

**DENVER RECREATION CENTER
AND SWIMMING POOL
WATER USE AND EFFICIENCY ANALYSIS
SUMMARY REPORT 2007**



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Prepared for: Denver Water



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2007 DENVER RECREATION CENTER AND SWIMMING POOL WATER USE AND EFFICIENCY ANALYSIS SUMMARY REPORT

Project Goals

The primary goal of the project was to carefully examine water use at 30 Denver recreation centers and 6 outdoor pool facilities (a total of 36 sites) and to determine what cost-effective water conservation measures can be successfully employed to reduce demand. Potential water savings have been projected for each site as well as for the 36 facilities as a whole. Water conservation measures were thoroughly examined to determine any negative or limiting factors that might be associated as well as any potential problems that might occur through equipment or process changes. Additionally the extent to which leaks are a problem at each site was documented. Outdoor irrigation was not included in this analysis. Individual site audit reports were prepared for each of the sites studied by Aquacraft. This summary report combines all results from those individual reports and compares demand patterns, conservation measures, and savings across different sites. This project was conducted by Aquacraft, Inc., Water Engineering and Management.

Analyses Performed

Beginning in May 2007, analysis began at Denver Recreation Centers and Pools. Aquacraft technicians audited a total of 30 Rec. Centers and 6 pool facilities. A detailed site audit was performed at each of the 36 sites. During the site audit every water using fixture, appliance, and piece of equipment at the site was identified and documented. Flow measurements were taken from faucets, showers and other available fixtures. As part of the audit a data logger was attached to the water meter at a majority of these facilities. Flow data was recorded from these water meters and end uses explored using Aquacraft's Trace Wizard software.

This summary report presents a synthesis of the individual report findings from 36 sites. This study identified significant water savings achievable from a range of potential retrofits, replacements and repairs of indoor water using fixtures and leaks. Many of these measures appear to be cost effective on their own, and others are cost effective only in combination with the entire package of measures.

In determining the benefits from conservation, the primary analyses took into consideration only the direct savings in water and energy to the operator of the recreation centers. If the capital value of the saved water is taken into consideration, which is a far greater value than that of the saved utility bills, then the conservation measures all appear much more desirable.

Recreation Centers and Pool Facilities

Denver recreation centers and pool facilities offer a range of amenities to visitors. The amenities at these sites typically include an indoor or outdoor pool, gymnasium, weight room, sauna, kitchen, multi-purpose rooms, arts and crafts rooms and game rooms. Ultimately, it is these amenities and the number of users that determine the level of indoor water demands and the potential for efficiency improvements. Appendix 1 provides details on the amenities and water usage found at each recreation center and pool site. Appendix 2 presents the total annual and average daily water demands at each site indoor meter.

Indoor Meter Water Demands

End uses of water at Denver Recreation Centers and pool facilities occur primarily through fixture and appliance use including: Faucet use, showering, toilet and urinal flushing, swimming pool filling, backwash, and maintenance, irrigation, evaporative cooling, leaks and other unexplained uses.

Table 1 shows the daily use estimates for all 36 sites. These estimates were developed through a complex process that involved flow trace measurement, analysis to total annual water use, and the number of patrons who visit each site per day. Denver Water provided historic consumption data and meter information on each site to Aquacraft at the beginning of this project. Patron usage data were obtained from the recreation department. During the analysis of flow trace data from these sites it became apparent that nearly half of the meters that Denver Water considered to be “indoor only” and pool meters actually served irrigation demands as well. This greatly complicated the analysis.

