Non-Code Ordinance

By: Public Works Department
Introduced: October 11, 2021
Public Hearing: October 25, 2021
Adopted: October 25, 2021
Yes: Brown, Graham, Harvey, Johnson, Sullivan-Leonard, Velock
No: None
Absent: None

City of Wasilla
Ordinance Serial No. 21-17

An Ordinance Of The Wasilla City Council Amending The Fiscal Year 2022 Budget By Appropriating Coronavirus Local Fiscal Recovery Funds In The Amount Of $2,616,209 For The City's Water And Sewer Enterprise Funds.

Section 1. Classification. This is a non-code ordinance.

Section 2. Purpose. To appropriate funding from the Alaska Department of Commerce, Community, and Economic Development, Division of Community and Regional Affairs through the American Rescue Plan to make investment in the City's water and sewer infrastructure in the amount of $2,616,209.

Section 3. Appropriation of Funds. The funds are appropriated to the following:

ARPA NEU Sewer	310-4369-436.45-72	$616,209
ARPA NEU Water	320-4359-435.45-36	$2,000,000

Section 4. Source of Funds.

ARPA NEU Water/Sewer	310-0000-331.31-52	$616,209
ARPA NEU Water/Sewer	320-0000-331.31-42	$2,000,000

Section 5. Effective Date. This ordinance shall take effect upon adoption.

ADOPTED by the Wasilla City Council on October 25, 2021.

Glenda D. Ledford, Mayor

ATTEST:

Jamie Newman, MMC, City Clerk

[SEAL]

City of Wasilla
Legislative Staff Report
Ordinance Serial No. 21-17
(Non-Code Ordinance)

Amending The Fiscal Year 2022 Budget By Appropriating Coronavirus Local Fiscal Recovery Funds In The Amount Of $2,616,209 For The City's Water And Sewer Enterprise Funds.

Originator: Public Works Director
Date: 9/15/2021

Agenda of: 10/11/2021

Route to:	Department Head	Signature	Date
X	Public Works Director	[signature]	9/29/21
X	Finance Director	[signature]	9-29-21
X	Deputy Administrator	[signature]	9/29/21
X	City Clerk	[signature]	9/29/2021
X	Mayor	[signature]	9-29-21

Fiscal Impact: ☒ yes or ☐ no **Funds Available**: ☒ yes

Account name/number:	ARPA NEU Sewer	310-4369-436.45-72	$616,209
	ARPA NEU Water	312-4359-435.45-36	$2,000,000

Attachments: Ordinance Serial No. 21-17 (1 page)
CRW Richmond Hills Booster Station Technical Memorandum (14 pages)
Stantec Wastewater Treatment Plant Projects Letter (4 pages)

Summary Statement: This ordinance is proposed to amend the fiscal year 2022 budget by appropriating Coronavirus Local Fiscal Recovery Funds through the American Rescue Plan to make investment in the City's water and sewer infrastructure. The primary use of these funds is proposed for the Richmond Hills Booster Station project that is currently under design by CRW Engineering Group. This project was initiated through Action Memorandum No. 21-24 on May 10, 2021, by awarding engineering services. This project is planned for construction in 2022 with a current cost estimate of $1,886,408. The balance of the funding is proposed to be invested in the Wastewater Treatment Plant with one of the projects described in the Stantec letter dated September 23, 2021. This ordinance is proposed to fund contracts that will be presented for City Council approval at a future date.

Proposed Action: Introduce and set the ordinance for public hearing.

Technical Memorandum

Date: June 15, 2021
To: Archie Giddings, City of Wasilla DPW Director
From: CRW Engineering Group, LLC
Project: Richmond Hills Booster Station Design
Project No: Purchase Order 23302 (CRW #21801.00)
Subject: DESIGN ANALYSIS

Background

The City of Wasilla (City) owns and operates the Richmond Hills Booster Station (RHBS), located at 930 South Enterprise Street. The purpose of this booster station is to increase the water pressure of the eastern side of the City's distribution system, where some of the residential and commercial districts are located at relatively high elevations. In these areas (zones), the City's distribution system cannot adequately supply sufficient working pressures without the use of pumps. The RHBS therefore provides a critical link between the City's water supply and the eastern zones of the distribution system. The City desires to increase the reliability of the RHBS by adding a second booster station that will provide 100% system redundancy. Once constructed and commissioned, the new booster station will function as the primary facility providing pressure and flow for both domestic and fire protection purposes. The existing RHBS is then intended to operate as a backup system to the new booster station.

Purpose

This design analysis provides the following information for the City's review and concurrence:

- Concept-level descriptions of the new facility, including structure type and materials, package pumping system, new power supply, electrical controls and instrumentation, standby power, new yard piping, and building orientation within the property.
- Findings of the hydraulic modeling of the City's existing piped system within the Richmond Hills Pressure Zone.
- Summary and analysis of relevant codes, standards, and design criteria to be used in the forthcoming design phases.
- Presentation of project design concepts developed to-date and known constraints used in their preparation.

Water System

Existing Facility

The RHBS is located near the intersection of Enterprise Street and Alaska Club Alley, just east of Cottonwood Creek, south of the Parks Highway. Three vertical in-line centrifugal pumps are used to supply the "Richmond Hills Service Zone." These pumps are arranged in a parallel configuration, with two functioning as low demand pumps and one functioning as a high demand pump. The low demand pumps are 10 HP Grundfos Model CR30-30U, having a design operating point of 150 gallons per minute (GPM) with a total dynamic head (TDH) of 150 feet. The high demand pump is a 125 HP Aurora Model 413 BF, having an operating flow of 2,000 GPM and a TDH of 165 feet. The low demand pumps serve ordinary domestic water flows. The high demand pump activates during high flow events, such as when hydrants are opened or when serving fire protection systems. All pumps operate with a variable frequency drive (VFD) control platform and provide adequate distribution system pressures by varying pump speeds or activating/deactivating the standby pump as water demands vary.

