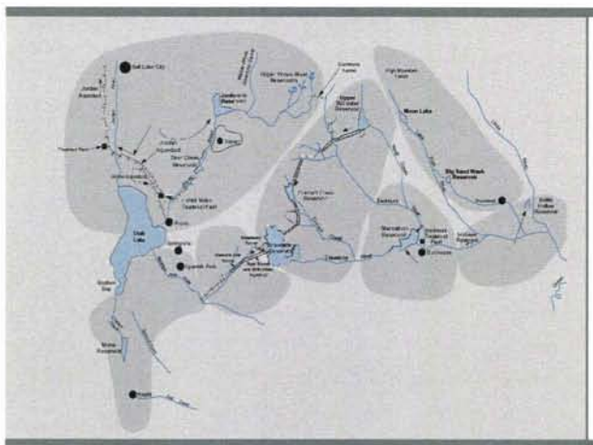
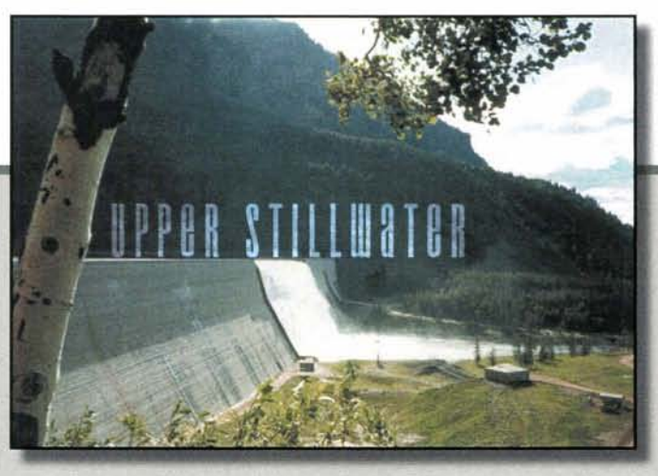
WATER SUPPLY APPENDIX
Volume 2 - M&I Water Demands

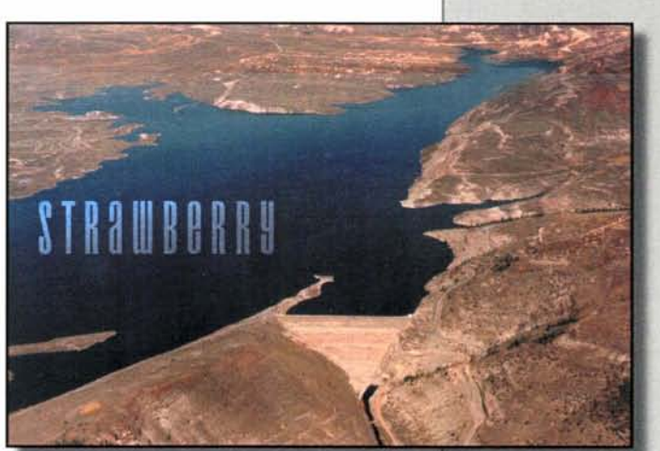
Central Utah Project Completion Program



Supplement to the 1988 Definite Plan Report for the Bonneville Unit

October 2004





UTAH RECLAMATION MITIGATION AND CONSERVATION COMMISSION

SUPPLEMENT TO THE BONNEVILLE UNIT DEFINITE PLAN REPORT

WATER SUPPLY APPENDIX, VOLUME 2 – M&I WATER DEMANDS

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Central Utah Project Completion Program

Chapter 1

October 2004

UTAH RECLAMATION
MITIGATION
AND CONSERVATION
COMMISSION

BACKGROUND AND SCOPE OF REFINEMENT

This M&I Water Needs Appendix presents a revised assessment of municipal and industrial (M&I) water needs of the Utah Lake Drainage Basin Water Delivery System (ULS) of the Bonneville Unit of the Central Utah Project (CUP). It was prepared initially to serve as a Supplemental Report to the *ULS Draft Plan Formulation Report* of February 2002 by the ULS Joint Lead Agencies - the Central Utah Water Conservancy District (District); Utah Reclamation, Mitigation and Conservation Commission (URMCC); and the U.S. Department of the Interior (DOI).

This most recent version of M&I Water Needs incorporates analyses of M&I water needs completed by the two Salt Lake County entities consisting of the Jordan Valley Water Conservancy District (Chapter 7) and the Metropolitan Water District of Salt Lake and Sandy (Chapter 8). An in-depth analysis of the water needs of Utah County was made by the District. The northern Utah County M&I needs are documented in this M&I Water Needs Appendix (Chapter 6) which draws upon work completed in another report, the *North Utah County Water Needs Study* completed by the District in October 2001. The in-depth analysis of southern Utah County water needs has been addressed in several reports with the results of the analyses being presented in Chapter 5 of this M&I Water Needs Appendix.

This M&I Water Needs Appendix identifies changes in methodology and assumptions since the February 2002 Draft Plan Formulation Report, presents an updated analysis of M&I water needs based on more recent population projections, provides a more detailed assessment of water availability from local sources, and describes wastewater recycling potential. The following chapters and appendices are contained in this M&I Water Needs Appendix.

- Chapter 1, Background and Scope of Refinement
- Chapter 2, Utah Lake Water Rights
- Chapter 3, Return Flows and Water Recycling
- Chapter 4, Eastern Juab County M&I Demands
- Chapter 5, Southern Utah County M&I Demands
- Chapter 6, Northern Utah County M&I Demands
- Chapter 7, Salt Lake County M&I Demands, Jordan Valley Water Conservancy District Service Area
- Chapter 8, Salt Lake County M&I Demands, Metropolitan Water District of Salt Lake and Sandy Service Area
- Chapter 9, Wasatch County M&I Demands
- Attachment A, Utah County Population Projections
- Attachment B, Detailed Compilation of Utah Lake Water Rights
- Attachment C, Agricultural Conversions
- Attachment D, Water Demand Sheets for Each County

The following subchapters of Chapter 1 review the derivation of the M&I water needs presented in the February 2002 Draft Plan Formulation Report, and then identify recent refinements in the

process of estimating M&I water needs from the ULS project, including revision of population projections, assumptions regarding local water supply availability, and the potential for reverse osmosis treatment of Utah Lake water and recycling of municipal wastewater.

SCOPING MEETINGS

Various scoping meetings were conducted by the joint-lead agencies to inform local water agency representatives and the general public of the proposed scope of the ULS planning effort, provide opportunities for local input to the planning process, and to determine M&I water needs of communities in the ULS service area. The first two public meetings were conducted as informal open houses - one in September 2000 to provide background information on the Bonneville Unit completion program and receive initial requests for Bonneville Unit water, and the other in October 2001 to provide information on the scope of the ULS, present preliminary results of the water needs analysis, and receive public comments.

Formal scoping meetings were held in February 2002 in Utah County and Salt Lake County to provide more specific information on ULS water delivery concepts and to solicit specific responses on those concepts from agency representatives and the public. The results of the various public meetings are documented in the following publications, which are on file at the District's office.

1. *Initial Scoping Comments, Utah Lake Drainage Basin Water Delivery System*, October 31, 2000.

2. *Public Information Meeting, Utah Lake Drainage Basin Water Delivery System*, October 17, 2001.

3. *Scoping Summary Report, Utah Lake Drainage Basin Water Delivery System*, May 2002.

At the scoping meetings it was stated that the M&I water demands analysis was preliminary and subject to revision based upon final population projections using census data for the year 2000.

DRAFT PLAN FORMULATION REPORT - FEBRUARY 2002

In February 2002, the *Draft Plan Formulation Report* was completed, which is on file in the District's Office. That report described the six-step planning process used to formulate water delivery concepts for the ULS. The steps consisted of 1) identifying water-related land resource problems and opportunities; 2) conducting inventories, forecasts and analyses of conditions related to those problems and opportunities; 3) formulating and assessing water delivery concepts to meet needs; 4) formulating those concepts into potentially viable alternatives; 5) evaluating and comparing the effects of those alternatives; and 6) laying the groundwork for the eventual selection of viable alternatives for subsequent National Environmental Policy Act compliance.

Key considerations during this six-step process were population projections, water conservation, and the capability of local water supplies to meet future M&I needs.

Initial M&I Water Requests as Presented in Draft Plan Formulation Report

The process of allocating project M&I water supply began with the evaluation of M&I water requests submitted to the District by communities and water agencies in October 2000, in response to a District letter requesting such information. Table 1-1 reiterates the summary of M&I water requests presented in the *Draft Plan Formulation Report.*

TABLE 1-1
Summary of M&I Water Requests
Draft Plan Formulation Report

Area	Municipal and Industrial (acre-feet)
East Juab County	2,600
Southern Utah County	65,000
Northern Utah County[1]	9,200
Salt Lake County	40,200
Wasatch County	4,000
Total	121,000

Notes:
[1]Communities of Eagle Mountain and Saratoga Springs are included in northern Utah County.
[2]Wasatch County amended their request with a letter dated April 26, 2001 to limit the amount of water requested to 4,000 acre-feet of municipal and industrial water.
Source: Initial Scoping Comments, October 31, 2000, Utah Lake Drainage Basin Water Delivery System (District 2000)

Preliminary Evaluation of M&I Water Requests in Draft Plan Formulation Report

The M&I water requests were evaluated as to their individual justification and overall effect on plan formulation. The results of the evaluation, described in the *Draft Plan Formulation Report*, used average annual amounts of water and did not address shortages that could arise from seasonal peak demands, seasonal timing of water availability, and geographic distribution of sources and facilities to obtain and distribute water. For example, while groundwater may be regionally available, some communities may not be able to fully develop groundwater within their incorporated boundaries. The *Draft Plan Formulation Report* anticipated that new population projections would become available in the late spring of 2002, and that they would be used to make more detailed analysis of M&I water needs in Utah County and Salt Lake County.

Water Conservation in the Draft Plan Formulation Report

In the *Draft Plan Formulation Report* the assumption was made that measures would be taken to be sure that each entity requesting ULS water would meet the target conservation goals established by the State, which provide for reductions in per-capita water use of 12 ½ percent by year 2020 and 25 percent by the year 2050. Upon further analysis it was concluded that the most practical means to meet these conservation goals would be to have agreements with the entities that contract for ULS water stipulating that they would be responsible for achieving the goals. For southern Utah County this would be the South Utah Valley Municipal Water Association (SUVMWA). In northern Utah County, because the communities are not represented by an umbrella organization, it would be the individual cities that contract for the ULS water. In Salt Lake County the responsible agencies would be the Jordan Valley Water Conservancy District (JVWCD) and the Metropolitan Water District of Salt Lake and Sandy (MWDSLS).

Accounting of Local Water Supplies in the Draft Plan Formulation Report

In estimating future demands for M&I water from the ULS Project, an accounting of potential water supplies from local sources to meet these projected needs was made. As noted above, the preliminary results presented in the *Draft Plan Formulation Report* were based on average annual amounts of water and did not address shortages that could arise from seasonal peak demands, seasonal timing of water availability, and geographic distribution of sources and delivery systems. And, among other things, the accounting did not include the following water supply aspects:

- Recognition of approximately 4,900 acre-feet of Strawberry Valley Project (SVP) water presently used as irrigation water within incorporated city boundaries in southern Utah County. This amount is projected to increase to approximately 10,200 acre-feet by the year 2050.

- Limitations on future conversion of SVP irrigation water. Any water above the 10,200 acre-feet per year from future urbanization of agricultural lands in southern Utah County would supply supplemental water to the remaining SVP agricultural lands, which presently experience a shortage of irrigation water.

- Firm reliable amount of Utah Lake Basin surface water that could be used for M&I purposes when the seasonal variability in flow was considered for streams such as the Spanish Fork River, Peteetneet Creek, and Summit Creek

- Limitations on the amount of groundwater that could be pumped.

- Limitations on the amount of the Districts' Utah Lake rights that would be acquired by the U.S. Department of Interior.

- The potential volume of Central Utah Project (CUP) return flows that may reach the Jordan River in Salt Lake County. The use of these return flow rights is subject to approval by the State Engineer. The revised assessment of M&I water needs in this *Supplemental Report* addresses the projected return flows.

Population Projections in the Draft Plan Formulation Report

The population projections in the *Draft Plan Formulation Report* of February 2002 were based on projections released in 2000 by the Governor's Office of Planning and Budget (GOPB). The projections were published to year 2030 for each community in the five planning areas. The GOPB made countywide population growth projections for the decades between 2030 and 2050, but did not publish them. Although not published, the data was made available to the countywide Associations of Governments (AOG) for their local planning purposes. The AOG's representing counties in ULS planning area are as follows:

- Utah and Wasatch Counties - Mountainland Association of Governments (MAG);
- Juab County - Six County Association of Governments; and
- Salt Lake County - Wasatch Front Regional Council

An AOG may, upon request by local communities, extend community population projections beyond 2030 to a longer planning horizon, such as the year 2050. To do this the local AOG disaggregates the GOPB county population among its communities subject to these general constraints; (1) the total county population projected by the GOPB may not be exceeded, and (2) the populations for communities must be reasonable compared to historical growth trends. Thus, for the *Draft Plan Formulation Report* the community population projections for the ULS service area were extended to 2050.

The *Draft Plan Formulation Report* anticipated that the community projections to 2050 would be updated in the late spring of 2002 based on the data from the 2000 census, and that a more detailed analysis of M&I water needs would then be made. Accordingly, the various chapters of this M&I Water Needs Appendix present updated community population projections prepared for use in estimating the water needs. An aspect of population growth that was not addressed in earlier projections is the build-out population of communities, considering geographical and other constraints. The estimation of M&I water needs takes into consideration that some communities would achieve build-out prior to the 2050 planning horizon, while other communities, particularly in southern Utah County, would achieve build-out after 2050.

REVISED POPULATION PROJECTIONS

In 2001, the GOPB furnished community population counts based on the 2000 census data.

Utah County. Using such information, MAG conducted a more in-depth review of Utah County population and prepared community projections to 2050. In conducting this review MAG worked closely with mayors, Utah County commissioners, other county officials, and the staff of

the GOPB to include a comprehensive growth perspective. The resulting projections recognized that build-out would occur in some communities prior to 2050, while for others build-out would occur after 2050.

Salt Lake County. Data from updated population projections, were used by the Jordan Valley Water Conservancy District and the Metropolitan Water District of Salt Lake and Sandy to revise their need for M&I water. These results are documented in Chapter 7 - Salt Lake County (Jordan Valley Water Conservancy District), Chapter 8 – Salt Lake County (Metropolitan Water District of Salt Lake and Sandy).

Juab and Wasatch County. While updated county projections had been made, revisions had not been released as of the date of the revised M&I Water Needs Assessment in January 2003. However, due to the small population base of these counties and the availability of local water supplies to meet needs, the updated population projections did not result in any demand for ULS water.

Community Growth in Utah County

The updated projections by MAG are presented below in Table 1-2. Additional details of these projections are presented in Attachment A. For several communities in Utah County, MAG estimated "build-out populations" that could be supported by available space and other resources. These communities are noted on Table 1-2, with their 2050 population projections and the projected build-out populations.

TABLE 1-2
Year 2050 and Build-out Population Projections for Utah County Communities

City	2050 Population	Build-out Population
Southern Utah County		
Elk Ridge	6,000	Same as year 2050
Genola	18,191	Projections beyond 2050 not made
Goshen	3,251	Projections beyond 2050 not made
Mapleton	34,024	Projections beyond 2050 not made
Payson	80,763	Projections beyond 2050 not made
Salem	31,409	Projections beyond 2050 not made
Santaquin	62,621	Projections beyond 2050 not made
Spanish Fork	66,028	Projections beyond 2050 not made
Springville	59,658	Same as year 2050
Woodland Hills	4,793	Same as year 2050
Northern Utah County [1]		
Alpine	18,900	Same as year 2050
American Fork	56,433	82,509
Cedar Fort	1,127	Same as year 2050
Cedar Hills	12,300	Same as year 2050
Eagle Mountain	53,644	190,000
Highland	28,163	Same as year 2050
Lehi	89,098	146,941
Pleasant Grove	40,700	Same as year 2050
Saratoga Springs	53,762	121,803

[1]Information on build-out populations are from both MAG and the "North Utah County Water Needs Study", dated October 9, 2001

Growth in Unincorporated Areas of Utah County

The projections by MAG included four newly listed unincorporated areas with significant growth potential. Three of the areas are in southern Utah County and one in northern Utah County. Growth in these unincorporated areas will accelerate overall county growth. Their year 2050 populations are listed in Table 1-3. The location of these unincorporated areas is shown on Figure 1-1 and on maps in Attachment A.

TABLE 1-3 Year 2050 Population Projections for Unincorporated Areas of Utah County	
Unincorporated Area	**2050 Population**
Southern Utah County	
Goshen Valley	48,114
West Shore Area	13,061
West Mountain Area	14,525
Northern Utah County	
Cedar Valley	33,666

REFINEMENTS IN METHODOLOGY

Following the completion of the Draft Plan Formulation Report of February 2002, planning efforts continued to refine the methods and underlying assumptions for computing M&I water demand. The more significant refinements are:

- Refinements in local responsibility to achieve water conservation goals;
- More in-depth analysis of the availability of local water supplies, particularly from agricultural conversion of Strawberry Valley Project (SVP) water in southern Utah County;
- Utilization of Utah Lake water rights through reverse osmosis treatment in Salt Lake County; and
- Analysis of the potential use of return flows through water recycling.

Table 1-4 summarizes the methodology and assumptions previously presented in the Draft Plan Formulation Report, together with the refinements used in this M&I Water Needs Appendix. The following paragraphs discuss these various refinements.

TABLE 1-4 Refinements in Methodology and/or Assumptions	
Assumptions Used in the Draft Plan Formulation Report	**Refinements To Assumptions**
1. Communities will be able to meet water conservation goals to reduce consumption 12 ½ percent by 2020 and 25 percent by 2050.	1. This assumption was refined to apply the conservation goals to the entities that contracted for ULS water. For southern Utah County this would be the Southern Utah Valley Municipal Water Association. In northern Utah County it would be the individual cities and in Salt Lake County it would be the Jordan Valley Water Conservancy District and the Metropolitan Water District of Salt Lake and Sandy.
2. An acre of irrigated land would be converted for every six new residents on the newly developed lands.	2. The following modifications were made: In Utah County, the State of Utah uses 9 people per acre for rate of urbanization of agricultural lands. An estimate was made of the percent of growth that would occur on agricultural lands and the percent of growth on non-agricultural lands. For example, if 50% of the growth is on non-agricultural lands then the net result is 1 acre of agriculture for each increase of 4.5 people.

TABLE 1-4 Refinements in Methodology and/or Assumptions	
Assumptions Used in the Draft Plan Formulation Report	**Refinements To Assumptions**
3. Agricultural conversion could meet a significant portion of M&I demand, particularly in southern Utah County. The dry-year supply for the converted irrigated land (e.g., 1961) would be available for conversion to M&I.	3. The following modifications were made: a) Recognition of 10,200 acre-feet of SVP irrigation water used within city boundaries with the remainder of the SVP water which amounts to 50,800 acre-feet (minus stream conveyance and canal seepage losses) to be used to meet needs of the other remaining agricultural lands. b) As lands are urbanized SVP water presently used on irrigated lands would be transferred to other SVP lands for use as a water supply to supplement late season irrigation needs on the remaining SVP agricultural lands. c) As irrigated lands are urbanized, up to 50 percent of Spanish Fork River water located within the declaration boundaries of the cities could become available for M&I use within the SUVMWA area. Competing demand for water rights would limit the supply available to SUVMWA. d) Up to 50 percent of Summit Creek water could be converted to M&I in Santaquin on irrigated lands urbanized. e) No further Salem Pond shares (22 shares) are obtained by Salem. The location of the remaining shares makes acquisition by the city unlikely. f) The entire yield of Peteetneet Creek, Spring Lake, Maple Creek and Hobble Creek becomes available to the cities as lands on which the shares are located are urbanized. g) Spanish Fork Southeast Irrigation Company lands have been designated as open space by Spanish Fork City and will continue to be irrigated in the city's plan for growth.
4. Communities would be able to fully develop their current groundwater rights.	4. No change

TABLE 1-4 Refinements in Methodology and/or Assumptions	
Assumptions Used in the Draft Plan Formulation Report	**Refinements To Assumptions**
5. Conjunctive use opportunities would eventually be realized in some communities to firm up or increase the yield of groundwater supplies.	5. No change
6. Distributing, transferring or exchanging the available M&I water supplies from one community to another could decrease the projected M&I shortages. This may particularly work for the South Utah Valley Municipal Water Association (SUVMWA), which is a legal entity comprised of the 10 communities in southern Utah County to promote development and financing of municipal water resources.	6. Based upon further review it was determined that this distribution would not be practical because of the lack of infrastructure to convey water from one community to another and the need to retain water by each community to meet its build-out population.
7. Utah Lake water compared to other water sources is not a feasible water supply because of the cost of demineralizing the water for culinary, outdoor or ornamental plant use.	7. The following modifications were made: In recognition of comments received from the public, scoping meetings of February 27th and 28th, 2002, the feasibility of using Utah Lake water through reverse osmosis treatment should be evaluated.

Refinements in Local Responsibility to Achieve Water Conservation in Southern Utah County

The initial ULS water demand sheets, based on meeting the State water conservation goals, were provided to the communities for review. Several communities in southern Utah County expressed concern over what they perceived as unrealistic water conservation projections. Representatives stated that the majority of existing homes located in some of the southern Utah County communities are situated on lots that are substantially larger than those found in more urban areas. Some communities such as Spanish Fork City have established large areas as green belts. The cities' representatives contend the higher per capita water usage rates in southern Utah County are more likely due to this factor than to over-consumption. SUVMWA, while acknowledging the validity of this argument, determined that an *average* 25% conservation goal could indeed be reached across its service area. This was reflected in the computations of water

demands for southern Utah County presented in Chapter 5 and in the detailed water demand sheets in Attachment D to this M&I Water Needs Appendix.

Local Water Supplies

Communities in the ULS service area generally have water rights to obtain their M&I supply from wells, springs, streams, and as holders of irrigation company stock. However, the dry-year yield from various water rights may be significantly less than the amount of the water right. Consequently water supply data from 1961 (a dry year), which is about 50% of the annual average streamflow, was used in order to approximate the reliable volume of water supplies.

As indicated above in Table 1-4, assumptions were adopted which more realistically represent the volume of water that would be available from the SVP, Spanish Fork River, and local irrigation companies. The following assumptions were made regarding the conversion of SVP water.

1. Recognition of 10,200 acre-feet of SVP water as existing irrigation water within city boundaries.

2. The portion of the SVP water that would become available through conversion of agricultural lands would become part of the irrigation water supply for the remaining SVP lands.

3. The irrigation water available from urbanization of lands with rights to Spanish Fork River water and other surface streams would become part of the water supply for the city in which the lands were urbanized. This water would supply needs of some of the communities in meeting the M&I demands for their build-out populations.

Utah Lake Water Rights

The water rights and operation of Utah Lake are key elements of the Bonneville Unit water supply. The lake's water was originally used solely for irrigation in Utah and Salt Lake counties. As agriculture in Salt Lake County declined, a significant portion of the irrigation rights have been purchased by other entities for industrial purposes and as a future potential municipal water supply after treatment such as reverse osmosis. Water rights, such as those held by the District and the Jordan Valley Water Conservancy District, will be used in a manner to meet the M&I needs of their service areas. A discussion has been included in Chapter 2 of this M&I Water Needs Appendix to illustrate the means whereby the waters of Utah Lake may be used for M&I purposes.

Return Flows and Water Recycling

Public Law 107-366, signed into law by President Bush on December 19,2002 amends the Central Utah Project Completion Act (CUPCA) to include funds for implementing conservation measures in a manner consistent with the intent of the amended CUPCA. The conservation measures include the use of reverse osmosis membrane technology, which is a key to direct use of water from Utah Lake and the Jordan River, and water recycling of return flows from wastewater treatment plants. Consequently, this M&I Water Needs Appendix contains an assessment of the potential for recycling water from wastewater treatment plants and reverse osmosis treatment of water from Utah Lake and the Jordan River for M&I use.

Central Utah Project Completion Program

Chapter 2

October 2004

UTAH RECLAMATION
MITIGATION
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Chapter 2

Utah Lake is an operational segment of the Bonneville Unit. This Chapter describes the way Utah Lake water rights would contribute to the water supply of the Bonneville Unit under the proposed Utah Lake Drainage Basin Water Delivery System (ULS).

HISTORICAL PERSPECTIVE ON UTAH LAKE WATER DEVELOPMENT

Utah Lake is a shallow, semi-saline remnant of ancient Lake Bonneville. The lake's inflow comes from the Spanish Fork, American Fork, and Provo rivers, various smaller streams, and surface and subsurface irrigation return flows. The lake's outlet discharges water to the Jordan River, which flows through Salt Lake County on its way to the Great Salt Lake. Because of its geographic situation, the lake can receive trans-basin imported water from Strawberry Reservoir through the Spanish Fork River, and from Jordanelle and Deer Creek reservoirs through the Provo River. The natural lake has been transformed into a storage reservoir through structural modification of its outlet beginning in 1872. A low dam was constructed at the Jordan River outlet to increase storage volume. A radial gate structure was constructed to control releases to the Jordan River. A high capacity pumping plant was added to discharge water when the lake level is too low for gravity release through the radial gate structure.

Water has historically been stored in Utah Lake to provide a regulated water supply in the Jordan River for diverters in Salt Lake County, and to provide water for certain irrigators in Utah County who pump directly from the lake. Since the Bonneville Unit M&I System became operational, the lake has become a key element in the operation of the Bonneville Unit. For example, under the Bonneville Unit the lake serves as a link for exchanges of storage with Jordanelle Reservoir, including conveyance of water released from Strawberry Reservoir. The lake captures return flows from M&I System water used in northern Utah County. In the future, the lake will also capture return flows from the Bonneville Unit which will deliver water through ULS project features to communities in southern Utah County. Under the completed Bonneville Unit, the lake will serve as a common operational interface between the Strawberry Collection, Diamond Fork, M&I, and ULS systems.

The water rights in Utah Lake are not defined by the storage capacity of Utah Lake. Instead, the water rights are defined in terms of quantities of water to satisfy beneficial uses and exchanges, and in terms of controlling water surface elevations that affect releases and exchanges on a monthly basis, as discussed in this chapter.

The maximum Utah Lake operational water surface elevation has been set at 4489.045 feet as a compromise between the need for storage and the need to avoid inundation of shoreline properties. The total storage capacity of the lake at the compromise elevation is approximately 870,000 acre-feet, of which 710,000 acre-feet is the active storage capacity. Approximately 160,000 acre-feet is inactive storage. The minimum operational water surface elevation of the lake (top of inactive pool) is 8.7 feet below the compromise elevation, or approximately elevation 4480.3 feet. This elevation has been set by the Utah State Engineer's Distribution Plan, which is described below Section 2.1.2 of this chapter. This minimum elevation corresponds approximately to the minimum water surface elevation at which the outlet pumps can operate.

The average annual inflow (1951-1999) to Utah Lake from all sources is about 726,000 acre-feet, including precipitation gains of more than 100,000 feet. Of this, approximately half is discharged to the Jordan River and the remainder is lost to evaporation from the lake surface. The average outflow is strongly affected by spills during very wet years. The average amount of the outflow that goes to meet demands is estimated to be about 266,000 acre-feet.

Review of Utah Lake Water Rights

The water rights in Utah Lake were set forth in the Morse (1901) and Booth (1909) decrees. The Morse decree identified two groups of water rights: 1) Direct flow rights on the Jordan River; and 2) Water rights in Utah Lake. The Booth decree allowed for additional appropriations of water from Utah Lake and set a maximum limit of 185,000 acre-feet on the diversions under the storage rights set forth in the Morse decree. In the State Engineer's interim distribution plan, the rights defined in the Morse decree are referred to as primary storage rights, and all subsequent rights established under applications to appropriate water are referred to as secondary storage rights.

The water supply for the primary rights is 192,906.15 acre-feet while the water supply for the secondary rights is 112,738.90 acre-feet, for a combined amount of 305,645.05 acre-feet. This amount includes carrier water of 3,600 acre-feet which must remain in the Jordan River. The total volume of divertable right, is 302,045.05 acre-feet.

The ULS project team recently investigated Utah Lake water rights to determine the following three items:

1. Verification of the volume of water covered by the Utah Lake rights

2. Estimation of the volume of potential deliveries that could be called for from the lake by current diverters and whether those deliveries are being called upstream or downstream of the lake; and

3. Determination of ownership of large blocks of water still available for call from the lake.

Two critical assumptions were made prior to the research. The first assumption was that the entire appropriation of Utah Lake water was originally owned by eight right-holders under eleven original rights. The second assumption deduced that all-subsequent assignments of rights stemmed from the subdivision of the eleven original rights. These assumptions were confirmed with staff of the State Engineer's office.

Table 2-1 summarizes the volume and current ownership of the eleven original Utah Lake water rights, as well as the volume of the annual yield presently remaining in the right. Detailed information relating the original rights and the corresponding subdivisions can be found in Attachment B.

TABLE 2-1
Summary of Utah Lake Water Rights

Water Right Number	Owner of Record	Amount of Original Right ac-ft	Amount Exchanged Upstream of Utah Lake ac-ft	Amount Exchanged Downstream of Utah Lake ac-ft	Amount of Remaining Right ac-ft
59-3500	South Jordan Canal Co.	29,634.85	6,265.97	6,589.95	16,778.93
59-3499	Utah and Salt Lake Canal Co	45,673.30	2,813.67	14,743.08	28,116.55
59-3496	North Jordan Irrigation Co	15,848.00	10,498.60	0	5,349.40
59-3517	Kennecott Utah Copper Corp	13,750.00	0	5,000.00	8,750.00
57-7637	East Jordan Irrigation Co.	48,400.00	11,194.51	9,096.78	28,108.71
57-7624	Salt Lake City	39,600.00	0	25,000.00	14,600.00
57-23	Sandy & Draper Irrigation Co	12,500	6,004.40	2,000.00	4,495.60
59-13	Utah Lake Distributing Co	43,165.9	3,267.24	39,898.66	0
	Subtotal	**248,572.05**	**40,044.39**	**102,328.47**	**106,199.19**
59-14,15,20	Central Utah Water Cons. District	57,073.00[1]	0	0	(1)

[1] This water right, purchased by the District from Kennecott Utah Copper Corporation, may be acquired by the U.S. Department of Interior to become part of the Bonneville Unit water supply.

Once the amount of water in the rights had been established, the next task was to establish whether the water covered by the rights was being diverted upstream or downstream from the Utah Lake. This determination is instrumental in refining the demand figures to be used in the hydrological modeling for the ULS project. The point of diversion determination was made using the State Engineer's water rights area map and the corresponding area prefix on the change application for each segregation. All area prefixes except 57 and 59 were assumed to be diversions upstream of the lake; prefixes 57 and 59 were assumed to be diversions downstream of the lake. Table 2-2 summarizes the results of this task.

TABLE 2-2 Point of Diversion Summary of Utah Lake Water Rights			
	Primary Storage Rights (acre-feet)	**Secondary Storage Rights (acre-feet)**	**Total Storage Rights (acre-feet)**
Diverted Upstream of Lake	30,772.76	9,271.64	40,044.40
Diverted Downstream of Lake	162,133.39	103,467.26	265,600.65
Total in Lake	**192,906.15**	**112,738.90**	**305,645.05**

State Engineer's Distribution Plan

The State Engineer has received various requests in recent years to make decisions on matters that significantly affect water distribution in the Utah Lake drainage basin. In 1992 the State Engineer issued the Interim Water Distribution Plan for the Utah Lake Drainage Basin that addressed Utah Lake water rights, the relationships between storage rights in the lake and upstream reservoirs, and other related water distribution issues. The interim distribution plan was issued under authority of the Utah Code Annotated 1953. The plan was intended to establish a general framework within which the respective rights can be administered. The distribution guidelines follow the priority doctrine of "first in time, first in right"; and where rights are equal in priority, each of those rights receives a proportionate share of the total water available for diversion under that priority.

The interim distribution plan specifies the volume of Utah Lake storage associated with the primary and secondary water rights. The first 125,000 acre-feet of storage is dedicated to providing sufficient water to meet the primary rights during dry years. The remaining 585,000 acre-feet of storage is referred to as system storage, and is used to meet the diversion requirements associated with both the primary and secondary rights. System storage may be held in Utah Lake or upstream (in Jordanelle or Deer Creek reservoirs). System storage held upstream is subject to call by Utah Lake water users when the Utah Lake level falls below the uppermost 125,000 acre-feet of active storage. On the other hand, when Utah Lake is above a predefined target level or conversion line, upstream system storage may be converted to priority storage according to the priority of the upstream rights. Once converted, priority storage is under the full control of the owner and is not subject to call by Utah Lake rights holders. Additional details regarding the interim distribution plan are found in Volume V of the Draft Water Supply Appendix to the March 1998 Supplement to the 1988 Bonneville Unit Definite Plan Report.

In issuing the interim distribution plan, the State Engineer observed that in order for the river commissioners to properly administer the numerous diversions, the amounts of the water rights and the relationships among them need to be fully understood by everyone involved. In simple terms, the water rights on the Provo River, Spanish Fork River, Utah Lake, Jordan River, and other sources in the basin need to be managed as one system. The objective visualized was not to remove local control or involvement in the management of the waters, but to provide for the

equitable distribution of water, according to the respective water rights, and to address problems from a more regional point of view.

UTILIZATION OF UTAH LAKE RIGHTS UNDER ULS PROJECT

Certain Utah Lake water rights will augment the supply of water available for the Bonneville Unit, either for release or to facilitate exchanges. Both the CUWCD and the Federal government hold water rights that may be useable for these purposes. In addition, the Jordan Valley Water Conservancy District has Utah Lake/Jordan River water rights.

Rights of Central Utah Water Conservancy District

The Central Utah Water Conservancy District has acquired two water rights that provide for diversion of water from Utah Lake and the Jordan River. These rights are described as follows:

- Water Right No. 57-7624 provides for diversion of 39,600 acre-feet of water, including 3,600 acre-feet of carrier water, which must remain in the Jordan River. This water right was acquired by the Central Utah Water Conservancy District on August 16, 1988. This is a primary storage right. Of the 39,600 acre-feet, Salt Lake City owns 14,600 acre-feet including the carrier water. The U.S. Department of Interior owns 7,900 acre-feet, the community of Elk Ridge in southern Utah County was assigned 237 acre-feet by the Central Utah Water Conservancy District, and the Central Utah Water Conservancy District owns the remaining 16,863 acre-feet. This is a decreed right granted by the Booth Decree of June 5, 1909.

- Water Right Nos. 59-14, -15, and -20 provide for diversion of 57,073 acre-feet and have a priority date of August 6, 1909, and February 28, 1911. The water right certificates were issued on March 27, 1969. This is a secondary water right. The diversion right was acquired from Kennecott Copper Corporation on December 31, 1987.

The District owns primary and secondary water rights in Utah Lake. Under the ULS System Proposed Action, the DOI would acquire all of the remaining District's secondary rights. These rights would amount to approximately 57,000 acre-feet and would yield at least 34,540 acre-feet. The acquired water rights would be used to convert or exchange water to Jordanelle Reservoir under approved water rights used in conjunction with the State Engineer's Utah Lake Distribution Plan.

Rights of Jordan Valley Water Conservancy District

The Jordan Valley Water Conservancy District has a goal for purchasing between 50,000 and 70,000 acre-feet of water rights from Utah Lake and the Jordan River. At the present time, JVWCD has purchased approximately 16,736 acre-feet of rights as tabulated on Table 2-3. Of the 16,736 acre feet, Jordan Valley anticipates 2,000-3,000 acre feet will be used to replace Utah County return flows associated with their Jacob-Welby exchange. In addition, losses and inefficiency associated with membrane treatment of Utah Lake water will reduce the useable

water under these rights. The JVWCD anticipates their total usable water supply, resulting from their tabulated Utah Lake rights, may be 9,000 acre-feet annually.

TABLE 2-3
Jordan Valley Water Conservancy District
Utah Lake and Jordan River Water Rights
(As of October 16, 2002)

Utah Lake Rights (Acquired as Irrigation Stock Rights from Local Water Companies)	Number of Shares Acquired	Unit Yield (AF/Share)	Total Yield (Acre-Feet)
Draper Irrigation Company	327.00	1.00	327.00
East Jordan Irrigation Company	1.00	4.84	4.84
North Jordan Irrigation Company	154.00	1.72	264.88
South Jordan Canal Company	217.50	4.94	1,074.45
Utah and Salt Lake Canal Company	652.00	4.59	2.992.68
Utah Lake Distributing Company	85.00	5.11	434.35
Welby Jacob Water Users Company	6,606.00	1.00	6,606.00
Subtotal, Utah Lake Rights	**8,042.50**		**11,704.20**
Jordan River Rights			**5,031.50**
Total	**8,042.50**		**16,735.70**

The U.S. Department of the Interior has acquired 7,900 acre-feet of the primary rights of the Central Utah Water Conservancy in order to complete the Indian Ford Exchange of the Bonneville Unit. These water rights will be operated to benefit the water supply of the M&I System. By holding this water in Utah Lake and/or exchanging it up to Jordanelle Reservoir the water supply of the M&I System is completed. In addition, the District proposes to use its secondary rights, as necessary, to make up for deliveries of ULS water above the 15,800 acre-feet that is currently available as additional Strawberry deliveries. As noted above, the historical use of the District's secondary water rights would yield at least 34,540 acre-feet on an annual average basis.

FUTURE AVAILABILITY OF UTAH LAKE WATER FOR M&I USE

Population projections indicate that urbanization will continue in Salt Lake County. In order to accommodate this population growth, land use will continue to shift from irrigated agriculture to residential and commercial use. Necessarily, water use will shift from agricultural to municipal and industrial as this growth continues. As the remaining agricultural lands in Salt Lake County are urbanized it is estimated that a water supply of approximately 75,000 acre-feet (on an average annual basis) would be made available for other use. This would essentially use all remaining Utah Lake irrigation rights in Salt Lake County.

Historically, the major use of Utah Lake water has been for irrigation of alfalfa, corn, barley, wheat and oats in the Salt Lake Valley. Other uses include industrial purposes such as mining and ore processing. In recent years, as Salt Lake County has continued to urbanize, communities in the county have developed pressurized irrigation systems for watering lawns and gardens. These communities have received complaints from residents that the Utah Lake water has damaged and killed many of the ornamental plants and shrubs used in landscaping. Although other communities are considering the installation of pressurized irrigation systems, they are studying the water quality aspect of using Utah Lake water on residential landscaping prior to plan implementation.

The conversion of agricultural lands in Salt Lake County is discussed in Chapter 7 in connection with the assessment of M&I demand in Salt Lake County and water rights aspects as noted above in this chapter. If such water were diverted directly from the lake or the Jordan River for culinary use, it would require treatment including membrane desalting. To the extent that such water can be obtained by exchange through groundwater pumping by exchange, treatment needs could be reduced.

To a much smaller extent in Utah County, a limited M&I use of the Utah Lake water resulting from agricultural conversion involves the change of diversion point from Utah Lake to groundwater pumping at other locations tributary to the lake. Some Utah County entities have done this by purchasing irrigation stock of 400 acre-feet from the East and South Jordan Canal Company that is located in Salt Lake County and which diverts water from the Jordan River downstream of the outlet of Utah Lake. However, further opportunities are becoming more difficult to arrange as the groundwater pumping throughout the Utah County area increases in response to the growing M&I needs of the municipalities.

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Chapter 3

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UTAH RECLAMATION
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Chapter 3

Return flows from the use of M&I water could, with appropriate treatment, provide additional water to help meet growing needs along the Wasatch Front. As noted in Chapter 1, Public Law 107-366 amended CUPCA to include authorization to implement measures for water conservation and reuse, including the application of reverse osmosis membrane technology and water recycling. The chapter identifies the potential volumes of wastewater that may be available for water recycling.

THE ROLE OF RETURN FLOW IN THE ULS

Occurrence and Use of Return Flow

Return flow from M&I water provided by the Bonneville Unit M&I System (Jordanelle Reservoir) occurs as municipal wastewater in Salt Lake, Utah, and Wasatch counties. Return flow from the use of M&I water from the Bonneville Unit's Utah Lake Drainage Basin Water Delivery System (ULS System) would occur as municipal wastewater in southern Utah County and Salt Lake County. The treatment and reuse of municipal wastewater could provide an additional water resource in the ULS project planning area.

