

This Handbook Belongs to: _____



3/15/2008

Recycled Water

Site Supervisor Handbook



Recycled Water Site Supervisor Handbook

- 1- Recycled Water Overview
- 2- Rules and Regulations
- 3- Backflow Prevention, Cross-Connection Testing
- 4- Responsibilities of Site Supervisor
- 5- Useful Numbers and Contacts

FOREWORD: SAFETY OF RECYCLED WATER

Disinfected tertiary recycled water is not drinking water. For nearly all uses, except for drinking and cooking, disinfected tertiary recycled water has been proven safe under the criteria of the California Department of Public Health. No cases of public health problems have been traced to any of the allowed uses of recycled water.

Even in recorded cases of inadvertent cross-connection with ingestion of the recycled water for relatively long periods of time, no documented cases of illness have been reported. Treatment technology, combined with regulatory requirements, has ensured that use of recycled water under proper regulatory

oversight is safe. Recycled water, however, is not drinking water.

Are There Risks To Using Recycled Water?

There are no problems associated with using recycled water as long as the system is properly designed and is operated and maintained according to professional standards and in accordance with local rules and regulations. When problems do occur, they are usually the result of using recycled water for potable water purposes. In addition to potential cross-connection at sites where both recycled and potable water are served, there is a risk that recycled water used for irrigation might be sprayed in an area where food is prepared, or that hoses used for drinking water are accidentally connected to recycled water pipes. This risk is significantly reduced when the assigned site supervisor is aware of the

rules and regulations regarding recycled water use, and regularly monitors and keeps track of the use of recycled water on the site.

Recycled Water Quality

Safe use of recycled water for the public is determined primarily by the bacteriological characteristics of the product water. Microbial indicators of public health suitability of recycled water include coliform bacteria (total coliform, in California, and fecal coliform in most other localities). Numerous field monitoring programs at major water recycling facilities have confirmed that as long as these indicators are at or below regulatory limits, then viruses and other pathogens are effectively inactivated. *Giardia* cysts and *Cryptosporidium* oocysts have been detected in some

samples of recycled water, but their viability remains questionable.

As the level of treatment increases toward the tertiary level, the risk approaches negligibility. However, as with all aspects of human experience, there is no such thing as “zero risk”. As the intimacy of use of water (direct contact) decreases from potable reuse to irrigation of orchards, so does the level of risk at any given treatment level.



North City Water Reclamation Plant is one of the most advanced plants in the world producing recycled water for many customers

PART 1—RECYCLED WATER OVERVIEW

What Is Recycled Water?

Recycled water is **water**, produced by removing pollutants from wastewater (sewage) to the point that it is clean enough to use for irrigation, cooling and other ***nonpotable*** (non-drinking) purposes. Since recycled water is manufactured from wastewater which can contain substances hazardous to human health, the treatment process is carefully managed by licensed professional engineers and treatment plant operators, and it is regulated to ensure that the recycled water is safe to use. The confidence these professionals

have in recycled water is an important factor in public acceptance of its use on parks and playgrounds, and for growing ornamental landscapes and food crops.

Why Reuse Water?

There are many reasons why communities throughout the United States choose to use recycled water. Often it is used to save **potable** (drinking) water from imported sources, such as the Colorado River and the State Water Project, which imports water from the San Francisco Bay-Delta.

Every gallon of recycled water used to irrigate parks or run cooling towers frees up a gallon of potable water that would have to be used instead. This is especially important during times of drought, or due to limitations in importation of water in response to the need to protect endangered species in the Bay-Delta.

California has even gone so far as to pass laws prohibiting the use of potable water for certain non-potable purposes when recycled water is available. In other cases, the supply of drinking water may be limited due to contamination, as when groundwater has been polluted by industrial waste or by the intrusion of sea water.

Recycled Water Quality for Landscapes

The most sensitive plants (such as strawberries, avocados, star jasmine, etc.) produce yields under 100 percent of their potential if salinity of the irrigation water exceeds 2 dS/m. As the salt tolerance of the plants—based on their evolutionary development—increases, yield reduction and damage occur at higher levels of salinity—see chart below.

