RUSSELLVILLE CITY CORPORATION

POLLUTION CONTROL WORKS (PCW)
PEAK INFLUENT CAPACITY STUDY

HW PROJECT NO. 2019071

DECEMBER 2023

PREPARED BY:

CITY CORPORATION
RUSSELLVILLE WATER & SEWER

RUSSELLVILLE CITY CORPORATION

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PEAK INFLUENT CAPACITY STUDY

HW PROJECT NO. 2019071

STATE OF ARKANSAS
LICENSED PROFESSIONAL ENGINEER
No. 19924
AUSTIN S. ANDERSON

CERTIFICATE OF AUTHORIZATION
HAWKINS-WEIR ENGINEERS, INC.
No. 101
ARKANSAS - ENGINEER

DECEMBER 2023

PREPARED BY:
HAWKINS-WEIR ENGINEERS, INC.
211 NATURAL RESOURCES DRIVE
LITTLE ROCK, ARKANSAS 72205

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1. Overview of Existing Pump Station

The existing Russellville Pollution Control Works (PCW) facility utilizes an influent pump station to lift flow into the treatment plant following a screening and grit removal process. The pump station both conveys influent flow to the treatment process and diverts flow to the equalization basins during wet weather peaks or to protect the plant from industrial high concentration loading. The pump station consists of a common rectangular wet well, which receives flow from the collection system, the equalization basins, process drains throughout the treatment facility, and four identical dry-pit submersible pumps. The current pumps were installed in 2000 and were refurbished in 2015. The documented pump design values are included in Table 1-1. All 4 pumps are installed with VFD controls and operate based on float switches in the wet well.

Table 1-1: Influent Pump Station- Pump Design Data

Influent Pump Station - Pump Design Data	
Number of Pumps	4
Manufacturer/Model	Sulzer-ABS/AFP3001
Intended Design Point	5,000 gpm @ 52' TDH
Motor Details	90 HP on VFD
Intake/Discharge/Common Header Diameter	20-inches/12-inches/24-inches

The pump discharges are connected to a common 24-inch diameter effluent header pipe that distributes flow to the treatment process and the equalization basins. In design, this header configuration gives all pumps the capability to discharge to the treatment process or the equalization basins. However, the existing header pipe is installed with two isolation gate valves and one isolation plug valve as shown in Figure 1-1.

Figure 1-1:Existing Pump Station and Isolation Valves

The plug valve provides complete isolation between the pumps and the treatment process. The gate valves provide pump discharge isolation allowing select pumps to discharge to the treatment process while others discharge to the equalization basins. All existing valves are manually operated via chainwheel operators and are set in planned open/close orientations that are not regularly modified. Currently, the valves are oriented such that up to two pumps can discharge to the treatment process while the remaining two pumps discharge to the equalization basins. The discharge pipes to the treatment process and equalization basins include electromagnetic flow meters. The flow meters are not used for any automatic control functions within the pump station.

2. Existing Treatment Process Capacity, Field Testing, and Limitations

The PCW facility is currently designed for a full-strength wastewater treatment capacity of 10 MGD and a peak hydraulic treatment process capacity of 18 MGD. Facility staff indicate that the current, observed peak facility influent flow rate is approximately 26 MGD. The existing influent pump station consists of four total pumps that are all installed with variable frequency drives (VFDs). One pump is dedicated to the equalization basins and two of the remaining pumps are utilized to send flow to Splitter Box No. 1, which distributes flow to different components of the treatment system based on flow rate. The third remaining pump provides redundancy by sending flow to either the equalization basins or the treatment process via isolation valves on the pump discharge header. However, the existing pump header isolation valves are manually actuated, so the pump is typically utilized in a planned pumping configuration and only modified in emergency situations. The existing pump configuration utilizes this pump to send flow to the equalization basins which results in two pumps for the treatment process and two pumps for the storage basins. Flow to the treatment process delivered through a 24-inch ductile iron force main is measured by a 20-inch electromagnetic flow meter installed in a below-grade concrete vault on the northwest side of the influent pump station.

The influent pumps convey flow to the treatment process by pumping from the influent pump station wet well to Splitter Box No. 1. The current maximum water elevation in Splitter Box No. 1 is approximately elevation (EL.) 352.50'. Static head for this system can be calculated by assuming minimum and maximum operational water levels in the influent pump station wet well. For this evaluation, minimum and maximum wet well water levels have been assumed to be EL. 322.50' and EL. 332.00', respectively. A system curve can be developed to indicate the required system pressure to convey a correlating flow rate based on the assumed static head and calculated friction losses over varying flow rates. Following calculation of the system curve, the pump curves can be plotted on the same graph to estimate the operating point of the pumps. Figure 2-1 shows the single-pump system curve for the treatment process system plotted against the pump curve included in the 2018 Master Plan. However, the 2018 Master Plan caveats that the pump curve is an “estimated” curve that is assumed to be representative for the influent pumps and pump data from the original installation was not available.

