

DROUGHT MANAGEMENT PLAN AND WATER USE REDUCTION GUIDELINES



**CITY OF PHOENIX
WATER SERVICES DEPARTMENT
2015 UPDATE**



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1.0 INTRODUCTION

Phoenix is built for drought.

In a broad sense, every water-related action the City and its residents have undertaken since the City was founded has been for the purpose of mitigating or responding to drought. Phoenix is not particularly vulnerable to earthquakes, blizzards, hurricanes, tornadoes, or other natural disasters, but it is nearly always hot and dry here, and drought is a constant threat. The rehabilitation of ancient canals, the building of Roosevelt Dam, the introduction of Colorado River water into central Arizona, the adoption of the Groundwater Management Act, the settlement of water rights claims with Native American communities, the development of the City's five surface water treatment plants, the installation of the water transmission mains and 7,000 miles of pipelines, the development of the City's two wastewater reclamation plants that treat water for re-use, the creation of the City's aquifer recharge facilities, the exchange program with the City of Tucson, and the implementation of the City's water conservation efforts are all activities undertaken to ensure public safety, economic opportunity, and quality of life in a desert community that basically exists in perpetual drought.

Since the 1980s, Phoenix has implemented water resource, water conservation, and infrastructure master plans. These efforts have led the City to have a diverse and ample water supply portfolio, have helped customers improve their water use efficiency, and have resulted in the infrastructure necessary to effectively convey water to customers. However, drought is a regular phenomenon in the southwestern U.S. and within the Colorado, Salt, and Verde River watersheds, where Phoenix gets most of its supplies. Reconstructed stream flow data on these watersheds indicates drought has endured for decades. Extended drought could lead to future water supply shortages for Phoenix. The Drought Plan builds upon these efforts and the City's Water Resources Plan, Water Infrastructure Master Plan, and Water Conservation Plan, and is crafted to:

- prepare Phoenix customers for the impacts of shortage;
- identify mechanisms through which the impacts caused by shortage can be shared equitably and in proportion to the magnitude of the shortage;
- identify tools that can be deployed to minimize disruption of the economy so that jobs are protected and regional economic stability is preserved;
- establish reliable two-way communication to provide timely information and feedback relative to voluntary measures and restrictions prior to and during shortage or other supply insufficiency conditions;
- ensure competent implementation of demand reduction measures; and
- identify tools that can be used to protect public health and safety during the most dire water shortage situations.



Phoenix completed its first Drought Management Plan (Plan) in 1990, followed by an update in 2000. In the 15 years since the update was completed, many tenets remain constant, but much has also changed and evolved. Changes in water demand since 2000, whether resulting from changes in plumbing code, landscaping preferences, types of non-residential uses, or other factors have implications for drought mitigation strategies. Phoenix has adjusted its supply portfolio by acquiring or leasing additional Colorado River supplies since 2000, but has also relinquished groundwater supplies from McMullen Valley. Climate change implications appear to be much more important, and many large-scale models point toward hotter and drier conditions in the southwestern U.S. However, much research still remains to be done to better understand what may happen in the future and how Phoenix’s supplies could be affected.

These factors, among others, led to this 2015 update to reflect these changes. One notable change for this update is the title of the plan, now called the Drought Management Plan and Water Use Reduction Guidelines. This change addresses a common misunderstanding about “drought” and “shortage”. The terms are often used interchangeably, but they have significantly different meanings, especially in the arid Southwest. In this context, **drought** is a prolonged period of unusually dry climatic conditions over the Colorado, Salt and Verde River watersheds that supply most of Phoenix’s water. These conditions reduce snowfall and rainfall, leading to a sustained period of below average spring runoff into reservoirs, which leads to a decline in reserve storage and supply security. **Shortages** occur when droughts endure with enough magnitude and severity such that normally available supplies are inadequate to meet current water demands. This distinction is important; it establishes a foundation for a prioritized, systematic framework of actions and measures that are adaptable to actual available supplies during both drought and shortage conditions.

It is also important to note that the City of Phoenix has maintained a very active and successful water conservation program since the 1980’s, and has experienced a significant decline in water consumption rates of roughly 30% over the last twenty years. The City focuses its water conservation efforts on long-term culture change regarding water use and encourages its customers to embrace a desert lifestyle. While demand management tools appear in the Drought Management Plan and Water Use Reduction Guidelines, these tools should not be confused with on-going water efficiency and conservation efforts, as the drought plan tools are targeted towards short-term efforts and extreme shortage situations. In other words, the drought plan is not a water conservation program.

1.1 CURRENT DROUGHT MANAGEMENT AUTHORITY AND REQUIREMENTS

1.1.1 DROUGHT MANAGEMENT ORDINANCE

In 1990 the Water Services Department (WSD) completed the first Drought Management Plan. That same year, WSD recommended that drought management authority be codified into ordinance to provide the mechanisms needed to implement the Plan by the WSD Director, which was adopted by City Council as the Drought Management Response Procedure (P.C.C. 37-



121). The Ordinance authorized the WSD Director to implement a Drought Management Plan based upon four progressively restrictive water use reduction stages tied to the severity of drought.

The WSD Director is authorized to declare water use reduction stages and impose water use reduction measures as generally prescribed below:

- A Stage 1 Water Alert is when an insufficient supply situation appears likely. This stage triggers an intensive public education and information program.
- A Stage 2 Water Warning is when an insufficient supply situation occurs. This stage authorizes the WSD Director to impose and enforce water use reduction regulations and to impose a drought surcharge on the City Services Bill.
- A Stage 3 Water Emergency is when additional reductions in water supplies occur beyond the Stage 2 level, and water transfers and groundwater pumping are insufficient to meet water demands in the service area. Additional or increased water use reduction regulations and increased surcharges may be implemented by the WSD Director at this stage.
- A Stage 4 Water Crisis is when the WSD Director determines that, based on the severity of the crisis, additional measures must be instituted to protect human health and safety.

The Drought Management Ordinance also describes the circumstances and uses of any surcharges, fees, penalties and variances that may be implemented by the WSD Director, and addresses shortages caused by short term events, giving the WSD Director the authority to implement an Emergency Response Plan to address them. Limited exemptions to drought response measures are given to reclaimed water users. Current language of the full ordinance can be found attached as Appendix A – Drought Management Ordinance.

