



# MEMORANDUM

DATE: December 7, 2023  
TO: Harrison Littledike  
CanyonStone Capital, Inc.

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SUBJECT: Santaquin East Bench - Water Master Plan Amendment  
PROJECT NO.: 344.295.100

**DRAFT**

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## INTRODUCTION

CanyonStone Capital, Inc. (CanyonStone) is working to propose a master planned development concept on the eastern bench of Santaquin City. The development concept is for an area which encompasses parcels east of Santaquin City that are within the Santaquin City Annexation Policy Plan Boundary.

## SUMMARY OF KEY FINDINGS

Key findings from the analysis are listed below. Details are included in the body of the memo.

- There does not appear to be excess source capacity in the Santaquin drinking water system when considering source redundancy. A new well is recommended to increase source capacity.
- Several master planned facilities must be constructed within the portion of the study area within Zone 12E, including drinking and pressurized irrigation (PI) water pipelines and a PI pump station.
- Fire flow capacity in Zone 12E is limited. Pipeline projects will be needed to provide fire flow capacity. The extent of the projects depends on whether the fire authority requires a capacity of 1,000 gpm or 1,500 gpm.
- Zone 13E will require a 2000 gpm pump station, pipelines, and a 1.5 MG tank.
- Zone 14E will require an 800 gpm pump station, pipelines, and a 1 MG tank.
- An upgrade in pumping capacity from Zone 10 to Zone 11E will be needed to facilitate delivery of water to Zones 13E and 14E.

## BACKGROUND

The Santaquin City Drinking and Pressurized Irrigation Water Master Plans were last updated in 2020, and finalized early in 2021. Following the update to the water master plans, the general plan was updated and planned future land uses were modified in some areas. Further analysis is needed to confirm that infrastructure will be adequate to provide service to future developments under newly planned land uses.

## **PRESSURE ZONES**

Approximate boundaries of existing and future pressure zones were defined as part of the City's 2021 drinking water and pressurized irrigation (PI) system master plans. Figure 1-3 in the drinking water master plan shows existing and planned future pressure zones. It is included for reference in Appendix A.

There is presently no drinking or PI water infrastructure available to serve Zones 13E and 14E. The PI system presently serves as high as Zone 11E and is planned to serve Zone 12E in the future. It was determined during the master planning effort that a separate pressurized irrigation (PI) system would not be constructed in Zones 13E and 14E.

## **STUDY AREA**

The study area for this evaluation consists of about 550 acres and includes parcels as specified by CanyonStone. Some of these parcels will be part of an upcoming annexation application. Others are anticipated to be annexed in the future, but are included in this analysis to provide a proper big-picture understanding of the water infrastructure needed to serve the wider area.

The study area boundary contains areas planned to be served in pressure Zones 11E, 12E, 13E, and 14E. See Figure 1.

## **DEVELOPMENT SCENARIO**

CanyonStone has proposed to construct development consistent with the latest City general plan. To evaluate development under this scenario, the following parameters were used:

- For areas in the general plan characterized as "New Neighborhood with Open Space," an average development density of 7.5 units per acre was used for analysis.
- For areas in the general plan characterized as "Hillside Protection/Large Lot," an average development density of 3 units per acre was used for analysis.
- Irrigable acreage was assumed to comprise 45% of buildable acreage within the study area. This value is consistent with other suburban development in Santaquin and accounts for irrigable acreage on private land as well as in parks, open space, and schools.

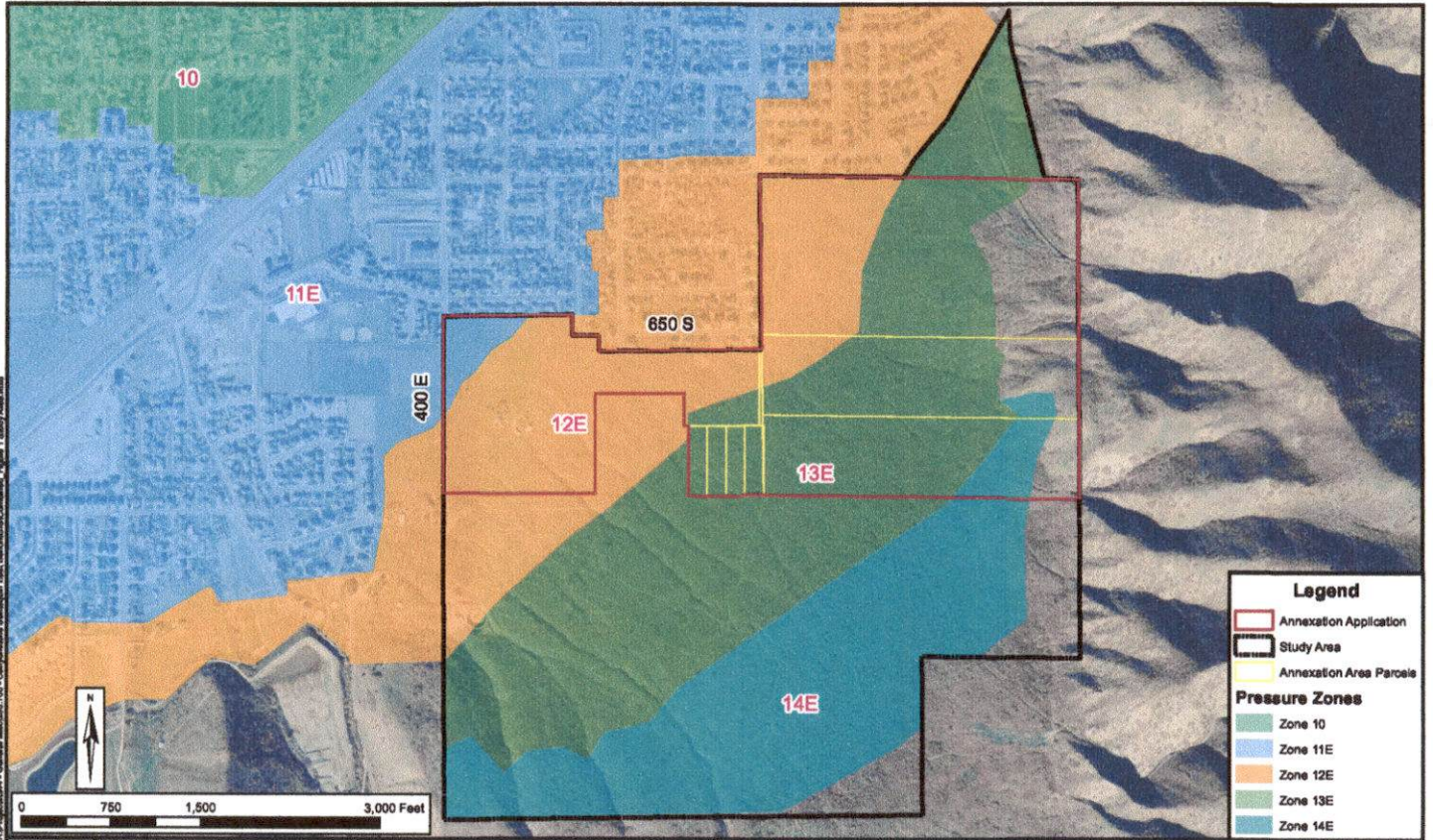
Figure 2 shows the land use classification of the parcels within the study area.

