UCLA WATER ACTION PLAN

DECEMBER 2013

PREPARED BY:

The University of California, Los Angeles
Campus Sustainability Committee—Water Task Force

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The University of California Policy on Sustainable Practices has committed each campus to achieve a per capita potable water consumption reduction target of 20 percent below a campus-specific baseline by 2020. This Water Action Plan has three main components: UCLA's existing & proposed initiatives for water reduction; education & outreach programs; and stormwater management. The combination of these efforts would enable the campus to meet the Policy's goal.

Pursuant to the UC Water Policy, UCLA used the fiscal years of 1999 through 2001to generate the campus' water baseline. During these three years, the campus used an average of 892,764,180 gallons of water per year.

To properly distribute the water use amongst the campus' range of water users, a weighted metric was applied to the defined populations. Thus, the 1999/2001 baseline is 17,084 gallons of water per weighted campus water user, per year. The 20 percent reduction target is 13,667 gallons per user.

Comparing the baseline to the weighted per capita water use for 2012/2013, UCLA has already reduced water consumption by 9 percent. This has been achieved through fixture retrofits, water recycling, drought tolerant landscaping and weather based irrigation.

TO REDUCE CAMPUS WATER USE BELOW THE 2020 TARGET REQUIRES REDUCING ANNUAL WATER USE BY 143,800,000

In addition, projects identified in the campus' 10-year plan that could be constructed by 2020, have the potential to add 28,800,000 gallons per year of potable water demand.

Thus, to reach a 20 percent reduction by 2020 that also accounts for growth, the campus needs to reduce potable water use by an estimated **143,800,000** gallons per year.

Through implementation of five current and proposed initiatives, the campus can meet the UC Policy water reduction goal. Attaining this goal relies on the Satellite Treatment Plant, which accounts for 80 percent of the anticipated reduction.

UCLA HAS IDENTIFIED FIVE MAIN INITIATIVES TO ACHIEVE THE 20 PERCENT REDUCTION GOAL

1 Satellite Treatment Plant Partnership with City of Los Angeles Department of Water & Power:
Reduction: 144,000,000 gallons per year (gpy)

2 CoGeneration Plant Blowdown Water Recycling:
Reduction: 25,500,000 gpy

3 Intramural Field Artificial Turf Installation:
Reduction: 6,400,000 gpy

4 On-Campus Housing Fixture Replacement:
Reduction: 4,300,000 gpy

5 Tiverton Greywater System:
Reduction: 190,000 gpy

TOTAL WATER USE REDUCTION
180,390,000 gallons per year

A SATELLITE WASTEWATER TREATMENT PLANT COULD RECYCLE 144 MILLION GALLONS OF WATER PER YEAR

STEP 1

FINE SCREENING: The wastewater flows through a perforated rotary drum screen to remove large material in the wastewater.

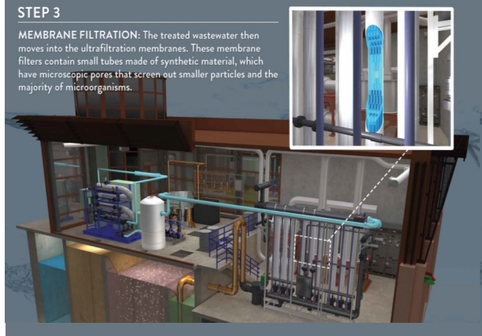
STEP 2

BIOLOGICAL TREATMENT: The screened wastewater then enters the bioreactor tanks (below ground) where microorganisms feed on waste particles and dissolved organic material to help clean the wastewater.

WATER RECYCLING DEMONSTRATION FACILITY

STEP 3

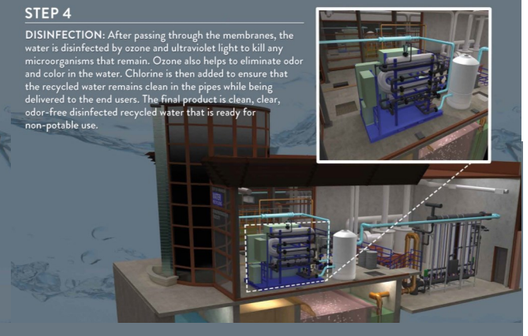
MEMBRANE FILTRATION: The treated wastewater then moves into the ultrafiltration membranes. These membrane filters contain small tubes made of synthetic material, which have microscopic pores that screen out smaller particles and the majority of microorganisms.