1.1.2 STATE COMMUNITY WATER SYSTEM REQUIREMENTS – DROUGHT PREPAREDNESS PLAN

The State of Arizona’s State Community Water System requirements (A.R.S. § 45-341 - 45-343) specify that large community water systems (those systems that serve more than 1,850 persons) must prepare a drought preparedness plan that shall be designed to meet the specific needs of the water system. The plan must include contact information for the persons responsible for directing operations during an emergency period, drought response stages for the implementation of reductions due to shortage, a plan of action that the community water system will take in response to drought conditions, including public information and education provisions, development of emergency supplies, and specific water supply and or demand management measures for each stage of drought or shortage conditions.



2.0 SUPPLY AND DEMAND – PROVIDING A CONTEXT FOR DROUGHT MANAGEMENT

Phoenix has a unique portfolio of water supplies and specific characteristics about its water demand that are intrinsic to the management of potential supply shortages. Brief overviews of the City’s supplies and demands described below are intended to provide some context to Phoenix’s drought management and shortage mitigation approach. A comprehensive summary of supplies and demands can be found in the Water Resources Plan.

2.1 SUPPLY

Phoenix’s typical water supplies delivered to customers are grouped into five major categories:

- Surface water associated with the Salt River Project (SRP);
- Salt and Verde River water supplies developed by or exchanged to Phoenix;
- Colorado River water delivered through the Central Arizona Project (CAP);
- Groundwater pumped from City wells or delivered by SRP;
- Reclaimed water (or treated wastewater effluent) for certain non-potable uses; and
- Long-term Storage Credits.

The first three categories are all surface water supplies. Normally, more than 90 percent of the City’s demand is met with surface water from the Colorado, Salt and Verde Rivers. Surface water supplies are considered renewable because they are replenished with runoff from melting winter snowpack from the mountainous watersheds of the rivers. This is in contrast to groundwater, which is generally considered non-renewable because natural recharge into the underground aquifer from the surface is often a very slow process. However, unlike groundwater, surface water supplies in the southwest are susceptible to multi-year cyclical wet and dry periods. Drier periods caused by drought can last many years, which can lead to supply shortages for Phoenix. Climate change may exacerbate the length and intensity of drought in the southwest.

Phoenix (and the Arizona Water Banking Authority on behalf of Phoenix and other entities) also periodically recharges surface water supplies into the aquifer as a hedge or bank against possible supply shortages. Once stored, this water becomes a Long-term Storage credit that can be pulled back out of the aquifer, or “recovered” through the use of wells.

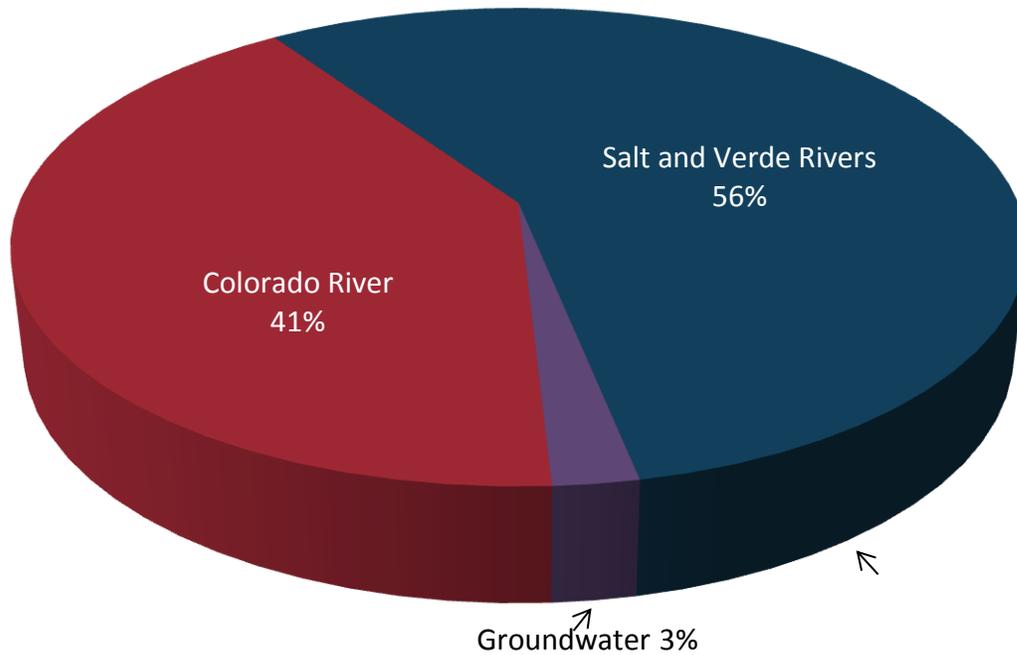


FIGURE 2-1. CITY DOMESTIC WATER SUPPLIES BY SOURCE, 2012 – 2014 AVERAGE

2.2 DEMAND

The City serves water for a wide range of uses. Residential water use, which includes single family homes, apartments, townhouses, condominiums, etc., accounted for about 71% of the City's water deliveries in 2014.

Commerce and Industry, which may include such diverse water uses as retail, restaurants, warehouses, hotels, offices and other non-residential private sector uses, accounts for another 20% of the City's water deliveries. Local, state and federal governments, as well as institutional users such as colleges and schools, account for the final 9% of the City's water deliveries.

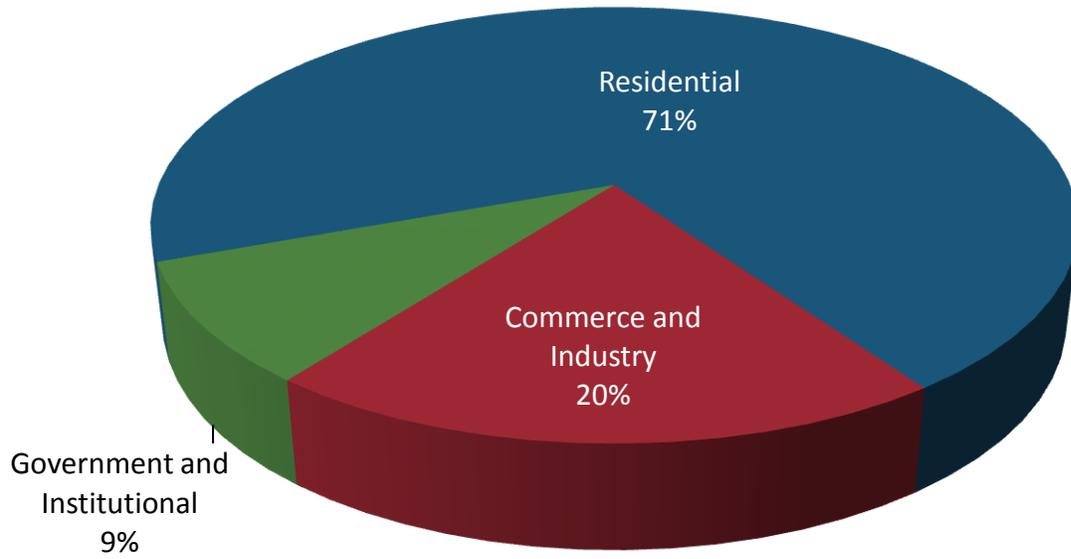


FIGURE 2-2. CITY WATER DELIVERIES BY SECTOR, 2014



3.0 PLANNING FOR DROUGHT

Preparing for drought-induced supply shortages requires strategies to both augment supply and reduce demand. The optimal mix of strategies is determined by the timing and potential volume of shortages, the lead time required to implement water supply augmentation and/or demand reduction projects, and the relative impact of each strategy. To determine the impact of each strategy, one must consider its relative costs, how scalable it is, how enduring its effects are, and its direct and indirect effects on economic, social, and environmental welfare.