The proposed development density differs from what was assumed in the most recent update of the Santaquin City Drinking and Pressurized Irrigation Water Master Plans (which was completed prior to the recent general plan update). As such, an amendment to the master plan is necessary to identify the infrastructure needed to serve the study area at the development density proposed.

Figures from the master plans that show assumed density of ERCs and percentage of land irrigated are included for reference in Appendix A.

## **ASSUMPTIONS**

The following assumptions were made for this analysis:



**Legend**

- Annexation Application
- Study Area
- Annexation Area Parcels

**Pressure Zones**

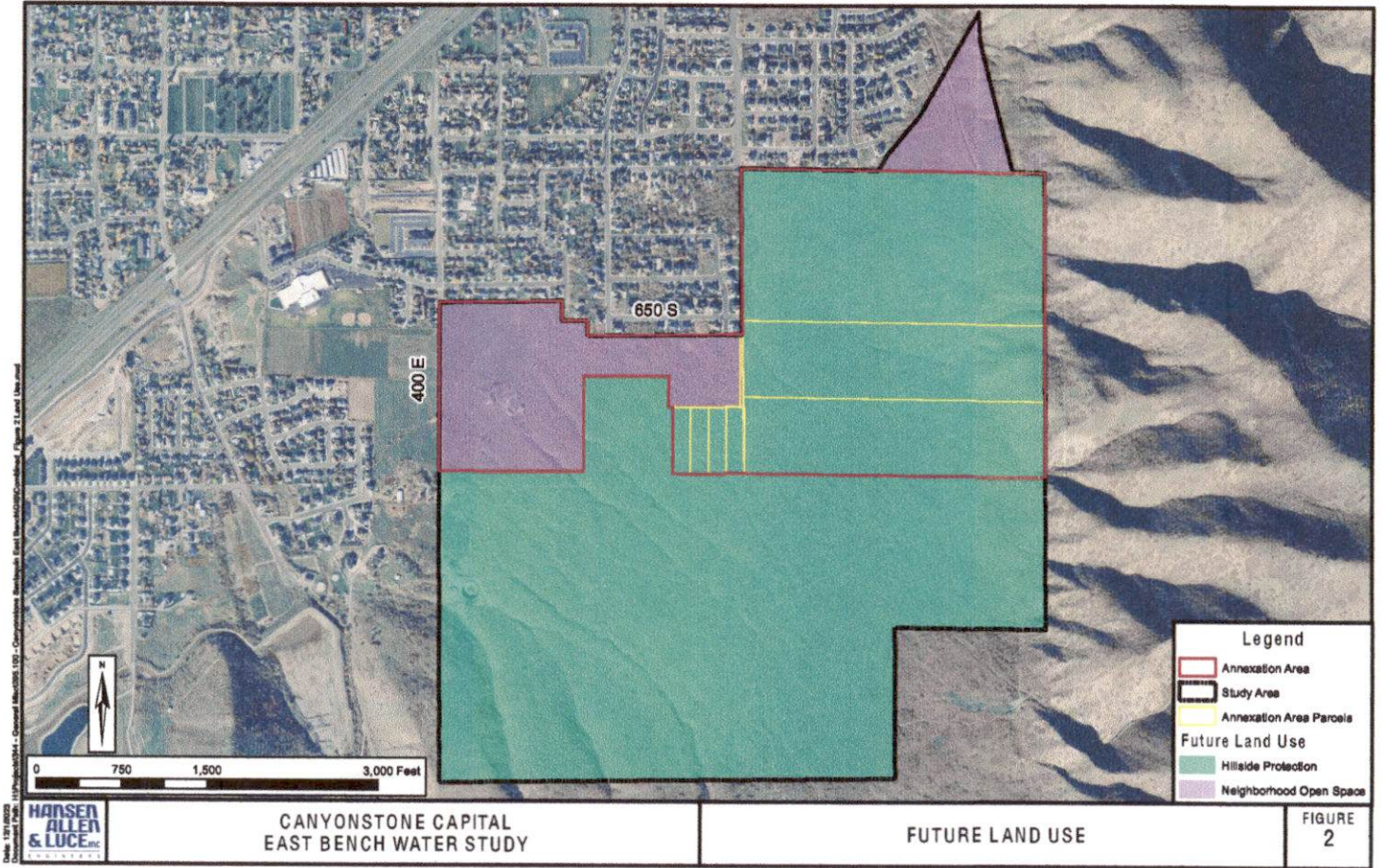
- Zone 10
- Zone 11E
- Zone 12E
- Zone 13E
- Zone 14E