Return flow from the M&I use of Bonneville Unit water is considered by the Department of the Interior (DOI) to be Bonneville Unit water, and thus available for reuse as a federal water supply. In the case of Salt Lake County, an official estimate of the amount of Bonneville Unit return flow that can be credited to the DOI is pending a ruling by the State Engineer.

Wastewater reuse can be divided into two categories:

1. "Direct reuse" refers to the intentional re-utilization of wastewater flows by, or in connection with, the agency providing or treating the wastewater flow. Such reuse occurs prior to the wastewater being released to surface waters or to groundwater aquifers where they are commingled with downstream water supplies.

2. "Downstream reuse" refers to the utilization of discharged wastewater after it has been discharged to and commingled with downstream water supplies. Downstream reuse is usually indirect and "unintentional," i.e., not specifically under the direction of the agency providing the treatment services.

Downstream reuse of wastewater already occurs in the Bonneville Unit area. Various municipal wastewater discharge points are located upstream of other water diversion points, and after discharge the treated wastewater commingles with streamflow and becomes available for downstream reuse. Utah Lake is a notable example of such reuse, in that treated Utah County wastewater entering the lake becomes part of the water supply of water right holders in Utah Lake. A portion is released to the Jordan River for crop irrigation in Salt Lake County.

The more significant potential for direct reuse of treated municipal wastewater effluent along the Wasatch Front includes the following opportunities.

1. Use in pressurized irrigation systems in the western portion of Salt Lake County

2. Use for wetlands habitat enhancement in the wildlife area around the south shore of the Great Salt Lake

3. Use for wetlands habitat enhancement in Benjamin Slough area of Utah Lake

4. Use for certain municipal purposes in Salt Lake County following membrane treatment and purification.

Approach to Determining Bonneville Unit Return Flows

The potential water supply to be provided by the ULS project includes return flows resulting from current and future use of Bonneville Unit M&I water. In order to integrate the reuse of return flows into the ULS water supply the following questions must be answered:

- How much Bonneville Unit water is delivered for M&I use in various locations?
- Where do municipal wastewater discharges occur in the Bonneville Unit and where and how are they measured?
- How much of the municipal wastewater discharge is Bonneville Unit return flow?
- What is the capability of local wastewater treatment plants to treat Bonneville Unit wastewater?
- For what purposes may the treated Bonneville Unit wastewater be used?

BONNEVILLE UNIT RETURN FLOWS IN SALT LAKE COUNTY

This section addresses the estimation of the quantities of municipal wastewater that can be expected to occur from the use of Bonneville Unit M&I water in Salt Lake County.

Bonneville Unit M&I Water Use in Salt Lake County

The use of 70,000 acre-feet of M&I water in Salt Lake County from the completed Bonneville Unit M&I System (Jordanelle Reservoir) would produce return flows to the Jordan River. A ruling by the State Engineer is pending regarding the amount of such return flows that could be credited to the Bonneville Unit of Central Utah Project. The ruling will determine the conditions under which water agencies in Salt Lake County may intercept and reclaim these return flows under agreements with the Secretary of the Interior. In absence of this ruling, a conservative estimate of 15% of the diversion of 70,000 acre-feet was made which equates to 10,500 acre-feet of return flow that may possibly be credited to the Bonneville Unit.

The use of 30,000 acre-feet of water in Salt Lake County from the proposed ULS System would produce additional return flows to the Jordan River. These return flows are not under the same State Engineer rules as those of the Bonneville Unit's Municipal and Industrial System because the water supply comes from outside the Jordan River/Utah Lake Drainage Basin. Return flow factors are administratively determined by the Utah Division of Water Rights based on best

scientific and professional judgment. The State Engineer's Office has indicated to the District that a 35 percent return flow factor from imported water would be appropriate for ULS operations. For the ULS System a return flow factor of 35% of the 30,000 acre-feet was used as an estimate of the return flow. This would amount to 10,500 acre-feet. Combined with the use of Jordanelle Reservoir water as noted above, the total amount of Bonneville Unit M&I water delivered to Salt Lake County would be 100,000 acre-feet per year with projected return flow of approximately 21,000 acre-feet that could be credited to the Bonneville Unit.

Approximately 18,000 acre-feet of the 21,000 acre-feet would return to the South Valley and Central Valley wastewater treatment facilities. Recycling of this water would help meet the municipal and industrial needs in the Jordan Valley Water Conservancy District service area. Recycling would involve the DOI, District, District's petitioners, and the owners of the wastewater treatment plants. The remaining 3,000 acre-feet of the 21,000 acre-feet would return to the Salt Lake City Wastewater Treatment Plant, which is located on the south shore of the Great Salt Lake at a point too far below the M&I service area to be economically recycled. The 18,000 acre-feet to be recycled would not be part of the ULS supply per-se but would be included in the overall Bonneville Unit water supply.

BONNEVILLE UNIT RETURN FLOWS IN UTAH COUNTY

In northern Utah County, the delivery and use of 20,000 acre-feet of Bonneville Unit M&I water for municipal and secondary system use would produce a return flow of 7,000 acre-feet to Utah Lake, based on a return factor of 35%. In previous Bonneville Unit documents, it was stated that this return flow to Utah Lake would be credited and exchanged to Jordanelle Reservoir. However, the State Engineer issued a decision in November 2002 that return flows from in-basin water would accrue to the Utah Lake as part of the water rights of those individuals and entities that have Utah Lake water rights. Consequently, return flows from the 20,000 acre-foot delivery in northern Utah County are not available to the project.

In southern Utah County the use of 30,000 acre-feet of Bonneville Unit water from Strawberry Reservoir for M&I purposes will return a portion of the indoor culinary, commercial and industrial uses to wastewater treatment plants located near the edge of Utah Lake. Of the 30,000 acre-feet, an estimated 3,000 acre-feet would be conserved under Section 207 projects, and assigned to DOI. Of the 1,590 acre-feet already under contract to SUVMWA, 590 acre-feet would be used by SUVMWA member cities as secondary M&I water. The remaining 1,000 acre-feet has been assigned to DOI. This leaves 27,590 acre-feet of M&I water to southern Utah County (30,000 + 1,590 – 3,000 – 1,000 = 27,590 acre-feet).

Based on a return flow percentage of 35%, the water delivered for these M&I purposes in southern Utah County would produce an estimated 9,660 acre-feet per year of additional return flow, which will become part of the Utah Lake water supply for exchange with Jordanelle Reservoir.

BONNEVILLE UNIT RETURN FLOWS IN WASATCH COUNTY

In the Heber Valley of Wasatch County, the Bonneville Unit will provide 12,100 acre-feet of irrigation water and 2,400 acre-feet of M&I water. Return flow from these uses, estimated to be 5,900 acre-feet annually, will be captured in Deer Creek Reservoir, from which they will be released as part of the Bonneville Unit M&I water supply.

POTENTIAL FOR UTILIZATION OF RETURN FLOWS

Figure 3-1 shows the location of existing wastewater treatment facilities in Salt Lake and Utah counties.

Salt Lake County

Salt Lake County Wastewater Treatment Plants. Table 3-1 contains a listing of municipal wastewater treatment plants, along with the design capacity of the respective plants.

TABLE 3-1
Wastewater Treatment Plants in Salt Lake County
(Source: Water Management Improvement Studies, "Report on the Study of Coordinated Operations," October 1995, CUPCA, Central Utah Water Conservancy District)

Location	Design Capacity (MGD)	Average Flow (MGD)	Provides Discharge	Current Reuse
Central Valley	62.50	58.92	Yes	Downstream
Magna	3.30	2.08	Yes	None
Salt Lake City	45.00	35.43	Yes	Downstream
South Valley	38.0	20.75	Yes	Downstream
Total (MGD)	**148.8**	**117**		
Total (acre-feet)	**168,000**	**132,000**		

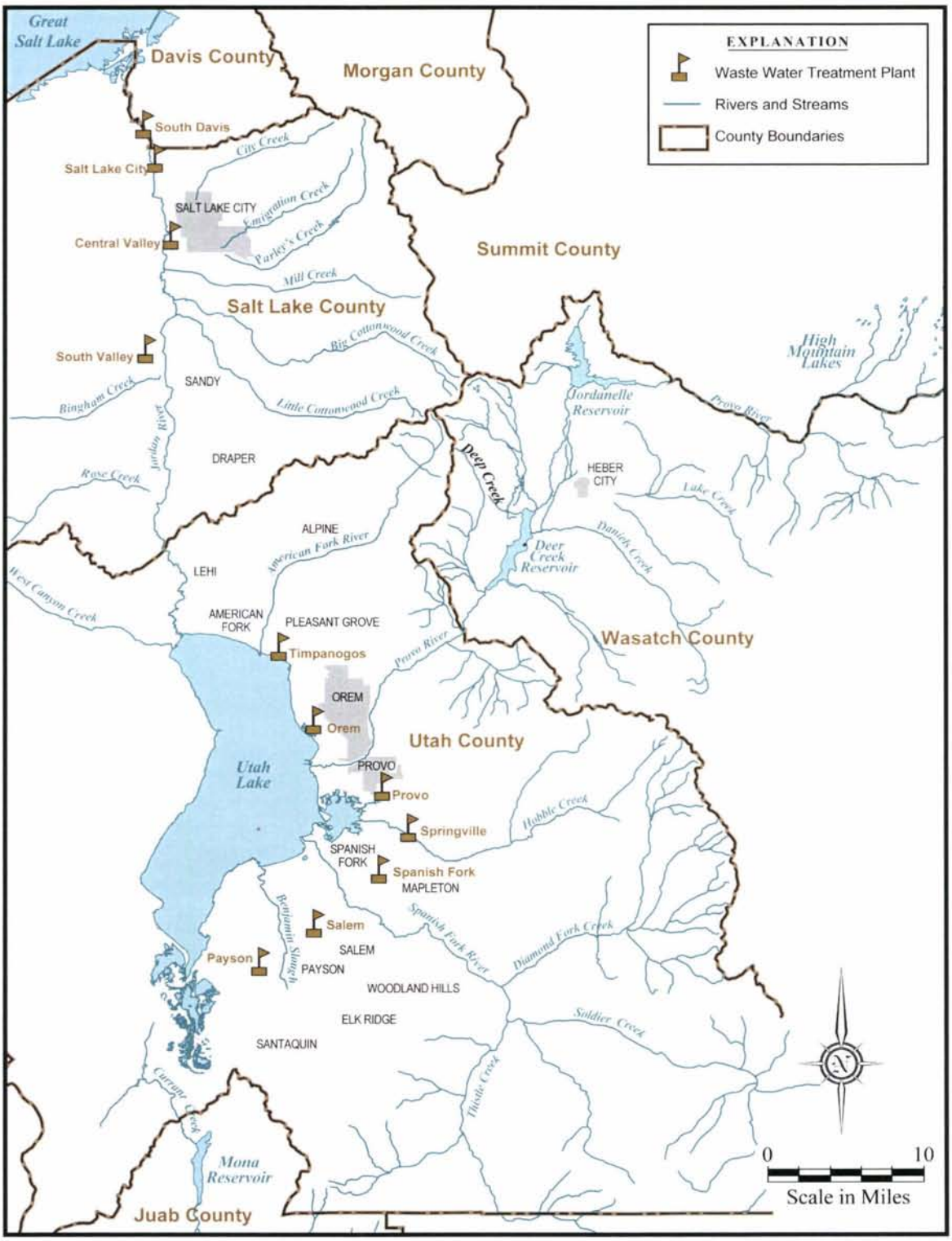


Figure 3-1
Wastewater Treatment Plants in Salt Lake and Utah Counties

Combined CUP and Non-CUP Return Flows. In order to place the CUP return flow amounts in perspective with other water supply aspects of Salt Lake County, a compilation was made of the combined amounts of return flows from the Bonneville Unit and from their other sources of water. Table 3-2 presents the estimates of the combined flows from the various wastewater treatment plants for selected future years.

TABLE 3-2
Projections of Salt Lake County Return Flows from CUP and Non-CUP M&I Water Use

	Bonneville Unit Return Flows (Distribution of 21,000 acre-feet Return Flow)						Non-Bonneville Unit Return Flows		
	Existing CUP (70,000 AF Delivery) (15% return flow)			ULS (30,000 AF Delivery) (35% return flow)					
	Wastewater Treatment Plants			Wastewater Treatment Plants			Wastewater Treatment Plants		
	Central Valley	South Valley	Salt Lake	Central Valley	South Valley	Salt Lake	Central Valley	South Valley	Salt Lake
2010	5,000	4,000	1,500	4,250	4,750	1,500	55,106	26,674	31,087
2020	5,000	4,000	1,500	4,250	4,750	1,500	56,000	27,000	33,067
2030	5,000	4,000	1,500	4,250	4,750	1,500	57,318	28,068	35,046
2040	5,000	4,000	1,500	4,250	4,750	1,500	61,743	30,856	37,025
2050	5,000	4,000	1,500	4,250	4,750	1,500	70,000	36,000	39,000

Table 3-3 summarizes the combined flows from the various Salt Lake County wastewater treatment plants for 2050. A comparison of the total CUP and non-CUP return flows from M&I use is presented in Table 3-3.

TABLE 3-3
Summary Projection of Salt Lake County Return Flows in 2050 From CUP and Non-CUP M&I Water Use

Wastewater Plant	CUP	Non-CUP	Total
South Valley	9,250	36,000	45,250
Central Valley	8,750	70,000	78,750
Salt Lake	3,000	39,000	42,000
Magna	0	350	350
Total	**21,000**	**139,350**	**166,350**

Note: Not all of the return flows could be used because of requirements in the wildlife refuge along the south shore of the Great Salt Lake. Water supply requirements for the refuge have not been defined.

Potential Uses of Recycled Water in Salt Lake County. An overview of the potential use of recycled water for outdoor uses is described below. Chapters 7 and 8, respectively present a more in-depth discussion of the plans of Jordan Valley Water Conservancy District and the Metropolitan Water District of Salt Lake and Sandy to recycle water in Salt Lake County.

Secondary Systems. Heretofore, the use of recycled wastewater for M&I purposes in Utah has been limited to the watering of parks, golf courses, and cemeteries. However, projects are in the planning stage that would use recycled water for lawns. This use requires separate distribution systems commonly referred to in Utah as secondary systems. The State of Utah is in the process of revising the regulations governing reuse of wastewater to allow for its use in secondary systems but only under stringent management systems. The technology, although costly, is currently available to treat the wastewater to a level that is required for the secondary systems.

As a first step, Salt Lake County could use recycled water exclusively on current and future parks and golf courses. If all of the current and future open space area was irrigated with recycled water, approximately 59,000 acre-feet of the future demand (2050) in Salt Lake County could potentially be met by recycled water. This scenario is obviously an over simplification of the many obstacles there are to be overcome in using this water, but it does indicate the magnitude of the potential for recycled water.

Currently two projects are being investigated that would use approximately 18,000 acre-feet recycled wastewater from WWTPs in the western portion of Salt Lake Valley for secondary irrigation systems (see Figure 3-2).

Wetlands. Another potential use of the return flow is to provide a firm water supply for the bird refuge along the south shore of the Great Salt Lake. Refer to Figure 3-3 for the location of this bird refuge. Although outside the ULS planning area, the South Davis Wastewater Treatment Plant in Davis County could provide a portion of the firm water supply. The Utah Division of Wildlife Resources has 250 cfs of water rights in the Farmington Bay Wildlife Refuge (FBWLR). In conversations with officials of the DWR, it is clear the FBWLR could use much more water for wetlands than is available on an average annual basis. Currently all of the effluent from the primary WWTPs in Salt Lake County ends up in the FBWLR.

Utah County

Figure 3-1, presented previously in this Chapter, shows the location of existing wastewater treatment plants in Utah County.

The wastewater treatment facilities in Utah County are grouped together according to the following regions:

- North Utah County (Timpanogos Regional WWTP)
- Central Utah County (Orem WWTP and Provo WWTP)
- Southern Utah County (Payson, Salem, Spanish Fork, and Springville WWTPs)

North Utah County

Existing Wastewater Treatment Plants. Table 3-4 displays information on the existing water treatment plant in north Utah County.

TABLE 3-4
Wastewater Treatment Plant in North Utah County
(Source: Annual Report 2002, Timpanogos Special Service District)

Location of Plant	Design Capacity (MGD)	Average Flow (MGD)	Provides Discharge	Current Reuse
Timpanogos	18	9.1	Yes	Wetlands enhancement and downstream
Total (MGD)	**18**	**9.1**		
Total (acre-feet)	**20,367**	**10,297**		

Potential Uses of Return Flows. The Parsons report for northern Utah County, identified a possible use of the return flow following tertiary treatment for watering of large urban open spaces used as green belts in the Eagle Mountain and Saratoga Springs area. (North Utah County Water Needs Study, Parsons Engineering, October 2001) This may require an exchange of Utah Lake water rights with Eagle Mountain and Saratoga Springs in order to not impair Utah Lake water right holders. The potential as identified in that study is further presented in Chapter 6 on northern Utah County.

Central Utah County

Existing Wastewater Treatment Plants. Table 3-5 displays information on the existing waste water treatment plants in central Utah County

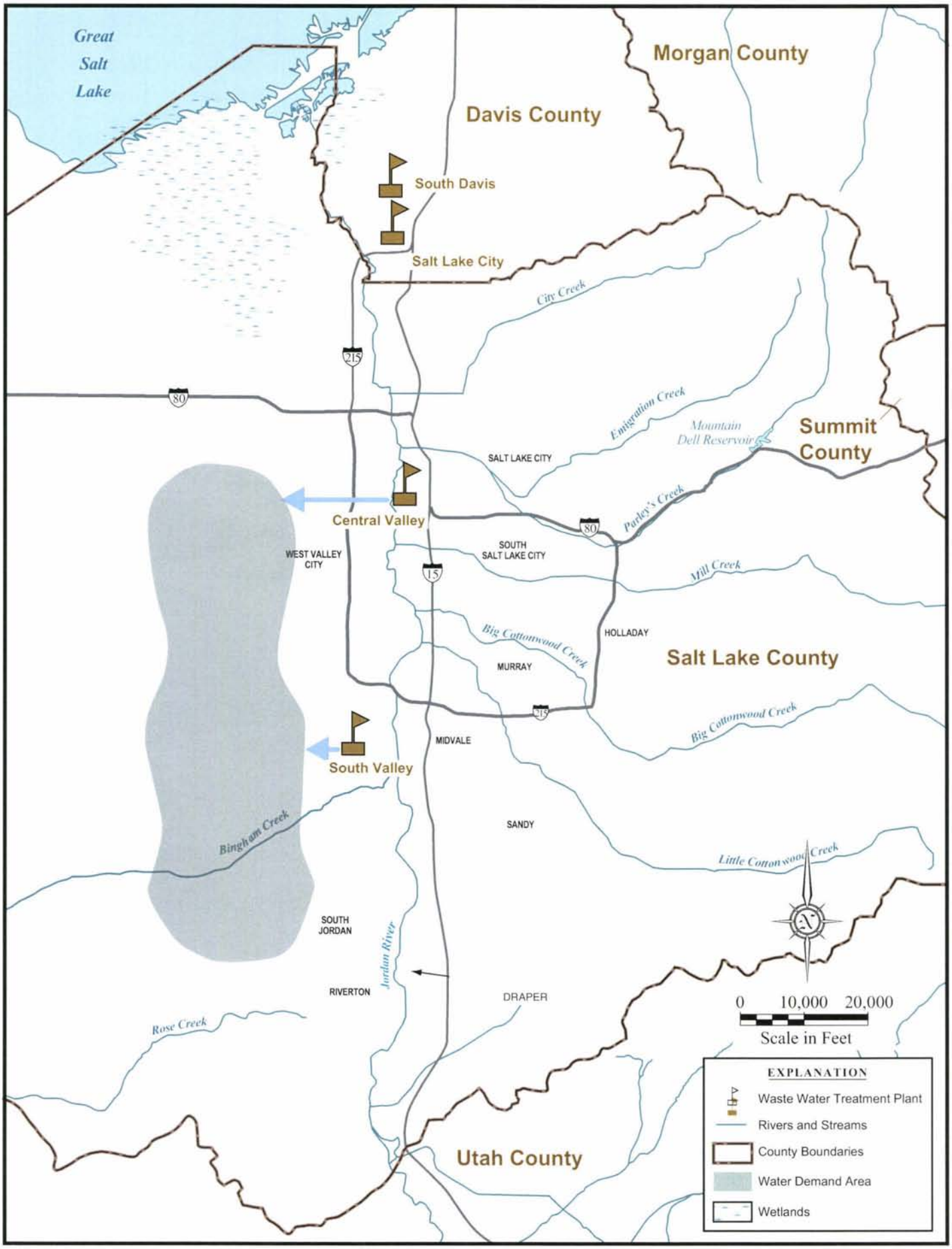


Figure 3-2
Potential Secondary System Water Demand Areas

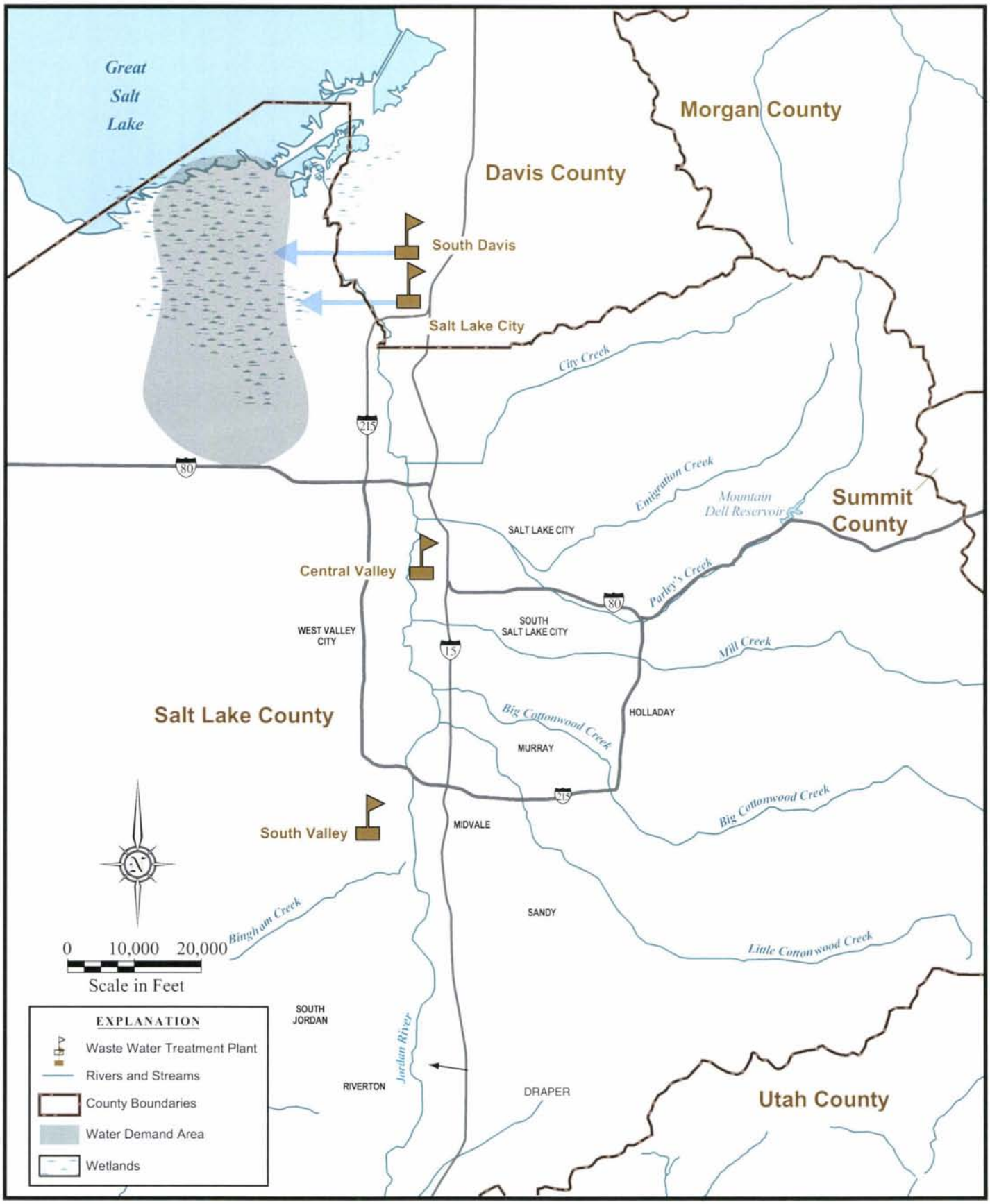


Figure 3-3

Potential Use of Return Flows for Wildlife Refuge

TABLE 3-5
Wastewater Treatment Plants in Central Utah County
(Source: Water Management Improvement Studies, "Report on the Study of Coordinated Operations", October 1995, CUPCA, Central Utah Water Conservancy District)

Location Of Plant	Design Capacity (MGD)	Average Flow (MGD)	Provides Discharge	Current Reuse
Orem	12.3	7.94	Yes	Downstream
Provo	21.0	15.66	Yes	Golf course irrigation and Utah Lake
Total (MGD)	**33.3**	**23.6**		
Total (acre-feet)	**37,679**	**26,703**		

Potential Uses of Return Flows. Due to the capability of existing water supplies to meet the long term needs of the residents of the Orem and Provo area there is limited reason for these two communities to pursue any ambitious plans for water recycling within the cities. In addition, re-use potential may be limited in order to not impair downstream Utah Lake water right holders.

Southern Utah County

Existing Wastewater Treatment Plants. Table 3-6 displays information on the existing water treatment plants in southern Utah County. In January 2001, the South Utah Valley Municipal Water Association completed a report on the possibilities of constructing regional wastewater reclamation treatment facilities in southern Utah County. This concept is discussed in Chapter 5 on southern Utah County.

TABLE 3-6
Wastewater Treatment Plants in Southern Utah County
(Source: Water Management Improvement Studies, "Report on the Study of Coordinated Operations", October 1995, CUPCA, Central Utah Water Conservancy District)

Location of Plant	Design Capacity (MGD)	Average Flow (MGD)	Provides Discharge	Current Reuse
Payson	1.25	0.81	Yes	Downstream
Salem	1.50	0.71	Yes	Downstream
Spanish Fork	5.0	2.64	Yes	Downstream
Springville	6.48	3.03	Yes	Downstream
Total (MGD)	**14.23**	**7.19**		
Total (acre-feet)	**16,101**	**8,135**		

Potential Uses of Return Flows. The southern Utah County cities are projecting the need for regional wastewater treatment plants around year 2020. Possible locations of such plants are shown in Figure 3-4. The effluent from such plants could be used for the following:

1. Flow into Utah Lake and become a part of the overall Utah Lake water supply,

2. Be used in secondary water systems for some of the areas in southern Utah County; and

3. Be used for wetlands enhancement in wildlife preserves around the southern boundaries of Utah Lake.

However, these uses would be only on a limited basis resulting from State of Utah water right laws that limit the water exchange to only the consumptive use so as to not adversely impact downstream water right holders.

Wasatch County

In Heber Valley, the Heber Valley Special Services District presently uses wastewater treatment plant flows for raising alfalfa hay for sale to local dairies. The Jordanelle Special Services District is investigating a recycling plant that would deliver treated effluent to other irrigated lands in Heber Valley.

Juab County

Juab County has a small urban population in relation to the larger communities in Utah and Salt Lake counties. The water needs assessment in Chapter 4 on Juab County determined that the communities would have adequate long term M&I water supplies through the conversion of agricultural to M&I in the Mona area and Nephi City has adequate groundwater rights to meet its M&I water supply for the ULS planning horizon of year 2050. Due to these factors, there are no present plans to pursue water recycling. Rocky Ridge, a community of only 404 residents, is not likely to consider water recycling because of the high cost of recycling and its limited financial base.

SUPPLEMENTAL INFORMATION TO CHAPTER 3

The following information was the first approach used in determining M&I return flows. Subsequent to this it became evident that the State Engineer's position on return flows associated with the Bonneville Unit's Municipal and Industrial System (Jordanelle Dam and Reservoir) would be different than the results for this analysis. The analysis is included here as part of data preservation and for future studies that may have application to this approach. An example would be the M&I return flow from non-Bonneville Unit water.

ESTIMATION OF UNIT RATES OF M&I RETURN FLOW IN SALT LAKE COUNTY

This section describes, for future reference, the process of estimating what percentage of the M&I water used is captured by municipal sewer systems and conveyed to wastewater treatment plants (WWTPs) where it may be treated for reuse on landscaping, golf courses and other related outdoor uses which have limited contact with people.

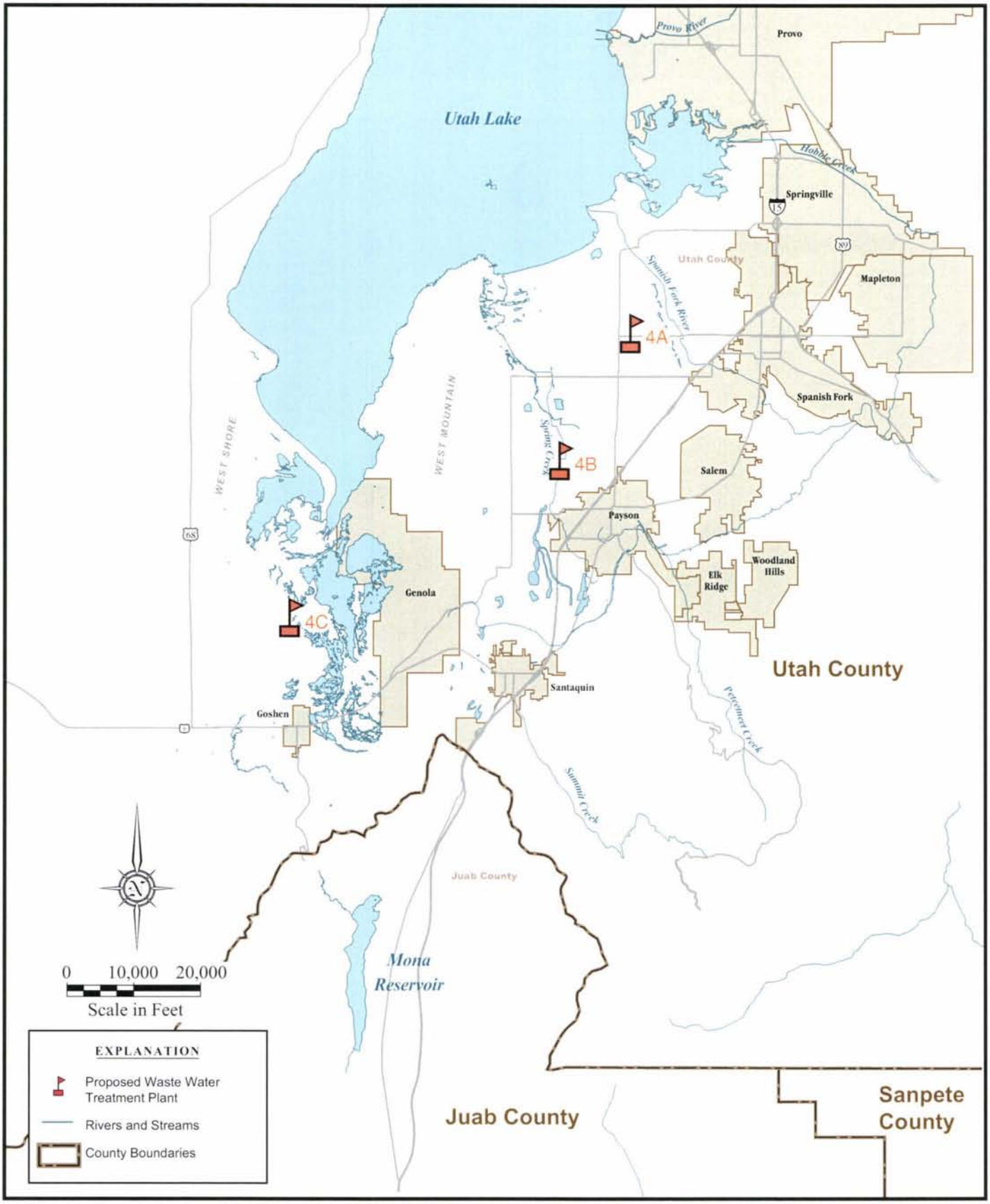


Figure 3-4
Potential Regional Waste Water Treatment Plants

Estimation of Water Use Rates by Category

In order to estimate the amount of return flow from M&I water use, it is necessary to divide the per capita water use into various categories (e.g., residential indoor use, residential outdoor use, institutional use and so forth). Then it is necessary to determine the percentage of water in each category that will be collected as municipal wastewater and piped to WWTPs.

The per capita use of M&I water in Salt Lake County is estimated to decline over time from 256 gallons per capita per day (gpcd) in 2000 to 192 gpcd in 2050. This estimate is based on the application of State requirements for M&I water conservation. As noted in Chapter 1, these requirements provide that between year 2000 and year 2020 the per capita water use will be reduced by 12 ½ % through conservation, and then another 12 ½ % between 2020 and 2050 for a total of 25% for the planning period. The daily use rates cited above were then distributed among types of uses as noted above. Table 3-7 below presents the estimated distribution of M&I water use over the planning period horizon at year 2050.

TABLE 3-7
Distribution of M&I Water Use by Category
(Use in gpcd)

	Residential Indoors	Residential Outdoors	Institutional	Commercial	Industrial	Total
Year	Assumed Percentage of Distribution [1]					
	66%		17%	12%	5%	Total (gpcd)
	33%	67%				
2000	56	113	44	31	13	256
2010	52	106	41	29	12	240
2020	49	99	38	27	11	224
2030	46	94	36	26	11	213
2040	44	89	34	24	10	202
2050	42	85	33	23	10	192

[1]For Salt Lake County only the total per capita use was readily available. To break this down into categories the total amount (for example 256) was multiplied by the following percentages: for residential (66%) of which 33% is indoors and 67% is outdoors; institutional 17%; commercial 12%; and industrial 5%. The source of these percentages are from, Utah Division of Water Resources, Utah State Water Plan, "Utah's Water Resources, Planning for the Future", May 2001.(page 28, Figure 11 of the referenced report)

Determination of Return Flow Percentage

The next step in estimating return flows from M&I use was to determine the percentage of the water used in each category (e.g., residential indoor use, residential outdoor use, institutional use and so forth) that is subject to collection in sewer systems and delivery to municipal wastewater treatment plants (WWTP). Table 3-8 following shows the percentages of return flow from each

category of use identified in Table 3-7. The resulting wastewater volumes are also calculated and expressed in terms of gallons per capita per day.

As an example of the calculation, the 56 gpcd for year 2000 residential indoor use on Table 3-7 is multiplied by the 90% return flow factor on Table 3-8 to produce 50 gpcd as the amount of return flow that would return to a wastewater treatment plant.

TABLE 3-8
Determination of Overall M&I Return Flow Percentage
(Return Flows in GPCD)

Year	Residential Indoors	Residential Outdoors	Institutional	Commercial	Industrial	Total GPCD	Percent Return Flow
		Assumed Percent That Returns from Each Category					
	90%	0%	70%	75%	0%		
2000	50	0	31	23	0	104	41%
2010	47	0	31	22	0	100	41%
2020	44	0	29	20	0	93	41%
2030	42	0	27	20	0	89	41%
2040	40	0	26	18	0	84	41%
2050	38	0	25	17	0	80	41%

A "reality check" on the estimated volume of wastewater delivered to a WWTP was made by comparing the computations of return flows in this chapter with the historical flow records from existing wastewater treatment plants in Salt Lake County. From these records, the recent historical flow to WWTPs' was 122,775 acre-feet. This amount was then divided by the present population of Salt Lake County, which is approximately 800,000 people. The result was 0.145 acre-feet per person per year, which equates to 129 gallons per capita per day. The State of Utah Department of Environmental Quality has a design standard of 100 gallons per capita per day for peak design flow periods in the wastewater treatment plant. The 129 gpcd from historical records is about 20% to 30% greater than the design standard which would indicate there is a significant amount of seepage of groundwater and possibly storm water runoff that is included in the 122,775 acre-feet. Assuming that 80% of the 129 gpcd is return flow from municipal use, the gallons per capita per day would be about 103 gpcd which compares well with the 104 gpcd at year 2000 in Table 3-8.

Central Utah Project Completion Program

Chapter 4

October 2004

UTAH RECLAMATION
MITIGATION
AND CONSERVATION
COMMISSION

Chapter 4

The area of Juab County that has historically been involved with the potential water supply from the Bonneville Unit is the northeastern part of the county lying along the Interstate 15 corridor. Geographically, this part of Juab County, which lies in the Utah Lake drainage basin, occupies the northern half of Juab Valley. The valley lies between the southern extension of the Wasatch Range and a low ridge of hills known as the West Hills. The area contains three communities, which are, from north to south, Rocky Ridge, Mona, and Nephi. The first is a growing residential community just south of the Utah/Juab county line. The latter two communities are the centers of agricultural areas of the same names. The town of Levan and areas south of the Levan Ridge (located between Nephi and Levan) geological feature are not located within the Utah Lake Drainage Basin and therefore are not within the ULS planning area.

POPULATION PROJECTIONS

At present, the only change in population projections from the February 2002 Plan Formulation Report is the replacement of the year 2000 population with year 2000 census data. Using the census date, the GOPB has set new Juab County population totals for the period of years 2000 to 2030. However, because of the small change, city populations for the various communities have not been adjusted by the Six-County Association of Governments to reflect the updated projections. The data recently available for year 2000 census populations and the population projections contained in the Draft Plan Formulation Report are presented in Table 4-1.

TABLE 4-1
Population Projections
Eastern Juab County

		Projections as Presented in Draft Plan Formulation Report					
Area	**2000 Census**	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
Mona	850	1,004	1,386	1,790	2,139	2,716	3,293
Nephi	4,733	5,016	6506	7,870	9,052	11,002	12,952
Rocky Ridge	404	354	465	505	540	598	655
Balance of County	2,251	1,958	2,215	2,424	2,607	2,907	3,207
Total	**8,238**	**8,332**	**10,572**	**12,589**	**14,338**	**17,223**	**20,107**

It should be noted that a population "spill over" from the Santaquin area of Utah County could occur in the next 50 years. This potential "spill over" would be facilitated by the ease of access to I-15 for commuting and other travel. Such a development could, in the long term, result in the need for greater quantities of M&I water than are shown in Table 4-1. In this event, it is possible that additional M&I water could be needed along the I-15 corridor from the Utah/Juab County line southward to the town of Nephi. However, all ULS planning is based on GOPB county totals as currently established.

TOTAL M&I DEMANDS WITH CONSERVATION

The future projection of M&I demand for the year 2050 has not changed from that presented in the Draft Plan Formulation Report of February 2002. The population change was only minor and the results of the analysis indicate that the communities have ample existing and potential future water to meet needs until year 2050. The in-depth analysis for each community in Juab County is presented in Attachment C in Table C-1 (Mona), Table C-2 (Nephi), and Table C-3 (Rocky Ridge).

Projected Water Use with Conservation in Gallons per Capita per Day

Table 4-2 presents the projected M&I water demands in gallons per capita per day (gpcd) for the three communities in eastern Juab Valley. The projections assume that the State's water conservation goals would be met, which call for reductions in per capita use of 12 ½ percent by year 2020 and 25 percent by the year 2050.

TABLE 4-2
Projected Juab Valley Per Capita M&I Water Use
With Conservation Element Included
(12 ½ % by year 2020 and 25% by year 2050)
(Units: Gallons per Capita per Day)

Area	2000	2010	2020	2030	2040	2050
Mona	260	244	227	216	206	195
Nephi	266	251	234	223	212	201
Rocky Ridge	70	70	70	70	70	70

Projected M&I Water Demands in Acre-Feet

The projected M&I water demands of the three communities in Juab Valley were calculated by multiplying the population projections in Table 4-1 with the per-capita water use values presented in Table 4-2. The resulting projections of M&I demands in acre-feet are projected to year 2050 in Table 4-3.