The City has reported that the pumps occasionally fail to activate, which leads to insufficient pressures in the distribution system. In ordinary flow conditions, around 40 PSIG of system pressure is available at the inlet pipes supplying the pumps. Without the pumps in operation, this pressure cannot provide sufficient pressure and flow for domestic users, hydrants and fire protection systems in the Richmond Hills Service Zone. The City has also observed a considerable time lag after a high flow event begins in the downstream distribution and is eventually detected at the RHBS to engage the standby low demand pump, or the high demand pump.

Water Distribution System – Richmond Hills Service Zone

For purposes of this design analysis, the "Richmond Hills Service Zone" is defined as shown on Figure 1 in Appendix A. This pressure zone originates at the RHBS and currently serves the areas immediately south and east of the facility, and the residential and commercial districts located east and west of Hermon Road and north of the Parks Highway (area shown in green, Figure 1 in Appendix A. The pressure zone boundary is located at the pressure reducing station on 3680 Old Matanuska Road. Beyond this boundary, the City distribution system serves residential and commercial districts further to the east, south of the Parks Highway (herein called "East Zone", shown in pink, Figure 1 in Appendix A.

The Richmond Hills Service Zone currently provides water service to over 120 residential and 80 commercial properties, which are generally located in near proximity to the Parks Highway.

Residential use varies between single family and multi-family homes. Commercial use varies between retail spaces, restaurants, hotels, and entertainment venues. The approximate length of large diameter piping in Richmond Hills Service Zone consists of 12,200 LF of 12-inch diameter and 4,100 LF of 16-inch diameter ductile iron pipe (DIP). The existing water distribution system does not currently provide service to the residential properties located north of Sun Mountain Avenue (currently shown in peach and yellow colors, Figure 1 in Appendix A. Existing developed properties without City water service currently use private wells.

For the purpose of modeling future conditions, the RHBS is assumed to also serve the area of properties north of those currently served (called "Central Zone", peach-colored area, Figure 1 in Appendix A, which is estimated to consist of up to 275 single-family homes. The Central Zone is generally comprised of the highest elevations in the Richmond Hills Service Area on its eastern side, with lower elevations characterizing its eastern side (Figure 2 in Appendix A). The area located north of the Central Zone and along the Palmer-Wasilla Highway (called "North Zone", yellow-colored area, Figure 1 in Appendix A is conservatively assumed to also be served by the RHBS in the future. This area is characterized largely by commercial properties situated at significantly lower elevations (by 80 feet ±) relative to the "Central Zone", Figure 2 in Appendix A.

To summarize, the Richmond Hills Service Zone is assumed to include the following areas as shown in Figure 1 in Appendix A:

- Existing Conditions: Green and pink areas.
- Future Conditions: Green, pink, peach and yellow areas.

Water Supply

The RHBS is supplied by the City water distribution system located west of Cottonwood Creek. The City's distribution system is served by several wells and water storage tanks located around the downtown area of Wasilla. Of these, three water storage tanks are located within a 2.5-mile radius of the RHBS, each having a nominal storage capacity of 1 MGD:

1. 1150 Susitna Avenue with a base elevation of 410 feet, estimated max water elevation of 446 feet, and an adjacent well producing 300 GPM.
2. 701 Wasilla-Fishhook Road, near the Wasilla High School, with a base elevation of 360 feet and estimated max water elevation of 396 feet.
3. 190 Spruce Ave with a base elevation of 510, estimated max water elevation of 546 feet, and an adjacent well producing 1000 GPM.

These tanks are included in the hydraulic modeling, in addition to the main line piping connecting them as reservoirs and supply routes to the RHBS. The main line pipes between the tanks and the RHBS varies between 10, 12, and 16-inch DIP in size. No water storage tanks are currently located within the Richmond Hills Service Zone, and no future tanks are assumed in the modeling.

Modeling Summary

Hydraulic models were created to determine flow conditions for the design of the booster pumping system. The modeling was accomplished using WaterCAD Connect Edition Update 3, by Bentley Systems. It is important to note that the focus of this study is to determine the sizing of the new pumping system, which is reasonably determined by using an approximate hydraulic model. Therefore, no efforts have been made to calibrate the hydraulic models with actual pressure and flow measurements.

The narrative below generally summarizes the assumptions and findings of the modelling effort. A more detailed description of the modelling effort is found in Appendix B.

General Approach

The modeling effort focused only on critical design conditions and flow scenarios assumed for the Richmond Hills Service Zone, with the East and North Zones included as outlying served areas. An exhaustive, detailed effort was not performed to simulate local piping configurations and flow scenarios for every property served by the RHBS. Only mainline piping was approximately modeled with nodes representing the water demands of local areas. The existing geography, topography and the current residential/commercial developments of the modeled areas facilitated a narrowed focus in simulating the specific flow scenarios that would drive the sizing of the pumping system. The 2011 MSB LiDAR-generated topography was used to estimate piping elevations, assuming a consistent 11-foot depth below ground surface (BGS) to the piping springline.

