

Resolution 15-99

A RESOLUTION ADOPTING THE CITY OF MOAB WATER CONSERVATION PLAN.

Whereas, pursuant to the requirements of H.B. 418, the City of Moab prepared a water conservation plan; and

Whereas, the City of Moab held a public hearing to receive input on the plan on June 22, 1999; and

Whereas, the City of Moab Water Conservation Plan has been presented to this meeting of the City Council;

NOW THEREFORE, WE, THE GOVERNING BODY OF THE CITY OF MOAB, DO HEREBY RESOLVE TO ADOPT THE PLAN AS PRESENTED TO THIS MEETING.

This resolution shall take effect immediately upon passage.

Passed and adopted by action of the Governing Body of the City of Moab in open session this 13th day of July, 1999.

CITY OF MOAB

By: 

Karla R. Hancock
Mayor

Attest:



Rachel Ellison
City Recorder

WATER CONSERVATION PLAN
City of Moab
Grand County, Utah
June 1999 - Adopted by Resolution #15-99

To meet the requirements of H.B. 418, an unfunded mandate
passed in the 1998 General Session of the Utah State Legislature
Utah Code Annotated 73-10-32

Introduction and Overview

The City of Moab, moved by severe water shortages during the uranium boom of the early 1950's, acquired rights to underground water which exceed culinary demand at currently zoned build out. The City of Moab can also meet additional culinary water demands from limited commercial annexations into the City or higher-density rezoning for affordable housing which might occur in the future. The City has a Public Facilities Analysis which defines, and Impact Fees to provide financing for, modest water system pumping and storage improvements to meet projected total service demands at build out. Projection of adequate drinking water supplies at build out depends on assumptions used by Utah State University (USU) that peak consumption will be 844.43 gallons per day per Equivalent Residential Unit (ERU). Only residences and guest accommodation units were considered in the USU ERU totals. The USU study did not project increases in other commercial or public facility water use.

The City of Moab is authorized to collect tax as a resort community by the State of Utah. Since 1996, non-residents in commercial facilities such as City motel and bed-and-breakfast rooms and restaurants consume an equal or greater amount of culinary water than is consumed by City, residents in housing units during the warm months of the year. The City of Moab confronts gallons-per-day demand 5.4 times higher for residences, 6.5 times higher for commercial facilities, and 15.1 times higher for public facilities like parks, schools, and cemeteries in the peak water use summer months than in the off-season coldest months. This peak demand is higher by 2,840,781 gallons per day, or 105% in 1998 than it was in 1993. This Water Conservation Plan takes the form of a report on the culinary water situation the City is currently experiencing, the trends in that experience in the past six years, and describes the measures the City plans to take to prevent growth in outside water use by residences, commercial establishments, and public facilities from overwhelming its otherwise adequate drinking water source and distribution capacity.

The requirements of H.B. 418 are largely redundant to those of the Regional Drinking Water Facilities Plan initiative currently underway in Utah to equip public drinking water suppliers to meet the new requirements imposed by the 1996 Federal Safe Drinking Water Act Amendments. Federal funds for the Regional Plan program are administered through the State of Utah Department of Environmental Quality's Division of Water Resources. One prescribed element in the Regional Plan for each water retailer is the water conservation measures taken and to be

taken by each retailer. This plan was therefore written by the Administrator of the Regional Drinking Water Facilities Plan designated by the Grand County Council from materials that will appear as a subset of the Regional Plan.

For the benefit of the Division of Water Resources staff who are obliged under H.B. 418 to prepare a summary of Water Conservation Plans to present to the Utah Legislature in November 1999, the "Data and Analysis" information types listed in the Division's "Developing a Water Management and Conservation Plan" guidelines are listed below the City of Moab Water Conservation Plan subheadings to which they pertain. The entire list of 17 items appears at the end of the Plan with commentary or indexing to the Plan, for the convenience of Division staff.

Historical Overview

The City of Moab was incorporated in 1902. The City is located at the north end of Spanish Valley to the south of the Colorado River. Spanish Valley is a salt collapse graben, formed when a dome of Paradox Formation salts bulged up, fracturing the overlying sedimentary formations. The fractured overburden and part of the salt dome eroded away, largely from runoff from six glacial periods in the La Sal Mountains through the Pack Creek drainage. Both sides of Spanish Valley have the sedimentary rock formations from the Navajo down through the Hermosa tilting upwards as they reach the valley walls. The formations on the east side of Spanish Valley are also uplifted further towards the east by the laccolithic intrusions that formed the La Sal Mountains. The Glen Canyon Group (Navajo, Kayenta and Wingate) of faulted sandstone conducts water downward from the mountains which surfaces in springs at various points along the Eastern Moab Fault complex on the eastern edge of Spanish Valley. The Utah DEQ Division of Drinking Water classifies this water as Pristine Ground Water.

