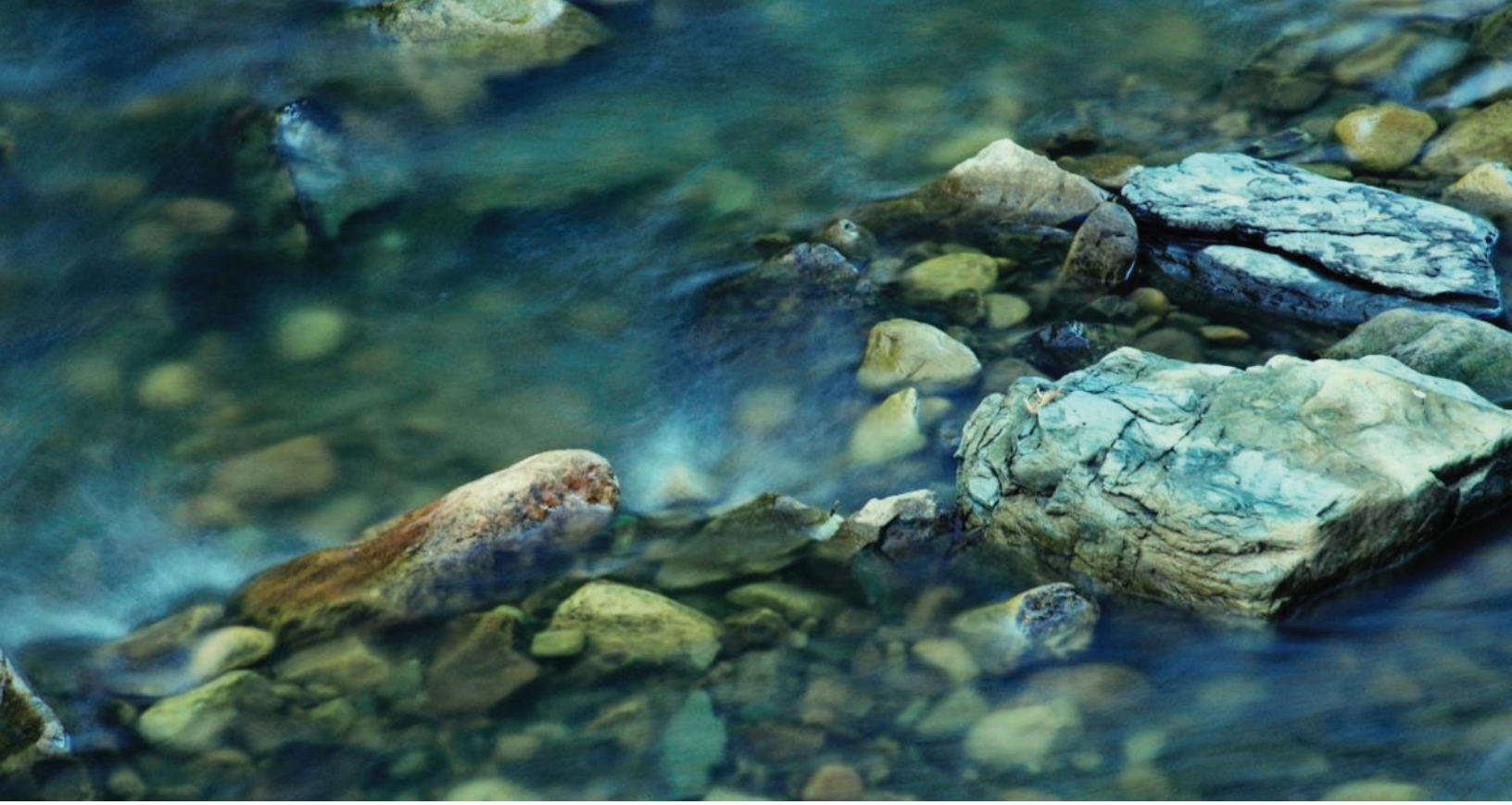

JAugust 2021
Idledale Water System Improvements Project

Orsatti Water Consultants

Idledale Water System Engineering Study

Prepared for Idledale Water and Sanitation District

DRAFT

August 2021
Idledale Water System Improvements

Idledale Water System Engineering Study

Prepared for
Idledale Water and Sanitation District
P.O. Box 52
Idledale, CO 80453

Prepared by
Orsatti Water Consultants
3821 Union Ct.
Wheat Ridge, CO 80033

Project Number: OWC2002
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APPENDICES

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1 Introduction and Background

Idledale Water and Sanitation District (District) is a quasi-municipal organization which exists to provide potable water service within its service area boundary that occupies much of the area known as Idledale, Colorado. Idledale is geographically located on Colorado State Highway 74 and contiguous Bear Creek, approximately 3 miles west of Morrison. Figure 1 provides a 3-mile radius map of the project area showing surrounding features and District facilities.

The District provides potable water service to 147 residential customers by owning and operating 3 groundwater wells, a 250,000-gallon buried water storage tank, 2 disinfection systems, booster pumping facilities and the water distribution system including buried piping, valves, and fire hydrants. Each individual water service line is owned and maintained by the individual water service customer from the tap at the main to the point of service. Currently, there is only one service meter installed within the District.

The District has recently experienced compounding negative impacts that have included equipment failures, unchecked system leaks, multiple years of historic drought, and water quality compliance advisories from CDPHE. These issues have caused repeated water shortages and use restrictions to customers. The District has even resorted to purchasing bulk water and hauling it from Morrison on multiple occasions. Given their limited financial resources for operational expenses, the water hauling activities has also depleted District financial capital reserves.

Faced with these mounting operational, regulatory, and financial challenges, the District engaged Orsatti Water Consultants (OWC) to evaluate the potable water system facilities, identify and prioritize specific concerns, and provide alternatives and recommendations, including cost estimates for the design and construction of improvements. This Water System Engineering Study serves to document that process and presents an organized approach to understanding and resolving the District's concerns.

During the past year, OWC has performed various assessments and evaluations of the District facilities, identified viable solution alternatives and prepared recommendations in a series of technical memoranda for District review. The District has provided active input during this initial process, with subsequent review meetings being held to discuss and document the District's feedback. This Water System Engineering Study brings together those previous efforts into a summarizing document that will serve as a foundational planning tool for the District to take the next step to acquire State and Federal grant and loan funding for the design and construction of the recommended improvements.

2 Regulatory Coordination

Prior to OWC involvement, the Colorado Department of Public Health and Environment (CDPHE), conducted a sanitary survey of the potable water system facilities in March of 2018. No significant deficiencies or violations were found at that time, but CDPHE did provide 8 comments/ recommendations for the District to follow. Most comments focused on management and documentation issues, but Comments 4 and 5 provided the initial indication of potential surface water influence (GWUDI) to Well Nos. 1A and 1B. A copy of the Sanitary Survey is included in Appendix A.1.

Additionally, in March of 2020, CDPHE provided final notification that Well No. 1A was GWUDI determined and included recommendations for treatment and the steps to be followed to reach compliance. A copy of that determination is included in Appendix A.2.

Since being engaged by the District, OWC has communicated with CDPHE on numerous occasions to confirm prior and existing conditions, provide coordination with design of emergency treatment measures and certify construction of District installed treatment improvements to the Ridgeway Well that will be discussed later in the report. The most recent ongoing coordination with CDPHE includes confirming and correcting a uranium concentration exceedance on the Ridgeway Well supply and blending system.

In response to the GWUDI determination for Well No. 1A by CDPHE, a site visit was performed on May 11, 2020 by OWC to assess the current state and subsequent needs of the existing water treatment system to comply with GWUDI regulations. OWC was accompanied by Richard Pintor Jr., the Operator in Responsible Charge (ORC) for the District. To comply with GWUDI requirements, it is required that chlorine residual concentration and turbidity be continuously recorded prior to release into the distribution system. This has required the District to purchase and install a turbidimeter and a chlorine residual analyzer for Well 1A, both which read and record measurements continuously on the SCADA system.

Since the site visit, the appropriate field instruments have been installed including sampling points at representative locations within the treatment system that reflects the turbidity and chloride residual concentration that enters the distribution system.

Both monitoring systems should be inspected daily to confirm that continuous monitoring of chlorine residual and turbidity are being recorded and reported as required by the Colorado Water Quality Control Commission stipulates recordkeeping requirements for turbidity and disinfectant monitoring in 5 CCR 1002-11 (CDPHE, 2020).

The turbidimeter is also required to measure below 1.0 NTU (Nephelometric Turbidity Unit) and to record concentrations continuously. This GWUDI requirement is intended to assess the ongoing performance of the filtering system, which will be installed soon. Turbidity must be monitored at least every four hours while the filtration process is in operation (CDPHE, 2020).

Moving forward, any new water source will require an initial water quality analysis to determine the requirements and determination regarding additional treatment steps including GWUDI. For planning purposes, OWC is anticipating that the new groundwater source will be similar to Well 1A and the Ridgeway Well in that the new water source will require both GWUDI treatment and iron/manganese removal.

3 Water Balance Assessment

The focus of the Water Balance Assessment is to provide an assessment of the District's available water supply and the opposing demand profile that is created by the residents within the District's water distribution system. The analysis addresses the current available groundwater water supply and the seasonal variations; the District system demand for water on the distribution system with the seasonal trends including surplus and deficit periods; and results from leak testing conducted throughout the District's distribution system.

3.1.1 Currently Available Water Supply

For the past two years, the District's supply of drinking water has come primarily from two wells (Well 1A and 1B) located near the 250,000-gallon water storage tank and treatment building. Two formerly active supply wells, Ridgeway, and Sawmill were not operational during the majority of this time due to electrical issues and radionuclide contamination. The ongoing non-operational status of these two wells has reduced the incoming supply of water substantially. Using only Wells 1A and 1B, the District has suffered from supply deficits typically starting in early May and continuing through the fall months, approximately from late-April to September. During this time, Wells 1A and 1B have been unable to meet the water demand even with restrictions on outdoor water use. This deficit required the District to truck in additional water from Morrison and set up an emergency treatment system last summer to provide an additional 200,000 gallons to meet the demand. While these emergency steps kept the water flowing to residents, both were expensive and unsustainable practice for long-term system operation.

Relying on only Wells 1A and 1B for water supply has put the District in a precarious situation where demand outweighs supply during periods of high temperature and low precipitation. The aquifer supplying these wells is predominantly replenished by precipitation. During periods of low rainfall, the water table becomes depleted, limiting the available drawdown and volume available for pumping. Once the water table drops below a certain depth, well pumping will produce reduced flow until the aquifer is replenished through precipitation. This operating condition will continue to create supply shortfalls during periods of drought in the summer and fall months unless additional sources of water are brought into the system.

In response to this ongoing challenge, the District has resolved the electrical service problem to the Ridgeway Well and has restarted the well operations including blending and system monitoring prior to feeding the Distribution System at the Ridgeway Blending Facility. As of this date, the Ridgeway Well restart appears to have delayed if not prevented the need to haul or emergency treat additional water this year.

3.1.2 Supply Estimates from Operational Data

Water supply data analysis focused on data available from dataloggers installed at Wells 1A and 1B, and the upper water tank near the treatment building. These dataloggers record well pumping rate, water levels present in the wells, total volume pumped from each well, and the storage tank level. Historic data was available for August 2018 – August 2020 and are summarized in Figures 3.1-3.3. Figure 3.1 displays monthly average tank levels and well water levels for wells 1A and 1B. Figure 3.2 shows monthly average well pumping rates compared to tank level. Figure 3.3 displays a histogram of average incoming supply volume, outgoing water volume, and net surplus or deficit for each month based on the period of record. Table 3.1 summaries the data depicted in Figure 3.3.

Figure 3.1 illustrates the supply-side issue the District is facing during the late spring to late summer. During this period, roughly April-August, the water levels present in the wells decrease significantly due to lowered groundwater recharge and high pumping rates. During this same period, water demand increases due to outdoor irrigation and increased domestic consumption. In response to the increased demand that exceeds production, the tank level decreases.

In the future when the District can maintain a surplus production supply year-round, the tank would remain full continuously for required fire protection supply and individual well production could be adjusted to lower levels on an average annual basis.

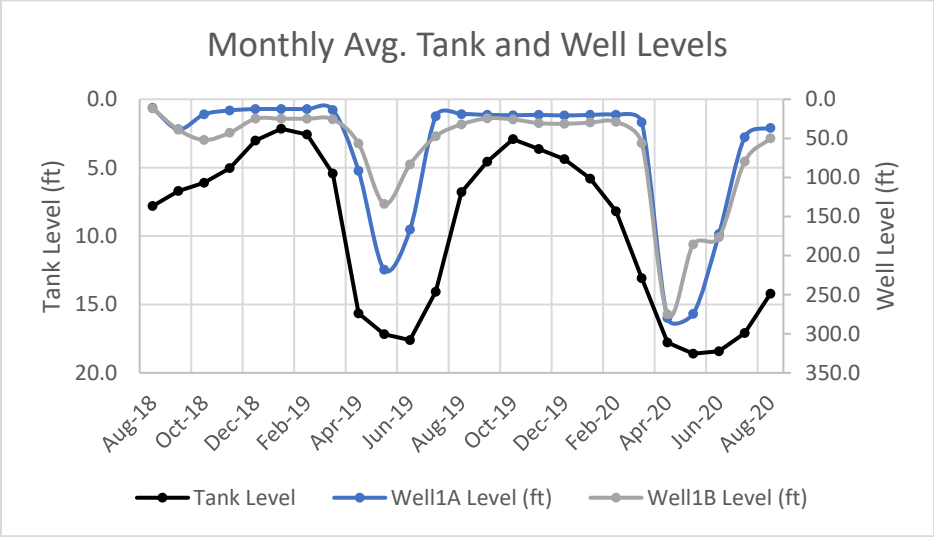

Figure 3.1: Monthly average tank and well levels

Figure 3.2 shows the relationship between changes in seasonal potable water demand, the well pumping rate response to the increased consumption, and the falling water storage tank levels when consumption exceeds the total well output. As the tank level starts to fall, pumping rates increase slightly until they reach their maximums and then start to fall also as the subterranean water supply starts to shrink for the season. As shown in Figure 3.3, this deficit condition typically starts in May

and continues for 5 to 6 months until Fall brings lower temperatures and increasing precipitation. This cycle was shown to be more pronounced in the summer of 2019. Pumping rates and well production has been limited historically by the decreased recharge in the aquifer.

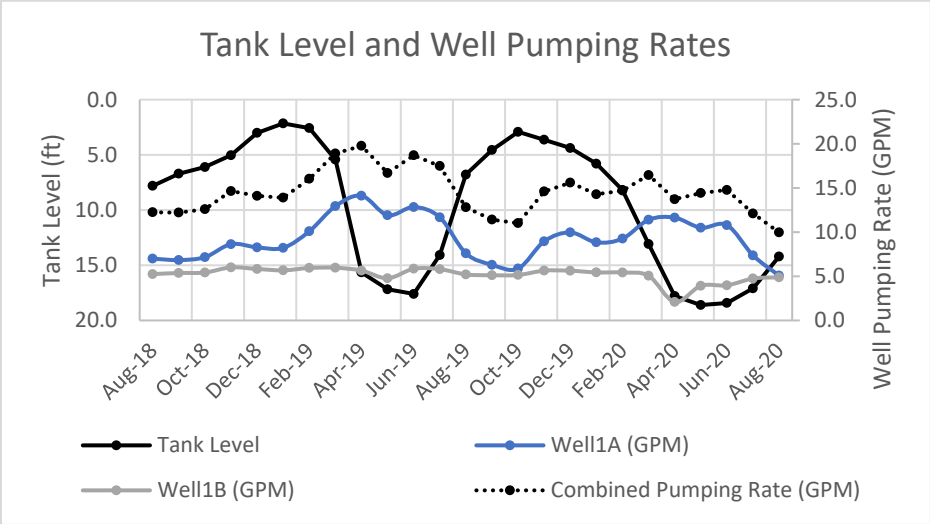

Figure 3.2: Monthly average tank levels compared to well pumping rates

Additional information collected this current season showed an even more pronounced drought effect on the groundwater supply in 2020. Fortunately, the District has taken steps in reducing system leaks and utilizing other sources of water supply. The net effect has been somewhat offsetting, in that the District finds itself no worse off than last year, but not as well as anticipated. The improvements made created only small overall gains in the water balance struggle.

3.1.3 Estimating Supply Deficits

The amount of water delivered through the distribution system can be calculated using the tank level and well pumping data. A simple conversion is applied that subtracts the daily change in tank level by the amount pumped into the tank each day. Tank levels can be converted to a volume using the tank diameter of 50-feet, which correlates to 1-foot of tank level equals 14,700 gallons. With the incoming and outgoing flowrates known, the net surplus or deficit volume can be calculated, which is shown in Figure 3.3 and Table 3.1. Any month that is shown to have a net surplus will continue to fill the 250,000-gallon storage tank until the tank is full. A month with a net deficit will reduce the tank level to make up for the decreased volume coming into the system. During extended deficit conditions, the storage tank level may drop enough to necessitate trucking in additional water.

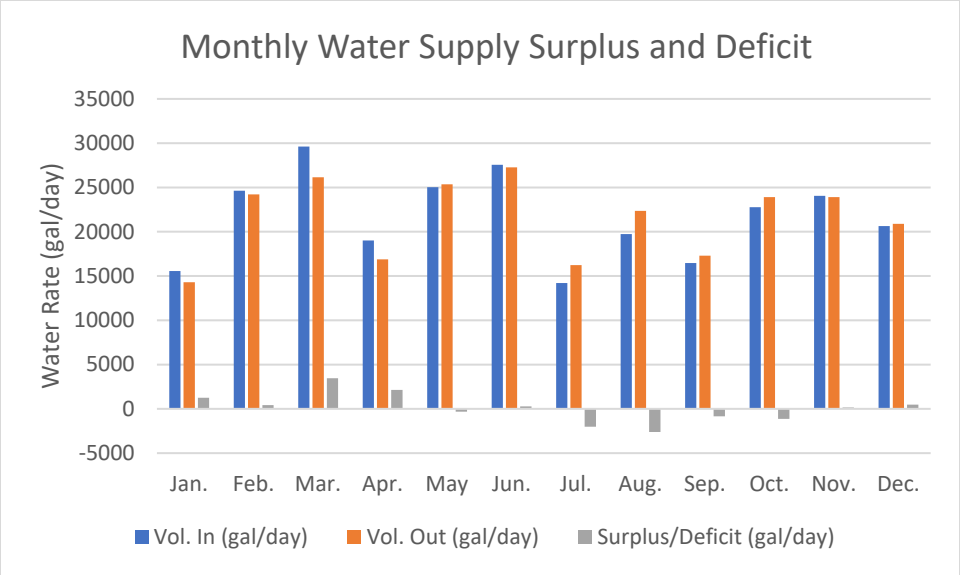

Figure 3.3: Average water volume into and out of system with monthly surplus and deficits (Data from August 2018 – August 2020).

Table 3.1: Tabulated monthly average pumping rates and well production volumes (Data from August 2018 – August 2020).

Month	Volume In: Well Production (gal/day)	Volume Out: Average Daily Demand (gal/day)	Surplus/Deficit (gal/day)	Water Condition
January	15,560	14,300	1,260	Surplus
February	24,640	24,220	420	Surplus
March	29,620	26,160	3,460	Surplus
April	19,020	16,880	2,140	Surplus
May	25,030	25,353	**-320**	**Deficit**
June	27,560	27,280	280	Surplus
July	14,210	16,230	**-2,020**	**Deficit**
August	19,740	22,360	**-2,620**	**Deficit**
September	16,460	17,300	**-840**	**Deficit**
October	22,770	23,900	**-1,140**	**Deficit**
November	24,050	23,900	150	Surplus
December	20,630	20,800	490	Surplus
Yearly Avg.	*21,610*	*21,560*	*105*	*Surplus*

A deficit condition was observed in May, July, August, September, and October. The largest deficit was seen during August and averaged -2,620 GPD. Average daily demand can be estimated from the available data as well. Average consumption was calculated by subtracting the amount of water

coming into the system by the change in tank storage (Table 3.1). The average annual daily water demand was approximately 21,560 GPD or 15 gpm, continuously.

Additional water sources are urgently needed for the District to make up for the peak water deficit of -2,620 GPD. On average, Wells 1A and 1B historically produced around 13,600 GPD and 7,720 GPD, respectively. However, drought conditions in 2020 resulted a 15% further reduction in water production during the deficit months, driving even greater urgency.

In the spring of 2020, the District mitigated a significant portion of the total water deficit by collecting and treating approximately 200,000 gallons of water from the historic spring that was collected in the old concrete reservoir. A Sunspring packaged water treatment system was loaned to the District through the Colorado Rural Water Association that provided potable water treatment through ultrafiltration of the spring water at approximately 3.5 gpm prior to blending with Wells 1A and 1B for disinfection. The system was designed, approved by the CDPHE, and certified for construction in 60 days. This effort significantly reduced the amount of water the District had to purchase and haul in during a heavy drought year.

The deficit has shown itself to vary between 20 and 30% of the production of Well 1A. Increasing water well supply by approximately 5 -7 gpm would alleviate the supply side deficit during the summer months. There has been no indication of supply deficits during the winter or spring months, when outdoor water use is negligible, temperatures are low, and precipitation is relatively high. During this period, well water levels remain high and pumping rates can maintain a sustainable supply and consistent tank level. The supply deficit will continue to be an issue during summer months until additional water sources are developed for the system. Currently, the deficit is dependent on precipitation rates and groundwater recharge from precipitation. The supply deficit is likely going to be an increasing issue as residential development increases locally and if drought conditions continue to be a persistent issue in Colorado.

3.1.4 Effects of Climate

The Idledale Water and Sanitation District is located in a high-elevation, semi-arid zone of marginal precipitation. Monthly average high and low temperatures and average monthly precipitation rates are shown below in Figure 3.4.

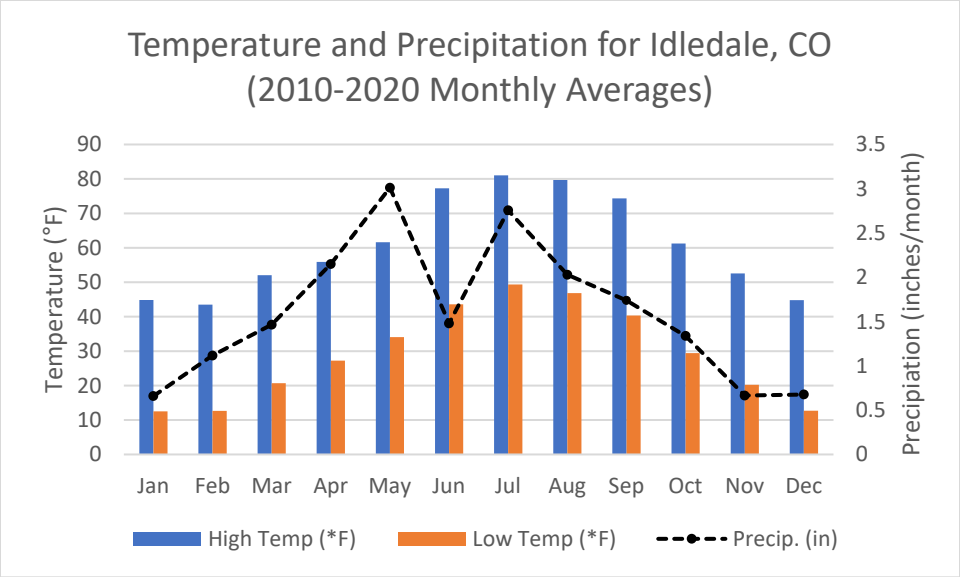

Figure 3.4: Temperature and precipitation for Idledale based on climate records from 2010-20 (CCC, 2020).

Annual high temperatures occur between June-September, with two peaks in precipitation in May and July. This two-peak precipitation pattern is due to early season cool rains of May and the warmer onset of the North American Monsoon in late June – July. During this drop in precipitation in June, aquifer storage begins to decrease after peak snowmelt has occurred. Groundwater levels in the Front Range of Colorado typically begin to steadily drop after peak snowmelt has occurred, unless precipitation remains high during the summer months. The precipitation trends in Figure 3.4 correlate with the decreased groundwater levels observed at Wells 1A and 1B in Figure 3.1.

3.2 Water Demand

3.2.1 Comparison to Nearby Communities

No water meters or consumption data is currently being recorded by the District. The District monitors well pumping rates and the water storage tank level but water usage by individual property owners is not recorded. Without a record of water consumption or demand for Idledale, research was conducted on nearby communities and counties to determine representative water consumption rates. Research focused on residential consumption in Jefferson County and nearby municipalities that have similar precipitation, climate, and water use patterns.

A study conducted by the Colorado Statewide Water Supply Initiative (SWSI) used county-wide weighted average water use for all water users to determine per capita water use across Colorado. Results in gallons per capita per day (GPCD) for Jefferson and nearby counties indicate the following consumption rates, which include both municipally supplied sources as well as privately owned wells and surface water supply (CDM, 2011)).

- Jefferson County: 159 GPCD
- Gilpin County 177 GPCD
- Clear Creek County: 298 GPCD
- Park County: 254 GPCD

The most relevant value, from Jefferson County, includes indoor and outdoor water use averaged annually, regardless of water source. Jefferson County has lower consumption rates compared to nearby counties due to a high percentage of urban-residential properties. A large portion of consumption in Jefferson County is from urban and suburban municipalities such as Lakewood, Arvada, Golden, and Ken Caryl, while most properties in Park, Clear Creek, and Gilpin are substantially more rural. Urban and suburban water consumption rates tend to be lower than rural consumption rates due to lower outdoor water demand, less small-scale agriculture, and less wildfire mitigation. Idledale's near-rural location in the mountains and relatively large average lot size might ultimately lead to higher outdoor irrigation demand. Additional estimates of residential water demand in Colorado include the following consumption rates:

- Colorado single-family residential water use: 96-143 GPCD (CSU, 2011)
- Denver South Metro Region single-family residential water use: 118-137 GPCD (DSEDP, 2020)
- Denver Water single-family residential water use: 90-120 GPCD (Denver Water, 2020)

Significant differences in these estimates are likely attributable to outdoor water usage and city or county initiatives to replace faucets, toilets, and shower heads to more water efficient models. It is also important to distinguish between normal, reasonable water demand and the water restriction and shortage demand conditions that the District has been forced to apply year-round. The most relevant consumption rate identified, 159 GPCD (CDM, 2011), likely reflects a "water-happy" unrestricted water demand for Idledale residents. This rate parallels the outdoor water usage typical of communities in Jefferson County and accounts for less efficient water appliances likely used in Idledale. The most recently reported population of Idledale is 252 individuals (US Census Bureau, 2010). Based on the reference per-capita daily consumption rate of 159 GPCD, the anticipated average annual daily demand is 40,100 GPD (0.12 acre-feet/day).

The estimate of average annual water demand of 40,100 GPD, based on comparisons with Jefferson County consumption rates, is substantially higher than the 21,560 GPD calculated using actual system data (Table 3.1). Based on the current population of Idledale, the per capita water demand is calculated at 85.6 GPCD, also considerably lower than the average consumption rates of nearby communities. There are various explanations for this discrepancy, but one of the most credible explanation is the District's self-imposed state of water use restrictions. Longer term, the difference can be explained by differing land use trends and potable water use for irrigation. Jefferson County includes multiple mixed development types throughout the county area, including rural and urban residential, commercial, and industrial areas, all of which have different water consumption rates.

Idledale is comprised of almost entirely single-family residential, which typically has significantly lowered rates of water consumption than areas with mixed development types. Also, even though the lots are larger, the steeper terrain landscaping methods result in smaller formal irrigated areas and larger portions of natural & native landscaping with less intensive irrigation requirements than are common to other suburban regions of Jefferson County.

3.2.2 Future Water Demand Projections

Both total annual and average daily water demand are anticipated to increase as population and development continues to grow in the District's service area. The question of significance is related more to the anticipated rate of growth and the associated effect on water supply planning. The District's service area includes approximately 418 individual parcels. These parcels consist of road rights-of-way, residentially zoned parcels, and properties owned by Idledale Water and Sanitation District, Jefferson County and the City and County of Denver. A breakdown of parcel type and area is shown in Table 3.2.

Table 3.2: Idledale parcel data summary by zoning type (Jefferson County, 2020)

Parcel Type	Count of Parcels	Area of Parcels (Acres)
Right-of-way Parcels (Roads)	138	124
City & County of Denver	3	<1
Jefferson County	7	3
Idledale Water & San. District	7	3
Residential (Developed)	188	355
Residential (Vacant Land)	75	189
Total	**418**	**675**

The total area zoned for residential use is approximately 545 acres, of which 355 acres have been developed and the remaining 189 acres are listed as vacant land. The vacant land is of importance to the District for projecting future water demand since these parcels could be developed in the future, requiring either District supplied water service or privately owned wells.

Currently Idledale is suppling water to approximately 147 properties or 78% of the developed parcels. This value includes all known service line connections, there may be some service lines using District water that are unaccounted for in this value. The remaining developed properties are likely connected to privately-owned groundwater wells, as is the case for multiple properties located near Bear Creek. A total of 44 wells have been permitted in Idledale but records do not indicate which of these wells are still in operation (CODWR, 2020). 44 residential groundwater wells correspond to

approximately 23% of water service connections in Idledale. Figure 3.5 shows the location of wells that have been permitted and constructed in the Idledale vicinity.

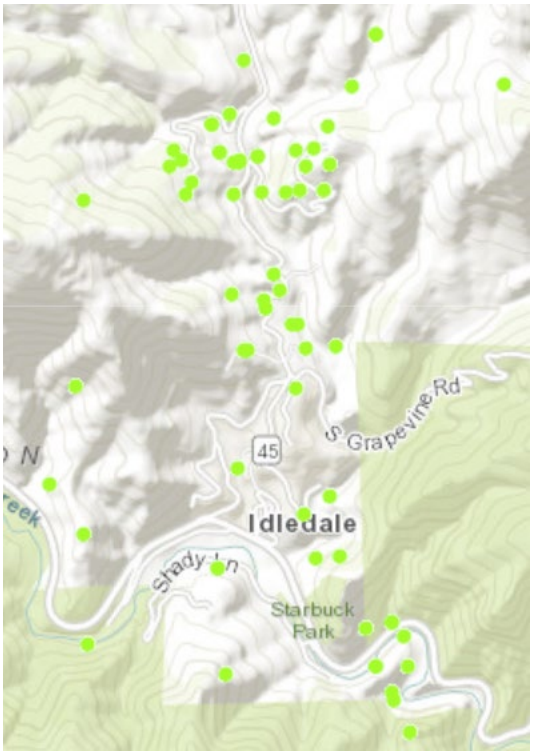

Figure 3.5: Groundwater wells (green symbols) permitted and constructed near Idledale. (CODWR, 2020).

While a maximum of 75 vacant parcels could require water service or wells if they were to be developed, at least 40% of the topography appears difficult to develop due to the mountainous terrain. This translates to an estimate of 45 more taps or a 25% increase as a conservative upper limit of water demand, without further service area annexation. While this estimate may be high, additional development will likely continue in Idledale at some level due to regional population pressures.

This water demand increase could be reduced if some properties permit and construct their own personal groundwater wells. The increased use of privately owned groundwater wells will adversely impact the water supply available to the District by further lowering the groundwater table in summer months or during periods of drought. A lowered groundwater table will reduce the rate and total quantity of water available to the existing District wells.

As one point of reference, a recent water consumption study conducted in Jefferson County projects an anticipated population growth rate of 1% until 2030 (CDM, 2011). Clear Creek and Gilpin Counties

are both expected to grow at 1.5% annually. Given the recent and likely continued effects through 2021 of Covid on economic factors, any measurable short-term growth would seem optimistic.

However, at some point, normal economic growth forces and development pressures are expected to increase the water demand by the amounts shown in Table 3.3. Three different levels of per capita daily demand have been applied to project a range of future demand. The current demand used in Table 3.3 includes the current water restrictions consumption rate of 27,280 GPD which establishes an uncomfortably low average daily demand of approximately 86 GPCD. Higher per capita demand values of 120 and 135 GPCD presented in this table reflect anticipated and potential maximum water demands without water restrictions and a 1% population growth until 2030. The final value projects future water demand to support a conservative full development build out scenario for the District.

Table 3.3: Range of Projected Water Demand based on Growth

Water Demand Driver	Increased Demand (GPD)	Avg. Daily Demand (GPCD)	Est. Service Area Population	Est. Water Service Taps	Avg. Max Monthly Demand (GPD)
Current Demand w/ Water Restrictions (Actual 2018-2020 data)	NA	85.6	252	147	27,280
Current Demand W/ No Water Restrictions	NA	120	252	147	30,240
Population Increase W/ No Water Restrictions (+1.0%/yr. for 10 yrs.)	6,080	120	278	162	33,360
Population Increase W/ No Water Restrictions (+1.0%/yr. for 10 yrs. Max demand)	10,250	135	278	153	37,530
Service Area Fully Developed (41 new service taps)	11,360	120	322	188	38,640

3.3 Water System Leak Assessment

As part of the overall scope of the Preliminary Engineering Study, leak detection was performed on the distribution system to assess the locations and relative amount of water lost to leakage. This section presents a description of the activities performed and the results of the survey.

3.3.1 Leak Detection Methods

Leaks within a water distribution system are an avoidable source of water consumption. The most effective way of eliminating leaks is to systematically check the system and identify areas where leaks

may be occurring. Service to these zones can then be isolated while leak repairs are completed. One cost effective method of leak detection employs sonic methods. The non-invasive process identifies leaks based on the sounds and vibrations produced at the site of the water jet escaping from the pipe under pressure. Pipe joints, fittings, valves, or hydrants that produce a strong sonic signature (>100 decibel) are likely to be the source of a leak. Advanced sonic testing equipment can more precisely define the leak location at the surface and significantly reduce the time and extent of excavation required. This method of leak detection does not directly quantify the magnitude of leaks, but estimates can be determined based on operator experience.

Leak testing of the Idledale water distribution system was conducted by Colorado Underground Detection, LLC on July 20-21, 2020. District operations staff prepared the system for leak detection by uncovering water main isolation valves, hydrant isolation valves, clearing undergrowth from valve locations, and clearly painting service line shut-off valves (curb stops). Every accessible point in the distribution system was tested for leaks in a systematic manner. First, all water main isolation valves, fire hydrants, and hydrant isolation valves were tested to assess leaks within the main distribution lines. Certain segments of the water distribution system extend 1,000 linear feet or more between isolation valves and sonic detection methods are less accurate when identifying leaks in long segments of pipes. To improve accuracy of leak detection along the main lines, residential service curb-stops were then tested. The spacing of curb-stops was significantly shorter than the system isolation valves, improving the quality of leak testing in the main distribution lines.

Each residential service line curb-stop that was known and accessible to District operators was also tested using sonic leak detection methods. In the event of high-decibel sonic readings at a curb stop, the homeowner was contacted to see if any water-consuming appliances were being used such as outdoor irrigation, dishwashers, washing machines, showers, faucets, or toilets. Any water use will register a similar sound as a leaking pipe and all usage must be stopped to accurately identify leaks. During the leak detection process, a “red” class water restriction was in place by the District, which prohibited outdoor water use. After it was confirmed that no water was being used at a property, a high-decibel sound emanating from a curb-stop identified a leak either between the curb-stop and home or between the curb-stop and water main. Additional testing methods using multiple sonic detectors can then be used to isolate the line where the leak is occurring.

3.3.2 Leak Detection Results

A total of 33 isolation valves, 126 curb-stops, and 8 hydrants were tested for leaks. That represented all known curb-stops and all isolation valves that could accessed without requiring significant excavation and utility line conflicts. Appendix B.1 includes water system leak detection results as a table of the decibel values recorded at each location and corresponding coordinates of the feature. A feature identification number was assigned to each testing point for ease of recording, these identification numbers do not correspond to numbers used by the District for identification. Most

tested features had sonic readings of less than 50db, corresponding to no leaks. Each isolation valve has also been located on a District map as illustrated in Appendix B.1

A total of five leaks were identified: two in hydrants and three in residential service lines. These results are summarized in Table 3.4.

Table 3.4: Identified Leaks and Locations

Feature Type	Location	Address (Coords)	Decibel Reading	Estimated Leak Magnitude
Hydrant (OLD-06)	Shady Lane near bridge	(39.6623, -105.2410)	128 db	2-3 GPM
Hydrant (OLD-01)	End of Mt. Evans Rd.	(39.6689, -105.2415)	105 db	2-3 GPM
Service Line	W Grapevine and HWY 74	21789 State HWY 74	338 db	3-5 GPM
Service Line	SE Grapevine and Ryan's Ln	2895 SE Grapevine Rd	250 db	2-4 GPM
Service Line	Middle of SE Grapevine Rd	2694 SE Grapevine Rd	334 db	2-4 GPM

A conservative total of 11 GPM was estimated at the time as being lost through leaks in the system, which represents a significant percentage of the total well pumping rates shown in Table 3.1. The average annual combined pumping rates from Wells 1A and 1B are 14.6 GPM. Water losses through leaks could then be calculated at 75% of the total water supply, which is substantially larger than typical municipal water system losses of 16%. Leak sources were as follows:

- Hydrant OLD-06, on Shady Lane, was leaking through a crack in the outer casing even though the hydrant valve and hydrant isolation valve were both shut off. This indicates a faulty isolation valve that should be replaced to stop the leak. This hydrant is also nonoperational due to cracks in the hydrant casing and should be removed, per request by Foothills Fire District.

- Hydrant OLD-01, at the end of Mt. Evans Road, was likely leaking below grade, a common issue with older fire hydrants. This hydrant is also non-operational due to a stuck main hydrant valve. The isolation valve for hydrant OLD-01 is shut off but continues to register a high-decibel signal, indicating a faulty value that should be replaced to stop the leak.

- The first service line leak, located at 21789 State HYW 74, was the strongest leak identified in the system. The homeowner was contacted to ensure no water was being used on the premises. The service line was isolated by shutting off the water service valve on the inside of the home. The curb-stop was still registering a high-decibel signal, indicating a leak between the curb stop and house water shut-off valve. Additional test methods were used that

narrowed the leak to the service line behind an approximate 12-foot retention wall. The homeowner was contacted, and the curb-stop was shut off until the leak could be repaired.

- The second service line leak, located at 2895 SE Grapevine Rd, was identified through a high decibel reading. The homeowner could not be reached, and no individuals were at the property at the time of inspection and no confirmation could be obtained regarding water usage. This leak could either be a service line leak or running faucet or toilet, but the homeowner needs to be contacted to confirm. This property should be checked for leaking faucets or toilets and reassessed for leaks. The curb-stop was shut-off until the property owner could be contacted to repair any leaking appliances.