3.1 SHORTAGE RESPONSE FRAMEWORK

The City of Phoenix integrates supply and demand strategies through a provision to help cover the additional costs of “emergency” supply deliveries and demand reduction programs specified in the City’s Drought Ordinance and through an adaptive Shortage Response Planning Framework that includes both supply augmentation as well as demand reduction measures (see Figure 3.1). Integrated supply and demand strategies are necessary because research suggests that surface water shortages on the Colorado, Salt and Verde River systems may last decades. In addition, the uncertainty of climate change may introduce a new normal in average annual surface water flows, requiring a need for long-term reductions in demand. The Shortage Response Framework is a progressive series of supply and demand actions designed to proactively prepare and respond to shortage impacts. Additional details on the Shortage Response Framework can be found in the Water Resources Plan.



**CITY OF PHOENIX
DROUGHT MANAGEMENT PLAN AND
WATER USE REDUCTION GUIDELINES**

PHASE	Lead Time	Supply Related Actions	Demand Related Actions
MONITOR	Continuous	<ul style="list-style-type: none"> - Monitor watersheds, reservoir status and threats to supplies. - Identify opportunities for supplemental or “safety net” supplies that can be acquired at a low cost relative to expected future supplies. 	<ul style="list-style-type: none"> - Monitor growth and usage trends. - Anticipate trend changes. - Research large water uses to better understand potential for demand reduction. - Maintain public awareness.
EXPLORE AND PLAN	Near term - decades	<ul style="list-style-type: none"> - Explore options to fund and deploy supplemental or “safety net” supplies. - Acquire necessary supplies or secure access to supplies. - Conceptualize regional scale supplemental supply projects such as infrastructure and supply exchanges. 	<ul style="list-style-type: none"> - Advocate for plumbing code changes to generate long-term savings. - Support customer actions to improve landscape water efficiency. - Prepare customers for future drought conditions.
PREPARE AND DEPLOY LONG RANGE	5-10 Years	<ul style="list-style-type: none"> - For large scale or infrastructure intensive projects, secure funding, develop designs, acquire land access and make other investments to reduce construction lead time. - For other projects where multiple purposes may be served (such as new wells for system redundancy), design, fund and construct accordingly. 	<ul style="list-style-type: none"> - Evaluate large commercial and industrial customers and sectors for opportunities to develop cooperative agreements.
DEPLOY SHORT RANGE	2-5 Years	<ul style="list-style-type: none"> - If supported by a current risk analysis and re-evaluation of shortage impacts, begin constructing necessary facilities. 	<ul style="list-style-type: none"> - Execute demand reduction agreements with specified large customers or sensitive customers in anticipation of shortage. - Establish general customer outreach strategy.
OPERATE	1 Year	<ul style="list-style-type: none"> - Prepare facilities and or supplies for deployment. 	<ul style="list-style-type: none"> - Prepare customers for mandatory demand curtailment measures. - Implement drought surcharge - Implement curtailment measures.
MANAGE	During Shortage	<ul style="list-style-type: none"> - Execute plans for supply deployment. - Manage sources in a manner to preserve options (e.g. maintain groundwater reserves to the highest degree practical, etc.). 	<ul style="list-style-type: none"> - Assist customers in meeting voluntary or mandatory reduction measures - Enforce mandatory measures.

FIGURE 3-1. SHORTAGE RESPONSE FRAMEWORK



3.2 MANAGING DEMAND IN THE CONTEXT OF SUPPLY SUFFICIENCY

The City of Phoenix distinguishes between two water use reduction strategies that are influenced by the availability of supplies relative to demand. The first strategy, improved efficiency, is one of the basic tenets of traditional water conservation efforts. Efficiency programs impart gradual reductions in water use and do not adversely impact customer lifestyles or business opportunities. Efficiency gains prove beneficial to customers and the City by reducing waste, reducing costs and augmenting supplies that may buffer shortage. The City of Phoenix emphasizes efficiency gains as a long-term culture change in the community. Citizens are encouraged to embrace a desert lifestyle as a benefit to the customer and the community, and as proactive mitigation against drought conditions. While a variety of efficiency programs will be on-going during “normal” supply conditions, these efforts may be accelerated as the probability of shortage increases.

The second strategy, demand curtailment, is characterized as an urgent reduction of water demand necessary to mitigate supply shortfalls. Curtailment programs can be structured to minimize customer impacts and avoid measures that impose severe impacts on a customer’s quality of life and/or the local economy. Curtailment programs typically supplement, rather than replace efforts to accelerate efficiency improvements.

If demand curtailment becomes necessary, the City will employ a triage approach to balance water demand with available supplies; first targeting water use that provides the least value to customers and the community at-large. It is an inherently hierarchical approach, protecting societal and economic needs by initially targeting relatively innocuous uses such as leakage and waste followed by discretionary uses as deemed necessary. Only in the most pressing situations would essential uses get targeted for curtailment (See Figure 4-2, Demand Management and Supply Sufficiency).

The concepts shown in Figure 3-2 provide the foundation for WSD’s approach to prioritizing the curtailment measures identified under the water use reduction guidelines described in Chapter 4.