WATER RECYCLING DEMONSTRATION FACILITY

STEP 4

DISINFECTION: After passing through the membranes, the water is disinfected by ozone and ultraviolet light to kill any microorganisms that remain. Ozone also helps to eliminate odor and color in the water. Chlorine is then added to ensure that the recycled water remains clean in the pipes while being delivered to the end users. The final product is clean, clear, odor-free disinfected recycled water that is ready for non-potable use.



City of Anaheim website (http://www.anaheim.net/articlenew2222.asp?id=5035

IN PARTNERSHIP WITH THE CITY OF LOS ANGELES, UCLA COULD BE ONE OF MANY SITES FOR A SATELLITE WASTEWATER TREATMENT PLANT

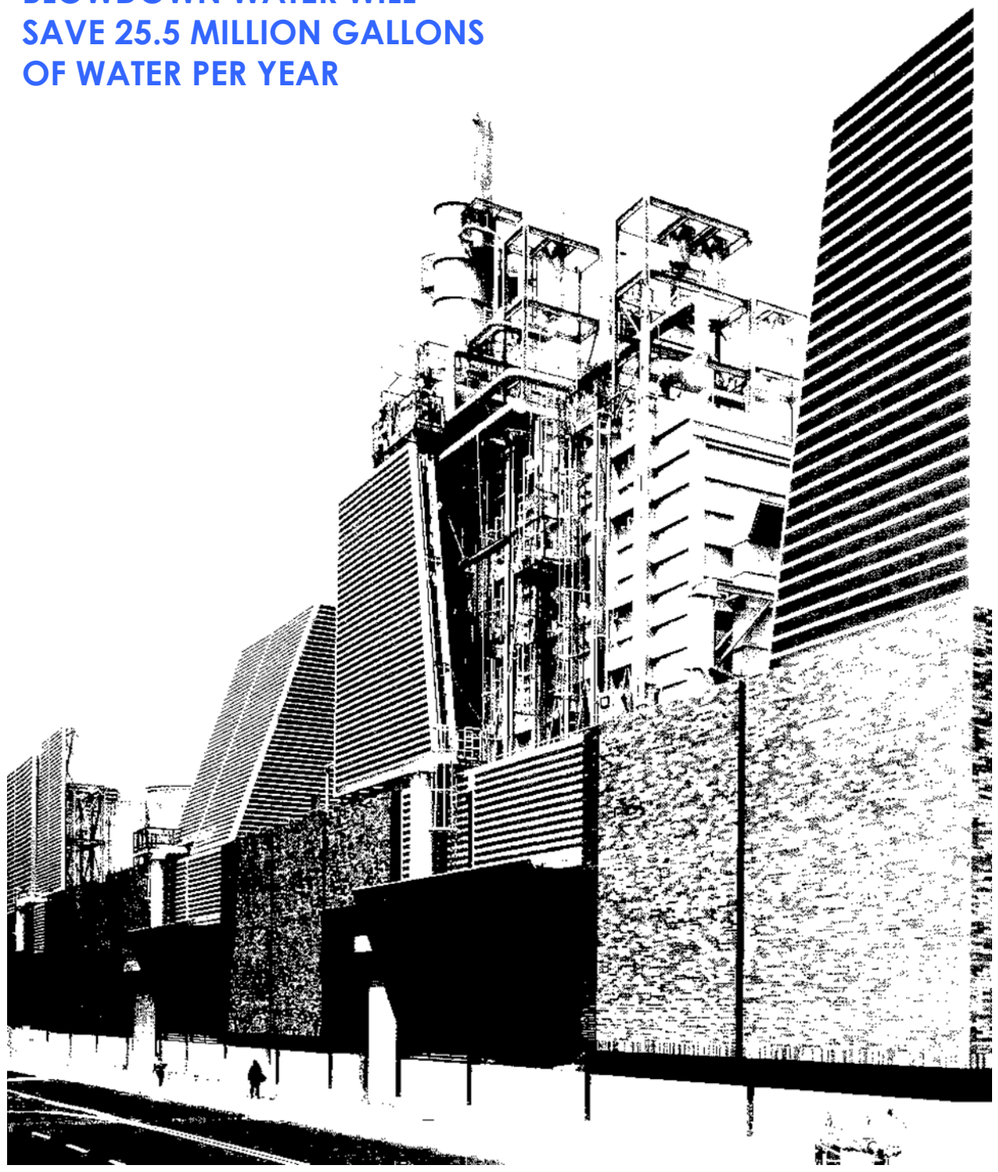
The Northwest Zone of the campus is home to over 11,000 undergraduate resident students. This density generates over 0.5 million gallons of wastewater per day.