- The last service line leak, located at 2694 SE Grapevine Rd, was likely a significant leak in a toilet or other water-consuming appliance. The homeowner was contacted regarding indoor water use during the test but indicated no leaks were present. During a previous round of leak testing, this same home was identified as having a leaking toilet. The homeowner was informed they needed to fix the issue by hiring a plumber to repair the toilet, but no confirmation was received by the District for whether this repair occurred. After the homeowner was contacted, they were informed they needed to repair the leaking toilet before their service would be turned back on.

3.3.3 Leak Testing Conclusions

As of this date, all previously identified leaks have been repaired or isolated, saving the District significant water during the recent period of drought and water deficit. If wells would return to performing at pre-2020 drought conditions, the saving of this wasted water reduces the amount and duration of the water supply deficit condition discussed earlier.

Leak testing is an efficient and cost-effective tool for identifying wasted consumption in a water distribution system. It is essential to minimize leaks in a small community water system, especially one that is experiencing water supply deficit problems. Leak testing should be conducted regularly (every 1-2 years) to assure water loss is kept low. The addition of water meters, a topic discussed in a prior memo to the District, would also provide another line of leak detection. Water meters can provide a quick and easy method of identifying leaks in service lines when a property is not actively consuming water. Implementing a leak detection program, in conjunction with water meter installations, will greatly improve the District's ability to minimize system losses.

4 Water System Fire Protection Assessment

This Section of the report summarizes the findings of fire hydrant inspections and flow testing conducted on the Idledale Water and Sanitation District's (the District) water distribution system on June 4th, 2020.

A hydrant testing plan was developed by Orsatti Water Consultants in collaboration with Idledale Water and Sanitation District and Foothills Fire Protection District (Foothills) to assess the condition of Idledale's fire protection water distribution system. Each fire hydrant currently installed on the District's distribution system was visited for condition assessment and flow testing. A total of nine hydrants were visited and four hydrants were flow tested. This information serves to guide recommendations for the District's fire protection system to improve system performance and meet the desired expectations of the local fire protection district, Foothills Fire and Rescue.

4.1 Hydrant Inspections and Flow Testing Results

Each of the District's nine fire hydrants were assessed for condition, functionality, and flow rate, whenever possible. The locations of each of these hydrants are listed in Table 4.1, along with their operational status and notes regarding condition. Each of the hydrants listed as functional were flow tested. Hydrant Nos. 3, 4 6, 7 and 9 were considered unacceptably difficult to open by Foothill's Fire personnel. These hydrants all required the use of a large breaker bar and 2 personnel to operate the main valves. Foothill's personnel noted that the difficultly of operation renders them unacceptable to effectively utilize in the event of a fire. Hydrant Nos. 5, 6, 7, 8, and 9 had substantial leaks in either the casing or near the threads of the outlets.

When the main valve is turned on, significant leaking occurred. This hindered the ability to effectively perform flow tests on multiple hydrants. Hydrant No. 4 showed significant build-up of calcium scaling, which was partially flushed out during flow testing. The amount of scale built up within this hydrant would have been enough to inhibit flow in hoses during a firefighting event.

Table 4.1: Hydrant locations, elevations, and notes

*Hydrant Identifier**	*Functional (yes/no)*	*Latitude*	*Longitude*	*Elev. (ft - MSL)*	*Notes*
1	Yes	39.6728584	-105.2424346	6,783	Fully functional
2	Yes	39.6710212	-105.2415770	6,745	Functional but very loose main valve stem. Likely a loose or broken internal bushing.
3	No	39.6688746	-105.2415347	6,745	Unable to open main hydrant valve

4	Yes	39.6682513	-105.2427186	6,648	Functional but very difficult to operate main hydrant valve. Breaker bar and 2 people were required to operate main hydrant valve.
5	No	39.6663350	-105.2411710	6,575	Large crack on hydrant casing.
6	No	39.6655631	-105.3421945	6,480	Significant crack on hydrant casing near outlet threads. Breaker bar and 2 people were required to operate main hydrant valve.
7	No	39.6649788	-105.2476585	6,478	Significant crack on hydrant casing near outlet threads. Breaker bar and 2 people were required to operate main hydrant valve.
8	No	39.6623320	-105.2409466	6,415	Large crack on top of hydrant casing
9	Yes	39.6679199	-105.2454655	6,630	Significant crack on hydrant casing near outlet threads. Breaker bar and 2 people were required to operate main hydrant valve.

*Note: Hydrant identifiers used in this memo may differ from identifiers used by Idledale operators. Hydrant identifiers will be updated once established ID's are provided by Idledale operators.

Flow testing was performed on the functional hydrants listed in Table 4.1. Flow testing was performed in accordance with AWWA M17 guidelines for hydrant flow testing (AWWA, 2006). A closed 2.5" adapter fitted with a pressure gauge provides static pressure while a pitot tube fitted to 2.5" threaded female adapter provides pitot pressures during flow release. The outlet fitting within the fire hydrant is noted prior to flow testing to provide a discharge coefficient. The static pressure gage is fitted to a hydrant outlet and the main flow valve is opened. After the pressure stabilizes, the static pressure is recorded. The main valve is then turned off and the static gauge is removed and replaced with the pitot tube. The main valve is then opened a second time and the hydrant discharges through the pitot tube. The pitot pressure is recorded after the pressure gauge has stabilized. The static pressure, pitot pressure, outlet diameter and discharge coefficient allow for flow rates to be calculated after data collection. A summary of field data and flow rates are shown in Table 4.2.

Table 4.2: Summary of hydrant flow testing results

Hydrant Identifier	*Discharge Coeff.*	*Outlet Dia. (in)*	*Static Pressure (psi)*	*Pitot Pressure (psi)*	*Calculated Discharge (gpm)*
1	0.9	2.5	22.5	5	375
2	0.9	2.5	37.5	5.25	384
4	0.9	2.5	96	6.25	419
*9**	0.9	2.5	90	4.5	356

*Note: Hydrant 9 had significant leaks coming from outlet threads during flow testing.

The calculated discharge values in Table 4.2 show a strong correlation with static system pressure and flow rate. Foothill's personnel indicate that they utilize final flowrate values to assess the viability of a hydrant for fire protection purposes. The flow rates from the tested hydrants indicate low but acceptable flow rates for fire suppression.

4.2 Pressure Relief Valves

The Idledale Water and Sanitation District operates three pressure relief valves (PRVs) to manage the high elevation heads present in the system. The locations and elevations of the PRVs are summarized in Table 4.3.

Table 4.3: Pressure Relief Valve locations and elevations

PRV Identifier	*Latitude*	*Longitude*	*Elev. (ft-MSL)*
1	39.667665	-105.24164	6,645
2	39.662309	-105.24074	6,438
3	39.665771	-105.24364	6,471

The District is current in the process of replacing these PRV's to ensure they properly maintain pressure in the water distribution system. District operators noted that the existing pressure gauges installed on the PRVs were not fully functional and do not provide accurate pressure readings. We recommend that the District installs new working pressure gauges on the existing PRVs to provide additional pressure data. This pressure data would assist in the on-going assessment of the water distribution system. Along with pressure gauges, we also recommend installing flow meter heads on

the PRVs when replacement occurs. Flow meter heads on the PRVs would provide an additional line of evidence for water consumption at multiple points in the system without requiring substantial numbers of water meters to be installed along distribution lines.

4.3 Fire Protection System Recommendations

Foothills Fire Protection District is not currently relying on water from Idledale's distribution system and fire hydrants for local fire protection. Fire suppression operations rely on other natural water sources, such as Bear Creek, for their water supply requirements. Foothills have recognized ISO-approval throughout the Town of Idledale, allowing residents to obtain fire-related homeowners insurance. The ISO rating Foothills currently holds is not contingent on the use of fire hydrants on Idledale's water system.

Due to the current ISO rating of Foothills and the existing operating practices of fire suppression, additional fire hydrants are not being recommended at this time. It is the recommendation of this assessment to either replace or recondition all non-functioning fire hydrants to a condition that is satisfactory to Foothills personnel. The American Water Works Association's Manual of Water Supply Practices provides documentation of best-practices for installing and testing fire hydrants (AWWA, 2006). Non-functioning hydrants, including hydrants that cannot be opened by one person with a standard hydrant wrench, should be painted black to indicate they are not currently functional. This is a simple indicator to firefighting personnel that the fire hydrant is not adequate to assist in fire suppression activities.

Fire hydrants that are being replaced or reconditioned and/or are in proper working order, should be color coded for flow rate based on National Fire Protection Association (NFPA) and Foothills standards. These standards include the following (NFPA 291, 2019):

Blue: 1,500 GPM or higher
Green: 1,000-1,500 GPM
Orange: 500-1,000 GPM
Red: Less than 500 GPM

By replacing or reconditioning all hydrants to acceptable working condition, the fire suppression ability of Idledale's water system will be greatly improved. Even without the use of Idledale's water system for fire suppression purposes, Foothills Fire Protection District has established procedures in place to adequately protect Idledale from fire dangers. Repairing existing hydrants and bringing them up to NFPA standards would increase the efficiency of Foothills ability to fight natural and structural fires in and near Idledale.

In addition to revitalizing existing fire hydrants, on-going operation and maintenance procedures should be followed by District operators to maintain functionality. It is recommended that the District

develop an operation and maintenance plan specific to the fire protection system. This maintenance program should include the follow attributes:

- Twice annual inspection of dry-barrel hydrants (6-month spacing between inspections)
- Lubricate hydrant valves and outlet threads based on manufacturers specifications
- Repair leaks noted during system operation
- Twice annual hydrant flushing to remove scale build up
- Record keeping to maintain on-going record of maintenance activities

There are many resources available to develop a fire hydrant maintenance plan including AWWA M17 (AWWA, 2006). Frequently inspecting and operating fire hydrants provides a cost-effective method of assessing the fire protection system while allowing for early detection of any issues with hydrant operation.

5 Water System Improvement Alternatives

This Section summarizes the condition of the existing groundwater supply infrastructure, with recommendations for continued operation and maintenance. Different alternatives for improving the quantity and reliability of the raw water supply for the District are also developed.

Given the seasonal variability of the current water source and the observed shrinking availability, the District should acquire additional water supply to provide year-round firm water capacity for the system. Failure to respond will result in water shortages, continued water hauling and the associated financial repercussions. Two different paths for providing the required water supply are presented for comparison. These include the construction of a new District water well or connecting the entire District to the adjacent Genesee Water & Sanitation District. Required improvements, operational logistics, generalized costs, risks, and final recommendations will be discussed as related to gaining that firm capacity.

5.1 Existing Supply Wells

As previously mentioned, the District currently has four groundwater wells installed and connected to the distribution system. These include three currently operational wells: Well 1A and Well 1B located near the water storage tank, and the Ridgeway Well located further down valley close to the Forks Building. The additional Sawmill Well, is located approximately 600 feet northeast of the Forks Building. However, this well is not currently operational and has been disconnected from the System. Each well is located within the District as shown on Figure 5.1 in Appendix C.1.

Well improvement surveys were performed in 2020 to assess the condition and need for potential improvements to these existing wells. These surveys, conducted by Colorado Water Well in March and September of 2020, included downhole video assessments and water quality analyses. A summary of these surveys, construction details, relevant water quality information, and recommendations for improvements are discussed in the following sections with supporting documentation in Appendix C.2.

5.1.1 Well 1A Facilities

Well 1A is located immediately southeast and adjacent to the 250,000 gallon water storage tank, and has just recently experienced an electrical failure. This has occurred shortly after a new pump and motor were installed by Colorado Water Well last year. The District has observed that the well output has been decreasing in the last 6 months and the reduced production may have resulted in insufficient motor cooling, leading to premature motor failure. Prior to the failure, it was producing a consistent 6-10 gpm and was thought to be one of the District's best producing wells, but it was experiencing a reduced output of 4-5 gpm shortly before failure. Existing well construction and pump details are listed in Table 5.1.

Table 5.1: Well 1A construction and existing pump details

Well 1A		
Feature	**Value**	**Unit**
Casing Size and Material	6" Steel	-
Well Screen Type	PVC	-
Discharge Type	Pitless Adapter	-
No. of Screened Intervals	2	-
Pump Model	Goulds 13GS30	-
Pump Voltage and Phase	230v/3P	Volts/Phase
Pump Horsepower	3HP	HP
Pump Setting Depth	460’	Feet below top of casing
Pitless Discharge	5'	Feet below top of casing
Top of PVC Drop Pipe	12'	Feet below top of casing
Static Water Level	21'	Feet below top of casing
Top of 1st Screen	628'	Feet below top of casing
Bottom of 1st Screen	648'	Feet below top of casing
Top of 2nd Screen	668'	Feet below top of casing
Bottom of 2nd Screen	688'	Feet below top of casing
Total Well Depth	708'	Feet below top of casing

The District has since followed the recommendations outlined by Colorado Water Well and presented to the District as a proposal dated July 22, 2020 included in Appendix C.2. These recommendations included the following items:

- First address the reduced well output and proper hydraulic sizing of the pump and motor to confirm adequate cooling requirements before proceeding with Colorado Water Well recommendations of July 2020.

- Following confirmation of appropriate hydraulic sizing, replace the existing submersible pump with a higher output pump (Grundfos 16S50-38), increasing power from 3HP to 5HP.
- Lower the pump to a depth of approximately 680-feet below ground surface (BGS), an increase in depth of approximately 220'
- Provide upgraded electrical connections to supply new submersible pump and associated piping and transducers to support these modifications
- Test the new pump and integrating transducers and electronic components within existing pump controls and programming

These pump modifications have occurred this past May and the summary of the pump and motor replacement and resetting is detailed in the Well Installation Report prepared by Colorado Water Well in Appendix C.2. Lowering the pump and increasing its power should increase the spatial influence of the well and improve overall annual production. It is expected with the lower setting depth that the well will see favorable pumping conditions for more days of the year.

5.1.2 Well 1B Facilities

Well 1B is located southwest of the water storage tank, near the east shoulder of S. Grapevine Rd. It is also directly northwest of the Treatment Building, is currently operational and had been historically producing between 2.5-5 gpm of water. With the recent failure of Well 1A, production rates at Well 1B have increased slightly to 5-6 gpm. Well construction and pump details are listed below in Table 5.2.

Table 5.2: Well 1B construction and pump details

Well 1B		
Feature	**Value**	**Unit**
Casing Size	6" Steel	-
Well Screen Type	Open Hole	-
Discharge Type	Pitless Adapter	-
Pump Model	Goulds	-
Pump Voltage and Phase	230 V, 3 Phase	Volts/Phase
Pump Horsepower	3 hp	HP
Top of Casing	0'	Feet below top of casing
End of Casing (Open Hole Start)	20'	Feet below top of casing

Static Water Level	40'	Feet below top of casing
Total Well Depth	451'	Feet below top of casing

Following the inspection and cleaning of Well 1B by Colorado Water Well, no issues of concern were observed that required attention and no recommendations for improvement were provided. There is the added concern that increasing production at Well 1B could negatively impact Well 1A production due to the wells' proximity to each other. If production of Well 1A is not substantially increased after the pump modifications are completed, additional improvements to Well 1B may be warranted. However, until improvements to Well 1A and others are implemented, it is recommended to continue the operation of Well 1B as it is currently configured.

5.1.3 Wells 1A and 1B Water Quality

CDPHE has determined through water quality testing that both Wells 1A and 1B are classified as GWUDI (groundwater under direct influence of surface water). As such, the District has been mandated to provide GWUDI treatment of both wells and has also been directed to increase the disinfection dosage to confirm 4-log removal of pathogens until the improvements have been implemented.

The plan moving forward as discussed earlier is to install GWUDI treatment in the Upper Treatment Building at the existing Well Influent Manifold, upstream of the existing disinfection injection point and flow meters.

Otherwise, water quality testing results for Wells 1A and 1B as provided in Appendix B show water quality to be generally good with no elevated primary or secondary MCLs (maximum concentration levels) of measured contaminants.

5.1.4 Ridgeway Well Facilities

The Ridgeway Well is located near the Forks Treatment/Blending Building in the back yard of a private residence on SW Grapevine Road, near the center of the distribution system as shown on Figure 5.1 in Appendix C.1. The Ridgeway Well underwent a down hole inspection, cleaning and pump and motor replacement by Colorado Water Well in August 2020. Results of that rehabilitation are also included in Appendix C.2. Electrical power service improvements were recently made by the District for the well and it now provides water to the Forks Treatment Building. Flow output from the well has been measured at 9-10 gpm continuously. However, existing piping conditions are limiting actual flow to the distribution system to 4 gpm. While the well pump appears to be operating without problems, this existing output is significantly less than the well's previous historic output.

There is speculation that partial blockage in the piping between the well and the Forks Building may exist.

A minimum of weekly monitoring of the well pump and motor's hydraulic and electrical performance is recommended. Specific well construction and pump details are listed in Table 5.3.

Table 5.3: Ridgeway Well construction and pump details

Ridgeway Well		
Feature	**Value**	**Unit**
Casing Size	6" Steel	-
Well Screen Type	PVC	-
Discharge Type	Pitless Adapter	-
Pump Model	Sta Rite L20P4JH	-
Pump Voltage and Phase	460v/3P	Volts/Phase
Pump Horsepower	3HP	HP
Pumping Setting Depth	481.5′	Feet below top of casing
Top of Casing	0'	Feet below top of casing
Pitless Discharge	5′	Feet below top of casing
Top of PVC Drop Pipe	9′	Feet below top of casing
Static Water Level	104′	Feet below top of casing
Top of 1st Screen	241′	Feet below top of casing
Bottom of 1st Screen	261'	Feet below top of casing
Top of 2nd Screen	402′	Feet below top of casing
Bottom of 2nd Screen	483′	Feet below top of casing
Total Well Depth	502′	Feet below top of casing

5.1.5 Ridgeway Pipeline

To better use the available capacity of the Ridgeway Well, it is recommended to build a new pipeline to connect the Ridgeway Well to the Upper Treatment Building near the water storage tank as illustrated in Figure 5.1 in Appendix C.1. According to historic knowledge, an abandoned water line runs between the two treatment buildings. This could provide a cost-effective means of running a new 2" main inside the existing pipe, significantly reducing construction costs. This pipeline would create the immediate benefit of being able to utilize 100% of the Ridgeway Well output capacity, which translates to a 5-6 gpm increase in the net water supply delivered to the system.

The existing non-functional water line could be used as a conduit, through which to run a new smaller water line, which would reduce construction costs compared to constructing a new water line in an existing easement. Potentially, a continuously insulated, 2-inch polyethylene waterline, could be installed in the existing waterline using direct push/pull installation techniques. The insulation would protect the new line from freezing in areas where the existing waterline conduit is within the frost-zone of the subsurface. It is highly recommended that the District perform a video survey of the existing abandoned water line to confirm its ability to be used as anticipated.

The existing water line is approximately 2,530-feet long. An additional 900-feet of water line would be required to connect the Ridgeway Well with the existing waterline conduit, for a total piping length of 3,430-linear feet. The final 900-feet could be completed using direct push or traditional trench techniques, which would occur predominantly in the public right-of-way along South and Southwest Grapevine Roads. This 2" waterline would connect to the pitless adapter currently installed at the Ridgeway Well and would add approximately 120 ft of additional head to the pump hydraulic requirements. This will also increase the pump motor horsepower requirements and necessitate a new replacement pump, motor, and variable frequency drive. No additional electrical improvements are anticipated. Total costs for this new water line and associated well improvements are presented as Items 1A-F in Appendix C.3, the Preliminary Construction Cost Estimate.

5.1.6 Ridgeway Water Quality

As is understood by the District, the Ridgeway Well suffers with various water quality issues. The constituent of greatest concern is Uranium. Background concentrations of Uranium in the Ridgeway Well water supply exceed the USEPA maximum contaminant level. Water sampling conducted on August 12, 2020 indicated uranium concentrations of 0.046 mg/L, which is 0.016 mg/L above the USEPA MCL of 0.03 mg/L. As mandated by CDPHE, blending is required to reduce uranium concentrations and conform with drinking water regulations. The blending system designed and approved by CDPHE at the Forks Treatment Building currently provides for the 50% dilution by volume with the District's existing potable water supply. Blending the Ridgeway Well water at a 1 to 1 ratio with other acceptable water sources will continue to be required to mitigate the background uranium.

In addition, the Ridgeway Well has elevated concentrations of secondary contaminants including carbonates, sulfates, iron, and manganese. These contaminants do not present direct health concerns, but they do contribute to water taste, odor, clarity issues, and will be a source of continuous maintenance if not properly managed. While various treatment technologies are available, green sand pressure filtration has been used very cost effectively in treating groundwater sources of similar quality. It requires a small footprint for the filtration equipment and the addition of readily available potassium permanganate or sodium hypochlorite which is the District's primary disinfectant. This treatment technology is easily scalable and can be upsized if needed to treat an additional water source.

By delivering the Ridgeway water supply to the Upper Treatment Building, a single water treatment facility can be more efficiently operated and maintained by combining the GWUDI filtration requirements for Wells 1A and 1B with the dilution and green sand filtration requirements for the Ridgeway Well. Should a new well source require either or both treatment technologies, this Upper Treatment Facility would be easily modified to provide that additional capability. Treatment modifications to the Upper Treatment Building represent another area of essential improvements to the District infrastructure and costs for these improvements are identified as Items 3A-F in Appendix C.2, the Preliminary Project Cost Estimate.

5.1.7 Sawmill Well Facilities

The Sawmill Well is located approximately 800 feet to the northeast of the Forks Treatment building, down closer to the thalweg of the drainage basin. The Sawmill Well is not currently used for production due to radionuclide contamination. However, recent well survey information indicates the well is capable of being placed in an operational condition. Currently the Sawmill well does not contain a functioning pump. Well construction details are listed below in Table 5.4.

Table 5.4: Sawmill Well construction and pump details

Sawmill Well		
Feature	**Value**	**Unit**
Casing Size	6" Steel	-
Well Screen Type	PVC/Open Hole	-
Discharge Type	Pitless Adapter	-
Top of Casing	0'	Feet below top of casing
Pitless Discharge	5′	Feet below top of casing

Static Water Level	23′	Feet below top of casing
Top of Screen	111′	Feet below top of casing
Bottom of Screen/Begin Open Borehole	213′	Feet below top of casing
Total Borehole Depth/End of stable Open Hole	249′	Feet below top of casing
Total Well Depth	451′	Feet below top of casing

Based on limited documentation, the Sawmill Well was identified as a strong producer at approximately 20 gpm. But it was decommissioned from use due to elevated radionuclide concentrations and a failure to properly operate and maintain the radiological treatment equipment. This resulted in the District decommissioning the treatment process and the well. While no further investigations have been performed by the District, an abandoned uranium mine is located 800 feet up gradient from the well. It was designated as a Superfund site by the EPA and surface remediation was performed at the site. It is reasonable to deduce that the radionuclides present in the Sawmill Well water originate from this mine geology.

While the volume of water from the Sawmill Well is excellent, the District Board does not wish to evaluate current technologies for the treatment and removal of the radionuclide contamination. The added risk related to occupational safety and disposal of radioactive waste is not a burden the District wishes to undertake at this time considering the recent history. Because of these factors, the Sawmill Well will remain decommissioned and excluded from further evaluation at this time.

5.2 Water Supply Development Alternatives

In addition to the well improvements recommended above, it is essential for the District to acquire additional year-round reliable water supply. Of the potential solutions available to the District, two approaches have been selected as the most practical and potentially affordable alternatives to evaluate. The first alternative includes the drilling of an additional hard rock well, and the construction of the supporting infrastructure. The second alternative evaluates the connection of the District to the adjoining Genesee Water and Sanitation District via a master service meter connection and 2" transmission main. The "Genesee Connection" will be summarized immediately following the discussion on drilling a new well.

5.2.1 New Well Development Risks and Recommendations

Additional water supply could be provided to the District by constructing a new groundwater extraction well. A new well could be placed to extract water from a different zone in the groundwater table, providing additional supply and increasing system-wide reliability and redundancy.

There are, however, risks associated with constructing new wells that the District should consider. These risks include uncertainty in production quality and quantity, and groundwater recharge potential. Even with extensive investigation into subsurface characteristics, it is impossible to guarantee that a well will consistently produce the amount of water the system requires and there is the possibility a newly constructed well does not end up justifying its development costs.

Some of the most common points-of-uncertainty exist in the following factors: seasonal groundwater fluctuations that could reduce pumping rates during periods of low recharge, seasonal fluctuations of groundwater quality that impair the drinking water quality during certain times of the year, long-term sedimentation that could require significant operation and maintenance costs, low recharge for extended periods of time due to local or regional drought conditions, low performance due to lower than anticipated groundwater recharge, and soil movement due to erosion, flooding, or rockfall.

An appropriate strategy to mitigate these risks is to perform a hydrogeological investigation of the area to assess long-term performance of the new well, determine if the pumping rates are adequate for the system's needs, and determine the best available location for construction. Even with an appropriate feasibility study, increased uncertainty exists with well construction in the mountainous Idledale areas. Mountainous regions experience significantly increased risks for slope erosion and movement, recharge rate uncertainty, and fluctuating supply rates through hard-rock fractures.

5.2.2 New Well Construction and Considerations

A newly constructed well in Idledale will have comparable build specifications to the existing wells in the system: Well 1A, Well 1B, and Ridgeway are all hard rock wells, drilled into bedrock to intercept water bearing seams in the bedrock geology. Until recently, Wells 1A and 1B were providing a consistent supply of water, with rates declining during the late spring to early fall. This is likely due to lowered groundwater recharge conditions associated with extended periods of low rainfall and drought.

After consulting with Tom Dea of Colorado Water Well, Jordan Keaton of James Drilling was engaged to provide insight and recommendations for the placement of a new well in Idledale. James Drilling is responsible for drilling the majority of the residential hard rock water wells in the surrounding area and has one of the best understandings of local hard rock well geology and hydrogeology.

Determining the potential location for a new supply well typically involves researching locations and depths of existing groundwater wells, utilizing GIS data to uncover faults and formations in the vicinity, and even drilling exploratory wells to determine if a location would provide the quantity of water required of the system. Another method of informing well design is to investigate the construction of wells permitted in the area. Using data available from the Colorado Dept. of Natural Resources Division of Water Resources, we have assessed construction specifications for privately

owned groundwater wells in the Idledale area. There are approximately 48 permitted groundwater wells within Idledale town limits (CODNR, 2020). These wells range in water production from 1-15 GPM, with an average production rate of 7.5 GPM. Wells located at higher elevations generally have lower production rates than those located at lower elevations. The depths of these wells range depending on their location, with wells located higher in elevation generally being deeper than those located near Bear Creek. Well depths ranged from 120-742 feet BGS, with an average depth of 332 feet BGS.

Land ownership is also a significant factor in determining the locations of new wells. New well construction costs can be substantially reduced if the well can be built on land already under District control. An additional design consideration is how the well would be incorporated into the existing piping and treatment system. New well installation costs could be significantly reduced if the well placement location does not require extensive piping connections or appurtenances. For these reasons, feasible well locations for new construction have been limited to within a one quarter-mile radius of the Upper Treatment Building.

5.2.3 New Well Placement Recommendations

A field investigation was performed with Jordan Keaton and Michael Whelan in early March to scout out and discuss potential alternative locations to drill a new water supply well. We used the one-quarter mile radius from the Upper Treatment Building as the initial survey area to keep pipeline costs within projected limits. Figure 5.1 in Appendix C.1 shows the one-quarter mile radius and three potential sites that were located on the visit within that area. Each of these locations was selected based on surface conditions and anticipated geologic and hydrogeologic conditions. It is recommended that the District confirm land ownership at these three locations and initiate discussions to determine common interest in the development of a new water well to be owned and operated by the District.

Depending on the outcome of the land ownership contact process, additional sites also exist in the vicinity, and it appears that Site Nos. 3 – 6 may exist on District owned property, as assessed using Jefferson County parcel data (Jefferson County 2021). Each of these locations are near the Upper Treatment Building and storage tank, which provides close access to existing system piping and tie-in locations. Site No. 2 is northeast of the existing Water Treatment Building and is located on privately owned property. This area has been selected due to its location upslope of the Treatment Building and further distance away from existing wells 1A and 1B. A new well in this area would have even less influence on production at the existing wells. Additional analysis would be required to determine which of these potential well locations would be the most cost-effective location for new well construction.

All these sites are located within the Piney Creek Alluvium, which is the same geologic layer that all existing District wells are currently located (Scott, 1972). Identified well locations are near the Junction Ranch Fault, which likely contains zones of fractured bedrock that could promote well production and funnel water to well capture zones. The identified areas are all within a zone of known water-bearing geologic formations, which reduces production risks by extracting within a proven formation. All feasible well locations are substantially upgradient from the historic Grapevine Uranium mine, reducing potential radionuclide contamination.

5.3 Genesee Connection Alternative

In evaluating different alternatives to provide year-round reliable water supply to its customer base, it is routine to assess the potential to regionalize or become part of an adjacent, larger system rather than provide the capital required to significantly improve the existing water system. In the case of Idledale, this alternative is a very real potential situation. The Genesee Water and Sanitation District is contiguous to and immediately west of Idledale's service area. They have been contacted by the District to discuss and determine the viability of Idledale becoming a service customer of the Genesee District. Through numerous discussions, it has been determined that the best technical solution includes the construction of a 1.5-inch master service meter station located just adjacent to 2136 Montane Drive East where an existing 8" watermain would be tapped as shown on Figure 5.2 in Appendix C.1. The Master Meter installation would also require approximately 4,025 lineal feet of 2" potable transmission main, crossing private property to ultimately connect to the Upper Treatment Building for delivery to the 250,000-gallon storage tank. Construction of the pipeline is anticipated to incorporate Horizontal Directional Drilling (HDD) to reduce construction costs and minimize surface disturbance.

The Genesee Connection concept has significant benefits when compared to the alternative to improve and expand Idledale's groundwater well system infrastructure. By connecting to Genesee, the District would be connecting to a source that comes from surface water rights of supply which are inherently more reliable over the life of the District. There would be no further concerns about existing well facilities operation & maintenance or seasonal problems with groundwater recharge. The District functioning and associated day to day responsibilities would become far simpler, focusing on the continued operation and maintenance of the water storage tank and distribution system.

5.3.1 Genesee Connection Requirements and Cost Considerations

There are constraints that the Genesee Water & Sanitation District has placed on a master meter service connection that need to be understood before assessing Idledale's appetite for this approach. Specifically, Genesee has stated, "Any water not stored, but diverted, treated, and supplied by Genesee to Idledale would need to be predicated upon the successful transfer of related water rights by Idledale, in the amount necessary and when in priority, for Genesee to divert at its' Genesee

Mountain Pipeline ("point of diversion") for subsequent treatment, pumping and distribution to a separately metered Master Tap."

This would require Idledale to first acquire and perfect the necessary water rights through related engineering and the Colorado water courts. Only then would Genesee move forward with a realistic service agreement. Conversations with Genesee indicate they recently acquired an option to purchase 9 shares of Hodgson Ditch water. This was done primarily with Idledale's interests in mind, believing this may provide for a possible but unknown solution to the water rights issue. The Hodson Ditch is the No. 3 right on Bear Creek, meaning it is a very senior right on the stream system and, historically not called out very often. The water right (9 shares) would require the necessary engineering and legal work to quantify usable amounts and ability to move the water from the ditch upstream to Genesee's point of diversion.

Genesee is of the opinion, this water rights work and all associated costs should be the full responsibility of Idledale as Idledale would be the beneficiary and owner of the right, should it ultimately provide a solution to the matter. Associated costs to move through this process have been estimated for comparison purposes and total costs for the Genesee Connection alternative have been estimated at $2.23 M as detailed in Appendix C.3, Genesee Connection Alternative Costs. Finally, Genesee would also plan to charge Idledale $18.00 per 1,000 gallons of metered flow as an ongoing direct service charge.

5.4 Water Service Meters Assessment

This Section summarizes options for residential water service meters incorporating local considerations and provides final recommendations for what a typical meter installation should include. Currently, only one domestic water meter has been installed at a point-of-use location within the distribution system. This installation came out of an awareness of a leaking service line that was negatively impacting the operation of the entire water system.

The current configuration of the District's distribution system only provides for water quantity measurement coming from groundwater well pumping, but at no points on the consumption side of the system. This prevents the District from monitoring water consumption for comparison to water production, the difference potentially representing on-going system leaks. This situation also limits available information about trends in consumption. Given how dramatically close the District is forced to maintain the daily water balance in the system, it is essential to increase operational awareness by installing water meters on all service lines. This will promote more effective system operation, reduce system losses, and will provide sorely needed information about water demand within the District's system.

Primary considerations for water meter installation design include options for physical placement on service lines, the type of meter and anticipated maintenance, installation costs, and the meter

reading and data collection process. Finally, standard design recommendations for a typical residential water meter installation will be provided.

5.4.1 Water Meter Selection

Water meters used to measure municipal water consumption are typically positive displacement, flow-through style meters which measure the total volume of water that passes through a specific point along a water main or domestic water service line. In the case of monitoring residential water usage, the American Water Works Association (AWWA) has established a standard that water meters shall be placed at a point on the service line that supplies a property with water, prior to any withdrawals. This approach assures that a single meter measures all the water (and only that water) being consumed at a given property or associated billing address.

The AWWA has also established standards for different types of water meters used by municipalities and water districts to ensure consistency and compatibility throughout any given distribution system. AWWA has recommended multiple different water meter designs, but most commercially available meters are compliant with AWWA standards for accuracy and long design life (AWWA, 2012A). The selection of any given meter should depend on anticipated flow rates, pipe size, pressure losses, maintenance requirements, ease of access for recording readings, frost/freeze protection, and cost. Regardless of which meters are selected, they should be uniform across a system when installing new meters or replacing existing meters. This will allow for ensuring compatibility in replacement meters as well as for potential bulk purchasing discounts. An acceptable water meter is one that is reliable in accuracy, have a long design life, be easy to maintain, and have low initial costs and maintenance costs.

One of the most cost-effective, durable and accurate meter designs for domestic potable service applications is a positive displacement, nutating disc meter. Various high quality meter manufacturers employ this design and one such example is the T-10 meter by Neptune Technology Group, as highlighted in Appendix D.1, Residential Water Service Meter Example. While a variety of sizes are commercially available, most residential dwellings would utilize a 5/8”x 3/4” meter size which accurately measures flows to 25 gallons per minute and provides the additional benefit of preventing reverse installation of the meter.

5.4.2 Water Meter Placement Location

The physical placement location of water meters is an important factor to consider when implementing service metering in a distribution system. Individual lot size and building zoning conditions will help direct the meter placement, but a consistent location is typically along the existing water service line where it crosses the serving property line and immediately downstream of the water service shut-off valve. Most Districts take the position that the service line is the

landowner's maintenance responsibility once it comes onto the private property. Typically, a shut-off valve is placed on or near the property line to isolate each individual water supply.

Following that concept, the District could choose to place water meters outdoors, below grade in a meter pit or box, at a location along each service line near the customers' property line, immediately after the service shut-off valve. This allows for accurate recordings of the water delivered to a property, prior to possible leaks that might occur in the service line. Placing meters as close to the property line as possible will provide accurate readings for the water delivered to a property. This will also reduce District liability for leaks along the service lines and place it with the individual customer. This location also places the meter under the direct control of the District and minimizes the potential for meter tampering. Water district customers would have the ability to compare water meter readings with their water consumption and identify leaks within their private service line, if metered water is substantially greater than the amount of water used on the property.

5.4.3 Required Equipment and Installation

The placement of meters outdoors in meter pits has been accomplished successfully for decades, even in cold, mountainous terrain. Locations will need to provide easy access to District personnel for operation, maintenance and reading of the meters. When water meters are placed in pits outside, additional protection must be provided against frost or freezing, and flooding from precipitation or snowmelt, and vandalism.

Each water meter installation will involve locating the service line near the water main, excavating down to the service line, avoiding nearby utility lines, isolating the service line, and installing the water meter near the service line curb stop. The water meters will then record the water delivered along the service line, prior to any withdrawals. Due to the winter climate of Idledale, frost and freeze protection will be required for all outdoor-installed water meters. This is resolved with a meter pit/box and freeze-protected water meter. Meter pit/boxes designed for harsh winter weather conditions are recommended for installation in Idledale. These boxes are commercially available from numerous suppliers, with Ford Meter Box Company, Inc. providing an example of a standard of quality. To increase protection against freezing, meter box risers can also be installed to lower water meters further below grade. A standard installation detail for a meter pit rated to appropriate weather conditions for Idledale is illustrated in Appendix D.2

Additional water meter equipment requirements include appropriately sized curb stops (valves which are likely already installed along existing service lines), yoke or meter setter, ball valves to isolate the water meter from the service line. A meter setter allows water meters to be removed and replaced quickly and easily without the need for additional supports or pipe unions. Many commercially available pipe assemblies contain a yoke or meter setter, ball valve, and check valve that are compatible with specific water meters. This simplifies installation and standardizes equipment

between each location a water meter is installed. This is further illustrated in Appendix D.2, and typical equipment data information is provided in Appendix D.3. It is critical that all piping and components that contact potable drinking water are compatible with Federal Safe Drinking Water Act regulations. Compliance can be ensured if all brass components comply with AWWA C-800 standards (AWWA, 2012B).

5.4.4 Water Meter Data Collection

Traditionally, collecting water meter data has been a labor-intensive activity. Water meter recordings, typically the volume of water delivered to a property, would need to be collected once a month to inform billing. This usually involves a water district representative visiting each property where a water meter is installed and recording monthly water usage. Many of the disadvantages of collecting meter data can be alleviated by using remote recording devices or automatic meter reading (AMR) systems. As of 2012, over half of all residential water meters sold in the US were some variation of an AMR system and they are becoming the industry standard for recording water usage (AWWA, 2012A).

AMR systems require specific water meters that are connected to an electronic transmission device, which transmits water meter data to a mobile collection device over radio frequency. While more expensive variations on AMR systems can connect to cellular service for remote data collection, the most common and cost-effective types use short-distance radio frequency to transmit data. This requires water district or municipal personnel to drive or walk near the water meter locations and get within range of the water meter transmitter. Once within range, a mobile collection device will record the water meter reading into a digital database. AMR systems reduce the need to enter the home or property of customers and can reduce the time and costs associated with manual data collection. Additionally, AMR systems greatly increase the frequency of water meter data collection which can lead to rapid identification of leaks in the distribution system. Individual AMR water meters typically run on batteries, with most manufacturers guaranteeing a battery life of 15-years or more before replacement is required (CEC, 2010). The typical standard of quality of this type of system as manufactured by Neptune Technology Group is the E-corder R-900i meter head and MRX-920 Mobile Data Recorder as illustrated in Appendix D.4.

