

Graywater and Rainwater Harvesting Stakeholder Group

<u>Name</u>	<u>Organization</u>
Lisa Hoffman (Alternates: Nate Allen, Kevin Koch)	Technicians for Sustainability
Alex Jacome	Southern Arizona Home Builders Association
Kevin Barber	American Institute of Architects
Dr. Paul Green (Alternate: Kendall Kroesen)	Tucson Audubon Society
Matt Hogel (Alternates: Jenny Neeley, Cory Jones)	Sierra Club – Rincon Group
Andy Karic	Triumph Builders
Brad Lancaster (Alternates: Val Little, Kevin Koch)	Rainwater Harvesting for Dry Lands
George Larsen (Alternate: Don Baker)	Larsen Baker Commercial Developers
Michael McDonald (Alternate: Terry Dee)	Habitat for Humanity
Colin Zimmerman	Tucson Association of Realtors
Jason Meininger (Alternate: Amy McCoy)	The Sonoran Institute
Nick Nieto	Plumbing, Heating & Cooling Contractors Association
Dave Pittman (Alternate: Brian Brown)	Arizona Builders Alliance
Jay Tripp (Alternates: Jay Casey, Mike Collins)	Plumbers and Pipefitters Union Local #469

ADOPTED BY THE
MAYOR AND COUNCIL

ORDINANCE NO. 10597

RELATING TO BUILDINGS, ELECTRICITY, PLUMBING AND MECHANICAL CODE; AMENDING THE TUCSON CODE CHAPTER 6 BY ADDING A NEW ARTICLE VIII, RAINWATER COLLECTION AND DISTRIBUTION REQUIREMENTS, SECTIONS 6-181 THROUGH 6-188 REGULATING THE USE OF RAINWATER HARVESTING AND STORAGE SYSTEMS; REQUIRING A LANDSCAPE WATER BUDGET FOR ALL COMMERCIAL DEVELOPMENTS; PROVIDING THAT A MINIMUM 50% OF THE LANDSCAPE WATER BUDGET BE SUPPLIED BY HARVESTED RAINWATER; PROVIDING FOR EXCEPTIONS TO THE RAINWATER HARVESTING REQUIREMENT; REQUIRING AN ANNUAL RAINWATER HARVESTING REPORT; AMENDING TUCSON CODE CHAPTER 27, WATER, ARTICLE I, IN GENERAL, SECTION 27-15(A) TO INCLUDE A RAINWATER HARVESTING PROVISION AS AN ELEMENT OF WATER WASTAGE; SETTING AN EFFECTIVE DATE; AND DECLARING AN EMERGENCY.

WHEREAS the City of Tucson (the "City") has experienced substantial growth, continues to experience growth, and water resources sufficient to meet the growing needs of the community must be ensured and;

WHEREAS the City must secure additional water supplies over the long term; that such supplies will become more costly over time; and that the potential for drought in the Southwest is a real and continuing problem and;

WHEREAS the City and its citizens must acknowledge, and successfully manage and coexist with the resource limitations of the arid Sonoran Desert environment and;

WHEREAS water conservation constitutes a legitimate and critical public health, safety, welfare, economic, and sanitation concern and;

WHEREAS the City should maintain its leadership role among desert cities as an innovator in water resource management, water use efficiency, technology, policy, and regulation; and continue to create sound, sustainable policies for new developments that are cost-effective and responsible and;

WHEREAS, Tucson Water estimates that 45% of all water usage in its service area is dedicated to outdoor purposes;

BE IT ORDAINED BY THE MAYOR AND COUNCIL OF THE CITY OF TUCSON, ARIZONA, AS FOLLOWS:

SECTION 1. The Tucson Code Chapter 6 is hereby amended by adding a new Article VIII Sections 6 -181 through 6-188, to read as follows:

ARTICLE VIII. RAINWATER COLLECTION AND DISTRIBUTION REQUIREMENTS

Sec. 6-181. Definitions.

As used in this article, the following terms are defined as follows:

Commercial development means any new non-residential development that is intended to be used primarily for commercial activities, and is subject to the requirements of the International Building Code.

Rainwater means water that has fallen as rain and contains little dissolved mineral matter, or any other form of precipitation.

Sec. 6-182. Rainwater Harvesting Plan.