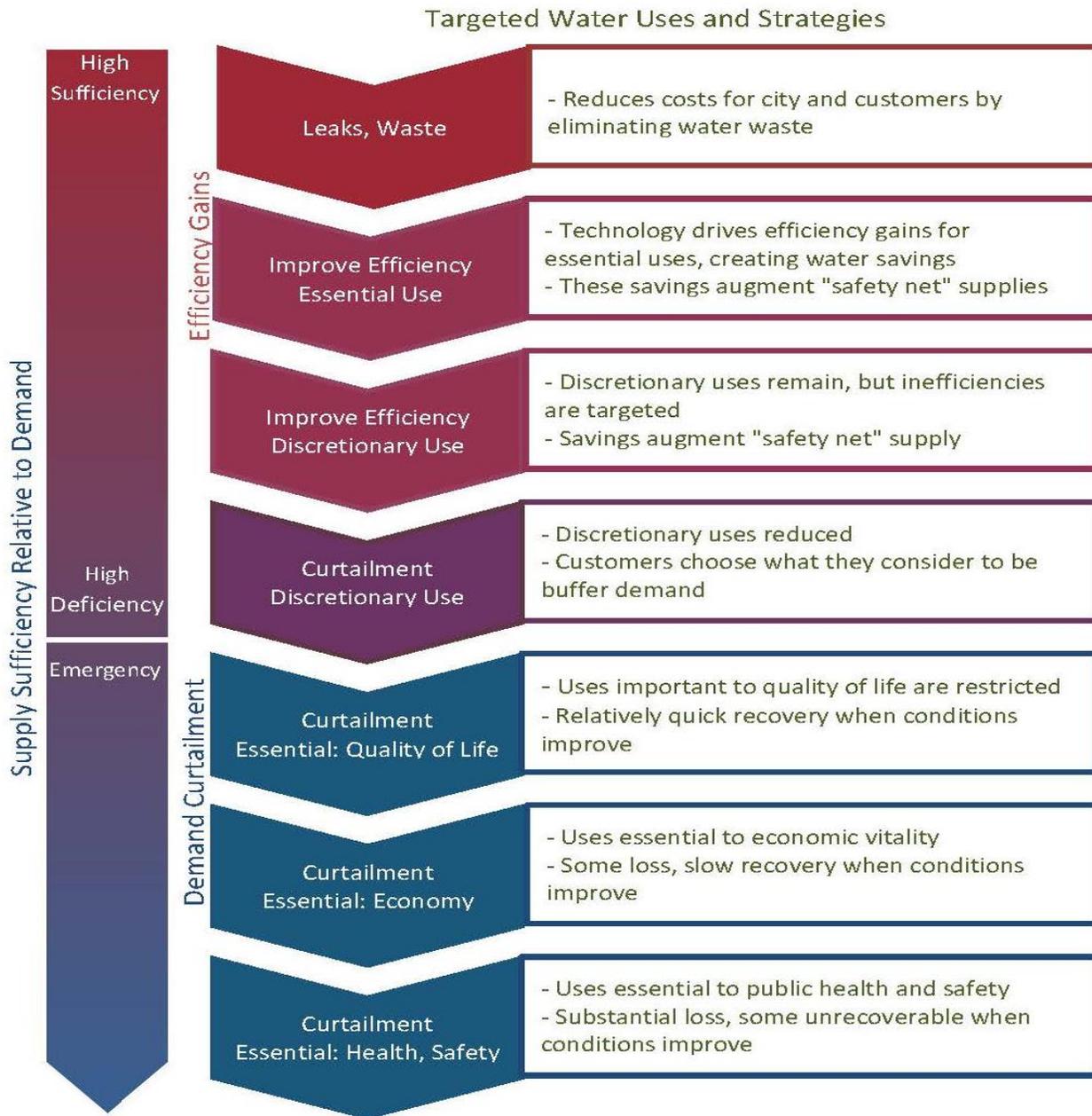


FIGURE 3-2. DEMAND MANAGEMENT AND SUPPLY SUFFICIENCY



CITY OF PHOENIX DROUGHT MANAGEMENT PLAN AND WATER USE REDUCTION GUIDELINES

One purpose of the Drought Management Plan and Water Use Reduction Guidelines is to raise customer awareness about ways to reduce their vulnerability to drought. This can be accomplished in part by identifying the types of water uses that are most likely to be impacted by regulations and/or surcharges if and when the City is faced with responding to supply shortages. It is a goal of the WSD to make adequate water available for customers to maintain a lifestyle of their choice, however it is important for customers to understand decisions on how water is used can come with a risk when the City is facing supply deficits.



4.0 SHORTAGE REDUCTION GUIDELINES

Because the severity, timing, and duration of a shortage is highly unpredictable, the measures described within this chapter serve as guidelines for specific actions that may be taken by the WSD Director if the City were to declare a shortage. These guidelines adhere to the intent of the Drought Ordinance.

The shortage reduction guidelines are summarized in Figure 4-1. Each curtailment measure was assessed for the following:

Primary Goal

- **Decision Making-** Specific actions to take during shortage will need to be periodically evaluated by internal and external stakeholders as shortage conditions are declared and unfold. Implementation of specific measures will need to be monitored, may require coordinated efforts, and where necessary, may need to be adjusted to achieve targets.
- **Raise Awareness-** Measures that inform and educate customers about water use and efficiency, as well as voluntary and mandatory requirements.
- **Reduce Waste-** Measures that address reducing water waste and leaks.
- **Improve Efficiency-** Measures that address improving water use efficiency through operational improvements, maintenance or replacement.
- **Curtail Demand-** Measures that either through voluntary or mandatory actions reduces water demand.
- **Use Avoidance-** Measures that prevent or reduce new water demand.

Relative Impact- Relative impacts are measured under broad and somewhat subjective “low”, “medium” and “high” categories. Impacts will need to be further defined when curtailment measures are anticipated to be executed in the near term.

- What is the water **savings potential** of the measure?
- **Scalability-** Can the measure pinpoint targeted sectors, be rapidly expanded or simply be implemented at such a large scale to effectuate notable water savings?
- **Durability-** Will the water savings of the measure endure, particularly if shortage is persistent and requires continued demand reductions?
- **City Cost-** How expensive will the measure be to the City?
- **Customer Cost-** How expensive will the measure be to the customer?

Stage- Is the curtailment measure a viable option for a stage or multiple stages specified in the Drought Ordinance (Stage 1- Water Alert, Stage 2- Water Warning, Stage 3- Water Emergency, and Stage 4- Water Crisis)?