TABLE 4-3
Total M&I Water Demands in Northern Juab Valley
With Conservation Element Included
(12 ½% by Year 2020 and 25% by Year 2050)
(Units: acre-feet)

Area	2000	2010	2020	2030	2040	2050
Mona	247	378	456	519	626	719
Nephi	1,420	1,830	2,066	2,263	2,613	2,914
Rocky Ridge	32	37	40	43	48	52
Total	**1,699**	**2,245**	**2,562**	**2,825**	**3,287**	**3,685**

CAPABILITY OF EXISTING SUPPLIES TO MEET M&I DEMANDS

M&I demands are currently being met by groundwater pumping in the vicinities of the communities. Increased future demand could be met by additional groundwater pumping, which typically would involve the purchase of groundwater pumping rights currently exercised for production of irrigation water. Such "conversion" of water would generally involve the urbanization of the agricultural lands and transfer of the water attached to that land under water right laws of the State of Utah.

Existing M&I Water Supplies in East Juab County

The existing M&I water supplies come from the following two water sources:

- Groundwater
- Springs

Groundwater. Table 4-4 presents the groundwater rights, present yield of wells and the projected use of groundwater by the year 2050. The reason that groundwater pumping in the case of Nephi seems rather low for a community of its size, is that Nephi has a M&I water supply of 2,752 acre-feet from springs which essentially meets all of Nephi's M&I demands. Due to the low cost of conveying the spring water and the minimal water treatment costs, a city will utilize its springs to the maximum extent prior to pumping their groundwater supply.

TABLE 4-4
Yield and Utilization of Northern Juab Valley Groundwater Wells in Meeting M&I Demand
(Units: acre-feet)

Community	Water Right (acre-feet)	Present Yield of Wells (acre-feet)	Total Groundwater Projected to be Used in Meeting Needs at Year 2050 (acre-feet)	Present Utilization of Groundwater Rights (%)
Mona	11	11	11	100%
Nephi	5,000	5,000	584	12%
Rocky Ridge	115	115	52	45%

Springs. As shown in Table 4-5, all of the communities will utilize 100% of their water supply from springs by the year 2050. After this the cities will either begin to pump their groundwater supplies or provide water through secondary irrigation systems from water obtained through urbanization of irrigated lands.

TABLE 4-5
Spring Water Available to Northern Juab Valley Communities
(Units: acre-feet)

Community	Water Right (acre-feet)	Present Yield (acre-feet)	Amount of Springflow Projected to Be Used to Meet 2050 Needs (acre-feet)	Percent Utilization of Springs (%)
Mona	339	339	339	100%
Nephi	2,752	2,752	2,752	100%
Rocky Ridge	0	0	0	0

Aggregate Capability of Existing Supplies

The aggregate capability of existing supplies to meet projected M&I water demands in northern Juab Valley is presented in Table 4-6.

TABLE 4-6
Aggregate Capability of Existing Northern Juab Valley Water Sources to Meet M&I Demand
(Units: acre-feet)

Community	Groundwater Wells	Springflow	Total Available Supply	Year 2050 Needs
Mona	11	339	350	719
Nephi	5,000	2,752	7,752	2,914
Rocky Ridge	115	0	115	52
Total	**5,126**	**3,091**	**8,217**	**3,695**

A comparison of the available supplies for each community with the projected needs that were presented in Table 4-3 indicates that the Mona area would need to develop additional M&I water supply, whereas the Nephi and Rocky Ridge areas would not. A potential source of additional water would be the conversion of irrigation water to M&I use through urbanization of irrigated land or through acquisition of irrigation water rights from lands not urbanized. That potential is discussed in the following sections of this chapter.

OTHER POTENTIAL SOURCES OF WATER FOR M&I USE

The greatest potential for additional water supplies to meet M&I water needs is through either or both of the following two processes:

- The urbanization of irrigated land with groundwater or surface water rights that can be converted for M&I use.
- The purchase of irrigation water rights from other irrigated lands not urbanized.

The following subsections discuss the general location of irrigated lands, their water supplies, and the potential amount of water made available through the two processes listed above.

Irrigated Land in Northern Juab Valley

Agricultural land lies more or less continuously between the Juab County-Utah County line on the north and the Levan Ridge south of Nephi, a distance of some 21 miles, with a width of 2 to 4 miles. Agricultural production is currently based on about 26,000 acres of land, of which 15,500 acres are irrigated at least partially. For planning purposes the north Juab Valley is divided into two separate agricultural areas--the Nephi and Mona areas.

The Nephi area has approximately 7,800 acres of irrigated land within the Nephi Irrigation Company, most of which is irrigated by diversions from Salt Creek, and supplemented by groundwater pumping. Adjacent to the irrigated lands are about 6,360 acres of currently developed but non-irrigated agricultural land that are "dry-farmed."

In the Mona area, about 4,700 acres are irrigated by water diverted from creeks originating in the mountains east of Mona and by groundwater pumping. The existing irrigation distribution system consists primarily of open ditches and lacks flexibility in irrigation deliveries. The system is also subject to seepage loss, evaporation, and operational spill losses. Two irrigation companies located in the Mona area are the Mona Irrigation Company near Mona and the North Canyon Irrigation Company between Mona and Rocky Ridge.

Existing Irrigation Water Supply in Northern Juab Valley

The major stream flowing into the valley is Salt Creek, which flows through the community of Nephi. Several smaller streams also enter the valley from the east and are utilized for irrigation. Winter and spring flows of Salt Creek and other streams reach Currant Creek or its tributary West Creek, and accumulate in Mona Reservoir at the northern end of Juab Valley. West Creek and Currant Creek are fed by adjacent perennial springs. Mona Reservoir was constructed to provide irrigation water for the Goshen Valley in Utah County and regulation of flows on Currant Creek as the stream flows northward into Utah Lake. Irrigators in the Goshen Valley of Utah County hold the rights to storage in Mona Reservoir. The surface water supplies vary from year to year depending on the amount of natural runoff occurring in Currant Creek and the other minor creeks entering the valley.

Table 4-7 shows the existing irrigation water supply in relation to the agricultural acreage served by irrigation water supplies.

TABLE 4-7
Existing Irrigation Water Supplies in Northern Juab Valley
(Average Annual Values)

Area	Irrigated Acreage (acre-feet)	Existing Supply (acre-feet)
Mona	4,700	8,100
Nephi	7,800	20,700
Total	**12,500**	**28,800**

The East Juab County Water Conservancy District and Central Utah Water Conservancy District, co-sponsored the East Juab Water Efficiency Project to improve the efficiency of water use for approximately 5,300 acres of irrigated land in the Nephi Irrigation Company. The project replaced canals and ditches with a pipeline irrigation system that conserves over 5,000 acre-feet of water on an annual average basis.

Urbanization of Irrigated Lands

There are two likely scenarios for urban growth in northern Juab Valley. One is the gradual in-filling and expansion of existing communities. The Juab County Commission currently favors such residential development within existing cities. From a standpoint of water supply, such urban growth would occur partially on subdivided land in communities with the remainder on irrigated land. The other scenario, although discouraged by the Juab County Commissioners, is the creation of isolated residential developments on valley land that is favorably located for development purposes and water availability. A likely manifestation of this scenario would be the development of residential subdivisions on irrigated land with ready access to I-15 and secondary roads, where groundwater of good quality is available.

For the purpose of estimating the amount of water that would become available through urbanization of irrigated acreage, a value of 6 persons per acre has been applied to the population projections to determine the acreage involved. This valued is slightly lower than the 9 people per acre used by the Utah Division Water Resources in estimating population and the resulting land requirements to urban growth in Utah County. The average annual water yield of agricultural water in acre-feet per was used to estimate the amount of water that potentially would be converted. This value is the average water use of agricultural land, counting both irrigated and non-irrigated land. This approach reflects the probability that urbanization would occur on non-irrigated land as well as on irrigated land. Table 4-8 presents the resulting projections of irrigation water that could be made available as the population moves onto irrigated land in northern Juab Valley. These projections may be on the high side, inasmuch as some of the growth would occur within existing city subdivisions.

TABLE 4-8
Potential Water Made Available from Agricultural Conversion
(Source: Water Demand Sheets in Attachment D)
(Units: acre-feet)

Community	2000	2010	2020	2030	2040	2050
Mona	0	126	221	303	439	575
Nephi	0	496	878	1,209	1,755	2,301
Rocky Ridge	0	0	0	0	0	0

Purchase of Irrigation Water Rights

A second category of potential M&I water supplies is the purchase of irrigation water rights from willing sellers who own lands that are not projected to be urbanized by the year 2050. In such cases the sale of the water rights could be accompanied by a reversion to dry-farming on the lands involved, with appropriate equities established through the water rights sale.

SUMMARIZATION OF EASTERN JUAB COUNTY M&I WATER SITUATION

This analysis shows that in general the M&I water supply for the GOPB projected population of the northern Juab Valley can be met through existing M&I water supplies and in case of the town of Mona, the conversion of irrigation water for M&I use. The conversion of irrigation water would involve the cost of purchasing water rights, either in conjunction with the purchase of irrigated land for development or separately from urbanization of the irrigated land.

Central Utah Project Completion Program

Chapter 5

October 2004

UTAH RECLAMATION
MITIGATION
AND CONSERVATION
COMMISSION

Chapter 5

This chapter presents the water needs and supply of southern Utah County. Specific aspects addressed are the projected M&I water demand, local supplies currently available to meet M&I demand, and potential new supplies that may be developed to meet future needs, consisting primarily of conversion of irrigation water to M&I use and recycling municipal wastewater. The analysis includes a determination of the return flow from Bonneville Unit M&I water.

The population of southern Utah County lies primarily in the 10 cities that are members of the Southern Utah Valley Municipal Water Users Association (SUVMWA). When Mountainland Association of Governments (MAG) revised population projections during the summer of 2002, MAG identified three unincorporated areas in southern Utah County with significant potential for growth. These unincorporated areas are West Mountain, Goshen Valley and West Shore. Their locations are shown on the maps in Attachment B while their population growth and water needs are discussed in the remaining sections of this chapter.

The finding of this analysis is that the total M&I water deficit in 2050 under existing supplies is projected to be 32,000 acre-feet. The communities facing the greatest future shortages under existing supplies are located in the southern part of the Utah County, namely south of Utah Lake where little or no natural stream flow is available for M&I diversion, and where groundwater supplies tend to be relatively low. The most pressing examples are 1) the Goshen Valley Area with low amounts of ground water rights and spring water, and no CUP or SVP water, and where the only stream flow consists of Currant Creek and Warm Springs; and 2) Santaquin with moderate amounts of groundwater and stream flow (already heavily used), little CUP water, and no SVP water. The water supply of Warm Springs is being sought by the Utah Reclamation Conservation and Mitigation Commission for a local wetlands project and may not be available for municipal use.

Another important conclusion is there would not be any excess of Strawberry Valley Project (SVP) water that could meet M&I demands in southern Utah County other than the 10,200 acre-feet of SVP water that is anticipated being used within the communities.

REVISED POPULATION PROJECTIONS

The population projections, revised in 2002, for cities and unincorporated areas of southern Utah County are presented below in Table 5-1. The projections were prepared by MAG based upon the county total and are presented in Attachment B. As noted above, three new places have been added to the population table, namely the unincorporated areas of West Mountain, Goshen Valley and West Shore. The shaded areas on Table 5-1 for Elk Ridge, Springville, and Woodland Hills represent build-out populations, which are expected to occur prior to 2050. Build-out in many of the other communities will not occur until after the year 2050.

The revised population projections at year 2050 in southern Utah County is approximately 190,000 greater than the 2050 projection contained in the *Draft Plan Formulation Report*. This is a significant factor in the increase in M&I water needs in southern Utah County, presented later in this chapter. Beyond that, the projected build-out population for all cities combined is expected to be significantly greater than the 2050 population.

TABLE 5-1
Revised Population Projections for Southern Utah County

Community	Year					
	2000 Census	2010	2020	2030	2040	2050
Elk Ridge	1,838	3,093	4,391	5,024	6,000	6,000
Genola	965	1,565	2,392	4,744	11,467	18,191
Goshen	874	1,249	1,682	1,970	2,611	3,251
Mapleton	5,809	9,403	14,928	20,990	27,507	34,024
Payson	12,716	20,606	27,750	30,583	55,673	80,763
Salem	4,372	7,351	12,101	17,016	24,212	31,409
Santaquin	4,834	9,822	16,865	24,263	43,442	62,621
Spanish Fork	20,246	27,693	32,745	35,771	50,900	66,028
Springville	20,424	28,866	34,132	37,286	59,658	59,658
Woodland Hills	941	1,891	3,247	4,014	4,793	4,793
Goshen Valley	415	4,129	4,278	4,787	17,581	48,114
West Mountain	2,026	5,065	7,598	8,357	10,865	14,525
West Shore	44	438	454	508	1,866	13,061
TOTALS	75,504	121,171	162,563	195,313	316,575	442,438

TOTAL M&I DEMANDS WITH CONSERVATION

Projected Water Usage with Conservation in Gallons per Capita per Day

In the Draft Plan Formulation Report of February 2002, the analysis of future M&I water demands was prepared assuming that each city in southern Utah County would achieve a 12 ½ percent reduction by the year 2020 and a 25 percent reduction in water demand by the year 2050. When these initial water demand estimates were provided to the communities for review, several communities in southern Utah County expressed concern over what they perceived as unrealistic water conservation projections. Representatives stated that the majority of existing homes located in southern Utah County communities are situated on lots that are substantially larger than those found in more urban areas.

The cities' representatives contend the higher per capita water usage rates in southern Utah County are more likely due to this factor than to over-consumption.

The SUVMWA, acknowledging the validity of this argument, determined that an average 25% conservation goal could be reached on average within its service area. Table 5-2 shows the percent reduction necessary between years 2000 and 2050 to enable the presently incorporated communities of southern Utah County collectively to achieve the State's conservation goals cited above.

For the water needs analysis it was necessary to estimate per capita water use occurring within the 50-year planning horizon to 2050. In the process, the change in per capita use in each city

was estimated at 10-year intervals, based on the overall 50-year change listed in Table 5-2. The estimated 10-year values are presented in Table 5-3 on the next page.

TABLE 5-2
Achievement of SUVMWA Area-Wide Water Conservation of 25%

Community	2000 Per Capita Use (gpcd)	2050 Per Capita Use (gpcd)	Percent Reduction
Elk Ridge	256	220	- 14%
Genola	234	220	- 6%
Goshen	413	220	- 47%
Mapleton	536	220	- 59%
Payson	275	220	- 20%
Salem	230	220	- 4%
Santaquin	344	220	- 36%
Spanish Fork	233	220	- 6%
Springville	311	220	- 29%
Woodland Hills	151	190	+ 26%
Average Reduction in Water Use for the Ten Communities			**25%**

TABLE 5-3
Projected Water Usage in Gallons per Capita per Day with Conservation Element Included (12 ½% by year 2020 and 25% by year 2050)

Community	Year					
	2000	2010	2020	2030	2040	2050
	Gallons per capita per day (gpcd)					
Elk Ridge	256	245	240	235	230	220
Genola	234	231	228	225	222	220
Goshen	413	380	340	300	260	220
Mapleton	536	448	371	291	260	220
Payson	275	265	256	248	229	220
Salem	230	228	226	224	222	220
Santaquin	344	319	294	269	244	220
Spanish Fork	233	230	227	224	221	220
Springville	311	300	280	260	240	220
Woodland Hills	151	177	181	186	190	190

Note: A demand of 220 gpcd was assumed for the unincorporated areas of Goshen Valley, West Mountain, and West Shore in southern Utah County.

Projected M&I Water Demands in Acre-Feet

The projected volumes of M&I water demands for the ten cities and the three unincorporated areas of southern Utah County are presented on Table 5-4. These amounts were computed using the populations in Table 5-1 and the projected water use rate in gallons per capita per day in Table 5-3. As shown in Table 5-4, southern Utah County will have a water demand of 88,953 acre-feet by the year 2050 with conservation. This is an increase of 68,122 acre-feet over the requirements at year 2000. By the year 2070 when build-out may occur in other communities the total demand would be higher than the amounts shown in Table 5-4.

TABLE 5-4
Total M&I Water Demands in Southern Utah County
with Conservation Element Included
(12 ½% by year 2020 and 25% by year 2050)

Community	Year					
	2000	2010	2020	2030	2040	2050
	Acre-Feet					
Elk Ridge	527	849	1181	1323	1420	1479
Genola	253	405	611	1,196	2,852	4,483
Goshen	404	532	640	663	760	800
Mapleton	3,488	4,718	6,203	6,842	8,014	8,381
Salem	1,126	1,877	3,074	4,288	6,053	7,727
Santaquin	1,863	3,510	5,554	7,311	11,874	15,433
Spanish Fork	5,284	7,135	8,327	8,976	12,601	16,272
Springville	7,115	9,701	10,706	10,860	16,039	14,702
Woodland Hills	159	375	658	836	1,020	1,020
Goshen Valley Area	102	289	426	595	6,226	11,857
West Mountain Area	499	1,410	2,079	2,905	3,242	3,580
West Shore Area	11	31	45	63	1,641	3,219
Total	**20,831**	**30,832**	**39,504**	**45,858**	**71,742**	**88,953**

CAPABILITY OF EXISTING SUPPLIES TO MEET M&I DEMANDS

Existing Water Supplies in Southern Utah County

Existing water supplies include:

- Groundwater
- Springs
- 1,590 acre-feet of CUP water from Strawberry Reservoir.
- 10,200 acre-feet of Strawberry Valley Project (SVP) water
- Existing M&I rights on local surface streams

In addition to these sources that currently supply water to south Utah County, there are two other potential long term sources of water for M&I use. These sources are conversion of irrigation

water to M&I use and recycling of municipal wastewater, both of which are discussed later in this chapter. Recycling of municipal wastewater would likely occur after the ULS planning horizon at year 2050. Even then, limitations on its use would need to be dealt with such as downstream water right holders of Utah Lake water and the requirements of limiting the exchange to net consumptive use.

Groundwater

Table 5-5 presents the present groundwater rights, present yield of wells and the projected use of groundwater by the year 2050. The information in the table demonstrates that in order to meet their projected M&I needs most of the communities will need to increase their groundwater pumping significantly by the year 2050. The groundwater pumping of 31,291 acre-feet at year 2050 would be the amount that is projected to occur even with the ULS M&I water supply of 30,000 acre-feet to southern Utah County. Without the ULS water supply, the groundwater pumping would need to increase significantly beyond the year 2050 estimate of 31,291 acre-feet. With the existing groundwater rights being at 45,121 acre-feet, any additional groundwater pumping would undoubtedly be difficult to achieve because of impacts on other well owners and the general overall decline in the groundwater table and potential impacts on wetlands in southern Utah County.

TABLE 5-5
Yield and Utilization of Southern Utah County Groundwater Wells in Meeting M&I Demand
(Pumping is With 30,000 acre-feet of ULS Project Water)

Source	Water Right (acre-feet)	Present Yield of Wells (acre-feet)	Total Groundwater Projected to be Used in Meeting Needs at Year 2050 (acre-feet)	Percent Utilization of Groundwater Rights (%)
Elk Ridge	643	643	643	100%
Genola	161	161	161	100%
Goshen	188	188	188	100%
Mapleton	7,097	5,323	3,610	51%
Payson	7,057	3,300	7,057	100%
Santaquin	3,844	414	3,844	100%
Salem	3,592	3,344	3,592	100%
Spanish Fork	10,467	10,467	5,922	57%
Springville	10,816	8,246	2,968	27%
Woodland Hills	456	456	456	100%
Goshen Valley Area	0	0	0	N/A
West Mountain Area	500	500	500	100%
West Shore Area	300	0	300	100%
Total Within Existing Rights	**45,121**	**33,042**	**31,291**	**69%**

Springs. The utilization of water from springs is the first priority of communities in meeting their culinary water needs. This is because of the very limited water treatment requirements for culinary water supplies originating from springs. As shown in Table 5-6, in nearly every community the present use of springs is at 100% except for the community of Goshen, which is at 72%. The overall percent of utilization is 98% for southern Utah County.

TABLE 5-6
Spring Water Available
to Southern Utah County Communities
(Units: in acre-feet)

Community	Water Right	Present Yield	Amount of Spring Water Projected to be Used to Meet 2050 Needs	Percent Utilization of Springs (%)
Elk Ridge	0	0	0	N/A
Genola	2,915	240	2,915	100%
Goshen	1,086	1,086	778	72%
Mapleton	1,904	1,904	1,904	100%
Payson	1,448	1,448	1,448	100%
Santaquin	1,158	1,158	1,158	100%
Salem	200	200	200	100%
Spanish Fork	1,591	1,591	1,591	100%
Springville	8,000	8,000	8,000	100%
Woodland Hills	28	28	28	100%
Goshen Valley Area	0	0	0	0
West Mountain Area	0	0	0	0
West Shore Area	0	0	0	0
Total	**18,330**	**15,655**	**18,022**	**98%**

Existing CUP Water. Water from the CUP is used for M&I purposes in a number of southern Utah County communities. The annual amount of such water used in this analysis is 1,590 acre-feet, distributed as shown in Table 5-7. This information was obtained from the report, *Water Supply Planning for Southern Utah Valley Municipal Water Association*, prepared by Carl H. Carpenter, P.E, June 1996.

TABLE 5-7
CUP Water Use Within the Existing
City Limits of Southern Utah County Communities
(Units: acre-feet)

Source of Information: Report entitled, "Water Supply Planning for Southern Utah Valley Municipal Water Association", prepared by Carl H. Carpenter, P.E., June 1996.

Community	CUP M&I Water
Elk Ridge	34
Genola	24
Goshen	18
Mapleton	114
Payson	316
Salem	86
Santaquin	84
Spanish Fork	429[1]
Springville	463
Woodland Hills	22
TOTAL	1,590

[1] In the year 2003, Spanish Fork City was award partial funding for a secondary water system under the CUPCA Section 207 Water Conservation Credit Program. As part of the funding agreement the city will transfer its existing CUP water supply of 429 acre-feet to the District as part of the water conserved by the project.

Existing Strawberry Valley Project Water Current and Future Deliveries to the Cities. The amount of water provided by the SVP to communities is presented in Table 5-8. Additional detail regarding this water supply is shown in Attachment D. In the water demand sheets in Attachment D, the 4,749 acre-feet is shown as the existing SVP supply used by the cities, with an additional 5,427 acre-feet of SVP water being used by the cities over the ULS planning horizon.

TABLE 5-8
SVP Water Use
Within Southern Utah County Communities
(Units: acre-feet)

Community	Used By City	Used By Individual Shareholders	Total SVP Water (Rounded)
Elk Ridge	0	0	0
Genola	0	0	0
Goshen	0	0	0
Mapleton	31	1,796	1,827
Payson	1,840	1,917	3,758
Salem	124.63	0	125
Santaquin	0	0	0
Spanish Fork	1,703	1,714	3,417
Springville	1,051.00	0	1,051
Woodland Hills	0	0	0
Total	**4,750**	**5,427**	**10,177**
		Rounded to	**10,200**

Existing M&I Supplies from Local Surface Streams. Local stream flow available to southern Utah County communities is shown in the water demand sheets in Attachment C. As agricultural lands with water supply from local surface streams are annexed into the cities, the water is converted to urban use within those communities. As discussed in Section 5.4, the exception to this is that SVP irrigation water from urbanized lands could be transferred for use as agricultural water on other SVP lands to reduce irrigation shortages.

OTHER POTENTIAL SOURCES OF WATER FOR M&I USE

This section addresses local waters that are currently unavailable for M&I use, but that may have the potential for conversion to M&I use through institutional arrangements and/or appropriate treatment. Such waters might become available through these two types of actions:

- Conversion of irrigated lands to urban use
- Recycling of M&I wastewater at treatment plants

Conversion of Irrigated Lands to Urban Use

A general rule for urbanization of irrigated lands, is that as the irrigated lands are converted to community development, the irrigation water allocated to the irrigated lands must be made available to the cities for reallocation to other purposes, including M&I use. However, in southern Utah County the analysis of how much irrigation water may become available for their use is a complicated process. Included in this complexity is the fact that some lands receive only SVP water, others receive only Spanish Fork River water, and some lands receive a combination

of both SVP and Spanish Fork River water. These lands are scattered throughout the southern Utah County area. The intermixing of irrigation water from different sources, and the geographic distribution of agricultural lands with potential for urbanization makes estimating the potential for such conversion a complex process.

Since section 5.3.1.4 has already addressed existing and projected use of SVP water by the cities in south Utah County, this section will address conversion and use of other water supplies by the cities. The detailed analysis of the rate of agricultural conversion in southern Utah County is presented in Attachment C. The following sections of this chapter present the more important conclusions from the tables in Attachment C.

Reduction of Irrigated Land in Southern Utah County. Table 5-9 shows the historical and projected irrigated acreage remaining after the urbanization of irrigated lands for the Spanish Fork subarea in southern Utah County. This subarea is defined as irrigated lands under the following canals – Highline, Mapleton, Salem, East Bench, Spanish Fork Southfield, Spanish Fork Southeast, Spanish Fork Westfield, and Lake Shore. The amount of acreage reduction from the present irrigated acreage to the year 2050 is about 12,985 acres (45,668 minus 32,683) which when rounded to the nearest one thousand acres is 13,000 acres that is projected to be urbanized in southern Utah County. This estimate is based on the population growth needs, assuming one acre of land (combination of irrigated and non-irrigated) for each 9 person increase in population is required to accommodate the urban growth.

TABLE 5-9
Historical and Projected
Irrigated Acreage in Spanish Fork Subarea
of Southern Utah County
(Units: acres)

Historical		Projected Irrigated Acreage				
Year 1964	Year 1996	Year 2010	Year 2020	Year 2030	Year 2040	Year 2050
53,817[1]	45,668[2]	43,731	41,299	39,973	36,332	32,683

[1] This is the amount of acreage presented in the 1964 Bonneville Unit water supply appendix.
[2] This is the amount of acreage presented in the SFN System 1998 water supply appendix.

Amount of Spanish Fork River Water Converted to Use by the Cities. The cumulative average amount of Spanish Fork River water projected for conversion to use by the cities is presented in Table 5-10. As presented in the table, the overall projected average amount of Spanish Fork River water converted to the cities' use is 6,147 acre-feet with the largest portion of this amount occurring within the declaration boundaries of Spanish Fork City. The firm yield (or the water supply in a dry year) would be about one-half of that amount or 3,074 acre-feet. While Spanish Fork City is not projected to have a shortage of water during the ULS planning horizon of 2050, it is expected that Spanish Fork River water made available through urbanization will become part of the water supply required by the city during the period of time when build-out population will be achieved. This water converted to the cities' use is an input into the water demand sheets in Attachment D.

TABLE 5-10
Cumulative Average Spanish Fork River Water Converted from Irrigated Lands to Use
(Units: acre-feet)

Community	2010	2020	2030	2040	2050
Genola	1	3	7	19	32
Mapleton	3	13	17	16	21
Payson	14	26	31	76	120
Salem	122	316	517	811	1,106
Spanish Fork	631	1,059	1,316	2,598	3,880
Springville	0	0	0	0	0
West Mountain (Lakeshore)	109	282	462	725	988
Average Annual	880	1,700	2,351	4,246	6,147
M&I Firm Yield	440	850	1,176	2,123	3,074

Note: As shown the M&I firm yield (yield in a dry year) is approximately 50% of this average annual amount of converted water.

Recycling of M&I Return Flows

As was discussed in Chapter 3 of this report, following appropriate treatment, recycling of return flows from M&I water use could contribute to the future water supply of the area. This potential applies equally to return flows from the use of local and SVP waters, and from the use of Bonneville Unit M&I water. In southern Utah County the most likely use of recycled water is the demand for M&I water beyond the ULS planning horizon of the year 2050.

The discussion in the following sections is presented to illustrate the potential amounts of return flow recognizing there are constraints to using this return flow.

Limitations on Use of Return Flows. Any future use of return flows will need to consider the fact that return flows from M&I or temporary use of Bonneville Unit water for irrigation uses in southern Utah County contribute to the water supply of Utah Lake. Any potential impact on the downstream users of Utah Lake waters would need to be fully assessed before the State Engineer would approve the use of the return flow. Another limiting factor regarding Utah water right laws, would be the amount of net consumptive use that would be allowable. Another factor to consider is that return flows from the ULS project return to Utah Lake as part of the requirements to satisfy the M&I exchange to Jordanelle Reservoir that was briefly discussed in Chapter 2 on Utah Lake.

Accounting for M&I Return Flows. A distinction is drawn between M&I return flows from the use of local waters, and return flows from the use of Bonneville Unit M&I water. These two categories of return flow are accounted for differently because the water is supplied under different authorities.

Local Return Flows. Return flows from local sources that may be reclaimed are subject to local management arrangements. Generally, the wastewater-managing agency would make arrangements for recycling and reuse of this return flow with potential users of the recycled wastewater, under negotiated financial arrangements. The purchasers might be local, county, or federal agencies (e.g., federal purchase of wastewater for wildlife habitat maintenance).

Bonneville Unit Return Flow. The recycled return flows from Bonneville Unit M&I water could continue to be part of the Bonneville Unit water supply that are necessary for the exchange to Jordanelle Reservoir. Therefore, such return flows would not be available for redistribution before they reach Utah Lake.

Wastewater Treatment Facilities. Wastewater recycling would depend on configuring a wastewater treatment plant to provide sufficient treatment to meet the State quality requirements for the intended uses of the wastewater. Little of the wastewater in southern Utah County is currently being recycled and reused. This section discusses the existing and proposed wastewater treatment facilities that may provide for wastewater recycling.

Southern Utah County currently has five wastewater treatment plants, which are listed in Table 5-11. Most of the wastewater treated by the existing plants is disposed of in evaporation ponds. On average, the plants in combination are operating at approximately 63 percent of capacity. Considering the projected growth in the county reported at the beginning of this chapter, it is evident that increases in wastewater treatment plant capacity will be needed in the next decade or two.

TABLE 5-11
Wastewater Treatment Plants in Southern Utah County

Location of Plant	Design Capacity (MGD)	2000 Average Flow (MGD)	2000 Percent of Capacity
Payson	3.0	0.81	50%
Salem	1.25	1.02	82%
Santaquin	0.5	0.3	60%
Spanish Fork	5.0	3.53	70%
Springville	5.2	3.80	73%
Total (MGD)	14.95	9.46	63%
Total (acre-feet)	16,760	10,600	63%

In anticipation of increased future wastewater quantities in southern Utah County, SUVMWA is interested in promoting regionalization of wastewater treatment for reasons of economy and recycling potential. In October 2001, SUVMWA issued a report entitled *Wastewater Regionalization Feasibility Study for Southern Utah Valley Municipal Water Association* (Brown & Caldwell 2001). The report evaluated various alternatives for regionalizing the area's wastewater treatment through the construction of treatment plants at various locations that would serve two or more urban areas in common. The alternative recommended for further investigation featured the construction of three new regional plants, to be located west of Spanish Fork (west of the existing wastewater plant), northwest of Payson, and at the center of Goshen Valley. In addition, the existing Springville wastewater treatment plant would be expanded and

upgraded as needed to meet Springville's growing needs. Wastewater from cities not cited in the preceding sentences would be piped to one of the new wastewater plants. Table 5-12 summarizes the locations and capacities of the new plants identified in the report. The locations of these potential new plants were previously illustrated on Figure 3-4 in Chapter 3.

TABLE 5-12
Potential Return Flows from Regional Wastewater Treatment Plants for Southern Utah County
(Based on 2001 Feasibility Study. Subject to Consideration by Affected Cities)

Plant Designation	Plant Location	Cities Served	Year 2050	Buildout Design Capacity (MGD) [1]
WWTF 4A	West of Spanish Fork	Spanish Fork, Mapleton	Total M&I Demand Of 88,953 AF	16.2
WWTF 4B	Northwest of Payson	Payson, Salem, Woodland Hills, Elk Ridge		21.6
WWTF 4C	Goshen Valley	Goshen Valley, Genola		2.1
Springville	Springville	Springville		8.8
Total (MGD)				48.7
Total (acre-feet)			32,347 AF [2]	

[1]Source: *Wastewater Regionalization Feasibility Study for Southern Utah Valley Municipal Water Association,* October 2001. (Brown & Caldwell 2001)
[2]The 32,347 acre-feet is derived as shown in Table 5-13.

The plan described above is subject to refinement through the individual decision-making processes of the cities involved. Changes may occur in the locations and capacities of the three new wastewater treatment plants and the expansion of the existing Springville plant. However, the plan portrayed above indicates the potential amounts and locations of municipal wastewater that may become available.

Estimation of Unit Rates of M&I Return Flow in Southern Utah County. The M&I return flow discussed here is defined as that which would be collected and conveyed to wastewater treatment plants where it may be treated for reuse. This section deals with 1) estimating what percentage of the M&I water used is collected and conveyed to wastewater treatment plants (WWTPs), and 2) estimating the proportion of wastewater that is CUP water. It should be noted that the estimates described are approximations based on the imprecise information available.

The first item enumerated, wastewater conveyed to treatment plants, stems from the amount of M&I water delivered to municipal users and the percentage of that which is used in indoors. As shown in Table 5-2, the per capita use of M&I water in southern Utah County is estimated to decline to 220 gallons per capita per day (gpcd) by 2050. As noted there, the 2050 value is based on the application of State requirements for M&I water conservation, which provide that between 2000 and 2020 per capita water use will be reduced by 12 ½ % through conservation, and then another 12 ½ % between 2020 and 2050 for a total of 25% for the planning period. There is uncertainty about the percentage of the M&I water that would be collected as

wastewater that is related to uncertainty in geographic dispersal of growth in the county by 2050. However, a calculation was made for Salt Lake County that produced a value of 41 percent of delivered M&I water collected as municipal wastewater (see Chapter 3). However, in southern Utah County the plans are for the Bonneville Unit water to be delivered through secondary water systems. The return flow will contribute to the groundwater system and will reappear as water contributed to the water supply of Utah Lake. The return flow percentage for this water is assumed to be 35% of the water delivered. This is considered a conservative estimate of the amount of return flow from Bonneville Unit water.

The resulting percentages of CUP and non-CUP water used in 2050, summarized on Table 5-13, indicate that approximately 32,347 acre-feet of water would return in Southern Utah County in year 2050. Approximately 9,660 acre-feet would be CUP water returning to Utah Lake.

TABLE 5-13
Approximate Southern Utah County M&I Return Flow in 2050 and Division Between Non-Bonneville Unit and Bonneville Unit Waters (Units: acre-feet except where noted otherwise)

Element	Attributed to Both Sources	Attributed to Non-Bonneville Unit Water	Attributed to Bonneville Unit Water
1. Water Supply Situation in 2050			
M&I water use in 2050	88,953	55,335	31,590
3. Estimated Return Flow			
Less Conserved Water			4,000
Total M&I Water		55,335	27,590
Assumed % as return flow		41%	35%
Approximate Return Flow in Acre-feet		**22,687**	**9,660**
		Total Return Flow	**32,347**

Potential Uses of Recycled Wastewater. Assuming that constraints relating to return flows were resolved, the treated effluent from such plants could be used for the following:

1. Flow into Utah Lake and become a part of the overall Utah Lake water supply,
2. Be used in secondary water systems for some of the areas in southern Utah County;
3. Be used for crop irrigation as part of an exchange for irrigation water from the Spanish Fork River, and
4. Be used for wetlands enhancement in wildlife preserves around the southern boundaries of Utah Lake.

The potential uses above would probably require exchange of water rights to offset increased consumption.

POSSIBLE SEQUENCE OF DEVELOPMENT OF WATER SUPPLIES

The sequence of development of additional water supplies is dependent on several factors among which are patterns of population growth, ease of converting irrigation water to the cities' use, locations of wastewater treatment plants, limitations on use of recycled water, cost, and environmental and political issues.

Probable Cost Range

Detailed cost estimates for developing local sources of water are beyond the scope of this water needs analysis. However, experience gained by the District and other agencies with various methods of treating water permit the identification of approximate unit costs of providing water. Table 5-14 presents approximate costs for the potential sources of water discussed above. It should be noted that the tabulated costs should not be used to determine the feasibility of the sources; inasmuch as physical facilities are not well defined, and the economics of water treatment processes change with time.

TABLE 5-14
Probable Cost Range
for Developing New Water Sources for Southern Utah County

Water Source	Present Worth Cost ($/AF)	Annual Cost ($/AF)	Potential Use and Anticipated Limitation on Use
Conversion of irrigation water to M&I use	$600 to $1000 per acre-feet for distribution system facilities	Variable [1]	Culinary
ULS	Secondary systems at $600 to $1000 per acre-foot	$300 to $400 for the ULS water plus conveyance and/or distribution system OM&R	Culinary and industrial
Wastewater Recycling	$3,000 to $5,000 for recycling plant plus $600 to $1,000 per acre-foot for distribution system facilities	Dependent on end use and would vary (plus or minus) from a value of $300 per acre-foot	Limited to golf courses, other green spaces, and crop land

[1]Costs associated with water conversion would depend on the current mode of community domestic water supply. For communities that already treat surface water the cost could vary from only the cost of making legal and contractual arrangements, to expansion of domestic water treatment facilities. For communities that currently obtain their water from wells, the use of converted irrigation water could involve construction of domestic water treatment facilities.

Projected Sequence of Development

Generally, the lowest cost new sources available to the cities are developed first. Figure 5-1 shows a likely sequence of utilization of the ULS water supply.

Summary and Conclusions

Based on the considerations discussed in this chapter, it is concluded that a ULS supply of 30,000 acre-feet of M&I water for southern Utah County would be gradually utilized and be an essential new supply for the area after 2030. This would provide the area with an M&I water supply up to and beyond 2050. Flexibility is needed because the existing supply is not distributed evenly among cities and other growth centers in southern Utah County. The build-out population of the area will likely exceed the 2050 projections by a considerable amount. This will require that additional water be secured (see Table 5-15).

TABLE 5-15
Southern Utah County
Municipalities and Areas With M&I Shortages
(Units in acre-feet)

Area	Yr-2000	Yr-2010	Yr-2020	Yr-2030	Yr-2040	Yr-2050
Elk Ridge		164	496	638	735	794
Genola						1,307
Payson						4,350
Salem					1,722	3,365
Santaquin					3,187	6,271
Woodland Hills			174	352	536	536
Goshen Valley	102	237	335	456	4,978	10,609
West Mountain		554	960	1,465	1,670	1,877
West Shore					1,341	2,919
Total	**102**	**1,025**	**1,965**	**2,911**	**14,169**	**32,028**
					Rounded to	**30,000**

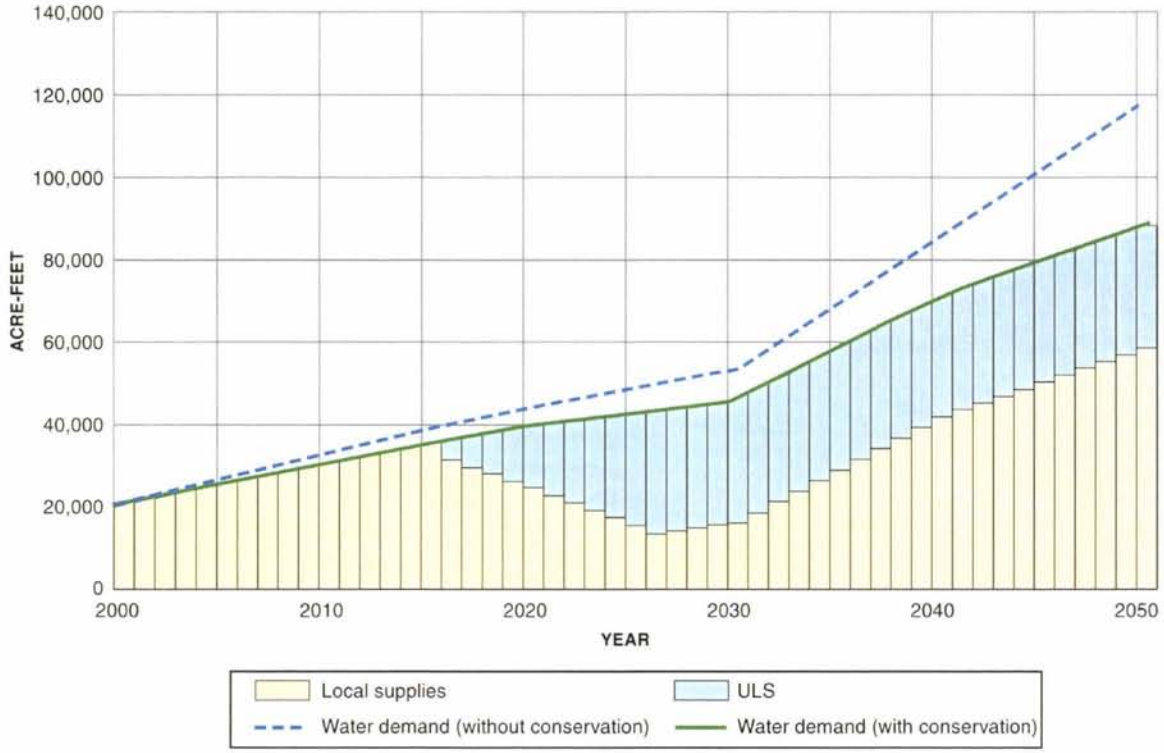


Figure 5-1

South Utah County M&I
Water Demand and Supply With and Without Conservation

Central Utah Project Completion Program

Chapter 6

October 2004

UTAH RECLAMATION
MITIGATION
AND CONSERVATION
COMMISSION

The *Draft Plan Formulation Report of February 2002* addressed M&I water needs for the following communities in northern Utah County: Alpine, American Fork, Cedar Fort, Cedar Hills, Eagle Mountain, Highland, Lehi, Pleasant Grove, and Saratoga Springs. When MAG revised the population projections during the summer of 2002, they identified two unincorporated areas in northern Utah County with significant growth potential. One of these is the extension of Draper City into Utah County. Draper City is located in southern Salt Lake County immediately adjacent to the boundary with Utah County. The second area of potential growth is the unincorporated area of Cedar Valley west of Utah Lake. Significant growth in the incorporated areas would occur in Lehi, Saratoga Springs, and Eagle Mountain.