5.4.5 Water Meter Testing and Maintenance

Regardless of meter selection and placement, all water meters should be tested prior to field installation. Testing ensures that water meters are functioning correctly and reading within a known accuracy. Water districts should have full confidence that water meters are reporting accurately in the case of a usage dispute with a customer. Properly functioning and calibrated water meters allow for accurate assessment of system leaks, if operators have confidence that they are working correctly. Types of water meter testing range between municipalities and water districts but simple volumetric tests can be utilized. Volumetric tests involve running a selected quantity of water through the flow

meter and calibrating it based on the known volume of water. AWWA has recommendations for accuracy limits during water meter testing depending on type of meter and flow rate (AWWA publications: C700, C701, C702, C703, C704, C708, C710, C712, C713). After meters are installed, periodic testing should be accomplished to ensure they continue to function accurately. The time between tests varies for utilities but range from between 5-10 years (AWWA, 2012A).

Water meters do occasionally require repair or replacement due to malfunction. The most common reasons for repair are freezing pipes, sediment or scale build up, and regularly scheduled maintenance based on manufacturers recommendations.

It is recommended that no less than 10 spare meters be purchased for eventual scheduled maintenance, and these can be utilized when individual meters would be sent to the manufacturer or manufacturer's approved maintenance shop for service.

5.4.6 Record Keeping

Record keeping is critical to maintaining accurate and useful water consumption data. Water meter records should include basic data for each meter, such as size, type, make, date of installation, testing results, and repair information. Water meter readings should be organized based on the specific property they are monitoring. A digital database or organized spreadsheet system can be used to assist in record keeping. If an AMR system is used for data collection, the system manufacturer likely provides recording keeping software that will automatically update after new water usage data is collected. Information that should be maintained and updated includes:

- Meter Size
- Meter Make/Model
- Meter Type
- Meter Serial Number
- Date of Purchase
- Previous Locations (if meter was moved)
  - Reason for relocation
- Repair History
  - Repair data
  - Type of repair
  - Materials & Parts used in repair
  - Labor time
  - Repaired by
  - Comments
- Testing History
  - Testing dates
  - Results
  - Tested by
  - Comments

6 Conclusions and Recommendations

A significant amount of information has been provided thus far with many details. While there are various conditions in the District that require attention and improvement, it is critical to focus on those improvements that have the largest potential positive impact while eliminating existing system deficiencies.

Before providing recommendations on the specific infrastructure improvements for Idledale, the higher-level decision for Idledale to move to a master meter water customer of Genesee Water & Sanitation District should be resolved first. Following that discussion, these recommendations include the construction of system improvements and the replacement of failed essential infrastructure within the water system in order of highest priority.

6.1 Genesee Connection Alternative Recommendations

While there are long-term water reliability advantages for the District to move forward with the Genesee Connection alternative, it is estimated that this path would initially cost the District $2.23M to bring the water to the exiting 250,000-gallon water storage tank as detailed in Appendix C.3. From there, essential water distribution system improvements would require an additional $129K, and new water service meters would require approximately $804K, also shown in Appendix C.3. This totals a project cost of approximately $3.065M inclusive of a 15% contingency. This represents over $830K more cost for the Genesee option vs. directly improving Idledale Water & Sanitation District infrastructure. This financial difference likely becomes too large for the District to afford and justify the long-term benefits. Also, this alternative requires the capital investment to occur more at once, with limited opportunity to pursue a stepped financial approach.

Conversely, the alternative to improve Idledale infrastructure and centralize treatment of the existing wells, in combination with drilling a new well provides a significantly lower capital cost solution. It also brings however, inherent risks and greater continued operation and maintenance responsibilities. Each alternative has clear advantages and disadvantages, and while the Genesee Connection would simplify overall operation and management for the District, it is doubtful whether the District has the financial capacity to fund this approach. It is understood that the Idledale infrastructure alternative approach has long term risks and requires more overall effort. However, it does provide a more realistic financial path that the District may wish to follow. With that understanding, it is important to consider that the cost saved from not pursuing the Genesee Connection is enough to potentially fund the development of at least 2 additional wells in the future.

6.2 Water Supply Recommendations

OWC supports increasing the firm raw water supply capacity of the District as it's highest priority. It would also be beneficial for the District to consolidate the raw groundwater well sources at a single location for treatment and blending, prior to feeding the 250,000-gallon storage tank. This approach best utilizes the total existing well supply and allows the District to better manage seasonal variations in individual well output. It also consolidates and simplifies treatment and operational activities of the entire water system and rehabilitates critical facilities for continued proper functioning for the future. Final recommendations for system improvements include:

- Regularly conduct down-hole well surveys to assess well condition and make repairs or improvements when needed. It is recommended to perform a down-hole video inspection of each operating well at least once every two-years to assess the condition of well casings and boreholes. By regularly surveying boreholes, corrective actions can be taken before supply deficits occur. Additionally, an on-going log of various system parameters should be maintained to record when any significant deviations occur. System parameters to monitor include static water levels, pumping rates, and well pump amperage draw. Deviations from regular measurements could indicate sediment build-up in pumps, clogged well screens, cracked conveyance piping, or changing recharge conditions. Monitoring these system parameters allows the District to proactively react to changing conditions and will improve equipment life expectancy and reactions to decreased water supply.

- Continue with operation of the Ridgeway Well and Forks Building blending system in the short-term and monitor overall water balance at the water tank. The District recently retrofitted the Ridgeway Well with a new pump, motor, and pressure transducer, including a new secondary power feed to the wellhead. The newly outfitted well is consistently producing approximately 9.5 gpm. Due to a naturally high uranium concentration in the Ridgeway water source, the water is required to be blended at a 1:1 ratio with distribution system water prior to delivery back to the system. The blending system has been fully demonstrated and certified and is currently delivering water as designed. Due to the prior blending system design and delivery point in the distribution system, only about 50% or 5 gpm of the Ridgeway Well source capacity is being delivered to customers.

- Improve Ridgeway Well Delivery. While the Blending Facility provides some water supply increase, the full 9.5 gpm Ridgeway Well water supply can be piped directly to the Upper Treatment Building. At that location, it can be added for blending and treatment with water from Wells 1A, 1B, essentially doubling its positive impact on supply. Existing buried water piping exists for all or most of the alignment between the Ridgeway Well and the Disinfection Building. It is recommended that the District perform a video survey to confirm the pipe

alignment, condition and ability to use the existing piping as a sleeve for a new 2" polyethylene transmission main. This focused effort represents the most practical next step to reducing the annual seasonal water supply deficit and is recommended as a high priority.

- Confirm land ownership conditions surrounding the Upper Treatment Building property, acquire additional property and or access easements and construct a new raw groundwater well immediately adjacent to the Upper Treatment Building to provide additional firm capacity raw water supply. Costs associated with a new hard rock water well, and the Upper Treatment Building Rehabilitation and associated facilities are summarized in Appendix C.3, the Preliminary Project Cost Estimate. Total installation costs for these project components are estimated at $520K, including general contract conditions and engineering costs.

  These costs are presented for planning level purposes and do not reflect an extensive evaluation of well placement locations or piping connections to the existing system. To present a conservative estimate of project costs, 700-feet was selected as the well drilling depth, which is comparable to the depth of Well 1A and would provide greater operational control to the District during periods of reduced groundwater recharge.

  The estimated costs do not include hydrogeologic investigations for determining well location, well permitting or water rights acquisition, or costs associated with land acquisition. Well drilling costs range significantly depending on the depth and type of substrate being drilled into. The costs assume drilling through substantial depths of hard rock material. The costs for connecting the well to the existing distribution system have conservatively assumed 1,000 lf of transmission main to connect to the Upper Treatment Building. Water line installation using trenching or horizontal directional drilling might be required in areas with significant hard rock near the surface. Additional appurtenances may also be required, such as pressure-reducing valves, air-release valves, or booster pumps, depending on where the well is located vertically and the pipeline profile to the Upper Treatment Building.

  Land acquisition, permitting, and water rights acquisition costs could cover a wider range of potential outcomes and it requires a more in-depth evaluation of potential well sites and initial discussions with existing landowners. Ideally, the District could locate the new well on land already controlled by the District or negotiate favorable terms and conditions with a private landowner including the inclusion of the property into the District with metered potable water service in exchange for a permanent utility easement to build and operate the well and pipeline.

- Re-activate the historic groundwater seep (Spring) to seasonally store the available water at the old water storage tank adjacent to the Upper Treatment Building for blending with other well sources prior to treatment, disinfection, and storage. The intent would be to use this water source during deficit emergency supply conditions only. Historic data suggests the availability of 200,000 - 400,000 gallons, depending on the time of year. Water quality data from this seep shows that the GWUDI treatment process required for Well 1A would be the same required to treat the spring source also. However, this approach will require a long-term solution to the unsafe and degrading structural condition of the old raw water storage tank. Additionally, recent damage to transmission piping from the Spring to the old tank will need to be repaired /replaced. This is recommended as a lower priority.

6.3 Existing Water System Repair Recommendations

The Idledale Water and Sanitation District water distribution system was assessed for condition, functionality, and flow. Only four of nine existing fire hydrants were found to be in acceptable working condition and provide low but adequate flow rates for fire protection. Five of nine hydrants were found to have substantial leaks and/or have hydrant valves that are either not functioning or inadequately functioning for use in fire suppression activities. During the assessment, it was also determined that a total of six existing isolation gate valves were broken, would not close, or were not properly functioning. Operating isolation valves are key to properly maintaining a distribution system and all six valves are recommended to be replaced. The recommendation also includes replacing all five non-functioning hydrants and bringing them up to NFPA and Foothills Fire Protection District standards. In addition, it is recommended to implement a bi-annual operations and maintenance program oriented to test and exercise all isolation valves and fire hydrants in the distribution system. Total costs for implementing these system repairs are estimated at approximately $112K as presented in Appendix C.2.

6.4 Water Service Meter Recommendations

Based on the existing configuration of Idledale's distribution system, cost considerations, and maintenance requirements, we recommend installation of an AMR water meter system at outdoor locations close to the water main and residential property lines. A schematic presentation of the water meter and pit installation is provided in Appendix D.2.

In general, the implementation of individual water meters will greatly improve the District's ability to assess water demand, determine distribution deficiencies, and identify leaks throughout the system. Additionally, state, and federal funding agencies may mandate meter installations to provide essential grant and loan funding for the larger improvement project. Meter installations will provide early identification of service line leaks that stops valuable water loss, causing potential property damage or erosion. In the future, if the District moves to charge customers based on individual water

usage, water meters and an AMR system will greatly assist in the transition. The AMR system would greatly reduce the labor required in collecting meter data and proper record keeping related to the water meter system will streamline future water consumption analyses.

Also provided in Appendix D.5 is an initial price quotation from Core & Main, the local equipment manufacturer's representative for the Neptune Technology Group. It includes the initial bid price for an AMR System including meters for 150 installations, data collector, software, and the first-year annual service agreement for approximately $47,000.00. Total costs for installation of 143 water meters in pits at the individual property line is estimated at $804K including contractor overhead and engineering.

As mentioned in the previous Fire Protection Assessment memo, a parallel recommendation is to install flow meters alongside the three pressure relief valves (PRVs) that are planned to be replaced/refurbished. These water meters, which can also be connected to the AMR system, can provide additional regional data for demand along different segments of the distribution mains. Individual service line water consumption could then be compared to the PRV water meters to provide a more comprehensive understanding of water consumption and better leak detection and identification. These PRV meters, however, are an additional benefit and not essential for proper operation and maintenance. Due to the additional cost, they have been identified as a lower priority.

6.5 Proposed Water System Improvements Project Schedule

To implement the construction of the recommended water system improvements, significant effort is anticipated in three different areas, Financial Aid, Engineering and Construction. The financial aid area includes the District effort required to acquire grants and loans to fund the initial engineering planning and design process, in addition to the actual construction costs.

For water system improvements of this type, at the State level, OWC has identified the Colorado Department of Local Affairs (DOLA) and the Clean Water State Revolving Fund (SRF) administered by Colorado Department of Public Health and Environment (CDPHE) as state agencies well suited to engage for project funding opportunities. At the federal level, the US Department of Agriculture (USDA), Department of Rural Development is well known to have available funds for water system improvements projects. Depending on the District's ultimate path, one or all the mentioned agencies may be engaged to supply project funding. Historically, the process is slightly different with each agency and may necessitate the repetition and repackaging of required information.

Following delivery of this report, OWC is ready to move forward with the next steps in the engineering process. OWC has submitted a proposal to the District to provide engineering services for the planning phase of the project. This effort includes supporting the District to prepare

necessary applications and authoring required engineering reports to further the preliminary design development and meet the specific needs of the individual application processes.

Appendix E.1 presents the Project Workflow Schedule for the Idledale Water System Improvements. This schedule shows calendar time expressed in days and months, placed along the X or horizontal axis. For this update of the schedule, the Project start has been moved to September 1, 2021.

Individual project work tasks are listed on the left vertical or Y axis and are grouped in project work phases, typically listed in chronological order. Each task has an estimated time duration (in days) and a connection to appropriate preceding and following tasks in the workflow. The tasks are then plotted with the associations to other tasks to create a critical path workflow schedule.

Phase 1, Project Financial Planning includes the framework for the District's preparation and submission of financial aid applications to Colorado DOLA, Water SRF and the USDA. Twelve subtasks have been identified to describe the workflow process for the Phase. The effort presented anticipates a Financial Plan development by October 1, 2021, followed by a Public Hearing and financial aid applications to all 3 funding agencies before the end of the Fall/Winter, 2021.

Phase 2, Preliminary Engineering has been subdivided into 3 major subtasks. Task 2A identifies the 7 anticipated steps required to provide preliminary engineering for the USDA funding process. Task 2B identifies 4 steps required to prepare the Project Needs Assessment (PNA) and coordinate the financial aid process with the Colorado DOLA and SRF programs for a December 2021 submission. Task 2C anticipates a 5-step process to prepare the Basis of Design Report (BDR) and gain approval from the CDPHE in the Spring of 2022.

Following BDR approval, Phase 3, Final Plans and Specifications preparation of the final engineering design process for the water system improvements occurs next on the schedule's critical path. Six tasks illustrate the development of the final design, the District review of those documents, submission, and approval of the final design documents by CDPHE. Currently, it is anticipated that the final design process will commence in the spring of 2022 and require approximately six months with CDPHE approval of the documents before the end of 2022.

Phase 4, Bidding captures the effort required to competitively hire a general contractor to construct the water system improvements presented in the Final Plans and Specifications. OWC has presumed that that construction project will utilize the Construction Management at Risk (CMAR) model for actual construction. This approach has advantages over conventional design-bid-build and allows for a more cooperative (less adversarial) relationship between the District, Engineer and Contractor. Essentially, this approach provides for the hiring of a contractor using both price and qualifications to perform a preconstruction phase where the contractor, engineer and District negotiate the final project scope and a Guaranteed Maximum Price (GMP) for the project. Conducting the pre-

construction process fosters a positive outcome where all project stakeholders help shape the final project scope, mutually balancing District needs and available funds. Phase 4 is anticipated to start before October 2022 and require approximately 4 months, concluding with executing the Preconstruction contract by the end of the year 2022.

With the presumption that the Preconstruction process requires 3 months and final GMP meets the District's expectations, the District would be positioned to move directly into finalizing the construction contract and construction documents and then construction contract execution. This is contingent on the District having previously acquired appropriate financial aid to initiate the construction contract with the CMAR. Following contract execution, Phase 5, Construction begins for the project with a Construction Kickoff meeting. It is anticipated that construction would begin in the spring of 2023.

The Construction process has been subdivided into 5 major subtasks, including the preconstruction phase to develop and negotiate the final GMP; construction contract execution and final document conformance; engineering construction office and construction field related subtasks; and the CMAR construction work. The CMAR construction work of Task 5E is further divided into the 5 major areas of construction improvements identified in the previous recommendations:

- Task 5E.1 – Improve Ridgeway Well Delivery
- Task 5E.2 – New Hardrock Water Well
- Task 5E.3 – Upper Treatment Building Rehabilitation
- Task 5E.4 – Replace Broken Distribution Infrastructure
- Task 5E.5 – Water Service Meters

At this preliminary stage, it has been assumed that all 5 areas will be constructed concurrently in parallel, with the water service meter installation work requiring the longest duration, resulting with a substantial completion in the Fall of 2024 and project closeout in the winter of 2024.

This Project Workflow Schedule will continue to function as a living document to aid in management of the project. As the workflow moves forward and the design and the implementation process is refined, the schedule will continue to be updated at appropriate stages to reflect an accurate forecast of the overall project direction.

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Appendix A.1
2018 CDPHE Sanitary Survey

May 21, 2018

A.J. Beckman
Idledale Water and Sanitation District
141 Union Blvd Ste 150
Lakewood, CO 80228-1898

Subject: Sanitary Survey of Idledale Water and Sanitation District
Public Water System Identification No. CO0130055
Jefferson County

Dear Mr. Beckman:

A sanitary survey was performed on March 27, 2018 by the Field Services Section of the Colorado Department of Public Health & Environment's Water Quality Control Division (the department) at Idledale Water and Sanitation District (the supplier) in accordance with *the Colorado Primary Drinking Water Regulations, 5 CCR 1002-11* (Regulation 11), Sections 11.38(1)(b) and 11.38(2). This letter serves to provide the supplier with written notification of the sanitary survey findings, including any identified significant deficiencies and violations of Regulation 11. The assistance provided was very helpful and is greatly appreciated. Table 1 identifies the parties present during the sanitary survey.

Table 1: Parties Present

Name	Organization
Richard Pintor J.r, Richard Pintor Sr., Mike Richardson	Idledale Water and Sanitation District
Jorge Delgado	Colorado Department of Public Health & Environment

Table 2: Sanitary Survey Findings

Severity Category	Number Identified	Written Response Due (within 45 days of letter date)	Resolution Due (within 120 days of letter, or department-approved alternate date)	Public Notice Required (Violations of Regulations 11)
Significant Deficiencies	0	Not applicable	Not applicable	Not applicable
Violations	0	Not applicable	Not applicable	Not applicable
Observations-Recommendations	8	No response required	Not applicable	Not applicable

A list of the findings for each category in Table 2 can be found in the following sections:

Section I: Significant Deficiencies

According to Regulation 11, Section 11.3(71), a significant deficiency means:

> *any situation, practice, or condition in a public water system with respect to design, operation, maintenance, or administration, that the state determines may result in or have the potential to result in production of finished drinking water that poses an unacceptable risk to health and welfare of the public served by the water system.*

No significant deficiencies were identified.

Section II: Violations

The items in this category are violations of Regulation 11. Please direct questions regarding resolution of the following items to the department inspector.

No violations were identified.

Section III: Observations/Recommendations

The department recommends the supplier follow up and consider the following observations-recommendations. Please direct questions regarding any of the items below to the department inspector.

1. F991 - Finished Water Storage: 2010 Storage Tank (SDWIS ID: 011)
Other Storage Observations: Department inspector identified storage observation.

During the sanitary survey, the department evaluated the supplier's 2010 Storage Tank. The tank access hatch is protected appropriately. In addition to the properly gasketed and watertight access hatch, there is an extra enclosure around the tank access for security and protection of the tank. The enclosure is vented. The department recommends that the vent be screened with a finer mesh screen to minimize the capability of insect's access to the enclosure.

2. D410 - Distribution: Distribution System (SDWIS ID: DS001)
Valve Inspection and Exercising Program: Valve inspection and exercising program implementation.

At the time of the sanitary survey, the department inspector and the supplier discussed the valve exercising program for the water system. The supplier indicated that currently, not all valves are accessible. Not having adequate access to all valves could limit the supplier's response capabilities to water line breaks and potential contamination scenarios. The department recommends that the supplier identify the inaccessible valves and make the necessary modifications and improvements to ensure that the valves are properly functioning. A component of a public water system Operations and Maintenance (O&M) plan is a valve inspection and exercising program. The supplier should have a list of all of the valves in the distribution system, their location and maintenance information. The department recommends developing a program in accordance with AWWA Standard G200-04 Distribution System Operation and Maintenance, which states:

"This program shall include at least the following elements: a) A goal for the number of transmission valves to be exercised annually based on the percentage of the total valves in the system. b) A goal for the number of distribution valves to be exercised annually. c) Measures to verify that the goals are met and written procedures for action if the goals are not attained. d) Critical valves in the distribution system shall be identified for exercising on a regular basis. Potential quality and isolation concerns shall be recognized. The program shall track the annual results and set goals to reduce the percent of inoperable valves."

Inspecting and exercising valves should include completely closing, opening and re-closing until the valve seats properly. Leaking or damaged valves should be scheduled for repair. A record of valve maintenance and operation, including the number and direction of turns to closure, should be kept.

3. D400 - Distribution: Distribution System (SDWIS ID: DS001)
Line Flushing Program: System lacked an adequate line flushing program or the flushing program can be improved.

At the time of the sanitary survey, the department inspector found that the supplier did have a program in place for line flushing or was in the process of developing a flushing program. The supplier indicated that currently not all hydrants are fully operational and need to be replaced. Not having adequate access to all hydrants could limit the supplier's flushing practices and could potentially have a negative impact on water quality. The department recommends that the supplier identify the malfunctioning hydrants and make the necessary modifications and improvements to ensure that the valve is properly functioning In accordance with the Standard G200-04, Distribution System Operation and Maintenance,

"the utility shall develop and implement a systematic American Water Works Association (AWWA) flushing program that meets the needs of the utility, taking into consideration the condition of the public water system including but not limited to, hydraulic capacity, treatment, water quality, and other site specific criteria. At a minimum, the flushing program, according to AWWA, shall incorporate the following items: 1. The program addresses a preventive approach to distribution system flushing, including occasional spot flushing to address localized problems or customer concerns and routine flushing to avoid water quality problems. 2. The utility shall perform system flushing at the velocity appropriate to address water quality concerns. 3. The utility has written procedures addressing all activities associated with system flushing, water quality, monitoring, frequency, locations, and duration, as well as adherence to all regulatory requirements."

The department recommends developing a written line flushing program that can be incorporated into the supplier's O&M plan. Records of flushing activities should be maintained in the plan.

4 and 5. S012 - Source: Well No 1A (SDWIS ID: 001) and Well No 1B (SDWIS ID: 004)
Groundwater Source Potential GWUDI: Supplier's sources may be under the direct influence of surface water as defined by Regulation 11, Section 11.3(36). The department will be evaluating the source for determination of groundwater under the direct influence (GWUDI) of surface water and the need to comply with Regulation 11, Section 11.8.

During the sanitary survey, the department inspector indicated that the supplier's Well No 1A and Well No 1B may be under the direct influence of surface water and based on the previous sanitary survey letter issued on October 13, 2015 has currently been referred to the department's source classification evaluation process. Additional testing may be required in the future to determine the appropriate source classification. The department may issue additional information regarding the source classification status of the source under a separate letter to the supplier. If you have already been coordinating with the department regarding this issue and have questions, please contact the department's Groundwater Evaluation Specialist, Bryan Pickle, at 303-692-3527 or bryan.pickle@state.co.us.

6. R540 – Monitoring, Recordkeeping and Data Verification:
Design Approval: Plans and specifications approval by the department prior to construction of renovations to the water system, including the addition of new sources, modifications of treatment or addition of storage tanks.

During the sanitary survey, the department evaluated the supplier's Forks Treatment Building water treatment plant which is currently under construction and was previously approved on October 4, 2016 by the department. At the time of the inspection, the plant was inactive however the department identified that as currently constructed and approved there was a cross connection which was inappropriately controlled. The Forks Building Treatment Plant for Well No. 3 is utilized for blending treated well water with water from the distribution system. The facilities distribution system's water supply line needs to be controlled with a double check backflow prevention assembly. The department reissued an updated approval letter on April 19, 2018 requiring that the installation of one double check valve, testable, for backflow prevention on the distribution system water inlet pipe after the last tee and prior to the connection with the inlet pipe for Well No. 3. The department expects that the supplier control the potential cross connection before the water treatment plant is operated.

7. M610 - Management:
Backflow Prevention and Cross-Connection Control Program: Written backflow prevention and cross-connection control (BPCCC) program.

With regards to the supplier's BPCCC Program, the department recommends that the supplier:

- Identify the total number of waterworks that require survey. This number needs to include all: treatment plants, storage tanks, pump stations, sample stations, etc.

- Update the program to reflect changes in regulation and appropriate control requirements and include provisions for discovered cross connections at residential connections. Please utilize the department provided template which can be found on the department's website.

- Further develop tracking mechanism for assembly testing, survey completions, etc.

- Further, evaluate integrated system agreements and BPCCC implementation.

- Continue to complete the annual written BPCCC report due May 1 of each year

Please contact Jorge Delgado by phone at 303-692-3511 or via email at jorge.a.delgado@state.co.us with any questions regarding BPCCC. More information can be found online at:
https://www.colorado.gov/pacific/cdphe/drinking-water-cross-connection-control-program

8. R510 – Monitoring, Recordkeeping and Data Verification:
General Monitoring Plan: Monitoring plan required content, updates for facility changes, submittal to the department.

According to Section 11.5 of Regulation 11, all suppliers of water shall develop and implement a monitoring plan. At the time of the sanitary survey, the department inspector reviewed the supplier's monitoring plan. Currently, the supplier is constructing a second treatment plant. Once the plant has been constructed the supplier will have 30 days to submit an updated monitoring report to the department. The supplier must develop a monitoring plan that includes all the requirements of Section 11.5. In order to aid in the development of the plan, the department recommends that the supplier use the department's monitoring plan template, which can be accessed from https://wqcdcompliance.com. If the supplier would like help developing the plan, please request coaching assistance via the department's Local Assistance Unit website at https://www.colorado.gov/pacific/cdphe/tools-drinking-water-facilities-managers, which has an online coaching request link. After developing the monitoring plan, the supplier is required to submit a copy to the department via the department's online portal, which can be accessed at https://wqcdcompliance.com/login. The supplier is required to create a portal account, if not done previously. The portal can be used for uploading non-emergency information for suppliers of water in addition to monitoring plans. For portal support, please contact Kaleb Winisko at kaleb.winisko@state.co.us or 303-691-7803. Once submitted to the department, the plan will be reviewed by the department's Drinking Water Compliance Assurance Section. For questions regarding the Monitoring Plan requirements please contact Tim Jones of the Compliance Assurance Section at timothy.jones@state.co.us or 303-692-2085.

Section IV: Field Verification/Sampling

While performing the sanitary survey, the department inspector performed water quality sampling for chlorine. Table 3 indicates the results of the water quality sampling performed on-site.

Table 3: Sampling Results

Parameter	Sample Location	Value	Units	Notes
Entry Point Disinfectant Residual	Entry Point	1.24	mg/L	
Distribution System Disinfectant Residual	New WTP	1.15	mg/L	

Reminders

- Regulation 11, Section 11.4(1)(b) (Prior Approval Required) requires the department's approval prior to commencement of construction of any improvements, treatment process modifications or the addition of new water sources.

- Most regulations, guidance documents and forms are available on the department's website at http://wqcdcompliance.com.

Enclosed with this letter you will find a postage-paid Customer Satisfaction Survey Postcard. Please take a few moments to complete the survey and return it to the department. Your efforts to provide feedback to improve the sanitary survey process are appreciated.

If you have any questions, please contact me at 303-692-3511 or jorge.a.delgado@state.co.us. Thank you for your time and cooperation.

Sincerely,

Jorge Delgado, P.E.
Senior Field Engineer
Field Services Section
Water Quality Control Division
Colorado Department of Public Health & Environment

cc: Jefferson County Public Health Department
Drinking Water File, PWSID No. CO0130055
Aquifer Case FS.18.INSP.04181
Richard Pintor Jr., ORC
Douglas Camrud, Engineering Review Unit Manager, CDPHE-WQCD-Engineering Section
Bryan Pickle, Sr. Groundwater Evaluation Specialist, CDPHE-WQCD-Compliance Assurance Section

Appendix A.2
2020 GWUDI Determination for Well 1A by CDPHE

COLORADO
Department of Public Health & Environment

Dedicated to protecting and improving the health and environment of the people of Colorado

March 9, 2020

MIKE RICHARDSON
IDLEDALE WSD - PWSID CO0130055
PO BOX 52
IDLEDALE CO 80453

Requirements for Reclassification to Ground Water Under the Direct Influence of Surface Water

Dear Mr. Richardson:

The Colorado Department of Public Health and Environment ("Department") notified IDLEDALE WSD ("Supplier") that Well No. 1A, Well No. 1B (001, 004) has been reclassified to ground water under the direct influence of surface water (GWUDI) on February 13, 2020. Listed below are the specific regulatory requirements associated with the reclassification.

Treatment
Section 11.8(1)(b)(iv) of the Colorado Primary Drinking Water Regulations 5 CCR 1002-11 ("Regulation 11") requires any ground water source determined to be GWUDI to provide adequate surface water treatment for the source within eighteen (18) months of receiving notification from the Department. Adequate surface water treatment is considered to be a treatment system that is designed and operated to:

1. Achieve at least 99.99 percent (4-log) inactivation and/or removal of viruses and at least 99.9 percent (3-log) inactivation and/or removal of Giardia lamblia cysts. The inactivation of viruses and Giardia lamblia is primarily accomplished by disinfection with chlorine.
2. Achieve at least 99 percent (2-log) removal of Cryptosporidium. Cryptosporidium cyst removal is achieved by filtration.
3. Additionally, the outcome of a source water risk assessment required by the Long Term 2 Enhanced Surface Water Treatment Rule may require additional treatment that is capable of removing/inactivating up to 99.9997 percent (5.5-log) of Cryptosporidium.

Section 11.8 of Regulation 11 requires additional daily turbidity and chlorine residual monitoring. The Supplier should consider the costs and benefits of adding/upgrading treatment to all water sources and the potential for other and future sources to be classified as GWUDI. The Supplier must install adequate surface water treatment by **August 13, 2021**. Alternatively, the Supplier may discontinue use by physically disconnecting GWUDI sources.

Waterworks Plan and Specification Approval
Section 11.4(1) of Regulation 11 requires plans and specifications associated with the construction or modifications of any waterworks to be submitted to the Department for review and approval. This includes, but is not limited to:

1. Commencing construction of any new waterworks.
2. Making improvements to or modifying any existing treatment.

3. Initiating the use of a new source.

Approval, for any changes, must be obtained prior to installation/operation. For community water systems, all plans and specifications must be prepared by a Professional Engineer registered in the State of Colorado. If the Supplier chooses to install filtration, note that water quality monitoring will be required to justify the design of the filtration system. Attachment A outlines the water quality that must be collected. The Department recommends the Supplier begin water quality monitoring as soon as possible to collect sufficient data to justify any design.

A copy of the design criteria and information regarding plan reviews, including all forms and guidance, can be obtained from the Department's website at wqcdcompliance.com/eng. If you have technical questions regarding plans and specifications submittal and review or questions about the approval process, please contact the Engineering Section at 303-692-6298.

Interim Measures

In accordance with Section 11.8(3)(a)(ii) of Regulation 11, the Supplier is required to implement interim measures until full surface water treatment is installed and operational. In order to protect public health and to comply with Regulation 11, all reclassified sources are evaluated by the Department to determine the degree of interim measures that are appropriate until adequate treatment is approved and installed. Until adequate surface water treatment is approved, installed and operational, the following interim measures are required for all reclassified GWUDI systems:

1. Immediately, the Supplier must operate continuous chemical disinfection treatment prior to each entry point to the distribution system.
2. The Supplier must begin maintaining 2.0 mg/L disinfection residual at all entry points served by Well No. 1A, Well No. 1B (001, 004) by **May 1, 2020**. On **May 1, 2020**, the Supplier must begin daily monitoring of the entry point. The first monthly operating report (MOR) must be submitted by **June 10, 2020** and monthly thereafter. Please visit wqcdcompliance.com/mors for reporting forms and additional reporting instructions.

A minimum entry point chemical disinfectant residual level of 2.0 mg/L must be maintained at all times unless a Department approved alternative minimum residual level is requested and obtained. Technical questions regarding alternative level approval should be directed to the Engineering Section. If the Supplier would like to request a reduction of the required disinfectant residual, the Supplier must contact the Department by **April 8, 2020**.

The disinfection residual must be measured, recorded and reported in accordance with the requirements in Sections 11.8(3)(c) and 11.8(3)(f) of Regulation 11, respectively. If additional interim measures are required in the future, the Department will notify the Supplier in writing.

Monitoring Schedule

As a result of the source water reclassification the Supplier's monitoring requirements may have changed. Please visit wqcdcompliance.com/schedules to access the Supplier's monitoring schedule and regularly check the website as schedules are updated on a weekly basis. If you have any problems accessing the schedule, or if you do not have computer access, please call 303-692-3556.

If there are any questions regarding the contents of this letter and/or requirements for the Supplier, please contact Jorge Delgado by phone at 303-692-3511 or by email at jorge.a.delgado@state.co.us.

ec:
MIKE RICHARDSON - CONTACT@IDLEDALEWSD.ORG; MIKE@IDLEDALEWSD.ORG; AC

RICHARD PINTOR JR - RJPINTOR@LIVE.COM; OPERATOR
M ROSE ZACCARO - ROSE.ZACCARO@COMCAST.NET; OWNER
MITCH BROWN - MLBROWN@JEFFCO.US; JEFFERSON COUNTY PUBLIC HEALTH
CHRISTINE BILLINGS - CBILLING@JEFFCO.US; JEFFERSON COUNTY PUBLIC HEALTH
JIM RADA - JRADA@JEFFCO.US; JEFFERSON COUNTY PUBLIC HEALTH

File: CO0130055, JEFFERSON COUNTY, COMMUNITY - GROUNDWATER

Attachment A: Water Quality Data Monitoring

As a result of the reclassification to GWUDI, the Supplier may choose to install filtration on the source. If filtration is chosen, the Supplier must collect sufficient water quality data to justify selection of a given filtration technology in accordance with Section 1.2.3 of the State of Colorado Design Criteria for Potable Water Systems (Policy 5, DCPWS).

Section 1.2.3 discusses that if Bag or Cartridge filtration is chosen, then in addition to water quality specified in Section 1.2.3, additional data must be collected in accordance with Section 4.3.9.5 of the DCPWS to ensure that the filtration will comply with Regulation 11. The options available to justify the selection of bag or cartridge filtration include: turbidity results, pilot/demonstration studies, or a particulate removal study. A summary of the options is below (for additional information consult the DCPWS):

- **Turbidity (Section 4.3.9.5a of the DCPWS):** Weekly raw water turbidity samples from March through June (one year preferred) to ensure turbidity stays below 1.49 NTU at all times. The Supplier should consider purchasing a turbidimeter so that samples can easily be analyzed on-site (for example: Hach 2100Q).
- **Pilot/Demonstration Study (Section 4.3.9.5b):** Install a filter onsite during the month of most challenging conditions and demonstrate the filter achieves less than 1.49 NTU turbidity as well as will work economically (doesn't require too frequent filter change out).
- **Particulate Removal Study (Section 4.3.9.5c):** Using a turbidimeter and the procedure outlined in Appendix L of the DCPWS, the Supplier can demonstrate that the proposed filtration is capable of removing the turbidity in the water. Weekly sampling must occur for two months.

