



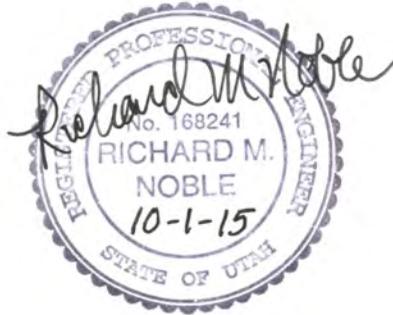
CITY OF WEST JORDAN

SECONDARY WATER MASTER PLAN UPDATE

(HAL Project No.: 089.20.100)

OCTOBER 2015

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Project Engineer



October 2015

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GLOSSARY OF TECHNICAL TERMS

Average Daily Flow: The average yearly demand volume expressed in a flow rate.

Average Yearly Demand: The volume of water used during an entire year.

Build-out: When the development density reaches maximum allowed by planned development.

Demand: Required water flow rate or volume.

Distribution System: The network of pipes, valves and appurtenances contained within a water system.

Drinking Water: Water of sufficient quality for human consumption. Also referred to as culinary or potable water.

Dynamic Pressure: The pressure exerted by water within the pipelines and other water system appurtenances when water is flowing through the system.

Equivalent Residential Connection: A measure used in comparing water demand from non-residential connections to residential connections.

Fire Flow Requirements: The rate of water delivery required to extinguish a particular fire. Usually it is given in rate of flow (gallons per minute) for a specific period of time (hours).

Head: A measure of the pressure in a distribution system that is exerted by the water. Head represents the height of the free water surface (or pressure reduction valve setting) above any point in the hydraulic system.

Headloss: The amount of pressure lost in a distribution system under dynamic conditions due to the wall roughness and other physical characteristics of pipes in the system.

Peak Day: The day(s) of the year in which a maximum amount of water is used in a 24-hour period.

Peak Day Demand: The average daily flow required to meet the needs imposed on a water system during the peak day(s) of the year.

Peak Instantaneous Demand: The flow required to meet the needs imposed on a water system during maximum flow on a peak day.

Pressure Reducing Valve (PRV): A valve used to reduce excessive pressure in a water distribution system.

Pressure Zone: The area within a distribution system in which water pressure is maintained within specified limits.

Service Area: Typically the area within the boundaries of the entity or entities that participate in the ownership, planning, design, construction, operation and maintenance of a water system.

Static Pressure: The pressure exerted by water within the pipelines and other water system appurtenances when water is not flowing through the system, i.e., during periods of little or no water use.

Storage Reservoir: A facility used to store, contain and protect drinking water until it is needed by the customers of a water system. Also referred to as a Storage Tank.

Transmission Pipeline: A pipeline that transfers water from a source to a reservoir or from a reservoir to a distribution system.

Water Conservation: Planned management of water to prevent waste.

ABBREVIATIONS

ac-ft	acre-feet
DDW	The State of Utah Division of Drinking Water
ERC	Equivalent Residential Connection
GIS	Geographic Information System
gpd	Gallons per Day
gpd/conn	Gallons per Day per Connection
gpm	Gallons per Minute
HAL	Hansen, Allen & Luce, Inc.
JVWCD	Jordan Valley Water Conservancy District
MG	Million Gallons
PRV	Pressure Reducing Valve
psi	Pounds per Square Inch
SCADA	Supervisory Control and Data Acquisition

CHAPTER I

INTRODUCTION

PURPOSE

This report is an update to previous secondary water master plans for the City of West Jordan (Hansen, Allen & Luce, Inc., 2001) (MWH, 2006). The purpose of this master plan update is to provide specific direction to West Jordan City for decisions that will be made both short-term as well as over the next 5 to 40 years implementation of a secondary water system within the City at the most reasonable cost. Recommendations are based on City land use data and existing secondary water infrastructure. Although secondary water systems are not regulated by the Utah Division of Drinking Water (DDW) per se, DDW standards for outdoor water requirements were used as the basis for determining demands.

SCOPE

This study evaluates the feasibility of implementing a secondary water system that would serve undeveloped, low-density areas, parks, and schools west of 5600 West; existing subdivisions west of 4800 West that have “dry” secondary water pipes installed; and existing parks and schools that are adjacent to dry pipe subdivisions. The study identifies potential water sources for the secondary water system, infrastructure needed (pipes, storage reservoirs, wells, and pump stations). Potential funding sources are also identified along with recommendations for rates structures and users rates that would be required to repay capital costs and to fund operation and maintenance of the system. Recommendations regarding water conservation measures to be implemented in conjunction with the secondary water system are also provided.

The conclusions and recommendations of this study are limited by the accuracy of the development projections and other assumptions used in preparing the study. It is expected that the City will review and update this master plan every 5-10 years or more frequently if indicated by a significant change in development.

BACKGROUND

West Jordan City is located in Salt Lake County, Utah and is bounded on the north by West Valley City and Taylorsville City and on the south by South Jordan City. West Jordan is bounded on the east by the Jordan River and stretches westward to the foothills of the Oquirrh Mountains. The general slope of the land in West Jordan is towards the Jordan River on the east side of the City. As of the 2010 census West Jordan was the fourth largest city in Utah with a population of 103,712. The eastern two-thirds of the City is mostly developed, with only scattered pockets of undeveloped land. The western third of the City is largely undeveloped and is the location where most of the future growth will occur.

The City of West Jordan has long considered developing a seasonal secondary water distribution system to support outdoor irrigation needs. This type of water delivery system would help relieve demand on the culinary water system and reduce the consumption of culinary quality water resources. The cost of new water resources to support the City is continually increasing and the availability of water resources is limited. Several studies have been completed in the past to evaluate the feasibility of a secondary water system, to date, West Jordan only operates a limited secondary water system to irrigate selected parks and open spaces. The City does not operate a secondary system to provide water to residential or commercial areas. The water resources to support such a system, as well as the major infrastructure features such as transmission pipelines, storage facilities and pumping facilities

have not been specifically defined or planned. The City now wants to look at the options for implementing and operating a secondary water system.

REPORT ORGANIZATION

This report is organized into six chapters and various appendices. The study findings and recommendations are summarized in chapters two through six. The appendices contain important technical and supporting information that may prove valuable to the City as a reference and in implementing the recommendations.

The chapters and appendices of this report are further described as follows:

Chapter I - Introduction discusses the purpose and scope of the study, an understanding of the project background, the previous studies completed prior to this project, and an overview of the organization used in this report.

Chapter II - Existing System presents a brief summary of the City's existing secondary water system components. The primary elements of the existing systems include "dry pipe" systems already installed by developers and others, wells and canals that can serve as water sources, and transmission pipes installed by others that can support a secondary water system. Sources of secondary water are identified.

Chapter III – Service Area and Secondary Water Demand discusses the areas that are proposed to be served by the secondary water system, the planned land use, and secondary water demands for those areas.

Chapter IV – Secondary Water Sources and Water Quality describes potential water sources for the secondary water system, the quantities of water available from those sources, and the water quality of those sources and suitability of the water for landscape irrigation.

Chapter V – Facilities Planning presents a description of the evaluation criteria used to develop a master plan. A phased system was developed and analyzed to provide secondary water to the areas designated for potential use described in Chapter III. A second alternative was also examined based upon providing service to only those areas where "dry-pipe" systems are already installed. Estimates were developed of source supply needs, storage capacity, pumping and transmission needs and a system developed to deliver the water. The system was evaluated using computer modeling techniques to confirm sizing and capacity requirements. Layouts of the system phases are presented showing system components. Phasing plans for Alternatives 1 and 2 are also presented

Chapter VI - Financial Analysis presents an estimate of the capital costs of recommended improvements. Operational costs are also identified. Potential funding sources are also identified along with recommendations for rates structures and users rates that would be required to repay capital costs and to fund operation and maintenance of the system.

Chapter VII - Recommendations summarizes recommendations for implementation of the secondary water system.

Appendix A -Design Criteria presents the design criteria used to develop this study.

Appendix B – Alternative 1 EPANET Model contains a screenshot of the EPANET model layout for Alternative 1.

Appendix C - Alternative 2 EPANET Model contains a screenshot of the EPANET model layout for Alternative 2.

Appendix D – EPANET Model Output contains a CD with the EPANET output for both Alternatives 1 and 2.

Appendix E – Maps of Alternative 1 Phases contains maps for each phase of the plan and individual projects included in that phase for Alternative 1.

Appendix F – Maps of Alternative 2 Phases contains maps for each phase of the plan and individual projects included in that phase for Alternative 2.

Appendix G – Alternative 1 Cost Estimates contains tabulations of estimated costs for each phase of Alternative 1.

Appendix H – Alternative 2 Cost Estimates contains tables that show estimated costs for each phase of Alternative 2.

CHAPTER II

EXISTING SYSTEM

INTRODUCTION

This chapter presents a summary of the City's existing secondary water system components. The City does not currently have an extensive secondary system providing service throughout the city. The existing secondary water system provides service only to isolated systems spread across the city. The facilities that do exist and the water sources that are currently used are discussed.

FACILITIES

In several locations across the city, developers and others have installed "dry-pipe" systems (systems without a connection to any secondary water source). In locations on the east half of the city small, isolated irrigation systems have been installed which draw water from either nearby canals or small wells. Existing storage of secondary water is very limited; however, the City has indicated two sites that have been considered for future storage reservoirs.

Piping

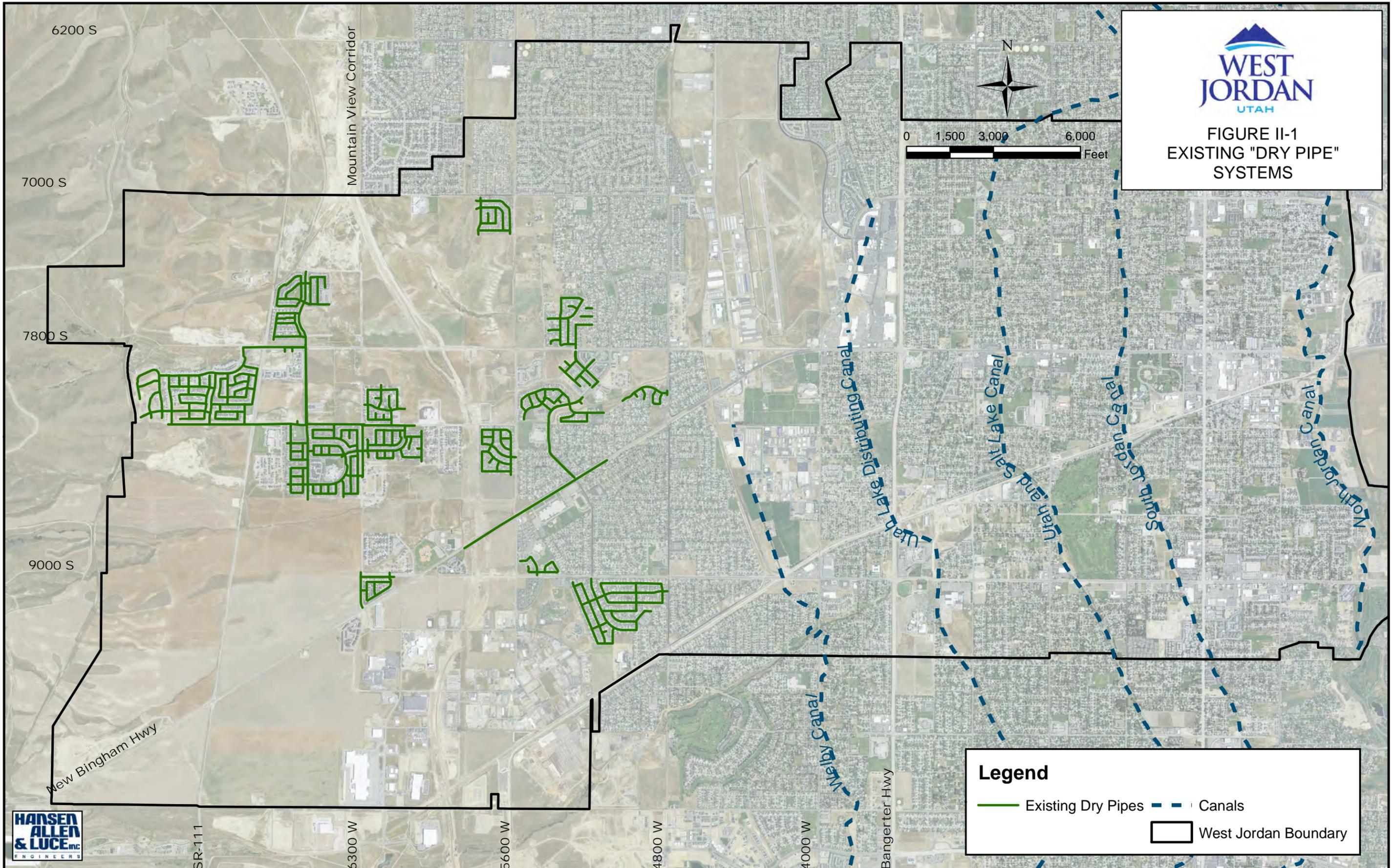
A few years ago the City had an ordinance requiring that secondary water pipes be installed in all new developments. This has resulted in several "dry pipe" distribution systems ready for service when a supply of secondary water can be provided. Additionally, some larger transmission lines have been installed. The majority of the "dry" piping is found west of 4800 West. A summary of the quantity of "dry pipes" in the city is listed by pipe diameter in Table II-1. The dry pipe ordinance was subsequently repealed and is no longer in effect.

**TABLE II-1
EXISTING DRY PIPE SUMMARY**

Diameter (inches)	Total Length (feet)
6	11,631
8	161,470
10	2,246
12	17,679
24	5,790
Total	198,816

The locations of these "dry pipe" systems are shown in Figure II-1. These "dry pipe" locations are based on information in the City's Geographic Information System (GIS). Actual pipe locations and sizes are subject to field verification.

Previous secondary water studies have recommended the installation of localized secondary water systems in the east half of the city (HAL 2001). The concept is to provide secondary water to City and other public properties with large irrigation demands, without suffering the expense of constructing a comprehensive secondary system in this already developed area of the city. In several cases the City has implemented this strategy, drawing water from nearby canals or small wells to irrigate parks and schools. Additionally, there are a number of private systems that have followed this practice.



Also noted in previous studies is the existence of a large diameter transmission line owned by Kennecott Utah Copper (KUC). The KUC pipeline runs from the North Jordan Canal to the city of Copperton along the railroad that eventually runs parallel to Old Bingham Highway. Originally used for transporting water to and from the canals and the Jordan River for mining operations. The pipe sat unused for many years when it was no longer needed.

In the secondary water system master plan prepared for the City in 2001 and 2006, the KUC pipeline was identified as a means for transporting water from the easterly, low elevation areas of the city to the West Side of the city (HAL 2001). Several years ago, Kennecott Land, a subsidiary of KUC, decided to re-commission the pipeline to supply water to a man-made lake in its Daybreak development located in South Jordan. In 2006, Kennecott Land had indicated that they were open to negotiation on the potential of a shared use of the pipeline by West Jordan. However, more recent discussions with Kennecott Land indicate that this is no longer an option. Therefore, use of this pipeline by West Jordan is not included in this master plan update.

CHAPTER III

SERVICE AREA AND SECONDARY WATER DEMAND

SECONDARY WATER SYSTEM SERVICE AREA

Previous studies indicated that it is not feasible to provide a city-wide secondary water system in West Jordan (MWH, 2006). According to these studies there are two limiting factors that dictate the service area of the proposed secondary water system. First, the high cost of constructing a comprehensive secondary water system in the well-developed area on the east side of the city makes it infeasible to include service areas east of 4800 West. Second, there are only limited sources of non-potable water that could be made available for a secondary water system. This limited availability of water sources limits the amount of area that can be served by a secondary water system.

It is important that developments with existing “dry pipes” be provided service first. For determining what additional areas to include in the system, limiting service area by land use type serves to maximize the effectiveness of the system. Large open spaces, such as parks, schools, and low-density residential land uses have the highest percentage of irrigable acreage to total acreage. Limiting the service of secondary water to these land use types maximizes the acreage served per connection. In other words the parks, schools, and low density residential land use types represent the largest irrigation demand, and serving them through a secondary system would result in the greatest benefit by reducing the demand on the drinking water system.

Using this reasoning, it is recommended that a comprehensive secondary water system provide service to no more than the existing “dry pipe” systems west of 4800 West and the future and existing parks, schools, and low-density residential developments west of 5600 West. There are scattered “dry pipe” systems in the area between 4800 West and 5600 West. Other than these few developments the area is well developed and to further develop a secondary system through the area would be infeasible due to costs and limited availability of water sources of high enough quality to serve them. The existing “dry” piping systems can easily be included in the proposed system. Figure III-1 shows the areas that would be served by the secondary water system according to the criteria described above and the City’s current land use plan.

Irrigable Acres

The areas shown in Figure III-1 encompass a total of 3,508 acres. A breakdown of this acreage by land use type is provided in Table III-1. The table also shows the percentage of land that is assumed to be irrigated for each land use type from the previous master plan (MWH, 2006). These percentages are applied to the total acres for each land use type to calculate the irrigable acres. As shown in the table, the secondary water system service area shown in Figure III-1 encompasses 2,586 acres of irrigable land.

**TABLE III-1
SECONDARY WATER SYSTEM SERVICE AREA AND IRRIGABLE ACRES
BY LAND USE TYPE**

LAND USE TYPE	TOTAL ACRES	PERCENT IRRIGATED	IRRIGABLE ACRES
High Density Residential	89	50%	44
Medium Density Residential	424	60%	255
Low Density Residential	2,036	75%	1,527
Very Low Density Residential	335	90%	302
Park	366	90%	330
School	258	50%	129
Total	3,508		2,586

SECONDARY WATER CONNECTIONS

The number of potential secondary water connections was estimated based on the total acres for each land use type multiplied by the maximum density (residential units per acre) for that land use type. For parks and schools the number of connections is the numbers of land parcels shown in the land use plan for those uses. The results are summarized in Table III-2. Based on the current land use plan the maximum number of secondary water connections for the anticipated service area is 9,822. This number could be smaller if developments use a lower density than the maximum allowed density.

**TABLE III-2
SECONDARY WATER SYSTEM POTENTIAL
NUMBER OF CONNECTIONS (ESTIMATED)**

LAND USE TYPE	TOTAL ACRES	DENSITY (CONNECTIONS/AC.)	POTENTIAL CONNECTIONS
High Density Residential	89	10	887
Medium Density Residential	424	5	2,121
Low Density Residential	2,036	3	6,107
Very Low Density Residential	335	2	671
Park	366		25
School	258		11
Total	3,508		9,822

SECONDARY WATER DEMAND

A demand use factor is applied to the estimated irrigated acreage served by the system to calculate an average yearly demand, maximum day demand, and peak hour demand. The demand factors are 3 acre-feet per irrigated acre for average yearly demand, 3.96 gallons per minute (gpm) per irrigated acre for maximum day demand, and 7.92 gpm per irrigated acre for peak hour demand. These demand factors are consistent with demand factors used in Utah Division of Drinking Water regulations (R309-510). The secondary water system will operate 6 months out of the year (April 15 to October 15) and watering during peak daily temperature periods will be restricted to reduce evaporation losses. Using the demand factors provided above, the average yearly demand for the secondary water system is 7,759 acre-feet. The maximum day demand is 10,242 gpm and the peak hour demand is 20,485 gpm.

POPULATION PROJECTIONS

The 2010 Census reported West Jordan had a population of 103,712. According to the City's general plan (City of West Jordan, 2012) population is projected to increase to over 155,000 by 2031. The Drinking Water Master Plan Update (Hansen, Allen & Luce, 2015) indicates that the population of West Jordan City is projected to increase to 180,050 in 2060. For purposes of this study, the city is assumed to reach build-out conditions in 2060. Figure III-2 shows the historical and projected population from 1940 through 2031.

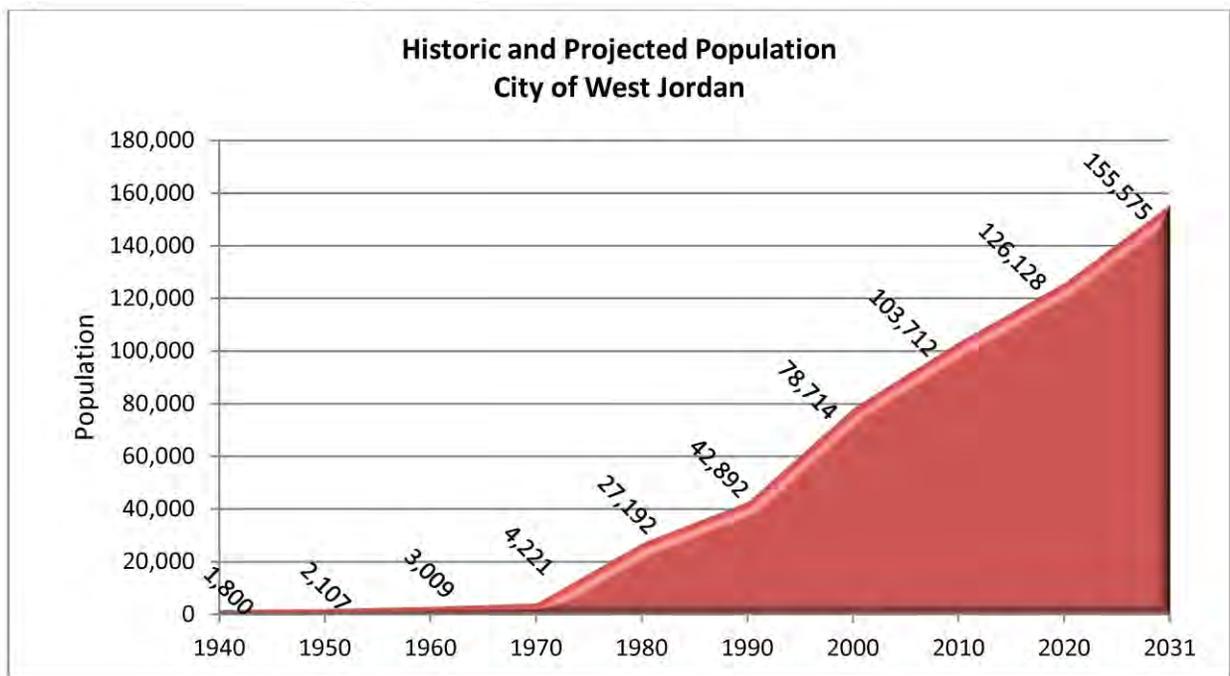


FIGURE III-2 – HISTORIC AND PROJECTED POPULATION

CHAPTER IV

SECONDARY WATER SOURCES AND WATER QUALITY

WATER SOURCES

One of the biggest obstacles for providing secondary water to West Jordan is the lack of suitable water sources. Previous master plan studies have identified existing and potential sources of water that could be used for West Jordan's secondary water system. This study provides an update of that inventory. It is important to note that several of the sources previously identified are located on the east side of the city and the study area for this master plan update is focused on the area west of 4800 West. Because these sources are so far away from the proposed area of use it is not practical to use them in the secondary water system. Required transmission pipelines and pump stations would make using these sources cost prohibitive. These sources could be used in localized small secondary systems for parks and schools. However, those types of systems are outside the scope of this study.

Existing Sources

In 2005 the City commissioned a study to evaluate the water resources available and make recommendations to develop, protect and use these resources for potable and non-potable use (MWH, 2005). Table IV-1 is a summary of existing non-potable sources and their production capacities. It shows that the City can currently produce up to about 1,300 acre-feet per year. Currently the City's non-potable water comes from the irrigation canals, the cemetery spring, the Steadman well, and the Sugar Factory well. The City has two non-potable wells that are not currently producing including the Jordan River well and Well #1 (near Fire Station 55). However, the 2005 study also concludes that the current uses are also about 1,300 acre-feet per year. These current uses include the soccer complex, cemetery, and a city park.

**TABLE IV-1
SUMMARY OF EXISTING NON-POTABLE
WATER SOURCES (MWH, 2005)**

Sources	Minimum Supply (ac-ft/yr)	Average Supply (ac-ft/yr)	Maximum Supply (ac-ft/yr)
Canal shares ¹	0	1,200	1,300
Cemetery spring	0	42	unknown
Steadman Well ²	0	33	65
Jordan River Well	0	0	0
Sugar Factory Well ³	0	40	81
Well #1	0	0	0
Total	0	1,315	At least 1,446

¹ Based on water rights and demand.

² Assuming 40 gpm for 6 months produces 33 ac-ft/yr.

³ Assuming 50 gpm for 6 months produces 40 ac-ft/yr.

Canal Shares – Five principal irrigation canals convey water through the City. The five canals are 1) the North Jordan Canal, 2) the South Jordan Canal, 3) the Utah and Salt Lake Canal, 4) the Utah Lake Distributing Canal, and 5) the Welby Canal. All of the canals have the Jordan River as their source with the ultimate source being Utah Lake. Each of the irrigation canals is owned and operated by a separate canal company, with a fixed number of shares held by private and municipal interests. The canals are operated and maintained by the canal companies. The canals are typically in operation from mid-April through early October, except the North Jordan canal, which is operated year round. Each of the five canals provides varying

amounts of non-potable water to the City (MWH, 2005). Because it is located farthest to the west and has higher elevation, the Welby Canal would be the most beneficial source of water to the secondary water system. However, of all of the canals the Welby Canal has the smallest flow capacity with a capacity of less than 25 cfs at its terminus near the soccer complex. The canal shares currently owned by the City are committed for irrigation use at other locations such as the soccer complex.

Cemetery Spring – The Cemetery Spring is used to irrigate the cemetery in the eastern part of the City. Because it is already used as a source for a localized secondary water system and because of its location, it would not be practical to use the Cemetery Spring in the secondary water system.

Steadman Well – The City owns an irrigation well named the Steadman well located on 8100 South and 4600 West, just west of the soccer complex. According to a previous study (HA&L, 1998), the original well was precluded from municipal use because of water quality limitations. However, the report suggested that this well may be a good water source for irrigation use. The Steadman well was re-drilled in late 2000 to a total depth of 400 feet below ground surface (bgs). Pump tests showed that its capacity is limited to 40 gpm. However, City personnel believe that the well may be plugged with drilling mud that was used during construction of the well. The City speculates that with additional well development work, the capacity could be increased. After well redevelopment the well would need to be re-equipped with a higher capacity pump and motor according to any increased well capacity gained through the redevelopment process. Because of its proximity to the Welby Canal, water from the Steadman well could easily be conveyed along with canal water to a secondary water system on the west side of the city.

Jordan River Well – The Jordan River well is a 12-inch well located at approximately 1100 West and 7000 South and was installed in an attempt to develop groundwater in the northeastern portion of the city (MWH, 2006). The well was drilled to 550 feet and groundwater samples were collected from various depths below ground surface. Following testing, the well was mothballed because of water quality and production rate concerns which were not adequate for its intended use as a drinking water source. The well casing was sealed with a welded plate and the well was left in place for future consideration. Despite previous recommendations and the limitations of water quality and flow rate, this well can be used for secondary irrigation. However, because it is located near the eastern boundary of the city, it would not be practical to use it as a source for a secondary water system on the west side of the city unless there were other transmission facilities available that convey other sources.

Sugar Factory Well – The Sugar Factory well is located on the former Sugar Factory property at approximately 8200 South and 2000 West near the City offices and City park. The Sugar Factory well is 250 feet deep with a diameter of 8 to 10 inches and is approved for 684.1 ac-ft/yr (MWH, 2005). The Sugar Factory well is old (1920's to 1930's timeframe) and was originally used for potable supply. Currently this well has serious equipment problems and the well itself is degraded. The well is currently being used to fill a pond that is used for the irrigation system of the City Park located adjacent to the Sugar Factory site. Because it is currently being used to irrigate the city park and because of its location on the east side of the city this well would not be a good source for the secondary water system.

Well #1 – According to the previous secondary water master plan (MWH, 2006) this well is best suited for use as an irrigation water supply. It has poor specific capacities (less than 2 gpm/ft) and a high sand content. The maximum sustainable capacity based on recent pump tests is approximately 200 gpm (about 161 ac-ft assuming continuous pumping for a 6-month irrigation season). The water quality is acceptable for secondary irrigation. There are no water rights

currently associated with this well. High sand content can lead to subsidence and equipment degradation (MWH, 2005).

Well #5 – Well #5 is currently used as a source for the drinking water system and is equipped to provide 2,000 gpm of source capacity. Between 1997 and 2004 the well produced an average of 570 acre-feet per year with a maximum annual production of 799 acre-feet. The well has a 16-inch diameter casing with a total depth of 620 feet (MWH, 2005). Water quality is good with TDS of about 700 ppm (MWH, 2006). Although Well #5 is used as a drinking water source, because of its proximity to proposed secondary water system facilities and its relatively good water quality, it could be used to provide water for blending with other lower-quality sources such as the Welby Canal to improve the overall water quality.

Potential New Sources

In addition to the existing sources described above, the following non-potable sources have been considered by the City for development of additional supplies:

- Cross connections with drinking water system,
- Shallow groundwater,
- Surface water, (Canal Shares)
- Wastewater reuse, and
- Taylorsville-Bennion Improvement District.

These sources were reviewed to determine the potential quantity of water available and the feasibility of development. A brief summary of the findings for each source is provided in the paragraphs that follow.

Cross Connections with Drinking Water System – Cross connections between the drinking water system could provide a short-term source of supply for subdivisions with existing dry secondary water pipes. These cross connections would allow the existing pipes to be pressurized and tested to identify any problems that may have developed since they were installed in the early 2000s. The cross connections would also allow the secondary system in these areas to operate until sources of non-potable water could be developed and connected to the system. Backflow protection would be provided by installing Reduced Pressure Zone backflow prevention devices (RPZs) at each cross connection. RPZs are approved by Utah Division of Drinking Water regulations (R309-105-12) for this type of use and are considered safe when properly maintained and tested. The RPZs provide a fail-safe barrier between the secondary water system and the drinking water system to protect public health. These cross connections could also provide a future emergency water supply during drought conditions that could be used to enhance water quality when water levels in Utah Lake are low.

Shallow Groundwater – The City owns a water right for underground water drains near the cemetery. The existing right is currently less than 1 ac-ft/yr even though the flows are much greater. Since it is such a small right, there is not currently a significant capacity for further development. In addition to this existing diversion and right, the City has a collection system of groundwater drains leftover from the City's agricultural past. The volume of water available for development is unknown but the collection system is already built. Because this source is located at a low elevation and near the eastern edge of the City, it would not be practical to construct transmission facilities to delivery this water to the west side of the City for use in a wide-spread secondary water system.

Surface Water (Canal Shares) – The City currently uses its full deliveries from canal shares for irrigation. In previous discussions, South Jordan City and Kennecott have both previously expressed interest in leasing or selling canal shares to the City. However, in more recent discussions, South Jordan City has determined that it cannot lawfully lease its water shares due to prohibitions in the Utah State Constitution. Additionally, Kennecott Utah Copper is now of the opinion that all of its water shares are needed for its mining operation or for Kennecott Land’s Daybreak development in South Jordan. Despite these setbacks, the City could acquire additional shares by direct purchase as the opportunity arises. JWCD owns a significant number of shares in each of the canals that pass through West Jordan including about 6,600 of the total 40,000 shares of the Welby Jacob Water Users Company (Welby Canal). JWCD has expressed willingness to trade shares acquired by West Jordan in the lower canals for Welby Canal shares. Such an exchange would enhance West Jordan’s ability to use Canal Shares in a secondary water system since the Welby Canal is the closest canal in proximity to the proposed secondary water system.

Wastewater Reuse – The requirements for reuse of reclaimed water are set forth in the Utah Administrative Code R317-3-11, *Use, Land Application and Alternative Methods for Disposal of Treated Wastewater Effluents*. Administrative and approval requirements for land application systems is found in R317-13, *Approvals and Permits for a Water Reuse Project*. Any entity that intends to use or provide for the use of treated wastewater must submit a Project Plan to the Director of the Division of Water Quality (Director) and to the local health department for approval. The items listed in R317-3-11.3 must be provided before any water deliveries are made including, but not limited to the following:

- A description of the quantity, quality, and use of the treated wastewater
- The location of the site
- An assessment of the direct hydrologic effects of the action
- How the requirements of R317-3-11 will be met
- A description of public notification and participation in development of the Project Plan
- An operation and management plan
- If the water will be delivered to other entities for transmission, distribution and/or use, a copy of the contract covering how the requirements of R-317-3-11 will be met

The operation and management plan must include a plan for prevention of cross-connections between reclaimed water distributions lines and potable water lines, schedules for maintenance, and a contingency plan for system failure or upsets (*Water Reuse in Utah, April 2005*).

The uses allowed for Type I reuse are listed in R317-3-11.4 which is for reuse applications where human exposure is likely. The secondary water irrigation system proposed by the City would be categorized as a Type I reuse which includes landscape irrigation at individual homes and irrigation of food crops where the applied water is likely to have direct contact with the edible part.

Type I reuse requires the following treatment processes as identified in R317-3-11.4B.

- Secondary treatment which produces effluent in which both BOD and TSS concentrations do not exceed the limits defined in R317-1-3.2.
- Tertiary treatment which includes additional filtration such as sand and/or anthracite, approved membrane processes, or other approved filtration processes.

- Disinfection which may be accomplished by chlorination, ozonation, or other chemical disinfectants, UV radiation, or other approved processes.

If a connection between the potable water system and the treated effluent water system is necessary, then an approved air gap must be provided. Use of a reduced pressure principle device requires approval from the Director, local health department, and the potable water supplier. Other requirements for drinking fountain or other public facilities, hose bibs, warning labels, and warning signs shall be as stated in the rule. Where treated effluent is used in individual residential landscape or public landscape area irrigation systems, a public education program must be implemented prior to initial operation of the program and, as necessary, during operation of the system.

In 1995 the Utah State Legislature passed the Conservation and Use of Sewage Effluent Act which sets forth basic guidelines regarding administration of water rights for water reuse projects. The act also authorized the State Engineer to make rules regarding the notification process for water reuse projects.

In relation to the City of West Jordan, the law states that they “may contract with the person responsible for administration of a regional Publicly-Owned Treatment Works (POTW) to act as its agent for the purpose of using sewage effluent discharge from the regional POTW.” The city must have valid water rights for the water produced at the POTW. According to the act, the City may use the treated effluent for “a beneficial use consistent with, and without enlargement of, those water rights.” The City must file a notification with the State Engineer prior to using the water. Agreements for water reuse would be needed with JVVCD, which provides most of West Jordan’s drinking water and with the U.S. Bureau of Reclamation (Reclamation), which holds the water rights for the Central Utah Project water delivered by JVVCD. JVVCD has expressed a willingness to enter into such an agreement and believes that Reclamation would also be willing.

West Jordan’s waste water is treated at the South Valley Water Reclamation Facility (SVWRF). It appears that the existing treatment facilities at the SVWRF meet the requirements of R317-3-11. However, additional filters would be needed for the City to be able to use their water from the treatment plant. The City currently has a capacity of approximately 18.2 million gallons per day (MGD) out of the 50 MGD capacity of the plant. The City’s average daily flow is around 8.1 to 8.5 MGD. SVWRF’s final filtration building has room for two additional filters with a capacity of 3 MGD each. By constructing these additional filters, disinfection works, pumps, and a transmission pipeline West Jordan could deliver about 3,340 acre-feet of reclaimed wastewater to the secondary water system during the 180-day irrigation season.