The City of Los Angeles, Department of Water and Power (DWP) is committed to increasing recycled water production to 59,000 acre-feet per year (19 Billion gallons) by 2035.

Capture and treatment of wastewater from the Northwest Zone would generate 400,000 gallons of recycled water per day to be used in the CoGen Plant's cooling towers.

If determined to be feasible, the project would be constructed and operated by DWP on the UCLA campus. The review of the project's feasibility will continue through 2014.

RECYCLING OF THE COGEN BLOWDOWN WATER WILL SAVE 25.5 MILLION GALLONS OF WATER PER YEAR



THROUGH INSTALLATION OF AN ACTIVE WATER TREATMENT SYSTEM, THE COGENERATION (COGEN) PLANT WILL RECYCLE DAILY BLOWDOWN WATER AND RETURN IT TO THE COOLING TOWERS

The CoGen Plant recirculates water seven times through the cooling tower system until the Total Dissolved Solids (TDS) reach a maximum threshold.

This water (called blowdown), cannot be passed through the cooling tower system due to its corrosive properties, thus, it is discharged to sewer at a volume of approximately 70,000 gallons per day.

Installation of a UCLA proprietary water treatment system developed by the Water Technology Research Center, would remove the TDS from the water and return it back to the CoGen cooling towers.

ARTIFICIAL TURF INSTALLED ON THE INTRAMURAL FIELD WILL SAVE 6.4 MILLION GALLONS PER YEAR

CONVERTING THE 7.7 ACRE INTRAMURAL FIELD FROM GRASS TO ARTIFICIAL TURF WILL NEARLY ELIMINATE WATER USE

An average watering day for the existing grass field uses 1,397 gallons of water per minute, with a run time of 22 minutes, for a total of 30,700 gallons per day. Multiplied by 5 days a week and 41 weeks a year (11 weeks for repair or weather) amounts to 6.4 million gallons per year.

An artificial turf surface would only require water for spot cleaning. The field is "refreshed" by grooming, thus watering of the entire field is unnecessary.

Artificial Turf technology has advanced significantly for both the "grass" cover and the infill medium. These advancements have reduced heat gain, though watering portions of the field to cool the surface may occur.

FIXTURE REPLACEMENT IN EXISTING RESIDENCE HALLS WILL REDUCE WATER BY 4.3 MILLION GALLONS ANNUALLY

HOUSING & HOSPITALITY SERVICES HAS BEEN RE-PLACING TOILETS, FAUCETS, AND SHOWERHEADS THROUGHOUT THE EXISTING RESIDENCE HALLS

This initiative includes the re-placement of 1.6 gallon toilets with 1.0 gallon toilets for an annu-al water reduction of 1.5 million gallons.

Replacement of faucets and showerheads and installation of faucet aerators in existing fixtures will reduce water use by 2.8 million gallons per year.

This initiative is currently under-way as of 2013 and will continue to be implemented through blocks of rooms or individual buildings into the year 2018.

THE TIVERTON HOUSE GREY-WATER SYSTEM WILL SAVE 190,000 GALLONS OF WATER PER YEAR

THE TIVERTON HOUSE IS AN OVERNIGHT FACILITY THAT CAN BE MODIFIED TO IN-STALL A PILOT GREYWATER SYSTEM

With a subterranean parking garage and exposed plumbing lines overhead, the discharged laundry water from the facility can be redirected into a grey-water system.

An estimated 510 gallons of water are discharged from the facility per day. This water can be cap-tured in an above grade bio-filtration unit to provide on-site irri-gation water.

Although the water reduction po-tential of this project is negligible, its true intent is to reveal strategies for retrofitting existing campus buildings with greywater treatment systems and to identify water reuse options.

