



**City of Phoenix
Water Services Department**

**TECHNICAL MEMORANDUM
ANALYSIS OF MULTIFAMILY WATER USE
FOR DETERMINATION
OF EQUIVALENT DWELLING UNIT FACTORS
FOR THE
WATER RESOURCES ACQUISITION FEE
AND FOR THE WATER IMPACT FEE**

August 15, 2006

EXECUTIVE SUMMARY

The City of Phoenix currently charges new development water resource and water impact fees to cover the cost of acquiring new water resources and constructing additional infrastructure to transport, treat and distribute water. These fees are assessed to different types of land uses using a system that utilizes the concept of equivalent dwelling units (EDU) to determine what the fair share of those costs will be – these EDU factors assign an average demand for service, in this case average water use, to various types of development projects. This study compares the average water use of a large sample of recently-constructed multifamily units with the average water use of single family units over the same period of time. More specifically, multifamily and single family water use data was used that reflected developments where water accounts were initiated after 1997 and that collected during the 2003, 2004 and 2005 calendar years. The results of the data analysis shows that the average daily water use (domestic & landscape) of a multifamily unit was 154 gallons over that period of time, and that the average daily use of single family units over the same time frame was 315 gallons a day. This analysis indicates that the MF EDU factor for multifamily units should be changed from the current .59 to .49.

INTRODUCTION

The City of Phoenix imposes development impact fees to finance a portion of the cost of infrastructure needed to provide services to new development, including facilities and water rights associated with water resources, and infrastructure associated with the treatment and transmission of potable water. Depending on the costs of providing these services, the fees are assessed differently in within different parts of the City.

Future fee levels for both the water acquisition fee and the water impact fee are determined by dividing up the cost of providing future services by the amount of anticipated future development. The cost of this infrastructure (or acquisition of water rights) through equivalent dwelling units (EDU's), which represent the proportionate share of demand placed on the water by a single-family residence. Average water use is used as a proxy for the amount of demand placed on the City's water system, and the EDU method of assigning demand for services is used both for 'planning' and 'assessment' purposes.

When estimating or interpreting existing and projected water demands (the 'planning' phase), the City of Phoenix Water Services Department (WSD) will either project total water demand by volume or by EDUs (which are based on volume) using estimates of water demand by either residential unit (single family or multifamily) or by thousands of square feet of office, retail, industrial or other specific uses. When assessing a fee for water acquisition or water treatment and distribution, WSD will also use EDU factors, although fees will be assessed either on the basis of unit type in the case of residential land uses, or on the basis of water meter size in the case of commercial and industrial land uses.

In 1994 a study commissioned by WSD to review the planning and assessment EDU factors used for water and wastewater was completed by MuniFinancial. That study investigated water use by various types of commercial and residential projects in Desert

View and Ahwatukee Villages, and provided revised EDU factors for a variety of land uses. One of the conclusions of the study was that not enough data was provided in the sample data on multifamily residential water use in the Desert Ridge and Ahwatukee to provide a definitive new MF EDU factor for either planning or assessment purposes. Instead, the study suggested that a second study be conducted using a larger sample of multifamily projects, perhaps across the entire City.

This technical memorandum summarizes the evaluation by WSD staff of a larger sample of multifamily project water use to determine the EDU factor that should be utilized for the determination of the water resource acquisition fee and the water infrastructure impact fee. WSD staff utilized water billing data provided by the Utilities Accounting division of the City of Phoenix Finance Department and apartment unit count data provided by the City of Phoenix Planning Department (Research Section) to estimate the average water use on a per unit basis in multifamily projects, and to compare that water use with average water use by single family units. An effort was made to utilize a sample of multifamily projects that reflected recent water use in a period of balanced water demands (i.e. wet and dry periods) that could be readily analyzed in conjunction with comparable single family water demands. As a result, data on water use by all multifamily projects built in the City of Phoenix in 1998 or later for the years 2003, 2004 and 2005 was evaluated on a per unit basis and compared with average water use by single family units built 1998 or later for the years 2003, 2004 and 2005.

This report summarizes the results of that analysis, and provides an EDU factor that can be used for both the 'planning' and 'assessment' phases of fee determination for the Water Resource Acquisition Fee and the Water Impact Fee. This revised EDU factor will be used by Red Oak Consulting in the preparation of the Phase II Water Resource Acquisition Fee Report, which will be available concurrently with this report, and by the Planning Department and Water Services Departments in the preparation of the water impact fee section of the City's impact fee update, which will probably be made available in the coming weeks.