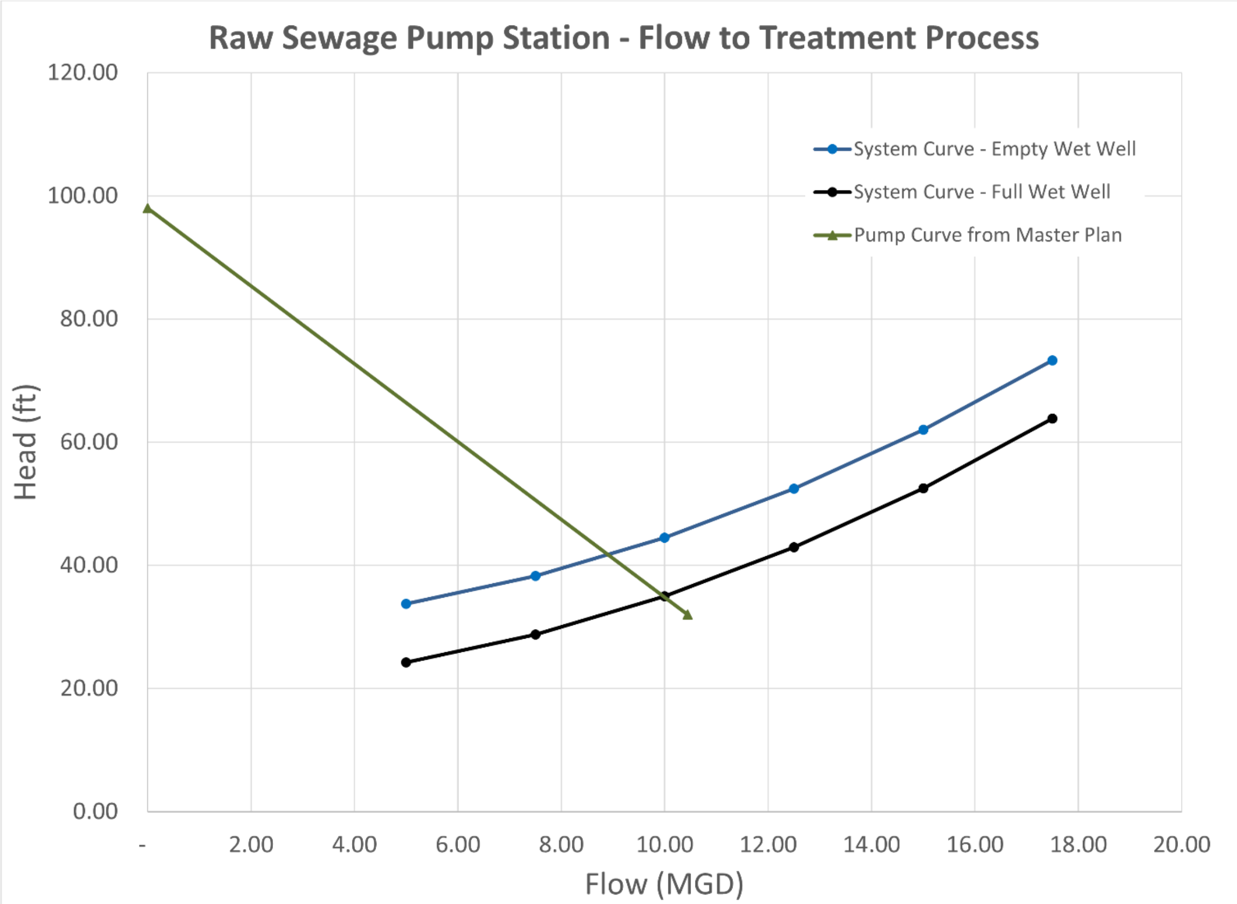

Figure 2-1: System Curves to Treatment Process

Field testing of the existing influent pumps was performed to estimate the accuracy of the available pump curve and pump conditions. Field testing consisted of intentionally operating pumps at full speed and known wet well levels while discharging through the existing flow meter. In theory, the pump test results should indicate a pumping capacity that can be compared to the available pump curve and utilized to estimate the peak pumping capacity to the treatment process. Unfortunately, only the two northernmost pumps (Pumps #3 and #4) were able to be tested as the flow meter to the equalization basins was out of service at the time of the testing and the manual pump header isolation valve was not operated due to concerns of properly reseating the valve following pump test completion. Table 2-1 shows the results of the field testing and Figure 2-2 shows the field-tested single-pump operation point with assumed system pressure compared to the estimated pump curve and system curve.

Table 2-1:Pump Field Testing Results (Flow)

Pump	Measured Flow Rate (MGD)	Wet Well Depth (ft)	Estimated Static Head (ft)
Pump 3	8.22	15.00	21.50
Pump 4	8.36	15.00	21.50
Pump 3 + Pump 4	15.05	15.80	20.70