Four primary models were developed and evaluated:

1. Existing Distribution Layout with Existing Pumping System (Baseline Model).
2. Existing Distribution Layout with Proposed Pumping System.
3. Future Distribution Layout with Proposed Pumping System.
4. Future Distribution Layout with Existing Pumping System.

In general, the following flow conditions were considered for both existing and future water usage scenarios:

- Average Daily Demand (ADD).
- Maximum Daily Demand (MDD).
- Peak Hourly Demand (PHD).
- Fire Flow Demands.

"Domestic" flow conditions were simulated by assuming tributary ADD, MDD or PHD rates discharging at every node simultaneously. PHD rates were used to evaluate maximum domestic hydraulic conditions in the distribution system model. Fire flow demands were simulated by imposing the targeted discharge rate at the particular point of use while tributary MDD rates were simultaneously applied at every node.

Determination of the existing and future ADD, MDD and PHD flow conditions were based on a combination of estimated domestic water usages for both residential and commercial properties and actual flow measurements tracked and recorded by the City. Future flow rates were simply estimated based on an anticipated population growth of 50% total for the next 25 years (2021 to 2046). Demand factors were based on generally-accepted estimating practices for the size of distribution system being evaluated. Future flow scenarios assume that mainline piping and hydrant coverage is extended to supply water to the Central and North Zones, currently unserved by the City (comprising local areas such as Whispering Woods, Happy Mountain Estates, Goddard, Utopia Meadows, Stonefield Development, Edlund Willie, Sun Mountain and Maney Subdivisions). The future mainline piping is assumed to be extended within existing streets and conceptual backlot easements to form basic network loops between Hermon Road and Seward Meridian Parkway (Figure 1 in Appendix A).

Existing and future ADD and MDD rates are summarized in Tables 1 and 2 below and in Appendix B.

TABLE 1. EXISTING DOMESTIC WATER DEMANDS

Water Demand	Factor	Flow Rate (GPM)	
		Richmond Hills Service Zone	East Zone
Average Daily Demand	1.00	98	31
Maximum Daily Demand	1.80	176	55
Peak Hourly Demand	3.25	317	100

TABLE 2. FUTURE (YEAR 2046) DOMESTIC WATER DEMANDS

Water Demand	Factor	Flow Rate (GPM)		
		Richmond Hills Service Zone *(Existing Served Area and Central Zones)*	East Zone *(Node J-8)*	North Zone *(Node J-16)*
Average Daily Demand	1.00	198	46	81
Maximum Day Demand	1.80	357	83	146
Peak Hourly Demand	3.25	644	150	263

Fire flow conditions were generally based on 2012 International Fire Code (IFC) site requirements. Three principal site scenarios were evaluated for fire flow needs:

- *Models 1 and 2:* 1,500 GPM hydrant flow at each node in the model (i.e. one hydrant flowed at a time at each node in several different model runs).
- *Models 3 and 4:* 1,500 and 1,000 GPM (respectively) future hydrant flow on East Elderberry Drive in the Goddard Subdivision (longest pipeline distance from RHBS, highest elevation and moderate flow requirements).
- *Models 3 and 4:* 2,000 GPM site flow at future hotel located in the Sun Mountain development on South Maney Drive (moderate pipeline distance from RHBS, moderate elevation and highest flow requirements).

Fire flow scenarios were evaluated using a minimum 20 PSIG residual pressure criterion at the point of use, and at the inlet piping supplying the RHBS. The water distribution network upstream of the RHBS was approximately modeled to help discern any apparent fire flow supply limitations therein.

Pumping systems were modeled by simulating the performance characteristics of the existing RHBS pumps for Models 1 and 4, and by simulating the performance curves of a 6-pump package mounted in parallel configuration, as provided by the Grundfos Hydro MPC BoosterpaQ (with 30 HP CR 90 pumps), for Models 2 and 3. For the new pumping system, all six pumps are identical in size and provide the same TDH. Each pump contributes a proportional flowrate volume to the total output of the package. Pumps are activated or deactivated in sequence to meet variable water demands, as the number of pumps called to action is generally proportional to the water demand. The hydraulic model software also simulates variable pump speeds when it calculates flows and pressures at nodes. When water demands can be met without the need for 100% pump speeds, the lesser speeds are reported in the outputs with the estimated node flows and pressures.

Modeling Results

General results for each of the four models are summarized as follows:

Model 1: Existing Distribution Layout with Existing Pumping System (Baseline Model)

- The existing pumping system met the existing domestic PHD flowrate and pressure requirements when using both low demand pumps.
- Using one low demand pump, high pressures (100+ PSIG) were obtained at ADD flow rates at lower elevations near the Old Matanuska Road and Seward Meridian Road intersection. In general, higher system pressures tend to be associated with lower topographic elevations.
- When the existing pumping system was modeled as being offline, resulting residual pressures were marginal (approx. 20 PSIG) at the domestic ADD flowrate near the intersection of Hermon Road and the Parks Highway (this area featuring the higher elevations of the existing distribution network). In general, lower system pressures tend to be associated with higher topographic elevations.
- Using both low demand and high demand pumps, a fire flow rate of 1,500 GPM was achieved with ample minimum residual pressure (nearly 50 PSIG) simulated near the intersection of Hermon Road and the Parks Highway (i.e., at the higher elevations of the existing distribution network).

