



Missouri Department of dnr.mo.gov

NATURAL RESOURCES

Michael L. Parson, Governor

Dru Buntin, Director

September 17, 2021

The Honorable Alan Griffin, Mayor
City of Carterville
1200 E. First Street
Carterville, MO 64835

**UNSATISFACTORY FINDING
RESPONSE REQUIRED**

Dear Mayor Griffin:

Staff from the Missouri Department of Natural Resources conducted an inspection on August 18, 2021 of City of Carterville public water system. The system operates under the public water system identification number MO5010141.

Compliance with Safe Drinking Water Law was evaluated. The enclosed report is being issued with Unsatisfactory Findings for the violations identified.

Please refer to the enclosed report for details on findings and required actions. **A written response documenting actions taken to correct the violations is required by the date specified in the report.**

The Department records will document continued non-compliance of the environmental laws and regulations until the required actions are completed. Please understand that ongoing violations of laws may result in a follow-up inspection.

If you have any questions or would like to schedule a time to meet with Department staff to discuss compliance requirements, please contact Yvonne M. Franklin, EIT of my staff, by calling 417-891-4300, by email at yvonne.franklin@dnr.mo.gov, or via mail at Southwest Regional Office, 2040 West Woodland, Springfield, Missouri 65807-5912.

Sincerely,

SOUTHWEST REGIONAL OFFICE

Mark Rader, Chief
Drinking Water Section

MDR/yfr

Enclosure

c: Gwenda Bassett, Southwest Regional Office
Will Cline, City of Carterville
Andy Novinger, PE, Anderson Engineering, Inc.
Public Drinking Water Branch, Monitoring Section
Public Drinking Water Branch, Compliance and Enforcement Section

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Carbon Copy Address Attachment

- Include information for each individual identified in the carbon copy line that is not a MDNR staff member in one of the groups below.
- All DEQ Program staff will receive documents via the exchange drive.
- All SWRO and other MDNR staff will receive documents via email.
- All Basecamp groups will receive documents via Basecamp (technical staff responsibility once final .pdf received). Note that technical staff copying a basecamp group will also carbon copy themselves.

Email Addresses: (for those that have indicated this is the preferred method of receipt)

Honorable Alan Griffin, Mayor
City of Carterville
mayor@cartervillemo.com

Will Cline, City Administrator
City of Carterville
admin@cartervillemo.com

Andy Novinger, P.E.
Anderson Engineering, Inc.
anovinger@ae-inc.com

**Missouri Department of Natural Resources
Southwest Regional Office/Public Drinking Water Branch
Report of Inspection
City of Carterville
Jasper County, Missouri
Public Water System ID Number MO5010141
September 17, 2021**

Introduction

An engineering sanitary survey was made by the Missouri Department of Natural Resources of the community public water system serving City of Carterville on August 18, 2021. Missouri Public Drinking Water Regulation 10 CSR 60-2.010(2)(S)(2) defines a sanitary survey as an on-site engineering inspection and review of a public water system, its supply source, treatment of supply source, treatment facilities, and distribution system, for the purpose of evaluating their adequacy, reliability, and safety for producing and distributing drinking water. 10 CSR 60-4.010(7)(A) further defines a sanitary survey for surface water systems and systems using groundwater under the direct influence of surface water as an on-site review, under the supervision of an engineer, of the water source, facilities, equipment, operation, maintenance, and monitoring compliance, in order to evaluate the adequacy of the system, its sources and operations and the distribution of safe drinking water. Like a compliance and operation type of inspection this survey reviews all eight critical components applicable to the public water system which are; 1. Source; 2. Treatment; 3. Distribution System; 4. Finished Water Storage; 5. Pumps, Pump Facilities and Controls; 6. Monitoring, Reporting and Data Verification; 7. System Management and Operation; and 8. Operator Compliance with Department Requirements.

The following people were present at the time of the inspection:

City of Carterville

Will Cline, City Administrator and Operator, 417-673-1341, admin@cartervillemo.com

Carze Brown, Operator, 417-673-1341

Andy Novinger, PE, Anderson Engineering, Inc., 417-830-9486, anovinger@ae-inc.com

Missouri Department of Natural Resources

Yvonne M. Franklin, EIT, Associate Engineer, 417-891-4300, yvonne.franklin@dnr.mo.gov

Facility Description and History

The community public water system serves 1,982 people through 782 residential connections and three commercial connections year round. The system is supplied by one state approved well with disinfection by sodium hypochlorite, a 300,000-gallon elevated tower, and an emergency connection to Webb City. All system components are interconnected.