Sensitive (EC 1-2)	Moderately Sensitive	Moderately Tolerant	Tolerant (EC > 10)
Star Jasmine	Yellow sage,	Weeping bottlebrush	Brush cherry
Pyrenees Cotoneaster	Orchid tree, Southern	Oleander	Evergreen pear
Oregon grape	Magnolia	European fan palm	Bougainvillea
Photinia	Japanese boxwood	Blue decaena	White/purple ice plant
Tulip tree	Xylosma	Rosemary	Crocus
	Cherry Plum	Aleppo pine	Palm tree
		Sweet gum	

Industrial Applications and Recycled Water Quality

For industrial and other uses of recycled water, other chemical constituents may be important criteria of suitability. For example, for boiler feed, salinity, iron, manganese, silicon, calcium, and other constituents are important criteria. For high-pressure boiler feed it may be necessary to treat the recycled water even further for removal of nearly all inorganic constituents.

PART 2. RULES AND REGULATIONS

The California Water Recycling Criteria are the governing regulations for safe use of recycled water for 43 specific allowed applications, including:

- Irrigation of residential landscapes, parks, golf course, cemeteries, school grounds, freeway landscaping, food crops, orchards, etc.
- flushing toilets and urinals
- priming drain traps in buildings
- water features, fountains
- fire fighting
- work area wash-down
- cooling and air conditioning
- dust control
- commercial laundry
- car washing
- mixing concrete



- Industrial uses (cooling towers, boiler feed, etc.)

These Criteria (regulations) are established by the State Department of Public Health and found in portions of Title 22 of the California Code of Regulations. Furthermore, Title 17 of the California Code of Regulations cover backflow prevention in dual-plumbed sites. A summary description of their content is provided below:

California Code of Regulations (CCR), Title 22, Division 4, Chapter 3, "Water Recycling Criteria" - These regulations are written by the State Department of Public Health (DPH) and specify the approved uses and use area requirements, such as hose bib restrictions, prohibition of irrigation near wells, etc. The regulations govern both the distribution system as well as the

customer's on-site system. These regulations can be found at <http://www.cdph.ca.gov/HealthInfo/environhealth/water/Pages/Waterrecycling.aspx>.

California Code of Regulations (CCR), Title 17, "Drinking Water Supply - Backflow Prevention" - Title 17 specifies requirements intended to protect the public drinking water supply from contamination. Some requirements specified in Title 17 include the use of backflow prevention devices, designation of a customer Site Supervisor, and cross-connection testing requirements. These regulations can be found at <http://www.cdph.ca.gov/HealthInfo/environhealth/water/Pages/Waterrecycling.aspx>.

Permits

Regional Water Quality Control Board –
The San Diego Regional Water Quality

Control Board (RWQCB) is the agency responsible for preserving the quality of the region's water resources. The RWQCB is also charged with the responsibility for issuing water recycling permits. These permits often contain requirements that go beyond the State requirements. Water agencies in San Diego County either have Master Water Reclamation Permits as provided in Water Code §13523.1, or are regulated under a waste discharge permit, and issued by Region 9 (San Diego) Regional Water Quality Control Board (RWQCB9). The website of RWQCB9 is:

<http://www.swrcb.ca.gov/rwqcb9/>

Local Regulations

Each local water agency in San Diego County has its own additional rules and regulations for safe use of recycled water. Site supervisors should obtain a copy of these rules from their water purveyors

and become thoroughly familiar with them. A contact list of San Diego water agencies that supply recycled water is provided in Part 5 of this handbook.

