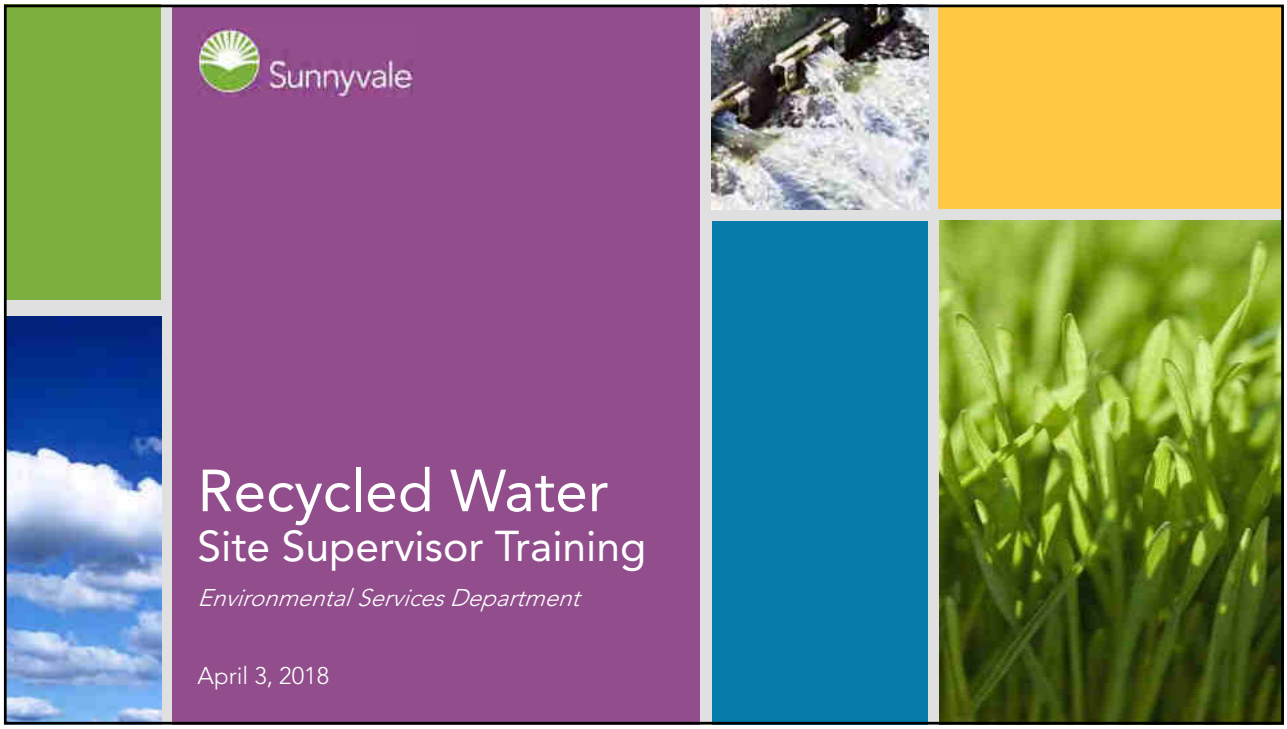
Sunnyvale
Recycled Water
Site Supervisor Training
Environmental Services Department
April 3, 2018


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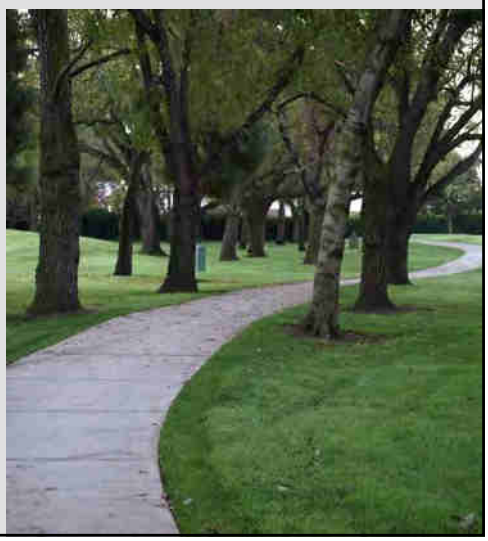
Recycled Water

Site Supervisor Training Goals

- How Sunnyvale produces recycled water
- Regulatory drivers behind recycled water
- Uses and restrictions of recycled water
- Roles and responsibilities of Site Supervisors
- Completing Self-Monitoring Report



Recycled Water

Site Supervisor Training Overview

9:00 – 9:20	Sign-In and Introductions
9:20 - 10:00	Production, Benefits, and Uses
10:00 – 10:30	Regulatory Drivers
10:30 – 10:40	Break
10:40 – 11:45	Site Supervisor Roles and Responsibilities
11:45 – 12:00	Summary and Quiz

Recycled Water Pumping Station
Water Pollution Control Plant

Sunnyvale

Recycled Water

Production, Benefits and Uses

- What is recycled water and how is it made?
- How does it get to me?
- What are the end uses of Sunnyvale's recycled water?
- How much recycled water does Sunnyvale produce?
- What are the benefits of using recycled water?

Recycled Water

What's in those Purple Pipes?

- Water which, as a result of treatment of waste, is suitable for direct beneficial use
- Sunnyvale's recycled water is derived from municipal wastewater
- There are laws and regulations that restrict its use mainly to protect public health
- Provides a drought proof resource that can offset potable water use

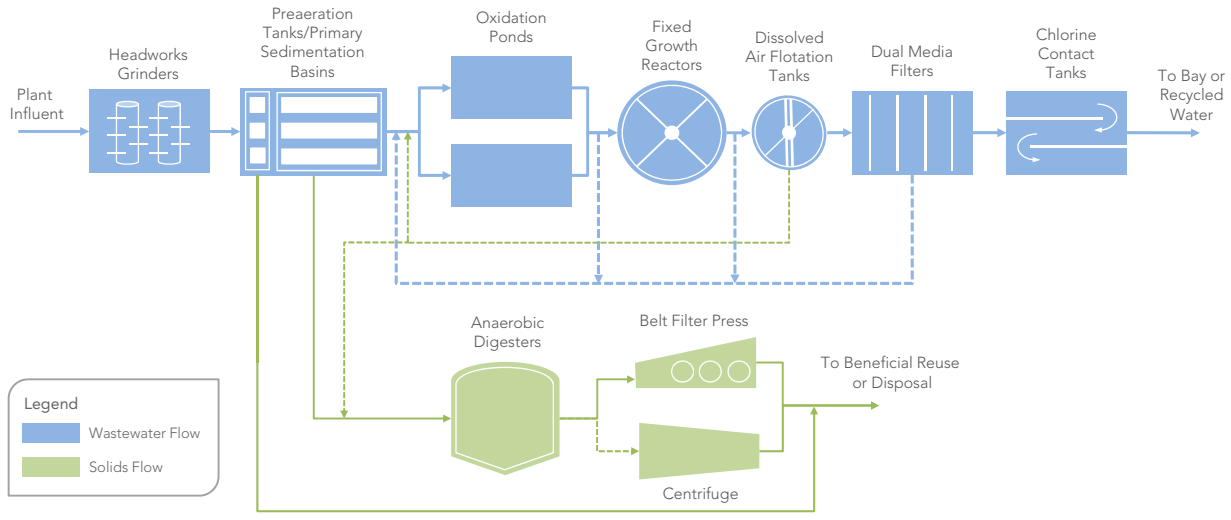
Recycled Water

Water Pollution Control Plant

- Design inflow of 29.5 MGD
- Current inflow around 13.0 MGD
- Recycled water production constitutes ~7-10% of daily inflow
- Produces disinfected tertiary recycled water
- Services more than 100 recycled water sites