The state-approved well was drilled in 1993 to a depth of 1,112 feet with twelve-inch casing to a depth of 475 feet. A submersible Grundfos pump with a 125-horsepower three-phase pump was installed at 840 feet February 25, 2021. The pump is rated at 475 gallons per minute (gpm) at 800 feet total dynamic head. Four Flomatic check valves are installed on the six-inch Domestic Galvanized steel drop pipe at 819 feet, 630 feet, 420 feet, and 210 feet. The static water level (SWL) was reported as 332 feet with a drawdown level (DD) of 328 feet. The Pumping Water Level (PL) is 660 feet. The system uses hypochlorination for disinfection.

Water storage and pressure is maintained by a 300,000-gallon elevated storage tank located adjacent to the well. The system has an interconnection with Webb City to provide water during times when the well or tower is down for repairs.

System Component Locations

System Component	Latitude	Longitude
Well	37.154823°	-94.437777°
Treatment	37.154821°	-94.437839°
300,000 Gallon Elevated Tower	37.154683°	-94.438107°

The distribution system mains are composed of the following materials: polyvinyl chloride (PVC), ductile iron, cast iron pipe, galvanized steel, and unknown material. The mains range in sizes of ¾-inch to a maximum of ten-inch pipes. There have been no major construction projects on the distribution system since the last inspection conducted in 2018; however, if there is an extension to the main or a change in the size of piping, then a construction permit application, engineering report, plans and specifications will need to be submitted to the Department.

Carterville Distribution System

Size of Pipe	Cast Iron	Ductile Iron	Galvanized	PVC	Unknown	Total Length
Unknown	0	0	0	0	687.99	687.99
¾"	0	0	294.26	0	0	294.26
1"	0	0	0	0	10,869.84	10,869.84
2"	0	0	0	0	8,740.71	8,740.71
4"	2,865.09	841.09	0	414.40	37,262.43	41,383.01
6"	6,329.52	0	0	0	5,671.34	12,000.86
8"	0	0	0	0	2,106.80	2,106.80
10"	0	0	96.73	0	3,471.47	3,568.20
Total Length	9,194.61	841.09	390.99	414.40	68,810.58	79,651.67

Since the last inspection conducted in 2018 the City of Carterville switched from a vertical turbine pump to a submersible pump on the well due to mechanical problems in February 2021. An emergency exception was granted for engineering to allow the repairs to be completed promptly since the city was being served through the emergency connection with Webb City. A final inspection was conducted by the Department March 3, 2021.

The system is located in the Spring River watershed (11070207).

The system requires an operator properly certified at the DS-1 level. Will Cline is properly certified above this level. Carze Brown and Jediah Rearrick completed an operator certification class in August 2021 and are scheduled to take their test on October 5 in Springfield. Until then, Will Cline is the only certified operator.

Voluntarily Chlorinated Systems

Due to recent changes to Missouri Safe Drinking Water Regulation 10 CSR 60-4.080 (3), water systems voluntarily adding chlorination must begin monitoring chlorine residuals on Monday through Friday excluding federal holidays and days not serving water to the public. If the system meets certain conditions, an alternate schedule for chlorine monitoring can be requested. A request form is attached for your convenience.

Discussion of Inspection and Observation

I contacted Will Cline to schedule a sanitary survey inspection for August 18, 2021. The inspection was conducted during normal business hours.

Upon arrival I met with Will Cline and Carze Brown at the well on North Pine Street. I briefly discussed the scope and the purpose of the sanitary survey inspection. I explained I would inspect the well, treatment, the elevated storage tower and the emergency connection to Webb City. Once I finish inspecting the components I would review the city records and discuss operation and maintenance procedures. I inspected the new well first and took several pictures. I asked if any improvements were completed since the final inspection conducted in March. They stated the leaking shut-off valve to the discharge piping was replaced and that section of the piping no longer leaks. Carze stated that Webb City had the vault open for the emergency connection to their system and we left to go inspect the vault while it was open.

The emergency vault is located at the far west end of West Main Street. Pictures were taken of the vault. The main located inside of the vault should be painted to minimize the rusting of the steel pipe. In addition, tree roots and debris were noticed inside of the vault. Both Will and Carze stated that due to recent wells being not in service in Webb City, the emergency connection is just enough to keep the Carterville system pressurized; however, customers call to complain about the lack of water when they try to use it at their homes. After inspecting the Webb City emergency connection, we (Will, Carze, and I) returned to North Pine Street.

I inspected the disinfection system located in a small room on the west side of the well house. I noticed the sodium hypochlorite was not vented to the outside of the building to prevent rusting of metal in the well house. Next, I inspected the elevated tower, and noted areas where the paint had deteriorated down to the metal of the riser pipe and rust was beginning to show. Will stated the tank was scheduled to be inspected and cleaned by Suez later this fall. After I finished taking pictures of the tank, Andy Novinger, PE from Anderson Engineering, Inc., arrived onsite.

Anderson Engineering is the City of Carterville's engineer. After we exchanged hellos, I followed Will and Carze to City Hall located on East First Street. There I reviewed the records for the system and found they were adequate. The final portion of the sanitary survey was discussing the city's operation and maintenance procedures. Andy Novinger stated that Anderson Engineering is in the process of preparing an Engineering Report/Study for new water system improvements – a new public water supply well, treatment, and elevated water tower to be located west of city hall.