DATA ANALYSIS

The objective of the Water Service Department analysis of multifamily water use was to determine the amount of water used by the average multifamily unit, and to compare that water use with the water used by the average single family unit, in order that an equivalent dwelling unit factor could be established for multifamily units. The existing EDU factor used in the City's Water Resource Acquisition Fee for both 'planning' and 'assessment' purposes, and in the City's Water Impact Fee for 'planning' purposes is .59. In functional terms, this meant that a multifamily unit was assumed to use, on average, about 59% of the water that a single family dwelling would use, and that as a result the water resource and water impact fees for a multifamily unit should be 59% of the water resource and water impact fees charged for a single family unit.

This factor was established in the 1980s, and since that time significant changes have taken place in water usage by residential and commercial customers at the City of Phoenix. As indicated in the Water Resource Plan and the Water Resource Fee Report (Phase II), average water use has steadily declined through the past decade and a half. Although much of this decline in water use can be attributed to advances in landscape

irrigation, reduction of turf areas, and the increased use of desert landscapes that require only occasional watering, some of the water use reduction can also be attributed to innovations in indoor fixtures like showers, toilets and washing machines. To identify how these changes in water use have affected the relative relationship between multifamily and single family water use, WSD staff analyzed data from the City of Phoenix Water Customer Information System, or WCIS, to establish an EDU factor for multifamily units based on more recent information.

Because the objective of the analysis was to provide a quantitative comparison of multifamily and single family unit water use under comparable and recent conditions, it was decided that only accounts established after 1998 would be used for the analysis, and that the water use data for 2003, 2004 and 2005 would provide the time period for the comparison. Utilities Accounting staff, who are very familiar with the water consumption data due to their water revenue modeling responsibilities, indicated that a significant change in water use was identified among units constructed after before or after 1998, making that a good 'cut off' time for the units to be analyzed. Utilities Accounting staff also indicated that the 2003, 2004 and 2005 time period would be a reasonable time period for comparing multifamily and single unit use because that timeframe included a good balance of wet and dry weather so that an unusually low or high level of rainfall would not skew the results either way (single family units likely have a higher proportion of outdoor irrigation water needs).

Using WCIS data provided by Utilities Accounting, WSD staff identified all multifamily projects that met the following criteria:

- A majority of the water meters were obtained in 1998 or later.
- Water use data was clearly discernable for both multifamily domestic (26) and landscape (02) meters.
- Water use data was clearly discernable for the entire 2003, 2004 and 2005 time period (36 months) for all of the water meters.
- Information was available from the Planning Department on the unit count for the address or addresses associated with the water meters.
- Account numbers and associated addresses could be clearly linked with unit count information provided by the Planning Department.

The resulting sample group included 14,472 units in 57 projects located in a variety of locations in Phoenix, including both the central City and the northern and southern growth areas of the City. As a result of the selection criteria, most of these projects were developed between 1995 and 2003, so the multifamily units are found in relatively new structures that tend to have water efficient irrigation systems and fixture units. Since the WCIS database does not provide information on actual unit counts (data is only kept on the water meters and associated information, and MF structures tend to have only one or a few water meters), only projects where the unit count was known were utilized.

Table 1 - Average Daily Water Use - Multifamily Projects (2003-05 Inclusive)