**CANYONSTONE CAPITAL  
EAST BENCH WATER STUDY**

**ANNEXATION AND STUDY AREAS**

**FIGURE  
1**



1. To provide water rights capacity for the development area, land developers will find and dedicate water rights to Santaquin City as specified in Santaquin City Code 8.04.100.
2. The local fire authority will specify a maximum fire flow requirement of 1,500 gpm for 2 hours.
3. The development will be a standard suburban development with land uses and water uses typical of other suburban development in Santaquin.
4. This is a planning-level analysis that will be updated and refined as the development concept for the area is developed.

**DESIGN PARAMETERS**

The proposed future system was designed using the parameters in Table 1. They are consistent with the level of service standards for Santaquin City, which were evaluated as part of the City’s master plans. Indoor water demands are computed based on equivalent residential connections (ERCs). Outdoor water demands are computed based on irrigated acreage.

**Table 1: Design Parameters**

Parameter	Drinking Water	Pressurized Irrigation
Minimum System Pressure	40 psi	40 psi
Maximum System Pressure	120 psi	120 psi
Maximum Daily Pressure Variation	20 psi	20 psi
Peak Day Demand	500 gpd per ERC <sup>1</sup>	8.0 gpm per irrigated acre
Peak Instantaneous Demand	0.69 gpm per ERC	16.8 gpm per irrigated acre
Average Yearly Demand	0.336 ac-ft per ERC	4.0 acre-feet per irrigated acre
Equalization Storage Requirement	360 gal per ERC	9,200 gal per irrigated acre
Fire flow requirement	1,500 gpm for 2 hours	N/A

1. The Santaquin City level of service requires that the indoor demand must be able to be met with the largest-producing drinking water source out of production.

**SOURCE REQUIREMENTS**

Water demands were forecasted based on the development projections and the level of service standards in Table 1.

**Indoor Water**

Indoor water demands for the annexation application area and the study area were projected as shown in Table 2.

**Table 2: Indoor Water Requirements**

Pressure Zone	Annexation Application Area			Study Area Total		
	ERCs	Peak Day Source (gpm)	Average Yearly Source (ac-ft)	ERCs	Peak Day Source (gpm)	Average Yearly Source (ac-ft)
11E	47	16.3	15.8	47	16.3	15.8
12E	461	160.1	154.9	565	196.2	189.8
13E	304	105.6	102.1	776	269.4	260.7
14E	26	9.0	8.7	405	140.6	136.1
<b>Totals</b>	<b>838</b>	<b>291.0</b>	<b>281.6</b>	<b>1,793</b>	<b>622.6</b>	<b>602.4</b>

**Irrigation Water**

Pressurized irrigation water demands for the annexation application area and the study area were projected as shown in Table 3.

**Table 3: Outdoor Water Requirements**

Pressure Zone	Annexation Application Area			Study Area Total		
	Irrigated Acreage	Peak Day Source (gpm)	Average Yearly Source (ac-ft)	Irrigated Acreage	Peak Day Source (gpm)	Average Yearly Source (ac-ft)
11E	2.8	22.4	11.2	2.8	22.4	11.2
12E	36.6	292.8	146.4	52.2	417.6	208.8
13E	43.5	348.0	174.0	102.6	820.8	410.4
14E	3.8	30.4	15.2	60.8	486.4	243.2
<b>Totals</b>	<b>86.7</b>	<b>693.6</b>	<b>346.8</b>	<b>218.4</b>	<b>1747.2</b>	<b>873.6</b>

**Water Rights**

Santaquin City Code 8.04.100 requires either dedication of water rights or payment of money in lieu of water rights in order to serve development. Because land in the study area is historically non-irrigated, the code specifies that the requirement is to be satisfied with payment in lieu of water rights.

Table 4 includes a summary of water rights requirements for the annexation application area and the study area.

**Table 4: Water Rights Requirement**

<b>Area</b>	<b>Area (ac)</b>	<b>Water Rights Requirement (ac-ft/Irr-ac)</b>	<b>Water Rights Requirement (ac-ft)</b>
Annexation Application Area	227	3	681
Remaining Study Area	317	3	951
<b>Totals</b>	<b>544</b>	<b>-</b>	<b>1,632</b>

The water rights requirement calculated in Table 4 is about 10% greater than the sum of the requirements calculated in Tables 2 and 3, chiefly because of the presence of unbuildable slopes within the study area.

### **Water Conservation**

It is recommended that water conservation strategies be considered in the development of the land use concept for the area. It may be possible to reduce water requirements by preserving natural open space, xeriscaping, or employing other water conservation strategies.

### **STORAGE REQUIREMENTS**

There is presently no storage facility in the Santaquin City drinking water system capable of providing service to the areas of the study area within Zones 13E or 14E. Storage capacity must be sufficient for equalization, emergency, and fire suppression purposes.

#### **Fire Suppression Storage**

The Santaquin City Fire Chief has recommended a minimum available fire flow requirement of 1,500 gpm for 2 hours (180,000 gallons) for every residential area in Santaquin City. Fire storage exists in Zones 11E and 12E and will be necessary in Zones 13E and 14E.