In this M&I Water Needs Appendix, only two incorporated communities, (Saratoga Springs and Draper) and one un-incorporated community (Cedar Valley) in Northern Utah County may have a need for assistance in meeting future water demands. However, these demands are not projected to occur until the time frame of 2040 to 2050. This is much later than the needs in Salt Lake County where significant water shortages will begin to occur starting around year 2015. There are, however, ways to meet needs in these areas in absence of any direct deliveries from the ULS project. Due to the small water demand and alternate opportunities, the ULS project alternatives have not focused on water deliveries to these northern Utah County communities.

The incorporated communities with potential shortages are Saratoga Springs (1,554 acre-feet) and Draper City (2,980 acre-feet). Draper City's needs would be met through deliveries from the Jordan Valley Water Conservancy District. The potential needs of Saratoga Springs could be met though local cooperative efforts with the District's remaining Utah Lake rights, a conjunctive use program in northern Utah County, and water recycling. Water for the conjunctive use program would be become available as significant blocks of irrigated lands are converted to urban use.

The un-incorporated area of Cedar Valley could experience a shortage of about 3,000 acre-feet if the projected growth at year 2050 were to occur. However, in the case of Cedar Valley there are no elected representatives that have petitioned for water. Because of this, there is not a foreseeable need to deliver water through either direct deliveries or through exchanges. The most likely scenario for any growth to occur in Cedar Valley would be for developers to purchase agricultural groundwater rights within Cedar Valley or irrigation rights outside the valley that with approval from the State Engineer could be transferred for M&I use. With growth from this water supply a small scale water recycling project would meet the remaining demands.

Another area that is likely to experience water shortages during the build-out phase of their population growth would be the city of Lehi. This growth would occur after the ULS planning horizon of the year 2050. Although the needs are not specifically addressed in this M&I Water Needs Appendix, it is likely some of the opportunities discussed in Section 6.4 of this chapter would be a means to supply M&I water to Lehi City.

POPULATION PROJECTIONS

The population projections for Utah County have been revised since the preparation of the Draft Plan Formulation Report to reflect the results of the 2000 census. As discussed in Chapter 1 of

this M&I Water Needs Appendix, the revisions were prepared by MAG in consultation with local communities and the GOPB. Additional details are contained in Attachment A. Table 6-1 presents the revised projections for northern Utah County. The shaded areas for Alpine, Cedar Hills, Draper, Highland and Pleasant Grove indicate build-out populations. Planning activities to address water needs during the build-out phase are beyond the scope of the ULS project.

Build-out populations for communities not shaded at year 2050 in Table 6-1 were presented previously in Chapter 1, Table 1-3. The communities with significant potential for growth and which will achieve build-out after the year 2050 planning horizon include American Fork, Eagle Mountain, Lehi and Saratoga Springs. Of these four communities only American Fork would have sufficient water to meet its build-out population needs. The increase in build-out population over the year 2050 projections for Eagle Mountain, Lehi and Saratoga Springs would be about 262,244.

TABLE 6-1
Population Projections for Northern Utah County
Revised to Reflect the 2000 Census

Community	Year					
	2000 CENSUS	2010	2020	2030	2040	2050
Alpine	7,146	9,874	11,752	15,675	18,900	18,900
American Fork	21,941	27,787	32,573	35,583	46,008	56,433
Cedar Fort	341	500	632	738	932	1,127
Cedar Hills	3,094	6,807	9,663	10,132	12,300	12,300
Draper	0	4,758	7,833	10,448	14,000	14,000
Eagle Mountain	2,157	9,758	16,756	22,770	38,207	53,644
Highland	8,172	14,940	20,120	23,564	28,163	28,163
Lehi	19,028	31,302	44,437	48,975	69,036	89,098
Pleasant Grove	23,468	27,334	30,415	33,226	40,700	40,700
Saratoga Springs	1,003	8,993	18,005	23,450	38,606	53,762
Cedar Valley	510	5,075	5,258	5,884	21,609	33,666
Totals	**86,860**	**147,128**	**197,444**	**230,445**	**328,461**	**401,793**

Notes:
1. The shaded areas for Alpine, Cedar Hills, Draper, Highland, and Pleasant Grove indicate build-out populations.
2. The community of Draper is centered in Salt Lake County. The population listed on this table is in the extension of Draper City across the county line into Utah County.

TOTAL M&I DEMANDS WITH CONSERVATION

Projected Unit Water Usage with Conservation Element

The projection of future unit water usage in gallons per capita per day to the year 2050 for northern Utah County is presented in Table 6-2. Northern Utah County has no overall umbrella organization that represents the communities such as SUVMWA in southern Utah County.

Therefore each community would have the responsibility to meet the water conservation goals of a 12½ percent reduction in water demand by the year 2020 and a 25 percent reduction in demand by year 2050.

TABLE 6-2
Projected Unit Water Usage in Northern Utah County
with Conservation Element Included
(12 ½% by year 2020 and 25% by year 2050)

Community	Year					
	2000	2010	2020	2030	2040	2050
	Water use in gallons per capita per day (gpcd)					
Alpine	322	302	282	269	255	242
American Fork	265	249	232	221	210	199
Cedar Fort	224	210	196	190	190	190
Cedar Hills	232	218	203	193	190	190
Cedar Valley	190	190	190	190	190	190
Draper	190	190	190	190	190	190
Eagle Mountain	256	240	224	213	203	192
Highland	241	226	211	204	197	190
Lehi	347	287	226	211	211	211
Pleasant Grove	170	170	170	170	170	170
Saratoga Springs	403	310	223	214	203	192

Projected M&I Demands

Projected M&I water demands are shown in Table 6-3. The demands were computed using the projected population on Table 6-1 and the projected water use rates in gallons per capita per day shown in Table 6-2. As shown in Table 6-3 northern Utah County will have a water demand of 91,285 acre-feet by the year 2050 with conservation. This is an increase of 66,038 acre-feet over the requirements at year 2000. A detailed water demand analysis is contained in Attachment D of this M&I Water Needs Appendix.

TABLE 6-3
Total M&I Water Demands in Northern Utah County with Conservation Element Included (12 ½% by year 2020 and 25% by year 2050)

Community	Year					
	2000	2010	2020	2030	2040	2050
	Acre-Feet					
Alpine	2,580	3,181	3,722	4,305	4,999	5,596
American Fork	6,519	8,246	9,447	10,670	12,390	13,872
Cedar Fort	86	192	294	454	734	1,181
Cedar Hills	804	1,659	2,198	2,195	2,617	2,617
Cedar Valley	109	306	453	9632	3,899	7,165
Draper	0	1,013	1,668	2,225	2,982	2,982
Eagle Mountain	619	2,625	4,206	5,442	8,674	11,538
Highland	2,206	3,782	4,753	5,383	6,213	5,993
Lehi	7,402	10,048	11,243	11,558	16,292	21,027
Pleasant Grove	4,469	5,205	5,792	5,756	7,751	7,751
Saratoga Springs	453	3,123	4,498	5,621	8,779	11,563
TOTAL	**25,247**	**39,380**	**48,274**	**63,241**	**75,330**	**91,285**

CAPABILITY OF EXISTING SUPPLIES TO MEET M&I DEMANDS

The bulk of the following information, previously used for the *Draft Plan Formulation Report of February 2002*, was abstracted from the report, *North Utah County Water Needs Study* of October 2001 by Parsons Engineering (the Parsons report) for the Central Utah Water Conservancy District.

Existing water supplies for northern Utah County communities include the following:

- Groundwater
- Springs
- Central Utah Project water (Jordanelle Reservoir); and
- Local surface streams, canals and storage water

Groundwater

In the Parsons report, one groundwater basin was assumed to exist in the area from Pleasant Grove to Lehi and a second groundwater basin to exist in the Cedar Valley area in which Eagle Mountain is located. The Cedar Valley groundwater basin is connected to both the Jordan Valley and Utah Valley groundwater basins. The southern portion of the groundwater basin in Cedar Valley discharges into Utah Valley while the northern portion drains into the Jordan Valley. The southern portion is significantly larger than the northern groundwater basin.

The average annual groundwater withdrawal from Pleasant Grove to the Lehi area of northern Utah County would be limited to 78,700 acre-feet[1]. The maximum one-year allowable withdrawal would be 98,400 acre-feet. However, pumping would be limited to the water rights that the cities have for groundwater pumping which presently total approximately 53,000 acre-feet. Table 6-4 presents the present groundwater rights, present yield of wells and the projected use of groundwater by the year 2050. The information in the table demonstrates that in order to meet their projected M&I needs most of the communities will need to maximize their groundwater pumping capabilities by the year 2050.

According to the Parsons report, the current groundwater usage for the northern Utah County communities is about 27,047 acre-feet per year. To meet the M&I demand of 91,285 acre-feet at year 2050, this would require that approximately 20,286 acre-feet of additional groundwater would need to be pumped to meet demand at year 2050. Overall this would require pumping at a capacity of 82 percent of their groundwater rights.

Groundwater in Cedar Valley has not been extensively studied. However reports cited in the Parsons study estimate that the groundwater recharge to Cedar Valley is approximately 24,000 acre-feet and that the discharge from Cedar Valley is approximately 22,000 acre-feet, of which about 15,000 acre-feet leaves Cedar Valley as subsurface flow to Utah Valley. It would seem likely that a portion of the 7,000 acre-feet not returning to Utah Valley would return to the Jordan Valley and could be utilized through purchase of irrigation rights in the Jordan Valley and exchanged to groundwater pumping in Cedar Valley.

[1] Information is taken from the report, "*North Utah County Water Needs Study, October 9, 2001*, by Parsons Engineering, Page 10.

TABLE 6-4
Yield and Utilization of Groundwater Wells to Meet M&I Demand in Northern Utah County

Source	Water Right (ac-ft)	Present Yield of Wells (ac-ft)	Groundwater Availability Projected to Meet Needs at Year 2050 (ac-ft)	Percent Utilization of Groundwater Rights (%)
Alpine	4,716	4,716	4,495	95%
American Fork	15,559	15,559	13,872	89%
Cedar Fort	62	62	62	100%
Cedar Hills	2,328	2,328	2,328	100%
Cedar Valley	620	620	620	100%
Draper(Utah Co.)	0	0	0	0%
Eagle Mountain	2,901	2,901	2,901	100%
Highland	4,006	4,006	4,006	100%
Lehi	11,554	11,554	11,554	100%
Pleasant Grove	14,716	14,716	6,517	44%
Saratoga Springs	1,598	1,598	1,598	100%
Total	**57,440**	**57,440**	**47,333**	**82%**

Springs

The utilization of water from springs is the first priority of communities in meeting their culinary water needs. This is because of the low level of water treatment required for culinary use. Unlike southern Utah County, the availability of water from springs in northern Utah County for use as an M&I water supply is very limited. The total amount of M&I water from springs in northern Utah County is about 1,926 acre-feet. As shown in Table 6-5, only four communities have a water supply from springs with 100% utilization by these communities.

TABLE 6-5
Spring Water Available to Northern Utah County Communities
(Units: acre-feet)

Source	Water Right (ac-ft)	Present Yield of Springs (acre-feet)	Total Springs Projected to Meet Needs at Year 2050 (acre-feet)	Percent Utilization of Springs (%)
Alpine	292	292	292	100%
American Fork	0	0	0	0
Cedar Fort	62	62	62	100%
Cedar Hills	0	0	0	0
Cedar Valley	0	0	0	0
Draper Extension	0	0	0	0
Eagle Mountain	0	0	0	0
Highland	0	0	0	0
Lehi	338	338	338	100%
Pleasant Grove	1,234	1,234	1,234	100%
Saratoga Springs	0	0	0	0
Total	**1,926**	**1,926**	**1,926**	**100%**

Existing CUP Water

Central Utah Project water is allocated to some of the communities within northern Utah County. This water is provided from storage in Jordanelle Reservoir and its use is limited by capacity in the Alpine Aqueduct. The allocation of CUP water among northern Utah County communities is as listed on Table 6-6.

TABLE 6-6
Allocation of CUP Water in Northern Utah County
(Units: acre-feet)

Community	Allocation (acre-feet)	Less Conservation Credit Program Turnback Water	Net Allocation After Turnback of Water
Alpine	1,645	875	770
American Fork	2,095	N/a	2,095
Cedar Hills	710	N/a	710
Highland	1,415	1,000	415
Lehi	1,145	N/a	1,145
Pleasant Grove	2,120	500	1,620
Others (Orem, i.e)	10,870	500	10,370
Totals	**20,000**	**2,375**	**17,125**

M&I Supply from Local Streams, Canals and Storage Water

Table 6-7 shows local stream flow, canal and storage water within incorporated boundaries of the northern Utah County communities. The amounts of water shown are not necessarily useable for M&I purposes because of seasonal flow variation. In other words, stream flow is high in the late spring and early summer as snowmelt occurs and tapers down to low flows in the late summer. Another characteristic of local surface streams is that their discharges tend to vary from year to year depending on winter snowfall, which is also variable from year to year. Thus the firm yield of the streams would be lower than the annual discharge amounts. To account for this seasonal variation, it has been assumed that 50 percent of the local stream flow would be useable for M&I purposes either directly in secondary water systems or for culinary use with suitable treatment. Some of the remainder could be used under a conjunctive use program to recharge local groundwater and thereafter be used indirectly by well pumping.

TABLE 6-7
Local Streams, Canals and Storage Water
Potentially Available to Northern Utah County Communities

Community	Surface Water Within Community's Incorporated Boundaries (acre-feet)	Average Annual Amount Through Agricultural Conversion at Year 2050 (acre-feet)	Percent That Would Potentially Be Available (%)	Estimate Of Firm Yield
Alpine	3,882	1,998	51%	Firm yield would be comprised of an amount that could be used directly in secondary systems plus the amount available through a conjunctive use program.
American Fork	15,639	7,665	49%	
Cedar Fort	2,268	969	43%	
Cedar Hills	1,283	289	23%	
Cedar Valley	0	11,442	0	
Draper City	0	0	0	
Eagle Mountain	0	0	0	
Highland	6,463	1,986	31%	
Lehi	15,366	12,558	82%	
Pleasant Grove	12,028	2,809	23%	
Saratoga Springs	8,411	8,069	96%	
Total	**65,340**	**49,835**		

POTENTIAL FOR OTHER WATER SUPPLIES TO MEET NEEDS

An analysis of the following water supplies is presented to determine the amount, if any, that could be used in meeting future M&I water demands in northern Utah County.

- Conversion of agricultural lands to urban use in northern Utah County
- Conjunctive use of surface water and groundwater

- Utilization of a portion of District's Utah Lake rights
- Purchase of irrigation company stock from canals having Utah Lake/Jordan River water
- Wastewater recycling and reuse (non-CUP return flow)

The focus of discussion on evaluation of other water supplies is the potentially water short areas of Saratoga Springs, Cedar Valley and Eagle Mountain, to assess the supplies which could meet the needs of these areas. As noted earlier, the portion of Draper City that will grow into Utah County will be served by the Jordan Valley Water Conservancy District.

Conversion of Agricultural Lands to Urban Use

Projected Urbanization of Irrigated Lands. In northern Utah County, surface water is currently used to irrigate approximately 21,500 acres. Water supply to this land comes from the following principal sources: Provo River, American Fork River, Battle Creek, Grove Creek, Dry Creek, and Utah Lake.

The Saratoga Springs area contains approximately 8,000 acres of irrigated land that receives its water supply from the Utah Lake Distributing Canal, which transports Utah Lake water. In the Draft Plan Formulation Report this supply was not considered as being useable for M&I because of the high total dissolved solids of the lake's water. The conversion of irrigation water from part of this area is included in this M&I Water Needs Appendix as a potential new M&I water supply, requiring treatment for such use.

Table 6-8 shows a summary of the projected amount of irrigated lands to be urbanized in northern Utah County. The majority of this would be in the general area of Eagle Mountain, Lehi, and Saratoga Springs, which would comprise 16,428 acres of the 27,906 acres projected for urbanization.

TABLE 6-8
Projected Amount of Irrigated Acreage Converted to Urban Use in Northern Utah County
(Source of Data: Attachment D, Table D- 18 through Table D- 28)

City	2000	2010	2020	2030	2040	2050
	Acres					
Alpine	0	303	512	948	1,306	1,306
American Fork	0	650	1,182	1,516	2,674	3,832
Cedar Fort	0	0	0	0	0	0
Cedar Hills	0	0	0	0	0	0
Cedar Valley	0	153	227	316	1,791	1,791
Eagle Mountain	0	844	1,612	2,291	4005	5,721
Draper City	0	0	0	0	0	0
Highland	0	456	1,027	1,907	1,907	1,907
Lehi	0	1,364	2,823	3,327	5,557	5,924
Pleasant Grove	0	444	852	1,551	1,983	2,642
Saratoga Springs	0	888	1,889	2,494	4,178	4,783
Total	**0**	**5,102**	**10,124**	**14,350**	**23,401**	**27,906**

Projected Amount of Irrigation Water from Urbanization of Irrigated Lands. Table 6-9 shows the amount of irrigation water projected to be available from urbanization of irrigated lands.

TABLE 6-9
Projected Average Annual Amount of Water From Urbanization of Irrigated Lands and Other Urban Lands with Surface Water in Northern Utah County
(Source of Data: Attachment D, Table D- 14 through Table D- 22)

City	2000	2010	2020	2030	2040	2050
	Units in Acres					
Alpine	0	464	783	1,450	1,998	1,998
American Fork	0	1,299	2,363	3,032	5,348	7,665
Cedar Fort	0	78	161	306	554	969
Cedar Hills	0	0	0	0	0	0
Cedar Valley	0	306	453	632	3,582	3,582
Draper	0	0	0	0	0	0
Eagle Mountain	0	1,689	3,244	4,581	8,011	11,442
Highland	0	474	1,068	1,986	1,986	1,986
Lehi	0	2,891	5,985	7,054	11,780	12,558
Pleasant Grove	0	1,110	2,130	2,809	2,809	2,809
Saratoga Springs	0	1,498	3,187	4,208	7,048	8,069
Total	**0**	**9,809**	**19,374**	**26,058**	**43,116**	**51,078**

The irrigation water supplies cited on Table 6-9 would be only partially available as a firm yield for M&I use. As discussed above under local stream flow, these irrigation water supplies tend to vary seasonally and yearly, and much of the volume cited on the table would occur during peak runoff periods. To develop them for M&I use, the specific water sources would need to be analyzed to determine the dependable yield. Beyond the direct use of such water, there remains the possibility of recharging water from high flows periods to local groundwater aquifers, and pumping the recharged water from wells under a conjunctive use operation as discussed in the following sections of this chapter.

Conjunctive Use of Surface Water and Groundwater

Conjunctive Use Identified in the Northern Utah County Water Needs Study. The Parsons report assessed the potential for conjunctive use of surface water and groundwater in northern Utah County. As stated in that report, the waters of the American Fork River, Dry Creek, Fort Creek, Battle Creek, and Grove Creek are used primarily for crop irrigation and secondary water systems. Because of the existing cropping patterns the irrigated lands require higher early season delivery (for example, May and June) than are required by urban landscapes. The difference in the timing of consumption of these two slightly different uses could provide a water supply for conjunctive use through storage of the surplus water in the groundwater basin for later extraction. This would amount to an annual average of approximately 12,800 acre-feet under existing water rights as identified in the Parsons report.

Conjunctive Use under CUPCA. At the present time, the Central Utah Water Conservancy District has initiated a cooperative effort with the northern Utah County communities and the U.S Geological Survey to conduct a three- to four-year study of the conjunctive use potential in northern Utah County. The District and other local entities are planning to enter into a cooperative agreement with the U.S. Geological Survey to complete a groundwater model of the groundwater basin in northern Utah County. Potential sites for recharge are shown on Figure 6-1. The cities would then pump this water directly from the groundwater basin in northern Utah County.

Utilization of a Portion of District's Utah Lake Rights

The water demand sheets contained in Attachment D identified M&I demands in the Saratoga Springs area of approximately 1,554 acre-feet above the existing locally available water supplies. This amount could be met by the District assigning 1,554 acre-feet of its primary and secondary water rights in Utah Lake to the Saratoga Springs area. The cost for this water is estimated to be the cost of drilling a water well. One water well of approximately 10 cfs capacity would supply the 1,554 acre-feet on an average annual basis with sufficient capacity for peak day and peak monthly use. Alternate methods for meeting the 1,554 acre-feet would be for the city or developers to purchase irrigation company stock from companies that have Utah Lake water rights and/or participation with a regional water recycling project from entities such as the Timpanogos Regional Wastewater Treatment facility.

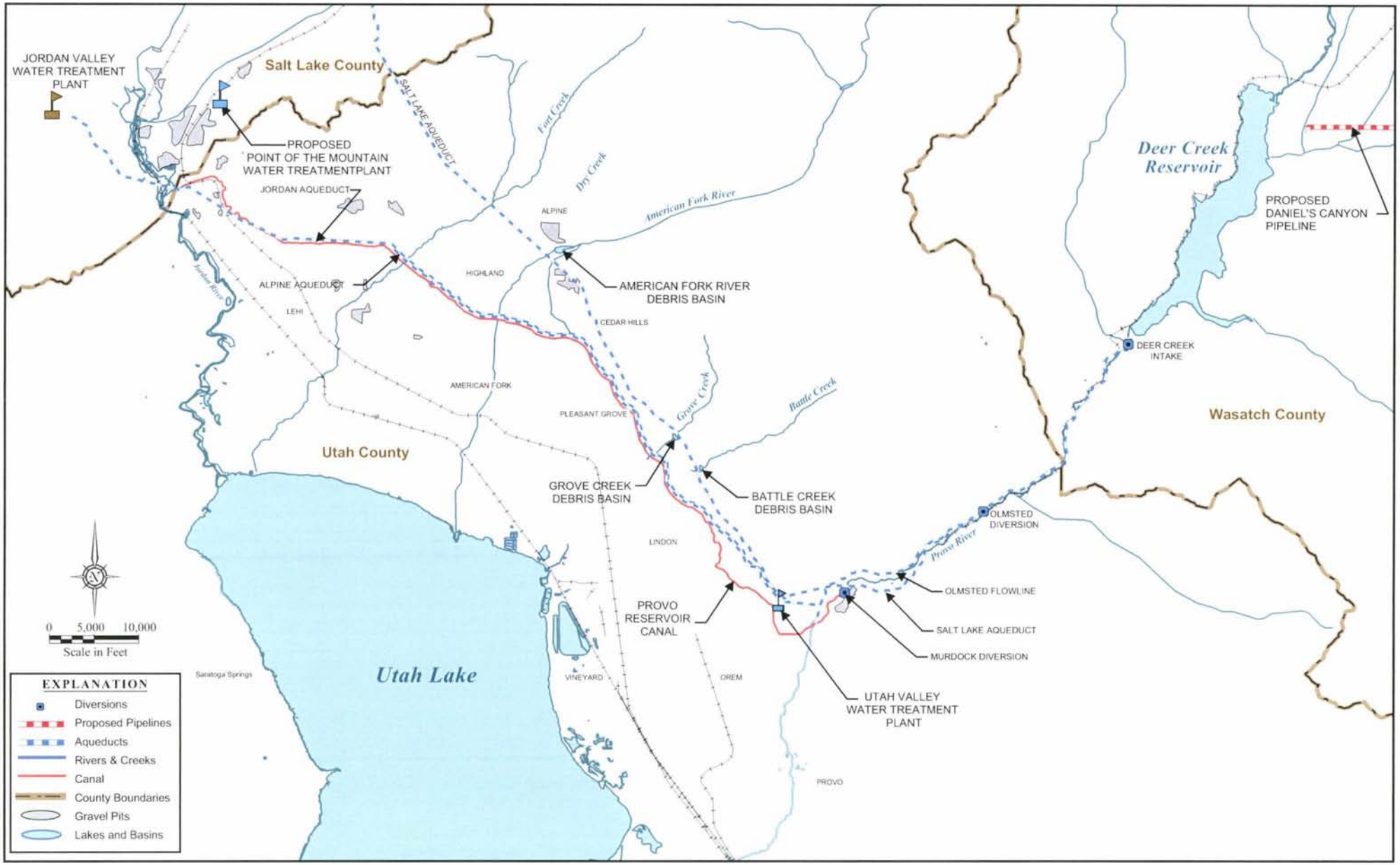


Figure 6-1
Conjunctive Use
Northern Utah County

Purchase of Irrigation Stock from Irrigation Companies in Salt Lake County

The Cedar Valley area is un-incorporated and without any elected representation. This area could realize about 3,000 acre-feet of demand above supplies at the year 2050, assuming the projected population growth occurs. The northern portion of the groundwater basin underlying Cedar Valley drains into the Jordan Valley. As stated in Section 6.3.1 of this chapter there would likely be a portion of the 7,000 acre-feet that discharges from Cedar Valley that would drain into Jordan Valley. Assuming 25 percent of this amount would drain through the subsurface to Jordan Valley there would be 1,750 acre-feet from purchase of irrigation stock to go toward meeting the remaining needs in Cedar Valley.

Recycling of Water from Wastewater Treatment Plants

Regional Use of Water Recycling. A significant benefit of using recycled water is that this source would be a firm water supply during periods of drought. Wastewater would still be available because indoor demands do not diminish significantly during drought periods. The information on water recycling for northern Utah County was addressed in the Parsons report. The report stated communities that could benefit from wastewater recycling from the Timpanogos Wastewater Treatment Plant are Lehi, Saratoga Springs, Eagle Mountain, and the commercial area of American Fork located south of Interstate 15 and the area surrounding the wastewater treatment plant. The amount identified in the Parsons report was 13,740 acre-feet.

Local Water Recycling in Eagle Mountain. Meetings were held during November 2002 between District staff and representatives of Eagle Mountain in which the representatives indicated that water recycling could become part of their long term water supply. Eagle Mountain plans to complete these efforts under its own initiative and funding.

Using a return factor of 41 percent as calculated for Salt Lake County and the projected water demand of 11,538 acre-feet at year 2050, there would be about 4,730 acre-feet that returns to the wastewater treatment facility which provides an opportunity for recycling.

Water Recycling in Cedar Valley. At the year 2050 the projected water demand in Cedar Valley would be 7,165 acre-feet. Using a return flow factor of 41%, 2,937 acre-feet that could potentially be recycled to meet a portion of the M&I needs associated with outdoor watering for areas which have minimal human contact.

POSSIBLE SEQUENCE OF DEVELOPMENT OF WATER SUPPLIES

The sequence of development of additional water supplies is dependent on several factors among which are patterns of population growth, ease of converting irrigation water to M&I use, locations of wastewater treatment plants, limitations on use of recycled water, cost, and environmental and political aspects.

Summary of Potential Undeveloped Water Supplies

Table 6-10 presents approximate costs for the potential sources of water discussed above.

TABLE 6-10
Summary of Potential for Undeveloped Water Supplies in Northern Utah County

Water Source	Average Annual Volume (acre-feet)	Potential Firm Yield Estimate (acre-feet)	Type of Use and Required Treatment	Likelihood Of Success
Pleasant Grove to Lehi Area				
Agricultural Conversion	38,393			
Secondary Systems		19,196	Outdoor	High
Conjunctive Use		12,800	Culinary	Moderate
Cedar Valley/Saratoga Springs				
Utah Lake Water Rights				
Districts rights (Saratoga Sps).	1,554	1,554	Culinary	High
Utah Lake Irrigation Stock	1,500	1,500	Culinary	Moderate
Water Recycling				
Timpanogos Regional WWTP		13,740	Secondary Systems	Moderate
Eagle Mountain	4,730	4,730		
Cedar Valley	2,937	2,937		

Probable Cost Range

Detailed cost estimates for developing potential sources of water are beyond the scope of this water needs analysis. Table 6-11 presents approximate costs for the various sources of water discussed above, and lists those sources in increasing order of cost. It should be noted that the tabulated costs should not be used to determine the feasibility of the sources; inasmuch as physical facilities are not well defined, and the economics of water treatment processes change with time.

TABLE 6-11
Probable Cost Range for Developing New Water Supplies for Northern Utah County

Water Source	Present Worth Costs ($/AF)	Annual Cost ($/AF)	Potential Use and Anticipated Limitations on Use
Conjunctive Use		Annual cost have not been computed for this M&I Water Needs Appendix since its primary focus is on water demands and likely sequence of development of water sources	Culinary/outdoors
Well Injection/spreading Basin	$2,000		
Main Trunk Line	Variable		
Secondary Systems	$600 to $1,000		
Agricultural Conversion			Outdoor
Secondary Systems	$600 to $1,000		
Utah Lake Water Rights	$2,000 to $2,500		Culinary
Districts Rights	N/a		
Irrigation Stock (in Salt Lake Co.)	$2,000 to $2,500		
Wastewater Recycling			Outdoors With minimal Human contact
Treatment Plant	$3,000 to $5,000		
Main Trunk Line	Variable		
Secondary Systems	$600 to $1,000		

Projected Possible Sequence of Development for Communities with M&I Shortages

The projected sequences of development for Cedar Valley and Saratoga Springs are listed in Table 6-12. In general, the lowest cost sources would be developed first while the more costly sources would be staged as later additions or new ventures.

TABLE 6-12
Possible Sequence of Water Development in Cedar Valley and Saratoga Springs

	2000	2010	2020	2030	2040	2050
Cedar Valley						
Water Demand	109	306	453	632	3,899	7,165
Existing Supplies	0	0	0	0	0	0
Shortage	109	306	453	632	3,899	7,165
Future Supplies						
Agricultural Conversion	109	306	453	632	3,582	3,582
Utah Lake Irrigation Stock					317	1,750
Water Recycling						1,833
Remaining Shortages	**0**	**0**	**0**	**0**	**0**	**0**

TABLE 6-12 (continued) Probable Cost Range for Developing New Water Supplies for Northern Utah County						
Saratoga Springs						
Water Demand	453	3,123	4,498	5,621	8,779	11,563
Existing Supplies						
Groundwater	453	1,283	1,755	2,285	3,685	3,685
Canals/storage water		342	342	342	342	342
Shortages	0	1,498	2,401	2,994	4,752	7,536
Future Supplies						
Agricultural Conversion	0	1,498	2,401	2,994	4,675	5,982
District's Utah Lake Rights	0	0	0	0	77	1,554
Remaining Shortages	**0**	**0**	**0**	**0**	**0**	**0**

SUMMARY OF M&I NEEDS

With diligent efforts, the Saratoga Springs and Cedar Valley area of northern Utah County would be able to meet their M&I needs without any deliveries from the ULS project. This may require use of a small portion of the District's Utah Lake rights, water purchase from irrigation stock of canal companies in Salt Lake County, and water recycling.

New M&I water from conversion of agricultural lands would be driven by population and community growth. The availability of new M&I water from this source would depend on the urbanization of agricultural land irrigated with lake/river water. While the locations of lands irrigated with this water are a matter of record, the tracts of irrigated land that will be urbanized are not known. In general, the conversion of irrigated lands will probably occur concurrently in communities throughout the area as the population projections are realized.

Central Utah Project Completion Program

Chapter 7

October 2004

UTAH RECLAMATION
MITIGATION
AND CONSERVATION
COMMISSION

INTRODUCTION

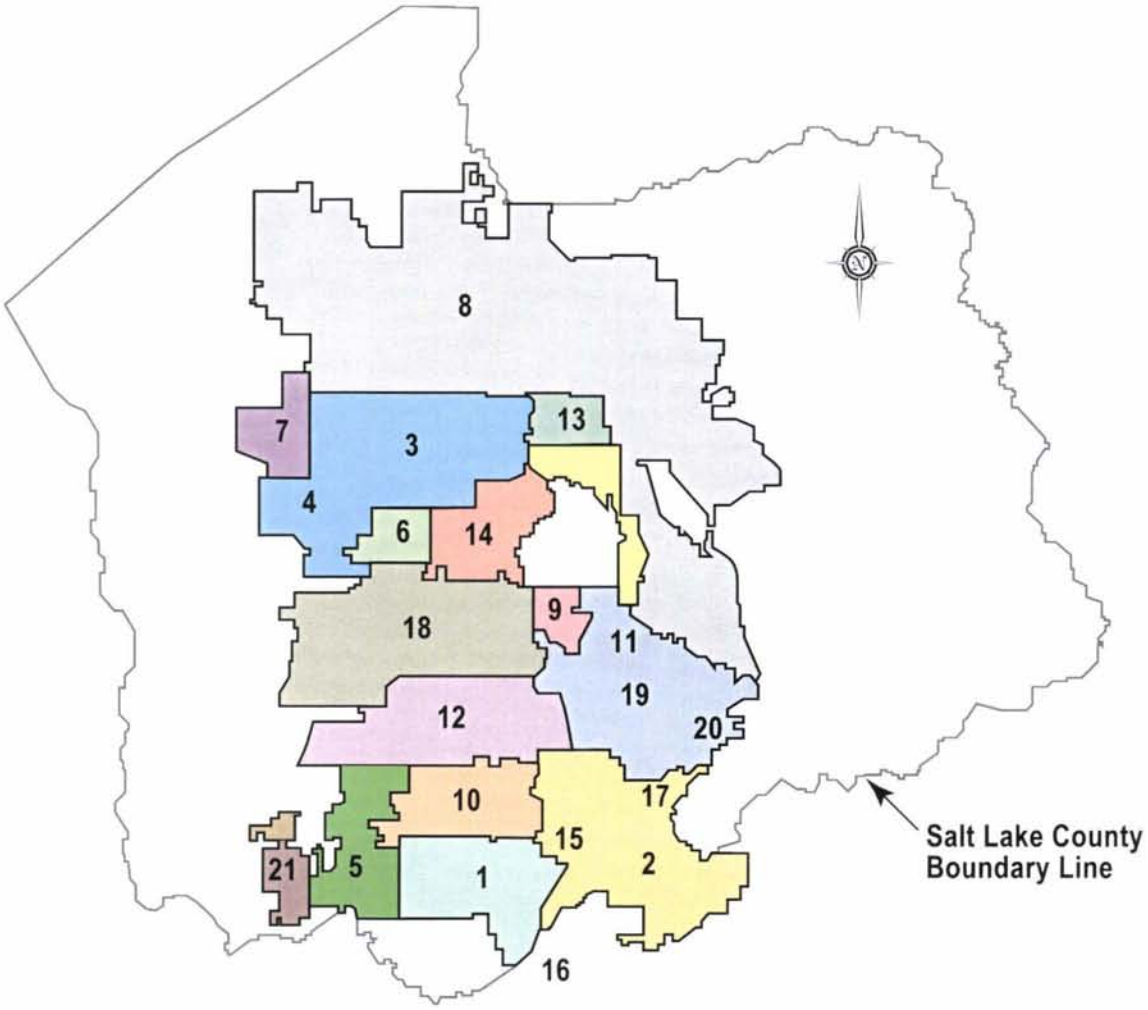
This Chapter was prepared by the Jordan Valley Water Conservancy District, as a result of a request by the Joint Lead Agencies for the Utah Lake Drainage Basin Water Delivery study. The Joint Lead agencies are comprised of the U.S. Department of Interior, Central Utah Water Conservancy District and the Utah Reclamation Mitigation and Conservation Commission. The information was needed for use by the Joint Lead Agencies in completing the supplement to the Definite Plan Report for the Bonneville Unit and for an environmental impact statement on the Utah Lake Drainage Basin Water Delivery System (ULS). Included in the report are Jordan Valley Water Conservancy District's water conservation and water recycling plans and the time frame to take delivery of the ULS water.

Description of Entity

Jordan Valley Water Conservancy District (JVWCD) was created in 1951 by the Utah legislature under the Water Conservancy Act. JVWCD was organized as a regional water supply agency to develop a water supply for rapidly growing areas in the south and southwestern portions of Salt Lake County. JVWCD is primarily a wholesaler of water to cities and improvement districts within the County. It has 19 member agencies that include cities, improvement districts, state agencies, and private water companies. In addition, JVWCD operates a direct retail system in certain portions of Salt Lake County. Retail deliveries constitute approximately 15% of JVWCD total municipal and industrial water deliveries. Figure 7-1 is a map showing the JVWCD service area and the general location of each of its customer member agencies. A short description of each incorporated municipality and unincorporated Census Designated Place (CDP) within the JVWCD service area is included in Attachment 7-A. JVWCD is the largest petitioner for Bonneville Unit M&I water.

Water Conservation

The Joint Lead Agencies have established for the ULS System an average daily M&I water usage ranging from 180 to 220 gallons per capita per day (gpcd) to be eligible for Bonneville Unit water. One of the criteria for entities requesting Bonneville Unit water under the ULS System is that entities requesting water must have an acceptable water conservation plan. JVWCD has substantial water conservation programs currently in effect, and substantial additional plans. These are fully described in Section 7.4 of this report.



Location of Member Agencies

1. Bluffdale City
2. Draper City
3. Granger-Hunter Improvement District
4. Hexcel Corporation
5. Herriman
6. Kearns Improvement District
7. Magna Water Company
8. Metropolitan Water District of Salt Lake & Sandy
9. Midvale City
10. Riverton City
11. Sandy City
12. City of South Jordan
13. City of South Salt Lake
14. Taylorsville-Bennion Improvement District
15. Utah State Department of Corrections
16. Utah State Department of Public Safety
17. WaterPro, Inc.
18. West Jordan City
19. White City Water Improvement District
20. Willow Creek Country Club
21. Hi-Country Estates Phase II

Figure 7-1
Jordan Valley Water Conservancy District Service Area

Water Recycling

JVWCD has utilized fresh water supplies for its M&I water deliveries to date. Recycling of sewage effluent will become an integral part of future water supply planning for JVWCD. JVWCD has identified Bonneville Unit return flows as a potential water supply resulting from future water wastewater recycling.

Bonneville Unit return flows available for wastewater recycling involve Bonneville Unit water yielded from Jordanelle Reservoir and future Bonneville Unit water yielded from a ULS project. JVWCD estimates that the State Engineer will allow at least the following portions of Bonneville Unit waters for wastewater recycling applications:

- From Jordanelle Reservoir – 15%
- From ULS supplies – 35%

As a result, JVWCD estimates that a potential of 21,000 acre-feet can be recycled from Bonneville Unit water supplies delivered in Salt Lake County. Of this 21,000 acre-feet amount, JVWCD plans to recycle its corresponding 5/7 capacity share of these Bonneville Unit waters, or 15,000 acre-feet per year, in JVWCD's service areas.

