# The Village of Centertown, MO
# Drinking Water - Facility Plan

Project No. 19492.001

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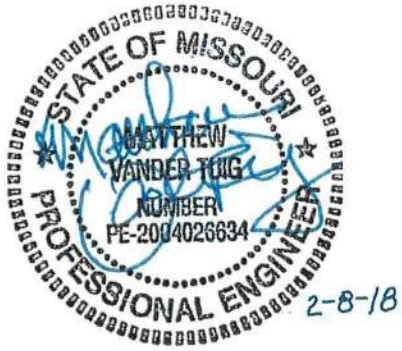


Matt Vander Tuig, P.E.
License No. PE-2004026634

February 2018

Bartlett & West, Inc.
Missouri Certificate of Authority No. 000167 Engineering.
1719 Southridge Drive, Suite 100
Jefferson City, Mo 65109
(573) 634-3181

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## System Introduction:

The Village of Centertown, MO is a bedroom community 10 miles outside of Jefferson City, MO. See **Figure 1** below for a location map showing the proximity to Jefferson City. The village population is 278 according to the most recent 2010 Census. Centertown is on the far west end of Cole County and directly off of Highway 50. The existing water system consists of a deep water well and a 50,000-gallon water tower. The facility was constructed in 1960 and has been in service ever since. The distribution system consists of 4.5 miles of waterline piping ranging from ¾" to 6" inches in diameter and has issues with chronically low water pressures. The existing elevated storage tank no longer meets safety standards and the distribution system pressures are low from the low height of the tank.

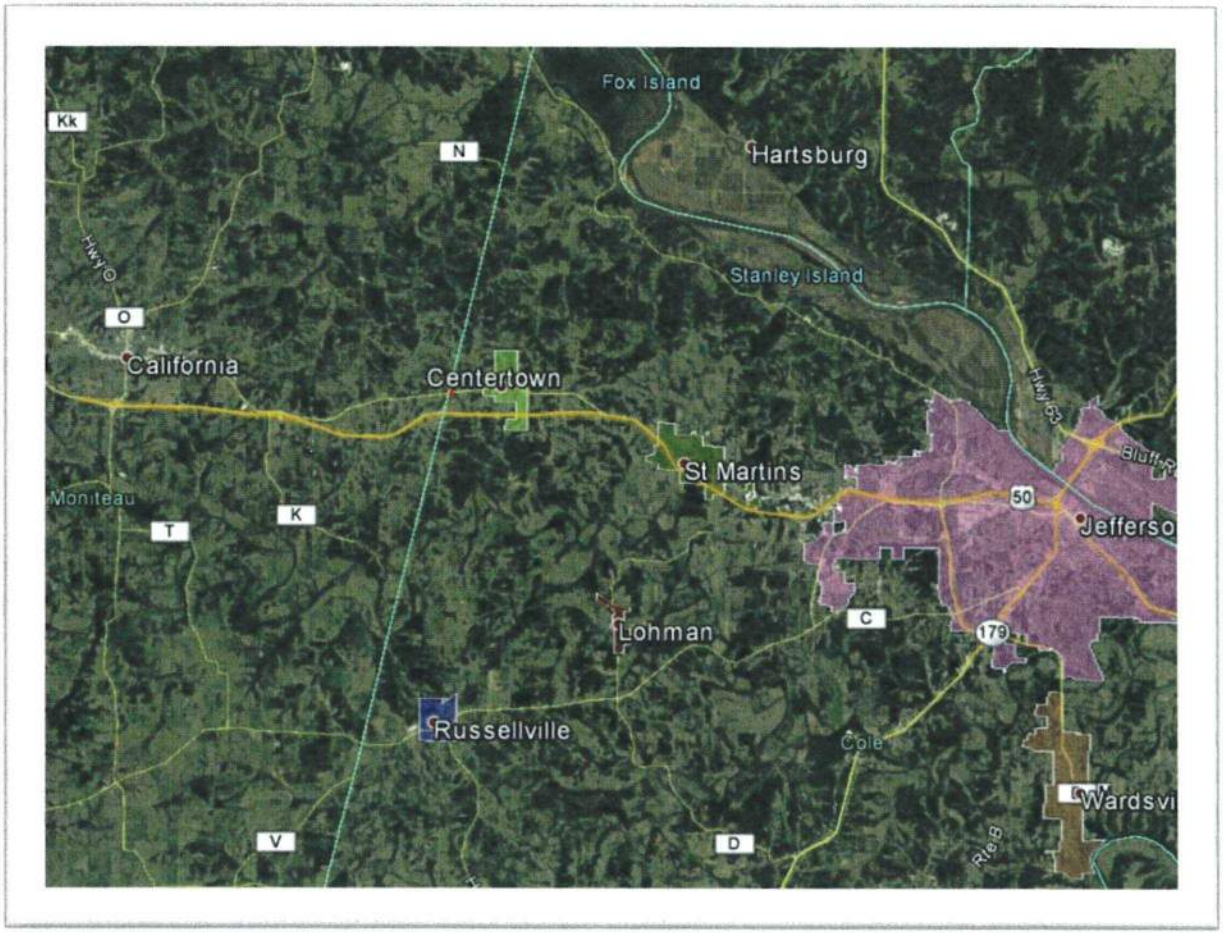


*Figure 1- Project Location Overview*

## Purpose of the Study

The Department of Natural Resources (DNR) conducted a Compliance and Operation Inspection Report on March 2nd, 2016. The inspection was to determine the facility's compliance with the Missouri Safe Drinking Water Law and the Missouri Safe Drinking Water Regulations. The results of that inspection included the following non-compliance items and recommendations:

- Not having a duly certified back-up distribution operator
- Not having an updated lead ban ordinance
- Not having a written emergency operations plan
- Not having monthly well tests to determine the operating condition of the well and pump
- Not having an updated wellhead protection plan
- The water system was lacking in adequate water pressure, which creates chronically low water pressure and a lack of fire flow
- Several safety deficiencies including an undersized balcony, no riser cover plate, no ladder inside the riser pipe, and an inadequate riser lip for protection
- There is no safety climbing device on the exterior access ladder
- Cabling attached to the side of the tank interferes with safely accessing the ladder and other attached items on the railing which should be checked for structural integrity
- The ground level manway opening at the tower is too small and does not meet OSHA standards
- The tower only has a single inlet and outlet pipe, which does not allow proper disinfection contact time in the tank
- The tower has lead based paint and exceeds the Toxicity Characteristic Leaching Procedure (TCLP) regulated limit for lead
- The storage tank and well should be fenced and gated for security
- There have been no low water pressure reports sent to DNR since 2012

Further details of the list of deficiencies above can be found in the complete Compliance and Operation Inspection Report found in **Appendix A**.

The purpose of this study is to evaluate the list of deficiencies from the DNR inspection and further evaluate the Centertown water system, propose a series of alternative solutions to address current deficiencies, compare those alternatives, and provide recommendations. These recommendations will consider the future water usage demand as well as the impact to the water service rates. The result will be recommendations for the Village to consider that will address current deficiencies while meeting DNR design guide requirements.

The two major deficiencies identified in the DNR inspection report were the lack of pressures and lack of a backup water supply. The lack of pressures are due to a very low static water system pressure even when the storage tank is full indicating that the current water tower is too short or not high enough in elevation or both. Therefore the report will focus on the following items:

- Identify the size, type, and location of a new elevated storage tank to increase water pressures.
- Identify and suggest a viable back up water source.
- Provide an opinion of probable cost of proposed improvements and associated estimated user rates.

## Population Projections

The village population has remained relatively steady over several decades. While there was a drop in the population between the 1990 and 2000 census results, there was an 8.2% growth from 2000 to 2010. That growth rate is similar to growth rates that Centertown has experienced in the past with growth between 1980 and 1990 exceeding that growth at 17.1% in 10 years.

From a conservative growth perspective, Cole County's average growth of 1.34% should be used for planning purposes giving Centertown a projected population of **371** in the year 2037 over the 20-year planning period. See **Figure 2** showing the historical population and growth projections of Cole County and **Figure 3** for the historical population and growth projections of Centertown.

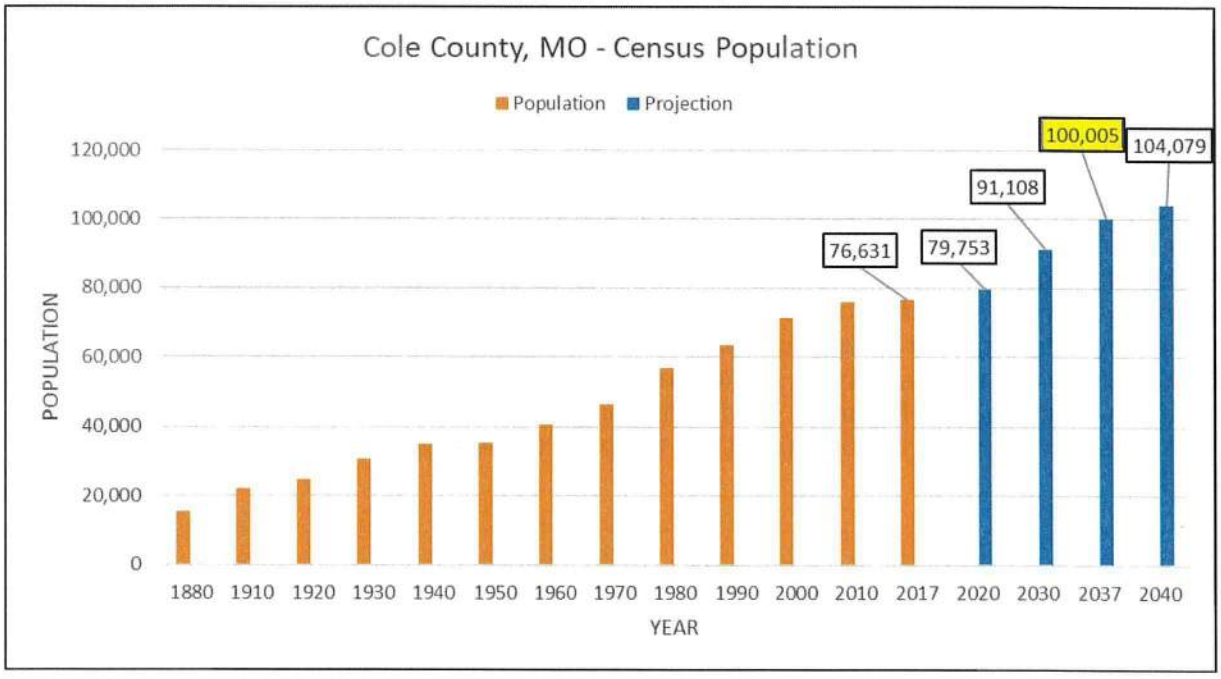


*Figure 2- 20 Year Projections for Cole County, MO*

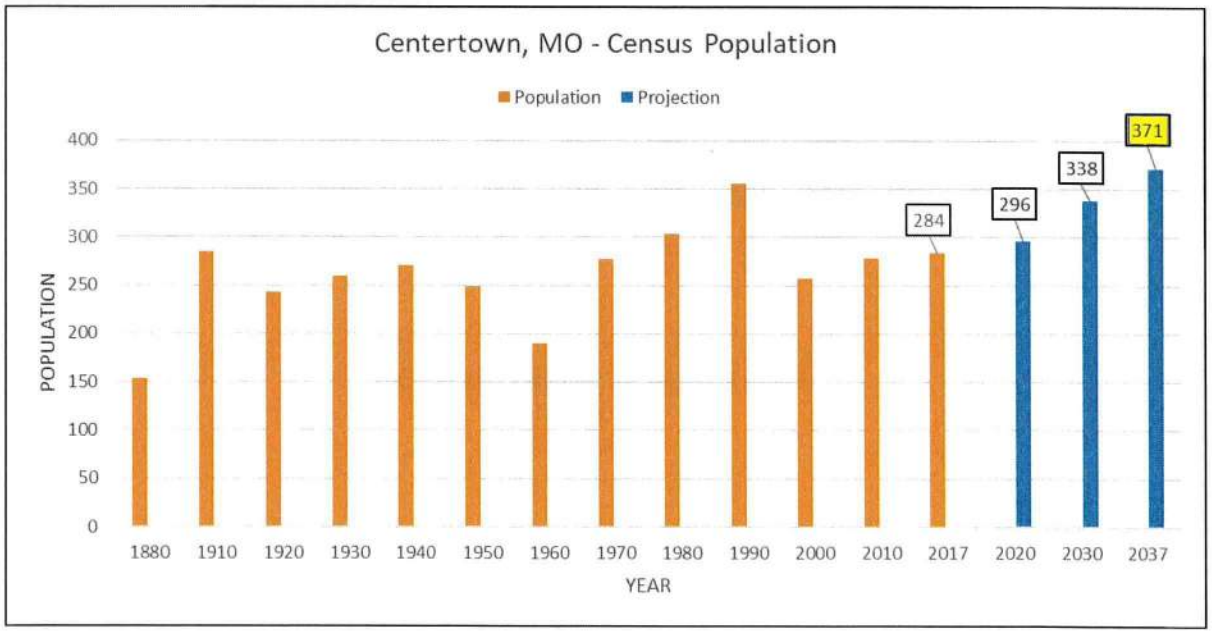


*Figure 3- 20 Year Projections for Centertown, MO.*

In the April 2017 elections, the voters passed propositions J and C. Proposition J was a bond election authorizing $130 million to build a second high school and renovate the current high

school. Proposition C was a levy to increase funds to operate the second high school and for additional instructional resources. Though the new school district lines have not been officially drawn, the Jefferson City School District Board has stated that the students who go to Thomas Jefferson Middle school would subsequently go to the new high school. Thomas Jefferson Middle School is where students from Centertown currently go. Given that the new school will be a state of the art facility, it is anticipated to be a large draw to the west side of Jefferson City. That potential growth could be an incentive for developers to consider Centertown for residential developments.