Guidelines

American Water Works Association (AWWA), California-Nevada Section, Guidelines For Distribution of

Nonpotable Water - This document provides recommended guidelines for planning, designing, constructing, and operating nonpotable water systems, including recycled water systems. The guidelines themselves are not regulations but many agencies have adopted them as general requirements. The document covers both installations of the Program distribution systems and on-site use systems. More information about AWWA's related programs can be found

at: <http://ca-nv-awwa.org/CA-NV/certification/crossconn.php>

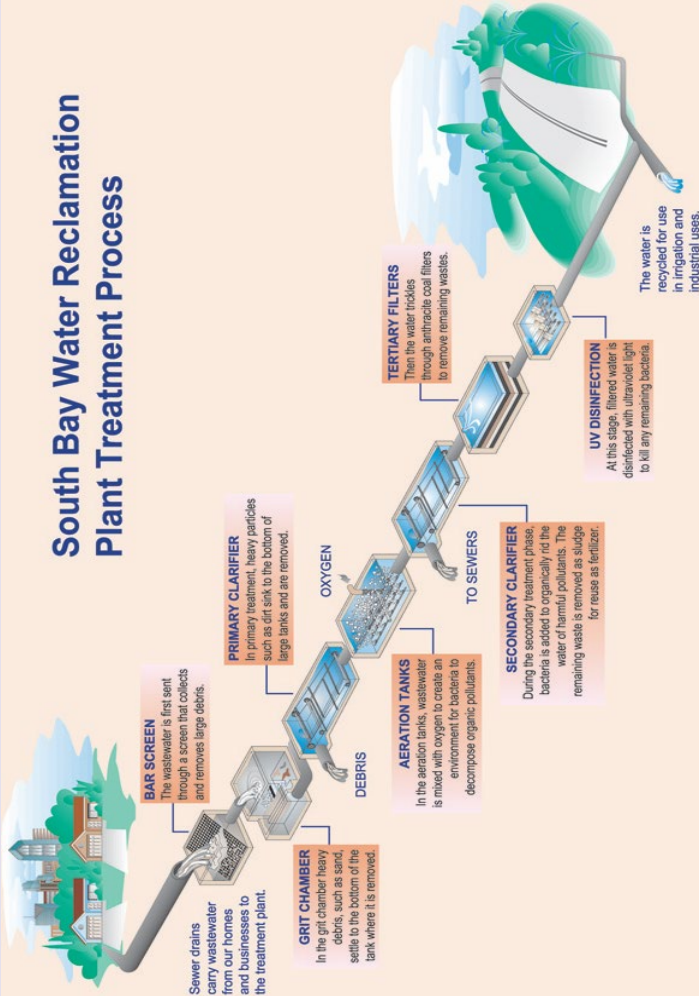
Treatment Technology

Several treatment steps are involved in transforming wastewater to disinfected tertiary recycled water. These steps are:

- Preliminary treatment
- Primary treatment (settling)
- Secondary treatment (biological)
- Tertiary treatment (filtration)
- Disinfection (chlorination)

Most water agencies in San Diego County treat their recycled water at the highest treatment level—disinfected tertiary. On the following page, a schematic of a typical recycled water plant treatment process is presented, illustrating the treatment steps described further below.

South Bay Water Reclamation Plant Treatment Process



Preliminary Treatment

This level of treatment is achieved at the “headworks”, where coarse materials, such as sand, gravel, cloth, and other inorganic material is taken out of the wastewater, dewatered, and usually trucked to the local landfill.

Primary Treatment

Wastewater is held in large sedimentation tanks so that heavier materials will settle to the bottom as “primary sludge” and lighter materials will float to the surface as scum. Both sludge and scum are removed with mechanical scrapers and treated in special digesters for separate disposal. The effluent from primary treatment is not adequately treated for most uses and is not allowed for reuse in California.

Secondary Treatment

Secondary treatment can take a variety of different forms. Secondary treatment is

typically—but not always—a biological process in which air (or pure oxygen) is supplied in superfluous quantities for microorganisms already in the wastewater to thrive, multiply and feed aggressively on the organic matter remaining in primary effluent. The air, or oxygen, is supplied to the secondary basins, along with recycled sludge from the same process, supplying additional food for vigorous growth and reproduction of the microbes. The active growth of microorganisms converts the organic matter in the primary effluent to a more stable biomass that can then be removed as sludge for separate digestion and disposal (or reuse as biosolids). Secondary effluent is recycled water for many non-potable uses as allowed by various regulatory agencies. However, it is not “pathogen-free” and is not suitable

for those uses where human exposure is a possibility.