A. All commercial development and site plans submitted after June 1, 2010 shall include a rainwater harvesting plan. The rainwater harvesting plan shall include a landscape water budget and an implementation plan.

1. The landscape water budget shall calculate the estimated volume of water required yearly for all site landscaping detailed in the development and/or landscape plan.
2. The implementation plan shall show how any combination of capture, conveyance, storage, and distribution will be utilized on-site to harvest rainwater. Implementation plans shall comply with applicable Development Standards for water harvesting applications.

3. The implementation plan shall also provide for water metering of all on-site landscape water through either:

(a) A separate water meter connected to the main water supply; or,

(b) An irrigation sub-meter.

B. The rainwater harvesting plan shall be submitted concurrently with the site plan and landscape plan.

C. The Director of the Development Services Department may authorize alternative compliance with Development Standards when conditions of topography, site soils or ratio of landscape area to total site area would make strict adherence to standard provisions unreasonable and the alternative compliance advances the spirit of this Article.

Sec. 6-183. Construction of rainwater harvesting system; Minimum landscape budget requirements; Request for Rainwater Harvesting Plan Revision.

A. All new commercial development built pursuant to a development plan submitted after June 1, 2010 shall include a rainwater harvesting system constructed according to an approved rainwater harvesting plan.

B. No later than three years from the date of issuance of a final certificate of occupancy, and for every year thereafter, 50% of the estimated yearly landscape water budget shall be provided by rainwater harvested on-site by a rainwater harvesting system constructed pursuant to an approved rainwater harvesting plan. The 50% landscape budget provision shall not apply in any calendar year in which the annual precipitation has fallen below the amount determined in the applicable development standards.

C. Within three years from the date of issuance of a final certificate of occupancy, the applicant, or a successor in interest, may request to revise the rainwater harvesting plan. The request shall be submitted to the Director of Development Services. The request shall be granted only if one of the following is true:

1. A mathematical or engineering error was made in the calculation of water required for on-site landscaping.

2. A variance related to landscape requirements, and which impacts the landscape water budget, is obtained subsequent to the approval of a submitted rainwater harvesting plan.

3. Additional data on site conditions or performance relevant to the subject site has been obtained, and results indicated a needed change in water budget calculations in the rainwater harvesting plan.

Sec. 6-184. Restrictions on installation of rainwater harvesting system invalid.

A. Any covenant, restriction or condition contained in any deed, contract, security agreement or other instrument affecting the transfer or sale of, or any interest in, real property which effectively prohibits the installation or use of a rainwater harvesting system is void and unenforceable.

B. A deed, contract, security agreement or other instrument affecting the transfer or sale of, or any interest in, real property entered into before June 1, 2010 shall not be subject to the provisions of this section.

Sec. 6-185. Exceptions.

A. That portion of a development which includes the following land uses shall be excepted from the 50% rainwater harvesting requirements:

1. Public parks and botanical gardens;
2. Outdoor recreation facilities, whether under public or private ownership, for public use, schools, and day care centers;
3. The playing areas of golf courses;
4. Cemeteries;
5. Natural open space;
6. Crop production.

Sec. 6-186. Annual Report.

A. A rainwater harvesting landscape water-use budget report shall be submitted annually by the owner or owner's agent to Tucson Water. The report shall include location and ownership information for the property, monthly rainfall totals collected from an on-site gauge or the SAHRA rain gauge closest to the site, monthly site water use data, and monthly relevant sub-meter or service meter data.

Sec. 6-187. Violation.

A. Failure to meet the 50% rainwater harvesting requirement for landscape irrigation shall constitute water wastage, and notwithstanding any other

provision of this section shall constitute a violation of Section 27-15 of this code.

B. The Director of Development Services or the Director of Tucson Water may require that any development not meeting the landscape budget requirements conduct and submit a landscape irrigation audit and report the results with the audit and reporting performed by a third party auditor and paid for by the property owner.

C. The imposition of civil liability shall not preclude the city from taking any other enforcement actions permitted under the code.

Sec. 6-188. Applicability.

The provisions of this Article shall apply to construction built pursuant to permits issued after June 1, 2010.

SECTION 2. The Tucson Code Chapter 27, Section 27-15 (a) is hereby amended by adding a new subsection (7) to read as follows:

7) Failure to meet the 50% rainwater harvesting requirement for landscape irrigation set forth in Chapter 6, Article VIII of the Tucson Code.