Table 1: Site end use estimates

| Rec. Center or Pool | END USE ESTIMATES (gallons/day) | | | | | | | | | |
|-------------------------|---------------------------------|---------|---------|---------|---------|---------|--------|------------|-------|---------|
| | Appliance | Cooling | Faucets | Showers | Toilets | Urinals | Pool | Irrigation | Leaks | Other |
| 20th St. | 30 | 0 | 190 | 821 | 758 | 322 | 425 | 0 | 40 | 54 |
| Ashland | 35 | 106 | 285 | 675 | 433 | 196 | 133 | 2,199 | 0 | 2 |
| Athmar | 0 | 583 | 250 | 994 | 637 | 159 | 775 | 5,725 | 24 | 110 |
| Aztlan | 0 | 0 | 62 | 187 | 191 | 48 | 0 | 0 | 0 | 12 |
| Barnum | 1 | 0 | 67 | 31 | 107 | 32 | 0 | 0 | 0 | 82 |
| College View | 7 | 0 | 121 | 29 | 304 | 71 | 0 | 0 | 0 | 0 |
| Community | 0 | 0 | 26 | 0 | 176 | 35 | 0 | 0 | 0 | 0 |
| Congress Park Pool | 0 | 0 | 110 | 547 | 520 | 241 | 15,286 | 0 | 0 | 8,611 |
| Cook | 36 | 46 | 102 | 726 | 412 | 121 | 0 | 0 | 0 | 19 |
| Eisenhower | 7 | 0 | 95 | 778 | 487 | 109 | 460 | 11,360 | 383 | 43 |
| Garfield Park Pool | 0 | 0 | 13 | 145 | 128 | 32 | 5,357 | 2,857 | 0 | 40 |
| Glenarm | 35 | 32 | 434 | 321 | 262 | 66 | 602 | 0 | 12 | 98 |
| Globeville | 25 | 0 | 56 | 121 | 144 | 90 | 0 | 0 | 46 | 18 |
| Globeville Pool | 0 | 0 | 56 | 54 | 300 | 0 | 3,513 | 0 | 0 | 80 |
| Green Valley Ranch | 42 | 0 | 38 | 103 | 326 | 85 | 0 | 2,804 | 580 | 8 |
| Green Valley Ranch Pool | 0 | 0 | 163 | 403 | 392 | 98 | 6,214 | 35,714 | 0 | 0 |
| Harvard Gulch | 37 | 142 | 90 | 230 | 286 | 71 | 792 | 4,850 | 245 | 15 |
| Harvey Park | 5 | 0 | 83 | 227 | 205 | 96 | 601 | 3,000 | 0 | 51 |
| Hiawatha Davis | 0 | 0 | 148 | 990 | 289 | 86 | 167 | 26,245 | 20 | 3,006 |
| Highland Senior | 7 | 0 | 155 | 0 | 275 | 69 | 0 | 0 | 0 | 23 |
| Johnson | 35 | 213 | 29 | 158 | 73 | 26 | 0 | 0 | 0 | 13 |
| La Alma | 95 | 0 | 87 | 224 | 135 | 50 | 0 | 0 | 338 | 30 |
| La Familia | 0 | 0 | 34 | 55 | 77 | 19 | 167 | 2,397 | 0 | 22 |
| Mestizo Pool | 0 | 0 | 166 | 810 | 531 | 133 | 4,536 | 40,000 | 579 | 18 |
| Martin Luther King JR | 0 | 0 | 145 | 401 | 274 | 77 | 1,001 | 0 | 180 | 123 |
| Montbello | 32 | 0 | 86 | 791 | 425 | 133 | 255 | 0 | 6 | 103 |
| Montclair | 77 | 0 | 53 | 373 | 224 | 56 | 157 | 0 | 0 | 24 |
| Platt Park Senior | 7 | 0 | 66 | 0 | 99 | 30 | 0 | 0 | 0 | 22 |
| Ruby Hill Pool | 0 | 0 | 35 | 259 | 335 | 92 | 5,214 | 0 | 5 | 178,760 |
| Rude | 0 | 0 | 126 | 1,029 | 538 | 252 | 675 | 0 | 76 | 5 |
| Scheitler (Berkeley) | 13 | 0 | 265 | 833 | 611 | 196 | 400 | 615 | 720 | 1,220 |
| Southwest | 30 | 0 | 22 | 98 | 159 | 40 | 934 | 0 | 2 | 52 |
| St. Charles | 38 | 6 | 83 | 61 | 207 | 70 | 0 | 6,520 | 0 | 10 |
| Stapleton | 13 | 10 | 234 | 645 | 749 | 187 | 0 | 1,909 | 4 | 12 |
| Swansea | 39 | 50 | 131 | 442 | 353 | 88 | 500 | 1,096 | 12 | 59 |
| Washington Park | 7 | 0 | 292 | 1,660 | 951 | 265 | 1750 | 0 | 76 | 0 |