Tertiary Treatment

Tertiary-treated recycled water has gone through all the prior steps of treatment plus an important additional step where secondary effluent is filtered through fine sand, coal, cloth, fine-textured membranes or a combination of these media. The filtration step prepares the recycled water for highly effective disinfection with chlorine, ultraviolet light, or ozone. Because the tertiary-treated recycled water contains extremely low numbers of remaining particles, the capability of disinfecting agents to penetrate the depth of water exposed to these agents is greatly increased. As a result, disinfected tertiary recycled water is essentially pathogen-free. It is suitable for all non-potable uses of water

PART 3. BACKFLOW PREVENTION, CROSS- CONNECTION CONTROL

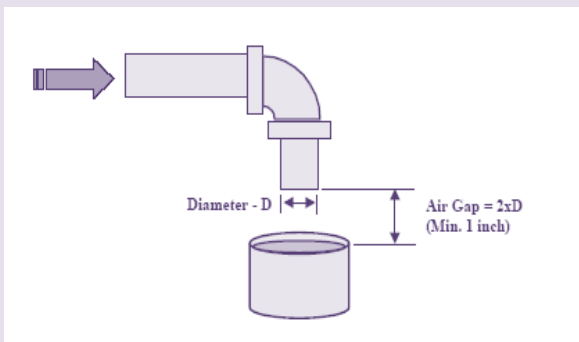
A cross-connection happens when the plumbing system for drinking water is accidentally or intentionally connected to a non-drinking (non-potable) source of water, including recycled water. Sites where both types of water are in use (e.g., buildings where recycled water is used for toilet flushing and parks where recycled water is used for irrigation while potable water is available at drinking fountains and washbasins) are called dual-plumbed sites.

When a cross-connection occurs, water can move back from the non-potable source into the drinking water system—called backflow—if pressure drops in the drinking water system. To prevent

backflow from happening, installation of approved backflow prevention devices at sites with dual-plumbed water is required. Most of the provisions for prevention of backflow are incorporated in the design and construction of dual-plumbed systems—where a recycled water system co-exists with a potable water system. Operationally, the most important methods and devices for prevention of backflow are described briefly in the following sections.

Air Gap

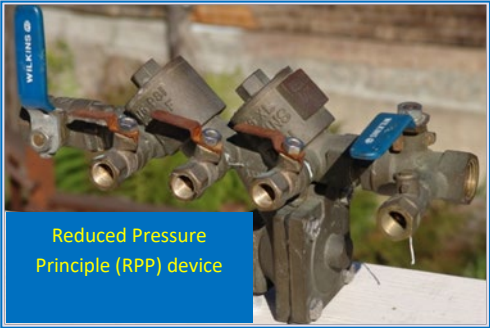
Air gap is the most effective provision for prevention of backflow into the community water system, as long as it is designed and maintained in accordance with regulatory criteria. An air gap is necessary if a recycled water storage reservoir needs augmentation with potable water during periods of high water demand.



Reduced Pressure Principle Backflow Assembly

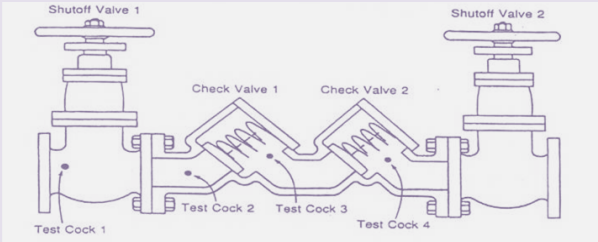
Reduced Pressure Principle (RPP) backflow assemblies involve two independently operating, spring-loaded check valves with a reduced pressure zone between the check valves. These devices are most commonly employed at commercial and industrial facilities, where the potential for cross-connection with non-potable water or with chemicals may be present. Annual tests by specially trained and certified cross-connection

specialists are necessary to ensure their proper operation.



Double Check Valve Assembly

Double check (DC) valve assemblies, shown schematically below, consist of two independently operating check valves, similar to RPP, but simpler and less dependable.



Annual tests by specially trained individuals (certified cross-connection specialists) are necessary to ensure their continued proper operation.

