
2015

UNIVERSITY OF **SOUTHERN CALIFORNIA**

# WATER CONSERVATION
# TASK FORCE RECOMMENDATIONS

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# TABLE OF CONTENTS

# EXECUTIVE SUMMARY

Due to record drought conditions, state and local water management authorities have drastically increased water conservation standards throughout the state. USC has a responsibility to meet water conservation goals without reducing the quality of service to USC students, faculty, and staff. The Water Conservation Task Force (WCTF) conducted an unprecedented comprehensive baseline assessment of campus water use and water management. The baseline assessment was conducted to:

- Understand past water use trends and current water utilization.
- Analyze current water conservation efforts and their impact on overall campus water use.
- Assess how the university can best achieve mandated water conservation targets.
- Recommend strategies to maximize university water efficiency.

The assessment included a review of water conservation best practices, and a survey of campus water management research and policy programs.

The Water Conservation Task Force identified five significant findings that influence the recommendations of the baseline assessment.

1. Prior to the WCTF's work, a comprehensive baseline water use assessment had not been completed in over 20 years. The current baseline assessment represents an important "first step" toward a comprehensive water management plan.
2. Most of the university's current water use is concentrated in buildings, which comprises approximately 40% of the university's total water demand. Laboratory use is by far the highest consumer of water in buildings, accounting for approximately 35% - 45% of total building water demand.
3. Water conservation measures currently in place have been effective, contributing to a 35% reduction of potable water use per square foot since 2007. The university's current programs helped reduce our mandated water conservation goal to just 16% (or about 52,000,000 gallons annually) by 2016 versus 25% for the state of California.
4. HSC has substantially lower water conservation potential due to existing drought-tolerant landscaping, existing metering, at the building level and no potential for purchasing recycled water from the city.
5. There are a number of faculty and research centers at USC engaged in improving water management and policy. Strong faculty engagement in this issue presents an opportunity for USC to position itself as a water conservation leader.

As a result, the Water Conservation Task Force recommendations focus on improving or extending the most successful active conservation programs at the university.

**Capital Investment** programs require new investment to expand or improve water conservation capacity.

- **Complete the recycled water system plan.** A completed recycled water system could yield up to a 39% (70,000,000 gallons) reduction in potable water use. This project is expected to save approximately $77,000 annually.
- **Replace water-intensive landscape vegetation with drought-tolerant planting.** This is one of the most effective water conservation investments the university could make. Current landscape conversion programs have yielded water savings of up to 43%. Converting approximately six acres of campus lawn area to drought-tolerant landscaping could save approximately 2,000,000 gallons of irrigation water and approximately $22,000 per year.
- **Consider stormwater management systems to collect rainwater and store it for reuse.** It is estimated that up to 300,000 gallons of rain water can flow from the UPC campus in a single significant storm event. Preliminary estimates indicate that placing a conservative number of cisterns would save 1,600,000 gallons of potable water and $17,600 annually.

**Operations and Management** programs focus on implementing new methods or investing in systems to help measure and monitor water consumption, leading to a reduction in water use.

- **Meter additional buildings to improve overall water management of the university's largest source of water demand.** As an initial phase, the WTCF has identified sixteen buildings that would benefit from accurate water use and inform a broader range of water management strategies. The cost for the initial phase is estimated at $80,000. Most of the recommendations made in this report depend on accurate reporting of metered water use.
- **Audit and replace outdated and inefficient fixtures.** A recent water fixture audit of the University Park Campus indicates that fixture upgrades have the potential to yield 36,000,000 gallons of water and $396,000 annually.
- **Reduce cooling tower cycling.** Cooling tower use accounts for nearly 25% of all UPC water usage. A change in the way water is used in cooling tower operations could save the university 3,000,000 gallons and $33,000 annually.
- **Turn off fountains.** Campus fountains comprise only 2% of the university's total water demand, but are a potent symbol of the university's commitment to water conservation. Other organizations, such as the Getty Museum, Stanford University, and the City of Brentwood; have already instituted a fountain management program, which will continue until drought conditions abate. Implementing this measure will save approximately 4,400,000 gallons and $48,400 annually.

**Outreach** programs focus on water conservation awareness and behavioral change.

- **Engage students, faculty, and staff in reducing personal water use.** According to research on university energy and water reduction programs, educational campaigns are essential to maximizing program effectiveness. LADWP has estimated that for certain programs, behavior changes can generate water savings ten times greater than comparable hardware modifications. Given the university's strong commitment to water conservation policy and research and existing water conservation programs, a comprehensive water conservation outreach plan should have a material impact on campus water use and utilization.