THE CAMPUS CONTINUES TO BE COMMITTED TO EDUCATION & OUTREACH THAT TEACHES WATER CONSERVATION AND SUSTAINABILITY

UCLA is a living laboratory for sustainability where students, staff and faculty collaborate. In addition to hundreds of courses and over 25 research centers focused on environment and sustainability, we are also integrating operations and academics, This section covers examples of these initiatives as well as a groundbreaking new interdisciplinary university wide research initiative on environment and sustainability that focuses on energy and water. Moving forward we will continue to use the physical campus as a test bed for new water technologies and conservation methods.

UCLA SUSTAINABILITY EDUCATION & OUTREACH

COOLING TOWER BLOWDOWN PILOT

1 The filtration system that will be installed at the Cogen cooling towers and help us meet our 2020 goals, was piloted at UCLA in 2011. This successful pilot was critical in development of the technology as well as providing an important water saving solution for UCLA. Professors and graduate students collaborated with Facilities Management staff during implementation.

The combination ultra-filtration/reverse-osmosis system, was devised by the UCLA Water Technology Research (WaTeR). The system is dubbed Com2RO: a compact, second-generation, reverse-osmosis system. What makes Com2RO unique is both its small size — designed under a grant from the Navy to fit into the watertight hatch doors of their ships — but, more importantly, the way the ultrafiltration (UF) and reverse osmosis (RO) modules of the system "talk" to each other. Most water-cleaning systems – "dumb" systems – fail when confronted with a change in water quality, Professor Cohen, Director of WaTeR said. In contrast, Com2RO is a smart system.

"Basically, this integrates ultra filtration with reverse osmosis in a new design that allows [the two operations] to talk to each other," Cohen said. "They can handle changing water-quality conditions, and the system figures out what adjustments to make."

The implications are huge and far-reaching: While water-cleaning systems have traditionally needed to be adjusted or even redesigned to handle different kinds of dirty water, the Com2RO could produce freshwater in poverty-stricken countries without experts to adjust the system if polluted water becomes more mineralized or salty. It could also be used on Navy ships to produce drinkable water from both salt water and gray water.

Credit: Alison Hewitt, UCLA Today

UCLA SUSTAINABILITY
EDUCATION & OUTREACH
ACTION RESEARCH TEAM-DROUGHT TOLERANT LANDSCAPING

2 UCLA's Institute of the Environment and Sustainability, home to the Environmental Science Major, the graduate Leaders in Sustainability certificate program, and eight research centers on sustainability, also runs the Education for Sustainable Living Program (ESLP), a unique series of academic courses.

A component of ESLP is the Action Research Team program. Action Research Teams (ART) is a student-run program held during winter and spring quarters with the goal of initiating dialogue, conducting research, and enacting change in sustainability by bringing together students, faculty, and administration. The Water Task Force had a dedicated ART team for the 2012/2013 year. The team was successful in moving forward two initiatives (not mentioned above) for a landscape survey of the student residents and future fixture replacement in core academic buildings.

Under the guidance of Housing & Hospitality's sustainability manager, Aliana Lungo-Shapiro, the ART team surveyed students on their thoughts regarding replacement of existing landscaping with native/drought-tolerant landscaping. The purpose of the study was to use the residents as a test case to understand the general population's understanding of what drought-tolerant landscaping looks like, why it is more sustainable, and would they want more of this landscaping on the Hill. Further, their responses could drive how the campus could incorporate drought-tolerant landscaping into the broader campus palette.

A survey of 134 students revealed a 73 percent preference for drought-tolerant landscaping over the predominately exotic landscaping on the Hill. In addition, 80 percent of students identified that they would want more drought-tolerant landscaping on the Hill in the future.

UCLA SUSTAINABILITY
EDUCATION & OUTREACH
ACTION RESEARCH TEAM-FIXTURE REPLACEMENT

3 The ART team also assisted Facilities Management's Tim Petta with a survey of water use in Powell Library and Boelter Hall. These are two of several core buildings that have not had fixture upgrades in the restrooms. The team collected data during peak hours, on how long each patron ran water from the sink faucets and how many times a patron turned the faucet on. This was done to establish an existing baseline to inform what water saving would be attained with installation of metered faucets.

