, Stockpile and Relay Street Surfacing	23,900	SqYd	\$12.00
3	6" PVC Watermain	12,500	Ft	\$65.00
4	6" Gate Valve	50	Each	\$2,000.00
5	DI Fitting	40	Each	\$1,500.00
6	Connect to Existing Watermain	2	Each	\$2,000.00
7	Fire Hydrant w/ Steamer	20	Each	\$5,000.00
8	1" PE Water Service Pipe	3,680	Ft	\$50.00
9	Saddle w/ 1" Corporation Stop	92	Each	\$700.00
10	1" Curbstop w/ Box	92	Each	\$700.00
11	Connect to Existing Water Service	92	Each	\$600.00
12	Bedding Material	2700	Tons	\$18.00
13	Gravel Base Course (10")	13,400	Tons	\$24.00
14	Traffic Control	1	LS	\$20,000.00
15	Storm Water Pollution Prevention Plan	1	LS	\$8,000.00
16	Exploratory Excavation/Potholing	20	Hours	\$500.00
17	Topsoil, Seed, Fertilize & Mulch	3.0	Acres	\$7,000.00
Construction Subtotal				\$2,376,600.00
Contingencies (15%)				\$357,000.00
Construction Total				\$2,733,600.00
Design Engineering				\$177,300.00
Bidding and Contract Documents				\$15,000.00
Construction Engineering				\$221,600.00
Administration & Legal				\$28,000.00
<b>Total Project Cost</b>				<b>\$3,175,500.00</b>

**Table 5.5.3-2 Water Distribution Alternative 3: EUAC**

<b>Item</b>	<b>Cost</b>	<b>SV</b>	<b>PW SV</b>	<b>NPW</b>
Mobilization	\$216,100.00	\$0.00	\$0.00	\$216,100.00
Remove, Stockpile and Relay Street Surfacing	\$286,800.00	\$0.00	\$0.00	\$286,800.00
6" PVC Watermain	\$812,500.00	\$487,500.00	\$186,755.25	\$625,744.75
6" Gate Valve	\$100,000.00	\$60,000.00	\$22,985.26	\$77,014.74
DI Fitting	\$60,000.00	\$36,000.00	\$13,791.16	\$46,208.84
Connect to Existing Watermain	\$4,000.00	\$0.00	\$0.00	\$4,000.00
Fire Hydrant w/ Steamer	\$100,000.00	\$60,000.00	\$22,985.26	\$77,014.74
1" PE Water Service Pipe	\$184,000.00	\$110,400.00	\$42,292.88	\$141,707.12
Saddle w/ 1" Corporation Stop	\$64,400.00	\$38,640.00	\$14,802.51	\$49,597.49
1" Curbstop w/ Box	\$64,400.00	\$38,640.00	\$14,802.51	\$49,597.49
Connect to Existing Water Serv	\$55,200.00	\$0.00	\$0.00	\$55,200.00
Bedding Material	\$48,600.00	\$29,160.00	\$11,170.84	\$37,429.16
Gravel Base Course (10")	\$321,600.00	\$192,960.00	\$73,920.60	\$247,679.40
Traffic Control	\$20,000.00	\$0.00	\$0.00	\$20,000.00
Storm Water Pollution Prevention Plan	\$8,000.00	\$0.00	\$0.00	\$8,000.00
Exploratory Excavation/Potholing	\$10,000.00	\$0.00	\$0.00	\$10,000.00
Topsoil, Seed, Fertilize & Mulch	\$21,000.00	\$0.00	\$0.00	\$21,000.00
Capital Costs	\$798,900.00	\$479,340.00	\$183,629.25	\$615,270.75
<b>Total Construction Cost</b>	<b>\$3,175,500.00</b>	<b>\$1,532,640.00</b>	<b>\$587,135.51</b>	<b>\$2,588,364.49</b>

**B. Operation and Maintenance Costs for Proposed Construction**

<b>Item</b>	<b>Annual Cost</b>	<b>NPW</b>
Labor	\$10,000.00	\$189,819.17
Materials	\$5,000.00	\$94,909.59
Miscellaneous	\$1,500.00	\$28,472.88
<b>Subtotal</b>	<b>\$16,500.00</b>	<b>\$313,201.64</b>

**C. Equivalent Uniform Annual Cost**

NPW Construction Cost	\$2,588,364.49
NPW of O & M Costs	\$313,201.64
<b>Total Net Present Worth</b>	<b>\$2,901,566.13</b>
<b>Equivalent Uniform Annual Cost</b>	<b>\$152,859.49</b>

## **6 SELECTION OF ALTERNATIVES**

### **6.1 WATER SOURCE**

#### **6.1.1 Water Source Alternative #1 “Do Nothing”**

The first alternative for water source improvements is to do nothing. This alternative is not recommended. The quality of water is not meeting the standards of the community. As a result, the “Do Nothing” alternative is not considered as an acceptable alternative.

#### **6.1.2 Water Source Alternative #2 Treatment Improvements**

The second alternative would be to update the current wells and use them to supply the town with water. If the town were to decide to utilize the wells, an updated treatment system would likely be needed to treat the water to an acceptable state. This alternative would require updates, annual maintenance and upkeep to an already functioning system. This could also include the treatment of Uranium in the water. This alternative would allow the town to continue to operate their system and improve water quality. This is a viable option but is not recommended.

#### **6.1.3 Water Source Alternative #3 Turn System Over to Fall River Water Users District**

The third alternative would change the source of water from their existing wells over to FRWUD. This alternative would eliminate the town’s water revenue. Before FRWUD would take over the system, the existing infrastructure would need to be overhauled. After a discussion with FRWUD, the system would not likely be accepted without the recommended alternatives being completed. This alternative is viable but not recommended.

#### **6.1.4 Water Source Alternative #4 Buy Water from Fall River Water Users District as a Bulk Consumer**

This alternative would change the source of water from their existing wells over to FRWUD. This alternative would not eliminate the town’s water revenue. The Town of Buffalo Gap would purchase the water as a bulk rate user and distribute the water to its residents. The Town would

be able to sell the bulk water to its residents while keeping the revenue. For approximately \$5,000 per year, the water could be provided by FRWUD.

## **6.2 WATER STORAGE**

### **6.2.1 Water Storage Alternative #1 Do Nothing**

The Do Nothing Alternative is a viable option at this time based on visual observations and maintenance records, however, should inspection indicate the need for additional repairs or ultimately, replacement of one or both of the storage tanks, this alternative should be revisited.

### **6.2.2 Water Storage Alternative 2: Ground Storage Miscellaneous Improvements.**

As discussed earlier in the report, the existing ground storage is in relatively good condition. As noted in the last inspection, there are a few minor upgrades that should be taken care of. These are minimal improvements that can be easily corrected by the Town. The ground storage tank could be cleaned and inspected every 3 years.

### **6.2.3 Water Storage Alternative 3: Below Grade Storage Miscellaneous Improvements**

As discussed earlier in the report, the existing below grade storage is in relatively good condition and is no longer in use. As noted in the last inspection, there are a few minor upgrades that should be taken care of. These are minimal improvements that can be easily corrected by the Town. The below grade storage tank could be cleaned and inspected every 3 years if it was going to be brought into service in the future.

## **6.3 WATER DISTRIBUTION**

### **6.3.1 Water Distribution Alternative #1 Do Nothing**

As the watermain remains in use past its design life, additional blocks will continue to have catastrophic failures resulting in budgetary challenges, as watermain is repaired and replaced on an emergency basis. In addition the 4" CIP watermain reduces flow and water quality. For this reason this "Do Nothing" alternative is not considered as an acceptable alternative.

### 6.3.2 Water Distribution Alternative #2 Cast Iron Pipe Replacement

This alternative will address most of the known deficiencies within the system as related to the existing CIP watermain. This will provide a boost to the water system flows and assist in the future integrity of the system. This alternative does not allow fire trucks to pump off the hydrants in the event of a fire. This alternative is a viable option but is not selected as our preferred alternative

### 6.3.3 Water Distribution Alternative #3 Cast Iron and 4” PVC Replacement

This alternative will address all known deficiencies within the system as related to the existing CIP watermain and 4” PVC watermain. This will provide a further boost to the water system flows and assist in the future integrity of the system. This will give the town the availability to pump off the 6” hydrants in the event of a fire. This alternative is recommended if the ability to finance the project is attainable.

## 6.4 SELECTED PLAN AND IMPACT ON USER FEES

A summary of the itemized costs associated with all of the alternatives that were chosen is given in Table 6.4-1.

**Table 6.4-1: Summary of Costs for Recommended Work**

<b>Recommended Projects</b>	<b>Estimated Project Cost</b>	<b>EUAC</b>
<b>Water Source Alternatives</b>		
Alt. #1 "Do Nothing"	\$0.00	\$0.00
Alt. #2 Treatment Improvements	NA	NA
Alt. #3 Turn System Over to FRWUD	No Direct Cost	NA
<b>Alt. #4 Buy Water Direct from FRWUD as a Bulk User</b>	<b>Yearly Expense</b>	<b>NA</b>
<b>Water Storage Alternatives</b>		
<b>Alt. #1 "Do Nothing"</b>	<b>\$0.00</b>	<b>\$0.00</b>
<b>Water Distribution Alternatives</b>		
Alt. #1 "Do Nothing"	\$0.00	\$0.00
Alt. #2 Cast Iron Pipe Replacement	\$2,269,900.00	\$114,331.99
<b>Alt. #3 Cast Iron and 4" PVC Replacement</b>	<b>\$3,175,500.00</b>	<b>\$152,859.49</b>
<b>Total Proposed Project Costs</b>	<b>\$3,175,500.00</b>	<b>\$152,859.49</b>

As part of the cost analysis of the recommended improvements, the estimated impact on the monthly user fees has been calculated. Financial data supplied by Buffalo Gap was used to determine the current operational status of the funds. The current water rate is a flat fee of \$39.00

per month for 3,000 gallons plus \$3.00 for every 1,000 gals thereafter. For 5,000 gallons the amount is \$45.00 per month. In order to be eligible for grant dollars from Rural Development or SD-DANR, the town needs to charge a minimum of \$30.00 per month.

Table 6.4-2 summarizes the financial data that is used to determine the current and proposed operational status of the wastewater fund with the recommended improvements. The water fund is shown to require additional revenue. These calculations were based on a 100% loan. Due to the project's life cycle the town qualifies for a loan of 3.25% for 30 years and a capital recovery factor of 5.27%. The short-lived asset replacement value was obtained from Table 6.4-3. This table indicates how much the Town needs to budget for maintenance. **The value of 3.25% is a conservative value. The actual rates will be dependent upon the actual funding that would be obtained.**

**Table 6.4-2 Operation of the Water Fund**

Projected Revenue	\$47,520.00
Projected Expenditures	\$40,000.00
<b>Net Income</b>	<b>\$7,520.00</b>
Annual Debt Retirement Costs with Project	\$167,290.79
10% Debt Reserves (Required by DENR & RD)	\$16,729.08
Asset Replacement	\$11,000.00
<b>Remaining Surplus After Project</b>	<b>-\$187,499.87</b>
Current Water Fee (5,000 gallons)	\$45.00
Increase of Water Charge per month	\$178.00
Number of Accounts	88
Water Fee after increase (5,000 gallons)	\$223.00
Added Revenue	\$187,968.00
<b>Surplus After Increase in Sewer Charge</b>	<b>\$468.13</b>

The Annual Debt Retirement Costs of Table 6.5-2 are for the recommended projects with 100% funding by loan (3.25% Interest, 30 year Term). The 10% Debt Reserves is the amount required by typical funding agencies such as SD DANR and Rural Development. The increase in user fee is with 100% loan funding for the project with no grant dollars allocated to the proposed projects. The short term asset replacement cost consists of water storage inspections, hydrant, valves & watermain maintenance costs, replacement of well pumps over the typical lifespan for each asset. The Town should budget this amount annually for this work. The short lived asset replacement is shown in Table 6.4-3. The asset replacement does not cover the replacement of the ground storage tank. It is recommended however that any surplus is retained for capital improvements.

Because the financing supplied by various funding agencies is unknown at this time, multiple columns of budget information are shown in Table 6.4-4 based on varying grant percentages. The DANR has set a recommended minimum water rate per month of \$30.00 for 5,000 gallons before they will consider applications for grant funding. Currently the Town's rate of \$45.00 per month for 5,000 gallons would qualify them for grant eligibility and/or principle forgiveness.

**Table 6.4-3 Short Lived Asset Replacement Schedule**

Expenses	Year											
	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	
GST and Elevated Tank Cleaning	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000
Meters	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000
<b>Annual Total to Be Budgeted</b>	<b>\$11,000</b>	<b>\$11,000</b>	<b>\$11,000</b>	<b>\$11,000</b>	<b>\$11,000</b>	<b>\$11,000</b>	<b>\$11,000</b>	<b>\$11,000</b>	<b>\$11,000</b>	<b>\$11,000</b>	<b>\$11,000</b>	<b>\$11,000</b>

**Table 6.4-4: Water Rate Analysis**

Funding Percentage	10/90	20/80	30/70	40/60	50/50	60/40	70/30	80/20
grant/loan	grant/loan	grant/loan	grant/loan	grant/loan	grant/loan	grant/loan	grant/loan	grant/loan
Annual O & M	\$40,000	\$40,000	\$40,000	\$40,000	\$40,000	\$40,000	\$40,000	\$40,000
Grant Amount	\$317,550	\$635,100	\$952,650	\$1,270,200	\$1,587,750	\$1,905,300	\$2,222,850	\$2,540,400
Loan Amount	\$2,857,950	\$2,540,400	\$2,222,850	\$1,905,300	\$1,587,750	\$1,270,200	\$952,650	\$635,100
Annual Loan Payment	\$150,562	\$133,833	\$117,104	\$100,374	\$83,645	\$66,916	\$50,187	\$33,458
Debt Reserves	\$15,056	\$13,383	\$11,710	\$10,037	\$8,365	\$6,692	\$5,019	\$3,346
Current Debt/Asset/Other Cost	\$11,000	\$11,000	\$11,000	\$11,000	\$11,000	\$11,000	\$11,000	\$11,000
Total Annual Costs	\$216,618	\$198,216	\$179,814	\$161,412	\$143,010	\$124,608	\$106,206	\$87,804
Annual Revenue	\$47,520	\$47,520	\$47,520	\$47,520	\$47,520	\$47,520	\$47,520	\$47,520
Surplus/Deficit After Project	-\$169,098	-\$150,696	-\$132,294	-\$113,892	-\$95,490	-\$77,088	-\$58,686	-\$40,284
per Month	\$160.13	\$142.70	\$125.28	\$107.85	\$90.43	\$73.00	\$55.57	\$38.15
Water Rate After Increase (Mo)	\$205.13	\$187.70	\$170.28	\$152.85	\$135.43	\$118.00	\$100.57	\$83.15

Estimated Project Cost \$3,175,500  
 Number of Users 88  
 Annual O & M \$40,000.00  
 Asset Replacement \$11,000.00  
 Period, Years 30  
 Interest Rate 3.250%  
 Capital Recovery Factor 5.27%

## **6.5 CAPITAL FINANCING PLAN**

It is recommended that the City make applications to state and federal resources for loan and grant assistance to complete the project during the upcoming construction season.