JVWCD anticipates that it will begin recycling Bonneville Unit return flows from water yielded from Jordanelle Reservoir prior to taking delivery of ULS water supplies.

POPULATION PROJECTIONS

The Governor's Office of Planning and Budget (GOPB) released future population projection data in 2002 which utilized the results of the 2000 Census. The GOPB data provides County-wide population estimates for 2010, 2020, and 2030, and more detailed sub-county population estimates are made by regional planning organizations.

Population for Salt Lake County

In 2003, the Wasatch Front Regional Council, in coordination with GOPB, released sub-county population estimates for each incorporated area and the balance of unincorporated Salt Lake County. Table 7-1 shows the population projections for each incorporated community in Salt Lake County and the entire unincorporated area.

TABLE 7-1
Salt Lake County Population

Community Name	Year							
	2000	2002	2005	2010	2020	2030	2040	2050
Alta Town	370	368	397	461	560	631		
Bluffdale City	4,700	5,230	6,723	10,591	28,282	46,279		
Draper City	25,220	28,555	32,185	40,719	47,208	51,309		
Herriman City	1,523	3,223	9,097	15,000	28,307	37,415		
Holladay City	19,246	19,328	19,403	19,736	22,526	24,696		
Midvale City	27,029	27,698	28,558	29,581	31,310	32,270		
Murray City	34,024	34,718	35,908	38,146	39,778	39,465		
Riverton City	25,011	28,935	37,046	56,167	63,298	65,195		
Salt Lake City	181,743	184,092	185,336	187,259	193,130	197,079		
Sandy City	88,418	93,399	99,967	108,000	119,292	122,357		
South Jordan City	29,437	32,218	37,689	48,118	68,610	92,474		
So. Salt Lake City	22,038	22,190	22,252	23,240	25,903	26,829		
Taylorsville City	58,764	59,656	60,001	63,876	72,134	74,996		
West Jordan City	78,714	83,577	96,310	126,021	144,941	152,393		
West Valley City	108,896	112,168	116,496	124,621	135,354	140,904		
Remainder of Salt Lake County	193,254	188,576	180,022	186,020	263,153	327,550		
Total	**898,387**	**923,931**	**967,390**	**1,077,556**	**1,283,784**	**1,431,843**	**1,625,103**	**1,866,299**

Source of data: 2000 – Census 2000 as revised by the Utah Population Estimating Committee
2010, 2020, 2030 – (for Countywide total only), Governor's Office of Planning & Budget (GOBP)
2002, 2005, and all sub-county community projections – Wasatch Front Regional Council in coordination with GOPB (released in 2003)
2040, 2050 – GOPB (release in 2000)

Population for JVWCD Service Area

Many of Utah's fastest growing communities are located in the JVWCD service area. Table 7-2 shows the population projections for those communities in the JVWCD service area. A brief description of each community in the JVWCD service area is included in Attachment 7-A.

TABLE 7-2
Population in JVWCD Service Area

	Year							
Community Name	**2000**	**2002**	**2005**	**2010**	**2020**	**2030**	**2040**	**2050**
Bluffdale City	4,700	5,230	6,723	10,591	28,282	46,279		
Draper City	25,220	28,555	32,185	40,719	47,208	51,309		
Herriman City	1,523	3,223	9,097	15,000	28,307	37,415		
Holladay City [a)]	1,050	1,050	1,075	1,100	1,150	1,200		
Midvale City [a)]	16,500	16,500	16,700	17,000	18,000	19,000		
Riverton City	25,011	28,935	37,046	56,167	63,298	65,195		
Sandy City [b)]	1,000	1,000	1,000	1,000	1,000	1,000		
South Jordan City	29,437	32,218	37,689	48,118	68,610	92,474		
So. Salt Lake City	22,038	22,190	22,252	23,240	25,903	26,829		
Taylorsville City	58,764	59,656	60,001	63,876	72,134	74,996		
West Jordan City	78,714	83,577	96,310	126,021	144,941	152,393		
West Valley City	108,896	112,168	116,496	124,621	135,354	140,904		
Remainder of Salt Lake County [c)]	91,910	84,859	81,010	83,709	118,419	147,397		
Total population in JVWCD service area	**464,763**	**479,161**	**517,584**	**611,162**	**752,604**	**856,392**	**975,062[d)]**	**1,119,779[d)]**

Notes:
a) Population shown is only for that portion of the community within the JVWCD service area.
b) Virtually all of Sandy City was removed from the JVWCD service area December 31, 2001. JVWCD does maintain a small (315 AF per year) contract with Sandy City which will not increase in the future (indicated with the constant population of 1000. In order to provide a common reference for water usage rates, the Sandy City population is also (except 1000) omitted from year 2000 data.
c) Kearns, Magna, Oquirrh and White City are unincorporated communities in the service areas of JVWCD wholesale customers. JVWCD provides retail service in portions of Cottonwood West and Little Cottonwood Creek Valley unincorporated communities.
d) Calculated estimate assuming JVWCD service area population remains at 60% of total population in Salt Lake County.

Urbanized Lands

Most of the lands within JVWCD's service area are still urbanizing. Infill development is typical in these areas. Population densities vary from rural densities below 1.0 person per acre to a well-developed density of 8.4 people per acre. Table 7-3 shows current population densities for communities in JVWCD, and projected population densities for the year 2030. Details for this information are located in Attachment 7-A. Note that there is room for substantial infill development within JVWCD, all occurring within boundaries of the communities.

TABLE 7-3
Population Density of Communities in JVWCD Service Area

Community	Population Density (People per acre)		Benchmark density for highly urban area
	Year 2000	Year 2030	
Bluffdale	0.4	4.4	9 to 11
Draper City	1.3	2.6	9 to 11
Herriman City	0.3	6.5	9 to 11
Holladay City	4.3	10.5	9 to 11
Midvale City	7.3	8.7	9 to 11
Riverton City	3.1	8.0	9 to 11
Sandy City	6.2	8.6	9 to 11
South Jordan City	2.2	6.9	9 to 11
South Salt Lake City	5.0	6.1	9 to 11
Taylorsville	8.3	10.9	9 to 11
West Jordan City	3.5	7.7	9 to 11
West Valley City	4.8	6.2	9 to 11
Unincorporated	n/a	n/a	9 to 11

EXISTING WATER USAGE RATE (GPCD)

In 2000, the water usage rate within the JVWCD service area was approximately 250 gallons per capita per day (gpcd). There is insufficient data to categorize the use accurately, but it is estimated that approximately 70% is consumed for residential use, and 30% is consumed for commercial, industrial, and institutional uses.

JVWCD has implemented conservation programs that are beginning to yield promising results. In 2002, the water usage rate within the JVWCD service area was calculated to be 224 gpcd.

CONSERVATION PLANS

Introduction

Jordan Valley Water Conservancy District (JVWCD) has made a long term commitment to water conservation. JVWCD recognizes that the tremendous projected growth cannot be sustained without a reduction in per capita water use. Water conservation will not only extend limited water supplies, but have the added benefit of deferring costly infrastructure and future water development projects.

The State of Utah has recently undergone a five year drought cycle from 1999 to 2003. The drought has exposed many limitations of existing water supplies. As rapid growth along the Wasatch Front and in the State of Utah continues, JVWCD's fear is that the next drought cycle will have far reaching and much greater impacts on the citizens of the state. Water conservation is not only important in response to this drought cycle, but will be essential in providing for the future health of the state.

Water Conservation Master Plan

In 1999 JVWCD adopted a water conservation plan in response to the "Water Conservation Plan Act" which was signed into State law in 1998. The objectives of the plan were as follows:

1. To become a leader in the implementation of water conservation programs and activities and in the dissemination of water conservation educational information.

2. To gain public recognition and support for meaningful water conservation programs and efforts.

3. To reduce the demand for water and delay costly water infrastructure and development projects.

4. To extend limited water supplies to provide for future growth in JVWCD's service area.

The plan focused on demand-side conservation. An inventory of water conservation activities implemented by comparable water agencies elsewhere in the Western United States was prepared and 37 conservation measures were subsequently evaluated based on water savings, benefits and costs. Eleven measures were determined to have potential for significant water savings and cost effectiveness. These eleven conservation measures were further evaluated based on their benefits and costs, affordability and other non-quantifiable impacts. As a result, the plan recommended four water conservation measures to be implemented in 1999, including:

1. A public education/information program.

2. A water conservation demonstration garden.

3. The development of model landscape ordinances.

4. A residential water auditing program ("Water Check" Program).

Following adoption of the Water Conservation Plan in March 1999, JVWCD immediately implemented these programs, hired a full time water conservation programs coordinator and submitted a conservation programs funding request to the Central Utah Water Conservancy District under Section 207 of CUPCA, Conservation Credit Program.

JVWCD has continued to develop and build on these initial programs since implementation in 1999. Additional programs have also been developed and implemented and a Water Conservation Programs cost effectiveness evaluation performed as further described herein.

Water Conservation Goal

As part of the 1999 Water Conservation Plan, JVWCD's Board of Trustees adopted a conservation goal of reducing total water demand by 10% by the year 2020. This was based on a 20% savings in outdoor water use which would be approximately equivalent to a 10% overall savings. JVWCD's Board of Trustees subsequently adopted the State of Utah's goal of reducing water consumption statewide by 25% by the year 2050.

More recently, due to additional studies in year 2002, JVWCD's Board adopted a new and more aggressive water conservation goal of reducing water demand within JVWCD's service area by 25% by year 2025. This goal would be measured in terms of per capita water use reduction beginning in year 2000. The water use per capita in year 2000 was calculated to be 250 gpcd. Therefore, in order for JVWCD to meet this goal, District-wide water use will need to be reduced to 188 gpcd by 2025.

Current Water Conservation Programs and Activities

Public Education and Information Campaign. With the adoption of the District's Water Conservation Plan in 1999, JVWCD retained a public relations/media consultant to assist in developing a water conservation information/education program. Working with JVWCD staff, the "Slow the Flow, Save H_2O" campaign was created. Since that time, the campaign has continued to be developed, receiving significant recognition and market penetration statewide. The "Slow the Flow, Save H_2O" public education and information campaign represents the core of all District conservation programs and activities.

The campaign includes the development and dissemination of water conservation educational information through printed materials, radio and television advertisements, and media and community events in order to create heightened public awareness of the benefits of reduced water use. JVWCD has been involved with this campaign for four years and plans to continue developing and building on this campaign in the future.
In August of 2001, the Governor of the State of Utah met with water and other governmental officials across the State to develop a statewide water conservation initiative. The purpose of this initiative was twofold as follows:

- To immediately increase public awareness and educate the citizens of the state on water saving measures to address the current drought;
- To generate a long-term water conservation ethic to address Utah's rapid population growth.

A water conservation team was formed to develop a statewide water conservation campaign. The funding members of the team include the State Division of Water Resources, JVWCD, Central Utah Water Conservancy District, Metropolitan Water District of Salt Lake & Sandy, Weber Basin Water Conservancy District, Washington County Water Conservancy District, and more recently the Utah Water Users Association and the Rural Water Association of Utah.

The team agreed that the statewide initiative should broaden the "Slow the Flow, Save H_2O" campaign created by JVWCD and expand the campaign statewide. This would provide for greater market penetration and greater awareness of water conservation on a statewide basis and provide an umbrella campaign for local conservation activities throughout the state.

The main focus of this campaign is to create a long-term conservation ethic through television and radio advertisements and dissemination of educational materials on water conservation, in order to meet the long-term water conservation goal of 25% reduction in water use.

Water Conservation Demonstration Garden. JVWCD recognized that the greatest potential for water conservation is through a reduction in outdoor water use. This reduction can take place through efficient irrigation systems, correct watering schedules and planting design and other principles of water-efficient landscaping. JVWCD designed and constructed a water conservation demonstration garden to show waterwise alternatives to the traditional landscape. The Garden demonstrates water conservation principles by emphasizing proper landscape design, irrigation technologies, the use of hardscape and mulches, and a wide variety of low water use plants. The basic premise behind the garden is to show how to create an attractive landscape suited to the Utah climate which will save water by using alternatives to the traditional blue grass lawn landscape.

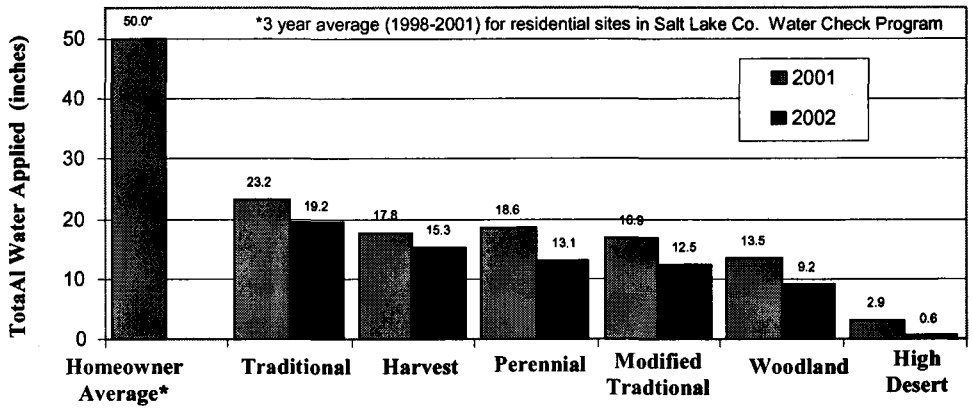
The Water Conservation Demonstration Garden consists of three main sections: The Neighborhood Garden; The Garden Park; and The Commercial Landscape. A brief description of each garden area is provided below:

<u>The Neighborhood Garden:</u> Construction of this area of the Garden was completed during the fall of year 2000. It features six themed yards or landscapes, along a mock residential street. These landscapes demonstrate water efficient practices that can be used as attractive alternatives to a typical predominantly bluegrass landscape. Each yard has its own water meter to monitor the actual amount of water being applied. The water usage of each yard is posted for comparison purposes with average homeowner water use. The six themed yards include:

- Traditional Landscape;
- Modified Traditional Landscape;
- Woodland Landscape;
- High Mountain Desert Landscape;
- Harvest Landscape; and
- Perennial Landscape.

A graph showing the amount of water applied to each landscape as compared to average homeowner use is provided in Figure 7-2.

Figure 7-2
JVWCD Demonstration Garden - Total Water Applied to Each Landscape in 2001 and 2002

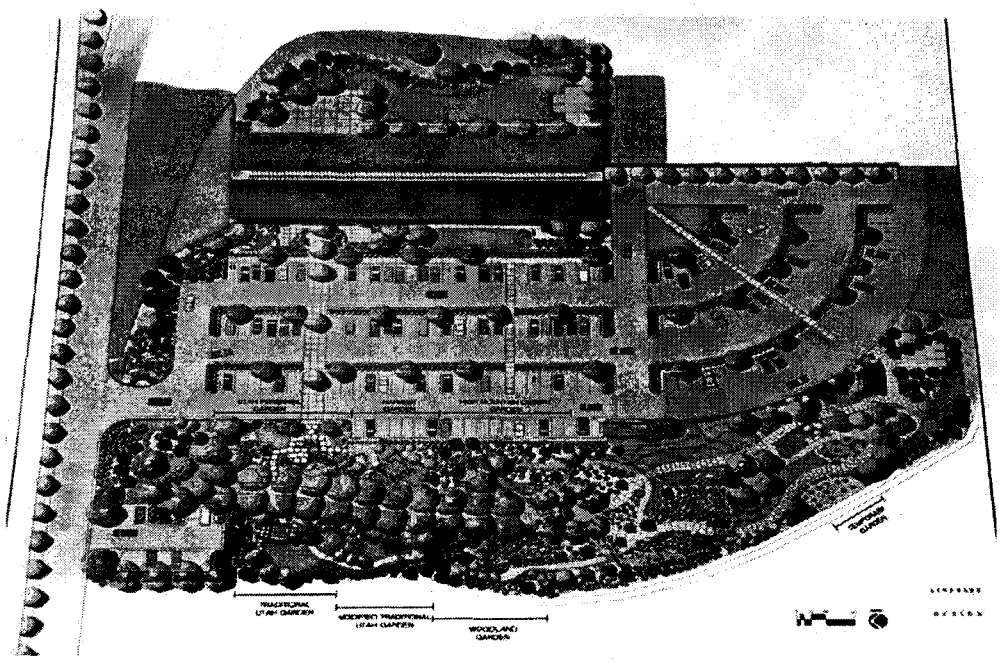


The Garden Park: Construction for this area of the Garden was completed in the fall of year 2001. The Garden Park is less formal, with wandering paths, a dry creek bed and bridges. Plants in the Garden Park range from Utah natives to vegetables, turf grasses and ornamental grasses. A range of alternative turf grasses are shown in plots, each with its own water meter. Water use data is shown for each turf plot for comparison purposes. This section of the Gardens also includes a weather station which measures evapotranspiration and precipitation, and controls the irrigation schedule for the Neighborhood Garden and Garden Park.

The Commercial Landscape: JVWCD re-landscaped the area immediately surrounding its administration buildings at its headquarters site in the summer of 2000. This was to provide an example of a waterwise commercial landscape. The turf area surrounding the building was reduced by 76% through the use of low water use plants, hardscapes and mulches. The design concepts utilized for the commercial landscape area are in accordance with the criteria identified in a model commercial landscape ordinance developed by JVWCD as further described herein.

A plan view drawing showing the Water Conservation Demonstration Garden is shown in Figure 7-3. The Garden is open and free to the public during spring, summer and fall months. The Garden is promoted through the "Slow the Flow, Save H_2O" public education and information campaign print materials and advertisements.

Figure 7-3



Thousands of people visit the Garden each year. Garden activities include Garden Fairs, dissemination of waterwise landscaping educational materials, volunteers, educational tours and free waterwise landscaping workshops.

Residential and Commercial Water Audits. Since adoption of the Water Conservation Master Plan in 1999, JVWCD and partnering agencies have pooled financial resources and contracted with Utah State University Extension to provide residential and commercial water audits (Water Checks) which are free to the public. Water audits target outdoor water usage and include an evaluation of the customer's soil type, plant root depth, sprinkler pressure, sprinkler distribution uniformity, and sprinkler precipitation rate. Following the audit, the customer is left with recommendations for sprinkler system repairs and adjustments to improve distribution uniformity and a customized irrigation schedule to improve watering efficiency. Water use records are obtained from each customer three years prior to and following the Water Check to measure the effectiveness of the water audit.

The Water Check program is now in its fifth year. More recently, there has been special emphasis placed on providing Water Checks for large water users including commercial, industrial and institutional water users.

The Water Audit Program has grown each year in terms of the number of Water Checks completed. Table 7-4 summarizes the total number of Water Checks performed within Salt Lake County during 1999 through 2002.

TABLE 7-4
Water Checks[1]

	1999	2000	2001	2002	Total
Residential	446	638	882	1,066	**3,032**
Commercial	n/a	n/a	20	50	**70**

[1] Totals include all Water Checks for Salt Lake County

Based on an evaluation of water use records of a randomly selected group of participants who received Water Checks in 1999, JVWCD and Utah State Extension Services have concluded that an average 15% reduction in water use has been achieved by participants receiving Water Checks. The Water Check data also shows that 66% of a resident's total water use is used outdoors and 34% is used indoors.

Model Commercial and Residential Landscape Ordinances. In 2000 JVWCD formed a working group which included representatives from the landscape and irrigation industry, Utah State University, and the Division of Water Resources to develop model commercial and residential landscape ordinances. With input from the working group, the model ordinances were developed over an 18-month period. The purpose of these ordinances is to provide models which JVWCD's member agencies, cities, counties and others can adopt to promote water-efficient landscaping of all new and rehabilitated commercial landscapes, and new residential landscapes.

The model commercial water-efficient landscape ordinance can be used for all new commercial and industrial developments. The main features of the ordinance include: the submission of a landscape plan documentation package by the developer, which is prepared by a landscape design professional, including a planting plan, irrigation plan, grading plan, soils report, a landscape water allowance worksheet and irrigation schedule; the landscape plan documentation package being approved prior to issuance and a building permit; the landscape irrigation systems being installed by a contractor certified by the Irrigation Association; a required water audit conducted by an independent Irrigation Association certified landscape irrigation auditor; and a requirement for the irrigation system to meet certain minimum efficiencies as certified by the irrigation auditor.

The model residential water-efficient landscape ordinance was designed for all new residences and is intended to heighten public awareness of water-efficient landscaping through the distribution of a landscape education packet for new homeowners. The residential packet includes information regarding waterwise landscaping, JVWCD Demonstration Garden activities and the Water Audit program.

JVWCD has been involved with its member agencies to form committees and working groups to assist with adoption of these landscape ordinances. To date, five of JVWCD's member agencies have adopted forms of the commercial landscape ordinance based on JVWCD's model. In terms

of water deliveries, the combined total of member agencies adopting the ordinance represents 54% of JVWCD's current yearly water delivery contract commitments.

Ultra Low Flush Toilet Pilot Replacement Program. In 2002 JVWCD implemented a pilot toilet replacement program within its retail service area. The program involved replacing 275 high flush toilets with flushing rates between 2.1 and 6.7 gallons per flush with new ultra low flush toilets (ULFTs) rated at 1.6 gallons per flush. The purpose of this program was to measure the water savings and calculate the cost effectiveness of replacing older high flush toilets with new ULFTs.

Three models of ULFTs were used for this program as follows: a Caroma Tasman 270, dual flush toilet with 0.8/1.6 gallons per flush (gpf); a Niagara Flapperless, with a tipping bucket flushing mechanism; and a Gerber Aqua Saver traditional style ULFT. Fifteen percent of the toilets installed were equipped with water measuring and flush counting equipment to determine water savings.

The water savings achieved from this program were found to be twofold. First, there were water savings associated with the reduced flush volume. Second, water savings were achieved through a reduction of toilets leaks associated with the older high flush toilets. Based on the preliminary evaluation of the data, Table 7-5 shows the water savings results:

TABLE 7-5

	Average Water Saved Per Day Per Toilet (gallons)	Average Water Saved Per Year Per Toilet (gallons)
Flush Volume	22.7	8,286
Savings due to leaks	19.2[1]	7,225
Total:	**42**	**15,511**

[1] The leak volume is calculated based on winter time water use records by the participants in the program. It should be noted that approximately 74% of the participants with water measuring and flush counter equipment had their new ULFT installed during winter months; therefore the full extent of toilet leaks cannot be calculated until water use records are obtained after the ULFT is in place for a full winter period. This data will be obtained in March 2004. The savings due to leaks will then be revised accordingly.

The total cost of the pilot toilet replacement program is summarized in Table 7-6 below.

TABLE 7-6	
Description	**Cost**
Toilet Installation	$25,127
Purchase of 275 ULFTs	25,046
Toilet Flush Measuring Equipment	3,130
Mailing Expenses	1,207
Legal Advertising	2,728
Less Participant Cost	(5,500)
JVWCD's Staff Time	3,262
Total Cost:	**$55,000**
	($200 per toilet)

Waterwise Classes and Workshops. In 2001, JVWCD hired a Conservation Horticulturalist as an addition to its Conservation Department staff. Among the duties included in this position are arranging for and teaching several waterwise landscaping classes throughout the spring and summer of each year. These classes are free to the public and include instruction on Utah native plants, designing efficient irrigation systems and waterwise landscapes, blue grass lawn care and alternatives and other topics emphasizing water conservation. Year 2003 marks the third year of these classes which are advertised through the "Slow the Flow, Save H_2O" campaign.

In addition, JVWCD staff and Utah State University Extension Services developed a new workshop series for large water users in 2001. This program was developed to educate large water users about landscape water conservation through proper landscape management, and targets decision makers and the maintenance staff of large water users throughout Davis, Weber, Salt Lake and Utah Counties. The workshop series began in 2002 and consists of a one-day instructional workshop including a morning classroom session followed by an afternoon field session. The curriculum includes irrigation system maintenance, irrigation scheduling, turf grass management, ornamental plant maintenance, irrigation auditing and field exercises. Attendees are given a work book, 24 catch cups and a soil probe.

The Large Water User Workshops are heavily subsidized by JVWCD, Weber Basin Water Conservancy District, State Division of Water Resources, Metropolitan Water District of Salt Lake & Sandy and Central Utah Water Conservancy District. The cost to each attendee is $10 which includes an approximate $90 subsidy. This program was largely successful in 2002 with 244 attendees spread over eleven workshops. Twelve workshops are scheduled for 2003, to be hosted by the five funding agencies.

Conservation Programs Cost And Cost Effectiveness. Table 7-7 shows the level of conservation funding in terms of cost per capita over the last three fiscal years.

TABLE 7-7			
Year	**Total Conservation Programs Cost**	**JVWCD Service Area Population**	**Cost Per Capita**
2000	$765,082	464,773	$1.65
2001	$938,548	471,967	$1.99
2002	$481,615	479,961	$1.00
2003*	$506,125		
* Total cost for 2003 is estimated.			

Conservation Cost Effectiveness. Table 7-8 below shows the amount expended for each of JVWCD's water conservation programs over the last three years.

TABLE 7-8				
Conservation Programs	**Program Cost**			
	2000	**2001**	**2002**	**2003***
Water Check / Hotline	$49,954	$93,225	$54,801	$54,615
Demonstration Garden	$465,661	$549,421	$91,061	$60,000
ULFT Program	$0	$0	$51,134	$55,000
Large Water User Workshops	$0	$0	$5,644	$5,645
State Media Campaign	$0	$34,333	$50,000	$50,000
JVWCD Media Campaign	$223,848	$250,693	$176,377	$213,623
Conservation Plan/Consulting	$19,003	$8,376	$48,892	$61,434
Education/Training/Member Dues	$6,616	$2,500	$3,706	$5,808
Total:	**$765,082**	**$938,548**	**$481,615**	**$506,125**
* Total cost for 2003 is estimated.				

The cost effectiveness of water conservation programs which primarily focus on public education and information is very difficult to calculate. However, it can be concluded that there has been tremendous water conservation savings over the past three years which is substantially due to the information being conveyed as part of the "Slow the Flow, Save H_2O" campaign. This is evidenced by the per capita water use reduction shown in Table 7-11. Table 7-9 below shows the calculated cost effectiveness, in terms of cost per acre-foot saved, for the Pilot Toilet Replacement Program and the Water Audit Program, since actual water savings have been

measured. The cost of these two programs can be compared with the estimated cost of future water development projects currently being considered and planned by JVWCD.

TABLE 7-9

Program/Project	Annual Cost ($/acre foot)
Pilot Toilet Replacement Program[1]	$313
Water Audit Program[2]	$252
Jordan River Shallow Groundwater RO Treatment	$180 - $400 (3)
Wastewater Recycling	$350 - $470
Bear River Development	$400 - $500 (3)
Utah Lake Agricultural Conversion – RO Treatment	$400 - $600 (3)

Notes:
1. Assumes 20 year life of toilet, savings of 42 gals/day/toilet, 4% interest
2. Assumes 15% reduction in outdoor water use for 5 years after Water Check, 4% interest
3. See Table 7-13.

CUPCA Section 207 Funding. In 1999, JVWCD submitted an application to Central Utah Water Conservancy District (CUWCD) for CUPCA Section 207 funding under its Conservation Credit Program. The application was approved for a 65% cost share of JVWCD's Water Conservation Demonstration Garden and other demand-side conservation programs. Table 7-10 shows the funding amounts which have been approved under CUPCA Section 207.

TABLE 7-10

Fiscal Year	*Funding Amount*
2000	$400,000
2001	$200,000
2002	$300,000
2003	$200,000
Total:	**$1,100,000**

In accordance with CUPCA Section 207 (b)(4) requirements, JVWCD will turn over 500 acre-feet of conserved water per year, for a five year period to CUWCD to enhance Provo River instream flows for environmental purposes.

Conservation Results. In order to achieve the water conservation goal of 25% water use reduction by 2025, a reduction in per capita use of 1% per year must be achieved. Table 7-11 shows that the actual per capita water use reduction has exceeded JVWCD's goal of 1% per year.

TABLE 7-11
JVWCD Service Area Population and Water Usage
(Updated May 23, 2003)

Year	[a]Population	Measured System Demand (AF)	Actual Usage Rate (gpcd)	[b]Water Usage Rate Goal (gpcd)
2000	464,773[c]	129,868	250	250
2001	471,967 [d]	128,617	243	248
2002	479,161	119,963	224	245
2005	517,584	[e]	N/A	238
2010	611,162	[e]	N/A	225
2020	752,604	[e]	N/A	200
2025	804,498	[e]	N/A	188
2030	856,392	[e]	N/A	188
2040	975,062	[e]	N/A	188
2050	1,119,779	[e]	N/A	188

(a) Population based on data furnished by the Governor's Office of Planning and Budget and Wasatch Front Regional Council.
(b) JVWCD's conservation goal is to reduce per capita water use 25% by year 2025, or 1% per year.
(c) Sandy City population (88,418) was part of JVWCD service area in 2000, but to provide a common reference for future water usage rates, Sandy City population and water uses is omitted from this data.
(d) Population estimated by interpolation.
(e) See Table 5-1 for future demand estimates with conservation.

Potential Future Programs

JVWCD is meeting the objectives set forth in the Water Conservation Master Plan adopted in 1999. JVWCD is recognized as a leader in conservation and has been influential statewide in its implementation of a comprehensive and complete water conservation plan.

In 2002, JVWCD adopted an aggressive water conservation goal of 25% water use reduction by the year 2025. Table 7-11 shows that significant water use reduction has occurred since year 2000. It is unknown whether this reduction in water use will be sustained due to a long term water conservation ethic or if there will be a rebound in water usage once the current drought cycle is over.

In spite of this, JVWCD is committed to continue its leadership role in the area of water conservation and implement those programs which are necessary to meet its conservation goal.

JVWCD recognizes that in order to achieve its conservation goal, its existing conservation programs will need to continue to be assessed, improved and refined. JVWCD will look to develop additional programs which will be effective in encouraging the structural changes needed within its service area to provide for long term water conservation.

Public Information/Education Program. Public education/information will continue to be the essence of JVWCD's water conservation programs. As an added feature in 2003, JVWCD will implement a waterwise reality home program which will serve as an education tool for the public to learn ways to save water on their landscapes. This program will be named "Water Quest, Saving Water by the Yard" and will include the selection of a family/homeowner from JVWCD's retail service area and replacing the homeowner's existing traditional blue grass landscape with a water efficient landscape.

The replacement work will include the removal of the homeowner's existing turf, plants and irrigation system and the installation of drought tolerant plants and turf, hardscaping features, mulches and an efficient irrigation system. The family will participate in the re-landscaping work and the media will track the progress of the landscape conversion process throughout the summer of 2003. In addition, the family's water use will be monitored and compared to past years water use to show the public the water savings that can be achieved through the structural changes made to the landscape.

Water Audit Program. Additional emphasis will be placed on performing water audits for large water users. This is because of the tremendous waste occurring due to inefficient irrigation schedules and systems belonging to commercial, institutional and industrial water users.

In addition, Water Savings Kits will be offered free of charge to homeowners who request Water Checks in 2003. The Water Savings Kits include a low flow shower head, two low flow faucet aerators, a displacement bag for the homeowner's toilet tank and toilet leak detection dye tablets.

Expanded Toilet Replacement Program. In the coming years, JVWCD has plans to enlarge its toilet replacement program by building on what was learned from the pilot toilet replacement program and other toilet replacement programs across the west. In fiscal year 2003/2004 (Year 1), JVWCD plans to replace at least 1,000 high flush toilets with a low flush flapperless toilet, which was determined to be the most effective in the pilot program. It is anticipated that JVWCD will offer these toilets at no charge to qualifying homeowners in its retail area and assist its member agencies in providing these toilets to homeowners within their respective service areas.

The proposed plan for Year 1 is as follows:

1. The program will be advertised through the use of billing stuffers.
2. Interested participants will mail or e-mail pertinent information back to the District and the District will confirm the information and determine if the participant qualifies.

3. If the participant qualifies, a voucher will be mailed to the participant which can be redeemable at JVWCD's offices for the flapperless ULFT.
4. The qualifying participant will be responsible to install the new toilet and dispose of the old toilet.
5. JVWCD will prepare and update a toilet replacement data base which will be used to confirm the participant's information and follow up on successful installation.

JVWCD also proposes to assist its member agencies in implementation of a similar program in Year 1. In future years, JVWCD's Board of Trustees is interested in further enlargement of a toilet replacement program by expanding the program county-wide or along the Wasatch Front if other water districts are willing to participate and if partial funding can be obtained. A successful toilet replacement program is a good example of a structural means of achieving water conservation.

Water Conservation Pricing. In 2002, JVWCD retained a consultant to assist it with a comprehensive financial review and water rate study. With assistance from its consultant, JVWCD considered several alternative water rate structures for both retail and wholesale service areas which would encourage the efficient use of water.

On June 11, 2003, JVWCD's Board of Trustees adopted seasonal water conservation rate structures for both retail and wholesale water deliveries, to become effective on July 1, 2003. The new seasonal rates are divided into winter months (November 1 through April 30) and summer months (May 1 through October 31), and are designed to be revenue neutral with a 25% differential between the winter and summer rate. This seasonal rate structure was adopted to encourage long-term conservation and the efficient use of JVWCD's water supply in order to sustain the tremendous growth expected.

Water Conservation Demonstration Gardens Master Plan. JVWCD's existing Water Conservation Demonstration Gardens have become a tremendous community asset and educational tool to demonstrate water conservation principles to the public. JVWCD owns additional property at its headquarters site which would provide for expansion of its existing Demonstration Gardens.

In May, 2003, JVWCD's Board of Trustees approved the selection of a consultant to assist JVWCD in the preparation of a Water Conservation Demonstration Gardens Expansion Master Plan. As part of the Master Plan, consideration will be given to additional educational features and displays which could be implemented in expanded garden areas which would further assist the District in showing the public how it can reduce per capita water use. A total of 17 acres of undeveloped property will be considered as part of the Master Plan. The work will include development of conceptual plan view drawings for the site, including plans for pathway expansion, additional parking, plant groupings, potential building space allotments and an additional innovative and interpretive design features for public education purposes. The work will also include construction phasing, construction schedules and cost estimates.

Additional Water Conservation Programs Master Planning Work. JVWCD will update its Master Plan work for future conservation programs and activities as needed. JVWCD will continue to monitor water use (on a per capita basis) and implement programs which are necessary to meet its water conservation goal.

JVWCD will continue to be involved with its member agencies and enlist their participation in meeting its conservation goal. Furthermore, JVWCD will look for opportunities to encourage its member agencies to implement water conservation measures within their own retail service areas. The following activities will be considered by JVWCD for its member agencies:

1. Provide funding assistance or a mechanism to provide funding assistance for implementation of water conservation programs among member agencies.

2. Require that member agencies prepare, submit and continue to update water conservation plans to meet the per capita water use reduction goal of the District.

3. Establish working groups with each member agency to assist in the implementation of effective and meaningful water conservation activities and programs.

TOTAL M&I DEMANDS WITH CONSERVATION

Table 7-12 shows the total estimated demands within the JVWCD service area. Demands are shown with and without conservation to illustrate the significant amounts of water which JVWCD expects to save through conservation. In 2002, JVWCD member agencies supplied 49,817 AF from their own sources and in the future are expected to ultimately be capable of supplying approximately 55,000 AF of the total demand within the JVWCD service area from their own sources.

TABLE 7-12
JVWCD Service Area Total M&I Demand Projections

Year	JVWCD Service Area Population	No conservation from 2000 usage rates		25% conservation by 2025 usage rates		Amount conserved (AF)
		Usage Rates (gpcd)	Total M&I Deliveries (AF)	Usage Rates (gpcd)	Total M&I Deliveries (AF)	
2000 [a)]	464,763	250	129,868	250	129,868	0
2005	517,584	250	144,942	235	136,246	8,697
2010	611,162	250	171,147	225	154,033	17,115
2020	752,604	250	210,756	200	168,605	42,151
2025 [b)]	804,498	250	225,288	188	169,417	55,872
2030	856,392	250	239,821	188	180,345	59,475
2040	975,062	250	273,052	188	205,335	67,717
2050	1,119,779	250	313,578	188	235,811	77,767

Notes:
a) Although JVWCD served water to Sandy City in 2000, a series of contracts executed in 1990 provided for Sandy City to de-annex from JVWCD with virtually all water deliveries to cease on December 31, 2001. Therefore, the population and water use data for Sandy City is omitted to provide a common comparison point for future population and water usage rates.
b) Estimated by interpolation between 2020 and 2030 estimates.

CAPABILITY OF EXISTING SUPPLIES TO MEET DEMANDS

Existing Supplies of JVWCD and Member Agencies

The JVWCD and its member agencies have a current water supply of approximately 133,436 acre-feet per year. This amount includes 13,636 acre feet of temporary, surplus water supply from the Metropolitan Water District of Salt Lake & Sandy (MWDSLS) which cannot be considered as a permanent supply. This surplus water supply was available to JVWCD by contract through December 31, 2001.

It is estimated that the JVWCD service area will have approximately 148,530 acre-feet per year as a water supply available by the year 2050. This will result from the termination of the temporary surplus water supply from MWDSLS, development of additional groundwater by JVWCD, and a second Central Utah Project increment of water supply being made available to reach a total petition amount of 50,000 acre-feet per year. The year 2050 water supply will come essentially from five sources:

- Groundwater developed by member agencies;
- Groundwater developed by JVWCD;

- Surface runoff from various Wasatch Front creeks in Salt Lake County;
- Water from the Weber and Provo Rivers available through an irrigation exchange known as the Welby Jacob Exchange; and
- Federally developed water from the M&I system of the Bonneville unit (Jordanelle Reservoir) of the Central Utah project.

A summary of water supplies from existing sources is presented in Table 7-13.

TABLE 7-13
Summary of Existing Water Supplies Available to the JVWCD
Drought Year Yield (acre-feet)

	Year 2000 with Temporary Surplus Water	Year 2050 w/o Temporary Surplus Water
Temporary Surplus Water [a)]		
From MWDSLS	13,636	0
Water Supply of Member Agencies		
Presently Developed (mostly groundwater)	55,000	55,000
Additional rights (groundwater)		0
Groundwater Wells	20,000	25,000
Springs	0	360
Surface Water		
High Quality (mountain front streams)	2,670	2,670
High Quality (Weber/Provo Rivers, Welby Jacob Exchange)	15,500	15,500
Central Utah Project		
1st increment	26,630	26,630
2nd increment		23,370
Total	**133,436**	**148,530**

a) The temporary surplus water terminated on December 31, 2001.

Projected M&I Shortages of JVWCD Under Existing Supplies

The future M&I use in the JVWCD service area was estimated using the population projections in Table 7-2 and the per capita use rates in Table 7-11. Table 7-14 presents the resulting M&I water demand in comparison with the existing supply. The estimates indicate that between 2000 and 2010 the JVWCD water supply will change from a surplus condition to a deficit condition as water demands increase and as temporary surplus water supply availability expires. The expiration of the temporary surplus water supply will be offset and superseded by increased well production and additional CUP water from the Bonneville Unit M&I System. However, in spite of these compensating supplies, the projected demand in excess of existing water supplies could

reach 90,000 acre-feet by the year 2050. Figure 7-4 displays the existing water supplies available to JVWCD and the projected water demands through 2050.

Table 7-14
Projected M&I Shortages Under Existing Water Supply Available to the JVWCD
(acre-feet)

Case	2000	2010	2020	2030	2040	2050
Total M&I Demand	129,868	154,033	168,605	180,345	205,335	235,811
Existing Supply [a)]	133,436	148,530	148,530	148,530	148,530	148,530
Surplus	**3,568**					
Deficit		**5,503**	**20,075**	**31,815**	**56,805**	**87,281**

a) In year 2010 the supply will be reduced by the loss of 13,636 acre-feet of temporary surplus water that was available in Year 2000 from MWDSLS. This reduction will be partially offset by increases in groundwater development and pumping by JVWCD, and by availability of additional CUP Bonneville Unit M&I System water under a JVWCD petition totaling 50,000 acre-feet.

Opportunities to fill this deficit include, in addition to the ULS water supply, the treatment of contaminated groundwater in the southwestern portion of Salt Lake County, membrane treatment of saline groundwater along the Jordan River, water recycling from wastewater treatment plants, and reverse osmosis treatment of Utah Lake water.