A sample of 50 men and 50 women in both Powell and Boelter Hall were observed by the team members, for a total of 200 samples. Observations were made during the busiest times when people most used the bathrooms and counted the number of sink users during the specified time. The chosen time was X:50 – X:05 when people were released from class and people were using the bathrooms before class. The team then assumed that there are eight (8) peak periods in the bathrooms per day and this occurred each day across a typical 5-day (Monday through Friday) school week.

The average faucet run time for women was 10 seconds and 9 seconds for men, with the combined average of 10 seconds per user. The averages informed what run times should be considered for the new metered faucets that would be set by the installer. In use, each run would be triggered by the patron by pushing a manual, spring-loaded lever. Each new metered faucet has an equipment-only cost of $150 and the sample bathrooms had a total of 20 sinks; thus, an equipment cost of $3,000.

Calculated water and cost savings for both a 5– and 8-second meter push are as follows:

	Water Savings (gallons)			Cost Savings		
Metered Faucet	5-year Operation	10-year Operation		5-year Operation	10-year Operation	ROI (years)
5-second meter	853,637	1,707,274		$6,646	$16,292	1.55
8-second meter	617,035	1,234,071		$3,973	$10,945	2.15

UCLA SUSTAINABILITY EDUCATION & OUTREACH

HOUSING & HOSPITALITY SERVICES SUSTAINABILITY INITIATIVES

4 Housing & Hospitality Services implements its own sustainability initiatives, which focus on Living Green for both on- and off-campus residents; Dining Green in on-campus dining halls; and waste management strategies for Rooms Division, Dining, and Catering, among others.

The Living Green program is dedicated to Housing operations that reduce energy and water consumption and reduce waste; which are essential to minimize the impacts of over 11,000 students living on "the Hill." Existing water initiatives include Solar Water Heating, Low Flow Fixtures, Weather Controlled Irrigation, Drip Irrigation Systems, and H2O-to-Go Filling Stations. More details about these initiatives can be found at http://www.sustain.ucla.edu/our-initiatives/housing/

UCLA Dining Services is committed to water reductions through the promotion of Beef-less Thursdays and Tray-Free Dining. Additional details can be found at http://www.sustain.ucla.edu/our-initiatives/housing/dining-green/

In addition to strategic initiatives, Housing & Hospitality Services has partnered with the Office of Residential Life to establish Team Green Coordinators—"eco-reps" that promote education and outreach within the on-campus residence halls. Team Green Coordinators organize building and Hill-wide programs, create passive education boards, and conduct trainings on energy, water, waste, food, and purchasing. Team Green Coordinators provide incentives (such as shower timers, reusable bags, or CFL light bulbs) to students to encourage long-lasting behavior change.

UCLA SUSTAINABILITY EDUCATION & OUTREACH

UCLA GRAND CHALLENGES

5 On November 15, 2013, UCLA unveiled plans designed to turn Los Angeles into a global model for urban sustainability. The project is the first of six in the UCLA Grand Challenge initiative that will unite the university's resources to tackle some of society's most pressing issues.

At a kickoff event at UCLA's Royce Hall, Chancellor Gene Block described the ambitious project, "Thriving in a Hotter Los Angeles," whose goal is for the Los Angeles region to use exclusively renewable energy and local water by 2050 while protecting biodiversity and enhancing quality of life.

"With our rich history of creating new ideas and a vibrant tradition of collaboration across disciplines, UCLA is uniquely capable of solving the most pressing issues facing society," Block said. "This is bigger than any research project we have tackled before. Each of our six UCLA Grand Challenge Projects will take on a different issue with an all-star campus-wide team of UCLA faculty, complemented by public engagement and student involvement. Our first project includes dozens of UCLA's most prominent and renowned scholars, who will create a model for sustainable living around the world."

"Thriving in a Hotter Los Angeles" seeks to raise $150 million for research on new technologies and policies. In 2019, UCLA will provide regional decision-makers with a detailed plan for how to achieve full sustainability in greater Los Angeles by midcentury. The roadmap will be backed by cutting-edge research, new technologies and breakthroughs, and recommendations on laws, policies and outreach, many of which will be tested first on UCLA's campus.

