ORDINANCE NO. 2025-O-19

AN ORDINANCE ADOPTING THE MIDVALE CITY WATER USE AND PRESERVATION ELEMENT OF THE GENERAL PLAN

WHEREAS, in accordance with Utah Code 10-9a-403 Midvale City is required to include a Water Use and Preservation Element in its General Plan; and

WHEREAS, the City desires to continue to create water policy that is beneficial to its citizens while balancing sustainability, the needs of the Great Salt Lake Watershed, and population growth; and

WHEREAS, the City has consulted with the Division of Water Resources, the Division of Drinking Water, the Department of Agriculture, the Jordan Valley Water Conservancy District, the Jordan River Commission and others to receive guidance and different perspectives on how to preserve the Great Salt Lake Watershed and be a part of a sustainable approach to water use; and

WHEREAS, the Midvale City Water Use and Preservation Element of the General Plan used Utah Code 10-9a-403 as its basis, analyzed the Midvale Water Conservation Plan, the Drinking Water System Master Plan, and the role of Midvale's land development system with regard to water use and preservation; and

WHEREAS, the Planning Commission held a public hearing on September 10, 2025, to review the plan, receive public comment and, after considering all the information received, made a recommendation to approve the Water Use and Preservation Element of the General Plan; and

WHEREAS, the City Council of Midvale City, Utah held a public hearing on October 7, 2025; and

WHEREAS, after taking into consideration citizen testimony, planning analysis, and the Planning Commission's recommendation as part of its deliberations, the City Council finds it is within the best interest of the City to amend the General Plan by adding a Water Use and Preservation Element.

NOW, THEREFORE, BE IT ORDAINED by the City Council of Midvale City, Utah as follows:

Section 1: The General Plan is hereby amended to include a Water Use and Preservation Element.

Section 2: This ordinance shall take effect upon the date of first publication.

PASSED AND APPROVED this 7th day of October 2025.

Dustin Gettel, Mayor

ATTEST:

Rori L. Andreason, MMC
City Recorder

MIDVALE CITY STATE OF UTAH INCORPORATED JULY 1, 1909 CORPORATE SEAL

Voting by the Council:	"Aye"	"Nay"
Bonnie Billings	Absent	
Paul Glover	✓	
Heidi Robinson	✓	
Bryant Brown	✓	
Denece Mikolash	✓	

Date of first publication: 10-9-2025

Midvale City

Water Use & Preservation Element of the General Plan

Approved 10/2025

Introduction

Life in the western part of the United States, including Utah, has always revolved around the availability and scarcity of water resources because water is one of the most basic necessities of life.

Early native American inhabitants of Utah, such as the Ute, Goshute, Paiute, and Navajo cultivated a harmonious relationship with this life sustaining resource. They lived nomadic or semi-nomadic lifestyles that tracked the availability of water and often moved in seasonal cycles with careful regard to their stewardship of the given resources. Their views about and use of water and other natural resources had deep spiritual roots and was sustainable.

The subsequent arrival of predominantly European-American settlers in 1847 followed by continued rapid immigration changed sustainable water practices in an environment of a stable population count to rapid population growth with its attendant demand for water in combination with non-native attitudes and techniques toward the use and harvesting of water.

With this pattern continuing until today the State of Utah finds itself in a situation where the population count is at an all-time high of approximately 3.5 million with water consumption patterns that have not changed enough to ensure that future population growth can be serviced without further damaging strained ecosystems like the Great Salt Lake.

The following sections will introduce the statutory background municipal water planning in Utah is based on, regional water conservation goals, the Midvale Water Conservation Plan, the Midvale Drinking Water System Master Plan, and the different means and ways of conserving water.

Water Planning in Utah

During the 2022 legislative session, the Utah Senate approved SB 110 (see below), which requires cities like Midvale to incorporate a Water Use and Preservation Element into their general plan. During the following legislative session SB 76 added a requirement to consult with the Division of Water Resources regarding regional conservation goals and how a city's plan may affect the Great Salt Lake.

The bill requires cities to take defined steps to create this new general plan element as spelled out in the bill text below. This general plan element will follow the state law's required analysis step by step to create recommendations and policy that comply with

regional water conservation goals and at the same time address Midvale City's residents' needs.

SB 110, Utah Code 10-9a-403 (2)(f)

(f) In drafting the water use and preservation element, the planning commission:

(i) shall consider:

(A) applicable regional water conservation goals recommended by the Division of Water Resources; and

(B) if Section 73-10-32 requires the municipality to adopt a water conservation plan pursuant to Section 73-10-32, the municipality's water conservation plan;

(ii) shall include a recommendation for:

(A) water conservation policies to be determined by the municipality; and

(B) landscaping options within a public street for current and future development that do not require the use of lawn or turf in a parkstrip;

(iii) shall review the municipality's land use ordinances and include a recommendation for changes to an ordinance that promotes the inefficient use of water;

(iv) shall consider principles of sustainable landscaping, including the:

(A) reduction or limitation of the use of lawn or turf;

(B) promotion of site-specific landscape design that decreases stormwater runoff or runoff of water used for irrigation;

(C) preservation and use of healthy trees that have a reasonable water requirement or are resistant to dry soil conditions;

(D) elimination or regulation of ponds, pools, and other features that promote unnecessary water evaporation;

(E) reduction of yard waste; and

(F) use of an irrigation system, including drip irrigation, best adapted to provide the optimal amount of water to the plants being irrigated;

(v)shall consult with the public water system or systems serving the municipality with drinking water regarding how implementation of the land use element and water use and preservation element may affect:

(A) water supply planning, including drinking water source and storage capacity consistent with Section 19-4-114; and

(B) water distribution planning, including master plans, infrastructure asset management programs and plans, infrastructure replacement plans, and impact fee facilities plans;

(vi) shall consult with the Division of Water Resources for information and technical resources regarding regional water conservation goals, including how implementation of the land use element and the water use and preservation element may affect the Great Salt Lake;

(vii) may include recommendations for additional water demand reduction strategies, including:

(A) creating a water budget associated with a particular type of development;

(B) adopting new or modified lot size, configuration, and landscaping standards that will reduce water demand for new single family development;

(C) providing one or more water reduction incentives for existing development such as modification of existing landscapes and irrigation systems and installation of water fixtures or systems that minimize water demand;

(D) discouraging incentives for economic development activities that do not adequately account for water use or do not include strategies for reducing water demand; and

(E) adopting water concurrency standards requiring that adequate water supplies and facilities are or will be in place for new development; and

(viii) for a town, may include, and for another municipality, shall include, a recommendation for low water use landscaping standards for a new:

(A) commercial, industrial, or institutional development;

(B) common interest community, as defined in Section 57-25-102; or

(C) multifamily housing project.

Midvale's Water Plans and Water Budget

Midvale's water policy is governed by two existing plans:

1. Midvale Water Conservation Plan
2. Midvale Drinking Water System Master Plan.

The Midvale Water Conservation Plan is based on the Utah Code 73-10-32 which was approved in 1998 and required a Water Conservation Plan from 1999 onward.

The latest version of the Midvale Water Conservation Plan is attached and serves as the basis from which to evaluate how Midvale can institutionalize water saving processes from within the General Plan context.

The Water Conservation Plan details the following:

1. Midvale's water use over time
2. Demand and Supply balance now and in the future
3. Delivery system improvements
4. Water rate structure
5. Existing conservation measures
6. Proposed conservation measures

The Water Conservation Plan builds on the Drinking Water System Master Plan and references its core analysis regarding the water demand and supply balance.

The Drinking Water System Master Plan states that Equivalent Residential Connections (ERCs) will increase from a13,940 in 2019 to 23,580 in 2060. An ERC represents the average water demand of an average residential water connection.

Under 2019 conditions Table 3-11 below (Drinking Water System Master Plan p.3-9) shows that Midvale has sufficient water to fulfill demand with a remaining source capacity of 232 acre feet.

Table 3-11: Existing Average Yearly Demand Requirements by Pressure Zone

Zone	ERCs	Demand (acre-feet)	Water Supply Capacity in Zone (acre-feet)			
			Available			Remaining
			City Water Rights	JVWCD[1]	Total	
Midvale	11,970	6,700	4,952	1,875	6,297	127
North Union	630	355	0	1,210	1,210	105
South Union	1,340	750				
Total	**13,940**	**7,805**	**4,952**	**3,085**	**8,037**	**232**

[1] The proportion of the JVWCD contract amount allotted to each zone is arbitrary. The contract does not limit volumes by pressure zone.

Conditions in the year 2060, however, show that Midvale's current supply will not be sufficient to service predicted demand (see Table 3-16 below, Drinking Water System Master Plan p.3-12).

Table 3-16: 2060 Average Yearly Demand Requirements by Pressure Zone

Zone	ERCs	Demand (acre-feet)	Water Supply Capacity in Zone (acre-feet)			
			Available			Remaining
			City Water Rights	JVWCD[1]	Total	
Midvale	11,970	11,345	4,952	1,875	6,827	-4,518
North Union	630	760	0	1,210	1,215	-650
South Union	1,340	1,100				
Total	**23,580**	**13,205**	**4,952**	**3,085**	**8,037**	**-5,168**

[1]The proportion of the JVWCD contract amount allotted to each zone is arbitrary. The contract does not limit volumes by pressure zone.

Midvale will require an additional 5,168 acre-feet of water from JVWCD to meet future demand (Drinking Water System Master Plan p.3-13). In a consultation with JVWCD (see Appendix F) Midvale was assured that future water supply for Midvale and other municipalities in the JVWCD service area is secure, however, the cost may increase substantially, especially if a member city demands water in excess of its contractual allotment.

For this reason, Midvale and JVWCD are actively involved in finding, incentivizing, and sustaining ways to decrease water consumption, which is addressed below.

Statewide and Regional Water Conservation Goals

In addition to the Midvale Water Conservation Plan, the State of Utah's Regional Water Conservation Goals (Appendix A) inform what this general plan element should focus on.

The Utah Department of Natural Resources describes the Regional Water Conservation Goals as follows (Department of Natural Resources, 7/7/2025. *Regional Water Conservation Goals*):

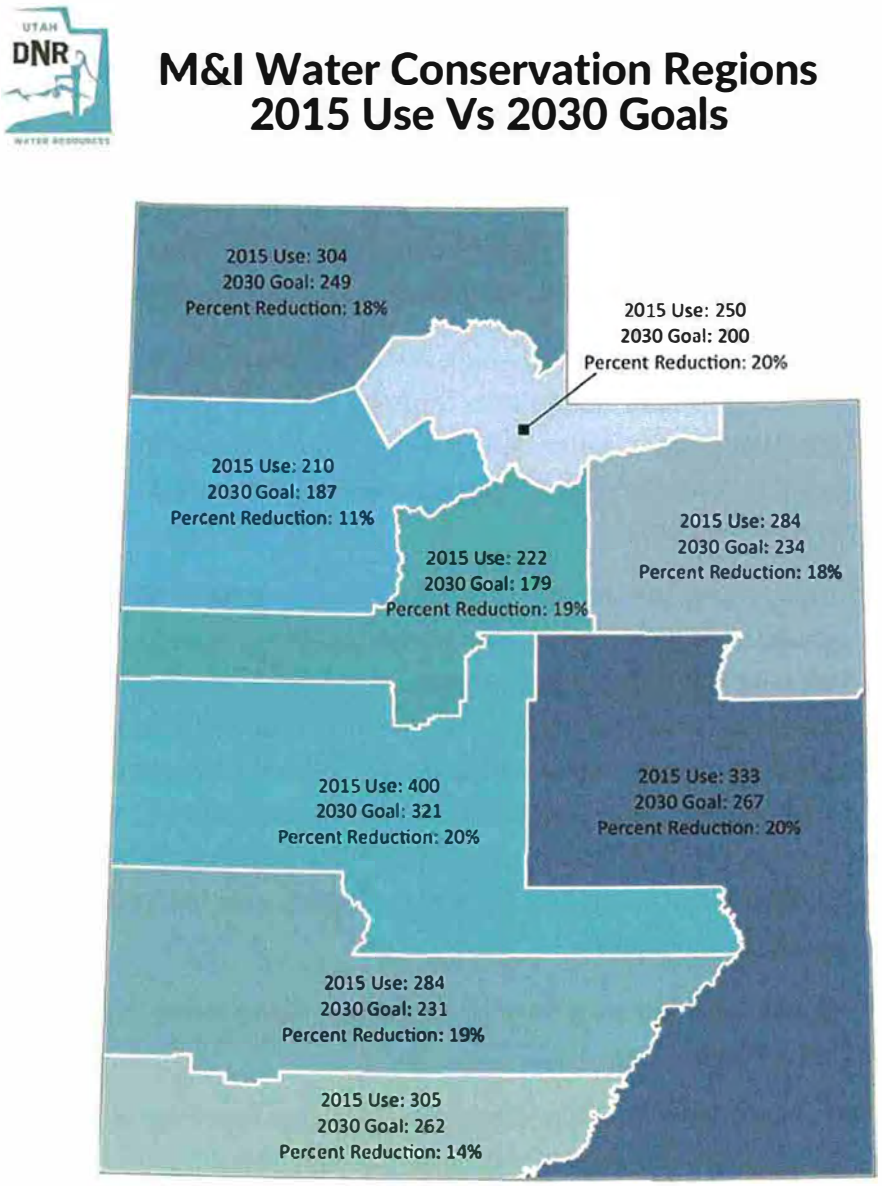
> The state's Regional Water Conservation Goals, established in 2019, are for Utah's nine municipal and industrial (M&I) areas. M&I includes residential, commercial, institutional (for example, schools and parks) and industrial water use, but excludes agriculture, mining, and power generation as these are classified individually.
>
> As recommended by the 2015 Legislative Audit, 2017 Follow-up Audit, Third-Party Review, and 2017 Recommended State Water Strategy, regional water conservation goals were developed to enhance water conservation efforts around the state. Region-specific goals support the unique characteristics and needs of Utah's diverse climates and ecosystems.
>
> Thanks to the efforts of many Utahns and their water providers, per capita water use has declined by at least 18%. We've made significant progress, but more must be done to accomplish these goals including policy and ordinance changes on state, local and municipal levels. Even with all the progress that has been made, balanced efforts both in water development and water conservation are still necessary to meet Utah's long-term water needs. This is the first time conservation goals have been established on a regional level, and they build on the previously established statewide goal of reducing per-capita use by 25% by 2025, (using the 2000 M&I water use report as a starting value).

Midvale City already reached the statewide goal of reducing per capita water consumption by 25% by 2025 (Water Conservation Plan, p.12).

The state goal for the Salt Lake/Tooele municipal and industrial area (see Figure 1) is a consumption of 187 GPCD (Gallon Per Capita Per Day) by the year 2030.

Today, Midvale is already 39 GPCD below the 2030 goal of 187 GPCD with a consumption of 148 GPCD and plans to continue to reduce per capita use by 11% from 2015 to 2030 for a consumption of 131.72 GPCD. At that point in time, Midvale will consume 55.28 GPCD (30%) less than the regional goal.

Figure 1



A regional approach allows the goals to be tailored for nine different regions and takes into account climate, elevation, and each region's characteristics. Note: Use is measured in gallons per capita per day.

Midvale's Water Conservation Policies

A further reduction in Midvale City's water consumption will require focused policies that institutionalize processes to save water. Midvale's current water conservation policies include the following:

Public Education

Midvale City actively promotes water conservation measures to its residents through multiple channels, ensuring a comprehensive approach to sustainability. The city's website serves as a central hub, offering detailed guidelines, tips, and resources on efficient water usage and the importance of conservation.

Annually, the city's water quality report not only provides essential information about the safety and quality of the water supply but also includes practical advice on how residents can reduce their water consumption. Additionally, the city newsletter features regular articles and updates on water-saving initiatives and upcoming conservation workshops.

Require Water Saving Fixtures

Midvale City has adopted the International Plumbing Code, mandating the use of water-saving plumbing fixtures in all new developments to enhance sustainability and resource efficiency. During the building permit review process, the city meticulously examines building plans to ensure they incorporate these water-efficient fixtures. Compliance with the code is further enforced through rigorous building inspections, ensuring that all new constructions adhere to these water conservation standards. This proactive approach not only promotes responsible water usage but also supports Midvale City's broader environmental goals.

Replace Old Water Service Laterals

Midvale City has adopted a material standard aimed at improving the durability and efficiency of its water infrastructure by requiring that all leaking galvanized water laterals be replaced with copper or poly piping. This measure is part of the city's commitment to maintaining a reliable and sustainable water supply system. When a pipeline replacement project is conducted, any existing galvanized laterals are systematically replaced to prevent future leaks and ensure long-term resilience. By upgrading to copper or poly piping, Midvale City not only enhances the overall quality of its water distribution network but also reduces maintenance costs and water loss.

Replacement Program for Old Pipelines

Midvale City is committed to the ongoing improvement of its water infrastructure by aiming to replace 1,000 feet of pipeline annually. This systematic approach is aligned with the city's master plan, ensuring that pipeline replacement projects are strategically conducted in conjunction with street renovations, as leaks are detected, and as the annual budget permits. By integrating pipeline replacements with broader infrastructure projects, Midvale City maximizes efficiency and minimizes disruption to residents. This proactive replacement strategy not only helps maintain a reliable water distribution system but also supports its broader water conservation goals by reducing leaks and water loss, thereby ensuring a more sustainable and efficient use of water resources for the community.

Replacement Program of Old Water Meters

Midvale City has implemented a comprehensive meter replacement program to enhance the accuracy and efficiency of water usage monitoring. New, accurate radio-read meters are installed at all connections, allowing for precise data collection. During monthly meter scans, the city identifies meters with continuous flow, indicating potential leaks, and promptly contacts the respective residents. Meters showing abnormally high usage are also flagged, with residents being notified to address possible issues. Additionally, meters registering zero flow are noted, and if found to be broken or inaccurate, they are promptly replaced. This diligent monitoring and proactive replacement approach ensures accurate billing and reduces water waste.

Restrict Water Use for Public Landscaped Areas

Midvale City enforces water use restrictions for public landscaped areas to promote efficient water usage and conservation. Sprinkler systems are carefully adjusted based on current weather conditions, ensuring that landscapes receive the appropriate amount of water without waste. Watering is scheduled for the evening or early morning hours to minimize water loss due to evaporation, maximizing the effectiveness of irrigation. This strategic approach not only conserves water but also helps maintain the health of public green spaces.

Require Separate Meters for Large Irrigated Areas

Midvale City mandates the installation of separate meters for large, irrigated areas in commercial and industrial properties. This requirement ensures that water usage for landscaping is distinctly monitored, promoting responsible water management practices. By isolating irrigation water consumption, the city can more accurately track and manage water usage, encouraging businesses to adopt efficient irrigation techniques. This policy

aids in identifying potential leaks and inefficiencies ensuring that commercial and industrial landscape areas are maintained without compromising valuable water resources.

Evaluate Water Rate Structure

Midvale City conducts an annual evaluation of its water rate structure to promote water conservation and ensure the sustainability of its water resources. By reviewing and adjusting the rates each year, the city aims to incentivize efficient water usage among residents and businesses. The rate structure is designed to reflect the true cost of water provision and to encourage conservation by implementing tiered pricing, where higher usage results in higher rates. The annual assessment allows the city to adapt to changing water supply conditions, economic factors, and consumption patterns, reinforcing its commitment to responsible water management and the long-term preservation of this vital resource.

The following conservation goals have been identified by the city to help continue to reduce water consumption. Some of these goals were previously implemented but are being updated with additional information to align with future conservation goals.

Public Education: Updated Annually

Midvale City remains committed to promoting water conservation measures among its residents through ongoing public education initiatives. In alignment with the newly adopted Jordan Valley Water Conservancy District conservation measures, the city will update all relevant information to ensure residents are well-informed and equipped to conserve water effectively. This commitment extends to advertising conservation measures by providing convenient access to water conservation websites through links on the city website. As part of these efforts, the city will continue public education campaigns, encouraging customers to limit outside watering to the hours of 6 pm to 10 am. This information will be reviewed and updated annually.

Unmetered Connections and Water Use: Conducted Monthly

The city will undertake efforts to identify potential causes of unmetered or unaccounted drinking water. The investigation and analysis is conducted monthly based on meter reading data. Midvale City aims to pinpoint areas where water may be escaping the metering system or being lost through leaks or other means. Additional Hydrant meters will be purchased to help account for water used during fire hydrant flushing. By addressing these issues proactively, the city can mitigate water loss, conserve resources, and ensure

efficient distribution of safe drinking water to residents and businesses. This will be reviewed and updated monthly.

Pipeline Repairs: Conducted Upon Discovery of Leak

Midvale City is committed to promptly replace leaking pipelines as they are discovered to minimize water loss and ensure the efficient delivery of clean water to residents. The city prioritizes replacement of leaking water pipes to minimize environmental impact and conserve resources. This will be conducted upon the discovery of a leak and processes will be reviewed and revised annually.

Landscaping Options for Public Streets

Utah Code 10-9a-403 (2)(f)(ii)(B) requires landscaping options within a public street for current and future development that do not require the use of lawn or turf in a park strip.

Midvale City complies with this stipulation because its zoning ordinances already allow park strips with xeriscape, for example in the Single-Family Residential Zone (SF-1) (Midvale Municipal Code 17-7-1.6(A)).

The zoning code states that xeriscape is allowed to fulfill the landscape requirements (see sentence in bold) while turf is just one of many options:

> A. *Landscaping Required*. Yard and setback areas visible from street access, including park-strips, that are not utilized as approved parking or access for vehicles, trailers, etc., shall be landscaped. Landscaping shall include the treatment of the ground surface with live materials such as, but not limited to, sod, grass, ground cover, trees, shrubs, vines and other growing horticultural plant material. **In addition, a combination of xeriscape plantings and designs that may include other decorative surfacing such as bark chips, crushed stone, mulch materials, decorative concrete or pavers shall also meet landscaping requirements.** Structural features such as fountains, pools, statues, and benches shall also be considered part of the landscaping, but such objects alone shall not meet the requirements of landscaping.

In addition to the above, Midvale City adopted the Jordan Valley Water Conservancy District Water Efficiency Standards on May 7th, 2024 (Attachment D) which supersede individual zoning requirements (Midvale Municipal Code 17-6-2) and further reduce the use of lawn in park strips by prohibiting it at slopes greater than 25% and when the narrowest point of the park strip is less than 8 feet in width:

F. **Lawn shall not be installed** in Park Strips, Paths, or on slopes **greater than 25%** or 4:1 grade, and be **less than 8 feet wide at its narrowest point**. To the extent reasonably practicable, Lawn shall be free from obstructions (trees, signs, posts, valve boxes, etc.).

Midvale City's newly adopted road cross sections do not feature park strips that are greater than 8 feet as a result turf is not allowed.

Principles of Sustainable Landscaping

Utah Code 10-9a-403 (2)(f)(iv) requires that municipalities consider the following principles of sustainable landscaping:

(A) reduction or limitation of the use of lawn or turf;

Midvale City adopted the Jordan Valley Water Conservancy District Water Efficiency Standards which specifically address the reduction and limitation of lawn or turf as shown in Attachment D.

(B) promotion of site-specific landscape design that decreases stormwater runoff or runoff of water used for irrigation;

Midvale City has an MS4 permit that addresses stormwater retention.

(C) preservation and use of healthy trees that have a reasonable water requirement or are resistant to dry soil conditions;

Midvale City created a Street Tree Selection Guide that promotes appropriate tree selection for local conditions (See Attachment E).

(D) elimination or regulation of ponds, pools, and other features that promote unnecessary water evaporation;

The regulation of ponds, pools, and other features that promote unnecessary water evaporation is currently not included in Midvale's ordinance system with regard to evaporation reduction but may be addressed at a future point in time.

(E) reduction of yard waste; and

Midvale City provides a Fall Leaf Cleanup Program and a Bulky Waste Program and educates residents about stormwater pollution prevention (see https://www.midvale.utah.gov/government/departments/public_works/stormwater_division/stormwater_education.php retrieved on 7/9/2025).

(F) use of an irrigation system, including drip irrigation, best adapted to provide the optimal amount of water to the plants being irrigated;

Midvale City's municipal code requires the use of drip irrigation (see Attachment D).

Other Recommendations for Water Demand Reduction Strategies

Utah Code 10-9a-403 (2)(f)(vii) provides the option to recommend additional water reduction strategies as shown below:

(vii) may include recommendations for additional water demand reduction strategies, including:

(A) creating a water budget associated with a particular type of development;

The Drinking Water System Master Plan models current and future water consumption and supply which shows a need for additional water purchases considering current consumption patterns. Any reduction in water consumption will reduce Midvale's reliance on water purchases.

(B) adopting new or modified lot size, configuration, and landscaping standards that will reduce water demand for new single family development;

Midvale City is very close to being built out and only few if any single-family development is anticipated in the future. If additional single-family development will occur the lot sizes will likely be less than 7,000 square feet and be covered by the Jordan Valley Water Conservancy District Water Efficiency standards.

(C) providing one or more water reduction incentives for existing development such as modification of existing landscapes and irrigation systems and installation of water fixtures or systems that minimize water demand;

Midvale City participates in the Localscapes program which is administered by the Jordan Valley Water Conservancy District and regularly receives applications to install waterwise landscaping compliant with the Localscapes criteria. For usage of the Localscapes program through JVWCD refer to Appendix G.

(D) discouraging incentives for economic development activities that do not adequately account for water use or do not include strategies for reducing water demand; and

Midvale City offers some incentives for economic development activities in its RDA project areas which focus on high density development and redevelopment. These types of projects are waterwise by nature because there is very little landscaping

required and lawn is prohibited in the Form-Based Code area. Other zones allow lawn but only within the confines of the Jordan River Water Conservancy District Water Efficiency Standards.

(E) adopting water concurrency standards requiring that adequate water supplies and facilities are or will be in place for new development; and

Concurrency standards for water facilities are in place as part of the development process and water supplies are adequate to cover current water demand and future growth.

(viii) for a town, may include, and for another municipality, shall include, a recommendation for low water use landscaping standards for a new:

(A) commercial, industrial, or institutional development;

(B) common interest community, as defined in Section 57-25-102; or

(C) multifamily housing project.

Commercial, industrial, institutional, common interest communities, and multifamily housing projects are already covered by the recently approved Jordan Valley Water Conservancy District Water Efficiency Standards which greatly reduce the amount of turf for landscaping in the above development scenarios.

Review of City's Land Use Ordinance for Inefficient Use of Water

Utah Code 10-9a-403 (2)(f)(iii) requires a review of the municipality's land use ordinances and includes a recommendation for changes to an ordinance that promotes the inefficient use of water.

Midvale City adopted the Jordan Valley Water Conservancy District's Water Efficiency Standards and incorporated them into the code under supplementary regulations. These regulations supersede the landscaping sections in the code if there is a discrepancy, such as in the Regional Commercial Zone (RM). Section 17-7-12.6(A)(5)(b)(iii) states:

iv. *Turfgrass*. Plan shall delineate turfgrass areas and include a calculation (%) of irrigated turfgrass not to exceed fifty percent of the landscaped areas. Turf areas shall be on a separate irrigation zone from other landscape zones.

This section contradicts Section 5-G-v in the Water Efficiency Standards which states:

> v. Lawn areas shall not exceed the greater of 250 square feet, or 35% of the Total Landscaped Area.

This obvious discrepancy between 35% and 50% may result in a landscape plan for new development that exceeds the governing provisions in the Water Efficiency Standards and may or may not be caught in a review. Future code revisions should address this discrepancy so that the water saving outcomes of lawn surface reduction is achieved.

What Are the Benefits of Water Conservation for Midvale City?

Water conservation will accomplish two separate goals for Midvale City and its residents:

1. Budgetary Predictability and Savings

   Water is one of the building blocks of life, especially in a geographic area that does not have abundant water resources. In Utah's history the importance of water was recognized early on and spurred the communal development of reservoirs, pipelines, and canals to collect this vital resource and deliver it to the consumer. This process was perfected over time and resulted in many people taking the availability of water for granted.

   With a growing population, rising water consumption due to growth, frequent drought, and exacerbating conditions driven by climate change, water will become more valuable and require higher levels of investment to maintain current service levels. As a result, conservation can serve as a fiscal "insurance policy" to minimize the cost of additional water purchases or additional infrastructure to develop more water resources.

2. Preservation of the Great Salt Lake Ecosystem

   The Great Salt Lake is the largest waterbody in the State of Utah and is threatened by overuse of its watershed. Since the late nineteenth century, the Great Salt Lake has seen a decline of 11 feet which threatens its ability to serve its role in the wider ecosystem.

The Great Salt Lake provides the following:

- Habitat for a wide array of local and migratory bird species
- Recreational and industrial activity worth $1.5 billion
- Generation of 50% of the precipitation of surrounding areas.

(Adapted from Utah Department of Environmental Quality, 9/3/2025. *Great Salt Lake Water Conservation Toolbox*)

The role of conservation in this context is critical. The Great Salt Lake needs additional water deliveries and these are directly driven by lower water consumption, especially in outdoor water use. Water savings that are generated in Midvale City directly benefit the Great Salt Lake due to the connected nature of the watershed.

Conclusion

This Water Use and Preservation Element of the General Plan has synthesized the currently existing water plans on the state and local level with an emphasis on water conservation and the outlook for Midvale's water supply and use balance.

Under current conditions, Midvale will be required to purchase additional water from JVWCD in the future due to growth related water consumption. By decreasing the per capita water consumption with the tools described in the plan, future water purchases can be reduced as much as possible. This will give Midvale a fiscal advantage over the status quo and contribute to responsible stewardship over the water resources in the Great Salt Lake watershed.

In the midterm, continued calibration of Midvale's ordinance system with respect to efficient outdoor water use and a more streamlined implementation of the JVWCD Water Efficiency Standards will ensure that Midvale will be able to reap measurable water savings.

Appendices

A. Utah's Regional M&I Water Conservation Goals
B. Midvale Water Conservation Plan
C. Midvale Drinking Water System Master Plan
D. Ordinance Adopting the Jordan Valley Water Conservancy District's Water Efficiency Standards
E. Street Tree Selection Guide
F. Consultation with JVWCD

Appendix A

Utah's Regional M&I Water Conservation Goals

PLAN, CONSERVE, DEVELOP, AND PROTECT UTAH'S WATER RESOURCES

Utah's Regional M&I Water Conservation Goals

November 2019

Prepared for:

UTAH DNR WATER RESOURCES

Prepared by:

HANSEN ALLEN & LUCE INC ENGINEERS

BOWEN COLLINS & ASSOCIATES

UTAH'S REGIONAL M&I WATER CONSERVATION GOALS

Prepared for:
Utah Division of Water Resources

Prepared by:
Hansen, Allen & Luce, Inc.
Bowen Collins & Associates, Inc.

Steven C. Jones, P.E.
Project Manager

November 2019

Hansen, Allen & Luce, Inc.
859 W. South Jordan Pkwy. Ste. 200
South Jordan, UT 84095
801-566-5599

TABLE OF CONTENTS

PREFACE

The 2030 water conservation goals in this report will require significant effort, increased attention, participation and funding from the legislature, state agencies, municipal water retailers, local elected officials, wholesale public water suppliers and citizens of Utah.

Depending on the approaches taken and water user behavior, costs for achieving the targets associated with the recommendations in this report are estimated in the range of $1.4 billion of capital cost. An important aspect of covering these costs will be who pays for the costs, what the relationship is between the cost and use of water, and how the capital costs of conservation net against not yet identified conservation savings and the price of increasing water scarcity.

The goals require the state and its municipalities to increase water pricing, establish and enforce water use ordinances, encourage broader adoption of existing water technology, as well as secure additional funding to reach the target water use levels.

These efforts fall on all those who have the authority to implement the measures recommended in this report, including but not limited to state and local elected officials in their key roles and businesses. These efforts include, but are not limited to:

1. Reducing new lot sizes, as determined by both market forces and state or local elected officials setting land use policy;
2. Adopting water efficient practices and landscaping changes, including reductions in grass, as determined by both market forces and state or local elected officials through landscaping and water restricting ordinances;
3. Installing secondary water meters and smart controllers on outdoor irrigation systems, as determined by water consumers through market forces and state or local elected officials; and
4. Increasing water pricing, as determined by municipal water retailers and state policies.

Recognizing these measures will require time to enact and implement, the state of Utah recommends a five-year flexibility period to achieve these 2030 goals.

Given the state's wholesale public water suppliers do not have the authority to regulate land use, mandate conservation practices or set end user water rates, they are tasked with providing support, recommendations, educational resources and leadership to the state as well as the municipalities and constituents in their respective service areas.

ABBREVIATIONS AND UNITS

ac	acre
ac-ft	acre-foot (325,851 gal)
AGRC	Utah Automated Geographic Reference Center
BC&A	Bowen Collins & Associates, Inc.
DNR	Utah Department of Natural Resources
DWRe	Utah Division of Water Resources
ET	evapotranspiration
ft	foot
ft^2	square foot
gal	gallon
gpcd	gallons per capita per day (based on permanent population)
gpm	gallons per minute
GSLAC	Great Salt Lake Advisory Council
GWSAT	Governor's Water Strategy Advisory Team
HAL	Hansen, Allen & Luce, Inc.
OLAG	Utah Office of the Legislative Auditor General
M&I	municipal and industrial [water use]
USGS	U.S. Geological Survey
yr	year

EXECUTIVE SUMMARY

Utah's Regional M&I Water Conservation Goals

PURPOSE

This project recommends regional goals and practices for municipal and industrial (M&I) water conservation. M&I includes residential, commercial, institutional (e.g., schools and parks), and industrial water use, and excludes agriculture, mining, aquaculture, and power generation. The project does not recommend a comprehensive water strategy.

PROGRESS TOWARD STATEWIDE GOAL

Utah's statewide water conservation goal has been "25% by 2025," that is, to reduce per-capita M&I water use by 25% when starting at the value estimated for 2000. Thanks to the efforts of many Utahns and their water providers, 2015 M&I per capita water use declined by at least 18% since then. Annual reporting from many individual water suppliers confirms significant progress in water conservation. According to the state's most recent data, the 2015 statewide M&I water use estimate is about 240 gallons per capita per day (gpcd). Water suppliers and users alike are commended for their efforts to reduce water use.

NEED FOR REGIONAL GOALS

While this progress is excellent, the continued growth and demand for water is not stopping. Both water conservation and development of new supplies will be necessary to meet Utah's long-term water needs. The next step—and one recommended by a legislative audit (no. 2015-01) and the *Recommended State Water Strategy*—is a suite of regional M&I water conservation goals that consider the various climates, populations, and water use practices in different parts of the state. These goals will guide the state's water industry in planning future infrastructure, policies, and programs consistent with Utah's semiarid climate and growing demand for water.

HIGHLIGHTS

- Regional M&I water conservation goals are recommended for 2030, and projections are given for 2040 and 2065.
- Utah's Municipal and industrial (M&I) per capita water use declined by at least 18% from 2000 to 2015.
- Considered together, the 2030 regional goals constitute a 16% reduction in per capita use from the new 2015 baseline.
- Several water conservation practices are recommended to help achieve the goals.
- Implementation will be an immense effort requiring funding and engagement from all Utahns.

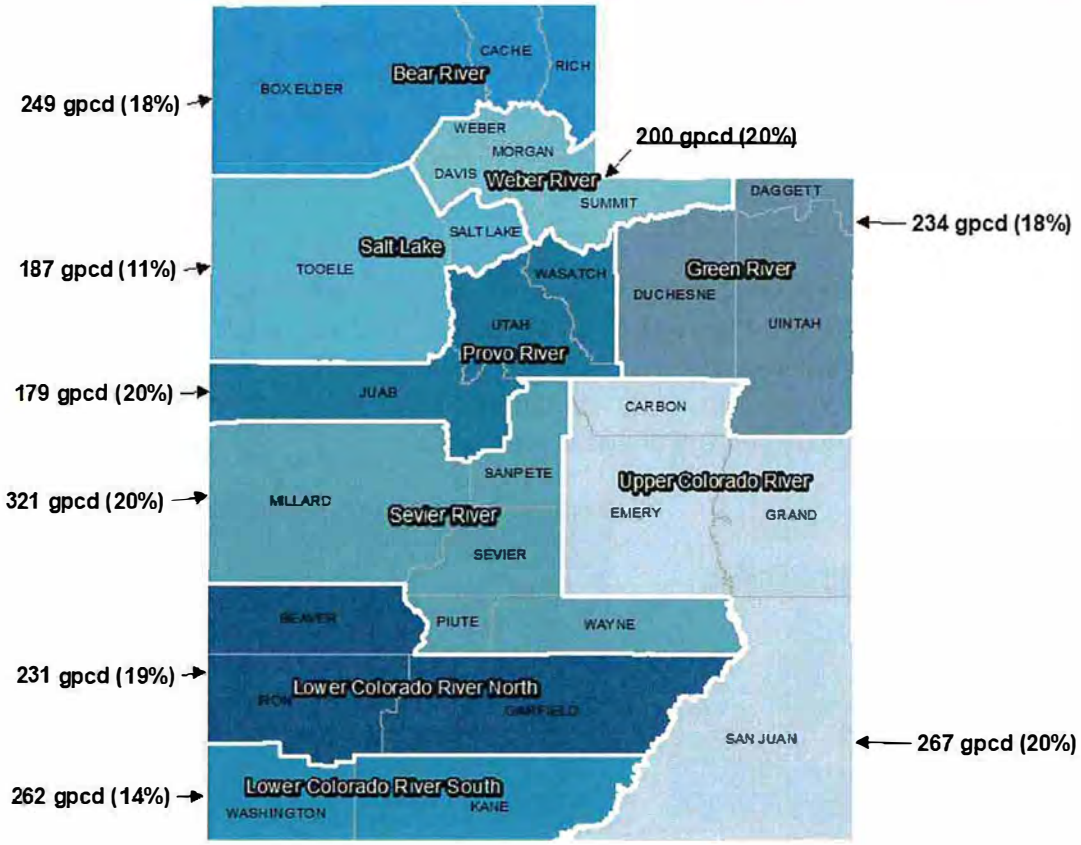
APPROACH

Recognizing its potential impact on Utahns, the project began with a large public involvement effort. An online survey collected information about water use awareness, attitudes, and opportunities from a broad audience, while a series of public open houses and interviews with key stakeholders provided more in-depth insight into the important issues. Early draft reports were circulated to several parties for review. The public process strongly affirmed the need for regional goals and guided the project team to data, perspective, and questions that improved the quality of the work.

Multiple factors were considered when determining regions, including data availability, number of regions, water use practices, similarity of climates, and the ability of the public to recognize the regions. Next, water conservation potential was developed for each region. Many variables were examined; the most influential were secondary metering, climate change, amount of turf on new properties, conversion of turf on existing properties, and conversion to high-efficiency fixtures and appliances. Scenarios were developed to characterize three levels of water conservation within each region. Water conservation practices were then evaluated on gross unit costs, potential for reducing water use, and public acceptance. Finally, combining all of these interdependent elements, the project team developed a timeline of regional water conservation goals and projections from the 2015 baseline year through 2065.

GOALS

Nine water conservation regions are proposed, along with a timeline of M&I water conservation goals and projections for each one. The 2030 values are recommended as the next goals for the State to pursue, while the 2040 and 2065 values are projected water use levels to inform future planning. Actual goals for 2040 will not be established until after evaluating progress toward the 2030 goal, and so on for future goals.



Proposed M&I Water Conservation Regions and 2030 Goals

Proposed Regional M&I 2030 Water Conservation Goals and Future Goal Projections

Region	2015 Baseline (gpcd)	2030 Goal		2040 Projection		2065 Projection	
		Goal (gpcd)	Reduction from 2015	Projection (gpcd)	Reduction from 2015	Projection (gpcd)	Reduction from 2015
Bear River	304	249	18%	232	24%	219	28%
Green River	284	234	18%	225	21%	225	21%
Lower Colorado River North	284	231	19%	216	24%	205	28%
Lower Colorado River South	305	262	14%	247	19%	237	22%
Provo River	222	179	20%	162	27%	152	32%
Salt Lake	210	187	11%	178	15%	169	19%
Sevier River	400	321	20%	301	25%	302	24%
Upper Colorado River	333	267	20%	251	25%	248	25%
Weber River	250	200	20%	184	26%	175	30%
Statewide	240	202	16%	188	22%	179	26%

Note M&I = municipal and industrial; gpcd = gallons per capita per day based on permanent population. Reported per-capita use includes all residential, commercial, institutional, and industrial uses averaged over the permanent population in each region.