### Number of Households and Families Projections

The 2010 census showed growth of 11 homes and 4 families compared to the 2000 census which also shows evidence of development and growth. It is feasible that with an improvement in water and sewer utilities, there would be an increase in development. Even one new subdivision could increase the number of households by as much as 40-50 homes. For example, there is a subdivision being developed with 60 new lots located just east of Centertown on Highway 50 approximately 4 miles west of the intersection of Business Highway 50 and Henwick Ln. The number of metered connections in 2037 based on projected growth for Centertown is shown in **Figure 4**. For the planning purposes of this report using the same 1.34% growth per year, it is estimated that there will be **166** metered connections in the year 2037.

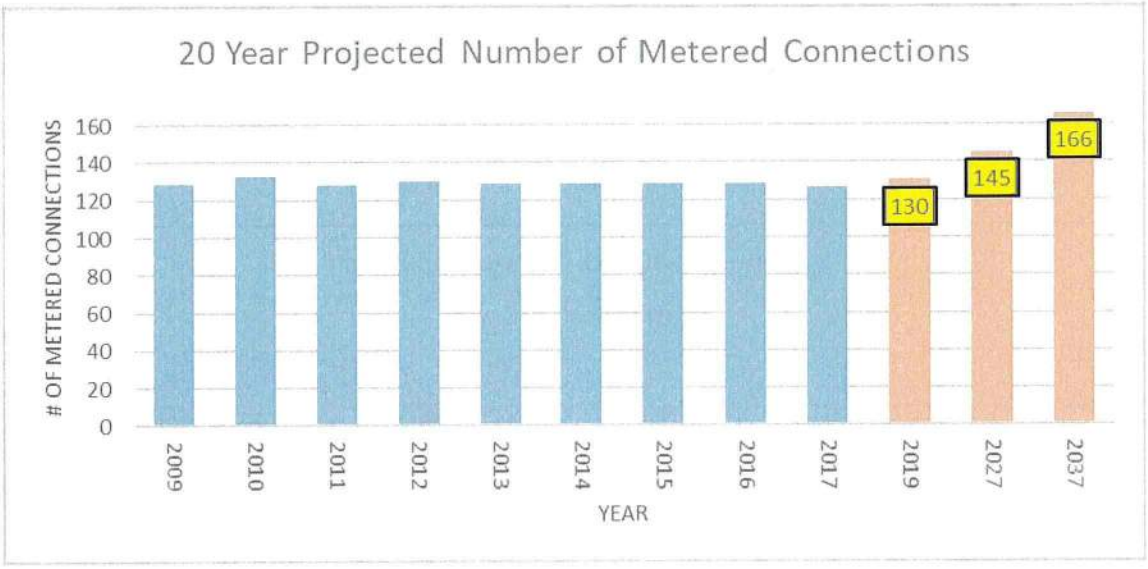


*Figure 4- Projected Metered Connections*

## Water Usage

### Average Demands

**Figure 5** below shows the historical average daily demands of the Centertown water system, which has been relatively level over the past 5 years. The average daily demand over the past 5 years is **16,763 GPD**. There is an obvious dip in the usage between years 2012 and 2013. The 2013 user rate increase along with the likely associated efficient water usage has probably

played a role in decreasing the average flows. The relatively low usage in Centertown can more importantly be attributed to the low system pressures due to the existing water storage tank that is too low. The current average gallon per person usage is **56.4** gallons per person per day. When the water pressure is corrected with a proposed taller storage tank, customers will have approximately double the water pressue that they currently experience and water usage will increase. For this reason, historical data should not be used. 100 gallons per person per day was used instead to calculate projected future average day demand - see **Figure 5**.

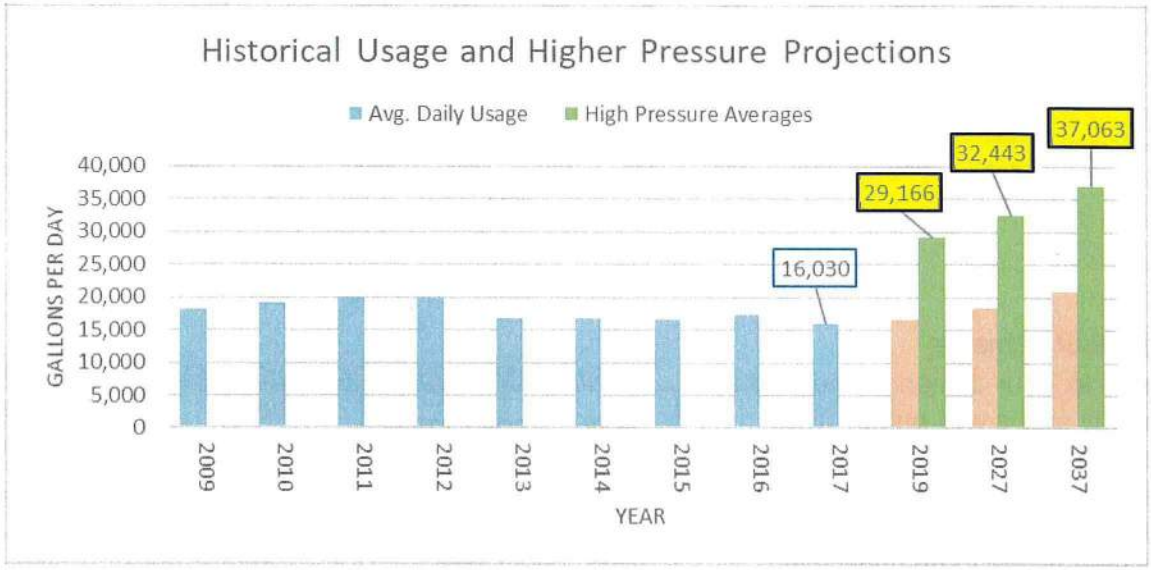


*Figure 5- Historical averages and projected future flows with higher pressures assuming 100 gallons/person/day*

So to summarize, by using the projected 1.3% growth rate, the population would increase to **371** people, roughly **166** metered homes, and an average daily flow of **37,063** gpd.

## Peak Demands

### Peak Day Average Demands

Using the Missouri DNR Minimum Design Standards, the maximum daily usage was determined by taking 150% of the average daily flows. **See Figure 6 below**. Based on this standard, the peak day demand would be **55,595** gpd.

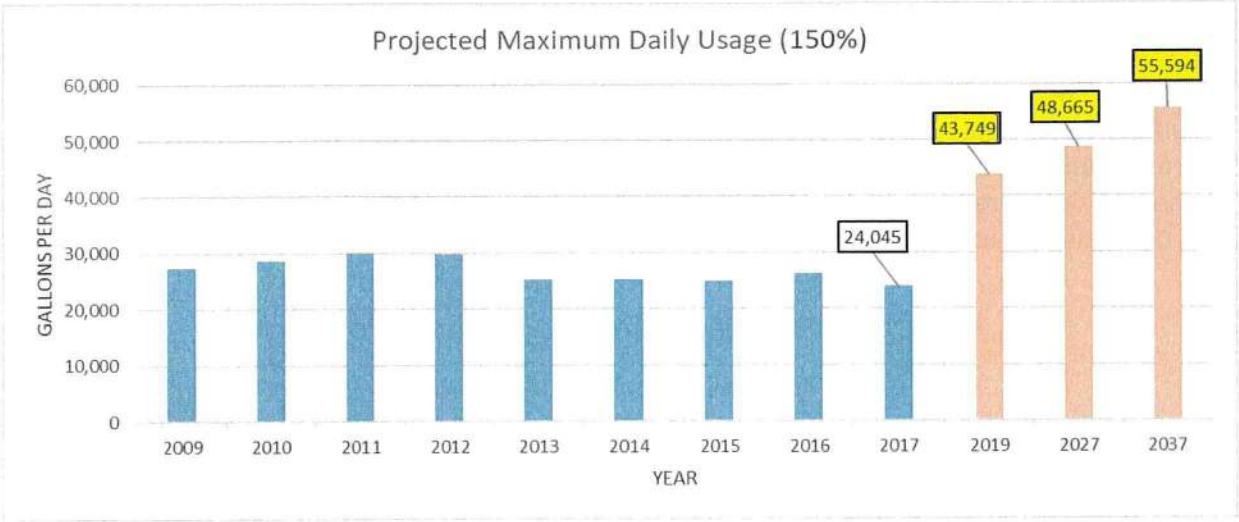


*Figure 6-Projected Maximum Daily Usage*

## Peak Hour Demands

The peak hour demand is needed to properly size a well pump. The pump needs to be able to sustain peak flows assuming the tower is out of service. The water tower allows real time peaks to be negligible because of the large amount of storage in the tank. However, if the tank were to be taken out of service for maintenance, the pump would need to be able to provide the peak demand for a period of time. The future peak hour demand was calculated using Missouri DNR's design guide formula shown below.

$P = 12 \times (N)^{(.515)} = 12 \times 166^{(.515)} = 167\ gpm$

*(where N is the projected number of service connections in the year 2037)*

Table 1 to the right shows the projected peak hour demands anticipated for the next 20 years based on the 1.34% growth per year.

**PEAK HOUR DEMAND PROJECTIONS BASED ON 1.34% GROWTH**

| YEAR | POPULATION | SERVICE CONNECTIONS | PEAK HOUR DEMAND (gpm) |
|---|---|---|---|
| 2017 | 284 | 127 | 145 |
| 2018 | 288 | 129 | 146 |
| 2019 | 292 | 130 | 147 |
| 2020 | 296 | 132 | 148 |
| 2021 | 300 | 134 | 149 |
| 2022 | 304 | 136 | 150 |
| 2023 | 308 | 138 | 152 |
| 2024 | 312 | 139 | 153 |
| 2025 | 316 | 141 | 154 |
| 2026 | 320 | 143 | 155 |
| 2027 | 324 | 145 | 156 |
| 2028 | 329 | 147 | 157 |
| 2029 | 333 | 149 | 158 |
| 2030 | 338 | 151 | 159 |
| 2031 | 342 | 153 | 160 |
| 2032 | 347 | 155 | 161 |
| 2033 | 351 | 157 | 162 |
| 2034 | 356 | 159 | 163 |
| 2035 | 361 | 161 | 165 |
| 2036 | 366 | 164 | 166 |
| 2037 | 371 | 166 | 167 |
| 2038 | 376 | 168 | 168 |
| 2039 | 381 | 170 | 169 |
| 2040 | 386 | 172 | 170 |

*Table 1-Projected Service Connections and Peak Demand*

# Water Supply and Storage

## Current Water Storage and Projected Needs

The current storage tank for the Village of Centertown is a multi-legged tank and has 50,000 gallons of storage capacity. Based on data from 2017, the tank turns over every 3 days or an approximate 32% turn-over rate. Missouri DNR design guide recommends a minimum of 25% turnover every day. Water turnover is important for many reasons but the two most important reasons are chlorine residual and water freshness. The chlorine used for disinfection has a limited residual life expectancy and needs to continue to disinfect while in the distribution system. If the water sits too long, the chlorine residuals will get too low. **Table 2** below shows the current tank dimensions, volume, and height.

| **Existing Tank 1 PWSSID: 3010149** | |
|---|---|
| Tank Capacity (gallons) | 50,000 |
| Base Elevation (ft) | 867.5 |
| Tank Height (ft) | 70 |
| Diameter (ft) | 20 |
| High Water Level (ft) | 937.5 |
| Low Water Level (ft) | 917.5 |

*Table 2-Current Storage Tank*

The existing tank elevation is at an elevation that is too low to properly serve the community with appropriate and more importantly safe water pressures as indicated in the DNR Sanitary Survey. The pressure at the tank currently ranges from 22 PSI to 30 PSI while the recommended distribution operating system pressure range is 60-80 PSI with 35-100 PSI on the extreme ends. In addition, the existing storage tank would need to be continually maintained and recoated due to the lead paint as indicated in the DNR Sanitary Survey (see **Appendix A** for details). Due to the pressure issues, capacity and lead paint concerns, it is recommended that a new storage tank is constructed that is much taller than the current storage tank. It should be noted that the data in Table 2 is from a July 1999 report that Bartlett & West completed and in that report it stated that the dimensions of the existing storage tank were received from Centertown. During design work, the base elevation at the new storage tank site will have to be confirmed by survey to ensure the proposed water storage tank is at the appropriate height for the desired system pressures.

As indicated in **Figure 7**, the high points in the system are along the main roads traveling east to west which is where the existing tank is located. Since the existing tank site is at the high elevation area of the village, it is evident that the low system pressures are due to the height of the tank, not the elevation of the existing grade at it's foundation. So that the new tank is built at these high elevations in Centertown and within close proximity to the existing well, the proposed tank should be built on the existing site or adjacent to it. However, the proposed tank should be much taller. The current tank overflow elevation is at 937.5 ft and the residence with the highest

elevation in the system is at 870 ft giving them an estimated static pressure of 29 PSI, even when the tank is completely full.

Although there are fire hydrants in town, Centertown does not guarantee fire flow. Emergency responders are worried that fire trucks' pumps would "pull" water at flow rates faster than the distribution system can supply creating severly reduced line pressures that could collapse the water lines. The DNR design guide states that if the community guarantees fire flow, the water system should be designed to maintain two hours of flow at a minimum of 250 gpm equating to 30,000 gallons of water volume. The new tank should be sized appropriately to meet this standard and provide emergency responders the needed capacity and capability to fight fires.

