

Preliminary Engineering Report

Water System Study - Supply
City of Storm Lake, Iowa

June, 2021

Project No. 20-24717



ISG

Architecture
Engineering
Environmental
Planning

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I HEREBY CERTIFY THAT THIS ENGINEERING DOCUMENT WAS PREPARED BY ME OR UNDER MY DIRECT PERSONAL SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF IOWA.



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Water System Study - Supply
Storm Lake, Iowa

Engineer's Project Number: 20-24717

Dated this 2nd day of June, 2021



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EXECUTIVE SUMMARY

ISG was retained by the City of Storm Lake, Iowa to complete a preliminary engineering report (PER). This PER presents recommendations and properly complies with current Iowa Department of Natural Resources (Iowa DNR), 2012 Recommended Standards for Water Works (Ten State Standards), and Statewide Urban Design and Specification (SUDAS) requirements. This study primarily addresses water supply needs as separate PERs are being prepared for storage, treatment, & distribution needs.

The City of Storm Lake, Iowa is in Buena Vista County and has a population of 10,600 per the 2010 census. It supplies water to the surrounding entities of Lakeside, Lake Creek Homeowners Association (Lake Creek HOA), Truesdale, and the unincorporated area on the south side of the lake. The City currently operates 10 water supply wells; 5 sand and gravel wells, 1 alluvial well, 3 Dakota wells, and 1 Jordan well. All of the drinking water wells are located along the west side of Storm Lake.

Evaluation of the existing source supply system and projected demands revealed the City of Storm Lake does not currently have the firm capacity to meet existing peak day 20-hr demand nor projected peak day demands for the future. Table 1 below summarizes projected peak day 20-hr demands and the City's firm source capacity with proposed source additions.

Three phases of projects are proposed to bring the City of Storm Lake's source capacity up to meeting the existing projected demand, the 10-Year projected demand, and the 20-Year projected demand. These phases include a series of well projects that cover both well replacement/upgrades and new wells to meet capacity. Table 1 also summarizes each phase, proposed timeline, and cost estimate.

ISG recommends the City of Storm Lake act upon the immediate needs listed within this PER and begin planning for future needs by creating a budget that is suitable for the engineer's opinion of probable costs listed. This series of actions will meet the City's projected supply demands with a long-range vision, protect the City's existing supply infrastructure investments, aid in protection of groundwater aquifers, and ensure sustainable water for years to come while potentially reducing operation & maintenance (O&M) costs.

Table 1. Summary Improvements, Cost, and Capacity.

Phase	Timeline	Target Date	Projected PEAK DAY 20-hr Demand (gpm)	City Firm Source Capacity (gpm)	Engineer's Opinion of Probable Cost
Existing	--	--	5,217	3,500	--
Immediate Needs	ASAP	2022	5,217	5,250	\$3,726,000
5-Year Improvements	2026 to meet 2031 Demand	2031	6,050	6,350	\$3,450,000
15-Year Improvements	2036 to meet 2041 Demand	2041	6,883	7,000	\$3,450,000
TOTAL					\$10,626,000

INTRODUCTION

The City of Storm Lake, Iowa is a growing community with diverse areas of growth and industry that has created challenges in meeting future water demand. The City has retained I&S Group, Inc. (ISG) to complete this Preliminary Engineering Report (PER) to explore the City’s current water supply. This PER presents recommendations and properly complies with current Iowa DNR, 2012 Recommended Standards for Water Works (Ten State Standards), and Statewide Urban Design and Specification (SUDAS) requirements.

BACKGROUND

The City of Storm Lake, IA is located in Buena Vista County. In the 2010 census, the City had a population of 10,600. The City supplies water to several consecutive systems including Lakeside, Lake Creek HOA, Truesdale, and homes outside of municipal boundaries (Figure 1). The collective population served as informed by the 2010 census and estimates of the unincorporated population is 12,038 as seen in Table 2.

Table 2. Summary of populations served.

Entity	Population	Data Source
Storm Lake	10,600	Census
Lakeside	917	Census
Outside Storm Lake Boundaries	265	2019 Sanitary Survey
Lake Creek HOA	175	2019 Sanitary Survey
Truesdale	81	Census
TOTAL	12,038	

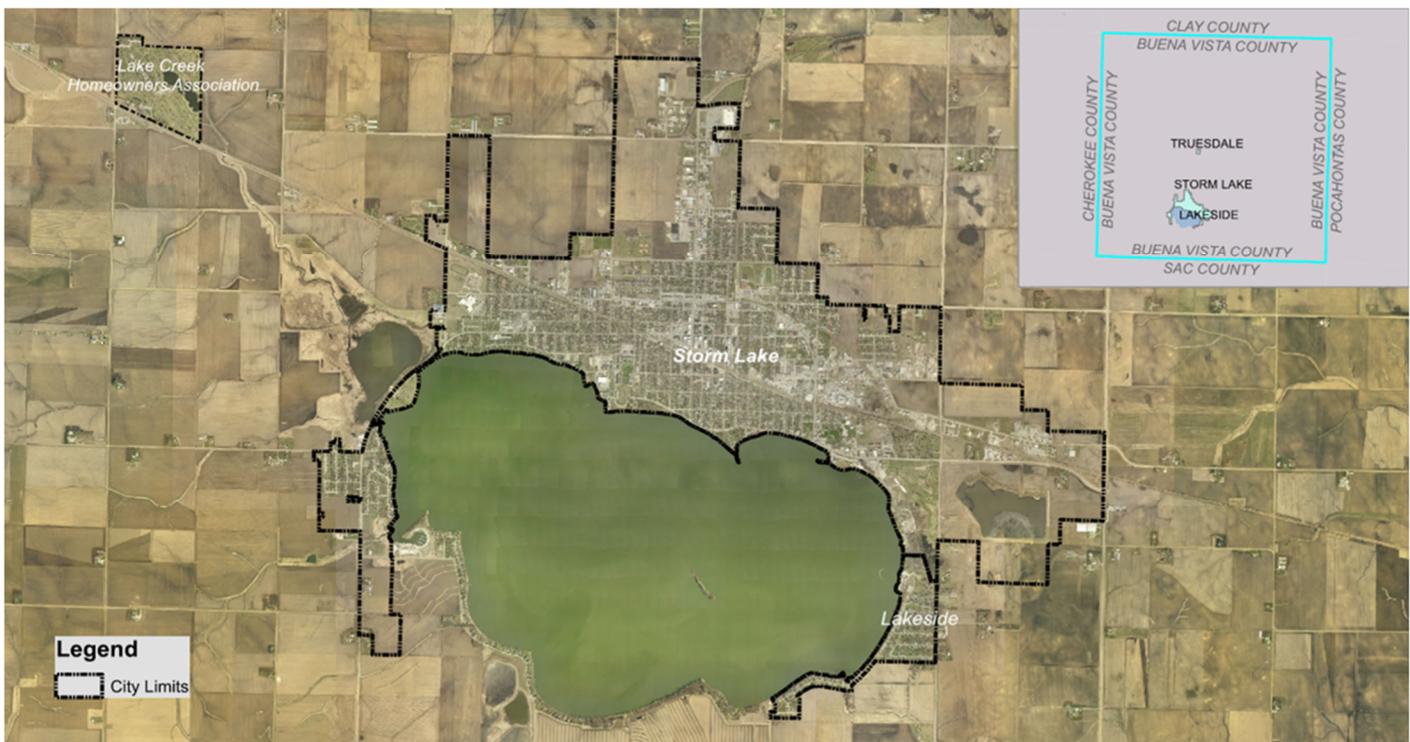


Figure 1. Location of Storm Lake and surrounding entities.

WATER USAGE

One of the first steps in the analysis of a water system includes determining the demand for water. This water demand is often quantified in terms of average and maximum daily usage. The average day demand is calculated as the average water usage per day over the given data set. The maximum day demand is the highest water usage the system experiences in one, 24-hour period. The maximum day demand is typically experienced in the summer months, due to irrigation practices. Part of the water demand analysis includes projections for future water demand.

THEORETICAL WATER DEMAND

Using SUDAS design standards, theoretical water demands are based on population and the following factors:

- Average daily demand: A consumptive rate of 100 gpcd was assumed over a 20-hour time period
- Peak day demand: A 20-hour operation period times twice the average daily demand
- Peak rate demand: The instantaneous peak rate factor was calculated as follows:

$$\text{Average day demand (gpm)} \times 7/P^{0.167}$$

Where P is the design year population in thousands.

Table 3. Theoretical Water Demand.

Water Demand	Calculation	Gallons per day (gpd)	Gallons per minute (gpm)
Average day demand	=12,038*100	1,203,800	1,003
Peak day demand	=1,203,800 MGD*2	2,407,600	2,006
Peak hourly demand	=1,000*7/(12.038 ^{0.167})	--	4,620

The results of this theoretical analysis are deficient. The City’s top two water users include a pork processing plant and a turkey processing plant. These two entities use approximately 70%-80% of the total water produced each year by the water system. Due to the large industrial presence, water demand cannot be predicted based upon population estimates.

HISTORICAL WATER DEMAND

Historical operating data is the most accurate way to analyze existing water demand. Storm Lake monthly operating reports (MORs) were analyzed from January 2016 to December 2020. MORs report the amount of water leaving the water treatment plant (WTP) and entering the distribution system. The plant currently experiences significant variation in water demand from 1 MGD to 4.5 MGD as seen in Figure 2.

Billing data for the top ten water users was also provided by the City from January 2016 to January 2021. The City’s top two water users include a pork processing plant and a turkey processing plant. These two entities use approximately 70%-80% of the total water produced each year by the WTP. It is no surprise that the operation of these industries therefore has a significant impact on usage trends. Figure 3 shows the last three months of 2020. Lower water usage is correlated with weekends whereas higher demand occurs during the weekdays. The lowest water demand in this data range can be observed on Thanksgiving 11/26/20 and Christmas 12/25/20 when the industries were not in operation.