The system currently charges a minimum bill of \$22.74 up to 100 cubic feet plus \$0.045 per 100 cubic feet (cu-ft.) thereafter. We recommend you evaluate the rate and determine if it meets the minimum necessary to recover the full costs associated with production, treatment, storage and distribution of water. Sale of water should be metered to encourage water conservation. Establishing regular cost of living adjustments can help eliminate large fee increases that occur when rate increases are delayed until large item expenses occur. The Department's Water Protection Financial Assistance Center can provide assistance to the system in determining if the current fees are appropriate by calling 573-751-1192.

We discussed that your emergency operation plan and procedures should be evaluated and updated. For more information please see the Model Emergency Operating Plan for Public Water Supplies located at <https://dnr.mo.gov/document-search/emergency-operating-plan-public-water-supplies-emergency-plan-form>.

Sampling and Monitoring

One drinking water sample was collected from City Hall and was submitted for microbiological analysis to the Greene County Health Department Laboratory. The sample tested total coliform absent or “safe”. The free chlorine entering the distribution system was 0.20 mg/L, and the total residual chlorine level in the system was 0.21 mg/L. Carterville should consider increasing the free chlorine level to 1.00 mg/L at the entry to the distribution system to ensure the total chlorine residual is at or above 0.20 mg/L in the farthest point of the distribution system.

The following is a history of monitoring and unsafe samples during the last 24 months.

The system failed to collect any microbiological routine samples during February 2021.

Please find enclosed a list of the sampling points that have been established for your water system and a Microbiological Sample Siting Plan form to be used to add the additional sampling locations needed to ensure the entire distribution system is represented. Because the well is a source water sample location and not considered a part of the distribution system, it should never be used as a routine sampling location. However, it remains a sampling point location if repeat source water samples are needed.

Engineering Assessment

An engineering assessment was conducted at the time of this inspection. The following discussion is intended to review the basic system capacity data and to draw ordinary observations and conclusions that would occur as part of an engineering assessment. It is not meant to be an exhaustive analysis, and it remains for the system’s continuing operating authority to carefully examine its records and physical status to determine whether more in-depth engineering is needed in order to thoroughly evaluate the system to serve its future customer base or to entertain notions of serving additional customers.

Currently there are 785 total active service connections – 782 residential and three commercial meters. The most recent population estimate for 2020 shows a population of 1,982, which equates to 2.53 persons per (residential) connection. Estimating future population is typically done by looking at historical data and estimating future growth based on past trends. If a moderate 3% increase occurs over each of the next two decades, the 20 year projected population being served by the City of Carterville would be 2,102 people by the year 2040.

City of Carterville Drinking Water System Parameters

Time	Current	20 years – no improvements	20 years – with improvements
Population (avg. of ≈2.53 persons per connection)	1,982	2,102	2,102
Total Active Service Connections/Meters (782 residential + 3 commercial)*	785	834	834
Average Day Pumpage (gpd, nearest 250 gal)	244,644	259,874	183,063
Maximum Day Pumpage (gpd)	366,966	389,811	274,595
Recommended Fire Flow (3500 gpm for two hours)	3,500	3,500	3,500

*assumed commercial meters will remain constant at three in the future.

The City of Carterville provided water usage data for 2020. The data included the overall gallons pumped from the wells, and the gallons of water billed to customers. That combined information is shown below in the following tables.

The amount of water pumped from the system’s wells was determined from well logs submitted by Will Cline dated from January 6, 2020 to December 31 for a total of 360 days; while the water consumption was determined from the Utility Billing Service Analysis report dated February 1, 2020 through February 1, 2021 (366 days). The Utility Billing Service Analysis report is billed one month behind; therefore it reflects water consumption for January 2020 through January 2021. The annual pumpage for 2020 will be estimated from the average daily pumpage. This will allow the same time span as the billed water consumption.

Average Daily Pumpage = $88,072,000 \div 360 \text{ days} = 244,644 \text{ gpd}$
 Estimate Pumpage for 366 days = $244,644 \text{ gpd} \times 366 \text{ days} = 89,539,704 \text{ gal.}$
 Maximum Daily Pumpage = $1.5 \times 244,644 \text{ gpd} = 366,966 \text{ gpd}$
 Average Daily Pumpage per meter = $244,644 \text{ gpd} \div 785 \text{ meters} = 311.6 \text{ gpd/meter}$

2020 Water Consumption

Billed Customers/Entities	Consumption Billed (gallons)
Rural Water	19,925,690
Residential (City)	34,324,157
Rural Water	3,673
Tax Exempt	441,978
City Property	456,332
Commercial	1,716,353
Total Consumption Billed	56,868,183