#### **Equalization and Emergency Storage**

The level of service for Santaquin City includes 360 gal/ERC to provide storage for equalization (i.e. water held in reserve to meet peaks in demand) and emergency purposes.

#### **Storage Requirements**

A summary of the total storage requirement for the study area is shown in Table 5.

**Table 5: Storage Requirements within Study Area**

Pressure Zone	ERCs	Irrigated Acreage	Indoor Equalization Storage (gal)	Outdoor Equalization Storage (gal)	Fire Storage (gal) <sup>1</sup>	Storage Requirement (gal)
11E	47	2.8	16,920	25,760	0	42,680
12E	565	52.2	203,400	480,240	0	683,640
13E	776	102.6	279,360	943,920	180,000	1,403,280
14E	405	60.8	145,800	559,360	180,000	885,160
<b>Totals</b>	<b>1793</b>	<b>218.4</b>	<b>645,480</b>	<b>2,009,280</b>	<b>360,000</b>	<b>3,014,760</b>

1. Fire storage currently exists in Zones 11E and 12E; therefore, no additional requirement is listed in this table.

Conclusions regarding storage capacity are as follows:

- The future Zone 13E tank requires a capacity of approximately 1.5 MG.
- The future Zone 14E tank requires a capacity of approximately 1.0 MG.

#### COMPARISON TO MASTER PLAN PROJECTIONS

Growth projections in the drinking water system are expressed in terms of Equivalent Residential Connections (ERCs) for indoor use and irrigable acreage (Irr-ac) for outdoor use. One ERC is equivalent to the amount of water used by a typical single-family residence in Santaquin City. Water users that use more water than a typical residence would be assigned a water use value consisting of multiple ERCs.

Within the study area, ERCs were calculated for pressure zones 11E and 12E at the proposed density and compared to the amount of ERCs assumed in the City's most recent master plan update. See Table 6. Because the study area contains the entirety of Zones 13E and 14E, and because no infrastructure currently exists in these zones, a comparison for these zones is not listed.

**Table 6: Proposed and Master Plan Indoor Water Requirements within Annexation Application Area**

Pressure Zone	Acreage	Master Plan ERCs	Proposed ERCs	Change (ERCs)	Change in Source Requirement (gpm)	Change in Storage Requirement (gal)
11E	7	26	47	+21	+7.3	+7,560
12E	81	389	565	+176	+61.1	+63,360
<b>Totals</b>	<b>88</b>	<b>415</b>	<b>612</b>	<b>+197</b>	<b>+68.4</b>	<b>+70,920</b>

A comparison of projected irrigable acreage for the development concept and from the City's master plans in Zones 11E and 12E is shown in Table 7.



**Table 7: Proposed and Master Plan Outdoor  
Water Requirements within Annexation Application Area**

<b>Pressure Zone</b>	<b>Master Plan Irr-Ac</b>	<b>Proposed Irr-Ac</b>	<b>Change (Irr-ac)</b>	<b>Change in Source Requirement (gpm)</b>	<b>Change in Storage Requirement (gal)</b>
11E	3	3	0	0	0
12E	54	37	-17	-136	-156,400
<b>Totals</b>	<b>57</b>	<b>40</b>	<b>-17</b>	<b>-136</b>	<b>-156,400</b>

A change to higher development density results in more ERCs and fewer irrigated acres.

### **REMAINING SYSTEM CAPACITY**

Remaining system capacity was estimated based on information in the master plan and rough projections of development that has occurred since that time. Details are included in Appendix B.

#### **Remaining Source Capacity**

Table 8 includes summary information about remaining source capacity in the system and by pressure zone.

**Table 8: Estimated Drinking Water System Source Capacity**

<b>Drinking Water Source Parameter</b>	<b>Remaining Capacity (gpm)</b>	<b>Annexation Application Area Requirement (gpm)<sup>1</sup></b>	<b>Study Area Requirement (gpm)<sup>1</sup></b>
System Source	1,541	669	1,930
System Source Considering Redundancy	-355	669	1,930
Zone 11E Pumping	723	16	16
Zone 12E Pumping	680	160	196

1. Includes indoor water only for Zones 11E and 12E and both indoor and outdoor water for Zones 13E and 14E.

The pumps serving Zones 11E and 12E have sufficient capacity to convey water to the study area. Source capacity is adequate with all sources operating. However, a deficiency would exist if the City's largest source were to fall on a peak day.

Remaining capacity in the PI system is characterized in Table 9.

**Table 9: Estimated PI Water System Source Capacity**

PI Water Source Parameter	Remaining Capacity (gpm)	Study Area Requirement (gpm)
Zone 11E Pumping	1,180	22

Pumping capacity in Zone 11E is adequate for the study area. It is assumed that the City has acquired additional Irrigation water shares from developers to maintain capacity within the system.

**Remaining Storage Capacity**

Remaining capacity in drinking water system storage facilities is characterized in Table 10.

**Table 10: Estimated Drinking Water Storage Capacity**

Storage Parameter	Remaining Capacity (gal) <sup>1</sup>	Study Area Requirement (gal) <sup>2</sup>
Zone 11E Storage	680,000	16,920
Zone 12E Storage	500,000	203,400
Zone 13E Storage	0	1,403,280
Zone 14E Storage	0	885,160
<b>Total Storage</b>	<b>750,000</b>	<b>2,508,760</b>

1. Storage held in higher zones can be utilized in lower zones. Up to 500,000 gallons of that could be used in Zone 12E, or up to 680,000 in Zone 11E, but not more than 750,000 gallons in total.
2. Zones 11E and 12E include indoor equalization storage requirements only. Zones 13E and 14E include indoor and outdoor equalization requirements and fire flow requirements.