Model 2: Existing Distribution Layout with Proposed Pumping System

- The proposed pumping system met the future PHD domestic flowrate and pressure requirements using only one pump.
- High pressures (120± PSIG) were obtained at ADD, MDD and PHD domestic flow rates at lower elevations near the Old Matanuska Road and Seward Meridian Road intersection using only one pump.
- Using three pumps, a fire flow rate of 1,500 GPM was achieved at each node with (in the worst case scenario) ample minimum residual pressure (nearly 50 PSIG) simulated near the intersection of Hermon Road and the Parks Highway (i.e., at the higher elevations of the existing distribution network).

- With the three pumps providing the 1,500 GPM fire flow rate, high pressures similar to the previous ADD-to-PHD flow cases were obtained at the same lower elevation locations. This result is expected, since the combination of identical pumps in parallel will produce a TDH similar to that of one pump (presuming that neither configuration is operating in "run-out" conditions).

Model 3: Future Distribution Layout with Proposed Pumping System

- The proposed pumping system met the future PHD domestic flowrate and pressure requirements using two pumps, but high pressures exceeded the maximum inlet pressure setting of the pressure reducing valve (PRV) at 3680 Old Matanuska Road (120 PSIG, based on record drawing information).
- High pressures (100 to 120+ PSIG) were obtained at ADD, MDD, and PHD domestic flow rates at lower elevations near the Old Matanuska Road and Seward Meridian Road intersection using one to two pumps.
- Using four pumps, a fire flow rate of 1,500 GPM was achieved at the highest-elevated areas in the Richmond Hills Service Zone on Elderberry Drive, with a minimum residual pressure of 20± PSIG at the point of discharge. At this rate, high pressures similar to the previous ADD-to-PHD flow cases were obtained at the same lower elevation locations.
- Using six pumps, a fire flow rate of 3,000 GPM was <u>not</u> achieved at the future hotel planned for construction in the Sun Mountain commercial development. The modeling of the City's water distribution system upstream of the RHBS (which is abbreviated and approximate) indicates that the system does not have sufficient supply capability to convey this flow rate (and future MDD rate) without operating below the RHBS pump system's required net positive suction head (NPSHr). See *Discussion* section below for further discussion on this modeling case.
- Using five pumps, a fire flow rate of 2,000 GPM was achieved at the future hotel planned for construction in the Sun Mountain commercial development, with residual pressures ranging above 20 PSIG at the pumping system intake.

Model 4: Future Distribution Layout with Existing Pumping System

- The existing pumping system met the existing domestic flowrate and pressure requirements using the two low demand pumps for all but the higher-elevated areas around Elderberry Drive. At these elevated areas, the high demand pump was needed to meet the MDD and PHD rates because the low demand pumps would have to operate near "run-out" conditions in order to provide the required flow. In this condition, the low demand pumps would not be able to provide the required TDH. Further, the discharge pressure setting of the existing PRV in the RHBS appeared to limit the high demand pump from increasing downstream pressures above 70 PSIG. When the model was run without the PRV enabled, system pressures increased at the higher-elevated areas, but the high pressures in the lower elevated areas also increased commensurately.

- High pressures (100+ PSIG) were obtained at ADD, MDD, and PHD flow rates at lower elevations near the Old Matanuska Road and Seward Meridian Road intersection using low demand, high demand, or both pump types.
- Using both the low demand and high demand pumps, a fire flow rate of only 1,000 GPM was achieved at the highest-elevated areas in the Richmond Hills Service Zone on Elderberry Drive, with a minimum residual pressure of about 20 PSIG at the point of discharge. The discharge pressure setting of the existing PRV in the RHBS appeared to limit the high demand pump from increasing downstream pressures above 70 PSIG. Without the PRV enabled, greater fire flow rates at sufficient residual pressures would be possible at the higher-elevated areas, but the high pressures in the lower elevated areas would also increase commensurately.
- Using both the low demand and high demand pumps, a fire flow rate of 2,000 GPM was achieved at the future hotel planned for construction in the Sun Mountain commercial development, with residual pressures ranging above 20 PSIG at the pumping system intake.

Discussion

The hydraulic modeling conducted for this project indicates that a five or six-pump package with the characteristics of the 30 HP Grundfos CR 90-2-1 will provide for domestic and fire flows to all properties located within the future Richmond Hills Service Zone. The modeling results also indicate that one to two pumps will provide for all existing and future water domestic water flow ranges. This finding may put into question the need for installing another 3 to 4 pumps for fire protection purposes. However, one benefit of operating with numerous additional pumps is the ability to gradually provide fire flows up to the point of that needed at any point of discharge, which will likely be quite variable, and be less than 1,500 GPM for most extraordinary water supply needs (such as fire and system maintenance). Doing so will mitigate or avoid excessive pressures in lower areas that otherwise might be more common with the use of one, very large, high demand pump. Another benefit is, by providing one extra pump beyond the 1,500 GPM or 2,000 GPM flow requirement, the "extra" pump can function as an on-the-floor spare, that will be exercised in the ordinary alternating usage or all pumps, as provided by the control system.

The modeling also appears to show that fire flow requirements higher than 2,000 GPM during future MDD conditions may be limited by the conveyance capabilities of the distribution system upstream of the RHBS. When a 3,000 GPM flow rate was attempted in the model, insufficient pressures resulted at the inlet of the pumping system, caused by the high elevation gain needed to reach the RHBS and by high friction losses from upstream pipe lengths that are "long" relative to the flow rate. However, these results were generated by a simplified model, which did not substantially account for the large water volume available in the downtown water network, which would have the effect of augmenting the water supply to the RHBS while reducing pipe friction losses. The availability and benefit of this unaccounted-for water volume in an extreme, prolonged fire emergency was not reviewed in this modeling effort. A more extensive and refined analysis of the City's upstream network is needed to confirm this apparent flow limitation, which at present is to be considered an approximation.