Recycled Water

Water Pollution Control Plant Treatment Process Overview

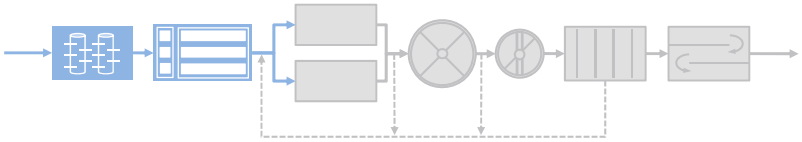


Recycled Water

Primary Treatment – Preaeration Tanks and Primary Sedimentation Basins

Solids Removal

- Protection of downstream equipment
- Wastewater initially enters Headworks 30 ft below grade
- Grinders macerate large debris
- Preaeration Tanks remove heavy inorganics (sand, gravel, coffee, eggshells, etc.)
- Primary Sedimentation Basins remove 50-75% heavy organics and floatable scum (fats, oils, and grease)

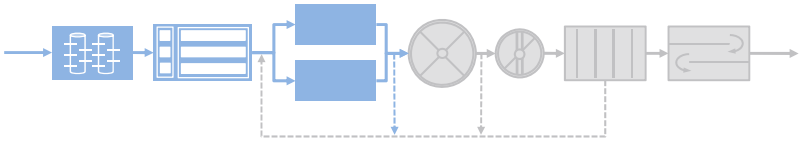


Recycled Water

Secondary Treatment - Oxidation Ponds

Organics/Ammonia Removal

- 440 acres of treatment ponds
- Open system (biological)
- Algae and bacteria provide treatment
- Seasonal influence on treatment efficiency (temp, wind, rain)
- >500 million gallons storage
- Publicly accessible

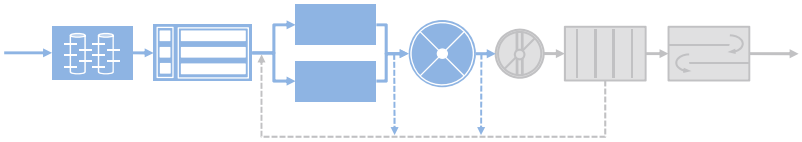


Recycled Water

Secondary Treatment – Fixed Growth Reactors

Ammonia Removal

- Back-up for the Oxidation Ponds during colder weather
- Assures compliance with seasonal discharge limits
- Wastewater spread over plastic media with high surface area
- Promotes growth of colonies of microorganisms (biofilms) on plastic media
- Biofilms convert ammonia to nitrate (nitrification)

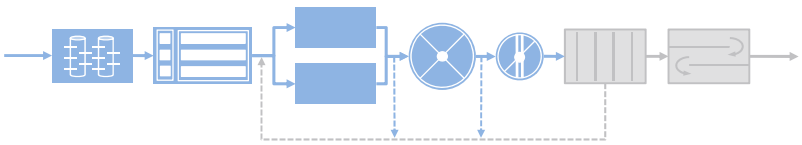


Recycled Water

Secondary Treatment – Dissolved Air Floatation Tanks

Solids Removal

- Clarifies algae and other solids entrained by the Oxidation Ponds
- Inject polymer to coagulate algae into flocs (clumps)
- Air is injected into mixture to cause flocs to float and form algal mat
- Mat is skimmed off surface water
- ~70-90% of solids removed

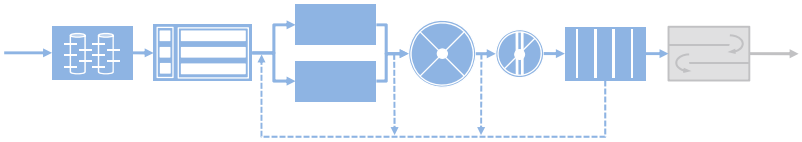


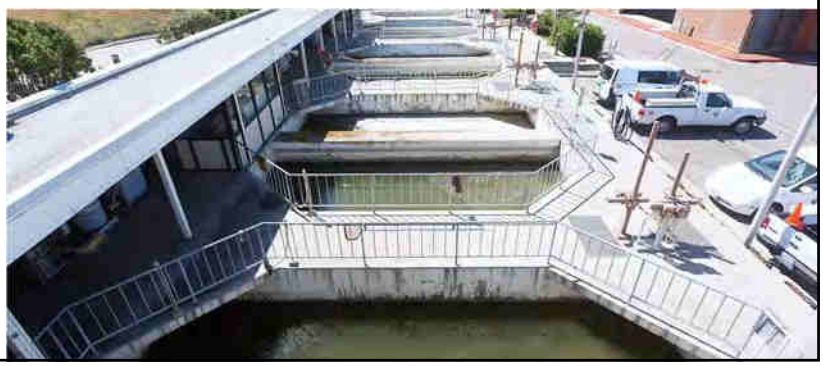
Recycled Water

Tertiary Treatment – Dual Media Filters

Polishing Filter

- Comprised of anthracite, sand and gravel
- Additional removal of remaining algae and particulate matter
- Assure compliance with recycled water turbidity requirements (Title 22)
- Frequently backwashed to minimize head loss across filters



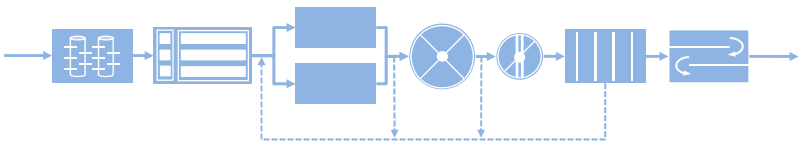


Recycled Water

Tertiary Treatment – Chlorine Contact Tanks

Disinfection

- Utilize chlorine (liquid sodium hypochlorite) to deactivate harmful pathogens
- Recycled water not currently produced in parallel with San Francisco Bay discharge
- Minimum of 90 minute contact time with chlorine
- Must meet additional CCR Title 22 requirements before distribution

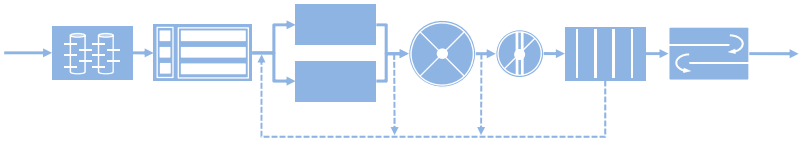


Recycled Water

Recycled Water Pumping Station

Dechlorination/Distribution

- Final product partially dechlorinated with sodium bisulfite
  - Drop from 5-10 mg/L to 2-3 mg/L
- Sent to Recycled Water Pumping Station at WPCP
- Distributed directly to customers and/or sent to San Lucar Storage and Pumping Facility
- Recycled water is NOT wastewater!