Cost Effective Savings

Indoor water using fixtures at each recreation center and pool facility were tested for their individual water demand. Existing fixtures that did not meet or exceed the efficiency level of currently available fixtures were considered for retrofit, replacement, or repair. If the benefit cost ratio of retrofitting, replacing or repairing fixtures was greater than one, the measure was deemed cost effective and was recommended for implementation. Those fixtures that use heated water generated greater monetary savings from combined energy and water savings thus making them more cost effective to retrofit, replace or repair.

The recommended measures in this study represent the “low hanging fruit” for water (and energy) savings at Denver recreation centers and pools. From the perspective of the facilities themselves, these measures offer the most cost effective savings or “bang for the buck”. Table 2 shows the estimated aggregate water savings and economic analyses for all recommended measures at each of the 36 sites. Please see Appendix 3 or the individual site report for a list of the individual recommended measures at each of the 36 sites.

Table 2: Total savings of recommended measures

| No. | Rec. Center/Pool | Water Savings (kgal/year) | Annual Savings (\$/year) | Present Worth of Savings (r = 7%, 10 years) | Cost of Recommended Measures | Benefit Cost Ratio |
|-----|-------------------------|---------------------------|--------------------------|---|------------------------------|--------------------|
| 1 | 20th St. | 242 | \$907 | \$6,370 | \$2,084 | 3.1 |
| 2 | Ashland | 98 | \$405 | \$2,845 | \$442 | 6.4 |
| 3 | Athmar | 298 | \$1,187 | \$8,337 | \$3,290 | 2.5 |
| 4 | Aztlan | 21 | \$91 | \$640 | \$87 | 7.4 |
| 5 | Barnum | 15 | \$64 | \$453 | \$62 | 7.3 |
| 6 | College View | 27 | \$113 | \$793 | \$185 | 4.3 |
| 7 | Community | 3 | \$11 | \$80 | \$26 | 3.1 |
| 8 | Congress Park Pool | 22 | \$88 | \$617 | \$321 | 1.9 |
| 9 | Cook | 69 | \$283 | \$1,989 | \$526 | 3.8 |
| 10 | Eisenhower | 194 | \$775 | \$5,443 | \$295 | 18.5 |
| 11 | Garfield Park Pool | 4 | \$15 | \$105 | \$3 | 35.0 |
| 12 | Glenarm | 33 | \$137 | \$961 | \$317 | 3.0 |
| 13 | Globeville | 35 | \$139 | \$974 | \$275 | 3.5 |
| 14 | Globeville Pool | 2 | \$9 | \$64 | \$20 | 3.2 |
| 15 | Green Valley Ranch | 177 | \$651 | \$4,571 | \$3,319 | 1.4 |
| 16 | Green Valley Ranch Pool | 9 | \$39 | \$274 | \$20 | 13.7 |
| 17 | Harvard Gulch | 81 | \$305 | \$2,145 | \$721 | 3.0 |
| 18 | Harvey Park | 14 | \$59 | \$414 | \$50 | 8.3 |
| 19 | Hiawatha Davis | 165 | \$693 | \$4,867 | \$579 | 8.4 |
| 20 | Highland Senior | 36 | \$149 | \$1,049 | \$171 | 6.1 |
| 21 | Johnson | 13 | \$56 | \$394 | \$178 | 2.2 |
| 22 | La Alma | 107 | \$404 | \$2,840 | \$504 | 5.6 |
| 23 | La Familia | 7 | \$31 | \$216 | \$20 | 10.8 |
| 24 | Mestizo Pool | 63 | \$245 | \$1,723 | \$138 | 12.5 |
| 25 | Martin Luther King JR | 105 | \$414 | \$2,906 | \$1,224 | 2.4 |
| 26 | Montbello | 72 | \$291 | \$2,044 | \$608 | 3.4 |
| 27 | Montclair | 23 | \$99 | \$692 | \$94 | 7.4 |
| 28 | Platt Park Senior | 6 | \$24 | \$170 | \$79 | 2.2 |
| 29 | Ruby Hill Pool | 1 | \$5 | \$36 | \$30 | 1.2 |
| 30 | Rude | 48 | \$177 | \$1,243 | \$259 | 4.8 |
| 31 | Scheitler (Berkeley) | 368 | \$1,415 | \$9,936 | \$1,952 | 5.1 |
| 32 | Southwest | 2 | \$10 | \$69 | \$16 | 4.3 |
| 33 | St. Charles | 12 | \$52 | \$363 | \$47 | 7.7 |
| 34 | Stapleton | 240 | \$947 | \$6,652 | \$2,123 | 3.1 |
| 35 | Swansea | 58 | \$239 | \$1,681 | \$297 | 5.7 |
| 36 | Washington Park | 357 | \$1,411 | \$9,910 | \$2,023 | 4.9 |
| | TOTAL | 3,028 | \$11,939 | \$83,862 | \$22,385 | 3.7 |

