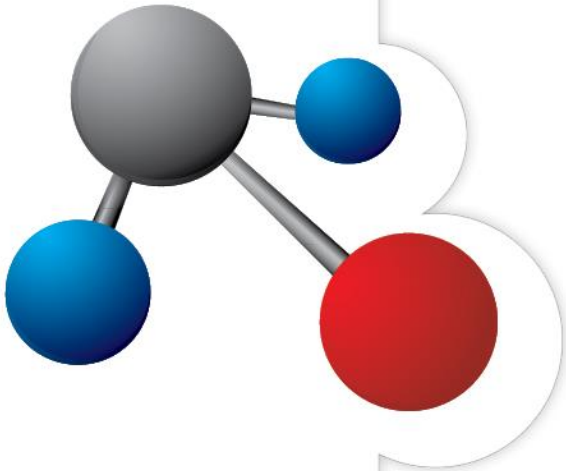
WONDERLAND HOMES WATER SYSTEM STUDY



Prepared For

Wonderland Homes Water and Service Co.

WATER SUPPLY STUDY

February 4, 2019

AE2S Project #: P12492-2018-000

WONDERLAND HOMES
WATER SYSTEM STUDY

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Prepared by:

1560 Concourse Drive
Rapid City, South Dakota
57703

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Professional Certification

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

Name: Dustin Dale

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Date: February 4, 2019 Registration Number: 12702

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APPENDICES

1. Introduction and Background

The Wonderland Homes Water & Service Co. owns and operates a private water supply system serving the Wonderland Homes housing development in Meade County, South Dakota. Currently, the president of Wonderland Homes Water & Service Co. is Mr. Sandi Kile. Wonderland Homes Water & Service Co. contracts out the day-to-day operations and the certified operator is Mr. Bob Powles, who currently operates and maintains the system.

Wonderland Homes housing development is located on the northeast side of I-90 in Meade County, South Dakota, approximately halfway between the cities of Piedmont and Summerset, South Dakota. The Wonderland Homes Water & Service Co. provides water and wastewater services to the housing development which consists of 258 connections serving a population of approximately 750 residents. The water system consists of two wells and a ground storage reservoir. The ground storage reservoir is situated to the east of the housing development and approximately 180 feet higher in elevation to provide pressure to the system. Figure 1-1 illustrates the Wonderland Homes service area.

1.1 Purpose and Scope

Wonderland Homes Water & Service Co. has two wells to provide drinking water to the Wonderland Homes housing development. In 2015, taste and odor began to develop in Well No. 2. At about the same timeframe, Well No. 2 also began to see a decrease in capacity. For these reasons, Well No. 2 was rarely used in 2016 or 2017 and Well No. 1 was used as the primary production well.

AE2S was contracted as a consultant to complete this water supply study and identify the best alternatives for the Wonderland Homes Water & Service Co. Possible alternatives to be considered include no-action, rehabilitation of existing well, drilling a new well, and regionalization.

1.2 Water Supply Study Funding

Wonderland Homes Water & Service Co. is considered a very small system by the DENR. Because of this, Wonderland Homes Water & Service Co. applied and was approved for a Small Community Planning Grant, which is funding the preparation of this water supply study. Depending on the cost of the selected alternative, Wonderland Homes Water & Service Co. may apply for a Drinking Water State Revolving Fund loan or funding through either the Consolidated Water Facilities Construction Program or other funding agency.

1.3 Planning Process

The planning process provides policymakers and the public with a detailed report on infrastructure needs and the recommended steps to meet those needs. Forward thinking and planning can establish priorities for the construction of necessary improvements within the context of a long-term plan to ensure compatibility and prudent management. Wonderland Homes Water & Service Co. recognizes that prudent management of annual operation and maintenance budgets, optimizing short-term capital improvement expenditures, and maximizing the benefits of long-term capital improvements require a consistent direction for the utility, which can be attained through planning.

As the Wonderland Homes Water & Service Co. adopts and cycles through the planning process, some uncertainties and changes are to be expected as equipment and infrastructure can fail at inopportune times. The impacts of these changes can best be managed through a continued proactive planning approach and the prudent spending of available funds. Responding to future challenges will be most appropriately accomplished through a dynamic planning process that enables the Water & Service Co. to maintain a clear vision and consistent direction for the Wonderland Homes water supply system.