Storage facilities are needed to serve Zones 13E and 14E. Existing storage capacity remains in Zones 11E and 12E.

Remaining capacity in PI water system storage facilities is characterized in Table 11.

**Table 11: Estimated PI Water Storage Capacity**

Storage Parameter	Remaining Capacity (gal)	Study Area Requirement (gal) <sup>1</sup>
Zone 11E Storage	1,740,044	25,760
Zone 12E Storage	0	480,240
<b>Total Storage</b>	<b>1,740,044</b>	<b>506,000</b>

1. A pump station will utilize storage in the Zone 11E tank to serve Zone 12.

The PI system presently has capacity remaining.

## **Remaining Distribution and Fire Flow Capacity**

Distribution facilities are sized to maintain the level of service pressure requirements as listed in Table 1.

Fire flow capacity in Zone 12E is limited. Areas south of 650 S in Zone 12E presently do not have capacity to deliver a fire flow of 1,000 gpm. Constructing a looped connection north of 650 S would increase fire flow capacity in the Zone 12E portions of the study area to 1,000 gpm (assuming sufficient looping and connectivity are provided by the developer to all areas). Constructing a pipe to connect through to the Foothill Village booster station would provide a fire flow capacity of 1,500 gpm. See Figure 3.

## **HYDRAULIC MODELING**

Several hydraulic models were prepared to simulate system demands as they would be when the proposed development is built out. Demands were allocated to the model for each of the proposed areas in the development. Tanks and pumps were sized based on the proposed demands and infrastructure requirements as calculated in previous sections of this report. Pipes were also sized to ensure that pressure swings and pipe velocities were appropriate and that all level of service requirements were met.

Recommendations for future infrastructure are based on model output.

## **RECOMMENDED INFRASTRUCTURE**

Modifications and additions to master plan infrastructure are required to accommodate the changes in planned land use. This section includes a description of recommended major infrastructure, organized by pressure zone.

### **Offsite Infrastructure**

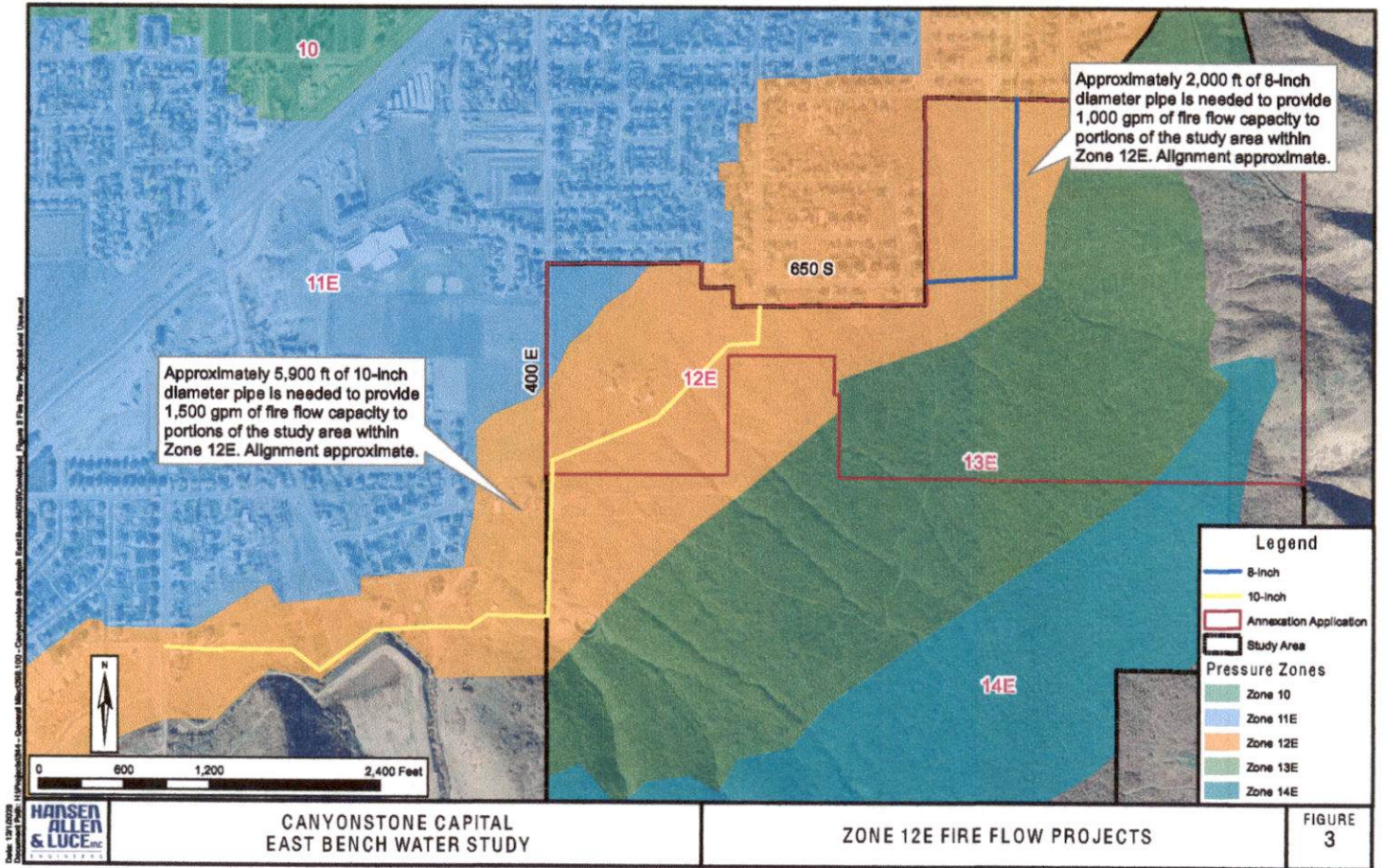
Based on information contained in the Santaquin City Drinking Water Master Plan, drilling a new well is the recommended approach to provide additional source and maintain redundancy in the drinking water system. It is anticipated that more source capacity will be needed soon. Further consultation with Santaquin City is necessary to more accurately define when a new well is necessary.