Appendix B.1
Water System Leak Detection Results

Attachment Table A1: Listing of leak testing features, decibel readings, and leak status

Feature ID	Latitude	Longitude	Decibel (db)	Leak Status (Y/N)
Curb Stop 1	39.6746648	-105.2421949	21	N
Curb Stop 2	39.6747172	-105.2417168	19	N
Curb Stop 3	39.6743933	-105.2414492	0	N
Curb Stop 4	39.6730398	-105.2418271	5	N
Curb Stop 5	39.6719407	-105.2418422	0	N
Curb Stop 6	39.6719082	-105.2419877	0	N
Curb Stop 7	39.6715903	-105.2417972	27	N
Curb Stop 8	39.6713557	-105.2416611	11	N
Curb Stop 9	39.6708163	-105.241247	13	N
Curb Stop 10	39.67071	-105.2414093	20	N
Curb Stop 11	39.6706527	-105.2413315	29	N
Curb Stop 12	39.6702904	-105.2416209	11	N
Curb Stop 13	39.6702842	-105.2415538	11	N
Curb Stop 14	39.6696586	-105.2415954	20	N
Curb Stop 15	39.6696952	-105.2415337	13	N
Curb Stop 16	39.6691843	-105.241701	4	N
Curb Stop 17	39.6689303	-105.2414325	33	N
Curb Stop 18	39.6688451	-105.2413392	16	N
Curb Stop 19	39.6684309	-105.2417127	30	N
Curb Stop 20	39.6684544	-105.2416658	11	N
Curb Stop 21	39.6681917	-105.2416185	21	N
Curb Stop 22	39.6679723	-105.2412309	11	N
Curb Stop 23	39.667963	-105.2412437	8	N
Curb Stop 24	39.667785	-105.2410103	19	N
Curb Stop 25	39.6651752	-105.242159	2	N
Curb Stop 26	39.6655504	-105.2464777	16	N
Curb Stop 27	39.6708945	-105.2423079	0	N
Curb Stop 28	39.6707608	-105.2424379	0	N
Curb Stop 29	39.6705157	-105.2424547	0	N
Curb Stop 30	39.669848	-105.2429982	24	N
Curb Stop 31	39.6694681	-105.2432369	11	N
Curb Stop 32	39.6694836	-105.2436825	23	N
Curb Stop 33	39.6698599	-105.2441938	20	N
Curb Stop 34	39.6696945	-105.2443956	13	N
Curb Stop 35	39.6698235	-105.2445532	0	N
Curb Stop 36	39.6697316	-105.245101	23	N
Curb Stop 37	39.6689561	-105.2447215	10	N
Curb Stop 38	39.6689254	-105.244639	33	N

Feature ID	Latitude	Longitude	Decibel (db)	Leak Status (Y/N)
Curb Stop 39	39.6686622	-105.2446514	0	N
Curb Stop 40	39.6683422	-105.2449575	16	N
Curb Stop 41	39.6683305	-105.2448094	0	N
Curb Stop 42	39.6680203	-105.2455195	0	N
Curb Stop 43	39.6677274	-105.2451215	2	N
Curb Stop 44	39.66753	-105.2447507	1	N
Curb Stop 45	39.6674069	-105.244684	24	N
Curb Stop 46	39.6678118	-105.2451436	0	N
Curb Stop 47	39.6671488	-105.2448908	11	N
Curb Stop 48	39.6671126	-105.2447963	8	N
Curb Stop 49	39.6669836	-105.2450055	13	N
Curb Stop 50	39.6670781	-105.2454299	14	N
Curb Stop 51	39.6671947	-105.2445757	20	N
Curb Stop 52	39.6669361	-105.2439926	16	N
Curb Stop 53	39.6636795	-105.2483988	8	N
Curb Stop 54	39.6639812	-105.2482248	21	N
Curb Stop 55	39.6643738	-105.2480196	60	N
Curb Stop 56	39.6646652	-105.2478362	7	N
Curb Stop 57	39.6646655	-105.2478268	11	N
Curb Stop 58	39.6649021	-105.2475885	42	N
Curb Stop 59	39.6646879	-105.2478151	21	N
Curb Stop 60	39.6649679	-105.2475073	7	N
Curb Stop 61	39.6650634	-105.2473863	11	N
Curb Stop 62	39.6651538	-105.2472602	42	N
Curb Stop 63	39.6653832	-105.2468693	0	N
Curb Stop 64	39.665696	-105.2460381	38	N
Curb Stop 65	39.6658576	-105.2455339	14	N
Curb Stop 66	39.6659768	-105.244642	11	N
Curb Stop 67	39.6659982	-105.2450789	11	N
Curb Stop 68	39.6659631	-105.2442846	20	N
Curb Stop 69	39.6659097	-105.2444908	7	N
Curb Stop 70	39.6658377	-105.2447168	10	N
Curb Stop 71	39.6659304	-105.2439246	23	N
Curb Stop 72	39.6663126	-105.2444278	338	Y
Curb Stop 73	39.6663085	-105.2442384	11	N
Curb Stop 74	39.666303	-105.2441847	57	N
Curb Stop 75	39.6662388	-105.2438548	14	N
Curb Stop 76	39.6660122	-105.2434525	5	N
Curb Stop 77	39.665886	-105.243136	14	N
Curb Stop 78	39.6658767	-105.2428007	250	Y

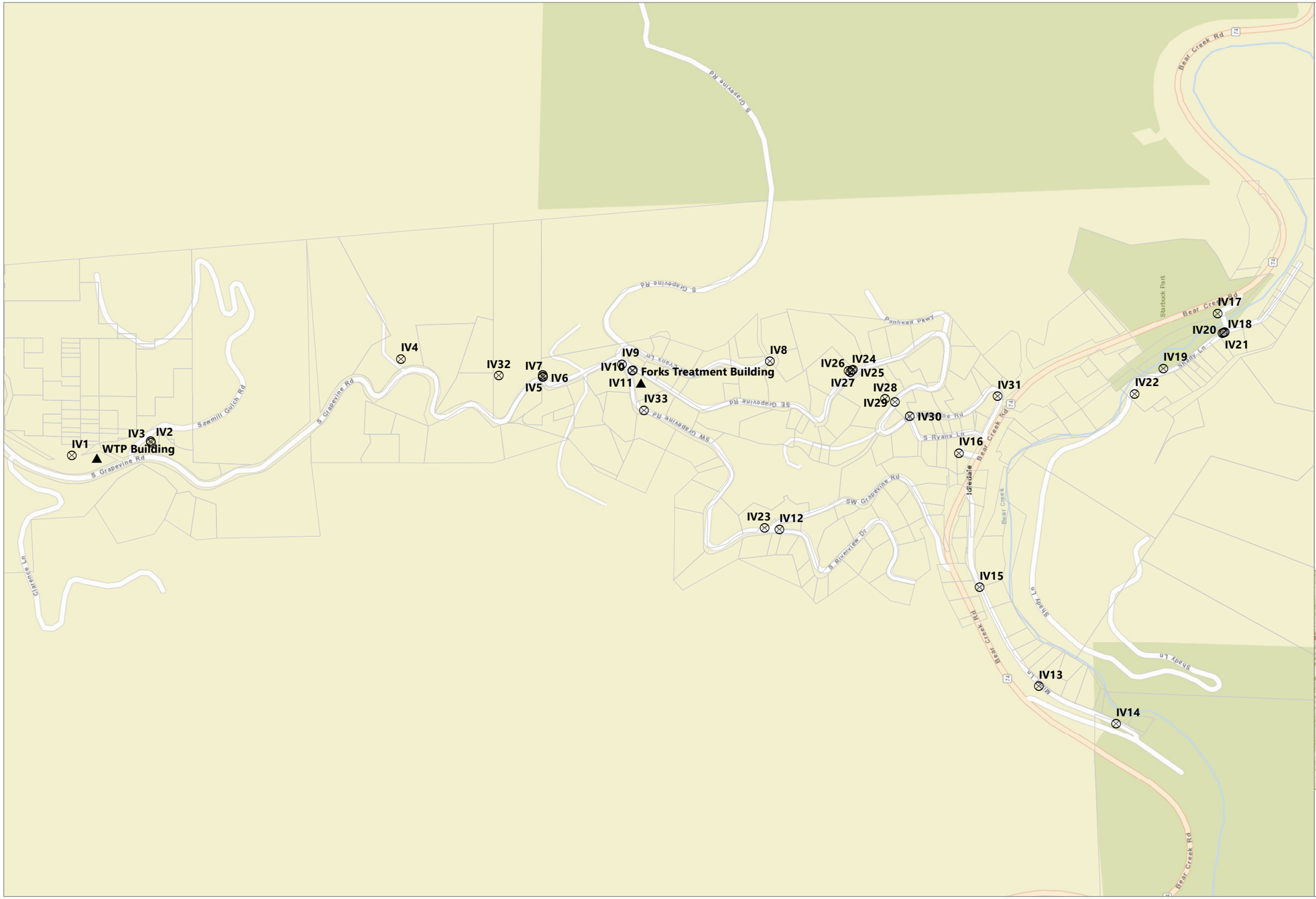
Feature ID	Latitude	Longitude	Decibel (db)	Leak Status (Y/N)
Curb Stop 79	39.6664107	-105.2429774	29	N
Curb Stop 80	39.6654392	-105.2426887	21	N
Curb Stop 81	39.665384	-105.2426177	21	N
Curb Stop 82	39.6652962	-105.2425067	7	N
Curb Stop 83	39.6656405	-105.2419126	42	N
Curb Stop 84	39.6657582	-105.2420886	0	N
Curb Stop 85	39.665544	-105.2419803	16	N
Curb Stop 86	39.6658093	-105.2423236	1	N
Curb Stop 87	39.6659827	-105.2424852	13	N
Curb Stop 88	39.6661278	-105.2424946	10	N
Curb Stop 89	39.6662212	-105.2425918	0	N
Curb Stop 90	39.6662966	-105.2425865	0	N
Curb Stop 91	39.6665072	-105.2425596	10	N
Curb Stop 92	39.6666842	-105.2424597	11	N
Curb Stop 93	39.6667586	-105.2425684	21	N
Curb Stop 94	39.6668293	-105.2426254	5	N
Curb Stop 95	39.667474	-105.2431541	10	N
Curb Stop 96	39.6671323	-105.2425305	20	N
Curb Stop 97	39.6670729	-105.2422747	1	N
Curb Stop 98	39.6667436	-105.2419129	19	N
Curb Stop 99	39.6664241	-105.2420443	16	N
Curb Stop 100	39.666285	-105.2414687	0	N
Curb Stop 101	39.6662953	-105.2411337	0	N
Curb Stop 102	39.6668042	-105.2413278	35	N
Curb Stop 103	39.6670734	-105.2414385	2	N
Curb Stop 104	39.6673186	-105.2415133	334	Y
Curb Stop 105	39.6682771	-105.2425154	0	N
Curb Stop 106	39.6682534	-105.2427062	17	N
Curb Stop 107	39.6681011	-105.2426844	4	N
Curb Stop 108	39.6693084	-105.2422968	10	N
Curb Stop 109	39.6696121	-105.2423843	8	N
Curb Stop 110	39.6623377	-105.2411984	30	N
Curb Stop 111	39.6624959	-105.2413198	48	N
Curb Stop 112	39.662595	-105.2414298	8	N
Curb Stop 113	39.6627096	-105.2415793	10	N
Curb Stop 114	39.6628211	-105.241643	0	N
Curb Stop 115	39.663008	-105.2418039	0	N
Curb Stop 116	39.6630234	-105.2418147	10	N
Curb Stop 117	39.6631318	-105.2418274	24	N
Curb Stop 118	39.6621887	-105.2409983	5	N

Feature ID	Latitude	Longitude	Decibel (db)	Leak Status (Y/N)
Curb Stop 119	39.6619041	-105.2408863	62	N
Curb Stop 120	39.6616369	-105.2406771	55	N
Curb Stop 121	39.6614201	-105.2403009	4	N
Curb Stop 122	39.6613546	-105.2401618	52	N
Curb Stop 123	39.6612152	-105.2398647	17	N
Curb Stop 124	39.6611362	-105.2397531	1	N
Curb Stop 125	39.6638984	-105.2417547	17	N
Curb Stop 126	39.6643637	-105.2421962	1	N
NA	39.6669116	-105.2421137	NA	NA
Isolation Valve 1	39.679022	-105.243252	13	N
Isolation Valve 2	39.6778739	-105.2429841	24	N
Isolation Valve 3	39.6778672	-105.243017	7	N
Isolation Valve 4	39.6742295	-105.2414552	19	N
Isolation Valve 5	39.6721709	-105.2417671	NA	N
Isolation Valve 6	39.6721642	-105.2417945	NA	N
Isolation Valve 7	39.6721683	-105.241807	NA	N
Isolation Valve 8	39.6688671	-105.2415253	19	N
Isolation Valve 9	39.6710166	-105.2415686	10	N
Isolation Valve 10	39.6708692	-105.2416879	7	N
Isolation Valve 11	39.6708625	-105.2416789	5	N
Isolation Valve 12	39.6687373	-105.2446856	0	N
Isolation Valve 13	39.6649703	-105.2476448	0	N
Isolation Valve 14	39.6638519	-105.2483579	7	N
Isolation Valve 15	39.6658318	-105.245783	29	N
Isolation Valve 16	39.6661255	-105.2432567	7	N
Isolation Valve 17	39.6623578	-105.2406415	24	N
Isolation Valve 18	39.6622915	-105.2410194	60	N
Isolation Valve 19	39.6631473	-105.2416749	48	N
Isolation Valve 20	39.6622706	-105.2410023	19	N
Isolation Valve 21	39.6622553	-105.2409983	NA	N
Isolation Valve 22	39.6635652	-105.2421506	12	N
Isolation Valve 23	39.6689525	-105.2446504	11	N
Isolation Valve 24	39.6676748	-105.2416933	11	N
Isolation Valve 25	39.6676634	-105.2416839	2	N
Isolation Valve 26	39.6677034	-105.2417329	2	N
Isolation Valve 27	39.6677235	-105.2416997	7	N
Isolation Valve 28	39.6671976	-105.2422307	234*	N
Isolation Valve 29	39.6670528	-105.2422928	49	N
Isolation Valve 30	39.6668347	-105.2425623	5	N
Isolation Valve 31	39.6655592	-105.2421841	29	N

Feature ID	Latitude	Longitude	Decibel (db)	Leak Status (Y/N)
Isolation Valve 32	39.6728117	-105.2417774	43	N
Isolation Valve 33	39.670701	-105.2424299	NA	NA
Hydrant 1	39.6728584	-105.2424346	21	N
Hydrant 2	39.6710212	-105.241577	10	N
Hydrant 3	39.6688746	-105.2415347	105	Y
Hydrant 4	39.6682513	-105.2427186	19	N
Hydrant 5	39.6663348	-105.2411706	48	N
Hydrant 6	39.6655631	-105.2421945	NA	NA
Hydrant 7	39.6649788	-105.2476585	21	N
Hydrant 8	39.6622969	-105.2410003	128	Y
Hydrant 9	39.6679199	-105.2454655	33	N

*High reading in Isolation Valve 28 due to valve being immediately down-system from active PRV. No leak anticipated

DRAFT



LEGEND:

- ▲ Building
- ⊗ Isolation Valve (IV##)
- Land Parcels

NOTES: Parcel data from Jefferson County GIS portal. Accessed 7/30/2020

0 500
Feet

Publish Date: 2020/07/30, 12:43 PM | User: kgustafson
Filepath: \\orcas\GIS\Users\kgustafson\Idledale Base Maps\Idledale_Valves\IdledaleValves.mxd

Orsatti Water Consultants

Attachment B
Water Main Isolation Valve Locations
Water Balance Memo
Idledale Water System Engineering Study

Appendix C.1

Figure 5.1 – New Well Site Locations

Figure 5.2 – Genesee Water System Connection Plan

LEGEND:

- Feasible Well Location
- Existing Waterline Alignment
- Proposed New Waterline Alignment

Existing Features

- Building
- Tank
- Well

Land Ownership

- Idledale Water & San. District
- 1/4 Mile Radius

NOTES: Parcel data from Jefferson County GIS portal. Accessed 10/26/2020

0 500

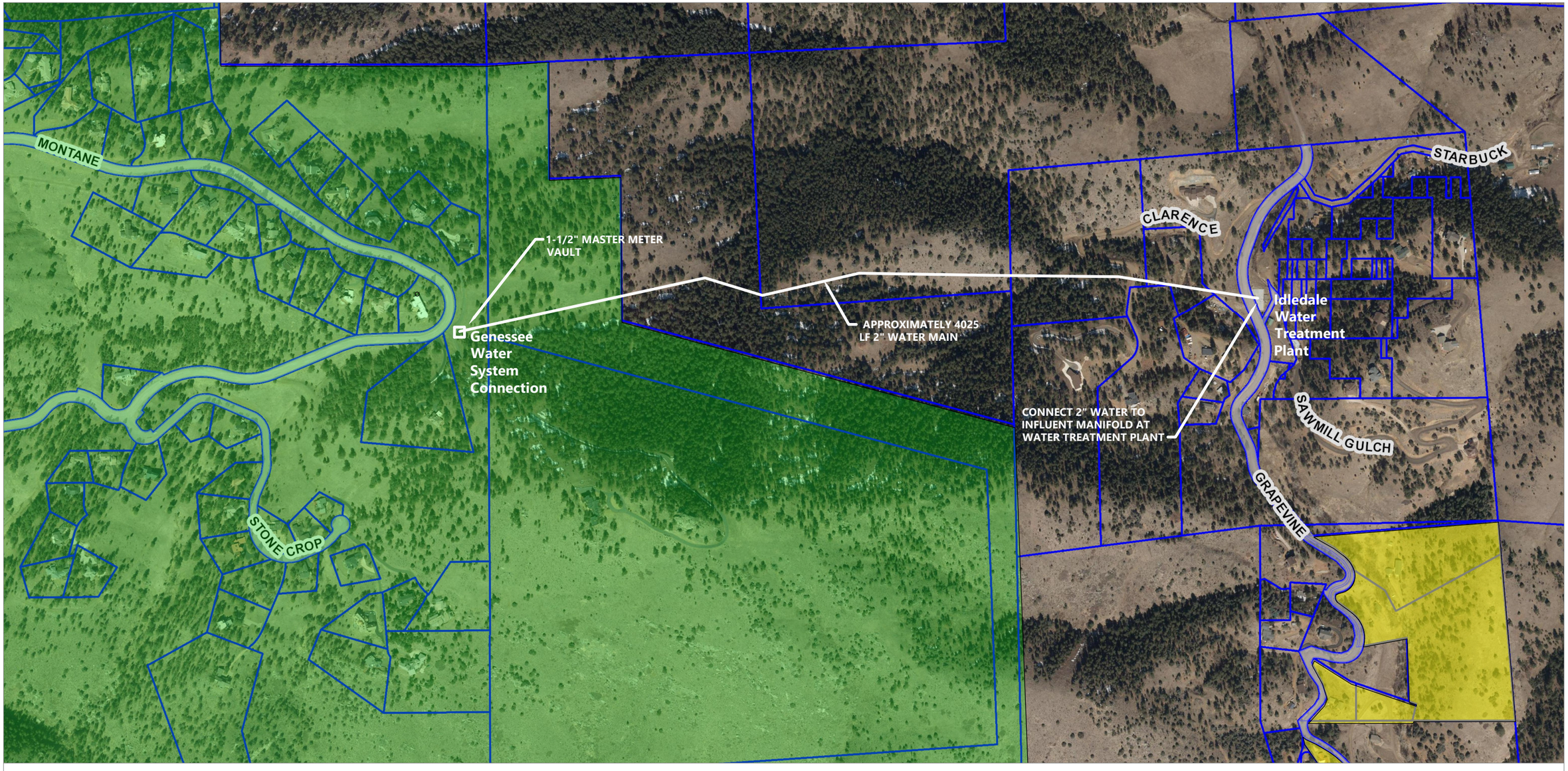
Feet

Publish Date: 2021/03/26, 3:38 PM | User: kgustafson
Filepath: \\orcas\GIS\Users\kgustafson\Idledale Base Maps\Idledale_Valves\Idledale_ProposedWellLocations_01122021.mxd

Orsatti Water Consultants

Figure 5.1
Feasible New Well Site Locations
Idledale Water System Engineering Study

DRAFT



SOURCE: Aerial ©2020 Microsoft Corporation ©2020 DigitalGlobe ©CNES (2020) Distribution Airbus DS
Elevation data: USGS National Map
HORIZONTAL DATUM: Colorado State Plane Central Zone, North American Datum of 1983 (NAD83), U.S. Survey Feet
VERTICAL DATUM: North American Vertical Datum of 1988 (NAVD88)

LEGEND:

- Parcel boundary (approximate)
- Idledale Water & Sanitation District
- Genessee Water & Sanitation District

0 500
Feet

Publish Date: 2020/10/19 5:13 PM | User: rpetrie
Filepath: K:\Projects\1818-Orsatti Water Consultants\Idledale\1818-Ideldale-RP001-Idledale-Genesee Connector.dwg Figure 1

Orsatti Water Consultants

Figure 5.2
Genesee Transmission Main

Appendix C.2
Existing Well Improvement Survey Results & Recommendations

CONTENTS

COLORADO WATER WELL

PUMP INSTALLATION REPORT

DATE INSTALLED	4/1/2020

CUSTOMER	IDLEDALE WATER & SAN
ADDRESS	WELL 1A
CITY	IDLEDALE
STATE & ZIP	CO

CONTACT	
PHONE	

PUMP INFORMATION

PUMP TYPE	SUBMERSIBLE
PUMP MFG	GOULDS
PUMP MODEL #	13GS30
PUMP SERIAL #	F1732928
DATE CODE	17-Jun
RATED GPM	13
RATED HEAD	
RATED HORSEPOWER	3 HP

MOTOR INFORMATION

MOTOR TYPE	SUBMERSIBLE
MOTOR MFG	CETRIPRO
MOTOR HORSEPOWER	3 HP
MOTOR VOLTAGE	230V
PHASE	3 PH
MOTOR MODEL #	M30432
MOTOR SERIAL #	B818Z310018
DATE CODE	
NAME PLATE AMPS	9.2
SF AMPERAGE	1.15
RPM	3450

WELL INFORMATION

WELL DEPTH	706
CASING SIZE	6" SURFACE/4" PLASTIC
STATIC LEVEL	23 FT
PUMPING LEVEL	
PITLESS ADAPTER	1.25 INCH
PICK SUB SIZE	1.5 INCH

SETTING INFORMATION

PUMP SETTING	460 FT
COLUMN PIPE SIZE	1.5 INCH
COLUMN PIPE MTL.	PVC SCH 120
COLUMN PIPE LENGTHS	20 FT
TREAD PATTERN	NPT
PICK UP SUBS	1.25
CHANGE OVER NIPPLES	
CHECK VALVE	1.5 BRASS
KNOCK OUT (yes/no)	NO
CHECK VALVE DEPTHS	380 FT
CHANGE OVER NIPPLES	
AIRLINE	1" FLUSH JOINT PVC
WIRE SZE	10/3G
PROBES SETTING	

START UP DATA

RESISTANCE L1 to GRD	>550
RESISTANCE L2 to GRD	>550
RESISTANCE L3 to GRD	>550
RESISTANCE L1 to L2	2.1
RESISTANCE L1 to L3	2.2
RESISTANCE L2 to L3	2.1
VOLTAGE L1 to L2	230
VOLTAGE L1 to L3	230
VOLTAGE L2 to L3	230
AMPERAGE L1	7.8
AMPERAGE L2	7.8
AMPERAGE L3	7.9
GPM	19 GPM
PWL	
DISCHARGE PRESSURE	

ELECTRICAL CONTOLS

VOLTAGE	230 V
PHASE	3 PH
FUSE SIZE & TYPE	
MOTOR STARTER MFG	PID 50
MOTOR STARTER SIZE	
HEATER SIZE	
CONTROL VOLTAGE	
CONTROL FUSE SIZE	
PHASE PROTECTION	

COLORADO WATER SYSTEMS
2001 E. 58th AVE.
DENVER, CO. 80216
(303) 892-9053
FAX 303-892-1924

April 7, 2020

AJ Beckman
Public Alliance
Idledale Water and Sanitation District Manager
3159 N. Speer
Denver, CO. 80211
Tel: (303) 877-6284

Dear AJ:

Below please find details of the well video logs performed in March of 2020 at Idledale Well 1A and Well 1B:

Well 1A – March 25, 2020

Depth	Description
**0’	24” (2’) Below Top of Casing – 6” steel casing
2.9	Pitless discharge (Note: water backflowing until valves were shut off)
10’	Top of PVC
19.0’	Static Water Level (SWL)
626’	Top of first screen (Note: Screen is only slotted on two sides)
646’	End of first screen section
666’	Top of second screen (Note: Screen is only slotted on two sides)
686’	End of second screen section
706’	Total Depth (TD) – note plastic scrapings at TD

While watching video of 1A, all depths should be adjusted by 2’ since video started 24” below ground. Video was clean and clear. Very little staining on PVC casing and screen.

Well 1B – March 27, 2020

Depth	Description
0’	Top of Casing – 6” steel casing (Note: transducer in hole collecting data)
4.9’	Pitless discharge
20’	End of Casing – Open Hole
28’	Noticeable water entering well bore
40’	Static Water Level (SWL)
410’	Transducer End
451’	Total Depth (TD)

Video was clean and clear. Open Hole appears stable to 451’

Sincerely,

Thomas M. Dea P.E.
Secretary / Treasurer

We Move Water

Mountain States ACCUTEST LABORATORIES

03/28/13

Technical Report for

Idledale Water

PWSID CO0130055, Idledale WSD

1A & 1B RADIONUCLIDE TESTING

Accutest Job Number: D40981X

Sampling Date: 11/15/12

Report to:

Total number of pages in report: **8**

ACCREDITED IN ACCORDANCE WITH nelac

Test results contained within this data package meet the requirements of the National Environmental Laboratory Accreditation Conference and/or state specific certification programs as applicable.

Brad Madadian
Laboratory Director

Client Service contact: Shea Greiner 303-425-6021

Certifications: CO, ID, NE, NM, ND (R-027) (PW), UT (NELAP CO00049), TX (T104704511-12-1)

This report shall not be reproduced, except in its entirety, without the written approval of Accutest Laboratories. Test results relate only to samples analyzed.

Table of Contents

Sections: 1 2 3

-1-

Accutest Laboratories

Sample Summary

Idledale Water

Job No: D40981X

PWSID CO0130055, Idledale WSD

Sample Number	Collected Date	Time	By	Received	Matrix Code	Matrix Type	Client Sample ID
D40981-1X	11/15/12	12:10	BF	11/15/12	DW	Drinking Water	008 1A/B

Sample Results

Report of Analysis

Misc. Forms

Custody Documents and Other Forms

Includes the following where applicable:

- Chain of Custody

ACCUTEST LABORATORIES

CHAIN OF CUSTODY

Page ____of____

4036 Youngfield Street
Wheat Ridge, CO 80033-3862
303-425-6021; 877-737-4521
FAX: 303-425-6854
www.accutest.com

Accutest Job # D40981

Client/Reporting Information
Company: Idledale Water Dept
Street: 141 Union Blvd
City: Idledale State: CO ZIP: 80453
Contact: R Porter E-Mail: rporter@[illegible].com
Phone: 720 318 9547 Fax:
Sampler: Phone:

Billing Information (If different from reporting)
Company:
Street:
City: State: ZIP:
Attention:
Client PO #:
Accutest Quote/Bottle Order #:

Project Information
PWSID or Project#: 1300355
System Name: Idledale Water
System Address: 141 Union Blvd
City: Lakewood State: CO ZIP: 80228
Contact Person: R Porter
Tel: Email: rporter@gmail.com

Turn Around Time (Business days)
- ☐ Std 10 business Days
- ☐ 5 Day Rush
- ☐ 3 Day Rush
- ☐ 2 Day Rush
- ☐ 1 Day Rush

Rush ASAP

State Form Information

State Forms Required	Yes	☐	No	☒
Compliance Samples	Yes	☐	No	☐
Mail Forms to State	Yes	☐	No	☐
Fax ☐	PDF	☐	EDD	☐

PHASE I, II, V Drinking Water Analyses (check analysis)

Sample Location or ID	Date	Time	No. of Containers	THM 524.2 ☐	VOC 524.2 ☐	Haloacetic Acids 552.2	EDB/DBCP 504.1	Pesticides / PCBs 508	Herbicides 515.4	SOC 525.2 (3 analytes only)	OP Pesticides 525.2	Carbamates 531.1	Glyphosate 547	Endothall 548.1	Diquat 549.2	Nitrate-N ☐	Nitrite-N ☐	Alkalinity ☐	Fluoride ☐	Langlier Index	DOC ☐	TOC ☐	Cyanide	UV254 ☐	SUVA ☐	11 Inorganic Metals *	Lead & Copper	Total Coliform (p/a)	Gross-A + Total Solid	Gross-A+B	Ra 228 ☐	Ra 226 ☐	Uranium	Lab Use Only
DOS 1A	11/15/12	12:10 PM																											X	X	X	X	X	01
DOS 1B	11/15/12	12:10 PM																											X	X	X	X	X	

Instructions: ALL ONE Sample (combined wells)

* Inorganic Metals include: Sb, As, Ba, Be, Cd, Cr, Hg, Ni, Se, Na, Tl

Sample Custody must be documented below each time samples change possession, including courier delivery.

Relinquished by Sampler:	Date/Time	Received By:	Date / Time	Relinquished By:	Date / Time
1	11-15-12 1315	1		2	
Received By:	**Date/Time**	**Relinquished By:**	**Date / Time**	**Received By:**	**Date / Time**
2 R Porter		3		3	

Custody Seal Intact ☒ Not Intact ☐ | Preserved where applicable HD ☒ | Cooler Temp: 3.9 | On Ice ☒ | Location:

CHAIN OF CUSTODY

ACCUTEST

4036 Youngfield St., Wheat Ridge, CO 80033
303-425-6021 FAX: 303-425-6854

Accutest Job #:	D40981X
Accutest Quote #:	0
AMS P.O. #:	
Project No.:	

Client Information

Name: Accutest Mountain States (AMS)
Address: 4036 Youngfield St.
City: Wheat Ridge, State: CO Zip: 80033
Send Report to: Tiffany Pham
Any questions contact: Shea Greiner
Phone/Fax #: (303) 425-6021; (303)425-6854

Subcontract Laboratory Information

Name: Hazen (Radiological)
Address: 4601 Indiana Street
City: Golden State: CO Zip: 80403
Contact: Sample Management
Phone: (303) 279-4501

Field ID / Point of Collection	Collection Date	Collection Time		Matrix	# of bottles	Preservation HCL	NaOH	HNO3	H2SO4	None	Radium 226/228	Uranium	Gross Alpha per email			Comments
D40981X -1	11/15/12	12:10 PM		DW	5						X	X	X			

Turnaround Information

[X] 10 Business Day Standard
[ ] Other RUSH (Days) 2 weeks
Approved By:
10 Day Turnaround Hardcopy, RUSH is FAX Data unless previously approved.

Data Deliverable Information

[ ] Commercial "A"
[ ] Commercial "B"
[ ] Commercial "BN"
[ ] Reduced Tier 1
[ ] Full Tier 1
[ ] PDF
[ ] Compact Disk Deliverable
[ ] Electronic Delivery:
[ ] State Forms
[ ] Other (Specify)

Comments / Remarks

Please use Colorado regulations and RLs.

Sample Custody must be documented below each time samples change possession, including courier delivery.

	Relinquished by:	Date & Time:	Received By:	Date & Time:
1	[signature]	11/15/12 1337	1	11/15/12 1337
2			2	
3			3	

For Subcontract Laborartory Use Only

Seal #:
Headspace: Yes [ ] No [ ] NA [ ]
Preserved where applicable: [ ]
Temperature °C _____ On Ice [ ]

3.1 3

D40981X: Chain of Custody
Page 2 of 3

Hazen Research, Inc.
4601 Indiana Street
Golden, CO 80403 USA
Tel: (303) 279-4501
Fax: (303) 278-1528

DATE	November 29, 2012
HRI PROJECT	009-93
HRI SERIES NO	K321/12
DATE REC'D.	11/16/2012
CUST. P.O.#	D40981X

Accutest Mountain States
Ann Doerr
4036 Youngfield
Wheat Ridge, CO 80033

REPORT OF ANALYSIS

SAMPLE NO. K321/12-1

SAMPLE IDENTIFICATION: D40981X-1 - Drinking water - Sampled on 11/15/2012 @ 1210

PARAMETER	RESULT	DETECTION LIMIT	METHOD	ANALYSIS DATE	ANALYST
Gross Alpha (+-Precision*), pCi/l (T)	8.7(+-3.2)	1.4	SM 7110 B	11/26/2012 @ 0841	AN
Gross Alpha (+-Precision*), pCi/l (T)***	5.8(+-3.2)	1.4	SM 7110 B	11/26/2012 @ 0841	AN
Radium-226 (+-Precision*), pCi/l (T)	0.3(+-0.2)	0.1	SM 7500-Ra B	11/26/2012 @ 1110	AN
Radium-228 (+-Precision*), pCi/l (T)	0.6(+-0.6)	0.6	EPA Ra-05	11/20/2012 @ 0647	EH
Uranium, pCi/l (T)**	2.9	0.5	ASTM D2907-97	11/16/2012 @ 2203	DP
Uranium, ug/l (T)	4.4	0.7	ASTM D2907-97	11/16/2012 @ 2203	DP

*Variability of the radioactive decay process (counting error) at the 95% confidence level, 1.96 sigma.
Certification ID's: CO/EPA CO00008; CT PH-0152; KS E-10265; NYELAP 11417;
PADEP 68-00551; RI LAO00284; TX T104704256-11-2; WI 998376610

**Uranium results reported assuming the activity of natural U = 6.77 x 10-7 Ci/gm.
***Less Radon and Uranium.

Results reported herein relate only to discrete samples submitted by the client. Hazen Research, Inc. does not warrant that the results are representative of anything other than the samples that were received in the laboratory.

CODES: (T) = Total (D) = Dissolved (S) = Suspended (R) = Total Recoverable
(PD) = Potentially Dissolved < = Less Than

By: Robert Rostad
Laboratory Manager

An Employee-Owned Company

D40981X: Chain of Custody
Page 3 of 3

Hazen Research, Inc.
4601 Indiana Street
Golden, CO 80403 USA
Tel: (303) 279-4501
Fax: (303) 278-1528

Lab Control ID: 20M02830
Received: Sep 30, 2020
Reported: Oct 12, 2020
Purchase Order No.
None Received

Customer ID: 04396Z
Account ID: Z05628

Michael Richardson
Idledale Water and Sanitation
PO Box 50
Idledale, CO 80453

ANALYTICAL REPORT

Report may only be copied in its entirety.
Results reported herein relate only to discrete samples submitted by the client. Hazen Research, Inc. does not warrant that the results are representative of anything other than the samples that were received in the laboratory

By: Jessica Axen
Jessica Axen
Analytical Laboratories Director

Hazen Research, Inc.
4601 Indiana Street
Golden, CO 80403 USA
Tel: (303) 279-4501
Fax: (303) 278-1528

Lab Control ID: 20M02830
Received: Sep 30, 2020
Reported: Oct 12, 2020
Purchase Order No.
None Received

Customer ID: 04396Z
Account ID: Z05628

ANALYTICAL REPORT

Michael Richardson
Idledale Water and Sanitation

Lab Sample ID	20M02830-001
Customer Sample ID	**011** - Idledale Water & Sanitation - PWSID: CO0130055 - 011 sampled on 09/30/20 @ 1430 by Richard Pintor

Parameter	Units	Code	Result	Precision* +/-	Detection Limit	Method	Analysis Date / Time	Analyst
Gross Alpha	**pCi/L**	**T**	8.8	3.5	0.1	SM 7110 B	10/5/20 @ 0914	KT
Gross Alpha* **	**pCi/L**	**T**	6.1	3.5	0.1	SM 7110 B	10/5/20 @ 0914	KT
Radium-226	**pCi/L**	**T**	0.2	0.2	0.2	SM 7500-Ra B	10/1/20 @ 1107	SS
Radium-228	**pCi/L**	**T**	2.8	0.9	0.3	EPA Ra-05	10/2/20 @ 1136	JR
Uranium**	**pCi/L**	**T**	2.7	-	0.7	ICP-MS 200.8	10/7/20 @ 0912	AL
Uranium	**ug/L**	**T**	4.0	-	1.0	ICP-MS 200.8	10/7/20 @ 0912	AL

Certification ID's: CO/EPA CO00008; CT PH-0152; KS E-10265; MI 9070; NJ CO008;
NYSELAP (NELAC Certified) 11417; RI LAO00284; WI 998376610, TX T104704256-15-6

*Variability of the radioactive decay process (counting error) at the 95% confidence level, 1.96 sigma.

**Uranium results reported assuming the activity of natural U = 6.77 x 10-7 Ci/g.
***Less Radon and Uranium.

Uranium analysis performed at subcontract laboratory - Huffman Hazen Laboratories - 4630 Indiana Street, Golden, CO 80403

Codes: (T) = Total (D) = Dissolved (S) = Suspended (R) = Total Residual (AR) = As Received < = Less Than

HAZEN RESEARCH, INC.
RADIOCHEMISTRY LABORATORY Date: 10/05/2020

Batch QC Summary Form

Analyte: Gross Alpha

Control Standard/LFB: ID: C-11 pCi/mL: 57.4 (use 1 diluted)

Spike Solution: ID: C-11 pCi/mL: 57.4 (use 1 mL)

Spike Recovery Calculation: Sample: Tap*

$$\text{Calculation: } \frac{(60.4)\ (1.000) - (0.4)\ (0.200)}{57.4} \times 100 = 105\%$$

Batch QC Evaluation:

Parameter	Criteria	Pass	Fail	N/A
Control Std./LFB	+/- 30 %	x		
Spike Recovery	70 - 130 %	x		
Blank	< or = 3 x Uncertainty	x		
Duplicate 1	95% confidence interval overlap	x		
Duplicate 2 *	95% confidence interval overlap			x

* Required for batch size greater than 10 samples.

Conclusions:

x Batch QC Passes**
_____ Batch QC Fails
_____ Batch QC Passes, with exceptions**:

Reruns Required: _____

Narrative:

**All QC data provided in this section of the report met the acceptance criteria specified in the analytical methods and procedures. State Maximum Contamination Levels (MCLs) are not evaluted in this report.

Batch Listing by Lab Control Number:

20M02794	
20M02795	
20M02830	
20M02838	
20M02848	
20M02849	

Evaluator: Lynnea Rockwell

10/06/2020
Date

HAZEN RESEARCH, INC.
RADIOCHEMISTRY LABORATORY Date: 10/01/2020

Batch QC Summary Form

Analyte: Radium-226

Control Standard/LFB: ID: NBL-6A pCi/mL: 23 (use 2 diluted)

Spike Solution: ID: NBL-6A pCi/mL: 23 (use 2 mL)

Spike Recovery Calculation: Sample: 20M02528-001c

$$\text{Calculation: } \frac{(48.0)\ (0.970) - (0.6)\ (0.970)}{46} \times 100 = 100\%$$

Batch QC Evaluation:

Parameter	Criteria	Pass	Fail	N/A
Control Std./LFB	+/- 20 %	x		
Spike Recovery	80 - 120 %	x		
Blank	< or = 3 x Uncertainty	x		
Duplicate 1	95% confidence interval overlap	x		
Duplicate 2 *	95% confidence interval overlap			x

* Required for batch size greater than 10 samples.

Conclusions:

x Batch QC Passes**
_____ Batch QC Fails
_____ Batch QC Passes, with exceptions**:

Reruns Required: _____

Narrative:

**All QC data provided in this section of the report met the acceptance criteria specified in the analytical methods and procedures. State Maximum Contamination Levels (MCLs) are not evaluted in this report.

Batch Listing by Lab Control Number:

20M02528	
20M02578	
20M02630	
20M02830	
20M02514	

Evaluator: Lynnea Rockwell

10/08/2020
Date

HAZEN RESEARCH, INC.
RADIOCHEMISTRY LABORATORY Date: 10/02/2020

Batch QC Summary Form

Analyte: Radium-228

Control Standard/LFB: ID: NBL-7A pCi/mL: 13.5 (use 10 diluted)

Spike Solution: ID: NBL-7A pCi/mL: 13.5 (use 10 mL)

Spike Recovery Calculation: Sample: 20M02632-003b

Calculation: $\frac{(147.3)\ (1.000) - (1.7)\ (1.000)}{135} \times 100 = 108\%$

Batch QC Evaluation:

Parameter	Criteria	Pass	Fail	N/A
Control Std./LFB	+/- 20 %	x		
Spike Recovery	80 - 120 %	x		
Blank	< or = 3 x Uncertainty	x		
Duplicate 1	95% confidence interval overlap	x		
Duplicate 2 *	95% confidence interval overlap			x

* Required for batch size greater than 10 samples.

Conclusions:

x Batch QC Passes**
_____ Batch QC Fails
_____ Batch QC Passes, with exceptions**:

Reruns Required: _____

Narrative:

**All QC data provided in this section of the report met the acceptance criteria specified in the analytical methods and procedures. State Maximum Contamination Levels (MCLs) are not evaluted in this report.

Batch Listing by Lab Control Number:

20M02623
20M02830

Evaluator: Lynnea Rockwell

10/08/2020
Date

HAZEN RESEARCH, INC.
RADIOCHEMISTRY LABORATORY Date: 10/07/2020

Batch QC Evaluation Form

Analyte: Uranium

Batch QC Evaluation:

Parameter	Criteria	Pass	Fail	N/A
MRL	+/- 50 %	x		
Control Std./LFB	+/- 15 %	**x**		
Spike Recovery	70 - 130 %	**x**		
Blank	< or = 2 x MRL	**x**		
Duplicate 1	0% - 20 %	**x**		
Duplicate 2 *	0% - 20 %			**x**

* Required for batch size greater than 10 samples.

Conclusions:

x Batch QC Passes**
_____ Batch QC Fails
_____ Batch QC Passes, with exceptions**:

Reruns Required: _____

Narrative:

**All QC data provided in this section of the report met the acceptance criteria specified in the analytical methods and procedures. State Maximum Contamination Levels (MCLs) are not evaluted in this report.