Effluent from the Dannon Foods plant was also considered as a potential source of recycled wastewater. The plant produces about 0.75 MGD of effluent and has a pretreatment facility to partially treat the water before it is discharged to the sewer collection system. However, in order to satisfy regulations for Type I reuse, additional treatment would be required. The most likely treatment method for this site would be a membrane bioreactor (MBR) process with chlorine disinfection. After studying the cost of the additional treatment, it was concluded that it would be cost prohibitive to use this source for the secondary water system and it was dropped from further consideration. The cost per acre-foot of water from this source would be slightly less than \$1,800, which is about 3 ½ times the cost of drinking water from JVVCD.

Taylorville-Bennion – Taylorville-Bennion Improvement District (TBID) indicated that they have wells that they no longer use because of lower water quality and/or low flowrates. Two wells, the High Zone East and West Wells, have TDS in the range of 900 to 1,200 mg/L range and also have high arsenic levels. The district is in the process of determining whether to sell

the wells or if they will abandon the wells. However, TBID would retain the water rights from these wells which are used at other points of diversion. Further analysis indicates that there is little advantage for West Jordan to acquire the TBID wells. The High Zone East and West Wells, although located near the West Jordan City boundary, were constructed in the early 1970s. The well casings are approaching the end of their projected useful life of 50 years. Additionally, West Jordan does not have water rights that could be moved into these wells.

Summary – About 7,760 acre-feet of water supplies will need to be developed to meet projected water use of the secondary water system. A review of potential sources revealed that there is adequate physical capacity to meet this future demand; however, additional water rights are required. Table IV-2 summarizes each source reviewed, the potential volume that could be developed, and a preliminary estimate of cost per acre-foot to deliver the water to Zone 4 of the secondary water system.

**TABLE IV-2
COMPARISON OF POTENTIAL WATER SOURCES FOR
SECONDARY WATER SYSTEM**

Source	Capacity (gpm)	Annual Volume (ac-ft)	TDS (mg/L) ¹	Cost per Acre-Foot ²	Notes
Well #5	2,000	1,591	704	\$88.96	
Well #1	200	159	550	\$85.95	Produces sand, water rights needed
Steadman Well	50	40	1,000-2,000	\$116.90	Well needs to be re-drilled or re-developed
Jordan River Well	500	398	1060	\$263.87	Water rights needed, well is neither developed nor equipped. Only viable in conjunction with SVWRF reuse.
Welby Canal	8,980	7,144	1015	\$115.09	High TDS, high organics, strong odor
SVWRF Reuse	4,167	3,315	685-953	\$457.67	Needs filtration & disinfection
Drinking Water System	7,150	5,688	251	\$479.00	Drinking water supplied by JWCD
Total	23,047	18,335			

¹ (MWH 2006)

² Includes capital cost and cost of pumping to Zone 4

WATER QUALITY

As shown in Table IV-2 the Welby Canal has the largest volume of potentially available water. However, the Welby Canal also has relatively poor water quality. By contrast, the drinking water system could provide an abundant supply of high quality water to the secondary water system. However, using drinking water in the secondary system defeats the purpose of having a secondary water system. The purpose of the secondary system is to preserve the high quality drinking water for indoor use only and use sources with lower water quality for secondary irrigation. Consequently, the drinking water system should be used as a secondary water source only as a temporary or emergency measure.

The poor quality of the canal water is a concern in using it to supply the secondary system. Water quality standards are much less stringent for secondary water relative to culinary water; however, a certain level of water quality is required to maintain healthy plant growth. Turf

grasses can tolerate lower quality water than trees, flowers and other ornamental vegetation. The existing, independent secondary systems are used primarily for irrigation of turf grasses and have been successful in doing so. Blending canal water with other sources such as Wells #1 and #5 along with SVWRF reuse water would improve the overall water quality and reduce the risk of damage to ornamental plants.

CHAPTER V

FACILITIES PLANNING

GENERAL SYSTEM LAYOUT

In developing a layout for the secondary water system a primary consideration was to divide the system into several pressure zones with pressure zone boundaries essentially the same as the zone boundaries for the drinking water system. The intent is to operate the secondary water system at pressures slightly lower than the drinking water system. The reason for doing this is to minimize the risk of backflow from the secondary water system into the drinking water system in the event of an unauthorized cross connection between the two systems. Another consideration is that by having pressures nearly the same between the two systems will allow homes with existing sprinkler systems to connect to the secondary water system without the need to dramatically reconfigure their systems.

A pond is provided above each pressure zone to provide regulating storage and allow for daily peaking during high demand periods. Since the water sources are located west of the service area or in the lowest pressure zones, booster pumps are required to lift the water from one pressure zone to the next.

A backbone of larger pipelines is provided to deliver water across each pressure zone. It is assumed that smaller distribution pipelines within individual subdivisions would be installed by the developer instead of as a capital project provided by the City. This is the same pattern that is followed for other utilities.

ALTERNATIVES

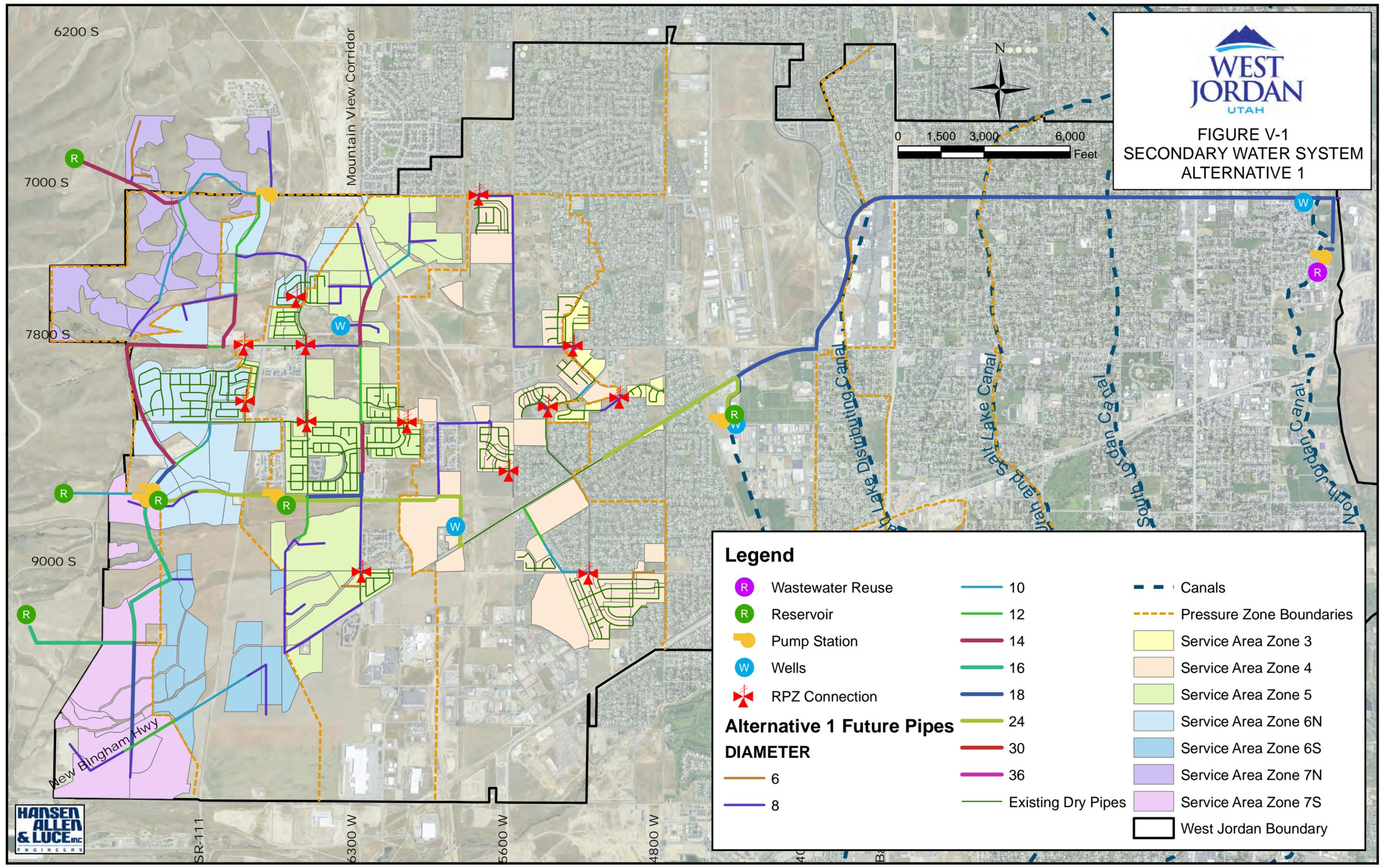
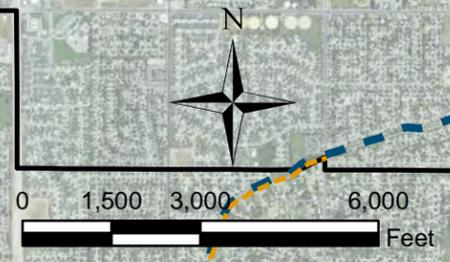
Two alternative plans for implementing a secondary water system are presented in this master plan update. Alternative 1 would provide secondary water to the entire service area described in Chapter III (see Figure III-1). Alternative 2 is a scaled-back plan that would only serve the subdivisions with existing dry pipes. Alternative 2 is provided as a fallback position in the event that the City is unable to carry out Alternative 1 due to lack of funding or water sources.

Alternative 1

As mentioned previously, Alternative 1 would serve the entire secondary water system service area including dry pipe subdivisions west of 4800 West and future planned low density and very low density residential areas west of 5600 West along with schools and parks in that area. Alternative 1 would provide service to 2,586 irrigable acres of land with an estimated 9,822 service connections. Figure V-1 shows the layout for the Alternative 1 system. As shown in the figure, the system is divided into five main pressure zones with two of the zones being divided into north and south areas. The system includes 5 new storage ponds and also utilizes the existing pond at the southwest corner of the soccer complex. Six booster pump stations are also provided to lift water from one zone to another. A total of 13 RPZ connections are provided to deliver culinary water to the secondary system during initial system startup and during emergencies. Water would be provided to the system from several sources including the culinary water system (initially), the Welby Canal, Steadman Well, Well #1, Well #5, and the South Valley Water Reclamation Facility. Figure V-2 is a hydraulic schematic of the Alternative 1 system. The figure shows in schematic format the elevations and interconnections of major system components.



FIGURE V-1
SECONDARY WATER SYSTEM
ALTERNATIVE 1

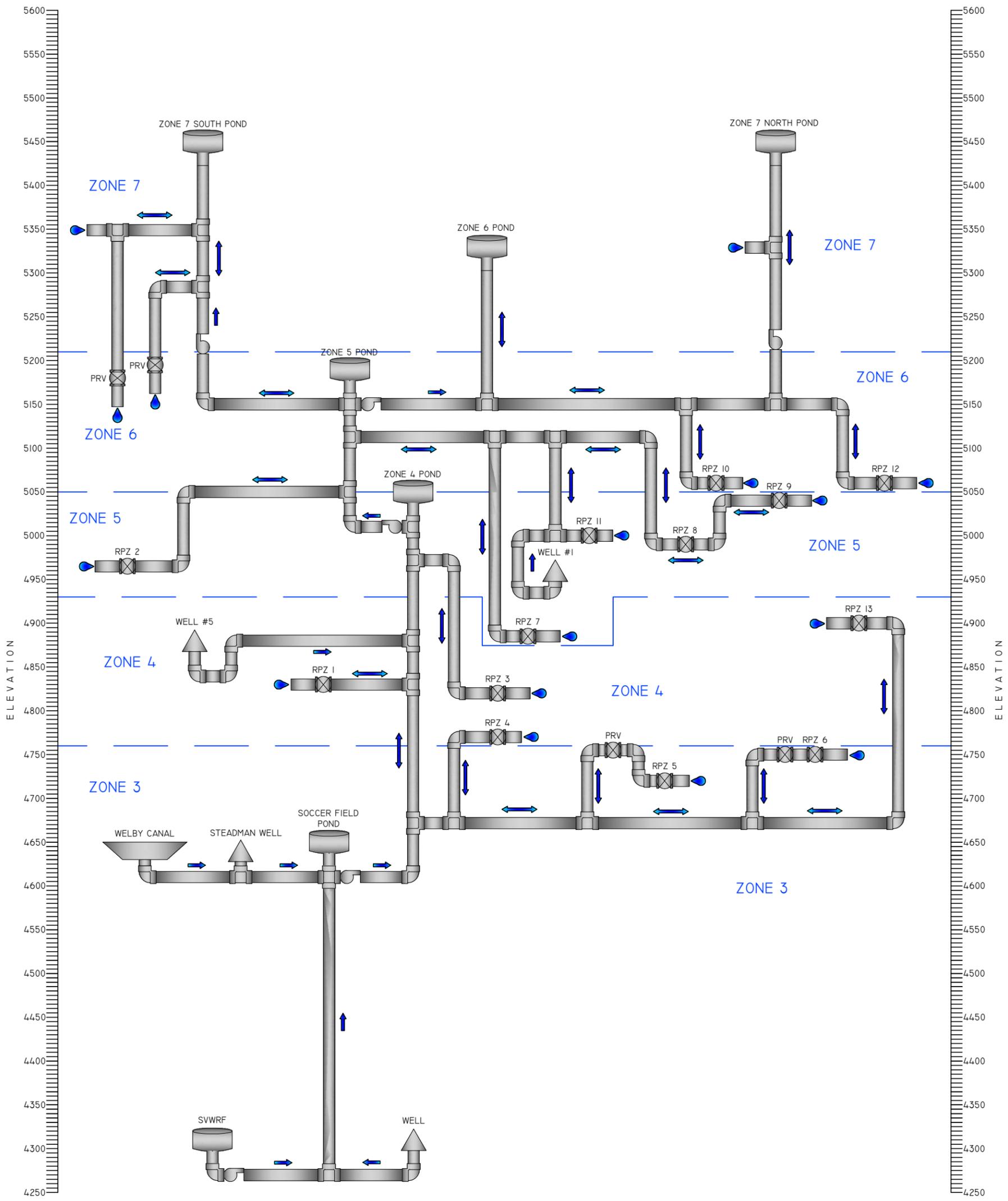


Legend

- | | | |
|------------------|--------------------|--------------------------|
| Wastewater Reuse | 10 | Canals |
| Reservoir | 12 | Pressure Zone Boundaries |
| Pump Station | 14 | Service Area Zone 3 |
| Wells | 16 | Service Area Zone 4 |
| RPZ Connection | 18 | Service Area Zone 5 |
| | 24 | Service Area Zone 6N |
| | 30 | Service Area Zone 6S |
| | 36 | Service Area Zone 7N |
| | Existing Dry Pipes | Service Area Zone 7S |
| | 8 | West Jordan Boundary |



FILE NAME: 10/07



West Jordan Secondary Water System
Alternative 1 - PROPOSED HGL SCHEMATIC

FIGURE
V-2

Alternative 2

Alternative 2 would serve only subdivisions west of 4800 West with existing “dry” secondary water pipes. This alternative would deliver water to 550 acres of irrigable land with an estimated 4,013 service connections. Figure V-3 shows the layout for the Alternative 2 system. As shown in the figure, the system is divided into four main pressure zones. The system includes 3 new storage ponds and also utilizes the existing pond at the southwest corner of the soccer complex. Three booster pump stations are also provided to lift water from one zone to another. A total of 13 RPZ connections are provided to deliver culinary water to the secondary system during initial system startup and during emergencies. Water would be provided to the system from several sources including the culinary water system (initially), the Welby Canal, Steadman Well, Well #1, and Well #5. Figure V-4 is a hydraulic schematic of the Alternative 2 system. The figure shows in schematic format the elevations and interconnections of major system components.

Design Criteria

Design criteria used for developing the master plan are essentially the same as those presented in an April 20, 2006 Technical Memorandum (MWH, 2006). A copy of the memorandum is provided in Appendix A. For the sake of convenience, key criteria are summarized below.

Demands

Demand areas are described the Chapter 3. Demand factors were applied to the irrigated acreage to calculate an average yearly demand, maximum day demand, and peak hour demand. These demand factors are 3 acre-feet per irrigated acre for average yearly demand, 3.96 gpm per irrigation acre for maximum day demand, and 7.92 gpm per irrigated acre for peak hour demand. The exception is that because HAL developed an extended time period computer model to analyze the system, the model used a daily demand curve that varies the demand factor throughout the day instead of using the peak hour demand factor. At any given time throughout the day, the instantaneous demand is obtained by multiplying the maximum day demand by the factor from the curve for that time period. This demand curve is based on SCADA data from the City’s drinking water system and reflects actual conditions observed throughout the City. Figure V-5 shows the demand curve used in the computer model.

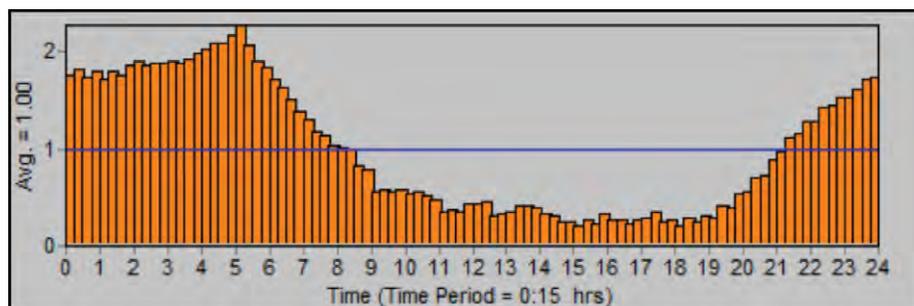
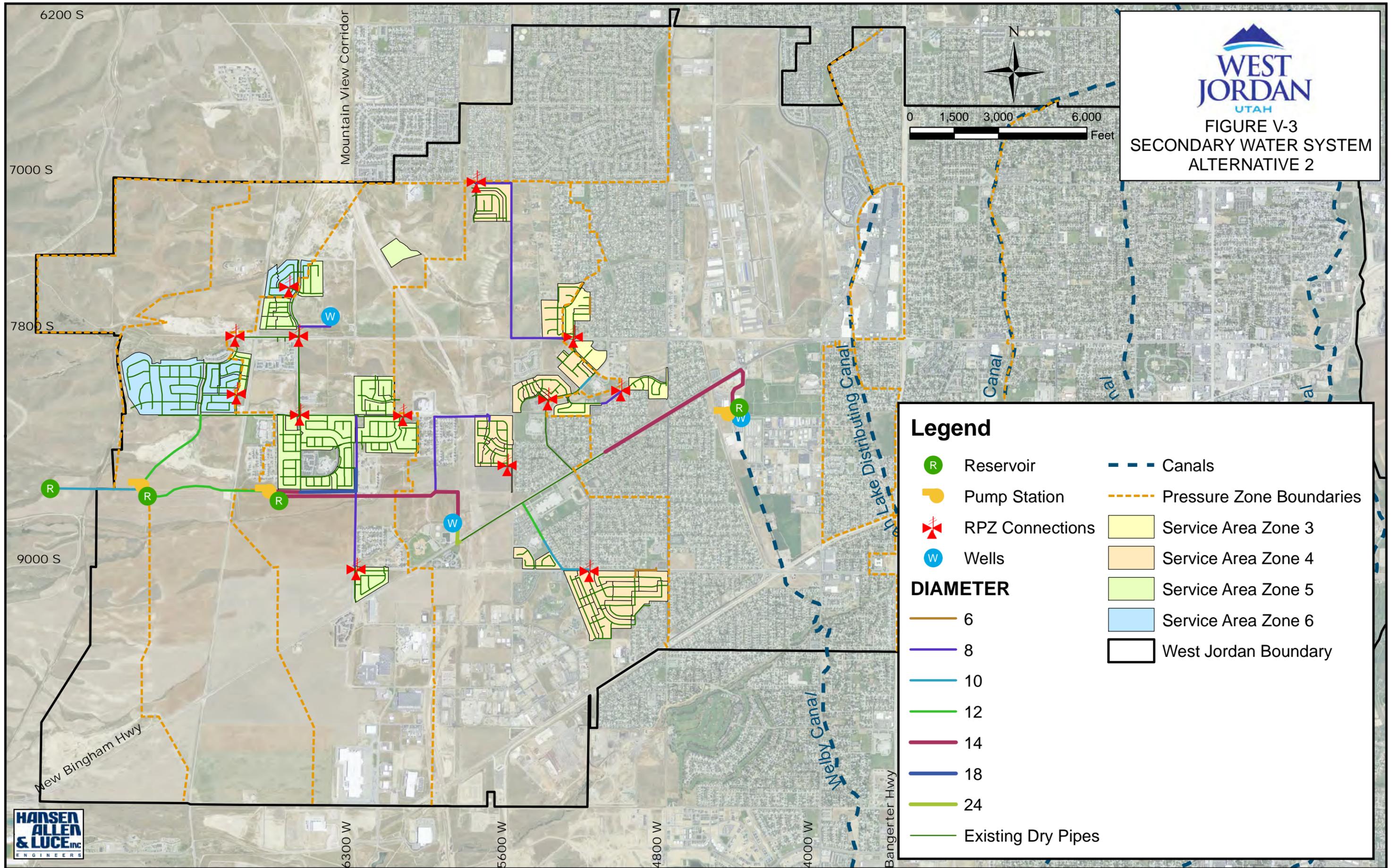


FIGURE V-5: DAILY DEMAND PATTERN

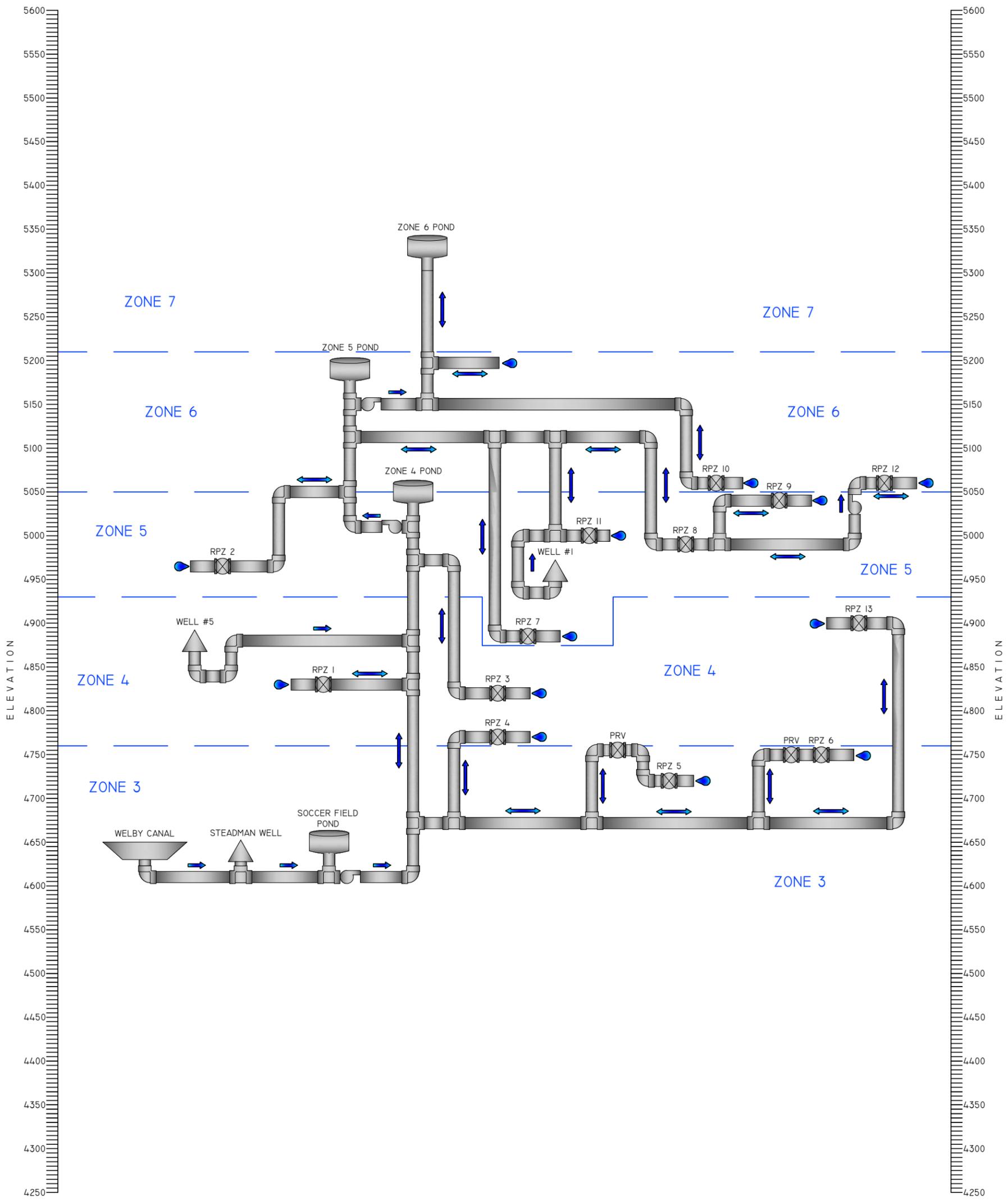


**FIGURE V-3
SECONDARY WATER SYSTEM
ALTERNATIVE 2**

Legend

	Reservoir		Canals
	Pump Station		Pressure Zone Boundaries
	RPZ Connections		Service Area Zone 3
	Wells		Service Area Zone 4
DIAMETER			Service Area Zone 5
	6		Service Area Zone 6
	8		West Jordan Boundary
	10		
	12		
	14		
	18		
	24		
	Existing Dry Pipes		

FILE NAME: 10/07



West Jordan Secondary Water System
Alternative 2 - PROPOSED HGL SCHEMATIC

FIGURE
V-4

Distribution System

Pipe Size - The City has adopted a minimum pipe diameter of six inches. Pipes with diameters less than or equal to twelve inches will be PVC or HDPE plastic. Pipes with diameters greater than twelve inches will be ductile iron.

Operating Pressure - Pressure criteria include minimum and maximum pressures. The system will be designed to maintain a minimum pressure of 50 psi at all points in the distribution system under all flow conditions. The maximum pressure that will be allowed in the system will be 120 psi.

Pump Sizing

All pump stations should have sufficient capacity to supply maximum day water demands within the safe operating range of the pump. All pump stations must be equipped with at least two pumps. The pump station must be able to provide the maximum pumping demand with one of the pumps out of service. Table V-1 provides a summary of pump sizing for Alternative 1. The same methodology was followed in sizing pumps for Alternative 2.

**TABLE V-1
BOOSTER PUMP SIZING FOR ALTERNATIVE 1**

	Area Served (acres)	Capacity Required per Acre (gpm)	Flow Capacity (gpm)	TDH (feet)	Motor Size (HP)
SVWRF Waste Water Reuse Booster Pump	N/A	N/A	4200	558	800
SVWRF Waste Water Reuse Booster Pump (Exchange Alternative)	N/A	N/A	4200	28	40
Welby Booster Pump	2586	3.96	10242	497	1716
Zone 5 Booster Pump	2096	3.96	8301	160	448
Zone 6 Booster Pump	1428	3.96	5655	152	290
Zone 7 South Booster Pump	690	3.96	2731	135	125
Zone 7 North Booster Pump	306	3.96	1211	234	96

Storage

Storage capacity requirements include provisions for operational storage only. The required operational storage is the maximum day demand on the system sustained over a 24-hour period. Table V-2 summarizes the pond sizing for Alternative 1. Ponds for Alternative 2 were sized using the same procedure. The existing pond at the southwest corner of the soccer complex will provide a collecting point for water from several sources including the Welby Canal, the SVWRF reuse project, and Steadman well. The exact capacity of the pond is unknown. However, based on aerial photography, the surface area of the pond is about 0.6 acres. The depth and side slopes of the pond are unknown, but the capacity of the pond is likely 3 to 5 acre-feet.

**TABLE V-2
POND SIZING FOR ALTERNATIVE 1**

	Outlet Elevation (feet)	Area Served (acres)	Capacity Required per acre (ac-ft)	Pond Capacity (ac-ft)
Zone 4 Pond	5040	490.26	0.0175	8.58
Zone 5 Pond	5180	668.17	0.0175	11.69
Zone 6 North Pond	5320	432.61	0.0175	7.57
Zone 7 South Pond	5440	689.72	0.0175	12.07
Zone 7 North Pond	5440	305.68	0.0175	5.35

Source Criteria

Supply sources are sized to provide a constant flow to the distribution system equal to the maximum day demand over a 24-hour period. At 3.96 gpm per acre and 2,586 irrigated acres, a total of 10,242 gpm of source capacity is required for Alternative 1. Alternative 2 requires 2,178 gpm of source capacity.

ANALYSIS METHODOLOGY AND RESULTS

Computer Model

A computer model of the proposed secondary water distribution system was developed to analyze the system performance and to select appropriate pipe diameters that satisfy the City's criteria for water system pressures and pipe velocities. The model includes existing dry pipes as well as proposed future pipes. The software used for the model was EPANET version 2.0. EPANET is a public-domain, water distribution system modeling software package developed by the United States Environmental Protection Agency's (EPA) Water Supply and Water Resources Division. It performs extended-period simulation of hydraulic and water-quality behavior within pressurized pipe networks.

Computer models were developed for both Alternative 1 and Alternative 2. Since there is no functioning secondary water system in West Jordan, it was not possible to calibrate the model with observed field measurements.

Model Components

The two basic elements of the computer model are pipes and nodes. A pipe is described by its inside diameter, overall length, minor friction loss factors, and a roughness value associated with friction head losses. A pipe can include elbows, bends, valves, pumps, and other operational elements. Nodes are the end points of a pipe and they can be categorized as junction nodes or boundary nodes. A junction node is a point where two or more pipes meet, where a change in pipe diameter occurs, or where flow is put in or taken out of the system. A boundary node is a point where the hydraulic grade is known (a reservoir or PRV).

The computer model of the water distribution system is not an exact replica of the actual water system. Pipeline locations used in the model are approximate and every pipeline may not be

included in the model, although efforts were made to make the model as complete and accurate as possible. It is not necessary to include all of the distribution system pipes in the model to accurately simulate its performance.

Analysis Methodology

The EPANET model was used to analyze the performance of the water system for projected future demands under peak day conditions using an extended period simulation. An extended period model is actually a static model run multiple times for each time period, like a movie is made up of individual pictures put together. The peak day extended period model includes the peak instantaneous flow at the peak demand period of the day as well as other periods of lesser demands. The extended period model analyzed a 24-hour period with 15-minute increments.

Model Analysis Results

Appendix B contains a screen shot of the model used to evaluate Alternative 1. Appendix C contains a screen shot for the Alternative 2 model. The full model output primarily consists of the computed pressures at nodes and flow rates through pipes. The model also provides additional data related to pipeline flow velocity and head loss to help evaluate the performance of the various components of the distribution system. Results from the model are available on a CD in Appendix D. Due to the large number of pipes and nodes in the model, it is impractical to prepare a printed table which illustrates pipe numbers and node numbers. The reader should refer to the CD to review model output.

PHASED IMPLEMENTATION PLAN

A phased implementation plan is proposed for West Jordan's secondary water system. The phased approach is designed to provide sources of secondary water to the existing dry pipe subdivisions first with subsequent phases that target future growth areas. Figure V-6 shows the proposed phases for Alternative 1. As shown in the figure, the implementation of Alternative 1 is divided into eight phases. A description of each phase is summarized below. Appendix E contains figures that show the detail of individual projects for each phase. The figures show pipe diameters for each project. A tabular description of each project is also provided.

Alternative 1 Phases

Phase 1 – Construct RPZ connections to drinking water system to provide a short-term water supply to dry pipe subdivisions

Phase 2 – Construct facilities to deliver water from Welby Canal, Steadman Well and Well #5 to dry pipe subdivisions in Zones 3 and 4.

Phase 3 – Construct facilities to deliver water from Zone 4 pond to dry pipe subdivisions in Zone 5.

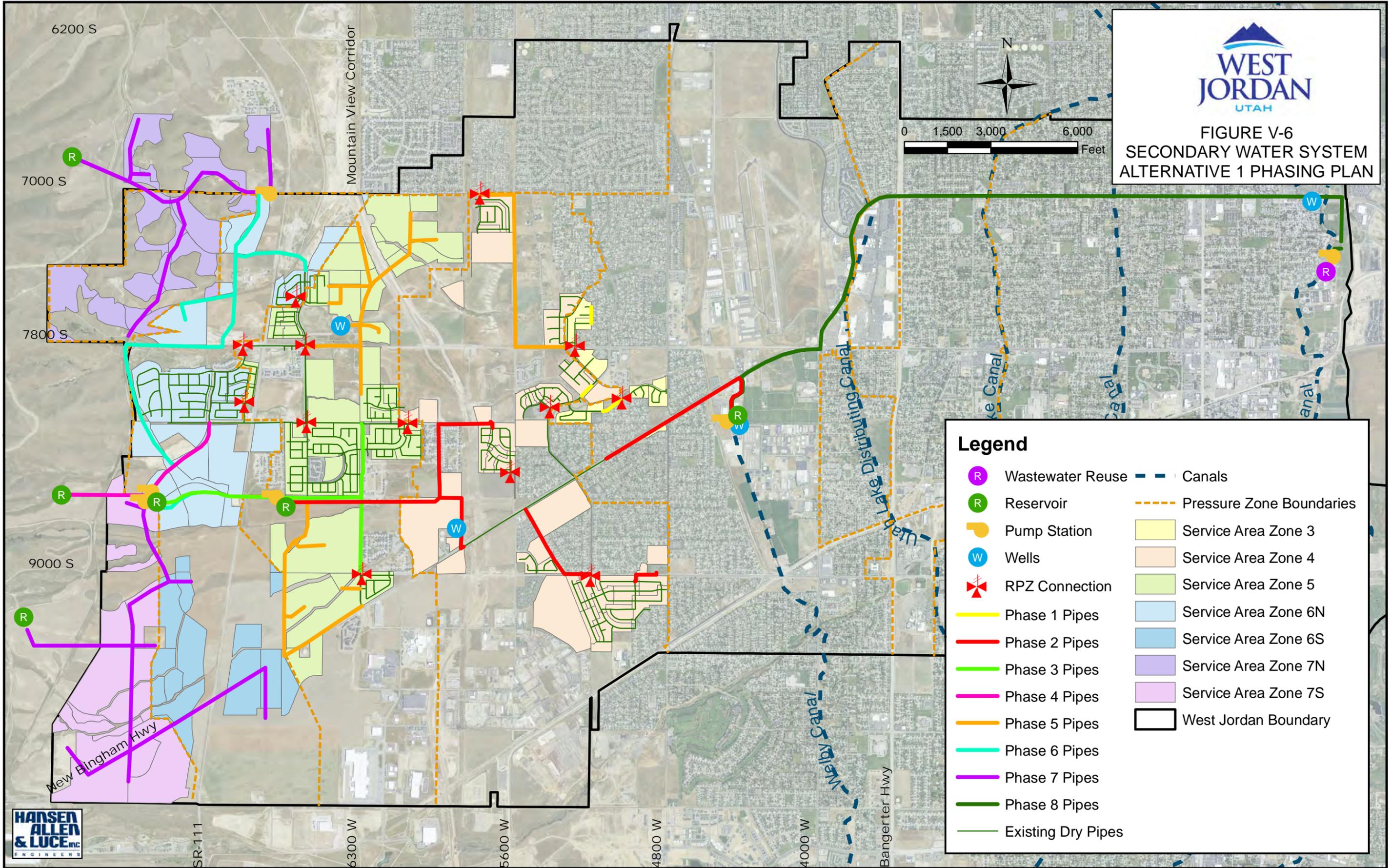
Phase 4 - Construct facilities to deliver water from Zone 5 pond to dry pipe subdivisions in Zone 6.