A previous hydrogeologic evaluation indicated that the east bench is not a promising site for a future well. Drilling a well elsewhere in Santaquin and boosting it to the study area is the recommended approach.

Drinking water master plan project 10 will eventually be required to provide additional conveyance to the Zone 10 Tank. Exact timing of these improvements depends on both development within the study area and elsewhere in the City.

### **Zone 11E**

The following infrastructure projects are recommended to increase capacity in Zone 11E enough to accommodate development in the study area:



- Upgrade the capacity of the Zone 10 to Zone 11E pump station. Projections indicate that the pump station will need a total capacity of at least 3,200; however, this number can be refined with more detailed study prior to design.
- Construct approximately 1,200 ft of 20-inch diameter pipe to provide conveyance between the Zone 10 and Zone 11E tanks.

### **Zone 12E**

Recommended master plan facilities within Zone 12E are as follows:

- The drinking water master plan calls for a 10-inch diameter drinking water pipe extending south and west from the intersection of 650 S and 690 E. See Figure 4. This project is listed as project 6 in the drinking water master plan.
- The PI water master plan calls for a future PI pump station to serve Zone 12E. Its planned location is near the western end of the study area. Several PI pipes in Zone 12E must also be upsized to meet master plan requirements. See Figure 5. This project is listed as project 9 in the PI water master plan.

### **Zone 13E**

Recommended master plan facilities within Zone 13E are as follows:

- A pump station from the Zone 11E tank with a capacity of 2,000 gpm
- A 1.5 MG tank
- A 16-inch diameter transmission line between the pump station and the tank
- A 10-inch diameter pipe to serve the north end of the zone.

### **Zone 14E**

Recommended master plan facilities within Zone 14E are as follows:

- A pump station from the Zone 13E tank with a capacity of 800 gpm
- A 1.0 MG tank
- 12-inch diameter transmission line between the pump station and the tank

### **Summary**

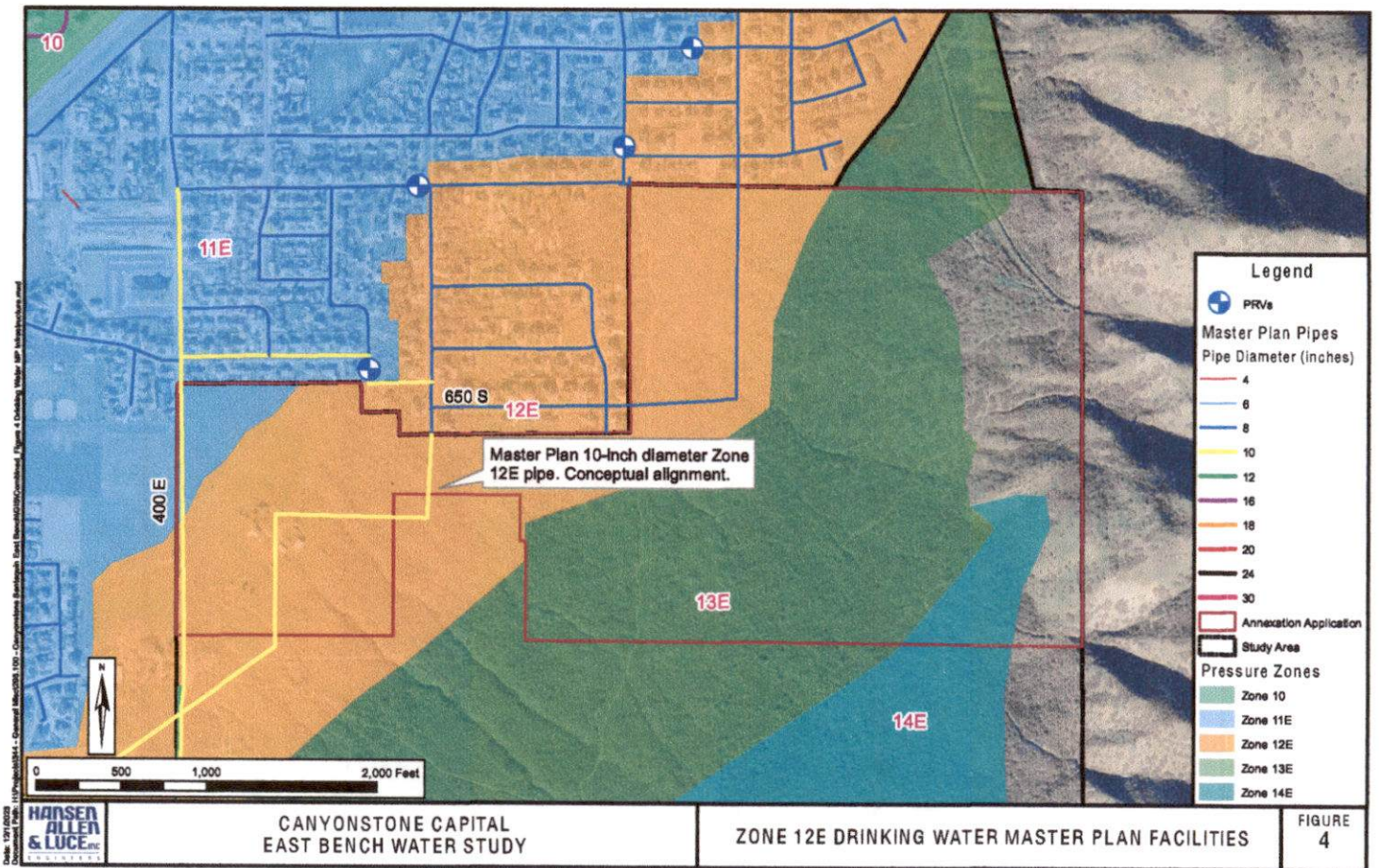
A summary of recommended off-site and Zones 13E and 14E infrastructure is shown on Figure 6.