Curtailed Measure	Primary Goal					Relative Impact					Ordinance Stage				
	Decision Making	Raise Awareness	Reduce Waste	Improve Efficiency	Curtailed Demand	Use Avoidance	Savings Potential	Scalability	Durability	City Cost	Customer Cost	Water Alert	Water Warning	Water Emergency	Water Crisis
Stakeholder Commission	✓						N/A	N/A	N/A	L	L	✓	✓	✓	✓
Implementation Task Force	✓						N/A	N/A	N/A	L	L	✓	✓	✓	✓
Customer Outreach		✓					L	L	M	M	L	✓	✓	✓	✓
City Actions			✓	✓	✓		L	M	M	M	L	✓	✓	✓	✓
Voluntary Reductions					✓		L	L	L	M	M		✓	✓	✓
Audits			✓	✓			M	M	M	M	M		✓	✓	✓
Rebates			✓	✓			M	H	H	H	M		✓	✓	✓
Efficiency Standards				✓		✓	H	H	H	M	H		✓	✓	✓
Mandatory Rationing					✓	✓	H	M	L	H	H			✓	✓
Moratorium on Growth						✓	H	L	L	H	H				✓

N/A = Not applicable H = High M = Medium L = Low

FIGURE 4-1. SUMMARY OF CURTAILMENT MEASURES

4.1 CURTAILMENT MEASURES

The following contains brief descriptions of the types of measures the WSD would consider if it becomes necessary to accelerate efficiency and/or curtail water use.

4.1.1 STAKEHOLDER COMMISSION

A stakeholder commission may be established prior to or during shortage conditions. The commission may consist of public and private sector members representing various water using customers and communities. The commission’s purpose would be to provide the WSD Director with guidance and feedback regarding potential implementation measures, to help the Director to understand how such measures may affect their communities, and to assist the Director with decisions regarding adjusting the implementation measures as shortage conditions evolve.

4.1.2 IMPLEMENTATION TASK FORCE

An Implementation Task Force may be established prior to or during shortage conditions. The Implementation Task Force would function as an interdepartmental group who would actively work to ensure curtailment measures required by the WSD Director are being effectuated, and



to provide feedback to both the Director and Stakeholder Commission regarding the outcomes of implemented measures.

4.1.3 CUSTOMER OUTREACH

Although the City maintains an active and effective conservation outreach program as part of its efforts to encourage customers to embrace a desert lifestyle, during certain drought or shortage conditions enhanced outreach will be necessary to update customers on water supply conditions and provide clear expectations about their water use. In addition, enhanced outreach communicates important ways customers may reduce their vulnerability to drought impacts and become more aware of shortage response measures, including voluntary rationing. Customer outreach may include general messages and/or targeted communication directed at specific types of customers or water uses. It may utilize traditional or social media platforms.

General Communication The following examples demonstrate how general messages might be altered to suit the different Water Reduction Stages in City Ordinance:

- **Water Alert-** Messaging raises awareness of watershed conditions, the probability of worsening conditions, and of actions by the City to avoid an imbalance.
- **Water Warning-** Messaging:
 - Updates the public on watershed conditions, the probability of imbalance, and actions by the City to augment supplies and/or curtail water use, and
 - Initiates a call-to-action for customers to take voluntary measures to curtail water use and reduce vulnerability to future restrictions and/or surcharges.
- **Water Emergency-** Messaging:
 - Updates customers on watershed conditions and imbalance intensity and duration, and
 - Informs customers of any education opportunities, incentive programs, mandatory measures, and surcharges.
- **Water Crisis-** Messaging:
 - Updates customers on the severity of watershed conditions and imbalance intensity and duration.
 - Informs customers of any education opportunities, incentive programs, and expanded mandatory measures and surcharges.

4.1.4 CITY ACTIONS

During a supply shortage it will be important for the City to demonstrate it is doing its part to extend available water supplies. The City will implement a **City Department Drought Response Plan**. The measures contained in the City Department Drought Response Plan will be



progressive to correspond with the Water Reduction Stages. The City Department Drought Response Plan will be implemented in a manner to avoid direct impacts on customers, though depending on the severity of the situation facilities used by customers such as parks and community pools may be impacted.

4.1.5 VOLUNTARY REDUCTIONS

During the early stages of stressed water supplies, the City may make a call-to-action for voluntary reduction measures. In general, voluntary reductions promote short-term curtailment of discretionary water uses. While customers would identify water uses they can curtail at their own discretion, the City will recommend opportunities to reduce consumption with the least impact to lifestyles. Voluntary reductions do not require enforcement and the primary cost of voluntary reductions to the City will be associated with customer outreach and education. Any costs incurred by customers as a result of voluntary reductions will be at the sole discretion of the customer and may be offset by lower water bills.

4.1.6 WATER AUDITS

Water audits of properties and/or buildings and facilities help customers reduce demand. The results of a water audit will typically include detecting leaks or waste, identifying inefficient devices that may be upgraded and discovering wasteful behaviors or water management practices that can be improved upon. Water audits can be performed at any property and often focus on both indoor and outdoor water use. Water audits can be conducted by property owners with guidance or be offered as a service by the City.

The City currently conducts audits for targeted single-family residential homeowners each year as part of a residential retrofit program. This type of program makes the most sense during normal supply conditions by targeting homeowners who may not otherwise be able to improve their water use efficiency without some assistance.

However, audit programs are highly scalable. When anticipating or during shortage, the City's current program can be expanded and altered in scope by matching the magnitude of the shortage and by expanding to sectors which are targeted for demand reductions. During shortages, water audit programs that have the greatest benefit when targeting a broader audience could be emphasized and become a higher priority. Notably, the biggest water-use efficiency improvements could be realized by targeting customers that use large volumes of water for irrigating landscaping, such as multifamily housing and homeowner association common areas. For this reason, new water audit programs implemented during a shortage will likely shift in emphasis to initially focus on residential and customers with large irrigation systems. Single-family residential audits would likely need to be completed at a large scale to reap significant demand reductions, although the high proportion of total water use at single-family residences may warrant the effort. Home audits are not terribly complex, and with



proper instruction can usually be completed by homeowners that have some knowledge of plumbing fixtures and irrigation systems. Commercial, industrial and large irrigation system audits can be very complex and require extensive training and practice.

Completing an audit may take time, be inconvenient for the customer and require technical skills. However, the process is usually completed at relatively low cost. While leak repair and replacing outdated devices can significantly add to the overall cost of an audit, changing behaviors and water management practices typically come at little or no cost. The expectation that leak repair and behavior change is likely to account for a large portion of any water savings from audits suggests any initial savings might be somewhat transient. While plumbing fixtures and appliances have a limited operating life, the savings that result from improving the efficiency of a device is considered one-way or permanent. In other words, it is not likely that a customer will revert to a less efficient device at some point in the future.

4.1.7 REBATES

Rebates provide financial assistance to customers encumbered by inefficient water uses found with older buildings or landscaping. The savings potential and scalability of a rebate program is limited by the presence of devices (or plant material) and the relative efficiency of water use.