SECTION 3. The various City officers and employees are authorized and directed to perform all acts necessary or desirable to give effect to this ordinance, including, but not limited to, providing an instructional pamphlet setting forth in plain language the requirements of this ordinance.

SECTION 4. If any of the provisions of this ordinance or the application thereof to any person or circumstance is invalid, the invalidity shall not affect other provisions or applications of this ordinance which may give effect without

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...

the invalid provision or circumstance, and to the end the provisions of this ordinance are severable.

SECTION 5. WHEREAS it is necessary for the preservation of the peace, health and safety of the City of Tucson that this ordinance become immediately effective, an emergency is hereby declared to exist and this ordinance shall be effective immediately upon its passage and adoption.


PASSED, ADOPTED AND APPROVED BY the Mayor and Council of Tucson, Arizona, _____.

MAYOR

ATTEST:

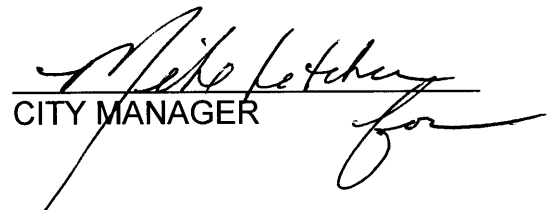
CITY CLERK

APPROVED TO FORM:



CITY ATTORNEY

REVIEWED BY:



CITY MANAGER

LK/kr
10/8/2008 11:53 AM

**CITY OF TUCSON
DEVELOPMENT STANDARD NO. 10-03.0
COMMERCIAL RAINWATER HARVESTING**

COMMERCIAL RAINWATER HARVESTING

- 10-03.1.0 GENERAL**
 - 10-03.2.0 DEFINITIONS**
 - 10-03.3.0 RAINWATER HARVESTING PLAN**
 - 10-03.4.0 EXCEPTIONS**
 - 10-03.5.0 ENFORCEMENT**
 - EXHIBITS**
-

10-03.0.0 COMMERCIAL RAINWATER HARVESTING.

10-03.1.0 GENERAL

- 1.1 **INTRODUCTION.** By minimizing amenity irrigation demands, rainwater harvesting reduces demand on the desert's most limited resource: water.
- 1.2 **PURPOSE.** This Development Standard has been prepared to facilitate effective use of available rainwater resources for landscape irrigation in commercial development as a means of reducing dependency on potable and reclaimed water sources. It shall clarify requirements for compliance with Ordinance No. xxxxx, the Commercial Rainwater Harvesting Ordinance. This standard provides:
 - A. Direction for design of rainwater harvesting systems;
 - B. Requirements and guidelines for the preparation and implementation of rainwater harvesting plans;
 - C. Requirements for maintenance and monitoring of completed installations;
 - D. Requirements for enforcement of the Standard, and;
 - E. Addresses special accommodations when warranted for site- and use-specific conditions.
- 1.3 This standard applies to all commercial development plans submitted after June 1, 2010.

10-03.2.0 DEFINITIONS. Other than as provided below, definitions used in this Standard are found in the Development Standards Glossary or Sec. 6.2.0 of the *LUC*.

- 2.1 *Commercial development.* Any new non-residential development that is intended to be used primarily for commercial activities, and is subject to the requirements of the International Building Code.
- 2.2 *Evapotranspiration (ET).* The loss of water from a vegetative surface through the combined processes of plant transpiration and soil evaporation. Simply put, the rate at which plants use water.

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2.3 *Reference Evapotranspiration (ET_o)*. An estimate of the water used by a well-watered, full-cover grass surface, 8-15 cm in height used to establish a reference point for determining water use by other plant types through the application of a plant coefficient. ET_o varies by month and is shown in inches (and feet) in the table below. (AZMET Station Data)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3.00 (.25)	3.72 (.31)	6.00 (.50)	8.04 (.67)	9.96 (.83)	10.56 (.88)	9.36 (.78)	7.92 (.66)	7.20 (.60)	5.76 (.48)	3.60 (.30)	2.64 (.22)

2.4 *Plant Coefficient (PC)*. Landscape plant types are assigned a plant coefficient for the purpose of calculating the water budget as shown in the following table.