Average consumption per day for 366 days = $56,868,183 \text{ gal/yr.} \div 366 \text{ days/yr.} = 155,378 \text{ gpd}$
 Average Water Usage per meter = $155,378 \text{ gpd} \div 785 \text{ meters} = 197.9 \text{ gpd/meter}$
 Average Water Usage per person = $197.9 \text{ gpd/meter} \div 2.53 \text{ person/meter} = 78.2 \text{ gpd/person}$

2020 Carterville Water Loss

Water Pumped	Water Consumed	Unaccounted Water Loss	Water Loss Percentage
89,539,704	56,868,183	32,671,521	36.5%

The Department’s standard allowance for average water loss is 10% or less; and every effort should be made to find and repair leaks to achieve this standard in the future. The water supply should have a goal of replacing most if not all mains smaller than six inches to provide adequate flow throughout the system, reduce low pressure incidents, reduce the frequency of water leaks, and finally reduce water loss in the system.

2020 Water Loss Reduction Chart

Percent Reduction for Water Loss	Amount Reduced (gal)	New Water Loss Quantity (gal)	New Quantity Pumped By Wells	New Water Loss Percentage (%)
No Reduction	0	32,671,521	89,539,704	36.5
25% Reduction	8,167,880	24,503,641	81,371,824	30.1
50% Reduction	16,335,761	16,335,760	73,203,943	22.3
75% Reduction	24,503,641	8,167,880	65,036,063	12.6
80% Reduction	26,137,217	6,534,304	63,402,487	10.3
81% Reduction	26,463,932	6,207,589	63,075,772	9.8

Remember the 2020 Average Day Pumpage is 244,644 gpd and the Average Consumption per day is 155, 378 gpd. Using this data, the future pumpage and consumption for 2040 without repairs and with repairs to reduce water loss will be determined. The estimated population for Carterville in 2040 is 2,102 people being served through a total of 834 connections (831 residential and three commercial).

2020 Water Pumpage without Repairs

Average Daily Pumpage per meter = $244,644 \text{ gpd} \div 785 \text{ meters} = 311.6 \text{ gpd/meter}$

2020 Water Pumpage with Repairs

Average Daily Pumpage = $63,075,772 \text{ gal/yr.} \div 366 \text{ days/yr.} = 172,338 \text{ gpd}$

Average Daily Pumpage per meter = $172,338 \text{ gpd} \div 785 \text{ meters} = 219.5 \text{ gpd/meter}$

Estimated 2040 Water Pumpage without Repairs

Future Average Daily Pumpage = $834 \text{ meters} \times 311.6 \text{ gpd/meter} = 259,874 \text{ gpd}$

Future Maximum Daily Pumpage = $1.5 \times 259,874 \text{ gpd} = 389,811 \text{ gpd}$

Estimated 2040 Water Pumpage with Repairs

Future Average Daily Pumpage = $834 \text{ meters} \times 219.5 \text{ gpd/meter} = 183,063 \text{ gpd}$

Future Maximum Daily Pumpage = $1.5 \times 183,063 \text{ gpd} = 274,595 \text{ gpd}$

2040 Water Consumption = $197.9 \text{ gpd/meter} \times 834 \text{ meters} = 165,049 \text{ gpd}$

The Department recommends a maximum run-time of eight hours per day for wells to allow the aquifer time to recharge. An analysis of the service/run-time indicates 510 gpm is needed to meet the current average daily pumpage and 765 gpm to meet the current maximum daily pumpage with a maximum run-time of eight hours for wells. Furthermore, to meet future demands after improvements have been completed; 382 gpm will be needed for the average daily pumpage and 572 gpm for maximum daily pumpage.

Currently, the City of Carterville has one well to meet the needs of the city. Well #1 is capable of meeting only the future average daily demand after repairs since the Grundfos pump has a capacity of 475 gpm (Flynn Drilling Well Pump Installation Record). If Well #1 must be put out of service, then an emergency connection to Webb City must be utilized. Will Cline and Carze Brown stated the emergency connection with Webb City was used in February 2021 when the old existing turbine pump developed mechanical issues. In addition, the emergency connection was used in June 2021 while city personnel replaced a leaking galvanized pipe located in an alley near Pearl and Lewis streets. The connection kept the Carterville system pressurized to allow repairs, but customers complained of low flow when they needed to use water at their homes.

The following table shows the individual run-time requirement for Well #1 to meet the current and future pumpage demands. It is recommended that a registered professional engineer be hired to complete an analysis of the well capacity to meet both the current and future production demands of the system. Once the analysis is complete, determine the capacity of a second well to be constructed.

Individual Well Service Run-Time Requirements

Well In Use	Well Capacity	Current Average Daily Pumpage	Current Maximum Daily Pumpage	Future Average Daily Pumpage with Repairs	Future Maximum Daily Pumpage with Repairs
	(gpm)	244,644 gpd	366,966	183,063	274,595
Well #1	475	8.6 hours	12.9 hours	6.4 hours	9.6 hours

Assume the well runs a maximum of eight hours (480 minutes) per day.