*Figure 7 – Topographic Map*

As discussed in the Average Demands section of this report, the average day demand for year 2037 is 37,063 gpd. When considering a 30,000-gallon fire fight; the optimal capacity for the proposed elevated strorage tank is **60,000** gallons. The higher proposed tank elevation would provide water pressures ranging from **54-90 psi** given the various elevations of homes in the distribution system. At the anticipated demand once the new tank is built and system pressures are raised to typical water system pressure levels, the turnover rate with the current number of service connections is expected to be 40%. This turnover rate is well witihin desired limits for a water storage tank. See **Table 3** below for proposed dimensions and capacity of the new elevated storage tank.

| Proposed Tank PWSSID: 3010149 | |
|---|---|
| Tank Capacity (gallons) | 60,000 |
| Base Elevation (ft) | 865 |
| Tank Height (ft) | 145 |
| Diameter (ft) | 27 |
| Operated Head Range (ft) | 19 |
| High Water Level (ft) | 1,008.0 ft |
| Low Water Level (ft) | 989 ft |

*Table 3- Proposed Tank Data*

## Existing Water Well and Projected Needs

The existing water well source is a deep-rock water supply well-constructed in 1960 by Henderson Drilling and put into service in 1961. According the latest well inspection report by Flynn Drilling, the actual well yield measured during the test was **200 gpm** – see **Appendix B**. The inspection report listed the design capacity at **135 gpm at 400 ft** of total dynamic head (TDH) See **Table 4** for a summary table of the Flynn Drilling well inspection report. .

| Well 1 PWSSID: 3010149 From Flynn Drilling Inspection, 6/12/17 | |
|---|---|
| Ground Elevation | 865 ft |
| Casing Depth | 462 ft (steel) |
| Total Depth | 822 ft |
| Actual Well Yield (gpm) | 200 |
| Pump Manufacturer | Grundfos |
| Pump Model | GF150S 200-10 |
| Motor Size | 20 hp |
| Column Pipe Size | 3" |
| Casing Pipe Size | 6" |
| Design Pumping Rate | 135 gpm |
| Static Water Level | 165 ft |
| Draw Down | 11 ft |

*Table 4- Existing Well Information*

A recent pump reading suggested the duty point of the existing pump is **158 gpm at 360 ft** of total dynamic head (TDH). Given that duty point and an average static head of the current

condition derived from the water surface elevation of the well to the high and low water elevations of the existing tower, the system head loss "k" value was calculated. Using this same "k" value but with the increased static head anticipated with the new taller storage tank, the duty point of the existing 10 stage Grundfos pump was calculated. If the existing 10 stage Grundfos pump used for the proposed storage tank, the capacity range would be approximately **133 to 142 gpm** and would not meet the peak 20-year design capacity of **167 gpm**. If an additional stage was added to the existing pump for an 11 stage configuration, the capacity range with the proposed storage tank would be approximately **148 gpm to 155 gpm.** While this doesn't quite meet the 167 gpm peak hour design goal, this will satisfy projected demand for at least 12 years (see Table 1), probably longer since 167 gpm should be considered the peak instantaneous flow rate. Therefore, the 11 stage Grundfos pump is recommended for the proposed pump configuration when the proposed storage tank is constructed.

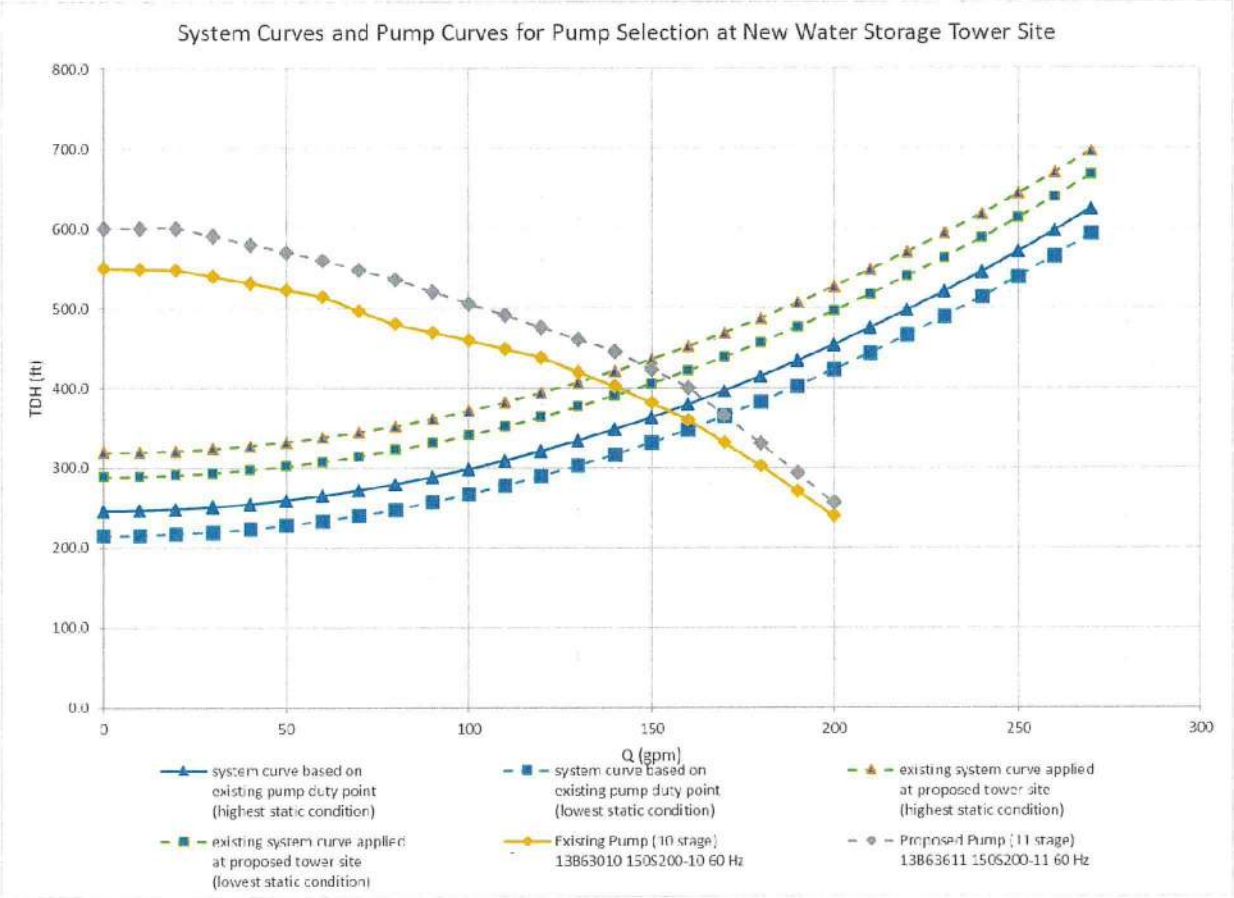


*Figure 8 – Estimated System and Pump Curves for Grundfos 10-Stage and 11-Stage Pumps – Existing and Proposed Sites*

The Grundfos pump data and curves of the existing 10-stage pump and proposed 11-stage pump can be found in **Appendix C.**

# Alternatives

## Back Up Supply Alternatives

1. **Install a new backup well** – This alternative includes investigating a new site for a possible additional well for backup requirements. This alternative allows the village the most control over their water production process. However, it would come a substantial capital investment. A well and well house could possibly be installed on the opposite end of the distribution system and connected to the existing distribution system. Although it would only serve as a backup well, it would require exercising and so a SCADA system would need to be installed to operate both wells in alternate sequence for a "call for water" from the tower. This option was not considered further due to the high capital investment. The estimated project cost for this is likely greater than **$1,200,000** including land acquisition, distribution improvements for large diameter water mains between the new well and storage tank, SCADA for efficient operation of both wells, and all other construction costs. Additional maintenance for the backup well and well house could be as high as **$100,000** for the 20-year design period.
2. **Connect to Moniteau PWSD No. 2** – Well #1 of Moniteau PWSD No. 2 is located just 2 miles west of the a 6-inch water main on the west side of Centertown. This option meets the requirement of a backup water system and would have much less O&M requirements than an additional well facility. Previous conversations between Centertown and Moniteau PWSD No. 2 suggest a willingness to consider this option as well as a cost sharing agreement for the water main extension. This option would require the installation of a master meter at the point of connection. The project cost for this alternative is estimated at **$1,172,830**.

## Storage Alternatives

1. **Keep Existing Storage Tank** –The current tank has lead based paint which would increase the cost of rehabilitation. As mentioned previously, the existing tank's height provides system pressures that are not adequate and are a safety concern. The capacity of the existing tank is also not adequate when considering future demand and fire flow. In addition, as indicated in the DNR Sanitary Survey, all the safety violations with the exception of security fencing are specific to the existing tank. These considerations make rehabilitating the existing tank cost prohibitive and not a viable 20-year solution. Therefore, this alternative is not recommended.
2. **Install a New Taller Storage Tank**– The alternative includes the installation of a new elevation storage tank at 145 ft in height with 60,000 gallons of storage in addition to adjacent yard piping and and an electronic actuator valve to prevent the new storage tank from overflowing due to the higher water level elevation of the Moniteau PWSD No 2 tank. It is recommended that this tower is constructed on an adjacent property in proximity to the existing well and tower so that current conditions can be maintained during construction of the new storage tank. This alternative will address all deficiencies reported on the DNR Sanitary Survey Inspection relative to the storage tank and provide typical operating system pressures throughout the distribution system. The project cost for this alternative is estimated at **$1,473,570**.

# Recommended Alternatives

Given the location of Centertown, it is our recommendation that the Village connect to Moniteau PWSD No. 2 as a backup water supply and construct a new water tower on the property adjacent to the existing well and tower site. These two recommendations provide the most economical and feasible solutions for the community.

## Backup Water Supply

Creating a connection between the two systems creates redundancy in the two water systems providing backup water sources to each community. The proposed connection point can be seen in **Figure 9**. Building a new well and well house would not be a cost-effective solution given the proximity of the Moniteau system, expecially considering the long term maintenance costs of that additional facility.

Currently the largest water line in the Centertown distribution system is a 6-inch line. It is proposed to match that water line size for the connecting water main between the two systems. The 6-inch line will experience a 9 psi headloss at the future peak demand flow. A 4-inch line has too high of headloss during typically demands in Centertown for it to be considered for the connection between the two systems.


*Figure 9- Point of Connection Map*

## Water Storage

It is recommended that the Village pursue acquiring land adjacent to the existing water tower location. See **Figure 10** for the location of adjacent land proposed for acquisition. This location would allow the tower to remain at the higher base elevation and to proximity to the existing well. This location would also require relatively minimal changes in yard piping to connect the well to the new tower. If the Village is unable to acquire adjacent land, the existing tank would have to be demolished prior to the construction of the new tower. Temporary water could be supplied by Moniteau PWSD No. 2 or a temporary pneumatic tank could be positioned on site at

the well to allow for continued operation of the well during existing tank demolition and proposed tank construction. The tank contractors will require a construction site of at least 100ft by 100ft as well as a large staging area.


*Figure 10-Adjacent Property (.6 ac)*

We recommend a pedestal tank over a legged tank due to its security, long-term cost effectiveness, and lower maintenance costs. Pedestal tanks are not climbable from the outside which reduces the liability of someone climbing the tank or contaminating the water source. Tanks also need resurfacing every 10-15 years. The cost to prep, power wash, blast and repaint is all determined by square footage. The pedestal tanks offer a smaller surface area which reduces the cost of the cleaning and resurfacing in the years to come. In addition, should the City not be able to acquire the additional property, the smaller footprint of the pedestal tank's foundation would be more applicable for the existing site, which has relatively little space for tank construction. See **Figure 11** for schematic drawings of a legged tank and a pedestal tank.

The higher tank elevation will provide water pressures ranging from **54-90 psi** (static) and will solve the issues with low water pressure in the system. However, the Village should anticipate possible water line breaks at weak spots throughout the distribution system as the system pressure is increased. The Village should be prepared to repair breaks that may occur when the system is brought up to standard system water pressures.

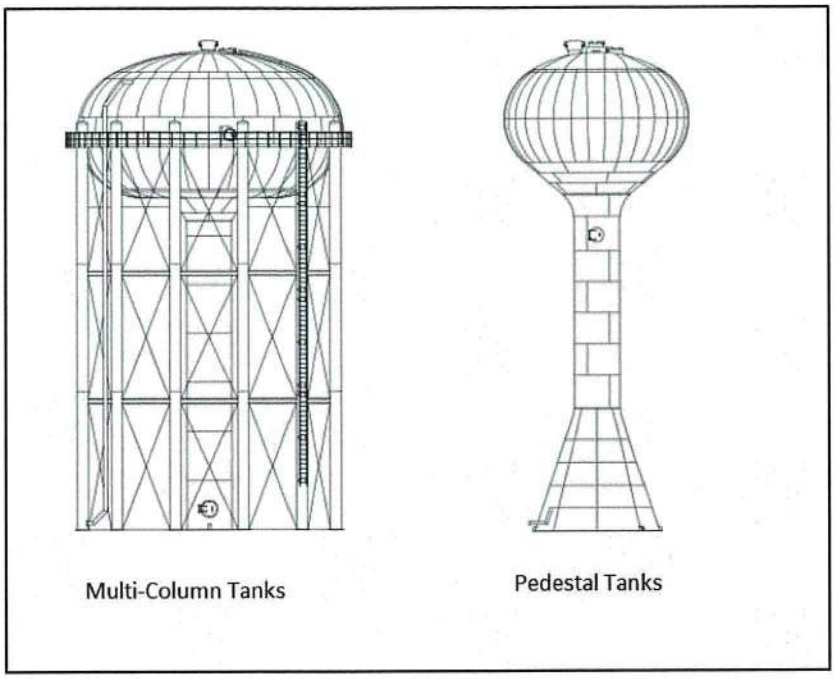


*Figure 11-Tank Comparison photo courtesy of Phoenix Fabricators and Erectors, LLC*

## Project Phasing Considerations

For the combined recommendation of the connection to Moniteau PWSD No. 2 and the new 60,000 gallon storage tank, project phasing should be considered based on whether or not the City can acquire the adjacent property shown in **Figure 10**. The following two scenarios should be considered:

1. The City is able to purchase the adjacent property:
   - Fill existing storage tank and make adjustments to existing pump.
   - Maintain current existing well and existing storage tank configuration while the new elevated storage tank is constructed.
   - Construct new yard piping from new elevated storage tank to point of connection with existing yard piping adjacent well house.
   - Rent temporary pneumatic tank for operation of existing well without a storage tank (assume 2 months conservatively) during yard piping connections between new tank and existing well.
2. The City is not able to purchase the adjacent property:
   - Fill existing storage tank and make adjustments to existing pump.
   - Rent temporary pneumatic tank for opertation of existing well without a storage tank (assume 12 months conservatively).
   - Demolition and containment of existing storage tank.
   - New elevated storage tank construction and new yard piping construction.
   - Construct new yard piping from new elevated storage tank to point of connection with existing yard piping adjacent well house
   - Yard piping connections between new tank and existing well.

