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Date: October 7, 2016

To: City Council

From: Todd Parton
City Manager

SUBJECT: Overview of Reuse Water Project

Attached is a summary of the reuse water pond and pump station project. This briefing is comprised of the following sections:

Origin of Project
Purpose of Project
Public Information About Project
Design of Project
Existing Reuse Water System
Reuse Water Demand
Functionality of the Project
Conclusion

Also included are six exhibits containing pertinent supporting information for this project.

This report has been provided as a historical reference and research document.

Origin of Project:

It is estimated that a minimum of 360 million gallons of the city's treated effluent goes unused each year. The city had identified this as a potential source to diversify and supplement its raw water supplies. In early 2013, the City Council and the Economic Improvement Corporation Board voted to conduct a professional engineering study to investigate the feasibility of adding additional reuse storage capacity and to prepare a reuse feasibility study.

On September 10, 2013, the City Council approved a professional services agreement for the reuse feasibility pond study with Freese and Nichols, Inc. Results of the study were presented to the City Council by the consultant on June 10, 2014, and to the Economic Improvement Corporation Board by city staff on June 23, 2014.

City Council approved a professional services agreement with Freese and Nichols for the design of a reuse pond on October 28, 2014. Pursuant to this agreement, Freese and Nichols prepared the designs for a pond to store up to 105 million gallons of unused reuse water and to achieve the original purpose of the project, to diversify and supplement the raw water supply.

The city began a year-long sampling protocol of the treated effluent in conjunction with the Texas Commission on Environmental Quality (TCEQ) in 2015. This sampling plan was implemented to help determine the options for treating the effluent to drinking water standards, with the ultimate plan to store this water in aqua storage and recovery (ASR) wells. TCEQ has been actively coordinating with the city on this sampling project and will support the injection of the treated effluent into ASR wells provided that the injected water is drinking water quality.

Purpose of Project:

The purpose of this project is to expand the available usage of the city's reuse water and to increase the flexibility of matching supply and demand. Effluent discharged from the City of Kerrville sewer plant is currently used for irrigation and other non-drinking water uses. On average, 2.2 million gallons of effluent is discharged from the plant daily. Of the 2.2 million gallons discharged, 2.0 million is available for distribution. There are peak demand days during the hottest time of the year (July through September) where the reuse system is operating at maximum capacity. Conversely, throughout the rest of the year a significant amount of the treated effluent is not demanded and, due to the lack of an ability to capture or store it, is lost downstream.

Constructing a facility to capture unused treated effluent (especially during low demand days, months, and seasons) affords Kerrville the most efficient means to meet the stated purpose of the project – to increase the flexibility of matching supply and demand. An ample resource will be provided to allow the city to more efficiently meet the needs of existing customers, expand service to other customers, and provide a constant supply to supplement the city's drinking water.

Public Information About Project:

The project has been discussed in 17 public meetings open to the pubic since April 2013. Additionally, there have been 21 articles published in the local newspapers during the same time period.

City Council appointed an ad hoc citizens advisory committee to review the project in November 2015. This committee met four times in public meetings from January 2016 through February 2016. The committee recommended unanimously that the city proceed with the project provided that it is used to supplement the city's raw water supply. Furthermore, the committee recommended that the city construct the water treatment facility as soon as practicable.

Design of Project:

The reuse project has been designed by Freese and Nichols, the engineering firm hired by the City of Kerrville. Design elements include the construction of a storage pond with 105 million gallons of capacity and a pump station to deliver 3.5 million gallons per day. This project will allow for the city to increase its reuse water capability from a current peak supply of 2.0 million gallons per day to 3.5 million gallons per day in the future.

There are two items within the pond and pump station project that require approval from the TCEQ, and those are the pond dam and the improvements to the wastewater and reuse systems. Coordination occurred with two separate divisions of the TCEQ with the Austin office.