## TABLE.1 PROJECTED WATER SAVINGS BY RECOMMENDATION (GALLONS)

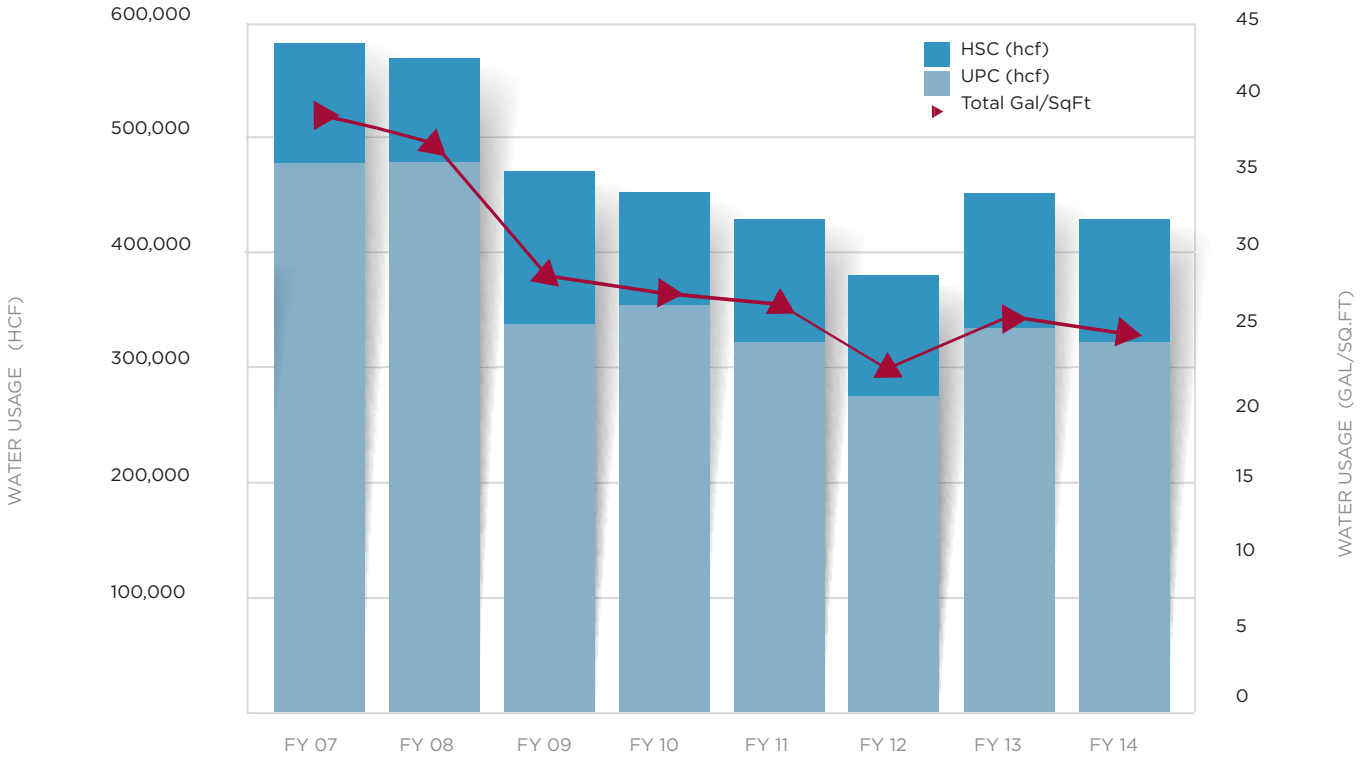
| RECCOMENDATION/OPPORTUNITY | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|---|---|
| Increased Metering [1] | 0 | 0 | 0 | 0 | 0 | 0 |
| Reclaimed Water System | - | - | - | - | - | 70,000,000 |
| Water Conservation Engagement Program | 1,584,000 | 4,800,000 | 4,800,000 | 4,800,000 | 4,800,000 | 4,800,000 |
| Storm water [2] | 528,000 | 1,600,000 | 1,600,000 | 1,600,000 | 1,600,000 | 1,600,000 |
| Cooling Towers | 990,000 | 3,000,000 | 3,000,000 | 3,000,000 | 3,000,000 | 3,000,000 |
| Fixtures | 11,880,000 | 36,000,000 | 36,000,000 | 36,000,000 | 36,000,000 | 36,000,000 |
| Landscape & Hardscape | 660,000 | 2,000,000 | 2,000,000 | 2,000,000 | 2,000,000 | 2,000,000 |
| Fountains | - | 4,400,000 | 4,400,000 | 4,400,000 | 4,400,000 | 4,400,000 |
| **POTENTIAL GALLONS SAVED** (potable water) | **15,642,000** | **51,800,000** | **51,800,000** | **51,800,000** | **51,800,000** | **121,800,000** |
| **COST** [3] | **$2,228,000** | **$2,148,000** | **$1,048,000** | **$1,048,000** | **$1,048,000** | **$1,048,000** |
| **POTENTIAL ANNUAL FISCAL SAVINGS** | **$172,062** | **$569,800** | **$569,800** | **$569,800** | **$569,800** | **$646,800** |

[1] While this will not directly save water, it will provide a clearer picture of water use on the UPC campus, making it easier to target future conservation efforts.
[2] Infiltration systems are excluded as they have an indirect benefit to USC. [3] Projects with estimated costs exceeding $1,000,000 (Storm water, Fixtures, Landscape and Hardscape) were spread over two years, those exceeding $4,000,000 (reclaimed water system) were spread over four years.