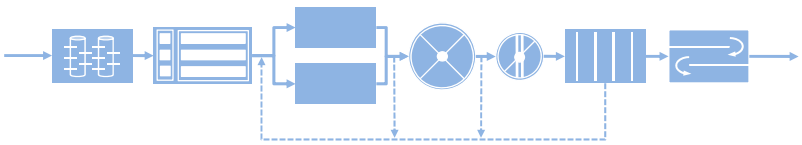


Recycled Water

Recycled Water Pumping Station

Water Quality Data

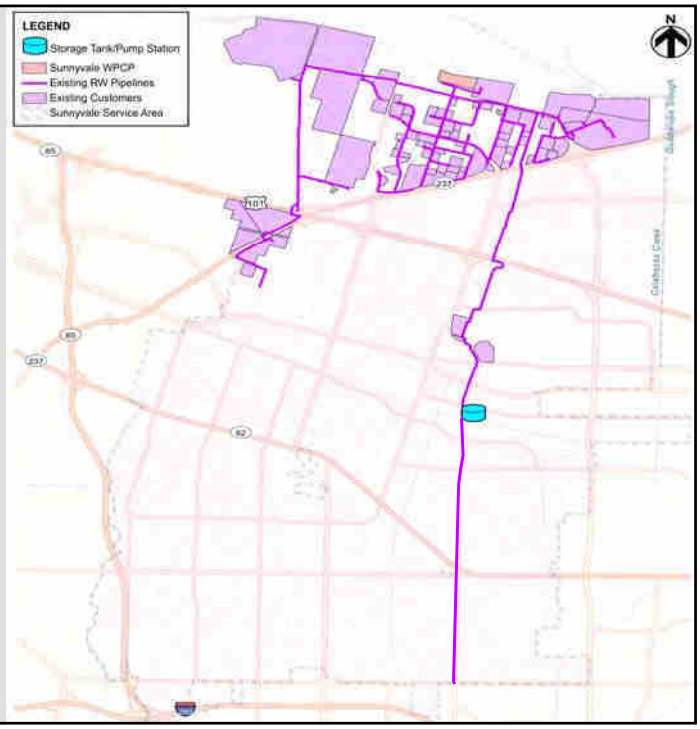
- Ammonia: <0.1 – 2.5 mg/L
- Nitrate: 5 – 25 mg/L
- Sulfate: 70 – 100 mg/L
- TDS: 800 – 1,200 mg/L
- Salinity: 0.5 – 1.0 g/L
- Hardness: 250 – 350 mg/L as $CaCO_3$
- *More data available upon request*



Recycled Water

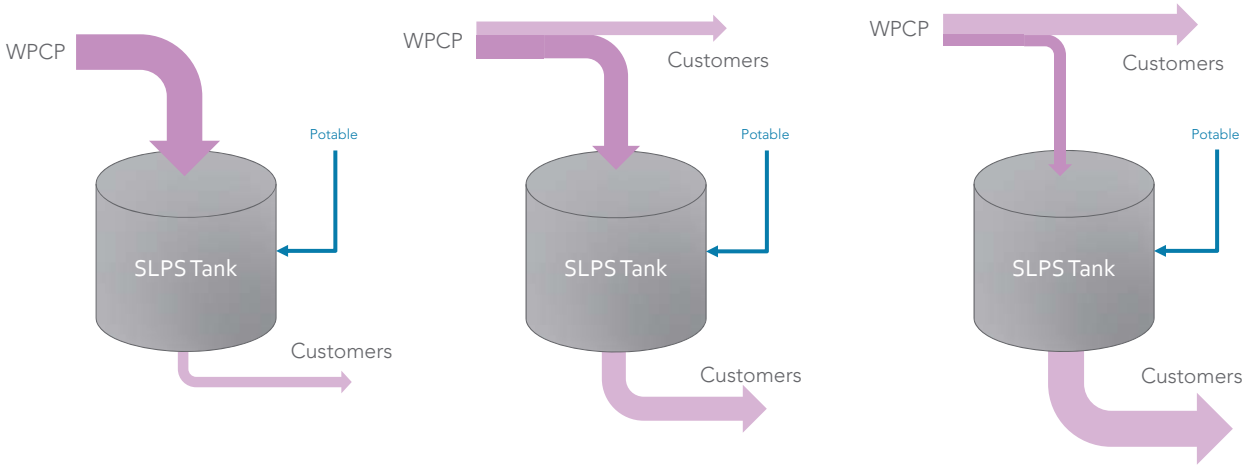
Sunnyvale Distribution System

- Approximately 75,000 ft of distribution "purple" pipes
- San Lucar Storage and Pumping Facility provides 2.5 million gallons of storage
- Flexibility of adding potable water as a backup source of supply



Recycled Water

Distribution Modes



Low Demand (winter)
Production 1-2x/wk

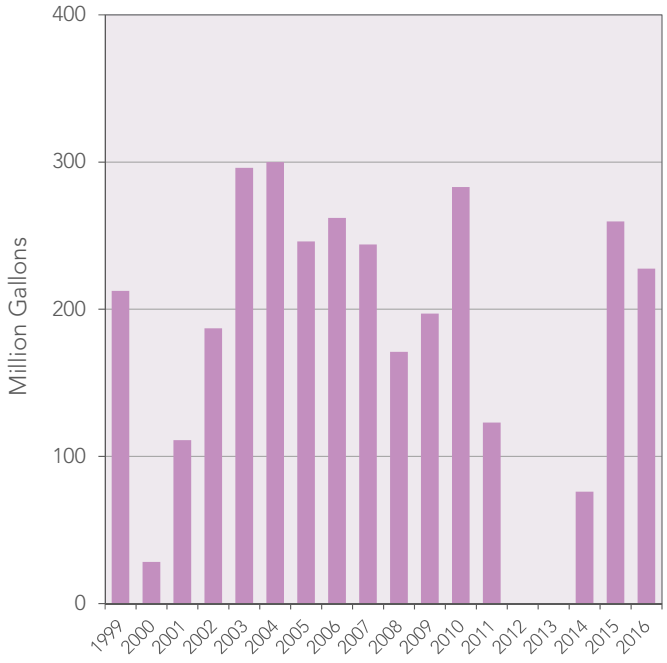
Moderate Demand (spring/fall)
Production 2-3x/wk

High Demand (summer)
Production 4-5x/wk

Recycled Water

Production and Uses

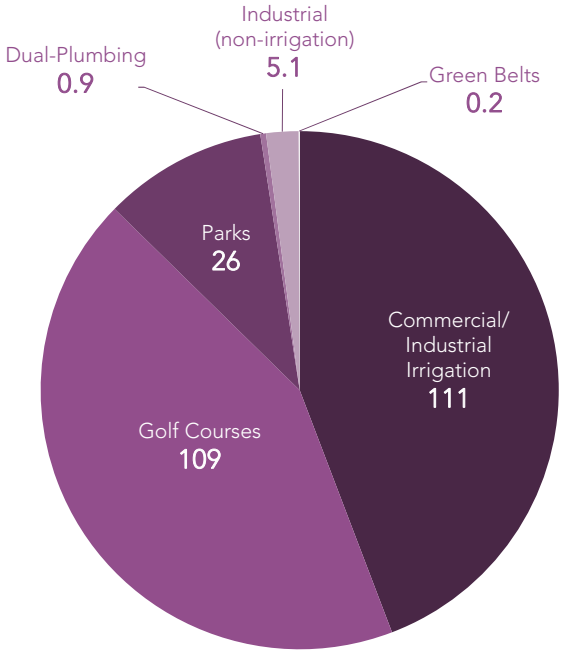
- Roughly 250 million gallons (770 acre feet) of recycled water produced in an average year
- That's 380 Olympic swimming pools of potable water saved!
- No production in 2012-2013 due to maintenance, capital projects, and operational challenges at the WPCP