## **6.6 ENVIRONMENTAL EVALUATION**

The Town has requested comments from concerned federal agencies. The correspondence related to these inquiries can be found in Appendix A.

## **6.7 VIEWS OF THE PUBLIC AND CONCERNED INTEREST GROUPS**

The Town will conduct a public hearing on any proposed project. Information related to the hearing will be submitted after it is conducted.

## **6.8 DESIGN OF SELECTED PLAN**

The design of the improvements to the water system will provide enhanced flexibility in operation and will be designed in accordance with the SD DANR design criteria and the accepted principles and standards for the water distribution system and finished water storage.

## **6.9 ENVIRONMENTAL IMPACTS OF SELECTED PLAN**

Environmental information gathered thus far does not indicate that any state or federal agencies will have environmental concerns related to the project or its proposed construction.

## **6.10 ARRANGEMENT FOR IMPLEMENTATION**

This report provides information to describe the proposed project and to support the decision to proceed with the improvements as quickly as possible. Final design will be completed by the Town's consultant and approved by the DANR. Cost estimates have been prepared and are referenced elsewhere in this document. The project will be bid in accordance with state statutes that govern municipal corporations and will be constructed by the lowest responsible bidder.

The anticipated schedule for the progression of the project is shown in Table 6.10-1

**Table 6.10-1 Schedule**

Facility Plan Submitted to Funding Agencies	April 1, 2022
Environmental Review Completed	April 17, 2022
Funding Agency Approval of Facility Plan	May 18, 2022
Funding Application	May 31, 2022
Final Funding Package Complete	August 14, 2022
Begin Design	September 13, 2022
Plans & Specifications Submitted to DENR	March 12, 2023
Plans & Specifications Approved by DENR	April 26, 2023
Advertisement for Bids	May 10, 2023
Open Bids	June 1, 2023
Award Bids	June 8, 2023
Begin Construction	July 23, 2023
Construction Complete	November 15, 2024
Project Close-out	December 15, 2024

**6.11 LAND ACQUISITION**

Land acquisition is not expected for completion of recommended alternatives.

**6.12 INTERAGENCY AGREEMENTS**

Loan documents will have to be executed with the appropriate lender but as Buffalo Gap is a municipal corporation, it has the legal authority to enter into such agreements. The Town’s attorney will advise the Council on any legal matters related to this issue.

## **7 FINANCING OPTIONS**

### **7.1 GENERAL**

Financing any major construction project is difficult for a community that has limited resources.

“Routine” community needs such as the improvements to streets, equipment replacement, correction of drainage problems, and solid waste issues cannot be neglected. These needs must be met and projects relating to addressing them must continue to be financed.

These “routine” types of projects frequently consume all or nearly all available community financial resources just to maintain an acceptable level of service. Consequently, to finance major capital improvement projects, other methods of obtaining capital must be investigated.

### **7.2 PAY-AS-YOU-GO**

For small communities, the most common method of financing needed improvements is the “pay-as-you-go” method. This method obtains revenue from general taxation, fees, service charges, special funds and/or special assessments. The advantages of this method are:

- 1) No interest payments; and
- 2) Greater budget flexibility.

Disadvantages of this method are:

- 1) Inequities between age groups (older citizens pay for a share of the project and younger citizens who may not have paid any of the costs realize greater benefits simply because of greater life spans);
- 2) Difficulty in generating large amounts of capital that is often required for large scale capital improvements; and
- 3) Large scale capital improvements often cannot be constructed efficiently by phased construction.

### **7.3 RESERVE FUNDS**

A variation of the “pay-as-you-go” method is using reserve fund financing. Communities using this method accumulate funds in advance for construction of needed capital improvements. This accumulation may be the result of surplus operating funds that are allowed to remain in the operating budget from year to year. These funds are often “earmarked” for a specific purpose. It may also be revenues from a certain percentage of the water or sewer rate that are specifically placed in a depreciation account. Financing projects in this manner is often attractive to communities.

This method can have its drawbacks. The most obvious drawback is that the fund has to have been established for some time to allow it to generate sufficient capital for a project that is needed today. Also, good management is required to ensure that the investment pays an adequate return. If the interest generated on the investment is not greater than the inflation rate, then gains in the accumulation of the fund may be lost to inflation.

#### **7.4 SALES TAXES**

Sales taxes can also be used to finance capital improvements. State statutes allow a City to dedicate sales tax revenues to capital improvement construction. A long-range plan can be developed to allow capital improvements to be constructed in phases. As revenue is generated each year, a segment of the overall plan is constructed. This method of constructing capital improvement projects is being used successfully by many communities.

#### **7.5 BONDS**

Another method of generating revenue for capital improvements is through the sale of bonds on the private bond market. Three different types of bonds are frequently used to finance capital improvement projects. Each has different requirements and will need the involvement of the City Attorney. The three types are General Obligation (GO), revenue and special assessment.

##### **7.5.1 General Obligation Bonds**

General Obligation bonds always require a bond election with a 60% majority because General Obligation bonds pledge the taxing authority of the City to repay the bond. As they are backed by the taxing authority of the City, General Obligation bonds frequently offer a lower interest rate than revenue bonds.

### **7.5.2 Revenue Bonds**

Revenue bonds, which pledge revenues (that is, user fees) generated from the project, are often sold to finance capital improvement projects. They, like special assessment bonds, do not require a bond election but with any action of a governmental body, the enabling ordinance that must be approved by the board can be referred.

### **7.5.3 Special Assessment Bonds**

Special assessment bonds have a limited payback period. Assessment for principal and interest repayment are levied against and collected from adjacent property owners over a given period of years. The special assessments are collected with property tax payments. Street improvements are frequently financed through the use of special assessment bonds.

## **7.6 LEASE-PURCHASE**

Local financial institutions are becoming interested in financing community improvements through lease-purchase programs. This interest appears to be the result of recently passed federal legislation that provides tax advantages to financial institutions that participate in community improvement efforts. Lease-purchase plans can also use sales tax revenues to provide the vehicle for repayment.

## **7.7 OTHER SOURCES OF FINANCING**

All of the previously discussed methods of financing rely on 100% local funding. Often it is difficult, if not impossible, for a community to finance projects with 100% local funding. Fortunately, there are other resources and programs available that can be used in conjunction with local funding to assist communities in financing projects such as the one being considered by the City.

## **7.8 STATE FINANCED LOANS / GRANTS**

The State of South Dakota has several programs that can provide financial assistance for community facility improvements. The programs are operated through various departments of state government. Some are financed with 100% state resources, some use a combination of state and federal funds and some are federal “pass-through” funds.

## **7.9 DANR PROGRAMS**

The Department of Agriculture and Natural Resources (DANR) has a low interest loan and grant programs. The original program was established in 1986 by combining several existing grant and loan

programs. It is funded entirely with state financing and is designed to provide financial assistance through grants and loans for water and wastewater projects throughout the state. This program was designed to replace the EPA, the federal construction grants program.

The Clean Water State Revolving Fund program was created in 1987 as a result of amendments to the federal Clean Water Act. This program was created for wastewater funding along with the Consolidated Water Facilities Construction Program.

In 1996 the Safe Drinking Water Act amendments created the Drinking Water State Revolving Fund which enable funding for water projects along with the Consolidated Water Facilities Construction Program. The funding from the construction grants program has been made available to the state. The federal funds are to be used in combination with state funds to create a revolving loan program that will be self-perpetuating. .

#### **7.10 GOED PROGRAM**

The Governor's Office of Economic Development (GOED) administers the Community Development Block Grant (CDBG) program. This program utilizes the US Department of Housing and Urban Development (HUD) small cities program funding. CDBG funds may be used for a variety of community development activities, including water and sewer system renovations and rehabilitation. The emphasis of this program is to provide benefits for low and moderate income people. Information supplied by GOED indicates that most communities can probably qualify for funds from this program; however, an income survey may be necessary.

#### **7.11 SUMMARY OF FUNDING OPTIONS**

No existing program will provide a 100% grant to finance a project. Most of the programs (both state and federal) require or strongly recommend that the applicant provide some local funding. Low interest loans and grant offers are frequently "packaged" with available local funds to completely finance capital improvement project activities. DANR also has minimum rate requirements that must be met by a community for it to be eligible for grant funding under the CWFCP. The DANR is recommending that the minimum rate for municipal water is \$30.00 per month for 5,000 gallons of water used. If a community does not have its rates at or above this level, it will not be eligible for grant assistance from the consolidated program.

## **7.12 FUNDING RECOMMENDATIONS**

Given the cost of construction of a project of this scope and the limited amount of local finances available, it is recommended that the community should:

1. Make application to place this project on the State Water Facilities Plan.
2. Evaluate its own financial resources, rate structure and various funding sources available to construct capital improvement projects to see if rate increases or other funding options may be used to finance all or part of the proposed project.
3. Complete applications for financial assistance to programs such as the CWFCP, CDBG Program, and/or USDA's Rural Development / Rural Utility Service Water and Sewer Program when the project is approved for the State Water Facilities Plan.

The process of completing applications for financial assistance could begin when an application to the State Water Facilities Plan is submitted. Early application for financial assistance could speed the process of obtaining financing for project construction as obtaining financing can be a lengthy process.

## 8 REFERENCES

Mays, Larry W., (2000). *Water Distribution Systems Handbook*, (New York, NY: McGraw Hill), pp.

Soil Conservation Service, South Dakota Agricultural Experiment Station. Soil Survey of Spink County, South Dakota. South Dakota: National Cooperative Soil Survey.

South Dakota Department of Environment and Natural Resources, (May 1990). *Recommended Design Criteria Manual for Water Works*, Pierre, SD: Division of Environmental Regulation.

United States Environmental Protection Agency, *Drinking Water Contaminants*

<http://www.epa.gov/safewater/contaminants/index.html>, May 20, 2009.

United States Environmental Protection Agency, *Ground Water & Drinking Water*

[http://www.epa.gov/safewater/contaminants/dw\\_contamfs/asbestos.html](http://www.epa.gov/safewater/contaminants/dw_contamfs/asbestos.html), May 20, 2009.

United States Environmental Protection Agency, *Asbestos*

<http://www.epa.gov/asbestos/pubs/help.html>, May 20, 2009.

# **Appendix A Environmental Review Comment Letters**



RECEIVED

March 28, 2020

APR 01 2020

SURFACE WATER PROGRAM

Mr. John Miller  
Department of Environment and Natural Resources  
Surface Water Program  
Joe Foss Building  
523 East Capitol Avenue  
Pierre, SD 57501

SURFACE WATER QUALITY DETERMINATION  
It appears, based on the information provided, that  
this project will have little or no impact on the surface  
water quality in this area. This project is approved.

Approved By: *Shannon Mervick*  
Date: 4/20/2020  
(605) 773-3351 FAX (605) 773-5286  
SOUTH DAKOTA DEPARTMENT OF ENVIRONMENT  
AND NATURAL RESOURCES

Re: Buffalo Gap Water Study  
A-7515

Dear Mr. Miller,

The Town of Buffalo Gap, located in Custer County, SD is looking to make much needed improvements to their water system.

The potential work could include replacement of water mains, distribution lines, culverts, water storage, and wells. All work will be completed in the ROW for existing roads, streets, and alley ways, or in areas where excavation for utilities have previously taken place.

We are requesting your comments concerning environmental impacts from the possible improvements to the water facilities. Please find the enclosed map showing the area being looked at for improvement and possible disturbance.

The work performed will be funded with State and Federal funding. The agencies tapped may include, Rural Development, Community Development Block Grants, EPA, State Revolving Funds and other South Dakota loan and grant funds.

If you have any questions, please contact our office. Your prompt response would be greatly appreciated.

Sincerely,  
Helms and Associates

*Brandon D. Smid*  
Brandon D. Smid, P.E.  
Helms & Associates

W/Enclosure

RECEIVED

APR 23 2020

HELMS & ASSOCIATES



United States Department of Agriculture

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April 23, 2020

Mr. Brandon D. Smid, P.E.  
Helms & Associates  
PO Box 111  
Aberdeen, South Dakota 57402

RE: Environmental Review for:  
Buffalo Gap Water Study  
A-7515

Dear Mr. Smid:

Thank you for the opportunity to provide a Farmland Protection Policy Act (FPPA) review on this project. The project as outlined will have **no impact** on prime or important farmland.

If you have any questions, please contact me at (605) 858-6670.

Sincerely,

A handwritten signature in cursive script that reads "Tim Nordquist".

TIM NORDQUIST  
Conservationist Agronomist

cc:

Nathan Jones, State Soil Scientist, NRCS, Huron SO  
Jessica Michalski, State Resource Conservationist, NRCS, Huron SO



March 28, 2020

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

This Constitutes a report of the Department of the Interior prepared in accordance with the Fish and Wildlife Coordination Act (16 U.S.C. 661 et seq). We have reviewed and have NO OBJECTION to this proposed project.

**SCOTT LARSON** Digitally signed by SCOTT LARSON  
Date: 2020.04.20 08:39:47 -0500  
Field Supervisor

Re: Buffalo Gap Water Study  
A-7515

Dear Mr. Gober,

The Town of Buffalo Gap, located in Custer County, SD is looking to make much needed improvements to their water system.

The potential work could include replacement of water mains, distribution lines, culverts, water storage, and wells. All work will be completed in the ROW for existing roads, streets, and alley ways, or in areas where excavation for utilities have previously taken place.

We are requesting your comments concerning environmental impacts from the possible improvements to the water facilities. Please find the enclosed map showing the area being looked at for improvement and possible disturbance.