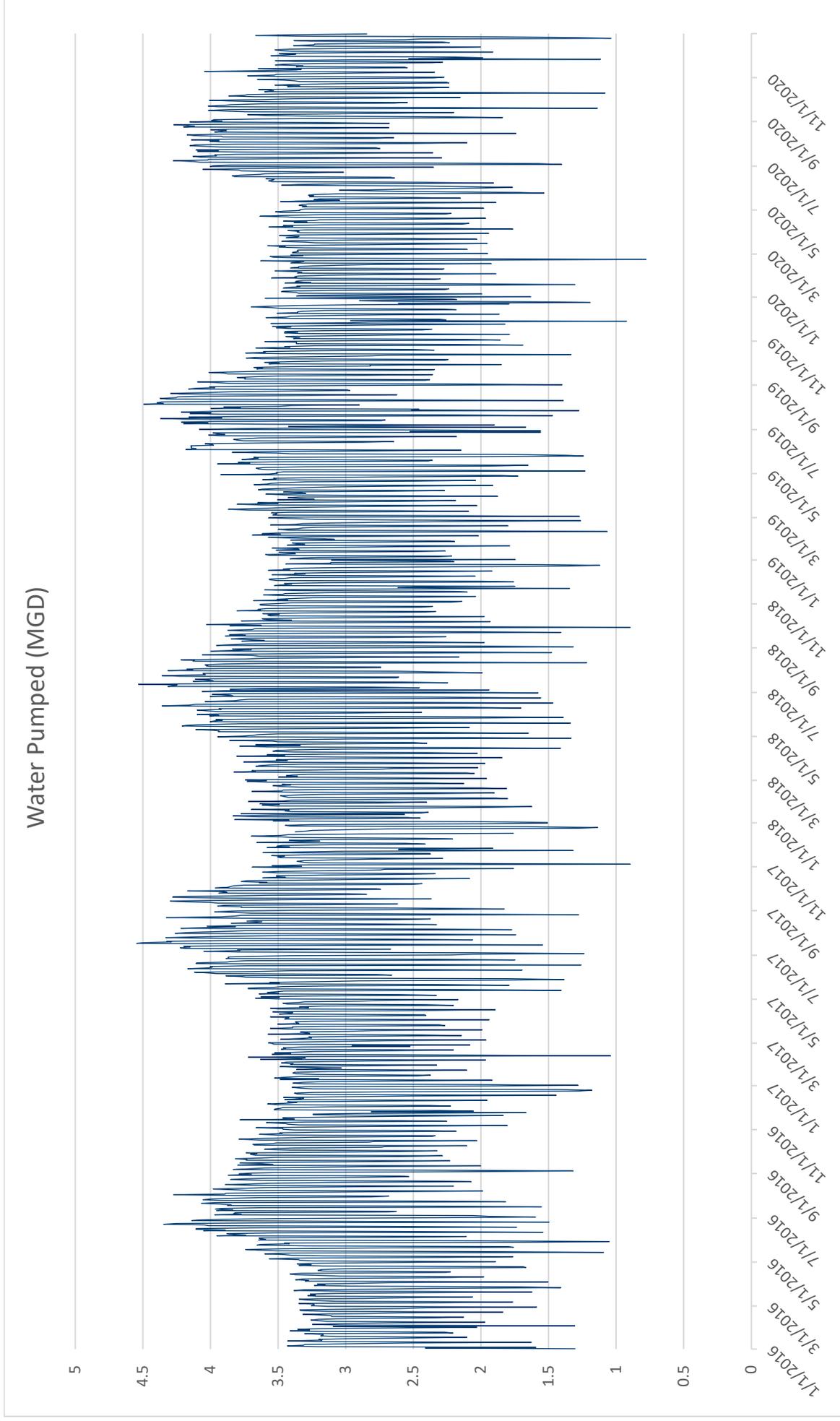


Figure 2. Existing water usage for the City of Storm Lake.

Oct-Dec 2020, Water Pumped (MGD)

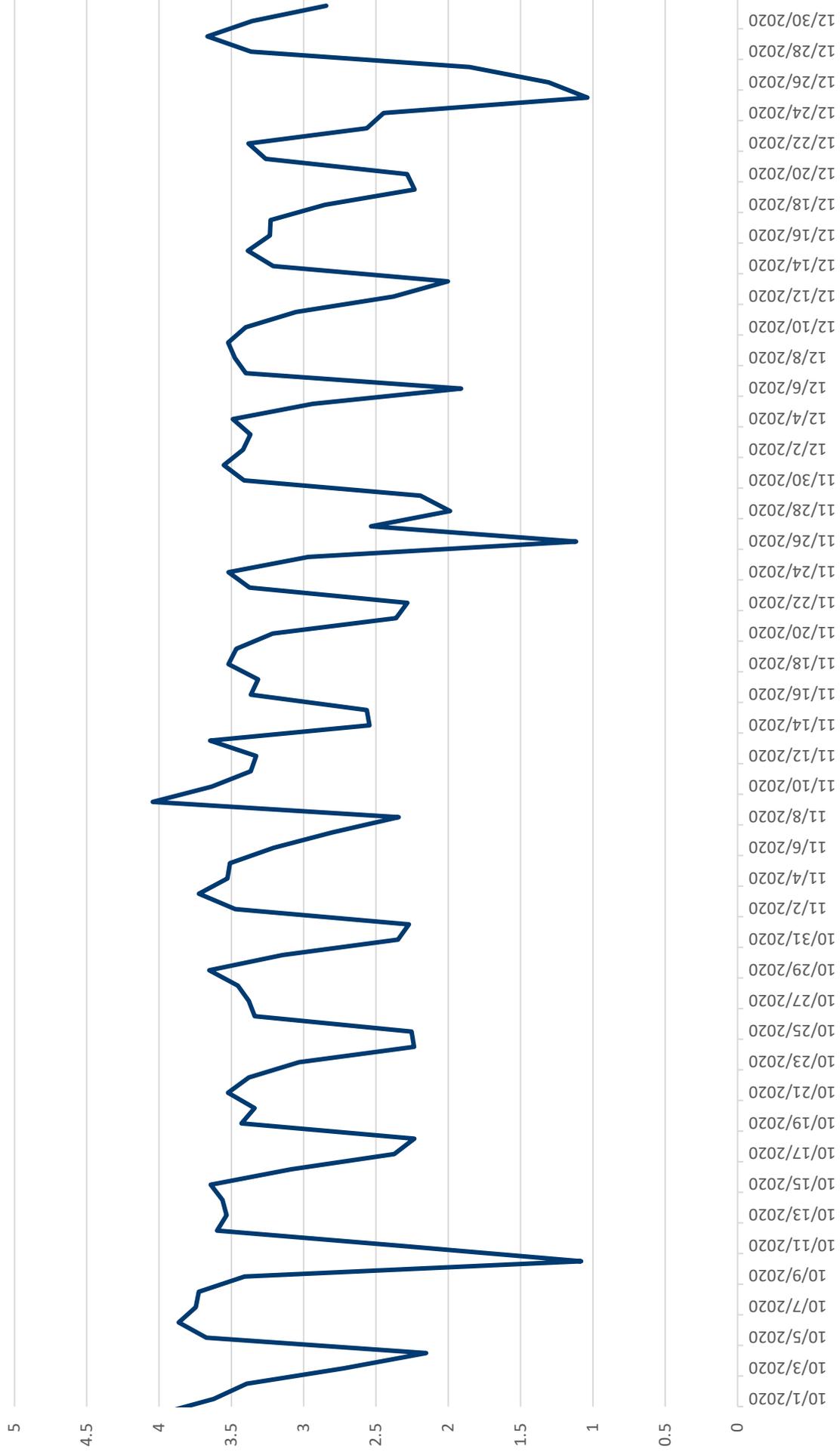


Figure 3. Snapshot of water demand data from 10/1/2020 to 12/30/2020 for Storm Lake, IA.

Table 4 shows the system’s yearly total and average daily water production. The average yearly water pumpage was found to be 1,143 MGY with a standard deviation of 18 MGY. The system’s water pumpage has remained relatively steady for the past 5 years. As discussed later in this section, history of water conservation implementation may deem these values inaccurate.

Table 4. Sum and average per year of water demand.

Year	Sum of Water Pumped (MG/YEAR)	Average of Water Pumped (MGD)
2016	1,112	3.04
2017	1,153	3.17
2018	1,156	3.17
2019	1,152	3.15
2020	1,145	3.13
Average	1,143	3.13

The statistical average day demand was found to be 3.13 MGD across the data set. The peak day was found to be 4.55 MGD and occurred on July 12th of 2018. Similar peaks around 4.5 MGD are seen each year occurring in the summer months. A peaking factor of 1.45 was calculated by dividing the peak day demand by the average day demand. The minimum water usage recorded over the data set is 0.78 MGD. The cause for this low water usage is unknown and appears to be an anomaly. The statistical 0.01 percentile of the data range is 1.05 MGD, therefore 1.05 MGD will be used for the historical minimum day demand.

As previously mentioned, the City’s demand varies directly with the local industries operational schedule. Table 5 provides a summary of the analysis completed per day of the week. The average weekday demand was found to be 3.47 MGD and the average weekend demand was found to be 2.28 MGD over the data set. On average, there is a 52% increase in demand from the weekend to the weekday.

Table 5. Summary of the day of the week demand.

Day	Average of Water Pumped (MGD)	Maximum of Water Pumped (MGD)
Sunday	2.21	4.01
Monday	3.43	4.55
Tuesday	3.57	4.50
Wednesday	3.57	4.39
Thursday	3.52	4.53
Friday	3.26	4.14
Saturday	2.35	4.15
	Daily Average = 3.13	Daily Maximum = 4.55

The City occasionally enforces water conservation, most recently in the summer and fall of 2020, which could cap the maximum historical water pumpage. As a result, the available historical average and peak day demand could skew artificially low. As mentioned in the theoretical demand section, 2.0 is typically the assumed peaking factor for residential communities. The City’s historical peaking factor is 1.45. This is a potential indicator of the maximum demand being suppressed. However, the local industries that account for 70-80% of the total demand may not follow typical residential peaking factors.

To address this uncertainty, conservative approaches for projecting the design demand will be utilized. Existing water demands are summarized below:

Table 6: Existing Water Demand Summary

	Demand (MGD)
Overall Average Day Demand	3.13
Weekday Average Day Demand	3.47
Weekend Average Day Demand	2.28
Observed Peak Day Demand	4.55
Observed Peaking Factor Peak Day	1.45
Minimum Day Demand	1.05

PROJECTED WATER DEMANDS

RESIDENTIAL

The 2017 Storm Lake housing study projected a growth of 400 people from 2017-2025 or 50 people per year. Conversations with the City have suggested a faster growth scenario of 600 units from 2017-2025. Assuming 2.5 persons per housing unit, this represents 1,500 people over 8 years or 187.5 people per year.

Table 7 shows the envelope of the projected water demands by the design year of 2041 following these growth patterns. Iowa DNR and Ten State Standards usage rates of 100 gpcd were used.

Table 7: Storm Lake population projections by 2041.

Persons per Year	2041 Projected Additional Population	Additional Residential Water Demand (GPD)
50	1,000	100,000
187.5	3,750	375,000

INDUSTRIAL

Exact industrial growth projections are unavailable at this time. Future conversations with the City and industries are planned. For the purpose of this report, an additional 10% contingency will be added to account for future growth of the industrial users.