In 2015, Utah's M&I water use was about 240 gpcd. When considering all regional results together, the resulting water use for the entire state is 202 gpcd by 2030 (16% reduction from 2015), 188 gpcd by 2040 (22% reduction from 2015), and 179 gpcd by 2065 (26% reduction from 2015). Meeting the initial 2030 goal will save nearly 165,000 acre-feet of water annually across the state.

PRACTICES

The following practices are recommended to help achieve the proposed regional M&I water conservation goals. Of necessity, these practices are limited to broad categories that may have different applications in different areas of the state. Local water suppliers, communities, and businesses are encouraged to adapt and refine these recommendations, as well as implement others, in their own water conservation efforts and in pursuit of the regional goals.

GENERAL

- **Water conservation education.** Continued emphasis and funding of education and outreach must be fundamental components of any water conservation plan.
- **Conservation pricing.** Financial impacts will help motivate water conservation. Important features are lowering base rates, increasing tiers for usage, reviewing funding sources, and using customer feedback technology.

INDOOR

- **Fixture conversion.** This will happen naturally with new construction and as old fixtures are replaced, but may be accelerated through incentives and policies.
- **Other measures.** Fixing indoor leaks and inspiring a change in indoor water use habits will reduce consumption.

OUTDOOR

- **Improved irrigation efficiency.** Secondary metering, smart irrigation controls, and drip irrigation systems will improve irrigation efficiency for any landscape.
- **Water-wise landscaping.** New construction can be water-wise from the beginning, while existing landscapes can be converted.
- **Lot size and density guidelines.** Smaller lot sizes and less irrigated area will reduce the amount of water needed outdoors in new developments.

Recommended M&I Water Conservation Practices

(Drawing at top by B. Banner from Salt Lake County)

COSTS

Achieving the goals identified in this report will require a major investment. As with past and current water conservation efforts, the costs are assumed to be borne by all Utahns; however, effective conservation strategies will closely connect water costs to water use.

IMPLEMENTATION

The pursuit of the regional M&I water conservation goals will be an endeavor of immense magnitude but is nonetheless worthwhile for the future of our state. By engaging all parts of our community —not just water suppliers—over extended time periods, this is a challenge we can meet. We can and must do better. Since changing water use behavior, policies, and technologies will become more difficult and expensive with time, prompt action on water conservation will bring the most benefit. A few starting actions are recommended here.

State and Local Policy Leaders

Policy plays a vital role in motivating and enabling water conservation. State, county, and local policy leaders should establish policies which require accountability for efficient water use. Policy leaders' support must consider universal metering, water loss control, education, and other water conservation activities, as well as the necessary funds for success. Policy leaders must also decide whether they are willing to support the necessary land use changes that will be required to reach the water conservation goals. This will include working with and being responsive to market forces to reduce both overall lot sizes for residential development and the amount of turf grass allowed. Water suppliers should be consulted in land-use decisions to ensure alignment with water conservation efforts. Policy leaders can set or influence the pricing of water to promote conservation and reflect the cost of water scarcity. State and local governments should consider the water use impacts of proposed businesses and their plans for water-efficient fixtures, landscaping, and operations before approving construction or incentives.

State Agencies

The Division of Water Resources and other state agencies should continue to support water suppliers' and end users' efforts by analyzing M&I water use data, administering funding programs, reviewing water conservation plans, and promoting education and outreach. It is recommended that the Division evaluate achievement of the 2030 goals and refine the 2040 and 2065 projections accordingly as new data, practices, and technologies develop.

Water Suppliers

Water suppliers have a public responsibility to provide sufficient, safe water to their customers and to carefully manage this invaluable resource. In fulfilling this responsibility, water suppliers are responsible for developing and implementing their own Water Conservation Plans that define local goals, practices, pricing, and accountability. This report recommends several practices which water suppliers may consider, supported by the other parties described here.

Water Users

The water conservation mindset begins with individual water users. By recognizing water as a limited resource and changing their water use practices accordingly, water users will directly impact the overall water situation and the achievement of the regional goals. All Utahns are encouraged to do their part in conserving water for Utah's future.

If you would like to read the entire plan, please access the url below:

https://conservewater.utah.gov/wp-content/uploads/2021/05/Regional-Water-Conservation-Goals-Report-Final.pdf

Appendix B

Midvale Water Conservation Plan

2025

Water Conservation Plan

Bryton Mecham

Utilities Water Quality and Regulatory Administrator

TABLE OF CONTENTS

Introduction

The Midvale City 2024 Water Conservation Plan has been prepared to comply with the Utah Water Conservation Plan Act of 1998 amended in 2004 with House Bill 71 Section 73-10-32. The act requires water conservancy districts and water retailers to file a water conservation plan with the Utah Board of Water Resources and ensure that it is updated every five years. This update outlines Midvale City's current water conservation efforts and presents its current conservation goals.

In response to projected future growth along the Wasatch Front, the citizens and leaders of Midvale City are concerned about the future water supply in the region. The city prepared the original Water Conservation Plan in 1999. Since then, the City's water conservation plan has been amended and updated accordingly to fit state requirements and city infrastructure growth. This report describes the drinking water system, reviews, and summarizes water consumption, assesses the water conservation alternatives available to the city, sets goals to conserve water, and identifies existing and proposed water conservation measures to be implemented by the city.

System Profile

Midvale City, located in the heart of Salt Lake County. The city is bounded by Murray City on the north, Cottonwood Heights on the east, Sandy City on the south, and the Jordan River on the west. As of 6/3/2024 Midvale city currently has 33,000 residents according to the Utah Department of Environmental Quality website.

In 1998, the city annexed the Union area which doubled the size and population of the city at the time. However, the drinking water needs for the Union area continued to be supplied by Sandy City and Jordan Valley Water Conservancy District (JVWCD). During the summer of 2009, Midvale City reached an agreement with Sandy City to take over the drinking water system for the Union area. This was accomplished by the installation of water meters on each pipeline that crossed the Sandy City - Midvale City boundary with Sandy City billing Midvale City on a wholesale basis for water provided to the Union area. As of 2018 Midvale City no longer purchases water from Sandy City. See figure 2-1 to see current water zones.

There are many redevelopment projects that are planned for the city, which are expected to add additional residential and commercial units. The city estimates that in the next 30 years the population will increase to 55,000 residents. Water demands for the city are expected to increase accordingly. As of 2/7/2024 the city currently has 8,432 water connections throughout the distribution system. The connection type is shown in Table 2-1.

Figure 2-1 Water Zone Map

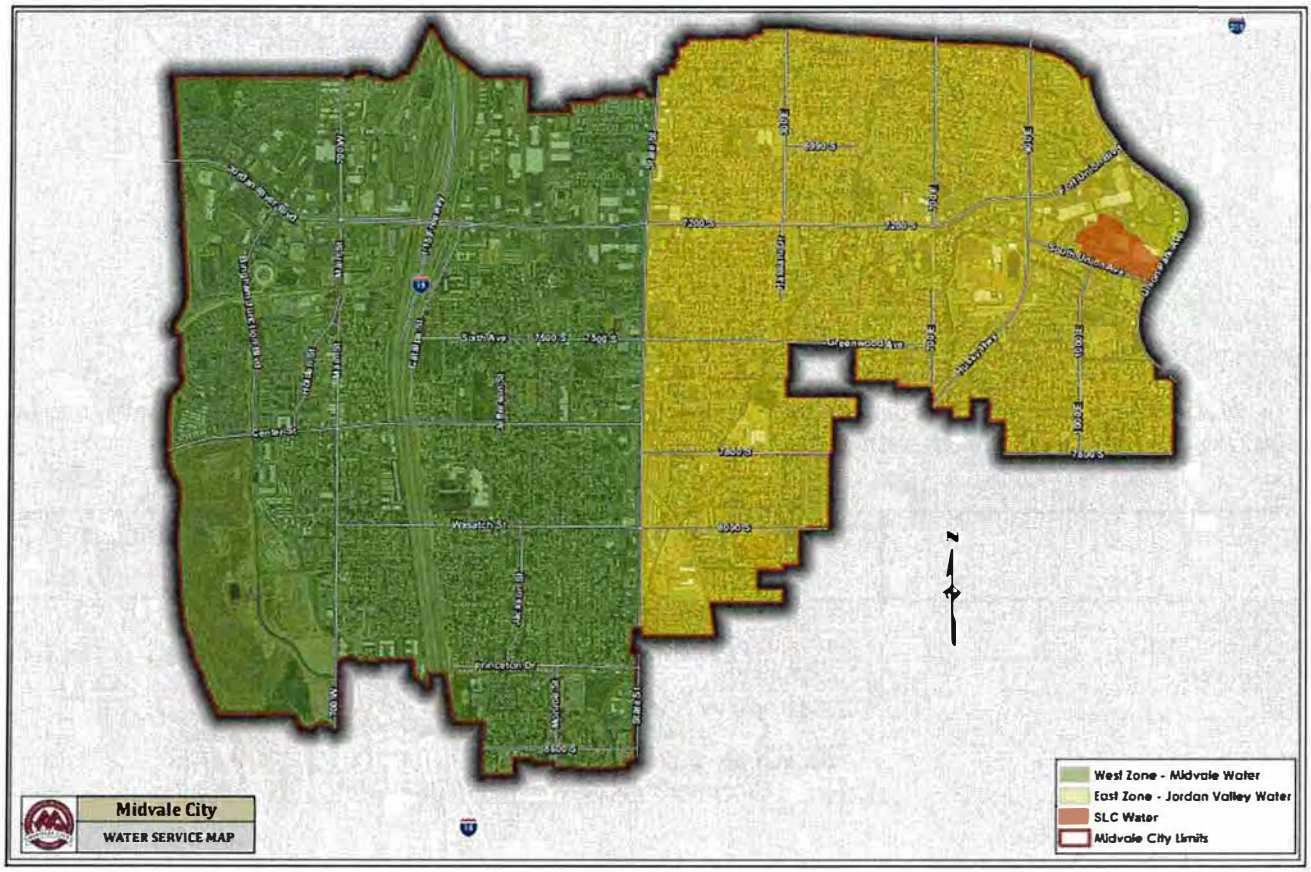


TABLE 2-1
2024 Water System Connections

Connection Type	Total Connections
Residential	7,389
Commercial	1,031
Industrial	3
Total	8,423

Inventory Of Water Resources

The city currently receives drinking water from three active wells, and several wholesale connections to Jordan Valley Conservancy District (JVWCD). Table 2-2 summarizes the city's drinking water sources.

TABLE 2-2 EXISTING WATER SOURCES

Source	Water Rights	Existing Source Capacity
Hancock Well	57-1398 (126 ac-ft), -2251 (4.47 cfs)	2,100 GPM
Million Gallon Well	57-1398, -2251, 7909 (158.5 ac-ft)	2,100 GPM
Oak Street Well	57-1398, -2251	1,200 GPM
JVWCD	Contract with JVWCD	3,085 ac-ft
Midvale reliable supply (Based on water right limitations and Current Contract with JVWCD):		Wells: 5,275 ac-ft JVWCD 3,085 ac-ft Total: 8,360 ac-ft

Water use

Historical Water supplied by the Midvale city drinking water sources is summarized in table 2-3.

TABLE 2-3 HISTORICAL WATER SUPPLY SUMMARY

YEAR	SOURCE SUPPLIED (AC-FT)					TOTAL (AC-FT)
	HANCOCK WELL	MILLION GALLON WELL	OAK STREET WELL	JVWCD	OTHER EXTERNAL USE	
2015	1144.3	1648.3	448.6	180.51	2,071.27	5,493
2016	856.1	2052.8	358.2	131.1	1,958.8	5,357
2017	979.2	1763.7	345.9	165.6	2,042.6	5,297
2018	915.2	2336.1	332.5	390.1	1,659.1	5,633
2019	1390.0	1393.5	277.5	2627		5,688
2020	1453.15	1459.65	453.2	3542		6,908
2021	1172.35	1218.45	443.2	3113		5,947
2022	920.9	1896.7	168.4	3092		6,078
2023	928.5	1415.9	513.6	3053		5,911

Based on population estimates collected from the US Census for Midvale City, the per capita water use for the city from 1998 through 2001 was approximately 250 gallons per capita per day (gpcd). From 2002 through 2009, the water use dropped to about 200 gpcd. From 2009 through 2014 the use dropped to about 190 gpcd. In the past 5 years, Midvale has continued to show a declining trend in water use. The average for the last 5 years has been 148 gpcd. (See Figure 2-2)

FIGURE 2-2 MIDVALE CITY HISTORICAL WATER USE

(Gallons per capita daily values were calculated using historical US Census data.)

Water use is categorized into residential, commercial, Industrial, and Institutional/other uses. The historical percentage of water use for each type of use is shown in Table 2-4. These percentages include the Union area. It should be noted that the commercial water use percentage also includes multi-unit apartment buildings.

TABLE 2-4
PERCENT WATER USE BY TYPE OF USE

Type of water use	Residential	Commercial	Industrial
2015	83.4%	16.5%	0.1%
2016	86.7%	13.2%	0.1%
2017	86.5%	12.6%	0.9%
2018	86.5%	12.5%	01%
2019	88.2%	11.1%	0.7%
2020	87.5%	11.5%	01%
2021	87.6%	11.4%	01%
2022	87.8%	11.3%	0.9%
2023	88.2%	10.9%	0.9%

Table 2-5 compares the water supplied to the Midvale City drinking water system to the metered water use for the years 2015 through 2023. About 9% of the water supplied by the City's drinking water sources was unaccounted for in 2023. Possible explanations for the unaccounted water use include leaks in the distribution system, meter inaccuracies, and miscellaneous unmetered water use (such as pipeline flushing, etc.).

TABLE 2-5
COMPARISON OF WATER SUPPLIED TO METERED WATER USE

Year	Supplied Water (ac-ft)	Metered Water Use (ac-ft)	Percent Difference
2015	5,492	4,831.0	-12%
2016	5,357	5,173.0	-3.4%
2017	5,297	5,065.0	-4.4%
2018	5,633	5,261.0	-6.6%
2019	5,688	4,856.0	-14.6%
2020	6,908	6,266.0	-9.3%
2021	5,947	5,384.6	-9.5%
2022	6,078	5,194.0	-14.5%
2023	5,911	5,222.0	-11.7%

Existing and Future Water Use

If current water conservation efforts can be maintained into the future, it will save the City about 3,630 ac-ft/year of required build-out water supply compared to their 1995 water use rates. Water losses in the system were low, but if water losses could be reduced to 4%, the estimated additional water savings at build-out would be about 360 ac-ft/year.

The city recently had a consultant review its current and future buildout source requirements. It was determined that current sources exceed buildout requirements and that no new sources will be required, especially if water conservation efforts continue.

Water Metering and Pipeline Replacement

Midvale City currently meters water use at all connections and reads meters on a monthly basis. Midvale City has replaced all water meters within the water system with radio-read meters within the past 10 years and continues to monitor and replace meters throughout the city as they become older and defective.

Midvale City has a current program to replace and/or upsize old or undersized water pipelines in streets that need to be re-constructed. Old or undersized pipelines have been and will be identified for replacement in the City's Water System Master Plan. These projects are implemented as City budget allows. The city also regularly replaces old water service laterals with new copper or poly lines as pipeline projects are constructed.

Current Water Structure

Midvale City's drinking water rate structure is summarized in Table 3-1. The city has different rates for nine-meter sizes in three different areas. Rates are evaluated regularly and adjusted for fiscal and water conservation needs.

TABLE 3-1
WATER RATE STRUCTURE 2024

Meter Size	Area #1	Area #2	Area #3
Base Rate			
3/4 "- 5/8"	24.46	25.81	26.34
1"	34.24	36.12	36.87
1.5"	44.03	46.46	47.42
2"	70.91	74.81	76.36
3"	268.67	283.77	289.63
4"	342.32	361.15	368.61
6"	513.15	541.75	552.95
8"	709.38	748.4	763.86

Identified Problems

Midvale City is concerned with the potential waste of water from inefficient indoor/outdoor water use and from system wide losses. The following specific concerns have been identified by the city:

- Many pipes in the drinking water distribution system are old, undersized, and may be leaking.
- The city has adopted an annually increasing rate structure with higher overage charges for peak usage times.
- Comparison of the water supplied to the distribution system and the monthly meter readings has revealed water that is unaccounted for.
- The city currently has no estimates for the amount of water used during fire hydrant tests and distribution system flushing.

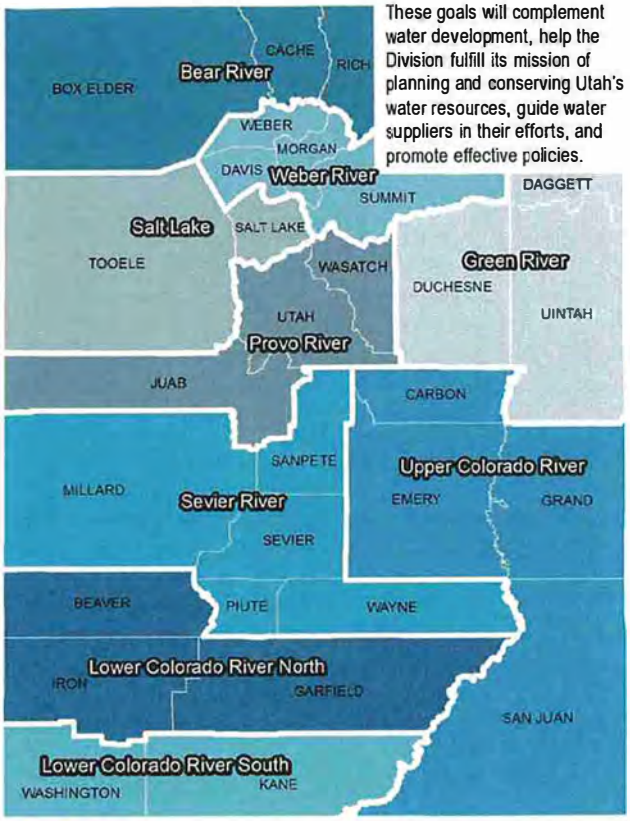
Goals

State regional water conservation goals:

The state's Regional Water Conservation Goals, established in 2019, are for Utah's nine municipal and industrial (M&I) areas. M&I includes residential, commercial, institutional (for example, schools and parks) and industrial water use, but excludes agriculture, mining, and power generation as these are classified individually.

As recommended by the 2015 Legislative Audit, 2017 Follow-up Audit, Third-Party Review, and 2017 Recommended State Water Strategy, regional water conservation goals were developed to enhance water conservation efforts around the state. Region-specific goals support the unique characteristics and needs of Utah's diverse climates and ecosystems.

Thanks to the efforts of many Utahns and their water providers, per capita water use has declined by at least 18%. We've made significant progress, but more must be done to accomplish these goals including policy and ordinance changes on state, local and municipal levels. Even with all the progress that has been made, balanced efforts both in water development and water conservation are still necessary to meet Utah's long-term water needs. This is the first-time conservation goals have been established on a regional level and they build on the previously established statewide goal of reducing per-capita use by 25% by 2025, (using the 2000 M&I water use report as a starting value).



These goals will complement water development, help the Division fulfill its mission of planning and conserving Utah's water resources, guide water suppliers in their efforts, and promote effective policies.

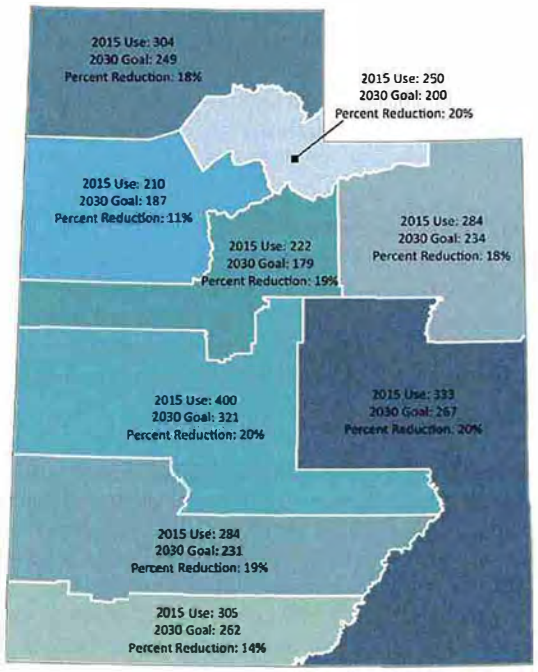
Midvale City's goal:

Midvale City has reached the state-wide goal of reducing their Per capita water consumption by 25%. A goal was also set in 2015 for each city in Salt Lake County to be below 187 GPCD. Midvale City currently has a gallon per capita daily water use of 148 based on current US Census data. Even though Midvale has completed both state goals and the new regional goal set in place in 2019 they will continue to promote conservation with a goal to reduce their per capita use by 11% aligning with the regional goal to reduce per capita use by 11%. Bringing Midvale City's GPCD to roughly 131.72 GPCD.

Midvale City believes that water conservation is an important factor for allowing the city to meet water demands into the future. Although the City has not appointed a separate water conservation coordinator, staff is aware of the conservation goals and work together to implement the goals. Water conservation efforts are coordinated by:

Wesley Vanvalkenburg
Midvale City Public Utilities Manager
801-567-7235

M&I Water Conservation Regions
2015 Use Vs 2030 Goals



A regional approach allows the goals to be tailored for nine different regions and takes into account climate, elevation, and each region's characteristics. Note: Use is measured in gallons per capita per day.

Midvale City Existing Conservation Measures

Public Education:

Midvale City actively promotes water conservation measures to its residents through multiple channels, ensuring a comprehensive approach to sustainability. The city's website serves as a central hub, offering detailed guidelines, tips, and resources on efficient water usage and the importance of conservation. Annually, the city's water

quality report not only provides essential information about the safety and quality of the water supply but also includes practical advice on how residents can reduce their water consumption. Additionally, the city newsletter features regular articles and updates on water-saving initiatives and upcoming conservation workshops.

Require Water Saving Fixtures:

Midvale City has adopted the International Plumbing Code, mandating the use of water-saving plumbing fixtures in all new developments to enhance sustainability and resource efficiency. During the building permit review process, the city meticulously examines building plans to ensure they incorporate these water-efficient fixtures. Compliance with the code is further enforced through rigorous building inspections, ensuring that all new constructions adhere to these water conservation standards. This proactive approach not only promotes responsible water usage but also supports Midvale City's broader environmental goals.

Replace Old Water Service Laterals:

Midvale City has adopted a material standard aimed at improving the durability and efficiency of its water infrastructure by requiring that all leaking galvanized water laterals be replaced with copper or poly piping. This measure is part of the city's commitment to maintaining a reliable and sustainable water supply system. When a pipeline replacement project is conducted, any existing galvanized laterals are systematically replaced to prevent future leaks and ensure long-term resilience. By upgrading to copper or poly piping, Midvale City not only enhances the overall quality of its water distribution network but also reduces maintenance costs and water loss.

Replacement Program for Old Pipelines:

Midvale City is committed to the ongoing improvement of its water infrastructure by aiming to replace 1,000 feet of pipeline annually. This systematic approach is aligned with the city's master plan, ensuring that pipeline replacement projects are strategically conducted in conjunction with street renovations, as leaks are detected, and as the annual budget permits. By integrating pipeline replacements with broader infrastructure projects, Midvale City maximizes efficiency and minimizes disruption to residents. This proactive replacement strategy not only helps maintain a reliable water distribution system but also supports its broader water conservation goals by reducing leaks and water loss, thereby ensuring a more sustainable and efficient use of water resources for the community.

Replacement Program of Old Water Meters:

Midvale City has implemented a comprehensive meter replacement program to enhance the accuracy and efficiency of water usage monitoring. New, accurate radio-read meters are installed at all connections, allowing for precise data collection. During monthly meter scans, the city identifies meters with continuous flow, indicating potential leaks, and promptly contacts the respective residents. Meters showing abnormally high usage are also flagged, with residents being

notified to address possible issues. Additionally, meters registering zero flow are noted, and if found to be broken or inaccurate, they are promptly replaced. This diligent monitoring and proactive replacement approach ensures accurate billing and reduces water waste.

Restrict Water Use for Public Landscaped Areas:

Midvale City enforces water use restrictions for public landscaped areas to promote efficient water usage and conservation. Sprinkler systems are carefully adjusted based on current weather conditions, ensuring that landscapes receive the appropriate amount of water without waste. Watering is scheduled for the evening or early morning hours to minimize water loss due to evaporation, maximizing the effectiveness of irrigation. This strategic approach not only conserves water but also helps maintain the health of public green spaces.

Require Separate Meters for Large Irrigated Areas:

Midvale City mandates the installation of separate meters for large, irrigated areas in commercial and industrial properties. This requirement ensures that water usage for landscaping is distinctly monitored, promoting responsible water management practices. By isolating irrigation water consumption, the city can more accurately track and manage water usage, encouraging businesses to adopt efficient irrigation techniques. This policy not only aids in identifying potential leaks and inefficiencies but also aligns with Midvale City's water conservation plan, ensuring that commercial and industrial landscape areas are maintained without compromising valuable water resources.

Evaluate Water Rate Structure:

Midvale City conducts an annual evaluation of its water rate structure to promote water conservation and ensure the sustainability of its water resources. By reviewing and adjusting the rates each year, the city aims to incentivize efficient water usage among residents and businesses. The rate structure is designed to reflect the true cost of water provision and to encourage conservation by implementing tiered pricing, where higher usage results in higher rates. This annual assessment allows the city to adapt to changing water supply conditions, economic factors, and consumption patterns, reinforcing its commitment to responsible water management and the long-term preservation of this vital resource.

PROPOSED CONSERVATION MEASURES

The following specific conservation goals have been identified by the city to help continue to promote conservation. Some of these goals were previously implemented but are being updated with additional information to align with future conservation goals.

Public Education: Updated Annually

Midvale City remains committed to promoting water conservation measures among its residents through ongoing public education initiatives. In alignment with the newly adopted Jordan Valley Water Conservancy District conservation measures, the city will update all relevant information to ensure residents are well-informed and equipped to conserve water effectively. This commitment extends to advertising conservation measures by providing convenient access to water conservation websites through links on the city website. As part of these efforts, the city will continue public education campaigns, encouraging customers to limit outside watering to the hours of 6 pm to 10 am. This information will be reviewed and updated annually.

Unmetered Connections and Water Use: Conducted Monthly

The city will undertake efforts to identify potential causes of unmetered or unaccounted for drinking water. Investigation and analysis conducted monthly based on meter reading data, Midvale City aims to pinpoint areas where water may be escaping the metering system or being lost through leaks or other means. Additional Hydrant meters will be purchased to help account for water used during fire hydrant flushing. By addressing these issues proactively, the city can mitigate water loss, conserve resources, and ensure efficient distribution of safe drinking water to residents and businesses. This will be reviewed and updated monthly.

Pipeline Repairs: Conducted Upon Discovery of Leak

Midvale City is committed to promptly replacing leaking pipelines as they are discovered to minimize water loss and ensure the efficient delivery of clean water to residents. The city prioritizes replacement of leaking water pipes to minimize environmental impact and conserve resources. This will be conducted upon the discovery of a leak and processes will be reviewed and revised annually.

Jordan Valley Water Conservancy District Conservation Measures

As of 2024 Midvale City adopted the Jordan Valley Water Conservancy District (JVWCD) conservation measures allowing all Midvale City residents the ability to utilize the conservation measures implemented by JVWCD in conjunction with the conservation efforts enforced by Midvale City. A summary of JVWCD efforts are included below or can be found at **https://jvwcd.org/public/conservation**

Free Water Audits:

JVWCD offers free water audits upon request for residential, commercial, industrial, or institutional water users. These audits involve a thorough examination of the sprinkling system and landscaping to identify opportunities for increasing irrigation efficiency and promoting conservation. By providing this service, JVWCD aims to empower water users with the knowledge and tools necessary to minimize water waste and optimize usage practices.

Water-Wise Landscaping Classes:

JVWCD provides Water-Wise Landscaping Classes tailored for both residential and commercial water users, emphasizing principles of water conservation. These classes offer participants valuable insights into sustainable landscaping practices that can significantly reduce water consumption while maintaining attractive and healthy outdoor spaces.

Large Water User Workshops:

JVWCD hosts Large Water User Workshops tailored for entities with extensive outdoor water usage, such as public schools, churches, parks and recreation areas, and municipalities. These workshops equip participants with practical tools and strategies for effectively managing large, landscaped areas while minimizing water consumption. By offering guidance on irrigation best practices, water-efficient landscaping techniques, and innovative water management technologies, JVWCD supports large water users in optimizing their operations for sustainability. These workshops serve as collaborative platforms for sharing knowledge, fostering partnerships, and collectively advancing water conservation efforts within the community.

Water Quest – Saving Water by the Yard:

This program showcases water-wise landscaping practices through the transformation of four residential homes across the Salt Lake Valley. These homes serve as living examples of sustainable landscaping in a residential setting, illustrating how water-efficient designs can enhance curb appeal while conserving water. With before-and-after photos featured on the JVWCD website, these demonstration gardens provide tangible inspiration and practical insights for homeowners looking to reduce their outdoor water usage.

Residential Landscape Incentives:

Homeowners in Jordan Valley's service area are eligible for up to $3.00 per square foot of lawn removed.

Commercial/Industrial/Institutional Incentives:

Businesses, institutions (including municipalities), and HOAs can now apply for incentives through Utah Water Savers. Visit https://utahwatersavers.com today to create an account and start saving!

Implementation Summary

Even though Midvale City has completed both state goals and the new regional goal set in place in 2019 Midvale will continue to promote conservation with a goal to reduce the 2023 148-gallon per capita daily use by 11% by 2030. This goal will be achieved by implementing the proposed conservation measures and educating city residents about Jordan Valley Water Conservancy District conservation measures that are now available to them. Conservation measures will be evaluated annually. An annual water use report will be pulled each year to track the progress of decreasing the Midvale City 2023 GPCD use by 11%. This goal will align with the Salt Lake regional goal to reduce per capita use by 11%. Midvale City's Council and staff are dedicated to achieving the established objectives and ensuring that necessary actions are implemented. Midvale City will establish a realistic timeline for each project to ensure that targets are met within the specified timeframe. Midvale City will also continue to revise the plan to ensure it adapts to evolving conditions and requirements within the City. This plan will be updated and resubmitted to the Utah Division of Water Resources when it is scheduled for submission.

APPENDIX A
PUBLIC EDUCATION MATERIALS

Ten ways that will save the most:

1. Water your lawn only when it needs it. Step on your grass. If it springs back when you lift your foot, it doesn't need water. So set your sprinklers for more day's in-between watering. Saves 750-1,500 gallons per month.
2. Fix leaky faucets and plumbing joints. Saves 20 gallons per day for every leak stopped.
3. Don't run the hose while washing your car. Use a bucket of water and a quick hose rinse at the end. Saves 150 gallons each time. For a two-car family that's up to 1,200 gallons a month.
4. Install water-saving shower heads or flow restrictors. Saves 500 to 800 gallons per month.
5. Run only full loads in the washing machine and dishwasher. Saves 300 to 800 gallons per month.
6. Shorten your showers. Even a one- or two-minute reduction can save up to 700 gallons per month.
7. Use a broom instead of a hose to clean driveways and sidewalks. Saves 150 gallons or more each time.
8. Don't use your toilet as an ashtray or wastebasket. Saves 400 to 600 gallons per month.
9. Capture tap water. While you wait for hot water to come down the pipes, catch the flow in a watering can use later on houseplants or your garden. Saves 200 to 300 gallons per month.
10. Don't water the sidewalks, driveway or gutter. Adjust your sprinklers so that water lands on your lawn or garden where it belongs--and only there. Saves 500 gallons per month.

In the bathroom:

1. Put a plastic bottle or a plastic bag weighted with pebbles and filled with water in your toilet tank. Displacing water in this manner allows you to use less water in each flush. (Don't use bricks, they decompose and can stain the toilet) Better yet, for even greater savings, replace your water-guzzling five to seven gallon a flush toilet with a three and a half gallon, low flush or one and a half gallon, ultra-low flush model.
2. Check toilet for leaks. Put dye tablets or food coloring in the tank. If color appears in the bowl without flushing, there's a leak that should be repaired.
3. Turn off the water while brushing your teeth.
4. Turn off the water while shaving. Fill the bottom of the sink with a few inches of water to rinse your razor.

In the kitchen and laundry:

1. If you wash dishes by hand, don't leave the water running for rinsing. If you have two sinks, fill one with rinse water. If you only have one sink, use a spray device or short blasts instead of letting the water run.
2. When washing dishes by hand, use the least amount of detergent possible. This minimizes rinse water needed.
3. Keep a container of drinking water in the refrigerator. This eliminates the need to run the tap water until it gets cold.

4. Don't defrost frozen foods with running water. Either plan ahead by placing frozen items in the refrigerator overnight or defrost them in the microwave.
5. Don't let the faucet run while you clean vegetables. Rinse them in a filled sink or pan.
6. Use the garbage disposal sparingly.

Outside:

1. Put a layer of mulch around trees and plants. Chunks of bark, peat moss or gravel slows down evaporation.
2. Water during the cool parts of the day.
3. Don't water the lawn on windy days. There is too much evaporation.
4. Cut down watering on cool and overcast days and don't water in the rain. Adjust or deactivate automatic sprinklers
5. Set lawn mower height to 2 1/2 to 3 inches. This promotes deeper roots and reduces evaporation.
6. Mow less frequently, this reduces the stress on turfgrass.
7. Sharpen mower blades. A cleaner cut grass blade heals quicker, thus less water.
8. Wash your car on the lawn. Rinse water can help water the grass.
9. Tell your children not to play with the garden hose.
10. Xeriscape--replace your lawn and high-water using plants with less thirsty ones. But do this only in early spring. Even drought tolerant plants take extra water to get them going.

ADDITIONAL WEBSITES PROMOTING WATER CONSERVATION:

- Jordan Valley Water conservation https://jvwcd.org/public/conservation
- Utah Water Savers https://www.utahwatersavers.com/
- Slow the flow https://slowtheflow.org/
- Conservation Garden Park https://conservationgardenpark.org/
- QWEL Workshops for landscape professionals https://www.qwel.net/
- Jordan Valley Water efficiency standards https://jvwcd.org/public/wes
- Utah division of water https://conservewater.utah.gov/

Appendix C

Midvale Drinking Water System Master Plan

MIDVALE CITY

DRINKING WATER SYSTEM MASTER PLAN

(HAL: Project No.: 141.43.100)

AUGUST 2020

HANSEN ALLEN & LUCE inc
ENGINEERS

THIS PAGE INTENTIONALLY LEFT BLANK

MIDVALE CITY

DRINKING WATER MASTER PLAN

(HAL Project No.: 141.43.100)

Katie Gibson Jacobsen, P.E.
Project Engineer

HANSEN ALLEN & LUCE INC
ENGINEERS

August 2020

THIS PAGE INTENTIONALLY LEFT BLANK

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

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.

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

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.

Head Loss: 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.

ABBREVIATIONS AND UNITS

ac	acre [area]
ac-ft	acre-foot (1 ac-ft = 325,851 gal) [volume]
CFP	Capital Facilities Plan
DIP	Ductile Iron Pipe
EPA	U.S. Environmental Protection Agency
EPANET	EPA hydraulic network modeling software
ERC	Equivalent Residential Connection
ft	foot [length]
ft/s	feet per second [velocity]
gal	gallon [volume]
gpd	gallons per day [flow rate]
gpm	gallons per minute [flow rate]
HAL	Hansen, Allen & Luce, Inc.
hr	hour [time]
IFC	International Fire Code
in.	inch [length]
irr-ac	irrigated acre
kgal	thousand gallons [volume]
MG	million gallons [volume]
MGD	million gallons per day [flow rate]
mi	mile [length]
psi	pounds per square inch [pressure]
s	second [time]
SCADA	Supervisory Control and Data Acquisition
yr	year [time]

ACKNOWLEDGMENTS

Successful completion of this study was made possible by the cooperation and assistance of many individuals, including the Mayor of Midvale City, City Council Members, City Staff, and the Midvale Area Inspector as shown below. We sincerely appreciate the cooperation and assistance provided by these individuals.

Midvale City

Mayor

Robert Hale

City Council

Quinn Sperry
Paul Glover
Heidi Robinson
Bryant Brown
Dustin Gettel

City Staff

Lesley Burns, City Planner
Christopher Butte, Economic Development Director
Matt Dahl, Assistant City Manager
Keith Ludwig P.E., City Engineer
Glen Kennedy, Public Works Director
Alan Hoyne, Public Works Operations Superintendent
Curtis Nielsen, Public Utilities Manager
David Stenquist, City Treasurer

Area Inspector

Christen Yee
Unified Fire Authority
(801) 743-7228, (801)750-9476

CHAPTER 1 INTRODUCTION

PURPOSE AND SCOPE

The purpose of this master plan is to provide direction to Midvale City regarding decisions that will be made now and well into the future to provide an adequate drinking water system for its customers at the most reasonable cost. Recommendations are based on demand data, growth projections, standards of the Utah Division of Drinking Water (DDW), city zoning, known and anticipated planned developments, and standard engineering practices. This master plan covers through approximately the year 2060, though full build-out is projected to occur beyond this time period. The service area considered in this master plan is the entire City of Midvale, as well as 45 acres located west of 700 West (Main Street) between approximately 8500 South and 9000 South that could be annexed into the City in the future.

The master plan is a study of the City's drinking water system and customer water use. The following topics are addressed herein: growth projections, source requirements, storage requirements, and distribution system requirements. Based on this study, needed capital improvements have been identified and conceptual-level cost estimates for the recommended improvements have been provided.

The results of the study are limited by the accuracy of growth projections, data provided by the City, 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 as new information about development, system performance, or water use becomes available. This master plan updates the previous plan completed by the City of Midvale in October 2010.

BACKGROUND

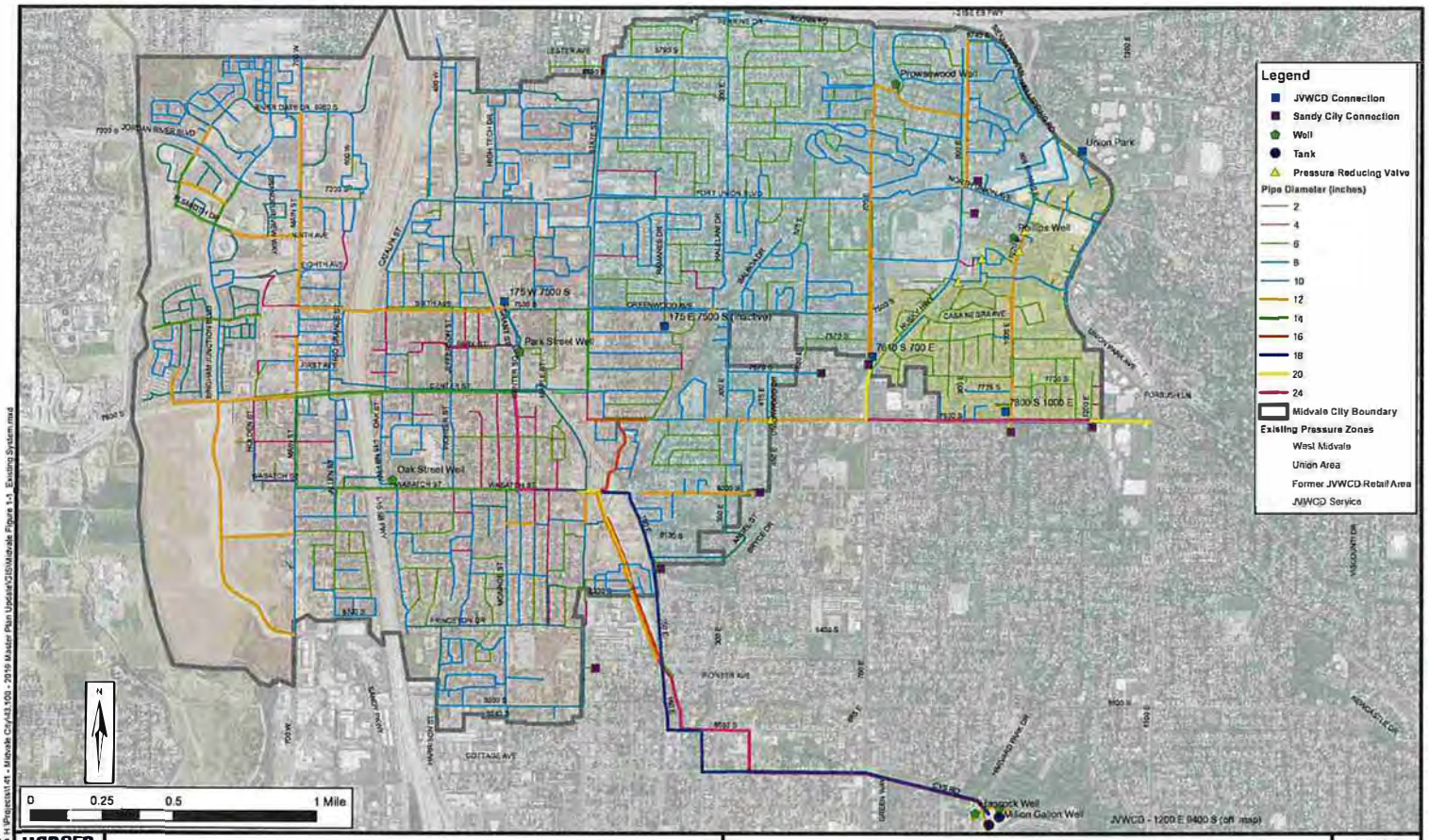
Midvale City covers an area of approximately 5.8 square miles in the central area of Salt Lake County and shares borders with Murray City on the north, Sandy City on the south, the Cottonwood area on the east, and West Jordan City on the west. Water is supplied to Midvale City by two separate distribution networks.