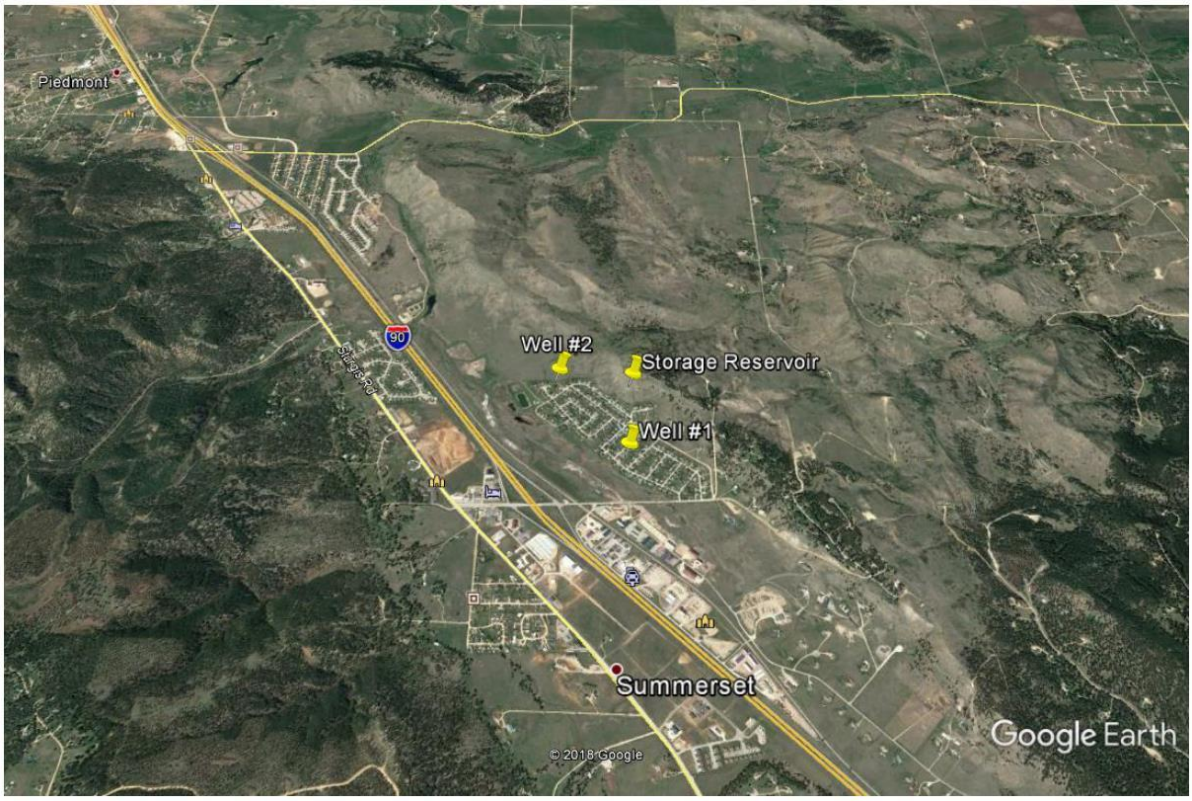

Figure 1-1: Wonderland Homes Vicinity Map

2. Existing System

The water supply system consists of two wells with submersible pumps in pitless units, two wellhouses for the addition of chemicals and metering, a storage reservoir, and transmission mains to provide service to the Wonderland Homes housing development. The Wonderland Homes Water and Service Co. has 258 service connections serving a population of approximately 750 people. A vicinity map included as Figure 1-1 in this study identifies the area of the wellhouses and reservoir.

2.1 Water Supply

Drinking water is supplied from two wells drilled to approximately 1,000 below ground surface (bgs). Groundwater accumulates in the voids created in the porous formation and provides an underground aquifer source.

Well No. 1 was constructed in 1977 and has a 7-inch casing to 824 feet bgs and an open hole to approximately 923 feet bgs. When constructed, it was capable of pumping 120 gpm at a dynamic groundwater elevation of 680 feet bgs. In December of 2016, a new larger submersible pump and motor were installed. The new pump is capable of producing 140 gpm. There is no instrumentation in the well casing to track static and dynamic head trends over time. Refer to Table 2-1 for additional information on the well.

Table 2-1: Well No. 1 Data

Well Data	Value
Well Casing Diameter (in.)	7"
Casing Depth (ft.)	824' of 7" screen
Well Depth (ft.)	923'
Static Water Level (ft. bgs)	130'
Pumping Water Level (ft. bgs)	680' @ 120 gpm
Specific Capacity (gpm/ft)	0.22
Current Pump Capacity (gpm)	140
Construction Date	1977

To provide a redundant water source, Well No. 2 was constructed in 1979. It has an 8-inch casing to 245 feet bgs, a 7-inch casing from 200 to 905 feet bgs, and an open hole to 1,005 feet bgs. This well is not as productive as Well No. 1 and only had a pumping capacity of 55 gpm at a pumping water elevation of 942 feet bgs when first constructed. Refer to Table 2-2 for additional Well No. 2 information.

After the taste and odor issues and declining performance of Well No. 2 started in 2015, several attempts were made to remediate the well. The well pump and motor were pulled, inspected,

and a pinhole was found on the pump. A new larger pump was installed, but that did not help. Next a camera was lowered into the well to look for any holes in the casing, but none were found. In the mid-1980s, a pump was dropped down to the bottom of the well. This old pump was removed, and the well was air surged and flushed. This also did not alleviate any of the well issues.

Specific capacity is a measure of the efficiency of a well and the transmissivity of the formation for water to flow. As you can see from Tables 2-1 and 2-2, even when first constructed, the specific capacity of Well No. 1 was much higher than Well No. 2, at 0.22 gpm/ft and 0.07 gpm/ft, respectively.

Table 2-2: Well No. 2 Data

Well Data	Value
Well Casing Diameter (in.)	8" top 7" bottom
Casing Depth (ft.)	8" 0' – 245' 7" 200' – 905'
Well Depth (ft.)	1,005'
Static Water Level (ft. bgs)	145'
Pumping Water Level (ft. bgs)	942' @ 55 gpm
Specific Capacity (gpm/ft)	0.07
Current Pump Capacity (gpm)	100
Construction Date	1979

Water is conveyed from each individual well with the use of a submersible pump and a pitless unit. From the well, the water is piped to a dedicated wellhouse for treatment before continuing on to the storage reservoir and from there to the distribution system.

Well No. 1 has worked well since its construction, but there has not been a redundant water source of high quality and quantity since Well No. 2 started experiencing taste and odor issues, as well as decreasing capacity, in 2015.

2.2 Wellhouses

Each well has a dedicated wellhouse that is used for treatment and to measure flow. Wellhouse No. 1 is used to measure and treat water from Well No. 1. Respectively, Wellhouse No. 2 is used for Well No. 2. Well No. 1 is the primary source of drinking water for the Wonderland Homes housing development. Subsequently, all of the treatment is performed in Wellhouse No. 1. Flow is measured with a meter in Wellhouse No. 1 and the appropriate amounts of chemicals are added. Hypochlorites are added for disinfection and fluoride for dental health. Since the levels of iron and manganese are very low and the raw water has a positive Langelier Index, no phosphates are added at this time.