Plant Coefficient	Plant Type
0.13	Very low water use
0.26	Low water use
0.45	Medium water use
0.65	High water use

2.5 *Plant Coverage Area (PCA)*. The area of ground covered by a plant or tree when viewed from above.

10-03.3.0 RAINWATER HARVESTING PLAN. A Rainwater Harvesting Plan is required to be submitted with all applications for land development where landscaping is required, except as noted in Section 10-03.410 of this standard. The Rainwater Harvesting Plan shall consist of a water budget and implementation plan addressing the information itemized below. Additional information may be requested or required by the Development Services Department (DSD) Director to evaluate rainwater harvesting proposals.

3.1 Water Budget.

A. **Rainfall Supply:** From 1993 to 2008, Tucson received as little 7.62 inches of rainfall (2004) to a high of 14.99 inches of rainfall (1999) with an average annual rainfall of 12.17 inches per year (Source: National Weather Service). To account for this variability, and ensure water harvesting systems function in the majority of years, water budgets prepared in compliance with this standard shall be based on nine (9) inches of rainfall per year. This equates to approximately 244,386 gallons per acre per year.

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- B. Landscape Irrigation Demand (LID). Landscape irrigation demand shall be stated in gallons and calculated on a monthly basis using the following formula:

$$\text{LID} = \text{PCA} \times \text{ETo} \times \text{PC} \times 7.48$$

PCA - Plant Cover Area

ETo - Reference evapotranspiration

PC - Plant Coefficient

7.48 - The number of gallons in a cubic foot of water.

Example: The formula for determining the landscape irrigation demand in gallons for a plant cover area of one acre (43,560 square feet) of all low water use plants (plant coefficient - 0.26) in January (ETo - three inches or .25 feet) would be as follows:

$$\text{LID}(\text{month}) = \text{PCA} \times \text{ETo}(\text{month}) \times \text{PC} \times 7.48$$

$$\text{LID}(\text{January}) = 43,560 \times .25 \times 0.26 \times 7.48$$

$$\text{LID}(\text{January}) = 21,179 \text{ gallons}$$

- C. Landscape Irrigation Supply (LIS). A minimum of 50 percent of the LID must be supplied by harvested rainfall. This requirement is represented by the following formulas.

$$\text{LIS} = \text{HRW} + \text{PW} + \text{OS}$$

and

$$\text{HRW} \geq 0.5 \times \text{LID}$$

HRW - Harvested Rainwater

PW - Potable Water

OS - Other sources of water

LID - Landscape Irrigation Demand

Potable Water Use. No more than 50 percent of the LID may be supplied by potable water sources.

$$\text{PW} \leq 0.5 \times \text{LID}$$

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3.2 Rainwater Harvesting Implementation Plan (RHIP). The Rainwater Harvesting Implementation Plan shall consist of a separate sheet with a plan view layout of the site. The format of the RHIP shall be consistent with the base plan, be it a plat (DS 2-03), site plan (DS 2-04), development plan (DS 2-05), or their successor documents as applicable, together with details necessary and appropriate to convey the technical concept of the rainwater harvesting system design and facilitate proper installation and maintenance of the rainwater harvesting system in compliance with the Ordinance No.xxxxx, the Commercial Rainwater Harvesting Ordinance, and this standard. The RHIP shall be consistent with the landscape plan and the grading plan and shall be referenced on both.

A. In addition to the requirements of the applicable base plan, the RHIP shall include the following notes:

1. Square footage of plant cover area for 1) very low water, 2) low, 3) medium, and 4) high water use type plants.
2. Landscape Irrigation Demand (LID) in gallons per year.
3. Harvested rainfall and potable water use in gallons per year.
4. Percentage of LID satisfied by 1) harvested rainfall, 2) potable water, and 3) other sources.
5. Volume in gallons, and area in square feet, of each water harvesting area, and total volume of water harvesting areas.
6. Total rainwater diverted from detention/retention basins.

B. In addition to the requirements of the applicable base plan, the RHIP shall show the following

1. Water harvesting catchment areas shall be conceptually delineated with shading or a hatched pattern, with volume shown within the catchment area or by notes.
2. Very low, low, medium, and high water use plant cover areas shall be labeled and delineated with a heavy outline. Plant cover areas with both canopy and understory shall be delineated with a double outline.
3. Spot elevations shall be shown on the grading plans to indicate final grade, depth of mulch/ground cover, and finished grade.
4. Final grading elevation, depth of mulch/ground cover, and finished elevation.
5. All paving shall be labeled with arrows indicating slope.
6. The location of any french drains within water harvesting areas must be indicated on civil/grading plans.