The largest of the networks serves water to the western portion of Midvale and includes four wells (three active and one inactive), two water storage tanks, and two inter-agency connections with the Jordan Valley Water Conservancy District (JVWCD). A second network serves water to the Union Area of Midvale, located in the eastern portion of the City. The Union Area network is comprised of two pressure zones which receive water via inter-agency connections with JVWCD and also contains two inactive wells. A portion of this network was previously managed by JVWCD. In 2019, infrastructure projects were completed to allow Midvale to incorporate the former JVWCD retail network into the City's Union Area network.

The City drinking water supplies water for both indoor and outdoor use throughout the service area. There is no secondary/pressurized irrigation water system for outdoor use in the City, nor any significant outdoor watering supplied by irrigation companies.

Figure 1-1 illustrates the extent of the Midvale water system and presents a graphic description of system components. The West Midvale and Union Area pressure zones of the Midvale City water system contain a total of approximately 120 miles of distribution pipe ranging in size from 2 to 24 inches in diameter.

THIS PAGE INTENTIONALLY LEFT BLANK



Date: 6/11/2020
Document Path: H:\Projects\41 - Midvale City\43.103 - 2019 Master Plan Update\GIS\Midvale Figure 1-1 Existing System.mxd

HANSEN ALLEN & LUCE, Inc.	MIDVALE CITY DRINKING WATER SYSTEM	EXISTING DRINKING WATER SYSTEM

FIGURE
1-1

Midvale includes a population of approximately 34,000 in 2020. Midvale includes 260 acres of undeveloped land in the Jordan Bluffs area (west of Main Street/700 West, south of Center Street/7800 South). City and State planners expect development of Jordan Bluffs, infill development, and redevelopment to increase the population of Midvale significantly over the next 40 or more years, reaching at least 60,000. Figure 1-2 shows the historic and projected population of Midvale through 2060. Additional detail is shown in Table A-1 in Appendix A. These growth estimates were generated using information from City records, the City Planning Department, and projections from the Governor's Office of Management and Budget (2012), Kem C. Gardner Institute (2016), and Wasatch Front Regional Council (2019).

The planning period of this master plan is through 2060, though Midvale may not reach its peak population by that time.

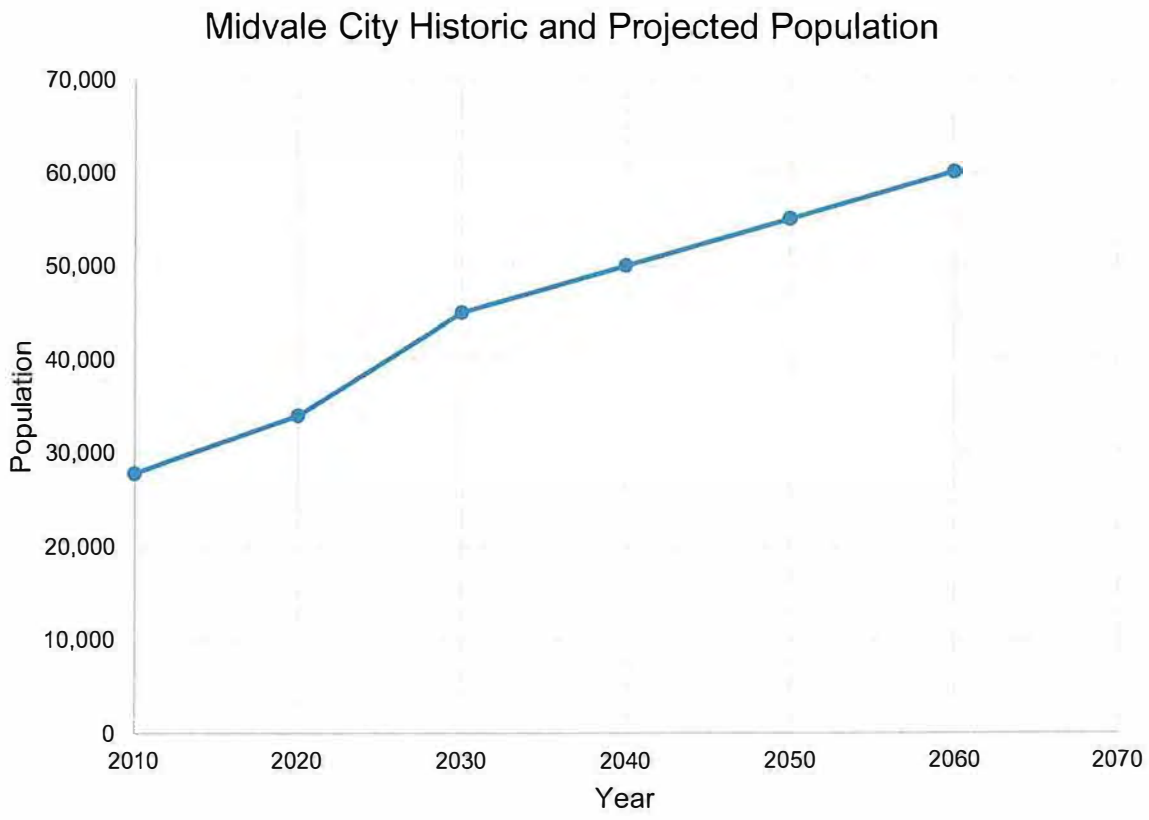


Figure 1-2: Midvale Historic and Projected Population

MASTER PLANNING APPROACH

The Midvale City water distribution network is made up of a variety of components, including pumps, storage facilities, valves, and pipes. Design and operation of the individual components must be coordinated so that they operate efficiently under a range of demands and conditions. The City water system must be capable of responding to daily and seasonal variations in demand while concurrently providing adequate capacity for fire-fighting and other emergency

needs. Furthermore, careful planning is required in order to ensure that the distribution system is capable of meeting the City's needs over the next several decades.

Both present and future needs were evaluated in this master plan. Present water needs were calculated using actual water production data and billing record data, according to Utah Division of Drinking Water (DDW) system-specific sizing requirements. These requirements were used to determine a responsible level of service for the system. Future water demands were predicted using this level of service, current zoning and expected development provided by the City, and future estimated population growth.

This report follows the DDW requirements of Rule R309-510 ("Facility Design and Operation: Minimum Sizing Requirements") and Rule R309-105 ("Administration: General Responsibilities of Public Water Systems") of the Utah Administrative Code. The report addresses sources, storage, distribution, minimum pressures, hydraulic modeling, capital improvements, funding, and other topics pertinent to Midvale's drinking water system.

In order to facilitate the analysis of the drinking water system, a computer model of the system was prepared and analyzed in two parts. First, the performance of existing facilities with present water demands was analyzed. Next, projected future demands were added to the drinking water system and the analysis was repeated. Recommendations for system improvement were prepared based on the results of these analyses.

LEVEL OF SERVICE (LOS)

HAL analyzed production and billing data provided by Midvale City for the previous three years. Once water production and demand patterns were well understood, HAL and the City met to establish a level of service (LOS) that is based on this data, and incorporates appropriate safety factors. A summary of the level of service selected by the City is included in Table 1-1. These values are expected to meet the requirements of the DDW.

Table 1-1: System Level of Service

Criteria	Level of Service
Average Yearly Demand	0.56 ac-ft/ERC = 182,500 gal/ERC
Peak Day Demand	1,200 gpd/ERC = 0.83 gpm/ERC
Peak Instantaneous Demand	1.7 Peaking Factor = 1.42 gpm/ERC
Equalization Storage	500 gal/ERC

ERCs are equivalent residential connections, and are discussed in more detail in the next chapter of this report.

DESIGN AND PERFORMANCE CRITERIA

Summaries of the key design criteria and demand requirements for the drinking water system are included in Table 1-2. The design criteria were used in evaluating system performance and in recommending future improvements. Criteria development is described in later chapters.

Table 1-2: System Design Criteria

	Criteria	Existing	2060
Equivalent Residential Connections	Calculated from past water use and projected growth	13,940	23,580
Source			
Peak Day Demand	Section R309-510-7/LOS	11,570 gpm	19,570 gpm
Average Yearly Demand	Section R309-510-7/LOS	7,806 ac-ft	13,205 ac-ft
Storage			
Equalization	Section R309-501-8/LOS	7.0 MG	11.8 MG
Emergency	City Preference	1.5 MG	1.5 MG
Fire Suppression	IFC/Fire Code Official	2.3 MG	2.3 MG
Total		10.8 MG	15.6 MG
Distribution			
Peak Instantaneous	1.7x Peak Day Demand	19,669 gpm	33,269 gpm
Minimum Peak Day Fire Flow	IFC/ Fire Code Official		
Residential (typical)		1,000 gpm @ 20psi	1,000 gpm @ 20psi
Non-Residential		2,000 gpm @ 20 psi	2,000 gpm @ 20 psi
Max. Operating Pressure	City Preference	110 psi	110 psi
Minimum Pressure: Peak Day	Section R309-510-9/City Preference	40 psi/50 psi	40 psi/50 psi
Minimum Pressure: Peak Instantaneous	Section R309-510-9/City Preference	30 psi/50 psi	30 psi/50 psi

1 – Fire flow requirements are dependent on building size, construction type, and presence of approved sprinkling systems. The values shown here are typical minimums.

THIS PAGE INTENTIONALLY LEFT BLANK

CHAPTER 2 SYSTEM GROWTH

EXISTING CONNECTIONS

According to billing records obtained for years 2016 through 2019, the Midvale distribution network serves a total of 7,875 connections. Included in this number are 7,190 residential connections and 685 non-residential connections. Drinking water demands are expressed in terms of equivalent residential connections (ERCs), which for planning purposes are the same as equivalent residential units (ERUs). The use of ERCs is a standard engineering practice to describe the entire system in a common unit of measurement. One ERC is equal to the average demand of an average residential connection. Non-residential demands are converted to ERCs for planning purposes. For example, a commercial building requiring six times as much water as a typical residential connection is assigned an ERC of 6. The entire water demand then can be described with a single ERC count.

HAL extensively analyzed the City's water billing data from January 2016 through December 2018. Billing data from Midvale and JVWCD for all of 2019 was also obtained and used to estimate the number of ERCs added to the Midvale system when Midvale took over a portion of the JVWCD network in 2019. It was determined that the existing system serves 13,940 ERCs.

ERCs representing demands were assigned to nodes within the extended-period hydraulic model based on the billing location. A breakdown of the existing ERCs by pressure zone is shown in Table 2-1.

A primary recommendation of this master plan is to combine the majority of the City into one large pressure zone. The portion of the City in the Union area east of 700 East/900 East will be divided into two additional small zones. Figure 2-1, Recommended Pressure Zones, located at the end of this chapter, shows the recommended new pressure zones. Projects will be required to connect piping across the former zone boundaries. Some valves will be closed to create the new zone boundaries. Pressure and flow settings at JVWCD connections will need to be adjusted. Details of these projects are discussed in Chapter 5, Water Distribution.

Table 2-1 includes the ERC breakdown for the new pressure zones. All remaining tables, charts, and figures in this report will use the recommended new pressure zones.

Table 2-1: Existing ERCs by Pressure Zone

Existing Pressure Zones		Recommended Pressure Zones	
Zone Name	**ERCs**	**Zone Name**	**ERCs**
West Midvale	7,135	Midvale	11,970
Union Area – North/West	5,490	North Union	630
Union Area – East/South	1,315	South Union	1,340
Total	**13,940**	**Total**	**13,940**

FUTURE CONNECTIONS

Future ERCs were calculated based on proposed development, land use patterns, zoning, and densities allowed by City code or possible in the future. Most of the remaining undeveloped land in Midvale is located in the 260-acre Jordan Bluffs area. City planners expect to see additional development at other locations throughout the City, including within Bingham Junction, near the Fort Union Shopping Area, along State Street and 7200 South, and in transit-oriented development zones. Infill development is possible on small pockets of land throughout the city. The remaining projected growth will likely take place through redevelopment in future decades. All projected growth is expected to be at higher densities than past development has typically been. The level of development expected by 2060 is significantly more than the buildout level of development expected in past master planning efforts.

Water usage for future development was based on existing usage for those same development types, as shown in Table 2-2.

Table 2-2: Water Usage of Future Development Types

Development Type	Usage
Office Buildings	25 ERCs per 100,000 SF
Retail	30 ERCs per 100,000 SF
Hotel	0.3 ERCs per room
Medium to High-Density Residential	0.5 ERCs per unit

Future ERCs were distributed as shown in Table 2-3.

Table 2-3: Future ERCs by Development Location or Type

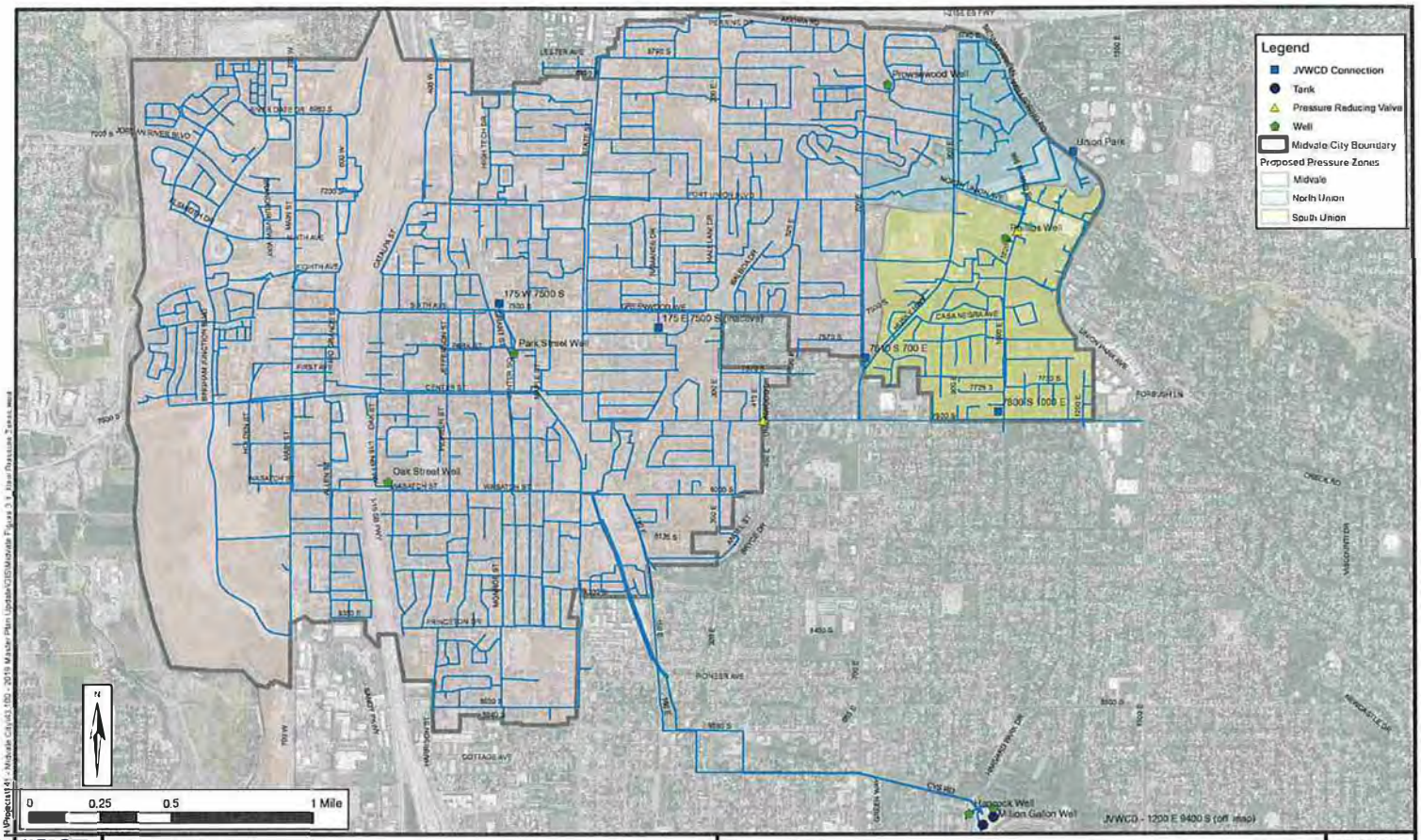
Development Location or Type	ERCs
Jordan Bluffs area	2,130
Bingham Junction area	275
Fort Union Shopping area	840
8500-9000 S Annexation area	400
Transit-oriented development zones	660
7200 South/State Street area	120
Infill/vacant parcels	1,185
Redevelopment	4,030
Total	**9,640**

These future ERCs were assigned to the proposed pressure zones as shown in Table 2-4 in the "Added" column. This table also shows the existing ERCs and total number of ERCs in each proposed pressure zone in 2060.

Table 2-4: Existing, Added, and Total 2060 ERCs by Pressure Zone

Zone Name	Existing	Added	Total
Midvale	11,970	8,290	20,260
North Union	630	725	1,355
South Union	1,340	625	1,965
Total	**13,940**	**9,640**	**23,580**

THIS PAGE INTENTIONALLY LEFT BLANK



HANSEN ALLEN & LUCE INC	MIDVALE CITY DRINKING WATER SYSTEM	RECOMMENDED NEW PRESSURE ZONES

FIGURE 2-1

CHAPTER 3 WATER SOURCES AND WATER RIGHTS

EXISTING WATER SOURCES

Midvale City owns six wells, including Hancock, Million Gallon, Oak Street, Park Street, Phillips, and Prowswood. The Phillips, Prowswood, and Park Street wells are currently inactive. Midvale also receives water from JVWCD at four locations. Midvale's sources are summarized in Table 3-1 and shown on Figure 1-1.

Table 3-1: Existing Drinking Water Sources

Source	Zone	Capacity (gpm)
Well Sources		
Hancock Well	Midvale	1,950
Million Gallon Well	Midvale	2,150
Oak Street Well[1]	Midvale	1,200
Park Street Well	Midvale	Inactive
Phillips Well	North Union	Inactive
Prowswood Well	Midvale	Inactive
Total Well Sources		**5,300**
JVWCD Sources		
JVWCD 175 W 7500 S	Midvale	1,000
JVWCD 1200 E 9400 S	Midvale	1,000
JVWCD 7610 S 700 E	Midvale	4,500
JVWCD 1000 E 7800 S	South Union	2,500
Total JVWCD Sources		**9,000**
Total		**14,300**

1 – The Oak Street well has been capable of pumping up to 1,200 gpm but is currently pumping 800 gpm.

Table 3-2 summarizes the existing drinking water sources by pressure zone using the new recommended pressure zones.

Table 3-2: Existing Drinking Water Sources by Pressure Zone

Zone	Capacity (gpm)
Midvale	11,800 gpm
North Union/South Union	2,500 gpm
Total	**14,300 gpm**

The current contract amount available to Midvale from JVWCD is 3,085 acre-feet.

Midvale's system includes inactive interconnections to the Sandy City network. These connections could be used in case of emergency, but are not considered as a Midvale City source.

WATER RIGHTS

A summary of Midvale City's water rights is shown in Table 3-3. In 2019-2020, an adjudication was performed for all Midvale water rights and volumetric restrictions were added to all of the rights that did not already have one. These are reflected in the table. Four of the water rights were solely used in the Phillips, Prowswood, or Park Street wells. Three of the change applications to add the Oak Street well as a point of diversion for these rights were approved and one is still under evaluation. These are indicated in the table.

Table 3-3: Summary of Midvale Water Rights

Water Right Number	Flow cfs (gpm)	Volume acre-feet	Status	Use	Time of Use	Point of Diversion
57-1008	0.61 (274)	118.5	Approved Change Application	Municipal	Jan-Dec	Park, Oak
57-1398	2.20 (987)	126.0	Certificated	Municipal	Jan-Dec	Park, Oak, Million Gallon, Hancock
57-2251	4.47 (2006)	3236.13	Certificated	Municipal	Jan-Dec	Park, Oak, Million Gallon, Hancock
57-3066	1.158 (520)	838.39	Approved Change Application	Municipal	Jan-Dec	Phillips, Oak
57-7909	0.64 (287)	158.50	Certificated	Municipal	Jan-Dec	Million Gallon
57-8248	0.178 (80)	44.00	Approved Change Application	Municipal	Jan-Dec	Prowswood, Oak
57-8505	1.27 (570)	430.20	Unevaluated Change Application	Municipal	Jan-Dec	Prowswood, Oak
57-1492	0.50 (224)	58.438	Certificated	Irrigation Stockwater Domestic	Apr 1-Dec 1 Jan-Dec Jan-Dec	Near 7200 S Cottonwood St.
57-1738	0.056 (25)	6.44	Certificated	Irrigation Stockwater Domestic	Apr 1-Dec 1 Jan-Dec Jan-Dec	Near 7200 S Cottonwood St.
57-2699	0.348 (156)	7.76	Certificated	Stockwater Domestic Commercial	Jan-Dec Jan-Dec Jan-Dec	8200 South Main Street
Total	**11.43 (5,130)**	**5,024**				

The water rights in Table 3-3 sum to 11.43 cfs (5,130 gpm) with an annual limitation of 5,024 acre-feet. However, if only the water rights related to domestic uses are considered, 57-1492, 57-1738, and 57-2699 are removed from consideration. These three water rights total 0.904 cfs (406 gpm) with an annual limitation of 72.6 acre-feet. After removing the water rights that are not available for municipal use, 10.526 cfs (4,724 gpm) with an annual limitation of 4,952 acre-feet remain. This is summarized in Table 3-4.

The point of diversion for water right 57-2699 is located at the City's public works building property, within the Central Region of the Salt Lake Valley Groundwater Management Plan. The Plan is included in Appendix B. The City wells are located in the Eastern Region. Water rights cannot be transferred from the Central region to the existing City wells in the Eastern Region. In addition, the Sharon Steel Restricted Area and the Southwest Remediation Area (Kennecott) are located to the west of the existing point of diversion for right 57-2699. It may be challenging to find a point of beneficial use for this water right within the Central Region. The City may be able to install equipment to use the water at the Public Works property for washing, irrigation, or other similar uses. When a beneficial use is identified, a change application should be filed to change the usage type to municipal. The water right could also be transferred to the Northern Region and exchanged for a right that is usable by the City.

Water right numbers 57-1738 and 57-1492 have the same authorized point of diversion in the Eastern Region (near 7200 South Cottonwood Street). A change application could be filed to move this water to the Oak Street Well. The point of diversion is no longer in use, but at the time of evaluation by the State Engineer in March 2019 as part of the ongoing adjudication, the beneficial use requirement was excused as a condition of being owned by a public water supplier consistent with Utah Code. These water rights are limited to the annual withdrawal of 64.878 acre-feet.

Table 3-4: Water Rights for Municipal Use

Water Rights	Flow Limitation		Volumetric Limitation
	cfs	gpm	acre-feet
All	11.43	5,130	5,024
Not available for domestic use	0.904	406	72.6
Available for domestic use	10.526	4,724	4,952

Because the water rights for the recently approved change applications are in an active adjudication area, the City can elect to have the applications proofed as part of the adjudication. It is recommended the City elect to do this for as much water as they have beneficial use in place.

The Division of Water Rights (DWRi) requires the City to have measuring and totalizing recording devices to meter all water diverted from all sources and to report this data to the DWRi Water Use Program each year.

All of the municipal water rights discussed are available for use in the new larger Midvale pressure zone. Rights associated with the Phillips well could be used in the North Union and South Union pressure zones, but the City does not plan to use the well to supply these zones.

WATER RIGHTS LIMITATIONS

The following tables summarize the water rights that can be used for each well. Table 3-5 is a mass balance based on instantaneous flow rate limitations and Table 3-6 is based on annual volumetric limitations. The values in the table show a possible mass balancing of the water rights. Because several of the water rights have multiple points of diversion, the rights could be assigned in other ways. These examples are based on the current typical operations of the wells.

Table 3-5: Water Rights for Midvale City Wells – Instantaneous Flow Limitation

Water Rights and Limitations		Well (Physical Capacity, gpm)					
Number	Flow (gpm)	Hancock 1,950	Mill. Gal. 2,150	Oak St. 800-1,200	Park St. (inactive)	Phillips (inactive)	Prowswood (inactive)
57-1008	274			274			
57-1398	987	-	987	-			
57-2251	2006	1,280	726	-			
57-3066	520			520			
57-7909	287		287				
57-8248	80			80			
57-8505	570			570			
Flow Rate Used by Water Right (gpm)		**3,280**		**1,444**	**0**	**0**	**0**
Remaining Well Flow Capac. (gpm)		**820**		**-244 to -644**	**0**	**0**	**0**

Based on flow rate limitations, the combined Hancock and Million Gallon wells are limited to 3,280 gpm. This would not allow both wells to be pumped simultaneously. This leaves 1,444 gpm available to be pumped at the Oak Street well. The Oak Street well is capable of pumping a maximum of 1,200 gpm, but typically pumps 800 gpm.

DWRi requires volumes used to be reported each year, and instantaneous flow rates used are not tracked. It is understood that the annual volumetric water right limitation is more critical than the instantaneous flow rate limitation. However, the wells could be limited to the instantaneous flow limitation if higher use causes excessive drawdown in nearby wells or if other water users are unable to withdraw their rightful flow rates from the aquifer in the future. Table 3-6 shows the volumetric limitations for each water right.

Table 3-6: Water Rights for Midvale City Wells – Annual Volumetric Limitation

Water Rights and Limitations		Well					
Number	Volume (acre-ft)	Hancock	Million Gallon	Oak Street	Park Street	Phillips	Prowswood
57-1008	118.5			118.5			
57-1398	126.0		126				
57-2251	3236.1	1750	1486.1				
57-3066	838.4			838.4			
57-7909	158.50		158.5				
57-8248	44.00			44			
57-8505	430.20			430.2			
Totals		1750	1770.6	1431.1	0	0	0
		3520.6		1431.1	0	0	0
		4951.7					

Using the active wells only, the total volume of 4,952 acre-feet is available to the Hancock, Million Gallon, and Oak Street wells. Of this, 1,431 acre-feet is available to the Oak Street well only. In Table 3-6, this full volume is assigned to Oak Street well. The Oak Street well would need to produce 887 gpm all year to use this volume of water rights. 158.5 acre-feet is available to the Million Gallon well only. The remaining 3,362 acre-feet is available to the Hancock, Million Gallon, and Oak Street wells. Table 3-6 shows the water rights used in the Oak Street well if it could be used all year at 887 gpm with the remainder of the water rights being used in the Hancock and Million Gallon wells, assigned approximately equally to the two wells.

In 2019, the City produced 5,660 acre-feet of water. This is lower than the volume expected to be used in 2020 and beyond because the City served the new JVWCD customers for less than half the year in 2019. The volume used in 2020 will likely increase because these customers will be served the full year. The calculated annual water right requirement presented in this report will nearly always be higher than the volume actually produced because the calculated requirement includes a variability factor and safety factor.

Of the 5,660 acre-feet used in 2019, 3,034 acre-feet was produced by City wells, and the remaining 2,626 acre-feet was purchased from JVWCD. Based on the existing pressure zones in the City, the City is likely incapable of using the entire available water right volume and will continue to underuse the available water rights and be required to supplement with significant volumes of JVWCD water. If the City adjusts the pressure zones as recommended in this master plan, the City can maximize the use of water from the City wells and reduce the amount required to be purchased from JVWCD. Upgrading the Oak Street pump/motor or redeveloping Oak Street well or Park Street well may be necessary in order to fully maximize use of the water rights available.

Because JVWCD water must be paid for whether it is used or not, the City should continue to use all contracted JVWCD water until the City's needs exceed the contract amount. The following example is based on 2019 usage, but these principles will benefit the City as the City's

water demands exceed the JVWCD contract amount. At that point, the City can then maximize the use of the City wells before increasing the JVWCD contract amount.

CAPACITY OF WELLS TO MEET DEMANDS – 2019 EXAMPLE WITH NEW PRESSURE ZONES

Based on production data for the three-year period covering April 2016 through March 2019, the City produces approximately 80% of the annual volume of water in April through October, and 20% of the annual volume in the remaining five months of the year.

The City wells are able to supply only the Midvale pressure zone (whether zone boundaries are changed or not) without a booster pump. Approximately 86% of the City's ERCs are located in the new recommended Midvale pressure zone. The remaining 14% of the City's ERCs are located in the new recommended North Union and South Union pressure zones. The new recommended zones are used in this example.

Table 3-7 calculates the average flow rates that were produced for current customers located in the new recommended pressure zones. This calculation is based on the 5,660 acre-feet produced in 2019. Approximately 5% production volume was added to account for the JVWCD customers being served less than half the year in 2019, resulting in an estimated total production volume of 5,960 acre-feet required to serve all current customers for the full year in 2019.

Table 3-7: Average Flow Rates Produced in 2019 with Proposed Pressure Zones

Zone	ERCs	Percent of ERCs	Production Volume (acre-feet)	April-October (213 days) 80% of production		Jan-Mar & Nov-Dec (152 days) 20% of production	
				Volume (acre-feet)	Avg Flow Rate (gpm)	Volume (acre-feet)	Avg Flow Rate (gpm)
Midvale	11,970	86%	5,125	4,100	4,356	1,025	1,526
North Union	630	14%	835	668	709	167	248
South Union	1,340						
Total	**13,940**		**5,960 ac-ft**	**4,768 ac-ft**	**5,065 gpm**	**1,192 ac-ft**	**1,775 gpm**
Total Volume				**5,960 acre-feet**			

As shown in the table, the approximate annual volume that would have been required for the recommended Midvale pressure zone is 5,125 acre-feet. Water rights available for domestic use is 4,952 acre-feet. As shown in Table 3-6, water rights totaling 3,520 acre-feet are available to be used by the Hancock well and Million Gallon well. An additional 1,431 acre-feet are available to be used in the Oak Street well.

The Oak Street well is currently producing approximately 800 gpm. At this flow rate, the 1,431 acre-feet annual volumetric limitation on the water right for this well will not be reached. The City should increase the production on this well to allow the full water right volume to be used. Approximately 887 gpm could be pumped all year to use the full volume of the available annual water right.

The Hancock and Million Gallon wells can provide 4,000 gpm when both are operational. If the Oak Street well is providing 800 gpm, the Hancock and Million Gallon wells could produce 3,560 gpm average (running approximately 21 hours each day) for more than 7 months before the volumetric water rights limitation is met. Water from JVWCD would then be used during the winter to supply the difference between demand and the volume produced by the Oak Street well.

In this 2019 example, the average summer flow rate required to be produced by the City wells is 4,356 gpm. The City wells should be able to provide this flow rate when all wells are in service. JVWCD water would be needed to provide the remaining required volume in the Union zones and to supplement flows if a well is out of service or if demands exceed the production capacity of the wells. In the winter, the average flow rate needed in the Midvale pressure zone was 1,526 gpm, which could be provided by the Oak Street well with supplementation from JVWCD or another well.

In this example, if the flow rate was increased at the Oak Street well, the City wells could be used to supply 4,952 acre feet of the City's annual requirement, using the full volume of the total available annual water rights. If the City desires to maximize the use of the City's water rights, use of the Oak Street well should be maximized all year to use as much of the water right as practical.

The City is charged for peaking from JVWCD connections, which is a concern during the summer. For this reason, it may be more beneficial to prioritize using JVWCD in the winter and reserving the full capacity of the city wells to meet peak demands in the summer. As noted previously, the full contracted volume of JVWCD water should be used each year because the City is required to pay for it whether it is used or not.

The above calculation is only an example based on 2019 production and requirements from year to year will vary. This demonstrates that if the new recommended pressure zones are used, the City will be able to use more City water rights by pumping from the City wells and reducing the volume required from JVWCD correspondingly. For years or months with higher demands than this example, and as development increases, the City will not be able to meet the requirements of the Midvale zone with only the City wells. Purchasing water from JVWCD to supply this zone will be required.

WATER RIGHTS RECOMMENDATIONS

By 2060, the City will require a minimum of 13,205 acre-feet of water rights to meet requirements for the drinking water system (see Table 3-15 in the next section of this report). Compared to the 4,952 acre-feet of existing water rights available, the City is deficient by 8,253 ac-ft. Similar to other components of the water system, water rights should have redundancy. Some water rights may not be able to be used as planned or do not yield the allowed flow. It is recommended that the City use the City wells as much as possible, up to the limits of the water rights, to show beneficial use of these rights. It is recommended that the City pursue opportunities to move the diversion point for water rights 57-1492, 57-1738, and 57-2699 to a location where these rights can be beneficially used in the drinking water system. If all City water rights can be used (5,024 acre-feet), the City will require **8,181 acre-feet** to be provided from JVWCD.

Water rights and JVWCD contract volumes should be evaluated yearly. It is recommended that the City set up a forecasting and tracking system to determine the recommended sources to use

each month to ensure that water rights are used to the maximum extent practical while remaining within limitations and minimizing costs.

EXISTING SOURCE WATER REQUIREMENTS

According to DDW standards (Section R309-510-7), water sources must be able to meet the expected water demand for two conditions. First, sources must be able to provide an adequate supply of water for the peak day demand (flow requirement). Second, sources must be able to produce a one-year supply of water, or the average yearly demand (volume requirement).

Peak day and average yearly demand are calculated using the level of service criteria shown in Table 1-1 of this report by computing the demand from water use data with a factor of safety for variance (Subsection R309-510-7(2)).

The level of service selected is based on the DDW standard, requiring minimum source and storage sizing to be based on system-specific analysis of three years of usage data. Because the DDW may recompute the requirements in the future, these values may vary, but should not increase significantly.

Existing Peak Day Demand

Peak day demand is the water demand on the day of the year with the highest water use. It is used to determine required source capacity under existing and future conditions. Based on the requirements shown in Table 1-1, the total peak day drinking water demand is 11,570 gpm (16.7 MGD), as shown in Table 3-8.

Table 3-8: Existing Peak Day Demand

ERCs	Peak Day Demand (gpm/ERC)	Total Peak Day Demand (gpm)
13,940	0.83	11,570

A breakdown of the existing peak day demand by pressure zone (using the new recommended pressure zones) is shown in Table 3-9. The table also shows the capacity available and remaining in each zone.

Table 3-9: Existing Source Requirements by Pressure Zone

Zone	ERCs	Demand (gpm)	Source Capacity in Zone (gpm)	
			Available	Remaining
Midvale	11,970	9,935	11,800	1,865
North Union	630	525	2,500	865
South Union	1,340	1,110		
Total	**13,940**	**11,570**	**14,300**	**2,730**

Approximately 2,730 gpm capacity is remaining in the system. This provides redundancy if one of the City's wells is out of service, but would not provide full redundancy if one of the larger JVWCD connections is out of service.

Existing Average Yearly Demand

Average yearly demand is the volume of water used during an entire year and is used to ensure the sources can supply enough volume to meet demand under existing and future conditions. Based on the requirements shown in Table 1-1, the total existing average yearly demand is 7,850 acre-feet, as shown in Table 3-10.

Table 3-10: Existing Average Yearly Demand

ERCs	Average Yearly Demand (ac-ft/ ERC)	Total Average Yearly Demand (ac-ft)
13,940	0.56	7,805

A breakdown of the existing average yearly demand by pressure zone (using the new recommended pressure zones) is shown in Table 3-11, along with the City water rights and JVWCD contract volume available in each zone. The JVWCD contract volume is not limited by zone. Amounts shown in the table are arbitrary and chosen so that each zone has some remaining supply volume allotted.

Table 3-11: Existing Average Yearly Demand Requirements by Pressure Zone

Zone	ERCs	Demand (acre-feet)	Water Supply Capacity in Zone (acre-feet)			
			Available			Remaining
			City Water Rights	JVWCD[1]	Total	
Midvale	11,970	6,700	4,952	1,875	6,297	127
North Union	630	355	0	1,210	1,210	105
South Union	1,340	750				
Total	**13,940**	**7,805**	**4,952**	**3,085**	**8,037**	**232**

[1] The proportion of the JVWCD contract amount allotted to each zone is arbitrary. The contract does not limit volumes by pressure zone.

Midvale City's water rights are not sufficient to meet the existing average yearly demand. The City requires water from JVWCD to meet these demands. When including the 3,085 acre-feet contract volume available from JVWCD, the current yearly supply available is sufficient to meet the required existing average yearly demand plus 232 acre-feet for future development. As discussed previously in this chapter, the volume used by Midvale City (produced from wells and received at JVWCD connections) is less than the requirements shown herein. Also, the City should maximize use of the City wells before purchasing additional JVWCD water.

FUTURE WATER SOURCE REQUIREMENTS

Future water source requirements were evaluated based on the same criteria as existing water source requirements. To summarize, this includes the following:

1) Sufficient water source capacity is needed to meet peak day flow.
2) Water sources must also be capable of supplying the average yearly demand.
3) Sufficient sources should be available to supply the system even if a well is out of service.
4) Peak day and average yearly demand are calculated using the level of service criteria shown in Table 1-1 of this report by computing the demand from actual water use data with a factor of safety for variance (Subsection R309-510-7(2)).
5) The level of service selected is based on the DDW standard, requiring minimum source and storage sizing to be based on system-specific analysis of three years of usage data. Future DDW standards may vary slightly from year to year.

As discussed in Chapter 2 of this report, this master plan covers the planning period through 2060, when the City is projected to reach 23,580 ERCs. A significant portion of this growth will occur west of I-15, primarily in the Jordan Bluffs area.

Future Peak Day Demand

Following the methodology described for existing conditions and estimating 23,580 ERCs in 2060, the peak day source requirement is projected to be 19,571 gpm (28.2 MGD). See Table 3-12.

Table 3-12: 2060 Peak Day Demand

ERCs	Peak Day Demand (gpm/ERC)	Total Peak Day Demand (gpm)
23,580	0.83	19,571

A breakdown of the 2060 peak day demand by pressure zone (using the new recommended pressure zones) is shown in Table 3-13. The table also shows the capacity available and remaining in each zone.

Table 3-13: 2060 Source Requirements by Pressure Zone

Zone	ERCs	Demand (gpm)	Source Capacity in Zone (gpm)	
			Available	Remaining
Midvale	20,260	16,815	11,800	-5,015
North Union	1,355	1,125	2,500	-255
South Union	1,965	1,630		
Total	**23,580**	**19,570**	**14,300**	**-5,270**

Under 2060 conditions, there is a projected source capacity deficiency of 5,270 gpm based on the capacity of the existing sources, including the current JVWCD connections. This deficiency does not consider the ability to provide redundancy if one of the City's wells or a JVWCD connection is out of service.