Industries account for 70-80% of the total water demand in the City. With an average weekday demand of 3.47 MGD, industries account for approximately 2.43-2.75 MGD during the week. A 10% increase in demand would result in an additional 0.24-0.28 MGD.

FIRE FLOW DEMAND

Fire flow can only be provided if residual pressure remains at or above 20 psi. Table 8 includes the fire flows that are recommended by SUDAS.

Table 8. Fire flow demands.

Water Demand	Distance between Buildings (feet)	Total Gallons per Minute (gpm)
Fire Flow Demand	Over 100'	500.0
Fire Flow Demand	31' to 100'	750.0
Fire Flow Demand	11' to 30'	1,000.0
Fire Flow Demand	10' or less	1,500.0

DESIGN WATER DEMAND

The City’s design water demand was conservatively selected from the analysis above and is summarized in Table 9.

Table 9. Summary of design average day water demand.

Average Water Demand	MGD
Existing Average Total Demand	3.47
Projected Increase Average Residential Demand	0.375
Projected Increase Average Industrial Demand	0.280
Total Projected Average Design Demand	4.13

Table 10 shows a summary of the design water demand that this report will be based on. A peaking factor of 2.0 has been assumed for peak day demand. This is consistent with typical design standards. Design standards require that the peak day demand calculated for a system must be met within 20 hours of production time. It has been assumed that the average day will be met in 20 hours as well to prevent on/off cycling of the lime softening plant.

Table 10. Design Water Demands.

2041 Projected Water Demand	Projected Demand (MGD)	Projected Demand (gpm)	Design Run Time
Average Day Demand	4.13	3,441	Met in 20-hr Day
Peak Day Demand	8.26	6,883	Met in 20-hr Day
Fire Flow Demand	-	1,000	

EXISTING WATER SOURCES

Each component of the Storm Lake water supply system is discussed below. Information was provided by the City staff as well as the most recent sanitary surveys completed by the Iowa DNR. The City of Storm Lake relies on 10 groundwater wells as their water supply source as summarized in Table 11. Those 10 wells consist of 5 sand and gravel (Pleistocene) wells, 1 shallow alluvial well, 3 Dakota Aquifer wells, and 1 Jordan (Cambrian-Ordovician) well. Table 11 below gives basic characteristics for each active well.

Table 11. Summary of existing wells.

Well	Year drilled	Well Depth (ft)	Aquifer	Rated Capacity (gpm)
Well #3	1949	110	Pleistocene	350
Well #7	1968	110	Pleistocene	600
Well #8	1969	89	Pleistocene	600
Well #11	1972	90	Pleistocene	350
Well #18	2007	96	Pleistocene	600
Well #19	2010	115	Alluvial	350
Well #14	1988	464	Dakota	1,000
Well #15	1990	488	Dakota	800
Well #20	2015	497	Dakota	1,100
Well #4	1959	1,690	Jordan	600

RAW WATER CHARACTERISTICS

Only constituents that were of note for design are shown below. A maximum contaminant level (MCL) is an enforceable drinking water standard. A secondary MCL is non-enforceable and is usually associated with aesthetic considerations such as taste, color and odor, examples are iron and sulfate. Health Advisory limits (HA) are an estimate of acceptable levels in drinking water based on current health effect information. These are not legally enforceable, but some agencies may require public notices to be sent out and an action plan to bring the constituent under the HA (i.e. Manganese). Ammonia has been included in this analysis as it affects disinfection and total chlorine concentrations.

Table 12. Summary of raw water characteristics.

Constituent	MCL/SMCL/HA (mg/L)
Combined radium	MCL 5.0 (pCi/L)
Iron	SMCL 0.3
Manganese	SMCL 0.05 HA 0.3
Ammonia	HA 30.0
Total Hardness	N/A

SUPPLY CONDITION ASSESSMENT

Part of assessing Storm Lake's water supply is taking a holistic look at existing infrastructure for potential improvements. The following sections will break down components of each well to look at age and capacity, site and wellhouse, and electrical and mechanical condition. Storm Lake operators requested installing VFDs for all of their wells to allow more control over well flow as well as the ability to slow the startup to decrease unnecessary wear on the well pumps. The City operators also requested adding flow meters to wells where it was possible. Some of the wells as discussed in the following sections do not have enough pipe in the wellhouse to be able to install a flow meter. The results of the condition assessment will offer a list of needs for the existing wells on top of any proposed replacement and new wells. Figure 4 below shows an aerial map of the current Storm Lake wells.

RAW WATER TRANSMISSION LINES

The City of Storm Lake did not indicate any existing issues with the raw water transmission lines feeding to the water treatment plant. The following is a breakdown of the raw water transmission lines in Storm Lake.

Wells #19, #11, #3, and #7 are all connected to a 12" raw water transmission line south of the plant. The max flow contributed by the wells on the southern 12" main is 1,300 gpm (due to Wells #3 or #11 only being capable of running at one time). The capacity of the southern 12" main is 1,762 GPM @ 5 feet per second and 2,467 GPM @ 7 feet per second. The 12" transmission line meets existing and future proposed capacities at a velocity of 7.2 feet per second.

Well #4 is connected to its own 12" raw transmission line into the plant. The 12" transmission line has ample capacity for Well #4 and could be utilized for a new Jordan well in the future with a higher capacity.

Wells #8 and #18 feed into a common 12" raw transmission line west of the water plant. The max existing flow that can be fed into the west transmission line is 600 gpm (due to Well #8 or #18 only being capable of running at one time). There is capacity for future potential wells added to the west transmission line.

Wells #14, #15, and #20 all feed into a northern raw transmission line that runs south to the plant. There is a 16" transmission line between Wells #15 and #20. The line between Wells #14 and #15 is only a 10" or 12" transmission line (as-built information is not available). The line between Well #14 and the plant is a 12" transmission line. The 10" transmission line only has a capacity of 1,713 gpm @ 7 fps and 2,467 gpm at 12". This only allows the City to operate two of the Dakota wells at one time but not all three. The 12" transmission line south of Well #14 has a capacity of 2,467 gpm @ 7 fps which would also be a hydraulic bottleneck to operate Wells #14, #15, and #20 together. Consideration should be taken in upsizing or adding a parallel transmission line to add capacity for future wells.



Water Supply Map - Existing Wells
 Storm Lake -
 Water System Study
 Storm Lake, Buena Vista County, Iowa

Source(s):
 Orthophoto (Buena Vista County)
 Parcels (Buena Vista County)

Figure 4. Water Supply Map – Existing Wells

WELL #3

Well #3 is located along the NW shore of Storm Lake along 85th Ave. as shown below in Figure 5.



Figure 5. Well #3 Aerial

WELL AGE AND CAPACITY

Well #3 is a buried sand and gravel well drilled in 1949 to a depth of 110 FT. It is currently rated at 350 gpm and is one of Storm Lake's oldest drinking water wells. Well #3 has been designated as a well that needs to be replaced due to its age. The well is currently rated for 350 gpm and feeds into a 12-inch raw water main that feeds back to the water treatment plant. A replacement well is suggested to make up for the 350 gpm of Well #3. Well #3 can be operated until major failure but should not be counted towards their capacity for future demand. Well #3 can run simultaneously with Well #7. It cannot be run at the same time as Well #11 as they are located too close and hydraulically interfere with each other.

Well #3 is a 30 HP vertical turbine pump in a brick and mortar wellhouse as shown below in Figure 6.



Figure 6. Well #3 Pump

SITE AND WELLHOUSE

Well #3 is a brick and mortar building that sits on state owned property as shown in Figure 7. As mentioned above, Well #3 needs to be retired and removed upon failure. This includes removing the pump and piping, decommissioning the well shaft, removing the well house, and regrading the site to natural habitat. This will require a well contractor to properly plug and cap the well.



Figure 7. Well #3 Wellhouse

ELECTRICAL AND MECHANICAL

Well #3 does not have a VFD or flow meter. The piping in the wellhouse is a short section of pipe with an air release valve. Fitting a flow meter between the pump and the elbow into the floor is not possible due to upstream and downstream pipe requirements. If the City intends to operate the well to failure, it is not recommended to add either a VFD nor flow meter to this well.

WELL #7

Well #7 is located East of 85th Ave in the parking lot of the Unity Point Clinic as shown in Figure 8.



Figure 8. Well #7 Aerial

WELL AGE AND CAPACITY

Well #7 was drilled in 1968 to a depth of 110 feet. It is a buried sand and gravel well that has a rated capacity of 600 gpm. Well #7 is a reliable well source that is often run simultaneously with either Well #3 or Well #11. Well #7 feeds into the same 12" raw water line as Wells #3, #11, and #19. It is a vertical turbine pump that has a very short stem of pipe that also includes an air release valve as shown in Figure 9.



Figure 9. Well #7

SITE AND WELLHOUSE

Well #7 is located in the parking lot of the Unity Point Clinic. It is a prefab FRP building as shown in Figure 10. The wellhouse itself has gaps and degradation at the foundation around the entire perimeter which can be seen in Figure 11. On the day ISG inspected wells, Well#7 had puddled water on the floor and signs of water damage along the wall. ISG suggests repairing or replacing the wellhouse and to find a way to contain and reduce the amount of water on the floor that is damaging the wellhouse.



Figure 10. Well #7 Wellhouse



Figure 11. Well #7 Wellhouse Degradation

ELECTICAL AND MECHANICAL

Well #7 does not have a VFD or a flow meter. There is not enough raw water piping in the wellhouse to fit a flow meter. The wellhouse for Well #7 can fit a VFD. The motor identification plate on the well was corroded and ISG was unable to identify the well HP. ISG will identify the well size and HP based on relative flow rate and depth before sizing a new VFD.

WELL #8

Well #8 is located west of the water treatment plant on state owned land as shown in Figure 12.



Figure 12. Well #8 Aerial

WELL AGE AND CAPACITY

Well #8 was drilled in 1969 to a depth of 89 feet. It is a buried sand and gravel well that has a rated capacity of 600 gpm. Well #8 feeds into a 12" raw water main that feeds back to the plant. It shares the 12" line with Well #18 which is further west. Wells #8 and #18 are too close together to be operated at the same time as they pull from the same source. The City operates Well #8 with other buried sand and gravels and Dakota wells. Well #8 is a vertical turbine pump as shown in Figure 13.



Figure 13. Well #8 Pump

SITE AND WELLHOUSE

The wellhouse for Well #8 is on state land west of the water treatment plant. The wellhouse is a stick built wellhouse with metal siding on a concrete foundation as shown in Figure 14. The site also includes an antenna tower for wireless communication. The inside of the wellhouse was in decent shape with some water staining but no obvious structural degradation. The air release valve on Well #8 was leaking badly at the time of ISGs inspection. It is suggested the City assess repairing or replacing the leaky part before it does permanent damage to the wellhouse.