The modeling results also indicate that, as a standby to the new system, the existing booster system will not likely meet future flow requirements for the higher elevations around Elderberry Drive. This issue does not appear to be alleviated with an adjustment of the RHBS PRV. If/when water service is expanded to this area, this future issue might be addressed at a later time by lowering the hydrant flow criterion to 1,000 GPM (as this volume is still fairly robust for dealing with fire emergencies in residential areas). Or it might be that the City elects to construct a water storage tank in the area as a means of increasing the reliability of its water supply east of Cottonwood Creek. Locating a tank within the higher elevated area in the Richmond Hills Service Zone would enhance the local hydrostatic pressures. It does appear that the existing system will currently provide 2,000 GPM of fire flow to the Sun Mountain commercial development, including the future hotel. At the present time, fire flow requirements have not yet been communicated by the designer of record of this development. If greater fire flows are required for this particular development, a closer review of the City water supply and its infrastructure may be needed.

As expected, due to the variations in the local topography, pressures vary widely. The use of VFDs with the pumps will somewhat alleviate the problem of excessive pressures in low areas, but pressure reducing stations would be needed to positively and reliably maintain local pressure within the conventional range of 30 to 80 PSIG. Future expansions of the water system should require further hydraulic modeling to examine where pressure reducing stations may be best located.

One such future area encountering high system pressures may be the "North Zone." This area is characterized largely by commercial properties situated at significantly lower elevations (by 80 feet ±) relative to the "Central Zone" and consequently, relatively higher system pressures would be expected for this area. If the City water service is ever extended to the North Zone from the RHBS, a future pressure reducing station may be needed to lower the pressures.

RECOMMENDATIONS FOR WATER SYSTEM

The following general recommendations are made at this time, based on the modeling analysis:

- Use of a 5 or 6-pump package based on the Grundfos Hydro MPC BoostpaQ with a combined parallel pump rating of 2,250 GPM minimum (6 each x 450 GPM) at 182 feet of total dynamic head (TDH). A 6-pump package would provide additional redundancy that would increase the reliability of the water conveyance system.
- Continued use of existing pumping system as a standby pressure booster system until such time that distribution system extensions create local hydraulic requirements that cannot be met. Until water service expansions actually happen, distribution system enhancements in association with the use of this facility do not appear needed for the foreseeable future.
- Adjustments made to existing pressure reducing stations as needed to better protect downstream systems from operating under excessively high pressures.
- Consideration to replace the use of the one large PRV in the existing booster station with multiple pressure reducing stations located adjacent to local distribution systems in lower elevations, as doing so would better control high pressures where needed.
- Looped piping networks in future water system extensions, to more efficiently convey water to distant and higher-elevated locations within the Richmond Hills Service Zone.
- Consideration of a future "parallel" water transmission main linking the RHBS with the downtown water distribution system, or the use of a new water storage tank located east of Cottonwood Creek to increase the reliability of supplying water to the Richmond Hills Service Zone.

Water System Design Criteria

The design criteria and associated assumptions used to evaluate the different hydraulic modeling scenarios are summarized below.

WATER DISTRIBUTION SYSTEM

- *Size future water distribution system to:*
  - Meet PHD for domestic water needs.

    - Meet Fire Flow plus MDD for fire protection water needs.
- *Minimum Main Pipe Diameter:* 8 inches.
- *Pipe Material:* Class 52 ductile iron pipe (DIP).
- *Residential Fire Flow Rate:* 1,500 GPM at hydrants during MDD.
- *Commercial Fire Flow Rate:* 2,000 GPM total available for building sprinkler systems and nearby hydrants during MDD.
- *Minimum Domestic Working Pressure:* 35 psi at ground level.
- *Maximum Domestic Working Pressure:* 80 psi at ground level.
- *Fire Flow Minimum Residual Pressure*: 20 psi at ground level.
- Fir*e Flow Maximum Static Pressure:* 80 psi at ground level.
- *Maximum Allowable System Pressure*: 120 psi at ground level (Old Matanuska Road pressure reducing valve).
- *Maximum Water Velocity:*
    - 10 feet per second (FPS) for emergency water needs.
    - less than 5 FPS for ordinary water needs.

PUMPING SYSTEM

- Six-pump parallel configuration with lead-lag operation.
- Operating point for each pump is established as 450 GPM at 182 feet of total dynamic head (TDH).
- Domestic design based on achieving peak hourly demand (PHD) at domestic working pressure level.
- Design based on MDD and a minimum fire flow of 1,500 GPM at Elderberry Drive.
- Design based on MDD and a fire flow ranging between 2,000 and 3,000 GPM for new hotel development (assumed to be located at New Maney Drive and Sun Mountain Avenue).
- Minimum relative speed of 50 percent for variable frequency drive (VFD) pumps during operation (per manufacturer's instructions).

Water System Codes and Standards

In general, the water system design will comply with 2012 edition of Recommended Standards for Water Works (i.e. "Ten States' Standards") and City requirements as minimum guidelines, and with applicable State drinking water and water quality regulations. Fire flow provisions in Wasilla should be designed in accordance with the 2012 International Fire Code including State-adopted ICC Code Amendments.