It is recommended that Midvale pursue obtaining an additional JVWCD connection at Winchester Street and 700 West. This connection should be capable of providing 4,000 gpm. Approximately 3,000 gpm will be used under typical peak day conditions, and the remaining 1,000 gpm will be used to provide some redundancy. The capacity of the other existing JVWCD connections will need to be increased to meet future peak day requirements. Table 3-14 shows the required source capacities for Midvale wells and JVWCD connections for 2060 peak day conditions. A new vault will be required for the 175 West 7500 South JVWCD connection.

Table 3-14: 2060 Drinking Water Sources

Source	Zone	Maximum Flow (gpm)
Well Sources		
Hancock Well	Midvale	1,950
Million Gallon Well	Midvale	2,150
Oak Street Well	Midvale	1,200
Park Street Well	Midvale	n/a
Phillips Well	North Union	n/a
Prowswood Well	Midvale	n/a
Total Well Sources		**5,300**
JVWCD Sources		
Winchester St. 700 West	Midvale	4,000
175 W 7500 S	Midvale	4,000
1200 E 9400 S	Midvale	1,000
7610 S 700 E	Midvale	6,500
1000 E 7800 S[1]	South Union	4,500
Total JVWCD Sources		**20,000**
Total		**25,300**
Demand		**19,570**
Remaining		**5,730**

Note: The flow required at the 1000 East 7800 South JVWCD connection may be provided through multiple connections.

The North Union and South Union area of Midvale will continue to be supplied by JVWCD. The new pressure zones recommended in this plan minimize the area of the City that will be

supplied by JVWCD. Storage is discussed in Chapter 4 of this plan. If JVWCD supplies the only storage for this area, it will be located hydraulically distant from the City and the JVWCD connection(s) for this area must be capable of providing peak instantaneous flow for the North Union and South Union pressure zones. The majority of this flow will likely be provided at the 1000 East 7800 South JVWCD connection, but it is possible that JVWCD may be able to provide a connection near Union Park Avenue/Fort Union Boulevard to reduce reliance on the 1000 East 7800 South connection and to reduce the amount of transmission required north of the connection. In Table 3-14, all flow is assumed to be provided at the 1000 East 7800 South connection.

As shown in Table 3-14, with the recommended sources in place there is 5,730 gpm source available for redundancy and future demands. It is recommended that the City consider redeveloping Oak Street well and possibly Park Street well to provide full beneficial use of the City's water rights and to provide additional redundancy in the future.

Future Average Yearly Demand

Following the methodology described for existing conditions and estimating 23,580 ERCs in 2060, the average yearly source requirement is projected to be 13,205 ac-ft. See Table 3-15.

Table 3-15: 2060 Average Yearly Demand

ERCs	Average Yearly Demand (ac-ft/ ERC)	Total Average Yearly Demand (ac-ft)
23,580	0.56	13,205

A breakdown of the existing average yearly demand by pressure zone (using the new recommended pressure zones) is shown in Table 3-16.

Table 3-16: 2060 Average Yearly Demand Requirements by Pressure Zone

Zone	ERCs	Demand (acre-feet)	Water Supply Capacity in Zone (acre-feet)			
			Available			Remaining
			City Water Rights	JVWCD[1]	Total	
Midvale	11,970	11,345	4,952	1,875	6,827	-4,518
North Union	630	760	0	1,210	1,215	-650
South Union	1,340	1,100				
Total	**23,580**	**13,205**	**4,952**	**3,085**	**8,037**	**-5,168**

[1]The proportion of the JVWCD contract amount allotted to each zone is arbitrary. The contract does not limit volumes by pressure zone.

Midvale City's water rights and the current JVWCD contract amount are not sufficient to meet future average yearly demand. The City will require approximately 5,170 acre-feet in annual supply from JVWCD to meet these demands.

FUTURE WATER SOURCES AND RECOMMENDATIONS

The City should maximize use of the existing City wells to maximize use of the City's water rights and reduce the volume required to be purchased from JVWCD in the future. If the pressure zones are reconfigured as recommended in this master plan, this will increase the proportion of the system demand that can be provided by the City wells.

As source demand increases over time, the existing City wells and JVWCD connections will not provide sufficient redundancy if the largest well or JVWCD connection is ever out of service. Additionally, older wells can reduce production or stop producing over time due to a variety of reasons including biofouling and chemical encrusting. It is recommended that development of additional wells near the existing City wells should continue to be pursued to provide redundancy and to replace wells as they age.

Future planned drinking water sources include a connection from JVWCD at 700 West Winchester Street and increased capacity at the existing connections at 175 West 7500 South, 7610 South 700 East, and 1000 East 7800 South. Vaults at 700 West Winchester and 175 West 7500 South are currently in design and the desired future connections will be accommodated to the extent possible in the vault designs. The new 700 West Winchester Street connection will require constructing a 20-inch transmission line to 6980 South. The cost for upgrading the 175 West vault is approximately **$200,000**. The cost for constructing a vault for Midvale outside the JVWCD 700 West vault is approximately **$200,000** and the cost for the transmission line to 6980 South is approximately **$657,000**. These costs are detailed in Chapter 6, Capital Facility Plan.

It is recommended that the City continue to maintain emergency connections with Sandy City to provide redundancy (discussed in Chapter 5, Water Distribution.)

THIS PAGE INTENTIONALLY LEFT BLANK

CHAPTER 4 WATER STORAGE

EXISTING WATER STORAGE

The City's existing drinking water system includes two concrete storage facilities with a total capacity of **6.6 MG**. Tank locations are shown on Figure 1-1. Table 4-1 presents a listing of the names and select attributes of the City water storage tanks. Both tanks supply water to the Midvale pressure zone. Storage for the North Union and South Union pressure zones is currently provided by JVWCD, with a contracted volume of **4.8 MG** provided by JVWCD.

Table 4-1: Existing Storage Tanks

Tank Name	Diam. (ft)	Calculated Volume (MG)	Base/ Outlet Elevation	Emergency Storage Volume (gallons)	Fire Suppression Volume (gallons)	Minimum Level (Elevation) of Equalization Volume	Overflow Level (Elevation)
4 MG (East)	188	4.03	4572.1	611,000	770,000	6.65 (4578.75)	19.4 (4591.5)
2.5 MG (West)	150	2.56	4572.1	389,000	490,000	6.65 (4578.75)	19.4 (4591.5)
Total		**6.6**		**1,000,000**	**1,260,000**		

EXISTING WATER STORAGE REQUIREMENTS

According to DDW standards outlined in Section R309-510-8, storage tanks must be able to provide: 1) equalization storage volume to make up the difference between source and demand; 2) fire suppression storage to supply water for firefighting; and 3) emergency storage, if deemed necessary. Each of the requirements is addressed below.

Equalization Storage

As shown in Table 1-1, Midvale has planned for a level of service of 500 gallons per ERC of equalization storage. With 13,940 existing ERCs, the City needs 7.0 MG of equalization storage in its existing drinking water system. Table 4-2 lists the equalization storage requirement by pressure zone.

Table 4-2: Existing Drinking Water Equalization Requirements

Zone	ERCs	Equalization (MG)
Midvale	11,970	6.0
North Union	630	0.3
South Union	1,340	0.7
Total	**13,940**	**7.0**

Fire Suppression Storage

Fire suppression storage is required for water systems that provide water for firefighting (Subsection R309-510-8(3)). HAL has consulted with the local fire authority to determine the requirements for fire suppression storage. The contact information for the Midvale fire code official is as follows:

Fire Code Official: Christen Yee, Area Inspector, Unified Fire Authority
Phone: 801-743-7228, 801-750-9476
Email: cyee@unifiedfire.org

The minimum fire flow requirement is 1,000 gpm for 2 hours. Larger structures require larger fire flows, with all fire flow requirements based on the International Fire Code (IFC) and fire code official recommendations. The largest fire flow requirements for each zone were determined as shown in Table 4-3.

Table 4-3: Existing Fire Suppression Requirements

Zone	Building and Location	Fire Flow Requirement		Fire Suppression Volume (MG)
		Flow (gpm)	Duration (hours)	
Midvale	East Midvale Elem. School 6990 South 300 East	5,250	4	1.3
North Union & South Union[1]	Commercial District 900 East-1300 East	4,000	4	1.0
Total				**2.3**

[1]Storage for the North Union and South Union zones will be provided at a single location.

The water system should be managed so that the storage volume dedicated to fire suppression is available to meet fire flow requirements whenever or wherever needed. This can be accomplished by designating minimum storage tank water levels that provide a reserve storage equal to the fire suppression storage required. Even though it is important to utilize equalization storage, typical daily water fluctuations in the tanks should not be allowed below the minimum established levels, except during fire or emergency situations. The minimum levels for fire and emergency storage are shown in Table 4-1.

Emergency Storage

DDW standards suggest that emergency storage be considered in the sizing of storage facilities. Emergency storage is intended to provide a safety factor that can be used in the case of unexpectedly high demands, pipeline failures, equipment failures, electrical power outages, water supply contamination, or natural disasters. The City selected 1.5 MG of emergency storage level of service. 1.0 MG is assumed for the Midvale pressure zone and 0.5 MG is assumed for the North Union and South Union pressure zones.

Total Storage

A summary of existing storage requirements is included in Table 4-4.

Table 4-4: Existing Storage Requirements

Zone	ERCs	Recommended Storage Requirements (MG)				Existing Storage	Remaining
		Equalization	Fire Suppression	Emergency	Total		
Midvale	11,970	6.0	1.3	1.0	8.3	8.6[1]	0.3
North & South Union	1,970	1.0	1.0	0.5	2.5	2.8[1]	0.3
Total	**13,940**	**7.0**	**2.3**	**1.5**	**10.8**	**11.4[1]**	**0.6**

[1] 4.8 MG of storage is currently provided by JVWCD and can be used in either pressure zone.

JVWCD is currently providing 4.8 MG storage for the existing Union Area pressure zone, which is significantly larger than the recommended North Union and South Union pressure zones. Table 4-5 shows the calculated storage volume required based on the number of ERCs in the existing Union area pressure zone and the requirements detailed in this report.

Table 4-5: Storage Requirements for Union Zone Currently Provided by JVWCD

Zone	ERCs	Recommended Storage Requirements (MG)			
		Equalization	Fire Suppression	Emergency	Total
Union Area	5,491	2.7	1.0	0.5	4.2

Based on the requirements shown, and the volume of storage being provided by JVWCD, the existing storage meets existing requirements. In the future, Midvale will be required to provide their own storage for the entire City or negotiate with JVWCD to continue to provide storage for a portion of the City. Table 4-5 can be used to understand Midvale's current storage requirements if they were required to provide their own storage now, without revising the City pressure zones as recommended in this report.

Midvale City's preferred solution is for the City to construct storage for the recommended Midvale pressure zone and pay JVWCD to construct the volume needed for the recommended North Union and South Union pressure zones. The storage for the North Union and South Union zones is anticipated to be constructed at a JVWCD location (wherever JVWCD determines

storage is needed), and Midvale's 1000 East 7800 South connection will provide peak instantaneous flows for the North Union and South Union pressure zones. By revising the pressure zones, Midvale is minimizing the volume of storage required to be provided by JVWCD.

FUTURE WATER STORAGE REQUIREMENTS

Storage requirements through the 2060 planning period were assessed using the same methodology as outlined for existing conditions.

Equalization Storage

Following the methodology described for existing conditions and calculating 23,580 ERCs in 2060, the projected equalization storage requirement per the standards shown in Table 1-1 is 11.8 MG. Table 4-6 lists the equalization storage requirement by pressure zone.

Table 4-6: 2060 Drinking Water Equalization Requirements

Zone	ERCs	Equalization (MG)
Midvale	20,260	10.1
North Union	1,355	0.7
South Union	1,965	1.0
Total	**23,580**	**11.8**

Fire Suppression Storage

Fire suppression storage is assumed to remain similar to current conditions, as shown in Table 4-3. There are no plans to reconstruct East Midvale Elementary, but if it is replaced by new construction, the fire flow volume in the Midvale zone could be reduced.

Some buildings may require approved sprinkling systems to reduce their fire flow requirement to the flow rates available. All new buildings should be constructed to meet these requirements.

Emergency Storage

The same emergency volume of 1.0 MG for the Midvale pressure zone and 0.5 MG for the North Union and South Union pressure zones was maintained for future conditions.

Total Storage

A summary of storage requirements for 2060 is included in Table 4-7.

Table 4-7: 2060 Storage Requirements

Zone	ERCs	Recommended Storage Requirements (MG)				Existing Storage	Remaining
		Equalization	Fire Suppression	Emergency	Total		
Midvale	20,260	10.1	1.3	1.0	12.4	6.6	-5.8
North & South Union	3,320	1.7	1.0	0.5	3.2	0	-3.2
Total	**23,580**	**11.8**	**2.3**	**1.5**	**15.6**	**6.6**	**-9.0**

Approximately 9 MG additional storage (beyond existing) is required to meet 2060 requirements.

Table 4-8 shows the volume of storage that will be needed based on the number of ERCs in the City. Estimated years are included, but these will vary based on growth rate.

Table 4-8: Storage Requirements by ERCs

ERCs	Estimated Year[1]	Required Storage[2] (MG)	Existing Storage (MG)		Additional Storage Needed (MG)	Location of New Storage	
			Midvale	JVWCD[3]		JVWCD System[3]	Midvale
13,940	2020	10.8	6.6	4.8	0.0	0.0	0.0
15,400	2024	11.4	6.6	4.8	0.0	0.0	0.0
17,100	2028	12.3	6.6	4.8	0.9	3.2	0.0
17,600	2029	12.5	6.6	0	5.9	3.2	2.8
18,900	2035	13.2	6.6	0	6.6	3.2	3.5
19,900	2040	13.7	6.6	0	7.1	3.2	4.0
20,800	2045	14.1	6.6	0	7.5	3.2	4.4
21,700	2050	14.6	6.6	0	8.0	3.2	4.9
22,600	2055	15.0	6.6	0	8.4	3.2	5.3
23,600	2060	15.6	6.6	0	9.0	3.2	5.8

[1]Years are estimated based on projected growth rates. ERCs control the volume of storage needed.
[2]Required storage includes 2.3 MG for fire suppression, 1.5 MG for emergency, and 500 gallons per ERC for equalization.
[3]The current storage contract with JVWCD ends in 2029, so JVWCD storage is shown as dropping to 0 in that year. Midvale plans to pursue building 3.2 MG in the JVWCD system.

As shown in the table, additional storage will be required by the time the City adds approximately 1,460 ERCs. Based on projected growth rates, this may happen as soon as 2024. If 3.2 MG is constructed in the JVWCD system for the North Union and South Union pressure zones, an additional 2.8 MG would be needed for the Midvale zone by the time the City reaches 17,600 ERCs (~2029). Volumes needed beyond this are shown in Table 4-8. It is recommended that a 4.0 MG storage tank be constructed by 2029 to meet requirements for the

next 20 years. A modular tank design could be used to allow the tank to be expanded in the future. The following section explores storage alternatives.

FUTURE WATER STORAGE ALTERNATIVES

Midvale has the ultimate responsibility to provide storage for the entire City. Midvale will attempt to reach an agreement with JVWCD to supply storage for the North Union and South Union pressure zones. Midvale City would pay for the storage to be constructed and pay ongoing operations and maintenances fees to JVWCD. The storage tank would be located on a JVWCD site and the tank would operate as part of JVWCD's wholesale distribution system. JVWCD would operate the tank and supply peak instantaneous flows to areas of the City supplied by the tank. If Midvale is unable to reach an agreement with JVWCD, the City would need to supply the full storage requirement. The following paragraphs discuss storage alternatives for each pressure zone in the City.

Several location alternatives for the Midvale zone were evaluated. Storage for this zone should be located at the same elevation as the existing storage, with the base at elevation 4572. The blue contour (4590) on Figure 4-1 Storage Alternatives (located at the end of this chapter) shows the approximate desired elevation for a buried storage tank.

Near Existing Tank Site – Quarry Bend Drive/Harvard Park Drive

Storage could be added near the location of the existing tanks. Midvale may be able to purchase a piece of the Pebblebrook Golf Course. A piece of property behind a church just north of the golf course would be at the correct elevation for a partially-exposed tank. The property includes a pavilion and softball backstops and is likely unavailable for purchase. The City could also purchase home lots at the correct elevation. A transmission line could be constructed on Harvard Park Drive and 1000 East and could utilize the existing Midvale 24-inch transmission line on 7800 South.

Encompass Health Rehabilitation Hospital of Utah – 8074 South 1300 East

Approximately 2.2 acres west of the hospital is used for landscaping and could be used to construct a buried tank. The available shape is long and somewhat narrow, but could accommodate a rectangular tank. Transmission would likely be provided in 1300 East and would utilize the existing 24-inch City transmission line in 7800 South.

Commercial Parking Lots – 7800-8000 South 1300 East

The commercial parking lots in the Macey's/Vasa Fitness complex are at the correct elevation for a buried tank. It would be extremely difficult to use these areas for construction during the time period required for tank construction. Transmission would likely be provided in 1300 East and would utilize the existing 24-inch City transmission line in 7800 South.

Storage for North Union and South Union Zones

Storage for the North Union and South Union zones should be located with the base at approximately elevation 4705. The red contour (4725) shows the desired elevation for a buried storage tank. Specific locations were not evaluated. If JVWCD can provide storage for these zones, it would be located at 2800 East 9400 South or at 2300 East 9800 South. These locations are shown on Figure 4-1. The 2800 East 9400 South location is occupied by aging steel tanks that will need to be replaced. Larger tanks could be constructed at this location. There is space available at the 2300 East 9800 South location and this location is also in need of storage for the JVWCD system to function optimally. Both JVWCD sites are several miles from Midvale City boundaries and transmission from the tank sites to Midvale would be through the existing or future JVWCD system.

A tank constructed by Midvale City for the North Union and South Union pressure zones could also serve the Midvale zone through PRVs, but would not be the most energy efficient solution. A tank to serve the entirety of these zones would need to be located at an approximate elevation of 4725. The red contour on Figure 4-1 shows the approximate desired elevation for a buried storage tank to serve these zones. Specific locations have not been evaluated. As shown on Figure 4-1, the 4725 contour is located some distance away from the City and a transmission pipeline between the service area and the tank would likely be 2-2.5 miles long. The line would be required to be large (approximately 36") to avoid significant pressure losses.

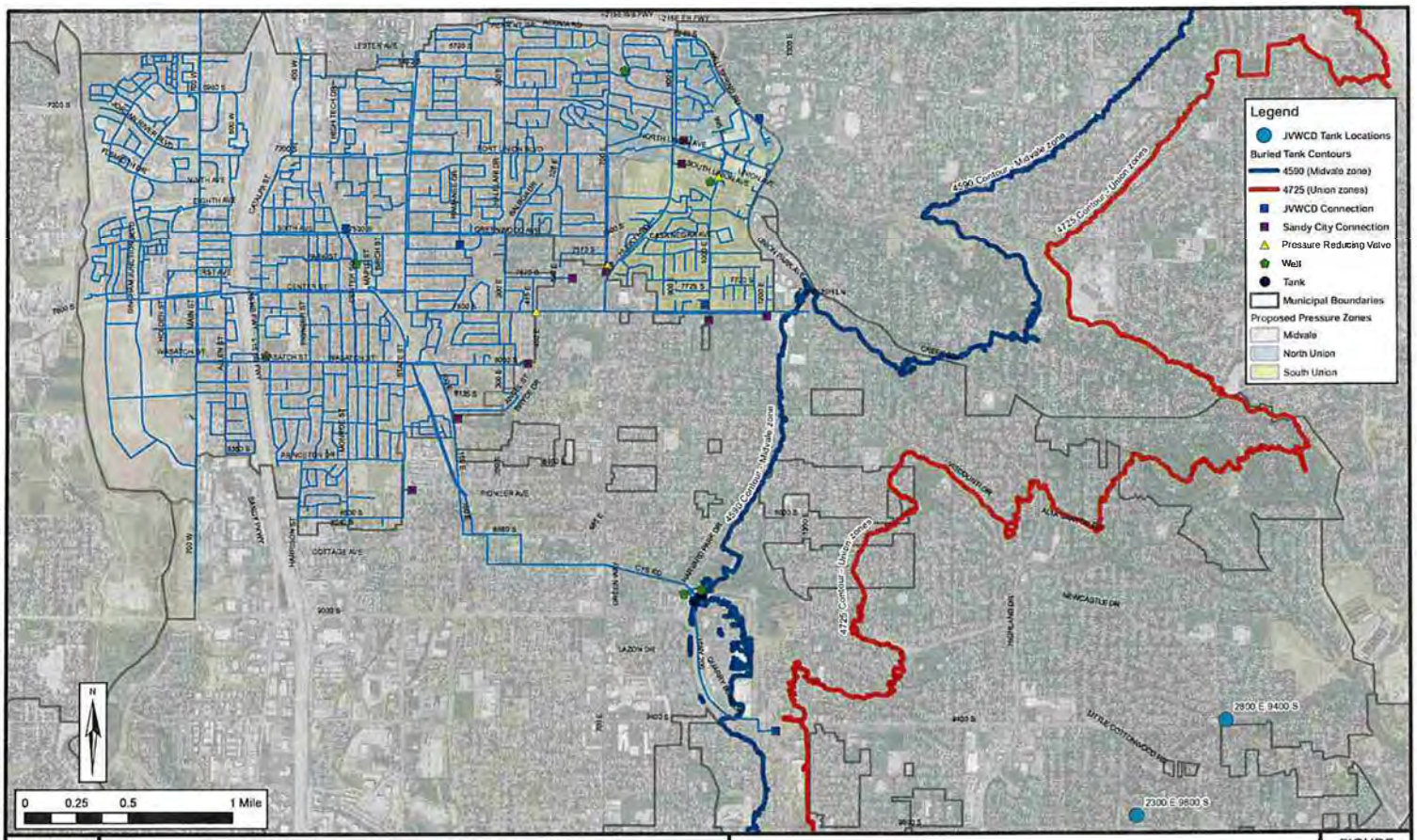
EXISTING AND FUTURE WATER STORAGE RECOMMENDATIONS

The City currently requires 10.8 MG drinking water storage. The City will need a total of 15.6 MG of drinking water storage in 2060. The City currently owns a total of 6.6 MG storage. An additional 9 MG of storage is needed to meet 2060 requirements. Potential locations for future drinking water storage tanks are shown on Figure 4-1.

It is recommended that the City pursue obtaining property to construct a tank capable of serving the Midvale pressure zone. The City should begin feasibility studies and design of a 4 MG tank. This will supply storage needs until the City reaches 19,900 ERCs (~2040). A modular tank design could be used to allow the tank to be expanded in the future. A possible location for this storage and associated transmission is shown on Figure 5-2, Recommended Capital Facility Projects. It is also recommended that the City continue discussions with JVWCD concerning participation in an agreement for JVWCD to supply storage to the North Union and South Union pressure zones.

The cost for adding new storage facilities varies based on the costs of land, labor, and construction materials. However, $1.15 per gallon of storage has been found to be a reasonable, conservative estimate. In addition, it is recommended that 20% of the estimated cost should be added for contingency and 15% for engineering. Therefore, the total cost that should be planned for providing adequate storage by 2060 is approximately **$14,300,000**. The cost of transmission lines is in addition to tank costs and will likely total at least **$2,800,000**. Costs for storage and associated transmission are included in Chapter 6, Capital Facility Plan.

THIS PAGE INTENTIONALLY LEFT BLANK



HANSEN ALLEN & LUCE INC ENGINEERS	MIDVALE CITY DRINKING WATER SYSTEM	STORAGE ALTERNATIVES	FIGURE 4-1

Date: 8/11/2020
Document Path: H:\Projects\41 - Midvale City\43.100 - 2019 Master Plan Update\GIS\Midvale Figure 4-1_Storage Alternatives.mxd

CHAPTER 5 WATER DISTRIBUTION

HYDRAULIC MODEL

Development

A computer model of the City's drinking water distribution system was developed to analyze the performance of the existing and future distribution system and to prepare solutions for existing facilities not meeting distribution system requirements. The model was developed with the software InfoWater 12.4 (Innovyze, 2018). InfoWater simulates the hydraulic behavior of pipe networks. Sources, pipes, tanks, valves, controls, and other data used to develop the model were obtained from GIS data of the city's drinking water system and other updated information supplied by the City. The model has been transferred to EPANET to allow the City to use it as desired.

HAL developed models for two phases of drinking water system development. The first phase was a model representing the existing system (existing model). This model was used to calibrate the model and identify deficiencies in the existing system. Calibration was performed by comparing model results to system performance gathered by City personnel. Calibration data is included in Appendix C.

The second phase was a model representing future conditions and improvements necessary to accommodate growth. The future model represents the level of growth projected to be reached by 2060 (2060 model), and includes 23,580 ERCs.

Model Components

The two basic elements of the model are pipes and nodes. A pipe is described by its inside diameter, length, minor friction loss factors, and a roughness value associated with friction head losses. A pipe can contain elbows, bends, valves, pumps, and other operational elements. Nodes are the endpoints of a pipe and 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 added (source) or removed (demand). A boundary node is a point where the hydraulic grade is known (a reservoir, tank, or PRV). Other components include tanks, reservoirs, pumps, valves, and controls.

The model is not an exact replica of the water system, although efforts were made to make the model as complete and accurate as possible. Pipeline locations used in the model are approximate and not every pipeline may be included in the model. Moreover, it is not necessary to include all distribution system pipes in the model to accurately simulate its performance. The model includes all known distribution system pipes of all sizes, sources, storage facilities, pump stations, pressure reducing valves, control valves, controls, and settings.

Pipe Network

The pipe network layout originated from GIS data provided by the City. Projects completed in recent years were added/updated in the model. Elevation information was obtained from the GIS data provided by the City. Smaller 8-inch and 10-inch pipes are generally PVC. The Darcy-Weisbach method was used, and roughness coefficients for pipes in this model ranged from 0.4-1.01, which is typical for these pipe materials in modeling software (Rossman 2000, 31).

The existing water system contains approximately 120 miles of pipe with diameters of 2 inches to 24 inches. Figure 5-1 presents a summary of pipe length by diameter.

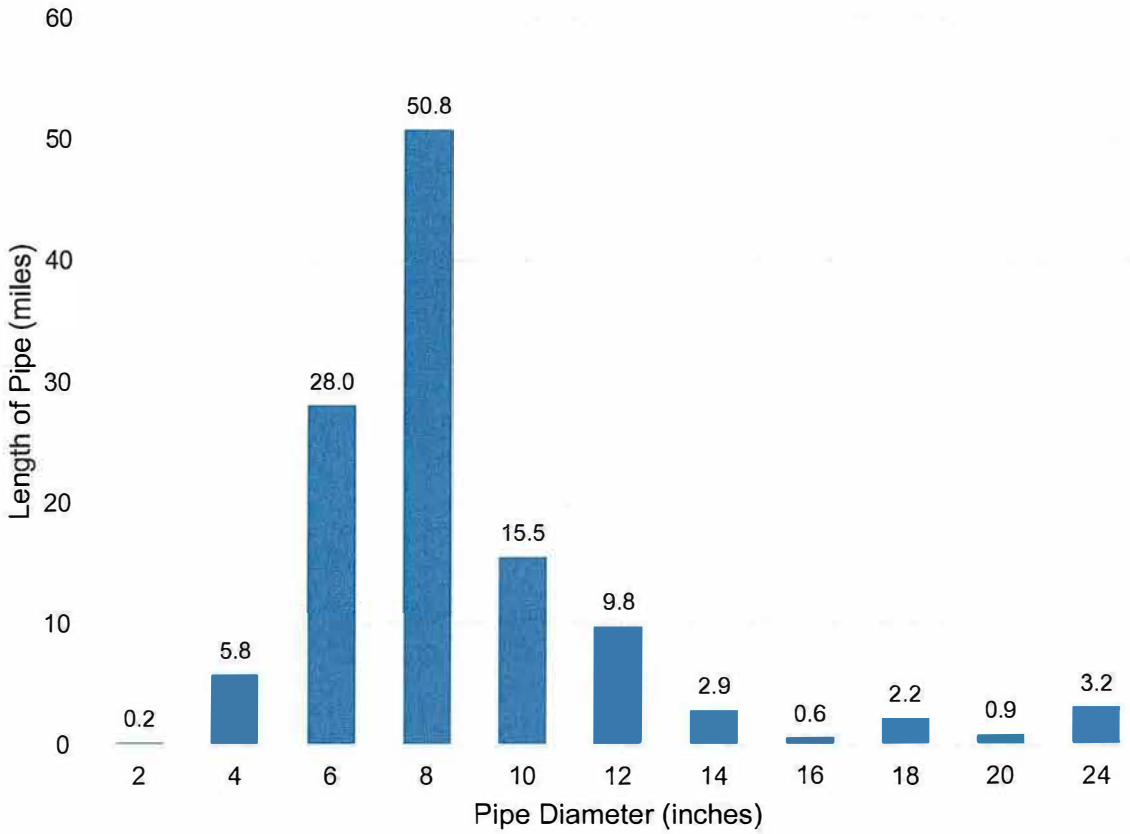


Figure 5-1: Summary of Pipe Length by Diameter

Water Demands

Water demands were allocated in the model based on billed usage and billing locations. Peak month demand was determined for each billing location and linked to the geocoded physical locations for each customer. The geocoded demands were then assigned to the closest model node. With the proper spatial distribution, demands were scaled to reach the peak day demand determined in Chapter 3. For the 2060 model, future demands were estimated as described previously in this report. Future demands were assigned to new nodes representing the expected location of new development in each pressure zone.

The pattern of water demand over a 24-hour period is called the diurnal curve, or daily demand curve. The diurnal curve for this master plan was taken from past SCADA data from the City. The diurnal curve for this study has a peaking factor of 1.7. The diurnal curve was input into the model to simulate changes in the water system throughout the day.

In summary, the spatial distribution of demands followed geocoded water use data, the flow and volume of demands followed the level of service standards described in Chapter 1, and the temporal pattern of demand followed a diurnal curve developed from SCADA data.

Water Sources and Storage Tanks

The sources of water in the model are the wells and JVWCD connections. A well is represented by a reservoir and pump. A JVWCD connection is represented by a reservoir and a flow control valve. Tank location, height, diameter, and volume are represented in the model. The extended-period model predicts water levels in the tanks as they fill from sources and as they empty to meet demand in the system.

RECOMMENDED PRESSURE ZONES

HAL recommends that Midvale expand the existing West Midvale pressure zone to encompass the majority of the city. The remainder of the City east of 700 East/900 East will be divided into two additional small pressure zones. Figure 2-1 shows the recommended new pressure zones. Several projects are required to combine these zones.

- Increase connectivity within the new Midvale pressure zone by constructing or upsizing connecting pipes at the following locations:
    - State Street/7200 South
    - State Street/Inglenook Drive
    - 7800 South, Sandra Way to 200 East
    - 8000 South, 100 East to 150 East
    - Greenwood Avenue, 270 East to Regent Park Lane
- Add PRV/check valve vaults to provide interconnections and redundancy between zones:
    - 900 East Fairmeadows Drive
    - 700 East 7200 South
- Close pipes that cross the proposed pressure zone boundaries to isolate the North Union and South Union zone from the Midvale zone.
- Increase flow at JVWCD 700 East connection and adjust pressure settings.

Midvale City is still paying for storage within the JVWCD system. Flow at the JVWCD 700 East connection will be allowed to peak until Midvale City constructs new storage. Pressure at this connection will need to be set to maximize pressure for residents at the top of the new pressure zone (just west of 900 East) and prevent the existing City tanks from overtopping. Until additional storage is constructed, flow from the 700 East JVWCD connection should not be encouraged to flow westerly, in order to allow the existing City tanks to function properly. This means that several of the zone connections may not be required until development increases in the future. Finalizing the exact settings is beyond the scope of this master plan and additional analysis will be required before creating the new pressure zones. Capital projects required to modify the zone boundaries are shown in Table 5-1.

All costs shown in this master plan are based on the 2019 RS Means Heavy Construction Cost Data, as shown in the unit costs table in Appendix D. All costs shown in all following tables include 20% for contingency and 15% for design. Costs are discussed in more detail in Chapter 6, Capital Facility Plan.

Table 5-1: Projects to Modify Zone Boundaries

	Location	Pipe Diameter (inches)	Length of Pipe (feet)	Cost
1	State Street/7200 South	12	100	$50,000
2	State Street/Inglenook Drive	12	100	$50,000
3	7800 South, Sandra Way to 200 East	12	300	$105,000
4	8000 South, 100 East to 150 East	12	250	$88,000
5	Greenwood Ave, 270 East to Regent Park Lane	12	330	$66,000
6	900 East Fairmeadows Drive PRV/Check Valve			$50,000
7	700 East 7200 South PRV/Check Valve			$50,000
Total Cost for Projects to Modify Zone Boundaries				**$459,000**

SYSTEM ANALYSIS METHODOLOGY

HAL used extended-period and steady-state modeling to analyze the performance of the water system with current and projected future demands. An extended-period model represents system behavior over a period of time: tanks filling and draining, pumps turning on or off, pressures fluctuating, and flows shifting in response to demands. A steady-state model represents a snapshot of system performance. The peak day extended period model was used to set system conditions for the steady-state model, calibrate zone to zone water transfers, analyze system controls and the performance of the system over time, and to analyze system recommendations for performance over time. The steady-state model was used for analyzing the peak day plus fire flow conditions.

Two operating conditions were analyzed with the extended period model: peak day conditions and peak instantaneous conditions. Peak day plus fire flow conditions were analyzed using a steady-state model. Each of these conditions is a worst-case situation so the performance of the distribution system may be analyzed for compliance with DDW standards and City preferences.

Existing Peak Day Conditions

The DDW requires that a minimum pressure of 40 psi must be maintained during peak day demand (Subsection R309-105-9(2)). Midvale City desires that 50 psi should be maintained. Peak day demand was evaluated at the level of service shown in Table 1-1. This amounts to an existing peak day demand of 11,570 gpm. The hydraulic model indicates that the system is capable of providing at least 40 psi at nearly every point of connection in the system at this level of demand. The paragraphs below describe all locations not meeting Midvale's current designated level of service. All points of connection meet DDW requirements, and there are no existing deficiencies for this demand condition.

Pressure Swings

The westerly portion of the existing Union pressure zone located between State Street and 300 East, from I-215 to 7200 South experiences pressure swings of 20 psi during the peak day. This

is not considered a serious deficiency and no mitigation projects are recommended. Pressure swings in all other areas of the City are less than 20 psi on the peak day.

High Velocity
Several pipes experience high velocities during peak day conditions. These high velocities do not appear to be causing unacceptable pressure drops or pressure swings. As demands increase, these pipes will need to be upsized or parallel pipes added.

700 East, JVWCD Connection to Downing Lane – velocities in the 700 East pipes are as high as 7.6 feet per second at the peak instantaneous condition. Buildout requirements are discussed below.

Fort Union Boulevard, Pearl Circle to 525 East – this short length of pipe is a bottleneck and experiences velocities up to 5.6 fps. Buildout requirements are discussed below.

1000 East, JVWCD Connection to Casa Roja Street – velocities in the 1000 East pipe reach 6.1 fps. Buildout requirements are discussed below.

Greenwood Avenue, 270 East to Regent Park Lane – This short length of pipe experiences velocities as high as 8.7 fps. This pipe is located at the boundary of the existing pressure zones and would serve as a good location to connect the zones in the future.

Existing High Pressure Conditions

The area west of I-15 experiences high pressures, which are greatest during the lowest demand times. This area experiences pressures up to 135 psi during typical operating conditions. The City should require individual PRVs for each new customer connection, particularly in these areas. No pressure changes are recommended, because this would reduce pressures in the upper portions of those zones to levels below the minimum desired. No capital projects are recommended to mitigate high pressures.

Existing Peak Instantaneous Conditions

A minimum pressure of 30 psi must be maintained during peak instantaneous demand (Subsection R309-105-9(2)). The City desires 50 psi to be available. Peak instantaneous demand was defined based on SCADA data for the peak day demand in Midvale. The highest peaking factor present on the peak day was 1.7, resulting in a peak instantaneous demand of 19,795 gpm. The hydraulic model indicates that the system is capable of providing at least 30 psi at every point of connection in the system at this level of demand, and nearly all locations receive 50 psi. There are no existing deficiencies in the system for this demand condition.

Existing Peak Day plus Fire Flow Conditions

A minimum pressure of 20 psi must be maintained while delivering fire flow to a particular location within the system and supplying the peak day demand to the entire system (Subsection R309-105-9(2)). As specified by the Midvale Fire code official, a minimum fire flow of 1,000 gpm is required in all areas of the City. In 2010, an extensive review was made of all large buildings in the City to determine fire requirements. This review was updated as part of this master plan. Recent reconstruction of several schools has reduced fire flow requirements at those schools,

because the new construction uses more fire-resistant materials and includes approved sprinkling systems. Most new construction of large/commercial building includes approved sprinkling systems, allowing the fire flow requirements for these buildings to be minimized. Based on the results of the review, fire flows typically around 1,500-2,500 gpm are required for commercial and industrial areas. The largest required fire flows in the City reach 4,000-5,250 gpm. Required fire flows are shown throughout the City on the Available Fire Flow map (Figure E-1) in Appendix E.

Figure E-1 also shows fire flow available at nodes throughout the entire system. Future construction should be required to use building materials and sprinkling systems to reduce the required fire flows to the amount the system can provide. Identifying every pipe incapable of supplying the required fire flow is beyond the scope of this study. The computer analysis should not replace physical fire flow tests at fire hydrants as the primary method of determining fire flow capacity.

Several locations throughout the City experience fire flows below the desired level of service. The majority of these are cul-de-sacs or long, dead-end lines with 4-inch or 6-inch pipe sizes. Several of the locations are discussed below. Recommended projects to increase fire flow are shown in Table 5-2 and numbered on Figure 5-2, Recommended Capital Facility Projects, at the end of this chapter.

East Midvale Elementary
The largest fire flow required in the City is at East Midvale Elementary School (6990 South 300 East). There are no plans to reconstruct this school. The required fire flow is 5,250 gpm and only4,500 gpm is available. The fire department may be unable to use significantly more than 4,000 gpm during fire suppression efforts. Connecting Splendor View Circle (6815 South) to 6850 South would improve connectivity and raise the available fire flow at the school to 4,900 gpm. This project was recommended in the 2010 Master Plan and is shown in the table below. Reconfiguring the pressure zones as recommended will further improve connectivity and raise the available fire flow to at least 5,250 gpm.

300 East 8000 South
A building at 300 East 8000 South requires 4,250 gpm fire flow. 2,450 gpm is available from the Midvale City system. Additional flow is available from the Sandy City system at a fire hydrant immediately east of the building. No project to increase fire flow is recommended. When the pressure zones are reconfigured, a connection can be added on 8000 South from approximately 100 East to 150 East. This would increase flows significantly at this location. The 8000 South zone connection is included in Table 5-1.

Other Locations
Projects are not recommended to increase fire flows at the ends of very short cul-de-sacs if sufficient fire flow is available at the adjacent street. Emergency interconnections with Sandy City should be maintained where possible and would benefit both cities.

Table 5-2: Projects to Resolve Low Fire Flow

	Location	Description	Solution	Length (feet)	Cost
8	Splendor View Circle (6815 South) to 6850 South	Lack of connectivity between two dead-end lines	Connect lines	210	$42,000
9	Depot Street, Holden Street to Main Street	4-inch line	Construct 8-inch	410	$66,000
10	Center Street, Main Street to LePage Street	Hydrants connected to 4-inch line	Connect two hydrants to 12" line in Center St.	-	$20,000
11	Cooper Street, south of Center Street	6-inch line	Construct 8-inch	450	$72,000
12	Alta View Drive, east of Chapel Street	4-inch line	Construct 8-inch	390	$63,000
13	Olympus Circle, north of Garden View Dr.	4-inch line	Construct 8-inch	630	$101,000
14	Cox Street, State Street to Rusty Drive	4-inch line	Construct 8-inch	820	$160,000
Cost for Fire Flow Projects			**$496,000**		

REPLACEMENT PROJECTS

Transite Pipes

City records indicate there are approximately 5,000 linear feet of asbestos-cement (transite) piping in the City system. This pipe material can contaminate water if it starts to break down and should be replaced. The locations of these pipes are shown in Figure 5-2 and the cost of replacing these lines is shown in Table 5-3.