Recycled Water

Production and Uses

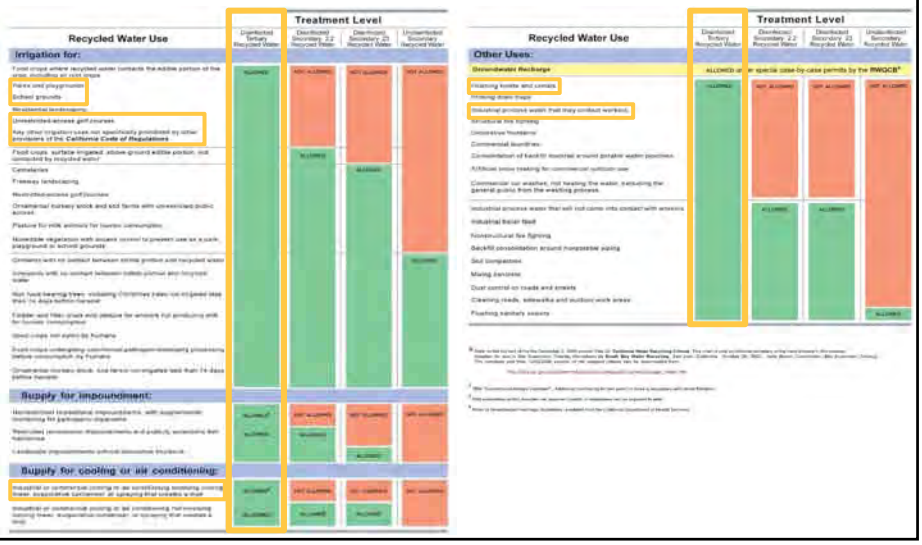
- Roughly 250 million gallons of recycled water in an average year
- Majority of use from Commercial/Industrial Irrigation and Golf Courses
- Handful of dual-plumbed sites but more anticipated
- Annual Report
  https://sunnyvale.ca.gov/property/water/recycled/customers.htm



Recycled Water

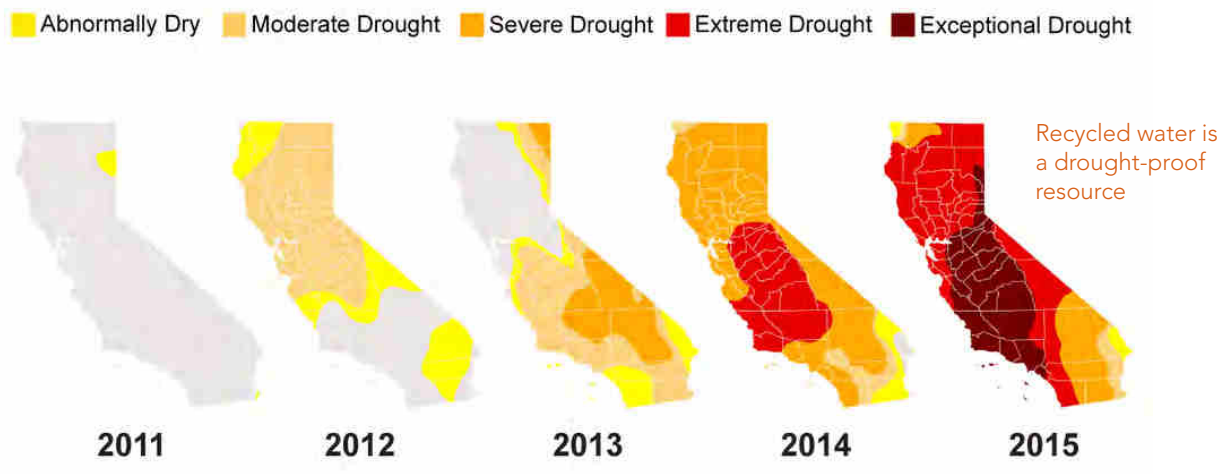
California Approved Uses

- City provides disinfected tertiary recycled water
- High-quality recycled water, but NOT potable
- Most approved uses compared to other treatment levels
- Highlighted uses show variety of end uses in Sunnyvale



Recycled Water

California's Drought and Recycled Water Relief

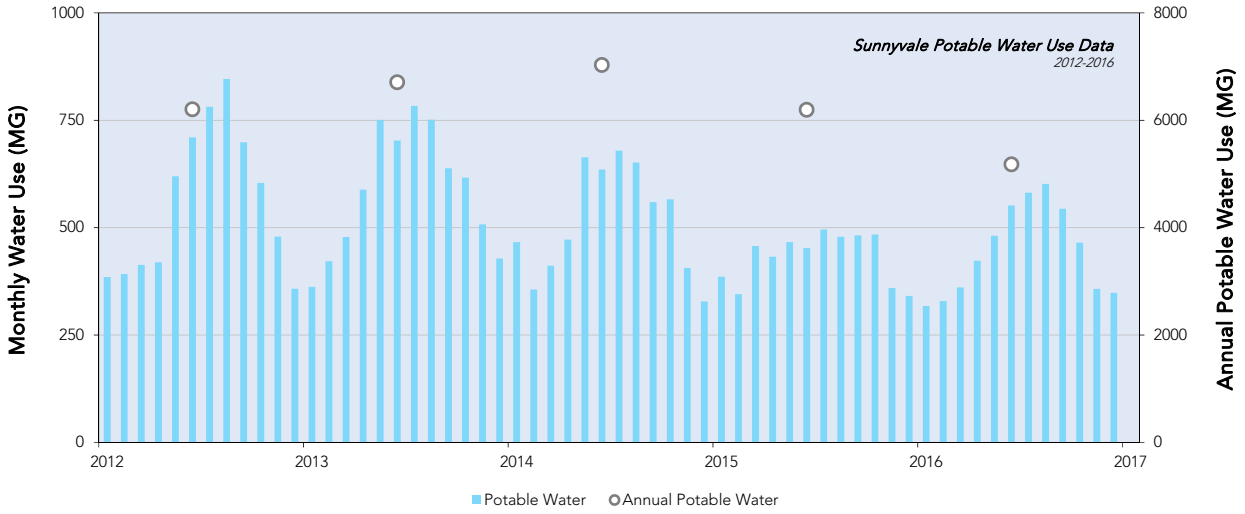


Recycled water is a drought-proof resource

Source: US Drought Monitor (www. http://droughtmonitor.unl.edu/Home.aspx)

Recycled Water

California's Drought and Recycled Water Relief



Recycled Water

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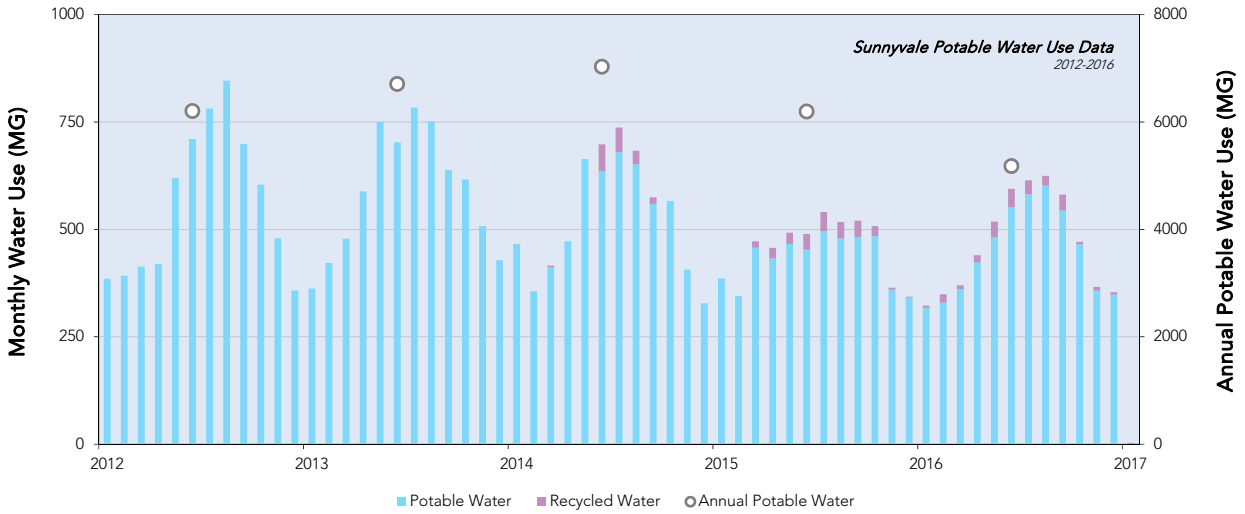