CITY OF WASILLA
RICHMOND HILLS BOOSTER STATION IMPROVEMENTS
CONSTRUCTION COST ESTIMATE - 50% DESIGN

IMPORTANT NOTE: The quantities provided below are an estimate. The contractor shall be responsible to validate all quantities as part of their bid. Other construction items, materials and services not listed herein that are necessary for the completed project are required to be included.

SITE CIVIL					
ITEM No.	**ITEM DESCRIPTION**	**UNIT**	**ESTIMATED QUANTITY**	**UNIT PRICE**	**TOTAL COST**
20.09	Removal of Pavement	S.Y.	34	$40	$1,360
20.10	Unusable Excavation (*Building Footprint*)	C.Y.	50	$50	$2,500
20.13	Trench Excavation and Backfill (Various Depths)	L.F.	130	$150	$19,500
20.16	Furnish Bedding Material (Class E)	L.F.	130	$35	$4,550
20.21	Classified Fill and Backfill (Type IIA)	TON	200	$22	$4,400
20.22	Leveling Course	TON	60	$35	$2,100
20.27	Disposal of Unusable or Surplus Material (*Trench Excavation*)	C.Y.	67	$50	$3,350
40.06	Asphalt Concrete Pavement (Class E)	TON	43	$200	$8,600
55.02	Furnish and Install 4-inch CPEP	L.F.	25	$45	$1,125
60.02	Furnish and Install 12-inch Ductile Iron Pipe	L.F.	33	$550	$18,150
60.02	Furnish and Install 16-inch Ductile Iron Pipe	L.F.	89	$700	$62,300
60.03	Furnish and Install 12-inch Valve	EA	2	$6,000	$12,000
60.03	Furnish and Install 16-inch Valve	EA	1	$8,000	$8,000
60.03	Furnish and Install 16-inch Valve, Live Tap (*Inserta Valve*)	EA	2	$20,000	$40,000
60.06	Furnish and Install Anode	EA	8	$300	$2,400
60.13	Connect to Existing Water Pipe 12-inch Live Tap	EA	1	$18,000	$18,000
60.13	Connect to Existing Water Pipe 16-inch with 12-inch By-Pass	EA	1	$12,000	$12,000
70.08	Remove and Reset Fence (*Chain-link*)	LF	50	$30	$1,500
70.12	Traffic Maintenance	LS	1	$6,500	$6,500
70.13	Bollard	EA	3	$800	$2,400
C-001	Furnish and Install Natural Gas Service Piping	LF	32	$55	$1,760
C-002	Furnish and Install Dry Well System	EA	1	$3,500	$3,500
				Subtotal	**$235,995**

WATER PROCESS					
ITEM No.	**ITEM DESCRIPTION**	**UNIT**	**ESTIMATED QUANTITY**	**UNIT PRICE**	**TOTAL COST**
P-001	Furnish and Install Booster Pump Package	LS	1	$384,000	$384,000
P-002	Furnish and Install Piping and Fittings	LS	1	$68,000	$68,000
P-003	Furnish and Install Instrumentation	LS	1	$24,500	$24,500
			0		
				Subtotal	**$476,500**

STRUCTURAL					
ITEM No.	**ITEM DESCRIPTION**	**UNIT**	**ESTIMATED QUANTITY**	**UNIT PRICE**	**TOTAL COST**
S-001	Insulated Concrete Forms	S.F.	1,632	$6	$9,792
S-002	ICF Reinforced Concrete	C.Y.	40	$2,500	$101,244
S-004	Reinforced Concrete Footer	C.Y.	7	$2,500	$17,778
S-006	Reinforced Concrete Slab	C.Y.	11	$2,500	$26,667
S-008	Reinforced Concrete Housekeeping pads	C.Y.	2	$2,500	$4,630
S-009	Wood Trusses	L.F.	420	$10	$4,200
S-010	Plywood Roof Sheathing	S.F.	810	$10	$8,100
S-011	Generator Slab (Concrete & Rebar)	C.Y.	2	$2,500	$4,630
				Subtotal	**$177,040**

ARCHITECTURAL					
ITEM No.	ITEM DESCRIPTION	UNIT	ESTIMATED QUANTITY	UNIT PRICE	TOTAL COST
A-001	Underslab Vapor Barrier	S.F.	600	$1.50	$900
A-002	Metal siding (exterior)	S.F.	1,200	$25	$30,000
A-003	Metal Liner Panel (interior)	S.F.	1,600	$20	$32,000
A-004	Batt Insulation (Roof)	S.F.	600	$3.50	$2,100
A-005	Roofing Underlayment	S.F.	800	$1.25	$1,000
A-006	Metal Roofing	S.F.	800	$25	$20,000
A-007	Metal Flashing & Trim	L.S.	1	$3,500	$3,500
A-008	Roof Fascia	L.F.	60	$15	$900
A-009	Continuous Soffits	S.F.	150	$12	$1,800
A-010	Continuous Ridge Vent	L.F.	26	$18	$468
A-011	Exterior Doors and Frames	L.S.	1	$6,500	$6,500
A-012	Damp Proofing of ICF (sub-grade)	S.F.	400	$5	$2,000
A-013	Sealants	L.S.	1	$1,000	$1,000
A-014	Roof Access Door	L.S.	1	$1,200	$1,200
A-015	Resilient Base	L.F.	100	$5	$500
A-016	Painting	L.S.	1	$2,500	$2,500
A-017	Fire Extinguisher	L.S.	1	$350	$350
				Subtotal	**$106,718**