Figure 14. Well #8 Wellhouse

ELECTRICAL AND MECHANICAL

As mentioned in the previous section Well #8 uses wireless communication. The City mentioned that they have had issues with wireless communication between the well and the plant. Wells #8 and #18 are relatively close together on the same road west of the plant and both have wireless communication. It is the opinion of ISG that adding in a project to run fiber to these two well houses would be beneficial as both are deemed reliable wells that are used to blend with other wells to supply the needed capacity. Well #8 does not have a flow meter. Figure 15 below shows the pipe off of Well #8 with an air release valve and manual gate valve. A flow meter could fit in that length of pipe.



Figure 15. Well #8 Pump Piping

Well #8 does not include a VFD control. According to the well pump motor plate the well has a 3 phase 30 HP motor. All of Well #8's electrical panels are on a shared backboard. The wellhouse has room to add a VFD but may require some reworking on the existing panel.

WELL #11

Well #11 is located along the NW shore of Storm Lake along 85th just SW of Well #3 as shown in Figure 16 below.



Figure 16. Well #11 Aerial

WELL AGE AND CAPACITY

Well #11 is a buried sand and gravel well drilled in 1972 to a depth of 90 feet. Well #11 has shown a decreased capacity over recent years and is reaching end of life. Its current capacity is only 350 gpm and feeds into the same 12" raw water main as Well #3, #7, and #19. Well #11 is at end of life and has been designated to be replaced similar to Well #3. The well can be run until major failure, but a replacement source should be added when counting total capacity for future demand. As mentioned previously Well #11 cannot run simultaneously with Well #3 due to their proximity to one another. Well #11 is a 30 HP vertical turbine pump as shown in Figure 17 below.



Figure 17. Well #11 Pump

SITE AND WELLHOUSE

Well #11 is a pre-fab FRP wellhouse on a concrete pad as shown in Figure 18. As mentioned previously Well #11 needs to be retired and removed. As with Well #3 decommissioning this will require removing the well pump, piping, electrical, decommissioning the well shaft, removing the well house, and regrading the site to natural habitat. This will require a well contractor to properly plug and cap the well. From the time the well is operated until failure there are no pressing immediate needs regarding site and wellhouse.



Figure 18. Well #11 Wellhouse

ELECTRICAL AND MECHANICAL

Well #11 does not have a VFD or flow meter. Due to the age and planned replacement, ISG does not recommend investing in a flow meter nor VFD for Well #11. As far as electrical and mechanical needs, nothing was brought to the attention of ISG and due to age of the well work should be limited to routine maintenance.

WELL #18

Well #18 is located west of the water treatment plant on the same access road on state owned land as Well #8 as shown in Figure 19.



Figure 19. Well #18 Aerial

WELL AGE AND CAPACITY

Well #18 was drilled in 2007 to a depth of 96 feet deep. It is a buried sand and gravel well that has a rated capacity of 600 gpm. Well #18 feeds into the same 12" raw water main as Well #8 feeding into the plant. As stated earlier Wells #8 and #18 are too close in proximity to run at the same time. Well #18 is a vertical turbine pump as shown in Figure 20.



Figure 20. Well #18 Pump Piping

SITE AND WELLHOUSE

The wellhouse for Well #18 is a pre-fab FRP building on a concrete pad as shown in Figure 21. The site also utilizes an antenna for wireless communication back to the plant. There were no significant problems with the wellhouse inside or outside.



Figure 21. Well #18 Wellhouse

ELECTRICAL AND MECHANICAL

Well #18 has wireless communication that the City staff had suggested was not entirely reliable. As suggested with Well #8 a fiber run from the plant to Wells #8 and #18 would improve signal reliability. Well #18 currently has an operable flow meter. It does not have a VFD. There is room in the existing wellhouse to fit a VFD for the 30 HP 3 Phase motor. The ventilation and cooling would need to be evaluated when adding a VFD.

WELL #19

Well #19 is located on 610th Street west of Storm Lake as shown in Figure 22.



Figure 22. Well #19 Aerial

WELL AGE AND CAPACITY

Well #19 was drilled in 2010 to a depth of 115 feet. It is considered a shallow alluvial well with no confining layer. It has been deemed as not under the influence of surface water per the DNR. It has a capacity of 350 gpm. Well #19 feeds into the 12" raw water main that Wells #3, #7, and #11 feed into. The City can operate #19 whenever they need it without other wells affecting its drawdown. Well #19 is a vertical turbine pump as shown in Figure 23.



Figure 23. Well #19 Pump Piping

SITE AND WELLHOUSE

The wellhouse for Well #19 is located next to a private residence but the property is owned by the City of Storm Lake as shown in Figure 24. The wellhouse is a stick-built building on a concrete slab with vinyl siding. The site also includes an antenna pole and communicates wirelessly with the plant. The inside of the wellhouse is in good shape and had no immediate needs inside or out.



Figure 24. Well #19 Wellhouse

ELECTRICAL AND MECHANICAL

Well #19 uses wireless communication. Due to the distance from the plant running fiber to Well #19 may be cost prohibitive unless there is existing residential fiber near that location. Well #19 already has a flow meter in it. It does not have a VFD or soft start. The wellhouse has room to add a VFD for the 30 HP 3 phase well motor. As in other locations, an assessment of the existing electrical panel as well as cooling and ventilation will need to occur with the addition of the VFD.

WELL #14

Well #14 is located in the NE corner of 90th and Milwaukee Ave. next to Hope Evangelical Free Church as shown in Figure 25.



Figure 25. Well #14 Aerial

WELL AGE AND CAPACITY

Well #14 was drilled in 1988 to a depth of 464 feet. It is a deep well that pulls from the Dakota Aquifer with a capacity of 1000 gpm. Well #14 feeds into a 12" raw water main that runs south to the water treatment plant. It shares the 12" main with Wells #15 and #20. The City can operate two Dakota Aquifer wells at one time. Well #14 is often run simultaneously with the shallower wells for blending. Well #14 is an oil lubricated vertical turbine pump as shown in Figure 26.



Figure 26. Well #14 Pump

SITE AND WELLHOUSE

The wellhouse for Well #14 is located in the right of way for 90th Avenue. The wellhouse is a pre-fab FRP building on a concrete pad as shown in Figure 27. Well #14 site also has a generator next to it for emergency power support as shown in Figure 28. The City did not indicate that there were any major issues with the on-site generator.



Figure 27. Well #14 Wellhouse



Figure 28. Well #14 Generator

ELECTRICAL AND MECHANICAL

No major electrical or mechanical issues were pointed out for Well #14. Well #14 already has a VFD. It has no flow meter and there is not enough pipe length to fit a flow meter. There are no recommendations for improvements regarding electrical and mechanical for Well #14 outside of standard maintenance.

WELL #15

Well #15 is located on 90TH Ave. north of town as shown in Figure 29.



Figure 29. Well #15 Aerial

WELL AGE AND CAPACITY

Well #15 was drilled in 1990 to a depth of 488 feet. It is a deep well pulling from the Dakota Aquifer with a capacity of 800 gpm. The City has noted a loss in capacity in Well #15 due to age and due to the relining of the casing. Well #15 has been identified as a well that needs to be replaced. It is used a substantial amount during summer months and the loss in capacity is significant. A new Dakota well on the same City owned site as the existing Well #15 is suggested with a capacity of 1,000 to 1,100 gpm. Due to a regional concern about the capacity of the Dakota Aquifer and interference concerns, it is not recommended to continue to run the existing Well #15 once the replacement well is drilled. Well #15 feeds into a 10" or 12" raw water transmission line that runs south towards the WTP. The raw water line is a bottle neck for running all three of the Dakota wells simultaneously. The capacity of the 10" raw water transmission line at a velocity of 7 feet per second is only 1,700 gpm and 2,467 gpm at 12". It is recommended a new water transmission line between Wells #15 and the Water Treatment Plant is added to accommodate all three Dakota wells as well as a proposed new Jordan well to prevent future bottlenecks.

SITE AND WELLHOUSE

The City of Storm Lake owns the property Well #15 is on. The well site has both a wellhouse and a shed for an inoperable mobile generator. Both buildings are pre-fab FRP buildings on a concrete slab as shown in Figure 30 and Figure 31. Decommissioning of Well #15 includes removing the pump and piping, decommissioning the well shaft, properly plugging the well, removing the well house, and regrading the site to natural habitat. The storage shed for the inoperable generator would need to be demolished as well.



Figure 30. Well #15 Wellhouse



Figure 31. Well #15 Generator Enclosure

ELECTRICAL AND MECHANICAL

The existing site electrical should be used for the new proposed Dakota well on the Well #15 site. Due to the existing Well #15 being decommissioned, there are no major points or recommendations for Well #15.

WELL #20

Well #20 is located north of 590th Street west of the intersection of 590th Street and 90th Avenue as shown in Figure 32.



Figure 32. Well #20 Aerial

WELL AGE AND CAPACITY

Well #20 was drilled in 2015 to a depth of 497 FT. It is a deep well that pulls from the Dakota Aquifer with a capacity of 1,100 gpm. Well #20 is the City's newest well. Well #20 ties into an 8" water transmission line that runs south to 590th Street where it connects to a 16" water transmission line. The 16" raw transmission line runs east to the intersection of 590th Street and 90th Ave and then runs south to Well #15. As mentioned in the Well #15 well capacity section, ISG suggests adding a parallel water transmission line from Well #15 to the plant to ensure the full use of all of the north wells as well as giving some redundancy to the source transmission system.

SITE AND WELLHOUSE

The wellhouse for Well #20 is on City owned property north of 590th Street. The wellhouse is a pre-fab FRP building on a concrete pad as shown in Figure 33. The site also includes a generator for emergency power support. Well #20 is the newest well and there are no significant issues.



Figure 33. Well #20 Wellhouse

ELECTRICAL AND MECHANICAL

Well #20 is the City’s newest site and no significant issues regarding electrical or mechanical were noted. Well #20 already has a VFD and a flow meter. There are no recommendations for improvements regarding electrical and mechanical outside of standard maintenance.

WELL #4

Well #4 is located northwest of the intersection of 85th Avenue and West 5th Street just south of the Water Treatment Plant as shown in Figure 34.



Figure 34. Well #4 Aerial

WELL AGE AND SITE CAPACITY

Well #4 was drilled in 1959 to a depth of 1,690 feet. It is a deep well that pulls from the Jordan Aquifer with a current capacity of 600 gpm. Well #4 was relined in recent years to extend the well's life but resulted in a lower overall capacity. Jordan wells also typically are a much harder water source compared to the shallower wells. Well #4 has its own 12" water transmission line to the plant and has no capacity bottlenecks. The City currently operates Well #4 during periods of higher demand. Figure 35 below shows the pump for Well #4.