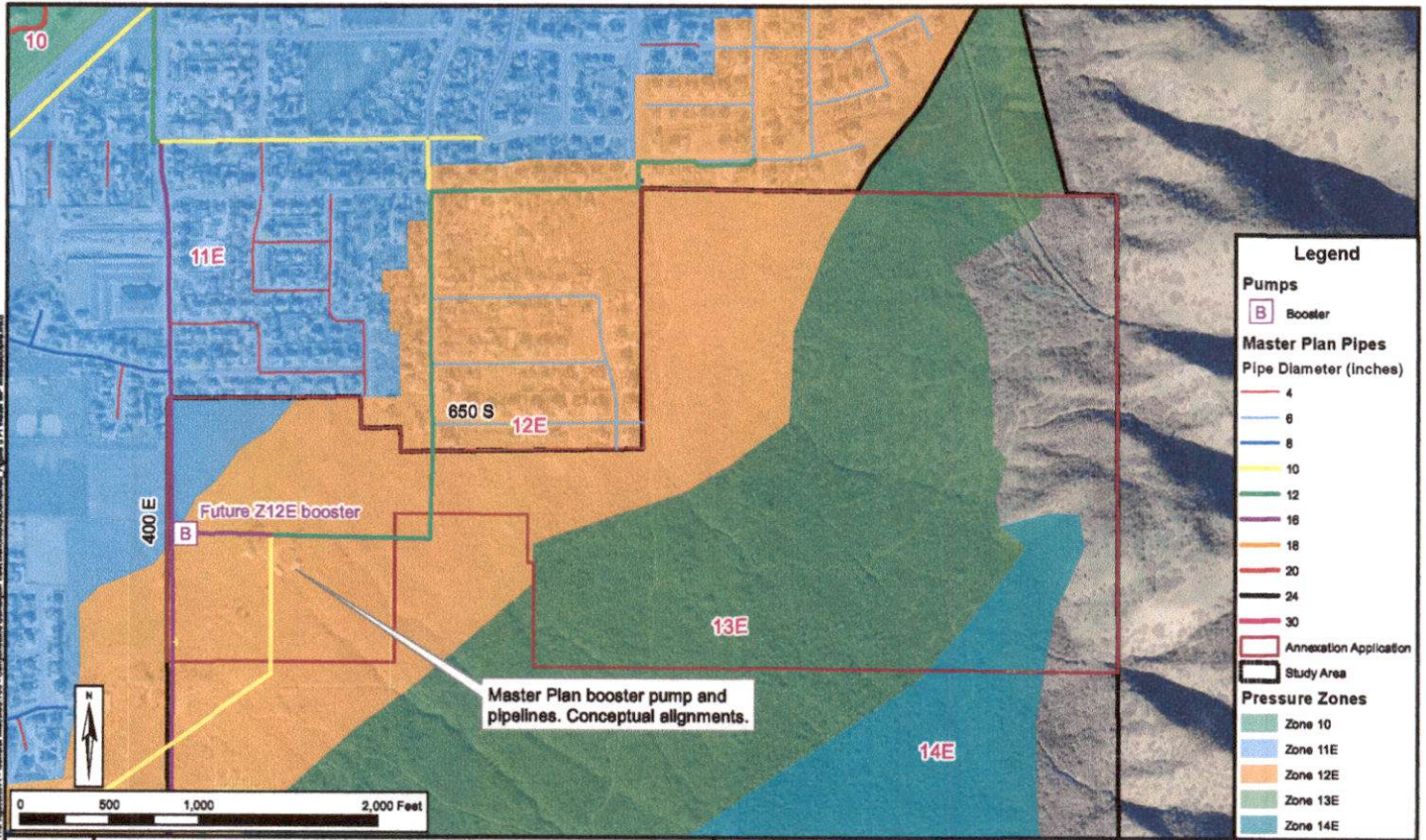
## **CONCLUSIONS AND RECOMMENDATIONS**

Recommendations to meet the system requirements outlined in the previous sections are discussed in this section.