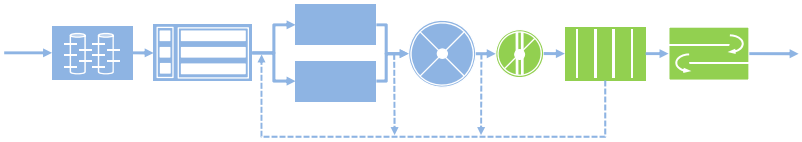
Recycled Water

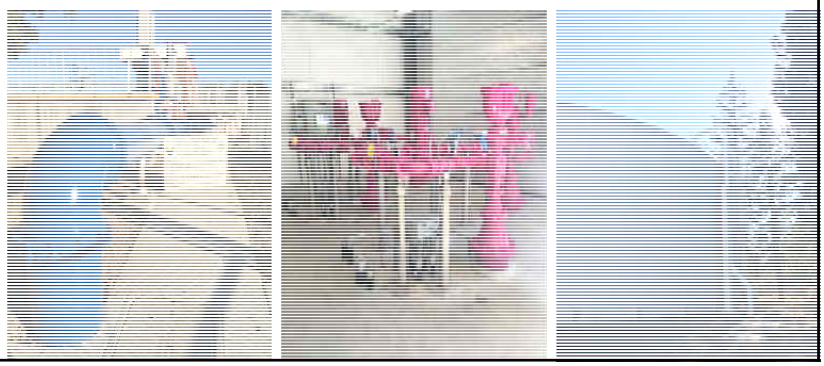
Continuous Recycled Water Production Facility

- Provides parallel production of recycled water and San Francisco Bay discharge
- Currently produced in batches
- More reliable production
- Proposition 84 State funded
- Part of larger project expanding Wolfe Road pipeline to new Apple® Campus 2 in Cupertino

SUNNYVALE CLEANWATER PROGRAM

http://www.sunnyvalecleanwater.com/

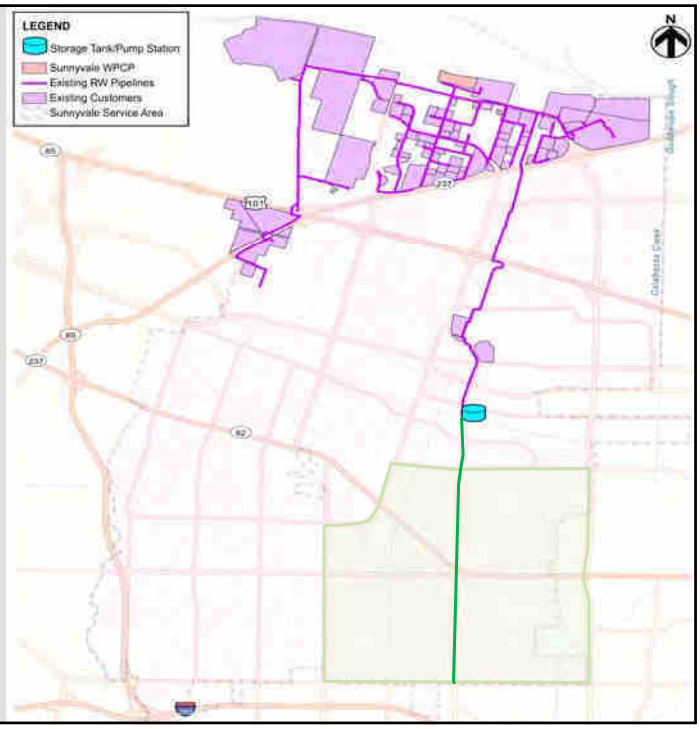




Recycled Water

Recycled Water Expansion

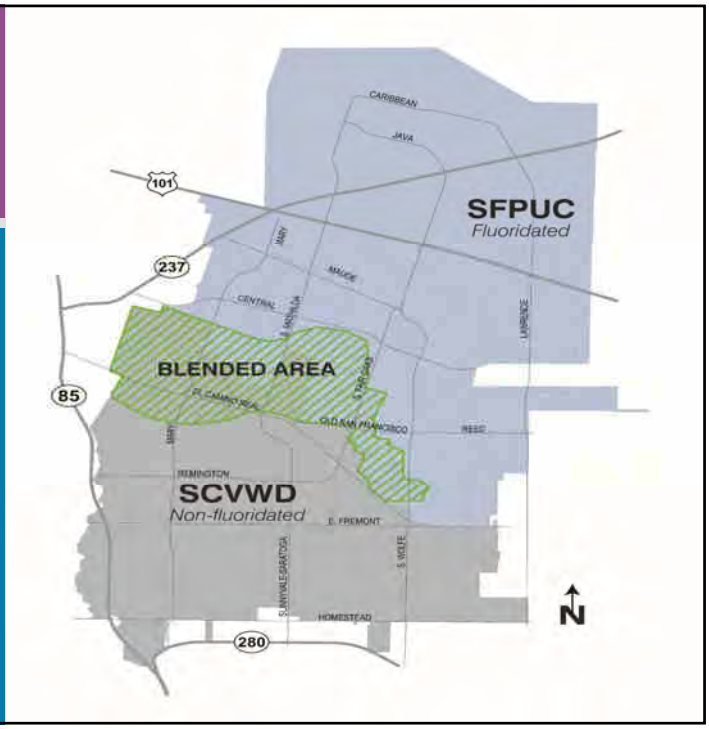
- Wolfe Road Pipeline Extension Project (green line)
- Completed in late-2017, delivery mid-2018
- Approximately 13,300 linear feet extending from San Lucar Pumping and Storage Facility to Kifer Rd/Homestead Ave
- Partnership with Santa Clara Valley Water District
- Possibility to expand recycled water service in vicinity (green shaded area)



Recycled Water

Potable Water in Sunnyvale

- Two main sources:
  - San Francisco Public Utility Commission (SFPUC)
  - Santa Clara Valley Water District (SCVWD)
- Division in potable water sources roughly along El Camino Real
- Water Quality Report
  https://sunnyvale.ca.gov/property/water/water.htm



Chlorine Contact Tank
Water Pollution Control Plant

Sunnyvale

Recycled Water

Regulatory Drivers

- California Health and Safety Code
- California Code of Regulations (CCR) Title 22 and 17
- Sunnyvale Recycled Water Permit No. R2-1994-069
- Sunnyvale Design and Construction Guidelines
- Sunnyvale Rules and Regulations
- Plumbing Code

Recycled Water

Regulatory Drivers

State Regulations

State Water Resource Control Board

- Recycled Water Policy
- Delegate to SF RWQCB

- Division of Drinking Water (Health and Safety Code)
  - CCR Title 17 (Cross-Connection Control)
    - Protection of public drinking water supply through control measures
    - Backflow prevention equipment
    - Cross-connection tests
  - CCR Title 22 (Recycled Water Quality Criteria)
    - Water quality criteria to protect public health
  - Review Engineering Reports for Dual-Plumbed Systems