Well No. 2 and its associated wellhouse are primarily used as an emergency back-up. This wellhouse is equipped to feed chlorine, but the meter is not working to accurately dose chlorine or keep track of the amount of water pumped.

2.3 Water Storage

Wonderland Homes Water and Service Co. currently has one ground storage tank located just to the northeast of the housing development, but at a significantly higher elevation to provide water pressure. The reservoir is a 160,000-gallon rectangular concrete structure.

2.4 Distribution System

The distribution system is comprised of 6-inch PVC watermains with 1-inch poly service feeds to each of the 258 residential connections. The distribution system also has the necessary gate valves and hydrants. Figure 2-1 shows an aerial photo of the Wonderland Homes housing development.

Figure 2-1: Wonderland Homes Water and Service Co. Service Area

2.5 Water Supply and Demand

Wonderland Homes Water & Service Co. currently has 258 connections serving approximately 750 residents in the housing development. While the Service Co. has two wells, only Well No. 1 has been used to provide drinking water since 2016 because of taste, odor, and decreasing capacity of Well No. 2. Water demand trends and issues are further discussed below.

2.5.1 Water Usage

Water usage data was obtained from Wonderland Homes Water & Service Co. for 2016, 2017, and the completed months of 2018. For November and December of 2018, these months were averaged from the previous two years, so a yearly comparison could be made.

Wonderland Homes Water & Service Co. bills for water used on a monthly basis. For 2018, water cost was $45.00 for the first 10,000 gallons used and $1.00 per 1,000 gallons after that. A rising block rate is not currently being utilized that would promote water conservation.

Table 2-3: Water Usage Analysis

Month	2016	2017	2018
January	1,173,600	925,500	1,177,600
February	917,800	854,700	821,000
March	1,130,000	973,500	949,900
April	1,135,300	1,040,900	1,158,200
May	1,475,100	1,594,700	1,322,500
June	3,801,600	2,886,100	1,642,800
July	2,351,200	3,015,900	1,956,200
August	1,849,500	1,975,400	1,846,100
September	1,347,400	1,533,600	1,558,600
October	1,338,000	1,123,000	1,052,600
November	1,050,700	1,166,800	1,108,750[a]
December	1,084,400	774,000	929,200[a]
Yearly Metered Usage	18,654,600	17,864,100	15,523,450
Total Pumped	18,338,500	18,651,800	N/A
Percent Water Loss	-2%	4%	N/A
Avg. Day Demand (gpd)	51,108	48,943	42,530
Max. Day Demand (gpd)[b]	152640	130,689	84,769

a = Average of previous two years.
b = Estimated MDD based on highest month.

Over this three-year span, it can be seen that water use significantly decreased in 2018. 2018 had a seventeen percent decrease in water use from 2016. The main reason for this is that a watering restriction for lawns was implemented in 2018. Lawn watering can only be performed from 5-8 a.m. and 6-10 p.m. for even numbered addresses on even days and odd numbered addresses on odd days. This watering restriction stems from the high usage experienced in June of 2016 when the Well No. 1 pump was running for nearly 24-hours per day to keep up with demand.

2.5.2 Water Supply Issues

Currently, Wonderland Homes Water & Service Co. utilizes Well No. 1 as a primary well and Well No. 2 as emergency back-up well. Well No. 2 was originally operated as a primary well along with Well No. 1 in a lead/lag operating scheme to split motor runtime hours between the two well pumps, but was relegated to an emergency back-up well in 2015 because it started losing pumping capacity as well as taste and odor issues.

Well No. 1 was drilled and the well pump installed in 1977, and the same for Well No. 2 in 1979. Well No. 1 was originally rated for 120 gpm, but a larger motor and pump was installed in 2016 and the capacity is now 140 gpm. In 2016 before the watering restrictions were implemented, the well pump barely kept up with demand and Well No. 2 could not be used to supplement production because of the taste and odor issue. Similar to Well No. 1, Well No. 2 has recently had a larger motor and pump installed for a current capacity of about 100 gpm. However, if the water was of higher quality, it could have been used to supplement Well No. 1 and the two pumps together cold have better kept up with demand. Since both of these wells have had larger pumps installed, the dynamic water elevation should be carefully monitored so that the pumping water elevation is sufficiently above the pump suction, so it does not cavitate or air-lock the pump. Currently, this is not possible since the necessary instrumentation is not installed in the casing pipe.

As mentioned above, Well Nos. 1 and 2 are quite old and nearing the end of their expected operational life at 41 and 39 years old, respectively. Over time as water flows to the well in the aquifer, it carries fine particles and deposits with it that will start to plug the pore spaces in the formation and limit water flow. While both pumps have recently been installed, there is still the possibility of mechanical failure with bearings, seals, etc. Since there is not a good redundant well with a high quality and quantity of raw water, if Well No. 1 pump failed this could be catastrophic in nature to the residents of Wonderland Homes housing development. Well No. 2 could only provide about two-thirds of the water of Well No. 1 and while the taste and odor present in Well No. 2 may not have any adverse health effects, its poor aesthetic quality may cause the residents to not want to use the water. The effects of a failure of Well No. 1 would be even more detrimental if it occurred during the summer months when usage is about twice that of the winter months.

3. Development of Alternatives

The goal of this water supply study is to evaluate alternatives to provide Wonderland Homes Water & Service Co. a water supply of adequate quality and quantity and recommend the best alternative to provide the water in the most fiscally responsible manner. This can be accomplished by different means. These alternatives are further discussed in detail in the following paragraphs.