Reroute Tank Transmission Line

The existing 24-inch transmission line from the tanks to the City travels under an industrial area, including the Altaview Concrete plant and RelaDyne facility tank farm. The pipe cannot be easily accessed for operations and maintenance and should be rerouted. A proposed alignment north of Resaca Street and on State Street is shown on Figure 5-2. This project is included in Table 5-3.

Table 5-3: Replacement Projects

	Location	Description	Pipe Diameter (inches)	Length (feet)	Cost
15	Southcrest Circle, west of 900 East	Transite	8	100	$16,000
16	900 East, Casa Negra to Lyndy Drive	Transite	8	100	$16,000
17	Casa Blanca Drive, 7575 South, and Casa Verde Street	Transite	8	1,000	$160,000
18	7575 South (not in street), Casa Negra Circle to 1000 East	Transite	8	1,350	$216,000
19	Mecham Lane (7575 South), east of 1000 East	Transite	8	350	$56,000
20	Wood Street, Marquette Dr. (north) to Princeton Drive	Transite	8	1,300	$208,000
21	North of Resaca Street and State Street, Resaca to 8000 South	Transmission realignment	30	2,000	$700,000
Total Cost for Replacement Projects					**$1,500,000**

Aging Pipes

The City should continue replacing aging pipes on a regular basis. Table 5-4 shows the cost of all existing pipes and the cost to replace them over a 50-year service life. Replacement of 4-inch pipes should be of high priority when road replacement projects are completed.

Table 5-4: Replacement Program for Existing Pipes

Pipe Diameter (inches)	Length of Pipe (feet)	Cost
2	1,100	$176,000
4	30,800	$4,928,000
6	147,900	$23,664,000
8	268,300	$42,928,000
10	82,000	$14,760,000
12	51,800	$10,360,000
14	15,400	$3,388,000
16	3,400	$816,000
18	11,900	$2,975,000
20	4,700	$1,269,000
24	16,600	$5,146,000
Total Cost for Replacement of All Existing Pipes		**$110,410,000**
Annual Cost for Replacement of All Pipes Over 50 Years		**$2,208,000**

FUTURE (2060) WATER DISTRIBUTION SYSTEM

2060 Peak Day and Peak Instantaneous Conditions

A minimum pressure of 40 psi must be maintained at all connections during peak day demand and 30 psi must be maintained during peak instantaneous demand (Subsection R309-105-9(2)). The City prefers that 50 psi be available under all conditions. All but a few locations maintain a minimum of 50 psi under peak instantaneous demand. Future peak day demand is discussed in Chapter 3 of this report. With 23,580 ERCs projected, the system's 2060 peak day demand is estimated at 19,571 gpm. A significant portion of the increased future demand will be required in the 260-acre Jordan Bluffs area. City planners expect to see additional development at other locations throughout the City, including within Bingham Junction, near the Fort Union Shopping Area, along State Street and 7200 South, and in transit-oriented development zones. Infill development is possible on small pockets of land throughout the City. The remaining projected growth will likely take place through redevelopment in future decades.

Peak instantaneous demands were calculated in a similar manner to existing conditions. The peak day to peak instantaneous peaking factor is 1.7 and the total peak instantaneous demand is 33,484 gpm.

The 2060 peak day and peak instantaneous conditions were evaluated using the recommended new pressure zones. The following projects are required to meet peak day and peak instantaneous requirements in 2060:

- Increase transmission capacity on 700 East
- Increase transmission capacity on 1000 East
- Increase transmission capacity on 7200 South (Fort Union Boulevard)
- Increase transmission capacity on North Union Boulevard
- Add separate service line on 7800 South if existing line is used for lower zone transmission
- Construct storage for Midvale pressure zone and transmission to City
- Increase flow rate and contract volume from JVWCD sources at 175 West, 700 East, 1000 East
- Add new JVWCD source at Winchester Street/700 West
- Add 20-inch transmission line from Winchester Street/700 West to 6980 South
- Connect existing pressure zones at the following locations (costs previously shown in Table 5-1):
    - State Street/7200 South
    - State Street/Inglenook Drive
    - 7800 South, Sandra Way to 200 East
    - 8000 South, 100 East to 150 East
    - Greenwood Avenue, 270 East to Regent Park Lane
- Add PRV/check valve vaults to provide interconnections and redundancy between zones (costs previously shown in Table 5-1):
    - 900 East Fairmeadows Drive
    - 700 East 7200 South

Details of improvements for source and storage have been discussed in previous sections of this report. Recommended transmission projects are shown in Table 5-5 and on Figure 5-2, Recommended Capital Facility Projects. Costs for source and storage are included in the Capital Facility Plan in Chapter 6.

Table 5-5: Transmission Projects for 2060 Conditions

	Location	Pipe Diameter (inches)	Length of Pipe (feet)	Cost
Increase existing transmission capacity				
22	700 East, JVWCD Connection (7600 South) to 7200 South	30	2,920	$906,000
23	700 East, 7200 South to Downing Street	16	850	$204,000
24	7200 South, 300 East to 700 East	20	2,650	$716,000
25	7200 South, Ramanee Drive to 300 East	16	1,100	$264,000
26	7200 South, State Street to Ramanee Drive	12	1,360	$272,000
27	1000 East, JVWCD Connection to Casa Roja Street	20	550	$149,000
28	1000 East, Casa Roja Street to Union Creek Way	16	1,800	$432,000
29	North Union Avenue	12	1,320	$264,000
Add parallel service line				
30	7800 South, Devin Place to 1200 East	8	3,000	$480,000
Add transmission for new source				
31	700 West, Winchester Street to 6980 South	20	2,430	$657,000
Add transmission for new storage tank				
32	Transmission from proposed tank to City[1]	30	8,000	$2,800,000
	Total Cost for 2060 Transmission Projects			**$7,144,000**

1 – Transmission costs for the proposed storage tank could be as much as $6,000,000 if the tank must be located several miles from the City.

2060 Peak Day plus Fire Flow Conditions

The same fire requirements used in the existing condition have been used in the 2060 condition. Fire flow requirements may decrease at some areas in the City (including Midvale Elementary and the building at 300 East 8000 South) as older buildings are removed and new buildings are constructed using more fire-resistant materials and approved fire sprinkling systems. Fire flow available does not significantly decrease in the 2060 condition and even increases in some areas as better connectivity is achieved. A site-specific analysis of available fire flow should be performed for each new development early in the development review process. All new construction should be required to use building materials and sprinkling systems to reduce the required fire flows to the amount the system is capable of providing. The PRV/check valves vaults previously recommended between the Midvale and Union pressure zones will provide redundancy and increase available fire flow in the 2060 condition.

CONTINUED USE OF THE MODEL

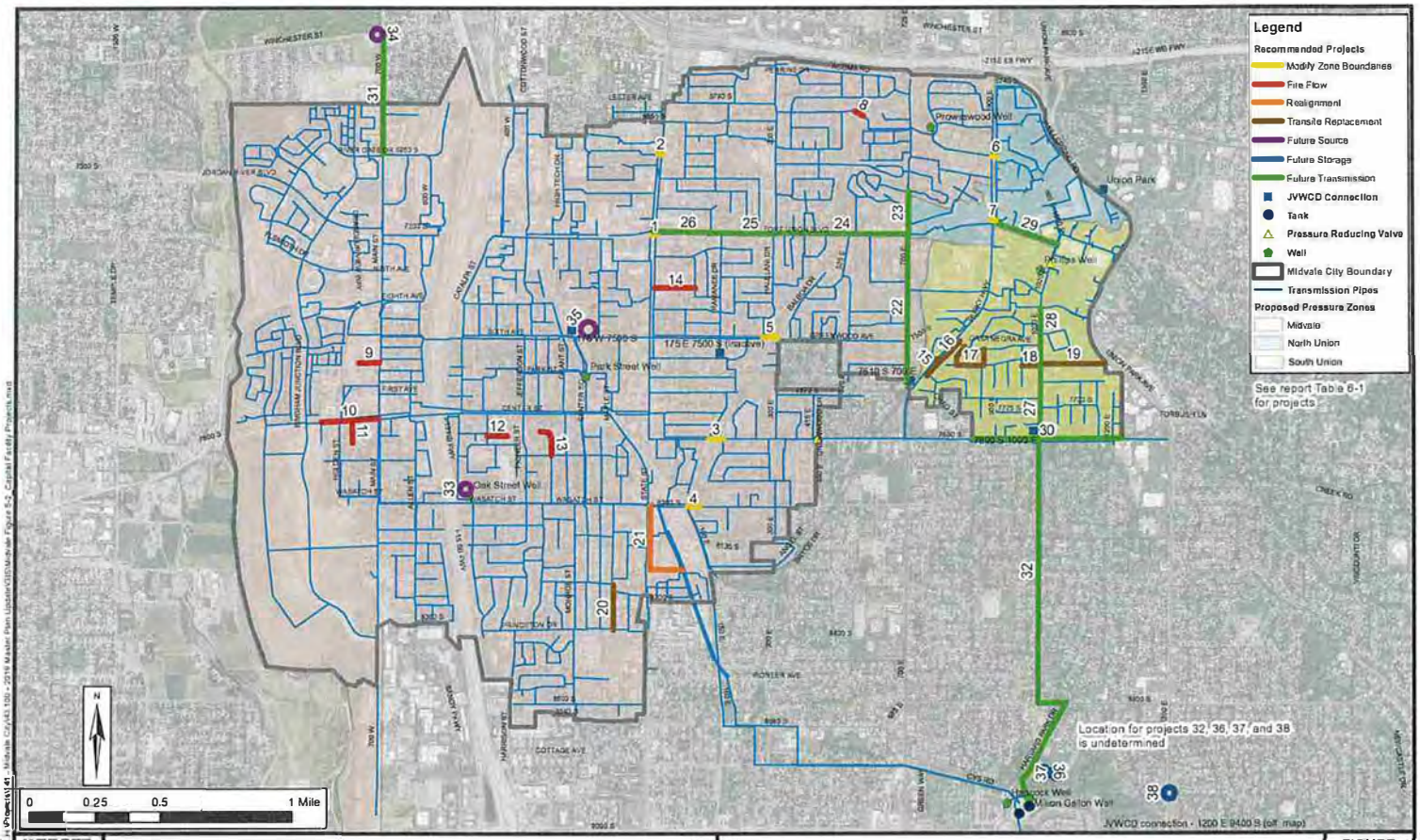
The model output primarily consists of the computed pressures at nodes and flow rates through pipes. The model also provides additional data related to pipeline flow velocity and head loss to help evaluate the performance of the various components of the distribution system. Results from the model are available on a CD in Appendix F. Due to the large number of pipes and nodes in the model, it is impractical to prepare a figure which illustrates pipe numbers and node numbers. The reader should refer to the CD to review model output.

The model should continue to be updated as the water system changes. The City can use the model as a tool for determining the effect of changes to the system and capacity of the system to provide fire flows for new developments. Fire flow tests should be completed on an ongoing basis to refine the model calibration as system conditions change.

WATER DISTRIBUTION SYSTEM RECOMMENDATIONS

In addition to all projects recommended in Tables 5-2 through 5-5, additional localized transmission pipelines are expected to be installed as the City develops. The locations and lengths of these transmission pipelines will vary depending on the final location of future streets and the majority will be minimum sized pipes constructed by developers. The City will continue to review individual developments through the Development Review Committee (DRC) process. This should include analyzing transmission line size requirements, particularly for developments in areas where the water system is developing or not well connected, such as in the Jordan Bluffs area, or in the future annexation south of Jordan Bluffs. Pipe sizes in these developments may need to be increased for initial service, even if the ultimate size requirement is smaller when developments are well connected.

THIS PAGE INTENTIONALLY LEFT BLANK



HANSEN ALLEN & LUCE inc ENGINEERS

MIDVALE CITY DRINKING WATER SYSTEM

RECOMMENDED CAPITAL FACILITY PROJECTS

FIGURE 5-2

CHAPTER 6 CAPITAL FACILITY PLAN

GENERAL

Throughout the master planning process, the three main components of the City's water system (source, storage, and distribution) were analyzed to determine the system's ability to meet existing demands and anticipated future demands. System deficiencies identified in the master planning process and described previously in this report were presented to City staff. Possible solutions were discussed for system deficiencies, maintenance and other system needs not identified in the system analysis.

The purpose of this section is to summarize all drinking water facilities required for the 40-year planning period to meet the demands placed on the system by future development. Projects required to meet existing level of service criteria are also included in this section, including desired fire flow, replacement of transite pipes, existing pipe realignment, and replacement of aging pipes.

Cost estimates have been prepared for the recommended projects and are included in Table 6-1. Unit costs for the construction cost estimates are based on conceptual level engineering and are shown in the unit costs table in Appendix D. Sources used to estimate construction costs include:

1. "Means Heavy Construction Cost Data, 2019"
2. Price quotes from equipment suppliers
3. Recent construction bids for similar work

All costs are presented in 2020 dollars. Costs shown below include 20% for contingency and 15% for design. 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.

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 completed. The following levels of precision are typical:

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

For example, at the master planning 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 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.

SYSTEM IMPROVEMENT PROJECTS

All projects recommended in previous chapters of this report are summarized in Table 6-1 (table continues on to page 6-3). The Map ID corresponds to the project number on Figure 5-2, Recommended Capital Facility Projects, located at the end of Chapter 5.

Table 6-1: Recommended Capital Facility Projects

Type	Map ID	Project Description	Cost
Projects to Revise Pressure Zones			
Internal Zone Connectivity	1	State Street/7200 South	$50,000
	2	State Street/Inglenook Drive	$50,000
	3	7800 South, Sandra Way to 200 East	$105,000
	4	8000 South, 100 East to 150 East	$88,000
	5	Greenwood Ave, 270 East to Regent Park Lane	$66,000
Connection Between Zones	6	900 East Fairmeadows Drive PRV/Check Valve	$50,000
	7	700 East 7200 South PRV/Check Valve	$50,000
Total Cost, Projects to Revise Pressure Zones			**$459,000**
Projects to Mitigate Existing Fire Flow Deficiencies			
Fire Suppression Flow	8	Splendor View Circle (6815 South) to 6850 South	$42,000
	9	Depot Street, Holden Street to Main Street	$66,000
	10	Center Street, Main Street to LePage Street	$20,000
	11	Cooper Street, south of Center Street	$72,000
	12	Alta View Drive, east of Chapel Street	$63,000
	13	Olympus Circle, north of Garden View Dr.	$101,000
	14	Cox Street, State Street to Rusty Drive	$132,000
Total Cost, Projects to Mitigate Existing Fire Flow Deficiencies			**$496,000**

(Table continues...)

Type	Map ID	Project Description	Cost
Projects to Replace Existing Transmission Lines			
Transite Pipe Replacement	15	Southcrest Circle, west of 900 East	$50,000
	16	900 East, Casa Negra to Lyndy Drive	$50,000
	17	Casa Blanca Drive, 7575 South, and Casa Verde Street	$105,000
	18	7575 South (not in street), Casa Negra Circle to 1000 East	$88,000
	19	Mecham Lane (7575 South), east of 1000 East	$66,000
	20	Wood Street, Marquette Dr. (north) to Princeton Drive	$208,000
Transmission Realignment	21	North of Resaca Street and State Street, Resaca to 8000 South	$700,000
Total Cost, Replacement Projects			**$1,267,000**
Projects to Accommodate Future Demand			
Transmission	22	700 East, JVWCD Connection (7600 South) to 7200 South	$906,000
Transmission	23	700 East, 7200 South to Downing Street	$204,000
Transmission	24	7200 South, 300 East to 700 East	$716,000
Transmission	25	7200 South, Ramanee Drive to 300 East	$264,000
Transmission	26	7200 South, State Street to Ramanee Drive	$272,000
Transmission	27	1000 East, JVWCD Connection to Casa Roja Street	$149,000
Transmission	28	1000 East, Casa Roja Street to Union Creek Way	$432,000
Transmission	29	North Union Avenue	$264,000
Transmission	30	7800 South, Devin Place to 1200 East	$480,000
Transmission	31	700 West, Winchester Street to 6980 South	$657,000
Transmission	32	Transmission from proposed tank to City[1]	$2,480,000
Source Redundancy	33	Replace/redevelop Oak Street or Park Street well	$2,000,000
Source	34	Vault for JVWCD connection at 700 West Winchester Street	$200,000
Source	35	Upgrade vault for JVWCD connection at 175 West 7500 South	$200,000
Storage	36	4.0 MG tank for Midvale pressure zone	$6,300,000
Storage	37	1.8 MG tank for Midvale pressure zone	$2,800,000
Storage	38	3.2 MG tank for North Union & South Union pressure zones	$5,100,000
Total Cost, Projects for Future Demand			**$23,424,000**
Annual Replacement of Aging Pipes			
Annual Cost to Replace Aging Pipes (pipes over 50-year cycle)			**$2,308,000**

[1] - Transmission costs for the proposed storage tank will increase if the tank is located farther from the City.

The following recommendations shown in Table 6-2 were discussed in this plan, but no costs have been evaluated.

Table 6-2: Additional Recommendations

Recommendation
Determine beneficial use for water right 57-2699
File change application to add Oak Street well as point of diversion to water rights 57-1738 and 57-1492
Proof recent change orders as part of the ongoing adjudication
Create forecasting/tracking system for JVWCD water and water rights and evaluate annually
Maintain emergency interconnections with Sandy City

SUMMARY OF COSTS

Table 6-3 includes projects shown in Table 6-1 and is a summary of project costs through 2060. This cost represents a best estimate for total cost in 2020 dollars to maintain the desired level of service while accommodating future growth through 2060 conditions. This table does not include any financing costs associated with funding options.

Table 6-3: Summary of Costs

Project Type	Cost
Revise Pressure Zones	$459,000
Mitigate Existing Fire Flow Deficiencies	$496,000
Replace Existing Transmission Lines	$1,267,000
Accommodate Future Demand	$23,424,000
Total	**$25,646,000**
Plus Annual Replacement of Aging Pipes	**$2,308,000**

FUNDING OPTIONS

Funding options for the recommended projects, in addition to water use fees, could include general obligation bonds, revenue bonds, State/Federal grants and loans, and impact fees. The City may need to consider a combination of these funding options. The following discussion describes each option.

General Obligation Bonds

This form of debt enables the City to issue general obligation bonds for capital improvements and replacement. General Obligation (G.O.) bonds would be used for items not typically financed through the Water Revenue Bonds. For example, the purchase of water source to ensure a sufficient water supply for the City in the future. G.O. bonds are debt instruments backed by the full faith and credit of the City, which would be secured by an unconditional pledge of the City to levy assessments, charges or ad valorem taxes necessary to retire the bonds. G.O. bonds are the lowest-cost form of debt financing available to local governments. G.O. bonds can be combined with other revenue sources, such as specific fees, or special assessment charges to form a dual security through the City's revenue generating authority. These bonds are supported by the City as a whole, so the amount of debt issued for the water system is limited to a fixed percentage of the real market value for taxable property within the City.

Revenue Bonds

Revenue Bonds are another form of debt financing available for utility-related capital improvements. Unlike G.O. bonds, revenue bonds are not backed by the City as a whole, but constitute a lien against the water service charge revenues of a water utility. Revenue bonds are riskier to the investor than G.O. bonds, since repayment of debt depends on an adequate revenue stream, legally defensible rate structure and sound fiscal management by the issuing jurisdiction. Due to this increased risk, revenue bonds generally require a higher interest rate than G.O. bonds. Interest rates are currently at historic lows. This type of debt also has very specific coverage requirements in the form of a reserve fund specifying an amount, usually expressed in terms of average or maximum debt service due in any future year. This debt service is required to be held as a cash reserve for annual debt service payment to the benefit of bondholders. Typically, voter approval is not required when issuing revenue bonds.

State/Federal Grants and Loans

Historically, both local and county governments have experienced significant infrastructure funding support from state and federal government agencies in the form of block grants, direct grants in aid, interagency loans, and general revenue sharing. State/federal grants and loans should be further investigated as a possible funding source for needed water system improvements.

As with the revenue bonds discussed earlier, the ability of infrastructure programs to wisely manage their finances will be a key element in evaluating whether many secondary funding sources, such as federal/state loans, will be available to the City.

Impact Fees

Impact fees can be applied to water related facilities under the Utah Impact Fees Act. The Utah Impacts Fees Act is designed to provide a logical and clear framework for establishing new development assessments. It is also designed to establish the basis for the fee calculation which the City must follow in order to comply with the statute. However, the fundamental objective for the fee structure is the imposition on new development of only those costs associated with providing or expanding water infrastructure to meet the capacity needs created by that specific new development. Also, impact fees cannot be applied retroactively. Though Midvale City has not imposed impact fees in recent years, it may be a possibility for future development.

SUMMARY OF RECOMMENDATIONS

Several recommendations were made throughout the master plan report. The following is a summary of the recommendations.

1. Reconfigure the existing pressure zones to create a larger Midvale pressure zone, with the area east of 700 East/900 East remaining an upper zone (two sub-zones) served by JVWCD.

2. Determine a beneficial use for water right 57-2699 or exchange it for a right usable by the City.

3. Amend water rights 57-1738 and 57-1492 to include the Oak Street well as a point of diversion.

4. Elect to have recently approved change applications proofed as part of the ongoing water rights adjudication.

5. Monitor the Average Yearly Demand and use a forecasting and tracking system to ensure the JVWCD contract is neither too high or too low to responsibly meet the needs of the City's drinking water system.

6. Obtain a JVWCD connection at Winchester Street and 700 West.

7. Increase the capacity of the JVWCD connection at 175 West 7500 South, 700 East 7610 South, and 1000 East 7800 South.

8. Consider redeveloping Oak Street well and/or possibly Park Street well to provide full beneficial use of City water rights and provide additional redundancy.

9. Maintain connections from the Sandy City system for emergency use.

10. Pursue negotiations with JVWCD to continue to provide storage volume for the City (at a minimum for the new North Union and South Union pressure zones).

11. Pursue acquiring property appropriate for a storage tank for the Midvale pressure zone.

12. Complete the Existing and Future Recommended Projects.

13. Continue to update the model as the water system changes (including verification of pipe diameters) and use the model as a tool for determining the effect of changes to the system and capacity of the system to provide fire flows.

14. Continue to conduct fire flow tests on an ongoing basis to refine the model calibration as system conditions change.

REFERENCES

DDW (Utah Division of Drinking Water). "Drinking Water Laws and Rules." https://deq.utah.gov/drinking-water/laws-and-rules

DWR (Utah Division of Water Rights). "Public Water Supplier Information, Midvale City Water Department." https://waterrights.utah.gov/asp_apps/viewEditPWS/pwsView.asp?SYSTEM_ID=1093

EPA (U.S. Environmental Protection Agency). 2014. "EPANET: Software that Models the Hydraulic and Water Quality Behavior of Water Distribution Piping Systems." Accessed Oct. 14. http://www.epa.gov/nrmrl/wswrd/dw/epanet.html

GOMB (Utah Governor's Office of Management and Budget). 2012. "Municipal Population Projections, 2010-2060." https://mountainland.org/img/Data/Projections/GOMBSmallAreaProjections.pdf

Kem C. Gardner Policy Institute. 2016. "State and County Projections." https://gardner.utah.edu/demographics/population-projections/

Rossman, Lewis A. 2000. "EPANET 2 Users Manual." EPA/600/R-00/057. Cincinnati, Oh.: U.S. Environmental Protection Agency, National Risk Management Research Laboratory. http://nepis.epa.gov/Adobe/PDF/P1007WWU.pdf.

State of Utah. 2020a. Utah Administrative Code, Section R309-105: Administration: General Responsibilities of Public Water Systems. https://rules.utah.gov/publicat/code/r309/r309-105.htm

———. 2020b. Utah Administrative Code, Section R309-510: Facility Design and Operation: Minimum Sizing Requirements. https://rules.utah.gov/publicat/code/r309/r309-510.htm

Wasatch Front Regional Council. 2019. "Population Projections (City Area)." https://data.wfrc.org/datasets/06cb3e239a3743fab7796165e1c66ad9_0

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX A
Growth Projections and Projected ERCs

THIS PAGE INTENTIONALLY LEFT BLANK

Table A-1
Growth Projections and Projected ERCs

Year	Projected ERCs	Annual ERC Growth
2020	13,940	-
2021	14,298	2.8%
2022	14,667	2.8%
2023	15,045	2.8%
2024	15,435	2.8%
2025	15,836	2.8%
2026	16,248	2.8%
2027	16,672	2.8%
2028	17,108	2.8%
2029	17,556	2.8%
2030	18,017	2.8%
2031	18,194	1.1%
2032	18,372	1.1%
2033	18,552	1.1%
2034	18,735	1.1%
2035	18,919	1.1%
2036	19,105	1.1%
2037	19,293	1.1%
2038	19,483	1.1%
2039	19,676	1.1%
2040	19,870	1.1%
2041	20,047	1.0%
2042	20,226	1.0%
2043	20,407	1.0%
2044	20,590	1.0%
2045	20,774	1.0%
2046	20,961	1.0%
2047	21,149	1.0%
2048	21,338	1.0%
2049	21,530	1.0%
2050	21,723	1.0%
2051	21,901	0.9%
2052	22,081	0.9%
2053	22,262	0.9%
2054	22,445	0.9%
2055	22,630	0.9%
2056	22,816	0.9%
2057	23,004	0.9%
2058	23,193	0.9%
2059	23,384	0.9%
2060	23,577	0.9%

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX B
Water Rights

THIS PAGE INTENTIONALLY LEFT BLANK

State of Utah
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WATER RIGHTS

Michael O. Leavitt
Governor
Robert L. Morgan
Executive Director
Jerry D. Olds
State Engineer

1594 West North Temple, Suite 220
PO Box 146300
Salt Lake City, Utah 84114-6300
(801) 538-7240 telephone
(801) 538-7467 fax
www.nr.utah.gov

June 25, 2002

Salt Lake Valley Groundwater Users:

Enclosed is the final Salt Lake Valley Groundwater Management Plan which replaces the interim plan implemented in 1991. Although we are implementing this management plan on a "permanent" rather than on an interim basis, we are allowing for the prospect of modifying this plan in the future as conditions change. Modification to this management plan would occur in consultation with water users and other interested parties.

We have received numerous comments and a lot of input during the development of this plan. We would like to thank all of those who have contributed to this process. Many of the provisions in this plan reflect the concerns and issues raised by many of you.

In addition, we have relied heavily on data, information, and computer models which were developed by the United States Geological Survey. The publications containing much of this data and information and other related documents are available on the division's website - waterrights.utah.gov.

The water rights configuration in Salt Lake Valley is complex and offers many unique challenges for both water users and water managers. We believe that this management plan adequately addresses these challenges. We also believe that this will be a useful tool in helping water users plan for future development as well as help this division in the administration and management of this precious resource. We ask for your continued support.

Sincerely,

Jerry D. Olds

Jerry D. Olds, P.E.
Utah State Engineer

Introduction

This document presents the state engineer's policy for the management of the ground-water resources of Salt Lake Valley. The objectives of this ground-water management plan are to promote wise use of the ground-water resource, to protect existing water rights, and to address water quality issues and over-appropriation of ground water in the valley. In implementing this ground-water management plan, the state engineer is using his statutory authority to administer the measurement, appropriation, and distribution of the ground water of Salt Lake Valley. The intent of this plan is to provide specific management guidelines under the broader statutory provisions within Title 73 of the Utah Code.

For the purposes of this plan, the Salt Lake Valley consists of the unconsolidated basin-fill material generally bounded by the Wasatch Range to the east, Oquirrh Range to the west, Great Salt Lake to the north, and Traverse Mountains to the south. This area is shown in Figure 1.

Salt Lake Valley Ground-Water Management Plan

The following policy guidelines are hereby implemented effective June 25, 2002:

1.0 Appropriations

The Salt Lake Valley is closed to new appropriations of ground water from the principal aquifer including fixed-time appropriations. This action is necessary because of the over-appropriation of water resources of the valley. All pending unapproved applications in the principal aquifer will be rejected. In addition, the state engineer will hold all applications to appropriate water from the shallow aquifer until further review and study of this source is conducted.

2.0 Ground-Water Withdrawal Limits

In order to fulfill the objectives of this management plan, guidelines are being implemented to help distribute ground-water withdrawals. If excessive withdrawals occur, the state engineer will distribute the water in accordance with the priority dates of the applicable water rights using the following guidelines:

2.1 Safe Yield from the Principal Aquifer

Salt Lake Valley has been divided into four regions - western, eastern, central, and northern as shown in Figure 1. The state engineer may limit the quantity of water withdrawn in these regions so that the average amount of water withdrawn over the long term does not exceed the safe yield. The safe yield of each region has been estimated and is shown in Table 1 below.

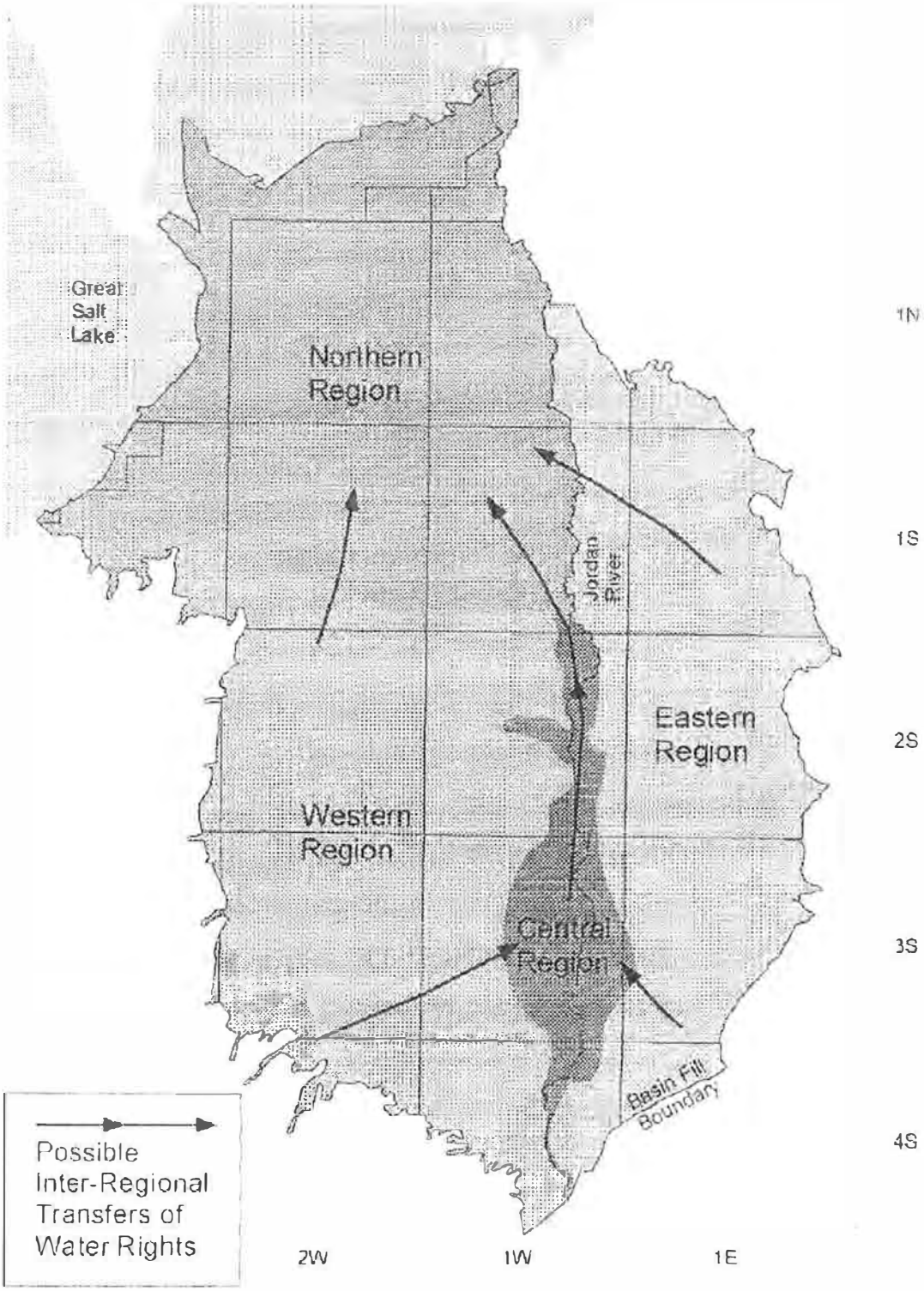


Figure 1. Salt Lake Valley Ground-Water Management Plan Regions

Table 1 Regional Safe Yields

Region	Safe Yield (acre-feet per year)
Western	25,000
Eastern	90,000
Central	20,000
Northern	30,000

2.2 Localized Ground-Water Withdrawals

The state engineer may limit withdrawals in any area of the valley where excessive withdrawals are causing definite and significant harm to the ground-water system. The state engineer recognizes that there are many different factors to consider in determining when and where this is occurring. Some of the relevant factors to consider are:

- ground-water level trends
- trends in the amount of ground-water withdrawals
- changes in water quality
- recent climatic conditions
- local hydro-geologic conditions

Upon identifying areas where excessive withdrawals are causing harm to the aquifer and after public review and commentary on applicable data, the state engineer may limit the withdrawals in that area according to the priority dates of each applicable water right and in harmony with all applicable state statutes. The total quantity of ground water restricted from withdrawal will correspond to at least the quantity necessary to preclude further harm to the aquifer system. Further pumping restrictions may be imposed if harm to the ground-water system worsens. Pumping restrictions may also be lifted in part or in whole after the ground-water system has recovered to an acceptable level, provided no future reoccurrences of the conditions which caused the harm are anticipated.

2.3 Ground-Water Withdrawals From the Southwestern Portion of the Valley

A portion of the aquifer in the Southwestern part of the valley is being remediated by the removal of contamination associated with past mining practices. As part of the remediation effort, Kennecott Utah Copper Corporation (KUCC) has committed to assist affected water users obtain adequate replacement water if adversely affected. Applications in this area which propose to change the point of diversion or drill a replacement well will be critically reviewed so as not to interfere with the remediation process. In conjunction with this, KUCC has committed to work with applicants to determine if there is a feasible well location, depth, and pumping rate for future wells in the contaminated area. The contaminated area is defined as extending 3000 feet from the known 250 mg/l sulfate isoconcentration contour. The approximate boundary for this area is shown in Figure 2.

3.0 Applications to Change the Point of Diversion, Place of Use, and/or Purpose of Use

Each change application will be evaluated based upon its own merits. Within the statutory requirements, the evaluation may consider – but will not necessarily be limited to – potential impacts on: existing water rights, the ground-water system, and overall water quality. In addition, the following guidelines will be used when evaluating change applications:

1). Change applications that propose to transfer water rights historically supplied from the shallow aquifer to the principal aquifer will not be approved.

2) Change applications that propose to transfer water rights into the eastern region, into the western region, or out of the northern region will not be approved. (See Figure 1.)

3) Change applications that propose to transfer water rights into a restricted area[1] will not be approved. (See Figure 2 and endnotes for details.).

4) Change applications that propose to transfer water rights into a section where the Transfer Index Number (TIN[2])under the current water rights exceed the limits set forth in Table 2 below will only be considered if the applicant can show that.

   a). There is sufficient reason to believe that existing water rights will not be impaired.

   b). Compensation and/or adequate replacement water will be provided to existing water right holders if impairment occurs.

   c). Additional ground-water withdrawals will not significantly reduce water levels, degrade the water quality, or otherwise negatively impact the ground-water system.

Table 2. Regional Transfer Index Number Limits

Region	TIN Limits (acre-feet per year)
Western	4,000
Eastern	12,000
Central	6,000
Northern	6,000

5). Change applications that propose to transfer water rights between sections that have Transfer Index Numbers exceeding the limits set forth in Table 2 may be approved, provided that the TIN in the hereafter section is at most 75% of the TIN of the heretofore section and the criteria listed under items 1-4 above have been met.

6). Change applications that propose to drill a replacement well within a distance of 2,640 feet from the original point of diversion may be approved provided that the criteria listed under items 1 and 3, above, have been met..

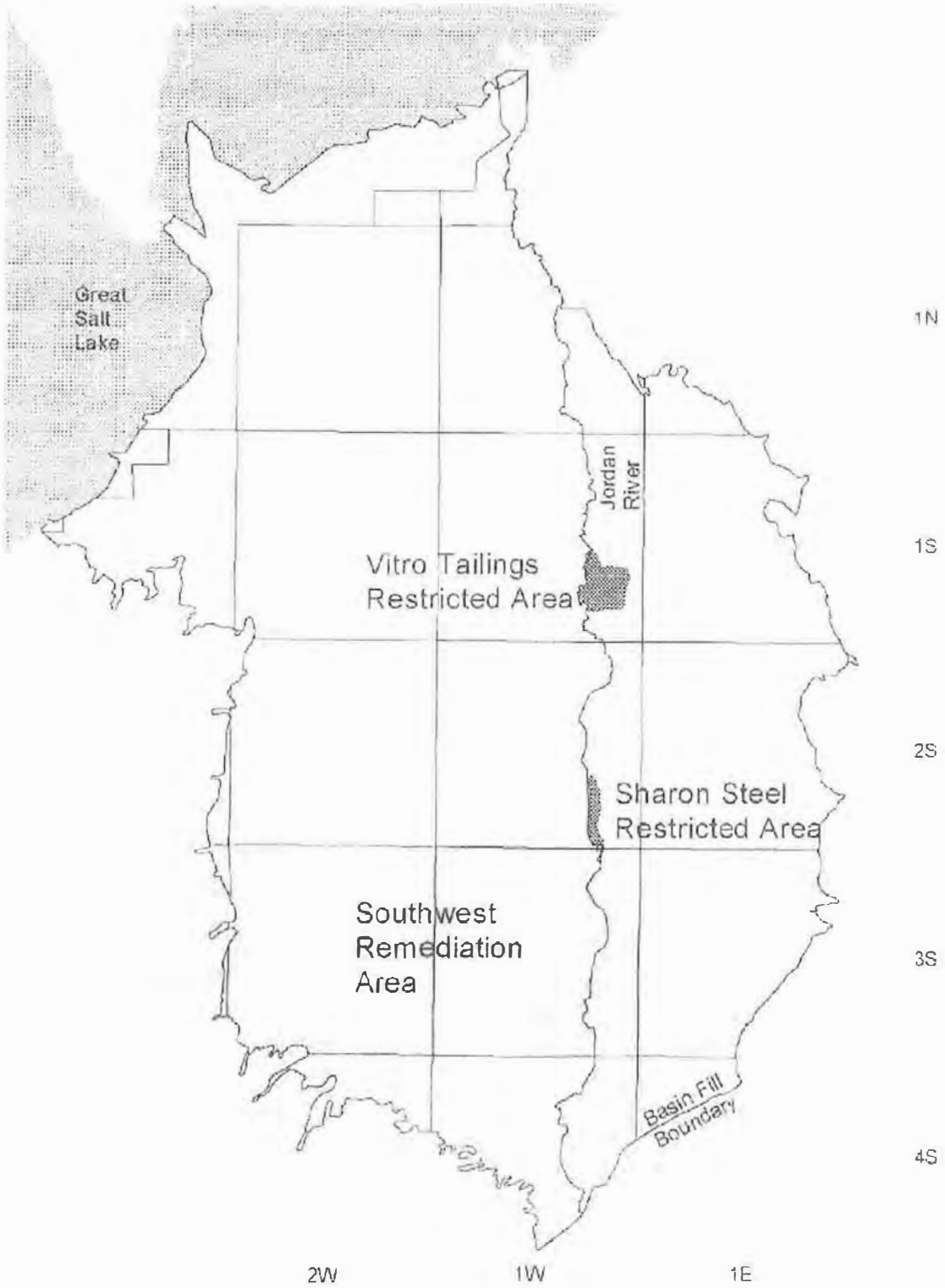


Figure 2. Salt Lake Valley Restricted Areas and Southwest Remediation Area

4.0 Well Spacing

Each new well should be designed, constructed, and operated so that, when pumped at its maximum flow rate, it will not cause more than 12 feet of draw down on an existing well unless the owner of the new well provides just compensation to the affected well owner(s).