Recycled Water

Regulatory Drivers

State Regulations

Regional Water Quality Control Board

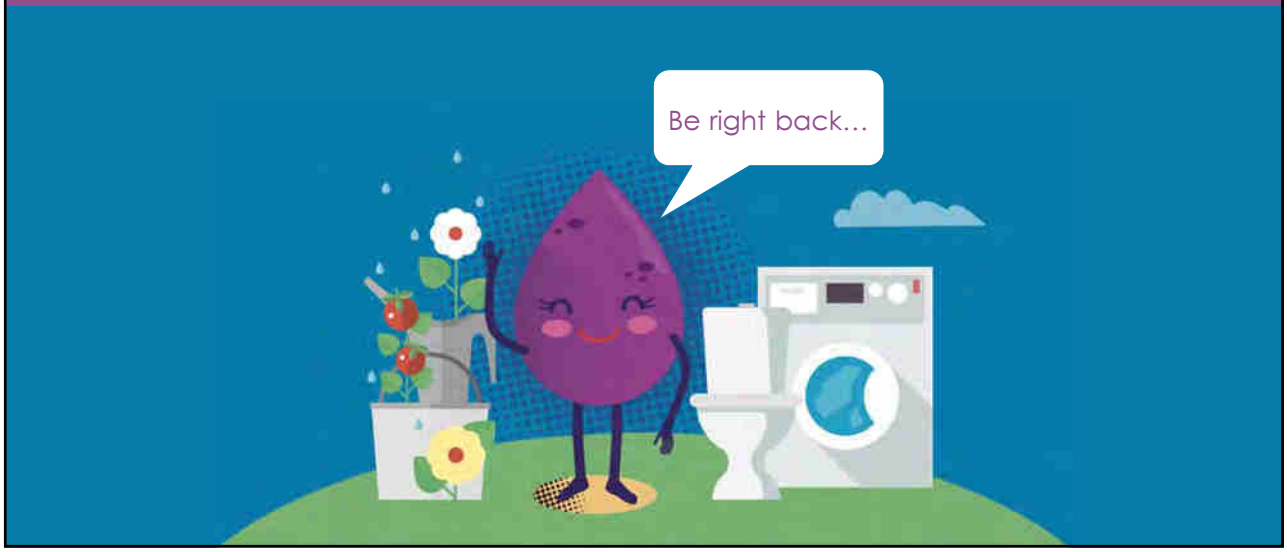
- Permit RW-94-0069 issued to Water Pollution Control Plant (1994)
- Incorporates CCR Title 17 and 22 requirements
- Specifies water quality requirements for recycled water
- Operation of WPCP's recycled water system under RW-94-0069
- Site Supervisor Training

Local Regulations

- Rules and Regulations
- Design and Construction Guidelines
- Permits
- Plumbing Code (included in Sunnyvale Municipal Code)

Recycled Water

Site Supervisor Training - Break



Dual Media Filter Galley
Water Pollution Control Plant

Sunnyvale

Recycled Water

Site Supervisor Roles and Responsibilities

- Designated Site Contact
- Maintenance of your Recycled Water System
- Recycled Water Signage
- Cross-connection and Backflow Prevention
- Annual Self-Monitoring Report
- Personnel and Staff Training

Recycled Water

Site Supervisor Roles and Responsibilities

Designated Site Contact

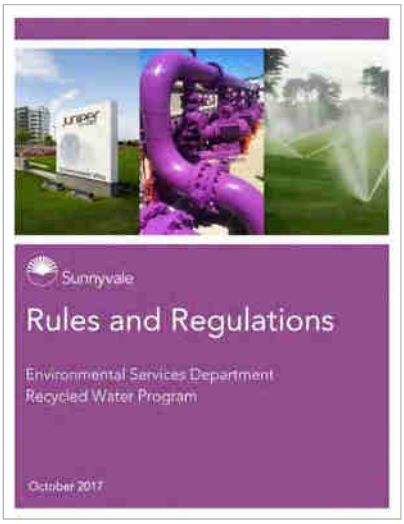
- Responsible for overseeing the operation and maintenance of the recycled water system
- Site Supervisor is the first point of contact for the City
  - Notify the City when…
    - Site Supervisor or contact information changes
    - Property is transferred to new owner or tenant
    - A deviation from the Rules and Regulations occurs
    - Planning to modify potable or recycled water systems
- Submittal of Self-Monitoring Report annually

Recycled Water

Site Supervisor Roles and Responsibilities

Rules and Regulations

- Primary reference guide and resource document
- Provides sufficient information to Site Supervisors to meet all applicable regulations
- Draws on multiple sources to assist with:
  - Design, installation, and operation and maintenance
  - Reporting requirements and site inspections
  - Applicable to new construction and retrofits/modifications
- May be other site-specific requirements not included
  - Such requirements will be specified in the site's recycled water use permit



Recycled Water

Site Supervisor Roles and Responsibilities

System Maintenance

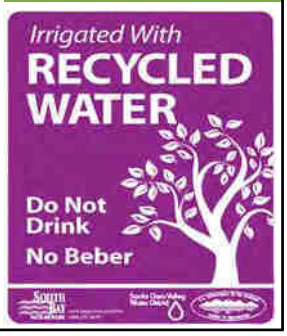
- Perform preventative maintenance measures
  - Ensure that your recycled water system and its operation remain in compliance with the City's Rules and Regulations
  - Adjust watering schedule and irrigation system to reduce overspray, runoff, and ponding
- Report any unauthorized discharge to the City immediately
  - Every effort should be made to contain the recycled water and prevent it from entering storm drains

Recycled Water

Site Supervisor Roles and Responsibilities

Maintain Signage

- Signs must be place throughout your facility
  - Include every driveway and walkway
- Signs must be clearly visible to the public and your employees
- Signs must notify the public and your employees that recycled water is used onsite
- Replace signs that are damaged or missing

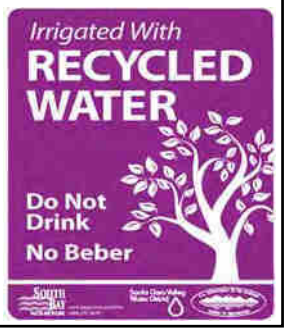


Recycled Water

Site Supervisor Roles and Responsibilities

Maintain Signage

- Sign specifications are contained in the City's Rules and Regulations and Design and Construction Guidelines
  - City can assist with determining appropriate spacing and placement at facility
  - Special requirements for dual-plumbed sites
  - Refer to Plumbing Code (Chapter 16)
- Signs can also be purchased from Arne Sign & Decal Co., Inc. in Santa Clara



Recycled Water

Site Supervisor Roles and Responsibilities

Maintain Signage

Recycled Water

Site Supervisor Roles and Responsibilities

Backflow and Cross-Connection Prevention

- Backflows and cross-connections pose dangers to drinking water and public health
- California requires adequate protection from cross-connection and backflow for all recycled water customers
  - Know your system
  - Report any system modifications and do plan review
  - Only use backflow devices approved by the City
  - Cross-connection tests every 4-years with permit renewal
  - Attend a Site Supervisor Training class and train staff

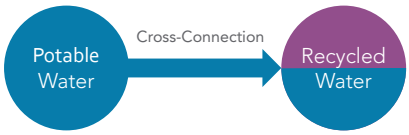
Recycled Water

Site Supervisor Roles and Responsibilities

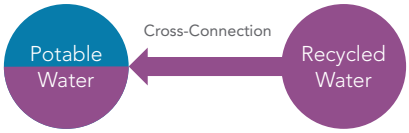
What is Backflow?