Water and Cost Savings Summary

The total water savings possible from the combined recommended measures are significant. If all the recommended cost-effective retrofits, replacements or repairs are performed at Denver Recreation Centers and pool facilities, then aggregate water savings are estimated at **3,028 kgal per year**, equivalent to **9.3 acre-feet** annually.

Using a ten year time horizon and a 7% discount rate the total present worth of water savings from the combined recommended measures is nearly \$84,000. The total cost of the combined recommended measures (fixtures and install costs) is over \$22,000. Therefore, the resulting **benefit-cost ratio 3.7** indicates this study's recommended measures are cost effective and should be implemented.

Potential Savings

This study also examined the potential savings associated with retrofitting, replacing or repairing all inefficient water using fixtures, regardless of their individual cost effectiveness. If all inefficient fixtures at Denver Rec. Centers and pool facilities were retrofit, replaced or repaired the total water savings are estimated at 4,082 kgal per year, equivalent to 12.5 acre-feet annually. Thus, total potential savings is 3.2 acre-feet greater than what is possible with the aforementioned recommended measures. Table 3 shows the estimated aggregate water savings and economic analyses for this study's total potential savings.

Table 3: Total potential savings

| No. | Rec. Center/Pool | Water Savings (kgal/year) | Annual Savings (\$/year) | Present Worth of Savings (r = 7%, 10 years) | Cost of ALL Potential Measures | Benefit Cost Ratio |
|-----|-------------------------|---------------------------|--------------------------|---|--------------------------------|--------------------|
| 1 | 20th St. | 242 | \$907 | \$6,370 | \$2,084 | 3.1 |
| 2 | Ashland | 145 | \$405 | \$4,058 | \$3,031 | 1.3 |
| 3 | Athmar | 298 | \$1,187 | \$8,337 | \$3,290 | 2.5 |
| 4 | Aztlan | 53 | \$206 | \$1,449 | \$2,102 | 0.7 |
| 5 | Barnum | 34 | \$136 | \$952 | \$2,188 | 0.4 |
| 6 | College View | 75 | \$289 | \$2,030 | \$2,571 | 0.8 |
| 7 | Community | 41 | \$153 | \$1,075 | \$2,041 | 0.5 |
| 8 | Congress Park Pool | 43 | \$164 | \$1,155 | \$3,224 | 0.4 |
| 9 | Cook | 122 | \$480 | \$3,371 | \$3,395 | 1.0 |
| 10 | Eisenhower | 285 | \$1,109 | \$7,791 | \$3,774 | 2.1 |
| 11 | Garfield Park Pool | 9 | \$36 | \$256 | \$1,643 | 0.2 |
| 12 | Glenarm | 85 | \$328 | \$2,301 | \$3,399 | 0.7 |
| 13 | Globeville | 49 | \$188 | \$1,322 | \$2,213 | 0.6 |
| 14 | Globeville Pool | 16 | \$60 | \$419 | \$948 | 0.4 |
| 15 | Green Valley Ranch | 241 | \$883 | \$6,202 | \$6,188 | 1.0 |
| 16 | Green Valley Ranch Pool | 28 | \$110 | \$772 | \$2,072 | 0.4 |
| 17 | Harvard Gulch | 122 | \$456 | \$3,200 | \$6,099 | 0.5 |
| 18 | Harvey Park | 33 | \$130 | \$910 | \$790 | 1.2 |
| 19 | Hiawatha Davis | 186 | \$770 | \$5,410 | \$2,653 | 2.0 |
| 20 | Highland Senior | 75 | \$294 | \$2,064 | \$2,386 | 0.9 |
| 21 | Johnson | 14 | \$60 | \$421 | \$236 | 1.8 |