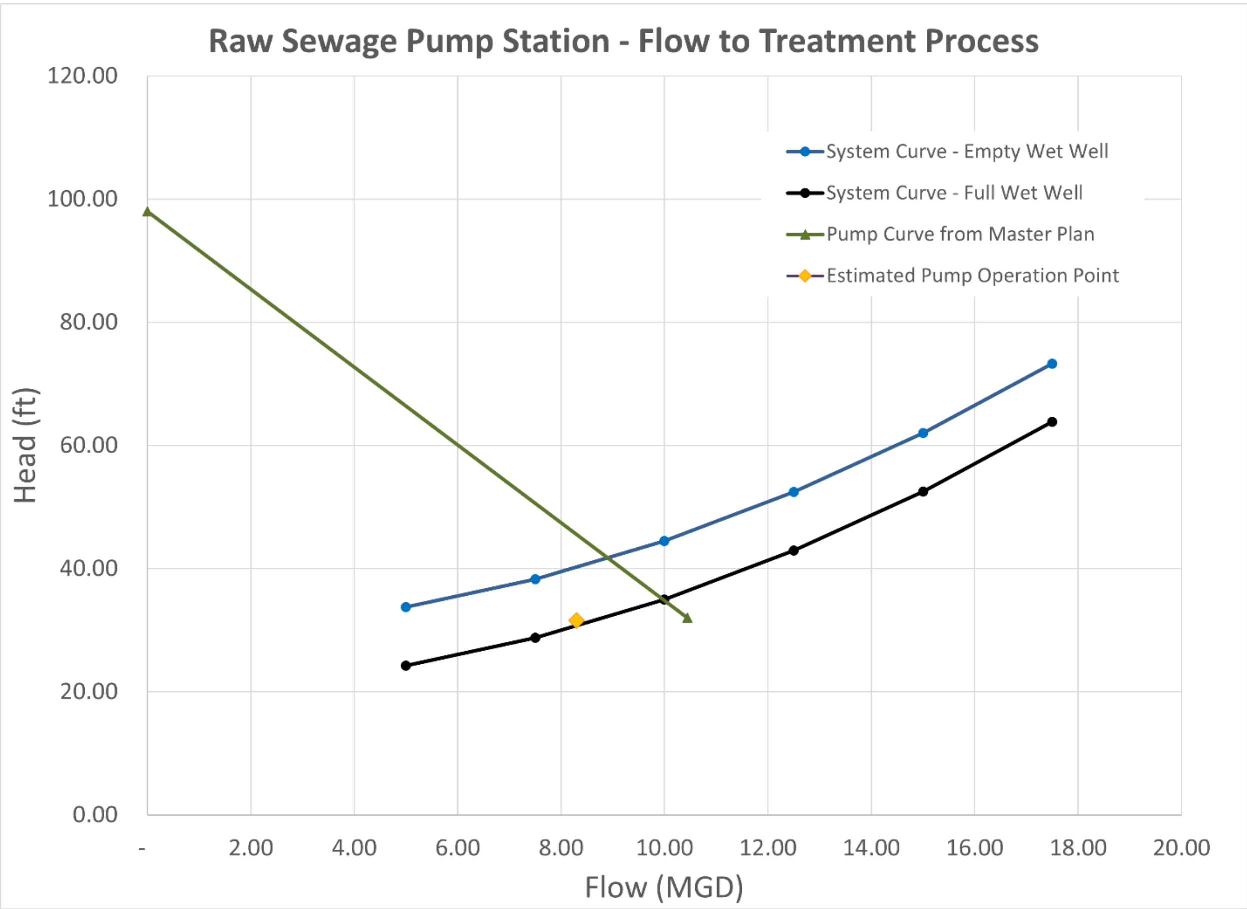

Figure 2-2: Estimated Pump Operation Point

As shown, the field data does not appear to correlate with the calculated operation point of the pumps based on the existing pump curves and resulted in lower flow rates than anticipated. The pump motor amperage was also monitored during the pump testing. Pump amperage during operation can be compared against the motor's "full-load amps" value to provide another indicator of pump output compared to the maximum design value. The pump amperage testing results are shown in Table 2-2.

Table 2-2: Pump Field Testing Results (Amps)

Pump	Measured Amperage	Documented Full-Load Amperage
Pump 3	104.40	145
Pump 4	107.5	145
Pump 3 + Pump 4	106/109	145

As shown in the table, the measured pump amperage also indicated a lower pump flow rate than what was anticipated based on the available pump data. Given that the pump effluent flow meter is showing lower flow values than anticipated and the measured motor amperage is lower than the value indicated on the available pump data, it is assumed that the pumps are operating below their design potential. This could result from wear and deterioration of mechanical pump components due to decades of operation.

The Recommended Standards for Wastewater Facilities, also known as the "10-States Standards" (10-States), recommends a maximum velocity of 8 feet per second (8 ft/s) for the design of all pressurized sewer systems. The existing pump station effluent piping to the treatment process is currently installed with 24-inch ductile iron pipe. The maximum treatment process flow that can be conveyed through this 24-inch piping, while meeting the recommended 10-States design standard, is approximately 16.2 MGD. Velocities above the recommended 8 ft/s can be utilized in specific circumstances, but there is an increased potential for scouring of pipe material and a reduced effective design life of the pipe.

In summary, the treatment process pumping capacity is currently limited by the manual isolation valves at the pump effluent header and current conditions of the existing pumps. Field testing indicated that the pumps are not operating at their intended design point and the manual isolation valves limit the flexibility of pump station operation during peak flow events. In addition, the existing pump discharge piping is 24 inches in diameter and will result in high fluid velocities during peak process flow events.

3. Existing Equalization Basin Capacity and Limitations

The existing Russellville PCW facility consists of three concrete-lined equalization basins (EQ basins) with a total storage capacity of 22.4 million gallons (MG) at an assumed maximum water elevation of 2 feet below the levees. A breakdown of the storage capacity in each basin is shown in Table 3-1 below.