Phase 5 – Construct facilities to deliver water to future growth areas in Zone 5, existing dry pipe subdivision at north end of Zone 4, and Well #1 connection to system.

Phase 6 – Construct facilities to deliver water to future growth areas in Zone 6 north area.

Phase 7 – Construct facilities to deliver water from Zone 6 pond to future growth areas in Zone 7 and south area of Zone 6.

Phase 8 – Construct SVWRF reuse project and facilities to deliver recycled wastewater to pond at southwest corner of the soccer complex.



**FIGURE V-6
SECONDARY WATER SYSTEM
ALTERNATIVE 1 PHASING PLAN**

Legend

- Wastewater Reuse
- Reservoir
- Pump Station
- Wells
- RPZ Connection
- Phase 1 Pipes
- Phase 2 Pipes
- Phase 3 Pipes
- Phase 4 Pipes
- Phase 5 Pipes
- Phase 6 Pipes
- Phase 7 Pipes
- Phase 8 Pipes
- Existing Dry Pipes
- Canals
- - - Pressure Zone Boundaries
- Service Area Zone 3
- Service Area Zone 4
- Service Area Zone 5
- Service Area Zone 6N
- Service Area Zone 6S
- Service Area Zone 7N
- Service Area Zone 7S
- West Jordan Boundary



A similar phasing approach is proposed for Alternative 2. Figure V-7 shows the proposed phases for Alternative 2. A description of each phase is summarized below. Appendix F contains figures identifying the individual projects for each phase along with a tabular description of each project.

Alternative 2 Phases

Phase 1 – Construct RPZ connections to drinking water system to provide a short-term water supply to dry pipe subdivisions

Phase 2 – Construct facilities to deliver water from Welby Canal, Steadman Well and Well #5 to dry pipe subdivisions in Zones 3 and 4.

Phase 3 – Construct facilities to deliver water from Zone 4 pond to dry pipe subdivisions in Zone 5.

Phase 4 - Construct facilities to deliver water from Zone 5 pond to dry pipe subdivisions in Zone 6.

Phase 5 – Construct facilities to deliver water to existing dry pipe subdivision at north end of Zone 4 and Well #1 connection to system.

ACTIONS REQUIRED TO IMPLEMENT THE SECONDARY WATER SYSTEM

Below is a list of actions that the City would likely need to take to implement a secondary water system. This list is not intended to be comprehensive. Rather it is provided for information to help guide discussions related to the secondary water system

Water Rights

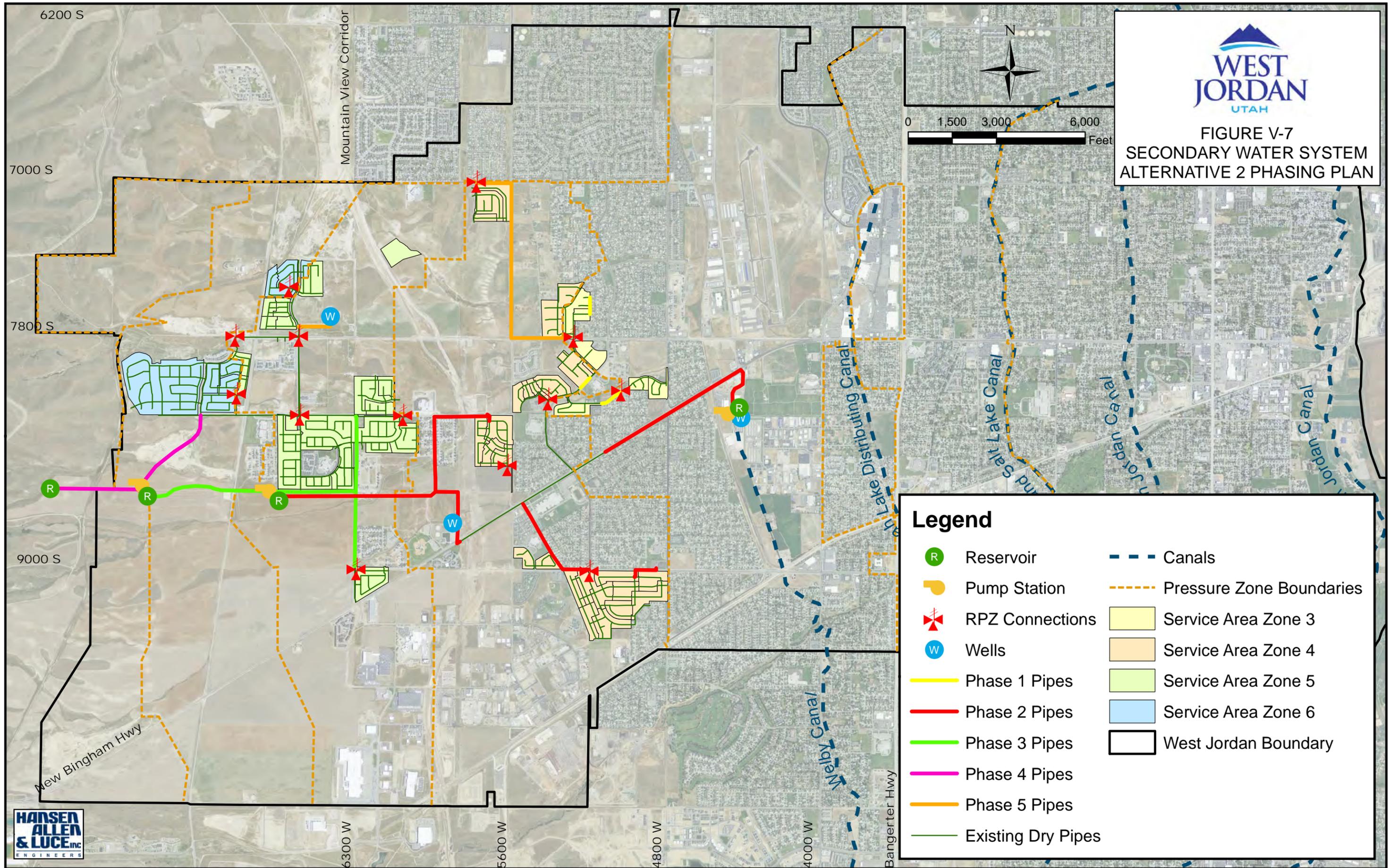
West Jordan does not currently hold enough water rights to operate the secondary water system. A plan will need to be developed for securing additional water rights or canal shares. As a consideration in water rights acquisition, it would be most beneficial to acquire water shares in the Welby Canal or to acquire other water shares or water rights that can be exchanged for Welby Canal shares.

Development Standards

Development standards are needed for secondary water system facilities. These would include standards for facilities that would be constructed by developers of new subdivisions. An ordinance is needed to require developers of new subdivisions to install secondary water pipes and service connections. The service connections should provide for installation of water meters. All new secondary water pipes should be pressurized so that any damage caused by new construction can be detected. If non-potable water sources are not yet available, the secondary water pipes should be pressurized through RPZ connections to the drinking water system until non-potable water becomes available.

Backflow Prevention

Existing backflow prevention ordinances need to be reviewed and revised as needed to reduce the risk of cross connections between the drinking water system and the secondary water system. Because of the proposed future use of recycled wastewater in the system, swing-type connections which allow sprinklers to switch back and forth between the drinking water system and the secondary water system are not recommended. Furthermore, a policy requiring inspection of each sprinkler system connection to the secondary water system is recommended to ensure that sprinklers are not cross connected to both systems.



Water Meters

Due to the expected high cost of water from the secondary water system, water meters are highly recommended to eliminate excessive water use and to ensure that the City recovers costs for operating the system. The cost of individual water meters is not included in the cost estimate for future growth areas. It is anticipated that the City will charge a connection fee to cover the cost of installing the meter.

Water Rates

Although general information is provided in this report regarding potential water rate structures, this information is provided for planning purposes only. A more detailed water rate study will be required for rate setting.

Water Conservation

The City's water conservation plan should be reviewed to identify any new water conservation measures or considerations that should be included that would be directly related to a secondary water system.

Public Education

A public education program will be needed to help residents understand health and safety issues related to a secondary water system. The plan should also help education residents on water conservation practices.

Wastewater Reuse

If the City elects to implement the water reuse component of the master plan, a water reuse plan must be submitted to the Director of the Utah Division of Water Quality and to the local health department for approval. Water reuse agreements will be needed with the Jordan Valley Water Conservancy District (JVWCD), U.S. Department of the Interior, and South Valley Water Reclamation Facility. Water right change applications may not be required since the water delivered by JVWCD is imported water designated for municipal use and may be completely consumed without provision for downstream water right holders.

CHAPTER VI

FINANCIAL ANALYSIS

INTRODUCTION

Capital costs and operation and maintenance costs for construction and operation of the secondary water system were developed for use in project financial planning and economic feasibility. Final costs of the project will depend on actual cost of labor and materials, competitive market conditions, actual site conditions and final project scope. Final costs will vary from the estimates contained in this master plan.

PRECISION OF COST ESTIMATES

When considering cost estimates, there are several levels or degrees of precision, depending on the purpose of the estimate and the percentage of detailed design that has been completed. The following levels of precision are typical:

<u>Type of Estimate</u>	<u>Precision</u>
Master Planning	±50%
Preliminary Design	±30%
Final Design or Bid	±10%

For example, at the master planning level (or conceptual or feasibility design level), if a project is estimated to cost \$1,000,000, then the precision or reliability of the cost estimate would typically be expected to range between approximately \$500,000 and \$1,500,000. While this may seem very imprecise, the purpose of master planning is to develop general sizing, location, cost, and scheduling information on a number of individual projects that may be designed and constructed over a period of many years. Master planning also typically includes the selection of common design criteria to help ensure uniformity and compatibility among future individual projects. Details such as the exact capacity of individual projects, the level of redundancy, the location of facilities, the alignment and depth of pipelines, the extent of utility conflicts, the cost of land and easements, the construction methodology, the types of equipment and material to be used, the time of construction, interest and inflation rates, permitting requirements, etc., are typically developed during the more detailed levels of design.

At the preliminary or 10% design level, some of the aforementioned information will have been developed. Major design decisions such as the size of facilities, selection of facility sites, pipeline alignments and depths, and the selection of the types of equipment and material to be used during construction will typically have been made. At this level of design the precision of the cost estimate for a \$1,000,000 project would typically be expected to range between approximately \$700,000 and \$1,300,000.

After the project has been completely designed, and is ready to bid, all design plans and technical specifications will have been completed and nearly all of the significant details about the project should be known. At this level of design, the precision of the cost estimate for the same \$1,000,000 project would typically be expected to range between approximately \$900,000 and \$1,100,000.

CAPITAL COSTS

Unit costs for the construction cost estimates are based on conceptual level engineering. Sources used to estimate construction costs include:

1. "Means Heavy Construction Cost Data, 2015"
2. Price quotes from equipment suppliers

3. Recent construction bids for similar work

All costs are presented in 2015 dollars. Recent price and economic trends indicate that future costs are difficult to predict with certainty. Engineering cost estimates provided in this study should be regarded as conceptual level for use as a planning guide. Only during final design can a definitive and more accurate estimate be provided for each project. The total estimated capital cost of Alternative 1 is \$72.3 million. A cost estimate calculation for each Alternative 1 project is provided in Appendix G. Table VI-1 provides a cost summary for the recommended system improvements of each phase for Alternative 1.

**TABLE VI-1
ALTERNATIVE 1 SUMMARY OF ESTIMATED CAPITAL COSTS**

Phase	Capital Cost
Phase 1	\$ 2,790,000
Phase 2	\$ 14,400,000
Phase 3	\$ 7,600,000
Phase 4	\$ 4,400,000
Phase 5	\$ 5,300,000
Phase 6	\$ 3,500,000
Phase 7	\$ 13,200,000
Phase 8	\$ 16,000,000
Water Rights Purchase (2,551 acre-feet)	\$ 5,100,000
Total Capital Cost	\$ 72,290,000

The total capital cost of Alternative 2 is estimated to be \$16.6 million. Cost estimate calculations for each Alternative 2 project are provided in Appendix H. Table VI-2 provides a cost summary for the recommended system improvements of each phase for Alternative 2.

**TABLE VI-2
ALTERNATIVE 2 SUMMARY OF ESTIMATED CAPITAL COSTS**

Phase	Capital Cost
Phase 1	\$ 2,790,000
Phase 2	\$ 6,770,000
Phase 3	\$ 3,660,000
Phase 4	\$ 2,020,000
Phase 5	\$ 1,360,000
Total Capital Cost	\$ 16,600,000

OPERATION AND MAINTENANCE COSTS

Annual operation and maintenance (O&M) costs for the secondary water system include equipment, maintenance facilities, operation of pump stations and system facilities. Additional personnel and equipment are expected to be needed for maintenance of the secondary water system. Costs were estimated as a percentage of capital costs and are based upon past experience with similar systems.

Following are assumptions used in developing the operation and maintenance costs:

- Pipelines and appurtenances: 0.5 percent of capital cost.
- Pump stations: 2 percent of capital costs
- Storage reservoirs: 1 percent of capital cost.
- Power for pumping: \$0.073 per kWh

Table VI-3 summarizes the annual O&M costs for Alternative 1 facilities based on the assumptions listed above. The estimated costs are based on full implementation of Alternative 1. As shown in the table, the estimated annual O&M cost is approximately \$2.1 million. Pumping power is a major component of the annual O&M cost.

**TABLE VI-3
ALTERNATIVE 1 SUMMARY OF ESTIMATED
ANNUAL O&M COSTS**

Item	O&M Cost
Pipelines	\$ 163,000
RPZs	\$ 14,000
Reservoirs	\$ 101,000
Pump Stations	\$ 284,000
Water Reuse	\$ 104,000
Pumping Power	\$ 1,430,000
Total Annual O&M Cost	\$ 2,096,000

Annual O&M costs for Alternative 2 are summarized in Table VI-4. The estimated annual O&M cost for Alternative 2 is \$306,000.

**TABLE VI-4
ALTERNATIVE 2 SUMMARY OF ESTIMATED
ANNUAL O&M COSTS**

Item	O&M Cost
Pipelines	\$ 45,000
RPZs	\$ 14,000
Reservoirs	\$ 26,000
Pump Stations	\$ 38,000
Pumping Power	\$ 183,000
Total Annual O&M Cost	\$ 306,000

PROJECTED COSTS AND WATER USE BY YEAR

In order to complete the financial analysis for the secondary water system, a projected schedule of capital costs, O&M costs, number of connections, irrigated acres, and water use by year are needed. Table VI-5 provides a summary projected costs and water use by year from 2015 through 2016 for Alternative 1. Assumed timing for implementation of the various master plan phases is also indicated. The table assumes a linear growth pattern of 129 connections per year until buildout. The analysis assumes that new connections would be served by drinking

**TABLE VI-5
ALTERNATIVE 1 PROJECTS COSTS AND WATER USE BY YEAR**

Year	Number of Connections Existing	Number of Connections New Growth	Total Connections	Existing Acres Irrigated by Potable Water	New Acres Irrigated by Potable Water	Total Acres Irrigated by Potable Water	Existing Acres Irrigated by Non-Potable Water	New Acres Irrigated by Non-Potable Water	Total Acres Irrigated by Non-Potable Water	Total Irrigated Acres	Total JVWCD Water Use (ac-ft)	Total Non-Potable Water Use (ac-ft)	Total Water Use (ac-ft)	Capital Expenditure	Annual JVWCD Water Cost	O&M Cost	Notes:
2015	0	0	0	0	0	0	0	0	0	0	0	0	0	\$ 500,000.00	\$ -	\$ -	Phase 1 implementation
2016	2006	129	2135	275	45	320	0	0	0	320	960	0	960	\$ 7,396,670.00	\$ 475,422.75	\$ 5,000.00	Phase 1 implementation plus 2,551 a.f. water rights purchase
2017	4013	258	4271	550	90	640	0	0	0	640	1921	0	1921	\$ 7,192,000.00	\$ 950,845.50	\$ 32,597.09	Phase 2 implementation
2018	4013	387	4400	550	135	685	0	0	0	685	2056	0	2056	\$ 7,192,000.00	\$ 1,017,893.25	\$ 34,895.64	Phase 2 implementation
2019	4013	516	4529	390	181	571	160	0	160	731	1712	480	2192	\$ 7,622,509.00	\$ 847,534.05	\$ 158,550.05	Phase 3 Implementation
2020	4013	645	4658	146	226	372	404	0	404	776	1117	1211	2327	\$ 4,399,704.00	\$ 552,717.00	\$ 345,823.86	Phase 4 implementation
2021	4013	774	4787	37	271	308	513	0	513	821	923	1539	2463	\$ 7,999,688.00	\$ 456,993.90	\$ 431,326.36	Phase 8 implementation
2022	4013	903	4916	37	316	353	513	0	513	866	1059	1539	2598	\$ 7,999,687.00	\$ 524,041.65	\$ 433,624.91	Phase 8 implementation
2023	4013	1032	5045	37	361	398	513	0	513	911	1194	1539	2734	\$ 5,303,070.00	\$ 591,089.40	\$ 435,923.45	Phase 5 implementation
2024	4013	1161	5174	0	201	201	550	205	755	956	604	2265	2869	\$ 3,496,722.00	\$ 298,841.40	\$ 621,884.05	Phase 6 implementation
2025	4013	1290	5303	0	151	151	550	301	851	1002	452	2553	3005	\$ 6,601,949.00	\$ 223,492.50	\$ 696,971.82	Phase 7 implementation
2026	4013	1419	5432	0	166	166	550	331	881	1047	497	2643	3140	\$ 6,601,949.00	\$ 245,841.75	\$ 722,119.00	Phase 7 implementation
2027	4013	1548	5561	0	0	0	550	542	1092	1092	0	3275	3275		\$ -	\$ 884,358.00	
2028	4013	1677	5690	0	0	0	550	587	1137	1137	0	3411	3411		\$ -	\$ 920,929.50	
2029	4013	1806	5819	0	0	0	550	632	1182	1182	0	3546	3546		\$ -	\$ 957,501.00	
2030	4013	1935	5948	0	0	0	550	677	1227	1227	0	3682	3682		\$ -	\$ 994,072.50	
2031	4013	2064	6077	0	0	0	550	722	1272	1272	0	3817	3817		\$ -	\$ 1,030,644.00	
2032	4013	2193	6206	0	0	0	550	768	1318	1318	0	3953	3953		\$ -	\$ 1,067,215.50	
2033	4013	2322	6335	0	0	0	550	813	1363	1363	0	4088	4088		\$ -	\$ 1,103,787.00	
2034	4013	2451	6464	0	0	0	550	858	1408	1408	0	4224	4224		\$ -	\$ 1,140,358.50	
2035	4013	2580	6593	0	0	0	550	903	1453	1453	0	4359	4359		\$ -	\$ 1,176,930.00	
2036	4013	2709	6722	0	0	0	550	948	1498	1498	0	4494	4494		\$ -	\$ 1,213,501.50	
2037	4013	2838	6851	0	0	0	550	993	1543	1543	0	4630	4630		\$ -	\$ 1,250,073.00	
2038	4013	2967	6980	0	0	0	550	1038	1588	1588	0	4765	4765		\$ -	\$ 1,286,644.50	
2039	4013	3096	7109	0	0	0	550	1084	1634	1634	0	4901	4901		\$ -	\$ 1,323,216.00	
2040	4013	3225	7238	0	0	0	550	1129	1679	1679	0	5036	5036		\$ -	\$ 1,359,787.50	
2041	4013	3354	7367	0	0	0	550	1174	1724	1724	0	5172	5172		\$ -	\$ 1,396,359.00	
2042	4013	3483	7496	0	0	0	550	1219	1769	1769	0	5307	5307		\$ -	\$ 1,432,930.50	
2043	4013	3612	7625	0	0	0	550	1264	1814	1814	0	5443	5443		\$ -	\$ 1,469,502.00	
2044	4013	3741	7754	0	0	0	550	1309	1859	1859	0	5578	5578		\$ -	\$ 1,506,073.50	
2045	4013	3870	7883	0	0	0	550	1355	1905	1905	0	5714	5714		\$ -	\$ 1,542,645.00	
2046	4013	3999	8012	0	0	0	550	1400	1950	1950	0	5849	5849		\$ -	\$ 1,579,216.50	
2047	4013	4128	8141	0	0	0	550	1445	1995	1995	0	5984	5984		\$ -	\$ 1,615,788.00	
2048	4013	4257	8270	0	0	0	550	1490	2040	2040	0	6120	6120		\$ -	\$ 1,652,359.50	
2049	4013	4386	8399	0	0	0	550	1535	2085	2085	0	6255	6255		\$ -	\$ 1,688,931.00	
2050	4013	4515	8528	0	0	0	550	1580	2130	2130	0	6391	6391		\$ -	\$ 1,725,502.50	
2051	4013	4644	8657	0	0	0	550	1625	2175	2175	0	6526	6526		\$ -	\$ 1,762,074.00	
2052	4013	4773	8786	0	0	0	550	1671	2221	2221	0	6662	6662		\$ -	\$ 1,798,645.50	
2053	4013	4902	8915	0	0	0	550	1716	2266	2266	0	6797	6797		\$ -	\$ 1,835,217.00	
2054	4013	5031	9044	0	0	0	550	1761	2311	2311	0	6933	6933		\$ -	\$ 1,871,788.50	
2055	4013	5160	9173	0	0	0	550	1806	2356	2356	0	7068	7068		\$ -	\$ 1,908,360.00	
2056	4013	5289	9302	0	0	0	550	1851	2401	2401	0	7203	7203		\$ -	\$ 1,944,931.50	
2057	4013	5418	9431	0	0	0	550	1896	2446	2446	0	7339	7339		\$ -	\$ 1,981,503.00	
2058	4013	5547	9560	0	0	0	550	1941	2491	2491	0	7474	7474		\$ -	\$ 2,018,074.50	
2059	4013	5676	9689	0	0	0	550	1987	2537	2537	0	7610	7610		\$ -	\$ 2,054,646.00	
2060	4013	5809	9822	0	0	0	550	2033	2583	2583	0	7749	7749		\$ -	\$ 2,092,351.50	

water through RPZs until infrastructure is in place to provide non-potable water. Table VI-6 shows similar information for Alternative 2.

ESTIMATED RATE FORECAST

Introduction

This rate analysis is limited to an “order of magnitude” evaluation of the likely revenue requirements and resulting rates based on the capital and operations and maintenance (O&M) costs identified in the Plan. Impact fees are not included in this analysis. In addition, it should be noted that implementation of a secondary water system and rates will affect the revenues to the City’s culinary water utility. This cause and effect relationship was not addressed as part of this initial financial analysis.

This financial analysis estimates the rates needed to support the construction, operation, and maintenance of the proposed secondary water system in West Jordan. There are two alternatives being considered in this chapter. Alternative 1 is engineered to accommodate 9,822 connections and to irrigate 2,586 acres. The total capital improvement program (CIP) for this alternative is \$72,305,948, expressed in 2015 dollars. Alternative 2 is more modest in scope, and is sized to accommodate 4,013 connections and to irrigate 550 acres. The total capital improvement program for this alternative is \$16,605,883, also expressed in 2015 dollars. The planning horizon for the financial analysis mirrors that of the engineering analysis, which is forty five years (i.e., from 2015 to 2060).

From the outset of the analysis, it was clear that the size of the capital program and the limited timeframe over which construction would occur mandated that debt financing be the primary funding tool. The analysis also assumes some grant funding under Alternative 1 at \$3,340,000 (\$1,670,000 in both 2021 and 2022). There is no grant funding included in Alternative 2. This leaves the financial program for Alternative 2 limited to rates and debt financing.

As discussed above, the overall forecast in the model goes out to 2060, and mirrors all of the data provided in Table VI-5. The raw CIP and O&M data in the table is in current dollars. Accordingly, these costs have been adjusted in the financial model for inflation at 3% per year. Earnings on fund balances are set at 0.60%. As directed by the City, CIP financing is done via 20 year revenue bonds at an interest rate of 3.5%; reserve requirements are included in the borrowing and coverage is set at 1.25 times annual debt service. A revenue bond is issued every year starting in 2015. For Alternative 1, the last issuance is done in 2026. For Alternative 2, the last issuance is 2021. To help buy down rates, interest earnings on the debt service reserve balance is transferred to the Operating Fund, and is treated as operating revenue for rate making purposes. Rather than accumulating and holding the cash resulting from meeting the annual coverage test, a capital projects fund was “created” where each year’s coverage surplus was transferred to this fund in order to “buy down” that year’s capital requirement (thus reducing borrowings).

The rate alternatives are broken out into two categories:

- Fixed monthly rates based on:
 - Estimated billable connections,
 - Estimated irrigated acres, and
 - Estimated acre feet of water delivered to the system

**TABLE VI-6
ALTERNATIVE 2 PROJECTS COSTS AND WATER USE BY YEAR**

Year	Number of Connections Existing	Number of Potential Connections New Growth	Total Potential Connections	Existing Acres Irrigated by Potable Water	Existing Acres Irrigated by Non-Potable Water	New Acres Irrigated by Non-Potable Water	Total Acres Irrigated by Non-Potable Water	Total Irrigated Acres	Total JWCD Water Use (ac-ft)	Total Non-Potable Water Use (ac-ft)	Capital Expenditure	Annual JWCD Water Cost	O&M Cost	Notes:
2015	0	0	0	0	0	0	0	0	0	0	\$ 500,000.00	\$ -	\$ -	Phase 1 implementation
2016	2006	0	2006	275	0	0	0	275	825	0	\$ 2,294,670.00	\$ 408,375.00	\$ 5,000.00	Phase 1 implementation
2017	4013	0	4013	550	0	0	0	550	1650	0	\$ 3,385,500.00	\$ 816,750.00	\$ 28,000.00	Phase 2 implementation
2018	4013	0	4013	550	0	0	0	550	1650	0	\$ 3,385,500.00	\$ 816,750.00	\$ 28,000.00	Phase 2 implementation
2019	4013	0	4013	390	160	0	160	550	1170	480	\$ 3,664,092.00	\$ 579,343.05	\$ 108,848.00	Phase 3 Implementation
2020	4013	0	4013	146	404	0	404	550	439	1211	\$ 2,018,888.00	\$ 217,478.25	\$ 232,079.64	Phase 4 implementation
2021	4013	0	4013	37	513	0	513	550	111	1539	\$ 1,357,233.00	\$ 54,707.40	\$ 287,510.61	Phase 5 implementation
2022	4013	0	4013	0	550	0	550	550	0	1650		\$ -	\$ 306,141.00	
2023	4013	0	4013	0	550	0	550	550	0	1650		\$ -	\$ 306,141.00	
2024	4013	0	4013	0	550	0	550	550	0	1650		\$ -	\$ 306,141.00	
2025	4013	0	4013	0	550	0	550	550	0	1650		\$ -	\$ 306,141.00	
2026	4013	0	4013	0	550	0	550	550	0	1650		\$ -	\$ 306,141.00	
2027	4013	0	4013	0	550	0	550	550	0	1650		\$ -	\$ 306,141.00	
2028	4013	0	4013	0	550	0	550	550	0	1650		\$ -	\$ 306,141.00	
2029	4013	0	4013	0	550	0	550	550	0	1650		\$ -	\$ 306,141.00	
2030	4013	0	4013	0	550	0	550	550	0	1650		\$ -	\$ 306,141.00	
2031	4013	0	4013	0	550	0	550	550	0	1650		\$ -	\$ 306,141.00	
2032	4013	0	4013	0	550	0	550	550	0	1650		\$ -	\$ 306,141.00	
2033	4013	0	4013	0	550	0	550	550	0	1650		\$ -	\$ 306,141.00	
2034	4013	0	4013	0	550	0	550	550	0	1650		\$ -	\$ 306,141.00	
2035	4013	0	4013	0	550	0	550	550	0	1650		\$ -	\$ 306,141.00	
2036	4013	0	4013	0	550	0	550	550	0	1650		\$ -	\$ 306,141.00	
2037	4013	0	4013	0	550	0	550	550	0	1650		\$ -	\$ 306,141.00	
2038	4013	0	4013	0	550	0	550	550	0	1650		\$ -	\$ 306,141.00	
2039	4013	0	4013	0	550	0	550	550	0	1650		\$ -	\$ 306,141.00	
2040	4013	0	4013	0	550	0	550	550	0	1650		\$ -	\$ 306,141.00	
2041	4013	0	4013	0	550	0	550	550	0	1650		\$ -	\$ 306,141.00	
2042	4013	0	4013	0	550	0	550	550	0	1650		\$ -	\$ 306,141.00	
2043	4013	0	4013	0	550	0	550	550	0	1650		\$ -	\$ 306,141.00	
2044	4013	0	4013	0	550	0	550	550	0	1650		\$ -	\$ 306,141.00	
2045	4013	0	4013	0	550	0	550	550	0	1650		\$ -	\$ 306,141.00	
2046	4013	0	4013	0	550	0	550	550	0	1650		\$ -	\$ 306,141.00	
2047	4013	0	4013	0	550	0	550	550	0	1650		\$ -	\$ 306,141.00	
2048	4013	0	4013	0	550	0	550	550	0	1650		\$ -	\$ 306,141.00	
2049	4013	0	4013	0	550	0	550	550	0	1650		\$ -	\$ 306,141.00	
2050	4013	0	4013	0	550	0	550	550	0	1650		\$ -	\$ 306,141.00	
2051	4013	0	4013	0	550	0	550	550	0	1650		\$ -	\$ 306,141.00	
2052	4013	0	4013	0	550	0	550	550	0	1650		\$ -	\$ 306,141.00	
2053	4013	0	4013	0	550	0	550	550	0	1650		\$ -	\$ 306,141.00	
2054	4013	0	4013	0	550	0	550	550	0	1650		\$ -	\$ 306,141.00	
2055	4013	0	4013	0	550	0	550	550	0	1650		\$ -	\$ 306,141.00	
2056	4013	0	4013	0	550	0	550	550	0	1650		\$ -	\$ 306,141.00	
2057	4013	0	4013	0	550	0	550	550	0	1650		\$ -	\$ 306,141.00	
2058	4013	0	4013	0	550	0	550	550	0	1650		\$ -	\$ 306,141.00	
2059	4013	0	4013	0	550	0	550	550	0	1650		\$ -	\$ 306,141.00	
2060	4013	0	4013	0	550	0	550	550	0	1650		\$ -	\$ 306,141.00	

- Fixed and variable rates based on:
 - Base charge per billable connection (base charge = debt service expense and coverage requirements)
 - Use charge per acre foot of water delivered to the system (use charge = O&M & water purchase expense)

It should be noted, this analysis does not attempt to calculate specific rates for each class of customer currently served under the City’s culinary water rate structure. The benchmarks/drivers shown above are the finest level of detail for this order of magnitude analysis.

The complete financial models for Alternative 1 and Alternative 2 are provided in Appendices I and J.

Analysis of Revenue Requirements

Revenue requirements are the total costs of providing services to secondary water customers over a specific period of time (usually one year). These costs include O&M and capital costs. O&M costs are the routine costs of operating and maintaining the secondary water system in order to provide service. For the purpose of this rate setting, revenue requirements are projected from pro forma expenses, and adjusted based on historical cost trends. Examples of O&M costs are electricity used for pumping and purchased water expense from Jordan Valley Water Conservation District (JVWCD).

Capital costs, as defined for the secondary water rates structure, are the resources used to acquire or construct capital assets. These costs are projected for the rate-setting period based on the CIP developed in the Plan along with the City’s bond covenants and utility policy. Based on cost and planning information provided through the engineering analysis, a financial model was developed for this analysis. The analysis is based on the following planning assumptions:

- **General inflation** is assumed to be 3.0% per year.
- **Capital financing** is done through the issuance of 20 year senior lien revenue bonds. By issuing the bonds, the City will impose and collect user fees and charges necessary to generate revenues from secondary system users that will be sufficient at all times to provide for the operational costs of the program as well as the capital needs and to provide net revenues not less than 1.25 times annual debt service. The planning related assumptions for the issuance of the bonds are as follows:
 - Interest rate.....3.5%
 - Issuance costs 1.0% of amount borrowed
 - Reserve requirement.... .1 year’s maximum annual debt service; included in borrowing
- **Operations and maintenance expenses** have been estimated through the engineering analysis. These costs include power and purchased water expense from the JVWCD. Future O&M expenditures are adjusted for inflation to correctly reflect future revenues required from rates.
- **Construction costs** have been estimated through the engineering analysis and inflated at 3% per year. The CIP (current dollars) and schedule for the two alternatives are summarized below:

CIP - Alternative 1		CIP – Alternative 2	
2015	\$500,000	2015	\$500,000
2016	\$7,396,670	2016	\$2,294,670
2017	\$7,192,000	2017	\$3,385,500
2018	\$7,192,000	2018	\$3,385,500
2019	\$7,622,509	2019	\$3,664,092
2020	\$4,399,704	2020	\$2,018,888
2021	\$7,999,688	2021	\$1,357,233
2022	\$7,999,687	TOTAL	\$16,605,883
2023	\$5,303,070		
2024	\$3,496,722		
2025	\$6,601,949		
2026	\$6,601,949		
TOTAL	\$72,305,948		

- Customer and Demand Data.** Tables VI-5 and VI-6 contain the drivers for estimating demand based on the number of connections, irrigated acreage and water use. These annual estimates have been incorporated into the financial model to establish the basis for the rate in each year of the forecast period (through 2060). These figures have not been adjusted for growth/inflation, and are direct inputs to the demand schedule provided through the engineering analysis.

Rate Approaches

As mentioned above, the Plan identifies a number of drivers that reflect demand on the proposed secondary water system. Given the “order of magnitude” direction from the City, each of these drivers has been evaluated opposite the revenues required from rates for the two alternatives. In addition, the City is metering their secondary water connections and is interested in evaluating the efficacy of applying a “typical” culinary water rate structure. This would combine both a fixed and variable component to determine the overall rate. This rate structure is evaluated in this analysis by applying the fixed portion of the rate using the number of connections and the variable or use portion of the rate is based on water used. Again, the fixed charge is a function of debt service expense and coverage requirements while the variable portion is based on O&M and water purchase expense. This is a very simplistic approach toward rate design but consistent with the City’s desire to get an “order of magnitude” financial evaluation prior to launching into a comprehensive rate and impact fee study. This financial analysis does not forecast or account for any secondary water development impact fees. If the City were to establish a secondary water impact fee, the cash collected from such fees could be applied to future capital costs providing future capacity to the system.

Alternative 1 - \$72.3 Million CIP

Figure VI-1 illustrates the monthly rate forecast for the various drivers under a fixed rate structure.