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- C. Design requirements. The City of Tucson Water Harvesting Manual should be used as a reference.
1. Design shall accommodate overflow from catchment areas.
 2. Water harvesting areas shall be sized according to the anticipated volume of water that will enter the basin, taking into consideration whether the basin will only collect water falling on the basin area or if it will be intercepting flows from adjacent watersheds. A 4:1 ratio of catchment area to plant coverage area adjusted as necessary in response to site conditions, is recommended.
 3. The edge of any ponding within water harvesting areas shall be at least 10 feet from building foundations. Closer placement may be possible with the approval of a soils professional and may include structural soil backfill with protective liner at the foundation.
 4. Water harvesting areas shall be designed so that water infiltrates the soil within twelve (12) hours.
 5. Water harvesting areas shall be designed to minimize ponding in areas which may create a nuisance for pedestrians.
 6. Unpaved or planted areas shall be below the grade of adjacent hardscape to create micro-basins wherever possible. Pedestrian circulation should be designed to discourage cutting across basins so as to avoid compaction, erosion, and damage to plants.
 7. Conveyance swales should incorporate check dams and/or nested micro-basins to slow and harvest water and trap sediment.
 8. Water should be harvested and slowed near its source.
 9. Plants selected for use in water harvesting shall have compatible water needs. Other considerations shall include sun exposure, maintenance requirements, shape, form and aesthetics. Certain plant forms may work better in informal vs. formal planting designs.
 10. Soil beneath the bottoms of all water harvesting areas should be ripped to a depth of at least 12 inches prior to trenching and installation of irrigation lines.
 11. Rip-rap shall be indicated where erosion protection at spillways is necessary.
 12. A 12 inch wide shoulder with a maximum two (2) percent cross slope away from the pedestrian circulation paths shall be provided adjacent to water harvesting catchment areas.
 13. Maximum reveal at edge of pedestrian circulation paving shall be 1" to minimize the risk of injury.
 14. Ponding limits shall be a minimum of ten feet from all buildings.

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15. Wherever possible hardscape surfaces shall be sloped toward water harvesting areas.
 16. The ground surface treatment of areas conveying significant water flows shall be able to withstand scouring. Acceptable materials include hardscape paving, rock mulch, graded or sized rock, rip rap, fractured rock, and, in limited situations, turf. Bare soil, decomposed granite, or other loose forms of mulch are not acceptable. Filter fabric placed with 12" minimum toe downs at edges shall be used under all rock, mulch, and rip rap within conveyance areas.
 17. Fine grades of decomposed granite shall not be used within or directly adjacent to water harvesting areas.
 18. The bottoms of water harvesting basins should receive ½"-1" sized/graded crushed rock that has been washed to remove all fines or organic mulch.
 19. Organic mulch is encouraged in locations where the vegetation, water collection, erosion, and slope characteristics make it appropriate.
- D. Containment systems. Containment systems, typically above or below ground tank systems, are not required but may be necessary in some applications to supply the minimum required 50 percent of LID with harvested rainfall.
1. The following requirements apply to both above and below ground containment systems.
 - a) Rainwater outlet points on the roof.
 - i. Rainwater falling on the roof may be concentrated using in gutters, canals, or other concentration point devices
 - ii. Determination of the number, volume and location of concentration points will be determined by the applicant.
 - iii. Sizing for these structures is per the plumbing code (IPC).
 - iv. The size and configuration off the outlet points will need to be able to be joined to create the inlet line to the tank.
 - b) Inlet piping.
 - i. The tank inlet piping must be installed to connect the roof outflow to the tank inflow port.
 - ii. Inlet piping shall be of sufficient diameter as required by the IPC. An overflow mechanism, separate from that of the tank, shall be provided to ensure that water does not back up on the roof.
 - iii. Inlet piping may convey water overhead from the roof to the tank, or in a U-configuration that conveys water to a lower entry point on the

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tank. The U configuration may be designed to hold standing water, and must be pressure rated and sealed to prevent leaks.