Batch Listing by Lab Control Number:

20M02830	
20M02835	
20M02869	
20M02871	
20M02874	

Evaluator: Lynnea Rockwell

10/12/2020
Date

HAZEN RESEARCH, INC.
4601 INDIANA STREET
GOLDEN, CO 80403
Phone - (303) 279 4501 Fax - (303) 278 1528

CHAIN OF CUSTODY RECORD, P. 1

20-W02830

Customer Information		Billing Information (If different)	
Client Name:	Idledale Water & Sanitation	Billing Name:	
Contact:	Michael Richarson	Billing Contact:	
Address:	PO Box 52	Billing Address:	
	Ideldale, CO 80453		
	operator@idledalewsd.org		
Phone:	303-697-4319 e-mail: contact@idledalewsd.org	PO #:	e-mail:

Report Delivery: Email Only_____ EMAIL and USPS (Additional $2.00 per report)_____

Sample Return (If not selected below, sample will be shipped back at client expense and added to the invoice. Not applicable to RadChem Waters)

Non-hazardous sample disposal ($2.00/sample)_____ Sample returned to client (UPS cost + overhead fee)_____

Sampler's Name(s) (Print) Richard Pinter (Signature)

PWSID: CO0130055 **System Name** **Entry Point:** **Facility ID:** 011 **Send Results to CDPHE:** Y N

Sample Identification	Sample Date and Time	Grab	Composite	Samp Type(1)	No. of Containers	Cont. Type(2)	Preservative(3)	Analyses Required
011	9/30/20 1530	x		DW	5	P	U	Gross alpha, Ra226/228, Uranium

(1) DW=Drinking Water WW=Wastewater SW=Surface Water SO=Soil GW=Ground Water SL=Sludge HZ=Hazardous O=Other
(2) P=Plastic G=Glass O=Other
(3) N=Nitric Acid U=Unpreserved C=Cooled S=Sulfuric Acid B=Sodium Hydroxide T=Sodium Thiosulfate Z=Zinc Acetate O=Other

By submitting samples for analysis, client agrees that services shall be govered by Hazen's analyticla terms and conditions; Hazen's terms and conditions supersede other terms and conditions (see page 2).

Relinquished by	Date/ Time 9-30-20 1309	Received by	Date/ Time /
Relinquished by	Date/ Time /	Received by	Date/ Time /
Shipped by	Date/ Time /	Received for Lab by Tynrea Rockwell	Date/ Time 9/30/2015:14

Method of Shipment

Requested Turnaround Time
Standard ☐ Rush (Must be approved, additional charges apply) ☒

Lab use only

Rec'd Preserved: Y N Date/Time: 9/30/20 1521

Updated 02/26/2020

TECHNICAL BROCHURE
B5-25GS R8

FEATURES

Powered for Continuous Operation: All ratings are within the working limits of the motor as recommended by the motor manufacturer. Pump can be operated continuously without damage to the motor.

Field Serviceable: Units have left hand threads and are field serviceable with common tools and readily available repair parts.

Sand Handling Design: Our face clearance, floating impeller stack has proven itself for over 50 years as a superior sand handling, durable pump design.

FDA Compliant Non-Metallic Parts: Impellers, diffusers and bearing spiders are constructed of glass filled engineered composites. They are corrosion resistant and non-toxic.

Discharge Head/Check Valve: Cast 303 stainless steel for strength and durability. Two cast-in safety line loops for installer convenience. The built-in check valve is constructed of stainless steel and FDA compliant BUNA rubber for abrasion resistance and quiet operation.

Motor Adapter: Cast 303 stainless steel for rigid, accurate alignment of pump and motor. Easy access to motor mounting nuts using standard open end wrench.

Stainless Steel Casing: Polished stainless steel is strong and corrosion resistant.

Hex Shaft Design: Six sided shafts for positive impeller drive.

Engineered Polymer Bearings: The proprietary, engineered polymer bearing material is strong and resistant to abrasion and wear. The enclosed upper bearing is mounted in a durable Noryl® bearing spider for excellent abrasion resistance.

5GS, 7GS, 10GS, 13GS, 18GS & 25GS

5-25 GPM, ½ – 5 HP, 60 HZ, SUBMERSIBLE PUMPS

BUILT IN THE USA
ENGINEERED, ASSEMBLED & TESTED

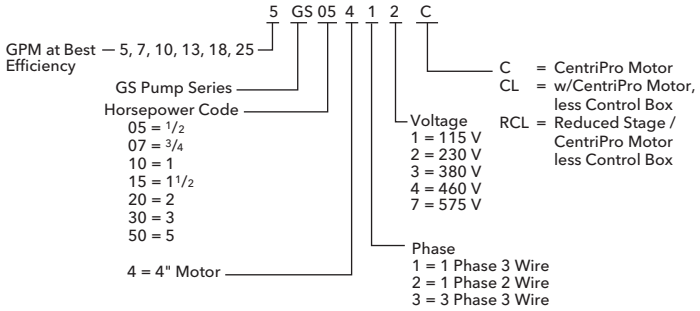
GOULDS WATER TECHNOLOGY
a xylem brand

WATER END DATA

Series	Model	Required HP	Stages	Length (in)	Weight (lbs)
5GS	5GS05R	.5	9	12.9	8
	5GS05	.5	12	15.0	9
	5GS07	.75	15	17.0	11
	5GS10	1	20	21.7	13
	5GS15	1.5	26	25.8	15
	5GS20	2	33	31.6	19
7GS	7GS05R	.5	7	11.7	6
	7GS05	.5	10	13.8	7
	7GS07	.75	13	16.0	8
	7GS10	1	17	18.8	9
	7GS15	1.5	22	23.6	12
	7GS20	2	27	27.2	13
	7GS30	3	34	33.2	18
10GS	10GS05R*	0.5	8	12.2	7
	10GS05*	0.5	10	13.6	8
	10GS07*	0.75	14	16.4	9
	10GS10*	1	16	17.7	11
	10GS15	1.5	17	18.4	12
	10GS20	2	20	21.7	13
	10GS30	3	27	27.5	18
	10GS50R	5	35	33	21
	10GS50	5	42	40.2	24
13GS	13GS05	.5	5	10.1	6
	13GS07	.75	7	11.5	7
	13GS10	1	10	13.6	8
	13GS15	1.5	12	15.0	9
	13GS20	2	17	18.4	12
	13GS30	3	21	22.3	15
18GS	18GS07	.75	6	11.8	7
	18GS10	1	8	13.5	8
	18GS15	1.5	11	16.1	10
	18GS20	2	14	18.6	11
	18GS30	3	19	24.1	15
	18GS50R	5	24	28.3	17
	18GS50	5	30	34.4	21
25GS	25GS10	1	7	13.4	8
	25GS15	1.5	9	15.3	9
	25GS20	2	11	17.2	10
	25GS30	3	15	20.9	14
	25GS50R	5	22	28.7	17
	25GS50	5	26	33.4	21

*New High Head Hydraulic Design for models manufactured starting 8/2017

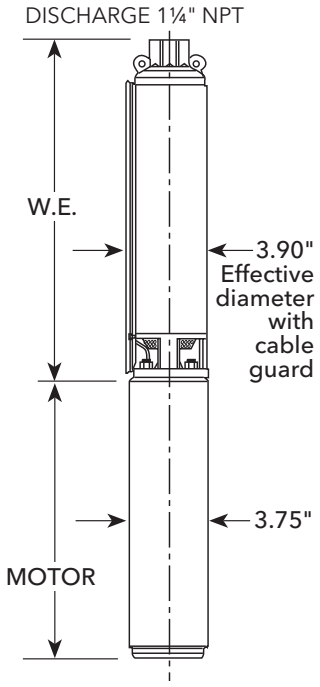
NOMENCLATURE See price book for complete order numbers.



"GS" SERIES MATERIALS OF CONSTRUCTION

Part Name	Material
Discharge Head	AISI 303 SS
Check Valve Poppet	AISI 304 SS
Check Valve Seal	BUNA, FDA compliant
Check Valve Seat	AISI 304 SS
Check Valve Retaining Ring	AISI 302 SS
Bearing Spider - Upper	Noryl® GFN2
Bearing	Proprietary Engineered Polymer
Klipring	AISI 301 SS
Diffuser	Lexan®
Impeller	Noryl®
Bowl	AISI 304 SS
Intermediate Sleeve *	AISI 304 SS, Powder Metal
Intermediate Shaft Coupling *	AISI 304 SS, Powder Metal
Intermediate Bearing Spider *	Glass Filled Engineered Composite
Intermediate Bearing Spider *	AISI 303 SS
Shim	AISI 304 SS
Screws – Cable Guard	AISI 304 SS
Motor Adapter	AISI 303 SS
Casing	AISI 304 SS
Shaft	
Coupling	AISI 304 SS, Powder Metal
Cable Guard	AISI 304 SS
Suction Screen	AISI 304 SS

*See repair parts for where used.



SPECIFICATIONS

Model	Flow Range GPM	Horsepower Range	Best Efficiency GPM	Discharge Connection	Minimum Well Size	Rotation①
5GS	1.2 – 7.5	½ – 2	5	1¼	4"	CCW
7GS	1.5 – 10	½ – 3	7	1¼	4"	CCW
10GS	3 – 16	½ – 5	10	1¼	4"	CCW
13GS	4 – 20	½ – 3	13	1¼	4"	CCW
18GS	6 – 28	¾ – 5	18	1¼	4"	CCW
25GS	8 – 33	1 – 5	25	1¼	4"	CCW

① Rotation is counterclockwise when observed from pump discharge end.

CENTRIPRO 4" SINGLE-PHASE MOTORS

Order No.	Type	HP	Volts	Length in. (mm)	Weight lb. (kg.)
M05421	2-wire PSC	½	115	11.0 (279)	20 (9.1)
M05422		½	230	11.0 (279)	20 (9.1)
M07422		¾		12.4 (314)	23 (10.4)
M10422		1		13.3 (337)	25 (11.3)
M15422		1.5		14.9 (378)	29 (13.2)
M05411	3-wire	½	115	10.0 (253)	19 (8.6)
M05412		½	230	9.7 (246)	18 (8.2)
M07412		¾		10.8 (275)	22 (10)
M10412		1		11.7 (297)	23 (10.4)
M15412		1.5		13.6 (345)	28 (12.7)
M20412		2		15.1 (383)	31 (14.1)
M30412		3		18.3 (466)	40 (18.1)
M50412		5		27.7 (703)	70 (31.8)

NEMA MOTOR

- Corrosion resistant stainless steel construction.
- Built-in surge arrestor is provided on single phase motors through 5 HP.
- Stainless steel splined shaft.
- Hermetically sealed windings.
- Replaceable motor lead assembly.
- NEMA mounting dimensions.
- Control box is required with 3 wire single phase units.
- Three phase units require a magnetic starter with three leg Class 10 overload protection.

CENTRIPRO 4" THREE-PHASE MOTORS

Order No. by Voltage			HP	Length in. (mm)	Weight lb. (kg.)
200V	230V	460V			
M05430	M05432	M05434	½	10.8 (275)	22 (9.7)
M07430	M07432	M07434	¾	10.8 (275)	22 (9.7)
M10430	M10432	M10434	1	11.7 (297)	23 (10.4)
M15430	M15432	M15434	1.5	11.7 (297)	23 (10.4)
M20430	M20432	M20434	2	13.8 (351)	28 (12.7)
M30430	M30432	M30434	3	15.3 (389)	32 (14.5)
M50430	M50432	M50434	5	21.7 (550)	55 (24.9)
M75430	M75432	M75434	7.5	27.7 (703)	70 (1.8)

Order No.	HP	Volts	Length in. (mm)	Weight lb. (kg.)
M15437	1.5	575	11.7 (297)	23 (10.4)
M20437	2		15.3 (389)	32 (14.5)
M30437	3		15.3 (389)	32 (14.5)
M50437	5		27.7 (703)	70 (31.8)
M75437	7.5		27.7 (703)	70 (31.8)

AGENCY LISTINGS

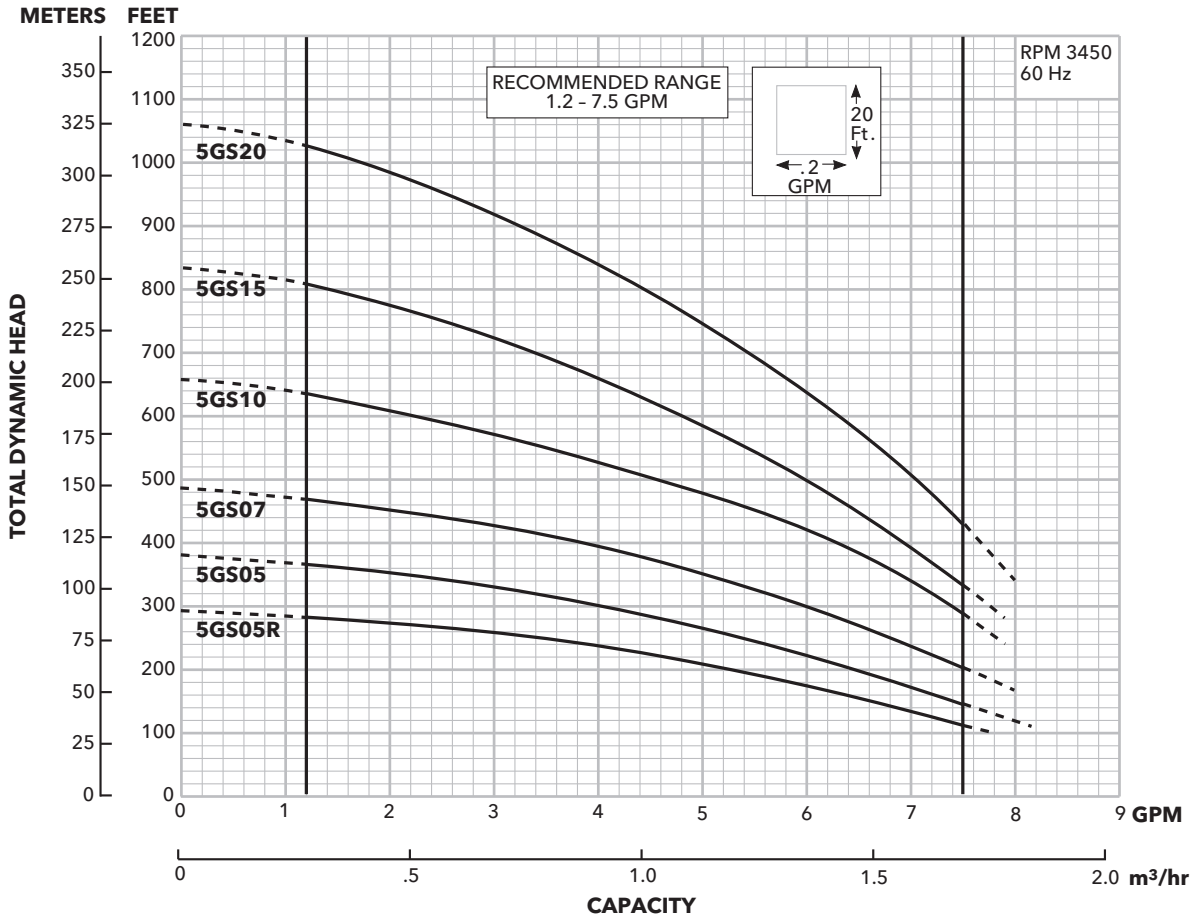
Pump/Water End and CentriPro Motor - tested to UL778 and CAN 22.2 by CSA International (Canadian Standards Association)

CentriPro Motor - Certified to NSF/ANSI 61, Annex G, Drinking Water System Components 4P49

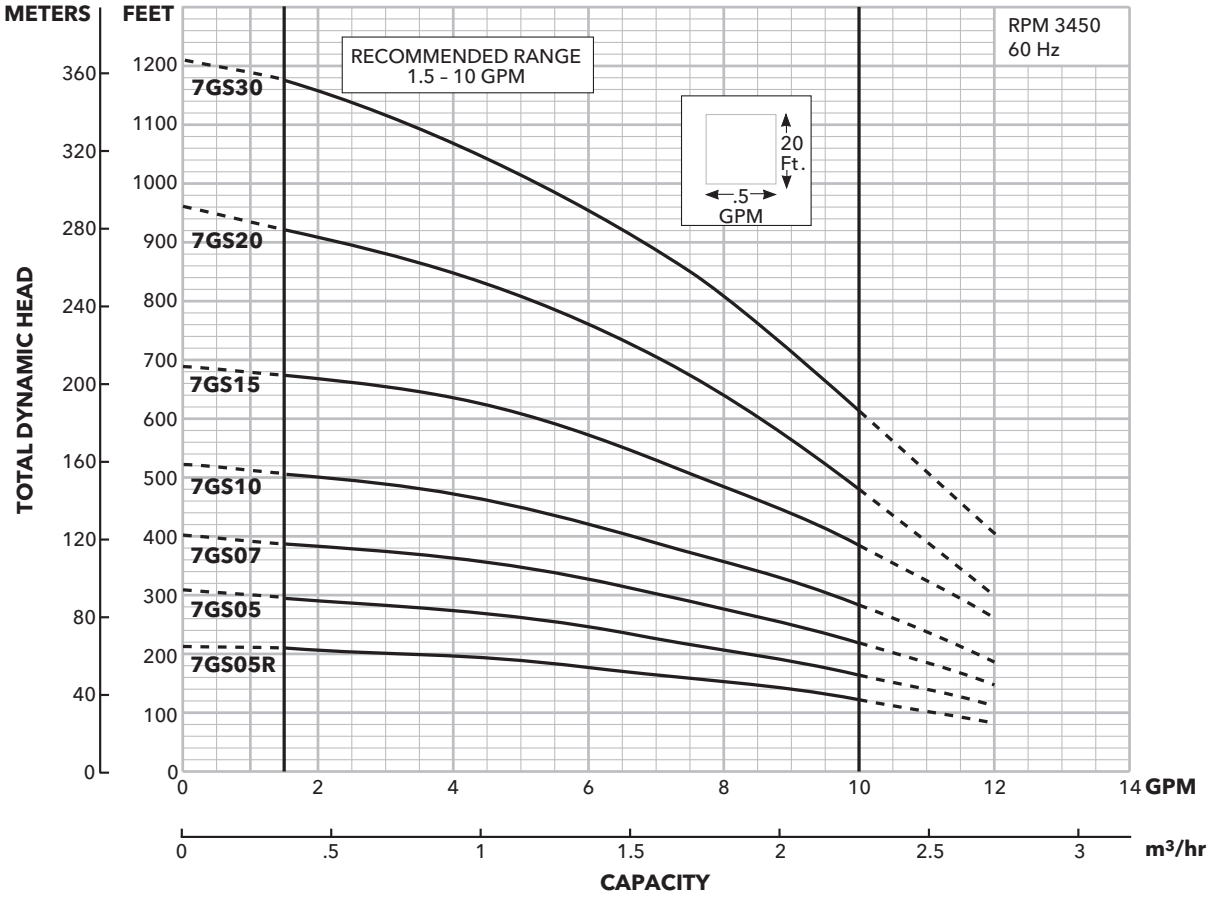
NSF/ANSI 372 – Drinking Water System Components – Lead Content

CLASS 6853 01 - Low Lead Content Certification Program - - Plumbing Products

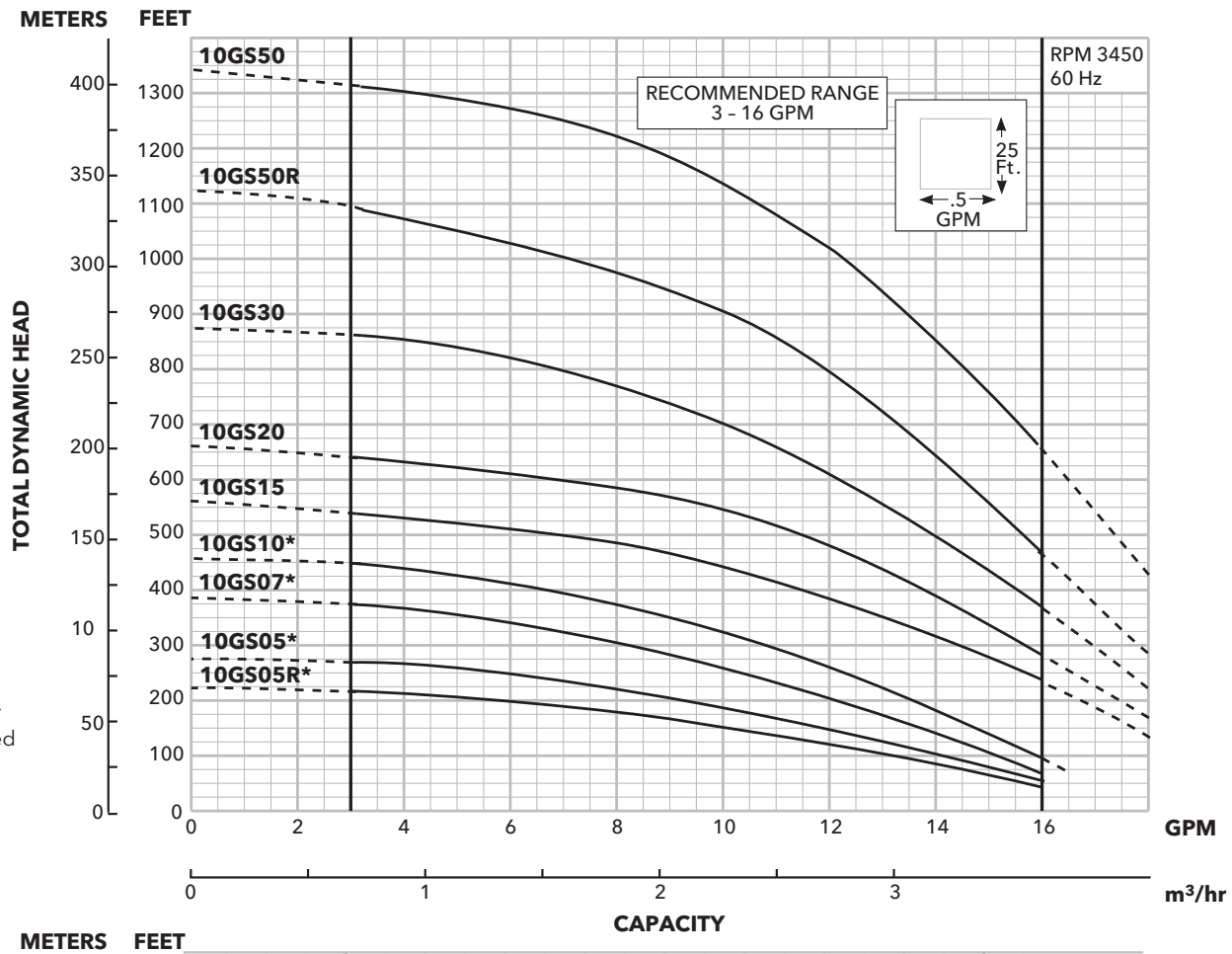
Model 5GS



Model 7GS



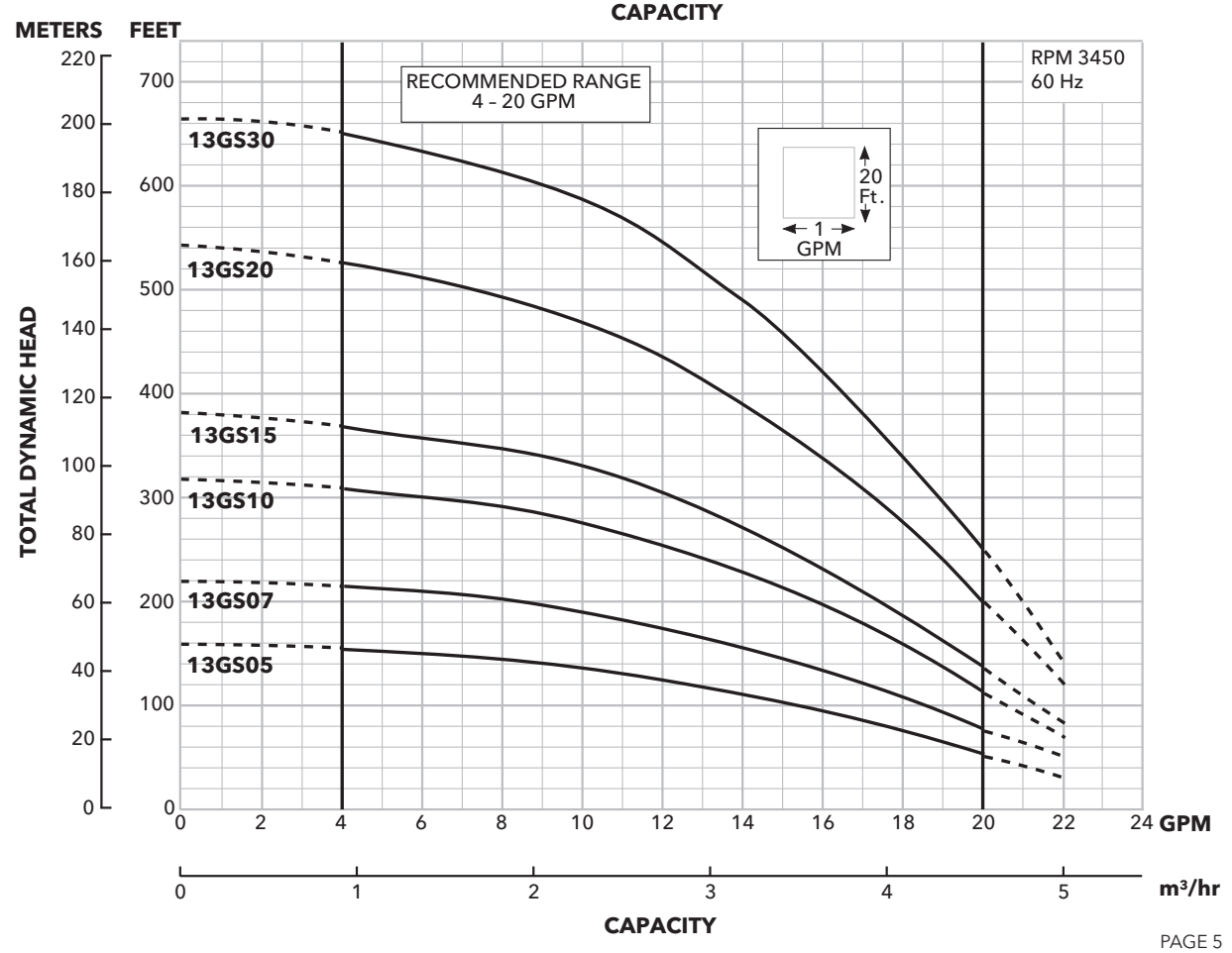
Model 10GS



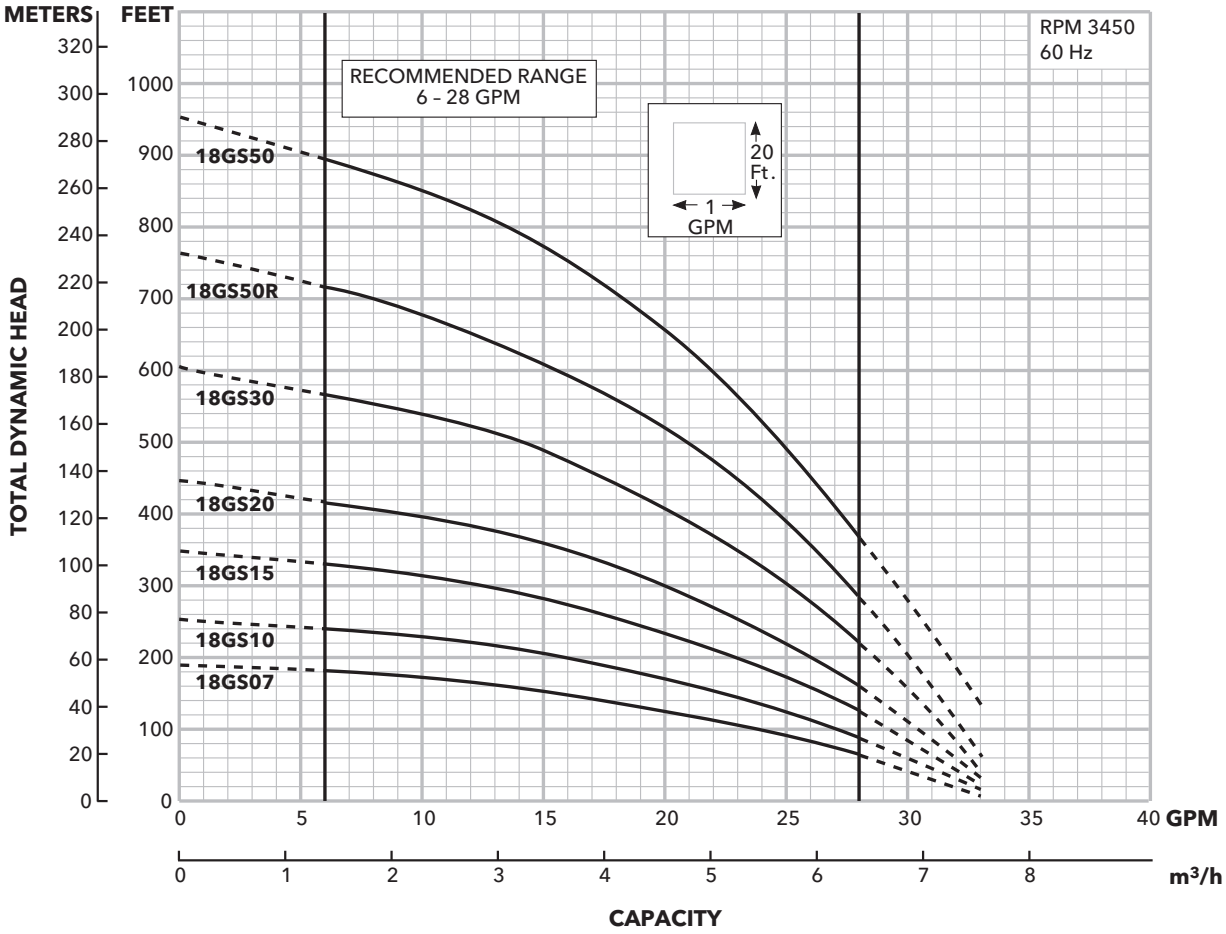
New High Head Hydraulic Design for models manufactured starting 8/2017

* HH Versions

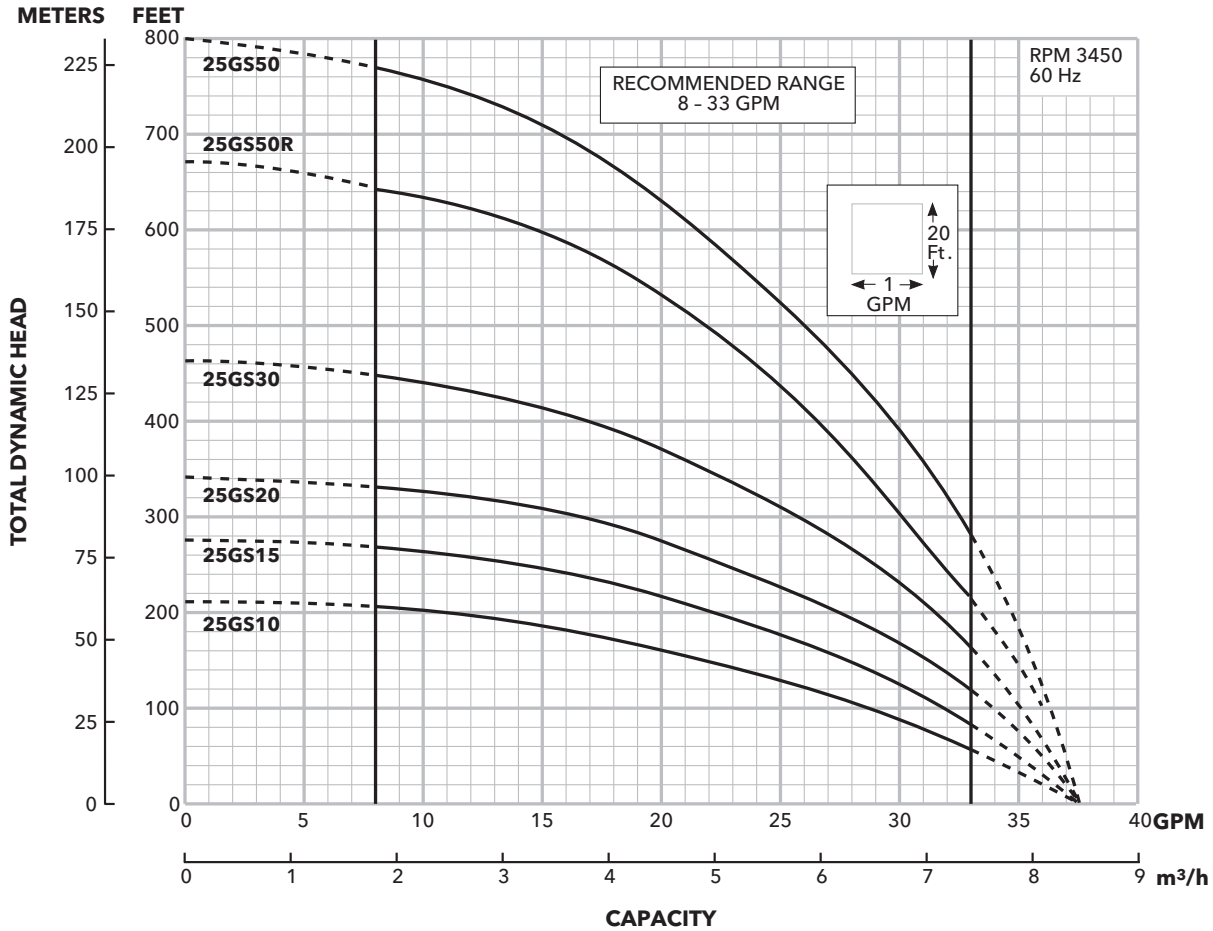
Model 13GS



Model 18GS



Model 25GS



MODEL 5GS

SELECTION CHART

Horsepower Range ½ – 2, Recommended Range 1.2 – 7.5 GPM, 60 Hz, 3450 RPM

Pump Model	HP	PSI	Depth to Water in Feet/Ratings in GPM (Gallons per Minute)																																				
			20	40	60	80	100	120	140	160	180	200	220	240	260	280	300	340	380	420	460	500	540	580	620	660	700	740	780	820	860	900	940	980	1020
5GS05R	½	0						7.4	6.9	6.3	5.8	5.3	4.7	4.0	3.0	1.4																							
		20				7.3	6.7	6.2	5.6	5.1	4.5	3.8	2.6																								
		30			7.2	6.6	6.1	5.6	5.0	4.4	3.6	2.3																								
		40		7.1	6.6	6.0	5.5	4.9	4.3	3.4	2.1																								
		50	7.0	6.5	5.9	5.4	4.9	4.2	3.3	1.8																								
		60	6.4	5.8	5.3	4.8	4.1	3.1	1.6																										
Shut-off PSI			118	109	101	92	83	75	66	57	49	40	31	23	14	5																			
5GS05	½	0							7.7	7.3	6.9	6.4	6.0	5.6	5.1	4.7	4.1	2.6																	
		20					7.5	7.1	6.7	6.3	5.9	5.4	5.0	4.5	3.9	3.2	2.3																				
		30				7.5	7.1	6.7	6.2	5.8	5.4	4.9	4.4	3.8	3.1	2.1																				
		40			7.4	7.0	6.6	6.2	5.7	5.3	4.9	4.3	3.7	2.9	1.9																				
		50	7.7	7.4	6.9	6.5	6.1	5.7	5.2	4.8	4.2	3.6	2.8	1.8																				
		60	7.3	6.9	6.5	6.0	5.6	5.2	4.7	4.2	3.5	2.6	1.6																						
Shut-off PSI			156	147	138	130	121	112	104	95	86	78	69	60	52	43	34	17																	
5GS07	¾	0										7.6	7.3	7.0	6.6	6.3	5.9	5.2	4.4	3.3	1.6														
		20								7.5	7.2	6.9	6.5	6.2	5.8	5.5	5.1	4.2	3.1	1.3															
		30							7.5	7.2	6.8	6.5	6.1	5.8	5.4	5.0	4.6	3.6	2.1																
		40						7.4	7.1	6.8	6.4	6.1	5.7	5.4	5.0	4.6	4.1	2.8																	
		50					7.4	7.1	6.7	6.4	6.0	5.7	5.3	4.9	4.5	4.0	3.4	1.8																	
		60			7.6	7.3	7.0	6.7	6.3	6.0	5.6	5.3	4.9	4.4	3.9	3.3	2.6																	
Shut-off PSI					184	175	167	158	149	141	132	123	115	106	97	89	80	63	45	28	11													
5GS10	1	0															7.5	7.0	6.5	5.9	5.3	4.6	3.8	2.8	1.6									
		20												7.6	7.4	7.2	7.0	6.4	5.9	5.2	4.5	3.7	2.6											
		30											7.6	7.4	7.2	6.9	6.7	6.1	5.5	4.8	4.0	3.1	1.9											
		40										7.6	7.4	7.1	6.9	6.6	6.3	5.8	5.1	4.4	3.5	2.5												
		50									7.5	7.3	7.1	6.8	6.6	6.3	6.0	5.4	4.7	3.9	2.9	1.7												
		60								7.5	7.3	7.1	6.8	6.5	6.3	6.0	5.7	5.0	4.3	3.4	2.3													
Shut-off PSI										214	206	197	188	180	171	162	154	136	119	102	84	67	50	32	15									
5GS15	1½	0																7.5	7.2	6.8	6.3	5.9	5.5	5.1	4.6	4.1	3.5	2.8	1.8					
		20														7.6	7.5	7.1	6.7	6.3	5.8	5.4	5.0	4.5	4.0	3.4	2.6	1.6						
		30													7.6	7.5	7.3	6.9	6.5	6.0	5.6	5.2	4.7	4.2	3.7	3.0	2.1							
		40												7.6	7.4	7.3	7.1	6.6	6.2	5.8	5.3	4.9	4.5	3.9	3.3	2.5	1.4							
		50											7.6	7.4	7.2	7.0	6.8	6.4	6.0	5.5	5.1	4.7	4.2	3.6	2.9	1.9								
		60										7.6	7.4	7.2	7.0	6.8	6.6	6.1	5.7	5.3	4.8	4.4	3.8	3.2	2.4									
Shut-off PSI												274	265	257	248	239	231	213	196	179	162	144	127	110	92	75	58	40	23					
5GS20	2	0																			7.4	7.1	6.8	6.4	6.1	5.7	5.4	5.0	4.7	4.3	3.9	3.3	2.7		
		20																		7.4	7.1	6.7	6.4	6.0	5.7	5.3	5.0	4.6	4.2	3.8	3.3	2.6	1.9		
		30																	7.5	7.2	6.9	6.5	6.2	5.8	5.5	5.1	4.8	4.4	4.0	3.5	2.9	2.2		
		40																	7.3	7.0	6.7	6.3	6.0	5.6	5.3	4.9	4.6	4.2	3.7	3.2	2.5	1.7		
		50																7.5	7.2	6.8	6.5	6.1	5.8	5.4	5.1	4.7	4.3	3.9	3.4	2.8	2.1			
		60															7.6	7.3	7.0	6.6	6.3	5.9	5.6	5.2	4.9	4.5	4.1	3.6	3.1	2.4	1.6			
Shut-off PSI																	328	311	293	276	259	242	224	207	190	172	155	138	120	103	86	68	51		