Table 3-1: EQ Basin Volumes

Basin	Volume (MG)
Basin 1	2.15
Basin 2	7.94
Basin 3	12.34
TOTAL	22.42

The EQ basins were installed to receive and temporarily store influent wastewater during periods of increased flow, which provides critical benefits to the PCW facility. Increased temporary flows can overload biological treatment processes beyond their intended capacity and significantly reduce their treatment effectiveness by “washing out” the biological components of the system. The EQ basins assist in preventing this affect to the biological process and, as such, must be capable of a fill/drain cycle that matches the necessary portion of influent flow to be diverted from the treatment process. Russellville facility staff have indicated desired design values of 24 hours for basin fill and 72 hours for basin drain time.

As described previously in this evaluation, the EQ basins are filled by the influent pump station which conveys a portion of the influent flow to the basins during periods of increased flow. The system is installed with an electromagnetic flow meter, but the meter is reportedly non-operational. As such, there is currently no active flow measurement for influent flow to the EQ basins. An estimate of the existing system curve for pumping capacity to the equalization basins is shown in Figures 3-1 and 3-2. These figures also show the estimated pump curve as described previously in this report. Utilizing two pumps, the average equalization basin fill rate is approximately 11.2 MGD. Utilizing one pump, the average equalization basin fill rate is approximately 8.5 MGD. The EQ basin pumping capacity is limited by the force main diameter, creating high velocities and increased head loss, and pumping capacity of two operational pumps due to manual valve settings. The high velocity created by the existing force main was likely designed due to the need to create a similar system curve to the pipe network that conveys flow to the treatment process. The elevation difference between the wet well water level and the empty EQ basins (system static head) is notably less than the treatment process system, so increased pipe velocities result in more similar pump operating points in both systems. As such, any future redesign of the EQ basin influent piping should be performed in conjunction with the installation of treatment process pumps such that the influent pumps are either dedicated to the EQ basin fill system or are able to efficiently operate on both system curves. In addition, the field-testing for the two existing pumps dedicated to the treatment process indicated that the pumps were likely not operating at the intended design point represented by the available pump curves. It is possible that the equalization basin pumps are operating under similar conditions and are not discharging the full intended design flow shown in Figures 3-1 and 3-2. The existing pump curves are assumed to be accurate for the EQ pumping calculations performed within this evaluation.