Figure 35. Well #4 Pump Piping

SITE AND WELLHOUSE

The wellhouse for Well #4 is located south on the plant west of 85th Avenue. The wellhouse is a pre-fab FRP building on a concrete pad as shown in Figure 36. The overall condition of wellhouse #4 is poor with signs of degradation along the gutterline. The wellhouse is made to be lifted off of the foundation for work on the well. Further consideration should be given to the integrity of the wellhouse to help understand if the damage that was seen is aesthetic or structural.



Figure 36. Well #4 Wellhouse

ELECTRICAL AND MECHANICAL

Well #4 does not include a VFD or flow meter currently. The piping in the wellhouse may be too short to include a flow meter. Due to the reduced capacity of Well #4 the City should consider forgoing adding a VFD at the present as Well#4 may need to be replaced to meet future 20-year demand. The City did not mention any significant mechanical electrical issues for Well #4.

SOURCE CAPACITY

EXISTING SOURCE CAPACITY

An assessment of the existing Storm Lake sources resulted in an existing firm source capacity of 3,500 gpm as shown below in Table 13. Firm capacity is the capacity with the largest source out of service which would be Well #20. The existing average demand was established as 3.47 MGD in Table 9. To meet existing demand, it has been assumed that the peak day will be met in 20 hours resulting in an existing peak demand of 5,217 gpm. The current firm source supply is 1,717 gpm deficient to meet peak day 20-hr demands.

Table 13: Existing Source Capacity

Well(s)	Capacity (gpm)	Note
Well #3 or #11	350	Wells #3 and #11 cannot run at the same time
Well #7	600	
Well #8 or #18	600	Wells #8 and #18 cannot run at the same time
Well #19	350	
Well #14 or #15 (800 gpm)	1,000	Wells #14, #15, and #20 cannot run at the same time due to pipe limitations
Well #20	1,100	
Well # 4	600	Jordan Well
Existing Source Capacity	4,600	
Existing Firm Capacity	3,500	Firm capacity is the capacity with the largest well out of service
Existing Peak Day 20-hr Day Demand	5,217	Based on 3.13 MGD x 2.0 peaking factor

PROPOSED SOURCE CAPACITY

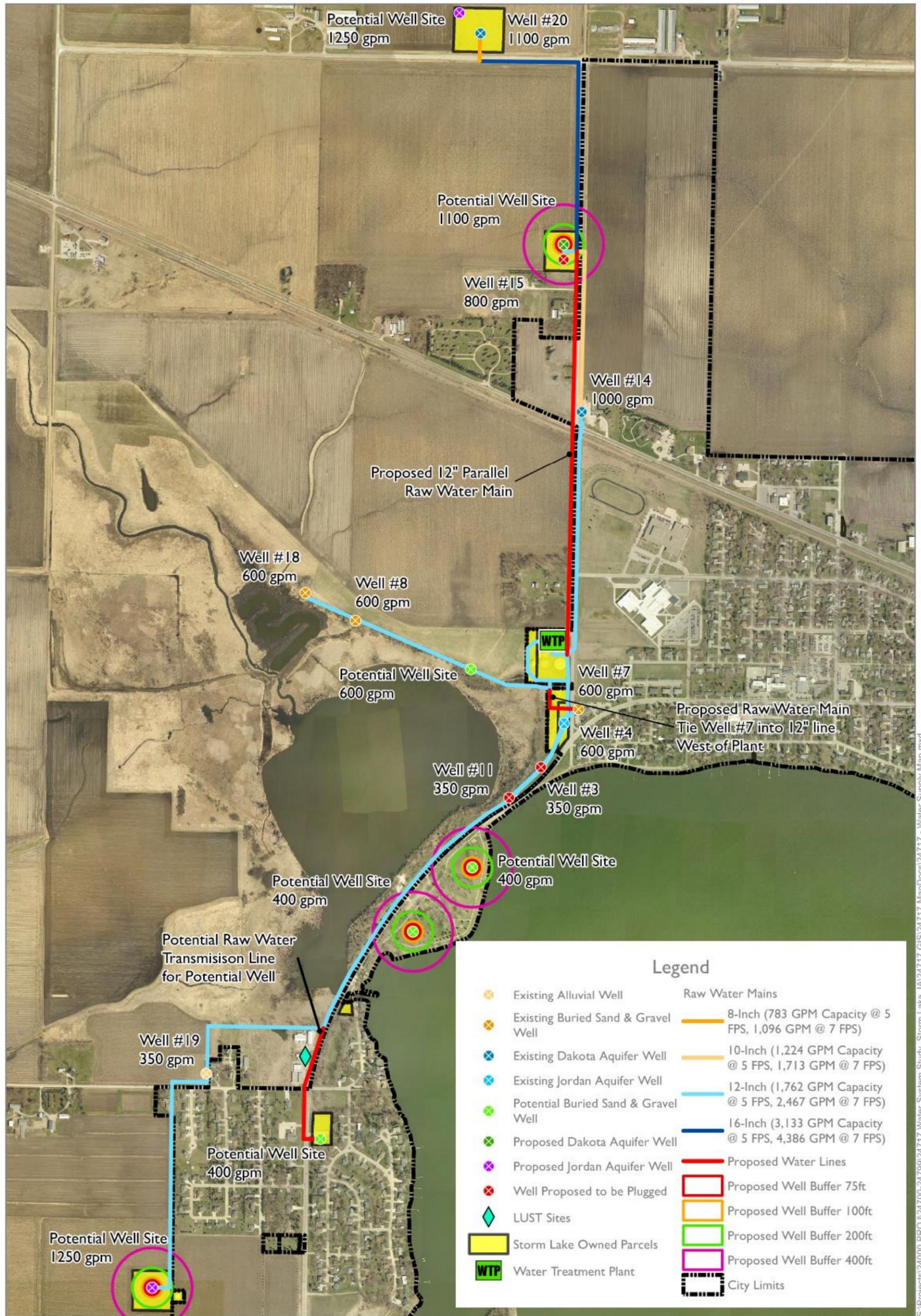
The projected water demand for a 20-year design life was established in Table 10 of the Design Water Demand section. The peak day projected demand was 8.26 MGD which equates to 6,883 gpm for a 20-hr per day design run time as shown below in Table 14.

Table 14: Source Demand Projection

Water Demand Projection	GPM
Existing Peak Day 20-hr Demand	5,217
Projected 2031 Peak Day 20-hr Demand*	6,050
Projected 2041 Peak Day 20-hr Demand	6,883
* Assumed Linear growth	

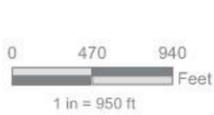
PROPOSED SOURCE IMPROVEMENTS

As outlined in the source capacity section previously, Storm Lake's existing water sources are currently operating below demanded capacity and future growth will significantly increase that demand by the year 2041. In Table 14 above, the existing, 10-Year (2031), and 20-Year (2041) demands are outlined. The proposed source improvements will be broken up into immediate needs to get to meet existing demand, 5-Year Improvements, and 15-Year Improvements to ensure that Storm Lake's source capacity can meet projected 10-Year and 20-Year demands. Figure 37 on the following page shows proposed well locations for potential sand and gravel wells as well as Jordan Wells. Not all sites shown as potential or proposed would necessarily be required to meet capacity but were identified as options if preferred well locations could not be used. Meeting future demand will require a mix of new shallower wells to replace Wells #3 and #11 as well as offering additional softer water sources to offset the harder water found in deep wells. Additional wells in the Dakota Aquifer are not an option. The Dakota Aquifer is already heavily used in the area and additional wells are not recommended. In the proposed improvements it was assumed that unless identified as currently in need of replacement or repair that the existing wells will receive standard maintenance and repair and any future need for replacement will not be included in this analysis.



Tuesday, June 1, 2021

Project Number 20-24717



Water Supply Map Storm Lake - Water System Study Storm Lake, Buena Vista County, Iowa

Source(s):
Orthophoto (Buena Vista County)
Parcels (Buena Vista County)



Figure 37. Storm Lake Proposed Supply Map

IMMEDIATE NEEDS SOURCE IMPROVEMENTS

As discussed in the source analysis some of the wells currently used by Storm Lake are at end of life and need replacement. Those wells in particular are Wells #3 and #11 which are sand and gravel wells, and Well #15 which is a Dakota well. As indicated earlier in Table 13 the City's firm source capacity is not meeting its peak day 20-Hour Design Demand by 1,717 gpm

Table 15 below includes existing and proposed sources to bring firm capacity to meet existing demand including the replacement wells identified. Assumptions were made for the capacities of proposed wells based on surrounding wells at similar depths.

A new 600 gpm sand and gravel well is proposed to be placed north of Little Storm Lake where Well #6 was abandoned on the same 12" raw water transmission line as Wells #8 and #18. The purpose of this well is to allow additional shallower water capacity that is intended to be run simultaneously with Wells # 8 or #18. A test well is suggested to ensure that the new well is not impacted by surrounding wells.

A new 400 gpm sand and gravel well is proposed to go in Frank Starr Park near abandoned Wells #3 and #11. The new well would tie into the existing 12" raw water main that runs from Well #19 to the plant.

A new 1,100 gpm Dakota well is proposed to replace existing Dakota Well #15 on the same property. A significant part of this work is adding a parallel raw water transmission line between Wells #15 and the plant to allow Wells #14, the replacement for #15, and #20 to be run simultaneously. The parallel 12" raw water transmission lines would allow for all of the northern wells to run together while also having capacity for future wells (this is based on conversations with City staff regarding no interference between the Dakota Wells and only having water main capacity limiting all three's operation). There is an assumption that Wells #14, the replacement for #15, and #20 can be run simultaneously without impacting each other's recharge rate based on testing by the City.

Table 16 below breaks down the proposed immediate needs and gives a preliminary cost estimate. The proposed improvements also include:

- Replacing the wellhouse for Well #7
- Installing VFD's on Wells #7, #18, & #19
- Fiber to Wells #8 & #18
 - Not included in cost as it is understood that the City may be already in the process of installing
- Installing Flow Meter on Well #8, and
- Generators to power supply for an average day demand
 - Wells #14 & #20 already have generators providing 2,100 gpm of the needed 2,608 gpm (2041 average day demand)
 - All new wells will include generators – Replacement Well #3, #11, & #15; meeting requirements for 2041 average day demand

There were identified as deficient in the condition assessment. Overall, the immediate needs improvements project is estimated to cost \$3,726,000 and will bring the City's firm capacity up to meet existing demands.