# BASELINE UNIVERSITY WATER DEMAND

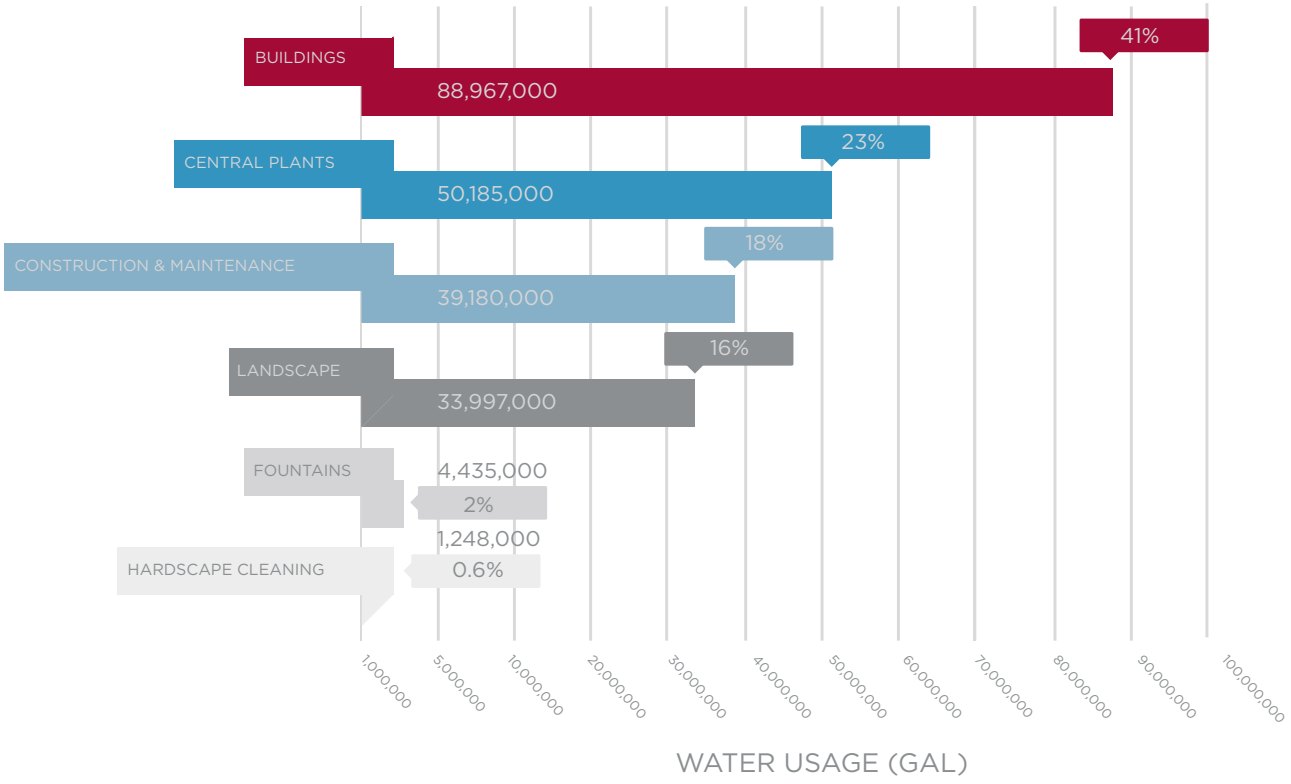
Initial research required a baseline assessment of current water use at USC's University Park and Health Sciences campuses. This data indicates a trend of consistent reduction in water use since 2010, resulting in a 14% decrease per square foot[4]. USC has been in compliance with the LADWP emergency drought restrictions since implementation in 2010. The data also show that the University Park Campus (UPC) is responsible for approximately 75% of all consumption (see Figure 1). Within UPC, buildings comprise the highest portion of water allocation, at 41%. Other notable uses include central plants (23%) and construction and maintenance (18%) (see Figure 2).

## FIG.1 USC POTABLE WATER USAGE[5,6]

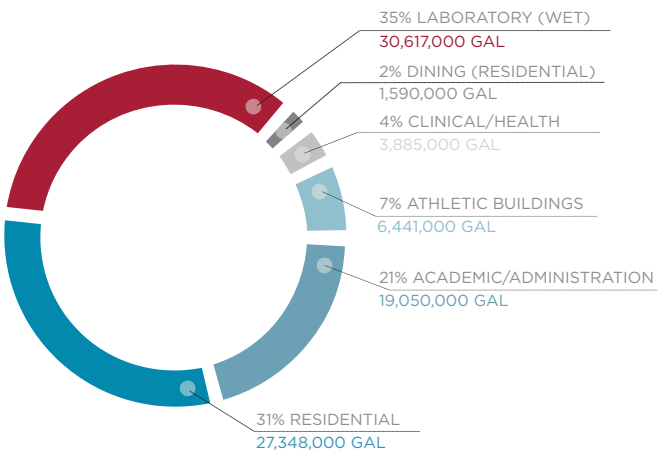



[4]This reflects USC's reduction of water use since the LADWP emergency drought restrictions in 2010. USC has reduced water use per square foot by 35% between 2007 and 2013.
[5]1HCF = 748 gallons
[6]Gal/Sq.Ft excludes off-campus apartments and parking structures

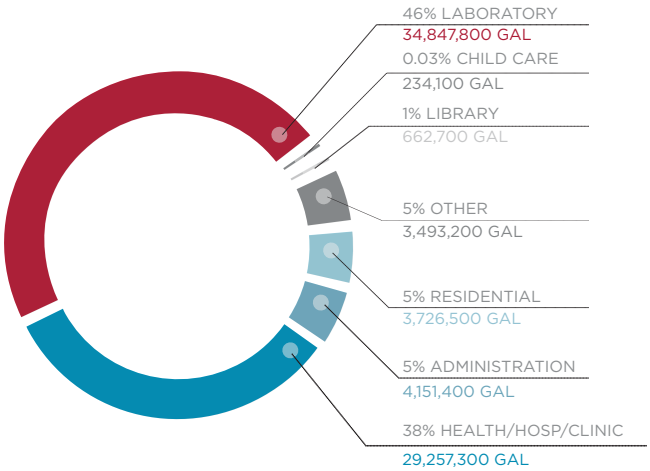
## FIG. 2 FY 2013 UPC WATER USE BY TYPE[7]




## FIG. 3 FY 2013 UPC WATER USE BY BUILDING TYPE




## FIG. 4 FY 2013 HSC WATER USE BY BUILDING TYPE




[7]This baseline is for the UPC campus proper only and does not include buildings outside the boundaries of Figueroa St., Exposition Blvd., Vermont Ave., and Jefferson Blvd. This information is based on metered data (where available), extrapolated metered data, and calculated data.

# SURVEY OF WATER MANAGEMENT & POLICY

Water management and conservation are increasingly becoming important as sources are threatened by environmental pollution and overuse. Rather than manage areas of water (e.g., groundwater, storm water, potable water, waste water) separately, the concept of "one water" embodies integrated water management and the pursuit of projects with multiple benefits. For example, storm water infiltration reduces pollution to oceans and treatment plants and encourages water recharge in aquifers, which is often a source for potable water. Therefore, a storm water infiltration project benefits storm water as well as potable and ground water. This management concept has been embraced by leading public and private entities, including the City of Los Angeles.

USC boasts a diversity of researchers striving to improve water conservation worldwide. The Social Influence and Environmental Sustainability Lab in USC Dornsife is participating in the Haynes Water Conservation Project, investigating psychological and social factors that may promote conservation of water resources in local residential homes. From the Viterbi School of Engineering, Professor Amy Childress is working on a concept to make desalination more energy-efficient and environmentally friendly in Southern California, while Assistant Professor Adam Smith is exploring the use of microbes for water purification and energy generation from wastewater. In the policy area, the Center for Sustainable Cities recently published a report that details conservation and new water supply projects and identifies challenges and prospects under climate change.