Run-time Service Current Average Daily Pumpage = $244,644 \text{ gpd} \div 480 \text{ min/day} = 510 \text{ gpm}$
 Run-time Service Current Maximum Daily Pumpage = $366,966 \text{ gpd} \div 480 \text{ min/day} = 765 \text{ gpm}$
 Run-time Service Future Average Daily Pumpage = $183,063 \text{ gpd} \div 480 \text{ min/day} = 382 \text{ gpm}$
 Run-Time Service Future Maximum Daily Pumpage = $274,595 \div 480 \text{ min/day} = 572 \text{ gpm}$

The system has approximately 300,000 gallons of storage in one elevated storage tower. The current storage does not meet the current maximum daily pumpage needs stated above in this report if improvements are not completed to reduce water loss. An additional tower should be considered to meet the maximum daily pumpage demands. An evaluation of fire flow needs should be considered for single-family residential areas, and fire flow for commercial, multi-family, and industrial areas.

Needed Fire Flow for single-family home residential areas will normally be 1,500 gpm. Fire flow for commercial, multi-family, and industrial areas should be capable of providing the calculated maximum Needed Fire Flow within its distribution system for a duration of two hours up to a maximum flow of 3,500 gpm to comply with Design Standard, Part 7.1.1. These flows may be reduced by setback restrictions and sprinkler requirements if these are enforced. Public water supplies may choose to meet ISO FSRs Needed Fire Flows above 3,500 gpm up to the ISO FSRs Needed Fire Flow maximum of 12,000 gpm. Systems should consider an alternate method of fire protection for properties needing fire flows that exceed 3,500 gpm.

The public water system was evaluated for Supply Works Capacity to see if it meets both current and future fire flow needs of 3,500 gpm for a two-hour duration. The City of Carterville does not have adequate storage to meet the recommended 3,500 gpm for a two-hour duration. An additional 100,000 gallons of elevated storage is needed to meet this recommendation.

Supply Works Capacity

Well Capacity	Storage Capacity	Maximum Daily Consumption	Supply Works Capacity
475 gpm (current, no repairs)	300,000 gallons	366,966 gpd	2,720 gpm
475 gpm (future, no repairs)	300,000 gallons	389,811 gpd	2,704 gpm
475 gpm (future, repairs)	300,000 gallons	274,595 gpd	2,784 gpm

Instantaneous peak flow shall be estimated by combining the domestic peak flow, lawn/garden irrigation peak flow, and commercial/larger users/confined feeding operations. Domestic peak flow should be calculated as the greater of a) One gallon per minute per connection or b) Peak = 12(N)^{0.515}, where ‘N’ stands for number of connections. Lawn watering estimation may vary depending on the irrigation type, available flow, flow pressure, the area of coverage, and even the number of people watering at one given time. Flow can be estimated from 0.75 – 3.0 gpm per sprinkler within a discharge pressure range of 35 – 100 psig. Assume one-seventh (1/7) of residential customers (moderate to middle income housing) will water their yards with end of hose sprinklers any given day of the week with an estimated flow of 1.25 gpm.

City of Carterville Instantaneous Peak Flow Estimates

Year	Number of Connections	Domestic Peak Flow (gpm)	Irrigation Instantaneous Peak Flow (gpm)	Instantaneous Peak Flow (gpm)
2020	782	782	140	922
2040	831	831	148	979

The existing water mains were not evaluated during this inspection for capacity. However, it is evident that a considerable amount of water loss is occurring and replacement is necessary to ensure meeting capacity evaluations as contained in this report. Future water main extensions and replacements shall conform to the minimum design standards found in the Department’s *Minimum Design Standards for Missouri Community Water Systems, 2013*.

Compliance Determination and Required Actions

The system was found to be in compliance with the Missouri Safe Drinking Water Regulations based on the observations made at the time of the inspection.

Unsatisfactory Findings

For all Unsatisfactory Findings listed below, a written response documenting actions taken to correct the violations is required by **October 18, 2021**.

1. The public water system failed to have a contingency plan for a standby replacement chief operator to be available at all times in violation of Safe Drinking Water Regulation 10 CSR 60-14.010(4)(A)6. All community and non-transient non-community public water systems must have a properly certified chief operator meeting the minimum classification required for that system. In addition, the system is required to have a contingency plan for a standby replacement chief operator, such as a second employee certified at the chief operator level, a mutual assistance agreement with a neighboring system, or a pre-arrangement with a contract operator. Our records indicate this contingency plan shall be for a DS-I replacement chief operator. If this requirement is to be met through operator training and examination for certification, please contact the Department's Operator Certification Unit at 800-361-4827 for information on training courses and examination dates.

