# MEMORANDUM

DATE: 7/7/2022

TO: Doug Gossett, Civil Engineer II, Town of Johnstown

CC: Ellen Hilbig, Utilities Director, Town of Johnstown

FROM: Steve James, J-U-B Engineers

SUBJECT: West Tank Cost Allocation

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Date: 2022.07.08 09:44:38 -06'00'

## Overview

The Town of Johnstown is experiencing significant interest in development in its West pressure zone. This is the area of highest elevation in the Town and an area that is not served by a storage tank. As a result, all demands including peak hour and fire flow must be met via the West Booster Pump Station located at the water treatment plant.

This creates a significant demand on this pump station. These peak demands also can exceed the water treatment plant capacity, drawing down the water treatment plant finished water tanks and reducing chlorine contact time which can cause the Town to violate surface water treatment rules. To meet peak instantaneous and fire demands, the Town intends to construct an elevated storage tank with connective piping in the West Zone and have asked J-U-B Engineers for a cost opinion for the tank and an estimated per user rate.

## Service Population Projections

The 2021 Johnstown Area Comprehensive Plan (2021) was examined as a basis for population projections. Using the projected residential densities and the associated acreage for the West Zone, the fully developed number of dwelling units could ultimately be as large as 24,600. This buildout density assumes that all available land can be developed and does not differentiate between single family and multifamily. Since this zone includes a number of areas that are not easily buildable, we compared this projected density to the density used in the Town's recent sewer master plan. Overlaying the projected sewer dwelling units on the West Zone Boundary and estimating a total of 350 single family equivalents (SFE) per quarter section (160 acres) for

areas outside of the sewer plan, yields a total of 13,290 SFE served by the West Zone (see attached **Figure 1**). This appears to be a more reasonable estimate of ultimate build-out.

## Tank Sizing/Height

The proposed tank size based on historical master planning (J-U-B, 2016) is 2 million gallons (MG). This volume was compared against the required storage for service to the West zone as presented in the following table:

| Storage Component | Volume Required (gallons) | Comment |
|---|---|---|
| **Fire Flow** | 630,000 | 3 hrs at 3500 GPM |
| **Equalization** | 1,300,000 | Assumes AWWA diurnal and supply = 1.25 MDD |
| **Emergency** | 0 | Nested with Fire |
| **Total** | **2,000,000** | |

Although the West tank can be used in other zones, this analysis shows that the full 2 MG of storage is needed for the West zone.

The height of the tank is expected to be 140 feet to provide a minimum of 50 psi to the highest elevation areas of the zone.

## Connective Piping

The West tank location is anticipated to be at the East boundary of the Town so approximately 1,750 feet of 24" pipe is budgeted to connect to the existing pipe network. The existing distribution piping to the West of I-25 consists of 8", 10", and 12" lines so additional looping and/or pipe replacement will be required to meet future peak demands. This is assumed to be included in future development so is not budgeted here.

This zone will also require an additional pipe crossing of I-25. Currently, the Western side of I-25 is served by an existing 20" and a new 12" pipe crossing. The 20" line provides adequate capacity for peak demands plus fire in the West Zone but the 12" line does not. A parallel 16" pipe crossing of I-25 is included to provide full reliability to the existing 20" crossing. It should be noted that only the tunnelling across I-25 is included in these costs and any connective piping is assumed to be completed by adjacent developments.

## Cost Allocation

The projected cost of the new tank, tank piping, and 16" pipe loop under I-25 is $12,900,000 (see appendix A) including a 20% contingency. Allocating this cost over the projected 13,290 SFE yields $970 per SFE in the West Zone.