For the purposes of planning, the more costly scenario number 2 above was used for project funding and it's costs were listed in all estimates in this report for the new storage tank. In summary, the estimates are as follows:

| | |
|---|---|
| **Connection to Moniteau PWSD No. 2 for emergency water:** | **$1,172,830** |
| **New elevated storage tank, yard piping, and site improvements:** | **$1,473,570** |
| **TOTAL** | **$2,646,400** |

## Project Schedule

| Task | Date |
|---|---|
| **Facility Plan Completion & SRF Application** | **January 12, 2018** |
| DNR SRF Application Submittal | Feb 15, 2018 |
| Filing Date for Bond Election | May 29, 2018 |
| | |
| **Bond Election** | **Aug 7, 2018** |
| Negotiate Engineering Agreement | Sep 2018-Oct 2018 |
| Project Design | Nov 2018-May 2019 |
| | |
| Permitting (USACE, MoDOT, DNR, County, Railroad, etc.) | May 2019 – Sep 2019 |
| Bid Advertising | Oct 2019 |
| Bid Opening | Oct 2019 |
| Notice of Award | Nov 2019 |
| Agreement and Notice to Proceed | Jan 2020 |
| Construction | Jan 2020 – Jan 2021 |
| | |

*Table 1- Estimated Project Schedule*

## User Rates

User rates were increased in 2013 by decreasing the number of billable brackets. The current water rate for 5,000 gallons of water is $32.50. According to the 2017 MRWA Water Study Report, the annual water revenue was $43,300. See **Appendix E** for the MRWA Water Rate Study.

In an effort to meet the financial needs of the recommended alternatives in this report as well as the addition of a sewer collection system it is recommended that the Village consider a combined Drinking Water and Sewer Rate Increase in the 2018 Bond Elections. The sewer collection project estimates had not been at the time of the writing of this report; however, the water rate increases were as stated below and shown in **Appendix F**.

The user rate at a minimum will have to be increased to 2% of the Village's MHI to qualify for any financial assistance. The 2010 Census says that the MHI of Centertown, MO is $28,542.00, 2% of that amount equates to $47.57 per 5,000 gallons of water usage.

Based on this report's calculated rate increases due to covering the capital improvement costs for the recommended projects, the Village should expect to see the water rates increase to between $47.57 (SRF loan and grant and CDBG grant) and $173.05 (lease purchase loan). See **Appendix F** for the summary of calculations for the various funding scenarios. The next step recommended for the Village is to submit this engineering report and apply for the loans and grants available through SRF, USDA, and CDBG.

# Appendix A

## DNR Compliance and Operation Inspection Report, March 25th, 2016

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Bartlett & West

Driving Community and Industry Forward, Together.

STATE OF MISSOURI
Jeremiah W. (Jay) Nixon, Governor  Sara Parker Pauley, Director
DEPARTMENT OF NATURAL RESOURCES
dnr.mo.gov

3.200 Centertown
Cole County
PWS ID #3010149

March 29, 2016

Mr. Jesse Corona
Board Chairman-Village of Centertown
1227 Broadway
P.O. Box 175
Centertown, MO 65023

Dear Mr. Corona:

Enclosed is a copy of a Compliance and Operation Inspection Report on the public water system serving the Village of Centertown in Cole County, Missouri. The inspection reviewed all eight (8) critical components applicable to the public water system. Please direct your attention to the unsatisfactory conditions and recommendations contained in the report and provide a written response to the unsatisfactory conditions **within 60 days**. Your response should be specific in detailing how you intend to correct the problems identified.

If you have any questions regarding this report or require technical assistance in responding to any specific items listed, please contact Mr. Richard Morrow at (660) 385-8000 in our Northeast Regional Office, 1709 Prospect Drive, Macon, MO 63552.

Sincerely,

NORTHEAST REGIONAL OFFICE

Irene Crawford
Regional Director

IC/ramd

Enclosures: Compliance and Operation Inspection Report, Newly Revised Model Lead Ban policy, Model Customer Complaint form

c: Ms. Susan Gilliam, Village Clerk
Mr. Derek McCubbin, Chief Operator

**Missouri Department of Natural Resources**
**Northeast Regional Office/Public Drinking Water Program**
**Report of Inspection**
**Centertown**
**1227 Broadway, Centertown, MO 65023**
**Cole County**
**March 29, 2016**
**MO3010149**

## Introduction

Pursuant to Section 640.120.5 RSMo of the Missouri Safe Drinking Water Law, a routine compliance and operations inspection of the Centertown public drinking water system, ID# MO3010149 in Cole County, Missouri, was conducted by Mr. Richard Morrow of the Northeast Regional Office on March 2, 2016. Mr. Derek McCubbin, Chief Operator, participated in the inspection.

This inspection was conducted to determine the facility's compliance with the Missouri Safe Drinking Water Law and the Missouri Safe Drinking Water Regulations. This report presents the findings and observations made during the inspection.

## Facility Description and History

The Village of Centertown was reissued a permit to dispense on July 23, 2015, and has been classified by the department as a community public drinking water system requiring a certified operator with a minimum DS-II level distribution certification. The designated chief operator is Mr. Derek McCubbin who is currently certified as a DS-II level distribution operator.

Centertown is currently serving water to approximately 278 individuals. The Centertown water system is a ground water system that consists of one active well and one emergency well with disinfection.

The system received a Consumer Confidence Report (CCR) reporting violation in January 2014 for failure to properly notify the public and/or submit a copy of the Public Notice (PN) and certification form to the department. The system notified the public and submitted the PN and certification form to the department as required in November 2014.

The Northeast Regional Office previously conducted a sanitary survey of the facility on January 24, 2013. The following items from the previous inspection have been addressed; reportedly, the chief operator will ensure new water mains are pressure tested as required. The prompt actions taken to address these issues are commendable.

## Discussion of Inspection and Observations

I contacted Mr. Derek McCubbin on or around February 26th to schedule a compliance and operations inspection the first week of March. Prior to conducting the inspection, I created an

inspection report on the SWIFT database and reviewed all pertinent files for the Centertown public drinking water system.

The inspection was conducted during normal business hours. Upon arrival at the village hall, I met with Mr. Derek McCubbin. The scope and purpose of the inspection was outlined. I completed a review of the systems records and completed the inventory portion of the checklist. Mr. McCubbin accompanied me throughout the rest of the inspection including a tour of the well house, chlorination room, and elevated storage facility.

At the end of the inspection, I tested for free and total chlorine residual and collected a bacteriological sample at the village hall. Photos were collected using an Olympus Stylus SP-820UZ camera. Proper sampling procedures were followed for collecting a bacteriological sample. I delivered the bacteriological sample to the State Health laboratory to be analyzed.

During the inspection, I thanked Mr. Derek McCubbin for meeting with me and explained that the report for the inspection would be sent to the Village of Centertown.

## Sampling and Monitoring

The appropriate sampling materials were taken on the inspection, including Missouri State Health Department approved bacteriological sample bottles, a Hach PCII pocket colorimeter to test for chlorine residuals, a Hach DR/890 multi-parameter colorimeter, and the necessary equipment and reagents needed to conduct the sampling and monitoring.

The results of the samples are as follows:

## Distribution

Disinfectant residual measured 1.72 mg/L free chlorine available, 1.76 mg/L of total chlorine. The bacteriological sample collected on March 2, 2016, tested absent for Total Coliform.

## Compliance Determination and Required Actions

This facility was found to be in **non-compliance** with the Missouri Safe Drinking Water Regulations based on observations made at the time of the inspection.

1. The department has designated the Centertown public drinking water system as a DS-II system. Reportedly, the system has designated Mr. James Wickers as the system's back-up chief operator for distribution but he does not hold a DS-II certification. Therefore, the system does not have a duly certified back-up distribution operator designated at the DS-II drinking water distribution level or higher. The Missouri Public Drinking Water Regulation 10 CSR 60 14.010(4)(A)6 governs the operation of public water systems by

requiring each system to develop a contingency plan for a stand-by replacement chief operator to be available at all times. This plan may be a second certified employee, a mutual assistance agreement with a neighboring system, or a pre-arrangement with a contract operator. Please provide a schedule of activities and a timeline for the system to have a certified back-up operator for distribution who has met all applicable certification requirements.

2. The system does not have an up-to-date lead ban ordinance that takes into account the January 4, 2014, revisions to the Lead-Copper Regulations. A newly revised model lead ban ordinance that takes into account the reduced lead standards in distribution and residential fittings is attached for the system to review and consider for adoption.

3. The Village of Centertown has only one active well. If the well would fail to operate, it will leave the system without water. The existing emergency operations plan has been updated and reportedly the system has a contract with "Opies Transport" to truck in water if required. Public Drinking Water regulation 10 CSR 60-12 states that the plan must include key items including **written emergency procedures including those for tank truck disinfection and protection, installation of emergency chlorinators or disinfection of trucked water.** Please adopt these procedures if they are not already a part of the systems current EOP.

**REQUIRED ACTIONS:** The facility shall submit a written statement to the Northeast Regional Office **within 60 days**, explaining what actions have been taken to correct the unsatisfactory features and prevent a reoccurrence in the future.

**Recommendations**

1. Draw down, yield, and static water level tests should be performed and recorded once every month on the well. These tests are necessary to determine if the well and its pump are operating properly. The tests will alert an operator to pump problems or low water levels in the well before the pump fails or the well completely quits and leaves the system out of water.

2. The system's wellhead protection plan has not been updated. The system needs to submit a copy of a newly revised plan to the department for approval. If you have any questions, please contact Mr. Ken Tomlin at the Public Drinking Water Branch at (573) 751-5331.

3. Reportedly, there is only 25 psi in the system when the elevated storage tank is full and there is a chronic low pressure issue in most of the village. Each fire hydrant provides less than 500 gpm and when flow tested, most of the hydrants have a static pressure less than 20 psi. Reportedly, the system has contacted their engineering firm and is in the

process of securing funding for construction of a new higher elevated tank to correct the low pressure issue and lack of fire protection. This issue should be a system priority.

4. If the needed funding is not procured for the new storage facility, then the following items will need to be addressed and noted on the last tank inspection report. Several safety deficiencies including an undersized balcony, no riser cover plate, no ladder inside the riser pipe, and an inadequate riser lip for protection need to be corrected.

5. A safety climbing device was not provided on the exterior access ladder of the tower. A safety climbing device needs to be installed as soon as possible on the exterior access ladder so maintenance and inspection work can be safely conducted on the tank.

6. There is cabling attached to the side of the exterior ladder at the tower that interferes with safely accessing the ladder. The cables should be enclosed in conduit with proper brackets that stand off of the tower. Having the cables in conduit and off the surface of the tower will prolong the life of the cables and reduce maintenance costs since they will not have to be removed to sandblast and paint.

7. Cables and antennae have been attached to the balcony's railing. The system should contact their engineering firm to have an analysis conducted to assure that the railing is structurally capable of supporting the additional weight and stress subject in high wind conditions.

8. The ground level manway opening at the water tower is too small. The manway opening should be enlarged to a minimum of 24" to meet OSHA standards.

9. The tower was constructed with one inlet/outlet pipe, which does not allow for proper contact time for disinfectant reactions and for sufficient turnover in the tank. Modifications to the existing inlet or a separate inlet and outlet pipe should be provided to improve mixing and contact time in the tower.

10. Reportedly, the tower's exterior paint is lead-based and exceeds the TCLP regulated limit for lead. Because of this, shrouding, sandblasting, blast media collection-removal as a hazardous waste, and painting of the storage facility will be cost prohibitive. The system should have the paint routinely touched up to limit further deterioration of the coating and steel surface until the structure can be replaced.

11. All water storage facilities should include measures to provide protection against unauthorized entry. The elevated storage tank should be fenced and gated. Gates should be locked and "Authorized Personnel Only" signs should be posted to prevent unauthorized access.

12. There have been no low pressure reports submitted to our office since 2012. Please understand, anytime the pressure in the distribution system drops below 20 psi, the system must notify affected customers, issue a boil water advisory until further notification for the affected area, and send our office a low pressure report within 48 hours of discovery. If a leak is determined as the reason for the low pressure event, the system should repair the leak as soon as possible following procedures for properly disinfecting the repair area, repair components, and affected sections of the distribution system. This should be followed by unidirectional flushing and confirmation bacteriological sampling upstream and downstream of the break area before lifting the boil water notification. Failure to do so can be construed as a violation.

**TMF & Safety**

1. Water systems need to meet the minimum technical, managerial and financial capacity requirements to operate a viable public water system. The system was meeting most of the managerial capacity requirements except that it did not have written consumer complaint procedures for receiving, investigating, resolving and recording customer complaints. A model customer complaint form is attached.