REQUIRED ACTION: If the staff members who will test for certification in October are unable to obtain certification, then a contingency plan is needed for a standby replacement chief operator certified at the DS-I level or higher. If needed, submit the plan including their name, address, telephone number, and certification number in writing to the Department of Natural Resources, 2040 West Woodland, Springfield, MO 65807-591

Recommendations

1. The well discharge piping was not protected against physical damage. The discharge piping near the chlorine injection point and all exposed piping should be protected against deterioration, physical damage, and freezing.

Paint the discharge piping to protect it from corrosion.

2. The storage tank needs exterior painting.

Steel tanks without adequate paint coating will quickly deteriorate from corrosion. The tanks must have the exteriors cleaned and painted. If the tank interiors have not been inspected in the past three years, the interiors should be inspected, cleaned, and repainted as necessary. Note that interior paint must be approved by Missouri Department of Natural Resources Public Drinking Water Branch.

The Department recommends cleaning and painting the exterior of the 300,000 gallon elevated storage tank. If the interior has not been inspected in the past three years, the interior should be inspected, cleaned, and repainted with Missouri Department of Natural Resources Public Drinking Water Branch approved paint as necessary.

3. The elevated storage tank is not equipped with facilities for collecting bacteriological samples.

Sample taps should be provided so that water samples can be obtained from each water source, from appropriate locations in each unit operation of treatment, and from unpressurized tanks and reservoirs. Taps shall be consistent with sampling needs and shall not be of the petcock type, and those used for obtaining samples for bacteriological analysis shall be of material that resists flaming, smooth-nosed type without interior or exterior threads, shall not be of the mixing type, and shall not have a screen, aerator, or other such appurtenances.

The Department recommends installing an appropriate sample tap on the discharge pipe of the elevated storage tank.

4. The public water system well is not equipped with a finished water sample tap. Specifically, there was no sample tap.

The Design Guide requires sample taps be provided so that water samples can be obtained from each water source and from appropriate locations in each unit operation of treatment. These sample taps shall be consistent with sampling needs and shall not be of the petcock type, and those used for obtaining bacteriological samples shall be of material that resist flaming, smooth-nosed type without interior or exterior threads, shall not be of the mixing type, and shall not have a screen, aerator or other such appurtenances.

The Department recommends installing a finished water sample tap a sufficient distance downstream of chlorine injection so that adequate mixing and dispersion will ensure that the residual reading is accurate. Ideally, this finished water sample tap will be on the water main immediately downstream of the final detention tank or, if installed, fat pipe.

5. The public water system records show a water loss greater than 10%.

The wells currently pump an average of 244,644 gallons per day or 7,461,642 gallons per month while the amount of water sold through individual meters averages 155,378 gallons per day or 4,739,015 gallons per month. Based upon these figures, the calculated loss of water amounts to an average of 89,266 gallons per day or 2,722,627 gallons per month, which equates to an average water loss of 36.5%. The Department recommends that no more than an average of 10% water loss occur. If you multiply the monthly electric bill for the well pump operation by this 36.5% (or 0.365) loss rate, you will see how much city revenue is spent every month to pump the additional water being lost to leaks, and this does not take into account the additional wear and tear on the pump and controls. It is recommended that this situation be brought under control.

Use every method available to determine the cause of excessive water loss and make the needed repairs. The Missouri Rural Water Association (MRWA) has leak detection equipment available. The MRWA can be contacted at 901 Richardson Drive, Ashland, Missouri 65010, or by phone at 573-657-5533.

Additional Comments

As per Missouri State Statute 640.115 RSMo, all water systems must notify and provide engineering plans and specifications to the Department prior to any new construction, qualified alteration, or extension of your water system. Qualified alterations include those that would change or alter plant capacity or treatment processes such as adding, removing, or changing chemical additives and/or their injection locations, altering finished water storage capacity, pumping capacity, line pressures, etc. If you have questions regarding qualified alterations, please contact the Missouri Department of Natural Resources, Public Drinking Water Branch, by calling 573-751-5331 or by mail at P.O. Box 176, Jefferson City, MO 65102.

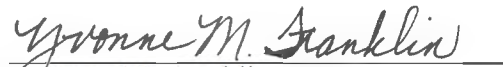
The process of planning for necessary maintenance and upgrades should be a continuous process with constant re-evaluation, establishing both short term and long term goals. It is strongly recommended that an annual review of water/sewer (if a combined system) rates be evaluated and compared to revenues and available finances. As appropriate, the supply should increase rates as needed to meet the needs of their operations budget/expenses and capital improvement programs. You can contact the Department's Financial Assistance Center for guidance/assistance on calculating user rates at 573-751-1192.