MECHANICAL					
ITEM No.	ITEM DESCRIPTION	UNIT	ESTIMATED QUANTITY	UNIT PRICE	TOTAL COST
M-001	Gas-Fired Unit Heater (45 MBH)	EA	1	$2,250	$2,250
M-002	Intake/Exhaust vent piping kit with terminations and wall caps	EA	1	$6,120	$6,120
M-003	Electric Unit Heater (10 KW)	EA	1	$3,250	$3,250
M-004	Floor Drain	EA	2	$1,050	$2,100
M-005	4" Cast Iron Pipe	L.F.	100	$59	$5,850
M-006	1/2" Black Steel Gas Piping	L.F.	40	$21	$820
M-007	Ventilation Fan (120 CFM)	EA	1	$4,075	$4,075
M-008	10/10 Relief Duct w/ insulation and damper	L.F.	1	$2,760	$2,760
M-009	Bird Spikes (for hoods, pipe, vents)	LS	1	$130	$130
M-0010	Pipe Supports	EA	10	$25	$250
M-0011	Well Tank	EA	1	$43,450	$43,450
M-0012	Articulating Arm Jib Crane	EA	1	$40,850	$40,850
M-0013	Testing	LS	1	$1,150	$1,150
				Subtotal	**$113,055**

ELECTRICAL					
ITEM No.	ITEM DESCRIPTION	UNIT	ESTIMATED QUANTITY	UNIT PRICE	TOTAL COST
E-001	400A 480V SERVICE (Feeders ATS MAIN Breaker)	EA	1	$12,000	$12,000
E-002	250kW self contained generator	EA	1	$60,000	$60,000
E-003	Main feeders and circuits (MDP and distribution)	LS	1	$20,000	$20,000
E-004	Interior distribution	LS	1	$10,000	$10,000
E-005	Interior lighting etc	LS	1	$2,500	$2,500
E-006	Inter building connection	LS	1	$3,000	$3,000
E-007	SCADA (Replace existing)	LS	1	$40,000	$40,000
E-008	SCADA Remote panel in new Booster	LS	1	$15,000	$15,000
E-009	Cameras	EA	2	$4,500	$9,000
E-010	MEA NEW 400A 480 v UG service	LS	1	$25,000	$25,000
				Subtotal	**$196,500**

CONSTRUCTION COST SUBTOTAL:	$1,451,083
GENERAL REQUIREMENTS, OH&P (15%):	$217,662
ESTIMATING CONTINGENCY (15%):	$217,662
TOTAL CONSTRUCTION COST ESTIMATE:	**$1,886,408**

Stantec

Stantec Consulting Services Inc.
725 East Fireweed Lane Suite 200, Anchorage AK 99503-2245

September 23, 2021
File: 204700415

Attention: Archie Giddings
City of Wasilla
290 East Herning Avenue
Wasilla, AK 99654-7091

Reference: Wasilla Wastewater Treatment Projects

Dear Mr. Giddings:

Stantec Consulting Services Inc (Stantec) is providing the City of Wasilla (City) budgetary estimates for three potential projects at the Wasilla Wastewater Treatment Plant (WWTP) as requested. Cost estimates are rough order of magnitude (ROM) estimates and include design, permitting, and construction using 2021 costs and 4% annual escalation to year 2024. These projects have not been designed, so the provided ROM estimates are preliminary numbers, and final cost will vary with final configuration and market conditions.

PILOT STUDY WETLAND DISCHARGE – ADDITIONAL 3 YEARS

The Wasilla Wastewater Pilot Study Discharge began in June of 2019 and has continued without apparent issue for approximately 28 months with only limited interruption. The discharge has been at 300,000 gpd since June of 2020, essentially full plant flow. Data to date continues to show good removal of nutrients and bacteria within the wetlands, with no evidence of nutrients or bacteria leaving the test site at levels higher than background. There is evidence that nutrient concentrations downstream of the WWTP are declining, suggesting improvements to water quality in the project area. Testing of offsite residential wells has found no degradation of groundwater. Based on success to date, the Alaska Department of Environmental Conservation has extended the pilot study until at least September 2021. The pilot study extension is predicated, in part, upon continuation of discharge monitoring.

The long-term impacts of the discharge to area wells and the wetland vegetation itself unfortunately will not be immediately apparent. Continued monitoring of the discharge quality, area wells, and vegetation health within the wetland is warranted through 2024 if not longer as part of the development of permitting and compliance activities. Work for this effort includes field sampling, laboratory analysis, and reporting on effluent discharge and water quality within the project limits, as well as private well testing, and vegetation monitoring in field and via drone. Annual public meetings to keep the community apprised of the project as well as website maintenance are also recommended.

Based on current year efforts (2021) annual costs for pilot study monitoring and compliance are approximately $480,000 per year. **A three-year program extension will be approximately $1.62 million**, including 4% annual escalation, but not including City oversight and administrative costs.

Reference: **Wasilla Wastewater Treatment Projects**

NITRIFICATION TREATMENT – SAGR SYSTEM

Wetlands pilot study work to date has found good removal of ammonia and nitrate in summer and fall, with increased levels of ammonia in the winter. This is due to reduction of biological activity in the treatment lagoons during cold weather. It is likely additional treatment to remove ammonia from the effluent will be required as a permit condition for the wetlands discharge, especially if the wetlands are used year-round.