| 22 | La Alma | 123 | \$463 | \$3,252 | \$3,373 | 1.0 |
| 23 | La Familia | 24 | \$93 | \$655 | \$2,726 | 0.2 |
| 24 | Mestizo Pool | 88 | \$335 | \$2,351 | \$1,861 | 1.3 |
| 25 | Martin Luther King JR | 138 | \$536 | \$3,764 | \$1,951 | 1.9 |
| 26 | Montbello | 103 | \$403 | \$2,830 | \$5,244 | 0.5 |
| 27 | Montclair | 62 | \$241 | \$1,690 | \$4,497 | 0.4 |
| 28 | Platt Park Senior | 6 | \$24 | \$170 | \$712 | 0.2 |
| 29 | Ruby Hill Pool | 16 | \$60 | \$419 | \$1,647 | 0.3 |
| 30 | Rude | 81 | \$298 | \$2,090 | \$2,211 | 0.9 |
| 31 | Scheitler (Berkeley) | 458 | \$1,744 | \$12,252 | \$5,748 | 2.1 |
| 32 | Southwest | 34 | \$125 | \$879 | \$2,250 | 0.4 |
| 33 | St. Charles | 46 | \$177 | \$1,245 | \$3,432 | 0.4 |
| 34 | Stapleton | 240 | \$947 | \$6,652 | \$2,123 | 3.1 |
| 35 | Swansea | 108 | \$425 | \$2,984 | \$2,828 | 1.1 |
| 36 | Washington Park | 357 | \$1,411 | \$9,910 | \$2,023 | 4.9 |
| | TOTAL | 4,082 | \$15,632 | \$111,009 | \$98,952 | 1.1 |

Supplemental Recommendations

Dedicated Meters. Throughout the course of this study it was apparent that dedicated recreation center or pool facility meters are a rarity in Denver. Approximately half of the facilities evaluated have a mixed use meter that is shared with irrigation demands. Several of the shared meters are large enough that they are unlikely to provide a good resolution measure of low flow rate uses, such as faucets or showering. Thus, it would be beneficial for billing purposes and future analyses to install dedicated meters at all recreation centers and pool facilities.

Evaporative Cooler Audits. Evaporative coolers are typical at recreation centers, particularly above the gymnasiums. A detailed water audit of these cooling devices would offer insights into their water demand and the economic feasibility of replacing them with air conditioned units.

Improved Swimming Pool Metering. The level of water use efficiency at swimming pools is largely unknown. Pool filter back flush water, as well as (outdoor) annual pool refill and emptied water volumes are significant and require better data and metering to fully understand. The analysis in this report is limited to input data from Denver Water's billing database and anecdotal information from knowledgeable pool technicians. In most cases, direct measurements

were impossible to make. In a number of cases the meter identified by Denver Water appeared to served both a swimming pool and a neighboring irrigation system.

Irrigation Audits Needed. Irrigation demands appear to be a significant component of water use at and around Denver Recreation Center and pool facilities. A detailed water audit of the irrigated area, number of zones and overall system efficiency may offer valuable insights towards meeting *Tap-Smart: the Conservation Master Plan* objectives. Aquacraft recently conducted audits of the irrigation systems at Denver libraries and found significant problems at nearly all of these sites that if repaired could result in substantial water savings.