The City currently assists targeted single-family residential homeowners each year as part of a residential retrofit program by replacing older inefficient toilets and fixtures in older homes with modern, water efficient devices. However, Phoenix currently does not intend to have a large scale rebate program during normal supply conditions. If Phoenix provided rebates for replacing toilets or converting to desert landscaping on a large scale, the cost would need to be covered by a rate increase or a tax revenue subsidy. In either case, Phoenix water customers would ultimately foot the bill. The success of current, ongoing water use reductions by customers indicates that rebates are not warranted during normal supply conditions.

During a shortage, rebates may prove to be a useful tool for accelerating the process of improving efficiency and reducing water demand by providing an incentive for customers to replace inefficient devices and landscape features with more modern, water efficient equivalents.

Examples of some, but not all, possible rebate programs include: installing efficient plumbing fixtures and appliances such as toilets and clothes washers, replacing aesthetic grass with desert adapted vegetation, replacing active (athletic) grass with synthetic turf, or installing smart irrigation components such as weather-based controllers or soil moisture sensors.



4.1.8 EFFICIENCY STANDARDS

The U.S. Congress' passage of the 1992 Energy Policy Act played a big role in raising water and energy efficiency of homes. Since then, the U.S. EPA's Energy Star and WaterSense programs have contributed to further advancements in water and energy efficiency of household devices. Many toilets and washing machines available on the market today far exceed federally mandated efficiency requirements. These innovative technologies continue to drive down water use without impacting customer's quality of life.

Long term, sustained shortages may require adoption of water efficiency standards by the City that exceed WaterSense specifications.

4.1.9 MANDATORY RATIONING

Physical rationing and mandatory water use reductions are aggressive curtailment measures. These measures are usually "last resort" options when shortages persist and previously implemented measures do not provide sufficient relief. Rationing schemes typically target discretionary water uses. Common methods include percentage reductions, budgeted (or seasonal) allotments, fixed allotments and bans on specific end-uses:

Percent Reduction mandates reduce water use relative to historic water use. For example, customers may be required to reduce consumption by 10% compared to the prior year. Percent reduction mandates tend to disproportionately impact customers that already use water efficiently or have a high percentage of use that goes toward non-discretionary purposes. Percent reduction mandates are highly scalable in the sense that the reduction target can be adjusted to achieve the necessary level depending on water supply conditions. Percent reductions can usually be enforced through regular meter reading; however notice to customers will typically lag water use as a result of the billing schedule.

Budgeted Allotments limits the amount of water that is allowable for specific uses. Most commonly associated with landscape irrigation, water budgets have the benefit of being able to be scaled to reflect individual customer conditions. This allows a degree of fairness that is difficult to achieve through most rationing schemes. In addition, budgeted allotments can often be enforced through regular meter reading. Budgeted allotments can also be adjusted to achieve the necessary reduction levels depending on water supply conditions. For example a water budget may be designed to ensure "efficient" irrigation takes place during early stages of shortage, or a budget may be reduced to require deficit irrigation practices if necessary under severe shortage conditions.



Fixed Allotments are similar to budgeted allotments but they are not scaled to reflect unique customer conditions. Fixed allotments tend to disproportionately impact customers that use less water for discretionary purposes. However, some inequities can be reduced by establishing unit based allotments such as gallons per square feet of lot. The primary benefit of fixed allotments is they can be enforced very easily through regular meter reading.

End-Use Bans are imposed through customer information and enforcement. Specific bans, such as irrigation schedules, and restricted use of water features can be effective at reducing peaks as well as overall demand. Bans also help generate awareness and establish equity across the community. The enforcement of bans within a service area the size of Phoenix can be very challenging and costly.

Mandatory rationing measures will need to be accompanied by an established process for considering customer appeals for hardship.

4.1.10 MORATORIUM ON GROWTH

New development, even when allowed only with the most essential water uses, may be considered enough of risk to cause undue harm to providing an adequate supply to the existing customer base. A moratorium on new building permits may be warranted if supplies are stressed to a level that dictates severe demand reduction measures. Expanding water resource acquisition projects funded by new development may help avoid a moratorium.

4.2 SURCHARGES, FINES AND PENALTIES

The Drought Ordinance authorizes the assessment of surcharges, fines, and penalties to be placed in a special fund and to strictly meet the expenses of enforcing demand reduction measures, providing demand reduction assistance to customers, meeting demand reduction-induced cash shortfalls, or augmenting water supplies.

4.2.1 SURCHARGES

The Drought Ordinance authorizes the WSD Director to implement drought surcharges when declaring a Stage 2 – Water Alert, Stage 3- Water Emergency or Stage 4- Water Crisis. The surcharge has two basic purposes: 1) encourage demand curtailment motivated by cost avoidance, and 2) generate additional revenue. Revenue generated from the surcharge can be used to offset revenue losses resulting from curtailment measures, augment water supplies, fund programs that assist customers with reducing demand, and recover costs of enforcing mandatory rationing measures. While a drought surcharge might be perceived as being needed only as a “last resort” option, the complexity and costs of certain measures to mitigate shortage may warrant employing surcharges sooner than generally expected. First, in order for revenue



from the surcharge to help offset revenue losses, expand outreach efforts, and/or contribute to adequately fund supply augmentation programs, the surcharge would be most effective when assessed early during a drought cycle. Second, with respect to using a surcharge to spur demand reductions, particularly when targeting discretionary water uses, fairness and equity concerns are largely overcome by granting customers the choice to curtail demand in ways that least impact their lifestyle, or pay the higher price for the water they use. Third, customers that have adopted water efficient lifestyles often avoid significant impacts of a surcharge. And finally, the cost of administering and enforcing drought surcharges is relatively low compared with other mandatory rationing options.

4.2.2 FINES AND PENALTIES

The Drought Ordinance also authorizes the WSD Director to implement fines when declaring a Stage 2 – Water Alert, Stage 3- Water Emergency or Stage 4- Water Crisis and in conjunction with mandatory demand curtailment measures. Similar to surcharges, fines would encourage demand curtailment. However, because fines and penalties are imposed only after there has been a violation of an existing curtailment measure, they are of course result in an additional cost to a customer or business. Fines would usually target and discourage discretionary water uses, maximizing the City’s ability and extent to provide water for essential uses. While lighter or more limited fines may be more appropriate and effective to curtail demand during earlier stages of a drought cycle, stiffer and more comprehensive may be implemented during the later stages of a drought when supplies are more compromised. While fines and penalties may provide additional revenue to implement curtailment measures, they are not expected to be nor should be a reliable revenue stream.