The university has also hosted high-profile events on water conservation. The Forum on Envisioning Drought-Resilient Cities included prominent architects, engineers, and sustainability experts exploring the transformation of cities to meet increasing water scarcity in the arid Southwest. The Schwarzenegger Institute and Public Policy Institute of California sought long-term solutions to California's water woes at a recent forum. The Dornsife Economics Leadership Council sponsored a panel event titled, "Tapped Out: Opportunities and Challenges in the Absence of Water." Most recently, Governor Jerry Brown and C.E.O. of the Los Angeles Times Austin Beutner met for "The California Conversation" to discuss feasible drought responses.

Progress has also been made in behavior and infrastructure on campus. USC's Environmental Student Assembly collaborated with UCLA to promote water conservation through the non-profit organization Change the Course, collecting pledges that resulted in corporate-sponsored projects to restore more than 2 million gallons of water back into the Colorado River. Additionally, housing services, Facilities Management Services, and a student-led campaign have installed outdoor and indoor water bottle filling stations across campus over the past year.

The university stands to make strides in water savings, acting as a laboratory for innovative development and coordinating management efforts with city- and state-wide campaigns. These efforts build on a recent assessment of the university's sustainability goals done before the emergency drought regulations. It included water recommendations to reduce potable water consumption by 10% in 2017 and 20% by 2020 from 2014 usage, increase conservation awareness, and implement campus-wide educational campaigns.

# CURRENT EFFORTS & RECOMMENDATIONS

USC is making a determined effort to reduce potable water use. A number of ongoing projects are increasing efficient use of water on campus, including the installation of purple pipe which supplies reclaimed water, outdoor landscape and hardscape management, and fixture upgrades.

While USC's water management efforts have already reduced the university's drought footprint, the Water Conservation Task Force makes several operational and behavioral recommendations to further minimize wasteful and inefficient water use on campus. These recommendations also consider existing conservation projects and programs at USC with the intention of sustaining these foundational initiatives and seeing their investments fully realized.

Note that recommendation costs are only preliminary estimates that require further investigation to verify based on time, conditions, and feasibility.

## METERS

Source: United States. Department of the Interior. Bureau of Reclamation. Water Measurement Manual: A Water Resources Technical Publication, 2010. Web

It is recommended that the University adopt a plan to meter all representative water use types individually on all campuses as well as at all on-campus dorms. Deployed technologies should allow for online monitoring. Although there are currently three meters used for billing on the University Park Campus, data from the meters will improve water characterization and enable more detailed monitoring and identification of water issues. In addition to tracking the gains made by fixture upgrades and educational campaigns, the data can further compel students, staff, and faculty to cut their use through outreach and education. Individual meter installation for a building or end-use can cost approximately $5,000 per building. All buildings at HSC are already individually metered. Most of the recommendations made in this report depend on accurate reports of metered water use.

### RECOMMENDATION:

It is recommended that the University add 16 meters to a range of building (resident, lab, and academic) and end-use types (landscape, fountains) with the ability to monitor the meters online. This is projected to cost approximately $80,000. While this will not directly save water, it will provide a clearer picture of water use on the UPC campus, making it easier to target future conservation efforts.

# RECLAIMED WATER SYSTEM


Source: "Purple (or Are They Pink?) Pipes to Deliver Recycled Water to Elysian Park." The Eastsider LA, 6 May 2014. Web.

Working with the Los Angeles Department of Water and Power (LADWP), the university has supported a water reclamation project to bring recycled water through a separate purple pipe to the UPC campus for irrigation and industrial uses. The committee also investigated on-site reclamation systems, such as that used at Emory University. However, after considerations of space limitations, cost, construction time, and odor, the committee elected to support the purchase of reclaimed water from LADWP.

Once fully realized, the project, which would serve landscaping and cooling towers, could yield up to a 39% reduction (approximately 70,000,000 gallons annually) in potable water usage. The current timeline for the LADWP project anticipates completion by 2020. The task force recently met with LADWP representatives and continues discussion to expedite the process in light of mounting drought concerns. In the meantime, Facilities Management Services (FMS) has been proactively installing purple pipe infrastructure around the UPC campus to distribute future recycled water. To date, approximately 4,000 linear feet of 10 inch recycled water main line piping has been installed on the UPC campus along McClintock Ave, Childs Way and Watt Way per the approved Master Plan. FMS has plans to install the remaining approximately 2,000 linear feet of 10 inch recycled water main line over the course of the next few years in anticipation of the LADWP project providing a future source. Typically the recycled water piping is installed alongside other utility infrastructure projects; however, on a standalone basis, it will cost roughly $2,000,000 to complete the recycled water main line system on the UPC campus.

Currently, replacing potable water usage in cooling towers and landscaping with recycled water results in 10% rate savings, or $70,000 on UPC. LADWP has no current plans to provide recycled water to the Health Sciences Campus area at this time.

Once FMS has completed the main lines, and LADWP has provided the source of recycled water, USC will need to convert the irrigation systems of large fields, parks and landscape areas to recycled water in order to realize a significant savings on potable water. The areas we have identified include, but are not limited to, Howard Jones Field, Alumni Park, Jaques Plaza, Associates Park, Meldman Family Cinematic Arts Park, and McCarthy Quad. Per LADWP case studies, the approximate cost to convert an irrigation system from potable to recycled water is $2,500 - $3,000 per acre feet. However, this will need to be evaluated on a case by case basis.

Another potential use for recycled water is cooling towers on the UPC Campus. Once a source is provided by LADWP, then all buildings with cooling towers would need to be plumbed to the roof with purple pipe meeting appropriate City and Department of Public Health requirements. The cooling towers are located at Parking Structure A (PSA), Physical Education Building (PED), Tutor Campus Center (TCC), and Seaver Science Center (SSC). The approximate cost to switch over a building cooling tower to recycled water can be in the range of $200,000 - $250,000; however this will need to be evaluated on a case by case basis as it is dependent on building height, size of piping, location of recycled water main, etc.