3.1 Do Nothing

The Do Nothing alternative would maintain the status quo and not make any improvements to the Wonderland Homes water supply. Operation of the two wells would continue with the same operational strategy.

Wonderland Homes & Service Co. is facing significant challenges with aging infrastructure and declining well performance. If Well No. 1 were to fail with either a faulty well pump or the casing pitted through, drastic reductions in water use would need to be enforced until such time that the issue could be resolved. In addition, the water provided by Well No. 2 is of inferior ascetic quality and may not be agreeable to some residents. The residents of Wonderland Homes will constantly be facing this threat until a reliable back-up water source can be found. Because the Do Nothing alternative addresses none of these issues, it has been removed from further consideration.

3.2 Rehabilitate Well

This alternate would rehabilitate the existing Well No. 2. There are several techniques available for well rehabilitation to include, but not limited to: jetting, air surging, chlorinating, acid injection, or injection with another chemical. To help determine the best course for rehabilitation, the first step is usually televising the well. Televising can help determine the condition of the casing, screen, and possibly how plugged the screen is and the type of deposits on the screen. Well rehabilitation can also include servicing or complete replacement of the existing well pump.

When first constructed, Well No. 2 had a relatively very low pumping capacity when compared to Well No. 1. Partial rehabilitation has already been attempted on this well with pump and motor replacement, televising, and air surging with flushing with no effect. Additionally, if hydrogen sulfide is present and causing the taste and odor issue, rehabilitation would most likely not have an impact on this issue since it is a natural part of the formation and being released when pumps. For these two reasons, this alternate has been eliminated from further consideration.

3.3 New Well

A new well may be drilled in the relative vicinity of the existing Wellhouse No. 2 to limit the amount of raw water pipe that would have to be installed. The existing Well No. 2 would then be abandoned in accordance with state and federal regulations. To proceed with this alternative, a well location with land already owned by Wonderland Water & Service Co. would need to be identified or the appropriate easements obtained.

3.4 Regionalization

Regionalization would tie the existing Wonderland Homes distribution system into a regional water supply system and become a consecutive user. Blackhawk Water Users District (WUD) has a pipeline in the near vicinity on the west side of I-90 along Sturgis Road that already supplies water to the City of Piedmont. This pipeline would need to be analyzed to determine whether it can provide an adequate supply of drinking water to Wonderland Homes. Also, a consecutive user agreement would need to be negotiated to purchase water and easements obtained to deliver the water to Wonderland Homes.

To connect to the Blackhawk WUD, a pipe corridor would need to be identified and I-90 would require being bored under. Two options are available to provide the desired flow and pressure to the Wonderland Homes housing development. If enough pressure is available, the new pipe would connect to the existing water storage reservoir and it would be used to provide storage capacity and pressure. If enough storage capacity is available in the Blackhawk WUD system, it could be piped directly into the Wonderland Homes distribution system. A hydraulic analysis of the Blackhawk WUD may be required to determine the capacity and system restraints.

4. Evaluation of Alternatives

4.1 Do Nothing

As explained in Section 3.1, this alternative was removed from further consideration.

4.2 Rehabilitate Well

As discussed in Section 3.2, this alternative was also eliminated for further consideration.

4.3 New Well

A new well is a viable option to provide a redundant raw water supply for the Wonderland Homes Water & Service Co. As mentioned above, both wells are over 40 years old and nearing the end of their expected useful life as pore spaces in the underground formation can fill over time and decrease the transmissivity of the aquifer around the well. A new well would provide a reliable redundant source of drinking water and a new well pump, meter, piping, and related appurtenances would lower the risk of a mechanical failure.

An appropriate area would need to be found with land owned by Wonderland Homes Water & Service Co. or an easement obtained. The new well would need to be far enough away from the wastewater ponds and up-gradient of the groundwater flow, but ideally be located close enough to the existing Wellhouse No. 2 to minimize the amount of raw water piping required from the well to the wellhouse. The piping leaving the wellhouse could be reused as the water would still be pumped to the storage reservoir. However, being too close to Well No. 2 would increase the risks of experiencing the same taste and odor issues.

The two wells owned and operated by Wonderland Homes Water & Service Co. are relatively deep at around 1,000-feet bgs. Because of this depth and the required drilling through cobbles and stone, it is very difficult and expensive to drill test wells to explore for an available water supply. Since test wells would most likely not be feasible, any production well drilled would have the pumping capacity dictated by the aquifer formation directly below it. This is the same reason that Well No. 1 has a greater than 150 percent capacity of Well No. 2. Also, the wells cannot be placed too closely together or the cone of influence from one well will affect the other well.

An estimated cost to install a new well is given below. Several assumptions were needed to be made to provide a complete opinion of total probably project costs. These assumptions include a total well depth of 1,000-feet bgs, re-use of Wellhouse No. 2, no additional chemical feeds, and a lump sum for raw water piping since the new well location is unknown. A detailed cost estimate is provided in Appendix No. 1.

Table 4-1: Estimated New Well Cost

New Well Construction:	
General Conditions:	$ 71,000
New Well & Abandon Existing Well	418,400
Contingencies (30%)	146,820
Legal, Administration, Engineering:	159,055
Opinion of Total Probable Project Costs	$ 795,275

4.4 Regionalization

Blackhawk WUD has a watermain located on the west side of I-90 running along Sturgis Road that serves the community of Piedmont. Regionalization would most likely entail installing a pipeline from the existing storage reservoir and connecting it to the Blackhawk WUD watermain.

Wonderland Homes Water & Service Co. would have to sign a consecutive user agreement with Blackhawk WUD to purchase water. A meter would be installed, and the bulk water cost would be distributed among the users of Wonderland Homes depending on their water usage. Depending on the rates that Blackhawk WUD charges, the Wonderland Homes rates may or may not need to be adjusted.