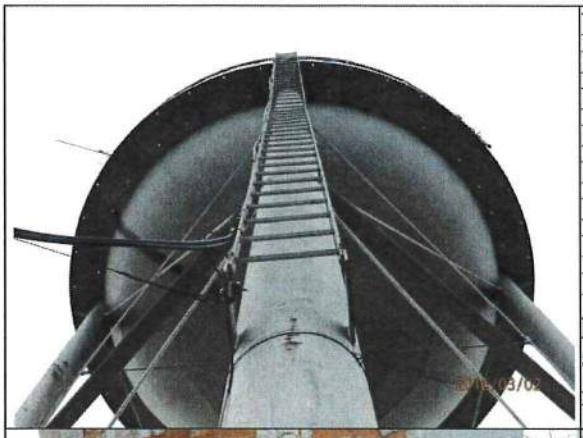
SUBMITTED BY:

Richard Morrow
Environmental Specialist
Northeast Regional Office

REVIEWED BY:

John Gibson
Environmental Supervisor
Northeast Regional Office

RAM/dm

| | |
|---|---|
|  | Photo #: 1<br>Date/Time Taken: 03/02/16 at approx. 1238 hours<br>By: Richard Morrow<br>Program: PDW Unit<br>File: 3.200<br>Facility: Centertown<br>Location: Water Tower<br>Description: There was no safety climbing device provided on the exterior access ladder and cables and antennae have been attached to the balcony's railing. |
|  | Photo #: 2<br>Date/Time Taken: 03/02/16 at approx. 1238 hours<br>By: Richard Morrow<br>Program: PDW Unit<br>File: 3.200<br>Facility: Centertown<br>Location: Water Tower<br>Description: The ground level manway opening at the water tower is too small. The manway opening should be enlarged to a minimum of 24" to meet OSHA standards. |
|  | Photo #: 3<br>Date/Time Taken: 03/02/16 at approx. 1238 hours<br>By: Richard Morrow<br>Program: PDW Unit<br>File: 3.200<br>Facility: Centertown<br>Location: Well #4 Well house<br>Description: This is a picture of the drawdown gauge and airline. Draw down, yield, and static water level tests should be performed and recorded once every month on the well. |
|  | Photo #: 4<br>Date/Time Taken: 03/02/16 at approx. 1238 hours<br>By: Richard Morrow<br>Program: PDW Unit<br>File: 3.200<br>Facility: Centertown<br>Location: Well house<br>Description: This is a picture of the well house. |

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# Appendix B

## 2017 Flynn Drilling Inspection Report

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# FLYNN DRILLING COMPANY, INC.
## ANNUAL INSPECTION

**OWNER** Village of Centertown

**Pump ID** 1 **Location** Broadway Street, across railroad tracks on left # 1227

**Inspection Performed By** Mike Lavy **Date** 6-12-2017 **Time** 3:00

### Historical Data If Available

**Well Info-Depth** 822 **Size** 6 **Casing Depth** 462 **SWL** 163 **DD** 2 **PWL** 165

**Pump Setting** 315 Column Size 3 Type Galv. Airline length 320 Shaft Size n/a

Motor Make/mod # Franklin Hp 20 Phase 3 Volts 230 FI amps 53.8-60-6 S.F.

Starter Make/mod # Furnas 14GP32B*81 NEMA 2.5 Overloads mod # K77 Amps 60 Cntrl volt 110

Pump Make/mod # Grundfos 150S200-10 Stages 10 Type S/S Sub OD/size 6

RPM 3450 Design 135 gpm@ 400 tdh S/S Sub Wire Size 4/3 w/ground

| | rated | actual |
|---|---|---|
| OutPut (gpm) | 185 | 200 |
| Head (tdh) | 285 | 285 |

**Discharge (psi)** 28

Comments

### Well Yield

| | Actual | Run Time |
|---|---|---|
| Static Level | 165 | |
| Pumping Level | 176 | Was Running |
| Drawdown..... | 11 | |
| Specific Capacity | 18 | |

PWl 176
Hd 65
Hf 44
TDH 285

Comments Airline Reading Over Pump
144' While Running
155' After Shut Down 30min

### Motor and Electrical System

| | Actual | | | % Imbalance |
|---|---|---|---|---|
| Voltage | 243 | 247 | 242 | |
| Amperage | 47 | 48 | 52 | |

Motor to Ground 50+ (M-ohms) Windings .7 .7 .7

Terminal Connections Clean & Tight

Motor Protection Overloads Only

Comments
Voltage 240-121-112-210 to ground

### Mechanical

Seal or Packing N/A
Check Valves Holding
Lubrication N/A
Airline & Gauge Working

Comments
This well has 2 check valves

### Sanitary Inspection

Vent & Screen 2" Vent
Well Head Seal 6" Flanged w/3" Tee
Air Release & Other N/A

Comments

### Initial Findings & Recommendations:

Meter always seems to show 10-15gpm more than pump curve shows at this tdh. Everything else looks and checks out good at this time and all the same as the last 3-4 years.

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# Appendix C

## Grundfos Pump Data and Curves

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GRUNDFOS

**Company name:**
**Created by:**
**Phone:**

**Date:** 12/5/2017

| Position | Count | Description |
|---|---|---|
| | 1 | **150S200-10** |

**Product photo could vary from the actual product**

Product No.: 13B63010
Multi-stage submersible pump for raw water supply, groundwater lowering and pressure boosting. The pump is suitable for pumping clean, thin, non-agressive liquids without solid particles or fibers.

The pump is made entirely of Stainless steel DIN W.-Nr. EN 1.4301 and suitable for horizontal and vertical installation.
The pump is fitted with a built-in non-return valve.

The motor is a 3-phase motor of the canned type with a sand shield, liquid-lubricated bearings and pressure-equalizing diaphragm.

**Liquid:**

| | |
|---|---|
| Pumped liquid: | Water |
| Maximum liquid temperature: | 104 °F |
| Max liquid temperature at 0.15 m/sec: | 104 °F |
| Liquid temperature during operation: | 68 °F |
| Density: | 62.29 lb/ft³ |

**Technical:**

| | |
|---|---|
| Speed for pump data: | 3450 rpm |
| Rated flow: | 159 US gpm |
| Rated head: | 354.3 ft |
| Shaft seal for motor: | SIC/SICNBR |
| Curve tolerance: | ISO9906:2012 3B |
| Motor version: | T40 |

**Materials:**

| | |
|---|---|
| Pump: | Stainless steel<br>EN 1.4301<br>AISI 304 |
| Impeller: | Stainless steel<br>EN 1.4301<br>AISI 304 |
| Motor: | Stainless steel<br>DIN W.-Nr. 1.4301<br>AISI 304 |

**Installation:**

| | |
|---|---|
| Maximum ambient pressure: | 870 psi |
| Pump outlet: | 3"NPT |
| Motor diameter: | 6 inch |

**Electrical data:**

GRUNDFOS

**Company name:**
**Created by:**
**Phone:**

**Date:** 12/5/2017

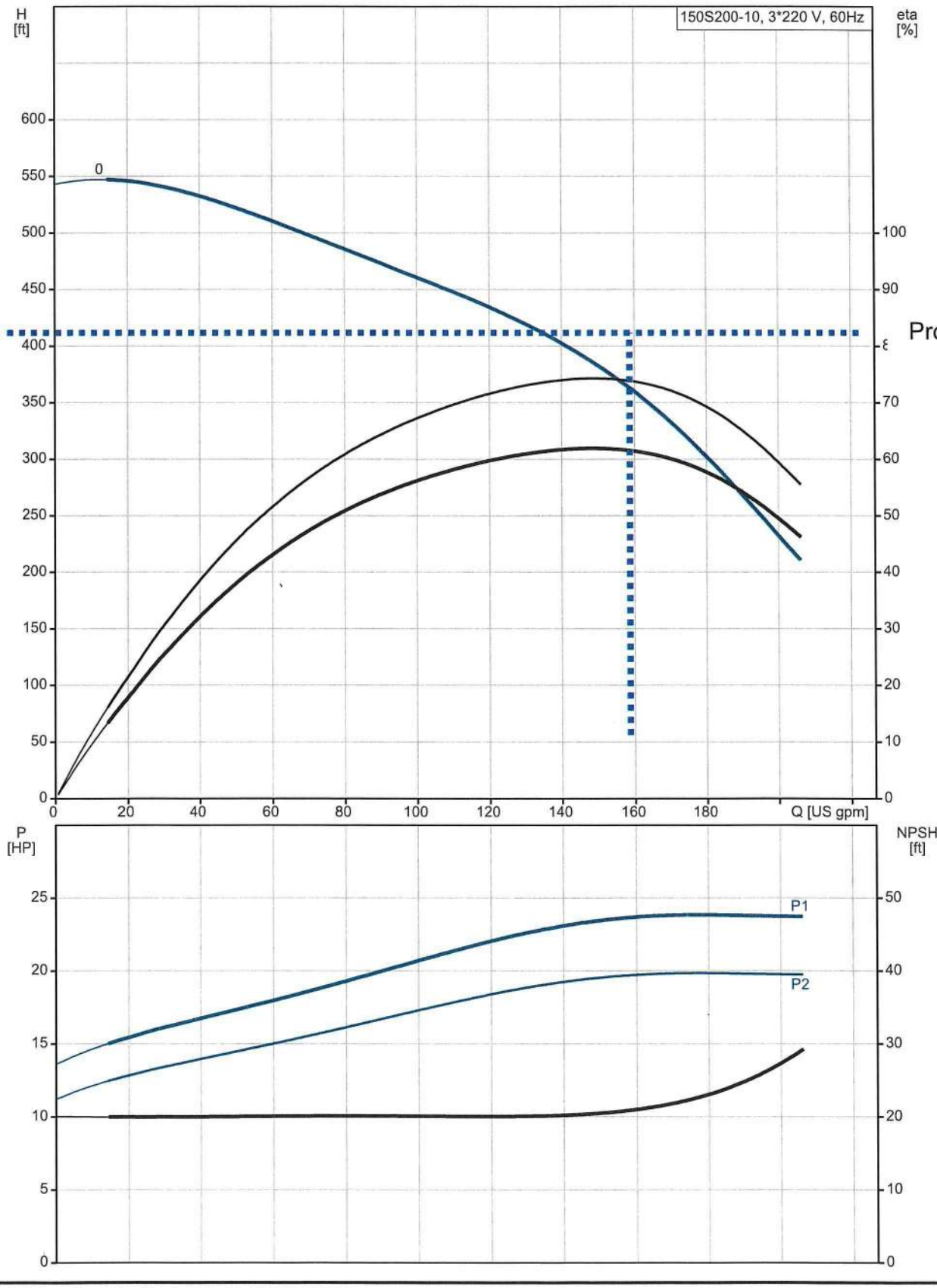
| Position | Count | Description | |
|---|---|---|---|
| | | Motor type: | MS6000 |
| | | Rated power - P2: | 20 HP |
| | | Main frequency: | 60 Hz |
| | | Rated voltage: | 3 x 208-220-230 V |
| | | Service factor: | 1.15 |
| | | Rated current: | 71.5-67.0-65.0 A |
| | | Starting current: | 460-520-570 % |
| | | | 343 A |
| | | Cos phi - power factor: | 0.86-0.85-0.84 |
| | | Rated speed: | 3430-3450-3470 rpm |
| | | Motor efficiency at full load: | 84.0 % |
| | | Start. method: | direct-on-line |
| | | Enclosure class (IEC 34-5): | IP68 |
| | | Insulation class (IEC 85): | F |
| | | Built-in temperature transmitter: | yes |
| | | **Others:** | |
| | | ErP status: | EuP Standalone/Prod. |
| | | Net weight: | 178 lb |
| | | Gross weight: | 253 lb |
| | | Shipping volume: | 9.32 ft³ |

GRUNDFOS

Company name:
Created by:
Phone:

Date: 12/5/2017

# 13B63010 150S200-10 60 Hz



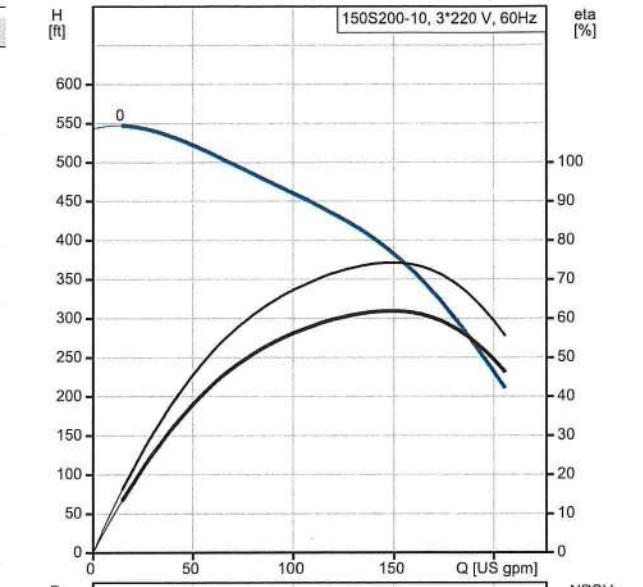

Proposed

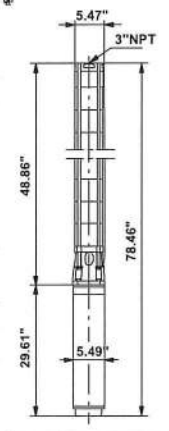
GRUNDFOS

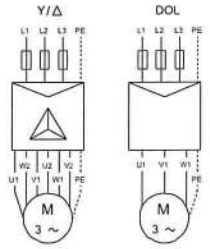
**Company name:**
**Created by:**
**Phone:**