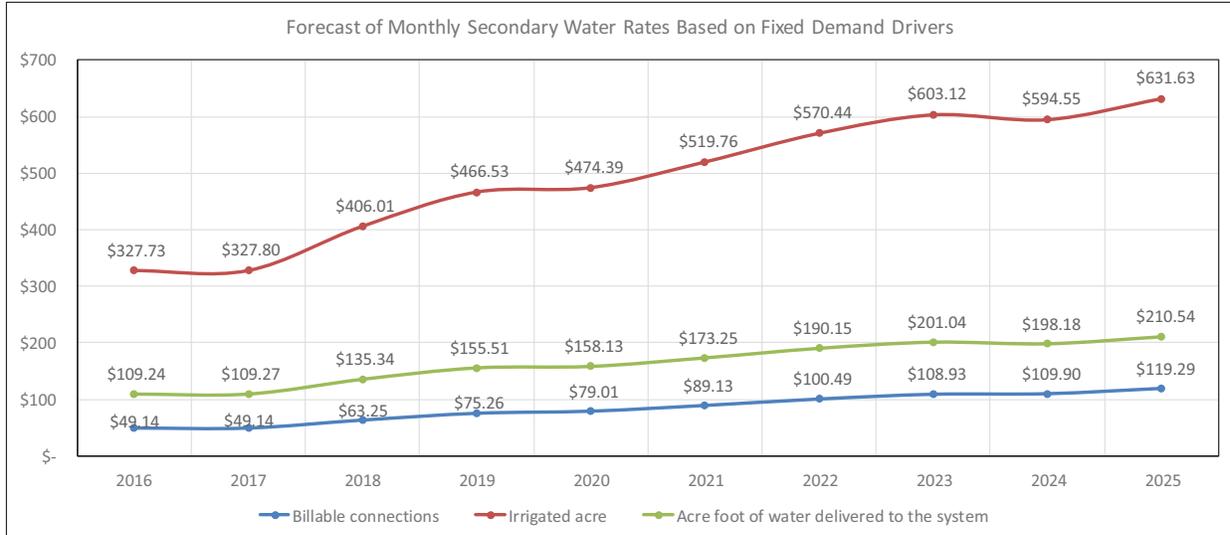


FIGURE VI-1 – ALTERNATIVE 1 FORECAST OF MONTHLY SECONDARY WATER RATES BASED ON FIXED DEMAND DRIVERS

Figure VI- 2 illustrates the forecast for a combined fixed and variable rate. The sum of the two rate elements would equal the total monthly bill:

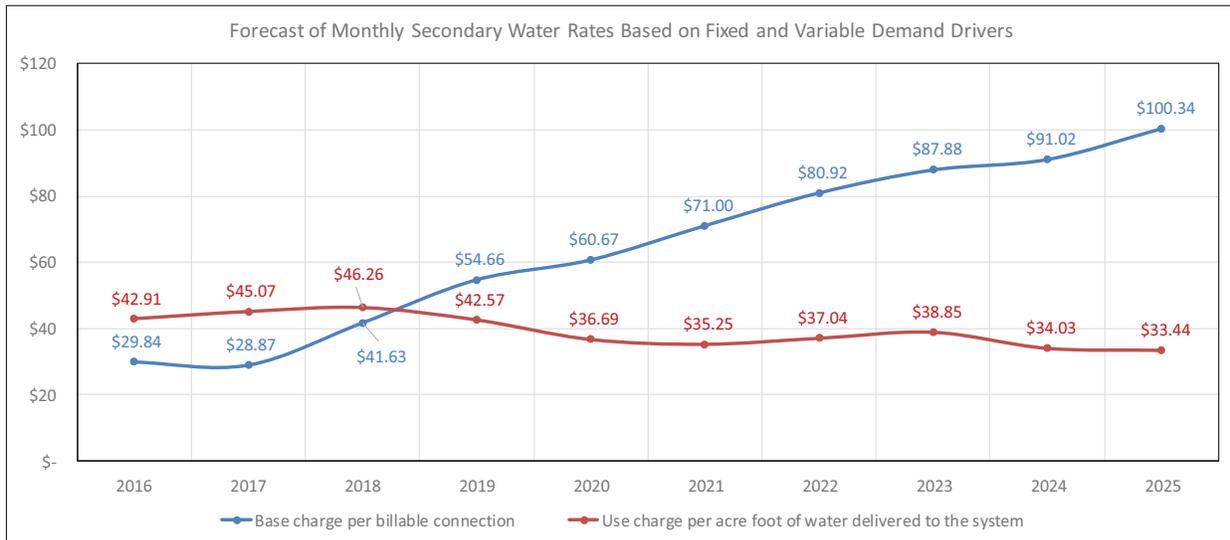


FIGURE VI-2 – ALTERNATIVE 1 FORECAST OF MONTHLY SECONDARY WATER RATES BASED ON FIXED AND VARIABLE DEMAND DRIVERS

Table VI-7 is a summary of the annual Alternative 1 revenue requirements of the secondary water utility that result in the rate profiles shown in Figures VI-1 and VI-2.

**TABLE VI-7
ALTERNATIVE 1 PROJECTION OF SECONDARY WATER OPERATING FUND REVENUE REQUIREMENTS AND DERIVATION OF MONTHLY RATES**

	Forecast											
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	
<i>Gross revenues required from rates:</i>												
Operations and maintenance expense	\$ -	\$ 494,835	\$ 1,043,334	\$ 1,150,411	\$ 1,132,357	\$ 1,041,655	\$ 1,060,701	\$ 1,177,809	\$ 1,300,989	\$ 1,201,338	\$ 1,237,027	
Operating fund capital outlays - small works	-	-	-	-	-	-	-	-	-	-	-	
Transfers to other funds excluding capital projects fund	-	-	-	-	-	-	-	-	-	-	-	
Debt service	30,604	611,584	1,183,874	1,758,375	2,376,511	2,713,188	3,262,682	3,818,799	4,256,263	4,521,171	5,108,188	
Revenue bond coverage requirement	-	152,896	295,968	439,594	594,128	678,297	815,671	954,700	1,064,066	1,130,293	1,277,047	
(Use)/Replacement of Operating Fund balance	-	-	-	-	-	-	-	-	-	-	-	
Subtotal gross revenues required from rates	30,604	1,259,315	2,523,177	3,348,380	4,102,995	4,433,140	5,139,053	5,951,308	6,621,317	6,852,802	7,622,262	
<i>Revenue offsets to cost of service:</i>												
Intergovernmental	-	184	3,670	7,103	10,550	14,259	16,279	19,576	22,913	25,538	27,127	
Investment income	600	60	827	1,703	2,241	2,805	2,675	3,369	3,697	4,082	4,264	
Miscellaneous	-	-	-	-	-	-	-	-	-	-	-	
Subtotal revenue offsets to cost of service	600	244	4,497	8,806	12,791	17,065	18,954	22,945	26,610	29,619	31,391	
<i>Revenues required from rates on a cash flow basis</i>	\$ 30,004	\$ 1,259,071	\$ 2,518,680	\$ 3,339,573	\$ 4,090,204	\$ 4,416,075	\$ 5,120,099	\$ 5,928,363	\$ 6,594,707	\$ 6,823,182	\$ 7,590,871	
<i>Summary of Monthly Rate Options:</i>												
Fixed monthly rates based on:												
Billable connections	no connections	\$ 49.14	\$ 49.14	\$ 63.25	\$ 75.26	\$ 79.01	\$ 89.13	\$ 100.49	\$ 108.93	\$ 109.90	\$ 119.29	
Irrigated acre	no irrigated acres	\$ 327.73	\$ 327.80	\$ 406.01	\$ 466.53	\$ 474.39	\$ 519.76	\$ 570.44	\$ 603.12	\$ 594.55	\$ 631.63	
Acre foot of water delivered to the system	no acre feet	\$ 109.24	\$ 109.27	\$ 135.34	\$ 155.51	\$ 158.13	\$ 173.25	\$ 190.15	\$ 201.04	\$ 198.18	\$ 210.54	
Fixed and variable monthly rates based on:												
Base charge per billable connection	no connections	\$ 29.84	\$ 28.87	\$ 41.63	\$ 54.66	\$ 60.67	\$ 71.00	\$ 80.92	\$ 87.88	\$ 91.02	\$ 100.34	
Use charge per acre foot of water delivered annually to the system	no acre feet	\$ 42.91	\$ 45.07	\$ 46.26	\$ 42.57	\$ 36.69	\$ 35.25	\$ 37.04	\$ 38.85	\$ 34.03	\$ 33.44	

Alternative 2 - \$16.6 Million CIP

Figure VI-3 summarizes the rates for the Alternative 2 using the fixed rate structures.

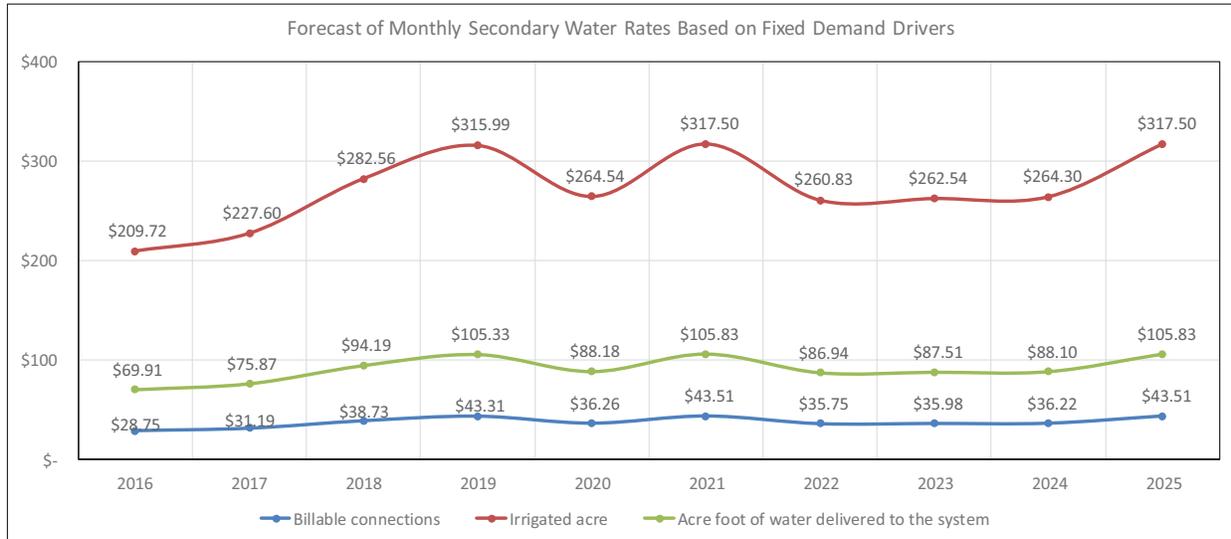


FIGURE VI-3 – ALTERNATIVE 2 FORECAST OF MONTHLY SECONDARY WATER RATES BASED ON FIXED DEMAND DRIVERS

Figure VI-4 overlays the rates required for Alternative 2 using a combination of fixed and variable rates. The sum of the two rate elements would equal the monthly bill.

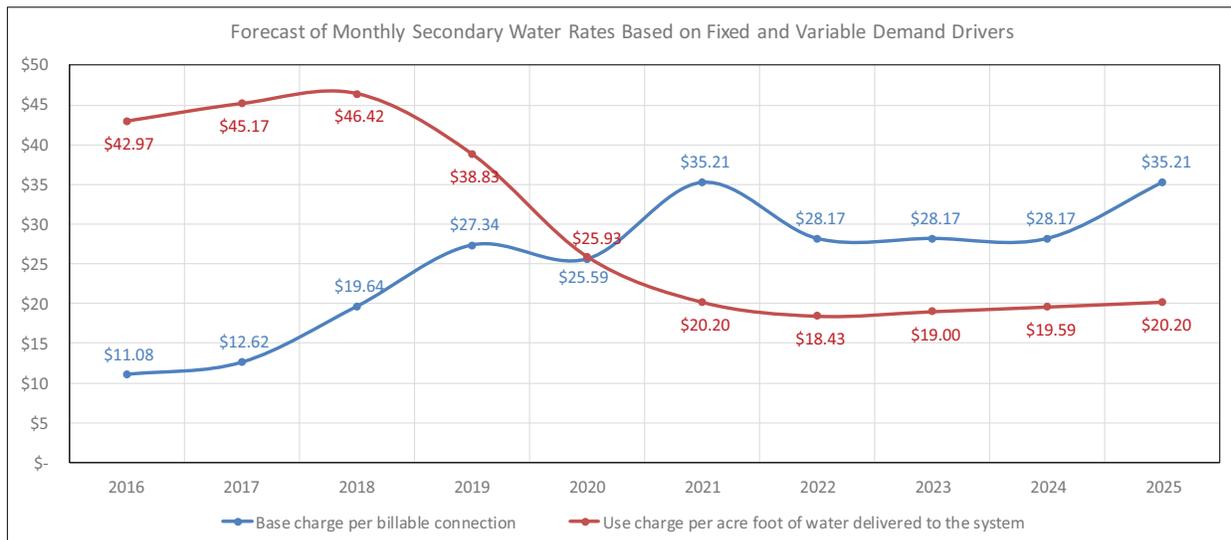


FIGURE VI-4 – ALTERNATIVE 2 FORECAST OF MONTHLY SECONDARY WATER RATES BASED ON FIXED AND VARIABLE DEMAND DRIVERS

Table VI-8 is a summary of the annual revenue requirements of the secondary water utility that result in the rate profiles shown in Figures VI-3 and VI-4.

**TABLE VI-8
ALTERNATIVE 2 PROJECTION OF SECONDARY WATER OPERATING FUND REVENUE REQUIREMENTS AND DERIVATION OF MONTHLY RATES**

	Forecast										
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
<i>Gross revenues required from rates:</i>											
Operations and maintenance expense	\$ -	\$ 425,776	\$ 896,195	\$ 923,081	\$ 774,565	\$ 521,161	\$ 408,626	\$ 376,515	\$ 387,810	\$ 399,445	\$ 411,428
Operating fund capital outlays - small works	-	-	-	-	-	-	-	-	-	-	-
Transfers to other funds excluding capital projects fund	-	-	-	-	-	-	-	-	-	-	-
Debt service	32,517	213,347	486,232	756,649	1,053,427	1,232,493	1,356,485	1,356,485	1,356,485	1,356,485	1,356,485
Revenue bond coverage requirement	8,129	53,337	121,558	189,162	263,357	-	339,121	-	-	-	339,121
(Use)/Replacement of Operating Fund balance	-	-	-	-	-	-	-	-	-	-	-
Subtotal gross revenues required from rates	40,646	692,461	1,503,985	1,868,892	2,091,349	1,753,654	2,104,232	1,733,000	1,744,295	1,755,929	2,107,034
<i>Revenue offsets to cost of service:</i>											
Intergovernmental	-	195	1,280	2,917	4,540	6,321	7,395	8,139	8,139	8,139	8,139
Investment income	600	199	519	1,098	1,243	1,353	1,353	3,388	3,388	3,388	3,388
Miscellaneous	-	-	-	-	-	-	-	-	-	-	-
Subtotal revenue offsets to cost of service	600	394	1,799	4,015	5,783	7,674	8,748	11,527	11,527	11,527	11,527
<i>Revenues required from rates on a cash flow basis</i>	\$ 40,046	\$ 692,067	\$ 1,502,187	\$ 1,864,877	\$ 2,085,566	\$ 1,745,980	\$ 2,095,484	\$ 1,721,473	\$ 1,732,768	\$ 1,744,403	\$ 2,095,507
<i>Summary of Monthly Rate Options:</i>											
Fixed monthly rates based on:											
Billable connections	no connections	\$ 28.75	\$ 31.19	\$ 38.73	\$ 43.31	\$ 36.26	\$ 43.51	\$ 35.75	\$ 35.98	\$ 36.22	\$ 43.51
Irrigated acre	no irrigated acres	\$ 209.72	\$ 227.60	\$ 282.56	\$ 315.99	\$ 264.54	\$ 317.50	\$ 260.83	\$ 262.54	\$ 264.30	\$ 317.50
Acre foot of water delivered to the system	no acre feet	\$ 69.91	\$ 75.87	\$ 94.19	\$ 105.33	\$ 88.18	\$ 105.83	\$ 86.94	\$ 87.51	\$ 88.10	\$ 105.83
Fixed and variable monthly rates based on:											
Base charge per billable connection	no connections	\$ 11.08	\$ 12.62	\$ 19.64	\$ 27.34	\$ 25.59	\$ 35.21	\$ 28.17	\$ 28.17	\$ 28.17	\$ 35.21
Use charge per acre foot of water delivered annually to the system	no acre feet	\$ 42.97	\$ 45.17	\$ 46.42	\$ 38.83	\$ 25.93	\$ 20.20	\$ 18.43	\$ 19.00	\$ 19.59	\$ 20.20

Summary

Alternative 1 – Rates for secondary water will be driven by debt service and coverage requirements. On a future dollars basis, this alternative assumes the City will have to borrow \$81,123,230 between 2015 and 2026. By the end of the construction period (i.e., 2026) the City will be facing principal and interest charges of \$5,707,918 per year. In order to fund the capital improvement plan, borrowings will occur in each of these years. From a ratemaking perspective, the use of long term debt for the buildout of the system is the only financially prudent alternative. A pay-as-you go strategy for the construction of the system is not feasible.

An additional burden on the secondary water system revenue requirements will come from the added cost of purchased water from JVVCD. This alternative assumes the City will be purchasing JVVCD water to supply the secondary water system from 2016 through 2026. The projected total future cost of this purchased water is \$7,174,906. All of this cost is an operating expense to the utility, and must be completely funded from secondary water rates.

Alternative 2 – Although considerably less expensive than Alternative 1, the rates for alternative 2 will also be driven by debt service and coverage requirements. The modeling assumes the City will be bonding in every year over the construction horizon of 2015 through 2021. Total future borrowings over this time frame amount to \$19,278,908. By the end of 2021, the City will be facing annual principal and interest expense of \$1,356,485. Due to the recurring annual demand for capital to fund the construction of the system, the use of long term debt is the only viable funding option for this system alternative.

As in the case of Alternative 1, this alternative is reliant on purchased water from JVVCD albeit to a lesser extent. Alternative 2 assumes the system will be purchasing water from JVVCD from 2016 through 2021; half as long as Alternative 1. The projected total future purchased water costs in this alternative amount to \$3,149,097.

CHAPTER VII

RECOMMENDATIONS

As the City of West Jordan moves forward with implementing a secondary water system, these recommendations are provided to assist the City in developing policies and procedures.

Water Rights

West Jordan does not currently hold enough water rights to operate the secondary water system. A plan will need to be developed for securing additional water rights or canal shares. As a consideration in water rights acquisition, it would be most beneficial to acquire water shares in the Welby Canal or to acquire other water shares or water rights that can be exchanged for Welby Canal shares.

Development Standards

Development standards are needed for secondary water system facilities. These would include standards for facilities that would be constructed by developers of new subdivisions. An ordinance is needed to require developers of new subdivisions to install secondary water pipes and service connections. The service connections should provide for installation of water meters. All new secondary water pipes should be pressurized so that any damage caused by new construction can be detected. If non-potable water sources are not yet available, the secondary water pipes should be pressurized through RPZ connections to the drinking water system until non-potable water becomes available.

Backflow Prevention

Existing backflow prevention ordinances need to be reviewed and revised as needed to reduce the risk of cross connections between the drinking water system and the secondary water system. Because of the proposed future use of recycled wastewater in the system, swing-type connections which allow sprinklers to switch back and forth between the drinking water system and the secondary water system are not recommended. Furthermore, a policy requiring inspection of each sprinkler system connection to the secondary water system is recommended to ensure that sprinklers are not cross connected to both systems.

Water Meters

Due to the expected high cost of water from the secondary water system, water meters are highly recommended to eliminate excessive water use and to ensure that the City recovers costs for operating the system. The cost of individual water meters is not included in the cost estimate for future growth areas. It is anticipated that the City will charge a connection fee to cover the cost of installing the meter.

Water Rates

Although general information is provided in this report regarding potential water rate structures, this information is provided for planning purposes only. A more detailed water rate study will be required for rate setting. Because approximately 70 percent of the capital costs for Alternative 1 are for future development, assessing impacts fees would provide an alternative means of recovering sunk costs for excess capacity or as a means of funding future capital projects. By

assessing impact fees the City could significantly reduce the fixed demand component of the monthly user fee.

Water Conservation

The City's water conservation plan should be reviewed to identify any new water conservation measures or considerations that should be included that would be directly related to a secondary water system.

Public Education

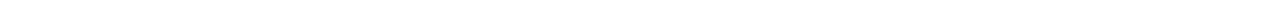
A public education program will be needed to help residents understand health and safety issues related to a secondary water system. The plan should also help education residents on water conservation practices.

REFERENCES

- City of West Jordan. (2012). *Comprehensive General Plan 2012, West Jordan, Utah*. West Jordan.
- Hansen, Allen & Luce. (2015). *West Jordan City Drinking Water System Master Plan Update*. Midvale.
- Hansen, Allen & Luce, Inc. (2001). *West Jordan City Secondary Water System Master Plan*. Midvale.
- MWH. (2005). *City of West Jordan, Utah Final Water Resources Update Report*. Salt Lake City.
- MWH. (2006). *City of West Jordan Secondary Water Master Plan Update*. Salt Lake City.
- MWH. (2006, April 20). Secondary Water Design Criteria Technical Memorandum.

APPENDIX A

Design Criteria



**MWH**
MONTGOMERY WATSON HARZA

To: Roger Payne**Date:** April 20, 2006**Subject:** The City of West Jordan's Secondary Water Design Criteria**From:** Stan Postma**Job No:** 1710633.011802

PURPOSE

The purpose of this technical memorandum (TM) is to define the criteria that will be used to design future facilities for the City of West Jordan's secondary water system. The design criteria table was developed and presented to the City in a meeting held on March 27, 2006. The City's comments were addressed and the final design table is included in this memorandum as Table 1.

CRITERIA DEVELOPMENT

This TM discusses criteria that cover requirements for piping, pumping, and storage facilities for the West Jordan's secondary water system. A summary of the criteria and associated references are provided in Table 1 at the end of this document. The criteria herein are based on adopted state and local regulations, and industry standards. Where not otherwise established, criteria are based on engineering experience. Table 1 shows the design criteria, the value or description of the design criteria, and the reference used to develop the design criteria.

In the discussions that follow, the performance criteria has been addressed:

- Demand Conditions Criteria
- Distribution System Criteria
- Service Connection Criteria
- Pumping Criteria
- Storage Criteria
- Supply Criteria

DEMAND CONDITIONS CRITERIA

The demand conditions criteria include the percentage of total acreage estimated to be irrigated, the demand unit use factors, and the operations of the system. The demand conditions used to evaluate the secondary water facilities are based on the percentage of the total acreage estimated to be irrigated. The percentage of total acreage estimated to be irrigated for each land use type were derived in the West Jordan City Report [1]. A demand use factor will be applied to the irrigated acreage to calculate an average yearly demand, maximum day demand, and peak hour demand. The demand factors will be 3 acre-feet per irrigated area for average yearly demand [2], 3.96 gallon per minute (gpm) per irrigated acre for maximum day demand [3], and 7.92 gpm per irrigated acre for peak

hour demand [3]. The secondary water system will operate approximately 6 months out of the year (approximately April 15 to October 15) and customers will be required to water between 6:00 p.m. and 6:00 a.m.

DISTRIBUTION SYSTEM CRITERIA

The distribution system criteria to be addressed pertain to diameter, Hazen-Williams Friction Coefficients (C), distribution system pressure, and velocity.

Diameter

The City has adopted a minimum diameter of six (6) inches for new construction or replacement. The City will allow diameters of less than six (6) inches where the secondary water line is existing or is already planned. Pipes with diameters less than or equal to twelve (12) inches will be PVC or HDPE. Pipes with diameters greater than twelve (12) inches will be DIP.

Hazen-Williams Friction Coefficient

The Hazen-Williams equation will be used for hydraulic calculations. PVC and HDPE pipe will have C factor of 140 [4], and Ductile Iron Pipe will have a C factor of 130 [5].

Pressure

Pressure criteria include minimum and maximum pressures. The system will be designed to maintain a minimum pressure of 50 psi at all points in the distribution system under all flow conditions [6,7]. The maximum pressure that will be allowed in the system will be 120 psi [2].

Velocity

There are no regulations governing velocity of flow in pipes. Criteria for evaluation and design are provided by way of recommendation rather than requirement. For design or sizing of recommended pipe improvements, a maximum velocity of 5 feet per second (fps) under maximum day conditions [8], and a maximum velocity of 8 fps under peak hour conditions is recommended [1,7].

SERVICE CONNECTION CRITERIA

The secondary water service connections will be sized to meet two sets of criteria. The first set of criteria is based on the size of the parcel or estimated secondary demand of large irrigated areas. The second set of criteria is based on the maximum flow allowed for each connection.

Service Connection Size

Service connections will be sized according to the size of the parcel or estimated secondary demand of large irrigated areas. Residential parcels less than three-fourths

SECONDARY WATER DESIGN CRITERIA TECHNICAL MEMORANDUM

(3/4) an acre will be serviced by a one (1) inch service connection. Residential parcels between three-fourths (3/4) and one-and-a-half (1 1/2) acre will be serviced by a one-and-a-quarter (1 1/4) inch service connection. Residential parcels greater than one-and-a-half (1 1/2) acre will be serviced by a one-and-a-half (1 1/2) inch service connection. Non-residential parcels will be serviced by a two (2) inch service connection. Service connections to parks or other large irrigated areas shall be designed to not exceed 6.7 feet per second to meet the distribution criteria with the maximum pipe size of six (6) inches [2, 7].

Maximum Flow per Connection

The service connection will also meet the maximum flow criteria established in Table 1. The flow for each service connection size was calculated by using the maximum velocity of 6.7 fps.

Pumping Criteria

All pump stations should have sufficient capacity to supply maximum day water demands without dangerous overloading (within safe operating range of the pump) [6]. All pump stations must be equipped with at least two pumps. The pump station must be able to provide the maximum pumping demand with one of the pumps out of service [5].

Storage Criteria

Storage capacity requirements include provisions for operational storage only. The required operational storage is the maximum day demand on the system sustained over a 24-hour period [1, 2].

Supply Criteria

Supply sources are required to provide the average of maximum day demand to the distribution system [2].

SECONDARY WATER DESIGN CRITERIA TECHNICAL MEMORANDUM

Table 1. Secondary Water Design Criteria

CRITERIA	VALUE/DESCRIPTION	REFERENCE
DEMAND CONDITIONS CRITERIA		
Percentage of total acreage estimated to be irrigated		
Rural Residential	90%	[1]
Low Density Residential	75%	[1]
Medium Density Residential	60%	[1]
High Density Residential	50%	[1]
Multi-family Residential	40%	[1]
Open Space	90%	[1]
Parks-Active Recreational	90%	[1]
Commercial Retail	10%	[1]
Public Facilities	25%	[1]
Industrial	10%	[1]
Enterprise Park	10%	[1]
Professional Office	20%	[1]
Large Users	From City Data	
Demand Unit Use Factors		
Average Yearly Demand	3 (AF/irrigated acre)	[2]
Maximum Day Demand	3.96 (gpm/irrigated acre)	[3]
Peak Hour Demand	7.92 (gpm/ irrigated acre)	[3]
Operational		
Irrigation Season	6 months	[2]
Irrigation Period	6 p.m. to 6 a.m.	[2]
DISTRIBUTION SYSTEM CRITERIA		
Minimum pipe size	6 (inch) (<6 special cases: existing or already planned)	[1]
Hazen-Williams Friction Coefficient, C		
PVC Pipe/ HDPE	140	[4] [5] [6]
Ductile Iron Pipe, Cement lined (>12")	130	[4] [5]
Distribution System Pressure		
Minimum pressure	50 (psi)	[6] [7]
Maximum pressure	120 (psi)	[2]
Velocity		
Maximum Day Velocity <18"	5 (fps)	[8]
Peak Hour Velocity	8 (fps)	[1] [7]
SERVICE CONNECTION CRITERIA		
Service Connection size		
< 3/4 acre parcel	1 (inch)	[2]
3/4 to 1 1/2 acre parcel	1 1/4 (inch)	[2]
> 1 1/2 acre parcel	1 1/2 (inch)	[2] [7]
Other land use	2 (inch)	[2] [7]
Parks, etc.	Calculate size for special conditions (maximum service connection is 6 inches)	
Maximum Flow Per Service Connection-Based on velocity of 6.7 ft/ sec		
1 inch Service	16 (gpm)	
1 1/4 inch Service	25 (gpm)	
1 1/2 in Service	36 (gpm)	
2 inch Service	65 (gpm)	
PUMPING CRITERIA		
	Maximum Day Demand One standby pump required	[5] [6]
STORAGE CRITERIA		
	Maximum day demand for 24 hrs	[1] [2]
SUPPLY CRITERIA		
	Average of Maximum Day Demand	[2]

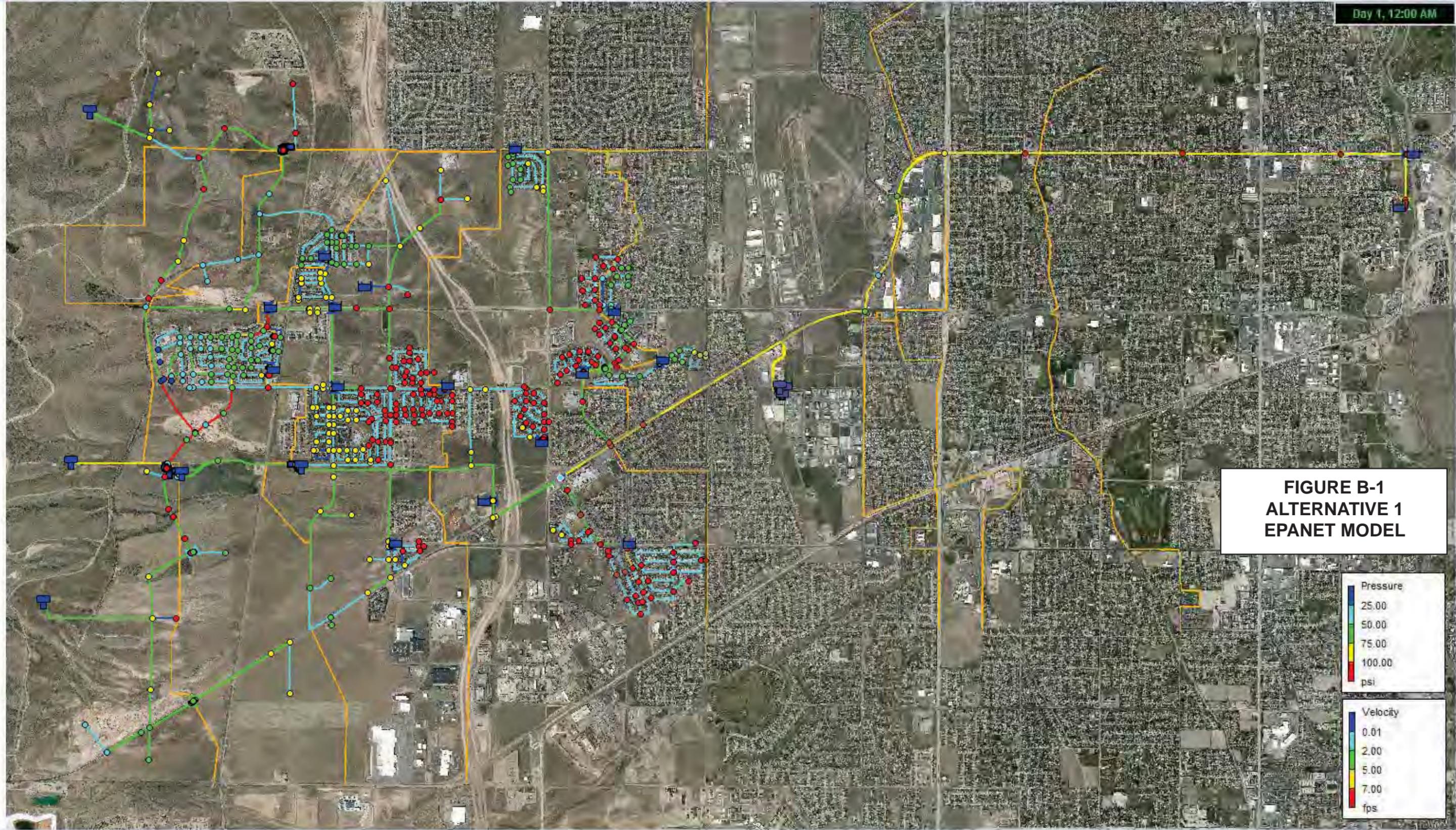
REFERENCES

1. Hansen Allen & Luce Inc., *West Jordan City Secondary Water System Master Plan*, 2001.
2. MWH, *Weber-Box Elder Conservation District Plain City/Farr West, Utah Irrigation System Master Plan*, 1997.
3. State of Utah. Utah Administrative Code, *Title R309-510 (Environmental Quality, Drinking Water. Facility Design and Operation: Minimum Sizing Requirements)*, 2006.
4. MWH Soft. Inc. *H₂OMAP Water: Users Guide*, 2004.
5. Great Lakes - Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers. *Recommended Standards for Water Works*, 2003.
6. CH2MHILL, *City of South Jordan Secondary Water System Master Plan*, 1999.
7. Brown & Root Services. *Cape Coral Utility Expansion Design Policies and Procedures*. Brown & Root Services, 2004.
8. American Water Works Association. *Manual of Water Supply Practices, Distribution Network Analysis for Water Utilities, AWWA Manual M32*, First Edition, 1989.