OTHER POTENTIAL LOCAL WATER SUPPLIES TO MEET M&I NEEDS

An array of potential water sources has been identified for development to meet the shortfalls indicated in Table 7-14 and in Figure 7-4. These potential sources are as follows:

- Southwest Salt Lake County contaminated groundwater treatment project
- Membrane treatment of Jordan Valley groundwater
- Agricultural conversion of Utah Lake water through reverse osmosis treatment
- Wastewater recycling
- Importation of Bear River water
- Delivery of water from the Utah Lake Drainage Basin Water Delivery System (ULS)

These water sources are described in the following paragraphs. Except for the delivery of Bonneville Unit water through the ULS, the potential sources contain water of low quality that will require expensive treatment before use as a culinary water supply.

The primary entity pursing these water supplies is JVWCD, which as presented in Table 7-14 will have an estimated shortage of 87,281 acre-feet by the year 2050.

Southwest Groundwater Treatment Project (Low Quality Source)

Historic mining practices in southwestern Salt Lake County have created a deep groundwater contaminant plume covering approximately 50 square miles. Contamination includes acidic waters, elevated metals concentrations, and elevated sulfate concentrations. The proposed project combines a CERCLA clean-up response action with a CERCLA natural resource damage settlement to accomplish the following purposes:

- Remediate the aquifer;
- Contain and contract the contaminant plume; and
- Produce a public water supply of approximately 7,000 acre-feet for drinking water

The project will produce potable water by pumping contaminated water from well fields and treating it with a reverse osmosis processes. The potable water will be delivered by the JVWCD through its existing water distribution system to the four communities affected by the contaminant plume, namely West Jordan City, South Jordan City, Riverton City, and Herriman City.

The project depends upon agreements being reached with Kennecott Utah Copper Corporation and with the Utah State Trustee holding the Natural Resource Damage Claim trust fund. The project also relies upon a concentrate discharge permit for the reverse osmosis treatment process. These agreements and discharge permits are currently being negotiated by JVWCD. Although it is anticipated that they will be executed during 2003, substantial difficulties still exist in reaching final agreements and a final permit.

JVWCD Membrane Treatment of Groundwater Using Its Existing Utah Lake/Jordan River Water Rights (Low Quality Source)

The Jordan Valley Water Conservancy District has a goal for purchasing between 50,000 and 70,000 acre-feet of water rights from Utah Lake and the Jordan River. At the present time, JVWCD has purchased 16,735 acre-feet of rights. In addition, JVWCD has negotiated the purchase of 6,000 – 7,000 acre-feet of Jordan River rights, subject to approval of change applications by the State Engineer. The change application has been submitted, and it is anticipated that this acquisition may be completed by JVWCD during 2004. However, substantial difficulties in overcoming protests of other potentially affected parties may exist.

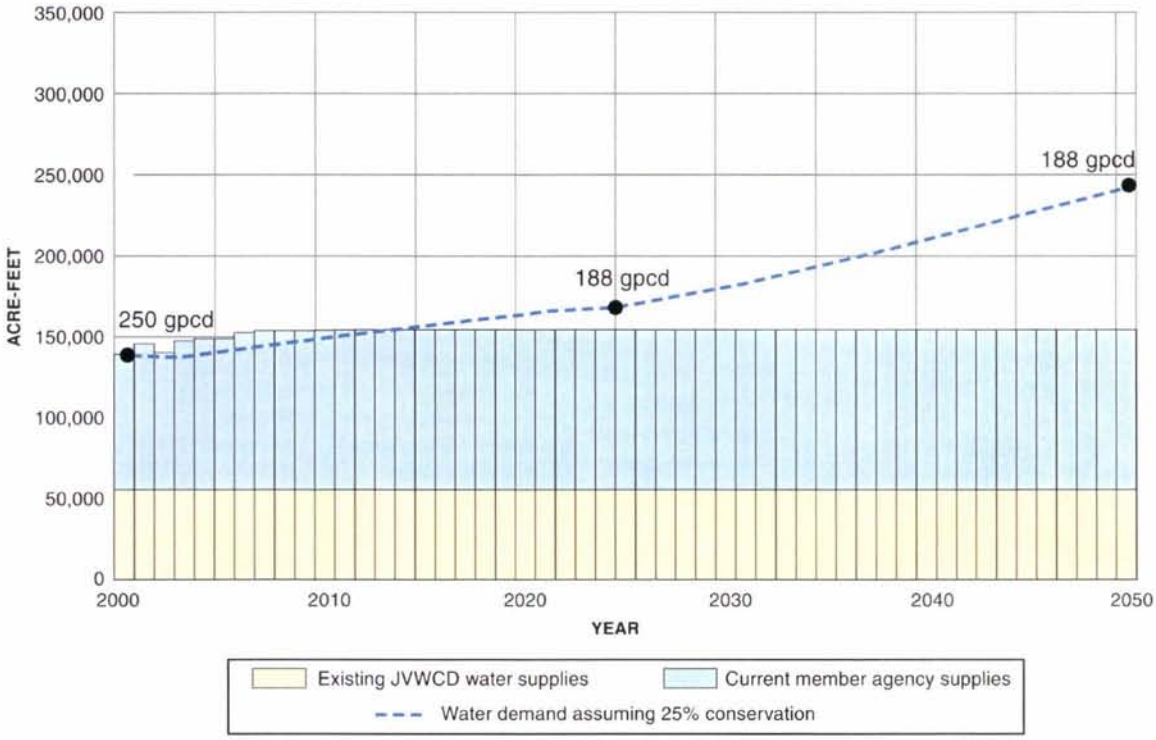


Figure 7-4
Jordan Valley Water Conservancy District
Water Supply and Demand Scenario for Drought Years

The JVWCD has completed studies to determine the most economical means of utilizing the water available under these existing rights. The most economical strategy is to use the shallow aquifer along the Jordan River as "pretreatment" of the Utah Lake/Jordan River waters to remove suspended matter and particles by means of riverbank filtration. Through a series of shallow riverbank filtration wells the water would then be extracted and treated for culinary use through a demineralization membrane treatment process. This process has been identified as reverse osmosis.

Of the 16,735 acre-feet of current rights, the JVWCD anticipates 2,000-3,000 acre feet will be required to replace Utah County return flows associated with its Welby Jacob Exchange. In addition to this, because of losses associated with the membrane treatment process (e.g. lost through brine disposal), JVWCD anticipates its total usable water supply resulting from the existing Utah Lake rights may be as low as 9,000 acre-feet annually.

JVWCD is pursuing plans to treat between 1,235 acre-feet and 2,300 acre-feet per year as an additional component of the Southwest Groundwater Treatment Project. This will involve extraction of shallow groundwater near the Jordan River by means of 4 – 6 riverbank filtration wells, and demineralization of that water through reverse osmosis treatment. As with the

Southwest Groundwater Treatment Project, challenges with the discharge of concentrate from this process will be encountered.

Water Supply and Reverse Osmosis Treatment of Water from Future Conversion of Irrigated Lands to Urban Use (Low Quality Source)

Development of this water source involves the conversion of Utah Lake/Jordan River water currently used for irrigation as community development occurs on irrigated acreage.

Rate of Urbanization of Agricultural Lands in Salt Lake County. The Draft Plan Formulation Report, Utah Lake Drainage Basin Water Delivery System, Central Utah Water Conservancy District, February 2002 excluded the conversion of Utah Lake water as a potential water supply for Salt Lake County in considering the need for ULS water. The rationale was that water from the lake is unsuitable for municipal use due to its dissolved solids content, and has taste and odor problems even with advanced water treatment procedures. Outdoor watering with Utah Lake water also is not desirable because the lake has a high calcium carbonate content that leaves a white film on shrubs and lawns. However, it was anticipated the JVWCD may eventually turn to this supply if other fresh water sources such as ULS water or other sources could not be secured or developed in a timely manner.

The present amount of irrigated land in Salt Lake County is approximately 14,021 acres, as listed on Table 7-15. Essentially all of the existing irrigated acreage in Salt Lake County lies within the boundaries of the Jordan Valley Water Conservancy District. Thus, it was assumed that the water made available by the retirement of the existing irrigated land would become largely available to the JVWCD. To estimate the rate at which irrigation water may become available for conversion to M&I use, an analysis was made of the rate of population growth and community development, and their influence on irrigated acreage reduction. Based on the proportions of irrigated land and non-irrigated land available for development, it was assumed that over the next five decades approximately 30 percent of the new growth would occur on presently irrigated land. The result was a gradual increase in availability of the amount of water presented on Table 7-15. The calculations are indicated on Table 7-16.

TABLE 7-15
Existing Irrigated Acreage in Salt Lake County
Associated with Water Rights From Utah Lake and the Jordan River
(Source: Utah Division of Water Rights, November 2002)

Canal Company	Primary or Secondary Right	Acres Irrigated	Acre-feet of Water
Utah and Salt Lake	Primary	5,517	27,676
South Jordan	Primary	2,870	14,306
East Jordan	Primary	2,564	13,962
North Jordan	Primary	1,070	5,350
Draper Irrigation & Sandy Canal Co.	Secondary	2,000	9,950
Total		**14,021**	**71,244**

TABLE 7-16
Projected Rate of Irrigation Water Conversion through Urbanization of Irrigated Lands in Salt Lake County

	2000	*2010*	*2020*	*2030*	*2040*	*2050*
Population						
JVWCD Population	464,763	611,162	752,604	856,392	975,062	1,119,779
Incremental Change		146,399	141,442	103,788	118,670	144,717
Population Density (assumed people/acre)		5	7	8	9	10
Total Acreage Urbanized						
Incremental acres		2,814	16,903	10,374	13,515	13,505
Cumulative acres		2,814	19,717	30,091	43,606	57,111
Assumed Distribution between Irrigated and Non-irrigated Acreage						
Non-irrigated (70%).		1,970	13,802	21,064	30,524	42,423
Irrigated (30%)		844	5,915	9,027	13,082	14,021 [a]
Water Supply (AF)						
Average (AF) [b]		4,220	29,575	45,135	65,410	70,105
Firm yield (AF) [c]		3,376	23,660	36,108	52,328	56,084

Notes:
a. From Table 7-1 the remaining agricultural land is approximately 14,021 acres, which happens to be less than 30 percent for the last decade prior to 2050.
b. From Table 7-1, the diversion requirement for the irrigated land is 5.0 acre-feet per acre as designated by the State Engineer in approval of water rights during the late 1800's. The average water supply is obtained by multiplying the irrigated acreage converted to urban use by 5.0 acre-feet per acre. For example, 844 acres times 5.0 acre-feet per acre = 4,220 AF (in Year 2010).
c. Firm yield is estimated to be 80% of the average yield. The firm yield is based upon drought cycles during which Utah Lake levels drop too low to pump full allotments.

Table 7-16 shows that a total of 70,105 acre-feet, based upon average yields, will become available for acquisition by the year 2050. Of this amount, it is assumed that 75% can be acquired by JVWCD, or 52,580 acre-feet. The remaining 25%, from experience by JVWCD, will be transferred to Utah County for conversion to groundwater sources, or will be retained by family trusts, estates, and small farm areas. In the case of a reduced firm yield of 56,084 acre-feet by 2050, the 75% acquisition by JVWCD would be 42,063 acre-feet.

Projected Volume of Yield Using Reverse Osmosis Treatment. Water demand projections and shortages that will result after all existing supplies have been developed will require the treatment of Utah Lake waters. This water will become available as the irrigated lands are converted as discussed above, and as the JVWCD makes use of additional Utah Lake water under other rights presently held or acquired in the future.

Feasibility studies by JVWCD have concluded that water from Utah Lake is expensive to treat For M&I use. Because of the high cost, it is likely that reverse osmosis (RO) treatment plants would be constructed in stages. A significant amount of waste byproduct results from RO treatment and its disposal would be an additional and substantial cost item. JVWCD projects a recovery rate of 75% for producing culinary grade water from the raw feed water delivered to reverse osmosis plants. This is based upon pilot reverse osmosis testing that JVWCD has performed.

The potential amount of water that could become available for RO treatment is estimated to be approximately 66,396 acre-feet. Note that 4,816 acre-feet of this feed water would be deep, brackish groundwater, to which JVWCD has water rights, to supplement irrigation stock from Utah Lake and the Jordan River. Of this feed water amount, it is anticipated that only about 50,000 acre-feet would be realized as product water. These amounts are presented in Table 7-17.

TABLE 7-17
Projected Yield of Converted Agricultural Water Using Reverse Osmosis Treatment (acre-feet)

Raw (Feed) Water Supply	Facility	Volume of Feed Water Treated	Culinary Grade Water Produced [1]	Byproduct Disposal [2]
Current JVWCD stock	Reverse Osmosis Plants	9,000	6,750	2,250
Future Conversion to JVWCD	Reverse Osmosis Plants	52,580	39,638	13,212
JVWCD Deep Brackish Groundwater	Reverse Osmosis Plants	4,816	3,612	1,204
	Totals	**66,396**	**50,000**	**16,666**

[1]A 75% recovery rate is assumed.
[2]25% of feed water will be discharged as a byproduct (concentrate) flow.

Wastewater Recycling (Low Quality Source)

This water source involves the recycling and reuse of return flows from M&I water use that is conveyed to municipal wastewater treatment plants in Salt Lake County. The treated wastewater would be piped from the treatment plants to secondary water systems in various parts of Salt Lake County. Calculations of volumes of CUP Bonneville Unit water return flows to the significant wastewater treatment plants in Salt Lake County have been made. The three major wastewater plants in Salt Lake County are:

- Central Valley Water Reclamation Facility (CVWRF)
- South Valley Water Reclamation Facility (SVWRF)
- Salt Lake City Reclamation Facility (SLCRF)

The two most likely candidates for water recycling in the JVWCD service area are member agencies and service areas in the CVWRF and in SVWRF. The estimated CUP Bonneville Unit return flows as sewage effluent to these facilities are estimated as shown in Table 7-18. Both current and future deliveries of Bonneville Unit M&I system from Jordanelle Reservoir are shown in Table 7-18.

TABLE 7-18
Central Utah Project Bonneville Unit
Estimated Return Flows as Sewage Effluent

CUP Water (AF/yr)			Sewage Effluent (AF/yr)		
CUP Component	**Treated Potable Water**	**Sewage Effluent**	**To CVWRF**	**To SVWRF**	**To SLCRF**
Bonneville Unit M&I System - JVWCD Petition	50,000	7,500[a]	4,000	3,500	0
Bonneville Unit M&I System - MWDSLS Petition	20,000	3,000[a]	1,000	500	1,500
ULS – JVWCD Allocation	21,429 (5/7 of 30,000)	7,500[b]	3,500	4,000	0
ULS – MWDSLS Allocation	8,571 (2/7 of 30,000)	3,000[b]	750	750	1,500
Totals	**100,000**	**21,000**	**9,250**	**8,750**	**3,000**

Notes:
[a]15% of treated potable water is assumed.
[b]35% of treated potable water is assumed.

The most practical use of recycled water from these wastewater treatment plants would be for outdoor watering, primarily on golf courses and other large, landscaped, urban areas. The following sections describe plans of JVWCD and its member agencies.

Central Valley Water Reclamation Facility Planning. The CVWRF is a regional wastewater treatment facility located at 800 West 3190 South. It services seven local entities, involving three cities and four special improvement districts. Some of the CVWRF member agencies are also JVWCD member agencies, as shown in Table 7-19.

TABLE 7-19
CVWRF and JVWCD Member Agencies

CVWRF Member Agency	JVWCD Member Agency
Cottonwood Improvement District	Partial, in JVWCD water retail delivery system
Granger-Hunter Improvement District (GHID)	Yes
Kearns Improvement District (KID)	Yes
Murray City	Partial, in JVWCD water retail system in newly annexed perimeter of Murray City
Salt Lake City Suburban Sanitary District #1	Partial, in JVWCD water retail service area
City of South Salt Lake	Yes
Taylorsville-Bennion Improvement Dist (TBID)	Yes

CVWRF recently completed a "Water Reuse Market Feasibility Study." This study considered a tertiary treatment level (filtration) and delivery of recycled sewage effluent to large landscaped parcels, such as golf courses and parks, within the CVWRF member agencies service areas. A transmission system was developed consisting of four main trunk lines. Phase 1 transmission lines include a West Line that would serve parcels in the West Valley City area and a South Line that would serve parcels along the Jordan River in Murray City. The Phase 2 transmission lines include a Southwest Line through the Taylorsville-Bennion Improvement District to the east boundary of the Kearns Improvement District, and a Southeast Line that would serve other east side parcels within Murray City, Cottonwood Improvement District and Salt Lake Suburban Sanitary District #1. The CVWRF on-site facilities would include a new recycled water facility that would provide effluent filtration treatment to a level that would meet the State of Utah Type I reuse classification.

CVWRF concluded in its study that an ultimate quantity of 2,779 acres could be irrigated with a recycling project suitable for large landscaped areas. An annual recycling of 8,799 acre-feet, at a seasonal peak day demand of 31.9 million gallons per day (mgd), would be feasible. The details of the CVWRF study are shown in Table 7-20.

TABLE 7-20
CVWRF Estimated Recycled Water Demand by Member Agency

Member Agency	Irrigated Area (Acres)	Seasonal Demand (AF)	Seasonal Peak Day Demand (mgd)
Cottonwood Improvement District	190	600	2.2
Granger-Hunter Improvement District (GHID)	944	2,990	10.8
Kearns Improvement District (KID)	316 553 Ultimate	1,000 1,750 Ultimate	3.6 6.3
Murray City	628	1,990	7.2
Salt Lake City Suburban Sanitary District #1	128	405	1.5
City of South Salt Lake	0	0	0
Taylorsville-Bennion Improvement District (TBID)	336	1,064	3.8
Total	2,542 2,779 Ultimate	8,049 8,799 Ultimate	29.1 31.9 Ultimate

Utah water law gives preference to retail water distribution agencies being able to own and recycle their sewage effluent. The statute allows for a retail water distribution agency which owns water rights to recycle a portion of that water, within its sewage effluent flow, to service the same lands within its service area and within its original water rights beneficial uses.

JVWCD has estimated the portion of the CVWRF recycling project that could provide recycled water to its member agencies and service area. This amount is estimated to be 6,026 acre-feet per year. It would involve the highest deliveries of recycled water to GHID, TBID, and KID. It would also involve deliveries to JVWCD retail areas within Cottonwood Improvement District, Murray City and Salt Lake City Suburban Sanitary District #1. JVWCD has initiated discussion with CVWRF to pursue a joint effort recycling project. This project could involve CUP Bonneville Unit return flows, as shown in Table 7-18.

South Valley Communities Recycling. The South Valley Water Reclamation Facility (SVWRF) serves eight cities in southern Salt Lake County, together with various unincorporated Salt Lake County areas. These communities have formed the Association of South Valley Communities ("South Valley Communities"). Most of the South Valley Communities are also member agencies of JVWCD. Table 7-21 lists these communities.

TABLE 7-21
South Valley Communities and JVWCD Member Agencies

South Valley Communities (Members of SVWRF)	JVWCD Member Agency
Bluffdale City	Yes
Draper City	Yes
Herriman City	Yes
Midvale City	Yes
Riverton City	Yes
Sandy City	Yes (limited to a contract of 315 AF per year)
South Jordan City	Yes
West Jordan City	Yes
Unincorporated Salt Lake County	Partial, in JVWCD retail service areas

The South Valley Communities have commissioned a "Preliminary Analysis of Water Reuse" during 2003. This analysis considered the potential for recycling sewage effluent from the South Valley Communities at SVWRF for irrigation of large urban landscaped parcels, such as golf courses and parks. An additional treatment facility at the SVWRF site would deliver treated wastewater appropriate for Utah type I reuse.

The preliminary analysis study identified the current sewage effluent flow rate of the South Valley Communities as 27 mgd. This is an annual average, which has very little seasonal variation. A reliable flow of 25 mgd was identified. The contribution of the cities is shown in Table 7-22.

TABLE 7-22 South Valley Communities Sewage Flows to SVWRF	
City	**Flow (mgd)**
Bluffdale City	0.6
Draper City	3.0
Herriman City	0.2
Midvale City	2.6
Riverton City	2.6
Sandy City	5.7
South Jordan City	3.1
West Jordan City	7.2
Total	25.0

In the preliminary analysis for a project, two project capacities were assumed. The first would have a peak delivery capacity of 10 mgd considered a 1st phase of the project. The second capacity would be 25 mgd. The assumed daily flow rate of recycled water potentially available to each city in SVWRF is shown in Table 7-23.

TABLE 7-23 Assumed Daily Sewage Effluent Recycled Flow Requirement for Each SVWRF City		
City	**Project Capacity**	
	10 mgd	**25 mgd**
	Flow Requirements (mgd)	
Bluffdale City	0.0	3.0
Draper City	0.0	2.0
Herriman City	0.0	0.2
Midvale City	0.0	2.0
Riverton City	3.0	3.8
Sandy City	1.5	2.0
South Jordan City	3.0	4.0
West Jordan City	2.5	8.0
Total	10.0	25.0

Two alternative transmission pipeline corridors were studied in this conceptual level preliminary analysis. The Jordan River Corridor Alternative involves a major transmission pipeline extending southward along the Jordan River. The 1300 West Corridor Alternative involves a major transmission pipeline extending southward along 1300 West Street. Each of these two corridor alternatives involved an analysis of a constant flow rate project and a seasonal variable

rate project. Annual delivery amounts and unit costs for the various project alternatives were calculated. Table 7-24 shows these various alternatives, together with construction costs, annual O&M costs, annual recycled water deliveries, and unit costs.

TABLE 7-24
South Valley Communities Recycled Water Project Deliveries and Costs

Project Capacity (Source /Delivery Scenario)	Treatment & Transmission Cost		Annual Recycled Deliveries (AF)	Unit Cost ($/AF)
	Construction	Annual O&M		
10 MGD (SVWRF/Constant Rate)	$17,570,000	$360,000	5,600	310
10 MGD (SVWRF/Variable Rate)	$17,570,000	$210,000	3,300	470
25 MGD (SVWRF/Constant Rate)	$37,440,000	$1,000,000	14,000	290
25 MGD (SVWRF/Variable Rate)	$37,440,000	$590,000	8,300	440

The ultimate 25 MGD project alternatives represent the annual recycled water volumes most likely in this project. They range from 8,300 acre-feet to 14,000 acre-feet per year.

JVWCD is participating in the technical and managerial committees which are considering wastewater recycling. The majority of sewage effluent of the South Valley communities involves effluent from JVWCD member agencies and retail service areas. JVWCD estimates that at least 8,300 acre-feet of recycled water will result from its member agencies and service areas.

Magna Wastewater Plant. JVWCD serves Magna Water Company, a water improvement district. In 2002 JVWCD delivered 818 acre-feet. It is projected that JVWCD will commonly deliver at least 1000 acre-feet per year to Magna within the next five years.

Magna Improvement District operates its own sewage treatment plant. JVWCD estimates that at least 350 acre-feet per year of water provided by JVWCD results as sewage effluent at Magna's plant. JVWCD has not held discussions with Magna regarding a potential water recycling project. However, JVWCD anticipates the potential of participating in a water recycling project with Magna in a similar manner as with the CVWRF and SVWRF member agencies.

Projected Sewage Effluent Recycling. JVWCD plans on participating in wastewater recycling projects within its service area, as shown in Table 7-25.

TABLE 7-25
Projected Wastewater Recycling in JVWCD Service Area

Wastewater Facility	Annual Wastewater Recycling (AF)
CVWRF	7,250
SVWRF	7,400
Magna	350
Total	**15,000 AF**

These recycled water volumes fall within the wastewater amounts resulting from CUP Bonneville Unit waters received and delivered by JVWCD. The total recycled water amount in the JVWCD service area is based upon the JVWCD's prorate share of Bonneville Unit water and flow capacity from Jordanelle Reservoir. This is based upon 5/7 of 21,000 acre-feet, which results in 15,000 acre-feet of recycled return flows from Bonneville Unit waters.

Importation of Bear River Water (High Quality Source)

In 1991 the Utah State Legislature passed the Bear River Development Act. The Act directed the Utah Division of Water Resources to develop 220,000 acre-feet of the waters of the Bear River and its tributaries. Of the 220,000 acre-feet, 50,000 acre-feet was allocated for delivery to the Jordan Valley Water Conservancy District. The development of Bear River water for use by JVWCD would involve large capital expenditures for diversion and conveyance facilities. Development of this source of water would be postponed by delivery of ULS water to JVWCD. Development of this source would be deferred until at least after the year of 2030.

Water from the Utah Lake Drainage Water Delivery System (High Quality Source)

The estimated volume of water that may be available to Salt Lake County from the ULS project is approximately 30,000 acre-feet. The current split of M&I System water between the MWDSLS and the JVWCD is 2/7 to MWDSLS and 5/7 to JVWCD. It is anticipated that the ULS water would be allocated in this same ratio. This would result in the following annual deliveries:

- JVWCD (5/7) – 21,429 acre-feet
- MWDSLS (2/7) – 8,571 acre-feet

However, JVWCD could use more than 5/7 of the ULS yield, or all of it, if it were available.

The most likely means for delivering this water would be through conveyance facilities associated with the existing water supplies from the Provo River System; especially from the mouth of Provo Canyon. Assuming ULS deliveries to the Provo Reservoir Canal near the mouth of Provo Canyon, the water could be conveyed to Salt Lake County through the following existing facilities:

- Jordan Aqueduct System (270 cfs capacity)
- Provo Reservoir Canal (with an existing permitted capacity of 550 cfs that is currently operational and limited to 340 cfs by constrictions)

Summary of Potential New Water Sources

A summary of the potential water supplies is presented in Table 7-26.

TABLE 7-26
Summary of Potential New Water Sources For JVWCD

Water Source	Volume (acre-feet)	Potential M&I Developable Volume (acre-feet)	Type of Use and Required Treatment	Likelihood of Success
Southwest Groundwater Treatment	7,000	7,000	M&I Use (RO Plant)	Moderate to High
Jordan River Shallow GW (Existing JVWCD Utah Lake Rights) RO treatment	16,000	9,000	M&I Use (RO Plant)	Moderate
Utah Lake Agricultural Conversion - RO treatment	66,396	50,000	M&I Use (RO Plant)	Moderate to low
ULS	30,000	21,429	M&I Use	High
Wastewater Recycling of Central Utah Project supply [a]				
➢ SVWRF	7,400	7,400	Outdoor Use (Tertiary Filtration)	Moderate to High
➢ CVWRF	7,250	7,250	Outdoor Use (Tertiary Filtration)	Moderate to High
➢ Magna	350	350	Outdoor Use (Tertiary Filtration)	Moderate to High
Subtotal for Recycled CUP Supply	15,000	15,000		
Bear River Import Water	50,000	50,000	M&I Use (Standard and RO Treatment)	Moderate

Notes:
a. Based on 15% of Jordanelle and 35% of ULS Bonneville Unit waters.

The sequence of development of water supplies is dependent on several factors including cost, limitations on use of the water, institutional and permitting issues, and environmental and political issues.

Cost Considerations. Detailed cost estimates for developing potential sources of water are beyond the scope of this water needs analysis. However, JVWCD and other agencies have performed preliminary planning studies sufficient to identify approximate unit costs of providing water from the various potential water supplies. Some refinements in the cost ranges may be made during the ULS planning process, particularly by CVWRF and the South Valley Communities who are continuing to study the potential for water recycling.

Table 7-27 presents the approximate costs for the various sources of water discussed above, and lists those sources in increasing order of cost. It should be noted that the tabulated costs should not be used to determine the feasibility of the sources; inasmuch as physical facilities are not well defined, and the economics of water treatment processes change with time.

TABLE 7-27
Probable Cost Range for Developing New Water Sources for JVWCD

Water Source	Annual Water Volume [1] (AF)	Estimated Annual Cost [2] ($/AF)	Potential Use and Anticipated Limitations on Use
Existing JVWCD water supplies	148,500	$150 to $300	M&I
Southwest Groundwater Treatment	7,000	$180 to $220[3]	M&I
Jordan River Shallow Groundwater (Existing JVWCD Utah Lake Rights) -RO treatment	9,000	$180 to $400 [4]	M&I (Agreement for operation for 40 yrs)
ULS	21,429	$300 to $400	M&I
Wastewater Recycling of Central Utah Project supply	15,000	$350 to $470	Parks, golf courses & large urban irrigated areas
Utah Lake Agricultural Conversion - RO treatment	50,000	$400 to $700	M&I
Bear River Import Water	50,000	$400 to $500	M&I

Notes:
[1]Annual costs are based on information from JVWCD except for the ULS.
[2]Includes operation, maintenance, and amortized capital costs.
[3]Subsidized from State Natural Resource Damage Claim Trust Fund
[4]The first 2300 acre-feet of this supply is subsidized by the State NRD Trust Fund

Sequence of Development. The new sources of M&I water listed on Table 7-28 have been listed in order of increasing cost. In general, the lowest cost sources would be developed first while the more costly sources would be staged as later additions or new ventures. Other factors to be considered in developing a sequence of deliveries include:

- Institutional and permit limitations
- Environmental challenges

- Degree to which capital expenditures can be phased in on modular basis, verses expending a large amount of capital at one time
- Timing of availability of water supply or project

Figure 7-5 shows the water supply plan of JVWCD for a dry year planning scenario. For JVWCD's planning purposes a "dry year" scenario is one in which the water sources will yield a certain supply with 90% probability; or in other words, a one dry year out of 10 years scenario. Figure 7-5 shows existing JVWCD water supplies, and projected timing of future water supplies to meet demands. The demand projection line is based upon the conservation goal of JVWCD to reduce per capita use by 25% by the year 2025.

The availability of ULS water in Figure 7-5 is based on the water distribution of 30,000 acre-feet to Salt Lake County. It is envisioned that 5/7 of the 30,000 acre-feet, or 21,429 acre-feet, will be allocated to JVWCD; with the remaining 2/7 or 8,571 acre-feet allocated to MWDSLS.

Table 7-27 summarizes the sources of water available to JVWCD, and compares the total supply with the projected demand. This table relates to Figure 7-5, which graphically shows these results.

TABLE 7-28
Projected Development of Water Supplies for the Jordan Valley Water Cons. District (acre-feet)

	Demand and Supply by Time Period					
	2000	**2010**	**2020**	**2030**	**2040**	**2050**
M&I Demand	129,868	154,033	168,605	180,345	205,335	235,811
Water Supplies						
Existing Supplies						
Member Agency Wells and Supplies	55,000	55,000	55,000	55,000	55,000	55,000
MWDSLS (surplus)	13,636	0	0	0	0	0
Mountain Front Streams	2,670	2,670	2,670	2,670	2,670	2,670
Welby-Jacob Exchange	15,500	15,500	15,500	15,500	15,500	15,500
Groundwater Wells and Springs	20,360	25,360	25,360	25,360	25,360	25,360
CUP (Jordanelle)	26,000	50,000	50,000	50,000	50,000	50,000
Subtotal	133,436	148,530	148,530	148,530	148,530	148,530
Future Supplies						
Southwest Groundwater Treatment	0	7,000	7,000	7,000	7,000	7,000
Jordan River Shallow Groundwater RO Treatment	0	0	0	0	9,000	9,000
ULS	0	0	21,429	21,429	21,429	21,429
Wastewater Recycling	0	15,000	15,000	15,000	15,000	15,000
Bear River	0	0	0	0	50,000	50,000
Utah Lake – Agriculture Conversion	0	0	0	0	0	15,000
Subtotal	0	12,000	35,429	35,429	102,429	117,429
Total M&I Supply	133,436	160,530	183,959	183,959	250,959	265,959
Net Surplus (or Shortage)	+3,568	+6,497	+15,354	+3,614	+45,624	+30,148

Note:
Water for these RO Plants would come from Utah Lake water rights, including those that could become available as the remaining irrigated lands in Salt Lake County are urbanized. The amount of water from these rights is approximately 75,000 acre-feet, of which the yield through a RO Plant would be about 50,000 acre-feet of culinary water and about 25,000 acre-feet of brine water.

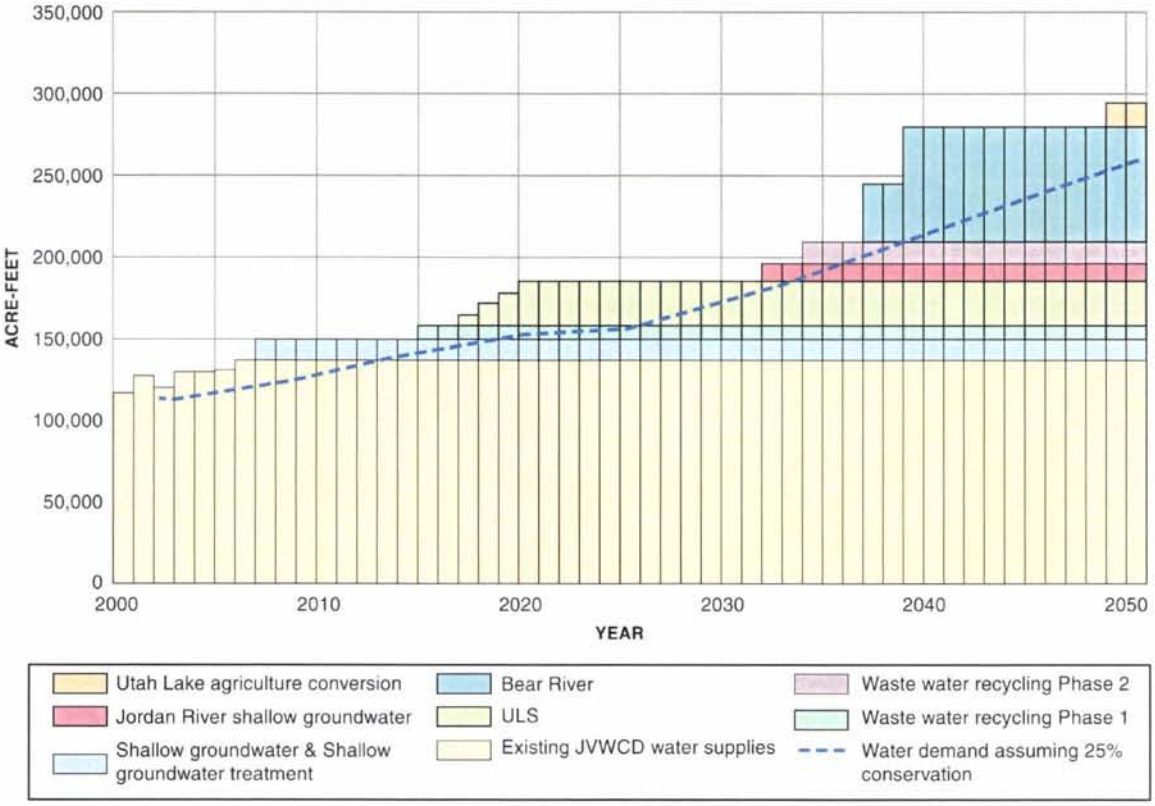


Figure 7-5
Jordan Valley Water Conservancy District Water Supply Plan
(Drought Year Scenario)

TIMING TO USE ULS WATER

As shown in Table 7-27 and Figure 7-5, JVWCD anticipates the need for ULS water between 2015 and 2020. JVWCD understands that this matches the availability of ULS water.

UNCERTAINTIES IN FUTURE WATER SUPPLIES DEVELOPMENT

The future water supply shown in Table 7-28 still have many challenges and uncertainties involved in their development. For example, sufficient technical institutional, and water right issues exist for each of those future water supplies to provide uncertainties as to whether they can be developed. Some of those issues are summarized in the following paragraphs.

Southwest Groundwater Treatment Project

As of the date of this report, this project still has not been approved by the State Natural Resource Damages Trustee. Substantial public opposition to the discharge of reverse osmosis concentrate to either the Jordan River or the Great Salt Lake has occurred. The Division of

Water Quality has not yet issued a UPDES permit for discharge of reverse osmosis concentrate to the Jordan River.

Jordan River Shallow Groundwater RO Treatment

The same challenges that have arisen in the Southwest Groundwater Treatment Project will be involved in development of this future water supply. The discharge of concentrate streams from reverse osmosis (RO) treatment will be a challenge as they involve either the Jordan River of the Great Salt Lake. Selenium concentrations have been shown to approach river water quality standards. The impacts of selenium in the Great Salt Lake south shore wetlands are not yet fully studied.

Wastewater Recycling

Water right notices and approvals will be required for recycling wastewater. The issues of ownership of the water and cost-sharing of the project cost are still unknown.

Bear River

Right-of-way acquisition for a conveyance system from western Weber County to northern Salt Lake County has been difficult. Rapid land development has precluded many portions of the corridor. Only 50% of the right-of-way has been acquired to date. Raw water storage issues on the Bear River system have been controversial, and are not yet answered. Water rights for the project have not yet been approved. State appropriations will rely upon the willingness of future legislatures.

Utah Lake Agriculture Conversion

Challenges similar to those involved in Jordan River shallow groundwater RO treatment will be involved in this project.

ATTACHMENT 7-A

Community: Bluffdale City

Population			Land Area	
2000 [a)]	2030 [b)]	1990 - 2000 AARC [a)]	(Sq. miles)	(Acres)
4,700	46,279	8.10%	16.4	10,500

Population Density (people/acre)	
Year 2000	Year 2030
0.4	4.4

Public Water Supplier: Bluffdale City Water

Bluffdale City Water	Source of Supply (acre-feet)	
	JVWCD	Self Supply
2000	1172	n/a
2002	1086	n/a

Primary Uses [c)]: Residential 82%, Commercial, Industrial, Institutional 18%

Bluffdale City is located in the southwest region of Salt Lake County. It is a residential community with most lot sizes large enough to accommodate horses and similar animals (1-acre typical). There is substantial vacant, undeveloped land within the City which is expected to substantially fill in during the next 30 years. A few small secondary irrigation water delivery systems are operated by homeowners associations, but no regional/city-wide secondary water system exists.

Notes:
a) Census 2000 data. AARC – Average Annual Rate of Change
b) Future population projections updated in 2003 by the Wasatch Front Regional Council in coordination with the Governor's Office of Planning and Budget.
c) Per the most recent data submitted by Public Water Suppliers to the Utah Division of Water Rights.

Community: Draper City

Population			Land Area	
2000 [a)]	2030 [b)]	1990 - 2000 AARC [a)]	(Sq. miles)	(Acres)
25,220	51,309	13.3%	30.3	19,400

Population Density (people/acre)	
Year 2000	Year 2030
1.3	2.6

Public Water Suppliers: Draper City Water, Draper Irrigation Co. (Water Pro)

Draper City Water	Source of Supply (acre-feet)	
	JVWCD	Self Supply
2000	2,104	---
2002	2,096	---

Primary Uses [c)]: Residential [d)]%, Commercial, Industrial, Institutional [d)]%

Draper Irrigation Co. (Water Pro)	Source of Supply (acre-feet)	
	JVWCD	Self Supply
2000	1,964	8,862
2002	2,185	6,691

Primary Uses [c)]: Residential 94%, Commercial, Industrial, Institutional 6%

Draper City is located in the southeast region of Salt Lake County. A portion of Draper City extends into Utah County. It is a residential community that has had a high rate of growth driven primarily by large planned residential developments. Two public water suppliers provide water service within Draper City. Draper Irrigation Co. (Waterpro) operates an extensive secondary irrigation system, which services residential and agricultural uses.

Notes:
a) Census 2000 data. AARC – Average Annual Rate of Change
b) Future population projections updated in 2003 by the Wasatch Front Regional Council in coordination with the Governor's Office of Planning and Budget.
c) Per the most recent data submitted by Public Water Suppliers to the Utah Division of Water Rights.
d) Data not available.