One treatment option under consideration for cold weather removal of ammonia is the Submerged Attached Growth Reactor (SAGR) system by NEXOM. The SAGR system uses a large, below ground (i.e., buried) bed of clean stone to culture the required nitrifying bacteria. The system is sized to accommodate the lower temperature of the effluent, while the buried stone bed is insulated to provide a stable temperature and environment to maintain biological activity throughout winter. The SAGR systems have been constructed in various Canadian and colder locations in the US and appear to be effective at winter removal of ammonia. Construction consists of a large excavation, an HDPE liner, the stone media (ordinary sewer drain rock), and aeration piping and blowers.

NEXOM provided Stantec a preliminary budget price for a SAGAR system sized for the Wasilla WWTP in 2018. The proposed system included two SAGAR cells constructed in the upland area east of WWTP Lagoon Cells 3 and 4. Each SAGAR measures 170 x 130 feet, 10 feet deep. The total SAGAR area is about 1 acre, slightly smaller than lagoon cells 3 and 4. Using current material prices, and escalation to 2024, **the ROM cost for a SAGAR system is approximately $5.24 million including engineering and permitting,** but not including any City administration or oversight costs. A budgetary level cost estimate is as follows:

Item	Quantity	Unit	Unit price	Total
Common Excavation	16500	Cy	$25	$412,500
New Berm Construction	3500	Cy	$25	$87,500
Piping from Lagoon to Splitter	1200	Lf	$350	$420,000
Piping from SAGR to Discharge	1200	Lf	$350	$420,000
Uniform Graded Clean Rock	13510	Cy	$45	$607,950
Insulating Wood Chips	1890	Cy	$18	$34,020
Non-Woven Geotextile	12000	sq yd	$3	$36,000
HDPE Liner	60,500	Sqft	$2	$133,100
Wall Framing and Sheathing	1260	Lf	$16	$20,160
Influent Flow Splitter Structure	1	Ls	$7,500	$7,500
Piping, Fittings Valves at SAGR	1	Ls	$60,000	$60,000
Effluent Level Control MH	1	Ls	$8,500	$8,500
Nexom Process Equipment	1	Ls	$750,000	$750,000
Install Nexom process equipment	1	Ls	$120,000	$120,000
			Subtotal	$3,117,230
Contingency and Misc.	30%			$935,169
Engineering, Permitting and CA Support	15%			$607,860
			TOTAL 2021	**$4,660,259**
Escalation to 2024	4%		**TOTAL 2024**	**$5,242,157**

SLUDGE REMOVAL EQUIPMENT

Wastewater sludge from the treatment processes accumulates on the bottom of the treatment lagoons. At present, the operators remove the sludge manually, a very disruptive, labor intensive and potentially hazardous operation that requires the lagoons be drained, and sludge pumped off the bottom of the lagoons using a pump the operators move around the bottom. The sludge removal causes treatment process upsets, and the discharge of the liquid sludge contributes to the large release of nitrates (i.e., the nitrogen footprint) from the WWTP.

A much less disruptive method of sludge removal uses a small, floating barge with suction dredge. The barge is moved back and forth across the lagoon using a winch and cable system; in this manner the settled sludge can be removed without draining or entering the lagoons. The liquid sludge is then treated with polymer, and pumped to a belt filter press, which dewaters the sludge to approximately 16-20% solids, roughly the consistency of wet sand. Liquids are returned to the lagoons, while the dewatered sludge is piled on site or hauled to landfill. This method of sludge removal and treatment reduces labor, reduces process unsets, and reduces the nitrogen footprint. Stantec has assumed the belt filter press is on a wheeled trailer, so it can be moved close to the lagoon cell to be cleaned. It may also be possible to permanently install the filter press and bring piping to the press. Either way, the estimate includes the cost for a pre-engineered metal building to store the equipment, as it will need to be protected from freezing.

The ROM cost to purchase sludge removal equipment is approximately $880,000. This includes an allowance for manufacturers startup services, but does not include WWTP labor for installation, setup and operations, or any City administration or oversight costs. The ROM cost for the sludge removal system is ballpark but could vary widely with final configuration. A budgetary level cost estimate is as follows:

Item	Quantity	Unit	Unit price	Total
Suction Dredge and Barge	1	LS	$55,000	$55,000
Self-Priming Sludge pump - diesel engine	1	LS	$40,000	$40,000
Polymer Feed System	1	LS	$7,500	$7,500
Belt Filter Press	1	LS	$120,000	$120,000
Mobile wheeled trailer (40 foot)	1	LS	$50,000	$50,000
Piping and Hoses	2000	LF	$20	$40,000
Electrical Allowance	1	LS	$35,000	$35,000
Ancillary Equipment	1	LS	$15,000	$15,000
Manufactures Startup and Training	1	LS	$25,000	$25,000
Shelter / Storage Building - 16 x 40	640	sq ft	$250	$160,000
			Subtotal	$547,500
Contingency and Misc.	30%			$164,250
Engineering	10%			$71,175
			TOTAL 2021	**$782,925**
Escalation to 2024	4%		**TOTAL 2024**	**$880,684**

Reference: **Wasilla Wastewater Treatment Projects**

CLOSURE

Please let us know if you have any questions about these ROM cost estimates. Stantec looks forward to supporting you on these projects and the continued development of wastewater treatment in Wasilla. If you have any questions, please contact me or Stephanie Gould (343-5235, Stephanie.gould@stantec.com).

Thank you,

Stantec Consulting Services Inc.

Dean Syta PE
Senior Principal
Phone: 907-343-5260
Fax: 907-258-4653 dean.syta@stantec.com

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