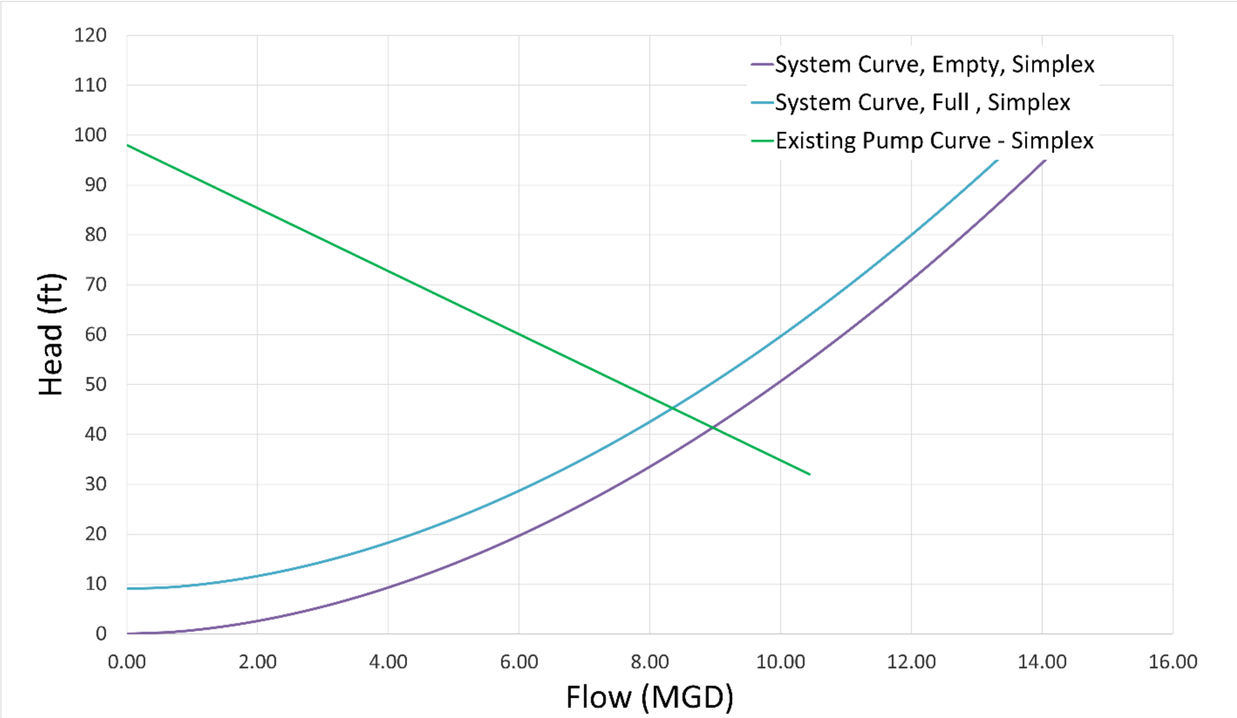

Figure 3-1:System Curves-Basin #1 Fill, 1 Pump

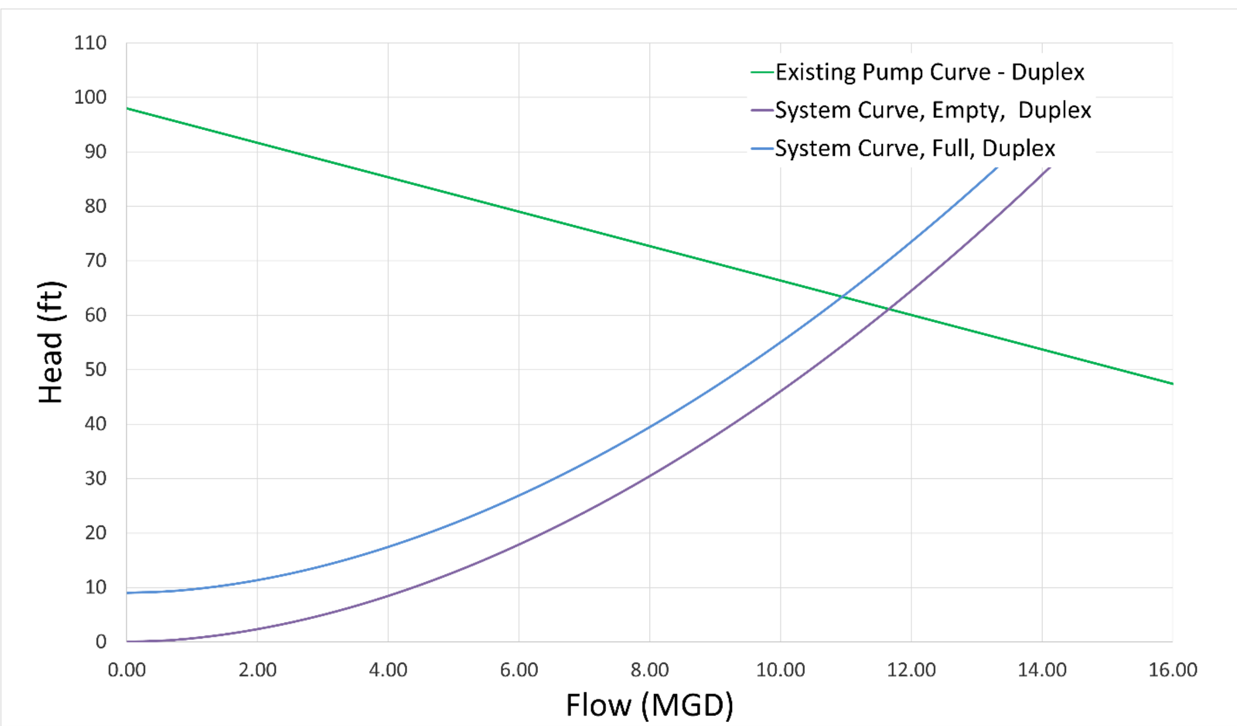

Figure 3-2:System Curves Basin 1 Fill, 2-Pumps

Utilizing the estimated EQ Basin flow rate for two operational pumps and the assumed total storage volume, the basins can currently be filled in approximately 48 hours. However, this pumping configuration does not consist of a designated spare pump that can be placed into service in the event of a pump failure. As such, the firm pumping capacity of the EQ basins is dictated by the capacity of one pump, resulting in an approximate fill time of 64 hours. It should also be noted that the existing EQ pumps were not available for field testing during the time of this evaluation. The EQ pumps are identical to the existing process flow pumps, which field-tested to operate at a lower design point than their pump curve indicated. It is possible that the EQ-dedicated pumps are similarly operating below their intended flow rate, thus decreasing the fill capacity of the EQ basins below the values listed herein. But it is also worth noting that the EQ-dedicated pumps likely have not accumulated the same runtime hours as the treatment-dedicated pumps and may not have the same degree of lost capacity due to wear.

Table 3-2: Estimated Basin Fill Times

Pumping Scenario	Discharge Flow Rate (MGD)	Total Basin Fill Time (hours)
Firm Capacity	8.5	64
Total Capacity	11.2	48

The EQ basins are drained back into the influent pump station's wet well via manually actuated drain valves after influent flows have reduced below the facility's maximum treatment capacity. The water level in the influent pump station wet well will directly influence the drain flow rate of the EQ basins if the level remains elevated above the basin drain connection. For the purpose of evaluating the existing drain conditions, it is assumed that the existing pump controls maintain a wet well water elevation below the bottom elevation of the EQ Basins during a drain cycle.

Basin #2 is drained by a dedicated 10-inch pipe that directly connects to the existing influent pump station wet well. Basins #1 and #3 share a common 12-inch diameter drainpipe to the influent wet well which divides into an individual 8-inch drain to Basin #1 and 12-inch drain to Basin #3. Due to the combined nature of this drain configuration, the drain rates of each basin are hydraulically affected by the water level in the other. An estimate of the current EQ Basin drain times, with all basins containing a water elevation at 2-feet below the top of the levee, is shown below in Table 3-3.

Table 3-3: Basin Drain Times

Basin	Drain Time (hours)
Basin 1	64
Basin 2	77
Basin 3	136

In summary, the existing EQ basins are generally operating as originally designed. However, the effectiveness of the storage capacity is limited by a lengthy cycle time to fill and drain the basins. The main impacts to this cycle time are firm pumping capacity, size of the basin influent piping, size and configuration of the Basins #1 & #3 drain piping, and potential water elevation in the influent pump station wet well. The basin influent flow meter is also inoperable such that basin influent flow rates cannot be actively monitored.