5.0 Extensions of Time for Water Right Applications

The state engineer will critically review all future extension requests on approved applications to appropriate or change water pursuant to Section 73-3-12 of the Utah Code. When reviewing extension requests, if unjustified delays or a lack of due diligence is found, the state engineer may reduce the priority date, grant the request in part, or deny the extension of time request.

6.0 Ground-Water Remediation Projects

The state engineer will evaluate each proposed ground-water remediation project based upon its own merits. In order to allow for remediation of ground water the state engineer may support withdrawal amounts in excess of the regional safe yield values outlined in Section 2.1 above or allow changes that would exceed the limits set forth in Section 3.0 above if it is determined to be in the best interest of the public and has a specific project life.

7.0 Aquifer Storage Recovery (ASR)

The state engineer will evaluate each proposed ASR project based upon its own merits. In general, withdrawals credited from aquifer recharge will not count towards the safe yield values outlined in Section 2.1 above. Some of the factors that will be considered in the evaluation of potential ASR projects are:

- hydro-geologic properties of the aquifer
- ground-water velocities
- amount of time between recharge and recovery
- potential effect on other water rights

Applicants may be required to monitor the effects of ASR projects to ensure that no unreasonable impact to the ground-water system or other water rights occurs.

8.0 Monitoring Activities and Aquifer Status Update

The Division of Water Rights will monitor water quality reports submitted by water users to the Department of Environmental Quality and periodically produce an updated, valley-wide water quality summary. Additionally, the division will provide water use information. Also, the division will review new pertinent data that further, or more accurately, defines the ground-water flow system and hydro-geology of Salt Lake Valley and will modify the plan if necessary. Any modifications to the plan will occur in consultation with water users and other interested parties.

June 25, 2002
Date

Jerry D. Olds
Jerry D. Olds, P.E.
Utah State Engineer

Endnotes

1. Restricted Areas
There are two restricted areas currently in the plan associated with the following contaminated sites as shown in Figure 2.

- Vitro Tailings Site
- Sharon Steel Site

In order to protect the quality of the water by preventing changes in the hydraulic gradient and mobilization of contaminants at these contaminated sites, the transfer of water rights into these areas will not be allowed. Restricted areas are based on available data and may change as new data is obtained. New restricted areas may be added to the plan upon request to the state engineer if an evaluation of the data supports such designation, and the public has had an opportunity to review the data and comment on the proposed designation.

2. Transfer Index Number (TIN)
Under the U.S. Public Land Survey system, the land is divided into township, range, and section. Each section is a square measuring approximately one mile on each side. In this management plan, each section in the valley fill of the Salt Lake Valley is assigned a Transfer Index Number which is based on the index values of every water use within that and each of the eight adjacent sections.

There are specific rules for calculating a section's TIN, which has units of acre-feet per year. A TIN may change over time as the water rights situation changes. The primary rules for calculating a section's TIN are outlined below.

1. Only approved and perfected, i.e. certificated, water rights are evaluated. Approved (but unperfected) changes on perfected water rights are not evaluated because of double accounting issues. Water rights under active litigation are not evaluated.
2. Only wells (both flowing and pumped) are evaluated. Tunnels, springs, drains, and other types of non-well, "underground" diversions are not evaluated.
3. Index values for indoor domestic uses are calculated at 0.45 acre-feet per family.
4. Index values for stock-watering uses are calculated at 0.023 acre-feet per equivalent livestock unit (ELU).
5. Index values for irrigation uses are calculated at 5 acre-feet per acre of irrigated land. If there is a sole supply acreage listed, the irrigation index value is equal to the number of sole supply acres multiplied by an irrigation duty of 5.
6. Index values for domestic, stock-watering, and irrigation uses are calculated by dividing the index value of a claims group by the number of supplemental rights in that group.
7. Index values for municipal uses are calculated by multiplying the flow rate (cfs) by 362.
8. Index values for industrial, mining, and other uses are calculated by multiplying the flow rate (cfs) by 18.

9. The total index value for a water right is the sum of the index values of all listed uses but will not exceed the maximum diversion volume (if listed on the right) nor the maximum flow rate (cfs) multiplied by 724
10. The total index value for a particular water right is divided evenly between each point of diversion listed under that water right.
11. Index values are calculated for each point of diversion in a section and summed up for the section in question and every adjacent section. This has been done for section 11 in the example below. *(Note: The TIN for section 11 is not 500.)*

3 800	**2** 1600	**1** 2100
10 2600	**11** 500	**12** 1200
15 3300	**14** 1100	**13** 900

Figure A. Evaluating water rights in all adjacent sections

12. A section's TIN is the *maximum sum* of any four adjacent section index values. In the figure below, section 11 has a TIN of 7,500 acre-feet per year

3 800	**2** 1600	**1** 2100
10 2600	**11** 500	**12** 1200
15 3300	**14** 1100	**13** 900

Sum = 5500

3 800	**2** 1600	**1** 2100
10 2600	**11** 500	**12** 1200
15 3300	**14** 1100	**13** 900

Sum = 5400

3 800	**2** 1600	**1** 2100
10 2600	**11** 500	**12** 1200
15 3300	**14** 1100	**13** 900

Sum = 7500

3 800	**2** 1600	**1** 2100
10 2600	**11** 500	**12** 1200
15 3300	**14** 1100	**13** 900

Sum = 3700

Figure B. Determining the TIN for a particular section by calculating the maximum sum

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX C
Calibration Data

THIS PAGE INTENTIONALLY LEFT BLANK

L Month July Year 2019 Million Gallon

.e	Time	Pump Level	Static Level	Tank AM	Tank Noon	Tank PM	Meter Reading (OOO)	GPM On/Off	Remarks	By
1		419.8		14.5			2295752.2	2142		RG/BS
2	8:28	410.9		16.2			32BB325	2145		BS/RG
3	8:24	414.3		14.0			4463058	2156		AA/RG
4	10:00	411.7		17.4		18.1	7756275	2136		BB
5	8:59	424.4		15.1			8027089	0		AA/RG
6	10:30	419		15.4		17.7	9328206	2145		BB
7	10:50	418.1		19		17.5	4977876	2148		BB
8	8:47	418.1		14.0			1282969	0		ER/MC
9	8:41	413.1		13.7			3760240	2148		BS/ER
10	8:27	411.8		15.4			6797294	2145		RG/AA
11	8:58	415.7		14.5			7944090			BS/ER
12	8:46	415.9		13.9			86 33900			ER/BS
13	10:09	408.0		15.8		18.0	1015493	2129		LG LO
14	8:59	411.8		14.5		17.3	1854009			LG LO
15	8:32	409.2		13.6			"			RG/BC
6	8:24	402.7		14.7			4887857	2126		BS/RG
17	8:49	459.3		11.5	11.11	10.1	8216814	2184		AA/LOU
18	7:39	463.3		5.9	6.9	8.5	1187876	2169	9.7	BS/TF
19	7:15	427.1		9.3	14.1	16.4	4232780	2164		TF
20	8:55	404.8		17.3	18.7	16.6	7413702	2185		TF
21	8:50	416.6		15.1	18.9	17.6	245 3015 IV	2127	5.15	TF
22	8:36	412.7		15.0	17.8	17.5	6502245	2128		
23	8:34	408.8		14.2			9654662	2146	17.7	AA/TF
24	7 59	398.5		15.0		17.2	2637695	2136	17.2	MC
25	8:30	400.1		15.0			5819745	2133		AA/RG
26	8:36	399.9		14.1			9021986	2122		ER/BS
27	9:24	410.6		15.5		17.7	2189186	2134		MC
28	8:41	407.1		14.8		17.4	5274289	2137	17.4	MC
29	8:42	400.0		14.0			8338758	2127		BS/RG
30	8:50	396		15.2			14614625 33	2133		TF
31	8:38	397.6		14.0			4740837	2119		ER/AA

Month August Year 2019 Million Gallon

..e	Time	Pump Level	Static Level	Tank AM	Tank Noon	Tank PM	Meter Reading (OOO)	GPM On/Off	Remarks	By
1	8:21	399.9		15.4			7863582	2138		AA
2	8:24	399.7		14.5			11 71196	2132		AA
3	9:10	396.4		14.7		CH	6122.9	2117	16.5 pm	CH
4	16:30	395		16.6		CH	2268646	2122	[illegible]	CH
5	07:09	394.2		15.0			433744	2139		ER/TF
6	8:30	394.8		16.6			3402666	2126		EK/TF
7	8:54	397.2		15.1			65238394	2118		BS/RG
8	8:18	391.3		16.0			9510538	2121		RG/EK
9	9:36	397.7		15.8			2647000	2114		Erlo
10	8:03	400.4		16.3		JW	5589155	2118		JW
11	8:34	457.1		11.9			8761472	2168		JW
12	8:50	402.0		12.7			1886735	2134		BS
13	8:39	397.9		18.3			4904916	2120		BS
14	8:45	402.4		15.3			8068400	2125		ER/BS
15	8:16	464.0		16.4			9877684	2115		ER/RG
6	9:10	462.0		15.7			4436556	2118		ER/BS
17	9:57	399.8		16.8		18.6	7636815	2108		RG
18	12:05	397.9		17.6		19.0	1130458	2107		RG
19	7:37	399.1		15.1			3730352	2124		EK/TF
20	7:45	396.7		16.2			6813576	2116		RG/BS
21	7:50	391.4		15.2			9889836	2123		BS/RG
22	7:50	389.0		15.7			2977856	2136		MPH
23	7:55	390.1		15.3			6025996	2138		BS
24	4:27	386.9		16.5		19.0	9464822	2131		BS
25	9:35	387.1		16.3		18.9	24B3022	2125		BS
26	7:59	387.1		14.9			5211332	2134		BS
27	8:00	382.7		17.3			8272997	2052		TF
28	8:05	387.7		14.2			1189971	2125		AA/BS
29	7:31	442.6		16.1			4199432	2165		AA
30	7:19	451.3		14.5			7089713	2163		MC
31	8:17	397.3		17.2			116050.5	2120	15.7	MC

189

17.0
13.4

Hancock Well Report **Midvale City**

Month July Year 2019

Date	Time	Meter Reading (000)	Mag Meter Total	Flow Rate	Peak	Pump Gpm	Pump Level	Static Level	Remarks	By
1	8:35	62/9301	8143K	4760		1948	342.2		14.5	RG
2	8:30	8984158	8049K	5130		1935	341.3		16.2	RG
3	8:26	1779887	9031K	5740		1943	336.7		14.0	RG
4	10:00	4176070	8039K	4060		1930	335		17.4	BB
5	8:43	74049187	8378K	4250		1945	345.9		15.1	RG
6	10:35	45/4375	8477K	3484		1940	341		15.4	BB
7	10:50	8390778	8973K	3502		1943	340.1		15.8	
8	8:51	5822997	89723	4546		1946	339.3		14.0	
9	8:44	8589074	8838K	4770		1942	333.9		13.7	BS CR
10	8:29	1339229	10058K	5320		1957			15.4	RG
11	9:03	4196197	8828K	4560		1926	337.3		14.6	EK
12	9:48	9603094	8828K	6440		1936	336.3		13.9	EK
13	10:12	1989092	9134K	4640		1929	330.4		15.8 18.0	EK
14	9:02	2551560	8559K	4520		1926	333.4		14.5 17.3	EK
15	8:34	5281147	8559K	6120		1935	330.2		13.6	RG
16	8:25	8032900	9195K	5280		1935	323.2		14.7	RG
17	8:53	6974.84	9380K	5010		1976	—	375.4	15.0 15.0	AA
18										
19	8:25	1610456	9380K	5000		1976	3754		15.0 14.1	RG
20	8:45	4216416	1062K	3850		1917	327.8		17.3 18.7	TF
21	8:55	5571498	7145K	3330		1926	337.6		15.8 18.9 17.5	TF
22	8:35	7150150	7145K	4520		1930	338.1		15.0 17.8	BS CR
23	8:40	994 1493	7819K	5800		1940	327.5		14.2	AA TF
24	8:03	2634987	9029K	6053		1427	322.6		15.0 17.2	MC
25	8:34	5475736	9334K	5070		1936	323.9		15.	RG
26	8:39	8264816	8697K	5810		1929	322.6		14.1	BS CR
27	9:26	1137887	8063K	3520		1928	323.2		15.5 17.7	MC
28	8:44	3638554	8386K	4567			324.3		14.8 17.4	MC
29	8:45	6618792	8439K	5560		1936	321.4		14.0	RG
30		1101516	9781K	4500			317		15 ?	TF
31	8:46	2146943	9281K	5604		1931	319.0		14.0	AA EK

Hancock Well Report **Midvale City**

Month: August Year: 2019

Date	Time	Meter Reading (000)	Mag Meter Total	Flow Rate	Peak	Pump Gpm	Pump Level	Static Level	Remarks	By
1	8:24	4896102	9324K	4360		1934	320.2		15.4	RG
2	8:27	7688796	7809K	6610		1933	320.3		14.5	RG
3	9:24	24	6769	4740		1431	324		14.7	CH
4	6:39	2494209	4240	4534		1916	318		16.6 18.9	CH
5	9:12	4702838	4470906	4970		1935	322.0		15.0	TH
6	8:35	4393336	9076K	4930		1917	317.7		16.6	JR
7	8:56	8063216	8934K	4720		1934	320.1		15.1	RG
8	8:20	1034319	8933	4740		1931	315.2		16.0	RG
9	9:09	3028650	7183K	3740		1919	320.5		15.8	EB
10	8:10	647.935	7430	4460		1931	323.6		16.3 17.0	JW
11	8:40		99K	0		1926			11.9	JW
12	8:53	5913438	8059K	4990		1943	324.2		12.7	BS
13	8:42	8651056	8547K	4610		1922	321.7		18.3	BS
14	8:47	2284604	8249K	4610		1917	325.3		15.3	JER
15	8:14	2225588	8845K	5320		1924	327.1		16.4	RG
16	9:18	4186525	8569K	4790		1930	324.7		15.8	BS ER
17	10:04	6724371	8037K	3980		1930	322.7		16.8 17.2	RG
18	12:07	8360165	8254K	3480		1921	321.2		17.6 19.0	RG
19	7:41	9784645	8259K	6930		1924	321.6		15.1	TE LR
20	7:48	1475659	8872K	5650		1926	320.5		16.2	RG BS
21	7:52	3094954	9007K	5680		1933	314.7		15.2	BS RG
22	7:53	5160392	8600K	5810		1934	314.8		15.7	HW TE
23	7:59	6878877	8518K	6270		1928	313.9		15.3	BS
24	9:30	9168172	8380K	4110		1926	311.3		16.5 19.0	BS
25	9:38	9499455.0	8430K	3580		1923	311.1		16.4 18.9	BS
26	8:02	2601149	8430K	6050		1929	310.5		14.9	BS
27	8:05	5360341	9043K	4990		1920	309.0		12.3	TE
28	8:12	7194876	8380K	5480		1933	310.1		14.2	AA BS
29	7:35	7798338	6143	4700		0	615.7		16.1	AA
30	7:24	7798338	6106K	5439		0	625.8		14.5	MC
31	8:20	9604444	5855K	3725			321.2		17.2 18.7	MC

13.4

Oak Strt Well Report Midvale City

Month July Year 2019

Date	Time	Meter Reading	Pump Level	Static Level	Oil 6-8DPM	PSI	GPM	Remarks	By
1	8:19	2035650	264		✓	95.0	822.38	1620RPm	BS/RG
2	8:15	2036690	262		✓	95.5	794.44	1605 RPM	RG/BS
3	8:14	2037668	264		✓	95.4	822.41	1620 RPM	RG/AA
4	9:04	2039637	261		✓	95.6	717.41	1566 RPM	RG/AA
5	↓	↓	↓		↓	↓	↓	↓	↓
6	10:20	2040678	261		✓	95.1	643.5	1542	BB
7	10:40	2041717	264		✓	95.5	610	1522	BB
8		POWER OUT				~~95.5~~		~~1620~~	~~BS~~
9	8:26	2042532	263		✓	95.5	813	1620	ER/BS
10	8:15	2043600	269		✓	95.5	818.74	1620	RG/AA
11	8:33	2044635	263		✓	95.5	821.74	1620 RPm	BS/ER
12	8:32	2045658	263		✓	94.8	818.86	1620 RPm	BS/GR
13	9:55	2046794	262		✓	95.5	645.10	1566 RPM	LaLo
14	8:46	2047730	262		✓	95.5	762.47	1602 RPM	LaLo
15	8:21	2048740	264		✓	94.2	828.89	1620 RPm	BS/RG
16	8:12	2049827	263		✓	95.2	812.74	1620 RPM	RG/BS
17	8:35	2050888	263		✓	94.4	829.19	1620 RPM	AA/LaLo
18	8:45	2052080	263		✓	95.5	838.63	1620	TF/BS
19	9:37	2053345	269		✓	94.8	817.36	1620	RG
20	5:38	2054511	260		✓	95.5	714.35	1431	TF
21	9:15	2055196	266		✓	95.5	670.17	1521	TF
22	8:24	2056021	263		✓	95.6	790.58	1605 RPm	BS/GR
23	8:20	2057020	264		✓	95.5	831.71	1620	TF/AA
24	8:31	2058063	265		✓	95.5	815.06	1620	MC
25	8:21	2059040	263		✓	95.3	817.52	1620	RG/AA
26	8:24	2060095	264		✓	93.8	835.48	1620 RPm	BS/ER
27	9 11	2061114	260		✓	95.5	656.86	1557	MC
28	8:31	2062067	261		✓	95.5	803.64	1614	MC
29	8:30	2063073	264		✓	94.7	818.56	1620RPm	BS/RG
30	8:12	2064159	266		✓	95.5	781.16	1614	TF
31	8:25	2065133	263		✓	94.9	818.70	1620	AA/LaLo

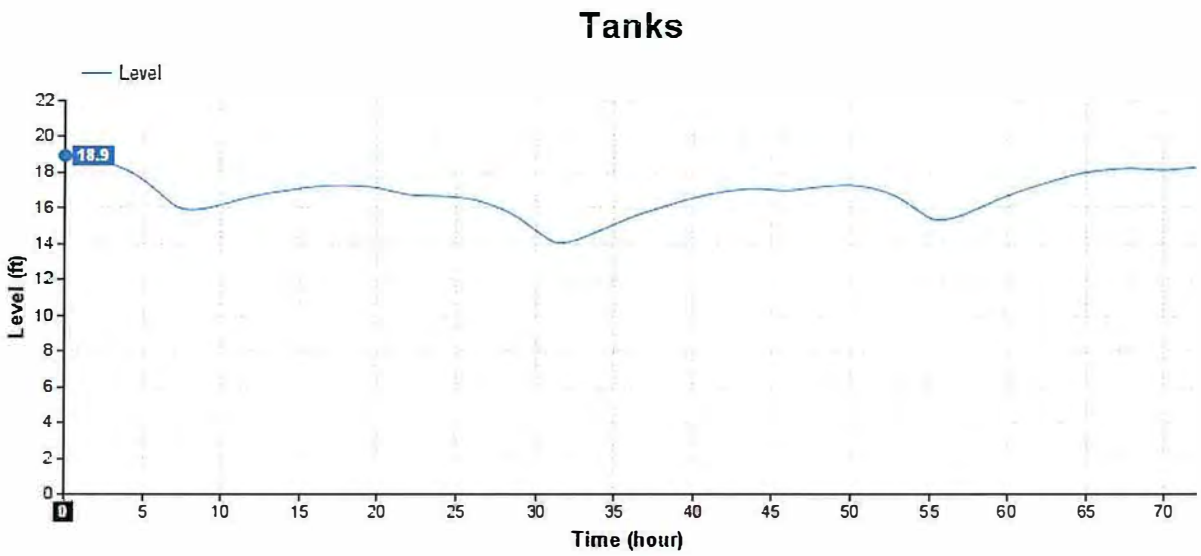
29455000

Oak Strt Well Report Midvale City

Month August Year 2019

Date	Time	Meter Reading	Pump Level	Static Level	Oil 6-8DPM	PSI	GPM	Remarks	By
1	9:17	2066171	263		✓	95.6	662.77	1545	RG
2	8:13	2067087	264		✓	94.5	811.75	1620	RG
3	9:10	2066814	263		✓	95.5	714.66	1614	CH
4	8:11	2069011	263		✓	95.4	711.54	1575	CH
5	8:55	2070047	263		✓	95.5	772.79	1596	TF/Lou
6	9:20	2071018	264		✓	95.5	721.45	1581	ER/TF
7	8:42	2071932	265		✓	95.6	717.85	1581 RPM	BS/RG
8	8:07	2072873	262		✓	955	736.62	1581	RG/LG
9	8:46	2073764	262		✓	95.5	663.72	1557	ER
10	7:45	2074595	265		✓	95.5	670.75	1566	JW
11	10:30	2075692	263		✓	95.4	889.2	1608	JW
12	8:32	2076750	262		✓	94.4	820.87	1620 RPM	BS
13	8:28	2077774	263		✓	95.5	658.54	1551 RPM	BS
14	8:30	2078703	262		✓	95.6	741.90	1605 RPM	BS/ER
15	8:04	2079619	262		✓	95.5	691.98	1566	RG
16	9:00	2080570	263		✓	95.5	738.47	1587	ER/BS
17	9:46	2081508	260		✓	95.5	596.00	1527	RG
18	11:54	2082503	259		✓	95.5	495.08	1500	RG
19	7:25	2083264	262		✓	95.5	824.50	1620	TF & R
20	7:30	2084242	262		✓	95.2	811.16	1620	RG/BS
21	7:37	2085151	263		✓	94.6	818.11	1620 RPM	BS/RG
22	7:35	2086118	266		✓	95.5	816.83	1620	MP/TF
23	7:39	2087043	262		✓	94.5	818.87	1620 RPM	BS
24	9:15	2088110	261		✓	95.6	587.76	1530 RPM	BS
25	9:16	2089032	262		✓	95.5	649.56	1548 RPM	BS
26	7:42	2089880	263		✓	94.0	822.95	1620 RPM	BS
27	7:45	2090871	264		✓	95.5	743.99	1587	TF
28	7:51	2091782	263		✓	94.2	831.56	1620 RPM	BS/AA
29	7:57	2092711	262		✓	95.6	589.85	1533 RPM	AA
30	9:26	262 # 2093584	264		✓	95.5	647.00	1554	MC
31	8:05	2094315	260		✓	95.5	526.48	1509 RPM	MC

Existing Model Output



THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX D
Unit Costs

THIS PAGE INTENTIONALLY LEFT BLANK

AVERAGE WATER PIPE COST PER FOOT

Diameter (in)	Diameter (ft)	Outside Diameter (ft)	Pipe Material & Installation (1)	Excavation	Imported Bedding Installed	Hauling Excess Native Mat'l	Trench Backfill Installed (3)	Trench Box per Day (2)	Average Daily Output	Trench Box Cost	Top Trench Width (ft)	Road Repair Width (ft)	Asphalt Cost	Service Lateral Cost	Fire Hydrant Cost	Valves & Fittings Cost	Pipeline Connection Costs	Conflicts (9)	Trench Dewatering (4)	Total Cost per Foot of Pipe	Adjusted Cost per foot	Cost Out of Street (3)	Diameter (in)
4	0.3	0.39	25.50	2.84	3.64	1.20	3.83	210.00	400	0.53	2.99	6.99	28.94	18.11	2.37	0.34	1.20	0.00	8.48	103	90	77	4
6	0.5	0.58	30.50	3.17	11.19	1.43	4.11	210.00	333	0.63	3.18	7.18	29.59	18.11	2.37	0.46	1.34	0.00	9.81	112	98	86	6
8	0.7	0.78	48.00	3.52	12.81	1.68	4.40	210.00	200	1.05	3.38	7.38	30.25	18.11	2.37	0.72	1.53	0.00	12.27	137	119	109	8
10	0.8	0.97	61.50	3.86	14.46	1.96	4.69	210.00	182	1.19	3.57	7.57	30.91	18.11	2.37	1.13	2.23	0.00	13.31	156	135	128	10
12	1.0	1.17	67.00	4.26	16.14	2.24	4.98	210.00	160	1.31	3.77	7.77	31.57	18.11	2.37	0.73	2.94	0.00	14.83	166	145	138	12
14	1.2	1.36	71.00	4.65	17.88	2.65	5.27	210.00	133	1.58	3.96	7.96	32.23	18.11	2.37	1.27	3.22	0.00	16.52	177	154	148	14
16	1.3	1.56	77.00	5.07	19.61	3.08	5.56	210.00	114	1.84	4.16	8.16	32.89	18.11	2.37	1.63	3.52	9.44	18.42	198	173	159	16
18	1.5	1.76	86.00	5.50	21.48	3.23	5.84	210.00	100	2.10	4.36	8.36	33.68	18.11	2.37	2.04	3.80	10.24	20.32	215	187	176	18
20	1.7	1.94	93.00	5.95	23.23	3.60	6.13	210.00	88	2.36	4.54	8.54	34.21	18.11	2.37	2.85	4.10	10.90	22.21	228	200	188	20
24	2.0	2.32	112.00	6.89	26.91	4.41	6.71	210.00	77	2.73	4.93	8.93	35.62	18.11	2.37	4.11	4.69	12.48	26.14	262	229	218	24
30	2.5	2.92	139.50	8.44	32.96	5.76	7.57	210.00	70	3.00	5.52	9.52	37.50	18.11	2.37	6.89	5.64	14.73	27.89	309	270	262	30
36	3.0	3.50	167.00	10.14	39.12	7.25	8.44	210.00	65	3.23	6.10	10.10	39.48	18.11	2.37	8.83	6.40	17.96	30.62	359	312	307	36

Reference: 2018 RS Means Heavy Construction Cost Data Updated by: JKN

Costs

$ 26.85	/CY Native Trench backfill - sec. 31 23 23.16 (0200): Fill by borrow [sand, dead or bank x 1.21 O&P] w/o materials (27.94+18.6)and convert from loose to compacted volume. $11.20/LCY * 1.39 LCY/ECY (see Note 5)
$ 50.05	/CY Imported Select Fill - sec. 31 23 23.16 (0200), 31 23 23.20 (4266), 31 23 23.23 (8050): Sand, dead or bank w/ hauling and compaction. ($33.50/LCY + $5.10/LCY)*1.39 LCY/ECY + $5.50/ECY (see Note 5)
$ 5.11	/CY Excavation - sec. 31 23.16.13 (6372): 10-14 ft deep, 1 CY excavator, Trench Box.
$ 30.42	/SY 4" Asphalt Pavement - sec. 32 11 23.23 (0390), 31 23 23.20 (4268), 32 12 16.13 (0120), 32 12 16.13 (0380): 9" Bank Run Gravel/Base Course ($7.10/SY), 2" Binder ($9.30/SY), 2" Wear ($10.40/SY [4"=$19.80/SY]) and Hauling [Item 4268] ($7.35/LCY * 1.39LCY/ECY * 0.361CY/SY) (see Note 5)
$ 2.63	/LF 4" Asphalt cutting - sec. 02 41 19.25 (0015, 0020): Saw cutting asphalt up to 3" deep ($1.68/LF), each additional inch of depth ($0.95/LF)
$ 1,811.32	/EA Service Lateral Connection (see Note 7)
$ 4,734.51	/EA Fire hydrant assembly including excavation and backfill (see Note 8)
$ 7.16	/CY Hauling - sec. 31 23 23.20 (4262): 20 CY dump truck, 6 mile round trip and conversion from loose to compacted volume. $4.13/LCY * 1.39 LCY/ECY (see Note 5)
$ 210.00	/day Trench Box - sec. 31 52 16.10 (4500): 7' deep, 16' x 8'
$ 63.32	/CY Stabilization Gravel - sec. 31 23 23.16 (0050), 31 23 23.20 (4266), 31 23 23.23 (8050): Bank Run Gravel ($36.50/LCY * 1.39 LCY/ECY) plus compaction ($5.50/ECY) and hauling ($5.10/LCY * 1.39 LCY/ECY) (see Note 5)
$ 1,152.00	/day Dewatering - sec. 31 23 19.20 (1000, 1020): 4" diaphram pump, 8 hrs attended ($1.025/day), Second pump ($127/day)

NOTES:

(1) Assumes: class 50, 18' lengths, tyton push-on joint for DIP (33 11 13.15 3000-3160); Pressure Pipe class 150, SDR 18, AWWA C900 for PVC <14" & AWWA C905, PR 100, DR 25 for 14" and larger (33 11 13.25 4520-4550 3030-3200); butt fusion joints SDR 21, 40' lengths for HDPE ().
DIP and HDPE costs only go up to 24". PVC costs only go up to 48". All costs for pipe larger than 48" are Prestressed Concrete pipe (PCCP), 150 psi, 24' length (Pg 315).

(2) 7' deep trench box (16' x 8') - on page 263

(3) Backfill Material & Installation assumes by sheet. For out of street unit costs, the backfill material cost has been added in place of base course and asphalt.

(4) Dewatering assumes 1" stabilization gravel at the bottom of the bench plus dewatering pumps

(5) Conversion from loose to compacted volumes assumes 125 PCF for compacted density and 90 PCF for loose density. Or (125 PCF/ECY)/(90 PCF/LCY) = 1.39 LCY/ECY

(6) Conversion from cubic yards to square yards for hauling of asphalt paving assumed a total thickness of 13". 3 ft x 3 ft x (13 in)/(12 in/ft) = 0.361 CY/SY

(7) Service Lateral costs are based on Beaver Dam short and long service connections average ($1,660.98/connection), with 45.40 for curb replacement, 40.20 for sidewalk replacement, and 158.19 for additional asphalt all added to the short service connection. Used historical cost index to update to current dollars.

(8) Fire Hydrant assembly costs are based on Beaver Dam Water Projects plus 45.40 for curb replacement and 158.19 for additional asphalt ($4341.55 per FH). Used historical cost index to update to current dollars.

(9) Conflicts amounted to be 2% of the cost on the Springville 400 South Pipeline project. Use 5% of total cost per ft.

(10) Joint Restraint has NOT been included in this spreadsheet.

Abbreviations:

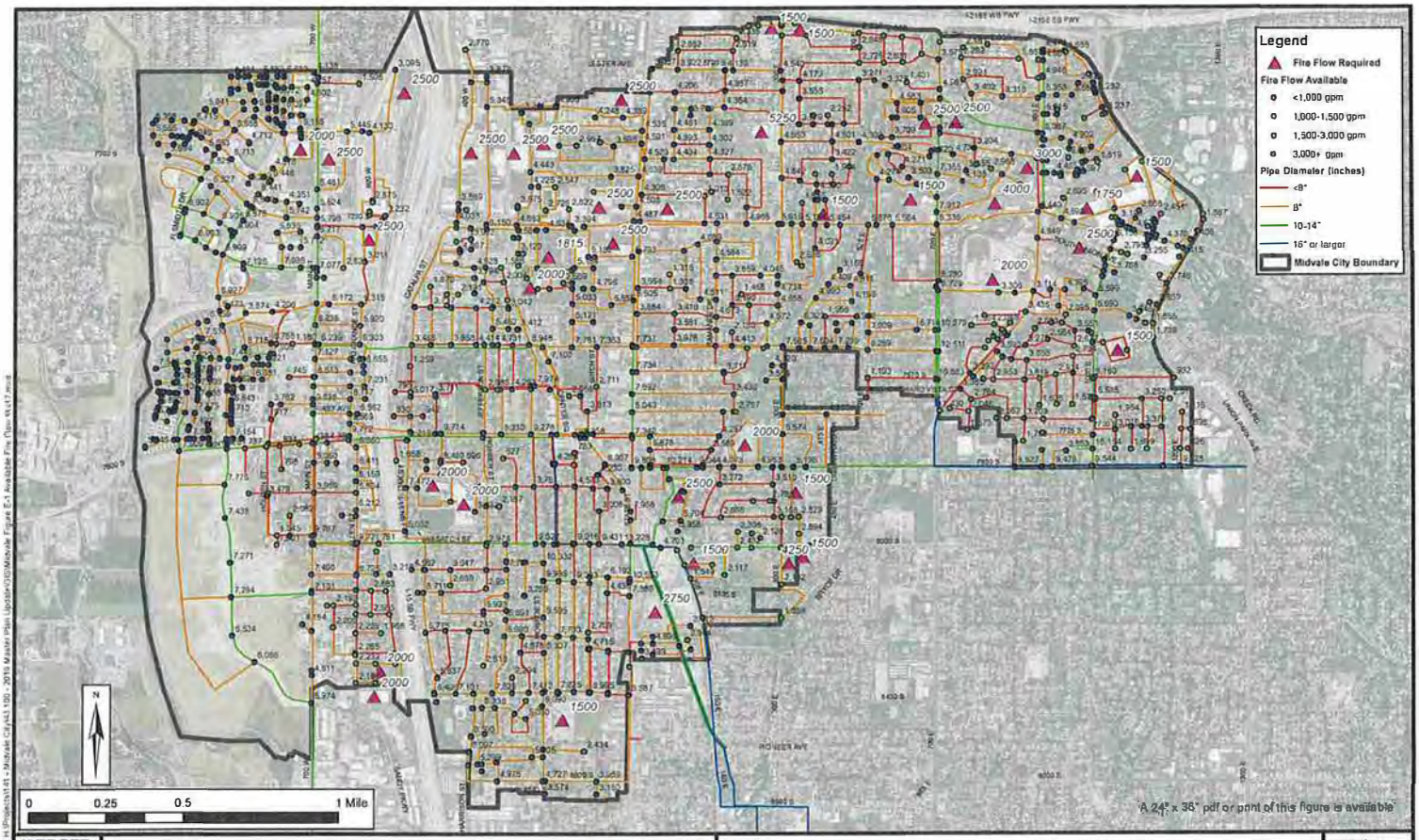
VLF	vertical linear foot
PCF	pounds per cubic foot
LCY	loose cubic yard
ECY	embankment cubic yard

Utah City Cost Indices

SLC	88.5
Ogden	85.8
Logan	87
Price	85
Provo	87.2

APPENDIX E
Available Fire Flow (Existing System)

THIS PAGE INTENTIONALLY LEFT BLANK



HANSEN ALLEN & LUCE INC ENGINEERS	MIDVALE CITY DRINKING WATER SYSTEM	EXISTING SYSTEM AVAILABLE FIRE FLOW

FIGURE E-1

APPENDIX F
InfoWater Hydraulic Models (Compact disc)

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX G
Checklist for Hydraulic Model Design Elements Report

THIS PAGE INTENTIONALLY LEFT BLANK

CHECKLIST FOR HYDRAULIC MODEL DESIGN ELEMENTS REPORT

The hydraulic model checklist below identifies the components included in the Hydraulic Model Design Elements Report for

Midvale City Drinking Water Master Plan
(Project Name or Description)

1093
(Water System Number)

Midvale City Public Water System
(Water System Name)

April 24, 2020
(Date)

The checkmarks and/or P.E. initials after each item indicate the conditions supporting P.E. Certification of this Report.

1. The Report contains:

(a) A listing of sources including: the source name, the source type (i.e., well, spring, reservoir, stream etc.) for both existing sources and additional sources identified as needed for system expansion, the minimum reliable flow of the source in gallons per minute, the status of the water right and the flow capacity of the water right. *[R309-110-4 "Master Plan" definition]* ☒ KJ

(b) A listing of storage facilities including: the storage tank name, the type of material (i.e., steel, concrete etc.), the diameter, the total volume in gallons, and the elevation of the overflow, the lowest level (elevation) of the equalization volume, the fire suppression volume, and the emergency volume or the outlet. *[R309-110-4 "Master Plan" definition]* ☒ KJ

(c) A listing of pump stations including: the pump station name and the pumping capacity in gallons per minute. Under this requirement one does not need to list well pump stations as they are provided in requirement (a) above. *[R309-110-4 "Master Plan" definition]* ☒ KJ

(d) A listing of the various pipeline sizes within the distribution system with their associated pipe materials and, if readily available, the approximate length of pipe in each size and material category. A schematic of the distribution piping showing node points, elevations, length and size of lines, pressure zones, demands, and coefficients used for the hydraulic analysis required by (h) below will suffice. *[R309-110-4 "Master Plan" definition]* ☒ KJ

(e) A listing by customer type (i.e., single family residence, 40 unit condominium complex, elementary school, junior high school, high school, hospital, post office, industry, commercial etc.) along with an assessment of their associated number of ERCs. *[R309-110-4 "Master Plan" definition]* ☒ KJ

(f) The number of connections along with their associated ERC value that the public drinking water system is committed to serve, but has not yet physically connected to the infrastructure. *[R309-110-4 "Master Plan" definition]* ☒ KJ

(g) A description of the nature and extent of the area currently served by the water system and a plan of action to control addition of new service connections or expansion of the public drinking water system to serve new development(s). The plan shall include current number of service connections and water usage as well as land use projections and forecasts of future water usage. *[R309-110-4 "Master Plan" definition]* ☒ KJ

(h) A hydraulic analysis of the existing distribution system along with any proposed distribution system expansion identified in (g) above. *[R309-110-4 "Master Plan" definition]* ☒ KJ

(i) A description of potential alternatives to manage system growth, including interconnections with other existing public drinking water systems, developer responsibilities and requirements, water rights issues, source and storage capacity issues and distribution issues. *[R309-110-4 "Master Plan" definition]* ☒ KJ

2. At least 80% of the total pipe lengths in the distribution system affected by the proposed project are included in the model. *[R309-511-5(1)]* ☒ KJ

3. 100% of the flow in the distribution system affected by the proposed project is included in the model. If customer usage in the system is metered, water demand allocations in the model account for at least 80% of the flow delivered by the distribution system affected by the proposed project. *[R309-511-5(2)]* ☒ KJ

4. All 8-inch diameter and larger pipes are included in the model. Pipes smaller than 8-inch diameter are also included if they connect pressure zones, storage facilities, major demand areas, pumps, and control valves, or if they are known or expected to be significant conveyers of water such as fire suppression demand. *[R309-511-5(3)]* ☒ KJ

5. All pipes serving areas at higher elevations, dead ends, remote areas of a distribution system, and areas with known under-sized pipelines are included in the model. *[R309-511-5(4)]* ☒ KJ

6. All storage facilities and accompanying controls or settings applied to govern the open/closed status of the facility for standard operations are included in the model. *[R309-511-5(5)]* ☒ KJ

7. Any applicable pump stations, drivers (constant or variable speed), and accompanying controls and settings applied to govern their on/off/speed status for various operating conditions and drivers are included in the model. *[R309-511-5(6)]* ☒ KJ

8. Any control valves or other system features that could significantly affect the flow of water through the distribution system (i.e. interconnections with other systems, pressure reducing valves between pressure zones) for various operating conditions are included in the model. *[R309-511-5(7)]* ☒ KJ

9. Imposed peak day and peak instantaneous demands to the water system's facilities are included in the model. The Hydraulic Model Design Elements Report explains which of the Rule-recognized standards for peak day and peak instantaneous demands are implemented in the model (i.e., (i) peak day and peak instantaneous demand values per *R309-510, Minimum Sizing Requirements*, (ii) reduced peak day and peak instantaneous demand values approved by the Director per *R309-510-5, Reduction of Sizing Requirements*, or (iii) peak day and peak instantaneous demand values expected by the water system in excess of the values in *R309-510, Minimum Sizing Requirements*). The Hydraulic Model Design Elements Report explains the multiple model simulations to account for the varying water demand conditions, or it clearly explains why such simulations are not included in the model. The Hydraulic Model Design Elements Report explains the extended period simulations in the model needed to evaluate changes in operating conditions over time, or it clearly explains (e.g., in the context of the water system, the extent of anticipated fire event, or the nature of the new expansion) why such simulations are not included in the model. *[R309-511-5(8) & R309-511-6(1)(b)]* ☒ KJ

10. The hydraulic model incorporates the appropriate demand requirements as specified in *R309-510, Minimum Sizing Requirements*, and *R309-511, Hydraulic Modeling Requirements*, in the evaluation of various operating conditions of the public drinking water system. The Report includes:
    - the methodology used for calculating demand and allocating it to the model;
    - a summary of pipe length by diameter;
    - a hydraulic schematic of the distribution piping showing pressure zones, general pipe connectivity between facilities and pressure zones, storage, elevation, and sources; and
    - a list or ranges of values of friction coefficient used in the hydraulic model according to pipe material and condition in the system. In accordance with

Rule stipulation, all coefficients of friction used in the hydraulic analysis are consistent with standard practices.
[R309-511-7(4)] ☒ KJ

11. The Hydraulic Model Design Elements Report documents the calibration methodology used for the hydraulic model and quantitative summary of the calibration results (i.e., comparison tables or graphs). The hydraulic model is sufficiently accurate to represent conditions likely to be experienced in the water delivery system. The model is calibrated to adequately represent the actual field conditions using field measurements and observations. *[R309-511-4(2)(b), R309-511-5(9), R309-511-6(1)(e) & R309-511-7(7)]* ☒ KJ

12. The Hydraulic Model Design Elements Report includes a statement regarding whether fire hydrants exist within the system. Where fire hydrants are connected to the distribution system, the model incorporates required fire suppression flow standards. The statement that appears in the Report also identifies the local fire authority's name, address, and contact information, as well as the standards for fire flow and duration explicitly adopted from *R309-510-9(4), Fireflow*, or alternatively established by the local fire suppression agency, pursuant to *R309-510-9(4), Fireflow*. The Hydraulic Model Design Elements Report explains if a steady-state model was deemed sufficient for residential fire suppression demand, or acknowledges that significant fire suppression demand warrants extended model simulations and explains the run time used in the simulations for the period of the anticipated fire event. *[R309-511-5(10) & R309-511-7(5)]* ☒ KJ

13. If the public drinking water system provides water for outdoor use, the Report describes the criteria used to estimate this demand. If the irrigation demand map in *R309-510-7(3), Irrigation Use,* is not used, the report provides justification for the alternative demands used in the model. If the irrigation demands are based on the map in *R309-510-7(3), Irrigation Use,* the Report identifies the irrigation zone number, a statement and/or map of how the irrigated acreage is spatially distributed, and the total estimated irrigated acreage. The indicated irrigation demands are used in the model simulations in accordance with Rule stipulation. The model accounts for outdoor water use, such as irrigation, if the drinking water system supplies water for outdoor use. *[R309-511-5(11) & R309-511-7(1)]* ☒ KJ

14. The Report states the total number of connections served by the water system including existing connections and anticipated new connections served by the water system after completion of the construction of the project. *[R309-511-7(2)]* ☒ KJ

15. The Report states the total number of equivalent residential connections (ERC) including both existing connections as well as anticipated new connections associated with the project. In accordance with Rule stipulation, the number of ERC's includes high as well as low volume water users. In accordance with Rule

stipulation, the determination of the equivalent residential connections is based on flow requirements using the anticipated demand as outlined in *R309-510, Minimum Sizing Requirements*, or is based on alternative sources of information that are deemed acceptable by the Director. *[R309-511-7(3)]* ☒ KJ

16. The Report identifies the locations of the lowest pressures within the distribution system, and areas identified by the hydraulic model as not meeting each scenario of the minimum pressure requirements in *R309-105-9, Minimum Water Pressure*. *[R309-511-7(6)]* ☒ KJ

17. The Hydraulic Model Design Elements Report identifies the hydraulic modeling method, and if computer software was used, the Report identifies the software name and version used. *[R309-511-6(1)(f)]* ☒ KJ

18. For community water system models, the community water system management has been provided with a copy of input and output data for the hydraulic model with the simulation that shows the worst case results in terms of water system pressure and flow. *[R309-511-6(2)(c)]* ☒ KJ

19. The hydraulic model predicts that new construction will not result in any service connection within the new expansion area not meeting the minimum distribution system pressures as specified in *R309-105-9, Minimum Water Pressure*. *[R309-511-6(1)(c)]* ☒ KJ

20. The hydraulic model predicts that new construction will not decrease the pressures within the existing water system such that the minimum pressures as specified in *R309-105-9, Minimum Water Pressure* are not met. *[R309-511-6(1)(d)]* ☒ KJ

21. The velocities in the model are not excessive and are within industry standards. ☒ KJ

THIS PAGE INTENTIONALLY LEFT BLANK

Appendix D

Ordinance Adopting the Jordan Valley Water Conservancy District's Water Efficiency Standards

Exhibit A – Ordinance

MIDVALE CITY

ORDINANCE NO. 2024-O-12

AN ORDINANCE CREATING CHAPTER 17-6 OF THE MIDVALE CITY MUNICIPAL CODE AND ENACTING THE JORDAN VALLEY WATER CONSERVANCY DISTRICT'S WATER EFFICIENCY STANDARDS.