Pressure Vacuum Breaker

Pressure Vacuum Breaker (PVB) is an independently operating spring-loaded check valve and an independently operating spring-loaded air inlet valve.

Atmospheric Vacuum Breaker

Atmospheric Vacuum Breaker (AVB) consists of a float check valve and an air inlet port, commonly used at residential landscape irrigation systems to prevent backflow into the home water system in case the home system pressure drops into the sub-atmospheric range.

Dual Check Valve

This device is a simple version of the DC valve described above, but without the provision of test valves for periodic testing of its functionality—this device is not permitted to be used in California.

Cross-Connection Tests

Cross-connection tests must be completed successfully before connecting to a new or an expanded/modified recycled water irrigation system. All such tests must be completed in conjunction with staff from San Diego County Department of Environmental Health (DEH). This requirement is for any recycled water use site where both recycled and potable water are present in separate piping systems. Exceptions are where only recycled water is used at a site—such as freeway landscaping.

This test is to ensure the separation of the recycled and potable water systems.

In addition to ensuring the presence of DEH staff, the Site Supervisor must also notify the water agency¹ staff ***at least*** 48 hours prior to the test so that the water agency staff can also be present—and possibly conduct the test.

The cross-connection test should be conducted by the water agency, or under the supervision of the water agency staff representatives and performed by an AWWA-certified cross-connection control specialist. **The Site Supervisor must always be present at the test during the test.** The test must be conducted using potable water in the irrigation system. Following test completion, the cross-

¹ The water agency is the one that actually serves (delivers) recycled water to the site

connection control specialist will provide a written report documenting the test results and will submit the report to the Site Supervisor and the customer (owner of the site) for inspection and review. If any cross-connection is found to exist, an emergency procedure should be immediately initiated and completed. An example of emergency procedures is available at San Diego County Water Authority.

Final Cross-Connection Test

The initial cross-connection test—if successful—is also the final cross-connection test. In case the initial test fails—discovers an actual cross-connection—emergency procedures and repairs will be necessary. After completion of repairs, a final test will be required. The water agency coordinates the scheduling of the final cross-connection test. A written report documenting the test results must be

submitted by the cross connection specialist in charge of the test to the applicable water agency, the California Department of Public Health, the local water purveyor, and San Diego County Department of Environmental Health following successful completion.

As an alternative to the pressure test, a dye test may be performed by charging the recycled water system with potable water containing a food grade colored dye. The unpressurized potable water system is then checked for any evidence of the colored dye. If the dye is found, a cross-connection exists. The test itself must be performed in a way that does not create a false cross-connection finding.

Upon the successful completion of one of the above tests, insuring no cross-

connections between the potable and recycled water systems, the User's irrigation system may be connected by the water agency to the recycled water distribution system.

Periodic Cross-Connection Testing

Periodic cross-connection shutdown testing must be performed at least once every four (4) years for "dual-plumbed" sites, unless visual inspections or major on-site water system changes reveal a need for more frequent testing.

Final Inspection and Approval upon Completion of System Expansion

An approved recycled water system may not be expanded unilaterally. Before an expanded or modified recycled water irrigation system is connected to the recycled water system, the local water agency staff (or its representative) will perform a final inspection to ensure all requirements have been met. This

inspection may be coordinated and completed at the same time when the cross-connection test is performed and completed. The site supervisor will ensure that the proper equipment was used and that all required tags, labels, and signs are in place.

The water agency must grant final approval before recycled water can be supplied to the expanded or modified system. Final approval will be granted when the expansion or modification has been completed in accordance with requirements of applicable local and state regulations, all cross-connection tests have been performed, and a final on-site inspection has been conducted satisfactorily.

During the lifetime of the recycled water system, the water agency will inspect the

recycled water system annually to ensure compliance with all applicable rules and regulations.



Purple is the standard color used to indicate that recycled water is in use at the site.

PART 4. RESPONSIBILITIES OF SITE SUPERVISORS

Designated Recycled Water Site

Supervisor responsibilities include:

- Maintaining recycled water system integrity at the site.
- preventing potential violations on the recycled water system.
- Preventing cross-connection between the potable and recycled water systems. While the site supervisor is not necessarily a certified cross-connection specialist, s/he should be able to recognize and prevent the possibility of a cross-connection.