### **System-Wide Considerations**

Conclusions and recommendations regarding capacity in the entire water and PI systems are as follows:



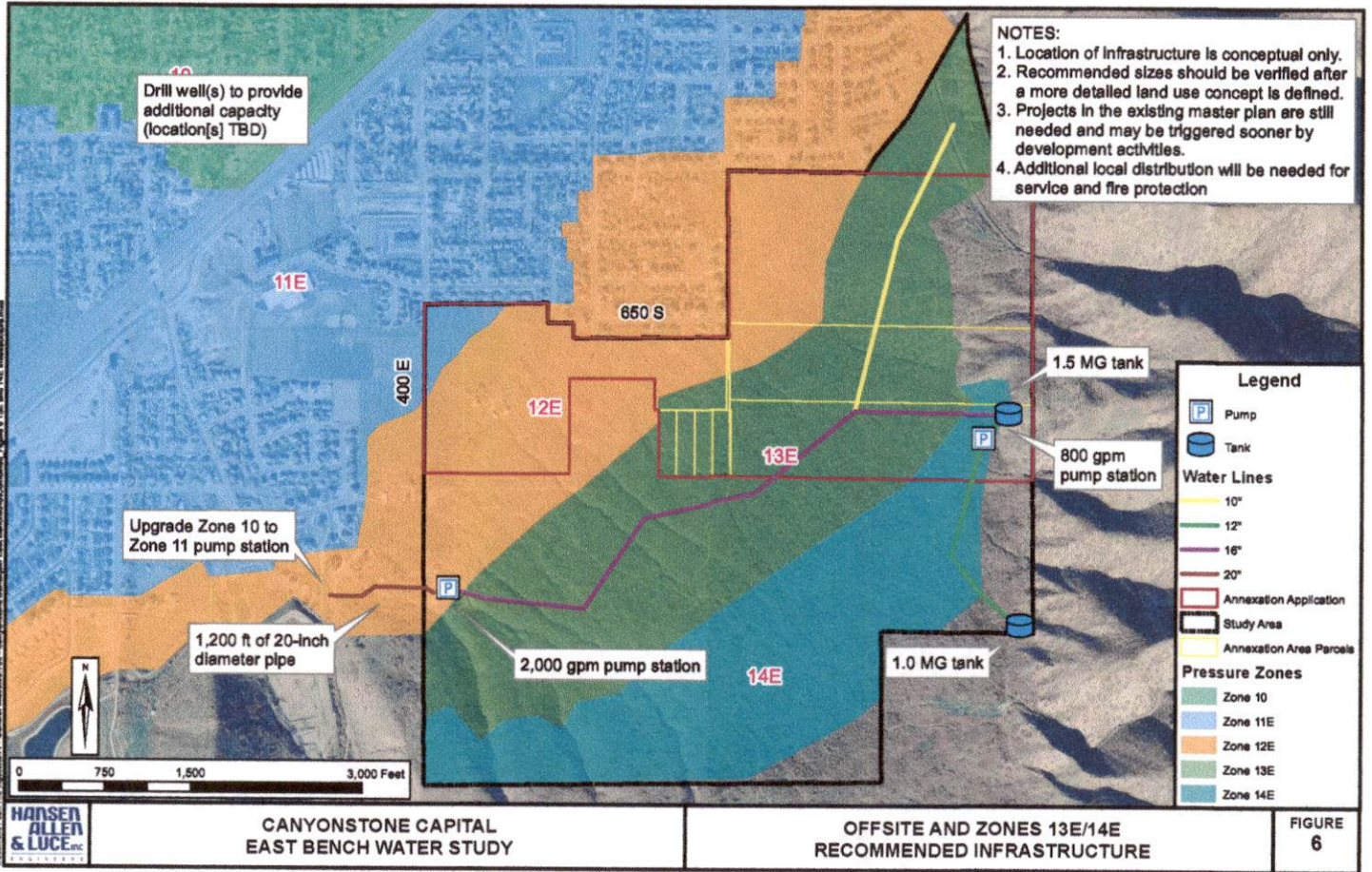


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Figure 5 of 10  
Hansen Allen & Luce, Inc.



CANYONSTONE CAPITAL  
EAST BENCH WATER STUDY

ZONE 12E PI WATER MASTER PLAN FACILITIES



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- Sufficient storage capacity exists in the drinking water system to serve areas within the study area and Zones 11E and 12E. Zones 13E and 14E will require new storage facilities.
- Sufficient storage capacity exists in the PI water system to serve areas within the study area and Zones 11E and 12E. Zones 13E and 14E are not planned to have separate PI service.
- Sufficient source capacity exists in the drinking water system, assuming all source facilities are operational.
- If the City's largest water source were to fail on the peak day, a deficit of approximately 355 gpm would be observed in the drinking water system under existing conditions.
- An additional well will be needed to provide source and redundancy to Santaquin City as it grows. A well within the study area is not expected to have a high yield; as such, an off-site well is recommended.

### **Pressure Zone 11E**

Conclusions and recommendations for Zone 11E are as follows:

- The portion of the study area in Zone 11E is quite small and changes as compared to the previous master plans are minor.
- The only modifications to the master plan in Zone 11E are related to conveying water through Zone 11E to higher zones. The portion of the study area within Zone 11E can be served as long as local water infrastructure is sized to provide appropriate conveyance and fire flow capacity.

### **Pressure Zone 12E**

Conclusions and recommendations for Zone 12E are as follows:

- Drinking water pipeline projects are needed to provide fire flow capacity to most areas of Zone 12E.
- Master planned pipelines for Zone 12E are needed within the study area for both the drinking water and PI water systems.
- Santaquin City should work to secure property for a future master planned pressurized irrigation pump station to serve Zone 12E. This pump station will be needed to maintain adequate storage capacity in the drinking water system.
- Sufficient capacity exists in the Zone 12E drinking water pump station to meet projected demands within the study area.

### **Pressure Zones 13E and 14E**

New infrastructure is needed in Zones 13E and 14E as recommended in this memo.

### **Source Recommendations**

Based on information contained in the Santaquin City Drinking Water Master Plan, drilling a new well is the recommended approach to provide additional source and maintain redundancy in the drinking water system.

Previous hydrogeologic evaluations have shown that the east bench is not a promising site for a future well. Drilling a well elsewhere in Santaquin and boosting water to the east bench is the recommended approach.