The main advantage of regionalization is that Blackhawk WUD would be responsible for all costs for producing potable water, operation, and maintenance. Wonderland Homes Water & Service Co. would no longer need to maintain the wells, wellhouses, chemical feed systems, or pay for the services of a certified treatment operator. The distribution system within the Wonderland Homes housing development may still be responsibility of Wonderland Homes Water & Service Co. depending on the terms of the consecutive user agreement. As part of a larger water user district, Wonderland Homes Water & Service Co. would lose direct control of treatment operations, planned upgrades, and water rates. However, interested residents of Wonderland Homes could potentially serve on the Blackhawk WUD board and have a say in the decision-making process. It also may be possible to negotiate the terms of the consecutive user agreement so that Wonderland Homes must always be represented on the board.

As with the new well alternative, several assumptions were needed to be made to generate an opinion of total probable project costs. These assumptions are as follows: Blackhawk WUD watermain along Sturgis Road is of sufficient size and capacity, zero connection fee, 8-inch transmission pipe with no rock excavation, pipe routed to the existing storage reservoir, and easements would be able to be obtained for the most direct pipe route for no cost. Refer to Figure 4-1 for the assumed pipe routing. A detailed cost breakdown is included in Appendix No. 1.

Table 4-2: Estimated Regionalization Cost

Regionalization:	
General Conditions	$ 63,000
Connection & Abandon Existing Wells	378,800
Contingencies (30%)	132,540
Legal, Administration, Engineering:	143,585
Opinion of Total Probable Project Cost	$ 717,925

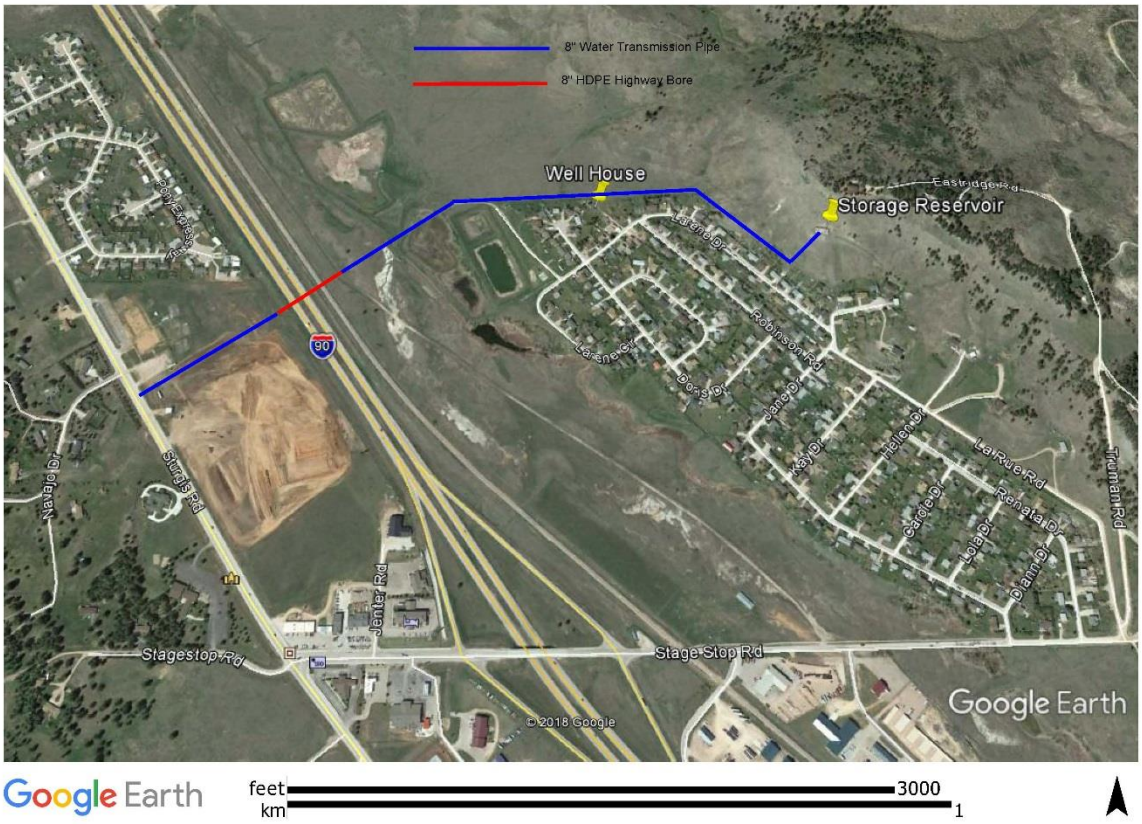

Figure 4-1: Regionalization Map

4.5 Conclusion and Recommendation

The above alternatives each have different benefits and disadvantages. Drilling a new well would allow Wonderland Water & Service Co. to retain complete control of their water supply system, but there is no guarantee that a dependable and adequate source of ground water could be found, and the cost is greater than connecting to the Blackhawk WUD.

It is the recommendation of this Water Supply Study to negotiate an agreement with Blackhawk WUD and become a consecutive user. Before a consecutive user agreement can be executed, it would need to be verified whether the Blackhawk WUD pipeline is of sufficient capacity and pressure. While drilling a new well would allow Wonderland Water & Service Co. to maintain control of their system, investing the capital to drill a new well without knowing how productive it will be is too great a risk when a viable source of drinking water is located a few thousand feet away and just requires connecting to it.

It is also recommended that Wonderland Water & Service Co. perform a rate analysis once the rates have been negotiated with Blackhawk WUD. Wonderland Water & Service Co. will see cost savings in not having to retain the services of a certified water operator, chemicals, and well operation and maintenance no longer being required. However, a slightly higher rate than the bulk water rate charged by the Blackhawk WUD would have to be charged to the residents of Wonderland Homes to pay for the upkeep, repairs, and replacement of the water distribution system within the housing development. A repairs and replacement fund should be set up to cover these costs as the system ages and will eventually need replacement.