MODEL 7GS

SELECTION CHART

Horsepower Range ½ – 1, Recommended Range 1.5 – 10 GPM, 60 Hz, 3450 RPM

Pump Model	HP	PSI	Depth to Water in Feet/Ratings in GPM (Gallons per Minute)																											
			20	40	60	80	100	120	140	160	180	200	220	240	260	280	300	320	340	360	380	400	420	440	460	480	500	540	580	620
7GS05R	½	0						10.2	8.9	7.5	5.9	3.6																		
		20				9.8	8.5	7.0	5.3	2.5																				
		30			9.6	8.3	6.8	4.9	1.9																					
		40		9.4	8.1	6.5	4.6	1.2																						
		50	9.2	7.8	6.3	4.2	0.5																							
		60	7.6	6.0	3.8																									
Shut-off PSI			85	77	68	59	51	42	33	25	16	7																		
7GS05	½	0								10.1	9.2	8.3	7.4	6.3	5.0	3.4														
		20						9.8	9.0	8.1	7.1	6.0	4.6	2.7																
		30					9.7	8.8	7.9	6.9	5.8	4.3	2.4																	
		40			10.4	9.6	8.7	7.8	6.7	5.6	4.1	2.0																		
		50		10.3	9.4	8.5	7.6	6.6	5.4	3.8	1.7																			
		60	10.2	9.3	8.4	7.5	6.4	5.1	3.5																					
Shut-off PSI			125	116	107	99	90	81	73	64	55	47	38	29	21	12														
7GS07	¾	0											10.0	9.3	8.6	7.9	7.1	6.2	5.2	4.0	2.4									
		20								10.4	9.8	9.1	8.4	7.7	6.9	6.0	4.9	3.5	1.8											
		30							10.3	9.7	9.0	8.3	7.5	6.7	5.8	4.7	3.3	1.5												
		40						10.2	9.5	8.9	8.2	7.4	6.6	5.6	4.5	3.1														
		50					10.1	9.4	8.8	8.1	7.3	6.5	5.5	4.3	2.8															
		60				10.0	9.3	8.7	7.9	7.2	6.3	5.3	4.1	2.5																
Shut-off PSI						140	131	122	114	105	96	88	79	70	62	53	44	36	27	18	10									
7GS10	1	0														10.1	9.6	9.0	8.5	7.9	7.3	6.7	6.0	5.3	4.4	3.4	2.1			
		20											10.4	9.9	9.4	8.9	8.3	7.7	7.1	6.5	5.8	5.0	4.1	3.0	1.6					
		30										10.3	9.9	9.3	8.8	8.2	7.6	7.0	6.4	5.7	4.9	4.0	2.8							
		40									10.3	9.8	9.2	8.7	8.1	7.5	6.9	6.3	5.6	4.8	3.8	2.6								
		50								10.2	9.7	9.2	8.6	8.0	7.4	6.8	6.2	5.4	4.6	3.7	2.4									
		60							10.1	9.6	9.1	8.5	7.9	7.3	6.7	6.0	5.3	4.5	3.5	2.2										
Shut-off PSI									166	158	149	140	132	123	114	106	97	88	80	71	62	54	45	36	28	19	10			

Horsepower Range 1½ – 3, Recommended Range 1.5 – 10 GPM, 60 Hz, 3450 RPM

Pump Model	HP	PSI	Depth to Water in Feet/Ratings in GPM (Gallons per Minute)																											
			200	220	240	260	280	300	340	380	420	460	500	540	580	620	660	700	740	780	820	860	900	940	980	1020	1060	1100	1140	
7GS15	1½	0								10.2	9.3	8.5	7.6	6.8	5.9	4.7	2.6													
		20							10.1	9.2	8.3	7.5	6.7	5.8	4.5	2.1														
		30						10.4	9.6	8.7	7.8	7.0	6.2	5.1	3.3															
		40					10.3	9.9	9.1	8.2	7.4	6.6	5.6	4.2	1.6															
		50				10.3	9.9	9.4	8.6	7.7	6.9	6.0	4.9	2.9																
		60			10.2	9.8	9.4	8.9	8.1	7.2	6.4	5.4	3.9																	
Shut-off PSI					194	186	177	168	151	134	116	99	82	64	47	30	12													
7GS20	2	0											9.8	9.3	8.7	8.4	7.8	7.1	6.3	5.4	4.5	3.5	2.2							
		20										9.8	9.3	8.7	8.4	7.7	6.9	6.2	5.3	4.3	3.2	2.8								
		30									9.9	9.5	9.0	8.5	7.9	7.2	6.4	5.7	4.4	3.7										
		40								10.0	9.7	9.2	8.7	8.3	7.5	6.7	6.0	5.2	4.1	3.0										
		50								9.9	9.4	8.9	8.5	7.8	7.2	6.3	5.5	4.7	3.5											
		60							10.0	9.6	9.1	8.7	8.2	7.4	6.6	5.8	5.0	4.0												
Shut-off PSI									268	251	234	216	199	182	165	147	130	113	95	80	61	43	26							
7GS30	3	0														9.8	9.5	9.2	8.7	8.3	7.9	7.4	6.8	6.2	5.4	4.7	3.9	3.0	2.0	
		20													9.8	9.4	9.2	8.7	8.3	7.8	7.2	6.7	6.2	5.3	4.5	3.7	3.3	1.7		
		30												10.0	9.6	9.2	8.8	8.5	8.0	7.5	6.9	6.3	5.7	4.8	4.1	3.2	2.3			
		40											10.0	9.7	9.4	9.0	8.6	8.2	7.7	7.2	6.6	5.9	5.2	4.4	3.6	2.7	1.7			
		50											9.9	9.5	9.2	8.7	8.4	7.9	7.4	6.8	6.3	5.5	4.8	3.9	3.1	2.2				
		60										10.0	9.7	9.3	9.0	8.6	8.1	7.6	7.0	6.5	5.8	5.1	4.2	3.4	2.5	1.5				
Shut-off PSI												320	303	286	268	251	234	216	199	182	165	147	130	113	95	78	61	43	27	

MODEL 10GS

SELECTION CHART Horsepower Range ½ – 3, Recommended Range 3 – 16 GPM, 60 Hz, 3450 RPM

Pump Model	HP	PSI	Depth to Water in Feet/Ratings in GPM (Gallons per Minute)																						
			20	40	60	80	100	120	140	160	180	200	220	240	260	280	300	320	340	360	380	400	420	440	460
10GS05R*	½	0			15.3	14.2	13.1	12.0	10.9	9.8	8.4	6.1	2.1												
		20	15.0	13.9	12.8	11.6	10.6	9.4	7.8	5.1	0.3														
		30	13.7	12.6	11.5	10.4	9.2	7.5	4.6																
		40	12.4	11.3	10.2	9.0	7.2	3.9																	
		50	11.1	10.1	8.8	6.8	3.2																		
		60	9.9	8.5	6.4	2.5																			
Shut-off PSI			89	80	72	63	54	46	37	28	20	11	2												
10GS05*	½	0			15.7	14.9	14.1	13.3	12.4	11.4	10.4	9.3	8.0	6.3	3.9										
		20	15.4	14.7	13.9	13.0	12.1	11.1	10.1	8.9	7.5	5.7	2.9												
		30	14.6	13.8	12.9	12.0	11.0	9.9	8.7	7.3	5.3	2.3													
		40	13.6	12.8	11.8	10.8	9.7	8.5	7.0	4.9	1.7														
		50	12.6	11.7	10.6	9.5	8.3	6.8	4.5	1.0															
		60	11.5	10.5	9.3	8.1	6.5	4.1	0.2																
Shut-off PSI			113	105	96	87	79	70	61	53	44	35	27	18	9	1									
10GS07*	¾	0				15.7	15.2	14.6	14.0	13.4	12.7	12.0	11.4	10.8	10.1	9.5	8.7	7.7	6.4	4.6	2.1				
		20	16.0	15.5	15.0	14.5	13.8	13.2	12.5	11.8	11.2	10.6	9.9	9.2	8.4	7.3	5.9	3.9	1.2						
		30	15.5	15.0	14.4	13.7	13.1	12.4	11.7	11.1	10.5	9.8	9.1	8.3	7.1	5.6	3.5	0.7							
		40	14.9	14.3	13.6	12.9	12.3	11.6	11.0	10.4	9.7	9.0	8.1	6.9	5.3	3.1	0.2								
		50	14.2	13.5	12.8	12.2	11.5	10.9	10.3	9.6	8.9	8.0	6.7	5.0	2.7										
		60	13.4	12.7	12.1	11.4	10.8	10.2	9.5	8.7	7.8	6.5	4.7	2.3											
Shut-off PSI			161	152	143	135	126	118	109	100	92	83	74	66	57	48	40	31	22	14	5				
10GS10*	1	0					15.7	15.2	14.8	14.4	14.0	13.6	13.2	12.7	12.1	11.4	10.7	10.0	9.3	8.6	7.9	7.0	5.7	3.8	0.6
		20		16.0	15.5	15.0	14.6	14.3	13.9	13.5	13.0	12.5	11.9	11.2	10.5	9.8	9.1	8.4	7.6	6.7	5.2	2.9			
		30	16.0	15.4	15.0	14.6	14.2	13.9	13.4	13.0	12.4	11.8	11.1	10.4	9.7	9.0	8.3	7.5	6.5	4.9	2.5				
		40	15.3	14.9	14.5	14.2	13.8	13.4	12.9	12.3	11.6	11.0	10.3	9.6	8.9	8.2	7.4	6.3	4.6	2.0					
		50	14.8	14.5	14.1	13.7	13.3	12.8	12.2	11.5	10.9	10.1	9.5	8.8	8.1	7.2	6.1	4.3	1.5						
		60	14.4	14.1	13.7	13.2	12.7	12.1	11.4	10.7	10.0	9.4	8.7	7.9	7.1	5.8	3.9	0.9							
Shut-off PSI			192	184	175	166	158	149	140	132	123	114	106	97	88	80	71	62	54	45	36	28	19	10	2

Pump Model	HP	PSI	Depth to Water in Feet/Ratings in GPM (Gallons per Minute)																								
			20	40	60	80	100	120	140	160	180	200	220	240	260	280	300	340	380	420	460	500	540	580	620	660	700	740	780	820
10GS15	1½	0												15.7	15.3	14.8	14.4	13.3	12.2	10.9	9.3	7.1	3.0							
		20									16.0	15.6	15.2	14.7	14.3	13.7	13.2	11.9	10.6	9.0	6.5									
		30								15.9	15.5	15.2	14.6	14.2	13.5	13.1	12.6	11.3	9.7	7.6	4.0									
		40							15.8	15.5	15.1	14.6	14.2	13.5	13.0	12.5	11.8	10.3	8.8	6.0										
		50						15.7	15.4	14.9	14.5	14.0	13.4	12.8	12.3	11.7	11.0	9.4	7.4	3.4										
		60					15.7	15.3	14.8	14.4	13.9	13.3	12.8	12.2	11.6	10.9	10.1	8.1	5.6											
Shut-off PSI							197	188	180	171	162	154	144	136	128	119	110	93	76	58	41	24	6							
10GS20	2	0														16.0	15.7	14.9	14.2	13.4	12.4	11.4	10.0	8.2	5.8					
		20												15.9	15.5	15.3	14.8	14.1	13.2	12.2	11.0	9.9	8.0	5.2						
		30											15.8	15.4	15.1	14.7	14.4	13.5	12.7	11.7	10.3	8.8	6.5							
		40										15.8	15.4	15.1	14.7	14.4	14.0	12.9	12.2	10.9	9.5	7.8	3.9							
		50								16.1	15.7	15.3	15.0	14.6	14.2	14.0	13.4	12.5	11.5	10.1	8.5	6.0								
		60							16.0	15.7	15.3	14.9	14.5	14.2	13.8	13.4	12.8	11.8	10.7	9.1	7.2	3.4								
Shut-off PSI									225	216	208	199	190	182	173	164	156	139	121	104	87	69	52	35	17					
10GS30	3	0																	15.8	15.2	14.6	14.0	13.3	12.6	11.9	11.0	10.0	9.0	7.5	5.8
		20																15.7	15.1	14.5	13.9	13.2	12.5	11.8	10.9	9.9	8.8	7.2	5.4	
		30															15.9	15.4	14.8	14.2	13.4	12.8	12.0	11.3	10.3	9.3	8.1	6.2	3.8	
		40														15.9	15.6	15.0	14.4	13.8	13.1	12.4	11.5	10.8	9.7	8.6	7.1	4.7		
		50												16.0	15.8	15.6	15.3	14.7	14.1	13.3	12.7	11.9	11.0	10.2	9.1	7.8	6.0	3.0		
		60											16.0	15.8	15.5	15.2	14.8	14.3	13.7	12.9	12.3	11.4	10.6	9.6	8.3	6.8	4.5			
Shut-off PSI													284	275	267	258	249	232	215	197	180	163	145	128	111	94	76	59	42	24

Horsepower Range 5, Recommended Range 3 – 16 GPM, 60 Hz, 3450 RPM

Pump Model	HP	PSI	Depth to Water in Feet/Ratings in GPM (Gallons per Minute)																	
			340	380	420	460	500	540	580	620	660	700	740	780	820	860	900	940	980	1020	1060
10GS50R	5	0					15.6	15.1	14.6	14.2	13.7	13.3	12.8	12.3	11.7	11.0	10.2	9.2	7.9	6.3	4.3
		20			16.0	15.5	15.0	14.6	14.1	13.6	13.2	12.7	12.2	11.6	10.9	10.1	9.0	7.6	6.0	3.9	
		30			15.7	15.3	14.8	14.3	13.8	13.4	12.9	12.4	11.9	11.2	10.4	9.5	8.2	6.7	4.9		
		40		16.0	15.5	15.0	14.5	14.0	13.6	13.1	12.6	12.1	11.5	10.8	9.9	8.8	7.4	5.7	3.6		
		50		15.7	15.2	14.7	14.2	13.8	13.3	12.9	12.4	11.8	11.1	10.3	9.3	8.0	6.5	4.5			
		60	15.9	15.4	14.9	14.4	14.0	13.5	13.0	12.6	12.0	11.4	10.7	9.7	8.6	7.2	5.4	3.2			
Shut-off PSI			341	324	306	289	272	255	237	220	203	185	168	151	133	116	99	81	64	47	29

Pump Model	HP	PSI	Depth to Water in Feet/Ratings in GPM (Gallons per Minute)																						
			440	480	520	560	600	640	680	720	760	800	840	880	920	960	1000	1040	1080	1120	1160	1200	1240	1280	1320
10GS50	5	0						16	15.5	15.2	14.9	14.5	14	13.5	13	12.5	12	11.5	10.8	10.2	9.5	8.5	7	5.2	
		20					15.9	15.4	15.1	14.8	14.5	13.9	13.4	12.9	12.4	11.9	11.3	10.7	10.1	9.4	8.2	6.8	4.3		
		30					15.6	15.2	14.9	14.6	14.2	13.7	13.1	12.6	12.1	11.6	11.0	10.4	9.8	8.8	7.5	6.0	3.0		
		40				15.8	15.3	15.1	14.7	14.4	13.8	13.3	12.8	12.3	11.8	11.2	10.6	10.0	9.2	7.9	6.6	4.1			
		50				15.5	15.2	14.9	14.6	14.1	13.6	13.0	12.5	12.1	11.5	10.9	10.3	9.7	8.6	7.3	5.6				
		60			15.7	15.3	15.0	14.7	14.3	13.7	13.2	12.7	12.2	11.7	11.1	10.5	9.9	9.0	7.7	6.5	3.2				
Shut-off PSI					346	329	312	294	277	260	242	225	208	191	173	156	139	121	104	87	69	52	35	17	

* HH Versions

MODEL 13GS

SELECTION CHART

Horsepower Range ½ – 3, Recommended Range 4 – 20 GPM, 60 Hz, 3450 RPM

Pump Model	HP	PSI	Depth to Water in Feet/Ratings in GPM (Gallons per Minute)																												
			20	40	60	80	100	120	140	160	180	200	220	240	260	280	300	340	380	420	460	500	540	580	620	660	700	740	780	820
13GS05	½	0			19.0	17.5	15.3	12.5	8.2																					
		20	18.8	16.5	14.5	12.0	8.0																							
		30	16.0	13.4	11.0	4.1																								
		40	13.3	10.6	4.0																									
		50	9.8																											
		60																												
Shut-off PSI			60	52	43	35	26	17	9																					
13GS07	¾	0				19.7	18.5	17.0	15.0	13.2	11.5	8.5																		
		20		19.4	18.0	16.4	14.8	12.9	10.5	6.0																				
		30	18.9	17.5	16.0	14.6	12.5	10.0	5.0																					
		40	17.4	15.9	14.4	12.4	9.7	4.0																						
		50	15.4	13.8	12.0	9.5																								
		60	13.2	11.5	8.5																									
Shut-off PSI			86	78	69	61	52	43	35	26	17	8																		
13GS10	1	0						19.6	18.4	17.6	16.6	15.4	14.1	12.8	11.4	9.5	6.0													
		20			20.0	19.4	18.5	17.2	16.3	15.0	13.8	12.5	11.0	8.5	4.0															
		30		20.0	19.2	18.2	17.1	15.8	14.7	13.6	12.2	10.5	7.5																	
		40	19.9	19.0	18.0	17.0	15.7	14.6	13.5	12.0	10.1	7.3																		
		50	18.8	17.8	16.8	15.5	14.5	13.0	11.6	9.9	7.0																			
		60	17.6	16.6	15.4	14.1	12.8	11.4	9.5	6.0																				
Shut-off PSI			128	119	110	102	93	84	76	67	58	50	41	32	24	15	6													
13GS15	1½	0							19.7	18.9	18.2	17.3	16.3	15.2	14.2	13.2	12.1	8.7												
		20					19.5	18.4	17.9	17.0	16.0	15.1	14.1	12.9	11.8	10.2	8.8													
		30			20.2	19.4	18.6	17.6	16.8	15.8	14.9	14.0	12.6	11.5	9.9	7.9	4.0													
		40		20.0	19.3	18.5	17.5	16.6	15.7	14.8	13.9	12.5	11.4	9.5	7.3	4.0														
		50	20.0	19.1	18.3	17.4	16.4	15.5	14.5	13.6	12.3	11.0	9.2	6.3																
		60	18.9	18.2	17.3	16.3	15.2	14.2	13.3	12.1	11.0	8.7	5.6																	
Shut-off PSI			156	147	139	130	121	113	104	95	87	78	69	61	52	43	35	17												
13GS20	2	0										20.0	19.5	19.0	18.3	17.9	17.2	15.8	14.4	12.6	10.5	7.7								
		20								19.8	19.4	18.8	18.2	17.6	17.0	16.3	15.6	14.1	12.4	10.2	6.8									
		30							19.7	19.3	18.7	18.2	17.4	16.8	16.2	15.5	14.8	13.1	11.1	8.8										
		40						19.6	19.2	18.6	18.1	17.3	16.7	16.1	15.4	14.7	13.8	12.0	9.8	6.0										
		50				20.1	19.5	19.1	18.4	18.0	17.2	16.6	16.0	15.2	14.6	13.7	12.9	10.8	8.5											
		60			20.0	19.5	19.0	18.3	17.9	17.2	16.5	15.8	15.1	14.4	13.6	12.6	11.5	9.2	5.0											
Shut-off PSI					206	198	189	180	172	163	155	146	137	129	120	111	103	85	68	51	33	16								
13GS30	3	0													19.8	19.4	18.9	18.0	17.1	16.0	14.6	13.5	11.9	10.0	7.3					
		20											19.6	19.2	18.9	18.3	17.9	17.0	15.9	14.7	13.3	11.8	9.7	6.9						
		30									20.0	19.5	19.1	18.8	18.2	17.8	17.4	16.4	15.2	13.9	12.3	10.5	8.3	4.0						
		40								20.0	19.4	19.1	18.7	18.2	17.8	17.3	16.8	15.6	14.5	13.0	11.4	9.5	6.0							
		50							19.9	19.5	19.0	18.6	18.1	17.7	17.2	16.7	16.1	14.9	13.7	12.0	10.1	7.9								
		60						19.8	19.4	18.9	18.5	18.0	17.5	17.1	16.6	16.0	15.4	14.2	12.9	11.0	9.0	5.0								
Shut-off PSI								235	226	217	209	200	191	183	174	165	157	139	122	104	87	70	53	35	18					

MODEL 18GS

SELECTION CHART

Horsepower Range ¾ – 5, Recommended Range 6 – 28 GPM, 60 Hz, 3450 RPM

Pump Model	HP	PSI	Depth to Water in Feet/Ratings in GPM (Gallons per Minute)																														
			20	40	60	80	100	120	140	160	180	200	220	240	260	280	300	340	380	420	460	500	540	580	620	660	700	740	780	820	860
18GS07	¾	0			28.2	26.5	24.0	21.0	17.9	13.5																					
		20	27.7	25.9	23.0	20.0	16.5	10.8																							
		30	25.0	22.0	18.8	15.7	9.5																								
		40	22.2	18.9	15.1	9.0																									
		50	18.4	15.0	7.5																										
		60	13.5	5.0																											
Shut-off PSI			74	66	58	49	40	32	23	14																					
18GS10	1	0					27.0	25.5	23.6	21.2	18.8	15.9	12.0																		
		20		28.0	26.6	25.1	22.7	20.0	17.6	14.0	10.0																				
		30	27.9	26.1	24.3	22.2	19.8	17.1	13.8	8.3																					
		40	26.0	24.1	22.0	19.7	17.0	13.1	8.0																						
		50	24.0	22.0	19.1	16.5	13.0	7.1																							
		60	21.0	18.6	15.8	12.0																									
Shut-off PSI			103	94	86	77	68	60	51	42	34	25	16																		
18GS15	1½	0						28.4	27.2	26.0	24.8	23.0	21.4	19.6	17.5	15.0	12.1														
		20				27.8	26.8	25.4	24.0	22.2	20.6	18.8	16.7	14.0	10.0																
		30			27.7	26.5	25.3	23.8	22.0	20.2	18.5	16.1	13.5	10.0																	
		40		27.5	26.3	25.0	23.6	22.0	20.1	18.1	16.0	13.1	9.5																		
		50	27.6	26.4	25.0	23.4	21.8	20.0	18.0	15.5	13.0	9.2																			
		60	26.0	24.6	23.0	21.2	19.5	17.5	15.0	12.0	7.9																				
Shut-off PSI			143	134	126	117	108	100	91	82	74	65	56	48	39	30	22														
18GS20	2	0								28.0	27.1	26.2	25.1	24.0	22.9	21.4	20.0	16.8	12.8												
		20						27.8	26.8	25.8	24.6	23.7	22.6	21.0	19.5	18.0	16.0	11.6													
		30					27.5	26.5	25.5	24.5	23.3	22.1	20.6	19.0	17.5	15.8	13.6	6.5													
		40			28.5	27.4	26.4	25.4	24.4	23.2	22.0	20.5	18.9	17.4	15.7	13.5	11.0														
		50		28.0	27.2	26.2	25.3	24.3	23.0	21.8	20.3	18.7	17.0	15.3	13.1	10.5	6.0														
		60	28.0	27.1	26.2	25.1	24.0	22.9	21.4	20.0	18.3	16.8	14.8	12.8	9.5																
Shut-off PSI			183	174	165	157	148	139	131	122	113	105	96	87	79	70	61	44	27												
18GS30	3	0											28.0	27.4	26.7	26.0	25.0	23.5	21.5	19.2	16.9	14.2	10.5								
		20									27.7	27.0	26.3	25.8	24.9	24.0	23.0	21.0	18.9	16.5	13.5	9.0									
		30								27.6	26.9	26.2	25.5	24.8	23.9	22.9	21.9	19.8	17.5	14.9	11.2										
		40							27.5	26.9	26.2	25.4	24.6	23.8	22.8	21.8	20.9	18.5	16.0	13.3	8.0										
		50						27.4	26.8	26.0	25.2	24.5	23.6	22.6	21.7	20.6	19.5	17.3	14.5	11.0											
		60				28.0	27.4	26.7	26.0	25.0	24.3	23.5	22.5	21.5	20.5	19.2	18.0	15.7	12.8	7.0											
Shut-off PSI						225	216	208	199	190	182	173	164	156	147	139	130	113	95	78	61	43	26								
18GS50R	5	0															27.7	26.6	25.4	24.0	22.5	20.8	19.0	16.9	14.5	11.7	8.1				
		20													27.6	27.0	26.4	25.2	23.8	22.2	20.5	18.7	16.6	14.1	11.2	7.4					
		30											28.0	27.5	26.9	26.3	25.7	24.4	22.9	21.3	19.5	17.5	15.2	12.5	9.1						
		40										27.9	27.4	26.8	26.2	25.6	25.0	23.5	22.0	20.3	18.4	16.2	13.7	10.6	6.7						
		50									27.9	27.3	26.7	26.1	25.5	24.8	24.1	22.7	21.0	19.2	17.2	14.8	12.0	8.5							
		60								27.8	27.2	26.7	26.1	25.4	24.7	24.0	23.3	21.7	20.0	18.1	15.9	13.3	10.1	6.0							
Shut-off PSI										261	252	244	235	226	218	209	200	183	166	148	131	114	96	79	62	44	27				
18GS50	5	0																	27.9	26.8	25.8	24.8	23.7	22.6	21.2	19.9	18.4	16.8	14.8	12.4	9.7
		20																27.5	26.6	25.6	24.5	23.3	22.2	21.0	19.8	18.0	16.2	14.3	12.0	8.8	
		30															28.0	26.9	26.0	25.0	23.9	22.9	21.6	20.3	18.6	17.0	15.0	13.0	10.2	6.2	
		40														28.0	27.4	26.3	25.3	24.4	23.2	22.1	20.1	19.4	17.9	16.0	14.0	11.6	8.0		
		50													27.9	27.3	26.8	25.9	24.9	23.8	22.7	21.3	20.1	18.5	16.9	14.9	12.8	10.0	6.0		
		60												27.9	27.2	26.8	26.2	25.2	24.1	23.0	21.9	20.7	19.2	17.5	15.8	13.6	11.0	7.8			
Shut-off PSI														307	298	290	281	264	246	229	212	195	177	160	143	125	108	91	73	56	39

MODEL 25GS

SELECTION CHART

Horsepower Range 1 – 5, Recommended Range 8 – 33 GPM, 60 Hz, 3450 RPM

Pump Model	HP	PSI	Depth to Water in Feet/Ratings in GPM (Gallons per Minute)																											
			20	40	60	80	100	120	140	160	180	200	220	240	260	280	300	340	380	420	460	500	540	580	620	660	700	740		
25GS10	1	0			32.8	30.8	28.6	26.2	23.5	20.0	16.2	11.0																		
		20	31.8	30.0	27.5	25.2	22.0	19.0	15.0	8.0																				
		30	29.6	27.2	25.0	21.6	18.0	14.0																						
		40	27.1	24.9	21.5	17.9	13.9																							
		50	24.3	21.0	17.5	13.0																								
		60	20.0	16.2	11.0																									
Shut-off PSI			82	74	65	56	48	39	30	22	13	4																		
25GS15	1½	0				33.0	31.8	30.3	28.8	26.9	24.8	22.0	19.8	16.5	11.0															
		20		32.6	31.2	29.6	28.0	26.0	23.8	21.0	18.1	14.8	8.0																	
		30	32.5	31.0	29.5	27.6	25.6	23.2	20.9	17.9	14.0																			
		40	30.9	29.4	27.5	25.5	23.1	20.8	17.7	13.6																				
		50	29.0	27.2	25.1	22.9	20.4	17.2	13.0																					
		60	26.9	24.8	22.0	19.8	16.5	11.0																						
Shut-off PSI			111	103	94	85	77	68	59	51	42	33	25	16	7															
25GS20	2	0						33.0	31.8	30.4	29.0	27.4	25.7	22.6	21.5	19.3	15.4													
		20				32.7	31.3	30.0	28.6	26.8	25.0	22.9	20.9	18.3	14.3	9.0														
		30			32.3	31.0	29.6	28.5	26.4	24.5	22.6	20.5	18.0	14.0	8.0															
		40			30.9	29.5	28.2	26.3	24.3	22.4	20.4	17.8	13.6	8.0																
		50		30.5	29.4	28.0	26.0	24.1	22.1	20.0	17.2	13.2																		
		60	30.4	29.0	27.4	25.7	22.6	21.5	19.3	15.4	12.2																			
Shut-off PSI			139	130	121	113	104	95	87	78	69	61	52	43	35	26	17													
25GS30	3	0								33.0	32.2	31.5	30.5	29.6	28.3	27.1	25.8	22.6	19.0	14.0										
		20						32.8	32.0	31.0	30.0	29.0	27.9	26.6	25.0	23.8	21.9	20.0	12.6											
		30					32.6	31.8	30.9	30.0	28.8	27.6	26.5	24.9	23.4	21.6	19.9	15.2	8.0											
		40				32.5	31.7	30.9	29.9	28.8	27.5	26.2	24.7	23.3	21.5	19.9	17.8	11.9												
		50			32.3	31.6	30.8	29.8	28.5	27.3	26.0	24.5	23.0	21.2	19.5	17.4	11.5													
		60	33.0	32.2	31.5	30.5	29.6	28.3	27.1	25.8	24.1	22.6	20.9	19.0	16.9	14.0	10.0													
Shut-off PSI			191	183	174	165	157	148	139	131	122	113	105	96	87	79	70	53	35	18										
25GS50R	5	0											32.7	32.2	31.7	31.2	30.5	29.1	27.3	25.3	23.3	21.4	19.3	16.5	11.7					
		20								33.0	32.5	32.1	31.5	31.0	30.3	29.6	28.8	27.0	25.0	23.0	21.1	18.9	15.9	10.6						
		30							32.9	32.5	32.0	31.5	30.9	30.2	29.5	28.7	27.8	25.9	23.9	21.9	19.9	17.4	13.3							
		40						32.9	32.4	31.9	31.4	30.8	30.1	29.4	28.5	27.6	26.7	24.7	22.7	20.8	18.6	15.3								
		50					32.8	32.3	31.8	31.3	30.7	30.0	29.2	28.4	27.5	26.5	25.6	23.6	21.6	19.6	16.9									
		60				32.7	32.2	31.7	31.2	30.6	29.9	29.1	28.3	27.4	26.4	25.4	24.4	22.4	20.4	18.2	14.6									
Shut-off PSI						252	243	234	226	217	208	200	191	182	174	165	156	139	122	104	87	70	52	35	18					
25GS50	5	0														33.0	32.5	31.5	30.2	29.0	27.6	26.0	24.2	22.4	20.5	18.3	15.8	12.0		
		20												32.9	32.3	31.8	31.3	30.0	28.8	27.2	25.8	23.9	22.0	20.0	17.8	15.0	11.0			
		30											32.8	32.2	31.8	31.2	30.5	29.3	27.9	26.4	24.8	22.9	21.0	18.9	16.2	13.0	8.0			
		40										32.7	32.1	31.7	31.1	30.4	29.9	28.5	27.1	25.4	23.7	21.9	19.9	17.5	14.5	10.5				
		50									32.6	32.1	31.6	31.0	30.3	29.9	29.2	27.8	26.3	24.5	22.6	21.8	18.7	16.0	12.7					
		60							33.0	32.5	32.0	31.5	30.8	30.2	29.8	29.0	28.3	26.9	25.1	23.3	21.5	19.5	17.0	14.0	9.5					
Shut-off PSI									286	277	268	260	251	242	234	225	216	199	182	165	147	130	113	95	78	61	43	26		

xylem
Let's Solve Water

Xylem Inc.
2881 East Bayard Street Ext., Suite A
Seneca Falls, NY 13148
Phone: (866) 325-4210
Fax: (888) 322-5877
www.gouldswatertechnology.com

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COLORADO WATER WELL PUMP

PUMP INSTALLATION REPORT

DATE INSTALLED	5-Oct-20
CUSTOMER	IDLEDALE WATER & SAN
ADDRESS	
CITY	
STATE & ZIP	
CONTACT	
PHONE	
WELL #	RIDGEWAY WELL
PERMIT #	

PUMP INFORMATION

PUMP TYPE	Submersible
PUMP MFG	Sta Rite
PUMP MODEL #	L20P4JH
PUMP SERIAL #	"7946011
DATE CODE	001G20D
RATED GPM	20
RATED HEAD	700
RATED HORSEPOWER	5

WELL INFORMATION

WELL DEPTH	498' 10"
CASING SIZE	4"
STATIC LEVEL	
PUMPING LEVEL	
PITLESS ADAPTER	2
PICK SUB SIZE	2

START UP DATA

RESISTANCE L1 to GRD	inf
RESISTANCE L2 to GRD	inf
RESISTANCE L3 to GRD	inf
RESISTANCE L1 to L2	5
RESISTANCE L1 to L3	4.9
RESISTANCE L2 to L3	4.9
VOLTAGE L1 to L2	
VOLTAGE L1 to L3	
VOLTAGE L2 to L3	
AMPERAGE L1	
AMPERAGE L2	
AMPERAGE L3	

MOTOR INFORMATION

MOTOR TYPE	Submersible
MOTOR MFG	Pentair
MOTOR HORSEPOWER	5
MOTOR VOLTAGE	460
PHASE	3
MOTOR MODEL #	P43B0050A4
MOTOR SERIAL #	E30202310107
DATE CODE	
NAME PLATE AMPS	7.6
SF AMPERAGE	8.5
RPM	3450

SETTING INFORMATION

PUMP SETTING	481' 6"
COLUMN PIPE SIZE	1.25 inch
COLUMN PIPE MTL.	PVC Sch 120
COLUMN PIPE LENGTHS	20 ft
TREAD PATTERN	NPT
PICK UP SUBS	2 inch
CHANGE OVER NIPPLES	2 x 1.25 inch
CHECK VALVE	461 ft
KNOCK OUT (yes/no)	no
CHECK VALVE DEPTHS	
CHANGE OVER NIPPLES	
AIRLINE	no
WIRE SZE	#10/3g
PROBES SETTING	

ELECTRICAL CONTOLS

VOLTAGE	
PHASE	

		FUSE SIZE & TYPE	
GPM		MOTOR STARTER MFG	
PWL		MOTOR STARTER SIZE	
DISCHARGE PRESSURE		HEATER SIZE	
		CONTROL VOLTAGE	
		CONTROL FUSE SIZE	
		PHASE PROTECTION	

COLORADO WATER SYSTEMS
2001 E. 58th AVE.
DENVER, CO. 80216
(303) 892-9053
FAX 303-892-1924

September 22, 2020

AJ Beckman
Public Alliance
Idledale Water and Sanitation District Manager
3159 N. Speer
Denver, CO. 80211
Tel: (303) 877-6284

Dear AJ:

Below please find details of the well video logs performed on September 1, 2020 at Idledale Ridgeway and Sawmill Gulch Wells:

Ridgeway Well – September 1, 2020

Depth	Description
0’	Top of Casing – 6” steel casing
4.2’	Joint in Steel
5.4’	Pitless discharge
6.4’	Joint in Steel
8.9’	Top of PVC
10.2’	Hole Cut in PVC – Likely cut for pitless window
18.4’	Joint PVC
38.5’	Joint PVC
58.6	Joint PVC
78.7’	Joint PVC
18.4’	Joint PVC
99.1’	Joint PVC
18.4’	Joint PVC
104.1’	Static Water Level
119.3’	Joint PVC
139.6’	Joint PVC
159.7’	Joint in PVC
176.2’	Dark spot on casing – tape?
180.0’	Joint PVC

119.3’	Joint PVC
200.2’	Joint PVC
220.3’	Joint PVC
240.6’	Joint PVC – Top Screen – more iron color staining
260.8’	Joint PVC – End Screen
281.0’	Joint PVC
301.1’	Joint PVC
321.3’	Joint PVC
341.4’	Joint PVC
361.7’	Joint PVC
381.9’	Joint PVC
402.1’	Joint PVC- Start Screen
422.3’	Joint Screen
442.4’	Joint Screen
462.7’	Joint Screen
483.0’	Joint – end Screen
493-496’	Rub Marks – Possible pump set depth
502’	Broken PVC casing
502.2’	Total Depth

Video was clean and clear. Minimal staining on PVC casing and screen.

Sawmill Gulch Well – September 1, 2020

Depth	Description
0’	Top of Manhole
5.0’	Pitless discharge
4.8’	Top of Steel Casing
22.5’	Static Water level – Heavy Buildup above screens
111.3	Joint – Slots begin
132’	Joint – Slotted
152’	Joint – Slotted
172’	Joint – Slotted
182’	large buildup in slot
193’	Joint – Slotted
213’	Begin Open Hole
249’	Total Borehole Depth
451’	Total Depth (TD)

Video was clear. Open Hole appears stable to 249’

Bob Orsatti has one copy of the video logs and I have one additional copy for you. Please let me know how you would like it delivered.

If you have any questions regarding this report, please don't hesitate to call me.

Sincerely,

Thomas M. Dea P.E.
Secretary / Treasurer

We Move Water

COLORADO WATER SYSTEMS

2001 E. 58th AVE.
DENVER, CO. 80216
(303) 892-9053
FAX 303-892-1924

March 29, 2021

Public Alliance
AJ Beckman,
Idledale District Manager
3159 N. Speer
Denver, CO. 80211

Re: Well Modification – Upgrade and Lowering of Idledale Well No. 1A Pump Equipment

Dear AJ,

Thank you for allowing Colorado Water Well (CWW) the opportunity to provide this proposal for installing a larger pump to a lower depth at the Idledale Well No. Well 1A.