Community: Herriman City

Population			Land Area	
2000 [a)]	2030 [b)]	1990 - 2000 AARC [a)]	(Sq. miles)	(Acres)
1,523	37,415	n/a	9.1	5,800

Population Density (people/acre)	
Year 2000	Year 2030
0.3	6.5

Public Water Suppliers: Herriman City Water, Herriman Pipeline & Development Company

Herriman City Water	Source of Supply (acre-feet)	
	JVWCD	Self Supply
2000	[d)]	---
2002	1,000	---

Primary Uses [c)]: Residential [d)]%, Commercial, Industrial, Institutional [d)]%

Herriman Pipeline & Development Company	Source of Supply (acre-feet)	
	JVWCD	Self Supply
2000	---	[d)]
2002	---	460

Primary Uses [c)]: Residential 100%, Commercial, Industrial, Institutional 0%

Herriman City is located in the southwest region of Salt Lake County. Herriman City incorporated in 1999 and is a residential community that is growing rapidly. Large tracts of vacant lands lie to the west of Herriman City boundaries which have a strong potential to be annexed into Herriman City within the next 30 years. Growth is primarily driven by large planned subdivision developments with varied densities (3 – 5 units per acre). In February 2003, Herriman City established its own water service department and began providing retail water service that had previously been provided by JVWCD retail.

Notes:
a) Census 2000 data. AARC – Average Annual Rate of Change
b) Future population projections updated in 2003 by the Wasatch Front Regional Council in coordination with the Governor's Office of Planning and Budget.
c) Per the most recent data submitted by Public Water Suppliers to the Utah Division of Water Rights.
d) Data not available.

Community: Holladay City

Population			Land Area	
2000 [a)]	2030 [b)]	1990 - 2000 AARC [a)]	(Sq. miles)	(Acres)
14,561	35,696	0.3%	5.3	3,400

Population Density (people/acre)	
Year 2000	Year 2030
4.3	10.5

Public Water Suppliers: Holladay Culinary Water., JVWCD retail, SLCPUD

Holladay Culinary Water	Source of Supply (acre-feet)	
	JVWCD	Self Supply
2000	---	4,608
2002	---	4,341

Primary Uses [c)]: Residential 86%, Commercial, Industrial, Institutional 14%

JVWCD Retail	Source of Supply (acre-feet)	
	JVWCD	Self Supply
2000	[d)]	n/a
2002	[d)]	n/a

Primary Uses [c)]: Residential [d)]%, Commercial, Industrial, Institutional [d)]%

SLCPUD	Source of Supply (acre-feet)	
	JVWCD	Self Supply
2000	---	[d)]
2002	---	[d)]

Primary Uses [c)]: Residential [d)]%, Commercial, Industrial, Institutional [d)]%

Holladay City is located in the central eastern region of Salt Lake County. JVWCD supplies water services to approximately 1,000 residents. Holladay City has been substantially developed and there is limited vacant land for new growth.

Notes:

a) Census 2000 data. AARC – Average Annual Rate of Change
b) Future population projections updated in 2003 by the Wasatch Front Regional Council in coordination with the Governor's Office of Planning and Budget.
c) Per the most recent data submitted by Public Water Suppliers to the Utah Division of Water Rights.
d) Data is not available specific to use within Holladay City.

Community: Midvale City

Population			Land Area	
2000 [a)]	2030 [b)]	1990 - 2000 AARC [a)]	(Sq. miles)	(Acres)
27,029	32,270	n/a	5.8	3,700

Population Density (people/acre)	
Year 2000	Year 2030
7.3	8.7

Public Water Suppliers: Midvale City Water, Sandy City Public Utilities, JVWCD Retail

Midvale City Water	Source of Supply (acre-feet)	
	JVWCD	Self Supply
2000	150	3,285
2002	161	3,061

Primary Uses [c)]: Residential 61%, Commercial, Industrial, Institutional 39%

Sandy City Public Utilities	Source of Supply (acre-feet)	
	JVWCD	Self Supply
2000	[d)]	[d)]
2002	[d)]	[d)]

Primary Uses [c)]: Residential [d)]%, Commercial, Industrial, Institutional [d)]%

JVWCD Retail	Source of Supply (acre-feet)	
	JVWCD	Self Supply
2000	[d)]	[d)]
2002	[d)]	[d)]

Primary Uses [c)]: Residential [d)]%, Commercial, Industrial, Institutional [d)]%

Midvale City is located in the south central region of Salt Lake County. Approximately 45% of the total population is served by Midvale City Water, 15% by JVWCD retail, and the balance by Sandy City Public Utilities Department. Midvale City has been substantially developed and there is limited vacant land for new growth.

Notes:
a) Census 2000 data. AARC – Average Annual Rate of Change
b) Future population projections updated in 2003 by the Wasatch Front Regional Council in coordination with the Governor's Office of Planning and Budget.
c) Per the most recent data submitted by Public Water Suppliers to the Utah Division of Water Rights.
d) Data is not available specific to use within Midvale City.

Community: Riverton City

Population			Land Area	
2000 [a)]	2030 [b)]	1990 - 2000 AARC [a)]	(Sq. miles)	(Acres)
25,011	65,195	8.3%	12.6	8,100

Population Density (people/acre)	
Year 2000	Year 2030
3.1	8.0

Public Water Supplier: Riverton City Water

Riverton City Water	Source of Supply (acre-feet)	
	JVWCD	Self Supply
2000	1,278	6,028
2002	623	7,570

Primary Uses [c)]: Residential 81%, Commercial, Industrial, Institutional 19%

Riverton City is located in the southwest region of Salt Lake County. It is a rapidly growing residential community with substantial undeveloped lands providing the potential for continued growth. Riverton City Water operates a secondary irrigation system which currently serves, or in the next 2-3 years will serve, virtually all lands within the City.

Notes:
a) Census 2000 data. AARC – Average Annual Rate of Change
b) Future population projections updated in 2003 by the Wasatch Front Regional Council in coordination with the Governor's Office of Planning and Budget.
c) Per the most recent data submitted by Public Water Suppliers to the Utah Division of Water Rights.

Community: Sandy City

Population			Land Area	
2000 [a)]	2030 [b)]	1990 - 2000 AARC [a)]	(Sq. miles)	(Acres)
88,418	122,357	1.7%	22.3	14,300

Population Density (people/acre)	
Year 2000	Year 2030
6.2	8.6

Public Water Supplier: Sandy City Water

Sandy City Water.	Source of Supply (acre-feet)	
	JVWCD	Self Supply
2000	7,853	23,663
2002	355	27,769

Primary Uses [c)]: Residential 94%, Commercial, Industrial, Institutional 6%

Sandy City is located in the southeast region of Salt Lake County. Prior to 2002, Sandy City was a major wholesale customer of JVWCD. Beginning in 2002, Sandy City joined the Metropolitan Water District of Salt Lake and Sandy and now receives only a limited supply from JVWCD. The 2002 supply from JVWCD to Sandy City supports a population of approximately 1,000 people and will not increase in the future. The 2002 amount shown for self supply includes deliveries from MWDSLS.

Notes:
a) Census 2000 data. AARC – Average Annual Rate of Change
b) Future population projections updated in 2003 by the Wasatch Front Regional Council in coordination with the Governor's Office of Planning and Budget.
c) Per the most recent data submitted by Public Water Suppliers to the Utah Division of Water Rights.

Community: South Jordan City

Population			Land Area	
2000 [a)]	2030 [b)]	1990 - 2000 AARC [a)]	(Sq. miles)	(Acres)
29,437	93,474	9.2%	20.9	13,400

Population Density (people/acre)	
Year 2000	Year 2030
2.2	6.9

Public Water Supplier: South Jordan City Water

South Jordan City Water	Source of Supply (acre-feet)	
	JVWCD	Self Supply
2000	8,993	---
2002	8,675	---

Primary Uses [c)]: Residential 86%, Commercial, Industrial, Institutional 14%

South Jordan City is located in the southwest region of Salt Lake County. It is a residential community that has been growing rapidly and there exists substantial vacant lands providing the potential for continued growth.

Notes:
a) Census 2000 data. AARC – Average Annual Rate of Change
b) Future population projections updated in 2003 by the Wasatch Front Regional Council in coordination with the Governor's Office of Planning and Budget.
c) Per the most recent data submitted by Public Water Suppliers to the Utah Division of Water Rights.

Community: South Salt Lake City

Population			Land Area	
2000 [a)]	2030 [b)]	1990 - 2000 AARC [a)]	(Sq. miles)	(Acres)
22,038	26,829	n/a	6.9	4,400

Population Density (people/acre)	
Year 2000	Year 2030
5.0	6.1

Public Water Suppliers: South Salt Lake City Water, JVWCD Retail

South Salt Lake City Water.	Source of Supply (acre-feet)	
	JVWCD	Self Supply
2000	1,148	2,958
2002	853	2,885

Primary Uses [c)]: Residential 32%, Commercial, Industrial, Institutional 68%

JVWCD Retail	Source of Supply (acre-feet)	
	JVWCD	Self Supply
2000	[d)]	---
2002	[d)]	---

Primary Uses [c)]: Residential [d)]%, Commercial, Industrial, Institutional [d)]%

South Salt Lake City is located in the central region of Salt Lake County. There is substantial commercial and industrial development in the City. There is limited opportunity for growth within the City and the population is projected to grow very modestly.

Notes:
a) Census 2000 data. AARC – Average Annual Rate of Change
b) Future population projections updated in 2003 by the Wasatch Front Regional Council in coordination with the Governor's Office of Planning and Budget.
c) Per the most recent data submitted by Public Water Suppliers to the Utah Division of Water Rights.
d) Data is not available specific to use within South Salt Lake City.

Community: Taylorsville

Population			Land Area	
2000 [a)]	2030 [b)]	1990 - 2000 AARC [a)]	(Sq. miles)	(Acres)
57,439	74,996	n/a	10.7	6,900

Population Density (people/acre)	
Year 2000	Year 2030
8.3	10.9

Public Water Supplier: Taylorsville-Bennion Improvement District

Taylorsville-Bennion Improvement District	Source of Supply (acre-feet)	
	JVWCD	Self Supply
2000	5,586	10,859
2002	4,627	9,706

Primary Uses [c)]: Residential 80%, Commercial, Industrial, Institutional 20%

Taylorsville City is located in the west central region of Salt Lake County. Since its incorporation in 1996, the City has grown steadily and is projected to continue growing at a moderate rate. The service area boundaries of TBID substantially coincide with the City's boundaries, but there are some limited areas in the City served by Granger Hunter Improvement District.

Notes:
a) Census 2000 data. AARC – Average Annual Rate of Change
b) Future population projections updated in 2003 by the Wasatch Front Regional Council in coordination with the Governor's Office of Planning and Budget.
c) Per the most recent data submitted by Public Water Suppliers to the Utah Division of Water Rights.

Community: West Jordan City

Population			Land Area	
2000 [a)]	2030 [b)]	1990 - 2000 AARC [a)]	(Sq. miles)	(Acres)
68,336	152,393	4.8%	30.9	19,800

Population Density (people/acre)	
Year 2000	Year 2030
3.5	7.7

Public Water Supplier: West Jordan City Water

West Jordan City Water	Source of Supply (acre-feet)	
	JVWCD	Self Supply
2000	13,715	3,652
2002	12,782	3,922

Primary Uses [c)]: Residential 70%, Commercial, Industrial, Institutional 30%

West Jordan City is located in the southwest central region of Salt Lake County. The community has been growing rapidly and is projected to continue to do so. Substantial amounts of vacant lands lie within the City and immediately adjacent to and west of the City boundaries.

Notes:
a) Census 2000 data. AARC – Average Annual Rate of Change
b) Future population projections updated in 2003 by the Wasatch Front Regional Council in coordination with the Governor's Office of Planning and Budget.
c) Per the most recent data submitted by Public Water Suppliers to the Utah Division of Water Rights.

Community: West Valley City

Population			Land Area	
2000 [a)]	2030 [b)]	1990 - 2000 AARC [a)]	(Sq. miles)	(Acres)
108,896	140,904	2.3%	35.4	22,700

Population Density (people/acre)	
Year 2000	Year 2030
4.8	6.2

Public Water Supplier: Granger Hunter Improvement District

Granger Hunter Improvement District	Source of Supply (acre-feet)	
	JVWCD	Self Supply
2000	19,188	7,159
2002	16,898	7,875

Primary Uses [c)]: Residential 78%, Commercial, Industrial, Institutional 22%

West Valley City is located in the west central region of Salt Lake County. It has grown steadily over the last 10 years and is projected to continue to do so. The service area boundaries of GHID substantially coincide with the City's boundaries, but the GHID service area does extend into limited areas of adjacent communities.

Notes:
a) Census 2000 data. AARC – Average Annual Rate of Change
b) Future population projections updated in 2003 by the Wasatch Front Regional Council in coordination with the Governor's Office of Planning and Budget.
c) Per the most recent data submitted by Public Water Suppliers to the Utah Division of Water Rights.

Community: Unincorporated Salt Lake County

Population			Land Area	
2000 [a)]	2030 [b)]	1990 - 2000 AARC [a)]	(Sq. miles)	(Acres)
193,254	327,550	-3.4%	n/a	n/a

Public Water Suppliers: JVWCD Retail, Kearns Imp. Dist., Magna Water Co., White City WID

JVWCD Retail	Source of Supply (acre-feet)	
	JVWCD	Self Supply
2000	d)	-
2002	d)	-

Primary Uses [c)]: Residential [d)]%, Commercial, Industrial, Institutional [d)]%

Kearns Improvement District	Source of Supply (acre-feet)	
	JVWCD	Self Supply
2000	8,286	727
2002	7,412	799

Primary Uses [c)]: Residential 75%, Commercial, Industrial, Institutional 25%

Magna Water Company	Source of Supply (acre-feet)	
	JVWCD	Self Supply
2000	590	727
2002	818	3,831

Primary Uses [c)]: Residential 95%, Commercial, Industrial, Institutional 5%

White City Water Improvement District	Source of Supply (acre-feet)	
	JVWCD	Self Supply
2000	121	3,920
2002	100	3,050

Primary Uses [c)]: Residential 93%, Commercial, Industrial, Institutional 7%

The portions of unincorporated Salt Lake County within the JVWCD service area include several communities identified as Census Designated Places (CDP) in the 2000 Census. Those communities are Magna CDP (served by Magna Water Co.), Kearns CDP and Oquirrh CDP (served by KID), White City CDP (served by WCWID), and portions of Cottonwood West CDP and Little Cottonwood Creek Valley CDP (served by JVWCD retail).

Notes:

a) Census 2000 data. AARC – Average Annual Rate of Change
b) Future population projections updated in 2003 by the Wasatch Front Regional Council in coordination with the Governor's Office of Planning and Budget.
c) Per the most recent data submitted by Public Water Suppliers to the Utah Division of Water Rights.
d) Data is not available specific to use within unincorporated Salt Lake City.

Central Utah Project Completion Program

Chapter 8

October 2004

UTAH RECLAMATION
MITIGATION
AND CONSERVATION
COMMISSION

Chapter 8

DESCRIPTION OF ENTITY

INTRODUCTION

The Metropolitan Water District of Salt Lake & Sandy (MWDSLS / or District) was created on August 30, 1935 pursuant to the provisions of the Metropolitan Water District Act of Utah. Salt Lake City was the only member city of the District from 1935 to 1990. The District annexed Sandy City in 1990 and since that time those two cities have been member cities of the District. MWDSLS functions primarily as a wholesale provider of water to its member cities. Customers of MWDSLS collectively provide retail service to over 800,000 persons in Salt Lake County. Salt Lake City and Sandy City, as member cities of the District, have a statutory preferential right to purchase all of the District's water supplies for use within each city. The other major customer of MWDSLS, on a surplus basis, is the Jordan Valley Water Conservancy District (JVWCD), which supplies water to its customer agencies and individuals in southern Salt Lake County outside of MWDSLS boundaries. Figure 8-1 shows the service area of each member city of MWDSLS which is the service area of MWDSLS.

Salt Lake City, as the capital of Utah and the major business center for the Wasatch Front, has experienced steady growth in connections to its water system. It has major areas of developable ground on the west side of the City in what is called the Northwest Quadrant. Sandy City has experienced rapid growth in its service area over the last 20 years and has been struggling to meet the water needs that rapid growth has created. MWDSLS has been actively pursing additional water supplies for its member cities to meet the existing and future needs.

POPULATION PROJECTIONS

Projections

The Governor's Office of Planning and Budget (GOPB) released future population projection data in 2002 which utilized the results of the 2000 Census. The GOPB data provides county-wide population estimates for 2010, 2020, and 2030, and more detailed sub-county population estimates are made by regional planning organizations.

Population for Salt Lake County

In 2003, the Wasatch Front Regional Council, in coordination with the GOPB, released sub-county population estimates for each incorporated area and the balance of the unincorporated Salt Lake County. Table 8-1 shows the population projections for each incorporated community in Salt Lake County and the entire unincorporated area.

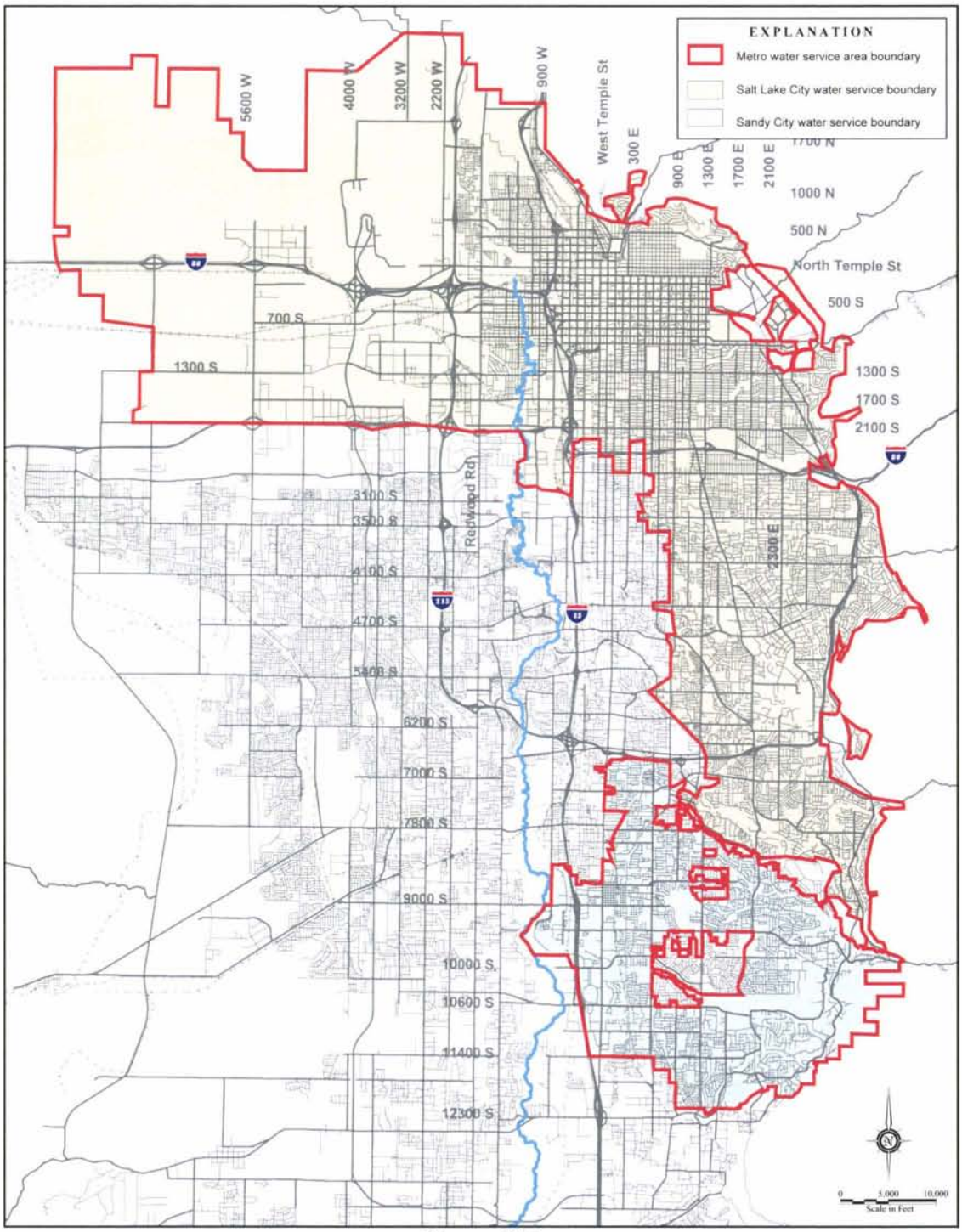


Figure 8-1
Service Area of Each Member City of MWDSLS

TABLE 8-1
Salt Lake County Population

Community Name	Year							
	2000	2002	2005	2010	2020	2030	2040	2050
Alta Town	370	368	397	461	560	631		
Bluffdale City	4,700	5,230	6,723	10,591	28,282	46,279		
Draper City	24,220	28,555	32,185	40,719	47,208	51,309		
Herriman City	1,523	3,223	9,097	15,000	28,307	37,415		
Holladay City	19,246	19,328	19,403	19,736	22,526	24,696		
Midvale City	27,029	27,698	28,558	29,581	31,310	32,270		
Murray City	34,024	34,718	35,908	38,146	39,778	39,465		
Riverton City	25,011	28,935	37,046	56,167	63,298	65,195		
Salt Lake City	181,743	184,092	185,336	187,259	193,140	197,079		
Sandy City	88,418	93,399	99,967	108,000	119,292	122,357		
So. Jordan City	29,437	32,218	37,689	48,118	68,610	92,474		
So. Salt Lake City	22,038	22,190	22,252	23,240	25,903	26,829		
Taylorsville City	58,764	59,656	60,001	63,876	72,134	74,996		
West Jordan City	78,714	83,577	96,310	126,021	144,941	153,393		
West Valley City	108,896	112,168	116,496	124,621	135,354	140,905		
Remainder of Salt Lake County	193,254	188,576	180,022	186,022	263,153	327,550		
Total	**898,387**	**923,931**	**967,390**	**1,077,556**	**1,283,784**	**1,431,843**	**1,625,103**	**1,866,299**

Source of data:
2000 – Census 2000 as revised by the Utah Population Estimating Committee.
2010, 2020, 2030 – (for Countywide total only), GOPB.
2002, 2005, and all sub-county community projections – Wasatch Front Regional Council in coordination with GOPB (released in 2003).
2040, 2050 – GOPB (released in 2000).

Population for MWDSLS Service Area

Table 8-2 shows the population projections for the service area of MWDSLS which includes Salt Lake City, Sandy City, portions of Midvale City, Holladay City, and major areas of unincorporated Salt Lake County.

TABLE 8-2
Population in MWDSLS Service Area

Community Name	Year							
	2000	2002	2005	2010	2020	2030	2040	2050
Holladay City [a)]	18,196	18,278	18,330	18,636	21,376	23,496		
Midvale City [a)]	10,529	11,198	11,858	12,581	13,310	13,270		
Sandy City [b)]	87,418	92,399	98,967	107,000	118,292	121,357		
Salt Lake City	181,743	184,092	185,336	187,259	193,130	197,079		
Remainder of Salt Lake County [c)]	110,873	103,717	99,012	102,311	144,734	180,153		
Total population in MWDSLS service area	**408,759**	**409,684**	**413,503**	**427,787**	**490,842**	**535,355**	**609,945[d)]**	**706,424[d)]**

Notes:

a) Population shown is only for that portion of the community within the MWDSLS service area.

b) Sandy City's population with reduction of 1,000 for JVWCD minor service areas within the City.

c) Salt Lake City serves major unincorporated areas on the east side of Salt Lake County, including water areas: Holladay, Murray, and Midvale City. Sandy City also provides retail service to county areas.

d) Calculated estimate assuming MWDSLS population remains at 37 percent of total population in Salt Lake County after 2030.

EXISTING WATER USAGE RATE

Table 8-3 presents historic and projected municipal and industrial (M&I) water demand, in gallons per capita per day, for each of the service areas of MWDSLS. The projections assume that the State's water conservation goals would be met, which call for reductions in per capita use by 12 ½ percent by 2020 and 25 percent by the year 2050. The 2002 numbers reflect the conservation efforts of the member cities over the last few years of drought. Salt Lake City's numbers reflect a seven percent reduction in per capita usage in past two years even with 2002 being an extremely dry summer. Sandy City essentially met the 25 percent goal for conservation between 2000 and 2002 due to increased conservation awareness and a new water rate structure that promotes water conservation within the City's service area. MWDSLS will work with Sandy City and Salt Lake City in achieving the State's water conservation goals into the future.

TABLE 8-3
Unit Water Demand with Conservation Element Included
(12 ½ Percent by Year 2020 and 25 Percent by Year 2050)
(Units: Gallons per Capita per Day)

Area	Year						
	2000 (actual)	2002 (actual)	2010	2020	2030	2040	2050
MWDSLS							
Sandy	250	189	235	220	209	199	188
Salt Lake	251	234	235	220	209	199	188

Salt Lake City's per capita usage rates are higher even with an aggressive conservation program because of the unique nature of their water system. Their per capita usage is affected by the following.

1. They are a regional economic hub with a transient daytime population approaching their resident population.

2. They have major industrial customers such as their largest customer, a refinery.

Salt Lake City's per capita usage for their residential customers is in the range of the State's proposed conservation guideline.

WATER CONSERVATION

MWDSLS has made a long-term commitment to water conservation. MWDSLS recognizes that the projected growth in its service area cannot be sustained by existing or future water sources without a reduction in per capita water use. Water conservation will not only extend limited water supplies, but have the added benefit of deferring costly infrastructure and future water development projects.

The State of Utah is now in the fifth year of a prolonged drought cycle. The drought has exposed many limitations of existing water supplies. As rapid growth along the Wasatch Front and in the State of Utah continues, the next drought cycle will have far reaching and much greater impacts on the citizens of the state.

Water Conservation Master Plan

In 2000, MWDSLS adopted a water conservation plan in response to the "Water Conservation Plan Act" which was signed into state law in 1998. The District adopted an overall Master Plan in 2001 which provided for the development of additional water conveyance facilities and

treatment capacity to enable the District to supply water to its member cities to meet their anticipated needs through the year 2025. Water conservation is a key component of the Master Plan. MWDSLS's conservation plan summarizes the water conservation measures undertaken by the District, within the District, and efforts by the District to promote water conservation by its member cities.

The plan focused on supply-side conservation. MWDSLS is a water wholesaler and has no retail customers. Therefore, the plan focuses on supply-side conservation and working with and financially supporting its member cities, Salt Lake City and Sandy, to promote demand side conservation.

Water Conservation Goal

MWDSLS's Master Plan assumes that MWDSLS will meet the State of Utah's goal of reducing water consumption statewide by 25 percent by the year 2050.

Current Water Conservation Programs and Activities

Public Education and Information Campaign. MWDSLS has been assisting in funding, the "Slow the Flow, Save H_2O" campaign. The campaign has continued to be developed, receiving significant recognition and market penetration statewide.

The campaign includes the development and dissemination of water conservation educational information through printed materials, radio and television advertisements, and media and community events in order to create heightened public awareness of the benefits of reduced water use.

In August of 2001, the Governor of the State of Utah met with water and other governmental officials across the state to develop a statewide water conservation initiative. The purpose of this initiative was twofold as follows:

- To immediately increase public awareness and educate the citizens of the state on water saving measures to address the current drought;
- To generate a long-term water conservation ethic to address Utah's rapid population growth.

A water conservation team was formed to develop a statewide water conservation campaign. The funding members of the team include the State Division of Water Resources, JVWCD, Central Utah Water Conservancy District (CUWCD), MWDSLS, Weber Basin Water Conservancy District (WBWCD), Washington County Water Conservancy District (WCWCD), and more recently the Utah Water Users Association (UWUA) and the Rural Water Association of Utah (RWAU).

The team agreed that the statewide initiative should broaden the "Slow the Flow, Save H_2O" campaign and expand the campaign statewide. This has provided for greater market penetration and greater awareness of water conservation on a statewide basis and provided an umbrella campaign for local conservation activities throughout the state.

The main focus of this campaign is to create a long-term conservation ethic through television and radio advertisements and dissemination of educational materials on water conservation, in order to meet the long-term water conservation goal of 25 percent reduction in water use.

Residential and Commercial Water Audits. Since adoption of the 1999 Water Conservation Master Plan, partnering agencies have pooled financial resources and contracted with Utah State University Extension to provide residential and commercial water audits (Water Checks) which are free to the public. Water audits target outdoor water usage and include an evaluation of the customer's soil type, plant root depth, sprinkler pressure, sprinkler distribution uniformity, and sprinkler precipitation rate. Following the audit, the customer is left with recommendations for sprinkler system repairs and adjustments to improve distribution uniformity and a customized irrigation schedule to improve watering efficiency. Water use records are obtained from each customer three years prior to and following the Water Check to measure the effectiveness of the water audit.

The Water Checks Program is now in its fifth year. More recently, there has been special emphasis placed on providing Water Checks for large water users including commercial, industrial and institutional water users.

The Water Audit Program has grown each year in terms of the number of Water Checks completed. Table 8-4 summarizes the total number of Water Checks performed within Salt Lake County during 1999 through 2002.

TABLE 8-4
Water Checks[1]

	1999	2000	2001	2002	Total
Residential	446	638	882	1,066	**3,032**
Commercial	n/a	n/a	20	50	**70**

[1] Totals include all Water Checks for Salt Lake County

Based on an evaluation of water use records of a randomly selected group of participants who received Water Checks in 1999, Utah State Extension Services have concluded that an average 15 percent reduction in water use has been achieved by participants receiving Water Checks. The Water Check data also shows that 66 percent of a resident's total water use is used outdoors and 34 percent is used indoors.

Water Conservation Pricing. Both member cities of MWDSLS now have in place water rates that encourage water conservation through charging higher rates for higher water use on a seasonal basis. Each city's rates are briefly discussed below.

Sandy City. In 2001, Sandy City adopted a water rate structure to encourage conservation. The rate structure has a much higher rate (186 percent) during the summer months of May through September when the City is trying to encourage conservation of outside water use. Historically, the City's outside water use accounted for 65 percent of the water used by City customers. The rate structure has resulted in lower water use during the last two years as reflected by decreasing per capita consumption and total water deliveries.

Salt Lake City. Salt Lake City's Council adopted a seasonal water conservation rate structure for retail water deliveries for the 2003 water season. This seasonal rate structure was adopted to encourage long-term conservation and the efficient use of the City's water supply. In spring of 2003, Salt Lake City adopted an inclining-block rate structure with three blocks. The first block is set to provide adequate supplies of water for indoor use based on the consumption levels of the average utility customer. The second block is set at 10 percent less than the average outdoor summer consumption. Block 3 is all the water consumed exceeding Block 2.

Commercial customers are billed under a three block structure, with the first block based on each meter's average winter consumption; Block 2 is 100 to 300 percent of Block 1 (the same ratio as established for residential customers); and Block 3 is all the water consumed outside of Block 2.

For those accounts connected to meters used only during the irrigation season, targets were established based on permeable area and historic evapo transpiration (ET) data; water used within the target is billed at the Block 2 rate and water used exceeding the target is billed in Block 3.

The rate restructuring was accompanied by a redesign of the utility bill to provide adequate information to the consumer regarding current and historical use.

Salt Lake City Conservation Activities.

Web-page Development. In 2001, the Salt Lake City Public Utilities Department (Public Utilities) launched a water conservation web page, designed to provide information for saving water indoors and outdoors to Public Utilities customers, both commercial and residential.

High Performance Building Guidelines. The City developed High Performance Building Guidelines, a tool to guide the design and construction of water and energy efficient buildings constructed in partnership with Salt Lake City. The water section addresses landscape design and maintenance, indoor efficiencies, stormwater protection, and reclaimed water opportunities.

Landscape Ordinance and Guidelines. Public Utilities worked with the Planning Department to update the park strip ordinance, and is involved in evaluating existing landscape ordinances to ensure that those ordinances meet broader administrative goals of encouraging water conservation. Public Utilities is also updating the Water-wise Landscape Plant list, first published in 1995.

Water Efficiency Study. The City performed a study which provided a planning-level evaluation of water conservation and efficiency opportunities with existing irrigation of City-owned open-space, secondary water system and source development, and landscaping requirements for new development. This report provided information as a planning resource for development, funding, and implementation of capital improvement programs needed to achieve the City's increased water conservation and efficiency goals.

Demonstration Gardens. Public Utilities is constructing a number of demonstration gardens throughout its service area. Two gardens have been constructed, one at Washington Square and the second at Concord Lift Station. Three more gardens are in the planning or design stage. Public Utilities has also partnered with other city or regional projects as a subject-specialist to ensure that water conservation and sustainability continue to be addressed in all landscape designs. Some of those projects include Library Square, Pork Chop Park, the 10th East Senior Center, and the Intermodal Hub (a LEED-qualified project).

Water Audit Project. Public Utilities conducted full irrigation audits at 17 City-owned sites, including six golf courses in order to 1) determine specific irrigation efficiency; 2) generate repair action-items lists; 3) develop long-term capital improvements goals; and 4) provide adequate data to establish economic incentives for improvements.

Water Shortage Contingency Plan. The contingency plan was adopted by the City council in July 2003, and includes the following four (4) components:

- *Ordinance* authorizes the Mayor to declare one of five water shortage stages; compels Public Utilities to draft and maintain a Water Shortage Plan; establishes fines; authorizes Public Utilities to enforce mandatory actions; and establishes an appeals process.

- *Water Shortage Plan* identifies and defines five stages of water shortage; establishes triggering criteria for the implementation and termination of the stages; outlines public education and notification process; defines terms; and describes hearing and appeals process.

- *Response Summary* provides quick reference to the five water shortage stages, dividing water customers into three categories (residential, commercial/industrial, and municipal), articulates specific response actions, assigns voluntary/mandatory status to each response action, and identifies Best Management Practices (BMP) (this has been designed to be web and brochure ready).

- *Appendices* provides a collection of BMP for a broad spectrum of water customers and uses, including residential; commercial carwashes; hotels and restaurants; pools; and the nursery and landscape industry.

The contingency plan is being modeled by a number of other communities, including Draper and Murray, and Grand Junction and Denver, Colorado.

Media.

- Salt Lake City was the focus of several news stories relating to the drought and water conservation, and appeared in two Associated Press (AP) stories which appeared in Colorado newspapers.

- Participated in a number of radio programs on KSL, KUER, and KCPW, and were featured on an hour-long syndicated morning news program which airs all non-clear channel stations.

- Provide weekly information, including water-use charts, to several local news networks for use on weather segments.

Brochure List. The City developed brochures for customers that provided guidance to customers for the following subjects.

- Lawn Watering Guide
- Parkstrip Guide
- Water Shortage Contingency Plan – BMP
- Rate Restructuring
  - Residential
  - Commercial

Sandy City Conservation Activities. In 1996, Sandy City completed a Water Conservation Plan. The detailed plan was the first of its kind in Sandy City. As a result of that conservation study, Sandy City implemented a number of conservation measures to reduce water usage. Some of these are identified below:

Water Meters. All residential, industrial and institutional connections to the City's water system are metered. The City also meters water that is used in public areas such as parks and streetscapes.

Pipeline Corrosion Protection. Sandy City requires the installation of corrosion protection on all ductile iron pipes in acidic soil. This measure is designed to reduce leaks in pipelines.

Conjunctive Use of Surface and Groundwater. Sandy City, by having membership in the MWDSLS, more efficiently utilizes surface waters when available and only uses groundwater supplies during periods of peak demand.

Public Education. Sandy City constructed a xeriscape demonstration garden called Sego Lily Gardens at its Zone 5 water tank site to illustrate landscape practices that conserve water. The gardens are open to the public during the warm weather months. The gardens provide an opportunity for the City to inform the public of low-water use that are available and landscaping techniques that promote water conservation. In addition, the City and its residents are able to learn, by first hand experience, which plant varieties and irrigation methods are the most effective at providing an aesthetically pleasing yet water saving landscape for the sandy soils prevalent in the area.

Use of Secondary Water on Parks. Sandy City has retrofitted two parks within the City (Lone Peak and Crescent) for use of secondary irrigation water for landscape watering. Two additional parks (Eastridge and Storm Mountain) are currently being considered for secondary water. The City also continues to investigate other potential uses for secondary water.

Renewed Emphasis on Conservation. The past few years have born a renewed emphasis on conservation in Sandy City and its neighboring communities. This is the result of both the recent period of drought and Sandy City's need to conserve water to meet future demands. The result of this renewed conservation effort is the implementation of several additional conservation measures[1] listed below.

Seasonal Rate Structure. In December 2000, the City council adopted a new water rate structure intended to provide an incentive for water users to conserve. The key element of the rate structure is an increased peak season overage rate during the months of May through September. The goal is to reduce peak system demands and reduce the waste of water on outdoor landscaping uses.

Monthly Billing. As part of the implementation of the water rate structure, the City has opted to begin billing customers on a monthly basis. Historically, the City billed on a bi-monthly basis. Monthly billing allows consumers to receive more frequent feedback on their water use habits and adjust their use accordingly.

Water Conservation Coordinator. The City hired a water conservation coordinator with a background in horticultural training with a specific emphasis on institutional water conservation. The duties of the water conservation coordinator include acting as a park visitor guide at Sego Lily Gardens, developing conservation education material, and performing irrigation system audits and low-water use landscape consulting throughout the City. The water conservation

[1] From the Sandy City Memo " Summary of Conservation Measures" dated February 5, 2002

coordinator also gives presentations on conservation to community groups (schools, churches, businesses, residents, etc.).

Expanded Public Education Program. Sandy City has greatly expanded their public education program in recent years to include a number of new components:

- "Slow the Flow" Campaign – Sandy City has provided financial support to the "Slow the Flow – Save H2O" water education campaign. This campaign was developed in conjunction with JVWCD and municipalities along the Wasatch Front to provide water education information, irrigation system water checks, advertising campaign, and related conservation efforts.

- Water Conservation Education Program – Sandy City also supports a program to educate school-aged children about water and the importance of conservation. This program is specifically designed to motivate children to use water wisely and grow up with a conservation ethic. It is hoped that this effort will motivate the children to encourage their parents to use water more wisely as well.

- Improved Xeriscape Demonstration Gardens – In 2002 and 2003, the Sego Lily Gardens were divided into different landscaped areas, each with separate metering. This will allow water use to be measured for specific landscaping themes.

- Water Conservation Classes – Six water conservation classes were offered in 2002 at Sego Lily Gardens. Topics discussed at the classes included low-water use landscape design, irrigation systems, varieties of turf, low-water use plants, native plants, and performing a home water check. All classes are free to the public.

- Sandy City Newsletter – The City has utilized the City newsletter to educate and inform the public regarding conservation and other water issues.

- Water Conservation Web Site – On the Sandy City web site, there is a page devoted to water conservation (http://www.sandy-city.net/Public_Utilities_Dept/water-conservation-tips.htm). It provides water conservation tips (both indoors and outdoors), announcements, pictures, and links to other water conservation related sites.

- Free Water Saving Material – The City has distributed water saving material to schools, community groups, and at Sego Lily Gardens. The material includes an indoor and outdoor water conservation kit, soil probes, and other educational information. The water conservation material is also sent to individual water users upon request.

Line Replacement Program. A new component has been added to the Sandy City Water Fund Budget for pipeline replacement. Funds reserved for this purpose will be used to replace old and failing water lines in the Sandy City water system. In addition to maintaining the system in good

working order, it is hoped that this effort will reduce the number and severity of water leaks in the system. The budget item for pipeline replacement was initially $500,000 in FY 2000-2001 and will grow to $1.5 million by FY 2005-2006.

Irrigation Restrictions. Sandy City has coordinated with other water agencies to develop a six-phase water restriction protocol to be implemented in times of drought or other water emergency. In 2001, the City went to the phase of recommending no outdoor watering between 10:00 a.m. and 6:00 p.m. The City Council took this concept a step further in December of 2001 by adopting an ordinance specific to the Sandy City water system that permanently restricts sprinkler irrigation between 10:00 a.m. and 6:00 p.m. for all water users. Violations of this ordinance are generally met with friendly reminders from the City, but the ordinance does allow the City to assess fines to chronic violators.

Water Efficient Landscape Ordinance. In January of 2002, the City Council adopted the Water Efficient Landscape Ordinance. This new ordinance was designed to promote water conservation in the landscaping of new development. The ordinance requires new commercial and multifamily developments, as well as new City-owned properties, to submit landscape and irrigation plans during the development review process. The plans are required to be designed by certified professionals in both landscape and irrigation systems. The landscaped areas of the new developments are required to meet certain irrigation system efficiency standards once installation in completed. In addition, water conserving plants are now required for slopes greater that 30 percent.