**Date:** 12/5/2017

| Description | Value |
|---|---|
| **General information:** | |
| Product name: | 150S200-10 |
| Product No.: | 13B63010 |
| EAN: | 5700391425929 |
| **Technical:** | |
| Speed for pump data: | 3450 rpm |
| Rated flow: | 159 US gpm |
| Rated head: | 354.3 ft |
| Impeller reduc.: | NONE |
| Shaft seal for motor: | SIC/SICNBR |
| Curve tolerance: | ISO9906:2012 3B |
| Stages: | 10 |
| Model: | B |
| Valve: | YES |
| Motor version: | T40 |
| **Materials:** | |
| Pump: | Stainless steel |
| | EN 1.4301 |
| | AISI 304 |
| Impeller: | Stainless steel |
| | EN 1.4301 |
| | AISI 304 |
| Motor: | Stainless steel |
| | DIN W.-Nr. 1.4301 |
| | AISI 304 |
| **Installation:** | |
| Maximum ambient pressure: | 870 psi |
| Pump outlet: | 3"NPT |
| Motor diameter: | 6 inch |
| **Liquid:** | |
| Pumped liquid: | Water |
| Maximum liquid temperature: | 104 °F |
| Max liquid temperature at 0.15 m/sec: | 104 °F |
| Liquid temperature during operation: | 68 °F |
| Density: | 62.29 lb/ft³ |
| **Electrical data:** | |
| Motor type: | MS6000 |
| Applic. motor: | GRUNDFOS |
| Rated power - P2: | 20 HP |
| KVA code: | H |
| Main frequency: | 60 Hz |
| Rated voltage: | 3 x 208-220-230 V |
| Starter: | 3 |
| Service factor: | 1.15 |
| Rated current: | 71.5-67.0-65.0 A |
| Starting current: | 460-520-570 % |
| | 343 A |
| Cos phi - power factor: | 0.86-0.85-0.84 |
| Rated speed: | 3430-3450-3470 rpm |
| Axial load max: | 59.5 lb |
| Motor efficiency at full load: | 84.0 % |
| Start. method: | direct-on-line |
| Enclosure class (IEC 34-5): | IP68 |
| Insulation class (IEC 85): | F |




| | |
|---|---|
| U1, W2 | Brown |
| V1, U2 | Black |
| W1, V2 | Grey |

GRUNDFOS

**Company name:**
**Created by:**
**Phone:**

**Date:** 12/5/2017

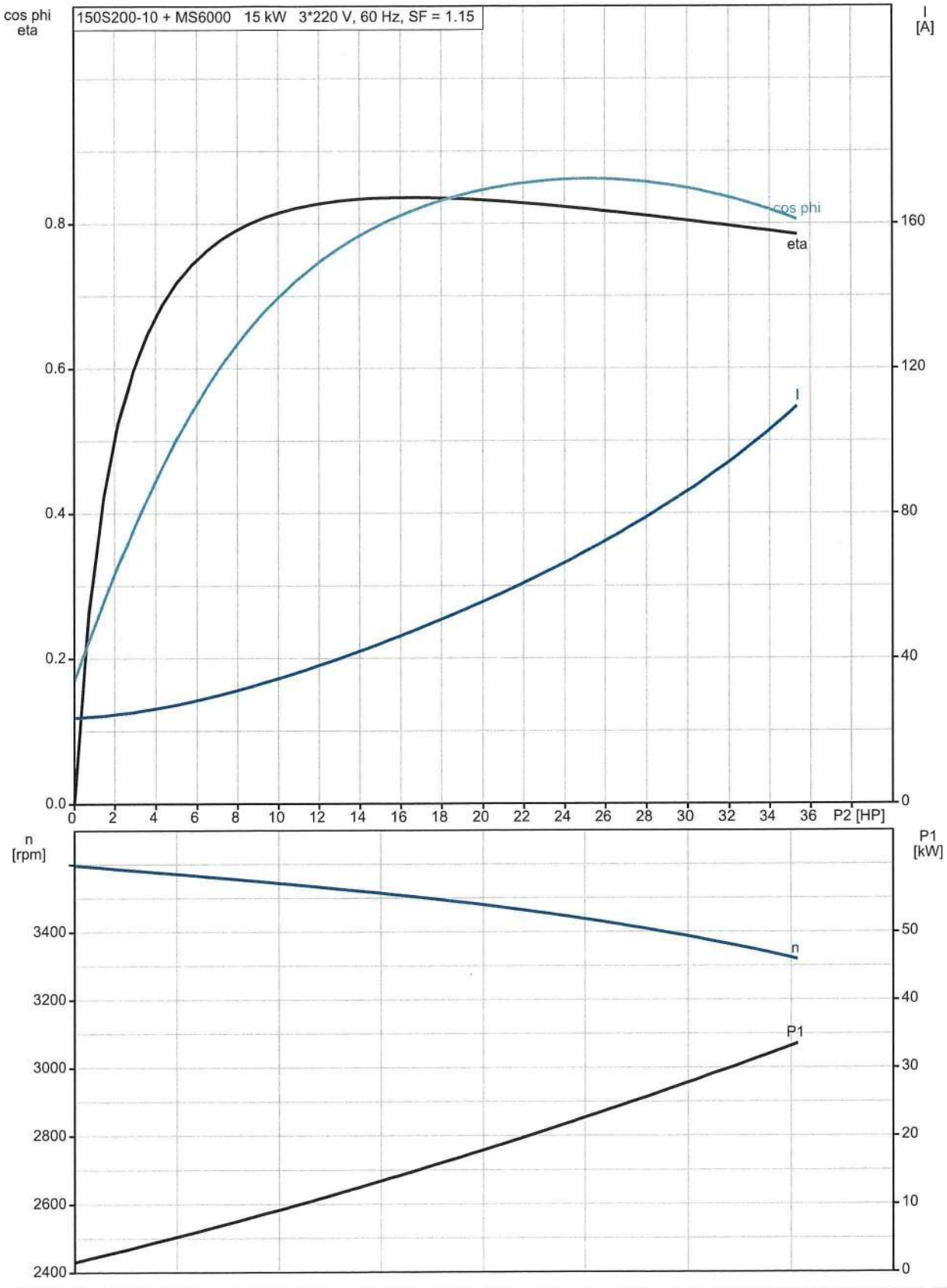
| Description | Value |
|---|---|
| Motor protection: | NONE |
| Thermal protec: | external |
| Built-in temperature transmitter: | yes |
| Motor Number: | 96166186 |
| Cable number: | 96163476 |
| **Controls:** | |
| Heather: | K79 |
| **Others:** | |
| ErP status: | EuP Standalone/Prod. |
| Net weight: | 178 lb |
| Gross weight: | 253 lb |
| Shipping volume: | 9.32 ft³ |
| Sales region: | Namreg |

GRUNDFOS

Company name:
Created by:
Phone:

Date: 12/5/2017

# 13B63010 150S200-10 60 Hz



GRUNDFOS

**Company name:**
**Created by:**
**Phone:**

**Date:** 12/12/2017

| Position | Count | Description |
|---|---|---|
| | 1 | **150S200-11** |

**Product photo could vary from the actual product**

Product No.: 13B63611
Multi-stage submersible pump for raw water supply, groundwater lowering and pressure boosting. The pump is suitable for pumping clean, thin, non-agressive liquids without solid particles or fibers.

The pump is made entirely of Stainless steel DIN W.-Nr. EN 1.4301 and suitable for horizontal and vertical installation.
The pump is fitted with a built-in non-return valve.

The motor is a 3-phase motor of the canned type with a sand shield, liquid-lubricated bearings and pressure-equalizing diaphragm.

**Liquid:**

| | |
|---|---|
| Pumped liquid: | Water |
| Maximum liquid temperature: | 104 °F |
| Max liquid temperature at 0.15 m/sec: | 104 °F |
| Liquid temperature during operation: | 68 °F |
| Density: | 62.29 lb/ft³ |
| Kinematic viscosity: | 1 cSt |

**Technical:**

| | |
|---|---|
| Speed for pump data: | 3450 rpm |
| Actual calculated flow: | 172 US gpm |
| Resulting head of the pump: | 360 ft |
| Shaft seal for motor: | SIC/SICNBR |
| Curve tolerance: | ISO9906:2012 3B |
| Motor version: | T40 |

**Materials:**

| | |
|---|---|
| Pump: | Stainless steel<br>EN 1.4301<br>AISI 304 |
| Impeller: | Stainless steel<br>EN 1.4301<br>AISI 304 |
| Motor: | Stainless steel<br>1.4301 EN<br>AISI 304 |

**Installation:**

| | |
|---|---|
| Maximum ambient pressure: | 870 psi |
| Pump outlet: | 3"NPT |
| Motor diameter: | 6 inch |

GRUNDFOS

**Company name:**
**Created by:**
**Phone:**

**Date:** 12/12/2017

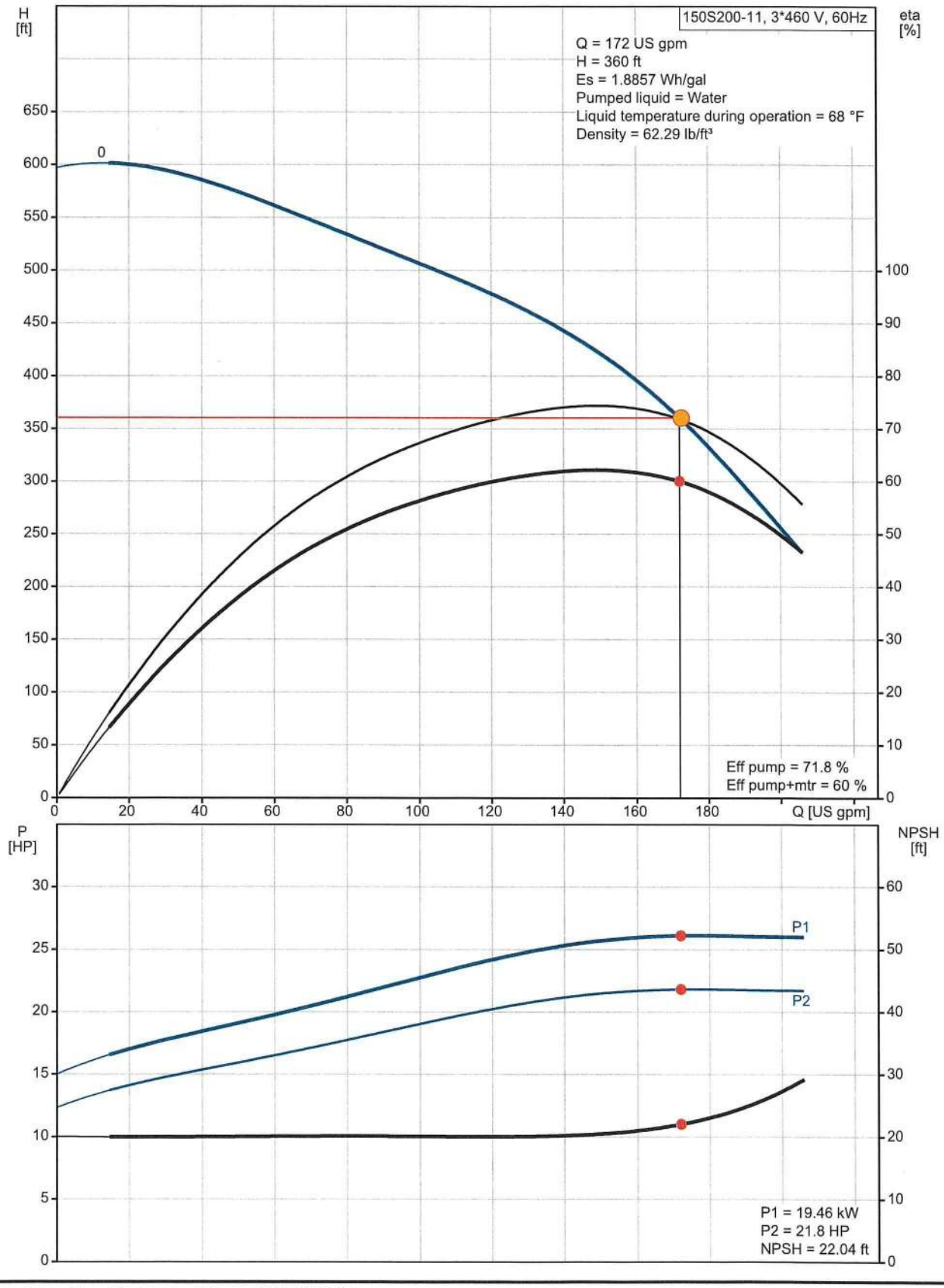
| Position | Count | Description | |
|---|---|---|---|
| | | **Electrical data:** | |
| | | Motor type: | MS6000 |
| | | Rated power - P2: | 20.12 HP |
| | | Main frequency: | 60 Hz |
| | | Rated voltage: | 3 x 440-460-480 V |
| | | Service factor: | 1.15 |
| | | Rated current: | 33.5-32.5-32.0 A |
| | | Starting current: | 520-570-610 % |
| | | | 172 A |
| | | Cos phi - power factor: | 0.85-0.84-0.81 |
| | | Rated speed: | 3450-3470-3480 rpm |
| | | Motor efficiency at full load: | 84.0 % |
| | | Start. method: | direct-on-line |
| | | Enclosure class (IEC 34-5): | IP68 |
| | | Insulation class (IEC 85): | F |
| | | Built-in temperature transmitter: | yes |
| | | **Others:** | |
| | | ErP status: | EuP Standalone/Prod. |
| | | Net weight: | 182 lb |
| | | Gross weight: | 257 lb |
| | | Shipping volume: | 9.32 ft³ |