Table 15: Immediate Needs Capacity Improvement

Well(s)	Capacity (gpm)	Note
Replacement Well #3* NEW Sand and Gravel Well***	600	New well. Preferred Location North of Little Storm Lake on same line as Wells #8 and #18*.
Well #7	600	
Well #8 or #18	600	Wells #8 and #18 cannot run at the same time
Replacement Well #11 NEW Sand and Gravel Well***	400	New well. Preferred Location Frank Starr Park.
Well #19	350	
Well #14	1,000	
Replacement Well #15 NEW Dakota Well***	1,100	Replacement for Well #15**
Well #20	1,100	
Well # 4	600	
Proposed Source Capacity	6,350	
Firm Source Capacity	5,250	Firm capacity is capacity with largest source out of service
Existing Peak Day 20-hr Day Demand	5,217	Based on 3.13 MGD x 2.0 peaking factor
* Location ideally able to run simultaneously with Well #8 or #18.		
** The New Dakota well will also require a parallel 12" raw water transmission line between Well #15 and the plant such that Wells #14, the new #15, and #20 can be run simultaneously		
*** New well capacities estimated based on wells in the system of similar depth in similar area		

Table 16: Immediate Needs Improvement and Cost Estimate

Improvement	Description	Preliminary Cost Estimate
Replacement Well #3 NEW Sand and Gravel Well	New 600 gpm well. Preferred Location North of Little Storm Lake on same line as Wells #8 and #18*.	\$863,000
Replacement Well #11 NEW Sand and Gravel Well	New well. Preferred Location Frank Starr Park.	\$764,000
Replacement Well #15 NEW Dakota Well	1,100 gpm Replacement for Well #15. Price includes new parallel 12" raw transmission line from Well #15 to WTP	\$1,799,000
Wellhouse, VFDs, Fiber, & Flow Meters	As indicated in source condition assessment	\$300,000
TOTAL		\$3,726,000

5-YEAR IMPROVEMENTS TO MEET 10-YEAR DEMAND

As discussed in the source analysis, Table 14 shows the projected water demands for 2031 and 2041. ISG suggests a series of projects in or around 2026 indicated here as 5-year improvements to ensure that the City can meet its projected demand of 6,333 gpm by 2031. This projected number is a simple linear interpolation between existing demand and 20-year demand and may occur earlier or later than 2031 dependent on industrial and residential growth in Storm Lake. What is identified here as 5-Year improvements is a second phase of improvements to meet that next step in increased demand.

Table 17 includes existing and proposed source improvements to meet the 10-year projected demand. Only one additional well would be required to meet the projected demand.

A new 1,250 gpm Jordan well is proposed to be placed south of Well #19 by Tower #4. The new Jordan well will tie into the existing 12" raw water transmission line that was run to the abandoned well near Tower #4.

Table 18 is a proposed cost estimate for the 5-year improvements. Overall, the 5-year improvements are estimated to cost \$3,450,000.

Table 17: 5-Year Capacity Improvement

Well(s)	Capacity (gpm)	Note
Replacement Well #3	600	Completed in Immediate Needs
Well #7	600	
Well #8 or #18	600	Wells #8 and #18 cannot run at the same time
Replacement Well #11	400	Completed in Immediate Needs
Well #19	350	
Well #14	1,000	
Replacement Well #15	1,100	Completed in Immediate Needs
Well #20	1,100	
Well # 4	600	
NEW Jordan Well***	1,250	New Jordan well. Preferred Location South of Well #19 by Tower #4
Existing source Capacity	7,600	
Firm Source Capacity	6,350	Firm capacity is capacity with largest source out of service
Existing Peak Day 20-hr Day Demand	6,333	
*** New well Capacities estimated based on wells in the system of similar depth in similar area		

Table 18: 5-Year Improvement and Cost Estimate

Improvement	Description	Preliminary Cost Estimate
NEW Jordan Well	New Jordan well. Preferred Location South of Well #19 by Tower #4	\$3,450,000
TOTAL		\$3,450,000

15-YEAR IMPROVEMENTS TO MEET 20-YEAR DEMAND

The final phase for source improvements are projects that will bring the City's sources up to the ability to meet projected 20-year demand. As mentioned earlier the assumption for these phases are that wells that were not identified as needing replaced were not included for repairs or replacements. The third phase may need to include assessing aging wells to ensure source reliability.

Table 19 includes existing and proposed source improvements to meet the 20-year projected demand. The overall improvements to meet demand are to replace Well #4 with a new Jordan well. Well #4 was relined and only gets 600 gpm in capacity. Replacing this well would result in getting a higher capacity that can be expected from a new Jordan well, estimated at 1,250 gpm.

Table 20 is the proposed cost estimate for the 15-year improvements. The replacement of Well #4 has an estimated cost of \$3,450,000. Placing the new well next to Well #4 would reduce costs of land acquisition and could utilize the existing raw transmission line for Well #4.

Table 19: 15-Year Capacity Improvement

Well(s)	Capacity (gpm)	Note
Replacement Well #3	600	Completed in Immediate Needs
Well #7	600	
Well #8 or #18	600	Wells #8 and #18 cannot run at the same time
Replacement Well #11	400	Completed in Immediate Needs
Well #19	350	
Well #14	1,000	
Replacement Well #15	1,100	Completed in Immediate Needs
Well #20	1,100	
Replacement Well #4*** NEW Jordan Well	1,250	Replace Well #4 Jordan well to regain lost capacity.
NEW Jordan Well	1,250	Completed for 10-Year Demand
Existing source Capacity	8,250	
Firm Source Capacity	7,000	Firm capacity is capacity with largest source out of service
Existing Peak Day 20-hr Day Demand	6,883	
*** New well Capacities estimated based on wells in the system of similar depth in similar area		

Table 20: 15-Year Improvement and Cost Estimate

Improvement	Description	Preliminary Cost Estimate
Replace Well #4 NEW Jordan Well	New 1,250 Jordan well to replace Well #4.	\$3,450,000
TOTAL		\$3,450,000

SUMMARY

The City of Storm Lake currently does not have sufficient supply to meet their peak day demand in a 20-hr runtime. Three phases of improvements are suggested to meet existing demand and future demand. These improvements include new and replacement wells and some raw water transmission line improvements as well as minor improvements to existing wells. ISG recommends the City of Storm Lake act upon the immediate needs listed within this PER and begins planning for future needs by creating a budget that is suitable for the engineer’s opinion of probable costs listed. This series of actions will meet the City’s projected supply demands with a long-range vision, protect the City’s existing supply infrastructure investments, aid in protection of groundwater aquifers, and ensure sustainable water for years to come while potentially reducing operation & maintenance (O&M) costs.

21 below summarizes the three phases, the projected demand, and preliminary cost estimate.

ISG recommends the City of Storm Lake act upon the immediate needs listed within this PER and begins planning for future needs by creating a budget that is suitable for the engineer’s opinion of probable costs listed. This series of actions will meet the City’s projected supply demands with a long-range vision, protect the City’s existing supply infrastructure investments, aid in protection of groundwater aquifers, and ensure sustainable water for years to come while potentially reducing operation & maintenance (O&M) costs.

Table 21 :Improvement Phases Summary

Phase	Timeline	Target Date	Projected PEAK DAY 20-hr Demand (gpm)	City Firm Source Capacity (gpm)	Cost Estimate
Existing	--	--	5,217	3,500	--
Immediate Needs	ASAP	2022	5,217	5,250	\$3,726,000
5-Year Improvements	2026 to meet 2031 Demand	2031	6,333	6,350	\$3,450,000
15-Year Improvements	2036 to meet 2041 Demand	2041	6,883	7,000	\$3,450,000
TOTAL					\$10,626,000

PERMIT REQUIREMENTS

All drinking water projects in Iowa are required to obtain construction permits through the Iowa Department of Natural Resources (Iowa DNR). Necessary permit applications will be submitted to the Iowa DNR upon completion of plans and specifications.

PRELIMINARY SCHEDULE

A project timeline for Immediate Needs can be seen in *Table 22*.

Table 22. Proposed preliminary schedule.

Task	Length of Time	Total Time
Immediate Needs	Design - 9 Months	24 Months
	Permitting - 3 Months	
	Construction - 12 Months	

*All dates are tentative and dependent on review/funding authorities.

Appendix A: Potential Funding Sources

Memorandum

No. 20-24717 Potential Funding Sources



To: City of Storm Lake
Date: June 2, 2021
Subject: No. 20-24717 Potential Funding Sources, Storage

STATE REVOLVING LOAN FUND (SRF) PLANNING AND DESIGN LOAN

This loan provides a 0% interest loan for up to three years with no initiation or servicing fees. The loan can be utilized to pay for engineering assessments and reports, legal/administrative fees as necessary, and for engineering design of the selected option. At the end of the three-year period (or before), the loan can be rolled into an SRF Construction Loan or is repaid when permanent financing is secured; for example, a loan through the SRF Drinking Water Program or financing through USDA Rural Development.

SRF DRINKING WATER FUND

The SRF Drinking Water Fund is a revolving loan fund through the State of Iowa Finance Authority. Currently, the SRF interest rate is 2.0% for a 20-year loan. In some cases, the term can be extended to 30 years at an interest rate of 3.0% if the project being funded has a lifespan greater than 30 years. The City may also be eligible and can apply for the Disadvantaged Community status, which finances the loan at a 2.0% interest rate over a 30-year term. Funding through the SRF Drinking Water Fund is subject to Federal Davis Bacon Prevailing Wages. The SRF program will also require and reimburse the City for the services of a Municipal Advisor (MA) to be eligible for funding. The MA will assist the City in determining utility rate adjustments that will be adequate to finance the identified improvements, maintain a required debt coverage ratio, and ensure a healthy fund balance for the utility fund.

REVENUE BONDS

Revenue bonds are a common way to finance a public improvement. The revenues collected from utility rates repay the revenue bond. Traditional revenue bonds typically have a higher interest rate than General Obligation Bonds and are typically not recommended as a financing mechanism for this project. Given that interest rates on bonds are currently at historical lows, the City may want to investigate this financing option further. Interest rates and loan terms vary depending on the lender.

COMMUNITY DEVELOPMENT BLOCK GRANT (CDBG) WATER AND SEWER FUND

The CDBG program is administered by the Iowa Economic Development Authority (IEDA) and allows municipalities to apply for grant funding on a competitive basis each year for water and wastewater improvements. The main criteria used in determining a community's grant eligibility revolves around the City's Low to Moderate Income (LMI) household percentage. To be eligible for funding, the community's LMI percentage needs to be greater than or equal to 51%. Storm Lake's recent community wide CDBG LMI survey had a result of 52.0%. The City of Storm Lake would be eligible for up to \$600,000 in grant funding if they applied for and secured funding through the CDBG Water and Sewer Fund program.