## RECOMMENDATION:

USC should continue to meet with LADWP to encourage the expedited construction of the purple pipeline to USC, while FMS continues to install the 10 inch recycled water main line per the approved Master Plan. In order to complete the system to receive recycled water when available, additional funding and planning will be required. Using only recycled water to irrigate landscape and run the cooling towers will save approximately 70,000,000 gallons of potable water and $77,000 annually. The projected cost of implementing this project is approximately $4,000,000.

# WATER CONSERVATION ENGAGEMENT PROGRAM


Source: "Mayor's Challenge April 2015." City of Ventura. City of Ventura, Apr. 2015. Web.

The task force recognizes the dramatic impact that across-the-board behavior changes can yield in terms of water savings. According to research on university energy and water reduction programs, technological improvements and educational campaigns together are more effective than alone[8]. LADWP has estimated that behavior changes can reap water savings in excess of ten times those achieved through hardware modifications.

Given the pattern of water consumption at USC – with the largest share of usage in building water fixtures – efforts to conserve water through educational programs may have the most notable impact.

Outreach efforts not only impact individual consumption but can also improve campus operations. Promotion of the Livesafe App or similar applications can encourage self-reporting of water leaks and other campus issues, bringing them to the attention of administration. By crowdsourcing water issues on campus, problems can be resolved efficiently.

An initial behavior change program would require cohesive signage and program materials to consistently message water conservation to various audiences on campus.

## RECOMMENDATION:

USC should therefore implement a comprehensive, long-term campus educational plan, targeting the following groups and areas:

- **Incoming freshman** through Orientation and information in courses;
- **Residential students** through the residential education program with dorm competitions and signage;
- **Student, faculty, and staff government leaders** (Academic Senate, Staff Assembly, Undergraduate Student Government, Graduate Student Government, Panhellenic Council, Interfraternity Council, and Residential Student Government) through issue training to raise awareness and increase communication;
- **Commuter and graduate students** through student government programs, a partnership with the Greek community, and water conservation communication in the Daily Trojan;
- **Lab users on UPC and lab and clinic users at HSC** through signage, communication to labs, and programs to increase education when fixtures are upgraded and labs and clinics inspected; and
- **General campus users** through signage, social media promotions, giveaways, and tabling at large events on campus and in the Coliseum.

Estimating an effective program with a reduction of 5% each for laboratories and housing on both campuses, we anticipate a program like this could save approximately 4,800,000 gallons annually. Preliminary estimates show the cost of this program to be approximately $15,000 annually.

[8]Reznick, Jake and Charlotte Arneson. "Conservation at College: A demand-side management approach to reduce student water consumption." Carleton College, Environmental Studies Comprehensive Project, n.d. Web.

Petersen, John E., Vladislav Shunturov, Kathryn Janda, Gavin Platt and Kate Weinberger. "Dormitory residents reduce electricity consumption when exposed to real-time visual feedback and incentives." International Journal of Sustainability in Higher Education 8:1 (2007): 16-33. Web.

# STORM WATER

A complete water management strategy includes not only reductions in water use, but also a proper mechanism for storm water mitigation that promotes groundwater filtration and permeation on the UPC Campus. Storm water management not only reduces pollution from runoff but can be stored for reuse or allowed to percolate to recharge the groundwater, increasing drinking water supplies. Filters capture pollutants and remove impurities before allowing water to return to the storm water pipeline.

On the UPC campus, pre-treatment along with infiltration systems encourage aquifer recharge and the long-term sustainability of the water table. Not including current construction projects, USC has systems, including bioswales and dry wells, in place to capture, treat and infiltrate the first flush of rain in a storm event for an area covering approximately 20 acres on the UPC Campus, resulting in a recharge volume of approximately 300,000 gallons. Due to hydrologic and geologic conditions, storm water infiltration is currently not feasible on the HSC campus.

As seen on the USC Water Conservation Initiatives map (pages 13-14), USC has installed storm water systems throughout UPC. USC will continue to install storm water infiltration systems which meet code requirements for new construction projects.

## RECOMMENDATION:

USC should consider investigating a standalone storm water management system not linked to new construction projects which may serve the campus on a larger scale and could increase the amount of infiltration/water diverted from the City's storm drain system. USC should also consider the installation of a capture and reuse system in lieu of infiltration which may provide a source of water for irrigation. While infiltration will not directly reduce water consumption, it benefits the Los Angeles region to divert water back into the water table, making it accessible for future use. Storm water capture for reuse directly benefits the campus. Preliminary estimates indicate that placing four 40,000 gallon cisterns on campus would cost approximately $1,000,000. Assuming 10 - 3/4" rain events per year[9], this project would save 1,600,000 gallons of potable water and $17,600 annually.

Costs for infiltration are excluded as they have an indirect benefit to USC. Further cost benefit analysis is needed to determine the fiscal and environmental impact of such a system.

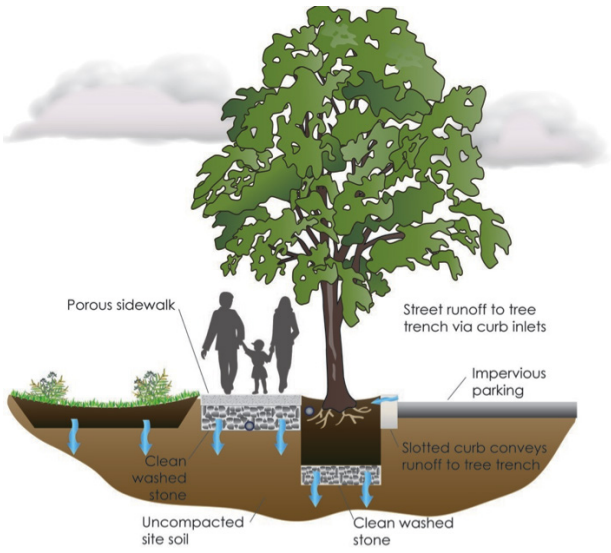



FIG. 4 Cross-section showing several infiltration options
Source: "Technologies for Stormwater Management." Meliora Design. Meliora Design, n.d. Web.