The work performed will be funded with State and Federal funding. The agencies tapped may include, Rural Development, Community Development Block Grants, EPA, State Revolving Funds and other South Dakota loan and grant funds.

If you have any questions, please contact our office. Your prompt response would be greatly appreciated.

Sincerely,  
Helms and Associates

Brandon D. Smid, P.E.  
Helms & Associates

W/Enclosure



SOUTH DAKOTA DEPARTMENT OF  
GAME, FISH AND PARKS

523 EAST CAPITOL AVENUE | PIERRE, SD 57501

May 4, 2020

Brandon Smid  
Helms and Associates  
221 Brown County Hwy #19  
PO Box 111  
Aberdeen, SD 57402

RE: Buffalo Gap Water Study  
A-7515

Dear Brandon,

The Department of Game, Fish and Parks has reviewed the above project involving improvements to a water system in Buffalo Gap, South Dakota.

Based on the information provided, there is no anticipated significant impact to fish and wildlife resources.

If you have any questions, please feel free to contact me at 605-773-6208.

Sincerely,

Hilary Morey  
Environmental Review Senior Biologist  
523 East Capitol Avenue  
Pierre, SD 57501  
[hilary.morey@state.sd.us](mailto:hilary.morey@state.sd.us)





DEPARTMENT OF THE ARMY  
CORPS OF ENGINEERS, OMAHA DISTRICT  
1616 CAPITOL AVENUE  
OMAHA NE 68102-4901

REPLY TO  
ATTENTION OF

April 27, 2020

RECEIVED

MAY 01 2020

HELMS & ASSOCIATES

Planning, Programs, and Project Management Division

Mr. Brandon D. Smid  
Helms & Associates  
221 Brown Co. Hwy #19  
PO Box 111  
Aberdeen, South Dakota 57402-0111

Dear Mr. Smid:

The U.S. Army Corps of Engineers, Omaha District (Corps) has reviewed your letter dated March 28, 2020 (received April 13, 2020) regarding the environmental review of the proposed water facilities improvement projects in Buffalo Gap, South Dakota. It is understood that the proposed potential improvements would include replacement of water main and distribution lines, culverts, water storage and wells. We offer the following comments for your consideration:

Your plans should be coordinated with the state water quality office that has jurisdiction within the area where the project is located to ensure compliance with federal and state water quality standards and regulations mandated by the Clean Water Act and administered by the U.S. Environmental Protection Agency. Please coordinate with the South Dakota Department of Environment & Natural Resources concerning state water quality programs.

If you have not already done so, it is recommended you consult with the U.S. Fish and Wildlife Service and the South Dakota Department of Game, Fish and Parks regarding fish and wildlife resources. In addition, the South Dakota State Historic Preservation Office should be contacted for information and recommendations on potential cultural resources in the project area.

The Federal floodplain management criterion basically states that construction which could be damaged by floodwaters or which could obstruct flood flows should not be located in the one percent annual chance floodplain. If this is not practicable, any residential construction that could be damaged by floodwater must be placed above the one percent annual chance floodwater surface elevation. Any nonresidential construction that could be damaged by floodwater must be placed above or flood proofed to above the one percent annual chance floodwater surface elevation. All construction should be designed to minimize potential harm to or within the floodplain. Higher levels of protection are encouraged to provide added safety. If the operation of the constructed facilities is considered critical during flood periods, the facilities should be protected from at least the 0.2 percent annual chance flood.

If construction must occur in the floodplain, it must be located outside the floodway. If a floodway has not been determined and designated, the construction should be as far from the

stream channel as possible. The goal of any construction in the floodplain is to achieve the highest level of flood protection with zero impact to adjacent property.

If the proposed waterline construction crosses the floodplains of small drainageways and streams, flood-related problems should not occur if the lines are buried far enough below the beds of drainageways and streams to prevent exposure due to streambed erosion during periods of high floodflows. Any aboveground construction subject to flood damage, such as pump houses, should either be placed above, or flood proofed to, a level above the one percent annual chance flood elevation.

Since the proposed project does not appear to be located within Corps owned or operated lands, your plans should be submitted to the local floodplain administrator for review and approval prior to construction. It should be ensured that the proposed project is in compliance with the floodplain management criteria of Custer County and the State of South Dakota. In addition, please coordinate with the following floodplain management office:

South Dakota Division of Emergency Management  
Attention: Mr. Marc Macy  
118 W. Capitol Avenue  
Pierre, South Dakota 57501  
Telephone: 605-773-3231 Fax: 605-773-3580  
Email: marc.macy@state.sd.us

Any proposed placement of dredged or fill material into waters of the United States (including jurisdictional wetlands) requires Department of the Army authorization under Section 404 of the Clean Water Act. You can visit the Omaha District's Regulatory website for permit applications and related information. Please review the information on the provided website (<http://www.nwo.usace.army.mil/Missions/RegulatoryProgram.aspx>) to determine if this project requires a 404 permit. For a detailed review of the permit requirements, preliminary and final project plans should be sent to:

U.S. Army Corps of Engineers  
Pierre Regulatory Office  
Attention: Mr. Steve Naylor, CENWO-ODR-SD  
28563 Powerhouse Road, Room 120  
Pierre, South Dakota 57501

If you have any questions, please contact Ms. Amanda Dague of my staff at (402) 995-2577 or [amanda.i.dague@usace.army.mil](mailto:amanda.i.dague@usace.army.mil) and reference PD# 8308 in the subject line.

Sincerely,

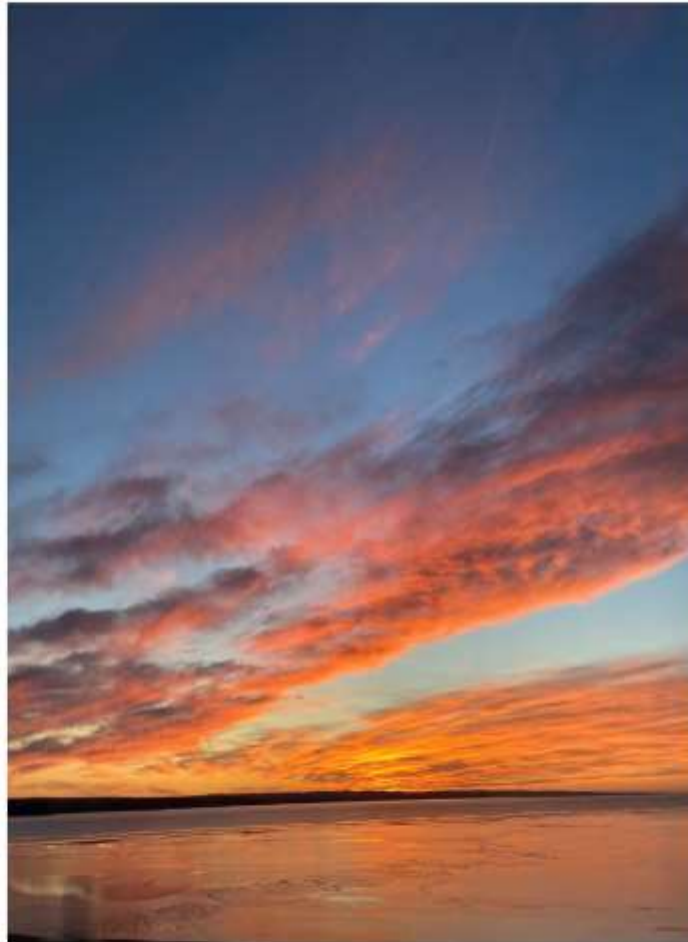


Aaron Quinn  
Chief, Environmental & Cultural Resources

# **Appendix B 2019 & 2020 Drinking Water Reports**



# TOWN OF BUFFALO GAP



2019

## Drinking Water Report

Contact us by calling (605)833-2332 or write us at PO Box 295 Buffalo Gap SD 57722-0295

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# Town of Buffalo Gap

## DRINKING WATER REPORT

### WATER QUALITY

Last year, the Town of Buffalo Gap monitored your drinking water for possible contaminants. This report is a snapshot of the quality of the water that we provided last year. Included are details about where your water comes from, what it contains, and how it compares to Environmental Protection Agency (EPA) and state standards. We are committed to providing you with information because informed customers are our best allies.

#### Water Source

We serve more than 126 customers an average of 9,450 gallons of water per day. Our water is groundwater that we produce from local wells. The state has performed an assessment of our source water and they have determined that the relative susceptibility rating for the Buffalo Gap public water supply system is low.

For more information about your water and information on opportunities to participate in public meetings, call (605)833-2332 and ask for Heather Besco-Clyde.

#### Additional Information

The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally-occurring minerals, and can pick up substances resulting from the presence of animals or from human activity.

Contaminants that may be present in source water include:

- *Microbial contaminants*, such as viruses and bacteria, which may come from sewage treatment plants, septic systems, agricultural livestock operations, and wildlife.
- *Inorganic contaminants*, such as salts and metals, which can be naturally-occurring or result from urban stormwater runoff, industrial or domestic wastewater discharges, oil and gas production, mining, or farming.
- *Pesticides and herbicides*, which may come from a variety of sources such as agriculture, urban stormwater runoff, and residential uses.
- *Organic chemical contaminants*, including synthetic and volatile organic chemicals, which are by-products of industrial processes and petroleum production, and can also come from gas stations, urban stormwater runoff, and septic systems.
- *Radioactive contaminants*, which can be naturally-occurring or be the result of oil and gas production and mining activities.

In order to ensure that tap water is safe to drink, EPA prescribes regulations which limit the amount of certain contaminants in water provided by public water systems. FDA regulations establish limits for contaminants in bottled water which must provide the same protection for public health.

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the Environmental Protection Agency's Safe Drinking Water Hotline (800-426-4791).

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. EPA/CDC guidelines on appropriate means to lessen the risk of infection by *Cryptosporidium* and other microbial contaminants can be obtained by calling the Environment Protection Agency's Safe Drinking Water Hotline (800-426-4791).

If present, elevated levels of lead can cause serious health problems, especially for pregnant women and young children. Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. The Town of Buffalo Gap public water supply system is responsible for providing high quality drinking water, but cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to 2 minutes before using water for drinking or cooking. If you are concerned about lead in your water, you may wish to have your water tested. Information on lead in drinking water, testing methods, and steps you can take to minimize exposure is available from the Safe Drinking Water Hotline or at <http://www.epa.gov/safewater/lead>.

### Detected Contaminants

The attached table lists all the drinking water contaminants that we detected during the 2019 calendar year. The presence of these contaminants in the water does not necessarily indicate that the water poses a health risk. Unless otherwise noted, the data presented in this table is from testing done January 1 – December 31, 2019. The state requires us to monitor for certain contaminants less than once per year because the concentrations of these contaminants are not expected to vary significantly from year to year. Some of the data, though representative of the water quality, is more than one year old.

---

## 2019 Table of Detected Regulated Contaminants For Buffalo Gap (EPA ID 0077)

### Terms and abbreviations used in this table:

- \* *Maximum Contaminant Level Goal(MCLG): the level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.*
- \* *Maximum Contaminant Level(MCL): the highest level of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLGs as feasible using the best available treatment technology.*
- \* *Action Level(AL): the concentration of a contaminant which, when exceeded, triggers treatment or other requirements which a water system must follow. For Lead and Copper, 90% of the samples must be below the AL.*
- \* *Treatment Technique(TT): A required process intended to reduce the level of a contaminant in drinking water. For turbidity, 95% of samples must be less than 0.3 NTU*
- \* *Running Annual Average(RAA): Compliance is calculated using the running annual average of samples from designated monitoring locations.*

### Units:

- \*MFL: million fibers per liter
- \*pCi/l: picocuries per liter(a measure of radioactivity)
- \*ppt: parts per trillion, or nanograms per liter
- \*mrem/year: millirems per year(a measure of radiation absorbed by the body)
- \*ppm: parts per million, or milligrams per liter(mg/l)
- \*ppq: parts per quadrillion, or picograms per liter
- \*NTU: Nephelometric Turbidity Units
- \*ppb: parts per billion, or micrograms per liter(ug/l)
- \*pspm: positive samples per month

Substance	90% Level	Test Sites > Action Level	Date Tested	Highest Level Allowed (AL)	Ideal Goal	Units	Major Source of Contaminant
Copper	0.1	0	09/30/17	AL=1.3	0	ppm	Corrosion of household plumbing systems; erosion of natural deposits; leaching from wood preservatives.
Lead	3	0	09/30/17	AL=15	0	ppb	Corrosion of household plumbing systems; erosion of natural deposits.

Substance	Highest Level Detected	Range	Date Tested	Highest Level Allowed (MCL)	Ideal Goal (MCLG)	Units	Major Source of Contaminant
Alpha emitters	5	ND - 5	04/18/17	15	0	pCi/l	Erosion of natural deposits.
Combined Radium	3	ND - 3	04/18/17	5	0	pCi/l	Erosion of natural deposits.
Combined Uranium	29	ND - 29	04/18/17	30	0	ppb	Erosion of natural deposits.
Fluoride	0.66		06/20/19	4	4	ppm	Erosion of natural deposits; water additive which promotes strong teeth; discharge from fertilizer and aluminum factories.
Total Coliform Bacteria	1	positive samples		5%	0	pspm	Naturally present in the environment.

Please direct questions regarding this information to Mr Todd Heck with the Buffalo Gap public water system at (605)833-2332.

**2019 Information on Violations For Buffalo Gap (EPA ID 0077)**

*(This Drinking Water Report can be used as a Tier III Public Notice if distributed to each customer within 12 months of when the system was notified of the violation.)*

<b>Violation Type</b>	<b>Parameter</b>	<b>Date System Notified</b>	<b>Duration In Months</b>	<b>Health Effects Language</b>	<b>Action Taken By Your System</b>
Lack of Certified Operator	DBP Stage 1	04/05/18			Back in compliance.

For additional information concerning any violation please contact Mr Todd Heck with the Buffalo Gap public water system at (605)833-2332.