WHEREAS, pursuant to Utah Code Annotated Sections 10-8-84 and 10-9a-501 through 10-9a-503, Midvale City ("the City") has authority to make and amend any regulation of or within zoning districts or any other provision of the land use ordinance to promote the prosperity, improve the morals, peace and good order, comfort, convenience, and aesthetics of the municipality; and

WHEREAS, on January 2, 2002, the Midvale City Zoning Ordinance, Title 17 of the Midvale City Municipal Code (the "Code"), became effective and is subject to amendments from time to time pursuant to Section 17-3-1 the Code; and

WHEREAS, pursuant to Section 17-1-1 of the Code, the City desires to promote coordinated development, redevelopment, effective use of land, and site planning; protect and promote public safety, health, and general welfare by providing adequate light and air, water and sewage control, police, fire and wetlands protection; and secure economy in governmental expenditures; and

WHEREAS, the City desires to create Chapter 17-6 to add supplementary regulations that have a general applicability across multiple zones; and

WHEREAS, the City desires to implement water conservation standards for the benefit of the City, its residents, and the State; and

WHEREAS, Utah Code Ann. § 73-10-37 and Utah Administrative Code R653-11 also require the City to adopt Jordan Valley Water Conservancy District's (JVWCD) Water Efficiency Standards in order for its residents to be eligible for landscaping conversion incentives; and

WHEREAS, the City wants its residents to eligible for landscaping conversion incentives; and

WHEREAS, the JVWCD Water Efficiency Standards have general applicability across multiple zones; and

WHEREAS, the Planning Commission held a public hearing on April 10, 2024, to review the request for text amendments and, after considering all the information received, made a recommendation to approve the text amendments to the City Council; and

WHEREAS, the City Council of Midvale City, Utah held a public hearing on April 16, 2024; and

WHEREAS, after taking into consideration citizen testimony, planning analysis, and the Planning Commission's recommendation as part of its deliberations, the City Council finds it is appropriate and within the best interest of the City to enact Chapter 17-6 to provide supplementary regulations that have a general applicability across multiple zones and to adopt JVWCD's Water Efficiency Standards.

NOW, THEREFORE, BE IT ORDAINED by the City Council of Midvale City, Utah, as follows:

Section 1. The following chapter of the Midvale City Municipal Code is hereby enacted as included in the following attachment:

- Attachment A: Chapter 17-6 Supplementary Regulations

Section 2. A violation of this ordinance includes the possibility of fines or imprisonment. Midvale City is required, under Utah Code Annotated Section 78B-22-301, to provide for indigent legal defense, as that term is defined in Utah Code Annotated Section 78B-22-102.

Section 3. This ordinance is effective upon publication in accordance with Utah Code Annotated Section 10-3-711.

PASSED AND APPROVED this 7th day of May, 2024.

Marcus Stevenson, Mayor

SEAL

MIDVALE CITY STATE OF UTAH INCORPORATED JULY 1, 1909 CORPORATE SEAL

Voting by City Council	"Aye"	"Nay"
Bonnie Billings	✓	
Paul Glover	✓	
Heidi Robinson	✓	
Bryant Brown	✓	
Dustin Gettel	✓	

ATTEST:

Rori L. Andreason, MMC
City Recorder

Published this 8th day of May, 2024, on the Utah Public Notice Website.

Attachment A: Chapter 17-6 Supplementary Regulations

Chapter 17-6
Supplementary Regulations

Sections

17-6-1 Applicability of this Chapter

The intent of this section is to provide for miscellaneous land development standards which are applicable in Title 17. An individual is required to follow all applicable standards under Title 17. When a conflict exists between these supplementary regulations in Chapter 17-6 and an individual zone. the standards of the individual zone shall supersede these supplementary regulations unless otherwise stated.

17-6-2 Water Conservation Standards

All new landscaping in all zones in the City shall conform with the Jordan Valley Water Conservancy District Water Efficiency Standards as published on the District's website (jvwcd.org). This requirement shall supersede individual zone requirements notwithstanding Section 17-6-1.

JVWCD Water Efficiency Standards

WATER EFFICIENCY STANDARDS

1. Purpose
   The purpose of these Water Efficiency Standards is to conserve the public's water resources by establishing water conservation standards for indoor plumbing fixtures and outdoor landscaping.

2. Applicability
   The following standards shall be required for all developer/contractor installed residential, commercial, institutional, and industrial construction, as applicable. The Outdoor Landscaping Standards shall also be required for new landscaping construction installed by homeowners.

3. Indoor Fixture Requirements
   It is recommended and encouraged, but not mandated, that all new and future construction and future additions, remodels, or refurbishments install plumbing fixtures that have the WaterSense label, including: lavatory faucets, shower heads, sink faucets, water closets (tank and flushometer-valve toilets), and urinals, to the extent Utah law allows municipalities or local districts to require these fixtures.

4. Outdoor Landscaping Standards
   All new and rehabilitated landscaping for public agency projects, private development projects, developer-installed landscaping in multi-family and single-family residential projects within the front and side yards, and homeowner provided landscape improvements within the front and side yards of single and two-family dwellings shall comply with the landscaping standards below:

   Definitions

   A. Activity Zones: Portions of the landscape designed for recreation or function, such as storage areas, fire pits, vegetable gardens, and playgrounds.

   B. Active Recreation Areas: Areas of the landscape dedicated to active play where Lawn may be used as the playing surface (ex. sports fields and play areas).

   C. Central Open Shape: An unobstructed area that functions as the focal point of Localscapes and is designed in a shape that is geometric in nature.

   D. Gathering Areas: Portions of the landscape that are dedicated to congregating, such as patios, gazebos, decks, and other seating areas.

   E. Hardscape: Durable landscape materials, such as concrete, wood, pavers, stone, or compacted inorganic mulch.

F. Lawn: Ground that is covered with grass or turf that is regularly mowed.

G. Localscapes®: A landscaping approach designed to create locally adapted and sustainable landscapes through a basic 5-step approach (central open shape, gathering areas, activity zones, connecting pathways, and planting beds).

H. Mulch: Any material such as rock, bark, compost, wood chips or other materials left loose and applied to the soil.

I. Park Strip: A typically narrow landscaped area located between the back-of-curb and sidewalk.

J. Paths: Designed routes between landscape areas and features.

K. Planting Bed: Areas of the landscape that consist of plants, such as trees, ornamental grasses, shrubs, perennials, and other regionally appropriate plants.

L. Total Landscaped Area: Improved areas of the property that incorporate all of the completed features of the landscape. The landscape area does not include footprints of buildings or structures, sidewalks, driveways, and other non-irrigated areas intentionally left undeveloped.

5. Landscaping Requirements

A. All irrigation shall be appropriate for the designated plant material to achieve the highest water efficiency. Drip irrigation or bubblers shall be used except in Lawn areas. Drip irrigation systems shall be equipped with a pressure regulator, filter, flush-end assembly, and any other appropriate components.

B. Each irrigation valve shall irrigate landscaping with similar site, slope and soil conditions, and plant materials with similar watering needs. Lawn and Planting Beds shall be irrigated on separate irrigation valves. In addition, drip emitters and sprinklers shall be placed on separate irrigation valves.

C. Landscaped areas shall be provided with a WaterSense labeled smart irrigation controller which automatically adjusts the frequency and/or duration of irrigation events in response to changing weather conditions. All controllers shall be equipped with automatic rain delay or rain shut-off capabilities.

D. At least 3-4 inches of Mulch, permeable to air and water, shall be used in Planting Beds to control weeds and improve the appearance of the landscaping.

E. At maturity, landscapes are recommended to have enough plant material (perennials and shrubs) to create at least 50% living plant cover at maturity at the ground plane, not including tree canopies.

F. Lawn shall not be installed in Park Strips, Paths, or on slopes greater than 25% or 4:1 grade, and be less than 8 feet wide at its narrowest point. To the extent reasonably practicable, Lawn shall be free from obstructions (trees, signs, posts, valve boxes, etc.).

G. In residential landscapes, the landscaping shall adhere to the following Localscapes requirements:

   i. If size permits, the landscaped areas of the front yard and back yard shall include a designed Central Open Shape created by using Lawn, Hardscape, groundcover, gravel, or Mulch.
   ii. Gathering Areas shall be constructed of Hardscape and placed outside of the Central Open Shape. In a landscape without Lawn, Gathering Areas may function as the Central Open Shape.
   iii. Activity Zones shall be located outside of the Central Open Shape and shall be surfaced with materials other than Lawn.
   iv. Paths shall be made with materials that do not include Lawn, such as Hardscape, Mulch, or other groundcover.
   v. Lawn areas shall not exceed the greater of 250 square feet, or 35% of the Total Landscaped Area.
   vi. Small residential lots, which have no back yards, which the Total Landscaped Area is less than 250 square feet, and which the front yard dimensions cannot accommodate the minimum 8 feet wide Lawn area requirement of the Landscaping Requirements in section F, are exempt from the 8 feet minimum width Lawn area requirement.

H. In commercial, industrial, institutional, and multi-family development common area landscapes, Lawn areas shall not exceed 20% of the Total Landscaped Area, outside of Active Recreation Areas.

I. Certain special purpose landscape areas (e.g. stormwater management areas, etc.) may receive exceptions from the slope limitations and other elements of the Landscaping Requirements (see Paragraph F, above). Applications to receive exceptions are to be considered on a case-by-case basis.

J. These outdoor standards are not intended to be in conflict with other landscaping requirements as defined by Utah law, including stormwater retention requirements and low-impact development guidelines. Notwithstanding these outdoor standards, whenever any requirement may be in conflict with Utah law, such conflicting requirements shall not apply.

Appendix E

Street Tree Selection Guide

Midvale, Utah
Street Tree Selection Guide

Document issued January 2025

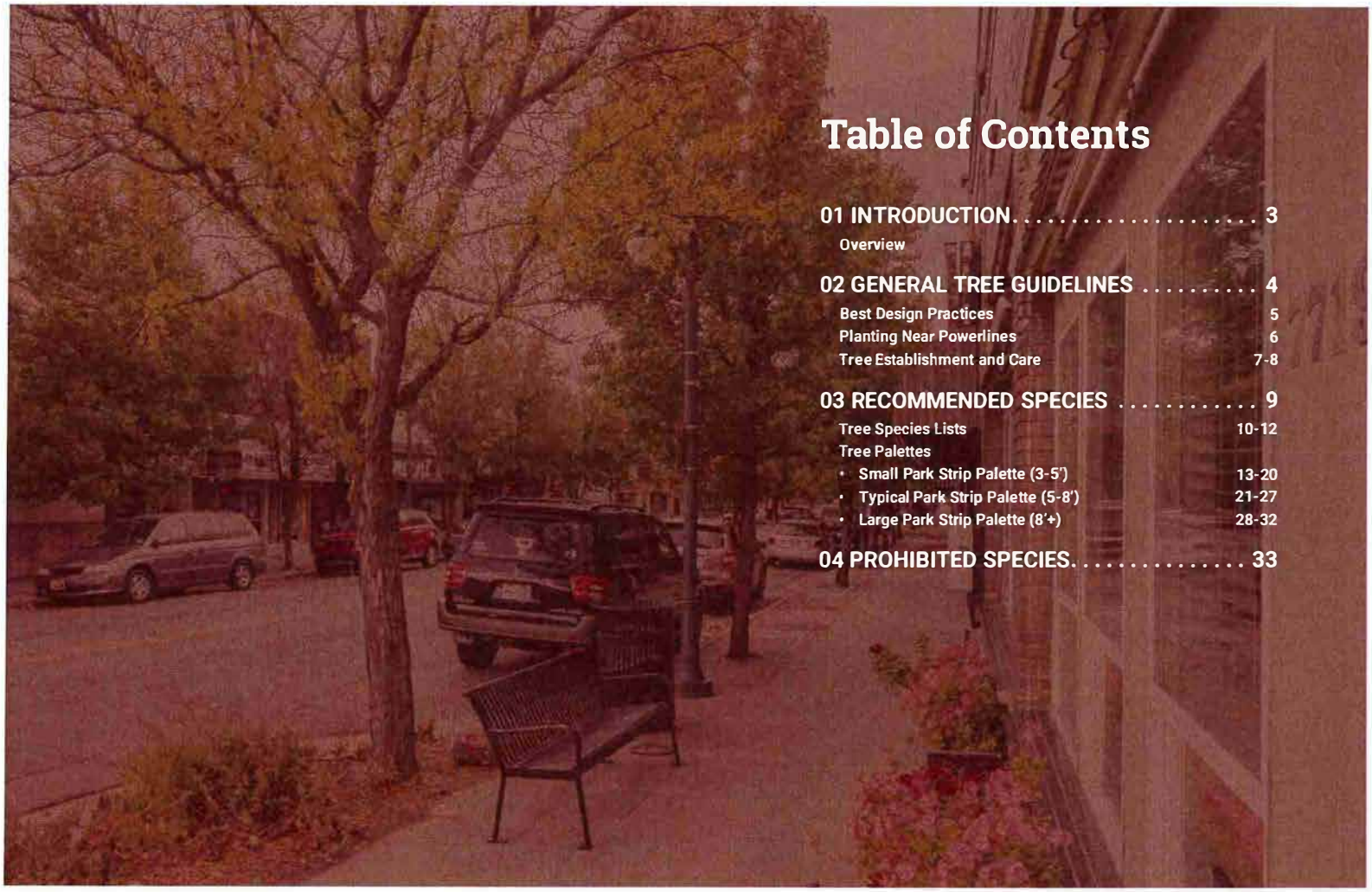


Table of Contents

01 Introduction

Overview

This document serves as a comprehensive resource for Midvale City staff, residents, developers, business owners, and other stakeholders, providing essential guidance on the selection, placement, and care of trees that are both attractive and suitable for Midvale's streetscape. The guidelines and standards outlined herein are designed to foster the development of a thriving, resilient, and diverse street tree canopy that significantly enhances the city's ecological, aesthetic, and social value. By following these recommendations, all members of the community can contribute to the creation of a greener, more vibrant Midvale.

02
General Tree Guidelines

General Notes

- This section provides practical guides for tree placement, planting, irrigation, and maintenance that ensures urban forestry success while minimizing conflicts with infrastructure.

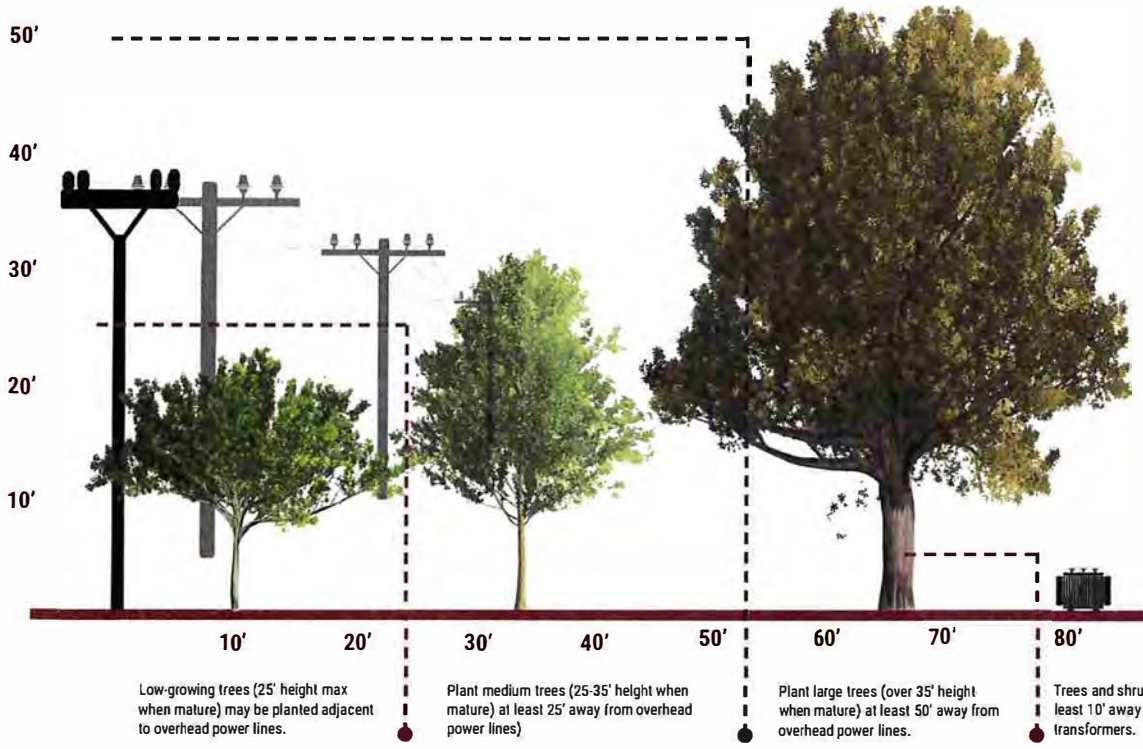
- This information serves as a general guideline for tree placement, selection, and care. Specific requirements and solutions should be determined on a project-by-project basis, taking into account site conditions, local regulations, and expert input. Always consult with a qualified professional for detailed project planning implementation.

Best Design Practices

General guidelines for successful integration of trees into the urban landscape

Planting Near Power Lines

Tips for planting trees near power lines to reduce the need for future pruning

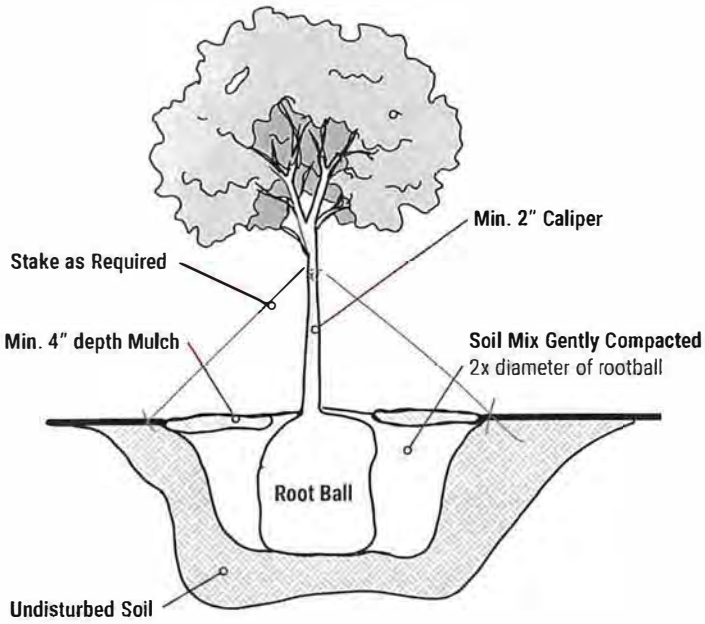


Tree Establishment and Care

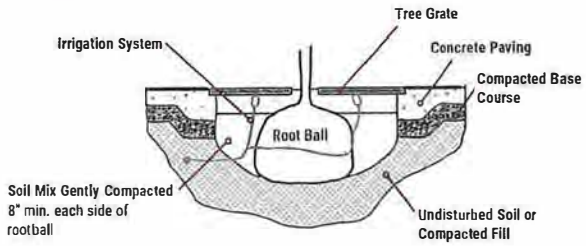
General criteria for successful integration of trees into the urban landscape

INSTALLATION AND PLANTING

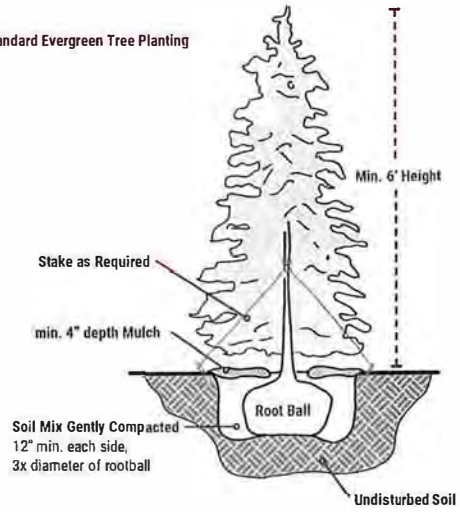
Standard Deciduous Tree Planting



Planting in Tree Grate



Standard Evergreen Tree Planting



TRIMMING AND PRUNING

Municipal Requirements

- Usually responsibility falls to city maintenance crews for public trees and property owners for private trees.

Best Practices

- For shade trees, leave enough clearance for people and vehicles to pass under.
- Help the tree establish a single leader.
- Remove dead, diseased, or damaged branches.
- Thin out dense growth to allow light, air, and rain to reach the interior of the tree.
- Remove V-shaped crotches as these can be a safety hazard and threaten the tree's health.

PESTS AND DISEASE

Best Practices

- Maintain tree health and resistance with proper watering and pruning, applying treatments as needed, and using integrated pest management (IPM) techniques to minimize chemical use.
- While some trees can get some of these pests and other diseases, they are not always fatal or threatening to the overall health of the tree. Asses the overall condition of the tree, or consult an arborist before seeking chemical treatment.
- Pests and disease to keep an eye out for in Midvale are:

STREET TREES

Municipal Requirements.

- Street tree species shall be selected according to the conditions of the park strip size shown in tables.
- A certified arborist may recommend species to be approved by the city on a per-project basis.

IRRIGATION AND WATER EFFICIENCY

Municipal Irrigation Standards Summary

- **Tree Irrigation: Provide drop emitters or bubblers for each tree; bubblers should not exceed 1.5 gallons per min.**
- Zone separation: Trees in turf areas should have separate irrigation zones for efficient water use.
- Runoff Control: On slopes, use low-precipitation systems like drip emitters to reduce runoff and improve water absorption.
- Detailed Plans: Include tree-specific irrigation needs in landscape plans, such as emitter placement and flow rates, to ensure proper watering.

03 Recommended Species

General Notes

- **This section outlines the recommended tree species selection for urban and street planting based on planter size, site conditions, and tree character.**
- **Some species listed include specific recommended cultivars chosen for their urban adaptability, size control, and growth habits, which may vary significantly in size compared to the species average. Always verify cultivar-specific details with local nurseries or arborists to confirm suitability for intended site.**
- **Disclaimer* Tree growth and success depends on local conditions such as soil type, irrigation, and climate. Prior to selection, confirm planter dimensions and space for root systems, compatibility with utility clearance requirements, and environmental factors.**

Small Palette (3-5' Park Strip Size)

- Suitable for constrained spaces such as narrow parking strips.
- Mostly includes species that grow under 25' height and spread, with non-invasive root systems.
- Should also be used in typical park strips where utility barriers exist.

Typical Palette (5-8' Park Strip Size)

- Appropriate for most urban settings and park strips
- Trees from small palette may also be used where infrastructure/utility/ environmental barriers exist. Large palette trees may be used where viable.

Large Palette (8'+ Park Strip Size)

- Best suited for streets that have ample room for root and canopy expansion, as well as parks and open spaces.
- Many of these species are especially effective for providing shade to hot urban environments.

List of Recommended Species - Small Trees

Park Strip Size	Tree Species			Mature Tree Size		Shape	Water Use	Under Powerlines	Spacing	Special Considerations	Pg. #
	Botanical	Common	Cultivar	Height	Spread						
Small (3-5')	Acer ginnala	Amur Maple	Ginnala 'Flame'	15-20'	15-20'	roundspreading	low-med	Yes	15-20'	Known for fiery red fall color and adaptability. It is the most drought tolerant of the maple varieties. Tree should only be pruned in the summer after the leaves have fully developed for the season. Can developchlorosis in alkaline soils. Ideal for residential areas.	13
	Acer glabrum	Rocky Mountain Maple	NA	20-25'	15'-20'	upright oval	low		20-30'	Native to Utah, has great drought tolerance.	
	Acer griseum	Paperbark Maple	NA	20-25'	15-20'	upright oval	med		20-25'	Needs a protected site; does not transplant well when bare-rooted. Unique peeling bark. Requires rich, well-drained soils, nothighly drought-tolerant.	
	Acer grandidentatum	Bigtooth Maple	Rocky Mt. Glow, Mesa Glow, Highland Park	20-30'	20-30'	oval to round	low-med	No	20-30'	Native to Utah, well adapted tolocal climate.	14
	Acer tataricum	Tatarian Maple	Hot Wings, Pattern Perfect, Rugged Charm	15-25'	15-25'	oval to round		Yes	15-20'	Resilient to harsh urban environments. Watch for occasional aphids or leaf scorch during drought.	
	Amelanchier laevis	Allegheny Serviceberry	NA	20-25'	15-25'	oval to round	med		15-25'	Ideal for sites with good drainage, avoid compacted soils. Susceptible to powdery mildew in humid or crowded environments. Monitor for fireblight and rust.	
	Amelanchier x grandiflora	Autumn Brilliance Serviceberry	Autumn Brilliance	15-25'	15-25'	broad oval to round			15-25'	See above. Not as drought-tolerant as some species; supplementalwater may be needed during dry spells.	15
	Cercis canadensis	Eastern Redbud	Alba, Forest Pansy, Ruby Falls	15-25'	20-30'	irregular			20-25'	Tolerantof partial shade, protected site needed. Alba cultivar features white flowers. Forest pansy cultivar has purple leaves that are susceptible to leaf scorch in full sun.	
	Cornus mas	Cornelia Cherry Dogwood	Golden Glory	15-20'	15-20'	low branched/round			15-20'	Exfoliating bark, best used as a multi-stem, low-maintenance and pest-resistant.	
	Crataegus crus-galli var. inermis	Thornless Cockspur Hawthorn	Thornless Cockspur	20-30'	25-30'	round spreading	low-med	No	15-20'	var. inermis lacks thorns. Tolerates wide range of soils withgood drainage, light shade and some drought, and many urban pollutants. Like most Hawthorns, these are susceptible to some pests and diseases such has Cedar-Hawthorn Rust. Pruning is best done in dormant season.	16
	Crataegus laevigata	English Hawthorn	Crimson Cloud	20-25'	15-20'	broad round	med	Yes	15-20'	Moderate drought tolerance. Prefers moist, well-drained soils. Crimson cloud cultivar is resistant to rust but prone to fire blight. Requires occasional pruning of crossing branches.	
	Crataegus x mordenensis	Morden Hawthorn	Toba	15-20'	15-20'	upright spreading			15-20'	Has sharp thorns. Best pruned in late winter once threat of extreme cold has passed.	
	Malus spp.	Adirondack Crabapple	NA	10-18'	8-12'	upright vase	med	Yes	10-12'	Upright form ideal for narrow spaces. Slower growing than other malus spp., known for good disease resistance and heavy white flowering.	17
		Prairifire Crabapple		15-20'	15-25'	round			15-20'	Attractive deep pink flowers and dark red fruit, one of the most popular of crabapples known for its striking beauty. Semi diseaseresistant	
		Spring Snow Crabapple		20-25'	15-25'	round			20-25'	More cold tolerant than other malus spp. Fruitless cultivarwith white flowers, especially low maintenance. Note that it has scab susceptibility.	
	Quercus robur x alba	Streetspire Oak	Streetspire 'JFS-KW1QK'	40-45'	12-16'	Columnar	med	No	15-20'	Best powdery mildew resistance for more moist areas. Excellent street tree when pruned.	18
	Quercus x warei 'Nadler'	Kindred Spirit Oak	Kindred Spirit 'Nadler'	35-60'	8-12'	narrow columnar	med		10-15'	Good mildew resistance, and is a sister seedling to 'regal prince', but is more tight and narrow and slower growing.	
	Syringa reticulata	Japanese Tree Lilac	Ivory Silk	20-25'	15-20'	uprightoval/round	low-med	Yes	15-20'	Attracts hummingbirds and butterflies, flowering, fragrant. Form makes for excellent street tree use.	
	Tilia cordata	Littleleaf Linden	SummerSprite	18-20'	12-15'	dense pyramidal	med		15-20'	Summer sprite cultivaris necessary for small park strip size andplanting under powerlines, and is ideal for confined spaces due to minimal canopy spread.	19
	Zelkova serrata	Japanese Zelkova	City Sprite	25-30'	15-20'	compactoval to vase		No	20-25'	Compact, upright growth ideal for narrow park strips without vertical restrictions. Minimal pruning needed.	
			Wireless	20-24'	30-35'	flat topped broad spreading		Yes	25-35'	Broad, low canopy design especially ideal under utility lines. Ideal for shade without verticalgrowth. May requiremore space toaccount for horizonal spreadinterference withinfrastructure or streets.	

List of Recommended Species - Medium Trees

Park Strip Size	Tree Species			Mature Tree Size		Shape	Water Use	Under Powerlines	Spacing	Special Considerations	Pg. #
	TREES FROM SMALL PALETTE MAY ALSO BE USED IN (5-8') PARK STRIPS, ESP. WHERE POWERLINES, UTILITIES, AND NARROW CORRIDORS EXIST.										
Medium Typ	Acer campestre	Hedge Maple	NA	25-35'	25-35'	oval/roundad, dense	low-med	No	25-35'	Compact and resistent	23
	Acer miyabei	Miyabe Maple	State Street	30-35'	30-35'	oval to round	low-med		30-35'	Hardy and pest resistent.	
	Acer negundo 'sensation'	Sensation Boxelder	Sensation	30-45'	25-30'	upright oval	low-med		25-35'	Male cultivar eliminates seed production. Avoid planting in overly wet soils.	
	Aesculus x carnea	Red Horsechesbrut	NA	30-40'	25-35'	oval to round	med		25-35'	Prefers well-drained soil	22
	Alnus glutinosa	European Alder		40-50'	20-40'	pyramidal	med-high		20-40'	Adapts to wet/poorly drained soils, fast growing and nitrogen fixing properties improves soil quality	
	Corylus colurna	Turkish Filbert		40-50'	20-30'	pyramidal to oval	med		20-30'	Highly rated street tree.	
	Crataegus ambigua	Russian Hawthorn		15-25'	15-20'	round	low-med	Yes	15-20'	Occasional spring thinning and summer trimming back suckers at base.	23
	Gleditsia triacanthos	Honeylocust	Shademaster, Skyline	25-50'	20-40'	pyramidal to round	low-med	No	20-40'	Provides filtered shade, avoid overplanting in areas with existing honeylocusts, fast growing. Skyline cultivar is most popular cultivar for it's form at all stages of growth that provide good traffic clearance.	
	Koelreuteria paniculata	Goldenrain Tree	All	30-40'	30-40'	round	low-med		30-40'	May reseed aggressively in some regions. 'Fastigiata' cultivar is narrow and good for narrow street tree applications, but other forms are broad-spreading and are well suited for roadside plantings and broad interchanges.	
			Fastigiata	20-25'	8-10'	narrow upright	low-med		10-15'		
	Maclura pomifera	Osage Orange Maackia	White shield, wichita	30-35'	30-35'	upright spreading	low-med		30-45'	Use 'white shield' and 'wichita' male thornless and fruitless cultivars to minimize maintenance. Extremely tough and drought-tolerant once established. They may require some pruning to maintain street tree clearance.	24
	Malus spp.	Various Crabapple	Various	Varies	Varies	Varies	Varies	Yes	Varies	See small palette recommendations	
	Ostrya virginiana	American Hophornbeam	Autumn treasure	25-40'	20-30'	oval to round	med	No	20-30'	Prefers moist, well-drained soils. Sensitive to transplanting, tough once established. Compatible with streets and urban soils, but seedlings are variable and may have low-hanging branches so look to recommended cultivars for street tree use.	
	Phellodendron amurense	Amur Corktree	His Majesty, Eye Stopper	30-45'	30-60'	round, broad spreading	low-med		30-60'	Plant male cultivars to avoid messy fruit. Can grow to be quite large and may require more space in optimal conditions.	
	Prunus padus	European Birdcherry	Albertii, Summer glow, Merlot	30-40'	15-30'	pyramidal to round	med		15-30'	Avoid overly wet soils. Many cultivars are low-branched and wide, but more upright cultivars such as 'Albertii', and 'Merlot' are good for street tree application.	25
	Pyrus calleryana	Callery Pear	Chanticleer, Aristocrat	30-50'	20-35'	upright to round	med		20-35'	Tolerant of urban pollution and alkaline soils. Avoid overplanting due to weak branching in mature tree. some breakage is inevitable. Widely used as a small to medium street tree. 'Chanticleer' cultivar is strongly recommended, and 'Aristocrat' as second option where a broader form is desired.	
	Pyrus ussuriensis	Ussurian Pear	Ballfrost	20-30'	15-20'	oval to round	med		15-20'	Cold-hardy, urban-tolerant ornamental pear with less breakage than Pyrus calleryana. However, for use as a street tree requires more width and pruning in most locations. If available, 'Ballfrost' is narrower cultivar and better street tree.	
	Quercus robur f. fastigiata	Columnar English Oak	Columnaris 'Fastigiata'	50-60'	10-15'	columnar	med		10-15'	Columnaris has narrower form suitable for smaller spaces. Prefers well-drained soils and full sun. Use as a hedge or screening tree where wide branching is a concern.	26
	Quercus robur x bicolor	Regal Prince Oak	Regal Prince 'long'	40-45'	15-20'	narrow columnar	med		15-20'	Narrow and tolerant of many soil conditions, noted for having excellent resistance to powdery mildew and borers.	
	Quercus robur x Quercus alba	Crimson Spire Oak	Crimschmidt	40-45'	15-20'	Columnar	med		15-20'	Ideal for tight urban spaces. Has powdery mildew resistance for more moist areas, and is known for its strong growth.	
	Ulmus parvifolia	Lacebark Elm	Frontier	30-50'	20-30'	upright, vase to broad oval	low-med		20-30'	Upright, compact form for restrained urban corridors, 'Frontier' cultivar is a hybrid between U. minor and U. parvifolia.	27

List of Recommended Species - Large Trees

Park Strip Size	Tree Species			Mature Tree Size		Shape	Water Use	Under Powerlines	Spacing	Special Considerations	Pg. #
	Botanical	Common	Cultivars	Height	Spread						
Large (8'+)	Ginkgo biloba	Ginkgo Tree	Autumn Gold, Princeton Sentry	40-55'	20-30'	pyramidal	low-med	No	20-30'	Known for its beauty and adaptability to all soils exept for constantly-wet soils. Male cultivars recommended to avoid messy fruit.	28
	Gymnocladus dioicus	Kentucky Coffeetree	Espresso, Prarie Titan	35-50'	15-25'	oval to upright	low-med		20-30'	Drought tolerant, pods may be messy. Growth habit makes for excellent street tree applications. These seedless cultivars give reliable shape and low maintenance.	
	Liquidambar styraciflua	American Sweetgum	Emerald Sentinel	25-60'	15-40'	pyramidal to round	med-high		15-40'	Requires well drained soils, prone to leaf spot and cankers. Best is open, sunny locations. Recommended cultivars for street tree use is 'Emerat Sentinel', and seed grown trees can be used along roadsides. Roots are among the worst for lifting concrete, so at least 8' planter strips are needed. Note than big size and spacing range includes all cultivar options, plant accordingly.	
	Liriodendron tulipifera	Tuliptree	Emerald City	50-55'	25-30'	pyramidal	med		25-30'	Fast growing. Prefers moist, deep, well-drained soils; susceptible to various pests. 'Emerald city' cultivar is the only one suitable for city-sized landscapes.	29
	Platanus x acerifolia	London Planetree	Exclamation	50-75'	35-50'	oval to round			35-50'	Highly resistent to urban poilution and pests, adaptable to most soils, but anthracnose is a concern. For street tree applications, give it root and crown space, and allow for a potential 5' trunk diameter. It is one of the best large canopy street trees.	
	Quercus bicolor	Swamp White Oak	NA	40-60'	35-45'	round	pyramidal to round		45-50'	Extremely drought tolerant once established, great choice for hot parking islands.	30
	Quercus imbricaria	Shingle Oak		40-60'	35-50'		med		35-50'	Tolerates alkaline soils. Foliage persists throughout winter, which is subjectively desirable and undesirable.	
	Quercus macrocarpa	Bur Oak	Urban Pinnacle	50-60'	40-50'	round	low-med		45-50'	Tolerates drought, poor soils, and urban environments. Urban pinnacle cultivar is narrow and ideal for tight spaces, and produces smaller acorns.	
	Quercus robur	English Oak	NA	50-70'	50-70'	round	med		70-75'	Tolerates various soils. Slow growingbut long-lived. May require larger space due to wide canopy. Better suited for parks instead of street corridors. Narrow columnar hybrids are better suited for street tree use.	31
	Tilia tomentosa	Silver Linden	Sterling Silver	60-65'	30-35'	broad pyramidal to oval			30-35'	Can be prone to aphid infestations, but is the most resistant of all linden. Provides excellent shade and is an effective street tree where there is room for its large and broad form. The tomentose foliage gives it aphid resistance, as opposed to to other lindens that drip sticky aphid honeydew.	
	Ulmus davidiana	David Elm	Greenstone 'JFS-KW2UD'	45-50'	35-40'	upright vase			40-45'	Greenstone cultivar is resistent to Dutch Elm disease and pests. Use where high overhead canopy is desired, as a shade tree, in parking lots and plazas.	
	Ulmus davidiana var. japonica	Accolade Elm	NA	50-60'	30-40'	vase			40-45'	Accolade cultivar is resistent to Dutch Elm disease and pests.	32
	Ulmus 'New Horizon'	New Horizon Elm		35-45'	20-30'	upright vase			40-45'	New horizon cultivar is resistent to Dutch Elm disease and pests. Fast growing with narrow form. May be susceptible to elm leaf beetle.	
	Ulmus 'Morton Glossy'	Triumph Elm		50-60'	40-50'	round to vase			50-55'	Triumph cultivar is resistentto Dutch Elm disease.	