[9] "Station Name: CA LOS ANGELES DWTN USC CAMPUS". National Oceanic and Atmospheric Administration. Retrieved 2014-05-09

# COOLING TOWERS

Cooling tower use accounts for nearly 25% of all UPC water usage. A pilot program by Facilities Management Services is underway to reduce water used for cooling tower operations, which stands to save 3,000,000 gallons and an estimated $33,000 annually. This is accomplished by allowing the concentration of deposits or minerals to increase in the cooling tower before adding new water to the process. However, concerns about performance of the overall chiller system as a result of the higher level of minerals within cooling tower infrastructure have yet to be assessed. This pilot program will evaluate how water-conscious changes impact system performance and costs in the long-term.

## RECOMMENDATION:

USC should assess the results of the pilot program and, if they are positive, support wide scale implementation and savings. The university should also continue to review best practices in the industry for implementation. If fully implemented, this program has the potential to save 3,000,000 gallons on an annual basis. While the estimated savings come in around $33,000, the projected costs associated with an increase in chemical use is approximately $30,000, making this effort effectively cost-neutral.

# FIXTURES

Source: "Water Conservation with Shower and Faucet Tips." Sierra Club Green Homes. Sierra Club, n.d. Web.

USC has replaced approximately 75% of faucets, toilets, urinals, and showerheads with low-flow units. This effort has yielded a 20% reduction in water use for toilets and a 90% reduction for urinals. A pilot project for waterless urinals, saving an average of 4,000 gallons per year per urinal, is currently underway in a number of housing and administrative buildings, and dual-flush toilets have been installed in the North University Park apartments. Additionally, the Office of Sustainability recently completed a fixture audit to determine additional upgrade needs and savings on the University Park Campus identifying 36,000,000 gallons and $396,000 annually.

## RECOMMENDATION:

Based on an audit conducted by the Office of Sustainability with assistance from Facilities Management Services and manufacturer American Standard, there are additional opportunities for water efficiency in campus fixtures on the University Park Campus. If existing fixtures were upgraded to California water efficiency standards (0.35 gallons per minute [GPM] faucets, 1.5 GPM showerheads, 1.1 gallons per flush [GPF] toilets, and 0.125 GPF urinals), the University Park Campus would reduce its water usage by over 36,000,000 gallons of water and $396,000 annually. This project has an estimated cost of over $1,200,000. This includes fixtures in campus buildings, Hospitality, and on- and off-campus housing. These estimates do not include costs for installation. USC should conduct an audit at the Health Science Campus in order to investigate potential savings.

# LANDSCAPE & HARDSCAPE

The landscape at USC has improved considerably since President Nikias started an initiative to plant thousands of trees on both campuses. Although trees require more water than shrubs, they require significantly less than flowers and turf. They also provide substantial biodiversity, storm water management, health benefits, and energy savings and are worth the investment in the long-term.

In considering options for water conservation strategies in landscaping, it is important to recognize the value of the use of water, especially if related to other benefits. Although a desert landscape may use the least amount of water, an urban forest reduces the urban heat island effect and energy costs, attracts biodiversity and pollinators, reduces storm water runoff by diverting water back into the water table, and contributes to a positive environment for learning and community. Additionally, native, drought-tolerant plants are more resilient, best adapted to the heat and long dry spells in Southern California. These native, drought-tolerant plants also bring more species of beneficial insects and pollinators including butterflies and bees, which are needed for almost all flowering plants but have faced reductions in habitat and drastic population collapses over the past decade.

To minimize water use in landscaping, USC has installed a weather-based drip irrigation system that provides field and plant areas with only the amount of water required on most of UPC as well as parts of HSC. The system uses local atmospheric conditions and specific plant requirements to calibrate the minimum necessary irrigation needs. By monitoring soil absorption, USC also aims to eliminate runoff.

On several athletic fields, including the Cromwell, Intramural, and Brian Kennedy fields, synthetic turf has replaced conventional, water-intensive lawns. Elsewhere on UPC, the landscape has been replaced with drought-tolerant plants and shrubs, a conversion yielding water savings of up to 43% for those areas. Landscaping at HSC already extensively includes drought-tolerant species and is continually being evaluated for opportunities to further integrate water wise plants.

A trend towards drought-tolerant planting has already demonstrated key water savings. For the UPC campus, a review of lawn area which has limited "event" use has indicated approximately 200,000 square feet of lawn could be changed to drought-resistant landscaping. This will save approximately 2,000,000 gallons of water per year, or 43% per square foot per year, and approximately $22,000 annually.

The maintenance of USC's hardscape has also provided opportunities for water-savings. Water efficient equipment, including scrubbers, steam cleaners that recycle water, and power washers, are used to clean hardscape.

## RECOMMENDATION:

It is recommended that USC implement a targeted plan to convert additional areas with turf, such as Bloom Walk and the Andrus Gerontology Center, to native shrubs and vegetation adapted to the low-water climate of Southern California on all campuses. New landscaping should also favor native plants that support pollinator species. While the HSC campus does not have expansive lawns, a priority on drought-tolerant plants supports both water conservation and pollinators. If fully implemented, this program has the potential to save 2,000,000 gallons of water and $22,000 on an annual basis. The estimated costs for this project are $1,800,000.

FIG. 5: Evapotranspiration Gauge that Uses Atmospheric Conditions to Calibrate the Minimum Necessary Irrigation for an Area on the University Park Campus

# FOUNTAINS

Source: "Drought, Plastic Bags Prompt New California Laws." KSBW. National Broadcast Corporation, 29 Dec. 2014. Web.