APPENDIX B

Alternative 1 EPANET Model





**FIGURE B-1
ALTERNATIVE 1
EPANET MODEL**

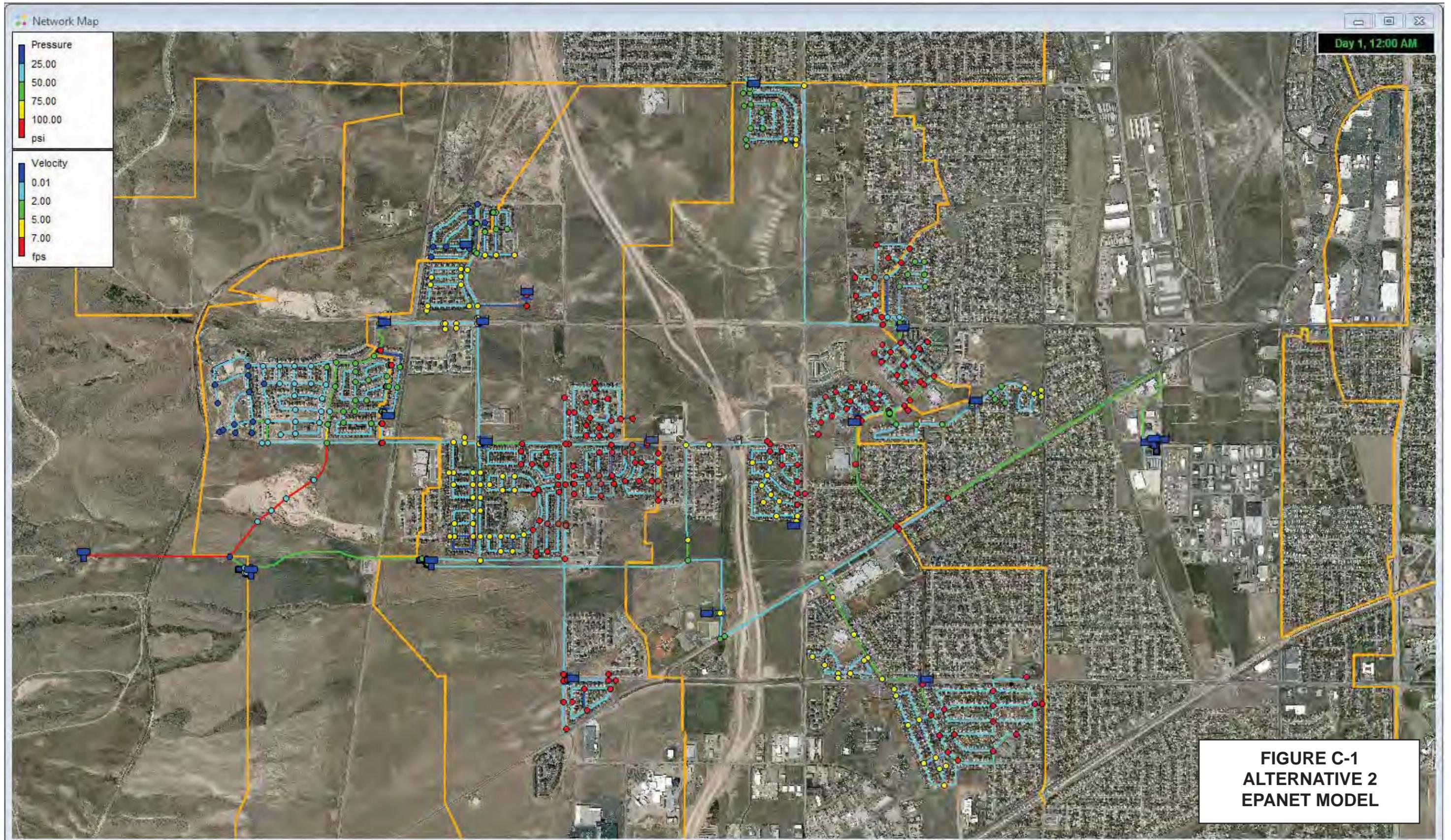
Pressure
25.00
50.00
75.00
100.00
psi

Velocity
0.01
2.00
5.00
7.00
fps

APPENDIX C

Alternative 2 EPANET Model





APPENDIX D

EPANET Model Output



SEE DISK



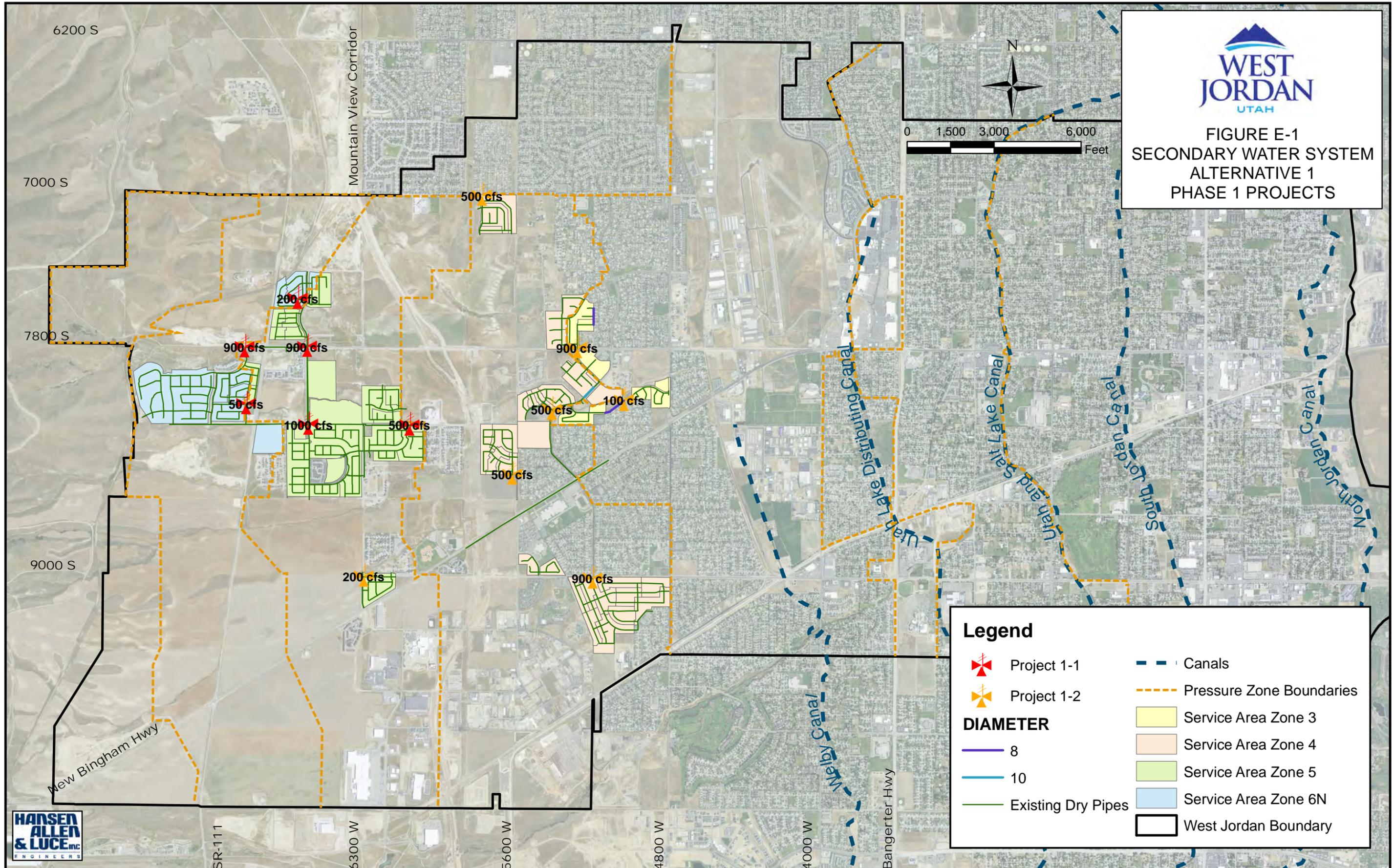
APPENDIX E

Maps of Alternative 1 Phases



**TABLE E-1
ALTERNATIVE 1 PROJECT DESCRIPTIONS**

Project ID	Project Description	Total Cost
1-1	RPZ 7-12 construction	\$ 406,000
1-2	RPZ 1-6 & 13 construction, install 1-1/2" PRV, install 1,346 L.F. of 8-inch pipe, install 466 L.F. of 10-inch pipe, and install Service Meters	\$ 2,388,670
2-1	15,842 L.F. of 24-inch Pipe	\$ 5,022,251
2-2	Install 1,033 L.F. of 6-inch pipe, install 4,651 L.F. of 8-inch pipe, install 2,060 L.F. of 10-inch pipe, install 1,435 L.F. of 12-inch pipe, install 1" PRV, and install 2-1/2" PRV	\$ 1,475,318
2-3	Welby Booster Pump	\$ 5,660,875
2-4	Zone 4 Pond	\$ 1,711,278
2-5	Steadman Well Redevelopment	\$ 286,551
2-6	Amiad Filter Station	\$ 227,125
3-1	Install 2,542 L.F. of 8-inch pipe, install 1,804 L.F. of 14-inch pipe, install 2,611 L.F. of 18-inch pipe, and install 5,375 L.F. of 24-inch pipe	\$ 3,015,462
3-2	Zone 5 Booster Pump	\$ 1,660,313
3-3	Zone 5 Pond	\$ 2,946,734
4-1	Install 4,143 L.F. of 10-inch pipe, install 1,153 L.F. of 12-inch pipe, install 1,476 L.F. of 18-inch pipe, and install 416 L.F. of 24-inch pipe	\$ 1,353,564
4-2	Zone 6 Booster Pump	\$ 1,132,750
4-3	Zone 6 Pond	\$ 1,913,389
5-1	Install 3,323 L.F. of 8-inch pipe, install 1,653 L.F. of 12-inch pipe, and install 731 L.F. of 14-inch pipe	\$ 905,487
5-2	Install 6,558 L.F. of 8-inch pipe, install 2,196 L.F. of 10-inch pipe, and install 1,400 L.F. of 14-inch pipe	\$ 1,541,040
5-3	Install 631 L.F. of 6-inch pipe, install 9,193 L.F. of 8-inch pipe, and install 1,739 L.F. of 12-inch pipe	\$ 1,703,941
5-4	Install 8,115 L.F. of 8-inch pipe	\$ 1,152,602
6-1	Install 1,605 L.F. of 8-inch pipe, install 545 L.F. of 12-inch pipe, install 7,380 L.F. of 14-inch pipe, and install 110 L.F. of 24-inch pipe	\$ 1,720,299
6-2	Install 5,297 L.F. of 8-inch pipe, install 3,698 L.F. of 12-inch pipe, and install 1,927 L.F. of 14-inch pipe	\$ 1,776,422
7-1	Install 784 L.F. of 6-inch pipe, install 1,172 L.F. of 8-inch pipe, install 9,722 L.F. of 16-inch pipe, install 267 L.F. of 18-inch pipe, and install 4" PRV	\$ 2,391,644
7-2	Install 3,474 L.F. of 10-inch pipe, and install 4,024 L.F. of 14-inch pipe	\$ 1,296,872
7-3	Install 6,043 L.F. of 8-inch pipe, install 2,970 L.F. of 10-inch pipe, install 2,063 L.F. of 12-inch pipe, install 3,619 L.F. of 18-inch pipe, and install 6" PRV	\$ 2,659,131
7-4	Install 2,539 L.F. of 6-inch pipe, install 4,410 L.F. of 8-inch pipe, install 2,592 L.F. of 10-inch pipe, and install 1,114 L.F. of 12-inch pipe	\$ 1,580,393
7-5	Zone 7 South Booster Pump	\$ 498,813
7-6	Zone 7 South Pond	\$ 3,043,922
7-7	Zone 7 North Booster Pump	\$ 340,688
7-8	Zone 7 North Pond	\$ 1,392,436
8-1	SVWRF Reuse Project, install 28,550 L.F. of 18-inch pipe, and construct Jordan River Wellhouse	\$ 15,999,375
	TOTAL	\$ 67,203,345



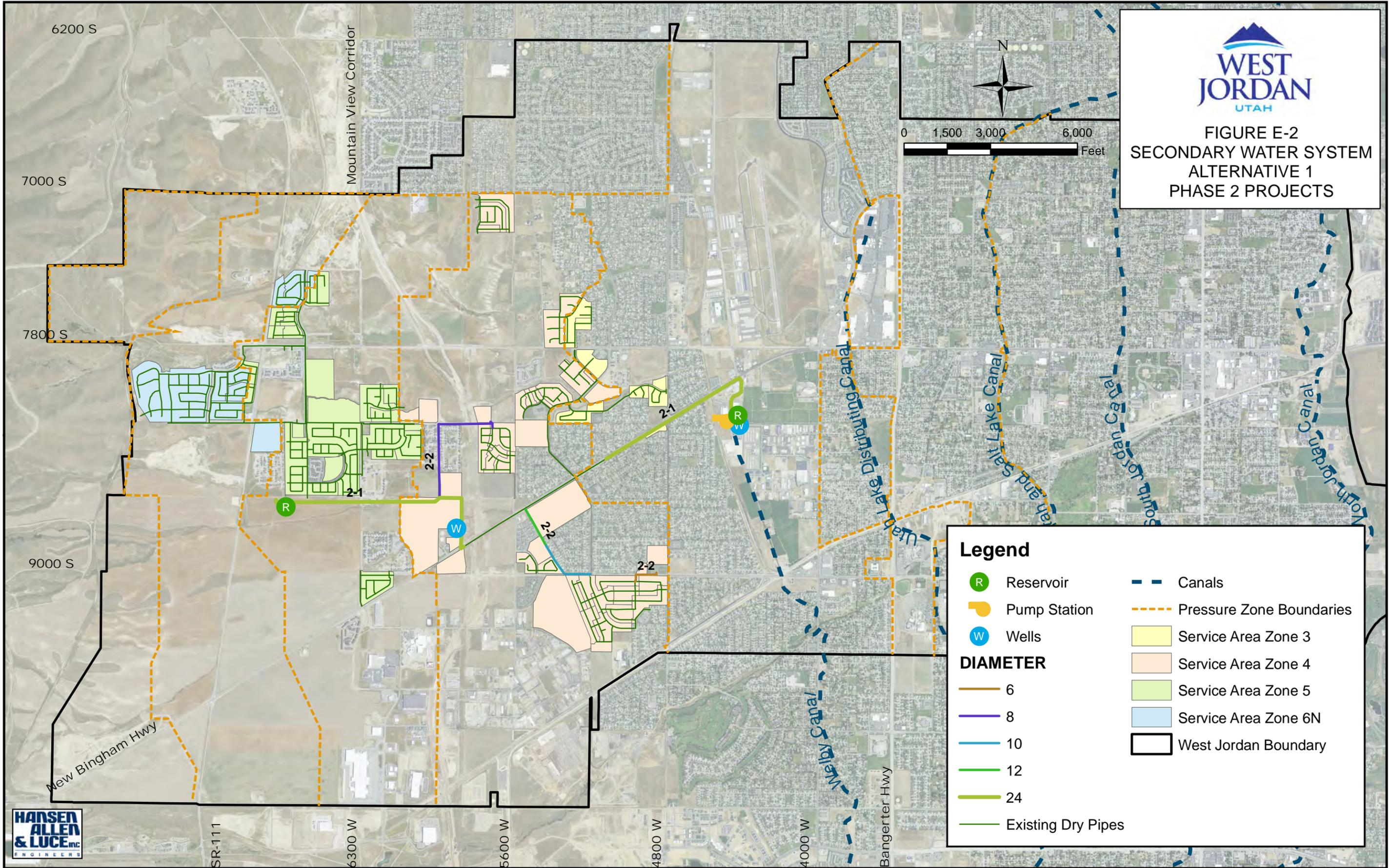
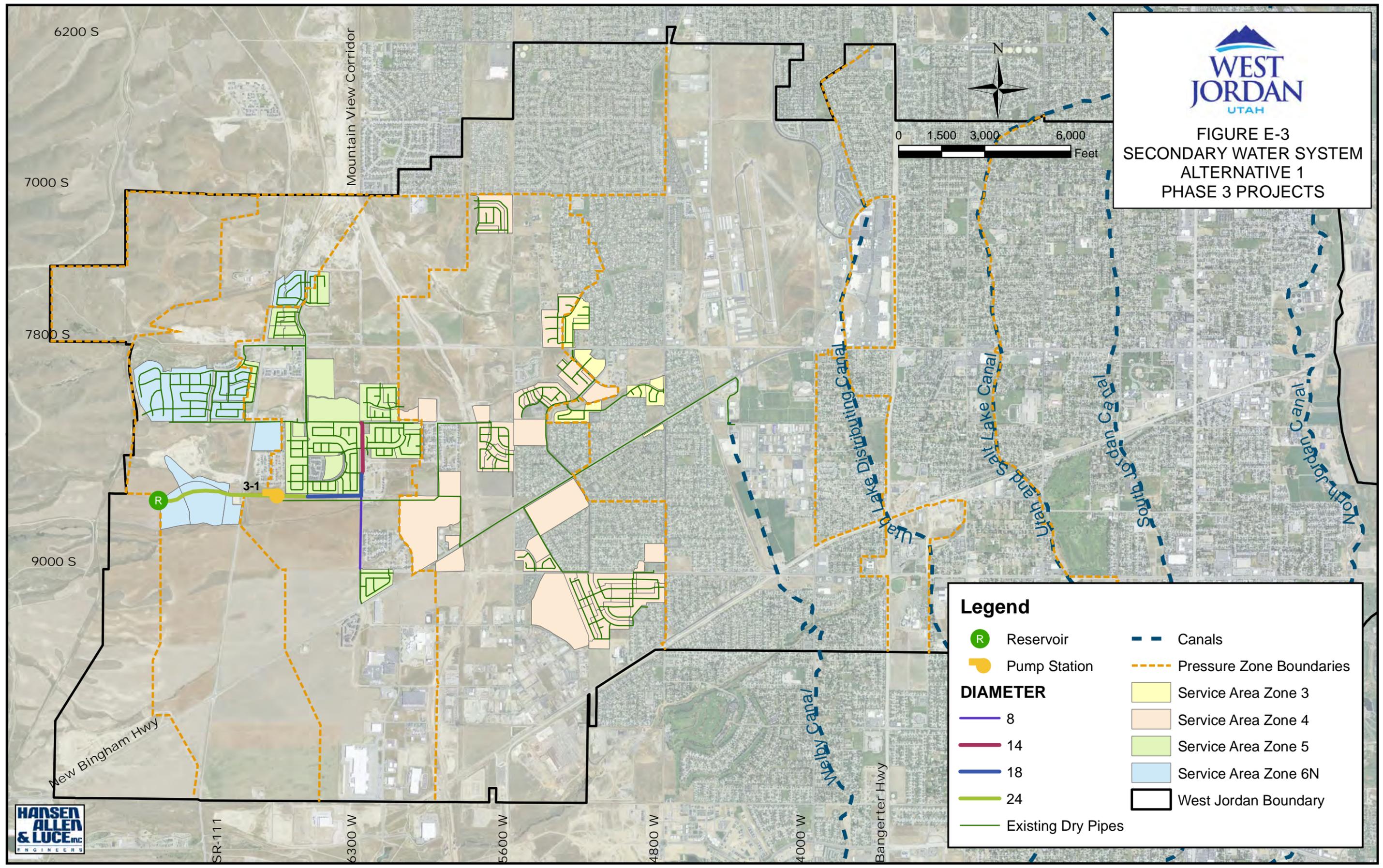




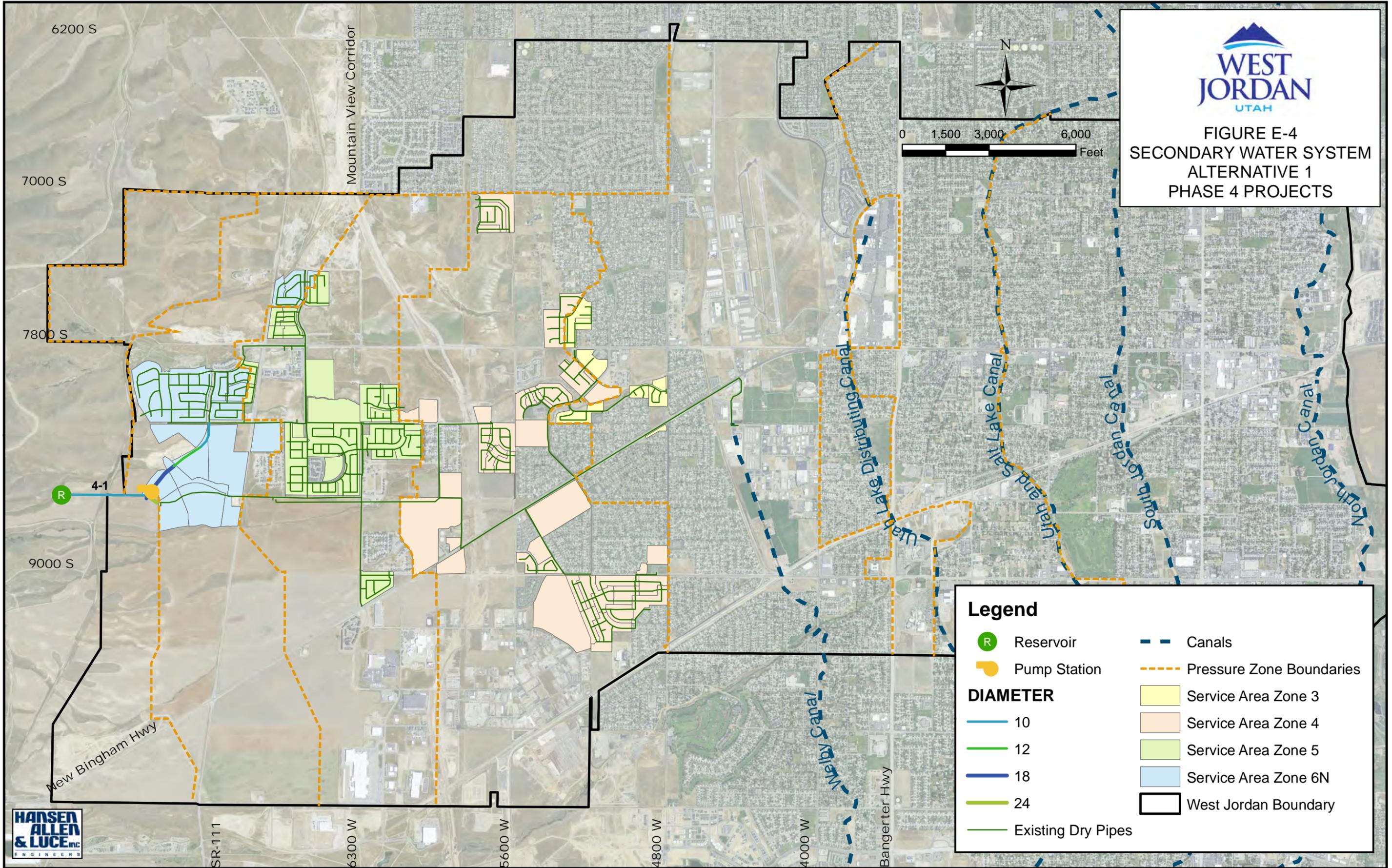
FIGURE E-3
SECONDARY WATER SYSTEM
ALTERNATIVE 1
PHASE 3 PROJECTS



Legend

	Reservoir		Canals
	Pump Station		Pressure Zone Boundaries
DIAMETER			Service Area Zone 3
	8		Service Area Zone 4
	14		Service Area Zone 5
	18		Service Area Zone 6N
	24		West Jordan Boundary
	Existing Dry Pipes		





**FIGURE E-4
SECONDARY WATER SYSTEM
ALTERNATIVE 1
PHASE 4 PROJECTS**

Legend

	Reservoir		Canals
	Pump Station		Pressure Zone Boundaries
DIAMETER			Service Area Zone 3
	10		Service Area Zone 4
	12		Service Area Zone 5
	18		Service Area Zone 6N
	24		West Jordan Boundary
	Existing Dry Pipes		



6200 S
7000 S
7800 S
9000 S
New Bingham Hwy
SR-111
6300 W
5600 W
4800 W
4000 W
Bangerter Hwy

Mountain View Corridor

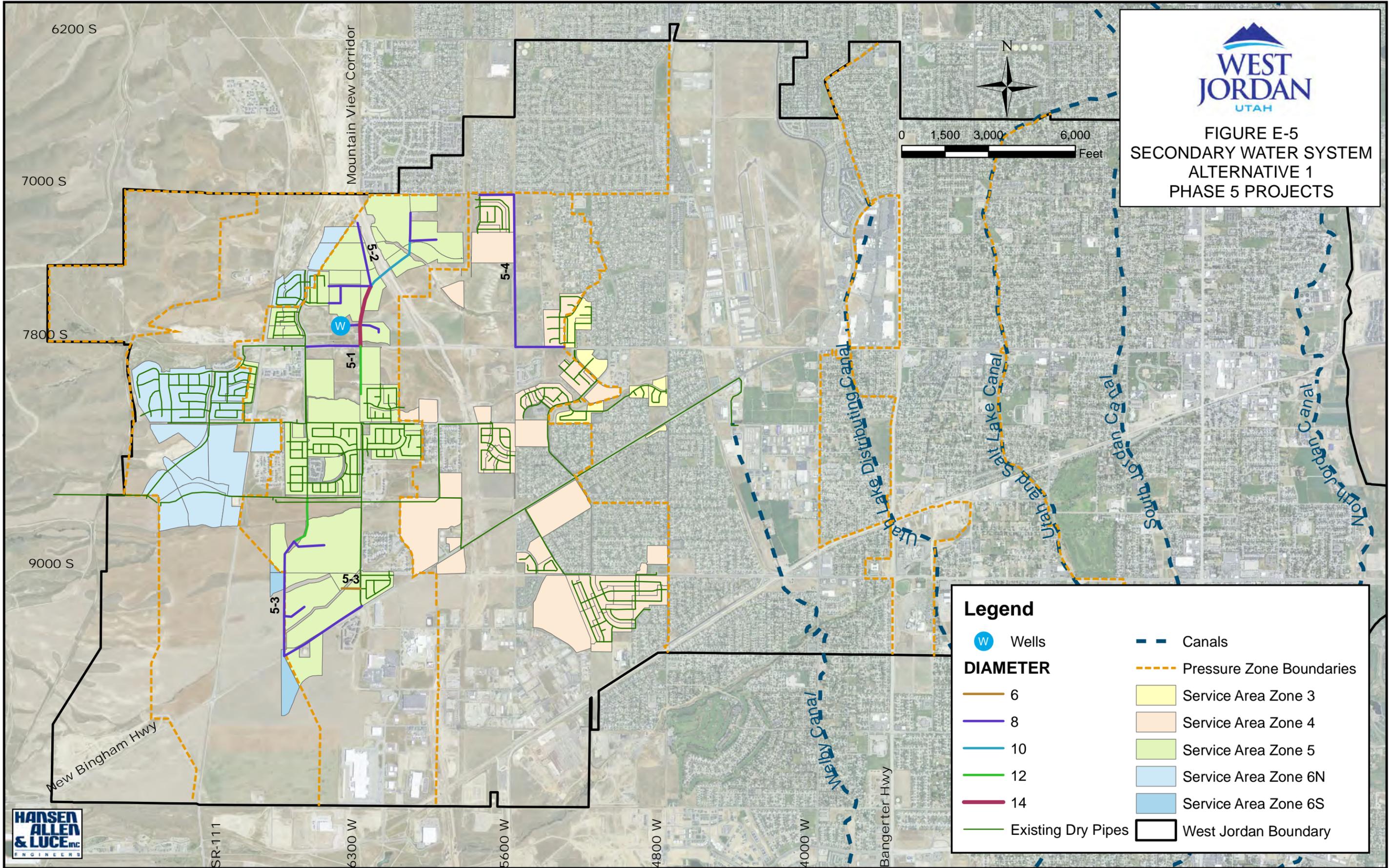
Utah Lake Distributing Canal

Utah and Salt Lake Canal

South Jordan Canal

North Jordan Canal

Melby Canal



**FIGURE E-5
SECONDARY WATER SYSTEM
ALTERNATIVE 1
PHASE 5 PROJECTS**

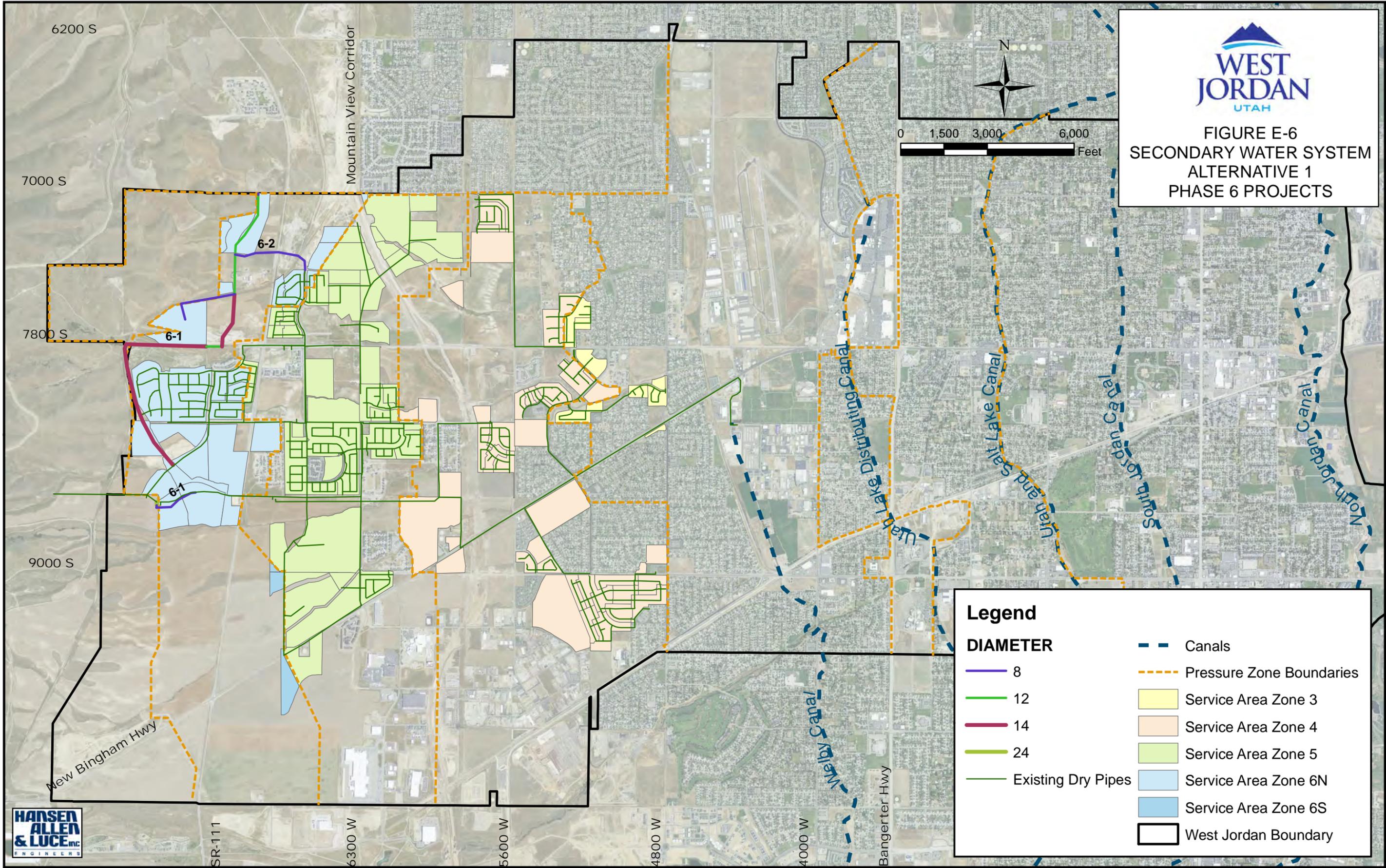
Legend

- W Wells
- Canals
- Pressure Zone Boundaries
- Service Area Zone 3
- Service Area Zone 4
- Service Area Zone 5
- Service Area Zone 6N
- Service Area Zone 6S
- West Jordan Boundary

DIAMETER

- 6
- 8
- 10
- 12
- 14
- Existing Dry Pipes



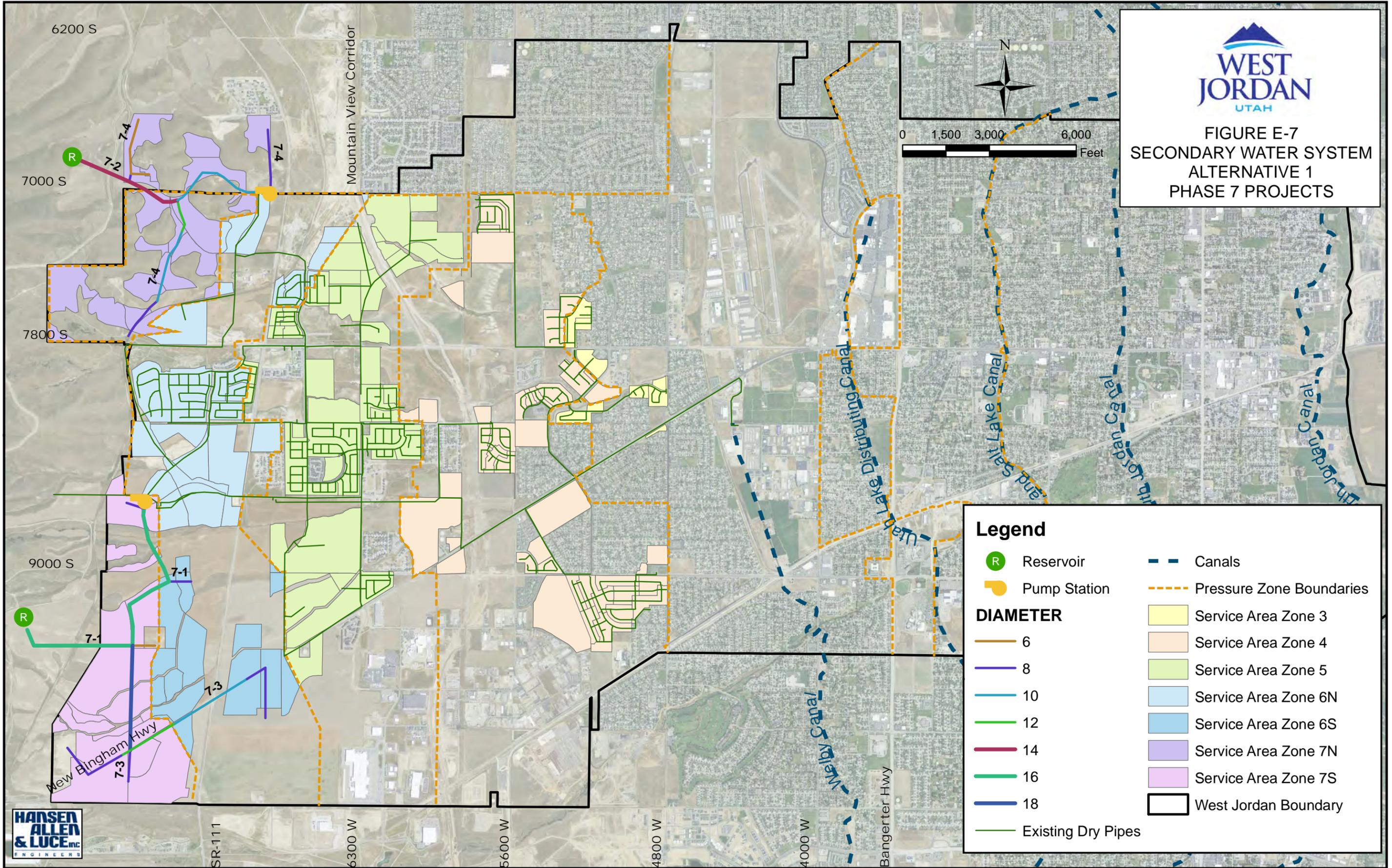


**FIGURE E-6
SECONDARY WATER SYSTEM
ALTERNATIVE 1
PHASE 6 PROJECTS**

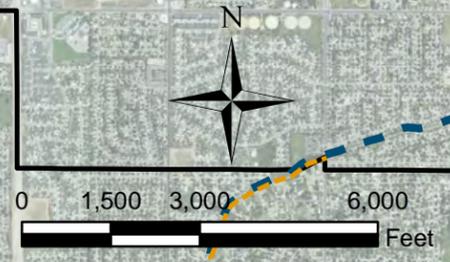
Legend

DIAMETER	— Canals
— 8	- - - Pressure Zone Boundaries
— 12	Service Area Zone 3
— 14	Service Area Zone 4
— 24	Service Area Zone 5
— Existing Dry Pipes	Service Area Zone 6N
	Service Area Zone 6S
	West Jordan Boundary