Shortly after its incorporation, the City of Moab acquired a half-interest in Skakel Spring, located behind the Grand Old Ranch House about a mile south of the Colorado River. Skakel Spring was used as the culinary source for the drinking water system installed in the original platted town blocks to the south. Outlying farmhouses utilized wells for water. Contemporary with formation of the City, the Moab Irrigation Company built a diversion dam on Mill Creek where the creek enters the side of Spanish Valley, and currently provides irrigation water throughout the City, and to unincorporated areas north and west of Moab City. The Moab Irrigation Company water shares also provide the irrigation water to South Mesa and Wilson Mesa agricultural lands. Many residential lots in the original Moab City town blocks still have irrigation shares with which outside watering is done, the water being delivered down the gutters of the town streets to inlets into yards. With the loss of cultivated farmland to residential development, 308.79 of the 1,086.897 shares of the Moab Irrigation Company stock were acquired in 1979 by the Grand County Conservancy District, which diverts Mill Creek upstream into Ken's Lake for irrigation delivery above Moab in Spanish Valley. Since then, 66.5 shares of Moab Irrigation Company stock have been leased or purchased and transferred by private owners upstream to the Mill Creek Diversion for Ken's Lake. Five years ago the Moab Irrigation Company put in pressurized irrigation pipeline to replace their original open ditch system within

Moab. This Plan describes measures to continue use of Moab Irrigation Company diverted surface water for seasonal outside watering, rather than placing additional seasonal demand on pristine culinary ground water resources for irrigation. It would be very expensive to rebuild the Moab Irrigation Company pipeline system to act as a city-wide secondary irrigation system, but use of this surface water for outside watering in areas served by the company's pipelines requires no infrastructure investment to affect.

When the uranium boom occurred in SE Utah after World War II, Moab's population suddenly jumped from about 1,500 to 8,000, resulting in severe shortage of culinary water. In 1955, the City purchased the 1,600-acre Lloyd Sommerville Ranch, which contained Sommerville #1, #2, #3, McConkie, and Birch Springs. The City sold most of the ranch lying west of the spring area to George White, and located the Moab City Cemetery, Old City Park (which contains McConkie and Birch Springs) and the Moab Golf Course (which contains the Sommerville #2 and #3 Springs) on part of the remainder. The City drilled six wells adjacent to the Sommerville #2 and #3 springs. The springs (including Skakel) and the wells are the City of Moab water supply source today. Water from the Sommerville Ranch springs can fill the City water storage tanks (three, having 3,500,000 gallons capacity) by gravity flow. This flow and existing pumps on city wells are currently capable of delivering 5,311,713 gallons per day (GPD). At this writing, a contract for the purchase of the other half interest in Skakel Spring has been unanimously approved by the Moab City Council. The City currently owns 2/3 of the spring. However, only 1/2 of the spring is approved for culinary use.

Water Rights/Water Source Capacity
 ("Supply Sources" and "Water Quality")

Municipal Springs (water rights perfected)

cfs	Name of Spring	Water Right #	Priority Date
0.627	Skakel Spring (1/2)	05-2105	1880
0.21	McConkie Spring	05-2007	1903
0.2	Sommerville Spring #1	05-2008	6-12-1951
0.207	Sommerville Springs #2,3	05-2511	10-20-1958
0.089	Sommerville Springs #2,3	05-734	3-04-1969

1.333 cfs springs subtotal = 598.25 gallons per minute

Municipal Wells (perfected and proving)

cfs	Name of Well	Water Right #	Priority Date
3.0	Wells 4a, 5, 6, 7, 9, 11	05-169	9-15-1955
1.63	Same, perfected	05-206	10-07-1964
2.256	Same, perfected	05-716	10-24-1968
1.0	Same, being proved	05-101	1-27-1954
1.114	Same, being proved	05-183	2-21-1956
1.0	Same, being proved	05-336	4-14-1961

6.886 cfs perfected well subtotal = 3,090.44 gallons per minute

3.114 cfs pending well subtotal = 1,397.56 gallons per minute

11.333 cfs municipal total water rights as of 2/99 = 5,086.25 gpm, or 7,324,200 gallons per day.

If the other half interest in Skakel is transferred to culinary use, this will produce an additional 0.627 cfs or 281.4 gallons per minute source capacity of ground water. With 100% of Skakel, City culinary water source capacity would be 7,729,416 gallons per day of water classified as pristine under the Utah groundwater classification system.