USC's picturesque water fountains are an important part of the campus experience and tradition. However, while they comprise only 2% of USC's total water use, they have unfortunately become a high-profile target and major concern for USC students, staff, and faculty who feel that USC is not taking the drought seriously. Many organizations have turned off their fountains, including the Getty Museum, Stanford University, and the City of Brentwood; the dry fountains are often accompanied with drought-conscious messaging.

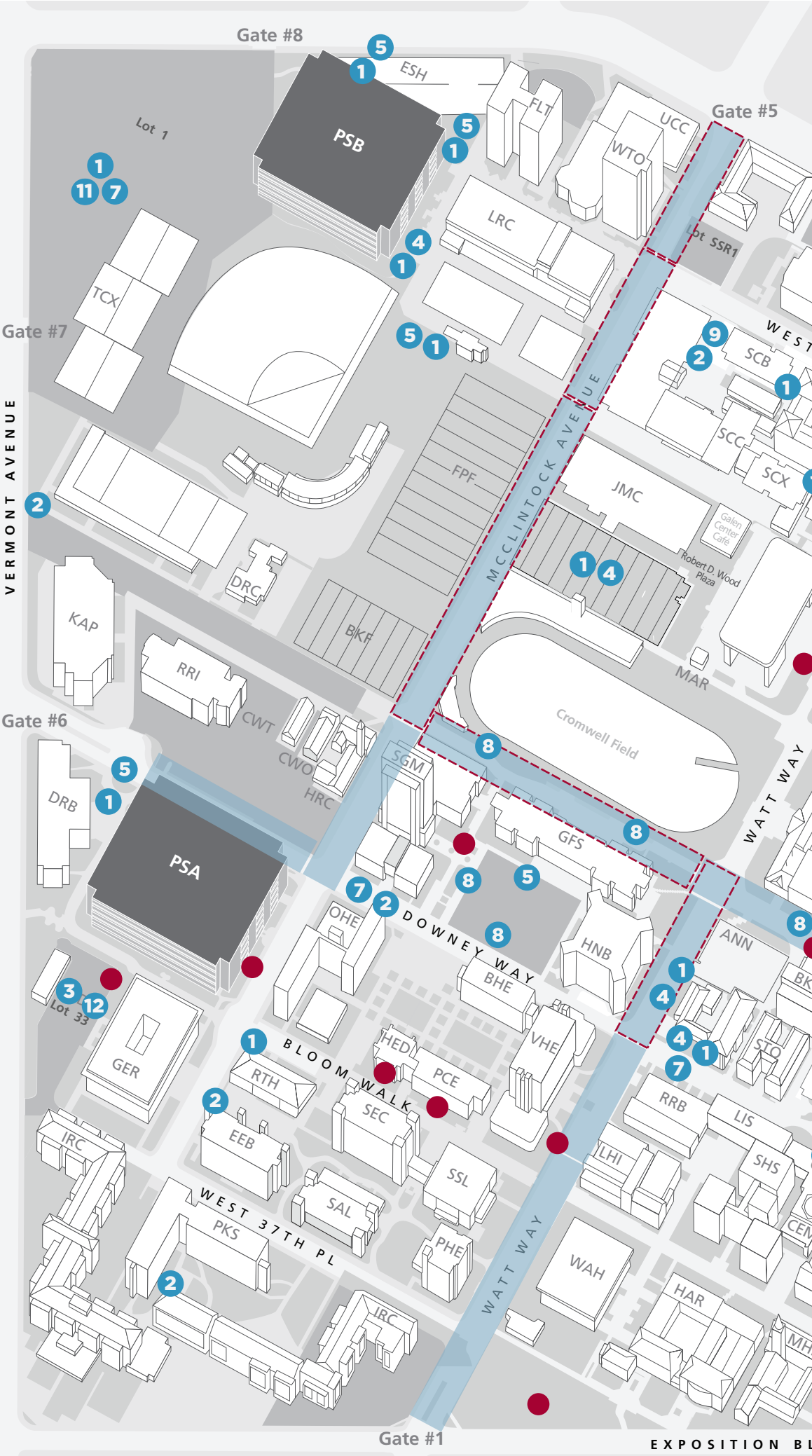
## RECOMMENDATION:

The task force proposes that the fountains on both campuses be drained and kept empty while the state remains in extreme drought conditions. Additionally, attractive signs placed near the fountains and online can inform campus users about the fountains (history and donors), the statewide water crisis, and the necessity of water savings on campus. Shutting off campus fountains will yield savings in excess of 4,400,000 gallons and $48,400 annually. This project is expected to have no additional costs for implementation or maintenance. As an alternative, the university could target a subset of the fountains rather than all of them.