Reversal of water flow from its normal or intended direction of flow due to physical link (cross-connection) or pressure differential

Cross-Connection Flow



Backflow



Recycled Water

Site Supervisor Roles and Responsibilities

Backflow Prevention Devices

The City has approved the use of the following devices

Air Gap
The most effective protection from backflow and cross-connection. Interrupts the piping flow with corresponding loss of pressure for subsequent use. Required when potable water is used as a back-up source for recycled water.

Reduced Pressure Principle
Maximum protection achieved against backpressure and backsiphonage. Required on the potable system at recycled water sites. Forms the backbone of cross-connection control programs.

Double Check Valve & Vacuum Break Assemblies
Not approved by the City for use on either potable or recycled water systems for new construction. If this type is already present at facility, then it must be replaced once it breaks. Repairs are prohibited.

Recycled Water

Site Supervisor Roles and Responsibilities

Backflow Testing and Maintenance

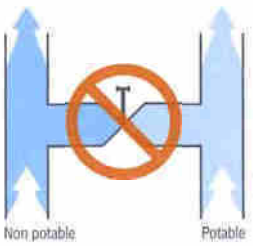
- City tests all backflow equipment immediately after they are installed, relocated, or repaired
  - Site Supervisor must notify the City
- Service not initiated until shown to be functional
- City tests all backflow prevention equipment at least annually
  - May test more frequently depending on the system size and complexity and/or site history
- City will notify the Site Supervisor when testing is due
  - Will work with Site Supervisor on date

Recycled Water

Site Supervisor Roles and Responsibilities

What is a Cross-Connection?

- Actual or potential connection between potable and non-potable (recycled water) systems
- Can result in contamination of potable water system
  - A closed valve is still a cross-connection
- Prohibited in California (CCR Title 17)
- Part of the permitting review process and checked during initial inspection by City
- Initial cross-connection test, then every 4-years
- Annual visual inspections by the City

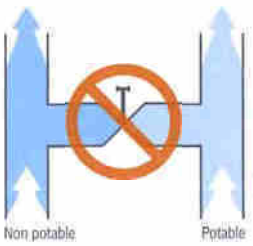


Recycled Water

Site Supervisor Roles and Responsibilities

How can Cross-Connections Happen?

- During Construction
  - Illegal jumpers and isolation valves
  - Failure to differentiate potable and recycled water systems – recycled water systems must be purple or have purple tape wrapping
- Unauthorized Modifications
  - Modifications made to the site without plan review and inspection
  - Changes to the recycled AND potable system must go through plan check

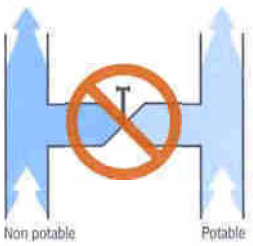


Recycled Water

Site Supervisor Roles and Responsibilities

How can Cross-Connections Happen?

- Inexperienced Personnel
  - Repairs or minor modifications made by persons who are unaware of the different systems or separation requirements
- Convenience
  - Connections are made for convenience and could cause dangerous conditions
- False Reliance
  - Connections are made with reliance on inadequate protection, such as unauthorized backflow prevention device
  - Assumption that only purple pipes contain recycled water

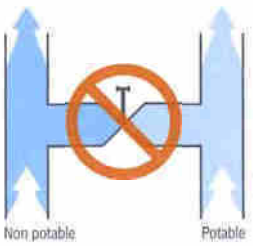


Recycled Water

Site Supervisor Roles and Responsibilities

Cross-Connection Prevention Measures

- New System Construction
  - Permit application and plan review
  - Installation must match plans
  - Inspections during construction will verify
  - Proper piping, tagging and labeling
  - Use of hose bibs prohibited
  - Refer to City of Sunnyvale Design and Construction Guidelines

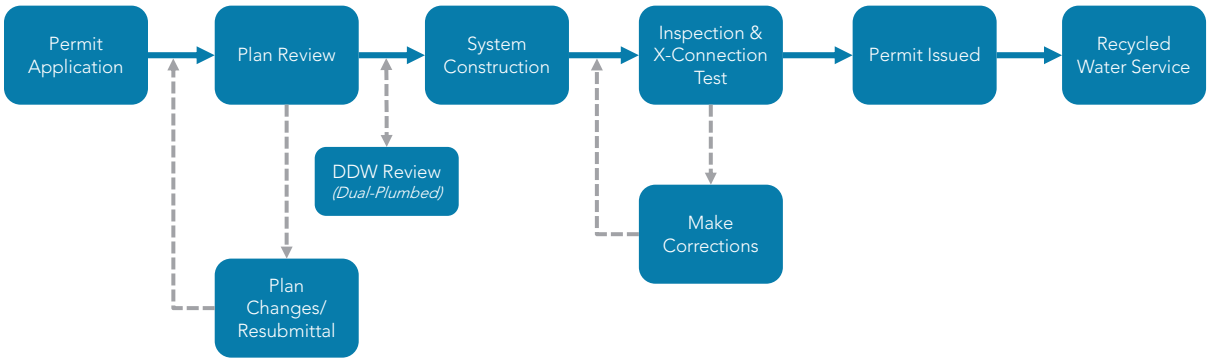


Recycled Water

Site Supervisor Roles and Responsibilities

Permitting Process Flowchart

New Construction

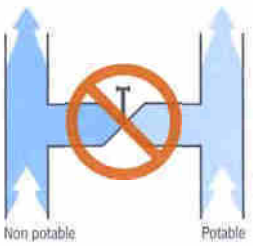


Recycled Water

Site Supervisor Roles and Responsibilities

Cross-Connection Prevention Measures

- Piping and Tagging

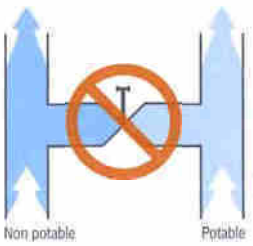


Recycled Water

Site Supervisor Roles and Responsibilities

Cross-Connection Prevention Measures

- Valve box lids, controllers, and couplers must be labeled
- Couplers must be visibly different from those on potable system

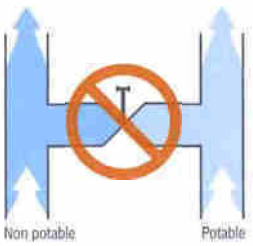


Recycled Water

Site Supervisor Roles and Responsibilities

Cross-Connection Prevention Measures

- Existing System Modifications
  - Plan review
  - Installation must match plans
  - Inspections during construction will verify
  - Proper pipe, tagging and labeling
  - Refer to City of Sunnyvale Design and Construction Guidelines

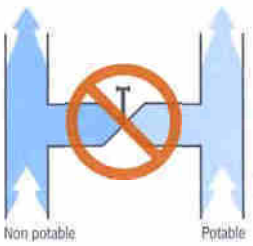


Recycled Water

Site Supervisor Roles and Responsibilities

Inspections and Cross-Connection Testing

- Initial and annual backflow prevention device testing
- Annual Site Inspection by City and Self-Monitoring Report by Site Supervisor
- Annual Visual Inspection by Cross-Connection Specialist
  - Recycled water and potable water meters
  - All pumps and equipment, room signs, and exposed piping
  - Check for overspray/runoff/pooling
  - Cross-connection test may be required if inspection results suggest that a plumbing modification has been made
- Full system shut-down every 4 years to test potable and recycled water systems for cross-connection – driven by permit cycle