Conversion of Public Landscapes. Many changes have been implemented in the landscaping of public areas. A parking strip at a public utilities booster station has been converted to a low-water use ground cover. The Parks and Recreation Department is experimenting with the conversion of streetscapes to bark and/or low-water use trees and plants. At Flat Iron Park, the Parks and Recreation Department has planted trees and shrubs on several existing inclines. Water use in these areas will be restricted once the plants are established. At the new 40-acre Hidden Valley Park, only two acres are planted with turf, with native plants being preserved in the remaining area.

Water Audits. Sandy City has begun the process of identifying which water users use excessive water on their landscape compared to plant needs. For those users with excessive water use, Sandy City will provide information and resources to help in their efforts to save water. Currently, the focus is on the top 100 non-residential water users and the top 25 residential water users. Sandy City residential water users may also request water audits through the "Slow the Flow" conservation campaign.

Water Conservation Hotline. Sandy City has a water conservation hotline. This hotline allows residents to report violations of irrigation restrictions and to ask questions regarding water conservation.

Charging True Water Costs to All Water Users. In the past, Sandy City has not charged City departments the true cost of their water. For example, the Parks and Recreation Department paid an annual charge based on a budget number rather that the amount of water actually used. Although the Parks and Recreation Department has traditionally done a commendable job of managing their water use, not charging the true cost of water gave the department little motivation to conserve. This policy has been changed and City departments are now charged for water based on actual water consumption. There is currently a cap on the amount charged to the Parks and Recreation Department to help the department make the transition to the new rate structure. Eventually, this cap should be removed and all departments should be charged the full cost of their water use.

Park Computerization. Over half of the City's large parks have been equipped with computerized irrigation systems. These systems allow the Parks and Recreation Department to closely monitor conditions at each park and maximize irrigation efficiency. The Parks and Recreation Department plans to computerize an additional three parks each year. It is expected that all parks will receive computerized irrigation systems by the year 2005.

Drought and Water Emergency Measures. In addition to its efforts to achieve long-term water use reductions through conservation, Sandy City also has a plan for reducing water consumption in times of drought or other water emergency. The current Sandy City drought and water emergency policy consists of two major components. First, Sandy City is a member agency of the Salt Lake Valley Conjunctive Management Team. This team consists of the water directors of Sandy City, Salt Lake City, MWDSLS, and JVWCD. During a water emergency, this team convenes to pool resources that can be used to resolve the emergency.

TOTAL M&I DEMANDS WITH CONSERVATION

Table 8-5 shows the total estimated demands within the MWDSLS service area and each individual member city service area. Demands are shown with and without conservation to illustrate the significant amounts of water which MWDSLS expects to save through conservation. Even with this conservation, Sandy City will need additional supplies to meet its future demands.

Table 8-5
Existing Water Supplies of the Metropolitan Water District of Salt Lake & Sandy
Dry Year Water Supply
(Units: acre-feet)

Water Source	Salt Lake City	Sandy City
Groundwater Wells	18,911	14,400
Surface Supplies		
Little Dell	3,100	
Big Cottonwood Creek	20,028	
City Creek	4,690	
Little Cottonwood Creek	13,212	7,880
Bell Canyon		880
Wholesale Water Purchase		
Provo River Project- Deer Creek Reservoir (Federal)	22,910	7,940
Central Utah Project-Jordanelle Reservoir (Federal)	22,800	
Jordan Valley WCD		315
Transmission Losses in PRC	-1,600	
Total	**104,051**	**31,415**

EXISTING SUPPLIES

Capability of Existing Supplies to Meet Demands

Salt Lake City and Sandy City, as member cities of MWDSLS, have a statutory preferential right to purchase all of MWDSLS water supplies for use within each city. The District supplies approximately 39 percent of the water used by Salt Lake City and approximately 67 percent of the water used by Sandy City during an average year. Local supplies provide the rest of the water.

Existing Supplies of MWDSLS

MWDSLS and its member cities have a current dry year water supply of approximately 137,066 acre-feet per year, of which 104,051 acre-feet belongs to Salt Lake City and 31,415 acre-feet to Sandy City. These supplies are derived essentially from three sources – federally developed supplies from the Provo River Project (Deer Creek Reservoir), the M&I System of the Bonneville Unit (Jordanelle Reservoir), surface runoff from various Wasatch front creeks in Salt Lake County, and local groundwater wells. A list of the existing supplies available to the MWDSLS member cities is presented in Table 8-5.

PROJECTED M&I SHORTAGES OF MWDSLS UNDER EXISTING SUPPLIES

The areas of the two cities within the MWDSLS service area are projected to fare differently under their existing M&I water supplies. The Salt Lake City service area, by virtue of its local and contracted water supplies, is projected to have a small excess of supply over demand to year 2050 when a slight deficit will exist. This is illustrated in Table 8-6 by a declining surplus to 2050. The Sandy City water service area, by contrast, has begun to experience a water supply deficit, which is projected to increase in future decades under existing supplies. This is illustrated in Table 8-6.

TABLE 8-6
Projected M&I Shortages Under Existing Supplies
Within the MWDSLS Service Areas
(Units: acre-feet)

Water Entity	2000	2010	2020	2030	2040	2050
Salt Lake City						
Total M&I Demand	96,000	96,000	96,448	97,304	97,887	107,154
Existing Supplies (Dry Year)	104,051	104,051	104,051	104,051	104,051	104,051
Surplus/Deficit	***8,051***	***8,051***	***7,603***	***6,747***	***6,164***	***-3,103***
Sandy City						
Total M&I Demand	34,979	33,928	32,503	32,885	38,556	41,600
Existing Supplies (Dry Year)	31,415	31,415	31,415	31,415	31,415	31,415
Surplus/Deficit	***-3,564***	***-2,513***	***-1,088***	***-1,470***	***-7,141***	***-10,185***

Table 8-6 poses the logical question of whether the Sandy City deficit could be offset by the Salt Lake City surplus over the next few decades, perhaps under the auspices of MWDSLS. The answer is that such a pooling of existing water supply is not practicable for several reasons, namely 1) each of the cities has water service responsibilities that extend beyond the jurisdictional area of MWDSLS, 2) the various water sources of each city are essentially held in trust for their local water using communities, 3) the estimated surplus or deficit of each city is a relatively small portion of its total water needs, and thus subject to unanticipated changes in population growth and permanence of water source capacity, and 4) the recent long-term dry cycles that have occurred in Utah require each member city to provide a reserve pool of their own supply to help meet their water needs during the multi-year drought cycles. The current Sandy City deficit is made up by lease of water from other agencies and Sandy City's utilization of groundwater supplies that will be limited in the future.

OTHER POTENTIAL WATER SUPPLIES TO MEET M&I NEEDS

Other potential water sources have been identified for development to meet the shortfall indicated in Table 8-6. These potential sources are as follows:

- Delivery of water from the Utah Lake Drainage Basin Water Delivery System
- Wastewater Recycling.

These water sources are described in the following paragraphs. Wastewater recycling will develop a water source of low quality water that will require expensive treatment before use as a culinary water supply, or possibly as a secondary water supply.

Water from the Utah Lake Drainage Basin Water Delivery System (High Quality Source)

The estimated volume of water that may be available to Salt Lake County from the Utah Lake System (ULS) project is approximately 30,000 acre-feet. The current split of M&I System (Jordanelle Reservoir) water between MWDSLS and the JVWCD is 2/7 to MWDSLS (20,000 acre-feet) and 5/7 (50,000 acre-feet) to JVWCD. It is anticipated that the ULS water would be split in this same ratio resulting in a split of 8,571 acre-feet for MWDSLS and 21,429 acre-feet for JVWCD. The final allocation of ULS water between JVWCD and MWDSLS has not been determined. It is assumed for this document to be as shown. The most likely means for delivering this water would be through conveyance facilities associated with the existing water supplies from the Provo River System. From the Provo River the water could be conveyed to Salt Lake County through one of the following existing facilities: Jordan Aqueduct (JA) (270 cfs capacity), the Provo Reservoir Canal (PRC) (550 cfs capacity), or the Salt Lake Aqueduct (SLA) (175 cfs capacity).

Wastewater Recycling (Low Quality Source)

This water source involves the recycling and reuse of return flows from M&I water use that is conveyed to municipal wastewater treatment plants in Salt Lake County. The treated wastewater would be piped from the treatment plants to secondary water systems in various parts of Salt Lake County. Calculations of volumes of Central Utah Project (CUP) Bonneville Unit water return flows to the significant wastewater treatment plants in Salt Lake County have been made. The three major wastewater plants in Salt Lake County are:

- Central Valley Water Reclamation Facility (CVWRF)
- South Valley Water Reclamation Facility (SVWRF)
- Salt Lake City Reclamation Facility (SLCRF)

The estimated CUP Bonneville unit return flows as sewage effluent to these facilities are estimated as shown in Table 8-7. Both current and future deliveries of Bonneville Unit M&I system from Jordanelle Reservoir are shown in Table 8-7.

TABLE 8-7
Central Utah Project Bonneville Unit
Estimated Return Flows as Sewage Effluent

	CUP Water (AF/yr)		Sewage Effluent (AF/yr)			
	CUP Component	**Treated Potable Water**	**Sewage Effluent**	**To CFWRF**	**To SVWRF**	**To SLCRF**
15 Percent	Bonneville Unit M&I System – JVWCD Petition	50,000	7,500	4,000	3,500	0
	Bonneville Unit M&I System - MWDSLS Petition	20,000	3,000	1,000	500	1,500
35 Percent	ULS – JVWCD Allocation	21,429 (5/7 of 30,000)	7,500	3,500	4,000	0
	ULS – MWDSLS Allocation	8,571 (2/7 of 30,000)	3,000	750	750	1,500
	Totals	**100,000**	**21,000**	**9,250**	**8,750**	**3,000**

The most practical use of recycled water from these wastewater treatment plants would be for outdoor watering, primarily on golf courses and other large, landscaped, urban areas. The following sections describe plans for use of the water from the various wastewater treatment plants.

Central Valley Water Reclamation Facility Planning. The CVWRF is a regional wastewater treatment facility located at 800 West 3190 South. It services seven local entities, involving three cities and four special improvement districts. Some of the CVWRF member agencies accept wastewater from areas served by MWDSLS member cities, as shown in Table 8-8.

TABLE 8-8
CVWRF Member Agencies

CVWRF Member Agency	MWDSLS Member City
Cottonwood Improvement District	Partial, in MWDSLS water delivery system
Granger-Hunter Improvement District (GHID)	No
Kearns Improvement District (KID)	No
Murray City	Partial, in MWDSLS water system in newly annexed perimeter of Murray City
Salt Lake City Suburban Sanitary District #1	Partial, in MWDSLS water service area
City of South Salt Lake	No
Taylorsville-Bennion Improvement District (TBID)	No

CVWRF recently completed a "Water Reuse Market Feasibility Study". This study considered a tertiary treatment level (filtration) and delivery of recycled sewage effluent to large landscaped parcels, such as golf courses and parks, within the CVWRF member agencies service areas. A transmission system was developed consisting of four main trunk lines. Phase 1 transmission lines include a West Line that would serve parcels in the West Valley City area and a South Line that would serve parcels along the Jordan River in Murray City. The Phase 2 transmission lines include a Southwest Line through the TBID to the east boundary of the KID, and a Southeast Line that would serve other east side parcels within Murray City, Cottonwood Improvement District and Salt Lake Suburban Sanitary District #1. The CVWRF on-site facilities would include a new recycled water facility that would provide effluent filtration treatment to a level that would meet the State of Utah Type I reuse classification.

CVWRF concluded in its study that an ultimate quantity of 2,779 acres could be irrigated with a recycling project suitable for large landscaped areas. An annual recycling of 8,799 acre-feet, at a seasonal peak day demand of 31.9 million gallons per day (mgd), would be feasible. The details of the CVWRF study are shown in Table 8-9.

TABLE 8-9
CVWRF Estimated Recycled Water Demand by Member Agency

Member Agency	Irrigated Area (Acres)	Seasonal Demand (AF)	Seasonal Peak Day Demand (mgd)
Cottonwood Improvement District	190	600	2.2
Granger-Hunter Improvement District	944	2,990	10.8
Kearns Improvement District	316 553 Ultimate	1,000 1,750 Ultimate	3.6 6.3
Murray City	628	1,990	7.2
Salt Lake City Suburban Sanitary District #1	128	405	1.5
City of South Salt Lake	0	0	0
Taylorsville-Bennion Improvement District	336	1,064	3.8
Total	2,542 2,779 Ultimate	8,049 8,799 Ultimate	29.1 31.9 Ultimate

Utah water law gives preference to retail water distribution agencies being able to own and recycle their sewage effluent. The statute allows for a retail water distribution agency which owns water rights to recycle a portion of that water, within its sewage effluent flow, to service the same lands within its service area and within its original water rights beneficial uses.

South Valley Communities Recycling. The SVWRF serves eight cities in southern Salt Lake County, together with various unincorporated Salt Lake County areas. These communities have formed the Association of South Valley Communities ("South Valley Communities"). Table 8-10 lists these communities.

TABLE 8-10
South Valley Communities

South Valley Communities (Members of SVWRF)	MWDSLS Service Area
Bluffdale City	No
Draper City	No
Herriman City	No
Midvale City	Partial
Riverton City	No
Sandy City	Yes
South Jordan City	No
West Jordan City	No
Unincorporated Salt Lake County	Partial

The South Valley Communities have commissioned a "Preliminary Analysis of Water Reuse" during 2003. This analysis considered the potential for recycling sewage effluent from the South Valley Communities at SVWRF for irrigation of large urban landscaped parcels, such as golf courses and parks. An additional treatment facility at the SVWRF site would deliver treated wastewater appropriate for Utah Type I reuse.

The preliminary analysis study identified the current sewage effluent flow rate of the South Valley Communities as 27 mgd. This is an annual average, which has very little seasonal variation. A reliable flow of 25 mgd was identified. The contribution of the cities is shown in Table 8-11.

TABLE 8-11
South Valley Communities Sewage Flows to SVWRF

City	Flow (mgd)
Bluffdale City	0.6
Draper City	3.0
Herriman City	0.2
Midvale City	2.6
Riverton City	2.6
Sandy City	5.7
South Jordan City	3.1
West Jordan City	7.2
Total	**25.0**

In the preliminary analysis for a project, two project capacities were assumed. The first would have a peak delivery capacity of 10 mgd considered a 1st phase of the project. The second capacity would be 25 mgd. The assumed daily flow rate of recycled water potentially available to each City in SVWRF is shown in Table 8-12.

TABLE 8-12
Assumed Daily Sewage Effluent Recycled Flow Requirement for Each SVWRF City

City	Project Capacity	
	10 mgd	25 mgd
	Flow Requirements (mgd)	
Bluffdale City	0.0	3.0
Draper City	0.0	2.0
Herriman City	0.0	0.2
Midvale City	0.0	2.0
Riverton City	3.0	3.8
Sandy City	1.5	2.0
South Jordan City	3.0	4.0
West Jordan City	2.5	8.0
Total	**10.0**	**25.0**

Two alternative transmission pipeline corridors were studied in this conceptual level preliminary analysis. The Jordan River Corridor Alternative involves a major transmission pipeline extending southward along the Jordan River. The 1300 West Corridor Alternative involves a major transmission pipeline extending southward along 1300 West Street. Each of these two corridor alternatives involved an analysis of a constant flow rate project and a seasonal variable rate project. Annual delivery amounts and unit costs for the various project alternatives were calculated. Table 8-13 shows these various alternatives, together with construction costs, annual operation and maintenance (O&M) costs, annual recycled water deliveries, and unit costs.

TABLE 8-13 South Valley Communities Recycled Water Project Deliveries and Costs				
Project Capacity (Source /Delivery Scenario)	Treatment and Transmission Cost		Annual Recycled Deliveries (AF)	Unit Cost ($/AF)
	Construction	Annual O&M		
10 MGD (SVWRF/Constant Rate)	$17,570,000	$360,000	5,600	310
10 MGD (SVWRF/Variable Rate)	$17,570,000	$210,000	3,300	470
25 MGD (SVWRF/Constant Rate)	$37,440,000	$1,000,000	14,000	290
25 MGD (SVWRF/Variable Rate)	$37,440,000	$590,000	8,300	440

The ultimate 25 mgd project alternatives represent the annual recycled water volumes most likely in this project. They range from 8,300 acre-feet to 14,000.

Salt Lake City Reclamation Facility. Salt Lake City is presently performing a study to determine the potential for use of their plant effluent for a recycled water supply for various low quality water users.

Projected Sewage Effluent Recycling. MWDSLS has the potential for wastewater recycling projects within its service area, as shown in Table 8-14.

TABLE 8-14 Projected Wastewater Recycling in MWDSLS Service Area	
Wastewater Facility	Annual Wastewater Recycling (AF)
CVWRF	1,750
SVWRF	1,250
SLCRF	3,000
Total	**6,000 AF**

These recycled water volumes fall within the wastewater amounts resulting from CUP Bonneville Unit waters received and delivered by MWDSLS.

SUMMARY OF POTENTIAL NEW WATER SOURCES

A summary of the potential water supplies is presented in Table 8-15.

TABLE 8-15
Summary of Potential New Water Sources For MWDSLS

Water Source	Volume (acre-feet)	Potential M&I Developable Volume (MWDSLS) (acre-feet)	Type of Use and Required Treatment	Likelihood of Success
ULS	30,000	8,571	M&I Use	High
Wastewater Recycling of Central Utah Project Supply[a]				
➢ SVWRF	8,750[b]	1,250	Outdoor Use (Tertiary Filtration)	Moderate to High
➢ CVWRF	9,250[b]	1,750	Outdoor Use (Tertiary Filtration)	Moderate to High
➢ SLCRF	3,000[b]	3,000	Outdoor Use (Tertiary Filtration)	Moderate to High
Subtotal for Recycled CUP Supply	21,000	6,000		
Total ULS & Recycled CUP	51,000	14,571		

Notes:
a. Based on 15 percent of Jordanelle and 35 percent of ULS.
b. Total estimated Bonneville Unit and ULS return flows at these facilities.

The sequence of development of water supplies is dependent on several factors including cost, limitations on use of the water, institutional and permitting issues, and environmental and political issues.

Cost Considerations

Detailed cost estimates for developing potential sources of water are beyond the scope of this water needs analysis. However, other agencies have performed preliminary planning studies sufficient to identify approximate unit costs of providing water from the various potential water supplies. Some refinements in the cost ranges may be made during the ULS planning process, particularly by CVWRF and the South Valley Communities who are continuing to study the potential for water recycling.

Table 8-16 presents the approximate costs for the various sources of water discussed above, and lists those sources in increasing order of cost. It should be noted that the tabulated costs should

not be used to determine the feasibility of the sources; inasmuch as physical facilities are not well defined, and the economics of water treatment processes change with time.

TABLE 8-16
Probable Cost Range for Developing New Water Sources for MWDSLS

Water Source	Annual Water Volume[a] (AF)	Estimated Annual Cost ($/AF)	Potential Use and Anticipated Limitations on Use
Existing MWDSLS Water Supplies	137,066	$150 to $220	M&I
ULS	8,571	$300 to $350	M&I
Wastewater Recycling of Central Utah Project and ULS Supply	6,000	$350 to $470	Parks, golf courses and large urban irrigated areas

Notes:
[a]Annual cost are based on information from MWDSLS except for the ULS.

SEQUENCE OF DEVELOPMENT

Salt Lake City

Table 8-17 summarizes the sources of water available to the Salt Lake City service area of MWDSLS and compares the total supply with the projected demand.

Table 8-17 shows that the Salt Lake City service area of the MWDSLS would have a sufficient water supply to meet its needs until 2050, based on its current sources of supply. The tabulated surplus of supply over demand would provide flexibility in water management to accommodate variations in the rate of community growth in its service area. It is noteworthy that the application of water conservation measures would have the effect of keeping estimated needs from rising above the 2000 amount until beyond 2030.

Sandy City

Table 8-18 summarizes the sources of water available to Sandy City service area of the MWDSLS and compares the total supply with the projected demand.

Table 8-18 shows that the water supplies available to the Sandy City service area of the MWDSLS, with the future ULS water supply and wastewater recycling, would meet its demand through the year 2050.

TABLE 8-17
Projected Development of Water Supplies for
Salt Lake City Service Area of MWDSLS
Dry Year
(Units: acre-feet)

	Demand and Supply by Time Period					
	2000	**2010**	**2020**	**2030**	**2040**	**2050**
M&I Demand	96,000	96,000	96,448	97,304	97,887	107,154
Water Supplies						
Existing Supplies						
Groundwater Wells	18,911	18,911	18,911	18,911	18,911	18,911
Little Dell Reservoir	3,100	3,100	3,100	3,100	3,100	3,100
Big Cottonwood Creek	20,028	20,028	20,028	20,028	20,028	20,028
City Creek	4,690	4,690	4,690	4,690	4,690	4,690
Little Cottonwood Creek	13,212	13,212	13,212	13,212	13,212	13,212
Deer Creek Reservoir	22,910	22,910	22,910	22,910	22,910	22,910
CUP Jordanelle	22,800	22,800	22,800	22,800	22,800	22,800
(Minus losses from CUP delivery)	(1,600)	(1,600)	(1,600)	(1,600)	(1,600)	(1,600)
Total Existing Supply	104,051	104,051	104,051	104,051	104,051	104,051
Future Supplies						
Wastewater Recycling-CUP	-	-	-	4,070	4,070	4,070
Subtotal	-	-	-	4,070	4,070	4,070
Total Supplies	104,051	104,051	104,051	108,121	108,121	108,121
Net Surplus (or Shortage)	8,051	8,051	7,603	10,817	10,234	967

TABLE 8-18
Projected Development of Water Supplies for Sandy City Service Area of MWDSLS
Dry Year
(Units: acre-feet)

	Demand and Supply by Time Period					
	2000	**2010**	**2020**	**2030**	**2040**	**2050**
M&I Demand	34,979	33,928	32,503	32,885	38,556	41,600
Water Supplies						
Existing Supplies						
Groundwater Wells	14,400	14,400	14,400	14,400	14,400	14,400
Little Cottonwood Creek	7,880	7,880	7,880	7,880	7,880	7,880
JVWCD Lease	315	315	315	315	315	315
Provo River Project- Deer Creek	7,940	7,940	7,940	7,940	7,940	7,940
Bell Canyon	880	880	880	880	880	880
Subtotal	31,415	31,415	31,415	31,415	31,415	31,415
Future Supplies						
Temporary Lease Water	-	5,000	-	-	-	-
ULS	-	-	8,571	8,571	8,571	8,571
Wastewater Recycling-CUP	-		-	1,930	1,930	1,930
Subtotal	-	5,000	8,571	10,501	10,501	10,501
Total Supplies	31,415	36,415	39,986	41,916	41,916	41,916
Net Surplus (or Shortage)	(3,564)	2,487	7,483	9,031	3,360	316

TIMING TO USE ULS WATER

Figures 8-2 and 8-3 show water demand and supply forecasts for MWDSLS member cities. MWDSLS anticipates the need for ULS water for its Sandy City service area between 2015 and 2020. MWDSLS understands that this matches the availability of ULS water. Salt Lake City does not anticipate a need for ULS water in the coming years.

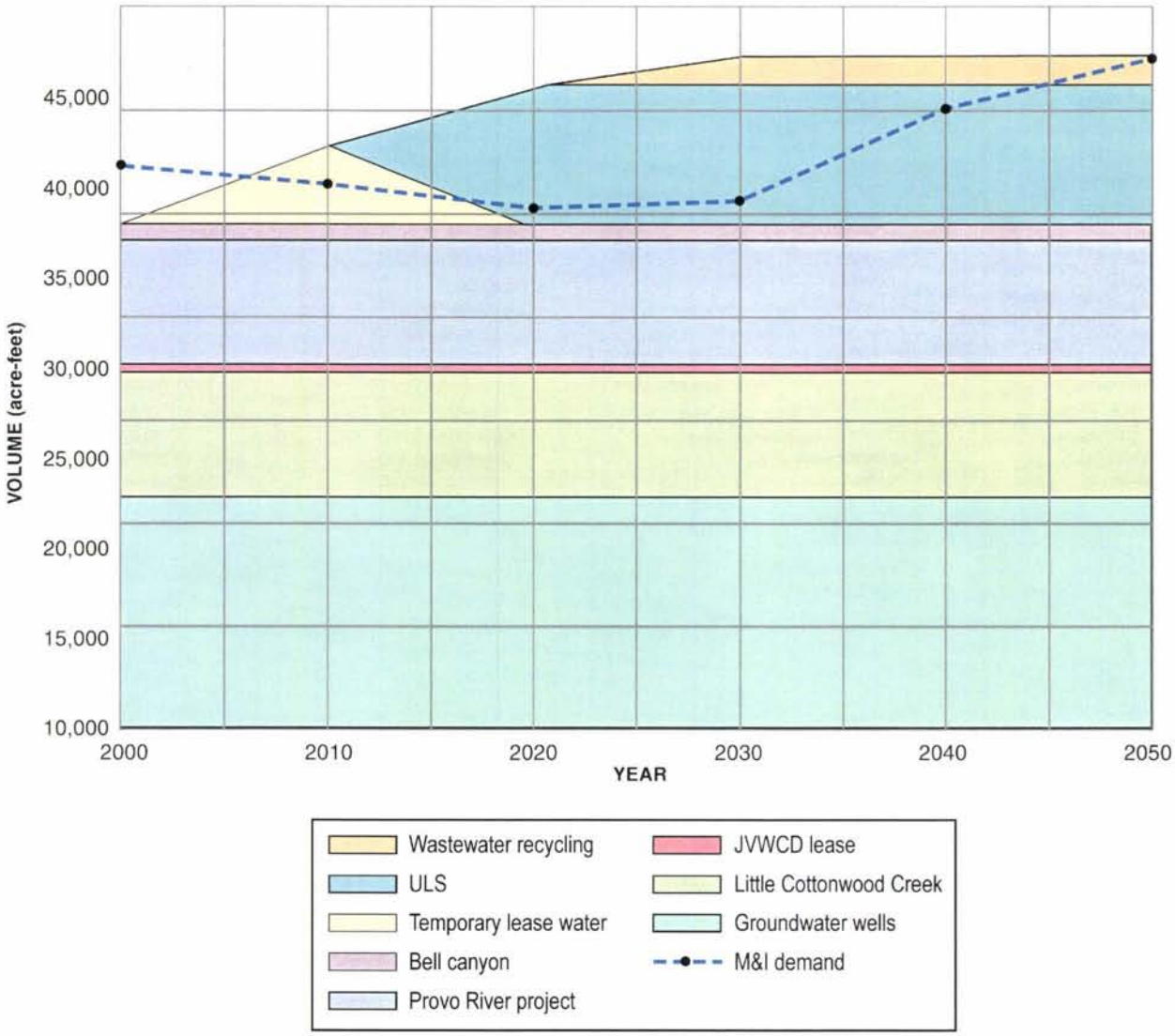


Figure 8-2
Water Demand and Supply Forecasts for MWDSLS Member Cities

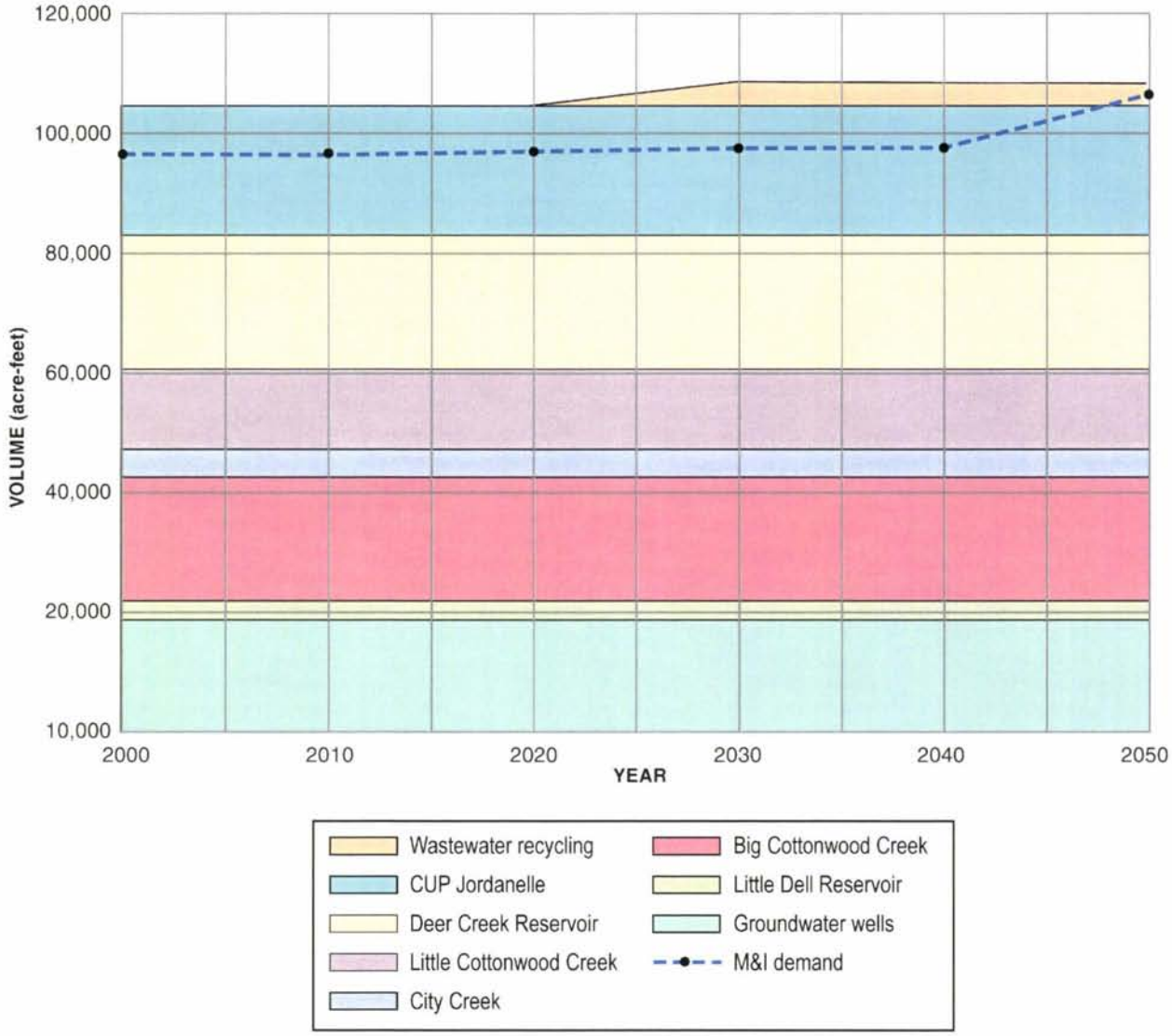


Figure 8-3
Water Demand and Supply Forecasts for MWDSLS Member Cities

Central Utah Project Completion Program

Chapter 9

October 2004

UTAH RECLAMATION
MITIGATION
AND CONSERVATION
COMMISSION

Chapter 9

The assessment of M&I needs in the Heber Valley of Wasatch County drew heavily from the analysis completed by J.M. Montgomery in 1993 as part of the Wasatch County Water Efficiency Project. Current information on water supply was obtained from the Jordanelle Special Services District. Information from the Montgomery study and this assessment confirms that Wasatch County has a significant amount of agricultural water that could be converted to meet future M&I needs. The analysis in this M&I Water Needs Appendix concludes there would be no need for additional M&I water beyond what local supplies and agricultural conversion could meet. Attachment C presents details on the analysis for the individual communities.

POPULATION PROJECTIONS

At present, the only change in population projections from the February 2002 Plan Formulation Report is the replacement of the year 2000 population with year 2000 census data. Using the census data, the GOPB has set new Wasatch County population totals for the period of years 2000 to 2030. However, because of the small change, city populations for the various communities have not been adjusted by the Mountain Land Association of Governments to reflect the updated projections. The data recently available for year 2000 census populations and the population projections contained in the Draft Plan Formulation Report are presented in Table 9-1.

TABLE 9-1
Population Projections
Wasatch County

Community	Projections as Presented in Draft Plan Formulation Report						
	2000 Census	2000	2010	2020	2030	2040	2050
Charleston	378	501	871	1,354	2,106	3,500	5,482
Heber	7,291	6,232	8,552	10,496	12,880	16,320	20,697
Midway	2,121	2,548	3,681	4,755	6,143	8,449	11,095
Jordanelle Special Services District	n/a	n/a	663	2,034	3,705	6,207	9,246
Balance of County	5,425	4,830	5,991	6,167	6,402	5,106	1,407

TOTAL M&I DEMAND WITH CONSERVATION

Projected Water Usage with Conservation in Gallons per Capita per Day

Table 9-2 presents the projected M&I water demands in gallons per capita per day (gpcd) for the three communities in Wasatch. The projections assume that the State's water conservation goals would be met, which call for reductions in per capita use of 12 ½ percent by year 2020 and 25 percent by the year 2050.

TABLE 9-2 Projected Water Usage in Gallons per Capita per Day with Conservation Element Included (12 ½ % by year 2020 and 25 % by year 2050) (Units in Gallons per Capita per Day)						
City	2000	2010	2020	2030	2040	2050
	Units in GPCD					
Charleston	300	281	262	250	237	225
Heber	350	328	306	292	277	262
Midway	565	530	494	471	447	424
Jordanelle Special Service Area	N/a	213	198	189	180	170

Projected M&I Water Demands in Acre-Feet

The projected M&I water demands of the three communities in Wasatch County were calculated by multiplying the population projections in Table 9-1 with the per-capita water use values presented in Table 9-2. The resulting projections of M&I demands in acre-feet are projected to year 2050 in Table 9-3.

TABLE 9-3 Total M&I Water Demands with Conservation Element Included (12 ½ % by year 2020 and 25 % by year 2050) (Units: acre-feet)						
City	2000	2010	2020	2030	2040	2050
	Units in Acre-Feet					
Charleston	127	274	398	590	931	1,381
Heber	2,858	3,143	3,600	4,207	5,065	6,085
Midway	1,343	2,184	2,634	3,240	4,234	5,267
Jordanelle Special Service Area	N/a	158	452	784	1,248	1,761
Total	**4,328**	**5,759**	**7,084**	**8,821**	**11,478**	**14,494**

CAPABILITY OF EXISTING SUPPLIES TO MEET M&I DEMANDS

M&I demands are currently being met by groundwater and springs in the vicinities of the communities. Increased future demand could be met by additional groundwater pumping, which typically would involve the purchase of groundwater pumping rights currently exercised for production of irrigation water. Such "conversion" of water would generally involve the urbanization of the agricultural lands and the water attached to that land.

Existing Water Supplies in Wasatch County

Existing water supplies include:

- Groundwater
- Springs
- Surface Streams

Groundwater. Table 9-4 presents the groundwater rights, present yield of wells and the projected use of groundwater by the year 2050. The information in the table demonstrates by the year 2050 the communities will begin to maximize their groundwater pumping rights. Additional rights could be purchased through the process of converting agricultural water to urban use.

TABLE 9-4
Yield and Utilization of
Groundwater Wells in Meeting M&I Demand
(Units: acre-feet)

Community	Water Right (acre-feet)	Present Yield of Wells (acre-feet)	Total Groundwater Projected to be Used in Meeting Needs at Year 2050 (acre-feet)	Present Utilization Of Groundwater Rights (%)
Charleston	229	228	228	100%
Heber	3,929	3,929	2,566	65%
Midway	455	455	455	100%
Jordanelle Special Services District	1,000	0	1,000	100%
TOTAL	**5,612**	**4,612**	**4,249**	**76%**

Springs. The utilization of water from springs is the first priority of communities in meeting their culinary water needs. This is because of the low level of water treatment required for culinary use. Unlike southern Utah County, the availability of water from springs in northern Utah County for use as an M&I water supply is very limited. The total amount of M&I water from springs in northern Utah County is about 1,926 acre-feet. As shown in Table 9-5, only four communities have a water supply from springs with 100% utilization by these communities.

TABLE 9-5 Spring Water Available to Wasatch County Communities (Units: acre-feet)				
Community	**Water Right (acre-feet)**	**Present Yield of Wells (acre-feet)**	**Total Groundwater Projected to be Used in Meeting Needs at Year 2050 (acre-feet)**	**Present Utilization Of Groundwater Rights (%)**
Charleston	180	180	180	100%
Heber	3,519	3,519	3,519	100%
Midway	1,564	1,564	1,564	100%
Jordanelle Special Services District	0	0	0	0
TOTAL	**5,263**	**5,263**	**5,263**	**100%**

OTHER POTENTIAL SOURCES OF WATER FOR M&I USE

The greatest potential for additional water supplies to meet M&I water needs is through one or both of the following processes:

- Conversion of agricultural water to urban use;
- Purchase of irrigation water rights from irrigated lands not urbanized; and
- Implementation of water recycling

Urbanization of Irrigated Lands

Table 9-6 shows the projected water that could be made available as the population moves onto irrigated land in Wasatch County.

TABLE 9-6 Water That Could Potentially Be Made Available to Wasatch County Communities From Urbanization of Irrigated Lands					
Community	**2010**	**2020**	**2030**	**2040**	**2050**
Charleston	247	488	864	1,561	2,552
Heber	631	1,603	2,795	4,515	6,703
Midway	780	1,317	2,011	3,164	4,487
Jordanelle Special Services District	158	452	784	1,248	1,761
TOTAL	**1816**	**3,860**	**6,454**	**10,488**	**15,503**

The water resources available to Heber Valley within Wasatch County include the Provo River system, tributary streams, return flows, and groundwater. Prior to the Wasatch County Efficiency Project, approximately 98,000 acre-feet per year of historical diversions occurred within Heber Valley each year. Historical diversions from the Provo River for agricultural use within the Valley averaged approximately 55,000 acre-feet per year over the period of 1950-

1991. Principal local tributaries of the Provo River in the Heber Valley are Snake, Spring, Lake, Center and Daniels creeks. Of the 98,000 acre-feet approximately 43,000 acre-feet is diverted from these 5 smaller creeks. Table 9-7 presents the potential of local surface supplies from agricultural conversion to meet M&I needs.

TABLE 9-7
Surface Supplies Potentially Available to Wasatch County Communities

Community	Surface Water Within Community's Incorporated Boundaries (acre-feet)	Average Annual Amount Through Agricultural Conversion at Year 2050 (acre-feet)	Amount That Would Potentially Be Available	Estimate of Firm Yield
Charleston	Estimate a range of 30,000 to 50,000 acre-feet within boundaries	2,552	15,503AF	(1)
Heber		6,703		
Midway		4,487		
Jordanelle Special Services District		1,761		

(1)Firm yield of the 15,503 AF would be comprised of an amount that could be used directly in secondary systems plus the amount available through a conjunctive use program. Firm yield would be about 50% of the 15,503 AF.

Purchase of Irrigation Water Rights

A second category of potential M&I water supplies is the purchase of irrigation water rights from willing sellers on lands not projected to be urbanized by the year 2050. As described in the preceding section, the historical diversions from surface streams has been approximately 98,000 acre-feet. Through acquisition of water rights by developers or the city's themselves, and by appropriate change applications with the State Engineer, these water supplies could be used for M&I purposes.

Water Recycling

In Heber Valley, the Heber Valley Special Services District presently uses treated wastewater flows for irrigation of alfalfa. The Jordanelle Special Services District is investigating a recycling plan that would deliver sewage effluent to other irrigated lands in Heber Valley in exchange for irrigation rights. Beyond these two water recycling projects, others may be limited in nature because the return flows from Wasatch County are captured in Deer Creek Reservoir, where they combine with other Bonneville Unit M&I water in route to use in northern Utah County and Salt Lake County.

Summary and Conclusions

The analysis shows that the M&I water supply for the GOPB projected population in Wasatch County can be met through full utilization of existing groundwater wells and springs coupled with future conversion of irrigated land to municipal use. Because the ULS project does not contemplate or plan to develop these water supplies no detailed hydrogeology studies were

conducted in this review of potential groundwater/agricultural water supply conversion. Additional studies of water quality, return flows, wetlands, and impacts to other water users would be required in order to fully utilize available groundwater and agricultural water supplies for M&I use within Wasatch County.