**FIGURE E-7
SECONDARY WATER SYSTEM
ALTERNATIVE 1
PHASE 7 PROJECTS**



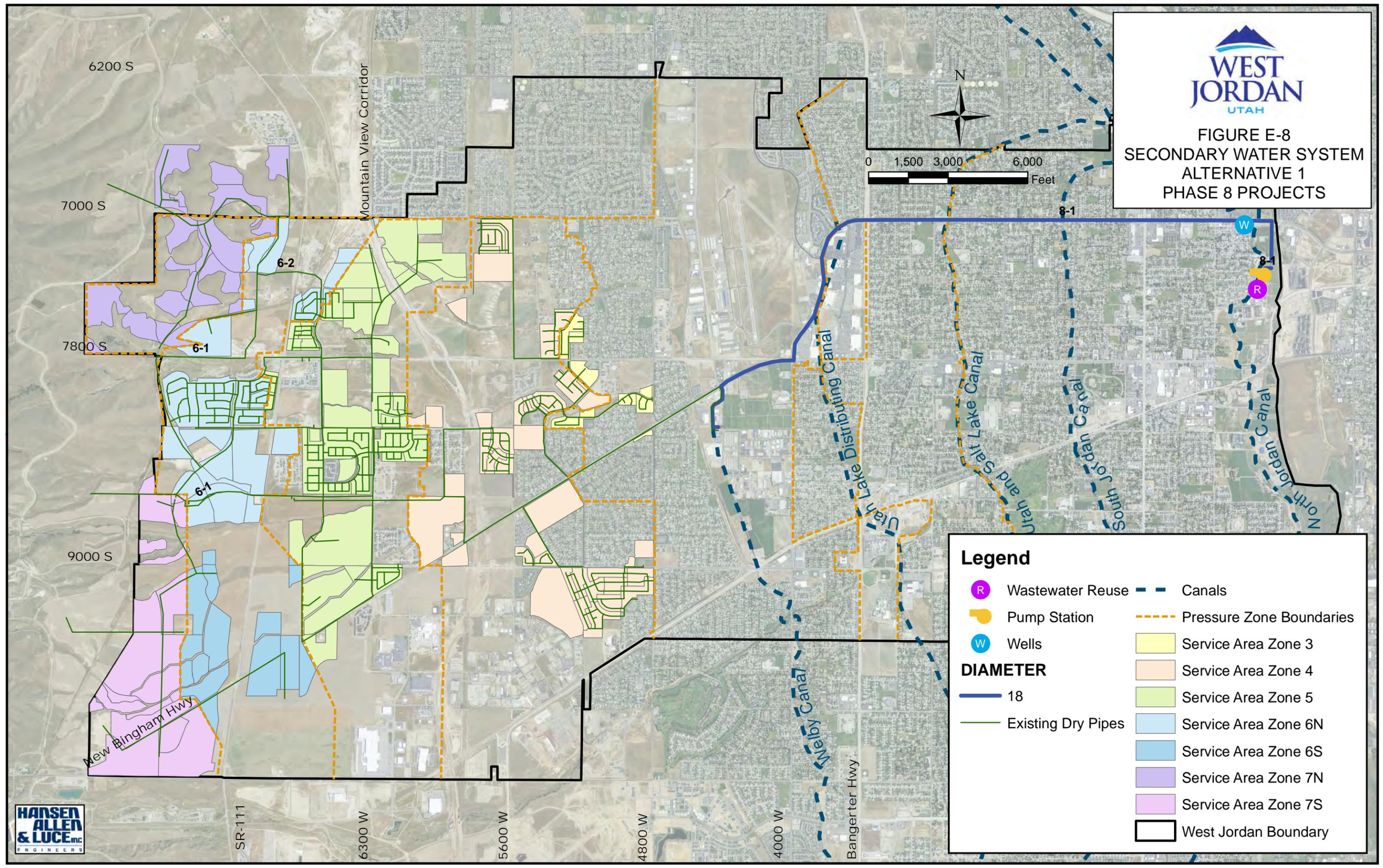
Legend

- Reservoir
- Pump Station
- Canals
- Pressure Zone Boundaries
- DIAMETER**
- 6
- 8
- 10
- 12
- 14
- 16
- 18
- Existing Dry Pipes
- Service Area Zone 3
- Service Area Zone 4
- Service Area Zone 5
- Service Area Zone 6N
- Service Area Zone 6S
- Service Area Zone 7N
- Service Area Zone 7S
- West Jordan Boundary





FIGURE E-8
SECONDARY WATER SYSTEM
ALTERNATIVE 1
PHASE 8 PROJECTS



Legend

- Wastewater Reuse
 - Pump Station
 - Wells
 - Canals
 - Pressure Zone Boundaries
 - Service Area Zone 3
 - Service Area Zone 4
 - Service Area Zone 5
 - Service Area Zone 6N
 - Service Area Zone 6S
 - Service Area Zone 7N
 - Service Area Zone 7S
 - West Jordan Boundary
- DIAMETER**
- 18
 - Existing Dry Pipes



APPENDIX F

Maps of Alternative 2 Phases



**TABLE F-1
ALTERNATIVE 2 PROJECT DESCRIPTIONS**

Project ID	Project Description	Total Cost
1-1	RPZ 7-12 Construction	\$ 406,000
1-2	RPZ 1-6 & 13 Construction, install 1-1/2" PRV, install 1,346 L.F. of 8-inch pipe, install 466 L.F. of 10-inch pipe, and install Service Meters	\$ 2,388,670
2-1	Install 15,071 L.F. of 14-inch pipe and install 771 L.F. of 24-inch pipe	\$ 3,021,010
2-2	Install 1,033 L.F. of 6-inch pipe, install 4,651 L.F. of 8-inch pipe, install 2,060 L.F. of 10-inch pipe, install 1,435 L.F. of 12-inch pipe, install 1" PRV, and install 2-1/2" PRV	\$ 1,218,037
2-3	Welby Booster Pump	\$ 1,170,125
2-4	Zone 4 Pond	\$ 1,074,499
2-5	Steadman Well Redevelopment	\$ 286,551
2-6	Amiad Filter Station	\$ 60,375
3-1	Install 4,355 L.F. of 8-inch pipe, install 4,091 L.F. of 12-inch pipe, install 1,285 L.F. of 14-inch pipe, and install 2,611 L.F. of 18-inch pipe	\$ 2,215,169
3-2	Zone 5 Booster Pump	\$ 498,813
3-3	Zone 5 Pond	\$ 950,111
4-1	Install 3,640 L.F. of 10-inch pipe and install 3,444 L.F. of 12-inch pipe	\$ 1,206,235
4-2	Zone 6 Booster Pump	\$ 211,313
4-3	Zone 6 Pond	\$ 601,341
5-1	Install 1,408 L.F. of 8-inch pipe	\$ 204,631
5-2	Install 8,115 L.F. of 8-inch pipe	\$ 1,152,602
	TOTAL	\$ 16,665,482

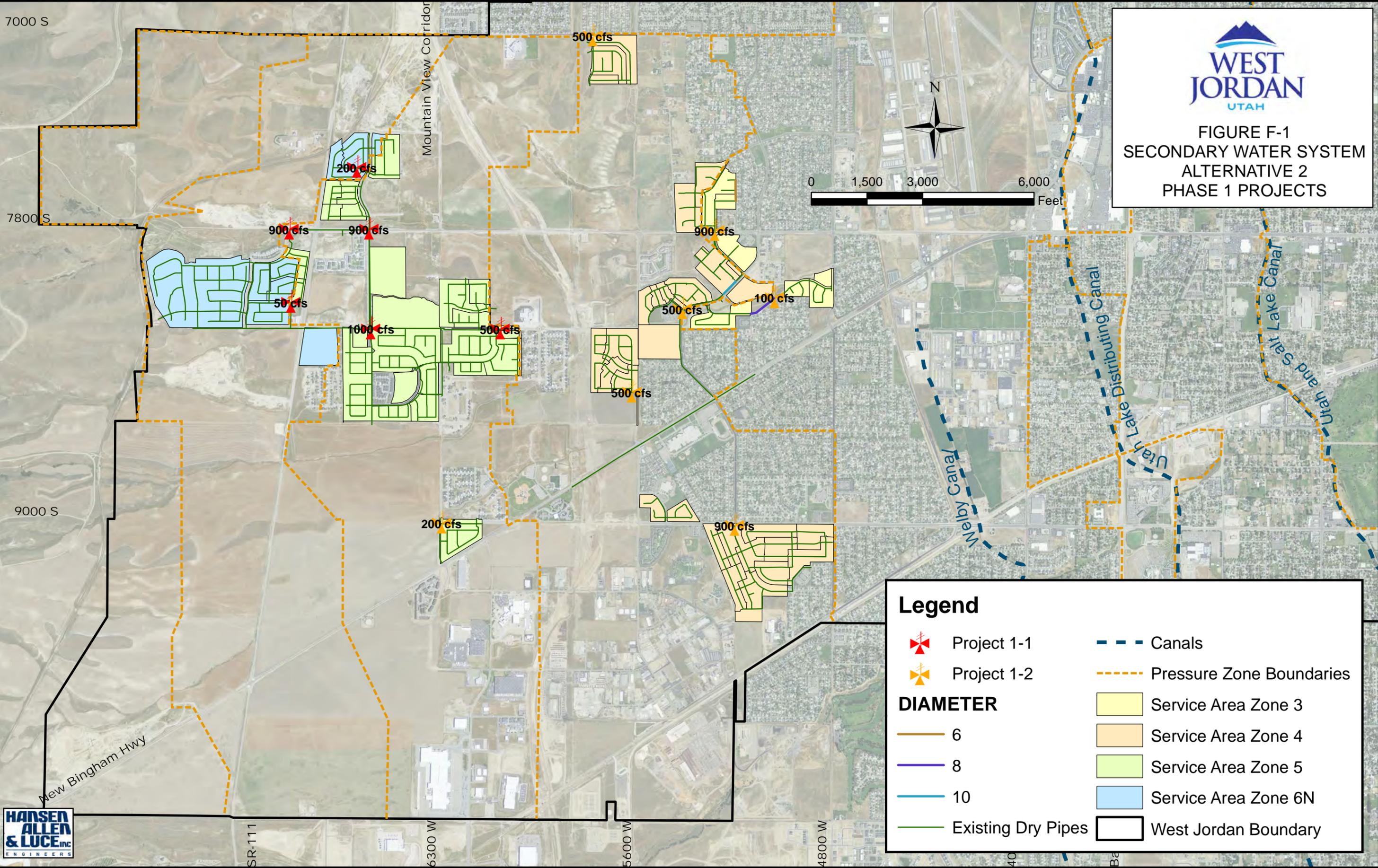
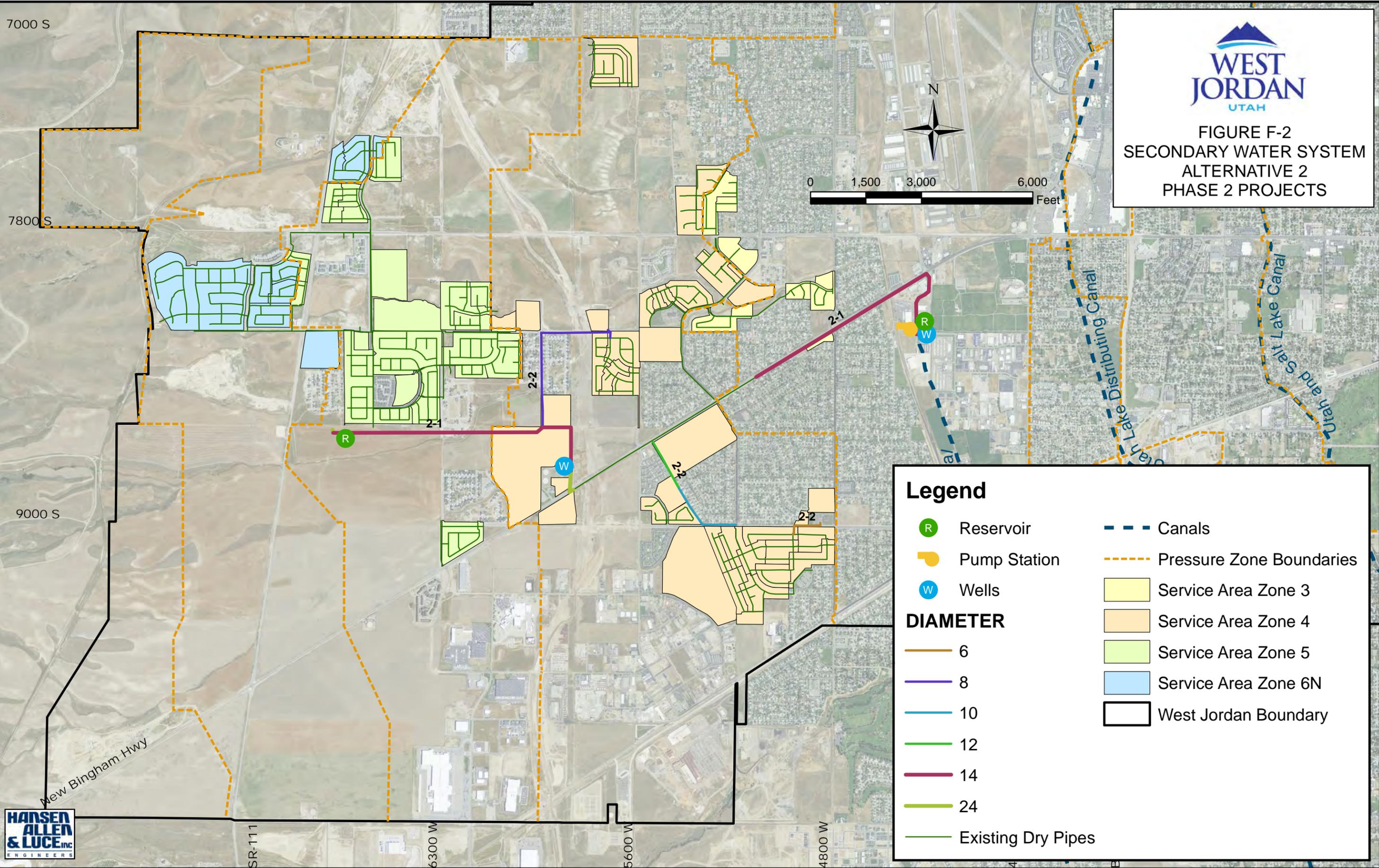


FIGURE F-1
SECONDARY WATER SYSTEM
ALTERNATIVE 2
PHASE 1 PROJECTS

Legend

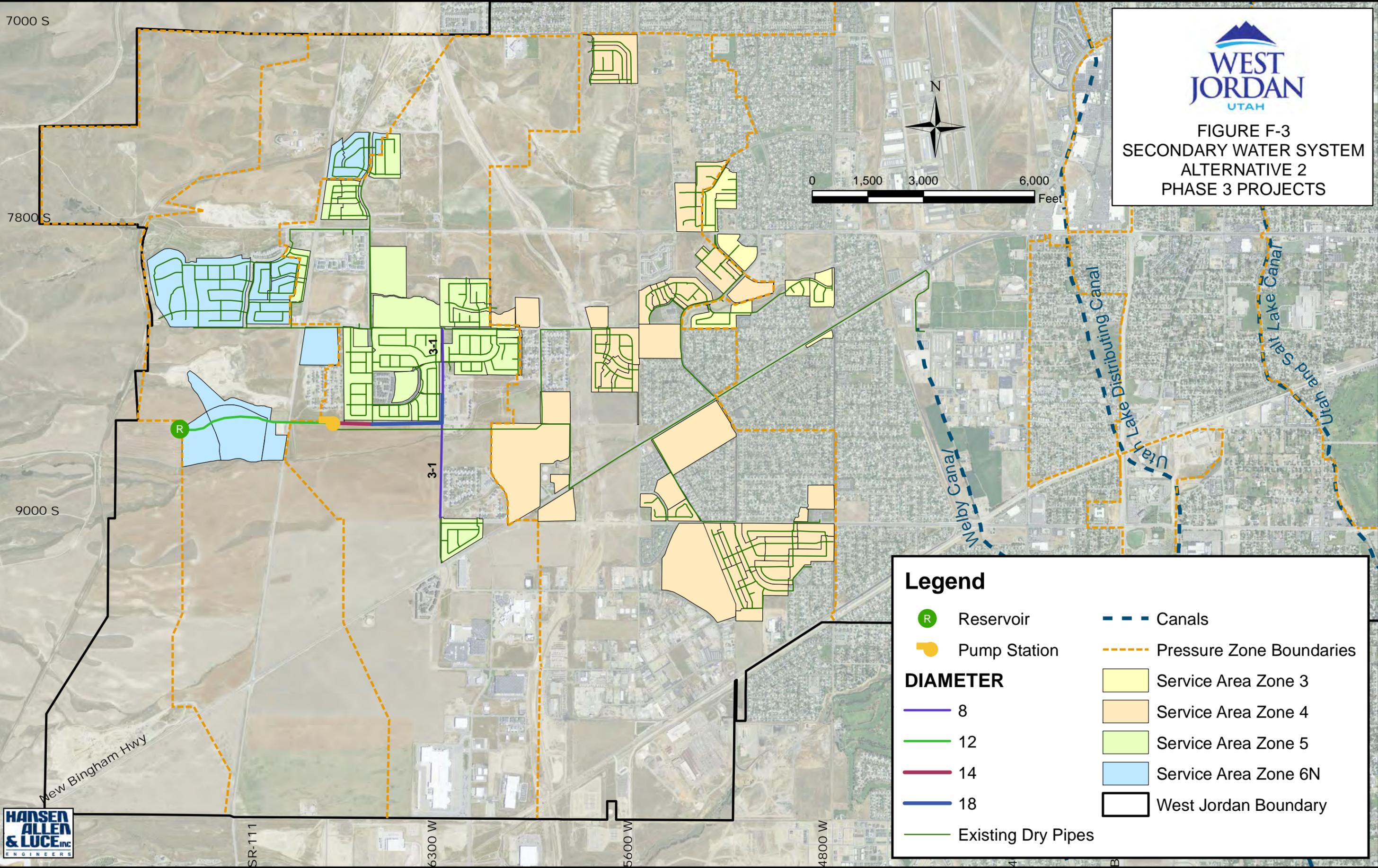
	Project 1-1		Canals
	Project 1-2		Pressure Zone Boundaries
DIAMETER			Service Area Zone 3
	6		Service Area Zone 4
	8		Service Area Zone 5
	10		Service Area Zone 6N
	Existing Dry Pipes		West Jordan Boundary



**FIGURE F-2
SECONDARY WATER SYSTEM
ALTERNATIVE 2
PHASE 2 PROJECTS**

Legend

- Reservoir
 - Pump Station
 - Wells
 - Canals
 - Pressure Zone Boundaries
 - Service Area Zone 3
 - Service Area Zone 4
 - Service Area Zone 5
 - Service Area Zone 6N
 - West Jordan Boundary
- DIAMETER**
- 6
 - 8
 - 10
 - 12
 - 14
 - 24
 - Existing Dry Pipes



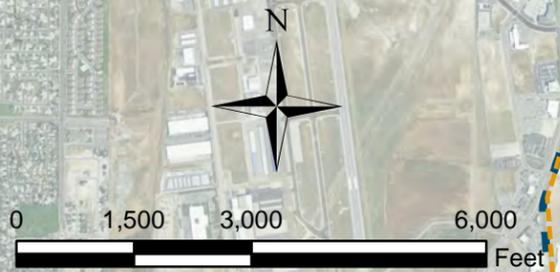
**FIGURE F-3
SECONDARY WATER SYSTEM
ALTERNATIVE 2
PHASE 3 PROJECTS**

Legend

- Reservoir
- Pump Station
- DIAMETER**
- 8
- 12
- 14
- 18
- Existing Dry Pipes
- - - Canals
- - - Pressure Zone Boundaries
- Service Area Zone 3
- Service Area Zone 4
- Service Area Zone 5
- Service Area Zone 6N
- West Jordan Boundary



7000 S
7800 S
9000 S



Mew Bingham Hwy

SR-111

6300 W

5600 W

4800 W

N

Welby Canal

Utah Lake Distributing Canal

Utah and Salt Lake Canal

3-1

4

B

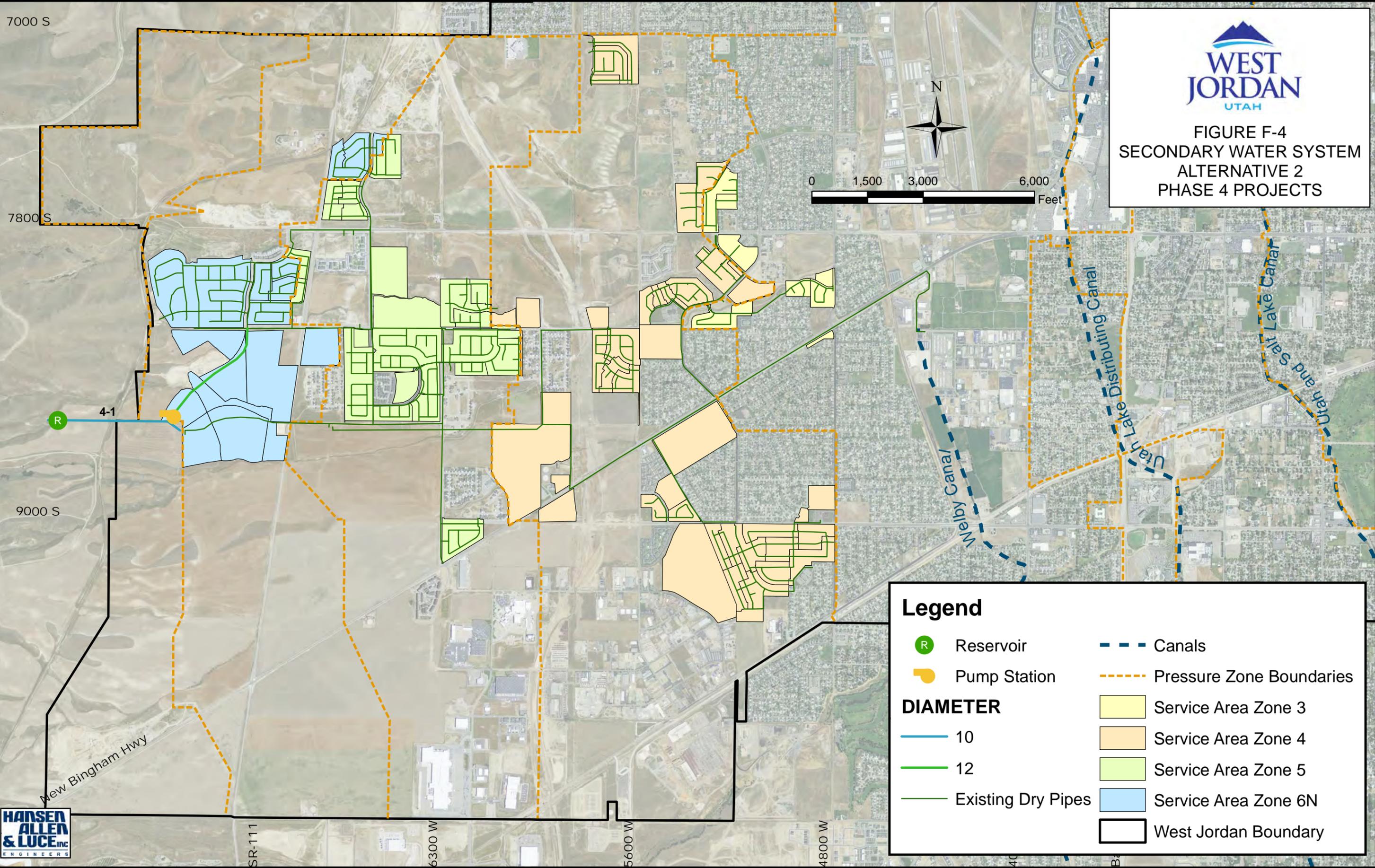


FIGURE F-4
SECONDARY WATER SYSTEM
ALTERNATIVE 2
PHASE 4 PROJECTS

Legend

- Reservoir
- Pump Station
- DIAMETER**
- 10
- 12
- Existing Dry Pipes
- - - Canals
- - - Pressure Zone Boundaries
- Service Area Zone 3
- Service Area Zone 4
- Service Area Zone 5
- Service Area Zone 6N
- West Jordan Boundary

7000 S

7800 S

9000 S

New Bingham Hwy



SR-111

6300 W

5600 W

4800 W



FIGURE F-5
SECONDARY WATER SYSTEM
ALTERNATIVE 2
PHASE 5 PROJECTS



0 1,500 3,000 6,000 Feet

Legend

Wells

Canals

DIAMETER

Pressure Zone Boundaries

8

Service Area Zone 3

Existing Dry Pipes

Service Area Zone 4

Service Area Zone 5

Service Area Zone 6N

West Jordan Boundary

5-1 W

5-2

Welby Canal

Utah Lake Distributing Canal

Utah and Salt Lake Canal

APPENDIX G

Alternative 1 Cost Estimates



West Jordan Secondary Water System Master Plan Update
Alternative 1
Phase 1 Projects

Item	Quantity	Unit	Unit Cost	Cost
Project 1-1				
RPZ-7 -- 500 gpm RPZ including connections to drinking water and secondary systems, flow meter, air valves, and drains	1	lump sum	\$ 52,000	\$ 52,000
RPZ-8 -- 1000 gpm RPZ including connections to drinking water and secondary systems, flow meter, air valves, and drains	1	lump sum	\$ 77,000	\$ 77,000
RPZ-9 -- 50 gpm RPZ including connections to drinking water and secondary systems, flow meter, air valves, and drains	1	lump sum	\$ 51,000	\$ 51,000
RPZ-10 -- 900 gpm RPZ including connections to drinking water and secondary systems, flow meter, air valves, and drains	1	lump sum	\$ 86,000	\$ 86,000
RPZ-11 -- 900 gpm RPZ including connections to drinking water and secondary systems, flow meter, air valves, and drains	1	lump sum	\$ 71,000	\$ 71,000
RPZ-12 -- 200 gpm RPZ including connections to drinking water and secondary systems, flow meter, air valves, and drains	1	lump sum	\$ 69,000	\$ 69,000
		Total Construction Cost	\$	406,000
 Project 1-2				
RPZ-1 -- 900 gpm RPZ including connections to drinking water and secondary systems, flow meter, air valves, and drains	1	lump sum	\$ 80,000	\$ 80,000
RPZ-2 -- 200 gpm RPZ including connections to drinking water and secondary systems, flow meter, air valves, and drains	1	lump sum	\$ 70,000	\$ 70,000
RPZ-3 -- 500 gpm RPZ including connections to drinking water and secondary systems, flow meter, air valves, and drains	1	lump sum	\$ 55,000	\$ 55,000
RPZ-4 -- 500 gpm RPZ including connections to drinking water and secondary systems, flow meter, air valves, and drains	1	lump sum	\$ 55,000	\$ 55,000
RPZ-5 -- 100 gpm RPZ including connections to drinking water and secondary systems, flow meter, air valves, and drains	1	lump sum	\$ 60,000	\$ 60,000
RPZ-6 -- 900 gpm RPZ including connections to drinking water and secondary systems, flow meter, air valves, and drains, also includes 1-1/2" PRV	1	lump sum	\$ 105,000	\$ 105,000
RPZ-13 -- 500 gpm RPZ including connections to drinking water and secondary systems, flow meter, air valves, and drains	1	lump sum	\$ 55,000	\$ 55,000
8" Dia. C900 PVC pipe	1346	l.f.	\$ 94	\$ 126,524
10" Dia. C900 PVC pipe	466	l.f.	\$ 106	\$ 49,396
Service Meters	4300	each	\$ 250	\$ 1,075,000
		Sub-Total	\$	1,730,920
		Contingency @ 20%	\$	346,184
		Sub-Total	\$	<u>2,077,104</u>
		Engineering, Admin, and Legal @ 15%	\$	311,566
		Total Construction Cost	\$	2,388,670
		Low Range	\$	2,270,000
		High Range	\$	2,747,000
		TOTAL PHASE 1 PROJECTS	\$	2,794,670
		Low Range	\$	2,655,000
		High Range	\$	3,214,000

**West Jordan Secondary Water System Master Plan Update
Alternative 1
Phase 2 Projects**

Item	Quantity	Unit	Unit Cost	Cost
Project 2-1				
Mobilization/Demobilization	1	lump sum	\$ 167,000	\$ 167,000
24" Dia. ductile iron pipe	15,842	l.f.	\$ 210	\$ 3,326,740
			Sub-Total	\$ 3,493,740
			Contingency @ 25%	\$ 873,435
			Sub-Total	<u>\$ 4,367,175</u>
			Engineering, Admin, and Legal @ 15%	\$ 655,076
			Total Construction Cost	\$ 5,022,251
			Low Range	\$ 4,772,000
			High Range	\$ 5,776,000
 Project 2-2				
Mobilization/Demobilization	1	lump sum	\$ 49,000	\$ 49,000
6" Dia. C900 PVC pipe	1,033	l.f.	\$ 88	\$ 90,904
8" Dia. C900 PVC pipe	4,651	l.f.	\$ 94	\$ 437,194
10" Dia. C900 PVC pipe	2,060	l.f.	\$ 106	\$ 218,360
12" Dia. C900 PVC pipe	1,435	l.f.	\$ 120	\$ 172,200
1" PRV	1	lump sum	\$ 26,675	\$ 26,675
2-1/2 " PRV	1	lump sum	\$ 31,975	\$ 31,975
			Sub-Total	\$ 1,026,308
			Contingency @ 25%	\$ 256,577
			Sub-Total	<u>\$ 1,282,885</u>
			Engineering, Admin, and Legal @ 15%	\$ 192,433
			Total Construction Cost	\$ 1,475,318
			Low Range	\$ 1,402,000
			High Range	\$ 1,697,000
 Project 2-3				
Mobilization/Demobilization	1	lump sum	\$ 188,000	\$ 188,000
Welby Booster Pump, 9742 gpm, 1633 h.p.	1	lump sum	\$ 3,600,000	\$ 3,600,000
Misc Piping and Vaults	1	lump sum	\$ 150,000	\$ 150,000
			Sub-Total	\$ 3,938,000
			Contingency @ 25%	\$ 984,500
			Sub-Total	<u>\$ 4,922,500</u>
			Engineering, Admin, and Legal @ 15%	\$ 738,375
			Total Construction Cost	\$ 5,660,875
			Low Range	\$ 5,378,000
			High Range	\$ 6,511,000
 Project 2-4				
Mobilization/Demobilization	1	lump sum	\$ 57,000	\$ 57,000
Zone 4 Pond, 6.65 acre-feet	1	lump sum	\$ 1,083,455	\$ 1,083,455
Misc Piping and Vaults	1	lump sum	\$ 50,000	\$ 50,000
			Sub-Total	\$ 1,190,455
			Contingency @ 25%	\$ 297,614
			Sub-Total	<u>\$ 1,488,068</u>
			Engineering, Admin, and Legal @ 15%	\$ 223,210
			Total Construction Cost	\$ 1,711,278
			Low Range	\$ 1,626,000

**West Jordan Secondary Water System Master Plan Update
Alternative 1
Phase 2 Projects**

High Range \$ 1,968,000

Project 2-5

Mobilization/Demobilization	1	lump sum	\$ 10,000	\$ 10,000
Steadman Well Redevelopment & Re-equipping (650 gpm)	1	lump sum	\$ 189,340	\$ 189,340

	Sub-Total	\$ 199,340
	Contingency @ 25%	\$ 49,835
	Sub-Total	\$ 249,175

Engineering, Admin, and Legal @ 15% \$ 37,376

Total Construction Cost \$ 286,551

Low Range \$ 273,000

High Range \$ 330,000

Project 2-6

Mobilization/Demobilization	1	lump sum	\$ 8,000	\$ 8,000
Amiad Filter Station (9742 gpm)	1	lump sum	\$ 150,000	\$ 150,000

	Sub-Total	\$ 158,000
	Contingency @ 25%	\$ 39,500
	Sub-Total	\$ 197,500

Engineering, Admin, and Legal @ 15% \$ 29,625

Total Construction Cost \$ 227,125

Low Range \$ 216,000

High Range \$ 262,000

TOTAL PHASE 2 PROJECTS \$ 14,384,000

Low Range \$ 13,665,000

High Range \$ 16,542,000

**West Jordan Secondary Water System Master Plan Update
Alternative 1
Phase 3 Projects**

Item	Quantity	Unit	Unit Cost	Cost
Project 3-1				
Mobilization/Demobilization	1	lump sum	\$ 100,000	\$ 100,000
8" Dia. C900 PVC pipe	2,542	l.f.	\$ 94	\$ 238,948
14" Dia. ductile iron pipe	1,804	l.f.	\$ 122	\$ 220,088
18" Dia. ductile iron pipe	2,611	l.f.	\$ 157	\$ 409,927
24" Dia. ductile iron pipe	5,375	l.f.	\$ 210	\$ 1,128,750
			Sub-Total	\$ 2,097,713
			Contingency @ 25%	\$ 524,428
			Sub-Total	<u>\$ 2,622,141</u>
			Engineering, Admin, and Legal @ 15%	\$ 393,321
			Total Construction Cost	\$ 3,015,462
			Low Range	\$ 2,865,000
			High Range	\$ 3,468,000
Project 3-2				
Mobilization/Demobilization	1	lump sum	\$ 55,000	\$ 55,000
Zone 5 Booster Pump, 8239 gpm, 445 h.p.	1	lump sum	\$ 1,000,000	\$ 1,000,000
Miscellaneous Piping and Vaults	1	lump sum	\$ 100,000	\$ 100,000
			Sub-Total	\$ 1,155,000
			Contingency @ 25%	\$ 288,750
			Sub-Total	<u>\$ 1,443,750</u>
			Engineering, Admin, and Legal @ 15%	\$ 216,563
			Total Construction Cost	\$ 1,660,313
			Low Range	\$ 1,578,000
			High Range	\$ 1,910,000
Project 3-3				
Mobilization/Demobilization	1	lump sum	\$ 98,000	\$ 98,000
Zone 5 Pond, 11.52 acre-feet	1	lump sum	\$ 1,876,902	\$ 1,876,902
Miscellaneous Piping and Vaults	1	lump sum	\$ 75,000	\$ 75,000
			Sub-Total	\$ 2,049,902
			Contingency @ 25%	\$ 512,475
			Sub-Total	<u>\$ 2,562,377</u>
			Engineering, Admin, and Legal @ 15%	\$ 384,357
			Total Construction Cost	\$ 2,946,734
			Low Range	\$ 2,800,000
			High Range	\$ 3,389,000
			TOTAL PHASE 3 PROJECTS	\$ 7,622,509
			Low Range	\$ 7,242,000
			High Range	\$ 8,766,000

**West Jordan Secondary Water System Master Plan Update
Alternative 1
Phase 4 Projects**

Item	Quantity	Unit	Unit Cost	Cost
Project 4-1				
Mobilization/Demobilization	1	lump sum	\$ 45,000	\$ 45,000
10" Dia. C900 PVC pipe	4,143	l.f.	\$ 106	\$ 439,158
12" Dia. C900 PVC pipe	1,153	l.f.	\$ 120	\$ 138,360
18" Dia. ductile iron pipe	1,476	l.f.	\$ 157	\$ 231,732
24" Dia. ductile iron pipe	416	l.f.	\$ 210	\$ 87,360
			Sub-Total	\$ 941,610
			Contingency @ 25%	\$ 235,403
			Sub-Total	<u>\$ 1,177,013</u>
			Engineering, Admin, and Legal @ 15%	\$ 176,552
			Total Construction Cost	\$ 1,353,564
			Low Range	\$ 1,286,000
			High Range	\$ 1,557,000
Project 4-2				
Mobilization/Demobilization	1	lump sum	\$ 38,000	\$ 38,000
Zone 6 Booster Pump, 5633 gpm, 289 h.p.	1	lump sum	\$ 700,000	\$ 700,000
Misc Piping and Vaults	1	lump sum	\$ 50,000	\$ 50,000
			Sub-Total	\$ 788,000
			Contingency @ 25%	\$ 197,000
			Sub-Total	<u>\$ 985,000</u>
			Engineering, Admin, and Legal @ 15%	\$ 147,750
			Total Construction Cost	\$ 1,132,750
			Low Range	\$ 1,077,000
			High Range	\$ 1,303,000
Project 4-3				
Mobilization/Demobilization	1	lump sum	\$ 64,000	\$ 64,000
Zone 6 Pond, 7.47 acre-feet	1	lump sum	\$ 1,217,053	\$ 1,217,053
Misc Piping and Vaults	1	lump sum	\$ 50,000	\$ 50,000
			Sub-Total	\$ 1,331,053
			Contingency @ 25%	\$ 332,763
			Sub-Total	<u>\$ 1,663,817</u>
			Engineering, Admin, and Legal @ 15%	\$ 249,573
			Total Construction Cost	\$ 1,913,389
			Low Range	\$ 1,818,000
			High Range	\$ 2,201,000
			TOTAL PHASE 4 PROJECTS	\$ 4,399,704
			Low Range	\$ 4,180,000
			High Range	\$ 5,060,000