Current Use and Per Capita Consumption

The City of Moab water billing system produces totals for the number of gallons billed for each billing period by meter service category. Service categories until January 23, 1997, were “residential,” “single rental,” “apartments,” “commercial,” “church-government,” “city-owned” (mainly parks and recreational facilities), “trailer courts,” “well,” “vacant,” and “lawn sprinkling.” For the following tables from 1993 through 1996, the column labeled “Dwellings” is a composite of residential, single rental, apartment, trailer court, and vacant totals, and consists entirely of occupied or vacant residential facilities. The “Church and Government” column is a composite of church-government, well, city owned, and lawn sprinkling categories, and represents almost entirely outdoor water delivery; in some winter months, almost all water in this category was unbilled discharge from the city springs. In the “Commercial” column, about 82% of the units served were transient rooms in bed-and-breakfast, motel, or hotel facilities. A table below shows the number of units by service category as of August, 1998, on the City of Moab billing system, with metered gallons of water in that billing period.

Moab has a high proportion of residents occupying manufactured housing (31.9% of all city residential electric connections), many of which are in 21 mobile home parks. There is no record of how many manufactured dwellings there are receiving water in the mobile home parks in each

billing period. After January 23, 1997, mobile home parks are considered a “commercial” connection by the billing system and water usage has to be estimated.

Because the Moab economy is dominated by the tourist services industry, “commercial” meters, in which category motels and restaurants are found, consume a relatively large portion of culinary water. The impact of visitors can be clearly seen in Grand County’s solid waste volume: although the county resident population whose solid waste is sent to the Klondike Flats landfill is about 7,500, during tourist season the volume of solid waste sent to the landfill is the amount one would expect from a resident population of 23,500. The amount of culinary water consumed by non-residents is not three times the amount of culinary water consumed by residents, but non-resident water consumption is critical to City of Moab water conservation and budgeting. The peak tourist season corresponds to the peak outside watering season, and accounts for a large portion of peak water demand on the City water system. In 1998, commercial accounts used 41.6% of all water delivered, versus 41.7% delivered to residences.

The only feasible method for calculating an estimate of per capita water use for resident humans in the City of Moab is to divide the estimated or inventoried number of residential units into the average gallonage delivered to them per day during a billing period, and then dividing this averaged-gallons-per-residence-per-day by the average household size (2.71) for Moab City as derived from the October 1998, Community Development Block Grant (CDBG) survey. There are two points in time in the 1990s when the number of residential units in the City of Moab was inventoried with some accuracy independent of the water billing system: in 1995 the Nellis and Hofman Public Facilities Plan found 2,051 residential units existing in the City; and in October, 1998 the CDBG survey found 2,281 residential electric meter connections in Moab which were not serving short-term rentals for tourists. The City water billing system was consolidated with the sewer billing system on January 23, 1997, and changed again in 1998 to include billing for refuse services. At intervals the number of meters and units served by those water meters was inventoried; the unit inventory for August 1998, is shown in a table below.

City of Moab Average Daily Culinary Water 1993-1994 Billings by Meter Type

Month	Dwellings gallons/day	Gallons per Capita*	Commercial gallons/day	Church and Government	TOTAL gallons/day
Jul 93	1,832,745	329.7	500,190	365,490	2,698,425
Aug 93	1,434,729	258.1	345,906	242,850	2,023,485
Sep 93	1,410,757	253.8	420,823	247,517	2,079,097
Oct 93	841,519	151.4	299,313	176,477	1,317,309
Nov 93	439,390	79.1	215,667	41,307	696,364

Dec 93	357,919	64.4	154,157	32,732	544,808
Jan 94	307,306	55.3	117,142	29,858	454,306
Feb 94	321,468	57.8	127,507	28,379	477,354
Mar 94	384,335	69.1	168,884	42,508	595,727
Apr 94	636,750	114.6	267,627	83,130	987,507
May 94	1,021,527	183.8	304,359	203,255	1,529,141
Jun 94	1,734,500	312.1	484,827	334,409	2,553,736
Avg.	896,506.7	159.74			

*Gallons per day per capita was calculated by dividing total residential gallonage by 2,051 dwelling units, then by average family size of 2.71. 150 gallons per day per person is used by the Utah Division of Water Resources guidelines as the benchmark above which water conservation measures are clearly needed.

In the 1993-1994 billing period, the highest residential use month consumed 5.95 times as much gallonage per day as the lowest residential use month. The highest commercial use month was 4.27 times higher than the lowest; the highest church and government use month was 12.88 times the lowest. The City of Moab water system delivered 5.94 times more gallons per day in the highest use month of July than in the lowest use month of January. In July 1993, at peak demand the water system was operating at 36.8% of its source capacity and 50.8% of its pumping capacity. In January, the City water system utilized only 6.2% of its source capacity and 8.6% of its pumping capacity. In the peak 1993-94 use month of July, 67.9% of water was consumed through residential meters, 18.5% through commercial meters, and 13.6% through church and government meters.