4. Existing Combined EQ and Treatment Process Capacity

As described previously within this evaluation, the current total pumping capacity of the PCW facility is a combination of the peak flows to the treatment process and the EQ basins. The existing pump station consists of four identical pumps configured such that the firm pumping capacity would include two pumps discharging to the treatment process and one pump discharging to the EQ basins. In this flow scenario, the original total design flow that could be received at the PCW facility influent is approximately 26.6 MGD. Additional detail for the estimated distribution of influent flow, as it was originally designed, is shown in Table 4-1.

Table 4-1: Distribution of Influent Flow

Pumping Scenario	Peak Hour Process Flow Rate (MGD)	EQ Basin Flow Rate (MGD)	Combined Facility Flow Rate (MGD)
Firm Capacity	18	8.6	26.6
Total Capacity A (3 Pumps to Process/ 1 to Pump EQ)	23	8.6	32.6
Total Capacity B (2 Pumps to Process/ 2 Pumps to EQ)	18	11.2	29.2

However, as described previously in this evaluation, field-testing indicated that the pumps to the treatment process may not be operating at their full design potential. In addition, the treatment process is currently only designed to process 18 MGD for a limited duration during wet weather events. Estimations for the current PCW facility influent capacity based on field testing are included in Table 4-2.

Table 4-2: Estimated Facility Capacity Based on Field Testing

Pumping Scenario	Peak Hour Process Flow Rate (MGD)	Estimated EQ Basin Flow Rate (MGD)	Estimated Combined Facility Flow Rate (MGD)
Firm Capacity (2-Pumps to Process)	15.1	7.9	23
Firm Capacity (8 MGD to Process)	8	10	18
Estimated Total Capacity	15.1	10	25

5. Improvement Options for the Influent Pump Station

The influent pump station at Russellville PCW appears to need improvements to replace aging equipment, increase the total influent flow capacity of the facility, and increase operability of the influent pump station. Recommended improvements within this section are separated out into "minimum recommendations" and "operational alternatives". Estimates of probable construction cost have also been included for each recommendation. The "minimum recommendations" generally consist of facility improvements that will be beneficial to the facility regardless of the selection for long-term pump station design alternatives. These recommendations will also provide immediate benefit to the operability of the pump station such that the facility operators will have more control over the operation of the pump station and real-time data on facility flows to make operational decisions. The "operational alternatives" are defined as design options for RCC's consideration that will increase the combined (process & EQ) firm capacity of the treatment facility to 26 MGD during all influent flow conditions. The improvement alternatives range from complete equipment replacement to lower-cost, short term options that increase the effective pump station capacity. These lower cost alternatives could be effective solutions to immediately increase available capacity while the RCC develops a stronger comfort level with the new treatment process at their PCW facility and gains influent flow monitoring capabilities by implementing the "minimum recommendations". The lower-cost alternatives and flow monitoring capabilities may also assist in allowing a period of data collection to fine tune influent design flows for a data driven approach to the allocation of funds toward long-range solutions at the pump station. Ultimately, HW recommends that the RCC implement one of the lower-cost alternatives with a preference for Alternative D as defined herein.

Minimum Recommendations

As defined previously within this evaluation, the existing pump station is limited by manually operated pump isolation valves, unreliable flow monitoring equipment, and undersized drain piping for EQ Basins #1 and #3. Minimally, the RCC should consider automating pump control valves, increasing the drain capacity of the EQ basins, and improving the pump station's effluent flow monitoring capabilities.

The current manual operation of the pump effluent isolation valves results in limited operational control for facility staff during peak flow events. The existing valves should be rehabilitated for electric actuation that will allow flexibility of facility operations during peak flow or emergency events. The valve actuators should be connected to the facility SCADA system such that the operations staff can alter pumping flow paths from the operations building. SCADA connection will allow the valve orientations to be automated based on observed flows and facility operating scenarios. Russellville should also consider adding another isolation valve on the common effluent header between Pump #3 and Pump #4 to provide the option of utilizing Pump #3 for influent flow to the equalization basins.

The influent piping for both the EQ basins and treatment process are installed with electromagnetic flow meters to collect useful information for facility operation. The flow meter to the EQ basins was out of service during the pump station evaluation. The flow meter to the treatment process was tested recently by the manufacturer and was found to be operating within the measurable tolerances. Despite the manufacturer's testing, Hawkins-Weir Engineers, Inc. (HW) believes the flow measurements produced by this meter are questionable. Both meters are over 20 years old according to available record drawings. Magnetic flow meter accuracy has improved significantly over that period. While an influent flow meter is not required for the PCW, it could be advantageous to have a meter that produced reliable data. As such, both flow meters should be considered for immediate replacement.

The existing equalization basin drain time is currently limited by the size of the basin drain piping, particularly at lower water surface elevations in the basins. Basins #1 and #3 drain back to the influent pump station wet well by a combined 12-inch diameter pipe that will significantly limit the drain time of Basin 3 during conditions where the treatment process can hydraulically receive flow rates nearing peak capacity. The section of drain piping that conveys combined flow from Basins 1 and 3 should be decommissioned and replaced with 24-inch diameter pipe.