West Jordan Secondary Water System Master Plan Update
Alternative 1
Phase 5 Projects

Item	Quantity	Unit	Unit Cost	Cost
Project 5-1				
Mobilization/Demobilization	1	lump sum	\$ 30,000	\$ 30,000
8" Dia. C900 PVC pipe	3,323	l.f.	\$ 94	\$ 312,362
12" Dia. C900 PVC pipe	1,653	l.f.	\$ 120	\$ 198,360
14" Dia. ductile iron pipe	731	l.f.	\$ 122	\$ 89,182
			Sub-Total	\$ 629,904
			Contingency @ 25%	\$ 157,476
			Sub-Total	<u>\$ 787,380</u>
			Engineering, Admin, and Legal @ 15%	\$ 118,107
			Total Construction Cost	\$ 905,487
			Low Range	\$ 861,000
			High Range	\$ 1,042,000
Project 5-2				
Mobilization/Demobilization	1	lump sum	\$ 52,000	\$ 52,000
8" Dia. C900 PVC pipe	6,558	l.f.	\$ 94	\$ 616,452
10" Dia. C900 PVC pipe	2,196	l.f.	\$ 106	\$ 232,776
14" Dia. ductile iron pipe	1,400	l.f.	\$ 122	\$ 170,800
			Sub-Total	\$ 1,072,028
			Contingency @ 25%	\$ 268,007
			Sub-Total	<u>\$ 1,340,035</u>
			Engineering, Admin, and Legal @ 15%	\$ 201,005
			Total Construction Cost	\$ 1,541,040
			Low Range	\$ 1,464,000
			High Range	\$ 1,773,000
Project 5-3				
Mobilization/Demobilization	1	lump sum	\$ 57,000	\$ 57,000
6" Dia. C900 PVC pipe	631	l.f.	\$ 88	\$ 55,528
8" Dia. C900 PVC pipe	9,193	l.f.	\$ 94	\$ 864,142
12" Dia. C900 PVC pipe	1,739	l.f.	\$ 120	\$ 208,680
			Sub-Total	\$ 1,185,350
			Contingency @ 25%	\$ 296,338
			Sub-Total	<u>\$ 1,481,688</u>
			Engineering, Admin, and Legal @ 15%	\$ 222,253
			Total Construction Cost	\$ 1,703,941
			Low Range	\$ 1,619,000
			High Range	\$ 1,960,000
Project 5-4				
Mobilization/Demobilization	1	lump sum	\$ 39,000	\$ 39,000
8" Dia. C900 PVC pipe	8,115	l.f.	\$ 94	\$ 762,810
			Sub-Total	\$ 801,810
			Contingency @ 25%	\$ 200,453
			Sub-Total	<u>\$ 1,002,263</u>
			Engineering, Admin, and Legal @ 15%	\$ 150,339
			Total Construction Cost	\$ 1,152,602
			Low Range	\$ 1,095,000
			High Range	\$ 1,326,000

**West Jordan Secondary Water System Master Plan Update
Alternative 1
Phase 5 Projects**

TOTAL PHASE 5 PROJECTS	\$	5,303,070
Low Range	\$	5,038,000
High Range	\$	6,099,000

**West Jordan Secondary Water System Master Plan Update
Alternative 1
Phase 6 Projects**

Item	Quantity	Unit	Unit Cost	Cost
Project 6-1				
Mobilization/Demobilization	1	lump sum	\$ 57,000	\$ 57,000
8" Dia. C900 PVC pipe	1,605	l.f.	\$ 94	\$ 150,870
12" Dia. C900 PVC pipe	545	l.f.	\$ 120	\$ 65,400
14" Dia. ductile iron pipe	7,380	l.f.	\$ 122	\$ 900,360
24" Dia. ductile iron pipe	110	l.f.	\$ 210	\$ 23,100
			Sub-Total	\$ 1,196,730
			Contingency @ 25%	\$ 299,183
			Sub-Total	<u>\$ 1,495,913</u>
			Engineering, Admin, and Legal @ 15%	\$ 224,387
			Total Construction Cost	\$ 1,720,299
			Low Range	\$ 1,635,000
			High Range	\$ 1,979,000
Project 6-2				
Mobilization/Demobilization	1	lump sum	\$ 59,000	\$ 59,000
8" Dia. C900 PVC pipe	5,297	l.f.	\$ 94	\$ 497,918
12" Dia. C900 PVC pipe	3,698	l.f.	\$ 120	\$ 443,760
14" Dia. ductile iron pipe	1,927	l.f.	\$ 122	\$ 235,094
			Sub-Total	\$ 1,235,772
			Contingency @ 25%	\$ 308,943
			Sub-Total	<u>\$ 1,544,715</u>
			Engineering, Admin, and Legal @ 15%	\$ 231,707
			Total Construction Cost	\$ 1,776,422
			Low Range	\$ 1,688,000
			High Range	\$ 2,043,000
			TOTAL PHASE 6 PROJECTS	\$ 3,496,722
			Low Range	\$ 3,322,000
			High Range	\$ 4,022,000

West Jordan Secondary Water System Master Plan Update
Alternative 1
Phase 7 Projects

Item	Quantity	Unit	Unit Cost	Cost
Project 7-1				
Mobilization/Demobilization	1	lump sum	\$ 80,000	\$ 80,000
6" Dia. C900 PVC pipe	784	l.f.	\$ 88	\$ 68,992
8" Dia. C900 PVC pipe	1,172	l.f.	\$ 94	\$ 110,168
16" Dia. ductile iron pipe	9,722	l.f.	\$ 134	\$ 1,302,748
18" Dia. ductile iron pipe	267	l.f.	\$ 157	\$ 41,919
4" PRV	1	lump sum	\$ 59,925	\$ 59,925
			Sub-Total	\$ 1,663,752
			Contingency @ 25%	\$ 415,938
			Sub-Total	<u>\$ 2,079,690</u>
			Engineering, Admin, and Legal @ 15%	\$ 311,954
			Total Construction Cost	\$ 2,391,644
			Low Range	\$ 2,273,000
			High Range	\$ 2,751,000
Project 7-2				
Mobilization/Demobilization	1	lump sum	\$ 43,000	\$ 43,000
10" Dia. C900 PVC pipe	3,474	l.f.	\$ 106	\$ 368,244
14" Dia. ductile iron pipe	4,024	l.f.	\$ 122	\$ 490,928
			Sub-Total	\$ 902,172
			Contingency @ 25%	\$ 225,543
			Sub-Total	<u>\$ 1,127,715</u>
			Engineering, Admin, and Legal @ 15%	\$ 169,157
			Total Construction Cost	\$ 1,296,872
			Low Range	\$ 1,233,000
			High Range	\$ 1,492,000
Project 7-3				
Mobilization/Demobilization	1	lump sum	\$ 89,000	\$ 89,000
8" Dia. C900 PVC pipe	6,043	l.f.	\$ 94	\$ 568,042
10" Dia. C900 PVC pipe	2,970	l.f.	\$ 106	\$ 314,820
12" Dia. C900 PVC pipe	2,063	l.f.	\$ 120	\$ 247,560
18" Dia. ductile iron pipe	3,619	l.f.	\$ 157	\$ 568,183
6" PRV	1	lump sum	\$ 62,225	\$ 62,225
			Sub-Total	\$ 1,849,830
			Contingency @ 25%	\$ 462,458
			Sub-Total	<u>\$ 2,312,288</u>
			Engineering, Admin, and Legal @ 15%	\$ 346,843
			Total Construction Cost	\$ 2,659,131
			Low Range	\$ 2,527,000
			High Range	\$ 3,059,000
Project 7-4				
Mobilization/Demobilization	1	lump sum	\$ 53,000	\$ 53,000
6" Dia. C900 PVC pipe	2,539	l.f.	\$ 88	\$ 223,432
8" Dia. C900 PVC pipe	4,410	l.f.	\$ 94	\$ 414,540
10" Dia. C900 PVC pipe	2,592	l.f.	\$ 106	\$ 274,752
12" Dia. C900 PVC pipe	1,114	l.f.	\$ 120	\$ 133,680
			Sub-Total	\$ 1,099,404
			Contingency @ 25%	<u>\$ 274,851</u>

**West Jordan Secondary Water System Master Plan Update
Alternative 1
Phase 7 Projects**

Sub-Total \$ 1,374,255

Engineering, Admin, and Legal @ 15% \$ 206,138

Total Construction Cost \$ 1,580,393

Low Range \$ 1,502,000

High Range \$ 1,818,000

Project 7-5

Mobilization/Demobilization	1	lump sum	\$ 17,000	\$ 17,000
Zone 7 South Booster Pump, 2731 gpm, 125 h.p.	1	lump sum	\$ 300,000	\$ 300,000
Misc Piping and Vaults	1	lump sum	\$ 30,000	\$ 30,000

Sub-Total \$ 347,000

Contingency @ 25% \$ 86,750

Sub-Total \$ 433,750

Engineering, Admin, and Legal @ 15% \$ 65,063

Total Construction Cost \$ 498,813

Low Range \$ 474,000

High Range \$ 574,000

Project 7-6

Mobilization/Demobilization	1	lump sum	\$ 101,000	\$ 101,000
Zone 7 South Pond, 12.07 acre-feet	1	lump sum	\$ 1,966,511	\$ 1,966,511
Misc Piping and Vaults	1	lump sum	\$ 50,000	\$ 50,000

Sub-Total \$ 2,117,511

Contingency @ 25% \$ 529,378

Sub-Total \$ 2,646,888

Engineering, Admin, and Legal @ 15% \$ 397,033

Total Construction Cost \$ 3,043,922

Low Range \$ 2,892,000

High Range \$ 3,501,000

Project 7-7

Mobilization/Demobilization	1	lump sum	\$ 12,000	\$ 12,000
Zone 7 North Booster Pump, 1210 gpm, 95 h.p.	1	lump sum	\$ 200,000	\$ 200,000
Misc Piping and Vaults	1	lump sum	\$ 25,000	\$ 25,000

Sub-Total \$ 237,000

Contingency @ 25% \$ 59,250

Sub-Total \$ 296,250

Engineering, Admin, and Legal @ 15% \$ 44,438

Total Construction Cost \$ 340,688

Low Range \$ 324,000

High Range \$ 392,000

Project 7-8

Mobilization/Demobilization	1	lump sum	\$ 47,000	\$ 47,000
Zone 7 North Pond, 5.35 acre-feet	1	lump sum	\$ 871,651	\$ 871,651
Misc Piping and Vaults	1	lump sum	\$ 50,000	\$ 50,000

Sub-Total \$ 968,651

Contingency @ 25% \$ 242,163

Sub-Total \$ 1,210,814

West Jordan Secondary Water System Master Plan Update

Alternative 1

Phase 7 Projects

Engineering, Admin, and Legal @ 15%	\$	181,622
Total Construction Cost	\$	1,392,436
Low Range	\$	1,323,000
High Range	\$	1,602,000

TOTAL PHASE 7 PROJECTS	\$	13,203,898
Low Range	\$	12,544,000
High Range	\$	15,185,000

**West Jordan Secondary Water System Master Plan Update
Alternative 1
Phase 8 Projects**

Item	Quantity	Unit	Unit Cost	Cost
Project 8-1				
Mobilization/Demobilization	1	lump sum	\$ 530,000	\$ 530,000
SVWRF Reuse Project 6 MGD - 2 alternatives	1	lump sum	\$ 5,717,650	\$ 5,717,650
18" Dia. ductile iron pipe	28,550	l.f.	\$ 157	\$ 4,482,350
Jordan River Wellhouse (500 gpm capacity, 200 hp)	1	lump sum	\$ 400,000.00	\$ 400,000.00
			Sub-Total	\$ 11,130,000
			Contingency @ 25%	\$ 2,782,500
			Sub-Total	<u>\$ 13,912,500</u>
			Engineering, Admin, and Legal @ 15%	\$ 2,086,875
			Total Construction Cost	<u>\$ 15,999,375</u>
			Low Range	\$ 15,200,000
			High Range	\$ 18,400,000
			TOTAL PHASE 8 PROJECTS	\$ 15,999,375
			Low Range	\$ 15,200,000
			High Range	\$ 18,400,000

APPENDIX H

Alternative 2 Cost Estimates



**West Jordan Secondary Water System Master Plan Update
Alternative 2
Phase 1 Projects**

Item	Quantity	Unit	Unit Cost	Cost
Project 1-1				
RPZ-7 -- 500 gpm RPZ including connections to drinking water and secondary systems, flow meter, air valves, and drains	1	lump sum	\$ 52,000	\$ 52,000
RPZ-8 -- 1000 gpm RPZ including connections to drinking water and secondary systems, flow meter, air valves, and drains	1	lump sum	\$ 77,000	\$ 77,000
RPZ-9 -- 50 gpm RPZ including connections to drinking water and secondary systems, flow meter, air valves, and drains	1	lump sum	\$ 51,000	\$ 51,000
RPZ-10 -- 900 gpm RPZ including connections to drinking water and secondary systems, flow meter, air valves, and drains	1	lump sum	\$ 86,000	\$ 86,000
RPZ-11 -- 900 gpm RPZ including connections to drinking water and secondary systems, flow meter, air valves, and drains	1	lump sum	\$ 71,000	\$ 71,000
RPZ-12 -- 200 gpm RPZ including connections to drinking water and secondary systems, flow meter, air valves, and drains	1	lump sum	\$ 69,000	\$ 69,000
Total Construction Cost			\$	406,000
 Project 1-2				
RPZ-1 -- 900 gpm RPZ including connections to drinking water and secondary systems, flow meter, air valves, and drains	1	lump sum	\$ 80,000	\$ 80,000
RPZ-2 -- 200 gpm RPZ including connections to drinking water and secondary systems, flow meter, air valves, and drains	1	lump sum	\$ 70,000	\$ 70,000
RPZ-3 -- 500 gpm RPZ including connections to drinking water and secondary systems, flow meter, air valves, and drains	1	lump sum	\$ 55,000	\$ 55,000
RPZ-4 -- 500 gpm RPZ including connections to drinking water and secondary systems, flow meter, air valves, and drains	1	lump sum	\$ 55,000	\$ 55,000
RPZ-5 -- 100 gpm RPZ including connections to drinking water and secondary systems, flow meter, air valves, and drains	1	lump sum	\$ 60,000	\$ 60,000
RPZ-6 -- 900 gpm RPZ including connections to drinking water and secondary systems, flow meter, air valves, and drains, also includes 1-1/2" PRV	1	lump sum	\$ 105,000	\$ 105,000
RPZ-13 -- 500 gpm RPZ including connections to drinking water and secondary systems, flow meter, air valves, and drains	1	lump sum	\$ 55,000	\$ 55,000
8" Dia. C900 PVC pipe	1346	l.f.	\$ 94	\$ 126,524
10" Dia. C900 PVC pipe	466	l.f.	\$ 106	\$ 49,396
Service Meters	4300	each	\$ 250	\$ 1,075,000
			Sub-Total	\$ 1,730,920
			Contingency @ 20%	\$ 346,184
			Sub-Total	<u>\$ 2,077,104</u>
			Engineering, Admin, and Legal @ 15%	\$ 311,566
			Total Construction Cost	\$ 2,388,670
			Low Range	\$ 2,270,000
			High Range	\$ 2,747,000
 TOTAL PHASE 1 PROJECTS				 \$ 2,794,670
				Low Range \$ 2,655,000
				High Range \$ 3,214,000

**West Jordan Secondary Water System Master Plan Update
Alternative 2
Phase 2 Projects**

Item	Quantity	Unit	Unit Cost	Cost
Project 2-1				
Mobilization/Demobilization	1	lump sum	\$ 101,000	\$ 101,000
14" Dia. ductile iron pipe	15,071	l.f.	\$ 122	\$ 1,838,662
24" Dia. ductile iron pipe	771	l.f.	\$ 210	\$ 161,910
			Sub-Total	\$ 2,101,572
			Contingency @ 25%	\$ 525,393
			Sub-Total	<u>\$ 2,626,965</u>
			Engineering, Admin, and Legal @ 15%	\$ 394,045
			Total Construction Cost	\$ 3,021,010
			Low Range	\$ 2,870,000
			High Range	\$ 3,475,000
Project 2-2				
Mobilization/Demobilization	1	lump sum	\$ 41,000	\$ 41,000
6" Dia. C900 PVC pipe	1,033	l.f.	\$ 88	\$ 90,904
8" Dia. C900 PVC pipe	4,664	l.f.	\$ 94	\$ 438,416
10" Dia. C900 PVC pipe	2,060	l.f.	\$ 106	\$ 218,360
1" PRV	1	lump sum	\$ 26,675	\$ 26,675
2-1/2 " PRV	1	lump sum	\$ 31,975	\$ 31,975
			Sub-Total	\$ 847,330
			Contingency @ 25%	\$ 211,833
			Sub-Total	<u>\$ 1,059,163</u>
			Engineering, Admin, and Legal @ 15%	\$ 158,874
			Total Construction Cost	\$ 1,218,037
			Low Range	\$ 1,158,000
			High Range	\$ 1,401,000
Project 2-3				
Mobilization/Demobilization	1	lump sum	\$ 39,000	\$ 39,000
Welby Booster Pump, 2194 gpm, 335 h.p.	1	lump sum	\$ 700,000	\$ 700,000
Misc Piping and Vaults	1	lump sum	\$ 75,000	\$ 75,000
			Sub-Total	\$ 814,000
			Contingency @ 25%	\$ 203,500
			Sub-Total	<u>\$ 1,017,500</u>
			Engineering, Admin, and Legal @ 15%	\$ 152,625
			Total Construction Cost	\$ 1,170,125
			Low Range	\$ 1,112,000
			High Range	\$ 1,346,000
Project 2-4				
Mobilization/Demobilization	1	lump sum	\$ 36,000	\$ 36,000
Zone 4 Pond, 4.06 acre-feet	1	lump sum	\$ 661,478	\$ 661,477.53
Misc Piping and Vaults	1	lump sum	\$ 50,000	\$ 50,000
			Sub-Total	\$ 747,478
			Contingency @ 25%	\$ 186,869
			Sub-Total	<u>\$ 934,347</u>
			Engineering, Admin, and Legal @ 15%	\$ 140,152
			Total Construction Cost	\$ 1,074,499
			Low Range	\$ 1,021,000
			High Range	\$ 1,236,000

**West Jordan Secondary Water System Master Plan Update
Alternative 2
Phase 2 Projects**

Project 2-5

Mobilization/Demobilization	1	lump sum	\$ 10,000	\$ 10,000
Steadman Well Redevelopment & Re-equipping (650 gpm)	1	lump sum	\$ 189,340	\$ 189,340
			Sub-Total	\$ 199,340
			Contingency @ 25%	\$ 49,835
			Sub-Total	<u>\$ 249,175</u>
			Engineering, Admin, and Legal @ 15%	\$ 37,376
			Total Construction Cost	\$ 286,551
			Low Range	\$ 273,000
			High Range	\$ 330,000

Project 2-6

Mobilization/Demobilization	1	lump sum	\$ 2,000	\$ 2,000
Amiad Filter Station (2194 gpm)	1	lump sum	\$ 40,000	\$ 40,000
			Sub-Total	\$ 42,000
			Contingency @ 25%	\$ 10,500
			Sub-Total	<u>\$ 52,500</u>
			Engineering, Admin, and Legal @ 15%	\$ 7,875
			Total Construction Cost	\$ 60,375
			Low Range	\$ 58,000
			High Range	\$ 70,000

TOTAL PHASE 2 PROJECTS	\$ 6,831,000
Low Range	\$ 6,490,000
High Range	\$ 7,856,000

**West Jordan Secondary Water System Master Plan Update
Alternative 2
Phase 3 Projects**

Item	Quantity	Unit	Unit Cost	Cost
Project 3-1				
Mobilization/Demobilization	1	lump sum	\$ 74,000	\$ 74,000
8" Dia. C900 PVC pipe	4,355	l.f.	\$ 94	\$ 409,370
12" Dia. C900 PVC pipe	4,091	l.f.	\$ 120	\$ 490,920
14" Dia. ductile iron pipe	1,285	l.f.	\$ 122	\$ 156,770
18" Dia. ductile iron pipe	2,611	l.f.	\$ 157	\$ 409,927
			Sub-Total	\$ 1,540,987
			Contingency @ 25%	\$ 385,247
			Sub-Total	<u>\$ 1,926,234</u>
			Engineering, Admin, and Legal @ 15%	<u>\$ 288,935</u>
			Total Construction Cost	\$ 2,215,169
			Low Range	\$ 2,105,000
			High Range	\$ 2,548,000
Project 3-2				
Mobilization/Demobilization	1	lump sum	\$ 17,000	\$ 17,000
Zone 5 Booster Pump, 1275 gpm, 67 h.p.	1	lump sum	\$ 300,000	\$ 300,000
Miscellaneous Piping and Vaults	1	lump sum	\$ 30,000	\$ 30,000
			Sub-Total	\$ 347,000
			Contingency @ 25%	\$ 86,750
			Sub-Total	<u>\$ 433,750</u>
			Engineering, Admin, and Legal @ 15%	<u>\$ 65,063</u>
			Total Construction Cost	\$ 498,813
			Low Range	\$ 474,000
			High Range	\$ 574,000
Project 3-3				
Mobilization/Demobilization	1	lump sum	\$ 32,000	\$ 32,000
Zone 5 Pond, 3.4 acre-feet	1	lump sum	\$ 553,947	\$ 553,947
Miscellaneous Piping and Vaults	1	lump sum	\$ 75,000	\$ 75,000
			Sub-Total	\$ 660,947
			Contingency @ 25%	\$ 165,237
			Sub-Total	<u>\$ 826,183</u>
			Engineering, Admin, and Legal @ 15%	<u>\$ 123,928</u>
			Total Construction Cost	\$ 950,111
			Low Range	\$ 903,000
			High Range	\$ 1,093,000
			TOTAL PHASE 3 PROJECTS	\$ 3,664,092
			Low Range	\$ 3,481,000
			High Range	\$ 4,214,000

**West Jordan Secondary Water System Master Plan Update
Alternative 2
Phase 4 Projects**

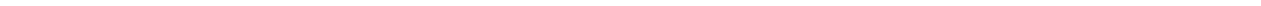
Item	Quantity	Unit	Unit Cost	Cost
Project 4-1				
Mobilization/Demobilization	1	lump sum	\$ 40,000	\$ 40,000
10" Dia. C900 PVC pipe	3,640	l.f.	\$ 106	\$ 385,840
12" Dia. C900 PVC pipe	3,444	l.f.	\$ 120	\$ 413,280
			Sub-Total	\$ 839,120
			Contingency @ 25%	\$ 209,780
			Sub-Total	<u>\$ 1,048,900</u>
			Engineering, Admin, and Legal @ 15%	<u>\$ 157,335</u>
			Total Construction Cost	\$ 1,206,235
			Low Range	\$ 1,146,000
			High Range	\$ 1,388,000
Project 4-2				
Mobilization/Demobilization	1	lump sum	\$ 7,000	\$ 7,000
Zone 6 Booster Pump, 506 gpm, 26 h.p.	1	lump sum	\$ 120,000	\$ 120,000
Misc Piping and Vaults	1	lump sum	\$ 20,000	\$ 20,000
			Sub-Total	\$ 147,000
			Contingency @ 25%	\$ 36,750
			Sub-Total	<u>\$ 183,750</u>
			Engineering, Admin, and Legal @ 15%	<u>\$ 27,563</u>
			Total Construction Cost	\$ 211,313
			Low Range	\$ 201,000
			High Range	\$ 244,000
Project 4-3				
Mobilization/Demobilization	1	lump sum	\$ 20,000	\$ 20,000
Zone 6 Pond, 2.23 acre-feet	1	lump sum	\$ 363,324	\$ 363,324
Misc Piping and Vaults	1	lump sum	\$ 35,000	\$ 35,000
			Sub-Total	\$ 418,324
			Contingency @ 25%	\$ 104,581
			Sub-Total	<u>\$ 522,905</u>
			Engineering, Admin, and Legal @ 15%	<u>\$ 78,436</u>
			Total Construction Cost	\$ 601,341
			Low Range	\$ 572,000
			High Range	\$ 692,000
			TOTAL PHASE 4 PROJECTS	\$ 2,018,888
			Low Range	\$ 1,918,000
			High Range	\$ 2,322,000

**West Jordan Secondary Water System Master Plan Update
Alternative 2
Phase 5 Projects**

Item	Quantity	Unit	Unit Cost	Cost
Project 5-1				
Mobilization/Demobilization	1	lump sum	\$ 10,000	\$ 10,000
8" Dia. C900 PVC pipe	1,408	l.f.	\$ 94	\$ 132,352
			Sub-Total	\$ 142,352
			Contingency @ 25%	\$ 35,588
			Sub-Total	<u>\$ 177,940</u>
			Engineering, Admin, and Legal @ 15%	\$ 26,691
			Total Construction Cost	\$ 204,631
			Low Range	\$ 195,000
			High Range	\$ 236,000
 Project 5-2				
Mobilization/Demobilization	1	lump sum	\$ 39,000	\$ 39,000
8" Dia. C900 PVC pipe	8,115	l.f.	\$ 94	\$ 762,810
			Sub-Total	\$ 801,810
			Contingency @ 25%	\$ 200,453
			Sub-Total	<u>\$ 1,002,263</u>
			Engineering, Admin, and Legal @ 15%	\$ 150,339
			Total Construction Cost	\$ 1,152,602
			Low Range	\$ 1,095,000
			High Range	\$ 1,326,000
			TOTAL PHASE 5 PROJECTS	\$ 1,357,233
			Low Range	\$ 1,290,000
			High Range	\$ 1,561,000

APPENDIX I

Alternative 1 Rate Model



- Summary of Planning Assumptions and Forecast of System Demand

West Jordan City Secondary Water Summary of Assumptions											
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Inflation Forecast:											
Personal services	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
Materials and services	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
Capital outlays	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
Transfers to other funds	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
Revenue Growth Forecast:											
Intergovernmental	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
Transfers from other funds	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
Investment income	0.60%	0.60%	0.60%	0.60%	0.60%	0.60%	0.60%	0.60%	0.60%	0.60%	0.60%
Miscellaneous	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
Demand Characteristics:											
Connections:											
Estimated connections beginning	-	2,006	4,013	4,271	4,400	4,529	4,658	4,787	4,916	5,045	5,174
Annual additions	-	129	258	129	129	129	129	129	129	129	129
Estimated connections ending	-	2,135	4,271	4,400	4,529	4,658	4,787	4,916	5,045	5,174	5,303
Irrigated Acres:											
Estimated acres beginning											
Acres irrigated by RPZs ¹	-	-	320	640	685	571	372	308	353	398	201
Acres irrigated by non-potable source	-	-	-	-	-	160	404	513	513	513	755
Subtotal estimated acres beginning	-	-	320	640	685	731	776	821	866	911	956
Annual additions:											
Acres irrigated by RPZs ¹	-	320	320	45	(115)	(199)	(64)	45	45	(197)	(51)
Acres irrigated by non-potable source	-	-	-	-	160	244	110	-	-	242	96
Subtotal annual additions	-	320	320	45	45	45	45	45	45	45	45
Estimated acres ending:											
Acres irrigated by RPZs ¹	-	320	640	685	571	372	308	353	398	201	151
Acres irrigated by non-potable source	-	-	-	-	160	404	513	513	513	755	851
Total acres ending	-	320	640	685	731	776	821	866	911	956	1,002
Acre Feet of Water Delivered:											
Estimated acre feet											
JWWCD potable	-	-	960	1,921	2,056	1,712	1,117	923	1,059	1,194	604
Non-potable sources	-	-	-	-	-	480	1,211	1,539	1,539	1,539	2,265
Subtotal estimated acre feet beginning	-	-	960	1,921	2,056	2,192	2,327	2,463	2,598	2,734	2,869
Annual additions:											
JWWCD potable	-	960	960	135	(344)	(596)	(193)	135	135	(590)	(152)
Non-potable sources	-	-	-	-	480	731	329	-	-	726	288
Subtotal annual additions	-	960	960	135	135	135	135	135	135	135	135
Estimated acre feet ending:											
JWWCD potable	-	960	1,921	2,056	1,712	1,117	923	1,059	1,194	604	452
Non-potable sources	-	-	-	-	480	1,211	1,539	1,539	1,539	2,265	2,553
Total acre feet ending	-	960	1,921	2,056	2,192	2,327	2,463	2,598	2,734	2,869	3,005

¹ A **Reduced Pressure Zone** Device (RPZD, RPZ, or RPZ valve) is a type of backflow prevention device used to protect water supplies from contamination. RPZDs may also be known as reduced pressure principle backflow prevention devices, or reduced pressure zone assemblies.

• Capital Projects Funding Analysis

West Jordan City
Summary of Secondary Water Capital Projects Funding Strategies

Assumptions:	
Fund Earnings %	1.00%
Issuance Cost:	
Short-Term	0.00%
Long-Term:	
Revenue Bonds	1.00%
G.O. Bonds	0.00%

Interim Financing:	
BANs Used? (1=Y,0=N)	0
BAN Interest Rate:	4.00%
Long-Term Financing:	
Revenue Bonds:	
Life of Debt (Years)	20
Interest Rate	3.50%
Coverage Factor Required	0.00
Fund Reserve from Proceeds? (1=Y,0=N)	1
Administration Fee (on Outstanding Bal)	0.0%
General Obligation Bonds:	
Life of Debt (Years)	20
Interest Rate	4.50%
Fund Reserve from Proceeds? (1=Y,0=N)	0

Fiscal Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Type of Long Term Debt Issued (1=Y,0=N):											
Revenue Bonds	1	1	1	1	1	1	1	1	1	1	1
General Obligation Bonds	0	0	0	0	0	0	0	0	0	0	0
Capital Improvements Financing											
Capital Costs to be Funded	500,000	7,618,570	7,629,993	7,858,893	8,579,201	5,100,463	9,552,046	9,838,606	6,717,770	4,562,429	8,872,467
less: Grants and contributions	-	-	-	-	-	-	1,670,000	1,670,000	-	-	-
less: Development Impact Fee Charge Contributions	-	-	-	-	-	-	-	-	-	-	-
less: General Fun contributions	-	-	-	-	-	-	-	-	-	-	-
less: Contributions From Utility Rates	100,000	25,000	150,000	350,000	500,000	700,000	700,000	900,000	1,000,000	1,100,000	1,200,000
Amount to be Financed	400,000	7,593,570	7,479,993	7,508,893	8,079,201	4,400,463	7,182,046	7,268,606	5,717,770	3,462,429	7,672,467
Interim Borrowing:											
BANs Issued:	-	-	-	-	-	-	-	-	-	-	-
less: Borrowing Cost	-	-	-	-	-	-	-	-	-	-	-
less: Interest Payments	-	-	-	-	-	-	-	-	-	-	-
plus: Interest Earnings	-	-	-	-	-	-	-	-	-	-	-
Net Available from BANS	-	-	-	-	-	-	-	-	-	-	-
Long-term Borrowing:											
Revenue Bonds:											
Amount Borrowed	434,953	8,257,121	8,133,619	8,165,044	8,785,188	4,784,990	7,809,637	7,903,761	6,217,408	3,764,988	8,342,913
less: Financing Cost	4,350	82,571	81,336	81,650	87,852	47,850	78,096	79,038	62,174	37,650	83,429
less: Reserve Funding	30,604	580,980	572,290	574,501	618,135	336,677	549,494	556,117	437,464	264,909	587,016
less: Refunding of BANS	-	-	-	-	-	-	-	-	-	-	-
Net Funds from Revenue Bonds	400,000	7,593,570	7,479,993	7,508,893	8,079,201	4,400,463	7,182,046	7,268,606	5,717,770	3,462,429	7,672,467
General Obligation Bonds:											
Amount Borrowed	-	-	-	-	-	-	-	-	-	-	-
less: Financing Cost	-	-	-	-	-	-	-	-	-	-	-
less: Reserve Funding	-	-	-	-	-	-	-	-	-	-	-
less: Refunding of BANS	-	-	-	-	-	-	-	-	-	-	-
Net Funds from G.O. Bonds	-	-	-	-	-	-	-	-	-	-	-
New Annual Debt Service:											
Principal & Interest Repayment	30,604	611,584	1,183,874	1,758,375	2,376,511	2,713,188	3,262,682	3,818,799	4,256,263	4,521,171	5,108,188
Administration Fee	-	-	-	-	-	-	-	-	-	-	-
Total Annual Debt Service	30,604	611,584	1,183,874	1,758,375	2,376,511	2,713,188	3,262,682	3,818,799	4,256,263	4,521,171	5,108,188

• Secondary Water Capital Projects Fund Cash Flow Forecast

West Jordan City Analysis of Secondary Water Capital Projects Fund Cash Flow											
	Forecast										
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Resources:											
Beginning Fund Balance	-	30,604	611,584	1,183,874	1,758,375	2,376,511	2,713,188	3,262,682	3,818,799	4,256,263	4,521,171
Revenues:											
Intergovernmental	-	-	-	-	-	-	-	-	-	-	-
Investment income	-	184	3,670	7,103	10,550	14,259	16,279	19,576	22,913	25,538	27,127
Grants and contributions	-	-	-	-	-	-	1,670,000	1,670,000	-	-	-
Subtotal revenues	-	184	3,670	7,103	10,550	14,259	1,686,279	1,689,576	22,913	25,538	27,127
Transfers from other funds - IN:											
Secondary Water Operating Fund	100,000	25,000	150,000	350,000	500,000	700,000	700,000	900,000	1,000,000	1,100,000	1,200,000
Other	-	-	-	-	-	-	-	-	-	-	-
Subtotal transfers IN	100,000	25,000	150,000	350,000	500,000	700,000	700,000	900,000	1,000,000	1,100,000	1,200,000
Bond proceeds:											
New revenue bonds - reserve requirement	30,604	580,980	572,290	574,501	618,135	336,677	549,494	556,117	437,464	264,909	587,016
New revenue bonds - project funding	400,000	7,593,570	7,479,993	7,508,893	8,079,201	4,400,463	7,182,046	7,268,606	5,717,770	3,462,429	7,672,467
Subtotal bond proceeds	430,604	8,174,550	8,052,283	8,083,394	8,697,336	4,737,140	7,731,540	7,824,723	6,155,234	3,727,338	8,259,484
Total Resources	\$ 530,604	\$ 8,230,337	\$ 8,817,536	\$ 9,624,371	\$ 10,966,262	\$ 7,827,909	\$ 12,831,007	\$ 13,676,981	\$ 10,996,946	\$ 9,109,138	\$ 14,007,782
Requirements:											
Expenditures:											
Capital projects	500,000	7,618,570	7,629,993	7,858,893	8,579,201	5,100,463	9,552,046	9,838,606	6,717,770	4,562,429	8,872,467
Transfers to other funds - OUT:											
General Fund	-	-	-	-	-	-	-	-	-	-	-
Secondary Water Operating Fund	-	184	3,670	7,103	10,550	14,259	16,279	19,576	22,913	25,538	27,127
Subtotal transfers to other funds - OUT	-	184	3,670	7,103	10,550	14,259	16,279	19,576	22,913	25,538	27,127
Contingency	-	-	-	-	-	-	-	-	-	-	-
New revenue bonds - reserve requirement	30,604	611,584	1,183,874	1,758,375	2,376,511	2,713,188	3,262,682	3,818,799	4,256,263	4,521,171	5,108,188
Unappropriated ending fund balance	(0)	-	-	-	-	-	-	-	-	-	-
Total Requirements	\$ 530,604	\$ 8,230,337	\$ 8,817,536	\$ 9,624,371	\$ 10,966,262	\$ 7,827,909	\$ 12,831,007	\$ 13,676,981	\$ 10,996,946	\$ 9,109,138	\$ 14,007,782