City of Moab Average Daily Culinary Water 1995-1996 Billings by Meter Type

Month	Dwellings gallons/day	Gallons per Capita*	Commercial gallons/day	Church and Government	TOTAL gallons/day
Aug 95	3,472,484	624.7	1,061,284	553,219	5,086,990
Sep 95	3,883,603	698.7	1,029,033	554,303	5,466,940
Oct 95	2,799,274	503.6	884,342	366,613	4,050,229
Nov 95	1,349,750	242.8	645,660	331,620	2,327,030

Month	Dwellings gallons/day	Gallons per Capita*	Commercial gallons/day	Church and Government	TOTAL gallons/day
Dec 95	861,248	155	414,994	388,777	1,987,600
Jan 96	732,165	131.7	318,174	233,187	1,283,526
Feb 96	814,862	146.6	311,996	148,343	1,275,200
Mar 96	951,374	171.2	402,010	166,484	1,519,868
Apr 96	1,336,520	240.5	669,130	213,493	2,219,143
May 96	2,122,265	381.8	1,069,348	369,926	3,561,539
Jun 96	3,115,817	560.6	1,333,267	457,607	4,906,690
Jul 96	3,274,113	589.1	1,527,245	543,552	5,344,910
Aug 96	3,574,500	643.1	1,357,600	823,477	5,755,577
Sep 96	3,340,603	601	1,213,213	781,967	5,335,783
Oct 96	2,351,232	423	1,259,868	385,452	3,996,552
Nov 96	1,877,213	337.7	1,269,230	306,583	3,453,027
Dec 96	1,143,871	205.8	734,677	243,348	2,121,896
96 Avg.	2,059,057	370.5	958,953	390,880	3,408,890
% Use	60.4%		28.1%	11.5%	100%
Ratio Hi/Lo	4.88 (Aug)/ 1 (Jan)	4.88/1	4.9 (Jul)/ 1 (Feb)	5.55 (Aug)/ 1 (Feb)	4.51 (Aug)/ 1 (Feb)

*Gallons per day per capita was calculated by dividing total residential gallonage by 2,051 dwelling units, then by average family size of 2.71.

At peak in August, the City of Moab water billing system shows daily delivery of 8.4% more gallons of water than the stated pumping capacity of the system. This is either due to a defect in the billing system, or to representation in it of water delivered to the Moab Cemeteries and Moab Golf Course which lie outside the city limits and consume water by a separate pumping and distribution line system than that which goes through chlorination and is fed into the City post-treatment storage tanks. This peak daily use represents 78.6% of City source water right volume. At lowest use in February 1996, the system was operating at 24% of current pumping capacity.

City of Moab Average Daily Culinary Water 1997-1998 Billings by Meter Type

Month	Dwellings gallons/day	Gallons per Capita*	Commercial gallons/day	Public Facilities gpd	TOTAL gallons/day
Jan 97	622,277	123.9	367,377	103,290	1,092,945
Feb 97	434,261	86.3	534,504	51,507	1,020,271
Mar 97	492,865	96.9	649,642	238,765	1,381,271
Apr 97	755,030	149.1	918,960	778,587	2,452,577
May 97	1,366,797	269.6	1,663,132	697,268	3,727,197
Jun 97	2,018,593	384.7	2,858,253	291,263	3,149,735
Jul 97	2,580,339	491.8	3,760,858	480,032	6,821,229
Aug 97	2,382,155	454	3,431,919	561,058	6,375,132
Sep 97	1,694,573	323	2,467,267	437,267	4,599,107
Oct 97	1,057,116	201.5	1,386,342	253,394	2,696,852
Nov 97	938,680	178.9	919,487	152,743	2,010,910
Dec 97	837,326	159.6	691,358	96,300	1,624,984
97 Avg.	1,270,879	242.2	1,644,807	346,771	3,262,457
% Use	39.0%		50.4%	10.6%	100%
Ratio Hi/Lo	5.94 (Jul)/ 1 (Feb)		10.24 (Jul)/ 1 (Jan)	13.54 (May)/ 1 (Feb)	6.69 (Jul)/ 1 (Feb)
Jan 98	769,252	124.4	558,184	679,032	1,395,339
Feb 98	965,596	156.2	562,166	699,929	1,798,518
Mar 98	1,501,019	242.8	1,254,135	69,452	2,824,606
Apr 98	791,040	128	775,117	85,453	1,651,610
May 98	891,623	144.2	883,523	161,842	1,936,987
Jun 98	1,061,233	171.7	958,147	279,300	2,298,680
Jul 98	1,487,806	240.7	1,607,577	1,015,458	4,110,810