- iv. Screening must be configured in such a way that an unmaintained screen can not cause detritus to block the inlet pipe preventing rainwater harvesting, and backing water up on the roof creating unsafe weight conditions on the roof.
 - v. Entry designs that involve water falling freely through the air before entering the tank will be allowed provided their design can minimize the entry of light and mosquitoes into the tank.
- c) First flush device.
- i. First flush devices deflect the first flush of rainfall off a roof before it goes into a tank. It is intended to deflect the associated dust, grit, leaves and other material that may accumulate on a roof from entering the tank.
 - ii. First flush devices are strongly recommended to be installed, but are not required.
 - iii. Both internal and external first flush devices are acceptable for use.
 - iv. Some first flush devices need post-rainfall maintenance to empty the device so its ready for the next rainfall.
- d) Access.
- i. Tank should have an entry port of sufficient size to conduct any necessary visual inspection, maintenance, entry for cleaning or repair and other tasks as described in the manufacturer's specifications or other guidance.
 - ii. Entry ports must be sealed to prevent entry of light and mosquitoes into the tank.
 - iii. If a manhole is provided with the intent of allowing human access into the tank, it must meet size and safety requirements for entry.
2. Irrigation Interconnect. A reverse pressure backflow preventer assembly is required when connecting irrigation from a rainwater collection tank to a potable water irrigation system in order to protect the public water system and/or building water system. (See Exhibit 3 Reduced Pressure Backflow Prevention Device.) The following requirements apply to above ground containment systems.
- a) Size.
- i. The dimensions of a tank will be determined by the applicant based on site-specific design needs.

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- ii. Design or review by a structural engineer may be required if there are no manufacturer specifications and/or details.
- b) Construction materials.
- i. Tanks and covers shall be constructed of materials appropriate for use for storing water in an above-ground configuration. These materials may include metal, plastic, reinforced concrete, fiberglass, or other DSD-approved material.
- ii. Tank construction material must be able to endure UV exposure without loss of structural integrity, or must be UV protected with an appropriate coating.
- iii. Tank construction material must be opaque to prevent sunlight from inducing algae growth.
- c) Foundation.
- i. Tanks shall have a base that meets manufacturer's specifications.
- ii. If no specifications are provided by the manufacturer, the base shall be designed by a structural engineer.
- d) Placement. Placement shall be as determined by the architect, landscape architect, and/or engineer, and shall meet all applicable codes.
- e) Overflow.
- i. There must be a structured overflow device installed with the tank to automatically allow excess infill water to exit the tank safely.
- ii. The overflow line capacity shall meet the requirements of the International Plumbing Code.
- iii. The outlet of the overflow pipe shall be positioned so as not to compromise the foundation of the building.
- f) Direct outlet device. For use directly from the tank rather than through irrigation system.
- i. Put only "keyed" hose bibs on tanks to prevent people from tapping the tank using a standard hose bib. This is intended to allow only authorized people to tap the tank water directly. Provided a yellow placard with black text at the hose bib stating the water is non-potable, as required by Uniform Plumbing Code section 601.2.2.
- ii. <<ADD MORE SPECS FOR SCREENING, SIZE, ETC, AS NEEDED BASED ON 9/30 MEETING WITH EXPERTS>>

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3. The following requirements apply to below ground containment systems.
- a) Construction materials.
 - i. Tanks shall be constructed of materials designed to be used for underground storage tanks holding water. These materials may include masonry, reinforced concrete, fiberglass, plastic, or other DSD-approved material.
 - ii. Materials must be installed and sealed per manufacturer's specifications.
 - iii. Any portion of a subsurface tank that is exposed to sunlight must be able to endure UV exposure without loss of structural integrity, or must be UV protected with an appropriate coating.
 - iv. Any portion of the subsurface tanks that is exposed to sunlight must be opaque to prevent sunlight from inducing algae growth.
 - b) Foundation. Tank should be installed in bedding per manufacturer's specifications and/or in consultation with a civil engineer to base the bedding on soil characteristics.
 - c) Placement. Placement shall be as determined by the architect, landscape architect, and/or engineer, and shall meet all applicable codes.
 - d) Overflow.
 - i. There must be a structured overflow device installed with the tank to automatically allow excess infill water to exit the tank safely
 - ii. The overflow line capacity shall meet the requirements of the International Plumbing Code.
 - iii. The outlet of the overflow pipe must be at least 10 feet from the foundation of a building and shall be positioned so not to compromise the foundation of the building.
 - e) Load bearing.
 - i. Below ground tanks must be designed and installed under the guidance of a civil or structural engineer and/or tanks must be installed per manufacturer's specifications regarding bedding, setting the tank, and backfill.
 - ii. Tanks must be utilized per the manufacturer's specifications regarding whether or not the finished installation is load bearing and the limits of that load.