Memorandum

No. 20-24717 Potential Funding Sources



USDA RURAL DEVELOPMENT WATER & WASTE DISPOSAL LOAN & GRANT PROGRAM

USDA Rural Development offers loans and potential grant funding packaged together for utility improvements. The USDA RD grant formula considers several factors when determining eligibility amounts including the number of households, Median Household Income (MHI), current utility rates, existing debt, current operations and maintenance costs, and short-lived assets. To determine grant funding, the loan amount is applied first until the predetermined affordability utility rate is reached. The approximate maximum grant amount that can be awarded for system improvements for Storm Lake is approximately 40% of project costs, although actual grant amounts would most likely be much lower. The City will need to coordinate Rural Development staff to apply for funding and determine maximum grant eligibility amounts. RD loans are serviced over a 40-year term at a fixed rate. Current interest rates range from 1.375% to 2.25%. To apply for funding the City must submit a loan application accompanied by a Preliminary Engineering Report/Facility Plan. This existing Facility Plan will need to be updated to meet USDA Rural Development requirements.

AMERICAN RESCUE PLAN

President Biden signed the American Rescue Plan (ARP) Act into law in 2021. The ARP includes \$365.9 billion in direct funding for state, local, tribal, and territory infrastructure systems. Eligible uses for these funds include capital investments in infrastructure systems and operation expenses. Storm Lake is eligible for \$1,431 million and the listed improvements in this report are eligible to be funded by the ARP.

Appendix B: Engineer's Opinion of Probable Project Costs

Cost Estimate

Client Name: CITY OF STORM LAKE

Location: STORM LAKE, IA

ISG Project Number: 20-24717

Date: JUNE 2, 2021

Engineer's Opinion of Probable Cost - Well #4 (Replacement) or Well #21

No.	ITEM DESCRIPTION	UNIT	QTY	UNIT PRICE	TOTAL AMOUNT
1	MOBILIZATION / DEMOBILIZATION	LS	1	\$200,000.00	\$200,000.00
2	WELL WATER POLLUTION PREVENTION PLAN (WWPPP) COMPLIANCE	LS	1	\$60,000.00	\$60,000.00
3	CONSTRUCTION STAGING AREA MAINTENANCE	LS	1	\$15,000.00	\$15,000.00
4	BALLAST ROCK	TN	150	\$25.00	\$3,750.00
5	CRUSHED STONE, CLASS 12A	TN	175	\$25.00	\$4,375.00
6	1,700' TEST WELL	LS	1	\$200,000.00	\$200,000.00
7	38" NOMINAL DRILL HOLE	LF	105	\$350.00	\$36,750.00
8	33" NOMINAL DRILL HOLE	LF	440	\$400.00	\$176,000.00
9	27" NOMINAL DRILL HOLE	LF	840	\$420.00	\$352,800.00
10	14" NOMINAL DRILL HOLE THROUGH WATER BEARING FORMATION	LF	305	\$175.00	\$53,375.00
11	34" CONDUCTOR STEEL CASING	LF	107	\$300.00	\$32,100.00
12	28" INTERMEDIATE STEEL CASING	LF	547	\$225.00	\$123,075.00
13	22" PRODUCTION STEEL CASING	LF	1387	\$200.00	\$277,400.00
14	PLUMBNESS & ALIGNMENT TEST	EA	1	\$10,000.00	\$10,000.00
15	GROUTING SET-UP & REMOVAL	EA	3	\$15,000.00	\$45,000.00
16	GROUT/SEAL CASINGS	SACKS	1700	\$40.00	\$68,000.00
17	WELL DEVELOPMENT SET-UP & REMOVAL	LS	1	\$15,000.00	\$15,000.00
18	WELL DEVELOPMENT	HR	80	\$650.00	\$52,000.00
19	AIR LIFT SURGING SET-UP & REMOVAL	LS	1	\$6,500.00	\$6,500.00
20	AIR LIFT SURGING	HR	80	\$450.00	\$36,000.00
21	SAND BAILING SET-UP & REMOVAL	LS	1	\$3,500.00	\$3,500.00
22	SAND BAILING	HR	40	\$200.00	\$8,000.00
23	DRILLING FLUID & CUTTINGS DISPOSAL	LS	1	\$25,000.00	\$25,000.00
24	SAND CONTENT TEST	EA	3	\$1,500.00	\$4,500.00
25	TELEVISION SURVEY	EA	1	\$2,500.00	\$2,500.00
26	GAMMA LOG	EA	1	\$6,500.00	\$6,500.00
27	WATER LEVEL RECORDS IN NEARBY WELL	LS	1	\$6,500.00	\$6,500.00
28	PUMPING TEST SET-UP & REMOVAL	LS	1	\$70,000.00	\$70,000.00
29	STEP-DRAWDOWN AQUIFER PUMPING TEST	HR	3	\$750.00	\$2,250.00
30	CONSTANT-RATE AQUIFER PUMPING TEST	HR	72	\$600.00	\$43,200.00
31	AQUIFER RECOVERY TEST	HR	8	\$450.00	\$3,600.00
32	DISINFECT WELL	LS	1	\$3,500.00	\$3,500.00
33	WATER QUALITY ANALYSIS	EA	2	\$4,500.00	\$9,000.00

34	GENERAL LOST CIRCULATION RECTIFICATION	LS	1	\$15,000.00	\$15,000.00
35	CATHODIC PROTECTION	LS	1	\$2,500.00	\$2,500.00
36	1,250 GPM SUBMERSIBLE PUMP, MOTOR, & DROP PIPE	LS	1	\$125,000.00	\$125,000.00
37	22" PITLESS UNIT	LS	1	\$50,000.00	\$50,000.00
38	WELL PUMP HOUSE & PLUMBING	LS	1	\$100,000.00	\$100,000.00
39	WELL PUMP HOUSE ELECTRICAL & BACKUP GENERATOR	LS	1	\$200,000.00	\$200,000.00
40	WATER MAIN, 12", OPEN CUT	LF	500	\$80.00	\$40,000.00
41	WELL #7 PUMP REPLACEMENT	EA	1	\$80,000.00	\$80,000.00
42	WELL #19 PUMP REPLACEMENT	EA	1	\$70,000.00	\$70,000.00
43	TRAFFIC CONTROL	LS	1	\$1,500.00	\$1,500.00
44	SITE RESTORATION	LS	1	\$15,000.00	\$15,000.00
				Construction Costs	\$2,654,175.00
				10% Contingency	\$265,417.50
				20% Non-Construction Cost	\$530,407.50
				TOTAL PROJECT COST	\$3,450,000.00

Client Name: CITY OF STORM LAKE

Location: STORM LAKE, IA

ISG Project Number: 20-24717

Date: JUNE 2, 2021

Engineer's Opinion of Probable Cost - Well #15 (Replacement)

No.	ITEM DESCRIPTION	UNIT	QTY	UNIT PRICE	TOTAL AMOUNT
1	MOBILIZATION / DEMOBILIZATION	LS	1	\$80,000.00	\$80,000.00
2	WELL WATER POLLUTION PREVENTION PLAN (WWPPP) COMPLIANCE	LS	1	\$40,000.00	\$40,000.00
3	CONSTRUCTION STAGING AREA MAINTENANCE	LS	1	\$15,000.00	\$15,000.00
4	BALLAST ROCK	TN	150	\$25.00	\$3,750.00
5	CRUSHED STONE, CLASS 12A	TN	175	\$25.00	\$4,375.00
6	28" NOMINAL DRILL HOLE	LF	340	\$300.00	\$102,000.00
7	23" NOMINAL DRILL HOLE	LF	150	\$150.00	\$22,500.00
8	24" CONDUCTOR STEEL CASING	LF	342	\$225.00	\$76,950.00
9	18" PRODUCTION STEEL CASING	LF	387	\$125.00	\$48,375.00
10	18" STAINLESS STEEL SAND SCREEN	LF	105	\$325.00	\$34,125.00
11	PLUMBNESS & ALIGNMENT TEST	EA	1	\$7,500.00	\$7,500.00
12	GROUTING SET-UP & REMOVAL	EA	2	\$15,000.00	\$30,000.00
13	GROUT/SEAL CASINGS	SACKS	600	\$40.00	\$24,000.00
14	WELL DEVELOPMENT SET-UP & REMOVAL	LS	1	\$15,000.00	\$15,000.00
15	WELL DEVELOPMENT	HR	48	\$650.00	\$31,200.00
16	INSTALL AND REMOVE DEVELOPMENT TOOLING	LS	1	\$5,000.00	\$5,000.00
17	NW-220 CHEMICAL TREATMENT DEVELOPMENT	HR	72	\$248.00	\$17,856.00
18	NW-220 CHEMICAL TREATMENT SET-UP AND REMOVAL	LS	1	\$2,250.00	\$2,250.00
19	DEVELOPMENT GENERATOR	LS	1	\$3,240.00	\$3,240.00
20	DRILLING FLUID & CUTTINGS DISPOSAL	LS	1	\$12,000.00	\$12,000.00
21	SAND CONTENT TEST	EA	1	\$1,500.00	\$1,500.00
22	TELEVISION SURVEY	EA	1	\$2,500.00	\$2,500.00
23	GAMMA LOG	EA	1	\$6,500.00	\$6,500.00
24	WATER LEVEL RECORDS IN NEARBY WELL	LS	1	\$6,500.00	\$6,500.00
25	PUMPING TEST SET-UP & REMOVAL	LS	1	\$10,000.00	\$10,000.00
26	STEP-DRAWDOWN AQUIFER PUMPING TEST	HR	3	\$600.00	\$1,800.00
27	CONSTANT-RATE AQUIFER PUMPING TEST	HR	24	\$400.00	\$9,600.00
28	AQUIFER RECOVERY TEST	HR	4	\$450.00	\$1,800.00
29	DISINFECT WELL	LS	1	\$3,500.00	\$3,500.00
30	WATER QUALITY ANALYSIS	EA	2	\$4,500.00	\$9,000.00
31	CATHODIC PROTECTION	LS	1	\$2,500.00	\$2,500.00
32	1,100 GPM SUBMERSIBLE PUMP, MOTOR, & DROP PIPE	LS	1	\$100,000.00	\$100,000.00
33	18" PITLESS UNIT	LS	1	\$35,000.00	\$35,000.00
34	WELL PUMP HOUSE & PLUMBING	LS	1	\$80,000.00	\$80,000.00

35	WELL PUMP HOUSE ELECTRICAL & GENERATOR	LS	1	\$150,000.00	\$150,000.00
36	WATER MAIN, 12", OPEN CUT	LF	4500	\$80.00	\$360,000.00
37	ABANDON WELL #15 & DEMO BUILDINGS	LS	1	\$12,000.00	\$12,000.00
38	TRAFFIC CONTROL	LS	1	\$1,500.00	\$1,500.00
39	SITE RESTORATION	LS	1	\$15,000.00	\$15,000.00
				Construction Costs	\$1,383,821.00
				10% Contingency	\$138,382.10
				20% Non-Construction Cost	\$276,796.90
				TOTAL PROJECT COST	\$1,799,000.00