The following recommendations are made:

- Continue to re-plumb the centers so that all irrigation use is on separate water meters.
- Many of the centers show large amount of unexplained water use. These should be given more detailed follow-up studies.
- Install water meters on all of the swimming pools so that the total water use by the pools can be accurately tracked.
- Evaporative cooling systems should be checked for leakage, blockage of the cooling pads and excessive bleed. These actions will improve their efficiency.
- Irrigation efficiency audits of the recreation centers and the parks around them should be conducted.
- Once the irrigation systems are isolated, leak detection and alarm devices could be installed on the water lines to notify operators of leakage and even turn off the water lines when leaks are detected.

Discussion

This report presents the water savings and economic feasibility of implementing water efficiency measures at Denver Recreation Center and pool facilities. Given the initial expense associated with retrofitting, replacing or repairing some fixtures, and the usage levels at each site, the recommended measures are suggested for immediate implementation. While economic analyses show that the additional measures that did not make the recommended list are not economically justified solely on the basis of savings to individual recreation centers and pools, they are validated when benefits and costs are aggregated across all sites.

The non-monetary value of saving an extra 3.2 acre-feet per year of water supply should not go unnoticed. The external benefits to the City of Denver (and its residents) associated with maximizing facility water use efficiency is that it may aid in meeting Denver's water conservation goals. Moreover, any reduction in Denver's water demand enables that much more flexibility during peak use times and in the event there are shortages due to climate related supply impacts.

As mentioned above, it is important to consider the capital value of the saved water to Denver Water when evaluating the possible retrofits. The current marginal value of gaining access to new firm water supplies along the Front Range is anywhere from \$10 to \$80 thousand dollars per acre-foot. This study finds cost per acre-foot of saved water is \$2,410 for the recommended measures and \$7,900 for the combined measures. Thus, taking advantage of every opportunity to

enhance supply through all available conservation measures makes sense when capital values are taken into consideration. Moreover, each unit of water that is freed up by enhancing water use efficiency at Denver Recreation Centers and pool facilities, which are served at a lower marginal water rate, is available to sell at a higher rate to other customers served by Denver Water.¹

Therefore, it is suggested that Denver Water consider contributing to the cost of implementing all the potential measures to ensure Denver Recreation Centers and pool facility patrons use the City public water supply as efficiently as possible.

¹The city of Denver has a special water rate. Denver Water cannot charge the city more than the cost of delivering the water to them according to city charter. The City rate in 2007 is \$1.71 flat winter and summer.