5.0 ADDRESSING SHORTAGE – CONCLUSION

Drought is a regular phenomenon and a fact of life in the arid southwest. Fundamental and progressive actions taken in Arizona and by Phoenix over the last few decades have greatly reduced the chances that drought will mean water shortages for City customers and businesses while simultaneously increasing the sustainability of our supplies.

Because of this foresight, the Drought Management Plan and Water Use Reduction Guidelines primarily focuses upon improving the water efficiency of our customers and helping them understand how to prepare for shortage when supplies are adequate, but shifts to curtailing demand when shortage occurs. Curtailment measures are progressive, focusing upon discretionary water uses at first, and would only address water uses important to quality of life, the economy, and public health, safety and welfare if absolutely necessary.

The City's approach to managing drought and the measures undertaken for water shortages will evolve with time. Changes in the water use characteristics by residents and businesses, the type and location of development and redevelopment in Phoenix, the regional climate and how regionally important supplies are managed all may alter Phoenix's drought management and curtailment measure strategies. As in the past, Phoenix will continuously strive to improve its water supply resiliency and to address these changes to ensure public safety, economic opportunity, and quality of life for residents and business.



APPENDIX A - DROUGHT MANAGEMENT ORDINANCE

ARTICLE X. DROUGHT MANAGEMENT RESPONSE PROCEDURE

37-121 Scope.

There is hereby established the following policies, rules, duties, penalties and plans for the City of Phoenix to be implemented during a declared water shortage. The drought management response procedure shall include the provisions of this article, rules and guidelines, adopted pursuant to this article and the drought management plan.

(Ord. No. G-3335, § 1)

37-122 Declaration of policy.

It is hereby declared that, because of the conditions prevailing in the City of Phoenix, the general welfare requires that the water resources available to the City be put to the maximum beneficial use to the extent to which they are capable, and that the waste or unreasonable use, or unreasonable method of use of water be prevented, and the conservation of such water is to be extended with a view to the reasonable and beneficial use thereof in the interests of the people of the City of Phoenix and for the public welfare.

(Ord. No. G-3335, § 1)

37-123 Authorization.

The Water Services Director, or his designated representative, is hereby authorized and directed to implement the applicable provisions of this article upon determination in accordance with the standards provided herein that such implementation is necessary to protect the public welfare and safety.

(Ord. No. G-3335, § 1; Ord. No. G-5444, § 3, adopted 10-21-2009, eff. 11-20-2009)

37-124 Application.

The provisions of this ordinance shall apply to all persons, customers, and property served by the Water Services Department wherever situated.

(Ord. No. G-3335, § 1; Ord. No. G-5444, § 3, adopted 10-21-2009, eff. 11-20-2009)



37-125 Water use reduction stages.

No customer of the City of Phoenix Water Services Department shall knowingly make, cause, use, or permit the use of water from the City for residential, commercial, industrial, agricultural, governmental, or any other purpose in a manner contrary to any provisions of this article, or in an amount in excess of that use permitted by the drought management plan, or emergency response plan, as appropriate, in effect pursuant to action taken by the Water Services Director, or his designated representative according to the provisions of this article.

The Water Services Director shall promulgate guidelines which shall set forth the criteria for determining when and where particular regulations within a water use reduction stage are to be implemented and terminated. Such guidelines shall be updated when, in the opinion of the Director, the conditions of the utility system have changed so as to necessitate such update. In addition, such guidelines shall be available for inspection at the City Clerk's office, and the Water Services Department administrative offices during normal business hours.

(Ord. No. G-3335, § 1; Ord. No. G-4317, § 1, passed 12-13-2000, eff. 1-12-2001; Ord. No. G-5444, § 3, adopted 10-21-2009, eff. 11-20-2009)

37-126 Stage 1—Water alert.

The Water Services Director is authorized to declare a Stage 1 Water Alert when the Salt River Project or the Central Arizona Water Conservation District announces reductions in allotments to the City of Phoenix water service area, when an insufficient supply appears likely due to water system limitations or structural failure, or when a catastrophic incident threatens the existing water supply or water delivery system. Such declaration may designate the entire area served by the City of Phoenix Water Services Department, or a portion or portions of the service area as affected, in the event the shortage is not system-wide.

Upon declaration by the Water Services Director of the Stage 1 Water Alert and publication of such declaration, the Water Services Department shall implement the latest drought management plan or emergency response plan on file in the City Clerk's office that has been approved by resolution and kept available for public use and inspection. The water alert shall trigger an intensive public education and information program to assist all customers impacted by the shortage to understand the state of the emergency and the need for voluntary compliance. City of Phoenix personnel will direct their resources to enforcement of all existing City codes which influence water use or misuse.

The Water Services Director is authorized to terminate the Stage 1 Water Alert when the Water Services Director determines that the conditions upon which the Stage 1 Water Alert was declared no longer exist.



(Ord. No. G-3335, § 1; Ord. No. G-4317, § 1, passed 12-13-2000, eff. 1-12-2001; Ord. No. G-5444, § 3, adopted 10-21-2009, eff. 11-20-2009)

37-127 Stage 2—Water Warning.

The Water Services Director is authorized to declare a Stage 2 Water Warning when the water deliveries from Salt River Project or Central Arizona Water Conservation district are reduced, an insufficient supply situation occurs due to water system limitation or structural failure, or a catastrophic incident limits the existing water supply or water delivery system. Such declaration may designate the entire water service area served by the City of Phoenix, or a portion or portions of the service area as affected, in the event the shortage is not system-wide. Upon declaration by the Water Services Director of the Stage 2 Water Warning, and publication of such declaration, elements of Stage 2 Water Warning as described in the drought management plan or emergency response plan may become mandatory and be enforced. authorized to be imposed by this chapter for such uses as are contained in section 37-131 [37-130.1] below Such elements may include, in addition to any other remedy available in this chapter, any surcharge.

If and when the Water Services Director becomes aware of any violation of any use reduction regulation pertaining to water use or misuse, the Water Services Director shall have authority to take actions, including mandatory measures up to and including disconnection of service, and other such enforcement actions as are required or deemed necessary to assure compliance with the use reduction plan. A written notice shall be placed on the property where the violation occurred; and duplicate mailed to the person who is regularly billed for the service where the violation occurs, and to any other person known to the Department who is responsible for the violation or its correction. Said notice shall describe the violation and order that it be corrected, caused [ceased] or abated immediately or within such specified time as the Department determines is reasonable under the circumstances. If said order is not complied with, the Department may forthwith disconnect the service where the violation occurs. If a service is disconnected, assessment of a fee, to be determined by the Water Services Department, will be assessed and collected before service is restored. Said fee shall be in addition to other fees or charges imposed by this chapter for disconnection or reconnection of service.