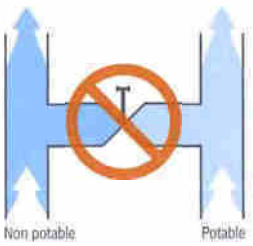


Recycled Water

Site Supervisor Roles and Responsibilities

Cross-Connection Test (Phase 1)

- Potable water is shut-down and fully depressurized
- Recycled water remains active and pressurized
- All fixtures (potable and recycled) are checked for flow
  - Indoor fixtures tested even if only irrigation service
- Cross-connection exists if:
  - Flow from potable water outlet
  - No flow from recycled water outlet
- Duration of test varies depending on the size and complexity of the system

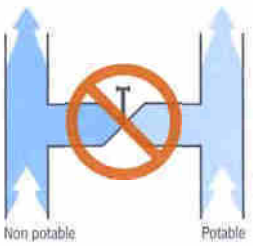


Recycled Water

Site Supervisor Roles and Responsibilities

Cross-Connection Test (Phase 2)

- Recycled water is shut-down and fully depressurized
- Potable water remains active and pressurized
- All fixtures (potable and recycled water) are checked for flow
- Cross-connection exists if:
  - Flow from recycled water outlet
  - No flow from potable water outlet
- Duration of test varies depending on the size and complexity of the system

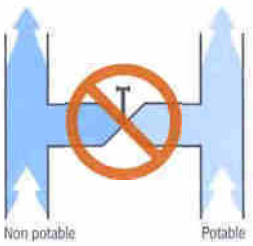


Recycled Water

Site Supervisor Roles and Responsibilities

Cross-Connection Discovered

- Shut-down recycled water system at the meter
- Shut-down potable water to the site at the meter
- Identify location of cross-connection and disconnect
- Repeat cross-connection test
- Chlorinate and flush the potable water system
  - Chlorinate with 50 ppm chlorine for 24-hours
  - Flush system for 24-hours
- Perform bacteriological test
- Recharge potable system if test results are favorable



Recycled Water

Site Supervisor Roles and Responsibilities

Cross-Connection Discovered

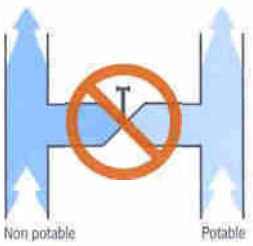
Responsible Party	Corrective Action
City of Sunnyvale	Shut down recycled and potable water system at the meter
Owner/Property Manager	Identify location of the cross-connection and disconnect
Owner/Property Manager	Repeat cross-connection test to confirm it has been disconnected
Owner/Property Manager	Chlorinate and flush the potable water system • Chlorinate with 50 ppm chlorine for 24-hours • Flush system with potable water for 24-hours
Owner/Property Manager	Perform bacteriological test
City of Sunnyvale	Recharge potable and recycled system if test results are favorable

Recycled Water

Site Supervisor Roles and Responsibilities

Backflow and Cross-Connection Prevention

- Build new systems according to approved plans
- Keep all as-built records easily accessible
- Only use backflow devices approved for use by City
  - Also has to be approved by USC
- Notify the City of all proposed modifications to existing potable and recycled water systems
  - If modification without notification identified during annual visual inspection, could trigger cross-connection test
- Conduct a cross-connection test if a cross-connection is suspected



Recycled Water

Site Supervisor Roles and Responsibilities

Self-Monitoring Report

- Completed annually by Site Supervisor
  - One Site Supervisor may oversee multiple sites
  - Turn-in one report for each site/permit
- Report due on or before July 1
- Submit to Water and Sewer Division
  - Raymond Orozco (rorozco@Sunnyvale.ca.gov)
- Documents routine monitoring of site(s)
- Keep permit and records of all incidents, repairs, system upgrades and modifications during reporting period on-hand


Sunnyvale

SITE INSPECTION REPORT (DUE July 1, 20__)

Recycled Water

Site Supervisor Roles and Responsibilities

Personnel and Staff Training

- Site Supervisors are responsible for training all personnel and staff involved with recycled water
  - All designated Site Supervisors must attend the Site Supervisor Training at least once
  - If Site Supervisor changes, new Site Supervisor must attend a training
  - Familiarize staff with City's Rules and Regulations
- Recycled water is safe if common sense is used and appropriate regulations are followed

Recycled Water

Site Supervisor Roles and Responsibilities

DO	DO NOT
Practice good hygiene	Drink recycled water
Wash hands before eating, touching eyes, nose or mouth	Use recycled water to wash hands
Promptly disinfect and bandage cuts and abrasions	Allow overspray or runoff to enter offices or eating areas
Avoid overwatering and irrigating when raining	Create overspray, runoff, or ponding
Retain As-built drawings of recycled water system	Cross-connect recycled and potable water systems
Post site with recycled water signs visible to the public	Use hose bibs
Quickly repair leaks or breaks in irrigation system	Use double check valve devices on recycled water lines
Inspect irrigation systems regularly	

Water Quality Analytical Samples
Water Pollution Control Plant

Sunnyvale

Recycled Water

Closing Remarks and Quiz

- Key points discussed
- Site Supervisor Roles and Responsibilities
- Facility Inspections
- Site Supervisor Quiz

Recycled Water

Key Points

- Sunnyvale WPCP produces roughly 250 MG annually of disinfected tertiary, drought proof recycled water
- Recycled water is the product of the advanced treatment of wastewater but is NOT a potable water source
- CCR Title 17 and 22 and Health and Safety Code govern the design, construction, and operation of recycled water systems
- Cross-connections are preventable if the proper procedures are followed in the Rules and Regulations and Design and Construction Guidelines
- Site Supervisor is point of contact with City and responsible for system O&M, City notifications, signage, and training
- Annual Self-Monitoring Report due on or before July 1

Recycled Water

Site Supervisor Quiz

What type of recycled water is produced in Sunnyvale?

A. Undisinfected secondary

B. Disinfected secondary

C. Disinfected tertiary

D. Direct potable reuse

Recycled Water

Site Supervisor Quiz

The Site Supervisor is responsible for which of the following?

A. Training all staff that work on the potable and recycled water system

B. Notifying the City of any changes or modifications to their potable and recycled water systems

C. Overseeing O&M of the recycled water system and maintaining signage

D. All of the above

Recycled Water

Site Supervisor Quiz

What is a cross-connection?

A. When overspray of recycled water enters into a storm drain or public eating area

B. When potable and recycled water pipes cross paths

C. An actual or potential connection between potable and recycled water systems

D. Reversal of water flow from its normal or intended direction of flow

Recycled Water

Site Supervisor Quiz

Which of these statements is false?

A. Cross-connection tests for dual-plumbed sites are performed every four years.

B. The regulations surrounding recycled water are lax, making it an approved source of potable water.

C. The City has specific types of backflow prevention devices that are approved for use.

D. The City should be notified if there is a transition to a new Site Supervisor.

Recycled Water

Site Supervisor Quiz

True or False?

You should always wash your hands before eating if you come into contact with recycled water.

True

There is no need to notify the City if you modify your potable water system.

False

Recycled Water

Site Supervisor Quiz

True or False?

Site Supervisors are responsible for attending a training course at least once.

True

Recycled water signage only needs to be visible to your employees and not the general public.

False

Recycled Water

Site Supervisor Quiz

True or False?

Recycled water is approved for drinking.

False

Recycled water is safe if common sense is used and appropriate regulations are followed.

True

Recycled Water

Resources

- Today's presentation
- Rules and Regulations
- Webpage
  https://sunnyvale.ca.gov/property/water/recycled/customers.htm
- Contact us

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Recycled Water

Site Supervisor Training