We recommend the following scope of work be completed, with price estimates included:

1. Prepare in shop, mobilize/demobilize and remove all existing pump equipment and reinstall new equipment.

   Estimate 12 hours @ $275.00/hour -- $3,800.00

2. Supply and install new pump (Grundfos 10S30-34), new 5HP motor (Grundfos 230 volt, three phase VFD rated) and 680’ of new submersible pump cable and 200’ of additional column pipe and PVC transducer pipe, Dynotek slimline transducer, and materials necessary to lower the new pump and motor to a setting depth of approximately 680’ below ground level.

   Lump Sum -- $12,484.00

3. Reinstall new Dynotek slimline transducer + programming, start up and test well.

   Lump Sum -- $2,000.00

4. File permanent installation reports with the State of Colorado

   No Charge

Total This Proposal - $17,924.00

Clarifications:

Colorado Water Well will remove the existing equipment and send the motor in for factory evaluation to determine if it is a warrantable failure. If warrantable, Colorado Water Well will credit Idledale for the materials that are warrantable

Idledale will be responsible for ensuring adequate power exists at the well building, through the existing VFD and to the wellhead. We propose installing a 5HP motor even though the max load will be equivalent to a 3HP motor for Well No. 1A.

Idledale will be responsible for providing adequate cable, conduit and junction boxes to run power from building to well head and a separate conduit with a pull box to run the transducer cable from the building to the well head. NOTE – Transducer may be spliced at the wellhead if desired by Idledale.

Idledale will pull electrical cable from the building to the well head. Idledale staff will work with CWW staff to program the existing VFD and set parameters prior to testing. Idledale is responsible for ensuring adequate wire size and filters (as necessary) from the VFD to the well head.

We will also need a signed approval and signed waiver (attached) to schedule this work.

If you have any questions or wish to discuss this proposal, please call me. We look forward to working with you on this important project.

Sincerely,

Approved By:_____

Thomas M. Dea

Tom Dea
Colorado Water Systems

Date:_____

We Move Water

COLORADO WATER WELL
2001 E. 58th AVE.
DENVER, CO. 80216

COLORADO WATER SYSTEMS
2001 E. 58th AVE.
DENVER, CO. 80216
(303) 892-9053
FAX 303-892-1924

August 17, 2021

Bob Orsatti, P.E
Orsatti Water Consultants
3821 Union Ct.
Wheat Ridge, CO 80033

bob@orsattiwaterconsultants.com
(303) 881-1337

RE: Idledale Well 1A Letter Report

Dear Bob:

This letter report is written to provide additional information on the well pump installation, start up, testing, and warranty information for Idledale Well 1A pump equipment.

The initial removal of the old pump and installation of a new pump and motor (Grundfos 10S30-34 3 HP wet end with a 5HP Grundfos 3 phase motor, addition of 1" diameter PVC piezometer pipe, and installation of all new submersible cable (#8/3 conductor with ground) from the pump set depth to the well head to a deeper depth (672') was performed on April 5, 2021.

Grundfos Wet End

After installation, negotiations took place and Idledale desired to raise the pump and motor up to above the uppermost screen because the pump was initially installed to a depth of 672' and motor cooling could not be guaranteed. The equipment was raised and Idledale staff requested start up on April 30th 2021. During the startup on April 30th Colorado Water Well (CWW) determined we had a motor issue and the motor installed was eventually confirmed to be the incorrect motor, a single phase motor instead of a three phase motor. On Saturday May 1, CWW removed equipment and reinstalled a new three phase 5 HP motor. We also set the equipment with a final pump intake setting depth of 608', bottom of the motor is at 610' (Top well screen is at 626'). Idledale staff set the water level transducer and made final terminations at the VFD as they had requested.

Start up and testing went well and Idledale staff recorded all data on their SCADA system as the well was placed into operation.

> NOTE- During pump removal on May 1, 2021, the PVC casing began coming up with the downhole equipment. When this was noticed, CWW staff lowered the pump and motor and the PVC casing released and then slid back into the well. The question of "Did the PVC separate or did it come up intact from the bottom" that was asked by you is not answerable. We do not know the answer to this because the casing string slid back into place. Based on our experience, we believe it is most likely that the entire casing string slid up and then slid back down, since no noticeable PVC elevation change occurred. We recommend that the next time the pump equipment is removed that the well be inspected with a color video with side scan capabilities.

CWW Warranty

1. CWW and Idledale staff worked together and the downhole assembly was installed, wired up to the District's existing VFD, started up and initially operated per all Colorado Water Well and manufacturer's warranty requirements. Start up was performed on May 1, 2021, and the pump intake is set at 608'. This setting forces all water produced to pass the motor before entering the suction of the pump.

2. CWW warrants the pump, motor, and installation for two years as it is currently installed with the existing VFD (bottom of motor at 610' below top of casing). The minimum flow rate must be 7 GPM and the minimum amount of water above the pump must be maintained at 50' (maximum pumping level of 558').

Variable Frequency Drive (VFD)

We were onsite while Idledale Staff started up and tested equipment utilizing the existing Idledale VFD and Colorado Water Well determined that the existing VFD was adequate to operate and protect the motor during normal operating conditions through the warranty period as long as the District can ensure that the following conditions have been met:

1. Minimum flow of 7 GPM when pumping
2. Minimum water level above the pump of 50'

Acceptable operating parameters that must be followed to maintain warranties are:

1. Minimum flow of 7 GPM when pumping

2. Minimum water level above the pump of 50’

Unfortunately, we are still awaiting the warranty evaluation and if the previous motor is covered we will provide a credit for that equipment if it is deemed a warrantable failure once that is resolved.

If you have any questions regarding this letter report, please call my cell phone.

Sincerely,

Thomas M. Dea P.E.
Secretary / Treasurer

Form No. GWS-32 10/2016	**PUMP INSTALLATION AND PRODUCTION EQUIPMENT TEST REPORT** State of Colorado, Office of the State Engineer 1313 Sherman St., Room 821, Denver, CO 80203 303.866.3581 dwr.colorado.gov and dwrpermitsonline@state.co.us	For Office Use Only

1. Well Permit Number: 34384-F **Receipt Number:**

2. Owner's Well Designation: Well #1

3. Well Owner Name: Idledale Water & Sanitation

4. Well Location Street Address: 2144 S, Grapevine Rd Golden CO. 80401

5. GPS Well Location: ☐ Zone 12 ☒ Zone 13 Easting: 479107.75 Northing: 4392146.61 **County:** Jefferson

6. Legal Well Location: ___ 1/4, ___ 1/4, Sec. _____ Twp. _____ ☐ N or S ☐, Range ____ ☐ E or W ☐
Distances from Section Lines: _____ ft. from ☐ N or S ☐ sec. line, and _____ ft. from ☐ E or W ☐ sec. line
Subdivision: _____ , Lot _____, Block _____ , Filing (Unit) _____

7. Check Installation Type: ☐ Initial Pump Installation ☑ Replacement Pump ☐ Change in Depth Only ☐ Repair

8. Pump Data: Type: Submersible Date Installed(mm/dd/yyyy): 05/01/2021
Pump Manufacturer: Grundfos Pump Model No. 10S30-34
Design GPM: 16 at RPM 3500 HP 5 Volts 230 3PH Full Load Amps 15
Pump Intake Depth: 608 Feet, Drop/Column Pipe Size Inches, 1.5 Kind of Drop Pipe PVC
Additional Information for Pumps Greater Than 50 GPM: Turbine Driver Type: ☐ Electric ☐ Engine ☐ Other _____
Design Head: _____ feet Number of Stages: _____ Shaft size: _____ inches

9. Other Equipment:
Airline Installed: ☐ Yes ☐ No, Orifice Depth ft. _____ Monitor Tube Installed: ☒ Yes ☐ No, Depth ft. 600
Flow Meter Mfg. _____ Meter Serial No. _____
Meter Readout: ☐ Gallons, ☐ Thousand Gallons, ☐ Acre feet Beginning Reading:

10. Cistern Information: Material: _____ Capacity: _____ gallons Date Installed:

11. Production Equipment Test Data: ☐ check box if data is submitted on Form Number GWS-39 Well Yield Test Report.

	Date:	5/1/21				
Total Well Depth: _____ ft.	Time:	01:00				
Static Level: 15 ft.	Rate (gpm):	15				
Date Measured: 05/01/2021	Pumping Level (ft):					

12. Disinfection: Type: Chlorine Dry Amt. Used: 2 cups

13. Notification: Was Advanced Notification Required Prior to Installation? ☐ Yes ☒ No, Date Notification Given:

14. Water Quality analysis available: ☐ Yes ☒ No If yes, please submit with this report.

15. Remarks:

16. I have read the statements made herein and know the contents thereof, and they are true to my knowledge. This document is signed (or name entered if filing online) and certified in accordance with Rule 17.4 of the Water Well Construction Rules, 2 CCR 402-2. The filing of a document that contains false statements is a violation of section 37-91-108(1)(e), C.R.S., and is punishable by fines up to $1,000 and/or revocation of the contracting license. If filing online, the State Engineer considers the entry of the licensed contractor's name to be compliance with Rule 17.4.

Company Name:	Email:	Phone w/area code:	License Number:
COLORADO WATER WELL	cowatersys@gmail.com	(303) 892-9053	1555

Mailing Address: 2001 E 58th Ave. Denver CO 80216

Sign (or enter name if filing online)	Print Name and Title	Date:
David Bomhoff	David Bomhoff Installer	05/24/2021

GWS-32
10/2016

INSTRUCTIONS FOR PUMP INSTALLATION AND TEST REPORT

The report must be computer generated, typed or printed in **BLACK OR BLUE INK**. All changes on the form must be initialed and dated. Attach additional sheets if more space is required. Each additional sheet must be identified at the top by the well owner's name, the permit number, form name/number and a sequential page number. Report depths in feet below ground surface.

If filing online please see the Form Submittal, Payment Options, & Fee Schedule

You may also save, print and email the completed form to: dwrpermitsonline@state.co.us

This form may be reproduced by photocopy methods, or by computer generation. Photocopy reproductions must retain margins and print quality of the original form.

This form must be submitted to the State Engineer's Office within 60 days after completing the well or 7 days after the permit expiration date, whichever is earlier.

A copy of the form must be provided to the well owner.

Item Instructions: (numbers correspond with those on the front of this form)

1. Complete the well permit and receipt number.
2. Provide the identification (owner's well designation) for the well.
3. Fill in well owner name.
4. Provide the street address where the well is located.
5. Provide the GPS location and County where the well is located (required field).
   Colorado contains two (2) UTM zones. Zone 13 covers most of Colorado. The boundary between Zone 12 and Zone 13 is the 108th Meridian (longitude). West of the 108th Meridian is UTM Zone 12 and east of the 108th Meridian is UTM Zone 13. The 108th Meridian is approximately 57 miles east of the Colorado-Utah state line. On most GPS units, the UTM zone is given as part of the Easting measurement, e.g. 12T0123456. Check the appropriate box for the zone.
6. Complete the legal description location of the well. For wells located in subdivisions, the name, lot, block, and filing, must be provided
7. Check the box representing the type of installation performed.
8. Indicate the type of pump installed and complete the other requested information. When installing pumps greater than 50 gpm, complete additional information in this area.
9. Provide the information on other equipment, which may be installed in the well.
10. Provide information for cisterns connected to water well supply systems
11. Report test data as required by Rule 12.4. Spaces are provided to report all measurements made during the test. The report should show that the test complied with the provisions of the rules. If available, report clock time when measurements were taken.
12. Record the type and the amount of disinfection used.
13. Indicate whether or not the well inspection team was required to be notified prior to construction. If required, provide the date notification was given. See https://dwr.colorado.gov/services/well-construction-inspection for more information.
14. Indicate if a water quality analysis was performed and submit a copy of the report if available.
15. Use the remarks area to note any additional information including additional equipment installed, water supply construction problems, etc.
16. Fill in Company Name and Address of Contractor who installed pumping equipment. The individual signing or entering their name in the report must be the licensed contractor responsible for the installation of pumping equipment. If you filled out this form on-line see online filing instructions. You may also save the form and email it to the address below or print the form, sign, scan and email the form to: dwrpermitsonline@state.co.us If filing online, the State Engineer considers the entering of the licensed contractors name on the form to be a certification of accuracy and truthfulness of the information contained therein in compliance with Rule 17.4 of the Water Well Construction Rules and Regulations, 2 CCR 402-2.
    Rule 17.4 Certification - Work reports must be signed and certified as to accuracy and truthfulness of the information on the report by the well construction or pump installation contractors or authorized individuals responsible for the work performed by them or under their direction or supervision, or by the private driller or private pump installer if the work was performed by them. Such reports are deemed to be completed, signed and certified under oath.

You may also mail the completed report to: State of Colorado, Office of the State Engineer, 1313 Sherman St., Room 821, Denver, CO 80203

IF YOU HAVE ANY QUESTIONS regarding any item on this form, please call the Division of Water Resources Ground Water Information Desk (303-866-3587), or the nearest Division of Water Resources Field Office located in Greeley (970-352-8712), Pueblo (719-542-3368), Alamosa (719-589-6683), Montrose (970-249-6622), Glenwood Springs (970-945-5665), Steamboat Springs (970-879-0272), or Durango (970-247-1845), or refer to our website at dwr.colorado.gov for general information, additional forms, and access to state rules and statutes.

Appendix C.3
Preliminary Construction Cost Estimate

Water System Improvements Project
Idledale Water Sanitation District
8/27/2021

Preliminary Project Costs

Orsatti Water Consultants

Item	Description	Quantity	Units	Material Cost	Installation Cost	Construction Cost Total	Engineering	Total Line Item Cost
	General Contract Requirements - Mobilization, management, contracting, insurance, permitting, shop drawings, staging, survey, traffic control, and Fee.	1	LS	$152,300	$121,900	$274,200		
1	Improve Ridgeway Well Delivery					$311,600	$65,000	$376,600
A	New Well Pump & Motor Downhole	1	LS	$8,000	$5,000	$13,000		
B	New VFD & Control Upgrade @ Forks Building	1	LS	$1,500	$500	$2,000		
C	2" PE Transmission Main (slipline exst)	2,530	LF	$40	$30	$177,100		
D	2" PE Transmission Main (conventional)	900	LF	$30	$80	$99,000		
E	2" Buried Isolation Valves	3	EA	$1,000	$1,500	$7,500		
F	2" ARV Vault	1	EA	$7,500	$5,500	$13,000		
2	New Hardrock Water Well (10-20 gpm)					$269,500	$45,000	$314,500
A	Drill and Develop Well (6" bore, 700 ft deep)	1	LS	$35,000	$35,000	$70,000		
B	Complete Outfitting of Well*	1	LS	$25,000	$15,000	$40,000		
C	Electrical Power Service & Meter for New Well	1	LS	$8,000	$7,000	$15,000		
D	2" PE Transmission Main (conventional)	1,000	LF	$30	$65	$95,000		
E	Buried Pump Conrtol Wiring (same trench)	1,000	LF	$10	$2	$12,000		
F	New VFD & Controls @ Upper Treatment Building	1	LS	$1,500	$500	$2,000		
G	2" Buried Isolation Valves	2	EA	$1,000	$1,500	$5,000		
H	2" ARV Vault	1	EA	$7,500	$8,000	$15,500		
I	Legal & Easement Costs	1	EA	$15,000	$0	$15,000		
3	Upper Treatment Building Rehabilitation					$165,500	$40,000	$205,500
A	Influent Flow Control Modifications	1	LS	$6,500	$4,500	$11,000		
B	GWUDI Filtration System	1	LS	$12,500	$7,500	$20,000		
C	Green Sand Pressure Filter System	1	LS	$40,000	$15,000	$55,000		
D	Electrical Improvements	1	LS	$12,500	$7,000	$19,500		
E	Instrumentation & Control Improvements	1	LS	$8,500	$3,500	$12,000		
F	Building Improvements	1	LS	$27,000	$21,000	$48,000		
4	Replace Broken Infrastucture					$92,400	$20,000	$112,400
A	Fire Hydrant Assembly	6	EA	$7,500	$4,500	$72,000		
B	6" Isolation Valve & Box	6	EA	$1,200	$2,200	$20,400		
5	Water Service Meters					$699,400	$105,000	$804,400
A	3/4" x5/8" Water Service Meter (w/ remote radio read)	147	EA	$250	$150	$58,800		
B	Water Meter Data Collector & Software	1	LS	$5,500	$0	$5,500		
C	Spare Meters	12	EA	$250	$0	$3,000		
D	Water Meter Pit Installation	147	EA	$1,500	$2,000	$514,500		
E	Surface Restoration	147	EA	$500	$300	$117,600		
Project Subtotals						**$1,813,000**	**$275,000**	**$2,088,000**
15% Estimating Contingency						**$272,000**	**$41,000**	**$313,000**
Project Totals						**$2,085,000**	**$316,000**	**$2,401,000**

Water System Improvements Project
Idledale Water and Sanitation District
8/27/2021

Preliminary Genesee Connection Alternative Cost Estimate

Description	Quantity	Units	Material Cost	Installation Cost	Construction Cost Total	Engineering	Total Line Item Cost
General Contract Requirements - Mobilization, management, contracting, insurance, permitting, shop drawings, staging, survey, traffic control, and Fee.	1	LS	$47,300	$23,650	$71,000		
Genesee Connection Alternative					$473,000	$90,000	
1.5" Master Meter & Vault w/ Main Connection	1	LS	$27,000	$25,000	$52,000		
2" PE Transmission Main (HDD)	4,025	LF	$30	$50	$322,000		
2" PE Transmission Main (conventional)	200	LF	$30	$70	$20,000		
2" Buried Isolation Valves	10	EA	$1,000	$1,500	$25,000		
2" ARV Vault	2	EA	$15,000	$12,000	$54,000		
Construction Project Totals					**$544,000**	**$90,000**	**$634,000**
Genesee Tap Fee (1.5" service)							$1,250,000
Purchase Surface Water Rights							$7,000
Perfect Surface Water Rights							$35,000
Legal Fees							$10,000
Project Subtotals					**$544,000**	**$90,000**	**$1,936,000**
15% Estimating Contingency					**$82,000**	**$14,000**	**$290,000**
Project Totals					**$626,000**	**$104,000**	**$2,226,000**

Appendix D.1
Residential Water Service Meter Example

A PRODUCT SHEET OF NEPTUNE TECHNOLOGY GROUP

T-10 Meter

SIZES ⅝", ¾", AND 1"

Every T-10® water meter meets or exceeds the latest AWWA C700 Standard. Its nutating disc, positive displacement principle has been time-proven for accuracy and dependability since 1892, ensuring maximum utility revenue.

Construction

The T-10 water meter consists of three major assemblies: a register, a lead free, high-copper alloy maincase, and a nutating disc measuring chamber.

The T-10 meter is available with a variety of register types. For reading convenience, the register can be mounted in one of four positions on the meter.

The corrosion-resistant, lead-free, high-copper alloy maincase will withstand most service conditions; internal water pressure, rough handling, and in-line piping stress.

The innovative floating chamber design of the nutating disc measuring element is unaffected by meter position of in-line piping stresses while the unique chamber seal extends the low-flow accuracy by sealing the chamber outlet port to the maincase outlet port. The nutating disc measuring element utilizes corrosion-resistant materials throughout and a thrust roller to minimize wear.

Warranty

Neptune® provides a limited warranty for performance, materials, and workmanship. See warranty statement for details.

Guaranteed Systems Compatibility

All T-10 water meters are guaranteed adaptable to our ARB®V, ProRead™ (ARB VI) AutoDetect, ProCoder™, E-CODER® (ARB VII), E-CODER®)R900*i*™, E-CODER®)R450*i*™, ProCoder™)R900*i*™, TRICON®/S, TRICON/E®3, and Neptune meter reading systems without removing the meter from service.

Systems Compatibility

Adaptability to all present and future systems for flexibility is available only with Neptune's ARB® Utility Management Systems™.

KEY FEATURES

REGISTER

- Magnetic-driven, low-torque registration ensures accuracy
- Impact-resistant register
- High-resolution, low-flow leak detection
- Bayonet-style register mount allows in-line serviceability
- Tamperproof seal pin deters theft
- Date of manufacture, size, and model stamped on dial face

LEAD FREE MAINCASE

- Made from lead free, high-copper alloy
- NSF/ANSI 372, NSF/ANSI 61
- Lifetime guarantee
- Resists internal pressure stresses and external damage
- Handles in-line piping variations and stresses
- Lead free, high-copper alloy provides residual value vs. plastic or composite
- Electrical grounding continuity

NUTATING DISC MEASURING CHAMBER

- Positive displacement
- Widest effective flow range for maximum revenue
- Proprietary polymer materials maximize long-term accuracy
- Floating chamber design is unaffected by meter position or in-line piping stresses

Specifications

- NSF/ANSI 372, NSF/ANSI 61
- National Type Evaluation Program (NTEP) certification

Application

- Cold water measurement of flow in one direction in residential service applications

Maximum Operating Water Pressure

- 150 psi (1034 kPa)

Maximum Operating Water Temperature

- 80°F

Measuring Chamber

- Nutating disc technology design made from proprietary synthetic polymer

Options

Sizes

- ⅝", ⅝" x ¾"
- ¾", ¾" SL, ¾" x 1"
- 1", 1" x 1¼"

Units of Measure:

- U.S. gallons, imperial gallons, cubic feet, cubic metres

Register Types

- Direct reading: bronze box and cover (standard)

Remote Reading:

- ProRead, ProCoder, E-CODER, E-CODER)R900*i*, E-CODER)R450*i*, ProCoder™)R900*i*™, TRICON/S, TRICON/E3
- Reclaim

Bottom Caps

- Synthetic polymer (⅝" only)
- Cast iron
- Lead free, high-copper alloy

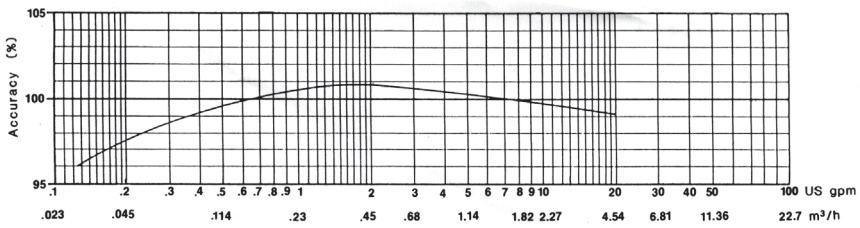
Connections

- Lead free, high-copper alloy, straight or bent

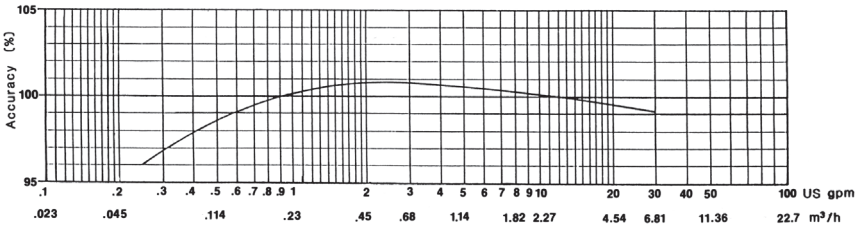
Environmental Conditions

- Operating temperature: +33° F to +149° F (0° C to +65° C)
- Storage temperature: +33° F to +158° F (0° C to +70° C)

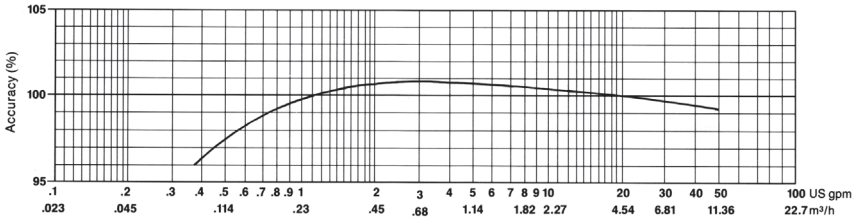
⅝" ACCURACY



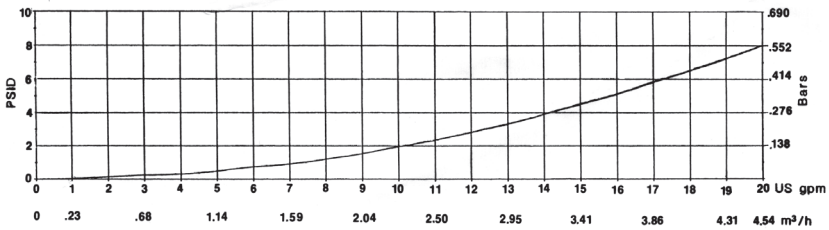
¾" ACCURACY



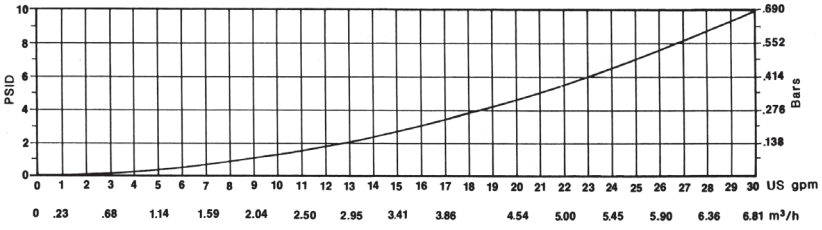
1" ACCURACY



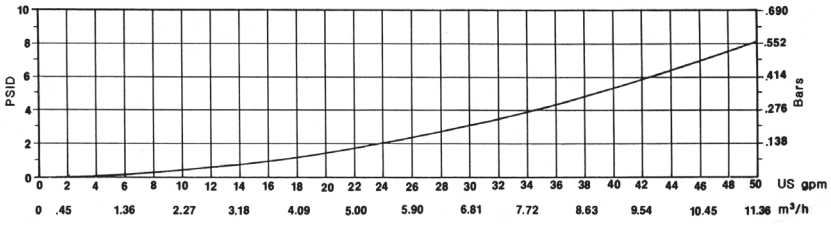
⅝" PRESSURE LOSS



¾" PRESSURE LOSS



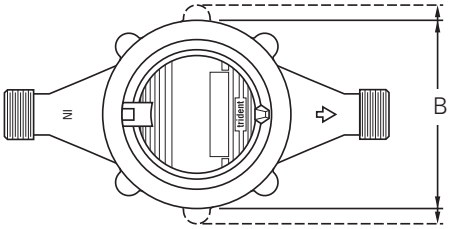
1" PRESSURE LOSS

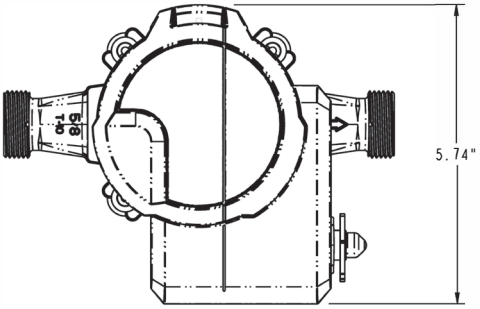


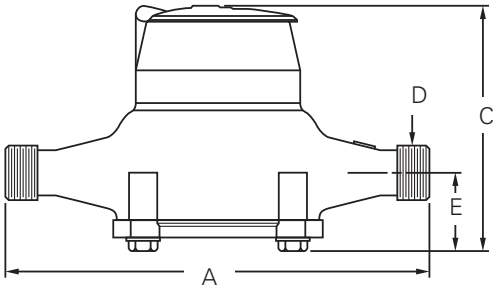
These charts show typical meter performance. Individual results may vary.

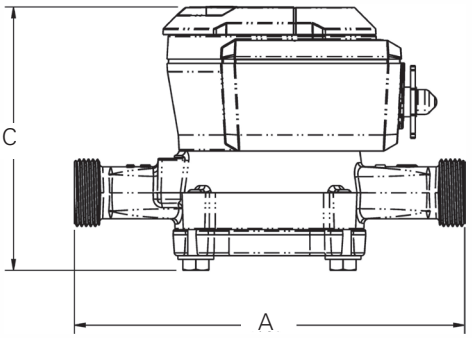
Dimensions

Meter Size	A	B	C					D-	E-	Weight lbs/kg
	in/ mm	in/ mm	Std. in/mm	ARB in/mm	ProCoder™ or E-CODER®	ProCoder™) R900*i*™ or ProCoder™) R450*i*™	E-CODER®) R900*i*™or E-CODER®) R450*i*™	NPSM Thread	in/ mm	
⅝"	7½ 191	3⅜ 92	4⅜ 111	5¼ 133	5¼ 133	5¼ 133	5¼ 133	¾" - 14"	1½ 38	3¼ 1.4
⅝" x ¾"	7½ 191	3⅜ 92	4⅜ 111	5¼ 133	5¼ 133	5¼ 133	5¼ 133	1" - 11½"	1½ 38	3⅜ 1.5
Pre 2011 ⅝"	7½ 191	3⅜ 92	4⅞ 124	5½ 146	5½ 139	5½ 139	5½ 139	¾" - 14"	1⅝ 41	3¾ 1.7
Pre 2011 ⅝" x ¾"	7½ 191	3⅜ 92	4⅞ 124	5½ 146	5½ 139	5½ 139	5½ 139	1" - 11½"	1⅝ 41	4 1.8
¾"	9 229	4⅜ 111	5½ 140	6¼ 159	6¼ 159	6¼ 159	6¼ 159	1" - 11½"	1⅞ 48	6 2.7
¾" SL	7½ 911	4⅜ 111	5½ 140	6¼ 159	6¼ 159	6¼ 159	6¼ 159	1" - 11½"	1⅞ 48	5½ 2.5
¾" x 1"	9 229	4⅜ 111	5½ 140	6¼ 159	6¼ 159	6¼ 159	6¼ 159	1¼" - 11½"	1⅞ 48	6½ 2.9
1"	10¾ 273	6½ 165	6⅜ 162	7 178	7 178	7 178	7 178	1¼" - 11½"	2⅛ 54	9¾ 4.4
1" x 1¼"	10¾ 273	6½ 165	6⅜ 162	7 178	7 178	7 178	7 178	1½" - 11½"	2⅛ 54	10¼ 4.6









Operating Characteristics

Meter Size	Normal Operating Range @ 100% Accuracy (+/- 1.5%)	AWWA Standard	Low Flow @ 95% Accuracy
5/8"	1/2 to 20 US gpm 0.11 to 4.55 m³/h	1 to 20 US gpm 0.23 to 4.5 m³/h	1/8 US gpm 0.03 m³/h
3/4"	3/4 to 30 US gpm 0.17 to 6.82 m³/h	2 to 30 US gpm 0.45 to 6.8 m³/h	1/4 US gpm 0.06 m³/h
1"	1 to 50 US gpm 0.23 to 11.36 m³/h	3 to 50 US gpm 0.68 to 11.4 m³/h	3/8 US gpm 0.09 m³/h

Registration

ProRead Registration (per sweep hand revolution)		**5/8"**	**3/4" & 1"**
10	US Gallons	√	√
10	Imperial Gallons	√	√
1	Cubic Foot	√	√
0.1	Cubic Metre	√	√
Register Capacity ProRead, ProCoder, and E-CODER		**5/8"**	**3/4" & 1"**
10,000,000	US Gallons	√	√
10,000,000	Imperial Gallons	√	√
1,000,000	Cubic Feet	√	√
100,000	Cubic Metres	√	√
ProCoder and E-CODER High Resolution (8-digit reading)		**5/8"**	**3/4" & 1"**
0.1	US Gallons	√	√
0.1	Imperial Gallons	√	√
0.01	Cubic Feet	√	√
0.001	Cubic Metres	√	√

NEPTUNE TECHNOLOGY GROUP

#winyourday
neptunetg.com

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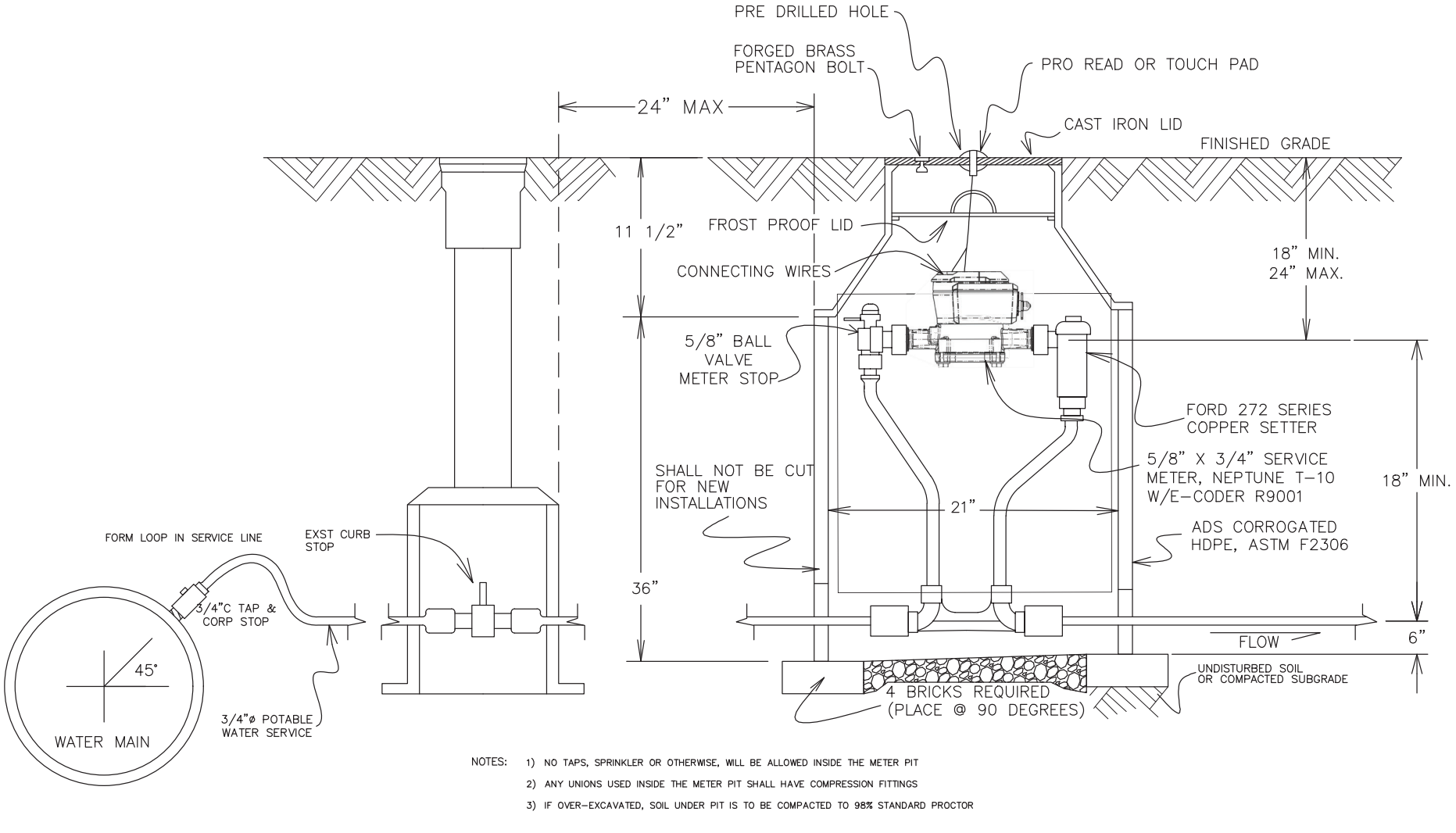
Neptune Technology Group
1600 Alabama Highway 229
Tallassee, AL 36078
800-633-8754 f 334-283-7293

Appendix D.2
Water Meter Pit Installation Detail



NOTES:
1) NO TAPS, SPRINKLER OR OTHERWISE, WILL BE ALLOWED INSIDE THE METER PIT
2) ANY UNIONS USED INSIDE THE METER PIT SHALL HAVE COMPRESSION FITTINGS
3) IF OVER-EXCAVATED, SOIL UNDER PIT IS TO BE COMPACTED TO 98% STANDARD PROCTOR

Publish Date: 2020/12/09 10:55 AM | User: rpetrie
Filepath: K:\Projects\1818-Orsatti Water Consultants\Idledale\1818-Idledale-RP002-MeterPit.dwg Figure 1

Orsatti Water Consultants

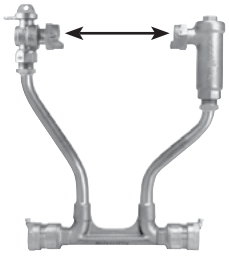
Figure 1
5/8" x 3/4" Meter Pit

Appendix D.3
Ancillary Water Meter Equipment Data

The Ford 270 Series Coppersetter

For 5/8", 5/8"x3/4", 3/4" or 1" Meter Size

Requires removable Pack Joint Assemblies (Assemblies ordered separately)



STEP 1. METER SIZE & VALVE TYPE - (FIRST PART OF CATALOG NUMBER)

Catalog Number (Meter Size and Valve Type)				Description	
For 5/8"	For 5/8"x 3/4"	For 3/4"	For 1"	Inlet Valve	Outlet Valve
271	272	273	274	None	None
V271	V272	V273	V274	Key	None
VB271	VB272	VB273	VB274	Ball	None
VBB271***	VBB272***	VBB273	VBB274	Ball	Ball
VV271	VV272	VV273	VV274	Key	Key
VVG271*	VVG272*	VVG273*	VVG274*	Key	Compression
VH271	VH272	VH273	VH274	Key	Single Check
VHH271	VHH272	VHH273	VHH274 ▼	Key	Cascading Dual Check
VHC271**	VHC272**	VHC273**	VHC274**	Key	● Cartridge Dual Check
VBG271*	VBG272*	VBG273*	VBG274*	Ball	Compression
VBH271	VBH272	VBH273	VBH274	Ball	Single Check
VBHH271	VBHH272	VBHH273	VBHH274 ▼	Ball	Cascading Dual Check
VBHC271**	VBHC272**	VBHC273**	VBHC274**	Ball	● Cartridge Dual Check

* Compression valve does not have padlock wing.

** 270 Series Coppersetters with cartridge dual check valve have a 9" minimum height for 5/8" and 5/8" x 3/4" meters, and a 12" minimum height for 3/4" and 1" meters.

*** The 5/8" port angle ball valve is a one-way directional valve designed for the inlet side of the meter and should not be used as a customer shut-off on the customer side of the meter.

▼ Angle Cascading Dual Check Valves contain 3/4" internal components. This valve meets the ASSE flow requirements of a 1" valve. For a full port valve, order the cartridge style check valve.

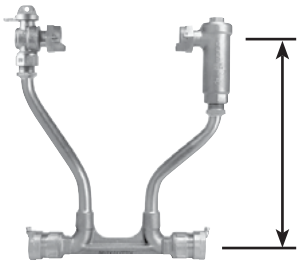
● Cartridges with enhanced chlorine/chloramine resistance are available. Add “CR” to end of alpha code. Example: VHCCR72-15W-NL

Note: Setters with angle ball valve will be reduced port unless otherwise requested. Reduced port valves usually provide suitable water flow. (Add “-FP” to catalog number for full port.)