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f) Strapping. A strap must be installed around the tank per the manufacturer's recommendations.

4. The option shall be provided for the design team to design an alternative containment system (above ground fountain, pond, etc.) that does not fall under the strict category of a tank. Such containment systems shall follow the aforementioned guidelines for tanks to the extent possible while maintaining their design intent and will be evaluated on an individual basis.

E. Irrigation systems.

1. Irrigation systems shall be capable of monitoring and responding to plant water needs through the use of soil moisture gauges and/or weather station and/or evapotranspiration data.
2. Irrigation plans must include calculations for estimated water use.
3. Irrigation systems shall maintain a minimum 80% distribution uniformity.

F. Details

1. Typical basin cross section, see Exhibit I.
2. <<potential details-
 - Water Storage Features
 - Water Harvesting areas
 - Regulatory Detention / Retention Basins
 - Sumps
 - Dry Wells
 - French Drains and other Subsurface Structures
 - Structural Soil
 - Bubbler Boxes
 - Sidewalk Scuppers
 - Storm Sewers
 - Area Drains
 - Infiltration Chamber
 - Permeable Paving
 - Curb Openings

3.3 Maintenance Standards. After the system has been constructed, it must be properly operated and maintained to assure reliable and safe service. A key issue for operation and maintenance is keeping the system clean and leak-free. Proper system design to prevent impurities from entering the system will greatly simplify upkeep. The following maintenance requirements shall be addressed on the RHIP.

- A. Pipes, pipe joints and connectors, pumps, vents, etc., shall be inspected monthly for any damage or disrepair. Problems noted shall be repaired and/or corrected.
- B. Gutters, leaf screens, filters, first-flush devices, etc., shall be cleaned monthly.

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- C. System shall be inspected during heavy rains or shortly thereafter to check for leaks and/or overflow problems. Problems noted shall be repaired and/or corrected.
- D. Containment structures shall be inspected annually. Residue and sludge that effects system performance or capacity shall be removed.
- E. Containment system access hatches should be checked regularly to make sure they are securely closed.
- F. Catchment areas shall be maintained to ensure they continue to function as designed.
- G. Overflow structures of water harvest basins shall be maintained to prevent erosion of basin or surrounding areas.
- H. All required water harvesting areas, containment systems, and site improvements necessary for the rainwater harvesting system to function as intended shall be maintained as shown on the approved plans

3.4 Monitoring

- A. Monitoring of water use and related information at the site shall be the responsibility of the property owner.
 - 1. A Tucson Water irrigation sub-meter is required except on smaller sites.
 - 2. Private sub-meter may be permitted on smaller sites. Private sub-meters must meet the accuracy standards provided in Exhibit 2 Accuracy Standards for Private Sub-meters.
- B. An Annual Report shall be submitted to the appropriate Department by January 30 of each year, on a form provided by the appropriate Department.
- C. The Report shall contain information for the previous calendar year:
 - 1. The amount of irrigation water delivered from the public water distribution system on a monthly basis.
 - 2. The amount of irrigation water delivered from the public water distribution system authorized under the RHIP.
 - 3. Changes to the landscape or irrigation system in the reporting calendar year.
 - 4. Rainfall
 - a) On-site gauge
 - b) Interpolated rain estimate from local rain gauge network.
 - 5. Water use data
 - a) Service meter

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b) Sub-meter

6. Other information as deemed necessary.

10-03.4.0 DROUGHT. <<address per Tucson Water – move to definitions?>>.