Aug 98	1,387,890	224.5	2,189,690	1,961,626	5,539,206
Sep 98	946,683	153.1	930,867	214,473	2,092,023
Oct 98	820,058	132.7	791,835	228,735	1,840,629
Month	Dwellings gallons/day	Gallons per Capita*	Commercial gallons/day	Public Facilities gpd	TOTAL gallons/day
Nov 98	582,440	94.2	406,137	142,630	1,131,207
Dec 98	308,129	49.8	341,968	236,510	886,606
98 Avg.	960,596	155.4	958,639	382,473	2,301,708
% Use	41.7%		41.6%	16.6%	100%
Ratio Hi/Lo	4.83 (Jul)/ 1 (Dec)		6.40 (Aug)/ 1 (Dec)	28.24 (Aug)/ 1 (Mar)	6.25 (Aug)/ 1 (Dec)

*In 1998, 2,281 dwellings with 2.71 persons per unit were divided into daily use.

8/24-9/23/98 Moab City Water Meter and Unit Inventory

Meter Classification	# Meters	# Units*	Gallons Delivered	% Use
Single-family Residences	1,265	1,265	29,887,000	54.1%
Multi-family Residences	82	322	4,704,100	8.5%
Trailer Courts	21	393	1,190,000	2.2%
SUBTOTAL RESIDENCES	1,368	1,980	35,781,100	64.8%
Motel/Hotel/Bed & Breakfast	57	1,289	6,863,000	12.4%
Restaurant/Bar	26	26	1,549,000	2.8%
Business	127	147	2,258,000	4.1%
Office Rentals	31	42	1,173,000	2.1%
Gas Stations	12	12	676,000	1.2%
Medical Offices	5	5	129,000	0.2%
Hospital	1	1	148,000	0.3%

Meter Classification	# Meters	# Units*	Gallons Delivered	% Use
Schools	13	13	138,000	0.2%
Churches	11	11	92,000	0.2%
Government Offices	5	5	159,000	0.3%
Cemeteries	4	4	2,282,000	4.1%
Unbilled Compound Meters	21	141	3,962,000	7.2%
TOTALS	3,048	3,676	55,210,100	

*# of Units is from the sewer billing system.

Capital Improvements Plan
 (“Demand Projections” and “System Deficiencies”)

In 1994, Grand County and the City of Moab collaborated in preparing a build out study as the basis for a Capital Improvements Plan for the County and the City to provide for public facilities demand at build out. The Public Facilities Analysis, Grand County/City of Moab was delivered by Lee Nellis and Bill Hofman on July 16, 1996. The County proceeded to have Nellis and Hofman prepare a “Development Impact Fee Report,” which was delivered April 3, 1997, and subsequently adopted county development impact fees. The City had Utah State University’s Department of Economics prepare a “Moab City Impact Fee Analysis,” which was delivered January 30, 1998. The City adopted impact fees in 1998 based on this rational matrix.

USU’s analysis concluded that, at build out, the City water system would need to both store and pump 6,019,122 gallons per day at peak summer demand. Current pumping capacity of 5,311,713 gallons per day is 707,409 GPD short, and storage of 3,500,000 gallons is 2,519,122 gallons short of needed capacity at build out. The build out study predicts 3,992 additional equivalent residential units (ERU) of culinary water demand at build-out in the City. Pump expansion costs of \$318,334, storage expansion costs of \$881,693, and planning/analysis costs of \$19,000 (totaling \$1,219,027) supports a water development impact fee of \$305 per ERU.

The City replaced the main transmission pipeline from the golf course spring and well field to the town storage tanks in 1993, at a cost of \$1,501,285, oversizing by 56% so the water distribution system can meet build out demand without further capital investment.

The 1996 Public Facilities Analysis, Grand County/City of Moab addressed the water demand from development of land already within the City of Moab, or contained in “islands” of unincorporated county within City boundaries, to the density limit of current zoning. Existing city residential zoning would allow 4,298 additional units to be added to the 2,051 existing in

1995. Annexation of unincorporated “islands” would add 288 additional ERUs to the 32 existing in these islands in 1995. At build out, total residential units equal 6,669 housing a projected population of 18,473. The USU study apparently assumes a peak per capita water consumption of 304.8 gallons per day, because the total gallonage per day divided by 7,128 ERUs at build out equals 844.43 gpd per ERU, and 18,473 divided by 6,669 housing units equals 2.77 average persons per residential unit.

City commercial zoning permits an expansion from approximately 1,521,000 square feet to 4,489,066 square feet, an increase of three times, given current lot coverage rates continue in new construction. Industrial zoning permits an increase from the current 97,400 square feet to 281,289 square feet, a 65% increase. In the commercial zones, for motels without restaurants the City assumes each motel room equals 0.48 ERU; for motels with restaurants each room equals 0.69 ERU when development impact fees are levied.