The effort will involve six dozen faculty and staff from about 30 centers and nearly two dozen departments, including environmental science, law, economics, urban planning, public policy, engineering, public health, conservation biology, transportation and communication studies. For more information please visit the website at http://grandchallenges.ucla.edu/

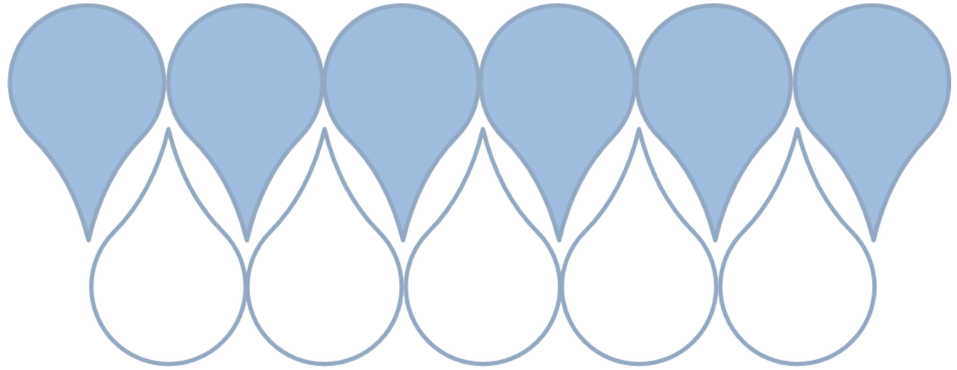
UCLA STORMWATER MANAGEMENT

REGULATION & INNOVATION

Since 2009, active and passive stormwater systems have been incorporated into new construction projects in response to the regulatory changes for the National Pollution Discharge Elimination System (NPDES) Statewide General Construction Permit. The General Permit is required for projects that would result in land disturbance of over one acre. In response, the campus has developed a variety of stormwater retention solutions on a project-by-project basis.

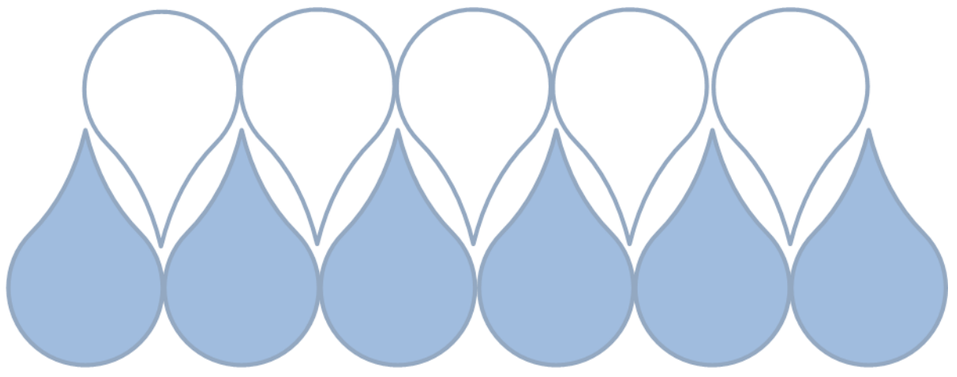
A comprehensive plan for how the campus can capture and reuse stormwater as part of its water portfolio will be the primary focus of the Water Task Force through 2014.

With support from a new ART team during the 2013/2014 academic year, and in conjunction with the UCLA Grand Challenges, the Water Task Force will develop stormwater initiatives that can be implemented on the campus as a test case for the larger Los Angeles Region.



APPENDIX A

THREE-YEAR BASELINE CALCULATIONS



UCLA BASELINE WATER USE VS. 2012/2013

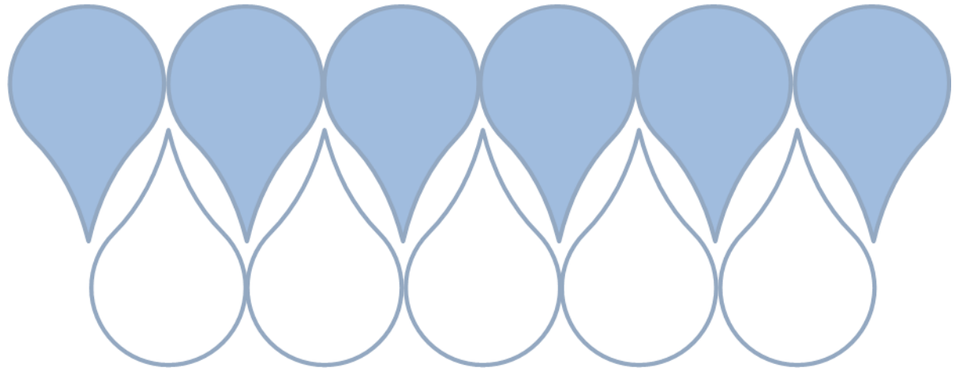
UCLA's baseline consists of the population and total campus water data for the three fiscal years of 1999/2000, 2000/2001, and 2001/2002. The various populations of those three years are multiplied by a weighted campus user factor to generate an annual water use per user.