Meter Valve Options for 270 Series Coppersetters: Seal wire hole in inlet valve, seal wire hole in check valve

STEP 2. HEIGHT - (SECOND PART OF CATALOG NUMBER)

NOTE: Height dimensions are approximate.



For 5/8" and 5/8"x3/4" Meter

Catalog Number	Height in Inches
7W-NL	7
9W-NL	9
12W-NL	12
15W-NL	15
18W-NL	18
21W-NL	21
24W-NL	24

For 3/4" Meter

Catalog Number	Height in Inches
8W-NL	8
12W-NL	12
15W-NL	15
18W-NL	18
21W-NL	21
24W-NL	24

For 1" Meter

Catalog Number	Height in Inches
10W-NL	10
12W-NL	12
15W-NL	15
18W-NL	18
21W-NL	21
24W-NL	24

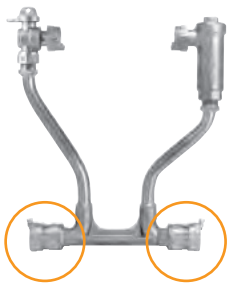
HEIGHT INFORMATION FOR 270 SERIES COPPERSETTERS:

- Contact factory for availability of heights not listed.
- Coppersetters are available in heights over 24" in 3" increments; 27", 30", 33" etc. To order, put desired height in catalog number. Example: V272-30W-NL is a 30" high setter.
- See table on page 8 for Tie Bar requirements

The Ford 270 Series Coppersetter

For 5/8", 5/8"x3/4", 3/4" or 1" Meter Size

Requires removable Pack Joint Assemblies (Assemblies ordered separately)



Pack Joint Assemblies (ordered separately) **Service Line Connections**

PACK JOINT ASSEMBLIES FOR 270 SERIES COPPERSETTERS

STEP 3. INLET & OUTLET SERVICE LINE CONNECTIONS

Catalog Number	Description	
	Size and Type of Existing Pipe	P.J. Assembly Required
♦ PJA4-11-NL	1/2" Copper or Plastic Tube	1/2" Pack Joint for Copper or Plastic Tubing (CTS)*
♦ PJA4-13-NL	3/4" Copper or Plastic Tube	3/4" Pack Joint for Copper or Plastic Tubing (CTS)*
PJA4-14-NL	1" Cop per or Plastic Tube	1" Pack Joint for Copper or Plastic Tubing (CTS)*
• PJA4-15-PJA6-14-NL	1-1/4" Copper or Plastic Tube	1-1/4" Pack Joint for Copper or Plastic Tubing (CTS)*
□ PJA4-16-AWT-NL	1-1/2" Copper or Plastic Tube	1-1/2" Pack Joint for Copper or Plastic Tubing (CTS)*
♦*** PJA4-44-C14-54-NL	1" Copper or Plastic Tube	1" Pack Joint for Copper or Plastic Tubing (CTS)*
♦*** PJA4-45-C14-55-NL	1-1/4" Copper or Plastic Tube	1-1/4" Pack Joint for Copper or Plastic Tubing (CTS)*
*** PJA4-46-C14-56-NL	1-1/2" Copper or Plastic Tube	1-1/2" Pack Joint for Copper or Plastic Tubing (CTS)*
PJA5-11-NL	1/2" Iron Pipe	1/2" Pack Joint for Iron Pipe
PJA5-13-NL	3/4" Iron Pipe	3/4" Pack Joint for Iron Pipe
PJA5-14-NL	1" Iron Pipe	1" Pack Joint for Iron Pipe
PJA5-15-NL	1-1/4" Iron Pipe	1-1/4" Pack Joint for Iron Pipe
□ PJA5-16-AWT-NL	1-1/2" Iron Pipe	1-1/2" Pack Joint for Iron Pipe
*** PJA5-44-C15-54-NL	1" Iron Pipe	1" Pack Joint for Iron Pipe
*** PJA5-45-C15-55-NL	1 1/4" Iron Pipe	1-1/4" Pack Joint for Iron Pipe
*** PJA5-46-C15-56-NL	1 1/2" Iron Pipe	1-1/2" Pack Joint for Iron Pipe
PJA6-13-NL	3/4" Polyethylene Pipe	3/4" Pack Joint for PE Pipe*
• PJA4-15-PJA6-14-NL	1" Polyethylene Pipe	1" Pack Joint for PE Pipe*
□ PJA6-15-AWT-NL	1-1/4" Polyethylene Pipe	1-1/4" Pack Joint for PE Pipe
□ PJA6-16-IDR7-AWT-NL	1-1/2" Polyethylene Pipe	1-1/2" Pack Joint for PE Pipe
*** PJA6-44-C16-54-NL	1" Polyethylene Pipe	1" Pack Joint for PE Pipe*
*** PJA6-45-C16-55-NL	1-1/4" Polyethylene Pipe	1-1/4" Pack Joint for PE Pipe
*** PJA6-46-C16-56-IDR7-NL	1-1/2" Polyethylene Pipe	1-1/2" Pack Joint for PE Pipe
PJA7-11-NL	1/2" PVC Pipe	1/2" Pack Joint for PVC Pipe
PJA7-13-NL	3/4" PVC Pipe	3/4" Pack Joint for PVC Pipe
PJA7-14-NL	1" PVC Pipe	1" Pack Joint for PVC Pipe
PJA7-15-NL	1-1/4" PVC Pipe	1-1/4" Pack Joint for PVC Pipe
□ PJA7-16-AWT-NL	1-1/2" PVC Pipe	1-1/2" Pack Joint for PVC Pipe
*** PJA7-44-C17-54-NL	1" PVC Pipe	1" Pack Joint for PVC Pipe
*** PJA7-45-C17-55-NL	1-1/4" PVC Pipe	1-1/4" Pack Joint for PVC Pipe
*** PJA7-46-C17-56-NL	1-1/2" PVC Pipe	1-1/2" Pack Joint for PVC Pipe

NOTE: Ford Pack Joints for PVC are recommended for Schedule 40 and Schedule 80 pipe only.

* **Grip Joint** for CTS (all sizes) and PE pipe (3/4" and 1") is available. Add "-G" to the catalog number. Example: PJA4-13-G-NL

♦ **Quick Joint** is available. Add "-Q" to the catalog number.

□ These items are not one piece but are two adapter pieces assembled watertight.

*** These pack joint assemblies are for 1" 274 Series Coppersetters or KH-4-NL Kornerhorns, DH-4 Drophorns and PH-4 Pretzelhorns listed in catalog Section B.

• This pack joint assembly is for use on 1-1/4" copper or plastic tubing (CTS) or 1" PE Pipe

PACK JOINT ELL ASSEMBLIES 5/8", 5/8"X3/4" AND 3/4" 270 SERIES COPPERSETTERS (TWO REQUIRED PER COPPERSETTER)

Catalog Number	Description	
	Size and Type of Existing Pipe	P.J. Assembly Required
PJAL4-13-NL	3/4" Copper or Plastic Tube	3/4" Pack Joint for Copper or Plastic Tubing (CTS)*
PJAL6-13-NL	3/4" Polyethylene Pipe	3/4" Pack Joint for PE Pipe*

* **Grip Joint** for CTS and PE pipe (3/4" & 1") is available. Add "-G" to the catalog number. Example: PJAL4-13-G-NL

Appendix D.4
Water Meter Data Recording

A PRODUCT SHEET OF NEPTUNE TECHNOLOGY GROUP

E-CODER®)R900*i*™

Eliminate Infrastructure Costs and Ongoing Network Maintenance

As part of the Neptune® Managed Services platform, the R900® was designed to eliminate the costs, frustrations, and maintenance of deploying your own AMI network infrastructure. Leveraging LoRa® Network-as-a-Service (NaaS) technology, your utility can now cover your service area with no operational burden, free to focus on water delivery and billing. Mobile and fixed network messages are interleaved and continuously transmitted, allowing your utility to maintain backup mobile reading capability of the same end-points.

Streamline Operations And Manage Resources

In addition to eliminating the need for programming, the E-CODER)R900*i* has no external wires, making installation easier, faster, and less costly; plus it reduces potential vandalism or tamper. As with the rest of the R900 System, the design of the unit is intuitive and user-friendly so that minimal training is required for operation. It's designed to help manage time, labor, and other resources. The radio frequency transmission of the E-CODER)R900*i* can save your utility significant amounts of time in terms of both meter reading and billing, and provide flexibility to reallocate personnel to different tasks depending on your changing workforce needs.

Do More With Detailed, Actionable Data

The types of data your utility can generate through the E-CODER)R900*i* can take you far beyond a simple meter reading for monthly billing. Hourly consumption profile information over an account's last 96 days, along with alerts for leak or backflow, help to proactively identify and resolve customer issues – heading off high bill complaints, reducing delinquent payments, and eliminating write-offs. Using Neptune® 360™ host software, your utility can leverage detailed data from the E-CODER)R900*i* to balance water produced versus water consumed, group accounts for District Metered Area analysis, and track and manage Non-Revenue Water. From increasing efficiencies to pinpointing possible tamper or water theft to aiding customer service, the data supplied by the E-CODER)R900*i* can help your utility make better, more informed decisions.

KEY BENEFITS

Facilitates Migration to AMI

- Eliminate the maintenance and burdens of deploying AMI network infrastructure with Network-as-a-Service using LoRaWAN™ technology.
- Interleaved mobile and fixed network messages facilitate migration without changing the "modes" in the MIU

Reduces Non-Revenue Water

- Provides leak history/diagnostics
- Enables proactive leak notification
- Provides hourly consumption data
- Improves meter reading accuracy
- Eliminates estimated reads

Identifies Potential Theft

- Tamper detection
- Reverse flow detection
- Identifies significant periods of zero consumption

Simplifies Installation Process

- Easy to install/no programming required
- No external wires
- Reduces labor cost
- Reduces potential wire vandalism and damage

Technical Specifications

Electrical Specifications

- MIU power: Lithium battery with capacitor

Transmitter Specifications

- Two-way MIU
- Transmit Options (interleaved mobile and fixed network messages):
  - R900 mobile message
  - R900 fixed network message
  - LoRa fixed network message
- FCC verification: Part 15.247:
  - Transmitter channels: 50 (R900 mobile and fixed network messages) and 64 (LoRa fixed network message); frequency-hopping, spread-spectrum
  - Channel frequency: 902 to 928 MHz
- Encoder register reading interval:
  - Every 15 minutes
- Data logging interval:
  - 96 days of hourly data

Environmental Conditions

- Operating temperature: -22°F to +149°F (-30°C to +65°C)
- Storage temperature: -40°F to +158°F (-40°C to +70°C)
- Operating humidity: Pit set - 100% submersible

Materials

- Register housing: Pit set: roll-sealed copper shell
- Lens: Pit set: glass

Antennas

- Through-the-lid antenna:
  - 18" Coax
  - 6' Coax
  - 20' Coax

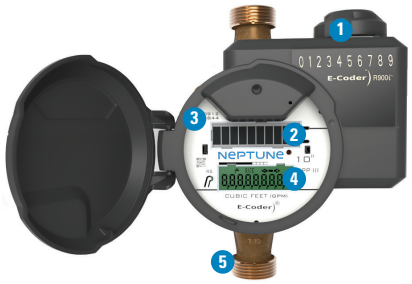
Options

Compatibility

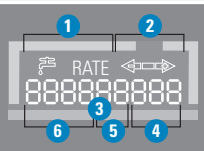
- Available for all sizes and makes of current Neptune meters
- Handhelds with R900® Belt Clip Transceiver - mobile RF
- MRX920™ - mobile RF
- R900® Gateways - fixed network RF
- LoRa LPWA IoT Network

Units of Measure: U.S. Gallons, Cubic Feet, Imperial Gallons, Cubic Metres

1. External Antenna Port
2. Solar Panel
3. Date of Manufacture
4. LCD Display
5. T-10® Meter



LoRa Alliance Certified™

	FLOW INDICATOR Shows the direction of flow through the meter: ON Water in use. OFF Water not in use. Flashing Water is running slowly. (-) Reverse flow. (+) Forward flow.
	LEAK INDICATOR Displays a possible leak: OFF No leak indicated. Flashing Intermittent leak indicates that water has been used for at least 50 of the 96 15-minute intervals during a 24-hour period. On Continuously Indicates water use for all 96 15-minute intervals during a 24-hour period.
RATE	RATE OF FLOW Average flow rate is displayed every twelve seconds on LCD display.
	LCD DISPLAY Nine-digit LCD displays the meter reading in billing units of measure: U.S. gallons, cubic feet, Imperial gallons, or cubic metres. 1 E-CODER basic reading/customary 6-digit remote reading 2 Customary sweep hand digits 3 E-CoderPLUS reading (8-digit remote reading) 4 Testing units used for diagnostics 5 Extended reading units 6 Customary billing units

NEPTUNE TECHNOLOGY GROUP

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neptunetg.com

Neptune Technology Group
1600 Alabama Highway 229
Tallassee, AL 36078
800-633-8754 f 334-283-7293

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A PRODUCT SHEET OF NEPTUNE TECHNOLOGY GROUP

MRX920™ Mobile Data Collector and MX900™ Software

Make Reading Success and Efficiency Automatic

Reliable, accurate, and field-proven, Neptune's MRX920™ mobile data collector – along with its MX900™ meter routes and mapping software – has helped water utilities across North America streamline, automate, and increase operational efficiencies. As part of Neptune's R900® System, the MRX920 helps transform data into actionable information that helps identify hidden causes of loss and optimize operational efficiency.

Strapped to the seat of your utility vehicle, the MRX920 reads up to fifty (50) meters simultaneously as your meter reader cruises down the streets. And in conjunction with the routes-integrated/Esri®-powered MX900 mapping, meter reading is automatic, fast, and effortless for your meter readers, accurate with less manpower deployed for your utility.

The MRX920 comes with Bluetooth capability, so your meter readers have the option of wirelessly updating routes and uploading the latest readings to the host system remotely and in near real-time without having to return to the office[1,2].

Additionally, Neptune has ported its well-established R900 radio frequency (RF) architecture to the latest release of MRX920 using software-defined radio (SDR) technology. This means all Neptune data collection systems have a common, core code base which translates to faster availability of new features and functionalities for your utility.

Make Migration to Other Technology Simple

The R900 System is designed to easily accommodate and support past generations of meters, encoder registers, and data collectors – while at the same time giving your utility the flexibility to incorporate future innovations as needed. The MRX920 is no exception, providing seamless compatibility with all generations of R900 MIUs. Its industry-leading performance can save days or even weeks for your meter reading routes, and new features within its MX900 software, such as Esri-powered mapping and wireless mobility, make valuable data available in real time as you read your system. Feel free to phase in these new features and equipment at your own pace, secure in the knowledge that Neptune will support your future needs without leaving you with stranded assets.

KEY BENEFITS

Reduced Meter Reading Time

- Reads up to fifty (50) meters simultaneously

Simple Access to Actionable Data

- Esri-powered GIS maps[1] show meter reading and flag status
- Wireless mobility – communicate meter reading data back to N_SIGHT® in real time[1]
- User-configurable advanced filtering shows you only the information you need
- Data logging and off-cycle reads without physical access to the meters[2]

Analyze Data at the Source

- View data logging graphs in the field and share with homeowner to address high bill complaints
- Identify high/low audit status failures
- Receive leak, reverse flow, and days of no flow alerts from E-CODER®-equipped meters

[1] *Optional MX900™ Mapping and Mobility module required. Mobile computing device recommended and not included.*
[2] *Cellular or Internet connection required.*

Save Your Utility – and Your Customers – Time and Money

While the R900 System always allows your utility to migrate forward to implement fixed network data collectors, or backward to use RF technology for individual off-cycle readings or data logging, using the MRX920 and MX900 software as a part of your system makes for fast and simple access to information that can provide effective resolutions to customers' water-related issues. With detailed consumption data in hand while working in the field, along with proactive alerts of leaks and backflow conditions, you can enhance customer service. In the process, you can even preempt high bill complaints, reduce delinquent payments, and eliminate write-offs.

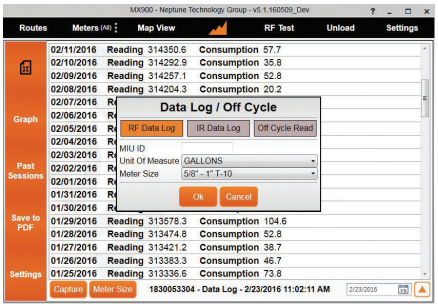
Specifications

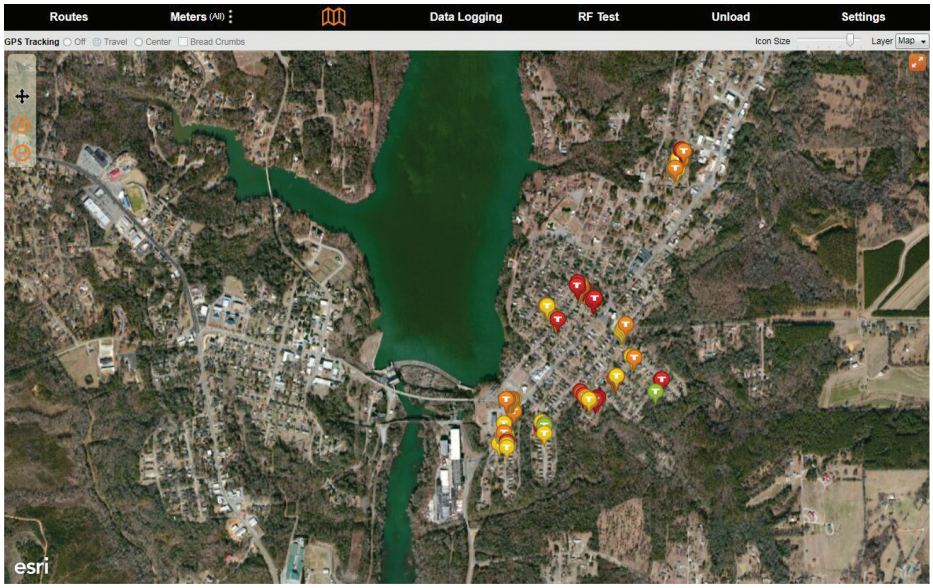
Physical Specifications

- Dimensions:
  8" (width) x 3.15" (height) x 11" (length excluding connections and handle)
- Weight: ~5 lbs

Electrical Specifications

- Power consumption: < 1A
- Power supply: 12V DC via vehicle power source adapter





Neptune recommends the following mobile computing hardware specifications for optimal performance:

- 12.1" XGA (800 x 600) minimum
- 89-key keyboard
- Operating System:
  - Windows® 7 Professional 32 & 64
  - Windows® 8 Professional 32 & 64
  - Windows® 8.1 Professional 64
  - Windows® 10 Professional 64
- .Net Framework 4.5 or higher
- Processor: Intel Pentium 1.7 Ghz or faster processor
- Memory: 1 GB minimum
- Communication
  - Internal 802.11 b/g wireless LAN
  - Windows Wireless Connection Manager (if Bluetooth connection to the receiver is desired, Bluetooth v2.1 + EDR required)
- USB 2.0
- GPS receiver (required for the mapping and mobility module)
- Minimum of 2 GB of available hard drive space

Environmental Conditions

- Operating temperature:
  -4°F to +122°F (-20°C to +50°C)
- Storage temperature:
  -40°F to +185°F (-40°C to +85°C)
- Operating humidity: 5 to 95% non-condensing relative humidity

NEPTUNE TECHNOLOGY GROUP

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neptunetg.com

Neptune Technology Group
1600 Alabama Highway 229
Tallassee, AL 36078
800-633-8754 f 334-283-7293

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Appendix D.5
Initial Water Meter Price Quotation

Bid Proposal for R900 AMR (Radio) System

CUSTOMER

IDLEDALE WATER& SAN DISTRICT
LAKEWOOD, CO 80228

Job
R900 AMR (Radio) System
Bid Date: 12/21/2020
Bid #: 1604026

CONTACT

Sales Representative
Zachary Dreier
(M) 678-799-2838
(T) 303-394-0004
(F) 303-394-4450
Zachary.Dreier@coreandmain.com

Core & Main
9451 Yosemite St
Henderson, CO 80640
(T) 303-394-0004

NOTES

Bid Proposal for R900 AMR (Radio) System

IDLEDALE WATER& SAN DISTRICT
Bid Date: 12/21/2020
Core & Main 1604026

Core & Main
9451 Yosemite St
Henderson, CO 80640
Phone: 303-394-0004
Fax: 303-394-4450

Seq#	Qty	Description	Units	Price	Ext Price
10		**RADIO WATER METERS INTERGRATED**			
20	150	T10 5/8X3/4 R900I MTR USG PROCODER CI BTM W/6' ANT ED2B11RPWG11SG89	EA	248.71	37,306.50
				SUBTOTAL	**37,306.50**
30		**DATA COLLECTOR**			
40	1	MRX920 V4 DATA COLLECTOR 13655-100 NO LEAD	EA	5,500.00	5,500.00
				SUBTOTAL	**5,500.00**
50		**NEPTUNE 360 SOFTWARE**			
60	1	NEPTUNE 360 HOSTED ANNUAL FEE	EA	2,500.00	2,500.00
70	1	1-TIME CLOUD IMPLEMENTATION FE	EA	1,750.00	1,750.00
				SUBTOTAL	**4,250.00**
				Sub Total	**47,056.50**
				Tax	0.00
				Total	**47,056.50**

Branch Terms:
CORE & MAIN WATERWORKS IS NOT LIABLE FOR DELIVERY DELAYS, CANCELLATIONS OR PRICE INCREASES RESULTING FROM ANY CAUSE BEYOND OUR CONTROL. THESE INCLUDE BUT ARE NOT LIMITED TO:MANUFACTURERS SHORTAGES, AVAILABILITY OR TIMELINESS OF TRANSPORTATION, MATERIALS, FUELS, OR SUPPLIES. THIS QUOTE IS NOT A CONTRACT TO SUPPLY MATERIAL OR GUARANTEE OF PRODUCT AVAILABILITY.
****

SALES TAXES NOT INCLUDED

ITEMS PICKED UP AT OUR FACILITY MAY BE SUBJECT TO CITY TAXES

UNLESS OTHERWISE SPECIFIED HEREIN, PRICES QUOTED ARE VALID IF ACCEPTED BY CUSTOMER AND PRODUCTS ARE RELEASED BY CUSTOMER FOR MANUFACTURE WITHIN THIRTY (30) CALENDAR DAYS FROM THE DATE OF THIS QUOTATION. CORE & MAIN LP RESERVES THE RIGHT TO INCREASE PRICES UPON THIRTY (30) CALENDAR DAYS' NOTICE TO ADDRESS FACTORS, INCLUDING BUT NOT LIMITED TO, GOVERNMENT REGULATIONS, TARIFFS, TRANSPORTATION, FUEL AND RAW MATERIAL COSTS. DELIVERY WILL COMMENCE BASED UPON MANUFACTURER LEAD TIMES. ANY MATERIAL DELIVERIES DELAYED BEYOND MANUFACTURER LEAD TIMES MAY BE SUBJECT TO PRICE INCREASES AND/OR APPLICABLE STORAGE FEES. THIS BID PROPOSAL IS CONTINGENT UPON BUYER'S ACCEPTANCE OF SELLER'S TERMS AND CONDITIONS OF SALE, AS MODIFIED FROM TIME TO TIME, WHICH CAN BE FOUND AT: https://coreandmain.com/TandC/

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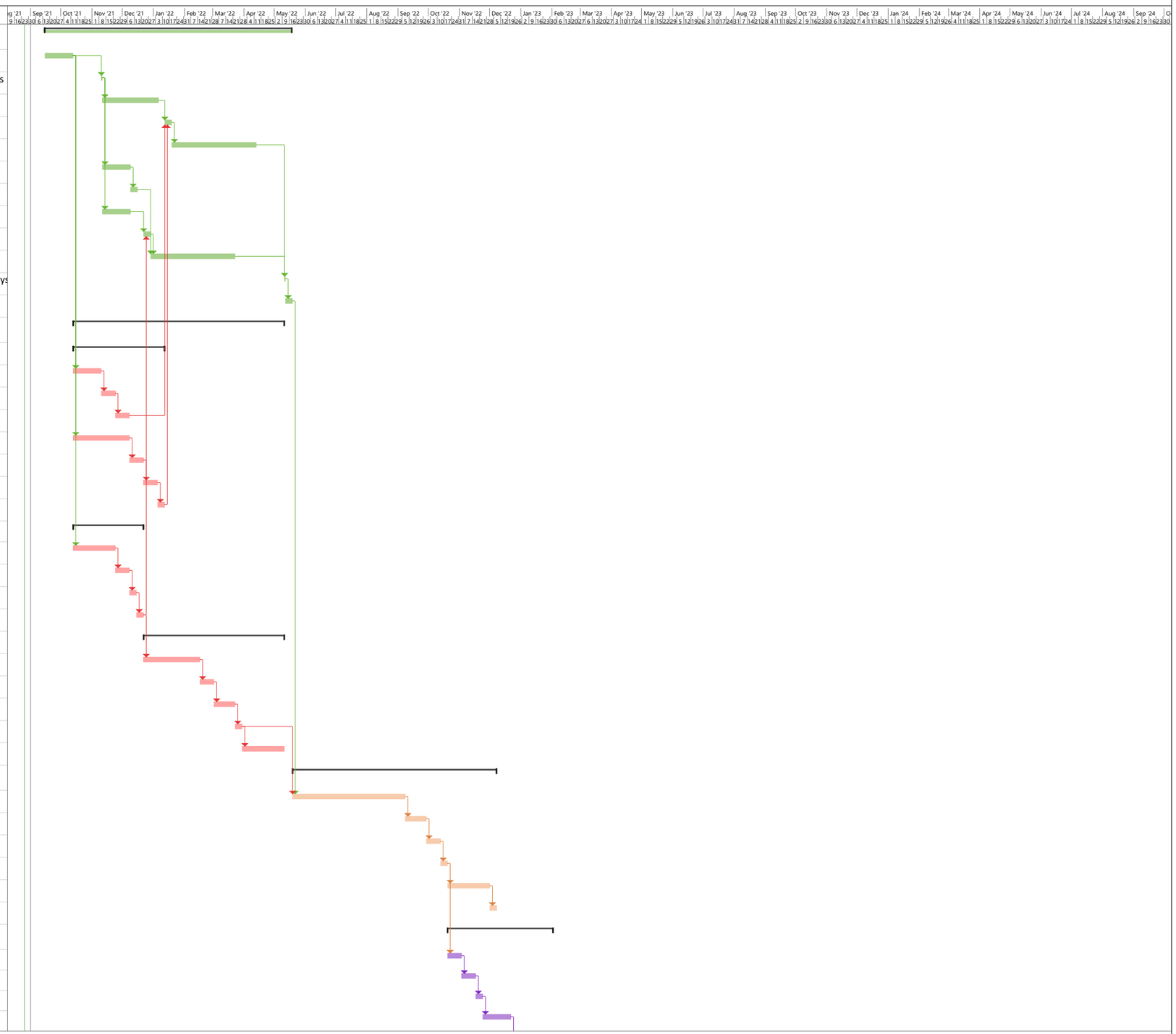
Appendix E.1
Preliminary Water System Improvements Project Workflow Schedule

Idledale Water & Sanitation District
Water System Improvements Project
08/26/21

Project Workflow Schedule Update

ID	Task Name	Duration	Start	Finish	Predecessors
1	**Phase 1 - Project Financial Planning**	176 days	Wed 9/15/21	Wed 5/18/22	
2	Task 1.1 - District Prepares Project Financing Plan	20 days	Wed 9/15/21	Tue 10/12/21	
3	Task 1.2 - District Conducts Financing Plan Public Hearing	1 day	Wed 11/10/21	Wed 11/10/21	2FS+20 days
4	Task 1.3 - District Prepares USDA Funding Applications	40 days	Thu 11/11/21	Wed 1/5/22	3
5	Task 1.4 - District Submits USDA Funding Applications	5 days	Wed 1/12/22	Tue 1/18/22	4,18,22
6	Task 1.5 - District Confirms USDA Project Funding Status	60 days	Wed 1/19/22	Tue 4/12/22	5
7	Task 1.6 - District Prepares Colorado Water SRF Grant & Loan Apps	20 days	Thu 11/11/21	Wed 12/8/21	3
8	Task 1.7 - District Submits Colorado Water SRF Grant & Loan Apps	5 days	Thu 12/9/21	Wed 12/15/21	7
9	Task 1.8 - District Prepares Colorado DOLA Funding Apps	20 days	Thu 11/11/21	Wed 12/8/21	3
10	Task 1.9 - District Submits Colorado Water DOLA Funding Apps	5 days	Wed 12/22/21	Tue 12/28/21	9,27
11	Task 1.10 - District Confirms Colorado Project Funding Status	60 days	Wed 12/29/21	Tue 3/22/22	10,8
12	Task 1.11 - Final Project Financing Public Hearing	1 day	Wed 5/11/22	Wed 5/11/22	11FS+20 days
13	Task 1.12 - Project Funding Becomes Available	5 days	Thu 5/12/22	Wed 5/18/22	12
14	**Phase 2 - Preliminary Engineering**	**150 days**	**Wed 10/13/2**	**Tue 5/10/22**	
15	**Task 2A - USDA Funding Coordination**	**65 days**	**Wed 10/13/21**	**Tue 1/11/22**	
16	Task 2A.1 - Prepare Draft Preliminary Engineering Report (PER)	20 days	Wed 10/13/21	Tue 11/9/21	**2**
17	Task 2A.2 - District Review of Draft PER	10 days	Wed 11/10/21	Tue 11/23/21	16
18	Task 2A.3 - Finalize PER	10 days	Wed 11/24/21	Tue 12/7/21	17
19	Task 2A.4 - Prepare Draft Environmental Report (ER)	40 days	Wed 10/13/21	Tue 12/7/21	2
20	Task 2A.5 - District Review of Draft ER	10 days	Wed 12/8/21	Tue 12/21/21	19
21	Task 2A.6 - Finalize ER	10 days	Wed 12/22/21	Tue 1/4/22	20
22	Task 2A.7 - USDA Financial Aid Application Coordination	5 days	Wed 1/5/22	Tue 1/11/22	21
23	**Task 2B - Colorado Water SRF Funding Coordination**	**50 days**	**Wed 10/13/21**	**Tue 12/21/21**	
24	Task 2B.1 - Prepare Draft Project Needs Assessment	30 days	Wed 10/13/21	Tue 11/23/21	2
25	Task 2B.2 - District Review of Draft PNA	10 days	Wed 11/24/21	Tue 12/7/21	24
26	Task 2B.3 - Finalize PNA	5 days	Wed 12/8/21	Tue 12/14/21	25
27	Task 2B.4 - SRF & DOLA Financial Aid Application Coordination	5 days	Wed 12/15/21	Tue 12/21/21	26
28	**Task 2C - Basis of Design Report (BDR)**	**100 days**	**Wed 12/22/21**	**Tue 5/10/22**	
29	Task 2C.1 - Prepare Draft BDR	40 days	Wed 12/22/21	Tue 2/15/22	27
30	Task 2C.2 - District Reviews BDR	10 days	Wed 2/16/22	Tue 3/1/22	29
31	Task 2C.3 - Prepare Final BDR	15 days	Wed 3/2/22	Tue 3/22/22	30
32	Task 2C.4 - Submit Final BDR to CDPHE	5 days	Wed 3/23/22	Tue 3/29/22	31
33	Task 2C.5 - CDPHE Approval of BDR	30 days	Wed 3/30/22	Tue 5/10/22	32
34	**Phase 3 - Final Plans & Specifications**	**145 days**	**Thu 5/19/22**	**Wed 12/7/2**	
35	Task 3A - Prepare Draft CMAR Plans and Specifications	80 days	Thu 5/19/22	Wed 9/7/22	32,13
36	Task 3B - District Reviews Draft Construction Documents	15 days	Thu 9/8/22	Wed 9/28/22	35
37	Task 3C - Prepare Final CMAR Plans and Specifications	10 days	Thu 9/29/22	Wed 10/12/22	36
38	Task 3D - Submit CMAR Plans and Specs to CDPHE & District	5 days	Thu 10/13/22	Wed 10/19/22	37
39	Task 3E - CDPHE Approval of CMAR Plans & Specs	30 days	Thu 10/20/22	Wed 11/30/22	38
40	Task 3F - Self Certification	5 days	Thu 12/1/22	Wed 12/7/22	39
41	**Phase 4 - Preconstruction**	**75 days**	**Thu 10/20/22**	**Wed 2/1/23**	
42	Task 4A - Prepare Draft CMAR Request for Proposals	10 days	Thu 10/20/22	Wed 11/2/22	38
43	Task 4B - District Reviews Draft CMAR RFP	10 days	Thu 11/3/22	Wed 11/16/22	42
44	Task 4C - Prepare Final CMAR RFP	5 days	Thu 11/17/22	Wed 11/23/22	43
45	Task 4D - Publicly Advertise CMAR RFP	20 days	Thu 11/24/22	Wed 12/21/22	44



Idledale Water & Sanitation District
Water System Improvements Project
08/26/21

Project Workflow Schedule Update

ID	Task Name	Duration	Start	Finish	Predecessors
46	Task 4E - CMAR Selection	15 days	Thu 12/22/22	Wed 1/11/23	45
47	Task 4F - District Executes CMAR Preconstruction Contract	15 days	Thu 1/12/23	Wed 2/1/23	46
48	**Phase 5 - Construction**	**464 day**	**Thu 2/2/23**	**Tue 11/12/2**	
49	**Task 5A - Preconstruction**	**58 days**	**Thu 2/2/23**	**Mon 4/24/23**	
50	Task 5A.1 - Preconstruction Coordination Meeting w/CMAR	3 days	Thu 2/2/23	Mon 2/6/23	47
51	Task 5A.2 - CMAR Develops Initial Guaranteed Maximum Price (G	20 days	Tue 2/7/23	Mon 3/6/23	50
52	Task 5A.3 - District Reviews Initial GMP Proposal	15 days	Tue 3/7/23	Mon 3/27/23	51
53	Task 5A.4 - District & CMAR Negotiate Final GMP	20 days	Tue 3/28/23	Mon 4/24/23	52
54	**Task 5B - Construction Contract Initiation**	**41 days**	**Tue 4/25/23**	**Tue 6/20/23**	
55	Task 5B.1 - Construction Contract Preparation	10 days	Tue 4/25/23	Mon 5/8/23	53
56	Task 5B.2 - Construction Document Conformance	15 days	Tue 5/9/23	Mon 5/29/23	55
57	Task 5B.3 - Construction Contract Review and Notice to Proceed	15 days	Tue 5/30/23	Mon 6/19/23	56
58	Task 5B.4 - Construction Kickoff Meeting	1 day	Tue 6/20/23	Tue 6/20/23	57
59	**Task 5C - Construction Office**	**406 days**	**Tue 4/25/23**	**Tue 11/12/24**	
60	Task 5C.1 - Construction Submittal Review	20 days	Wed 8/16/23	Tue 9/12/23	205,189,193
61	Task 5C.2 - Construction Pay Application Review	**331.25 da**	**Tue 4/25/23**	**Wed 7/31/24**	
78	Task 5C.3 - Construction Communication	300 days	Wed 6/21/23	Tue 8/13/24	58
79	Task 5C.4 - Bi-weekly Construction Meetings	**290.25 da**	**Wed 6/7/23**	**Wed 7/17/24**	
110	**Task 5C.5 - Construction Change Management**	**264.25 da**	**Sat 7/1/23**	**Fri 7/5/24**	
118	Task 5C.6 - Project Closeout	25 days	Wed 10/9/24	Tue 11/12/24	186
119	Task 5C.7 - Construction Record Documents	20 days	Wed 10/9/24	Tue 11/5/24	186
120	**Task 5D - Construction Field**	**359 days**	**Thu 5/25/23**	**Tue 10/8/24**	
121	**Task 5D.1 - Construction Observation**	**300.25 da**	**Thu 5/25/23**	**Thu 7/18/24**	
183	Task 5D.2 - Electrical Construction Inspection	20 days	Wed 5/22/24	Tue 6/18/24	191FF,195F
184	Task 5D.3 - Substantial Completion Inspections	5 days	Wed 9/11/24	Tue 9/17/24	191,194,195
185	Task 5D.4 - Facilities Commissioning Coordination	10 days	Wed 9/18/24	Tue 10/1/24	184
186	Task 5D.5 - Final Completion Inspections	5 days	Wed 10/2/24	Tue 10/8/24	185
187	**Task 5E - CMAR Construction**	**320 days**	**Wed 6/21/23**	**Tue 9/10/24**	
188	**Task 5E.1 - Improve Ridgeway Well Delivery**	**260 days**	**Wed 6/21/23**	**Tue 6/18/24**	
189	Submittals	40 days	Wed 6/21/23	Tue 8/15/23	58
190	Equipment Delivery	120 days	Wed 9/13/23	Tue 2/27/24	60
191	Construction	80 days	Wed 2/28/24	Tue 6/18/24	190
192	**Task 5E.2 - New Hardrock Water Well**	**240 days**	**Wed 6/21/23**	**Tue 5/21/24**	
193	Submittals	40 days	Wed 6/21/23	Tue 8/15/23	58
194	Equipment Delivery	120 days	Wed 9/13/23	Tue 2/27/24	60
195	Construction	60 days	Wed 2/28/24	Tue 5/21/24	194
196	**Task 5E.3 - Upper Treatment Building Rehabilitation**	**240 days**	**Wed 6/21/23**	**Tue 5/21/24**	
197	Submittals	40 days	Wed 6/21/23	Tue 8/15/23	58
198	Equipment Delivery	120 days	Wed 9/13/23	Tue 2/27/24	60
199	Construction	60 days	Wed 2/28/24	Tue 5/21/24	198
200	**Task 5E.4 - Replace Broken Distribution Infrastructure**	**220 days**	**Wed 6/21/23**	**Tue 4/23/24**	
201	Submittals	40 days	Wed 6/21/23	Tue 8/15/23	58
202	Equipment Delivery	60 days	Wed 9/13/23	Tue 12/5/23	60
203	Construction	**80 days**	Wed 1/3/24	Tue 4/23/24	202FS+20 d
204	**Task 5E.5 - Water Service Meters**	**320 days**	**Wed 6/21/23**	**Tue 9/10/24**	
205	Submittals	20 days	Wed 6/21/23	Tue 7/18/23	58
206	Equipment Delivery	60 days	Wed 9/13/23	Tue 12/5/23	60
207	Construction	160 days	Wed 1/31/24	Tue 9/10/24	206FS+40 d