With a source capacity of 7,324,200 gallons per day in hand, the City enjoys a surplus of 21.7% in water rights and source capacity over the 6,019,122 gallons per day build out **peak** demand. However, the Public Facilities Analysis did not assume any annexation of lands outside the current City of Moab perimeter boundary. This is a sound assumption for Grand County residential-zoned lands to the south of Moab in Spanish Valley. These rural residential areas are uphill from the Moab water system, already served by Spanish Valley Water and Sewer Improvement District (now the Grand Water and Sewer Service Agency), and typically consist of half acre or acre minimum lot sizes (larger minimums in most subdivisions by covenant) with farm animals and horses allowed on lots one acre or greater in size. The vast majority of these county property owners are as resistant to annexation into Moab as the City is rationally resistant to acquiring areas already receiving utility services which would bring no new tax revenues with them if annexed.

Commercial areas are a different matter. The unincorporated strip of private land along US 191 from the Moab City line to the Colorado River, then across it to the Arches National Park boundary, is zoned Highway Commercial by Grand County, and property owners there report plans for major tourist facility development. The first unit of this development exists, and construction of a second motel closer to the City boundary has been announced. One commercial property owner convinced the County to form the Arches Special Services District for water and sewer services to the area, but was apparently misinformed about the financial and regulatory feasibility of providing these services through a small district consisting entirely of commercially-zoned properties; speculative plans to do so appear to be abandoned at this time. The City of Moab collects no property tax, but funds municipal services primarily with the resort community sales tax authorized by the Utah State Legislature. Therefore, if the City annexes a commercial property, the City can collect taxes on sales to offset the cost of the municipal services the City provides. Cost-effective retailing of water and sewer services to the north US 191 corridor, and to the Arches National Park Visitors' Center and staff housing as the Superintendent has requested, has to come from the City of Moab, dictated by geography. Acquisition of the other half interest in Skakel Spring, which is located in the center of the north

US 191 unincorporated commercial corridor, permits the City to anticipate providing culinary water to the commercial properties and Arches National Park without reducing its surplus source capacity from the golf course area springs and wells. The cost of building water and sewer infrastructure in the north US 191 corridor is not contained in the City's Public Facilities Plan, but would be recovered from property owners as extraordinary costs upon annexation.

Moab City might modestly expand its municipal border southwards on US 191 in the Highway Commercial zoning district. However, much expansion in this direction is unlikely because one encounters the existing infrastructure of culinary water services from Spanish Valley Water and Sewer Improvement District on developed parcels, and there is a gain in elevation relative to the city water storage tanks as one goes south on US 191 from current Moab city limits.

Water Conservation Action Plans

The City of Moab has sufficient pristine groundwater source and distribution capacity at USU-projected levels of per capita or ERU use to meet reasonable future demands from growth within current city limits, from feasible annexation of commercial properties outside the city limits, and from limited rezoning of city parcels to higher density/granting density bonuses for the public purpose of facilitating the construction of affordable housing.

Ratio of Peak Summer Month Daily Drinking Water Use to Lowest Winter Month Use
City of Moab Drinking Water Billing System, by Meter Category

Billing Period	Dwellings	Commercial	Public Facility	TOTAL
7/1993-6/1994	5.95:1	4.27:1	12.88:1	5.94:1
1996	4.88:1	4.90:1	5.55:1	4.51:1
1997	5.94:1	10.24:1	13.54:1	6.69:1
1998	4.83:1	6.40:1	28.24:1	6.25:1
Average	5.40:1	6.50:1	15.10:1	5.85:1

However, as shown above, water use outside in peak summer months is many times winter use. As growth continues, the City will not have sufficient drinking water supplies if outdoor water use from the drinking water supply is not restrained. Three proposed measures serve this end:

1. Public education on wise water use: As can be seen from the above tables, from November through April water consumption per capita by residents is typically below 150 gallons per day. In the hottest month, water use per day per resident is 5.4 times the lowest, coldest month. Commercial water use is 6.5 times higher per day in the hottest than the coldest month annually. Residential + commercial use accounts for between 83% and 88% of annual metered drinking water use in Moab City. Most of this difference is due to outdoor water use from April through

October, peaking in July or August. Planned actions: (1) Renew City public education through the media and bill enclosures, reminding people to not water in the heat of the day; to water for a long period of time at intervals to get deep penetration of water and encourage deep rooting of landscaping, rather than for brief periods often; and to encourage low-water-demand plant selection for landscaping (xeriscaping); (2) Sponsor public workshops on water-efficient irrigation and landscaping as a public service; (3) Revise landscaping standards in residential and commercial site development zoning regulations to require water-efficient landscaping cultivar selection and irrigation systems; (4) Develop and place attractive placards in guest facility bathrooms reminding visitors that they are visiting a beautiful desert in which water is limited, and spelling out ways they can conserve water during their stay.