5. Funding

5.1 Opinion of Total Project Cost

An Opinion of Probable Cost (OPC) has been developed for each of the proposed alternatives. These costs reflect a total probable cost based on current project concepts and current bidding conditions. Table 5.1 below presents a summary of the cost estimate for each proposed alternative. The Do Nothing approach does not incur any costs, nor does it resolve any of the issues. Therefore, it was not estimated and included in the table.

5.2 OPC Description

Included in the OPC is consideration for construction including well drilling, piping and equipment, electrical construction, and general conditions. The OPC includes costs for professional services including engineering, legal, and fiscal related services. The OPC also includes costs for contingencies that are intended to provide flexibility within the project budget to account for project unknowns, price fluctuations, and bidding environment uncertainties. A detailed OPC for each alternate is included in the Appendix No. 1.

Table 5-1: OPC Summary

TASK	WATER SUPPLY ALTERNATIVES COST SUMMARY	
	New Well	Regionalization
General Conditions	$71,000	$63,000
Construction	$418,400	$378,800
Contingencies	$146,820	$103,080
Engineering, Legal & Admin	$159,055	$143,585
Total Probable Project Cost	**$795,275**	**$717,925**

5.3 Funding Approach

Currently there are a variety of available funding sources that will need to be considered for grant and loan monies for this project. Funding for these improvements may be available through a variety of low interest loan programs. Low interest loans could be acquired through the Drinking Water State Revolving Fund (DWSRF) and the USDA Rural Development (RD) programs.

5.3.1 Low-Interest Loans

The DWSRF is a common option for funding municipal drinking water projects. The DWSRF program provides low interest loans for public water system improvement projects, for compliance with Safe Drinking Water Act regulation, and to protect public health. Under the DWSRF Program, loans are amortized up to 20 years, or a maximum of 30 years if the average annual resident cost would exceed 1.2 percent of median household income. The anticipated interest rate for this program is typically between 2.0 to 3.5 percent. The program also mandates that the water system collect coverage equal to 20 percent of the annual debt service and O&M costs to demonstrate financial solvency. Additional program requirements for the receipt of DWSRF loan dollars include conducting an environmental review, adherence to the American Iron and Steel requirements, wage rate requirements, and disadvantaged business enterprise requirements.

The USDA RD program provides financial assistance for water system improvement projects in rural areas and municipalities with populations of 10,000 or less. Under this program, terms of the loan are determined based on the median household income of the area being served. If funds are available, a grant may be combined with a loan if necessary to keep user costs reasonable. Terms of the loan can vary. If there is a health and safety issue that the project will remedy and based on 2018 rates, the loan rate would be 2.375 percent and a maximum payback period of 40 years is available. If there is no health and safety issue, the interest rate would be 3.125 percent. However, the Federal Reserve has recently been increasing the prime rate and the interest rates going forward may be higher than those seen in 2018. This program requires a debt reserve and an emergencies and extension reserve, both equal to one annual debt service payment accumulated over the first 10 years of the loan. Additional program requirements for the receipt of USDA RD loan dollars include conducting an environmental assessment and preparing a preliminary engineering report.

5.4 User Impact

The ability for payment by Wonderland Homes Water & Service Co. is a matter of generating sufficient revenue to cover all existing and future costs, including the costs of the proposed project. Wonderland Homes Water & Service Co. is self-supporting, and repayment of the loan dollars is assumed to be accomplished through revenue from water sales.

5.4.1 Estimated Annual Debt Service Costs

The following calculation identifies the estimated Annual Debt Service Costs for Wonderland Home Water & Service Co. for any chosen alternative. The Annual Debt Service Costs are based on a payback period of twenty years and an assumed interest rate of three percent. The three

percent interest rate includes interest on principal (2.5 percent) and administrative fees (0.5 percent).

DWSRF Loan: (A/P, 3.0 %, 20 yrs) = ($Project Cost x 0.0672) = $Annual Payment

The DWSRF program can allow for equal annual payments over the period of the loan or something other than level debt service. For the purpose of this report it is assumed that debt service will be repaid in equal annual payments, as shown above.

5.4.2 Estimated Annual Operations and Maintenance Costs

A preliminary estimate of the annual O&M costs associated with a proposed Raw Supply Improvements project would have been derived using a combination of the following cost estimates: mechanical and electrical costs, labor costs, maintenance allowance costs, and miscellaneous O&M costs. The O&M costs for the new well alternative would remain the same as existing since the new well would simply replace the existing Well No. 2. While the regionalization alternate would not directly incur any O&M, these costs would be passed on by the regional system to Wonderland Homes. Because all proposed alternatives would not result in significant changes to the operation and maintenance of the water supply system infrastructure, it is anticipated that the annual O&M costs for any selected alternative would remain at, or near, current levels.

5.4.3 Estimated Annual Coverage and Reserve Costs

If Wonderland Home Water & Service Co. intends to fund the estimated total project costs through a DWSRF loan and fund debt service for the loan through water system revenues, the City will be required to fund a loan reserve account per the requirements of the DWSRF program. The reserve account must be fully funded within five years of loan inception.

In addition to the reserve account, the City must provide financial coverage to prove that the proposed water rates are sufficient to adequately fund the project. The coverage covenant requires that the net utility revenues (gross revenue minus operation and maintenance costs) must equal 120 percent of the annual debt payment for the utility. For the first five years, this additional 20 percent of revenue can be used to fund the required debt service reserves.