TCEQ Coordination

1. Dam Safety Section – Critical Infrastructure Division Coordination
    a. July 1, 2016 – FNI submitted 90% complete Plans and Specifications and additional documentation for preliminary review
    b. August 9, 2016 – TCEQ provided response and comments on preliminary plans and specifications
    c. September 23, 2016 – FNI provided a response to the TCEQ's comments and submitted the 100% complete plans and specifications for review, including TCEQ Hydrologic and Hydraulic Evaluation Summary Dated July 1, 2016
    d. FNI expects a response from the TCEQ within 30-days
2. Wastewater and Reuse System Improvements
    a. August 29, 2016 – FNI submitted 100% complete plans and specifications to the TCEQ for review. The notification for the wastewater and reuse system improvements was sent to the TCEQ's Region 13 (San Antonio) office, in accordance with the TCEQ's requirements
    b. The TCEQ has 30-days to provide comments on the submitted project or the project is considered to be conditionally approved for construction per TAC (TCEQ) Chapter 217

Environmental and Archeological Studies

1. Environmental Coordination
    a. June 4, 2014 – FNI provided a technical memorandum to the City as part of the reuse system feasibility report "City of Kerrville, TX: Water Reuse Site Feasibility"
    b. April 22, 2015 – FNI provide a technical memorandum to the City "Environmental Permitting Technical Memorandum"
2. Historical Commission Coordination
    a. January 7, 2015 – FNI provided a notification letter to the Texas Historical Commission (THC) requesting their review
    b. February 3, 2015 – The THC indicated that archeological sites exist in the area and an archeological review is required
    c. July 2015 – Draft Archeological Report provided to the THC for review and comment

d. August 17, 2015 – THC provided response that they occur with the recommendation that no further investigation is needed
e. September 2015 – Final archeological report completed

Engineering Documentation

1. June 2014 – Technical Memorandum "Water Reuse Feasibility Study"
2. June 2016 – Kerrville Reuse Facility Storage Pond – Emergency Action Plan Draft – Finalization Pending City Coordination
3. June 30, 2016 – Design Report "Water Reuse Facility Reuse Pond Design Report" – This includes the flood plain impact analysis
4. September 15, 2015 – Technical Memorandum "Reuse System Modeling Technical Memorandum"
5. September 29, 2016 - Exhibit showing velocities and 1% flood plain

Existing Reuse Water System:

Effluent is discharged throughout each day from the City of Kerrville sewer plant and is the final product generated from the cleaning and disinfection of raw sewage. It may be used directly from the plant for non-drinking water uses or may be further processed and used as a source for drinking water. In other words, it offers another alternative source of raw water for the city. The amount of effluent generated is directly linked to the amount of raw sewage that flows into the sewer plant, processing time for raw sewage, and speed by which the plant can discharge effluent.

The flow of raw sewage into the city plant varies greatly throughout the day and is directly relational to water usage patterns of residents and businesses. During a typical day the plant will receive between 2.0 million to 2.2 million gallons of inflow. The inflows are highly variable and range from a low flow of approximately 200 gallons per minute to a high flow of approximately 4,200 gallons per minute. The lowest period of inflow occurs late at night through early in the morning and the highest period of inflow occurs mid-day through early morning. Extreme weather conditions will also impact the inflow of sewer into the plant. For example, inflows are lower during periods of sustained drought and higher during major rain events.

Outflow of effluent from the plant also varies greatly through the day and is directly relational to the amount of raw sewage that comes into the plant. During a typical day the plant will release between 2.0 million to 2.2 million gallons of effluent. Effluent is typically discharged at a low rate of approximately 450 gallons per minute and a high rate of approximately 2,200 gallons per minute. Inflows into the plant are moderated through an on-site flow equalization basin because of the minimum flow required to keep the plant functional and the maximum treatment capacity of the plant. As a result of flow equalization, the discharge of effluent differs from the inflow of raw sewage.

The final sewage treatment step is chlorine disinfection. This step occurs in a contact chamber where treated wastewater is blended with chlorine as it leaves the plant to either be discharged into Third Creek or sent to reuse water customers. The contact chamber has a maximum capacity of 82,000 gallons and serves as the reservoir used to supply the city's reuse water customers. The 82,000 gallons of storage is the sole storage facility to supply maximum peak demands approaching 2 million gallons per day.

There are four pumps at the contact chamber with a total maximum pumping capacity of 2,400 gallons per minute that send reuse water to the city's customers. The maximum capacity of these pumps typically exceeds the flow of effluent discharged from the plant. There are times during the hottest, driest parts of the year where all of the pumps are running and, as a result, the 82,000 gallon reserve in the contact chambers is emptied and the pumps must shut off until the chamber can be refilled. This cycle reduces the overall efficiency of the reuse delivery system and limits the ability to meet both current and future customer demand for the reuse water product.