2. Study and adopt incremental water rates keyed to excessive, wasteful use: Both the Grand Water and Sewer Service Agency and the City of Moab wish to derive standards for reasonable household water use per day; average per capita gallons per day are 157 and 155 in 1998, respectively, which suggests a joint study towards development of standards is feasible for small lot residences. Grand Water seeks standards for outside water use based on lot size; most lots are larger than 1/4 acre in Spanish Valley. Moab City seeks standards for water use by motels; the number of transient rooms in the City (1,289) is 65% as great as residential units (1,980) on the City water billing system in September 1998. If study of water use patterns can reliably differentiate excessive, inefficient patterns of culinary water use from conventional, reasonably efficient use patterns, both Spanish Valley and Moab City can develop a differential water rate structure in their computerized billing systems which would place a stiff surcharge on water use above that in the reasonably efficient range given the characteristics of the metered customer.

3. Explore ways to retain Moab Irrigation Company water shares for use for outside watering on lands within current and future Moab City limits: Most of the 711.609 remaining Moab Irrigation Company water shares which are delivered in Moab, north and west of Moab, and on Wilson and South Mesas above Mill Creek to the east of Spanish Valley could be bought and transferred to the Ken's Lake diversion on Mill Creek. Only the flow of the Left Fork of Mill Creek has to be diverted at the Moab Irrigation Company diversion below the Power Dam, just to the east of the Moab City limits. Inside the City limits and in the north US 191 corridor, a number of orchards, hay fields, pastures and gardens are currently irrigated with these shares. The author believes recharge from this irrigation is largely responsible for inflow to the Matheson Wetlands Preserve operated by the Nature Conservancy at the north end of Spanish Valley. When some of these parcels have been converted to residential or commercial development in recent years, the predominant pattern has been to cluster building, leaving large amounts of open space. This type of Planned Unit Development is encouraged by both City and County Comprehensive General Plans which seek to preserve open space and, in the county, agriculture and a rural way of life. If this open space is not irrigated, it becomes a weedy desert. If this open space is landscaped as City site development standards require and irrigated with city culinary water, replacing Moab Irrigation Company surface-diverted water, it would greatly expand demand for peak water over that projected by the Public Facilities Plan and the USU Department of Economics impact fee study. The City needs to explore and define ways in which parcels that are developed with large open spaces can obtain and/or retain Moab Irrigation Company irrigation water shares for outside

landscaping irrigation. Acquisition of water shares by the Nature Conservancy to maintain recharge of the Matheson Preserve should be pursued.

Division of Water Resources Water Management and Conservation Plan
Data and Analysis Items in Guidelines

1. Current Use: is fully presented in the Current Use section above - data from 1993 through 1998.
2. Per Capita Consumption: is calculated in the current use tables above. For the most recent complete year of 1998, average per capita consumption is 155.4 gallons per resident per day. The conservation plan problem which the City of Moab must solve is reducing the peak demand per residence (41.7% of system water use) and per commercial connection (41.6% of system water use), which demand is 5.4 times higher for residences and 6.5 times higher for commercial customers in the hot peak months of July and August than in the lowest demand months of January and February each year.
3. Demand Projections: are contained in the build out study and Public Facilities Plan. The build out study accounts for all development of all private land available within the City of Moab, and therefore has a projective scope greater than 20 years.
4. Supply Sources: are detailed in the Historical Overview and Water Rights/Water Source Capacity sections, pages 2-4, above.
5. System Deficiencies: are detailed in the Public Facilities Plan, which is summarized in the Capital Improvements Plan section above.
6. Intersystem Agreements: There are none, nor does anyone consider them feasible or constructive. The Grand Water and Sewer Service Agency which serves Spanish Valley is uphill and to the south of the City, and does not have sufficient water sources in hand to meet build out demand. The Agency is currently undertaking a \$4.7 million project to improve storage and distribution to resolve current system deficiencies, and collects impact fees towards expanding the system to meet growth demands in the future. Geography and gravity dictates that the Agency could supply the City with culinary water, but the Agency doesn't have the water and the City doesn't need it. The Grand Water Service Agency and City of Moab collaborate on matters affecting both such as source protection plans, financing of expansion of the sewage treatment plant, and regional drinking water facility planning.
7. Water Quality: is excellent. All drinking water supply for the City of Moab is Pristine Ground Water from wells and springs in a sandstone aquifer. The City of Moab and the Grand Water and Sewer Service Agency have jointly hired the Utah Geological Survey to develop a Source Protection Plan. Grand County has enacted a "Watershed Protection Zone" which can be

applied to lands within the County which are identified by UGS as requiring protective measures to prevent contamination of the aquifer.