Commercial and industrial demands can be converted to SFE by dividing projected demand by average single family residential water usage. The 2016 Water System Master Plan identified average per capita daily demand as 130 gpd. Multiplying this per capita usage by the average household size of 2.96 people yields 385 gpd/SFE. An example calculation based on 1 acre-foot (AF) of domestic and 1 AF of irrigation is presented below:

Domestic SFE Calculation

$$SFE_{domestic} = \frac{Annual\ domestic\ water\ demand\ (AF) * 43{,}560 * 7.48}{365\frac{days}{yr} * 385\ \frac{gal/day}{SFE}}$$

*Example calculation for 1 AF domestic demand:*

$$SFE_{domestic} = \frac{1\ AF * 43{,}560 * 7.48}{365\frac{days}{yr} * 385\ \frac{gal/day}{SFE}} = 2.3\ SFE$$

Irrigation SFE Calculation

$$SFE_{irrigation} = \frac{Annual\ Irrigation\ Demand\ (AF) * 43{,}560 * 7.48}{irrigation\ season\ \frac{days}{yr} * 385\ \frac{gal/day}{SFE}}$$

*Example calculation for 1 AF irrigation – April 15 through October 15 (183 days):*

$$SFE_{domestic} = \frac{1\ AF * 43{,}560 * 7.48}{183\frac{days}{yr} * 385\ \frac{gal/day}{SFE}} = 4.6\ SFE$$

Total SFE Calculation

$$SFE_{total} = SFE_{domestic} + SFE_{irrigation}$$

*Example calculation for 1 AF domestic + 1 AF irrigation :*

$$SFE_{total} = 2.3\ SFE + 4.6\ SFE = 6.9\ SFE - rounded\ up\ to\ nearest\ full\ SFE = \mathbf{7\ SFE}$$