Spreading Columnar Weeping Round Oval Vase Pyramidal

Small Park Strip Palette (3-5')

Tree palette for 3-5' parking strips and confined spaces with utility barriers

Botanical Name:: Acer ginnala

Common Name: : Amur Maple

Recommended Cultivars: 'Flame'

Mature Size: 15-20' height, 15-20' spread

Water Needs: low-med,

Spacing: 15-20'

Special Considerations: Known for fiery red fall color and adaptability. It is the most drought tolerant of the maple varieties. Tree should only be pruned in the summer after the leaves have fully developed for the season. Can develop chlorosis in alkaline soils. Ideal for residential areas.

Botanical Name: : Acer glabrum

Common Name: : Rocky Mountain Maple

Recommended Cultivars: NA

Mature Size: 20-25' height, 15-20' spread

Water Needs: low

Spacing: 20-30'

Special Considerations: Native to Utah, has great drought tolerance but prefers filtered shade in the landscape.

Botanical Name: : Acer griseum

Common Name: : Paperbark Maple

Recommended Cultivars: NA

Mature Size: 20-25' height, 15-20' spread

Water Needs: med,

Spacing: 20-25'

Special Considerations: Needs a protected site; does not transplant well when bare-rooted. Unique peeling bark. Requires rich, well-drained soils, not highly drought-tolerant.

Botanical Name: : Acer grandidentatum

Common Name: : Bigtooth Maple

Recommended Cultivars: Rocky Mt. Glow, Mesa Glow, Highland Park

Mature Size: 20-30' height, 20-30' spread

Water Needs: low-med,

Spacing: 20-30'

Special Considerations: Native to Utah. In ideal conditions, may grow up to 40' tall. Rocky Mt. Glow cultivar is shown above.

Botanical Name: : Acer tataricum

Common Name: : Tatarian Maple

Recommended Cultivars: Hot Wings, Pattern Perfect, Rugged Charm

Mature Size: 15-25' height, 15-25' spread

Water Needs: low-med,

Spacing: 15-20'

Special Considerations: Resilient to harsh urban environments. Watch for occasional aphids or leaf scorch during drought. Hot Wings cultivar is shown above.

Botanical Name: : Amelanchier laevis

Common Name: : Allegheny Serviceberry

Recommended Cultivars: NA

Mature Size: 20-25' height, 15-25' spread

Water Needs: med

Spacing: 15-25'

Special Considerations: Ideal for sites with good drainage, avoid compacted soils. Susceptible to powdery mildew in humid or crowded environments. Monitor for fire blight and rust.

Botanical Name: : Amelanchier x grandiflora

Common Name: : Autumn Brilliance Serviceberry

Recommended Cultivars: Autumn Brilliance

Mature Size: 20-25' height, 15-25' spread

Water Needs: med

Spacing: 15-25'

Special Considerations: Similar to Allegheny Serviceberry, not as drought-tolerant as some species; supplemental water may be needed during dry spells. Their berries are edible and resemble blueberries.

Botanical Name: : Cercis canadensis

Common Name: : Eastern Redbud

Recommended Cultivars: Alba, Forest Pansy

Mature Size: 15-25' height, 25-30' spread

Water Needs: med

Spacing: 20-25'

Special Considerations: Tolerant of partial shade, protected site needed. Alba cultivar features white flowers. Forest pansy cultivar has purple leaves that are susceptible to leaf scorch in full sun.

Botanical Name: : Cornus mas

Common Name: : Cornella Cherry Dogwood

Recommended Cultivars: Golden glory

Mature Size: 15-20' height, 15-20' spread

Water Needs: low-med

Spacing: 15-20'

Special Considerations: Exfoliating bark, has multi-stem and tree form options, low-maintenance and pest-resistant.

Botanical Name: : Crataegus crus-galli var. inermis

Common Name: : Thornless Cockspur Hawthorn

Recommended Cultivars: Crusader

Mature Size: 20-30' height, 25-30' spread

Water Needs: low-med

Spacing: 15-20'

Special Considerations: Tolerates wide range of soils with good drainage, light shade and some drought, and many urban pollutants. Like most Hawthorns, these are susceptible to some pests and diseases such has Cedar-Hawthorn Rust. Pruning is best done in dormant season.

Botanical Name: : Crataegus laevigata

Common Name: : English Hawthorn

Recommended Cultivars: Crimson Cloud

Mature Size: 20-25' height, 15-20' spread

Water Needs: med

Spacing: 15-20'

Special Considerations: Moderate drought tolerance. Prefers moist, well-drained soils. Crimson cloud cultivar is resistant to rust but prone to fire blight. Requires occasional pruning of crossing branches. Shown above is Crimson Cloud cultivar.

Botanical Name: : Crataegus x mordenensis

Common Name: : Morden Hawthorn

Recommended Cultivars: Toba

Mature Size: 15-20' height, 15-20' spread

Water Needs: low-med

Spacing: 15-20'

Special Considerations: Has sharp thorns. Best pruned in late winter once threat of extreme cold has passed. Can be wide for street tree purpose, space around planting strip is necessary for wide spread.

Botanical Name: : Malus 'Adirondack'

Common Name: : Adirondack Crabapple

Recommended Cultivars: Adirondack

Mature Size: 10-18' height, 8-12' spread

Water Needs: med

Spacing: 10-12'

Special Considerations: Resilient to harsh urban environments. Good option for narrow parkstrips or tighter spaces.

Botanical Name: : Malus x 'Prariefire'

Common Name: : Prairifire Crabapple

Recommended Cultivars: Prairiefire

Mature Size: 15-20' height, 15-25' spread

Water Needs: med

Spacing: 15-20'

Special Considerations: Attractive deep pink flowers and dark red fruit, one of the most popular of crabapples known for its striking beauty. Semi disease resistant.

Botanical Name: : Malus x 'Spring Snow'

Common Name: : Spring Snow Crabapple

Recommended Cultivars: Spring Snow

Mature Size: 20-25' height, 15-25' spread

Water Needs: med

Spacing: 15-25'

Special Considerations: More cold tolerant than other Malus spp. Spring Snow is Fruitless cultivar with white flowers, especially low maintenance.

Botanical Name: : Quercus robur x Quercus alba 'JFS-KW1QX'

Common Name: : Streetspire English Oak

Recommended Cultivars: Streetspire 'JFS-HW1QX'

Mature Size: 40-45" height, 15-20' spread

Water Needs: med

Spacing: 15-20'

Special Considerations: Best powdery mildew resistance for more moist areas. Excellent street tree when pruned.

Botanical Name: : Quercus x warei 'Nadler'

Common Name: : Kindrid Spirit Oak

Recommended Cultivars: Kindred Spirit 'Nadler'

Mature Size: 30-40' height, 8-12' spread

Water Needs: med

Spacing: 10-15'

Special Considerations: Good mildew resistance, and is a sister seedling to 'regal prince', but is more tight and narrow and slower growing.

Botanical Name: : Syringa reticulata

Common Name: : Japanese Tree Lilac

Recommended Cultivars: Ivory Silk

Mature Size: 20-25' height, 15-20' spread

Water Needs: med

Spacing: 15-20'

Special Considerations: Attracts hummingbirds and butterflies, flowering, fragrant. Form makes for excellent street tree use.

Botanical Name: : Tilia cordata 'Halka'

Common Name: : Littleleaf Linden

Recommended Cultivars: Summer Sprite

Mature Size: 18-20' height, 12-15' spread

Water Needs: low-med,

Spacing: 15-20'

Special Considerations: Summer sprite cultivar is excellent for small park strip size and planting under powerlines, and is ideal for confined spaces due to minimal canopy spread.

Botanical Name: : Zelkova serrata 'City Sprite'

Common Name: : City Sprite Zelkova

Recommended Cultivars: City Sprite 'JFS-KW1'

Mature Size: 25-30' height, 15-20' spread

Water Needs: med

Spacing: 20-25"

Special Considerations: Compact, upright growth ideal for narrow park strips without vertical restrictions. Minimal pruning needed.

Botanical Name: : Zelkova serrata 'Schmidtlow'

Common Name: : Wireless Zelkova

Recommended Cultivars: Wireless 'JFS-KW1'

Mature Size: 20-24' height, 30-35' spread

Water Needs: med

Spacing: 35-35"

Special Considerations: Broad, low canopy design especially ideal under utility lines. Ideal for shade without vertical growth. May require more space to account for horizontal spread interference with infrastructure or streets.

Medium Park Strip Palette (5-8')

Tree palette for 5-8' parking strips and typical corridors

Botanical Name: : Acer campestre

Common Name: : Field/Hedge Maple

Recommended Cultivars: NA

Mature Size: 15-20' height, 15-20' spread

Water Needs: low-med,

Spacing: 15-20'

Special Considerations: It is the one of the more drought tolerant of the maple varieties. Tree should be pruned when young to develop a desirable shape.

Botanical Name: : Acer miyabei 'Morton'

Common Name: : State Street Maple

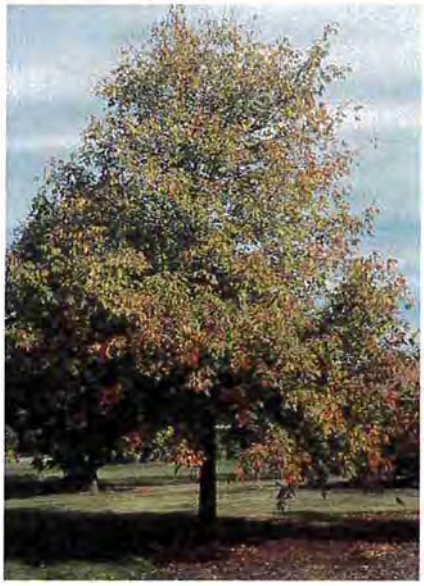
Recommended Cultivars: State Street

Mature Size: 30-45' height, 30-35' spread

Water Needs: low-med,

Spacing: 25-35'

Special Considerations: Good tolerance to alkaline soils.



Botanical Name: : Acer negundo 'sensation'

Common Name: : Sensation Boxelder

Recommended Cultivars: Sensation (must be this cultivar)

Mature Size: 30-45' height, 25-30' spread

Water Needs: low-med,

Spacing: 25-35'

Special Considerations: Must be Sensation cultivar, otherwise it is not permitted and can be invasive. This male cultivar eliminates seed production. Avoid planting in overly wet soils.

Botanical Name: : Aesculus x carnea

Common Name: : Red Horsechestnut

Recommended Cultivars: NA

Mature Size: 30-40' height, 25-35' spread

Water Needs: med

Spacing: 30-35'

Special Considerations: Prefers well-drained soil. In very hot summer conditions late season foliage burn is common.

Botanical Name: : Corylus colurna

Common Name: : Turkish Filbert

Recommended Cultivars: NA

Mature Size: 40-50' height, 20-40' spread

Water Needs: med

Spacing: 20-30'

Special Considerations: Highly rated street tree. Tolerates a wide variety of conditions including high soil pH and cold temperatures.

Botanical Name: : Crataegus viridis 'Winter King'

Common Name: : Green Hawthorn

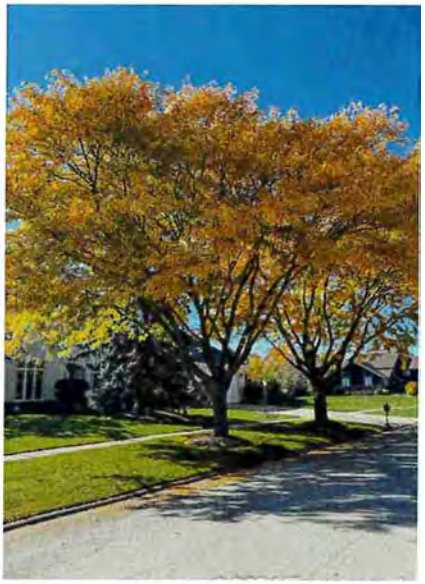
Recommended Cultivars: Winter King

Mature Size: 20-30' height, 20-30' spread

Water Needs: low-med

Spacing: 20-30'

Special Considerations: Hardy and adaptable, good winter interest, tolerates drought and urban pollution well. Good for areas with small landscape space but space for wide tree spread.



Botanical Name: : Gleditsia triancanthos

Common Name: : Honeylocust

Recommended Cultivars: Shademaster, Skyline

Mature Size: 20-50' height, 20-40' spread

Water Needs: low-med

Spacing: 20-40'

Special Considerations: . Provides filtered shade, avoid overplanting in areas with existing honeylocusts, fast growing. Skyline cultivar is most popular cultivar for its form at all stages of growth that provide good traffic clearance. It is a favored and excellent street tree.

Botanical Name: : Koelreuteria paniculata

Common Name: : Goldenrain Tree

Recommended Cultivars: All, Fastigiata

Mature Size: 15-20' height, 15-20' spread

Water Needs: low-med

Spacing: 15-20'

Special Considerations: May reseed aggressively in some regions. 'Fastigiata' cultivar is narrow and good for narrow street tree applications, but other forms are broad-spreading and are well suited for roadside plantings and broad interchanges.

Botanical Name: : Maclura pomifera

Common Name: :Osage Orange Maackia

Recommended Cultivars: White Shield, Wichita

Mature Size: 30-35' height, 30-35' spread

Water Needs: low-med

Spacing: 30-45'

Special Considerations: Use 'White Shield' and 'Wichita' male thornless and fruitless cultivars to minimize maintenance. Extremely tough and drought-tolerant once established. They may require some pruning to maintain street tree clearance.

Botanical Name: : Ostrya virginiana

Common Name: : American Hophornbeam

Recommended Cultivars: Autumn Treasure

Mature Size: 25-40' height, 20-30' spread

Water Needs: med

Spacing: 20-30'

Special Considerations: . Prefers moist, well-drained soils. Sensitive to transplanting, tough once established. Compatible with streets and urban soils, but seedlings are variable and may have low-hanging branches so look to recommended cultivars for street tree use.

Botanical Name: : Phellodendron amurense

Common Name: : Amur Corktree

Recommended Cultivars: His majesty, Eye Stopper

Mature Size: 30-45' height, 30-60' spread

Water Needs: low-med

Spacing: 30-60'

Special Considerations: Plant male cultivars to avoid messy fruit. Can grow to be quite large and may require more space in optimal conditions.

Botanical Name: :Prunus padus

Common Name: : European Birdcherry

Recommended Cultivars: Albertii, Merlot, Summer Glow

Mature Size: 3-40' height, 18-30' spread

Water Needs: low-med

Spacing: 18-30'

Special Considerations: Avoid overly wet soils. Many cultivars are low-branched and wide, but more upright cultivars such as 'Albertii', and 'Merlot' are good for street tree application.

Botanical Name: : Pyrus calleryana

Common Name: : Callery Pear

Recommended Cultivars: Chanticleer, Aristocrat, Respire

Mature Size: 30-40' height, 20-35' spread

Water Needs: med

Spacing: 20-35'

Special Considerations: . Prefers moist, well-drained soils. Sensitive to transplanting, tough once established. Compatible with streets and urban soils, but seedlings are variable and may have low-hanging branches so look to recommended cultivars for street tree use.

Botanical Name: : Pyrus ussuriensis

Common Name: : Ussurian Pear

Recommended Cultivars: Bailfrost

Mature Size: 20-30' height, 15-20' spread

Water Needs: med

Spacing: 15-20'

Special Considerations: Cold-hardy, urban-tolerant ornamental pear with less breakage than Pyrus calleryana. However, for use as a street tree requires more width and pruning in most locations. If available, 'Bailfrost' is narrower cultivar and better street tree.

Botanical Name: : Quercus robur 'Fastigiata'

Common Name: Columnar English Oak

Recommended Cultivars: NA

Mature Size: 50-60' height, 10-18' spread

Water Needs: med

Spacing: 10-20'

Special Considerations: Columnaris has narrower form suitable for smaller spaces. Prefers well-drained soils and full sun. Use as a hedge or screening tree where wide branching is a concern.

Botanical Name: : Quercus robur x bicolor 'Long Regal Prince'

Common Name: : Regal Prince Oak

Recommended Cultivars: Regal Prince

Mature Size: 40-45' height, 15-20' spread

Water Needs: med

Spacing: 15-20'

Special Considerations: Narrow and tolerant of many soil conditions, noted for having excellent resistance to powdery mildew and borers.

Botanical Name: : Quercus robur x alba 'Crimschmidt'

Common Name: : Crimson Spire Oak

Recommended Cultivars: Crimschmidt

Mature Size: 40-45' height, 15-20' spread

Water Needs: med

Spacing: 15-20'

Special Considerations: . Ideal for tight urban spaces. Has powdery mildew resistance for more moist areas, and is known for its strong growth.

Botanical Name: :Ulmus parvifolia

Common Name: : Lacebark Elm

Recommended Cultivars: Frontier

Mature Size: 30-50' height, 20-30' spread

Water Needs: low-med

Spacing: 20-30'

Special Considerations: Upright, attractive compact form for restrained urban corridors. Is adaptable to a wide variety of sites.

Large Park Strip Palette (8'+)

Tree palette for large parking strips, open space, and parks

Botanical Name: : Ginkgo biloba

Common Name: : Ginkgo Tree

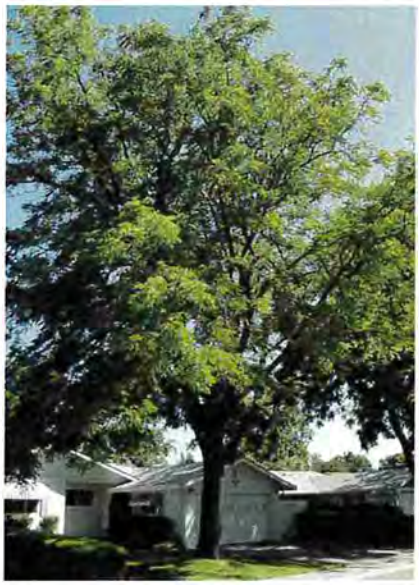
Recommended Cultivars: Autumn Gold, Princeton, Sentry

Mature Size: 40-55' height, 20-30' spread

Water Needs: low-med,

Spacing: 20-25'

Special Considerations: Known for its beauty and adaptability to all soils except for constantly-wet soils. Male cultivars recommended to avoid messy fruit.



Botanical Name: : Gymnocladus dioicus

Common Name: : Kentucky Coffeetree

Recommended Cultivars: Espresso, Prairie Titan

Mature Size: 35-50' height, 20-30' spread

Water Needs: low-med,

Spacing: 20-30'

Special Considerations: Drought tolerant, pods may be messy if seedless variety is selected. Growth habit makes for excellent street tree applications. The seedless cultivars give reliable shape and low maintenance.

Botanical Name: : Liquidambar styraciflua

Common Name: : American Sweetgum

Recommended Cultivars: Emerald Sentinel

Mature Size: 25-60' height, 15-40' spread

Water Needs:med-high

Spacing: 15-40'

Special Considerations: . Requires well drained soils, prone to leaf spot and cankers. Best is open, sunny locations. Recommended cultivars for street tree use is 'Emerald Sentinel'. Roots are among the worst for lifting concrete, so at least 8' planter strips are needed.

Botanical Name: : Liriodendron tulipifera

Common Name: : Tulliptree

Recommended Cultivars: Emerald City

Mature Size: 50-55' height, 25-30' spread

Water Needs: med

Spacing: 25-30'

Special Considerations: Fast growing. Prefers moist, deep, well-drained soils; susceptible to various pests. 'Emerald city' cultivar is the only one suitable for city-sized landscapes.

Botanical Name: : Platanus x acerfolia

Common Name: : London Planetree

Recommended Cultivars: Exclamation!

Mature Size: 50-70' height, 35-50' spread

Water Needs: med

Spacing: 35-50'

Special Considerations: Highly resistant to urban pollution and pests, adaptable to most soils, but anthracnose is a concern. For street tree applications, give it root and crown space, and allow for a potential 5' trunk diameter. It is one of the best large canopy street trees but may need additional root space to prevent damage to surrounding pavement.

Botanical Name: : Quercus bicolor

Common Name: Swamp White Oak

Recommended Cultivars: NA

Mature Size: 40-60' height, 35-45' spread

Water Needs: med

Spacing: 45-50'

Special Considerations: . Extremely drought tolerant once established, great choice for hot parking islands.

Botanical Name: : Quercus Imbricaria

Common Name: : Shingle Oak

Recommended Cultivars: NA

Mature Size: 40-60' height, 35-50' spread

Water Needs: med

Spacing: 45-50'

Special Considerations: Tolerates alkaline soils. Foliage persists throughout winter, which is subjectively desirable and undesirable.

Botanical Name: : Quercus macrocarpa

Common Name: : Bur Oak

Recommended Cultivars: Urban Pinnacle

Mature Size: 50-60' height, 40-50' spread

Water Needs: low-med

Spacing: 45-55'

Special Considerations: Tolerates drought, poor soils, and urban environments. Urban pinnacle cultivar is narrow and ideal for tight spaces, and produces smaller acorns.

Botanical Name: : Quercus robur

Common Name: :English Oak

Recommended Cultivars: See table

Mature Size: 50-70' height, 50-70' spread

Water Needs: med

Spacing: 70-75'

Special Considerations: Tolerates various soils. Slow growing but long-lived. May require larger space due to wide canopy. Better suited for parks instead of street corridors. Narrow columnar hybrids are better suited for street tree use.

Botanical Name: : Tilia tomentosa

Common Name: : Silver Linden

Recommended Cultivars: Sterling Silver

Mature Size: 60-65' height, 30-35' spread

Water Needs: med

Spacing: 30-35'

Special Considerations: Can be prone to aphid infestations, but is the most resistant of all lindens. Provides excellent shade and is an effective street tree where there is room for its large and broad form. Has a wonderful, sweet smell in June.

Botanical Name: : Ulmus davidiana

Common Name: : David Elm

Recommended Cultivars: Greenstone 'JFS-KW2UD'

Mature Size: 40-50' height, 35-40' spread

Water Needs: med

Spacing: 40-45'

Special Considerations: Greenstone cultivar is resistant to Dutch Elm disease and pests. Use where high overhead canopy is desired, as a shade tree, in parking lots and plazas.

Botanical Name: : Ulmus davidiana var. japonica

Common Name: : Accolade Elm

Recommended Cultivars: Accolade

Mature Size: 45-50' height, 35-40' spread

Water Needs: med

Spacing: 40-45'

Special Considerations: . Accolade cultivar is resistant to Dutch Elm disease and pests. Long-lived and tolerant of drought and poor soils

Botanical Name: : Ulmus 'Morton Glossy'

Common Name: : Triumph Elm

Recommended Cultivars: Triumph 'Morton Glossy'

Mature Size: 50-60' height, 40-50' spread

Water Needs: med

Spacing: 50-55'

Special Considerations: Triumph cultivar is resistant to Dutch Elm disease. It is the one of the most popular Elms and is usually easy to find in the nursery trade.

Botanical Name: : Ulmus 'New Horizon'

Common Name: : New Horizon Elm

Recommended Cultivars: NA

Mature Size: 35-45' height, 20-30' spread

Water Needs: med

Spacing: 40-45'

Special Considerations: New horizon cultivar is resistant to Dutch Elm disease and pests. Fast growing with narrow form. Tolerates road salts and clay soil.

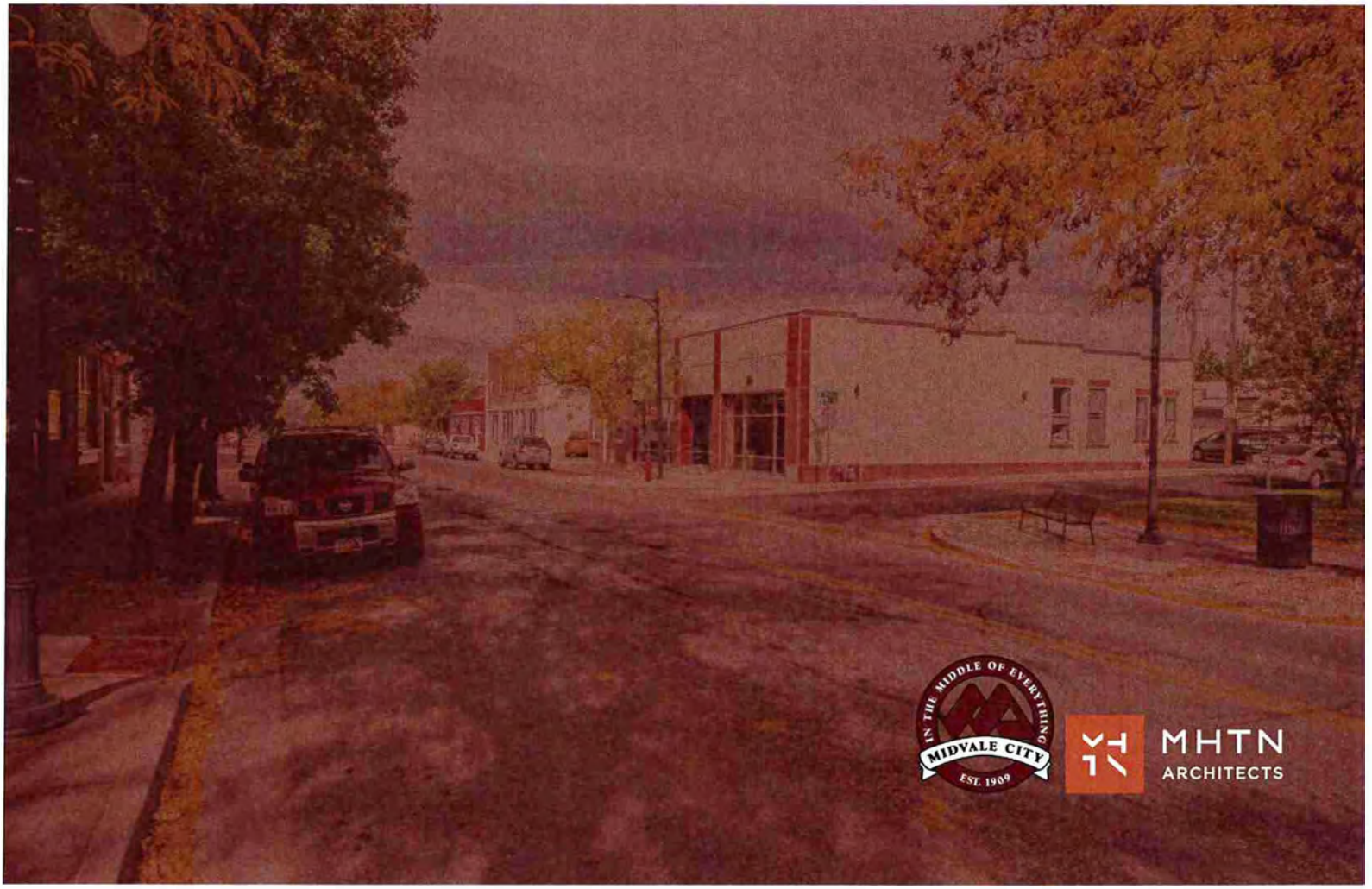
04

Prohibited Species

General Notes

- **The following list includes trees that are not recommended for planting along streets. Some of these species are excluded due to their invasive nature, while others may obstruct sightlines or create excessive litter and mess. Additionally, some trees on this list are known to be prone to diseases.**
- **It is important to note that while some trees, such as the Gambel Oak or Mulberry, can be excellent choices in the right setting and environment, they are not suitable for use as street trees. Therefore, it is essential to choose tree species carefully to ensure they thrive in urban landscapes without causing issues.**

Tree Species		
Botanical	**Common**	**Cultivars**
Acer negundo	Common Boxelder	NA
Acer saccharium	Silver Maple	
Acer x freemanii	Freeman Maple	Armstrong, Autumn Blaze, Autumn Fantasy, Sienna Glenn
Ailanthus altissima	Tree of Heaven	NA
Albizia julibrissin	Silk Tree	
Betula spp.	Birch (all species)	
Conifers (all species)		
Elaegnus angustifolia	Russian Olive	
Fraxinus	Ash Species	
Juglans nigra	Black Walnut	
Malus ioensis	Prairie Crabapple	'Plena' (Betchels Crabapple)
Malus x 'Schmidtcutleaf'	Golden Raindrops	'Schmidtcutleaf'
Morus alba	Mulberry (all fruiting species)	NA
Populus spp.	Cottonwood (all species)	
Populus balsamifera	Balm of Gildead	
Populus tremuloides	Aspen Species	
Pyrus calleryana	Callery Pear Tree	'Bradford'
Robinia pseudoacacia	Black Locust	'Purple Robe'
Salix spp.	Willow (all species)	NA
Tilia Americana	American Linden	
Ulmus pumila	Siberian Elm	
Quercus gambelii	Gambel Oak	
Ziziphus mauritiana	Chinese Date	


IN THE MIDDLE OF EVERYTHING
MIDVALE CITY
EST. 1909
MHTN
ARCHITECTS

Appendix F

Consultation with JVWCD

Consultation with JVWCD

On 8/6/2025 representatives from Jordan Valley Water Conservancy District met with Wesley VanValkenburg (Public Utilities Manager), Bryton Mecham (Utilities Water Quality and Regulatory Administrator), and Wendelin Knobloch (Planning Director) to consult on how the implementation of the Land Use Element and Water Use and Preservation Element of the General Plan will affect water supply and distribution planning.

The representative from the JVWCD reviewed the following with Midvale City:

- JVWCD Water Efficiency standards
- Water conservation programs (e.g., Localscapes)
- Water supply outlook
- Costs of water
- Effect of water conservation on the Great Salt Lake
- Technical aspects of Midvale's water distribution system
- Additional water connections from JVWCD to Midvale's distribution system

Utah Water Savers

JORDAN VALLEY WATER CONSERVANCY DISTRICT

2025 UTAH WATER SAVERS PROGRAMS UPDATE

(Updated 8/6/2025)

Landscape Incentive

	Bluffdale	Draper	GHID	Herriman	JVWCD (Retail)	KID	Magna Water	Midvale	Riverton	South Jordan	South Salt Lake	TBID	WaterPro	West Jordan	White City Water	Grand Total
Active Participants	11	30	29	34	31	15	4	14	26	18	11	39	26	82	16	386
Completed Projects	8	7	12	19	14	8	3	1	9	3	3	24	7	24	6	148
Rebate Amount ($)	$77,847	$30,304	$39,154	$69,001	$91,943	$42,355	$22,857	$11,413	$64,932	$18,898	$9,193	$153,751	$29,079	$154,748	$31,226	$846,702

Localscapes Rewards

Active Participants	3	4	8	2	4	7		2	6	2	3	3	3	14	1	62
Completed Projects									1							1
Rebate Amount ($)									$1,390							$1,390

Smart Controller Program

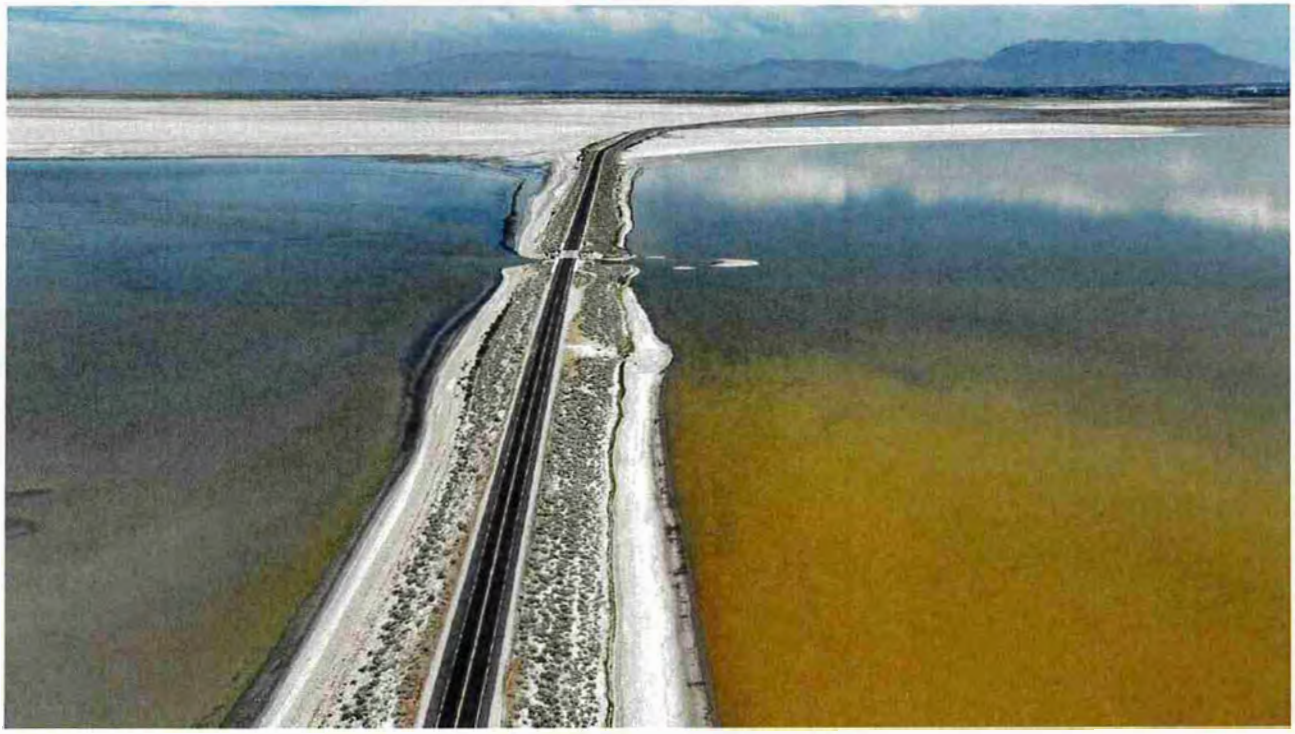
Total Rebates	7	16	50	48	36	25	9	24	48	76	2	43	53	102	24	563
Rebate Amount ($)	$700	$1,518	$4,840	$4,689	$3,571	$2,406	$877	$2,367	$4,615	$7,492	$200	$4,261	$5,230	$9,909	$2,357	$55,031

Toilet Rebate Program

Total Rebates	1		12		5	2		5	2	3	3	15		14	3	65
Rebate Amount ($)	$150		$2,339		$900	$300		$750	$244	$900	$569	$2,763		$2,361	$429	$11,705

Great Salt Lake to get another boost from Utah Lake after 2½-foot drop this summer

By Carter Williams, KSL.com | Posted - Sept. 17, 2025 at 2:15 p.m.



The Great Salt Lake and the causeway to Antelope Island on July 29. Great Salt Lake Watershed Enhancement Trust officials said Wednesday they've secured an agreement to help the lake get another 10,000 acre-feet of water to the lake. (Kristin Murphy, Deseret News)

- The water will flow through the Jordan River, aiding ecological and community benefits.
- This effort follows a summer of significant water loss due to heat and dryness.

Editor's note: *This article is published through the Great Salt Lake Collaborative, a solutions journalism initiative that partners news, education and media organizations to help inform people about the plight of the Great Salt Lake.*

SALT LAKE CITY — It's been a terrible, horrible, no good, very bad summer for the Great Salt Lake, but it's slated to get another boost from Utah Lake toward the end of the water year.

Great Salt Lake Watershed Enhancement Trust officials announced Wednesday that 10,000 acre-feet of water from Utah Lake to Great Salt Lake, as part of an agreement with Jordan Valley Water Conservancy District, The Church of Jesus Christ of Latter-day Saints, the Utah Division of Wildlife Resources and the Utah Division of Forestry, Fire and State Lands.

The additional water will flow into the Farmington and Gilbert bays via the Jordan River. It has the potential to help out more than just the Great Salt Lake because of the path it's taking, said Marcelle Shoop, director of the trust.

(The trust is) eager to see the benefits to the riparian and wetland ecosystems, the birds that are currently here on their fall migration path and other opportunities for communities along the Jordan River and the lake."

The announcement comes as the lake tumbled again this summer, which isn't uncommon. It typically adds water between the late fall and spring during the winter snowpack collection and spring snowmelt periods, before losing it during the summer and late fall months to evaporation and water consumption.

However, this year's summer was hotter and drier than normal, causing a larger drop than usual for the second-straight year. Its southern arm is down to 4,191.2 feet elevation, having lost about 2½ feet since it peaked earlier this year. Its northern arm is down to 4,191 feet as the lake has nearly leveled out for the first time since a berm at the causeway separating the two arms was raised to combat rising salinity levels in 2022.

The Great Salt Lake slipped back into what the state calls its "serious adverse effects" range of lake health, affecting brine shrimp viability, mineral production and recreation, and leaving communities prone to more dust storms.

The berm will be raised again if the lake drops below an elevation of 4,190 feet, but Utah lawmakers are considering legislation that could increase this requirement to 4,192 feet. It comes as salinity levels at Gilbert Bay and Saltair have risen in recent months, but both remain much lower than what was reported three years ago.

Jordan Valley Water Conservancy District and The Church of Jesus Christ of Latter-dav Saints directed 10,000 acre-feet of water to the lake last year, mostly through water saved by residents through conservation efforts. This year's releases follow a similar pattern.

"We are grateful to be able to contribute to another release of water to Great Salt Lake," said Alan Packard, general manager of the Jordan Valley Water Conservancy District. "Our community is taking positive steps to achieve levels of water conservation that are critical for a sustainable future. Releases like this depend on everyone making a consistent commitment to use our limited water resources wisely."

taken care of, said Bishop W. Christopher Waddell, First Counselor in the Presiding Bishopric.

The Key Takeaways for this article were generated with the assistance of large language models and reviewed by our editorial team. The article, itself, is solely human-written.

Related stories

Utah posts sixth-warmest, 18th-driest summer on record. These counties had it worse

Draft legislation aims to make it easier for officials to raise Great Salt Lake berm

After losing over 2 feet, Great Salt Lake to get another boost from Utah Lake

Most recent Great Salt Lake stories

Draft legislation aims to make it easier for officials to raise Great Salt Lake berm

Early winter outlooks leave Great Salt Lake advocates on edge

Great Salt Lake dust makes it all the way to Utah County

Related topics

Great Salt Lake Utah water Utah Environment Outdoors

Carter Williams

Carter Williams is a reporter for KSL.com. He covers Salt Lake City, statewide transportation issues, outdoors, the environment and weather. He is a graduate of Southern Utah University.

90 **COMMENTS**