Appendices

| Appendix 1 Rec. Center & Pool Facility Characteristics | | | | | | | | | | | | | | | | |
|---|-------------------------|-------------|--------------|--------------------|-----|-------------|-------|------------|---------|--------------------|---------------|-----------|------------------|--------------|---|-----------------------------|
| No. | Rec. Center / Pool | Indoor Pool | Outdoor Pool | Pool Volume (kgal) | Gym | Weight Room | Sauna | Steam Room | Kitchen | Multi-purpose Room | Arts & Crafts | Game Room | Annual Days Open | Uses per day | Water Use 2002-2006 Annual Average (kgal) | Irrigation on Logged Meter? |
| 1 | 20th St. | 1 | 0 | 77 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 302 | 386 | 797 | 0 |
| 2 | Ashland | 1 | 0 | 82 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 302 | 346 | 919 | 1 |
| 3 | Athmar | 1 | 0 | 124 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 302 | 319 | 2,796 | 1 |
| 4 | Aztlan | 0 | 1 | 128 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 250 | 96 | 2,566 | 0 |
| 5 | Barnum | 0 | 1 | 110 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 302 | 68 | 157 | 0 |
| 6 | College View | - | - | - | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 250 | 143 | 150 | 0 |
| 7 | Community | - | - | - | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 250 | 71 | 553 | 0 |
| 8 | Congress Park Pool | 0 | 1 | 388 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 70 | 289 | 2,084 | 0 |
| 9 | Cook | 0 | 1 | 170 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 302 | 311 | 794 | 0 |
| 10 | Eisenhower | 0 | 1 | 110 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 302 | 217 | 4,144 | 1 |
| 11 | Garfield Park Pool | 0 | 1 | 138 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 70 | 64 | 683 | 1 |
| 12 | Glenarm | 1 | 0 | 118 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 302 | 131 | 562 | 0 |
| 13 | Globeville | - | - | - | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 250 | 135 | 129 | 0 |
| 14 | Globeville Pool | 0 | 1 | 118 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 70 | 150 | 430 | 0 |
| 15 | Green Valley Ranch | - | - | - | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 250 | 170 | 1,203 | 1 |
| 16 | Green Valley Ranch Pool | 0 | 1 | 158 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 70 | 196 | 3,009 | 1 |
| 17 | Harvard Gulch | 0 | 1 | 158 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 250 | 143 | 1,689 | 1 |
| 18 | Harvey Park | 0 | 1 | 138 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 302 | 192 | 1,289 | 1 |
| 19 | Hiawatha Davis | - | - | - | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 302 | 257 | 6,786 | 1 |
| 20 | Highland Senior | - | - | - | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 250 | 137 | 1,408 | 0 |
| 21 | Johnson | - | - | - | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 250 | 51 | 137 | 0 |
| 22 | La Alma | 0 | 1 | 380 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 250 | 100 | 185 | 0 |
| 23 | La Familia | 1 | 0 | 120 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 302 | 38 | 909 | 1 |
| 24 | Mestizo Pool | 0 | 1 | 230 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 70 | 265 | 5,932 | 1 |

| Appendix 1 Rec. Center & Pool Facility Characteristics | | | | | | | | | | | | | | | | |
|---|-----------------------|-------------|--------------|--------------------|-----|-------------|-------|------------|---------|--------------------|---------------|-----------|------------------|--------------|---|-----------------------------|
| No. | Rec. Center / Pool | Indoor Pool | Outdoor Pool | Pool Volume (kgal) | Gym | Weight Room | Sauna | Steam Room | Kitchen | Multi-purpose Room | Arts & Crafts | Game Room | Annual Days Open | Uses per day | Water Use 2002-2006 Annual Average (kgal) | Irrigation on Logged Meter? |
| 25 | Martin Luther King JR | 1 | 0 | 190 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 302 | 155 | 576 | 0 |
| 26 | Montbello | 1 | 0 | 100 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 354 | 399 | 518 | 0 |
| 27 | Montclair | 1 | 0 | 187 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 354 | 167 | 38 | 0 |
| 28 | Platt Park Senior | - | - | - | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 250 | 61 | 30 | 0 |
| 29 | Ruby Hill Pool | 0 | 1 | 138 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 70 | 185 | 11,964 | -0 |
| 30 | Rude | 1 | 0 | 170 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 302 | 504 | 866 | 0 |
| 31 | Scheitler (Berkeley) | 0 | 1 | 170 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 302 | 346 | 1,597 | 1 |
| 32 | Southwest | 0 | 1 | 158 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 302 | 79 | 404 | 0 |
| 33 | St. Charles | - | - | - | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 250 | 140 | 1,749 | 1 |
| 34 | Stapleton | - | - | - | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 250 | 374 | 940 | 1 |
| 35 | Swansea | 0 | 1 | 125 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 250 | 176 | 692 | 1 |
| 36 | Washington Park | 1 | 0 | 190 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 354 | 530 | 1,813 | 0 |