When maintaining, upgrading or replacing systems, much care and consideration must be taken, as the processes are generally very expensive and can take years to complete. Please see how to plan a drinking water project with outlines of the steps in a capital improvement project at <https://dnr.mo.gov/document-search/planning-drinking-water-project-pub2649/pub2649>. The first step in a project is obtaining an engineer and completing an engineering report. The Department has drinking water engineering report grants available and guidance materials for obtaining an engineer please contact the Financial Assistance Center at 573-751-1192 for more information on applying for these grants. The Department of Agriculture Rural Development also has engineering report grants available for eligible systems <https://www.rd.usda.gov/programs-services/search-special-evaluation-assistance-rural-communities-and-households>.

In the future should it become necessary to obtain funding for upgrades and replacements after an engineering evaluation, the Department invites Carterville to review the information found in the following funding comparison table: <https://dnr.mo.gov/env/wpp/srf/docs/mwwrc-comparison.pdf> and apply to the Missouri Water and Wastewater Review Committee <https://dnr.mo.gov/env/wpp/srf/additional-resources.htm>. Applicants are expected to contact funding agencies prior to submittal to review funding options, and submit a proposal requesting funds from the agency or agencies that fits their needs.

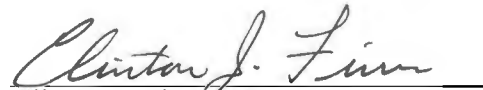
Signatures

SUBMITTED BY:



Yvonne M. Franklin, EIT
Associate Engineer
Drinking Water Engineering and
Technical Assistance Unit
Southwest Regional Office

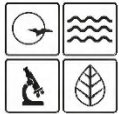
REVIEWED BY:



Clinton J. Finn, P.E.
Professional Engineer
Drinking Water Engineering and
Technical Assistance Unit
Southwest Regional Office

Attachments

Photograph Addendum 1 through 9
Carterville Bacteriological Sampling Site Plan
Chlorine Residual Reduced Operational Monitoring Schedule Request



PHOTOGRAPH #1
TAKEN BY: Yvonne M. Franklin, EIT
ENTITY: City of Carterville
PERMIT: MO5010141
LOCATION: Carterville well house.
DESCRIPTION: Well #1 well head equipped with casing vent plus drawdown gauge and tube.
DATE TAKEN: August 18, 2021
PROGRAM: Public Drinking Water Branch



PHOTOGRAPH #2
TAKEN BY: Yvonne M. Franklin, EIT
ENTITY: City of Carterville
PERMIT: MO5010141
LOCATION: Carterville well house.
DESCRIPTION: Discharge piping at the well. Operators can view the drawdown gauge through the black camera via smartphone. Rust is occurring around the chlorine injection.
DATE TAKEN: August 18, 2021
PROGRAM: Public Drinking Water Branch



PHOTOGRAPH #3
TAKEN BY: Yvonne M. Franklin, EIT
ENTITY: City of Carterville
PERMIT: MO5010141
LOCATION: Carterville well house.
DESCRIPTION: Pressure gage reading the tower pressure. Operators can view the pressure through the white camera via smartphone.
DATE TAKEN: August 18, 2021
PROGRAM: Public Drinking Water Branch



PHOTOGRAPH #4

TAKEN BY: Yvonne M. Franklin, EIT
ENTITY: City of Carterville
PERMIT: MO5010141
LOCATION: Carterville well house
DESCRIPTION: Sensaphone 400 alarm remote monitoring system accessed via smartphone.
DATE TAKEN: August 18, 2021
PROGRAM: Public Drinking Water Branch



PHOTOGRAPH #5

TAKEN BY: Yvonne M. Franklin, EIT
ENTITY: City of Carterville
PERMIT: MO5010141
LOCATION: Carterville well house.
DESCRIPTION: Stenner peristaltic pump used for disinfection.
DATE TAKEN: August 18, 2021
PROGRAM: Public Drinking Water Branch



PHOTOGRAPH #6

TAKEN BY: Yvonne M. Franklin, EIT
ENTITY: City of Carterville
PERMIT: MO5010141
LOCATION: East side of Carterville well house.
DESCRIPTION: Room used for disinfection located on the west side of the well house.
DATE TAKEN: August 18, 2021
PROGRAM: Public Drinking Water Branch



PHOTOGRAPH #7
TAKEN BY: Yvonne M. Franklin, EIT
ENTITY: City of Carterville
PERMIT: MO5010141
LOCATION: North Pine Street next to well house.
DESCRIPTION: 300,000-gallon elevated tower.
DATE TAKEN: August 18, 2021
PROGRAM: Public Drinking Water Branch



PHOTOGRAPH #8
TAKEN BY: Yvonne M. Franklin, EIT
ENTITY: City of Carterville
PERMIT: MO5010141
LOCATION: North Pine Street
DESCRIPTION: Delaminated spots with rust located on the tower riser.
DATE TAKEN: August 18, 2021
PROGRAM: Public Drinking Water Branch