10-03.5.0 ENFORCEMENT

5.1 All water harvesting area grading in planting areas must be inspected and accepted by DSD prior to plant installation and prior to application of mulch, or decorative rock, etc

5.2 Landscape Irrigation Audit <<necessary?>>

EXHIBITS

Exhibit 1 Basin Cross Section

Exhibit 2 Accuracy Standards for Private Sub-meters

Exhibit 3 Reduced Pressure Backflow Prevention Device

DRAFT 10-7-08



MEMORANDUM

DATE: October 9, 2008

TO: Honorable Mayor and Council

FROM: Commercial Rainwater Harvesting
Development Standard Technical
Advisory Group (see membership
below)

SUBJECT: Development Standard 10-03 Commercial Rainwater Harvesting

On September 4, 2008, our Technical Advisory Group (TAG) was convened to facilitate creation of a development standard to implement the Commercial Rainwater Harvesting Ordinance. The 24 member TAG is made up of design professionals in engineering, hydrology, planning, architecture and landscape architecture, as well as landscape contractors, general contractors, and water harvesting specialists. In the last five weeks the TAG has met ten times to develop an understanding of the key elements of water harvesting in Tucson and formed subgroups to address rainfall variability, water budget methodologies, irrigation efficiency and design, earthworks, containments structures, monitoring, and maintenance. This has been an intensive and fruitful effort.

The structure of the standard has been established and the technical content is 90% complete, however further refinement is required before the standard can be used for review. The main section of the standard, per the rainwater harvesting ordinance, is the Rainwater Harvesting Plan, and this makes up the bulk of the development standard. The Rainwater Harvesting Plan is further broken down into 1) Water Budget, 2) Rainwater Harvesting Implementation Plan, 3) Maintenance, and 4) Monitoring.

As our work progressed, we identified issues that are outside the scope of our assignment that nevertheless need to be addressed prior to the effective date of the Rainwater Harvesting Ordinance and the Commercial Rainwater Harvesting Development Standard. For example, the existing restrictions in the LUC as they relate to cisterns create unworkable constraints on the design of active water harvesting systems. Administration of the Land Use Code needs to address the appropriate placement of cisterns and calculation of lot coverage so as to not inhibit creative design in above ground water harvesting systems. The Water Waste Ordinance will need to be amended to facilitate enforcement of the Rainwater Harvesting Ordinance. When finalized, the standard could be applied to a limited number of real, implementable pilot projects which will highlight other areas of conflict that no doubt exist within existing regulations. Together with an education and outreach program, this will allow the issues to be addressed and the development community informed before the effective date of the ordinance and will result in a better, more workable development standard.

There are many other environmental issues that are directly related to this ordinance and development standard that could be negatively impacted if not taken into consideration. Property owners should be encouraged to incorporate maximum water harvesting principals in their projects, above and beyond the ordinance where possible, through incentives such as but not limited to; reduced service fees, and parking requirements, expedited reviews, and tax incentives at the state level.

It is this group's goal to ensure that the Rainwater Harvesting Ordinance and the Commercial Rainwater Harvesting Development Standard do not push new development to meet only the minimum landscape requirements. Instead, it should encourage environmental stewardship and sustainability, promoting developments that strive to reduce the heat island effect or provide shading for buildings to reduce their energy loads (which in turn saves the water used to create energy). This will require additional study of related code issues such as screening, setbacks, and parking requirements, both in material and number, among others.

The TAG asks that Mayor and Council adopt the Commercial Rainwater Harvesting Ordinance together with the draft Commercial Rainwater Harvesting Development Standard. With Council direction, following adoption of the ordinance, the TAG will reconvene to finalize the standard, with completion expected by the end of the year.

TAG Membership:

Kevin Barber, AIA, LEED AP
Eric Barrett, RLA, Arc Studios Inc.
Jeff Blau, PE, Parsons Brinkerhoff
Mike Censky, HSL Properties
Justin Cupp
Ben Hawkins, Contractor, H&S Consultants
Jason Isenberg
Tim Johnson, RLA
Andrew Karic, CEO, Triumph Builders S.W. LLC
Hank Krzysik, AIA, LEED AP
Tom Lodge, PE, Psomas
Tom Marshal
Grant McCormick, AICP
Rich Michal
Al Nichols, PE, CEM, GBE, LEED, President Al Nichols Engineering
Jennifer Patton, Norris Design
Wocky Redsar, WVR Consulting
Sandra Tolley, RLA, SAGE Landscape Architecture & Environmental
Robert Tucker, PE, Diamond Ventures
Diana Turner, APLD, Turner Design LLC
Richard Underwood CLP, President AAA Landscape
John Waid, President, Waid Construction
Dave Stewart, EIT, Pima County RFCD