GRUNDFOS

**Company name:**
**Created by:**
**Phone:**

**Date:** 12/12/2017

# 13B63611 150S200-11 60 Hz

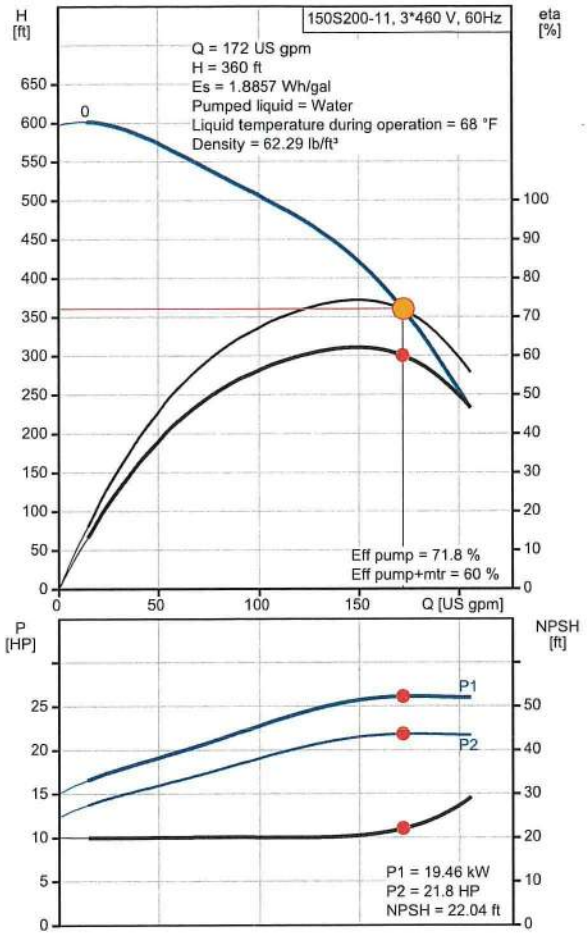


GRUNDFOS

**Company name:**
**Created by:**
**Phone:**

**Date:** 12/12/2017

| Description | Value |
|---|---|
| **General information:** | |
| Product name: | 150S200-11 |
| Product No.: | 13B63611 |
| EAN: | 5700391427756 |
| **Technical:** | |
| Speed for pump data: | 3450 rpm |
| Actual calculated flow: | 172 US gpm |
| Resulting head of the pump: | 360 ft |
| Stages: | 11 |
| Impeller reduc.: | NONE |
| Shaft seal for motor: | SIC/SICNBR |
| Curve tolerance: | ISO9906:2012 3B |
| Model: | B |
| Valve: | YES |
| Motor version: | T40 |
| **Materials:** | |
| Pump: | Stainless steel<br>EN 1.4301<br>AISI 304 |
| Impeller: | Stainless steel<br>EN 1.4301<br>AISI 304 |
| Motor: | Stainless steel<br>1.4301 EN<br>AISI 304 |
| **Installation:** | |
| Maximum ambient pressure: | 870 psi |
| Pump outlet: | 3"NPT |
| Motor diameter: | 6 inch |
| **Liquid:** | |
| Pumped liquid: | Water |
| Maximum liquid temperature: | 104 °F |
| Max liquid temperature at 0.15 m/sec: | 104 °F |
| Liquid temperature during operation: | 68 °F |
| Density: | 62.29 lb/ft³ |
| Kinematic viscosity: | 1 cSt |
| **Electrical data:** | |
| Motor type: | MS6000 |
| Applic. motor: | GRUNDFOS |
| Rated power - P2: | 20.12 HP |
| KVA code: | J |
| Main frequency: | 60 Hz |
| Rated voltage: | 3 x 440-460-480 V |
| Starter: | 2 |
| Service factor: | 1.15 |
| Rated current: | 33.5-32.5-32.0 A |
| Starting current: | 520-570-610 %<br>172 A |
| Cos phi - power factor: | 0.85-0.84-0.81 |
| Rated speed: | 3450-3470-3480 rpm |
| Axial load max: | 59.5 lb |
| Motor efficiency at full load: | 84.0 % |
| Start. method: | direct-on-line |
| Enclosure class (IEC 34-5): | IP68 |



GRUNDFOS

Company name:
Created by:
Phone:

Date: 12/12/2017

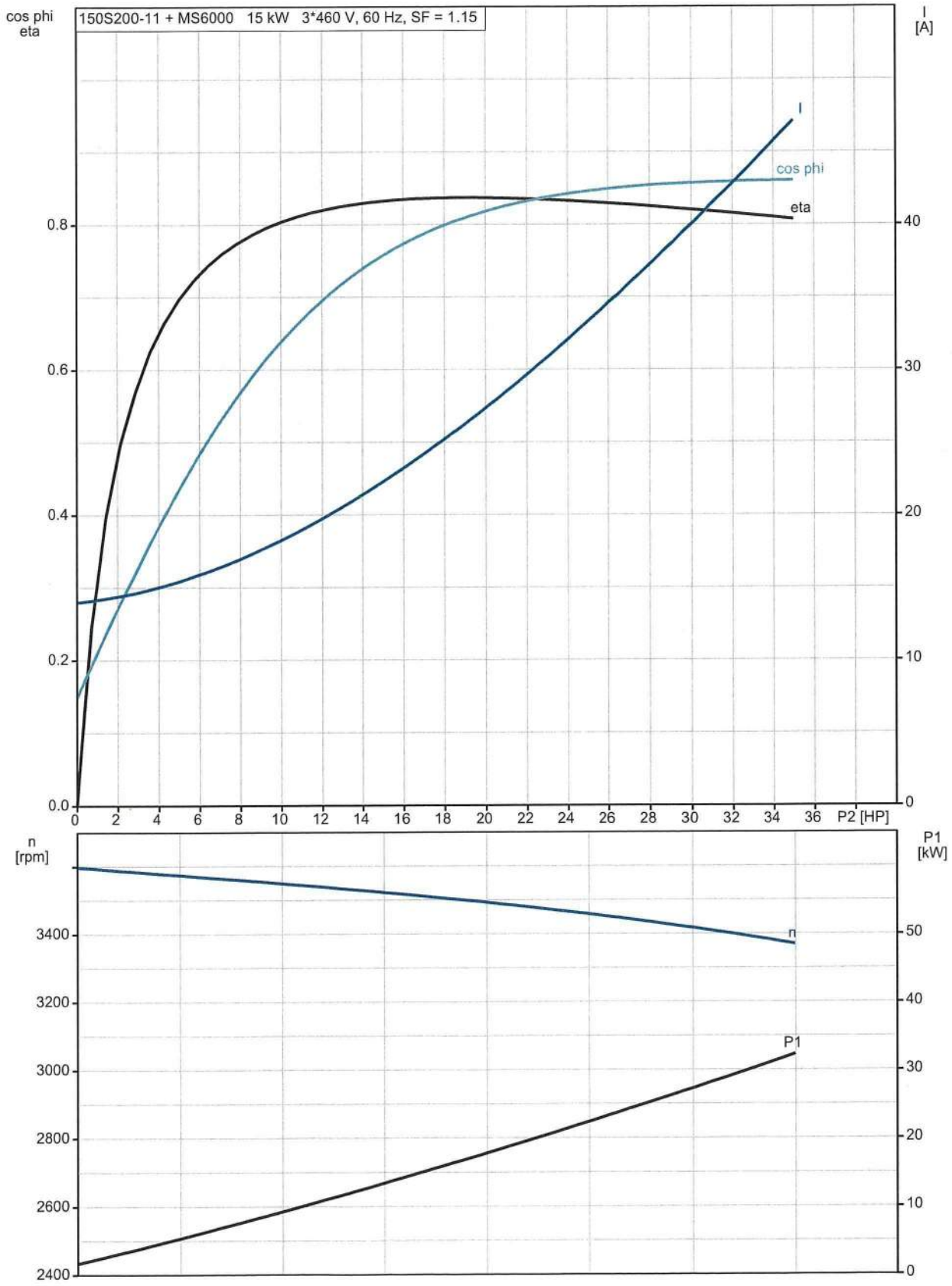
| Description | Value |
|---|---|
| Insulation class (IEC 85): | F |
| Motor protection: | NONE |
| Thermal protec: | external |
| Built-in temperature transmitter: | yes |
| Motor Number: | 96166166 |
| Cable number: | 96163476 |
| **Controls:** | |
| Heather: | K68 |
| **Others:** | |
| ErP status: | EuP Standalone/Prod. |
| Net weight: | 182 lb |
| Gross weight: | 257 lb |
| Shipping volume: | 9.32 ft³ |
| Sales region: | Namreg |

GRUNDFOS

Company name:
Created by:
Phone:

Date: 12/12/2017

# 13B63611 150S200-11 60 Hz



# Appendix D

## Cost Estimate of Recommended Improvements

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573.634.3181 ▪ FAX 573.634.7904 ▪ 866.869.8031
WWW.BARTWEST.COM

# Engineer's Estimate

**Date:** 01/25/18
**Project No.:** 19492.001

## Concept Level Project Costs

**Connection to Moniteau PWSD No. 2**

| ITEM | DESCRIPTION | UNIT | QUANTITY | UNIT COST | EXTENSION |
|---|---|---|---|---|---|
| 1 | Mobilization | LS | 1 | $55,280.00 | $55,280.00 |
| 2 | Erosion Control and Traffic Control | LS | 1 | $15,000.00 | $15,000.00 |
| 3 | 6" PR200 SDR 21 PVC Pipe | LF | 11,200 | $35.00 | $392,000.00 |
| 4 | Valves, Fittings, and other Appurtenances | LS | 1 | $78,400.00 | $78,400.00 |
| 5 | Bores under Creeks (6" PR200 Restrained Joint PVC) | LF | 480 | $200.00 | $96,000.00 |
| 5 | Bore under Paved Roadways (including 6" PR200 Restrained Joint PVC Pipe in 12" Steel Casing) | LF | 105 | $260.00 | $27,300.00 |
| 6 | Gravel Driveway with Full-Depth Granular Backfill | EA | 10 | $1,500.00 | $15,000.00 |
| 7 | Tie to Existing Water Main | EA | 2 | $3,000.00 | $6,000.00 |
| 8 | Master Meter Vault | LS | 1 | $60,000.00 | $60,000.00 |
| 9 | Clean up and Restoration | LS | 1 | $44,800.00 | $44,800.00 |
| | | | | **Total Estimated Construction Cost:** | **$789,780.00** |
| | | | | Construction Contingencies (10%): | $78,980.00 |
| | | | | **Total Estimated Construction Cost with Contingencies:** | **$868,760.00** |
| | | | | *Non-Construction Costs (35%): | $304,070.00 |
| | | | | **Total Estimated Project Cost:** | **$1,172,830.00** |

| New Water Tower | | | | | |
|---|---|---|---|---|---|
| ITEM | DESCRIPTION | UNIT | QUANTITY | UNIT COST | EXTENSION |
| 1 | Mobilization | LS | 1 | $67,370.00 | $67,370.00 |
| 2 | 60,000 Gallon Elevated Storage Tank (Complete) | LS | 1 | $600,000.00 | $600,000.00 |
| 3 | Miscellaneous Storage Tank Work Including Electric, Fence, and Connections to Yard Piping | LS | 1 | $20,000.00 | $20,000.00 |
| 4 | Yard Piping and Valve Manholes | LS | 1 | $60,000.00 | $60,000.00 |
| 5 | Overflow Tank Drainage System | LS | 1 | $15,000.00 | $15,000.00 |
| 6 | Pressure Transducer and Actuated Valve at the Tank | LS | 1 | $30,000.00 | $30,000.00 |
| 7 | Site Grading and Gravel Pavement and Drives | LS | 1 | $15,000.00 | $15,000.00 |
| 8 | Demolition of Existing Tower and Disposal | LS | 1 | $30,000.00 | $30,000.00 |
| 9 | Containment for Demolition | LS | 1 | $100,000.00 | $100,000.00 |
| 10 | Additional Stage for Existing Grundfos Pump | LS | 1 | $15,000.00 | $15,000.00 |
| 11 | Erosion Control, Site Cleanup, and Restoration | LS | 1 | $10,000.00 | $10,000.00 |
| | | | | **Total Estimated Construction Cost:** | **$962,370.00** |
| | | | | Construction Contingencies (10%): | $96,240.00 |
| | | | | **Total Estimated Construction Cost with Contingencies:** | **$1,058,610.00** |
| 1 | Higher of the cost of property acquisition and temporary pneumatic tank rental during demolition of existing tank and construction of new tank and yard piping ($44,450) | LS | 1 | $44,450.00 | $44,450.00 |
| | | | | *Non-Construction Costs (35%): | $370,510.00 |
| | | | | **Total Estimated Project Cost:** | **$1,473,570.00** |

**TOTAL OF BOTH PARTS OF RECOMMENDATION: $2,646,400.00**

This project cost opinion wes prepared using bid tabulation information available at the time of preparation and is prepared in good faith using engineer's judgment and experience. The engineer makes no guarantee as to the actual costs for construction. At the time of preperetion, the third party utility relocation needs were unknown, end therefore, are not included in this estimate. In addition, other project costs such as right-of-wey and eesement acquisition, permitting, and fees ere not included in this estimate.

*Non Construction Costs Include:

Engineering Report
Surveying - Boundary and Right of Way
Geotech
Design with Topo Surveying
Permitting
Bidding and Advertising
Construction Observation
Construction Administration
Legal Fees
Bond Counsel
Interest During Construction
Financing Fees
Construction Staking
Environmental Report

# Appendix E

## 2017 Centertown Water Rate Study

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# VILLAGE OF CENTERTOWN, MISSOURI
# WATER RATE STUDY
# OCTOBER 2017

The Village of Centertown requested assistance with a water rate study and analysis. Liz Grove, MRWA Management Circuit Rider worked with village clerk Debbie Baker to gather the needed information for the study.

The village did not have a budget for the water system when the study was started. The village has had turnover in administrative staff and previous accounting records were not complete or accurate. A budget was developed based on past expenses that were derived from previous records and estimates. Included in the budget is $3,700 for a reserve fund to put aside to pay for future major maintenance costs such as tower maintenance, waterline replacements, meter replacements, etc. This figure is ten percent of the expenses of the system.

Based on these assumptions, the following numbers were used for the analysis:

**Total number of customers:** 128
**Total gallons sold per year:** 5,032,000
**Total estimated annual expenses for the water system:** $37,386
**Total estimated annual revenues for the water system:** $43,300
**Estimated annual net income for the water system:** $5,914
**Current rates:** $25.00 for the first 2000 gallons
$2.50 for each 1000 gallons thereafter
**Water bill for 5000 gallons of use:** $32.50
The spreadsheet used for the calculations is attached to this summary.

Based on the information provided, the village's water rates are adequate. However, due to the use of estimated expenses, it is recommended that rates be reviewed each year as part of the budgeting process to insure they are adequate to maintain the system.