For the proposed water supply project DWSRF loan, it is estimated that the annual debt service would range from approximately $48,000 to $54,000, depending on the Alternative selected, and the required reserves for the first five years would range from $9,600 to $10,700. The estimated total annual project debt cost based on the described funding approach is shown for each alternative in Table 5-2. The Engineer's estimate is preliminary in nature and subject to change at this stage in development and may vary from the actual project cost. Because annual O&M costs are not anticipated to increase, it is anticipated that the existing coverage requirements will be increased by the total annual debt service and reserve amount only.

Table 5-2: Total Annual Debt Service and Reserve

	WATER SUPPLY ALTERNATIVES ANNUAL DEBT SERVICE & RESERVE	
	New Well	Regionalization
Annual Debt Service	$53,442	$48,245
Annual Debt Service Reserve	$10,689	$9,649
Total Annual Debt Service & Reserve	**$64,131**	**$57,894**

5.4.4 Rate Impact

Currently, Wonderland Home Water & Service Co. charges a base rate of $45.00 for the first 10,000 gallons used per month and an additional $1.00 per 1,000 gallons used after that. Wonderland Homes has approximately 258 total connections, which are all residential.

Assuming the project is funded through the use of DWSRF loans, with an interest rate of 3.0 percent and a payback period of 20 years, Wonderland Homes Water & Service Co. would need to raise their water rates to cover the annual costs of the loan repayment. It is recommended that a revenue adequacy study be completed to ensure that enough revenue is being generated to cover regular O&M as well as the debt service. Assuming the Regionalization alternative is selected, rates would have to be increased by $18.70 per month to pay for the annual debt service and reserve. The other alternate would require a greater rate increase because of its higher cost. The additional costs to cover the annual debt service and reserve for each alternative is shown in Table 5-3. For estimating purposes, it was assumed that no more than 10,000 gallons were used per month for each connection. It is also assumed that all of the project costs would be paid by a rate increase as the existing water rate is required for existing operations.

Table 5-3: Total Annual Project Debt and Rate Increase Analysis

	RAW WATER SUPPLY ALTERNATIVES ANNUAL DEBT COVERAGE	
	New Well	Regionalization
Total Annual Debt Service and Reserve	$63,345	$57,894
Total No. of Water Accounts	258	258
Annual Increase Cost per Account	$245.52	$224.40
Monthly Increase per Account	**$20.46**	**$18.70**

It is highly recommended that Wonderland Homes Water & Service Co. seek out any available grant funding to lower the potential increase in monthly water rates. If Wonderland Homes has a capital reserve fund, this could be used to pay down the amount that would need to be

financed and subsequently lower the monthly impact to water rates for the residents of Wonderland Homes. To illustrate this, Table 5-4 shows what the monthly increase to water rates would be if $100,000 were paid down.

Table 5-4: Total Annual Project Debt and Rate Increase Analysis w/down payment

	RAW WATER SUPPLY ALTERNATIVES ANNUAL DEBT COVERAGE	
	New Well	Regionalization
Opinion of Probable Construction Cost	$795,275	$717,925
Down Payment Amount	$100,000	$100,000
Total Annual Debt Service and Reserve	$56,067	$49,830
Total No. of Water Accounts	258	258
Annual Increase Cost per Account	$217.31	$193.14
Monthly Increase per Account	**$18.11**	**$16.09**

5.5 Funding Considerations

This Water Supply Study was funded by the DENR Community Planning Grant. Depending on the amount of the total project costs, median household income, etc., Wonderland Homes Water & Service co. has a couple of options to fund a water supply project.

It is anticipated that the proposed improvements will be accepted for funding through the DWSRF Program. The DWSRF provides below market rate loans for public water system improvements. The first step for obtaining a loan is to place the project on the State Water Plan. Applications to the State Water Plan (SWP) must be received by the DENR on or before the first day of October. A Preliminary Engineering Report or Facilities Plan must accompany the application. It should be noted that to be considered for DWSRF funding, the minimum monthly water rate must be at least $55/mo. for the first 7,000 gallons of water used.

It recommended that the Wonderland Homes Water & Service Co. apply to the DENR for inclusion on the SWP in an effort to start the process towards seeking funding for the Project. Placement on the SWP does not obligate Wonderland Homes in any way, it just places the Project on the funding list and scores the Project based on several different criteria.

The information that needs to be submitted includes a cover letter with an application and a Preliminary Engineering Report that contains the following items:

- Project owner name and name
- Name, address, telephone number, and email address for:
  - system representative

  - contact or engineering firm preparing documentation
- Population in the water system service area; projected population in 20 years
- Brief overall description of the current drinking water system
  - include source, treatment, storage and distribution categories
  - include age, condition, capability and capacity for major components
- Need for improvements
  - include existing and potential problems and system shortcomings
  - provide pertinent documentation
- Brief analysis of alternatives including summary cost estimates for each
- Alternative selected
  - provide reasons for selection and costs
  - adequately describe selected alternative
- Proposed project schedule
  - design, bidding, starting and completing construction, key dates
- Project area map
  - identify significant project components

Applications for amendment onto the State Water Facilities Plan are considered on a quarterly basis and must be received by the Department before the first day of February, May, and August.

5.6 Other Financial Considerations

It is important to note that the preliminary financial analysis completed in this section were based on the opinions of total probable project cost for each alternative. As such, it is not recommended that these financial analyses be used as the sole basis for utility fund budgeting. Rather, it is recommended that a comprehensive Rate Study be completed to identify true cost of service to Wonderland Home Water & Service Co. so that an equitable share of the Project costs can be fairly allocated between each user class.

6. Implementation Schedule

Following is a tentative schedule for project implementation. The schedule assumes that Regionalization is selected, and Wonderland Homes Water & Service Co. will pursue a DWSRF low interest loan.