Upon a second violation at the same property or by the responsible party, disconnection may be ordered immediately, and the service shall not be reconnected unless a device supplied by the Department which will restrict the flow of water to said service is installed. Furthermore, a fee for reconnection may be imposed in addition to other fees or charges imposed by this chapter for the disconnection and reconnection of service.



The Water Services Director is authorized to terminate a Stage 2 Water Warning when water allotments, deliveries, storage, or distribution system conditions are determined to be sufficient to meet consumption demand without mandatory use reduction compliance.

(Ord. No. G-3335, § 1; Ord. No. G-4317, § 1, passed 12-13-2000, eff. 1-12-2001; Ord. No. G-5444, § 3, adopted 10-21-2009, eff. 11-20-2009)

37-128 Stage 3—Water Emergency.

The Water Services Director is authorized to declare a Stage 3 Water Emergency when additional reductions in deliveries will occur to a level such that Stage 2 water use reduction measures and inter-service area water transfers, water withdrawals from City wells, and feasible water supply augmentation measures will be insufficient to meet water demands in the service area; or when a supply insufficiency due to system limitation or structural failure has occurred, and Stage 2 water use reduction measures and supply augmentation measures are either not possible or will not meet expected unrestricted demand. Such declaration may designate the entire water services area served by the City of Phoenix, or a portion or portions of the service area as affected, in the event the shortage is not system-wide.

Upon implementation by the Water Services Director or designated representative, mandatory water use reduction programs will be implemented and the surcharge recalculated and applied to meet the increased regulation and enforcement expenses per section 37-131 [37-130.1] below.

(Ord. No. G-3335, § 1; Ord. No. G-4317, § 1, passed 12-13-2000, eff. 1-12-2001; Ord. No. G-5444, § 3, adopted 10-21-2009, eff. 11-20-2009)

37-129 Stage 4—Water crisis.

The Water Services Director is authorized to declare a Stage 4 Water Crisis when the Director determines that, based on the severity of the crisis, additional measures must be instituted as determined by the Water Services Director to protect human health and safety. The Water Services Director shall declare Stage 4 Water Crisis when Stage 3 emergency supply and use reduction programs are insufficient to meet water demand. Such declaration may designate the entire water services area served by the City of Phoenix, or a portion or portions of the service area as affected, in the event the shortage is not system-wide. In addition to any other remedy available in this chapter, the Director is authorized to set water prices in the form of a surcharge that shall be adjusted to reduce demand to match available supplies. All monies collected from surcharges in excess of replacement of revenues lost through drought-induced



demand reductions and use reduction programs shall be used in a manner consistent with section 37-131 [37-130.1] below.

(Ord. No. G-3335, § 1; Ord. No. G-4317, § 1, passed 12-13-2000, eff. 1-12-2001; Ord. No. G-5444, § 3, adopted 10-21-2009, eff. 11-20-2009)

37-130 Water use reduction implementation.

During drought or other supply shortage conditions, the Water Services Director shall monitor the projected supply and demand for water on a daily basis and shall advise the City Manager on the extent of the use reduction required through the implementation and/or termination of particular use reduction stages in order for the Department to prudently plan for and supply water. Thereafter, the Water Services Director may order that the appropriate phase of water use reduction be implemented or terminated in accordance with the applicable provisions of this article. Said order shall be made by public announcement and shall be published a minimum of one time in a daily newspaper of general circulation. Applicable restrictions herein outlined shall take effect and be enforceable upon publication of the notice; except that restrictions due to water treatment or delivery system failure, or unforeseen sudden increases in demand for water, shall be enforceable immediately following the filing of intent with the office of the City Clerk. Restrictions shall remain in effect until such time as applicable restrictions are removed.

(Ord. No. G-3335, § 1; Ord. No. G-4317, § 1, passed 12-13-2000, eff. 1-12-2001; Ord. No. G-5444, § 3, adopted 10-21-2009, eff. 11-20-2009)

35-130.1 Surcharges, fees, penalties, and variances.

The assessment of surcharges, fees, and penalties is to be considered purely an exercise of the City's regulatory and police powers, and monies collected from reconnection fees, penalties, and surcharges are in no way to be considered rates for production of water revenue. Those monies shall be placed in a special fund. Said fund shall be used for, but not limited to, meeting the expenses of enforcement of this article, providing demand reduction assistance to customers, meeting demand reduction-induced cash shortfalls, or augmenting water supplies. The Water Services Director or his designated representative may, in writing, grant variances to persons who apply, on forms supplied by the City, for usages of water not in compliance with the water use reduction programs or for relief of the drought surcharge. These variances will be granted if it is found that such water use is necessary to prevent an emergency condition relating to health, safety, extreme economic hardship; or essential governmental services such as police, fire, and similar emergency services; or for customers who have made every



reasonable effort to reduce water use. Efforts made to conserve water at any time prior to onset of drought conditions may be considered in granting said variance.

(Ord. No. G-4317, § 1, passed 12-13-2000, eff. 1-12-2001; Ord. No. G-5444, § 3, adopted 10-21-2009, eff. 11-20-2009)

Editor's note—Ordinance No. G-4317, § 1, amended the Code by adding new provisions designated as §§ 37-131 and 37-132. At the discretion of the editor, these provisions have been renumbered as §§ 37-130.1 and 37-130.2, respectively, as ch. 37 already contained sections numbered 37-131 and 37-132

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37-130.2 Limited exemption to restrictions for users of reclaimed water.

The Water Services Director, at his discretion, may exempt certain uses and users of reclaimed water from any and/or all of the water use reduction requirements and drought restrictions contained in section 37-126 (Water Alert), through and including Section 37-129 (Water Crisis). Users must apply for exemption on forms supplied by the Water Services Department as outlined in Section 37-131 [37-130.1] (Surcharges, fees, penalties, and variances). Only the use of reclaimed water may be exempted from provisions of the drought plan. Users of both reclaimed water and potable water will not be exempt from restrictions on the use of potable water, and must comply with restrictions in effect during all stages of the plan.

The Water Services Director, in the interest of equity and community acceptance of said use of reclaimed water during a declared drought, may require exempt users to clearly post notices to the effect that the water being used is not from the public drinking water supply, and that said use conforms to water use restrictions in force at the time. Failure to make such posting in a timely fashion may, at the discretion of the Director, result in loss of exemption from the provisions of the drought plan as noted above.

(Ord. No. G-4317, § 1, passed 12-13-2000, eff. 1-12-2001; Ord. No. G-5444, § 3, adopted 10-21-2009, eff. 11-20-2009)

Note—See the editor’s note following section 37-130.1.