| Appendix 2 Total Water Use | | | |
|-----------------------------------|-------------------------|------------------------------|---|
| No. | Rec. Center/Pool | 2006 Total Use (kgal) | 2006 Average Daily Use (gallons/day) |
| 1 | 20th St. | 753 | 2,493 |
| 2 | Ashland | 1,392 | 4,609 |
| 3 | Athmar | 2,829 | 9,368 |
| 4 | Aztlan | 3,282 | 10,868 |
| 5 | Barnum | 83 | 275 |
| 6 | College View | 134 | 536 |
| 7 | Community | 1,095 | 4,380 |
| 8 | Congress Park Pool | 2,960 | 42,286 |
| 9 | Cook | 552 | 1,828 |
| 10 | Eisenhower | 4,564 | 15,113 |
| 11 | Garfield Park Pool | 802 | 11,457 |
| 12 | Glenarm | 475 | 1,573 |
| 13 | Globeville | 66 | 264 |
| 14 | Globeville Pool | 511 | 7,300 |
| 15 | Green Valley Ranch | 1,393 | 4,613 |
| 16 | Green Valley Ranch Pool | 3,020 | 43,143 |
| 17 | Harvard Gulch | 1,845 | 7,380 |
| 18 | Harvey Park | 1,742 | 5,768 |
| 19 | Hiawatha Davis | 9,426 | 31,212 |
| 20 | Highland Senior | 2,107 | 8,428 |
| 21 | Johnson | 136 | 544 |
| 22 | La Alma | 9 | 36 |
| 23 | La Familia | 807 | 2,672 |
| 24 | Mestizo Pool | 3,274 | 46,771 |
| 25 | Martin Luther King JR | 664 | 2,199 |
| 26 | Montbello | 1,017 | 2,873 |
| 27 | Montclair | 35 | 99 |
| 28 | Platt Park Senior | 24 | 96 |
| 29 | Ruby Hill Pool | 10,592 | 151,314 |
| 30 | Rude | 808 | 2,675 |
| 31 | Scheitler (Berkeley) | 2,147 | 7,109 |
| 32 | Southwest | 431 | 1,427 |
| 33 | St. Charles | 2,750 | 11,000 |
| 34 | Stapleton | 919 | 3,676 |
| 35 | Swansea | 681 | 2,724 |
| 36 | Washington Park | 1,575 | 4,449 |
| Total | | 64,900 | 452,558 |

| Appendix 3 Recommended Measures | | | | | | |
|--|-------------------------|---------------------------------------|-------------------|-------------|---------------|---------------|
| No. | Rec. Center/Pool | RETROFITS/REPLACEMENTS/REPAIRS | | | | |
| | | faucet aerator | showerhead | leak | urinal | toilet |
| 1 | 20th St. | x | x | x | x | x |
| 2 | Ashland | x | x | | x | |
| 3 | Athmar | x | x | x | x | x |
| 4 | Aztlan | x | x | | | |
| 5 | Barnum | x | | | | |
| 6 | College View | x | | | x | |
| 7 | Community | x | | | | |
| 8 | Congress Park Pool | x | x | | x | |
| 9 | Cook | x | x | | x | |
| 10 | Eisenhower | x | x | x | x | |
| 11 | Garfield Park Pool | | x | | | |
| 12 | Glenarm | x | x | x | | |
| 13 | Globeville | x | x | x | x | |
| 14 | Globeville Pool | x | | | | |
| 15 | Green Valley Ranch | x | x | x | | |
| 16 | Green Valley Ranch Pool | x | | | | |
| 17 | Harvard Gulch | x | | x | x | |
| 18 | Harvey Park | x | x | | | |
| 19 | Hiawatha Davis | x | x | x | x | |
| 20 | Highland Senior | x | | | x | |
| 21 | Johnson | x | x | | | |
| 22 | La Alma | x | x | x | | |
| 23 | La Familia | x | | | | |
| 24 | Mestizo Pool | x | x | x | | |
| 25 | Martin Luther King JR | x | x | x | | |
| 26 | Montbello | x | x | x | x | |
| 27 | Montclair | x | x | | | |
| 28 | Platt Park Senior | x | | | x | |
| 29 | Ruby Hill Pool | | x | x | | |
| 30 | Rude | | | x | x | |
| 31 | Scheitler (Berkeley) | x | x | x | x | |
| 32 | Southwest | x | | x | | |
| 33 | St. Charles | x | | | | |
| 34 | Stapleton | x | x | x | x | x |
| 35 | Swansea | x | x | x | x | |
| 36 | Washington Park | x | x | | x | x |