As stated, on a typical day there is 2.2 million gallons of effluent generated. Approximately 200,000 gallons is required for plant operations leaving 2.0 million for delivery to reuse customers. All pumps must run simultaneously to deliver the maximum amount of volume to the customers. With all the pumps running, the contact chamber's reserve is emptied within 35 to 40 minutes; however, the inflow coming into the contact chamber extends the timeline by which the contact chamber may supply reuse water. The maximum capability of the existing system allows for 15 hours of reuse water pumping in a typical high-demand 24-hour period. The remaining 9 hours of the day are used to refill the contact chamber (5.5 hours) and for plant operations (3.5 hours). Reuse water distribution must be suspended for 3.5 to 4.0 hours per day for plant operations. Consequently, the maximum daily amount of reuse water that can be sold is approximately 1.8 million gallons or approximately 82 percent of the total effluent discharged, given the current limitations of the existing storage and distribution system.

Reuse Water Demand:

In a typical year it is estimated that a total of 803 million gallons of effluent is discharged. In peak years, only about half of the annual effluent discharged is sold to reuse customers. This is because the effluent is distributed primarily for irrigation uses at the Comanche Trace Golf Course, Scott Schreiner Golf Course, and Tivy High School athletic fields. There are peak days in June, July, August, and September each year where the reuse distribution system is at or near it peak daily capacity. However, there are many days through the other 8 months of the year where a small amount of reuse water is demanded. The lowest demand for reuse water occurs during the months of December, January, and February.

Conservatively it is estimated that there are 360 million gallons of unused effluent each year that is released into Third Creek and lost to the city. Unused effluent exits the contact chambers and is released into Third Creek. Once it enters the creek it is lost to the city. Conversely, effluent belongs to the city prior to its release into the creek.

Functionality of the Project:

The key goals of the project are to:

1. Capture a significant volume of unused effluent,
2. Increase delivery capacity to meet existing demand more efficiently, and
3. Provide the opportunity to diversify the city's source of raw water.

The pond is a balancing reservoir that will catch a significant amount of effluent that is not used during periods of low demand. By creating a reservoir, a steady supply of water will be established which is necessary in order to meet increased demands for non-potable use and for direct potable reuse (the process of treating effluent to drinking water quality).

As discussed earlier in this report, the delivery capacity of the existing reuse system is maxed out on peak demand days. In addition, the flow of effluent is highly variable. A consistent, dependable supply of effluent is necessary in order to better manage the delivery of reuse water to existing customers, meet the needs of new customers, and feed a water plant to treat the effluent to drinking water standards.

Existing reuse water delivery pumps often run for days to meet current peak demand periods due to the fact that the pumping capacity exceeds the rate by which effluent is discharged by the plant. Upsizing the delivery pumps without increasing the reservoir capacity of 82,000 gallons will magnify the existing inefficiencies of the distribution system. This will simply drain the current supply faster thereby increasing the frequency of refills, reducing pump run times, and further decreasing distribution pump efficiency. With the construction of this project, the city plans to add additional reuse customers, which will increase the peak daily demand to approximately 3.2 million gallons per day. This peak demand exceeds the typical daily outflow of effluent by 1.0 million gallons. This increased demand may be met by setting up regular pumping schedules, upsizing the existing pumps to deliver water within a single day, and providing an adequate and consistently reliable supply of effluent for delivery.

Additionally, a water treatment plant for direct potable reuse requires a steady, consistent supply of water year round. A reservoir is mandatory to ensure a continuous supply of reuse water to the plant and must be built should the city plan to convert effluent to a source for potable water. This reservoir may be accomplished either through the construction of this pond system or through another storage system built at a future date.

Conclusion:

Effluent is a consistent, steady source of water that is fully owned and controlled by the city until it is released into Third Creek. The primary purpose of this project is to harness that resource and use it to help increase the sustainability of the community. Sustainability is increased by ensuring the continued viability of the city's core economic assets and diversifying and stabilizing the city's source of water. By constructing this project the city is efficiently harnessing this resource and achieving the stated objectives.

The capacity of the existing reuse water system is frequently maxed out during peak demand periods occurring primarily in the months of June, July, August, and September yet there are low demand periods occurring in the months of December, January, and February where a large portion of the effluent is lost. By constructing this reuse project the city will address significant system deficiencies that limit the ability to meet the demand for reuse water for non-potable uses and also to use this resource to supplement the city's supply of drinking water.

EXHIBITS

1. Project Background and Published Articles
2. Effluent Discharge Chart for September 30, 2016 and Pump Run Chart for August 6, 2016
3. Reuse Water Data – FY2011 and FY2016
4. Texas Historical Commission Documents
5. TCEQ Documents Regarding Dam Safety
6. TCEQ Documents Regarding Design and Environmental