- Secondary Water Operating Fund Cash Flow Forecast

West Jordan City Analysis of Secondary Water Operating Fund Cash Flow												
	Forecast											
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	
Resources:												
Beginning Fund Balance	100,000	9,996	137,892	283,861	373,454	467,582	445,879	561,549	616,249	680,315	710,608	
Revenues:												
Secondary water rates	40,000	1,259,071	2,518,680	3,339,573	4,090,204	4,416,075	5,120,099	5,928,363	6,594,707	6,823,182	7,590,871	
Transfer from Capital Projects Fund	-	184	3,670	7,103	10,550	14,259	16,279	19,576	22,913	25,538	27,127	
Investment income	600	60	827	1,703	2,241	2,805	2,675	3,369	3,697	4,082	4,264	
Miscellaneous	-	-	-	-	-	-	-	-	-	-	-	
Subtotal revenues	40,600	1,259,315	2,523,177	3,348,380	4,102,995	4,433,140	5,139,053	5,951,308	6,621,317	6,852,802	7,622,262	
Total Resources	<u>\$ 140,600</u>	<u>\$ 1,269,311</u>	<u>\$ 2,661,069</u>	<u>\$ 3,632,241</u>	<u>\$ 4,476,449</u>	<u>\$ 4,900,722</u>	<u>\$ 5,584,932</u>	<u>\$ 6,512,857</u>	<u>\$ 7,237,567</u>	<u>\$ 7,533,117</u>	<u>\$ 8,332,869</u>	
Requirements:												
Expenditures:												
Personal services	-	-	-	-	-	-	-	-	-	-	-	
Materials and services - base line	-	5,150	34,582	38,131	178,449	400,905	515,026	533,304	552,215	811,418	936,672	
Purchased water cost - JVVCD	-	489,685	1,008,752	1,112,279	953,907	640,750	545,675	644,505	748,774	389,920	300,355	
Materials and services -other	-	-	-	-	-	-	-	-	-	-	-	
Capital outlays - small works	-	-	-	-	-	-	-	-	-	-	-	
Subtotal expenditures	-	494,835	1,043,334	1,150,411	1,132,357	1,041,655	1,060,701	1,177,809	1,300,989	1,201,338	1,237,027	
Transfers to other funds - OUT												
General Fund	-	-	-	-	-	-	-	-	-	-	-	
Community Development Fund	-	-	-	-	-	-	-	-	-	-	-	
Secondary Water Capital Projects Fund - pj. Support	100,000	25,000	150,000	350,000	500,000	700,000	700,000	900,000	1,000,000	1,100,000	1,200,000	
Secondary Water Capital Projects Fund - overheads	-	-	-	-	-	-	-	-	-	-	-	
Subtotal transfers to other funds	100,000	25,000	150,000	350,000	500,000	700,000	700,000	900,000	1,000,000	1,100,000	1,200,000	
Debt service:												
Water fund legacy debt assigned to secondary system	-	-	-	-	-	-	-	-	-	-	-	
Revenue bonds - secondary	30,604	611,584	1,183,874	1,758,375	2,376,511	2,713,188	3,262,682	3,818,799	4,256,263	4,521,171	5,108,188	
Subtotal debt service	30,604	611,584	1,183,874	1,758,375	2,376,511	2,713,188	3,262,682	3,818,799	4,256,263	4,521,171	5,108,188	
Contingencies/Designations	-	-	-	-	-	-	-	-	-	-	-	
Unappropriated ending fund balance	9,996	137,892	283,861	373,454	467,582	445,879	561,549	616,249	680,315	710,608	787,655	
Total Requirements	<u>\$ 140,600</u>	<u>\$ 1,269,311</u>	<u>\$ 2,661,069</u>	<u>\$ 3,632,241</u>	<u>\$ 4,476,449</u>	<u>\$ 4,900,722</u>	<u>\$ 5,584,932</u>	<u>\$ 6,512,857</u>	<u>\$ 7,237,567</u>	<u>\$ 7,533,117</u>	<u>\$ 8,332,869</u>	

• Forecast Secondary Water System Revenue Requirements

West Jordan City Projection of Secondary Water Operating Fund Revenue Requirements											
Line Item Description	Forecast										
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Projection of Cash Flow:											
Revenues:											
Secondary water rates	40,000	40,000	1,259,071	2,518,680	3,339,573	4,090,204	4,416,075	5,120,099	5,928,363	6,594,707	6,823,182
Transfer from Capital Projects Fund	-	184	3,670	7,103	10,550	14,259	16,279	19,576	22,913	25,538	27,127
Investment income	600	60	827	1,703	2,241	2,805	2,675	3,369	3,697	4,082	4,264
Miscellaneous	-	-	-	-	-	-	-	-	-	-	-
Subtotal revenues	40,600	40,244	1,263,568	2,527,486	3,352,364	4,107,268	4,435,029	5,143,044	5,954,973	6,624,327	6,854,573
Expenditures:											
Operations and maintenance	-	494,835	1,043,334	1,150,411	1,132,357	1,041,655	1,060,701	1,177,809	1,300,989	1,201,338	1,237,027
Transfers to Other Funds	-	-	-	-	-	-	-	-	-	-	-
Debt service	30,604	611,584	1,183,874	1,758,375	2,376,511	2,713,188	3,262,682	3,818,799	4,256,263	4,521,171	5,108,188
Use of Operating Fund balance	-	-	-	-	-	-	-	-	-	-	-
Subtotal expenditures	30,604	1,106,419	2,227,208	2,908,786	3,508,867	3,754,843	4,323,383	4,996,608	5,557,252	5,722,509	6,345,215
Net Cash	9,996	(1,066,176)	(963,640)	(381,300)	(156,503)	352,426	111,647	146,436	397,721	901,818	509,358
Net Deficiency/(Surplus)	(9,996)	1,066,176	963,640	381,300	156,503	(352,426)	(111,647)	(146,436)	(397,721)	(901,818)	(509,358)
Test of Coverage Requirement:											
Operating Revenues:											
Secondary water rates	40,000	40,000	1,259,071	2,518,680	3,339,573	4,090,204	4,416,075	5,120,099	5,928,363	6,594,707	6,823,182
Transfer from Capital Projects Fund	-	184	3,670	7,103	10,550	14,259	16,279	19,576	22,913	25,538	27,127
Development impact fees	-	-	-	-	-	-	-	-	-	-	-
Transfers (To) From Rate Stabilization Account	-	-	-	-	-	-	-	-	-	-	-
Total Operating Revenues	40,000	40,184	1,262,741	2,525,783	3,350,124	4,104,463	4,432,354	5,139,675	5,951,275	6,620,245	6,850,309
Operating Expenses:											
Operations & Maintenance Expense	-	494,835	1,043,334	1,150,411	1,132,357	1,041,655	1,060,701	1,177,809	1,300,989	1,201,338	1,237,027
Transfers to Other Funds	-	-	-	-	-	-	-	-	-	-	-
Total Operating Expenses	-	494,835	1,043,334	1,150,411	1,132,357	1,041,655	1,060,701	1,177,809	1,300,989	1,201,338	1,237,027
Net Operating Income	40,000	(454,652)	219,407	1,375,372	2,217,767	3,062,808	3,371,653	3,961,866	4,650,286	5,418,907	5,613,282
Nonoperating Income (Expense):											
Interest Income:											
Secondary Water Operating Fund	600	60	827	1,703	2,241	2,805	2,675	3,369	3,697	4,082	4,264
Secondary Water Development Impact Fee Fund	-	-	-	-	-	-	-	-	-	-	-
Other Nonoperating Income (expense)	-	-	-	-	-	-	-	-	-	-	-
Miscellaneous	-	-	-	-	-	-	-	-	-	-	-
Total Nonoperating Income	600	60	827	1,703	2,241	2,805	2,675	3,369	3,697	4,082	4,264
Total Net Revenues Available for Debt Service	40,600	(454,592)	220,234	1,377,075	2,220,008	3,065,613	3,374,329	3,965,235	4,653,984	5,422,989	5,617,546
Debt Service:											
Senior Lien Parity Obligations:											
Oregon DEQ Revolving Loan	-	-	-	-	-	-	-	-	-	-	-
New revenue bonds	30,604	611,584	1,183,874	1,758,375	2,376,511	2,713,188	3,262,682	3,818,799	4,256,263	4,521,171	5,108,188
Total Senior Lien Parity Obligations	30,604	611,584	1,183,874	1,758,375	2,376,511	2,713,188	3,262,682	3,818,799	4,256,263	4,521,171	5,108,188
Senior Lien Parity Obligations Coverage Recognized	1.3266	(0.7433)	0.1860	0.7832	0.9341	1.1299	1.0342	1.0383	1.0934	1.1995	1.0997
Senior Lien Parity Obligations Coverage Required	1.2500	1.2500	1.2500	1.2500	1.2500	1.2500	1.2500	1.2500	1.2500	1.2500	1.2500
Senior Lien Coverage Deficiency	-	1,219,071	1,259,608	820,894	750,630	325,871	704,024	808,264	666,345	228,475	767,688
Net Deficiency/(Surplus)	-	1,219,071	1,259,608	820,894	750,630	325,871	704,024	808,264	666,345	228,475	767,688
Projection of Revenue Sufficiency:											
Maximum Deficiency	-	1,219,071	1,259,608	820,894	750,630	325,871	704,024	808,264	666,345	228,475	767,688
Percent Increase Required Over Current Rate Revenues	0.00%	3047.68%	100.04%	32.59%	22.48%	7.97%	15.94%	15.79%	11.24%	3.46%	11.25%
Stormwater rates reconciliation:											
Revenues recognized from current rates	40,000	40,000	1,259,071	2,518,680	3,339,573	4,090,204	4,416,075	5,120,099	5,928,363	6,594,707	6,823,182
Add revenues from rate increase	-	1,219,071	1,259,608	820,894	750,630	325,871	704,024	808,264	666,345	228,475	767,688
Total revenues recognized from rate increase	40,000	1,259,071	2,518,680	3,339,573	4,090,204	4,416,075	5,120,099	5,928,363	6,594,707	6,823,182	7,590,871

- Forecast Secondary Water System Rates and Charges

West Jordan City Projection of Secondary Water Operating Fund Revenue Requirements and Derivation of Monthly Rates											
	Forecast										
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
<i>Gross revenues required from rates:</i>											
Operations and maintenance expense	\$ -	\$ 494,835	\$ 1,043,334	\$ 1,150,411	\$ 1,132,357	\$ 1,041,655	\$ 1,060,701	\$ 1,177,809	\$ 1,300,989	\$ 1,201,338	\$ 1,237,027
Operating fund capital outlays - small works	-	-	-	-	-	-	-	-	-	-	-
Transfers to other funds excluding capital projects fund	-	-	-	-	-	-	-	-	-	-	-
Debt service	30,604	611,584	1,183,874	1,758,375	2,376,511	2,713,188	3,262,682	3,818,799	4,256,263	4,521,171	5,108,188
Revenue bond coverage requirement	-	152,896	295,968	439,594	594,128	678,297	815,671	954,700	1,064,066	1,130,293	1,277,047
(Use)/Replacement of Operating Fund balance	-	-	-	-	-	-	-	-	-	-	-
Subtotal gross revenues required from rates	30,604	1,259,315	2,523,177	3,348,380	4,102,995	4,433,140	5,139,053	5,951,308	6,621,317	6,852,802	7,622,262
<i>Revenue offsets to cost of service:</i>											
Intergovernmental	-	184	3,670	7,103	10,550	14,259	16,279	19,576	22,913	25,538	27,127
Investment income	600	60	827	1,703	2,241	2,805	2,675	3,369	3,697	4,082	4,264
Miscellaneous	-	-	-	-	-	-	-	-	-	-	-
Subtotal revenue offsets to cost of service	600	244	4,497	8,806	12,791	17,065	18,954	22,945	26,610	29,619	31,391
<i>Revenues required from rates on a cash flow basis</i>	\$ 30,004	\$ 1,259,071	\$ 2,518,680	\$ 3,339,573	\$ 4,090,204	\$ 4,416,075	\$ 5,120,099	\$ 5,928,363	\$ 6,594,707	\$ 6,823,182	\$ 7,590,871
<i>Summary of Monthly Rate Options:</i>											
Fixed monthly rates based on:											
Billable connections	no connections	\$ 49.14	\$ 49.14	\$ 63.25	\$ 75.26	\$ 79.01	\$ 89.13	\$ 100.49	\$ 108.93	\$ 109.90	\$ 119.29
Irrigated acre	no irrigated acres	\$ 327.73	\$ 327.80	\$ 406.01	\$ 466.53	\$ 474.39	\$ 519.76	\$ 570.44	\$ 603.12	\$ 594.55	\$ 631.63
Acre foot of water delivered to the system	no acre feet	\$ 109.24	\$ 109.27	\$ 135.34	\$ 155.51	\$ 158.13	\$ 173.25	\$ 190.15	\$ 201.04	\$ 198.18	\$ 210.54
Fixed and variable monthly rates based on:											
Base charge per billable connection	no connections	\$ 29.84	\$ 28.87	\$ 41.63	\$ 54.66	\$ 60.67	\$ 71.00	\$ 80.92	\$ 87.88	\$ 91.02	\$ 100.34
Use charge per acre foot of water delivered to the system	no acre feet	\$ 42.91	\$ 45.07	\$ 46.26	\$ 42.57	\$ 36.69	\$ 35.25	\$ 37.04	\$ 38.85	\$ 34.03	\$ 33.44

APPENDIX J

Alternative 2 Rate Model



- Summary of Planning Assumptions and Forecast of System Demand

West Jordan City Secondary Water Summary of Assumptions											
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Inflation Forecast:											
Personal services	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
Materials and services	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
Capital outlays	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
Transfers to other funds	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
Revenue Growth Forecast:											
Intergovernmental	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
Transfers from other funds	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
Investment income	0.60%	0.60%	0.60%	0.60%	0.60%	0.60%	0.60%	0.60%	0.60%	0.60%	0.60%
Miscellaneous	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
Demand Characteristics:											
Connections:											
Estimated connections beginning	-	2,006	4,013	4,013	4,013	4,013	4,013	4,013	4,013	4,013	4,013
Annual additions	-	-	-	-	-	-	-	-	-	-	-
Estimated connections ending	-	2,006	4,013	4,013	4,013	4,013	4,013	4,013	4,013	4,013	4,013
Irrigated Acres:											
Estimated acres beginning	-	-	275	550	550	390	146	37	-	-	-
Acres irrigated by RPZs ¹	-	-	-	550	-	-	146	37	-	-	-
Acres irrigated by non-potable source	-	-	-	-	-	160	404	513	550	550	550
Subtotal estimated acres beginning	-	-	275	550	550	550	550	550	550	550	550
Annual additions:											
Acres irrigated by RPZs ¹	-	275	275	-	(160)	(244)	(110)	(37)	-	-	-
Acres irrigated by non-potable source	-	-	-	-	160	244	110	37	-	-	-
Subtotal annual additions	-	275	275	-	-	-	-	-	-	-	-
Estimated acres ending:											
Acres irrigated by RPZs ¹	-	275	550	550	390	146	37	-	-	-	-
Acres irrigated by non-potable source	-	-	-	-	160	404	513	550	550	550	550
Total acres ending	-	275	550	550	550	550	550	550	550	550	550
Acres Feet of Water Delivered:											
Estimated acre feet											
JVWCD potable	-	-	825	1,650	1,650	1,170	439	111	-	-	-
Non-potable sources	-	-	-	-	-	480	1,211	1,539	1,650	1,650	1,650
Subtotal estimated acre feet beginning	-	-	825	1,650	1,650	1,650	1,650	1,650	1,650	1,650	1,650
Annual additions:											
JVWCD potable	-	825	825	-	(480)	(731)	(329)	(111)	-	-	-
Non-potable sources	-	-	-	-	480	731	329	111	-	-	-
Subtotal annual additions	-	825	825	-	-	-	-	-	-	-	-
Estimated acre feet ending:											
JVWCD potable	-	825	1,650	1,650	1,170	439	111	-	-	-	-
Non-potable sources	-	-	-	-	480	1,211	1,539	1,650	1,650	1,650	1,650
Total acre feet ending	-	825	1,650	1,650	1,650	1,650	1,650	1,650	1,650	1,650	1,650

¹ A **Reduced Pressure Zone** Device (RPZD, RPZ, or RPZ valve) is a type of backflow prevention device used to protect water supplies from contamination. RPZDs may also be known as reduced pressure principle backflow prevention devices, or reduced pressure zone assemblies.

• Capital Projects Funding Analysis

West Jordan City
Summary of Secondary Water Capital Projects Funding Strategies

Assumptions:	
Fund Earnings %	1.00%
Issuance Cost:	
Short-Term	0.00%
Long-Term:	
Revenue Bonds	1.00%
G.O. Bonds	0.00%

Interim Financing:	
BANs Used? (1=Y,0=N)	0
BAN Interest Rate:	4.00%
Long-Term Financing:	
Revenue Bonds:	
Life of Debt (Years)	20
Interest Rate	3.50%
Coverage Factor Required	0.00
Fund Reserve from Proceeds? (1=Y,0=N)	1
Administration Fee (on Outstanding Bal)	0.0%
General Obligation Bonds:	
Life of Debt (Years)	20
Interest Rate	4.50%
Fund Reserve from Proceeds? (1=Y,0=N)	0

Fiscal Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Type of Long Term Debt Issued (1=Y,0=N):											
Revenue Bonds	1	1	1	1	1	1	1	1	1	1	1
General Obligation Bonds	0	0	0	0	0	0	0	0	0	0	0
Capital Improvements Financing											
Capital Costs to be Funded	500,000	2,363,510	3,591,677	3,699,427	4,123,968	2,340,445	1,620,607	-	-	-	-
less: Grants and contributions	-	-	-	-	-	-	-	-	-	-	-
less: Development Impact Fee Charge Contributions	-	-	-	-	-	-	-	-	-	-	-
less: General Fun contributions	-	-	-	-	-	-	-	-	-	-	-
less: Contributions From Utility Rates	75,000	-	25,000	165,000	245,000	-	-	-	-	-	-
Amount to be Financed	425,000	2,363,510	3,566,677	3,534,427	3,878,968	2,340,445	1,620,607	-	-	-	-
Interim Borrowing:											
BANs Issued:	-	-	-	-	-	-	-	-	-	-	-
less: Borrowing Cost	-	-	-	-	-	-	-	-	-	-	-
less: Interest Payments	-	-	-	-	-	-	-	-	-	-	-
plus: Interest Earnings	-	-	-	-	-	-	-	-	-	-	-
Net Available from BANS	-	-	-	-	-	-	-	-	-	-	-
Long-term Borrowing:											
Revenue Bonds:											
Amount Borrowed	462,138	2,570,041	3,878,345	3,843,277	4,217,925	2,544,960	1,762,221	-	-	-	-
less: Financing Cost	4,621	25,700	38,783	38,433	42,179	25,450	17,622	-	-	-	-
less: Reserve Funding	32,517	180,831	272,885	270,417	296,778	179,066	123,992	-	-	-	-
less: Refunding of BANs	-	-	-	-	-	-	-	-	-	-	-
Net Funds from Revenue Bonds	425,000	2,363,510	3,566,677	3,534,427	3,878,968	2,340,445	1,620,607	-	-	-	-
General Obligation Bonds:											
Amount Borrowed	-	-	-	-	-	-	-	-	-	-	-
less: Financing Cost	-	-	-	-	-	-	-	-	-	-	-
less: Reserve Funding	-	-	-	-	-	-	-	-	-	-	-
less: Refunding of BANs	-	-	-	-	-	-	-	-	-	-	-
Net Funds from G.O. Bonds	-	-	-	-	-	-	-	-	-	-	-
New Annual Debt Service:											
Principal & Interest Repayment	32,517	213,347	486,232	756,649	1,053,427	1,232,493	1,356,485	1,356,485	1,356,485	1,356,485	1,356,485
Administration Fee	-	-	-	-	-	-	-	-	-	-	-
Total Annual Debt Service	32,517	213,347	486,232	756,649	1,053,427	1,232,493	1,356,485	1,356,485	1,356,485	1,356,485	1,356,485

- Secondary Water Capital Projects Fund Cash Flow Forecast

West Jordan City Analysis of Secondary Water Capital Projects Fund Cash Flow											
	Forecast										
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Resources:											
Beginning Fund Balance	-	32,517	213,347	486,232	756,649	1,053,427	1,232,493	1,356,485	1,356,485	1,356,485	1,356,485
Revenues:											
Intergovernmental	-	-	-	-	-	-	-	-	-	-	-
Investment income	-	195	1,280	2,917	4,540	6,321	7,395	8,139	8,139	8,139	8,139
Grants and contributions	-	-	-	-	-	-	-	-	-	-	-
Subtotal revenues	-	195	1,280	2,917	4,540	6,321	7,395	8,139	8,139	8,139	8,139
Transfers from other funds - IN:											
Secondary Water Operating Fund	75,000	-	25,000	165,000	245,000	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-	-	-
Subtotal transfers IN	75,000	-	25,000	165,000	245,000	-	-	-	-	-	-
Bond proceeds:											
New revenue bonds - reserve requirement	32,517	180,831	272,885	270,417	296,778	179,066	123,992	-	-	-	-
New revenue bonds - project funding	425,000	2,363,510	3,566,677	3,534,427	3,878,968	2,340,445	1,620,607	-	-	-	-
Subtotal bond proceeds	457,517	2,544,341	3,839,561	3,804,844	4,175,746	2,519,511	1,744,599	-	-	-	-
Total Resources	\$ 532,517	\$ 2,577,053	\$ 4,079,189	\$ 4,458,994	\$ 5,181,934	\$ 3,579,258	\$ 2,984,487	\$ 1,364,624	\$ 1,364,624	\$ 1,364,624	\$ 1,364,624
Requirements:											
Expenditures:											
Capital projects	500,000	2,363,510	3,591,677	3,699,427	4,123,968	2,340,445	1,620,607	-	-	-	-
Transfers to other funds - OUT:											
General Fund	-	-	-	-	-	-	-	-	-	-	-
Secondary Water Operating Fund	-	195	1,280	2,917	4,540	6,321	7,395	8,139	8,139	8,139	8,139
Subtotal transfers to other funds - OUT	-	195	1,280	2,917	4,540	6,321	7,395	8,139	8,139	8,139	8,139
Contingency	-	-	-	-	-	-	-	-	-	-	-
New revenue bonds - reserve requirement	32,517	213,347	486,232	756,649	1,053,427	1,232,493	1,356,485	1,356,485	1,356,485	1,356,485	1,356,485
Unappropriated ending fund balance	(0)	(0)	-	-	-	-	-	-	-	-	-
Total Requirements	\$ 532,517	\$ 2,577,053	\$ 4,079,189	\$ 4,458,994	\$ 5,181,934	\$ 3,579,258	\$ 2,984,487	\$ 1,364,624	\$ 1,364,624	\$ 1,364,624	\$ 1,364,624

• Secondary Water Operating Fund Cash Flow Forecast

West Jordan City Analysis of Secondary Water Operating Fund Cash Flow											
	Forecast										
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Resources:											
Beginning Fund Balance	100,000	33,083	86,420	182,978	207,141	225,497	225,497	564,618	564,618	564,618	564,618
Revenues:											
Secondary water rates	40,000	692,067	1,502,187	1,864,877	2,085,566	1,745,980	2,095,484	1,721,473	1,732,768	1,744,403	2,095,507
Transfer from Capital Projects Fund	-	195	1,280	2,917	4,540	6,321	7,395	8,139	8,139	8,139	8,139
Investment income	600	199	519	1,098	1,243	1,353	1,353	3,388	3,388	3,388	3,388
Miscellaneous	-	-	-	-	-	-	-	-	-	-	-
Subtotal revenues	40,600	692,461	1,503,985	1,868,892	2,091,349	1,753,654	2,104,232	1,733,000	1,744,295	1,755,929	2,107,034
Total Resources	<u>\$ 140,600</u>	<u>\$ 725,544</u>	<u>\$ 1,590,406</u>	<u>\$ 2,051,871</u>	<u>\$ 2,298,489</u>	<u>\$ 1,979,151</u>	<u>\$ 2,329,729</u>	<u>\$ 2,297,618</u>	<u>\$ 2,308,913</u>	<u>\$ 2,320,548</u>	<u>\$ 2,671,652</u>
Requirements:											
Expenditures:											
Personal services	-	-	-	-	-	-	-	-	-	-	-
Materials and services - base line	-	5,150	29,705	30,596	122,509	269,044	343,303	376,515	387,810	399,445	411,428
Purchased water cost - JVVCD	-	420,626	866,490	892,485	652,056	252,117	65,323	-	-	-	-
Materials and services -other	-	-	-	-	-	-	-	-	-	-	-
Capital outlays - small works	-	-	-	-	-	-	-	-	-	-	-
Subtotal expenditures	-	425,776	896,195	923,081	774,565	521,161	408,626	376,515	387,810	399,445	411,428
Transfers to other funds - OUT											
General Fund	-	-	-	-	-	-	-	-	-	-	-
Community Development Fund	-	-	-	-	-	-	-	-	-	-	-
Secondary Water Capital Projects Fund - pj. Support	75,000	-	25,000	165,000	245,000	-	-	-	-	-	-
Secondary Water Capital Projects Fund - overheads	-	-	-	-	-	-	-	-	-	-	-
Subtotal transfers to other funds	75,000	-	25,000	165,000	245,000	-	-	-	-	-	-
Debt service:											
Water fund legacy debt assigned to secondary system	-	-	-	-	-	-	-	-	-	-	-
Revenue bonds - secondary	32,517	213,347	486,232	756,649	1,053,427	1,232,493	1,356,485	1,356,485	1,356,485	1,356,485	1,356,485
Subtotal debt service	32,517	213,347	486,232	756,649	1,053,427	1,232,493	1,356,485	1,356,485	1,356,485	1,356,485	1,356,485
Contingencies/Designations	-	-	-	-	-	-	-	-	-	-	-
Unappropriated ending fund balance	33,083	86,420	182,978	207,141	225,497	225,497	564,618	564,618	564,618	564,618	903,740
Total Requirements	<u>\$ 140,600</u>	<u>\$ 725,544</u>	<u>\$ 1,590,406</u>	<u>\$ 2,051,871</u>	<u>\$ 2,298,489</u>	<u>\$ 1,979,151</u>	<u>\$ 2,329,729</u>	<u>\$ 2,297,618</u>	<u>\$ 2,308,913</u>	<u>\$ 2,320,548</u>	<u>\$ 2,671,652</u>

• Forecast Secondary Water System Revenue Requirements

West Jordan City Projection of Secondary Water Operating Fund Revenue Requirements											
Line Item Description	Forecast										
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Projection of Cash Flow:											
Revenues:											
Secondary water rates	40,000	40,046	692,067	1,502,187	1,864,877	2,085,566	2,085,566	2,095,484	2,095,484	2,095,484	2,095,484
Transfer from Capital Projects Fund	-	195	1,280	2,917	4,540	6,321	7,395	8,139	8,139	8,139	8,139
Investment income	600	199	519	1,098	1,243	1,353	1,353	3,388	3,388	3,388	3,388
Miscellaneous	-	-	-	-	-	-	-	-	-	-	-
Subtotal revenues	40,600	40,439	693,866	1,506,202	1,870,660	2,093,239	2,094,314	2,107,011	2,107,011	2,107,011	2,107,011
Expenditures:											
Operations and maintenance	-	425,776	896,195	923,081	774,565	521,161	408,626	376,515	387,810	399,445	411,428
Transfers to Other Funds	-	-	-	-	-	-	-	-	-	-	-
Debt service	32,517	213,347	486,232	756,649	1,053,427	1,232,493	1,356,485	1,356,485	1,356,485	1,356,485	1,356,485
Use of Operating Fund balance	-	-	-	-	-	-	-	-	-	-	-
Subtotal expenditures	32,517	639,124	1,382,427	1,679,730	1,827,992	1,753,654	1,765,111	1,733,000	1,744,295	1,755,929	1,767,913
Net Cash	8,083	(598,684)	(688,562)	(173,528)	42,668	339,586	329,203	374,011	362,716	351,081	339,098
Net Deficiency/(Surplus)	(8,083)	598,684	688,562	173,528	(42,668)	(339,586)	(329,203)	(374,011)	(362,716)	(351,081)	(339,098)
Test of Coverage Requirement:											
Operating Revenues:											
Secondary water rates	40,000	40,046	692,067	1,502,187	1,864,877	2,085,566	2,085,566	2,095,484	2,095,484	2,095,484	2,095,484
Transfer from Capital Projects Fund	-	195	1,280	2,917	4,540	6,321	7,395	8,139	8,139	8,139	8,139
Development impact fees	-	-	-	-	-	-	-	-	-	-	-
Transfers (To) From Rate Stabilization Account	-	-	-	-	-	-	-	-	-	-	-
Total Operating Revenues	40,000	40,241	693,347	1,505,104	1,869,417	2,091,886	2,092,961	2,103,623	2,103,623	2,103,623	2,103,623
Operating Expenses:											
Operations & Maintenance Expense	-	425,776	896,195	923,081	774,565	521,161	408,626	376,515	387,810	399,445	411,428
Transfers to Other Funds	-	-	-	-	-	-	-	-	-	-	-
Total Operating Expenses	-	425,776	896,195	923,081	774,565	521,161	408,626	376,515	387,810	399,445	411,428
Net Operating Income	40,000	(385,536)	(202,848)	582,023	1,094,852	1,570,726	1,684,335	1,727,108	1,715,813	1,704,178	1,692,195
Nonoperating Income (Expense):											
Interest Income:											
Secondary Water Operating Fund	600	199	519	1,098	1,243	1,353	1,353	3,388	3,388	3,388	3,388
Secondary Water Development Impact Fee Fund	-	-	-	-	-	-	-	-	-	-	-
Other Nonoperating Income (expense)	-	-	-	-	-	-	-	-	-	-	-
Miscellaneous	-	-	-	-	-	-	-	-	-	-	-
Total Nonoperating Income	600	199	519	1,098	1,243	1,353	1,353	3,388	3,388	3,388	3,388
Total Net Revenues Available for Debt Service	40,600	(385,337)	(202,330)	583,121	1,096,095	1,572,079	1,685,688	1,730,496	1,719,200	1,707,566	1,695,583
Debt Service:											
Senior Lien Parity Obligations:											
Oregon DEQ Revolving Loan	-	-	-	-	-	-	-	-	-	-	-
New revenue bonds	32,517	213,347	486,232	756,649	1,053,427	1,232,493	1,356,485	1,356,485	1,356,485	1,356,485	1,356,485
Total Senior Lien Parity Obligations	32,517	213,347	486,232	756,649	1,053,427	1,232,493	1,356,485	1,356,485	1,356,485	1,356,485	1,356,485
Senior Lien Parity Obligations Coverage Recognized	1.2486	(1.8061)	(0.4161)	0.7707	1.0405	1.2755	1.2427	1.2757	1.2674	1.2588	1.2500
Senior Lien Parity Obligations Coverage Required	1.2500	1.2500	1.2500	1.2500	1.2500	1.2500	1.2500	1.2500	1.2500	1.2500	1.2500
Senior Lien Coverage Deficiency	46	652,021	810,120	362,691	220,689	-	9,918	-	-	-	23
Net Deficiency/(Surplus)	46	652,021	810,120	362,691	220,689	-	9,918	-	-	-	23
Projection of Revenue Sufficiency:											
Maximum Deficiency	46	652,021	810,120	362,691	220,689	-	9,918	-	-	-	23
Percent Increase Required Over Current Rate Revenues	0.11%	1628.19%	117.06%	24.14%	11.83%	0.00%	0.48%	0.00%	0.00%	0.00%	0.00%
Stormwater rates reconciliation:											
Revenues recognized from current rates	40,000	40,046	692,067	1,502,187	1,864,877	2,085,566	2,085,566	2,095,484	2,095,484	2,095,484	2,095,484
Add revenues from rate increase	46	652,021	810,120	362,691	220,689	-	9,918	-	-	-	23
Total revenues recognized from rate increase	40,046	692,067	1,502,187	1,864,877	2,085,566	2,085,566	2,095,484	2,095,484	2,095,484	2,095,484	2,095,507

- Forecast Secondary Water System Rates and Charges

West Jordan City Projection of Secondary Water Operating Fund Revenue Requirements and Derivation of Monthly Rates												
	Forecast											
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	
<i>Gross revenues required from rates:</i>												
Operations and maintenance expense	\$ -	\$ 425,776	\$ 896,195	\$ 923,081	\$ 774,565	\$ 521,161	\$ 408,626	\$ 376,515	\$ 387,810	\$ 399,445	\$ 411,428	
Operating fund capital outlays - small works	-	-	-	-	-	-	-	-	-	-	-	
Transfers to other funds excluding capital projects fund	-	-	-	-	-	-	-	-	-	-	-	
Debt service	32,517	213,347	486,232	756,649	1,053,427	1,232,493	1,356,485	1,356,485	1,356,485	1,356,485	1,356,485	
Revenue bond coverage requirement	8,129	53,337	121,558	189,162	263,357	-	339,121	-	-	-	339,121	
(Use)/Replacement of Operating Fund balance	-	-	-	-	-	-	-	-	-	-	-	
Subtotal gross revenues required from rates	40,646	692,461	1,503,985	1,868,892	2,091,349	1,753,654	2,104,232	1,733,000	1,744,295	1,755,929	2,107,034	
<i>Revenue offsets to cost of service:</i>												
Intergovernmental	-	195	1,280	2,917	4,540	6,321	7,395	8,139	8,139	8,139	8,139	
Investment income	600	199	519	1,098	1,243	1,353	1,353	3,388	3,388	3,388	3,388	
Miscellaneous	-	-	-	-	-	-	-	-	-	-	-	
Subtotal revenue offsets to cost of service	600	394	1,799	4,015	5,783	7,674	8,748	11,527	11,527	11,527	11,527	
<i>Revenues required from rates on a cash flow basis</i>	\$ 40,046	\$ 692,067	\$ 1,502,187	\$ 1,864,877	\$ 2,085,566	\$ 1,745,980	\$ 2,095,484	\$ 1,721,473	\$ 1,732,768	\$ 1,744,403	\$ 2,095,507	
<i>Summary of Monthly Rate Options:</i>												
Fixed monthly rates based on:												
Billable connections	no connections	\$ 28.75	\$ 31.19	\$ 38.73	\$ 43.31	\$ 36.26	\$ 43.51	\$ 35.75	\$ 35.98	\$ 36.22	\$ 43.51	
Irrigated acre	no irrigated acres	\$ 209.72	\$ 227.60	\$ 282.56	\$ 315.99	\$ 264.54	\$ 317.50	\$ 260.83	\$ 262.54	\$ 264.30	\$ 317.50	
Acre foot of water delivered to the system	no acre feet	\$ 69.91	\$ 75.87	\$ 94.19	\$ 105.33	\$ 88.18	\$ 105.83	\$ 86.94	\$ 87.51	\$ 88.10	\$ 105.83	
Fixed and variable monthly rates based on:												
Base charge per billable connection	no connections	\$ 11.08	\$ 12.62	\$ 19.64	\$ 27.34	\$ 25.59	\$ 35.21	\$ 28.17	\$ 28.17	\$ 28.17	\$ 35.21	
Use charge per acre foot of water delivered to the system	no acre feet	\$ 42.97	\$ 45.17	\$ 46.42	\$ 38.83	\$ 25.93	\$ 20.20	\$ 18.43	\$ 19.00	\$ 19.59	\$ 20.20	