Client Name: CITY OF STORM LAKE

Location: STORM LAKE, IA

ISG Project Number: 20-24717

Date: JUNE 2, 2021

Engineer's Opinion of Probable Cost - Well #3 (Replacement)

No.	ITEM DESCRIPTION	UNIT	QTY	UNIT PRICE	TOTAL AMOUNT
1	MOBILIZATION / DEMOBILIZATION	LS	1	\$40,000.00	\$40,000.00
2	WELL WATER POLLUTION PREVENTION PLAN (WWPPP) COMPLIANCE	LS	1	\$20,000.00	\$20,000.00
3	CONSTRUCTION STAGING AREA MAINTENANCE	LS	1	\$15,000.00	\$15,000.00
4	BALLAST ROCK	TN	150	\$25.00	\$3,750.00
5	CRUSHED STONE, CLASS 12A	TN	175	\$25.00	\$4,375.00
6	110' TEST WELL	LS	1	\$30,000.00	\$30,000.00
7	30" NOMINAL DRILL HOLE	LF	110	\$300.00	\$33,000.00
8	16" PRODUCTION STEEL CASING	LF	75	\$125.00	\$9,375.00
9	16" STAINLESS STEEL SAND SCREEN	LF	35	\$325.00	\$11,375.00
10	PLUMBNESS & ALIGNMENT TEST	EA	1	\$5,000.00	\$5,000.00
11	GROUTING SET-UP & REMOVAL	EA	1	\$15,000.00	\$15,000.00
12	GROUT/SEAL CASINGS	SACKS	200	\$40.00	\$8,000.00
13	WELL DEVELOPMENT SET-UP & REMOVAL	LS	1	\$10,000.00	\$10,000.00
14	WELL DEVELOPMENT	HR	24	\$650.00	\$15,600.00
15	INSTALL AND REMOVE DEVELOPMENT TOOLING	LS	1	\$5,000.00	\$5,000.00
16	NW-220 CHEMICAL TREATMENT DEVELOPMENT	HR	48	\$248.00	\$11,904.00
17	NW-220 CHEMICAL TREATMENT SET-UP AND REMOVAL	LS	1	\$2,250.00	\$2,250.00
18	DEVELOPMENT GENERATOR	LS	1	\$3,240.00	\$3,240.00
19	DRILLING FLUID & CUTTINGS DISPOSAL	LS	1	\$12,000.00	\$12,000.00
20	SAND CONTENT TEST	EA	1	\$1,500.00	\$1,500.00
21	TELEVISION SURVEY	EA	1	\$2,500.00	\$2,500.00
22	GAMMA LOG	EA	1	\$6,500.00	\$6,500.00
23	WATER LEVEL RECORDS IN NEARBY WELL	LS	1	\$6,500.00	\$6,500.00
24	PUMPING TEST SET-UP & REMOVAL	LS	1	\$8,000.00	\$8,000.00
25	STEP-DRAWDOWN AQUIFER PUMPING TEST	HR	3	\$600.00	\$1,800.00
26	CONSTANT-RATE AQUIFER PUMPING TEST	HR	24	\$400.00	\$9,600.00
27	AQUIFER RECOVERY TEST	HR	4	\$450.00	\$1,800.00
28	DISINFECT WELL	LS	1	\$3,500.00	\$3,500.00
29	WATER QUALITY ANALYSIS	EA	2	\$4,500.00	\$9,000.00
30	CATHODIC PROTECTION	LS	1	\$2,500.00	\$2,500.00
31	600 GPM SUBMERSIBLE PUMP, MOTOR, & DROP PIPE	LS	1	\$70,000.00	\$70,000.00
32	WELL #18 PUMP REPLACEMENT (INCREASED HEAD)	LS	1	\$70,000.00	\$70,000.00
33	16" PITLESS UNIT	LS	1	\$35,000.00	\$35,000.00
34	WELL PUMP HOUSE & PLUMBING	LS	1	\$70,000.00	\$70,000.00

35	WELL PUMP HOUSE ELECTRICAL & GENERATOR	LS	1	\$80,000.00	\$80,000.00
36	WATER MAIN, 12", OPEN CUT	LF	20	\$100.00	\$2,000.00
37	ABANDON WELL #3 & DEMO BUILDING	LS	1	\$12,000.00	\$12,000.00
38	TRAFFIC CONTROL	LS	1	\$1,500.00	\$1,500.00
39	SITE RESTORATION	LS	1	\$15,000.00	\$15,000.00
				Construction Costs	\$663,569.00
				10% Contingency	\$66,356.90
				20% Non-Construction Cost	\$133,074.10
				TOTAL PROJECT COST	\$863,000.00

Client Name: CITY OF STORM LAKE

Location: STORM LAKE, IA

ISG Project Number: 20-24717

Date: JUNE 2, 2021

Engineer's Opinion of Probable Cost - Well #11 (Replacement)

No.	ITEM DESCRIPTION	UNIT	QTY	UNIT PRICE	TOTAL AMOUNT
1	MOBILIZATION / DEMOBILIZATION	LS	1	\$40,000.00	\$40,000.00
2	WELL WATER POLLUTION PREVENTION PLAN (WWPPP) COMPLIANCE	LS	1	\$20,000.00	\$20,000.00
3	CONSTRUCTION STAGING AREA MAINTENANCE	LS	1	\$15,000.00	\$15,000.00
4	BALLAST ROCK	TN	150	\$25.00	\$3,750.00
5	CRUSHED STONE, CLASS 12A	TN	175	\$25.00	\$4,375.00
6	110' TEST WELL	LS	1	\$30,000.00	\$30,000.00
7	30" NOMINAL DRILL HOLE	LF	110	\$300.00	\$33,000.00
8	16" PRODUCTION STEEL CASING	LF	75	\$125.00	\$9,375.00
9	16" STAINLESS STEEL SAND SCREEN	LF	35	\$325.00	\$11,375.00
10	PLUMBNESS & ALIGNMENT TEST	EA	1	\$5,000.00	\$5,000.00
11	GROUTING SET-UP & REMOVAL	EA	1	\$15,000.00	\$15,000.00
12	GROUT/SEAL CASINGS	SACKS	200	\$40.00	\$8,000.00
13	WELL DEVELOPMENT SET-UP & REMOVAL	LS	1	\$10,000.00	\$10,000.00
14	WELL DEVELOPMENT	HR	24	\$650.00	\$15,600.00
15	INSTALL AND REMOVE DEVELOPMENT TOOLING	LS	1	\$5,000.00	\$5,000.00
16	NW-220 CHEMICAL TREATMENT DEVELOPMENT	HR	48	\$248.00	\$11,904.00
17	NW-220 CHEMICAL TREATMENT SET-UP AND REMOVAL	LS	1	\$2,250.00	\$2,250.00
18	DEVELOPMENT GENERATOR	LS	1	\$3,240.00	\$3,240.00
19	DRILLING FLUID & CUTTINGS DISPOSAL	LS	1	\$12,000.00	\$12,000.00
20	SAND CONTENT TEST	EA	1	\$1,500.00	\$1,500.00
21	TELEVISION SURVEY	EA	1	\$2,500.00	\$2,500.00
22	GAMMA LOG	EA	1	\$6,500.00	\$6,500.00
23	WATER LEVEL RECORDS IN NEARBY WELL	LS	1	\$6,500.00	\$6,500.00
24	PUMPING TEST SET-UP & REMOVAL	LS	1	\$8,000.00	\$8,000.00
25	STEP-DRAWDOWN AQUIFER PUMPING TEST	HR	3	\$600.00	\$1,800.00
26	CONSTANT-RATE AQUIFER PUMPING TEST	HR	24	\$400.00	\$9,600.00
27	AQUIFER RECOVERY TEST	HR	4	\$450.00	\$1,800.00
28	DISINFECT WELL	LS	1	\$3,500.00	\$3,500.00
29	WATER QUALITY ANALYSIS	EA	2	\$4,500.00	\$9,000.00
30	CATHODIC PROTECTION	LS	1	\$2,500.00	\$2,500.00
31	400 GPM SUBMERSIBLE PUMP, MOTOR, & DROP PIPE	LS	1	\$50,000.00	\$50,000.00
32	16" PITLESS UNIT	LS	1	\$35,000.00	\$35,000.00
33	WELL PUMP HOUSE & PLUMBING	LS	1	\$70,000.00	\$70,000.00
34	WELL PUMP HOUSE ELECTRICAL & GENERATOR	LS	1	\$80,000.00	\$80,000.00

35	WATER MAIN, 12", OPEN CUT	LF	200	\$80.00	\$16,000.00
36	ABANDON WELL #3 & DEMO BUILDING	LS	1	\$12,000.00	\$12,000.00
37	TRAFFIC CONTROL	LS	1	\$1,500.00	\$1,500.00
38	SITE RESTORATION	LS	1	\$15,000.00	\$15,000.00
				Construction Costs	\$587,569.00
				10% Contingency	\$58,756.90
				20% Non-Construction Cost	\$117,674.10
				TOTAL PROJECT COST	\$764,000.00

Client Name: CITY OF STORM LAKE
 Location: STORM LAKE, IA
 ISG Project Number: 20-24717
 Date: JUNE 2, 2021

Engineer's Opinion of Probable Cost - Well Appurtenances

No.	ITEM DESCRIPTION	UNIT	QTY	UNIT PRICE	TOTAL AMOUNT
1	MOBILIZATION / DEMOBILIZATION	LS	1	\$35,000.00	\$35,000.00
2	WELL HOUSE #7	LS	1	\$50,000.00	\$50,000.00
3	WELL VFD'S	EA	3	\$33,000.00	\$99,000.00
4	WELL #8 FLOW METER	LS	1	\$30,000.00	\$30,000.00
5	TRAFFIC CONTROL	LS	1	\$1,500.00	\$1,500.00
6	SITE RESTORATION	LS	1	\$15,000.00	\$15,000.00
Construction Costs					\$230,500.00
10% Contingency					\$23,050.00
20% Non-Construction Cost					\$46,450.00
TOTAL PROJECT COST					\$300,000.00

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On January 12, 2017, ISG formally announced its transition of firm ownership to a 100% employee stock ownership plan (ESOP). As a multi-disciplinary firm that started 47+ years ago, ISG has since grown to be a Top 500 Design Firm as recognized by Engineering News-Record (ENR), a Zweig Group Hot Firm, and PSMJ Circle of Excellence recipient, illustrating the progressive increase in talent, expertise, and market share.