Multifamily Project	Total Water Use (03-05 Incl.) CCF	Number of Units	Per Unit Use (03-05 Incl.) CCF	Average Daily Use CCF	Average Daily Use Gallons
1	73,101	164	446	0.41	304
2	56,972	192	297	0.27	203
3	38,879	180	216	0.20	148
4	15,267	104	147	0.13	100
5	21,838	110	199	0.18	136
6	18,296	64	286	0.26	195
7	43,322	200	217	0.20	148
8	36,447	184	198	0.18	135
9	98,656	300	329	0.30	225
10	46,173	160	289	0.26	197
11	55,801	159	351	0.32	240
12	46,203	258	179	0.16	122
13	151,816	652	233	0.21	159
14	9,831	34	289	0.26	198
15	61,632	200	308	0.28	211
16	27,068	138	196	0.18	134
17	80,329	399	201	0.18	138
18	67,977	312	218	0.20	149
19	35,574	138	258	0.24	176
20	53,444	254	210	0.19	144
21	5,690	19	299	0.27	205
22	22,227	131	170	0.15	116
23	57,441	360	160	0.15	109
24	18,340	48	382	0.35	261
25	70,922	330	215	0.20	147
26	7,911	25	316	0.29	216
27	1,936	18	108	0.10	73
28	6,106	36	170	0.15	116
29	77,832	276	282	0.26	193
30	125,238	520	241	0.22	165
31	41,694	166	251	0.23	172
32	45,815	276	166	0.15	113
33	35,223	168	210	0.19	143
34	132,100	538	246	0.22	168
35	42,537	170	250	0.23	171
36	142,151	832	171	0.16	117
37	64,152	216	297	0.27	203
38	76,919	336	229	0.21	156
39	36,845	176	209	0.19	143
40	10,366	42	247	0.23	169
41	116,969	560	209	0.19	143
42	53,948	280	193	0.18	132
43	41,052	160	257	0.23	175
44	92,536	360	257	0.23	176
45	57,594	240	240	0.22	164
46	113,401	428	265	0.24	181
47	94,264	428	220	0.20	150
48	59,476	364	163	0.15	112
49	70,499	399	177	0.16	121
50	45,317	226	201	0.18	137
51	79,669	348	229	0.21	156
52	129,402	488	265	0.24	181
53	42,260	214	197	0.18	135
54	56,538	276	205	0.19	140
55	72,734	324	224	0.21	153
56	45,314	160	283	0.26	193
57	32,350	332	97	0.09	67
All Units	3,263,394	14,472	225	0.21	154

The average water use on a per day basis for all of the 57 projects and 14,472 units over the 2003 to 2005 period (36 months) was 154 gallons, with the lowest per unit daily water use showing at 67 gallons for one project and the highest per unit daily water use showing at 304 gallons for another project. However, most per unit water use was clustered within a relatively small band, with about three quarters of the multifamily projects showing average daily unit use of between plus or minus fifty gallons from the average unit use of 154 gallons. Only three projects showed very low average unit use at 100 gallons a day or less, and only nine projects had very high average unit use at 200 gallons a day or more. A significant portion of this difference is likely due to variations in landscaping water use – some of the projects had numerous water meters that showed heavy use, while others had much more limited numbers of landscape meters.

The per unit average daily water use calculated for multifamily units was then compared with the average daily water use for single family units. To obtain comparable single family water use, WCIS data for single family units built from 1998 on was obtained for the 2003-05 period (36 months) and used as a proxy for the equivalent dwelling unit for purposes of water use, and determination of the multifamily EDU factor for the water resource impact fee and water impact fee. The average single family dwelling unit water use for this group of relatively new homes was 315 gallons per day over the 2003-05 time period. Both the multifamily and single family average use numbers are from metered data, and only represent the amount of water used once water has been distributed to individual properties. The actual raw water and treated water quantities required to serve these types of homes is somewhat higher because of losses in the water treatment and distribution systems. However, for purposes of comparison for determination of EDU factors for water resource and water impact fees, the metered water use estimates are adequate.

Table 2 - Multifamily Water EDU Factor Calculations

Average MF water use per day per unit* (gallons)	154
Average SF water use per day per unit** (gallons)	315
MF Water EDU Factor	0.49

*Sample of 14,472 units in 57 projects that were built after 1998 (meter starts after 98) that have complete (36 months) domestic landscape meter data for 2003, 2004 and 2005

**All SF units that were built after 1998 (meter starts after 1998) that have complete (36 months) domestic and landscape meter data for 2003, 2004 and 2005

The best available data indicates that an EDU factor of .49 should replace the .59 factor used for multifamily units for purposes of calculating water and water resource impact fees. This represents an assumption that the average new multifamily unit uses slightly less half of the water used by the average new single family unit, in new developments in locations across the City of Phoenix. The .49 factor should be used for 'planning' and 'assessment' purposes, which is to say that the .49 factor should be used when estimating future water demands on the basis of land-use projections and when

determining the amount of fees that customers should be charged when obtaining permits for new buildings or new water connections.

Because water use in both multifamily and single family units is changing at a rapid pace, with significant reductions in water use still being achieved as the result of conservation programs, improved technologies and increased awareness of the need to reduce water use, this ratio should be re-evaluated some time in the next three to five years to ensure that the relationship continues to be accurately reflected. Unit sizes and fixture counts within both single family and multifamily structures continue to increase, while fixture units and landscape irrigation systems continue to become more efficient, so it is difficult to predict with any certainty how the ratio of water use between these two residential housing types will evolve.