PHOTOGRAPH #9
TAKEN BY: Yvonne M. Franklin, EIT
ENTITY: City of Carterville
PERMIT: MO5010141
LOCATION: West Main Street (dead-end)
DESCRIPTION: Emergency water connection with Webb City.
DATE TAKEN: August 18, 2021
PROGRAM: Public Drinking Water Branch

Sample Collection Point ID Issues

8/19/2021

ENVIRONMENTAL SAMPLE COLLECTION FORM

REQUIRED ANALYSES/TESTS:
 PUBLIC DRINKING WATER BACTERIAL ANALYSIS
 Total Coliform Bacteria and E. coli (Membrane/Needle Test)

PLEASE LEGIBLY: Instructions for completing form are supplied to the Collector. For complete monitoring guidelines, contact the Missouri Department of Natural Resources-Public Drinking Water Branch at (573) 751-5151 or your regional office. For laboratory and results of testing questions, contact the Missouri State Public Health Laboratory at (636) 531-3354.

Complete or correct the following information:

Collected Date: 2021-05-22	Collected Time: 08:50
PWS ID: MO1224667	Facility ID: 01 (or WFL#)
Sample Type: Raw/Line	Sample Collection Point ID: 03
Location: Example - 130 Main St	Collector: Miranda Harmon
Collector Phone: 555-555-1232	Sample Category: Bacterial
Repeat Location:	Order Number: 20-405
Flow Control: On	WAM Number: 000
Special Comment: Private Master	County Code:

BACTERIOLOGICAL SAMPLE SITING PLAN

Sample Collection Point ID	Location	Address Description
01	Example - City Hall	
02	Example - Fire Dept	
03	Example - 130 Main St	
04	Example - 80 Oak St	
07	Example - High School	
14	Example - Elementary School	
TCE	TOTAL COLIFORM RULE	
W. 1000	WELL # 1 - CITY PARK RD	

Above is an example of the Environmental Sample Collection form that is submitted with each bacteriological sample to the laboratory and an example of a Bacteriological Sample Siting Plan with approved sample site locations. When filling out each form, PLEASE write in the physical location description of the collected sample in the "Location" field and write in EXACTLY the Sample Collection Point ID as it is printed on your Bacteriological Sample Siting Plan in the "Sample Collection Point ID" field on the form. If this step is taken for each sample, the sample result report that is mailed back to you for recordkeeping will contain the correct information. If the "Sample Collection Point ID" field is incorrect or blank, the report sample location will read "TCR" or "MISSING".

On the back side of this document is a list of your bacteriological sample sites with assigned Sample Collection Point ID numbers and corresponding physical location descriptions. It is important to remember that the "Sample Collection Point ID" field is character specific so 03, 3, #3, and 003 are NOT the same ID. You MUST include the Sample Collection Point ID EXACTLY as printed on this list. Failure to do so will lead to incomplete data, data entry issues and incorrect reporting of results.

This list should be made available to the person(s) responsible for collecting bacteriological samples. To add or inactivate sampling sites, send updates as a fax to (573) 751-3110, call Lauren Ferland at (573) 526-0135, or send an email to lauren.ferland@dnr.mo.gov. If you have additional questions or concerns, please contact Scott Weckenborg at (573) 526-1124 or by email at scott.weckenborg@dnr.mo.gov.

BACTERIOLOGICAL SAMPLE SITING PLAN

Sample Collection Point ID	Location	Repeat Location (Upstream)	Repeat Location (Downstream)
01	105 E MAIN-FIRE STATION		
02	115 W. HALL		
03	202 S. KENTUCKY		
04	100 E MAIN		
05	CITY WELL HOUSE		
06	1200 FIRST ST		
07	608 N PINE		
08	ALL AMERICAN STORAG		
09	310 S. TENNESSEE		
10	426 N KENTUCKY		
11	WALNUT STREET		
SPECIAL	SPECIAL		
WL 13093	WELL # 1		

This is a list of approved bacteriological sampling sites the Department currently has for your system. Each sampling site has a unique 'Sample Collection Point ID' and associated 'Physical Location' description (i.e. City Hall, School Cafeteria, 130 Main St., etc.). Since 'Sample Collection Point ID' numbers are tied to historical data, the ID's cannot change or be reused for another location once they have been established. However, the sample locations no longer being used can be inactivated and new sample sites can be added to the sampling plan. New sample locations are acceptable as long as they help represent water quality throughout the distribution system.

Please use this list as a reference guide when collecting bacteriological samples. The approved 'Sample Collection Point ID' along with the corresponding 'Location' from this list, must be included in the appropriate field on the Environmental Sample Collection Form submitted with each water sample. (Turn page over to see an example)

All "Routine" samples must be collected from the distribution system (NOT from the well). However, the Ground Water Rule requires a sample from each well prior to treatment following a TC-Positive "Routine" sample. Department staff will advise you if source water samples are required. Each active well serving the public water system is included at the end of this list of sample sites and identified as "WL #####".