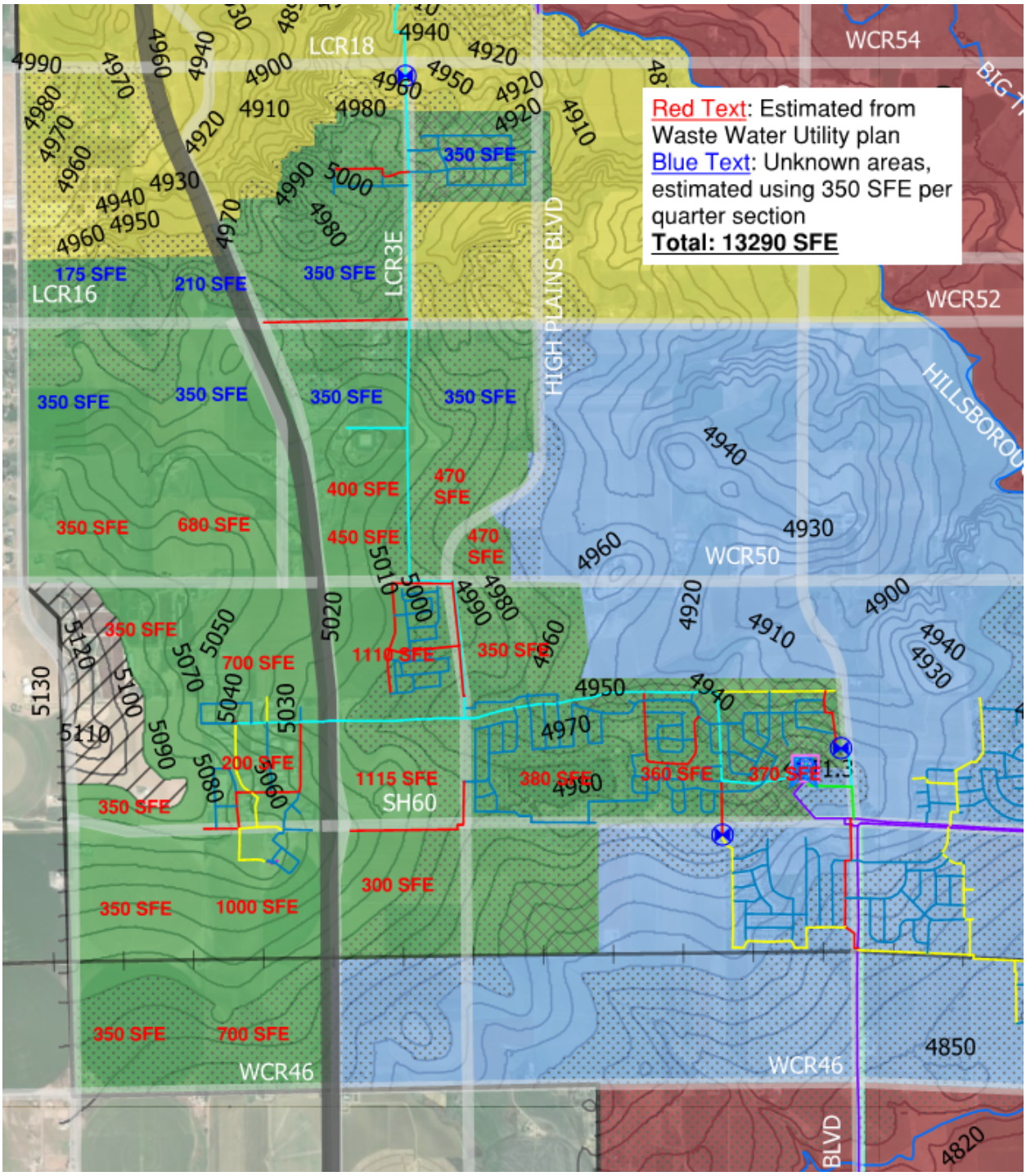


*Figure 1 – West Zone Buildout Density*

*Figure 1 revised 2/21/2024 to reflect updated pressure zone boundaries. Projected SFE count was not changed.

# Appendix A

Engineers Opinion of Probable Construction Cost

| ENGINEER'S OPINION OF PROBABLE COST | | | | | |
|---|---|---|---|---|---|
| **PROJECT:** | | | | **DATE:** | |
| | Town of Johnstown | | | | 7/7/2022 |
| **PROJECT DESCRIPTION:** | | | | | |
| | West Tank and Waterline Budget Cost | | | | |
| **CLIENT:** | | | | | |
| | Town of Johnstown | | | | |
| **ITEM** | | **SCHEDULE OF VALUES** | | | |
| **NO.** | **DESCRIPTION** | **QNTY** | **UNIT** | **UNIT PRICE** | **TOTAL COST** |
| | | | | | |
| | **Tank** | | | | |
| | Tank Construction | 2 | MG | $2,831,346 | $5,663,000 |
| | 24" Piping | 1,750 | LF | $350 | $613,000 |
| | Telemetry/electrical | 1 | LS | $25,000 | $25,000 |
| | Overflow Handling | 1 | LS | $100,000 | $100,000 |
| | **I-25 Crossing (water line looping)** | | | | |
| | I-25 Bore with 24" Casing pipe | 250 | LF | $1,200 | $300,000 |
| | 16" Piping | 2,000 | LF | $205 | $409,000 |
| | 16" valves | 6 | EA | $9,315 | $56,000 |
| | Fire Hydrant | 5 | EA | $12,075 | $60,000 |
| | Asphalt surface repair | 2,000 | LF | $125 | $250,000 |
| | | | | | |
| | **SUBTOTAL** | | | **$7,476,000** | |
| | | | | | |
| | Additional Elements (estimated % of above) | | | | |
| | Contractor mobilization and administration | | | 10.0% | $748,000 |
| | Bonding | | | 2.5% | $187,000 |
| | Contractor overhead and profit | | | 10.0% | $748,000 |
| | | | | | $0 |
| | | | | | |
| | **SUBTOTAL** | | | **$1,683,000** | |
| | | | | | |
| | | | | **SUBTOTAL** | $ 9,159,000 |
| | | | | *Contingency @ 20.0%* | $ 1,832,000 |
| | | | | *AIS/D-B Compliance @ 0.0%* | $ - |
| | | | | *Engineering Services @ 15.0%* | $ 1,649,000 |
| | | | | *Legal and Administrative @ 0.0%* | $ - |
| | | | | *Special Inspections @ 2.0%* | $ 220,000 |
| | | | | **TOTAL PROBABLE COST (2022 DOLLARS)** | **$12,860,000** |

J-U-B ENGINEERS, INC.