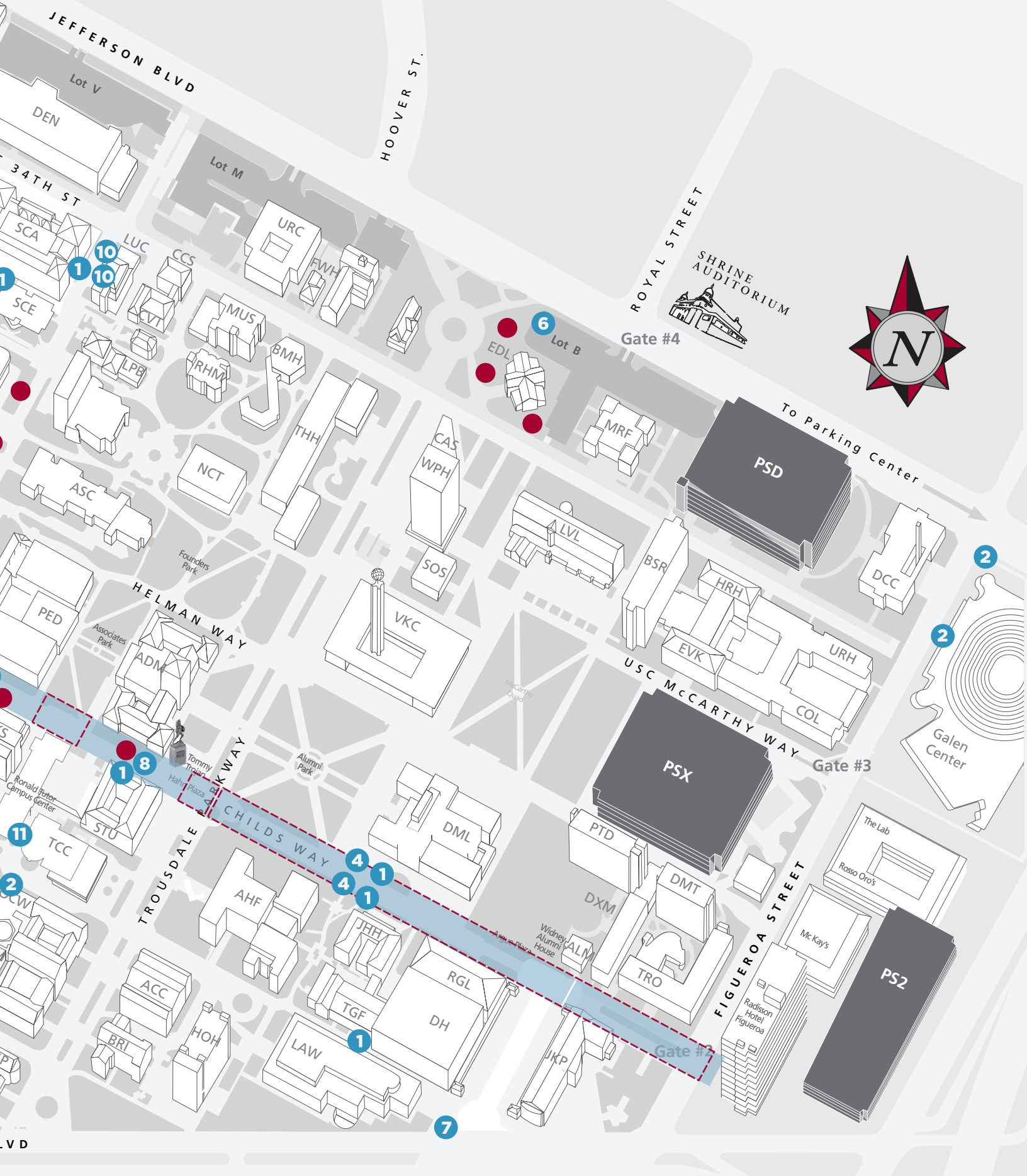
NEXT PAGE: USC has started water conservation efforts through storm water systems, purple pipe, and turf to shrub conversions throughout the UPC campus. The following map identifies these applications as well as planned purple pipe expansion.

# MAP LEGEND

- Turf to Shrub Conversion
- Stormwater Systems
  - 1 Fossil Filter Insert
  - 2 Mechanical Filter
  - 3 Roof Downspout Filter
  - 4 Infiltration Pipe
  - 5 Infiltration Trench
  - 6 Infiltration Basin
  - 7 Dry Well
  - 8 Bioswale
  - 9 Arched Infiltration Chamber
  - 10 Sand Filter Vault
  - 11 Modular Block Storage System
  - 12 Planter Box
- Purple Pipe Planned
- Purple Pipe Installed



# USC WATER
# CONSERVATION INITIATIVES



## TABLE.2 WATER CONSERVATION RECOMMENDATIONS BY LOCATION

| **RECOMMENDATION/OPPORTUNITY** | UPC | HSC |
|---|---|---|
| METER BY BUILDING/USE | X | (already metered) |
| RECLAIMED WATER SYSTEM | X | |
| WATER CONSERVATION ENGAGEMENT PROGRAM | X | X |
| RESIDENTIAL | X | X |
| LABS | X | X |
| STORMWATER | X | |
| COOLING TOWERS | X | |
| FIXTURES | X | |
| LANDSCAPE & HARDSCAPE | X | X |
| FOUNTAINS | X | |

# CONCLUSION

The current drought in California calls for urgent and comprehensive action. These actions should be pursued through the 'one water' paradigm, which calls for integrated water management and the engagement of projects with multiple benefits. This includes recognizing the value of our campus as an urban forest and the multiple health, energy, biodiversity, water and community benefits that our campuses provide. Additionally, continuing to support university sponsored research and policy work surrounding water conservation already underway at USC is an important step as we adapt to a changing global climate.

USC has reduced total water consumption through multiple efficiency and infiltration projects. These efforts have reduced overall water consumption while total building square footage has increased on both campuses. Additionally, modifications to infrastructure, data collection, and behavior will produce significant water savings as USC reinforces its resilience to drought and commitment to a sustainable future.

Assessing USC's current water consumption trends and analyzing best practices in effect at peer institutions, the task force has made recommendations for adaptations in both infrastructure and behavior.

The Water Conservation Task Force recommendations identify and describe high-impact investments that will yield reductions in water consumption. These recommendations incorporate 'one water' management by identifying and recommending projects yielding multiple benefits when available.

# CHARGE

The USC Water Conservation Task Force was asked to provide recommendations to the senior administration regarding university water conservation. Members are appointed by the Senior Vice President for Administration from a group of senior level administrators, staff, students, and faculty representatives knowledgeable in and who play a significant role in university water consumption. The Task Force reports to the President through the Senior Vice President for Administration and works closely with the Associate Senior Vice President for Administrative Operations, whose office provides staff support. The Task Force shall:

- Advise senior administration on water conservation strategies
- Recommend university water consumption targets, including reduction targets and objectives for:
    - Residential use
    - Non-residential building use
    - Aesthetic landscaping
    - Athletic field landscaping
    - Cooling towers
    - Storm water runoff
- Establish an accurate water consumption baseline
- Draft an educational campaign for:
    - Students (residents and non-residents)
    - Faculty/Staff
    - Visitors

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