**Town of Buffalo Gap**  
**DISTRIBUTION SYSTEM TESTING REQUIREMENTS FOR CALENDAR YEAR 2020**

The drinking water testing requirements for January 1 - December 31, 2020 for the **Town of Buffalo Gap (EPA ID#-0077)** (as of December 2019) in accordance with the South Dakota Drinking Water Standards are as follows:

1.       12       Microbiological samples for total coliform @ \$15 per analysis. These are the monthly routine/repeat samples for the Revised Total Coliform Rule (RTCR).
2.                    Fluoride samples @ \$13 per analysis for systems adding fluoride to their water.
3.                    Stage 1-Disinfection By-Products-THMs @ \$110 and Haloacetic Acids @ \$71 per analysis. If a system is on an annual or triennial sampling schedule, these samples must be taken between August 1 and September 30.
4.       5       Lead/Copper samples @ \$30 per analysis. If your water system currently monitors for lead and copper annually or triennially, these samples must be taken in June, July, August, or September.
5.       1       Asbestos - Samples must be sent to an out-of-state lab with testing arrangements made by the system or obtain waiver to eliminate the analysis.
6.       1       Stage 2-Disinfection By-Products-THMs @ \$110 and Haloacetic Acids @ \$71 per analysis. If a system is on an annual or triennial sampling schedule, these samples must be taken between August 1 and September 30.

**Special Notes:** Raw (and treated, if necessary) TOC samples and alkalinity samples (if necessary) are also required if DBP samples are required for surface waters. TOC and alkalinity samples must be arranged for by each system.

Systems that use chlorine dioxide must take daily on-site chlorite samples and must submit three monthly chlorite samples to a certified lab.

Bromate samples are needed for systems using ozone.

Chlorine/chloramine residuals must be taken each time a system submits a microbiological sample for RTCR compliance (both routine and repeats). This requirement now includes systems receiving chlorinated water from other systems. These are then reported on a quarterly basis to DENR.

**THESE ARE YOUR DISTRIBUTION SYSTEMS ANALYSES. IF YOU MAINTAIN YOUR OWN SOURCE OF WATER, INCLUDED IS ANOTHER LIST FOR THE ANALYSES REQUIRED FOR EACH OF YOUR ENTRY POINTS.**

The number indicated before each test type is the number of analyses to be performed by the lab. The prices quoted above are for the State Public Health Laboratory. Prices are subject to change without notice. You may have your testing performed by any lab that is State certified for a particular lab method.

If you desire to have the State Public Health Laboratory analyze your samples, please sign this form and return it as soon as possible to: Stacy Ellwanger, State Public Health Laboratory, 615 E Fourth, Pierre SD 57501. Fax: 605-773-6129. **Do not return this form to the Drinking Water Program.** It is not necessary to enclose any money as you will be billed on a monthly basis for testing performed. Your analyses will be scheduled and sample bottles sent to you sometime during the year; however, the water system is responsible to see that all analyses are performed and reported to DENR.

**If you do NOT desire to have the State Lab analyze your samples, please make arrangements with a certified private lab to do your testing.** Please review this form carefully, as it is the sole responsibility of the water system to have the proper number and applicable testing performed. You are responsible for notifying your lab of any sampling frequency changes or if certain samples must be taken in a particular month or calendar quarter.

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

Todd Heck PO Box 67 Buffalo Gap 57722

\_\_\_\_\_  
Complete UPS Shipping Address including Street Address, City, and Zip Code (NO PO BOXES!) (Please make corrections!)

SD4600077

**Town of Buffalo Gap**  
**ENTRY POINT TESTING REQUIREMENTS FOR CALENDAR YEAR 2020**

The drinking water testing requirements for this entry point for January 1 - December 31, 2020 (as of December 2019) in accordance with the South Dakota Drinking Water Standards are as follows:

**Entry Point Name-TREAT SITE - #1    Entry Point ID#-007701    EPA ID#-0077**

1.     1     Volatile organic chemical (VOC) group @ \$155 per analysis.
2.     1     Nitrate sample @ \$14 per analysis.
3.     \_\_\_\_\_ Nitrite sample @ \$14 per analysis.
4.   Phase II Inorganic (IOC) Group (Total Group Cost- \$225)
 

_____ 1     Antimony @ \$21	_____ 1     Mercury @ \$23
_____ 1     Arsenic @ \$21	_____ 1     Nickel @ \$21
_____ 1     Barium @ \$21	_____ 1     Selenium @ \$21
_____ 1     Beryllium @ \$21	_____ 1     Thallium @ \$21
_____ 1     Cadmium @ \$21	_____ 1     Fluoride @ \$13
_____ 1     Chromium @ \$21	_____
5.   Phase II/V Synthetic Organic Chemicals (SOCs) Group (Total Group Cost- \$1,115)-If you obtain SOC waiver, the analysis can be eliminated.
 

_____ 1     Carbamates (Method 531.1) @ \$90	
_____ 1     Chlorinated Acids (Method 515.1) @ \$200	
_____ 1     Diquat (Method 549) @ \$95	
_____ 1     Endothall (Method 548) @ \$130	
_____ 1     Glyphosate (Method 547) @ \$85	
_____ 1     GC/MS Organic Chemicals (Method 525) @ \$440*	
_____ 1     EDB/DBCP (Method 524/504) @ \$75	

\*If you do not need to test for all of the Method 525 chemicals, there is a \$100 extraction fee plus \$17.50 for each chemical requested.
6.     1     Radiological chemical group samples (You are charged for each specific parameter analyzed: Gross alpha-\$44, Radium 226-\$76, Radium 228-\$160, and Uranium-\$20).

**Special Notes:** Surface water systems must take daily turbidity samples as well as entry point chlorine residuals and submit results to DENR on a monthly basis.

**THESE ARE YOUR SAMPLING REQUIREMENTS FOR THIS PARTICULAR ENTRY POINT. YOU WILL RECEIVE A LIST FOR EACH ENTRY POINT THAT MUST BE SAMPLED AS WELL AS A LIST FOR YOUR DISTRIBUTION SYSTEM SAMPLING.**

The number indicated before each test type is the number of analyses to be performed at this entry point during this year. Some analyses allow for compositing of samples. In general, up to five entry point samples may be composited for each analysis. The prices quoted above are for the State Public Health Laboratory. Prices are subject to change without notice. You may have your testing performed by any lab that is State certified for a particular lab method.

If you desire to have the State Public Health Laboratory analyze your samples, please return this form as well as the distribution system sampling requirements list as soon as possible to: Stacy Ellwanger-State Public Health Laboratory, 615 E Fourth, Pierre SD 57501, Fax: 605-773-6129.

**Do not return this form to the Drinking Water Program.** It is not necessary to enclose any money as you will be billed on a monthly basis for testing performed. Your analyses will be scheduled and sample bottles sent to you sometime during the year; however, the water system is responsible to see that all analyses are performed and reported to DENR.

**If you do NOT desire to have the State Public health Lab analyze your samples, please make arrangements with a certified private lab to do your testing.** Please review this form carefully as it is the responsibility of the water system to have the proper number and applicable testing performed. You are responsible for notifying your lab of any sampling frequency changes or if certain samples must be taken in a particular month or calendar quarter.

## Common Test Results For The Town of Buffalo Gap (EPA ID: 0077)

Sampler- Mr Todd Heck      Work Phone-(605)833-2481  
Title- Utilities Manager  
Address- PO Box 67  
Buffalo Gap SD 57722

Location- City: Buffalo Gap      County: Custer  
Service Area- Municipality  
PWS Owner Type- Local Government  
Water Supply Type- Groundwater Supply

Population Served- 126      Service Connections- 88

### Sources for Buffalo Gap

Source	Name	Year Built	Depth (feet)	Diameter (inches)	Availability	Type	Vulnerability	Treatment
01	TREAT SITE - #1				Permanent	Treatment Plant	Non-Vulnerable	Disinfection - Hypochlorites
02	TREAT SITE - #2					Treatment Plant	Non-Vulnerable	Disinfection - Hypochlorites
05	#1	1963	1270	8	Permanent	Groundwater	Vulnerable	Treatment At Plant
06	#2	1997	1450	8		Groundwater	Non-Vulnerable	Treatment At Plant

## Common Test Results For The Town of Buffalo Gap (EPA ID: 0077)

### Test Data

(All chemical data are reported in milligrams per liter (mg/l) except pH and Langlier Index)

Source	Type	Date	TDS	Conductance	pH	Alk-M	Alk-P	Na	K	Ca	Mg	Fe	Mn	Cl	SO4	HCO3	CO3	Hardness	Langlier	NO3	F
01	Raw	06/01/95	438	770	7.48	267	0	24	12.0	105.0	24.0	0.95	0.04	3.0	138	326	0	362	+0.05	0.1	0.61
01	Raw	05/16/01	457	745	7.83	286	0	25	8.2	93.7	27.3	4.41	0.07	6.0	102	349	0	346	+0.78	0.5	0.64
02	Raw	05/16/01	115	230	9.46	80	0	25	8.8	3.2	8.7	0.41	0.05	7.0	14	67	15	44	+0.96	0.5	0.19
05	Raw	03/23/04	461	765	7.57	277	0	26	7.9	89.8	26.0	3.18	0.04	14.0	120	338	0	331	+0.46	0.1	0.63
Averages			368	628	8.09	228	0	25	9.2	72.9	21.5	2.24	0.05	7.5	94	270	4	271		0.3	0.52

Source	Type	Date	TDS	Conductance	pH	Alk-M	Alk-P	Na	K	Ca	Mg	Fe	Mn	Cl	SO4	HCO3	CO3	Hardness	Langlier	NO3	F
01	Treated	06/03/98	460	780	7.60	270	0	20	9.9	97.0	24.0	0.05	0.03	6.0	130	330	0	380	+0.54	0.1	0.62
01	Treated	03/27/07	441	755	7.85	282	0	23	8.2	90.3	26.7	0.05	0.01	7.0	101	344	0	335	+0.75	0.6	0.65
01	Treated	08/19/09	481	756	7.58	281	0	23	8.3	93.7	27.6	0.03	0.02	8.0	116	343	0	348	+0.45	0.2	0.65
01	Treated	01/15/13	459	794	7.63	289	0	30	7.7	100.0	26.2	0.52	0.02	19.8	115	352	0	358	+0.59	0.1	0.57
01	Treated	06/29/16	425	729	7.97	284	0	23	7.2	110.0	25.6	0.00	0.09	4.7	116	346	0	380	+0.96	0.1	0.61
01	Treated	06/20/19	449	779	8.13	284	0	27	7.5	99.5	26.5	0.07	0.02	16.7	119	346	0	357	+1.08	0.0	0.66
Averages			453	766	7.79	282	0	24	8.1	98.4	26.1	0.12	0.03	10.4	116	344	0	360		0.2	0.63

**Information on Lead and Copper for Buffalo Gap (EPA ID 0077)**

**Terms and abbreviations used in this table:**

\* Action Level(AL): the concentration of a contaminant which, when exceeded, triggers treatment or other requirements which a water system must follow. For Lead and Copper, 90% of the samples must be below the AL.

**Units:**

\*ppb: parts per billion, or micrograms per liter(ug/l)

\*ppm: parts per million, or milligrams per liter(mg/l)

Substance	90% Level	Test Sites > Action Level	Date Tested	Highest Level Allowed (AL)	Ideal Goal	Units	Major Source of Contaminant
Copper	0.1	0	09/28/14	AL=1.3	0	ppm	Corrosion of household plumbing systems; erosion of natural deposits; leaching from wood preservatives.
Lead	2	0	09/28/14	AL=15	0	ppb	Corrosion of household plumbing systems; erosion of natural deposits.

Sample Site	Sample Date	Lead(ppb)	Copper(ppm)	Sample Site Type
407 Main	09/28/14	3.00	0.05	Tier III
310 N 2nd	09/28/14	1.00	0.03	Tier III
206 Pine	09/28/14	1.00	0.04	Tier III
106 Oak	09/28/14	0.00	0.06	Tier III
303 Main	09/28/14	0.00	0.02	Tier III

Please direct questions regarding this information to Mr Todd Heck with the Buffalo Gap public water system at (605)833-2481.

# TOWN OF BUFFALO GAP



2020

## Drinking Water Report

Contact us by calling (605)833-2332 or write us at PO Box 295 Buffalo Gap SD 57722-0295

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# Town of Buffalo Gap

## DRINKING WATER REPORT

### WATER QUALITY

Last year, the Town of Buffalo Gap monitored your drinking water for possible contaminants. This report is a snapshot of the quality of the water that we provided last year. Included are details about where your water comes from, what it contains, and how it compares to Environmental Protection Agency (EPA) and state standards. We are committed to providing you with information because informed customers are our best allies.

#### Water Source

We serve more than 126 customers an average of 9,450 gallons of water per day. Our water is groundwater that we produce from local wells. The state has performed an assessment of our source water and they have determined that the relative susceptibility rating for the Buffalo Gap public water supply system is low.

**For more information about your water and information on opportunities to participate in public meetings, call (605)833-2332 and ask for Heather Besco-Clyde.**

#### Additional Information

The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally-occurring minerals, and can pick up substances resulting from the presence of animals or from human activity.

Contaminants that may be present in source water include:

- *Microbial contaminants*, such as viruses and bacteria, which may come from sewage treatment plants, septic systems, agricultural livestock operations, and wildlife.
- *Inorganic contaminants*, such as salts and metals, which can be naturally-occurring or result from urban stormwater runoff, industrial or domestic wastewater discharges, oil and gas production, mining, or farming.
- *Pesticides and herbicides*, which may come from a variety of sources such as agriculture, urban stormwater runoff, and residential uses.
- *Organic chemical contaminants*, including synthetic and volatile organic chemicals, which are by-products of industrial processes and petroleum production, and can also come from gas stations, urban stormwater runoff, and septic systems.
- *Radioactive contaminants*, which can be naturally-occurring or be the result of oil and gas production and mining activities.

In order to ensure that tap water is safe to drink, EPA prescribes regulations which limit the amount of certain contaminants in water provided by public water systems. FDA regulations establish limits for contaminants in bottled water which must provide the same protection for public health.

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the Environmental Protection Agency's Safe Drinking Water Hotline (800-426-4791).

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. EPA/CDC guidelines on appropriate means to lessen the risk of infection by *Cryptosporidium* and other microbial contaminants can be obtained by calling the Environment Protection Agency's Safe Drinking Water Hotline (800-426-4791).

If present, elevated levels of lead can cause serious health problems, especially for pregnant women and young children. Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. The Town of Buffalo Gap public water supply system is responsible for providing high quality drinking water, but cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to 2 minutes before using water for drinking or cooking. If you are concerned about lead in your water, you may wish to have your water tested. Information on lead in drinking water, testing methods, and steps you can take to minimize exposure is available from the Safe Drinking Water Hotline or at <http://www.epa.gov/safewater/lead>.