As shown below, the UCLA Baseline Weighted Water User is 17,084 gallons per year (gpy). Compared to the Fiscal Year 2012/2013, the annual gallons per weighted campus user was 15,543. This represents a nine (9) percent reduction from the baseline.

	Baseline	2012/2013
On-Campus Resident	6,957	12,190
Patients	622	675
Full-time Students (non-resident)	28,515	28,278
Full-time Staff & Faculty	18,094	22,499
Part-time Students	1,440	873
Part-time Staff & Faculty	17,383	19,638
total population	73,011	84,153
Total Campus Water Use (gpy)	892,764,180	956,542,400
Weighted Campus User	52,258	61,540
Water Use per Weighted Campus User (gpy)	***17,084***	***15,543***

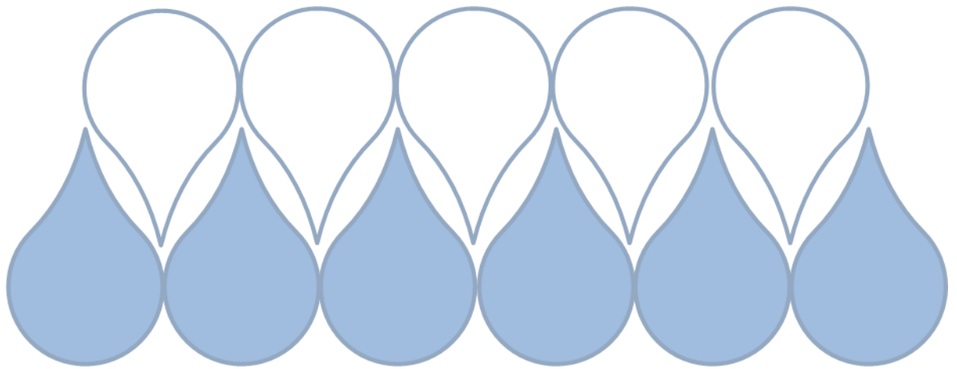
Per the UC Policy on Sustainable Practices, an average of the annual gallons per weighted campus user over the three chosen years is used for the campus baseline. The weight per user is as follows:

- On-Campus Resident: 1.0
- Patients: 1.5
- Full-Time Student/Staff/Faculty .75
- Part-Time Student/Staff/Faculty .50



APPENDIX B

INITIATIVE COST ESTIMATES & ROI



HOUSING & HOSPITALITY SERVICES FIXTURE REPLACEMENT INITIATIVE

The Housing &Hospitality Services initiative would replace the following fixtures as follows:

Toilets:	Replace 1.6 gallon per flush (gpf) with 1.0 gpf units
Faucet aerators:	Replace 2.2 gallon per minute (gpm) with 0.5 gpm units
Showerheads:	Replace 2.0 gpm with 1.5 gpm units
Showerheads:	Replace 2.5 gpm with 1.5 gpm units

Initiative	#Units	Est. Water Savings (gal)	Est. Install Costs
High efficiency toilets	1,330	1,500,000	$152,000
Low-flow aerators	1,640	900,000	$8,240
Low-flow showerheads (2.0)	1,210	1,100,000	$8,610
Low-flow showerheads (2.5)	120	800,000	$1,170
	4,300	**4,300,000**	**$170,020**

COGENERATION PLANT BLOWDOWN TREATMENT & RECYCLING INITIATIVE

The Blowdown treatment and recycling initiative would potentially have a payback in two (2) years based on the estimated cost of treatment equipment offset annually by water cost savings.

		0	1	2
		2014	2015	2016
Estimated Equipment Cost			($600,000)	
Blowdown Volume and Cost				
volume/day/gallons		70,000	-	-
volume/year/gallons		25,550,000	-	-
cost/gallons (cents)		0.013	0.013	0.013
Annual Cost		**($332,150)**	**($267,850)**	**$0**