Operational Alternatives

The influent pumps were originally installed in a 1998 facility improvements project and the motors were rebuilt in 2015. The pumps do not appear to be operating at their originally intended design capacity and improvements to the facility should be considered to increase the reliability, operability, and firm capacity of the pump station. Several options are available for improvements to the pump station depending on the long-term operational and budgetary goals of the RCC. The final estimates of construction cost for these operational alternatives also include the cost of the minimum recommended improvements described previously.

Alternative A – Existing Pump Replacement

Alternative A consists of the replacement of all four existing pumps due to their age and operational condition. This is the highest cost alternative included within the evaluation as it essentially replaces all operational equipment in the existing pump station due to age. Based on an assumed facility peak hour design influent flow rate of 26 MGD, the replacement pumps should be sized for a minimum firm capacity of 26 MGD. It is important that the new pumps are also designed such that the pump station can operate with treatment process flow rates down to 3 MGD during periods of low influent flow. The pumps should be sized such that they can efficiently convey flow to either the treatment facility or the equalization basins based on the needs of the facility and will likely result in half of the pumps being dedicated to either the treatment process or the EQ basins. Ideally, the EQ basin fill piping will be able to be sized such that the 'dedicated' treatment process pumps could deliver flow to the EQ basins, albeit at lower efficiency, during emergency conditions. The existing VFDs installed on the pumps are reaching the end of their effective life and are using technology that will be outdated for installation of new pumps. These existing VFDs should be replaced as a part of the pump station improvements project. As a part of the new pump and VFD design, the existing motor control center (MCC) should be inspected by an electrician to verify that its physical condition is suitable to be utilized with new VFDs. Based on HW's inspection, the MCC is believed to be in serviceable condition for the recommendations and cost estimates included in this report, however, there are portions of the MCC that could not be inspected during the evaluation. RCC should note the possibility that replacement of the existing pumps and VFDs with new equipment could also result in a reduction in peak electrical demand charges.

Alternative B – Replace One Existing Pump with Dedicated EQ Pump

Alternative B consists of the replacement of one existing pump with a new, dedicated EQ basin influent pump. The new EQ basin pump would be larger than the existing pumps such that it can facilitate higher flows to the EQ basins during peak influent scenarios while the existing pumps would be utilized for low-flow influent to the EQ basins. The new pump should be sized such that it can operate at higher flow rates while utilizing the existing EQ basin influent piping since the existing pumps will still be utilized for EQ basin filling during lower flow rates. The proposed pump should be designed for a combined facility peak EQ flow rate of 18 MGD to allow for a 26 MGD capacity during influent conditions where the treatment process is limited to 8 MGD. As described with Alternative A, the existing VFD associated with the new pump should also be replaced.

This alternative provides a lower-cost option to increase the peak influent flow rate to the EQ basins. However, there are several downsides with this approach. The facility will likely have a firm capacity notably below 26 MGD due to the reliance on a single, larger pump for increased capacity during a wet weather event. There is also the risk that the selected pump may not be the 'best fit' for the long-term planning of the facility when the remaining three pumps are eventually replaced.

Alternative C – Trailer-Mounted 'Bypass' Pumps

Alternative C consists of the utilization of trailer-mounted pumps to temporarily increase the capacity to the EQ basins during periods of wet weather peak flow or existing pump failures. This alternative would leave the existing pumps and operation unchanged, other than the minimum recommended improvements described previously, and would utilize trailer-mounted pumps to increase the firm capacity of the treatment facility. The trailer-mounted pumps could be utilized at the existing manhole upstream of the influent pump station wet well such that they could pump influent flow directly to EQ Basin 2, thus bypassing the influent pump station entirely or supplementing the available pumping capacity. A permanent concrete equipment pad, pump suction piping, and pump discharge piping would be installed at the existing manhole such that the portable pumps could be stored at a separate location and moved into place for simple hookup during periods of increased influent flows and high EQ basin influent capacity. For this evaluation, it is assumed that the temporary pumping capacity would be 8 MGD, which results in a total firm pumping capacity of 26 MGD.

Alternative C provides several benefits as a relatively low-cost alternative to directly increase the EQ basin pumping capacity during high flow and emergency conditions without modifying the existing pumps. The trailer-mounted pumps also provide the benefit of being useful at other pumping sites throughout the RCC collection system during emergency scenarios where the additional capacity at the treatment facility is not needed. The portable pumps are available in diesel-driven or electrically powered alternatives, each with benefits and detriments that should be weighed by RCC if this alternative is ultimately selected. The primary downside of this alternative is that the pumps will not be permanently installed as a part of the treatment facility. Facility operators will be required to manually relocate and connect/disconnect the pumps when they are utilized for operation. Bypass-style pumps generally operate at lower efficiencies than similarly sized pumps in permanent installations and diesel-powered pumps will also come with the additional requirements of fuel monitoring and motor maintenance.

Alternative D – New Gravity Influent Connection to EQ Basin #2

Alternative D consists of the installation of a new gravity influent line to EQ Basin #2 to increase the firm capacity of the pump station during high flow events without the installation of new pumps. The existing gravity piping between the grit removal equipment and the influent pump station is installed at an elevation above the bottom of EQ Basin #2. As such, a new pipe could be installed through the side wall of EQ basin #2 that connects to the piping upstream of the influent pump station to divert a portion of the influent flow during wet weather events. The pipe should be installed with an electrically actuated plug valve allowing it to be automatically or remotely placed into service based on elevated levels in the influent pump station wet well or at the discretion of the facility operations staff.