## Detected Contaminants

The attached table lists all the drinking water contaminants that we detected during the 2020 calendar year. The presence of these contaminants in the water does not necessarily indicate that the water poses a health risk. Unless otherwise noted, the data presented in this table is from testing done January 1 – December 31, 2020. The state requires us to monitor for certain contaminants less than once per year because the concentrations of these contaminants are not expected to vary significantly from year to year. Some of the data, though representative of the water quality, is more than one year old.

Coliforms are bacteria that are naturally present in the environment and are used as an indicator that other, potentially harmful waterborne pathogens may be present or that potential pathway exists through which contamination may enter the drinking water distribution system. We found coliforms indicating the need to look for potential problems in water treatment or distribution. When this occurs, we are required to conduct an assessment to identify problems and to correct any problems that were found during these assessments. A Level One assessment is a study of the water system to identify potential problems and determine why total coliform bacteria have been found in our water system. We conducted one Level One assessment in 2020 and have determined any corrective actions needed.

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**2020 Table of Detected Regulated Contaminants For Buffalo Gap (EPA ID 0077)**

**Terms and abbreviations used in this table:**

- \* **Maximum Contaminant Level Goal (MCLG):** the level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.
- \* **Maximum Contaminant Level (MCL):** the highest level of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLGs as feasible using the best available treatment technology.
- \* **Action Level (AL):** the concentration of a contaminant which, when exceeded, triggers treatment or other requirements which a water system must follow. For Lead and Copper, 90% of the samples must be below the AL.
- \* **Treatment Technique (TT):** A required process intended to reduce the level of a contaminant in drinking water. For turbidity, 95% of samples must be less than 0.3 NTU.
- \* **Running Annual Average (RAA):** Compliance is calculated using the running annual average of samples from designated monitoring locations.

**Units:**

- \*MFL: million fibers per liter
- \*pCi/l: picocuries per liter (a measure of radioactivity)
- \*ppb: parts per billion, or nanograms per liter
- \*mrem/year: millirems per year (a measure of radiation absorbed by the body)
- \*ppm: parts per million, or milligrams per liter (mg/l)
- \*ppq: parts per quadrillion, or picograms per liter
- \*NTU: Nephelometric Turbidity Units
- \*ppb: parts per billion, or micrograms per liter (ug/l)
- \*ppm: positive samples per month

Substance	90% Level	Test Sites > Action Level	Date Tested	Highest Level Allowed (AL)	Ideal Goal	Units	Major Source of Contaminant
Copper	0.1	0	09/30/20	AL=1.3	0	ppm	Corrosion of household plumbing systems; erosion of natural deposits; leaching from wood preservatives.
Lead	2	0	09/30/20	AL=15	0	ppb	Corrosion of household plumbing systems; erosion of natural deposits.

Substance	Highest Level Detected	Range	Date Tested	Highest Level Allowed (MCL)	Ideal Goal (MCLG)	Units	Major Source of Contaminant
Alpha emitters	17	ND - 17	11/03/20	15	0	pCi/l	Erosion of natural deposits.
Barium	0.021		11/03/20	2	2	ppm	Discharge of drilling waste; discharge from metal refineries; erosion of natural deposits.
Combined Radium	5	ND - 5	11/03/20	5	0	pCi/l	Erosion of natural deposits.
Combined Uranium	30	ND - 30	11/03/20	30	0	ppb	Erosion of natural deposits.
Fluoride	0.04		11/03/20	4	<4	ppm	Erosion of natural deposits; water additive which promotes strong teeth; discharge from fertilizer and aluminum factories.
Selenium	16		11/03/20	50	50	ppb	Discharge from petroleum and metal refineries; erosion of natural deposits; discharge from mines.
Total Coliform Bacteria	2	positive samples		5%	0	ppm	Naturally present in the environment.

Please direct questions regarding this information to Mr Todd Heck with the Buffalo Gap public water system at (605)833-2332.

# **Appendix C Hydrant Flow Test Worksheet**



## Fire Hydrant Testing

**Location:** Buffalo Gap, SD  
**Performed By:** Jordan Allbee, E.I.T. (Helms and Associates)  
 Mitchell Babcock (Helms and Associates)  
 Todd - Town of Buffalo Gap  
**Date:** 4/21/2021  
**Time:** 12 p.m. to 4 p.m.  
**Weather:** Sunny, 50°, Light Wind

Test Number	Static Pressure (psi)	Residual Pressure (psi)	Fire Flow (gpm)	Description of Static Hydrant	Description of Flowing Hydrant
1	46	21	425	Hydrant #2 ( Corner of Elm St and 4th St)	Hydrant #1 (North End of 3rd St)
2	52	15	560	Hydrant #15 (Corner of Main St and 1st St)	Hydrant #12 (Corner of Walnut St and 1st St)
3	50	15	425	Hydrant #18 (Corner of Cedar St and 3rd St)	Hydrant #19 (Corner of Cedar St and 2nd St)
<b>Static Pressures Measured at Houses and Yard Hydrants Around Town</b>					
1	45	Yard Hydrant @ 408 N 3rd St			
2	40	House Spicket on SE Corner of Elm St and 3rd St Intersection			
3	41	House Spicket @ 200 Pine St			
4	45	House Spicket @ 202 Pine St			
5	44	Yard Hydrant @ 204 Walnut St			
6	49	Yard Hydrant @ 105 Pine St			
7	47	Yard Hydrant @ 105 N 3rd St			
8	48	House Spicket on Old Church @ 205 Main St			
9	49	Yard Hydrant @ 156 Main St			
10	45	Building Spicket @ 104 Main St			
11	52	Yard Hydrant @ 105 Oak St			
12	49	House Spicket @ 202 S 2nd St			
13	75	House Spicket @ South End of 2nd St			
14	65	Yard Hydrant @ South End of 2nd St			



# **Appendix D Tank Inspection Reports**





# **Report of Procedures and Findings From the Cleaning & Inspection of**

## **Tank #1 On Grade Town of Buffalo Gap, SD**



**By**  
**Midco Diving & Marine Services, Inc.**

800.479.1558 (P)  
800.238.0217 (F)  
[www.midcodiving.com](http://www.midcodiving.com)  
[info@midcodiving.com](mailto:info@midcodiving.com)  
PO Box 513, Rapid City, SD. 57709 – 605.791.3030

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February 4, 2022

Town of Buffalo Gap  
PO Box 295  
Buffalo Gap, SD 57722

Attention: Todd Heck  
(503) 932-0787  
[Taskheck68@yahoo.com](mailto:Taskheck68@yahoo.com)

**RE: 2021 Tank Maintenance Project**

Dear Todd,

The following is a summary of a visual and video inspection of Tank #1 On Grade for the Town of Buffalo Gap in Buffalo Gap, SD. This inspection was undertaken on November 7 & 8, 2021 by Midco Diving & Marine Services, Inc., of Rapid City, SD. The findings of this inspection report are a supplement to the inspection video.

The reservoir was inspected by a surface supplied commercial air diver. The diver was equipped with real-time high-definition color video and a LED lighting system as well as live voice communication between the inspecting diver and the surface team.

All procedures were carried out in accordance with Midco's *Standards and Procedures*, as well as the appropriate guidelines and regulations of: the Association of Diving Contractors International (ADCI), U.S. Army Corps of Engineers (USACE), Bureau of Reclamation (BOR), U.S. Coast Guard and Occupational Safety and Health Administration (OSHA). These guidelines are strictly adhered to and in many cases, exceeded by Midco Diving.

If you have any questions about this report or if you would like an additional estimate for any repair work noted below, please feel free to contact the following:

Kelly Doak  
[k.doak@midcodiving.com](mailto:k.doak@midcodiving.com)  
Regional Manager

Greg Lakey  
[greg@midcodiving.com](mailto:greg@midcodiving.com)  
Business Development Manager

Kadi Gill  
[kadi@midcodiving.com](mailto:kadi@midcodiving.com)  
Sales Fulfillment Manager

Sincerely,

*Taylor Sawyer*

Taylor Sawyer  
Office Assistant

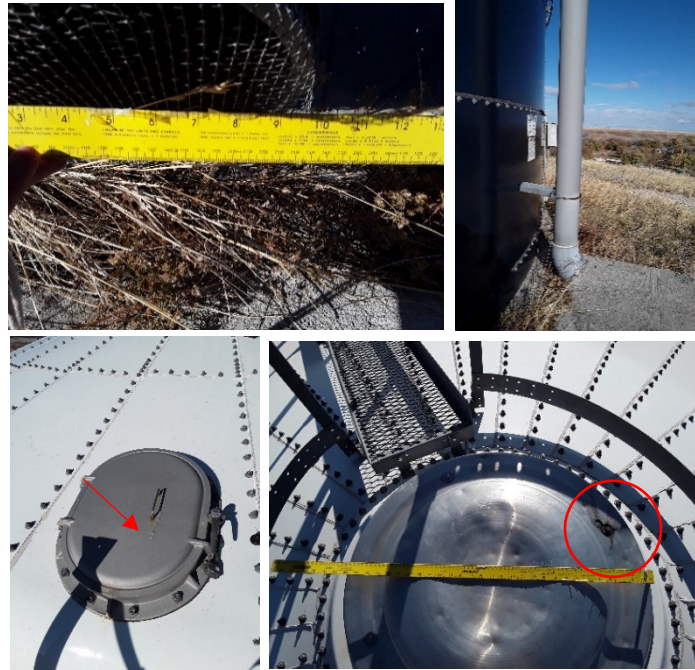
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[info@midcodiving.com](mailto:info@midcodiving.com)  
PO Box 513, Rapid City, SD. 57709 – 605.791.3030

## TANK #1 ON GRADE FINDINGS

### EXTERIOR FINDINGS

Upon visual inspection of the exterior of the structure, the reservoir appears to be in good condition, with the following findings noted:

1. The overflow screen is not #24 corrosion resistant mesh.
2. The overflow does not discharge at least 12"-24" above the splash plate.
3. Hardware corrosion noted on the access hatch.
4. Roof vent deterioration noted.



### INTERIOR FINDINGS

Upon visual inspection of the structure above and below the water line, the overall condition of the tank appears to be in good condition, with the following findings noted:

1. Up to 3" of sediment noted.
2. High turbidity noted upon tank entry.
3. Areas of corrosion noted.



#### DISCLAIMER

Midco Diving & Marine Services, Inc. does not provide consulting engineering services, nor do we employ licensed Professional Engineers. The findings contained herein were neither prepared or reviewed by a licensed engineer, but are based on the visual examination, experience, and training of the inspecting diver and dive support crew.

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# MIDCO

DIVING & MARINE SERVICES

## PROJECT INFORMATION

Job Number: P2021132  
Date Completed: November 7 & 8, 2021  
Location: 43.493458, -103.320070  
Buffalo Gap, SD 57722

## DIVE TEAM

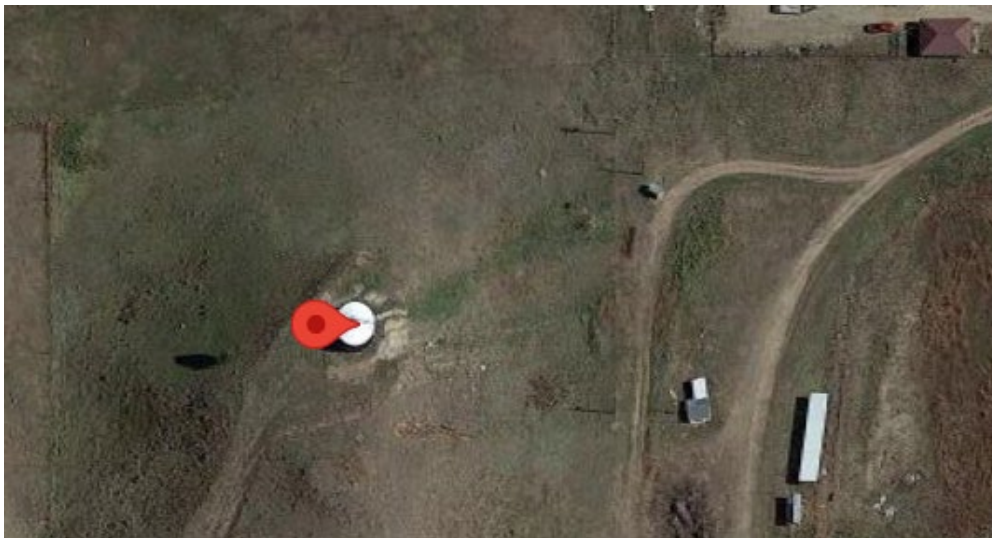
Dive Supervisor: Cameron  
Diver/Tender: Parr  
Diver/Tender: Patton

## RESERVOIR INFORMATION

Reservoir Name: Tank #1 On Grade  
Gallons: 88,000  
Diameter: 35'  
Height: 15'  
Water Depth: 12 1/2'  
Construction: Steel Bolted  
Last Inspected: 2018

## RECOMMENDATIONS:

1. Install #24 corrosion resistant mesh on the overflow.
2. Correct the overflow to discharge at least 12"-24" above the splash plate.
3. Monitor/repair the roof vent due to noted deterioration.
4. Monitor/repair noted corrosion.
5. Consider having Midco Diving & Marine Services, Inc., install a PAX Water Mixer.
6. Have Midco Diving & Marine Services, Inc. clean & inspect every 3 years or less.





DIVING & MARINE SERVICES

N/A - Not applicable

Excellent (Ex) - Like new condition, no maintenance needed.

Good - Cosmetic only problems, maintenance if wanted.

Fair - Minor problems, maintenance needed, not immediate.

Poor - Major problems, structural or like, immediate maintenance needed.