8. The Treatment System: consists of minimal chlorination. USGS water sampling in 1997 found the drinking water of the City of Moab, before treatment, equals the quality of bottled drinking water from springs sold in stores.

9. The Distribution System: is described in the Capital Improvements Plan section above. The system is in excellent condition and is sized to meet current and projected demand. Some expansion of storage and pumping capacity will be needed to meet build out demand; funds towards these improvements are collected through Development Impact Fees.

10. Reuse Potential: is nil because the City of Moab sewage treatment plant is located next to the Colorado River on the edge of the Matheson Wetlands Preserve at the far, low, north end of Spanish Valley.

11. Environmental Aspects: are absent, since the City of Moab will not develop new water supply sources, does not have a water treatment facility and will presumably never have one, and will not expand the distribution system except for additional storage tank capacity at existing sites. The one environmental issue identified in this Plan is that of preserving groundwater flow into the Matheson Wetlands Preserve. This may largely depend on keeping Moab Irrigation Company irrigation water delivered to adjacent, upgradient lands.

12. Institutional and Political Factors: are not present, in the sense of the state's guidelines. The only factor relevant to the City of Moab Water Conservation Plan is the ability of the City to work with the Moab Irrigation Company and its shareholders to keep surface-diverted irrigation water flowing to areas within the City, rather than being moved away from these lands for application elsewhere.

13. Financial Resources: are provided for. Impact fees provide funds for modest future system improvements. Past improvements, except for the bonding for the 1993 transmission line upgrade, are paid for. Connection fees and user fees fully support the costs of operating the system and retiring the modest bonded debt.

14. Fiscal Structure: issues are covered in #13. The rate structure for water billing by Moab City is: Residential - \$5.54 minimum charge, including the first 2,000 gallons of use; \$0.44 per additional thousand gallons used is charged to 10,000 gallons; and \$0.60 per thousand is charged over 10,000 gallons used by a residence during a billing period (meters are read as of the 23rd of each month). Commercial - \$9.45 minimum charge, includes the first 2,000 gallons of use; \$2.10 is charged per thousand from 3,000 to 5,000 gallons; \$0.54 per thousand from 6,000-10,000 gallons; \$0.62/thousand from 11,000 to 50,000 gallons; and \$0.74/thousand for amounts over 50,000 gallons used per billing period. Rates for residences and commercial establishments served outside the City limits are twice these rates.

Works Director, Brent Williams. Mr. Williams is responsible for the operation of the city water system in compliance with federal and state standards. The office of City Treasurer operates the user billing system for water, sewer and refuse services.

16. Current or Existing Water Conservation Programs: exist only in the form of the emergency plan. The sandstone aquifer recharge plus storage has always been greater than withdrawals, so no "drought" problem has been encountered since 1902. In event of emergency, such as the main well pump failure occurring in 1998 at the Moab Golf Course, citizens are asked through the media to discontinue all outside watering until adequate water flow is restored. City Public Works staff go in the field to identify customers who haven't gotten the message. If citizens refuse to stop outside watering when asked, their water meter is turned off and locked. Gravity flow from the Sommerville Springs to the City storage tanks is sufficient to keep the storage tanks full and meet inside culinary water needs. Under emergency conditions, the City's concern is to maintain the storage tanks full so that water is available for fire fighting if needed during the supply shortage.

17. Public Relations: will be primarily handled through an active public education program, focused on limiting outside water use from the culinary water system. Thrift and good stewardship of the environment are values generally held by all groups in Moab. Providing people with assistance in water-conserving practices, and providing financial penalties for clearly wasteful and excessive practices, should enjoy general public acceptance as prudent government management. A forthright, continuing public dialogue between the City and its customers is critical to public acceptance and support.

Resolution 15-99

A RESOLUTION ADOPTING THE CITY OF MOAB WATER CONSERVATION PLAN.

Whereas, pursuant to the requirements of H.B. 418, the City of Moab prepared a water conservation plan; and

Whereas, the City of Moab held a public hearing to receive input on the plan on June 22, 1999; and

Whereas, the City of Moab Water Conservation Plan has been presented to this meeting of the City Council;

NOW THEREFORE, WE, THE GOVERNING BODY OF THE CITY OF MOAB, DO HEREBY RESOLVE TO ADOPT THE PLAN AS PRESENTED TO THIS MEETING.

This resolution shall take effect immediately upon passage.

Passed and adopted by action of the Governing Body of the City of Moab in open session this 13th day of July, 1999.

CITY OF MOAB

By: Karla R. Hancock

Karla R. Hancock
Mayor

Attest:

Rachel Ellison

Rachel Ellison
City Recorder