Alternative D is a low cost and minimal maintenance option for increasing the firm capacity of the influent pump station. This option will also remain a useful addition to the treatment facility regardless of future pumping equipment improvements. However, it does come with a few downsides. EQ Basin #2 will be the only basin that can be filled by this piping configuration. As such, the water level in Basin 2 will need to be monitored so it does not exceed levels that will result in back-flooding of the existing grit removal process. This means that the gravity piping connection will only be available for use when Basin #2 is empty or at low water levels. The drain cycle of Basin #2 should be prioritized above the other two basins and the total capacity of the gravity drain will be limited to the volume of Basin #2 up to the flood level of the grit equipment. The estimated total gravity drain volume at this elevation is approximately 4.5 MG (57% of Basin #2).

Compared to the other three presented alternatives, Alternative D appears to provide the most immediate positive impact to treatment facility operation with the fewest operational drawbacks.

A summary of the construction cost estimates for all improvement alternatives is included in Table 5-1 below and attached as appendices to this report.

Table 5-1: Cost Estimates for all Improvement Alternatives[1]

Improvements	Total Estimated Construction Cost
Minimum Recommendations	$946,150.00
Alternative A	$3,008,280.00
Alternative B	$1,921,930.00
Alternative C	$1,287,470.00
Alternative D	$1,102,670.00

6. Summary and Conclusions

The existing Russellville PCW influent pump station consists of equipment that is approximately 20 years old, based on available record drawings, and is beginning to show signs of reduced operational effectiveness. In addition, the existing pump station utilizes manually actuated pump isolation valves such that the facility staff have limited operational flexibility of the equipment. The RCC intends for this pump station to be designed for a wet weather event that results in a peak influent flow rate of 26 MGD to the PCW and the pump station has been evaluated for its ability to facilitate this flow rate.

The existing pumps were field-tested and appear to be operating below their originally intended design point. The results of this testing also indicate a facility firm capacity of approximately 23 MGD during times of peak hydraulic loading of the treatment process. The firm capacity estimate is reduced to approximately 18.3 MGD when the peak treatment process capacity is restricted to 8 MGD due to influent wastewater characteristics. As such, improvements to the pump station should be considered to increase the firm capacity to 26 MGD for all influent wastewater characteristics. This evaluation presents minimum recommendations to increase the operational flexibility and data collection of the existing pump station and four alternatives to increase the facility's firm influent capacity to 26 MGD of combined treatment and storage. HW recommends that the RCC implement one of the lower cost alternatives, with a preference for Alternative D, as defined in this evaluation. This alternative presents an effective solution to immediately increase available capacity without compromising the ability to implement future pump improvements that are data driven based on the improved flow monitoring capabilities included in the minimum recommendations.

[1] All costs for 'Alternatives' include the cost for "Minimum Recommendations".

Appendix A

PCW Facility Peak Flow Improvements - "Alternative A" Replace Existing Pumps
HWEI Project No. 2019071
Opinion of Probable Construction Cost

Description	Total Cost
Influent Pump Station Improvements	
New Dry-Pit Submersible Pumps	$1,857,320.00
Minimum Recommended Facility Improvements	$946,150.00
EQ Basin Piping Improvements	$204,810.00
Total Estimate of Probable Construction Cost	**$3,008,280.00**

PCW Facility Peak Flow Improvements - "Alternative B" One (1) New Dedicated EQ Pump
HWEI Project No. 2019071
Opinion of Probable Construction Cost

Description	Total Cost
Influent Pump Station Improvements	
New Dry-Pit Submersible Pump	$770,970.00
Minimum Recommended Facility Improvements	$946,150.00
EQ Basin Piping Improvements	$204,810.00
Total Estimate of Probable Construction Cost	**$1,921,930.00**

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PCW Facility Peak Flow Improvements - "Alternative C" Trailer-Mounted EQ Pumps
HWEI Project No. 2019071
Opinion of Probable Construction Cost

Description	Total Cost
Influent Pump Station Improvements	
New Trailer-Mounted EQ Pumps and Misc. Piping	$277,500.00
Minimum Recommended Facility Improvements	$946,150.00
EQ Basin Piping Improvements	$63,820.00
Total Estimate of Probable Construction Cost	**$1,287,470.00**

PCW Facility Peak Flow Improvements - "Alternative D" Gravity Influent Piping to EQ Basin 2
HWEI Project No. 2019071
Opinion of Probable Construction Cost

Description	Total Cost
Influent Pump Station Improvements	
Gravity EQ Influent Piping	$135,160.00
SCADA Improvements for Flow Splitting	$21,360.00
Minimum Recommended Facility Improvements	$946,150.00
Total Estimate of Probable Construction Cost	**$1,102,670.00**

PCW Facility Peak Flow Improvements - Minimum Recommended Improvements
HWEI Project No. 2019071
Opinion of Probable Construction Cost

Description	Total Cost
Influent Pump Station Improvements	
New Isolation Valves and Controls	$319,512.12
Replace Existing Flow Meters	$184,669.56
EQ Basin Piping Improvements	$441,968.31
Total Estimate of Probable Construction Cost	**$946,150.00**