Component	Condition					Comments
	NA	Ex.	Good	Fair	Poor	
<i>Site Security</i>			X			
<b>Gate</b>			X			
<b>Fence</b>			X			
<b>Locks</b>			X			
<b>Alarm</b>	X					
<i>Reservoir Exterior</i>			X			
<b>Coating</b>			X			
<b>Foundation</b>			X			
<b>Cleanliness</b>			X			
<b>Seams/Joints</b>			X			
<i>Exterior Roof</i>			X			
<b>Coating</b>			X			
<b>Cleanliness</b>			X			
<b>Seams/Joints</b>			X			
<i>Exterior Ladder</i>			X			<b>Width: 16"</b>
<b>Coating</b>	X					
<b>Caged</b>			X			
<b>Safety Climb</b>	X					
<i>Roof Vents</i>			X			<b>Size: 29"</b> <b>Height: 8" – Deterioration Noted</b>
<b>Coating</b>	X					
<b>Screen</b>			X			
<i>Side Vents</i>	X					
<b>Coating</b>	X					
<b>Screen</b>	X					
<i>Exterior Telemetry</i>			X			
<b>Coating</b>	X					
<b>Functioning</b>			X			

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info@midcodiving.com

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Component	Condition					Comments
	NA	Ex.	Good	Fair	Poor	
<i>Manual Level Indicator</i>	X					
<b>Tag</b>	X					
<b>Cable</b>	X					
<b>Indicator</b>	X					
<b>Pulleys</b>	X					
<b>Base</b>	X					
<i>Exterior Man Entries</i>			X			<b>Size: 30"</b>
<b>Coating</b>	X					
<b>Gasket</b>			X			
<i>Exterior Inlet</i>	X					
<b>Coating</b>	X					
<b>Valve</b>	X					
<i>Exterior Outlet</i>	X					
<b>Coating</b>	X					
<b>Valve</b>	X					
<i>Exterior Drain/Scour</i>	X					
<b>Coating</b>	X					
<b>Valve</b>	X					
<i>Exterior Water Tap</i>	X					
<b>Coating</b>	X					
<b>Valve</b>	X					
<i>Exterior Overflow</i>				X		<b>Size: 9"</b>
<b>Coating</b>	X					
<b>Stand-offs</b>			X			
<b>Screen</b>				X		<b>Type: Screen – Not #24 Mesh</b>
<i>Access Hatch</i>			X			<b>Size: 19" x 24" – Hardware Corrosion Noted</b>
<b>Weather Stripping</b>			X			
<b>Coating</b>	X					
<b>Hinges</b>			X			
<b>Lock</b>			X			
<b>Safety Railing</b>			X			<b>Height: 30"</b>

Component	Condition					Comments
	NA	Ex.	Good	Fair	Poor	
<i>Interior Ladder</i>	X					
<b>Caged</b>	X					
<b>Safety Climb</b>	X					
<i>Telemetry Sensor</i>			X			
<b>Functioning</b>			X			
<i>Float</i>	X					
<b>Guide Wires</b>	X					
<i>Interior Floor</i>			X			
<b>Coating</b>			X			
<b>Sediment</b>				X		<b>Depth: Up to 3" of Sediment Noted – High Turbidity Noted Upon Entry</b>
<b>Seams/Joints</b>			X			
<i>Interior Walls</i>			X			
<b>Coating</b>			X			
<b>Seams/Joints</b>			X			
<i>Interior Ceiling</i>			X			
<b>Coating</b>			X			
<b>Rafters</b>			X			
<i>Interior Man Entries</i>			X			<b>Size: 24"</b>
<b>Coating</b>			X			
<b>Gasket</b>			X			
<i>Support Columns</i>	X					
<b>Coating</b>	X					
<b>Base</b>	X					
<b>Top</b>	X					
<i>Cathodic Protection</i>	X					
<b>Anodes</b>			X			
<b>Wires</b>	X					
<b>Sacrificial Anodes</b>			X			

Component	Condition					Comments
	NA	Ex.	Good	Fair	Poor	
<i>Interior Overflow Pipe</i>			X			<b>Size: 9" – Corrosion Noted</b>
<b>Coating</b>	X					
<b>Top/Cap</b>			X			
<b>Connections/Flange</b>			X			
<i>Interior Inlet</i>			X			<b>Size: 7" – Corrosion Noted</b>
<b>Coating</b>	X					
<b>Riser</b>			X			<b>Measurement: 12"</b>
<i>Interior Outlet</i>			X			<b>Size: 7" – Corrosion Noted</b>
<b>Coating</b>	X					
<b>Riser</b>			X			<b>Measurement: 12"</b>
<i>Interior Drain/Scour</i>	X					
<b>Coating</b>	X					
<b>Riser</b>	X					
<i>Interior Water Tap</i>	X					
<b>Coating</b>	X					
<b>Valve</b>	X					

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info@midcodiving.com  
PO Box 513, Rapid City, SD. 57709 – 605.791.3030**



**Cleaning Reservoir – High Turbidity Noted Upon Entry**

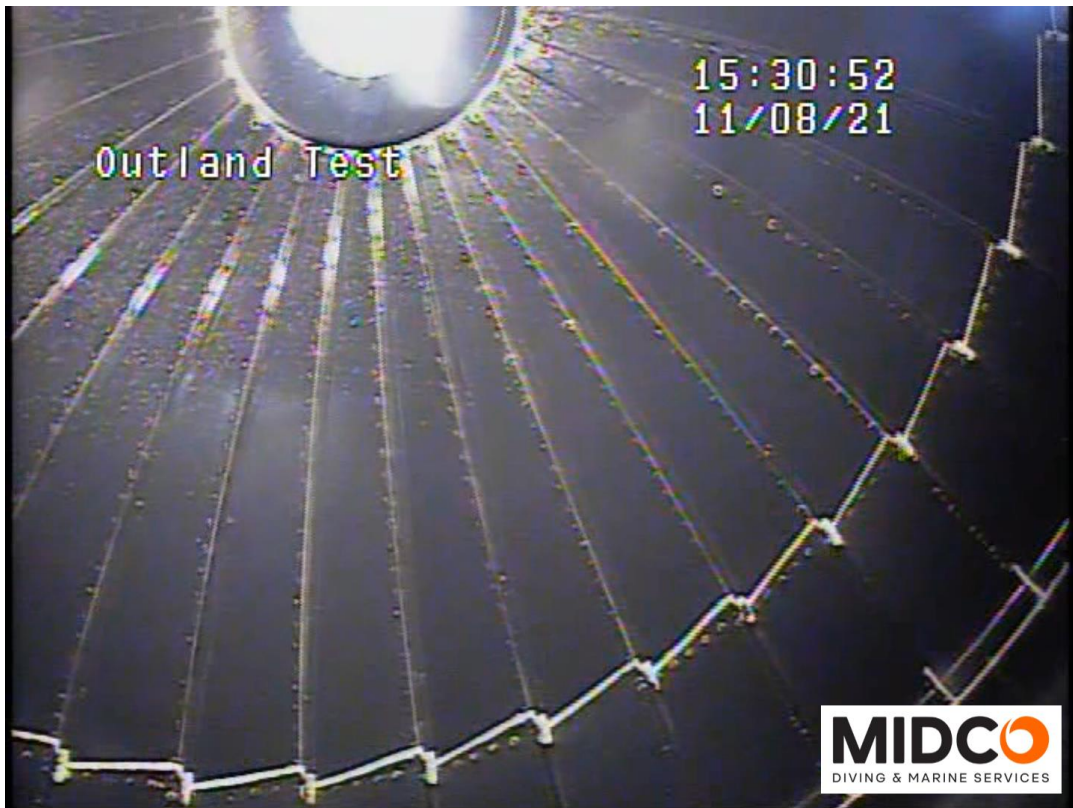


**Typical Wall**

800.479.1558 (P)  
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[info@midcodiving.com](mailto:info@midcodiving.com)  
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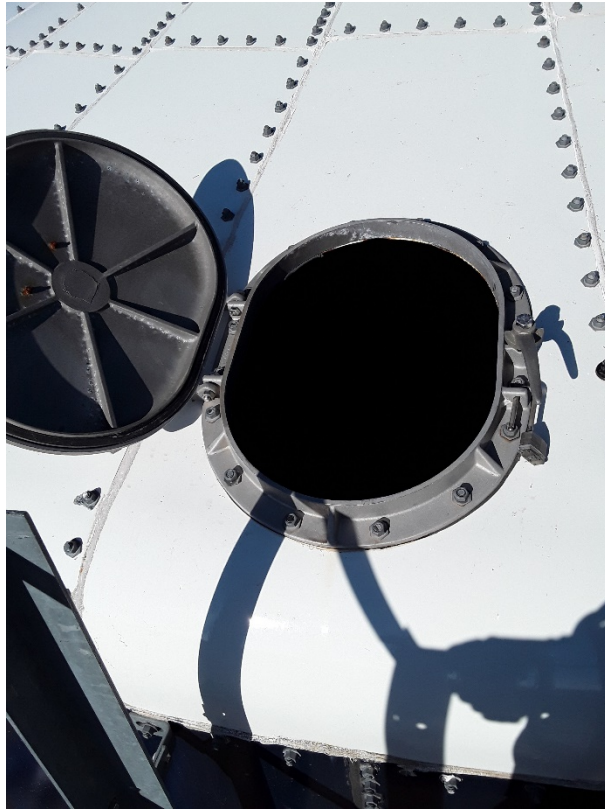


**Wall to Roof Seam and Overflow – Corrosion Noted**



**Typical Roof and Roof Vent**

800.479.1558 (P)  
800.238.0217 (F)  
[www.midcodiving.com](http://www.midcodiving.com)  
[info@midcodiving.com](mailto:info@midcodiving.com)  
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**Access Hatch**



**Access Hatch – Hardware Corrosion Noted**

800.479.1558 (P)  
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[info@midcodiving.com](mailto:info@midcodiving.com)  
PO Box 513, Rapid City, SD. 57709 – 605.791.3030



**Safety Rail**



**Exterior Ladder and Safety Rail**

**800.479.1558 (P)**  
**800.238.0217 (F)**  
**[www.midcodiving.com](http://www.midcodiving.com)**  
**[info@midcodiving.com](mailto:info@midcodiving.com)**  
**PO Box 513, Rapid City, SD. 57709 – 605.791.3030**



**Roof Vent – Deterioration Noted**



**Overflow Plumbing**

800.479.1558 (P)  
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[www.midcodiving.com](http://www.midcodiving.com)  
[info@midcodiving.com](mailto:info@midcodiving.com)  
PO Box 513, Rapid City, SD. 57709 – 605.791.3030



**Overflow Screen – Not #24 Mesh**



**Exterior Telemetry and Man Entry**

**800.479.1558 (P)**  
**800.238.0217 (F)**  
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**[info@midcodiving.com](mailto:info@midcodiving.com)**  
**PO Box 513, Rapid City, SD. 57709 – 605.791.3030**



**Man Entry**



**Reservoir Foundation**

**800.479.1558 (P)**  
**800.238.0217 (F)**  
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**[info@midcodiving.com](mailto:info@midcodiving.com)**  
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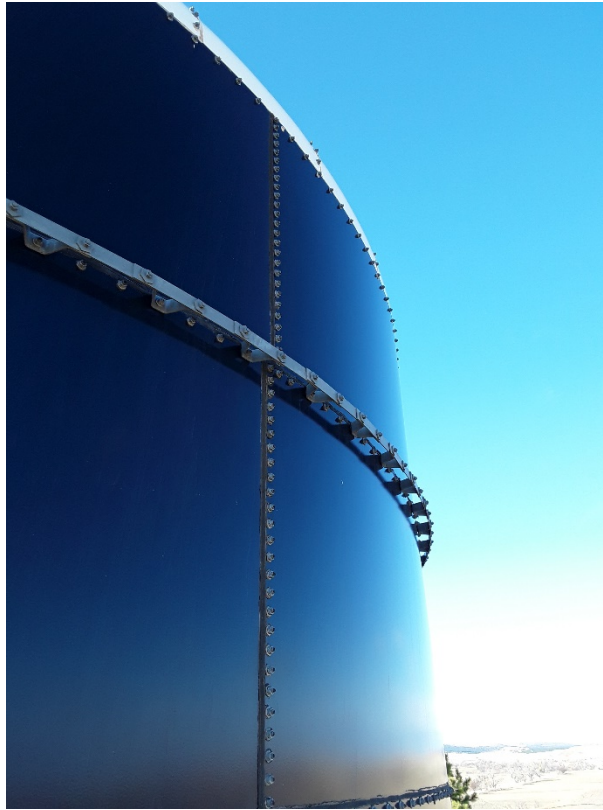


**Reservoir Foundation**



**Reservoir Foundation**

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**Exterior Reservoir**



**Exterior Reservoir**

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**EPA Region 8 Drinking Water Unit / Compliant Report  
Finished Water Storage Tank Inspection/ Cleaning Checklist**

Fill out one checklist per storage tank & submit labeled photos of each tank component with this form

Public Water System Name: Town of Buffalo Gap	Public Water System ID:
Reservoir Name: Tank #1 On Grade	Reservoir ID:
Proposed Inspection Date: November 7 & 8, 2021	Actual Inspection Date: November 7 & 8, 2021
Name of Person Filling Out Form: Taylar Sawyer	Title of Person Filling Out Form: Office Assistant
I certify that this information is complete and accurate: Yes <i>Taylar Sawyer</i> Date: February 4, 2022	

**Inspector Qualifications (answer to all questions must be "yes")**

Name and contact information of inspector or inspection company: **Midco Diving & Marine Services, Inc.**

<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Has the inspector completed confined space training?
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Did the inspector have a confined space entry permit?

**Overall Tank Condition**

Significant Deficiency	Required Correction	Proposed Completion Date	Proposed Completion Date
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Does the tank appear to be structurally sound?	If no, what repairs are suggested by the tank inspector?	
<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Are there any unprotected openings in the tank (breaches, leaks, daylight coming through tank in spots, etc.)	If yes, indicate type of breach and how it should be repaired.	

**Air Vent**

Significant Deficiency	Required Correction	Proposed Completion Date	Proposed Completion Date
<b>Above Ground Tanks (Ground Level or Elevated)</b> <input type="checkbox"/> Check if NA			
<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	<u>Downturned vent:</u> Is the vent at least 24" or 3 pipe diameters above the roof?	If no reconfigure vent to provide proper air gap.	
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<u>Non-downturned vent:</u> Is there a solid cover down to the bottom of the vent screen?	If no, indicate deficiency and proposed correction:	
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<u>Non-downturned vent:</u> Is the screen at least 8" above the roof surface? What is the height of the start of the screening above the tank?	If no, indicate deficiency and proposed correction:	
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Is the vent covered with #24 mesh corrosion resistant screening (some exceptions apply)? Mesh Size:	If no, indicate deficiency and proposed correction:	

<b>Buried or Partially Buried Tanks</b> <input checked="" type="checkbox"/> Check if NA				
<input type="checkbox"/> Yes <input type="checkbox"/> No	Is the vent covered with #24 mesh corrosion resistant screening?	If no, install proper #24 mesh corrosion resistant screening.		
<input type="checkbox"/> Yes <input type="checkbox"/> No	Does the air vent terminate downward?	If no, re-configure the vent so that it terminates downward.		
<input type="checkbox"/> Yes <input type="checkbox"/> No	Is the air vent at least 24" above the tank roof or ground surface (whichever is higher)? What is the height of the vent above the roof or ground surface?	If no, raise air vent to provide for an appropriate air gap.		