Table 6-1: Implementation Schedule

Task	Complete By
Funding Application Approval by the State	September 2019
Project Design and Review	September to December 2019
Bidding	February 2020
Construction	April to July 2020
Project Closeout	September 2020

Appendix No. 1 – Detailed Opinion of Probable Construction Costs

Client: Wonderland Homes Water & Service Co.
Project No.: P12492-2018-000
Date: 1/11/2019
Project : Water Supply Study
Alternative: New Well

Summary of Task: New well to replace existing Well No. 2

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	COST	INSTALLED COST
A. General Conditions					
1. Insurance, Bonds, Rentals, Travel, Subsistence, Etc.	1.00	ea.	6%	$418,400	$26,000
2. Mobilization	1.00	ea.	10%	$418,400	$45,000
Subtotal					**$71,000**
B. New Well					
1. Water Pollution Control	1	l.s.	$5,000	$5,000	$5,800
2. Bore Hole for 8" casing	250	l.f.	$105	$26,250	$30,200
3. Bore Hole for 7" casing	750	l.f.	$95	$71,250	$82,000
4. Geophysical Logging	1	ea.	$15,000	$15,000	$17,300
5. 8" Steel Casing	245	l.f.	$66	$16,170	$18,600
6. 7" Steel Casing	705	l.f.	$35	$24,675	$28,400
7. Set-up for Grouting	2	ea.	$4,000	$8,000	$9,200
8. Grouting	750	c.f.	$31	$23,250	$26,800
9. Cement Bond Logging	2	ea.	$5,600	$11,200	$12,900
10. Set-up for Well Development	1	ea.	$8,000	$8,000	$9,200
11. Well Development	12	hr	$500	$6,000	$6,900
12. Install Pitless Unit	1	l.s.	$5,000	$5,000	$5,800
13. Well Pump (20HP)	1	ea.	$12,750	$12,750	$14,700
14. 4" Steel Column Pipe	950	l.f.	$15	$14,250	$16,400
15. 4" Check Valve	2	ea.	$1,100	$2,200	$2,600
16. Submersible Cable	970	l.f.	$8	$7,760	$9,000
17. Disinfect Well	1	l.s.	$4,000	$4,000	$4,600
18. Water Quality Sampling and Testing	1	l.s.	$6,500	$6,500	$7,500
19. Site Grading and Restoration	1	l.s.	$15,000	$15,000	$17,300
20. Site Piping	1	l.s.	$45,000	$45,000	$45,000
21. Electrical (includes pressure sensor)	1	l.s.	$25,000	$25,000	$25,000
22. Connecting to Wellhouse No. 2	1	l.s.	$7,500	$7,500	$7,500
23. New meter	1	ea.	$5,000	$5,000	$5,000
C. Abandon Existing Well					
1. Setup for Well Abandonment	1	l.s.	$4,000	$4,000	$4,600
2. Grout for Well Abandonment	350	c.f.	$15	$5,250	$6,100
Subtotal					**$418,400**

Total Probable Construction Costs	
General Conditions	**$71,000**
New Well	**$418,400**
Contingencies (30%)	**$146,820**
Total Probable Construction Costs	**$636,220**
Other Costs	
Legal Expenses (2%)	$12,724
Administrative Expenses (3%)	$19,087
Engineering Expenses (20%)	$127,244
Total Other Costs	**$159,055**
OPINION OF TOTAL PROBABLE PROJECT COSTS	**$795,275**

Client: Wonderland Homes Water & Service Co.
Project No.: P12492-2018-000
Date: 1/11/2019
Project : Water Supply Study
Alternative: Regionalization

Summary of Task: Connect to Blackhawk WUD watermain

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	COST	INSTALLED COST	MULTIPLIER
A. General Conditions						
1. Insurance, Bonds, Rentals, Travel, Subsistence, Etc.	1.00	ea.	6%	$378,800	$23,000	0.06
2. Mobilization	1.00	ea.	10%	$378,800	$40,000	0.10
Subtotal					**$63,000**	
B. Connect to Blackhawk WUD						
1. 8" C900 DR18	4,400	l.f.	$35	$154,000	$154,000	1.00
2. 8" Cased Highway bore (I-90)	400	l.f.	$140	$56,000	$56,000	1.00
3. 8" Polybore (Sturgis Road)	100	l.f.	$45	$4,500	$4,500	1.00
4. 8" Gate Valve	4	ea.	$2,200	$8,800	$8,800	1.00
5. DI Fittings	500	lbs	$12	$6,000	$6,000	1.00
6. Blackhawk watermain tie-in	1	l.s.	$5,000	$5,000	$5,000	1.00
7. 6" meter vault	1	ea.	$85,000	$85,000	$85,000	1.00
8. Connecting to Wellhouse No. 2	1	l.s.	$5,000	$5,000	$5,000	1.00
9. Surface Restoration	19,600	s.y.	$2	$39,200	$39,200	1.00
C. Abandon Existing Wells						
1. Setup for Well Abandonment	2	l.s.	$4,000	$8,000	$9,200	1.15
2. Grout for Well Abandonment	350	c.f.	$15	$5,250	$6,100	1.15
Subtotal					**$378,800**	
Total Probable Construction Costs						
General Conditions					**$63,000**	
Connect to Blackhawk WUD					**$378,800**	
Contingencies (30%)					**$132,540**	30.00
Total Probable Construction Costs					**$574,340**	
Other Costs						
Legal Expenses (2%)					$11,487	2.00
Administrative Expenses (3%)					$17,230	3.00
Engineering Expenses (20%)					$114,868	20.00
Total Other Costs					**$143,585**	
OPINION OF TOTAL PROBABLE PROJECT COSTS					**$717,925**	