**Affordability:**

The state and federal funding agencies use a general "rule of thumb" to look at whether a system's water rates are affordable. This is used as a reference for determining the ability of a community to pay back a loan. Generally, two percent of the median household income (MHI) is considered an affordable water bill.

The median household income for the Village of Centertown according to the 2010 Census was $28,542 Using this figure, two percent would be $570.84 per year. Divide this by 12 months and an affordable water bill would be $47.57 per month for 5000 gallons of usage. Current rates are $32.50 for 5000 gallons, which is below the 2% figure.

## Appendix A to User Charge System
## CENTERTOWN FORCED CURRENT RATES

This appendix presents the methodology to be used in calculating user charge rates and illustrates the calculations followed in arriving at the first year's user charges. The unit costs established in this appendix are based on estimates of expenses. The actual expenses that occur may differ from these estimates and certainly they will change as time passes. Therefore, the unit cost must be reestablished whenever necessary to reflect actual expenses. Once the system is in use, the expenses can be determined from operating records and the unit costs can be adjusted based on these figures. By using the total water metered to customers as a bases for setting the rate, the cost of water loss is distributed even among users.

1. Expenses: The total annual expenses associated with the treatment works, as defined in article II, Section 8, are estimated as follow:

| Item | Annual Expense |
|---|---|
| Billing and Collection | $ 7,520.00 |
| Administration | $ 500.00 |
| Utilities | $ 1,500.00 |
| Labor (including fringe benefits) | $ 16,386.00 |
| Chemicals | $ 650.00 |
| Replacement Costs (see Appendix C) | $ 53,700.00 |
| Debt Service | $ - |
| Insurance | - |
| Professional service | - |
| Repairs & maintenance - includes tank and well inspection fees | $ 6,160.00 |
| Misc. Expense | - |
| Vehicle expense | - |
| Dues and training | $ 960.00 |
| Contract Labor | - |
| Telephone | $ - |
| Total Expenses | $ 87,366.00 |

Revenues Received from Other Sources

| | |
|---|---|
| Interest Income | $ - |
| Fees and charges | - |
| Other Revenue (specify) | $ - |
| Other Revenue (specify) | $ - |
| Other Revenue (specify) | $ - |
| Total Revenues from Other Sources: | $ - |
| Total Expenses to be Derived from User Charges: | $ 87,366.00 |

2. Allocation of Expenses: The total operation and maintenance, including replacement expenses, is allocated in the following manner:

| Minimum | | Volume | |
|---|---|---|---|
| Billing and Collection | $ 7,520.00 | Telephone | $ - |
| Administration | $ 500.00 | Utilities | $ 1,500.00 |
| | | Labor (including fringe benefits) | $ 16,386.00 |

| | | | | | |
|---|---|---|---|---|---|
| Debt Service* | | $ - | | Chemicals | $ 650.00 |
| Other (specify) | | $ - | | Replacement (see Appendix C) | $ 33,700.00 |
| Other (specify) | | $ - | | Insurance | $ - |
| Other (specify) | | $ - | | Professional services | $ - |
| Other (specify) | | $ - | | Repairs & maintenance | $ 6,150.00 |
| Other (specify) | | $ - | | Misc. Expense | $ - |
| Other (specify) | | $ - | | Vehicle expense | $ - |
| | | | | Dues and training | $ 860.00 |
| | Total | $ 8,020.00 | | Contract Labor | $ - |
| | | | | Total | $ 29,368.00 |

Missouri
Department of
Natural Resources

# Instructions for using the Drinking Water State Revolving Fund Rate Calculation

Welcome to the Drinking Water State Revolving Fund (DWSRF) Rate Calculation. Thank you for considering this rate program. For the benefit of the user, the rate program is not protected and can be modified to fit a participants specific needs. It is not a requirement of the DWSRF to use this program and using it does not waive the review requirements for participating in the DWSRF. This program is divided into four tabs Instruction, Budget and Rate Calculation, Replacement Schedule and Annuity Calculation.

In conjunction with this rate calculation there is a Water Use and User Charge Ordinance that may be used to fulfill the requirements of the DWSRF. These two ordinances may be used in their entirety as they include all required statements to satisfy Missouri Public Drinking Water Regulation 10 CSR 60-13.020 (2)(G) 3 and 4. It is not mandatory to use these ordinances and using them does not waive review requirements for participating in the DWSRF.
Both ordinances can be viewed and downloaded at the following site:
www.dnr.mo.gov/env/wpp/srf/dw-user-charge-ordinance.doc

This rate calculation is designed to determine the user charges according to actual use. It includes a method to accurately account for Debt Service, Operation and Maintenance, Replacement and revenues generated by the system.

The rate calculation is set up to have the Billing, Collection, Administration and Debt Service placed in the minimum charge. If the user wishes to move some of these cost to the volume charge they will have to make adjustments to the program. This is easily done if the user is familiar with excel.

## Before Starting

Several pieces of information are needed before the user starts to use the rate calculation. These include: current city budget, all existing debt attributable to the public drinking water system, new debt service for the DWSRF loan, metered gallons sold to customers, number of billing periods and the replacement schedule.

Metered gallons sold must be used because it excludes water loss. If total gallons produced were used there would be a larger amount of water to divide the volume expenses by. This would result in a shortfall in revenue. Using metered gallons sold also allows the water loss to be distributed evenly between all users. Normal water loss may occur from: leaking mains, backwash, flushing the system, firefighting, faulty meters, etc.

The Replacement Schedule is a list of all equipment and may include storage tank cleaning and painting that will be needed over the next twenty years. Normal operating cost for materials and parts should not be included in the replacement schedule. The schedule provided can list all items for a year and then add them for a yearly total. Each yearly total must be transferred to the last tab, the Annuity Calculation. The schedule will need adjusting to fit the needs of each specific user.

The Annual Annuity Calculation will use the yearly totals from the replacement schedule in todays estimates and account for inflation at a rate the user thinks is appropriate as well as the interest rate on the account the replacement funds will be deposited in. It will automatically calculate the amount to be deposited annually in the replacement account. It will also send this amount automatically to the second tab (Budget). If a number is manually placed in the budget for replacement, the automatic link to the Annual Annuity calculation will be broken.

**Again this program is not proteoted.** It is advisable to save a copy after it is downloaded as a separate document just as a precaution. Something may be deleted or written over while information is entered. If this can't be corrected, the second copy can be used to produce another working program without going back to the web site. Become familiar with the contents of each tab, particularly the Budget Tab. Work through the math to see how it generates a rate.

This program has information provided to show the user a completed rate calculation. To make a tailored rate calculation simply enter the users information and make any necessary adjustments. If you have questions, please call (573) 751-1192.

Watch for charging twice for the same gallons. This could occur if gallonage for contract users are included in the Volume Charge calculation. It could also occur if you specifically modify the program to collect for water loss. Water loss is already being collected for if metered gallons sold are used to calculate the rate.

Updating the Replacement Schedule annually when doing the same for the rates will help insure there are funds available to pay for replacement items when needed. Doing this will keep the user ready to replace items even after the loan is paid back. The replacement schedule is not the funding of depreciation. It is providing funds to cover replacement expenses over the design life of the drinking water improvements.

Remember, there are no protected cells in this program. If something is written over or links are broken the rate will not be accurate or may simply not work. It only takes about ten minutes to go over the finished rate program with a calculator to check for errors. Some errors may be very obvious and some hard to find. Once the program is set up for the users specific needs all that must be done each year is to enter the budget and the rest is automatic. Again, if you have questions, please contact the Water Protection Financial Assistance Center at (573) 751-1192.

| | | | | | |
|---|---|---|---|---|---|
| 3. Annual Metered Water, Billing and Connection Information | | | | | |
| Total water metered to customers | | | 5,032,000 | Gallons Per Year | |
| Number of billing periods | | | 12 | | |
| Number of Service Connections | | | 128 | | |
| 4. Volume Charge | | | | | |
| Volume Unit Charge | = | Annual cost allocated to volume / Total water metered to customers | | | |
| | = | $ | 29,366.00 / 5,032,000 | | |
| | = | $ | 0.005836 | per gallon | |
| | = | $ | 2.50 | per 1000 gallons (rounded up) | |
| 5. Minimum Charge | | | | | |
| Minimum Charge | = | Annual cost allocated to minimum/Number of service connections/Number of billing periods | | | |
| | = | $ | 20.00 | | |
| 6. Example User Charge | | | | | |
| Assume | 6,000 | gallons used | | | |
| User Charge | = | Minimum Charge + (Gallons Used/1,000) x Volume Charge per 1,000 gallons | | | |
| | = | $20.00 + (6,000/1,000) x $2.50 | | | |
| | = | $ 32.50 | per month | | |
| Are rates sufficient? | | | | | |
| Annual revenues generated from Minimum Charge | = | Minimum Charge per billing period x Number of Billing Periods x Number of Connections | | | |
| Annual revenues generated from Minimum Charge | = | $20.00 x 12 X 128 | | | |
| Annual revenues generated from Minimum Charge | = | $ | 30,720.00 | | |
| Annual revenues generated from Residential Unit Charge | = | Volume Charge x Total Annual Flow in 1000 gallons | | | |
| Annual revenues generated from Residential Unit Charge | = | $2.50 x 5,032,000/1000 | | | |
| Annual revenues generated from Residential Unit Charge | = | $ | 12,580.00 | | |

| | | |
|---|---|---|
| Total Annual Revenues | = | Annual revenues generated from Minimum Charge + Annual revenues generated from Residential Unit Charge |
| Total Annual Revenues | = | $30,720.00 + $12,580.00 |
| Total Annual Revenues | = | $43,300.00 |
| Budget Surplus/(Deficit) | = | Total Annual Revenues - Total Expenses to be Derived From User Charges |
| Budget Surplus/(Deficit) | = | $43,300.00 - $37,386.00 |
| Budget Surplus/(Deficit) | = | $5,914.00 |

# Appendix F
## Project Funding Scenarios

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Village of Centertown
Project Funding Scenarios and Associated Proposed Rates

**Village of Centertown, Current Water Rates**

Average Monthly Rate on 5,000 gallons: $32.50

**Disadvantaged Communities are defined as:**
--Population of 3,300 or less based on most recent decennial census
--Average User Rates for five thousand gallons is as least 2% of the recipient's median household income
--The median household income is at or below 75% of the state average as determined by the most recent decennial census

**Is Centertown considered a Disadvantaged Community?**
--The population per the 2010 census was 278
--The average user rate for 5000 gallons is $32.50 which *is less than* $47.57 (2% of MHI of $28,542/12)
--The median household income is $28,542 which is less than $34,696.50 (75% of the MMHI of $46,262)
***MEETS ALL 3 CRITERIA TO BE CONSIDERED A DISADVANTAGED COMMUNITY IF RATES ARE RAISED ABOVE $47.57/5,000 gallons***

**Centertown qualifies for a Poverty Rate of 2.125% with USDA due to their population and MHI.**

| Typical Funding Options: | | | | |
|---|---|---|---|---|
| **SOURCE** | **TYPE** | **TERMS** | **CONDITIONS** | **A/P** |
| USDA/Rural Development | Loan | 2.125%/35 years | Secured by Bonds | 0.0408 |
| USDA/Rural Development | Grant | varies | Availability of Funds | |
| State Revolving Grant (SRF) | Grant | varies up to 75% | Availability of Funds | |
| State Revolving Loan (SRF) | Loan | 2.0%/20 years | Secured by Bonds | 0.0612 |
| Lease Purchase | Loan | 4.0%/20 years | Secured by Assets | 0.0736 |
| CDBG | Grant | $5,000/connection | Supplemental | |

| | | |
|---|---|---|
| Number of Customers in Centertown: | | 127 |
| CDBG Grant Funds/Customer: | $ | 5,000.00 |
| Potential CDBG Grant: | $ | 500,000.00 |

| Centertown Water System Improvements 2018 | | | | | | |
|---|---|---|---|---|---|---|
| **TOTAL PROJECT COST:** | | | **$** | | | **2,646,400.00** |
| SOURCE | TYPE | RATIO | FINANCED AMOUNT | ANNUAL P/I* | AVERAGE MONTHLY RATE INCREASED BY | PROPOSED RATE FOR 5000 GALLONS WITH INCREASE |
| USDA loan | LOAN | 100% | $2,646,400 | $ 118,743 | $ 77.92 | $ 110.42 |
| USDA loan & grant | LOAN/GRANT | 70/30%** | $1,852,480 | $ 83,120 | $ 54.54 | $ 87.04 |
| USDA loan only /CDBG | LOAN/GRANT | 26/74%*** | $2,146,400 | $ 96,308 | $ 63.19 | $ 95.69 |
| USDA loan & grant with CDBG | LOAN/GRANT/GRANT | 51/30/19** | $1,352,480 | $ 60,685 | $ 39.82 | $ 72.32 |
| SRF loan only | LOAN | 100% | $2,646,400 | $ 178,030 | $ 116.82 | $ 149.32 |
| SRF loan & grant | LOAN/GRANT | 25/75%** | $661,600 | $ 44,507 | $ 29.20 | $ 61.70 |
| SRF loan only /CDBG | LOAN/GRANT | 26/74%*** | $2,146,400 | $ 144,393 | $ 94.75 | $ 127.25 |
| SRF loan & grant with CDBG | LOAN/GRANT/GRANT | 13/68/19%** | $341,291 | $ 22,959 | $ 15.07 | $ 47.57 |
| LEASE/PURCHASE | LOAN | 100% | $2,646,400 | $ 214,199 | $ 140.55 | $ 173.05 |
| L/P / CDBG | LOAN/GRANT | 26/74%*** | $2,146,400 | $ 173,729 | $ 114.00 | $ 146.50 |

*Includes 10% of P&I for debt service reserve
**30% grant is assumed for purposes of a possible grant amount based on averages from previous projects
***The loan/grant ratios is calculated based on the assumption of a $500,000 CDBG grant

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