<b>Access Hatch</b>				
<b>Significant Deficiency</b>		<b>Required Correction</b>	<b>Proposed Completion Date</b>	<b>Proposed Completion Date</b>
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Is the hatch raised at least 4" above the roof (for ground level or elevated tanks) or at least 24 inches above the roof or ground, whichever is higher (for buried or partially buried tanks)? What is the height of the access hatch above the roof or ground surface?	If no, the hatch should be raised to the appropriate height above the tank roof or ground.		
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Does the hatch have a shoe box lid?	If no, a properly designed shoe box type lid should be installed.		
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Is the lid water tight and sealed with a rubber gasket?	If no, the reason for the lack of a seal should be investigated and repaired.		
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Is the hatch locked?	If no, the hatch should be equipped with a lock.		

<b>Overflow</b> <input type="checkbox"/> Check if NA				
<b>Significant Deficiency</b>		<b>Required Correction</b>	<b>Proposed Completion Date</b>	<b>Proposed Completion Date</b>
<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Discharge has #24 mesh corrosion resistant screen OR a duckbill valve OR a properly sealed flapper valve with a screen inside (EPA recommends #24 mesh screen)?	If no, indicate proposed correction:		
<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Overflow terminates between 12 and 24 inches above the ground surface? At what height does the overflow discharge?	If no, modify overflow to provide for an appropriate air gap.		
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Overflow discharges over an inlet structure, splash plate, or engineered rip-rap?	If no, indicate proposed correction:		

<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Is the overflow directly connected to a sanitary sewer or storm drain?	If yes, indicate proposed correction:		
<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Is there blockage in the overflow, an inadequately sized overflow, a malfunction of the level control system, or other issue that is causing the tank to overflow through the hatch or vent?	If yes, indicate what is causing the problem and how it should be repaired:		
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Is the overflow discharge point visible? If no, it is recommended that the discharge point be moved to a location that is visible.		Not Required	

<b>Drain</b> <input checked="" type="checkbox"/> Check if NA				
<b>Significant Deficiency</b>		<b>Required Correction</b>	<b>Proposed Completion Date</b>	<b>Proposed Completion Date</b>
<input type="checkbox"/> Yes <input type="checkbox"/> No	Does the drain pipe have an air gap of 3 or more pipe diameters above the entrance to any storm or sanitary sewers?	If no, indicate proposed correction:		
<input type="checkbox"/> Yes <input type="checkbox"/> No	Does the discharge have a #24 mesh corrosion resistant screen OR a duckbill valve OR a properly sealed flapper valve with a screen inside? If no, EPA recommends that a #24 mesh screen be installed.		Not Required	
<input type="checkbox"/> Yes <input type="checkbox"/> No	Does the drain terminate between 12 and 24 inches above the ground surface and discharges over an inlet structure or splash plate? If no, it is recommended that the discharge point be modified to provide for the appropriate air gap.		Not Required	

<b>Cleaning and Other Items</b>				
<b>Significant Deficiency</b>		<b>Required Correction</b>	<b>Proposed Completion Date</b>	<b>Proposed Completion Date</b>
Describe any other items noted by the inspector that have the potential to cause contamination of the finished drinking water:		What repairs are suggested to prevent or eliminate the source of contamination?		
Depth of sediment found in the tank before cleaning (inches): <b>Up to 3" of sediment noted</b> How was the storage tank cleaned? <b>Diver with vacuum/hand nozzle system</b> How was the storage tank disinfected after cleaning? <b>N/A</b> List any objects found inside the tank during cleaning that may have introduced contamination into the water system (examples: debris, animals, etc.): <b>N/A</b> Please attach tank as-built drawings (if available) or a sketch of the tank's configuration and dimensions including the location, layout and dimensions of all major components (i.e. access hatch, vent, overflow, drain)				



# **Report of Procedures and Findings From the Cleaning & Inspection of**

## **Tank #2 Below Grade Town of Buffalo Gap, SD**



**By**  
**Midco Diving & Marine Services, Inc.**

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February 4, 2022

Town of Buffalo Gap  
PO Box 295  
Buffalo Gap, SD 57722

Attention: Todd Heck  
(503) 932-0787  
[taskheck68@yahoo.com](mailto:taskheck68@yahoo.com)

**RE: 2021 Tank Maintenance Project**

Dear Todd,

The following is a summary of a visual and video inspection of Tank #2 Below Grade for the Town of Buffalo Gap in Buffalo Gap, SD. This inspection was undertaken on November 8 & 9, 2021 by Midco Diving & Marine Services, Inc., of Rapid City, SD. The findings of this inspection report are a supplement to the inspection video.

The reservoir was inspected by a surface supplied commercial air diver. The diver was equipped with real-time high-definition color video and a LED lighting system as well as live voice communication between the inspecting diver and the surface team.

All procedures were carried out in accordance with Midco's *Standards and Procedures*, as well as the appropriate guidelines and regulations of: the Association of Diving Contractors International (ADCI), U.S. Army Corps of Engineers (USACE), Bureau of Reclamation (BOR), U.S. Coast Guard and Occupational Safety and Health Administration (OSHA). These guidelines are strictly adhered to and in many cases, exceeded by Midco Diving.

If you have any questions about this report or if you would like an additional estimate for any repair work noted below, please feel free to contact the following:

Kelly Doak  
[k.doak@midcodiving.com](mailto:k.doak@midcodiving.com)  
Regional Manager

Greg Lakey  
[greg@midcodiving.com](mailto:greg@midcodiving.com)  
Business Development Manager

Kadi Gill  
[kadi@midcodiving.com](mailto:kadi@midcodiving.com)  
Sales Fulfillment Manager

Sincerely,

*Taylor Sawyer*

Taylor Sawyer  
Office Assistant

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## TANK #2 BELOW GRADE FINDINGS

### EXTERIOR FINDINGS

Upon visual inspection of the exterior of the structure, the reservoir appears to be in good condition, with the following findings noted:

1. Roof Vent deterioration noted.
2. The overflow screen is not #24 corrosion resistant mesh.
3. The overflow does not discharge 12"-24" above the rip-rap.
4. Debris noted around the overflow.
5. No weather stripping noted on the access hatch.
6. The access hatch does not sit at least 24" above the ground surface.
7. The access hatch does not have a shoe box lid.
8. Areas of corrosion noted.
9. Spalling noted in the access hatch.



### INTERIOR FINDINGS

Upon visual inspection of the structure above and below the water line, the overall condition of the tank appears to be in good condition, with the following findings noted:

1. Up to 3" of sediment noted.
2. Areas of corrosion noted.



#### DISCLAIMER

Midco Diving & Marine Services, Inc. does not provide consulting engineering services, nor do we employ licensed Professional Engineers. The findings contained herein were neither prepared or reviewed by a licensed engineer, but are based on the visual examination, experience, and training of the inspecting diver and dive support crew.

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# MIDCO

DIVING & MARINE SERVICES

## PROJECT INFORMATION

Job Number: P2021132  
Date Completed: November 8 & 9, 2021  
Location: 43.493453, -103.320397  
Buffalo Gap, SD 57722

## DIVE TEAM

Dive Supervisor: Cameron  
Diver/Tender: Parr  
Diver/Tender: Patton

## RESERVOIR INFORMATION

Reservoir Name: Tank #2 Below Grade  
Gallons: 50,000  
Water Depth: 8'  
Construction: Concrete

## RECOMMENDATIONS:

1. Repair/replace the roof vent.
2. Install #24 corrosion resistant mesh on the overflow.
3. Correct the overflow to discharge 12"-24" above the rip-rap.
4. Clear out the debris from around the overflow.
5. Correct the access hatch to sit at least 24" above the ground with a shoe box lid.
6. Install weather stripping on the access hatch.
7. Monitor/repair noted spalling.
8. Monitor/repair noted corrosion.
9. Consider having Midco Diving & Marine Services, Inc., install a PAX Water Mixer.
10. Have Midco Diving & Marine Services, Inc. clean & inspect every 3 years or less.





DIVING & MARINE SERVICES

N/A - Not applicable

Excellent (Ex) - Like new condition, no maintenance needed.

Good - Cosmetic only problems, maintenance if wanted.

Fair - Minor problems, maintenance needed, not immediate.

Poor - Major problems, structural or like, immediate maintenance needed.

Component	Condition					Comments
	NA	Ex.	Good	Fair	Poor	
<i>Site Security</i>			X			
<b>Gate</b>	X					
<b>Fence</b>			X			
<b>Locks</b>			X			
<b>Alarm</b>	X					
<i>Reservoir Exterior</i>			X			
<b>Coating</b>	X					
<b>Foundation</b>			X			
<b>Cleanliness</b>			X			
<b>Seams/Joints</b>	X					
<i>Exterior Roof</i>			X			
<b>Coating</b>	X					
<b>Cleanliness</b>			X			
<b>Seams/Joints</b>	X					
<i>Exterior Ladder</i>	X					
<b>Coating</b>	X					
<b>Caged</b>	X					
<b>Safety Climb</b>	X					
<i>Roof Vents</i>				X		<b>Size: 4" – Deterioration Noted</b>
<b>Coating</b>	X					
<b>Screen</b>				X		
<i>Side Vents</i>	X					
<b>Coating</b>	X					
<b>Screen</b>	X					
<i>Exterior Telemetry</i>	X					
<b>Coating</b>	X					
<b>Functioning</b>	X					

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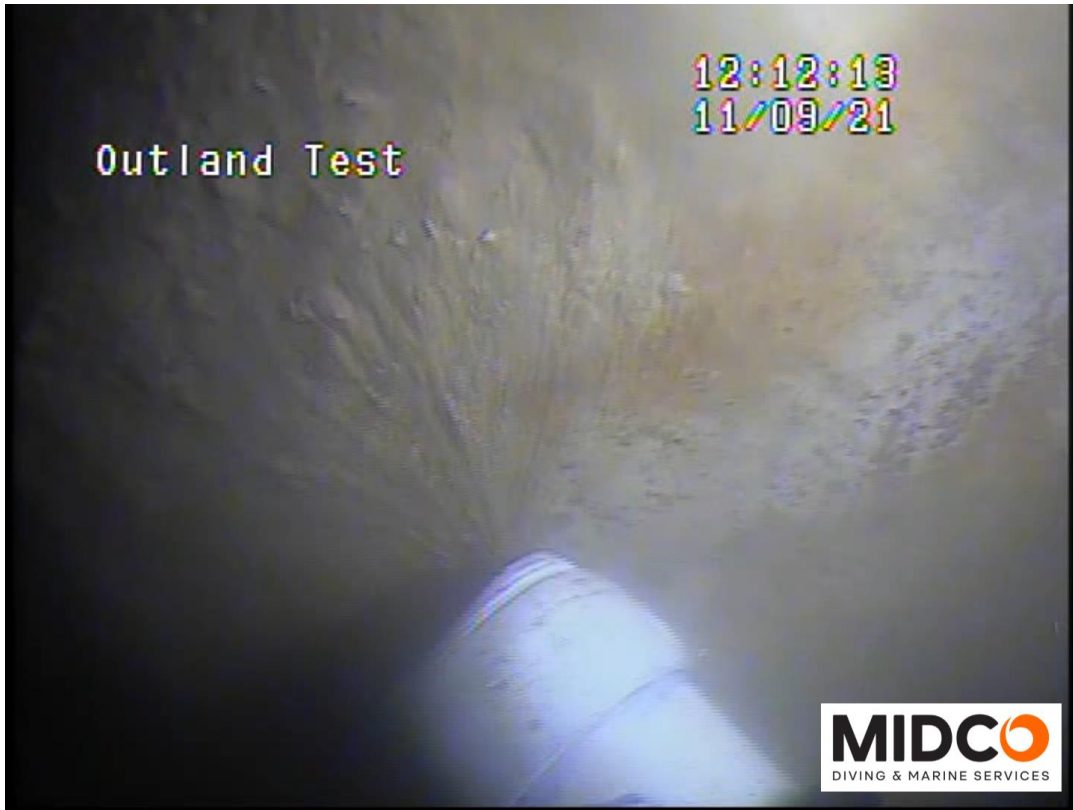
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Component	Condition					Comments
	NA	Ex.	Good	Fair	Poor	
<i>Manual Level Indicator</i>	X					
<b>Tag</b>	X					
<b>Cable</b>	X					
<b>Indicator</b>	X					
<b>Pulleys</b>	X					
<b>Base</b>	X					
<i>Exterior Man Entries</i>	X					
<b>Coating</b>	X					
<b>Gasket</b>	X					
<i>Exterior Inlet</i>	X					
<b>Coating</b>	X					
<b>Valve</b>	X					
<i>Exterior Outlet</i>	X					
<b>Coating</b>	X					
<b>Valve</b>	X					
<i>Exterior Drain/Scour</i>	X					
<b>Coating</b>	X					
<b>Valve</b>	X					
<i>Exterior Water Tap</i>	X					
<b>Coating</b>	X					
<b>Valve</b>	X					
<i>Exterior Overflow</i>				X		<b>Size: 9" Height: Flush – Debris Noted</b>
<b>Coating</b>	X					
<b>Stand-offs</b>	X					
<b>Screen</b>					X	<b>Type: Screen – Not #24 Mesh</b>
<i>Access Hatch</i>				X		<b>Size: 24" x 24" Height: 20"</b>
<b>Weather Stripping</b>					X	<b>No Weather Stripping Noted</b>
<b>Coating</b>	X					
<b>Hinges</b>	X					
<b>Lock</b>			X			
<b>Safety Railing</b>	X					

Component	Condition					Comments
	NA	Ex.	Good	Fair	Poor	
<i>Interior Ladder</i>	X					
<b>Caged</b>	X					
<b>Safety Climb</b>	X					
<i>Telemetry Sensor</i>	X					
<b>Functioning</b>	X					
<i>Float</i>	X					
<b>Guide Wires</b>	X					
<i>Interior Floor</i>			X			
<b>Coating</b>	X					
<b>Sediment</b>			X			<b>Depth: Up to 3" of Sediment Noted</b>
<b>Seams/Joints</b>			X			
<i>Interior Walls</i>			X			
<b>Coating</b>	X					
<b>Seams/Joints</b>			X			
<i>Interior Ceiling</i>			X			
<b>Coating</b>	X					
<b>Rafters</b>			X			
<i>Interior Man Entries</i>	X					
<b>Coating</b>	X					
<b>Gasket</b>	X					
<i>Support Columns</i>			X			
<b>Coating</b>	X					
<b>Base</b>			X			
<b>Top</b>			X			
<i>Cathodic Protection</i>	X					
<b>Anodes</b>	X					
<b>Wires</b>	X					
<b>Sacrificial Anodes</b>	X					

Component	Condition					Comments
	NA	Ex.	Good	Fair	Poor	
<i>Interior Overflow Pipe</i>			X			<b>Size: 9" – Corrosion Noted</b>
<b>Coating</b>	X					
<b>Top/Cap</b>	X					
<b>Connections/Flange</b>	X					
<i>Interior Inlet</i>			X			<b>Size: 4 1/2" – Corrosion Noted</b>
<b>Coating</b>	X					
<b>Riser</b>			X			<b>Measurement: 14 1/2"</b>
<i>Interior Outlet</i>			X			<b>Size: 4 1/2" – Corrosion Noted</b>
<b>Coating</b>	X					
<b>Riser</b>			X			<b>Measurement: 14 1/2"</b>
<i>Interior Drain/Scour</i>	X					
<b>Coating</b>	X					
<b>Riser</b>	X					
<i>Interior Water Tap</i>	X					
<b>Coating</b>	X					
<b>Valve</b>	X					

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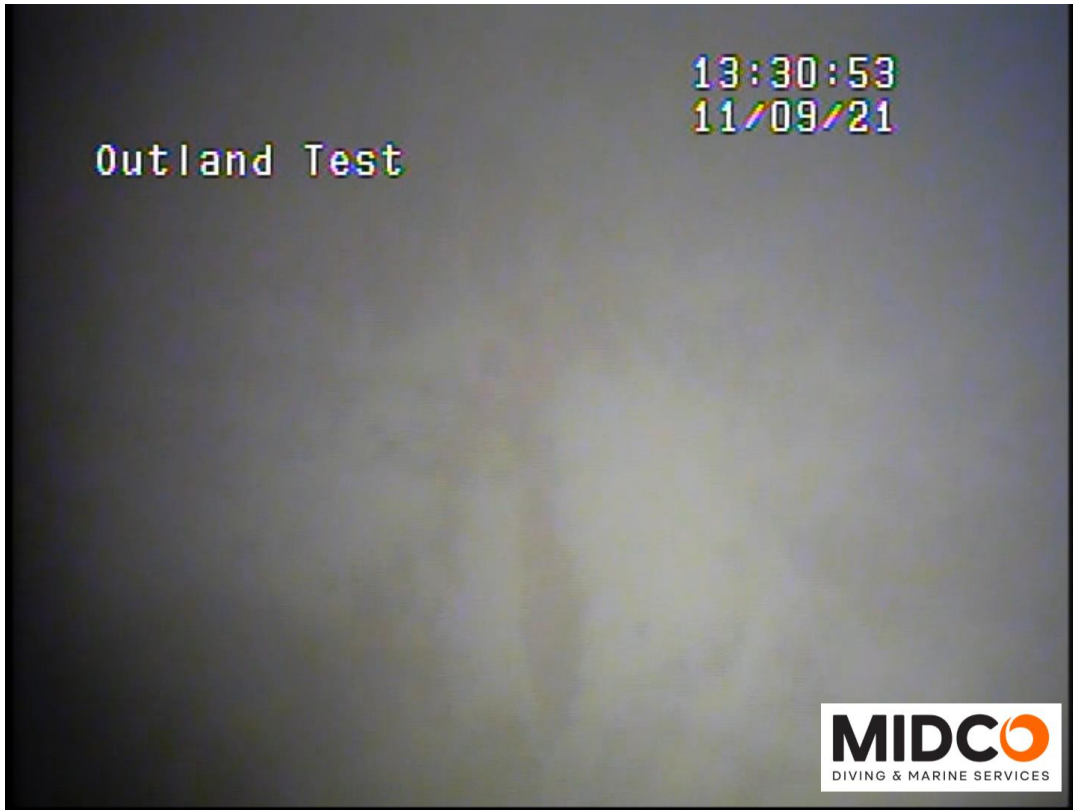


**Cleaning Reservoir**



**Cleaning Reservoir**

800.479.1558 (P)  
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**Typical Floor**

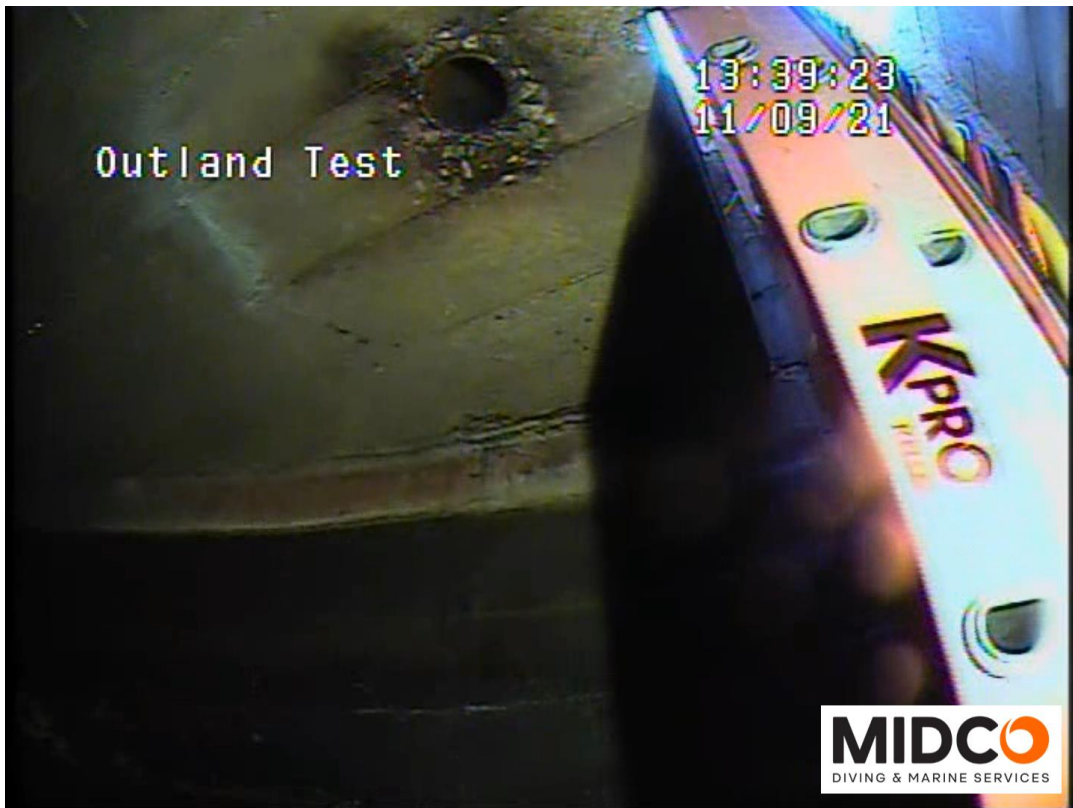


**Wall to Roof Seam**

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**Typical Roof**



**Roof Vent**

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**Overflow Plumbing – Corrosion Noted**



**Common Inlet/Outlet – Corrosion Noted**

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**Support Column**



**Access Hatch Locks**

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**Access Hatch – No Weather Stripping Noted**



**Access Hatch – Spalling Noted**

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**Access Hatch**



**Roof Vent**

**800.479.1558 (P)**  
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**[info@midcodiving.com](mailto:info@midcodiving.com)**  
**PO Box 513, Rapid City, SD. 57709 – 605.791.3030**



**Roof Vent – Deterioration Noted**



**Overflow Plumbing and Screen – Screen Deterioration & Debris Noted**

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**EPA Region 8 Drinking Water Unit / Compliant Report  
Finished Water Storage Tank Inspection/ Cleaning Checklist**

Fill out one checklist per storage tank & submit labeled photos of each tank component with this form

Public Water System Name: Town of Buffalo Gap	Public Water System ID:
Reservoir Name: Tank #2 Below Grade	Reservoir ID:
Proposed Inspection Date: November 8 & 9, 2021	Actual Inspection Date: November 8 & 9, 2021
Name of Person Filling Out Form: Taylar Sawyer	Title of Person Filling Out Form: Office Assistant
I certify that this information is complete and accurate: Yes <i>Taylar Sawyer</i> Date: February 4, 2022	

**Inspector Qualifications (answer to all questions must be "yes")**

Name and contact information of inspector or inspection company: **Midco Diving & Marine Services, Inc.**

<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Has the inspector completed confined space training?
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Did the inspector have a confined space entry permit?

**Overall Tank Condition**

Significant Deficiency	Required Correction	Proposed Completion Date	Proposed Completion Date
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Does the tank appear to be structurally sound?	If no, what repairs are suggested by the tank inspector?		
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Are there any unprotected openings in the tank (breaches, leaks, daylight coming through tank in spots, etc.)	If yes, indicate type of breach and how it should be repaired.		

**Air Vent**

Significant Deficiency	Required Correction	Proposed Completion Date	Proposed Completion Date
<b>Above Ground Tanks (Ground Level or Elevated)</b> <input checked="" type="checkbox"/> Check if NA			
<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<u>Downturned vent:</u> Is the vent at least 24" or 3 pipe diameters above the roof?	If no reconfigure vent to provide proper air gap.	
<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<u>Non-downturned vent:</u> Is there a solid cover down to the bottom of the vent screen?	If no, indicate deficiency and proposed correction:	
<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<u>Non-downturned vent:</u> Is the screen at least 8" above the roof surface? What is the height of the start of the screening above the tank?	If no, indicate deficiency and proposed correction:	
<input type="checkbox"/> Yes <input type="checkbox"/> No	Is the vent covered with #24 mesh corrosion resistant screening (some exceptions apply)? Mesh Size:	If no, indicate deficiency and proposed correction:	

<b>Buried or Partially Buried Tanks</b> <input type="checkbox"/> Check if NA				
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Is the vent covered with #24 mesh corrosion resistant screening?	If no, install proper #24 mesh corrosion resistant screening.		
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Does the air vent terminate downward?	If no, re-configure the vent so that it terminates downward.		
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Is the air vent at least 24" above the tank roof or ground surface (whichever is higher)? What is the height of the vent above the roof or ground surface?	If no, raise air vent to provide for an appropriate air gap.		

<b>Access Hatch</b>				
<b>Significant Deficiency</b>		<b>Required Correction</b>	<b>Proposed Completion Date</b>	<b>Proposed Completion Date</b>
<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Is the hatch raised at least 4" above the roof (for ground level or elevated tanks) or at least 24 inches above the roof or ground, whichever is higher (for buried or partially buried tanks)? What is the height of the access hatch above the roof or ground surface?	If no, the hatch should be raised to the appropriate height above the tank roof or ground.		
<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Does the hatch have a shoe box lid?	If no, a properly designed shoe box type lid should be installed.		
<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Is the lid water tight and sealed with a rubber gasket?	If no, the reason for the lack of a seal should be investigated and repaired.		
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Is the hatch locked?	If no, the hatch should be equipped with a lock.		

<b>Overflow</b> <input type="checkbox"/> Check if NA				
<b>Significant Deficiency</b>		<b>Required Correction</b>	<b>Proposed Completion Date</b>	<b>Proposed Completion Date</b>
<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Discharge has #24 mesh corrosion resistant screen OR a duckbill valve OR a properly sealed flapper valve with a screen inside (EPA recommends #24 mesh screen)?	If no, indicate proposed correction:		
<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Overflow terminates between 12 and 24 inches above the ground surface? At what height does the overflow discharge?	If no, modify overflow to provide for an appropriate air gap.		
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Overflow discharges over an inlet structure, splash plate, or engineered rip-rap?	If no, indicate proposed correction:		

<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Is the overflow directly connected to a sanitary sewer or storm drain?	If yes, indicate proposed correction:		
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Is there blockage in the overflow, an inadequately sized overflow, a malfunction of the level control system, or other issue that is causing the tank to overflow through the hatch or vent?	If yes, indicate what is causing the problem and how it should be repaired:		
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Is the overflow discharge point visible? If no, it is recommended that the discharge point be moved to a location that is visible.		Not Required	

<b>Drain</b> <input checked="" type="checkbox"/> Check if NA				
<b>Significant Deficiency</b>		<b>Required Correction</b>	<b>Proposed Completion Date</b>	<b>Proposed Completion Date</b>
<input type="checkbox"/> Yes <input type="checkbox"/> No	Does the drain pipe have an air gap of 3 or more pipe diameters above the entrance to any storm or sanitary sewers?	If no, indicate proposed correction:		
<input type="checkbox"/> Yes <input type="checkbox"/> No	Does the discharge have a #24 mesh corrosion resistant screen OR a duckbill valve OR a properly sealed flapper valve with a screen inside? If no, EPA recommends that a #24 mesh screen be installed.		Not Required	
<input type="checkbox"/> Yes <input type="checkbox"/> No	Does the drain terminate between 12 and 24 inches above the ground surface and discharges over an inlet structure or splash plate? If no, it is recommended that the discharge point be modified to provide for the appropriate air gap.		Not Required	

<b>Cleaning and Other Items</b>				
<b>Significant Deficiency</b>		<b>Required Correction</b>	<b>Proposed Completion Date</b>	<b>Proposed Completion Date</b>
Describe any other items noted by the inspector that have the potential to cause contamination of the finished drinking water:		What repairs are suggested to prevent or eliminate the source of contamination?		
Depth of sediment found in the tank before cleaning (inches): <b>Up to 3" of sediment noted</b> How was the storage tank cleaned? <b>Diver with vacuum/hand nozzle system</b> How was the storage tank disinfected after cleaning? <b>N/A</b> List any objects found inside the tank during cleaning that may have introduced contamination into the water system (examples: debris, animals, etc.): <b>N/A</b> Please attach tank as-built drawings (if available) or a sketch of the tank's configuration and dimensions including the location, layout and dimensions of all major components (i.e. access hatch, vent, overflow, drain)				