- Being present at all cross-connection tests.
- Informing the recycled water purveying agency of all failures, violations and emergencies that occur involving the recycled or potable water systems. Each of the water agencies have their own standard forms for reporting.
- Having knowledge of the provisions contained in applicable laws, rules, and regulations relating to the safe use of recycled water.
- maintaining accurate records of repairs, adjustments, inspections.
- Informing personnel at the use site on the proper uses of recycled water.

- Annual inspection of the use site and submittal of a written report to the water agency, along with any corrective actions taken.
- Maintaining a current identification card, documenting completion of Recycled Water Site Supervisor training workshop.

Maintenance

The Site Supervisor is required to perform preventive maintenance to ensure that the recycled water system always remains in compliance with the water agency's rules and regulations. As part of a preventive maintenance program, the Site Supervisor should:

- Perform regular inspections of the entire recycled water system including sprinkler heads, drip

irrigation system emitters, spray patterns, piping and valves, pumps, storage facilities, controllers etc.

Immediately repair all broken sprinkler heads, faulty spray patterns, leaking pipes or valves, or any other noted condition that violates the recycled water use requirements.

- Check all recycled water identification signs, tags, stickers, and above grade pipe markings for their proper placement and legibility. Replace damaged, unreadable, or missing signs, tags, stickers, and pipe markings.
- Check spray patterns to eliminate ponding, runoff and windblown spray conditions. If evidence of ponding or runoff is noted, sprinkler heads should be adjusted to prevent further ponding or runoff. Most water agency regulations require that

evidence of mosquitoes breeding within ponding should be noted and immediately eliminated.

- Establish and maintain an accurate record keeping system of all inspections, modifications and repair work.

Informing the Personnel

The Site Supervisor is responsible for informing all personnel (under his/her supervision) involved with recycled water so that they are familiar with the water agency's rules and regulations. This effort is not intended as a substitute for the formal Site Supervisor training workshop offered by San Diego County Water Authority, and that personnel cannot be designated as "Site Supervisors" which meet the

requirements of the California Department of Public Health. At a minimum, the Site Supervisor should convey the following information to personnel working at the site:

- Working with nonpotable recycled water is safe if the knowledge gained during Site Supervisor training is used and appropriate regulations are followed.
- The water agency's recycled water, although highly treated, is non-potable and must never be used for human consumption or for cooking, bathing and washing.
- Regulations prohibit ponding, windblown spray and runoff of recycled water.
- Laws prohibit connections between the recycled water and the potable water systems.

Personnel should also be instructed on the proper procedures for immediately reporting unauthorized discharges and identifying, reporting, and correcting any cross-connections. Any modifications in the system in the event of an earthquake or other disaster should be reported as quickly as possible.

Annual Inspection

Recycled water Site Supervisors are expected to participate in all annual recycled water inspections—in coordination with the San Diego County Department of Environmental Health and the local water agency. The water agency usually initiates the inspection process. The results of this inspection must be documented and submitted to the San Diego County Department of Environmental Health by the water

agency in a written report. The Site Supervisor must retain a copy of the results of the observations, along with a description of any corrective actions taken. The questions on the annual inspection report, to be completed by the water agency inspector may include the following:

1. Was there evidence of recycled water runoff from the site? Show affected area on a sketch and estimate volume. How was the problem resolved?
2. Is there an odor of wastewater origin at the irrigation site? If yes, indicate apparent source, characterization, direction of travel, and any public use areas or off-site facilities affected by the odors. Provide corrective measures taken to solve the problem.

3. Is there any evidence of recycled water ponding, and/or evidence of mosquitoes breeding within the irrigation area due to ponded water?
4. Are warning signs, tags, stickers, and above ground pipe markings properly posted to inform the public that irrigation water is recycled water, which is not suitable for drinking? If not, what has been done to correct the situation?
5. Is there evidence of leaks or breaks in the irrigation system piping, or tubing? If yes, what corrective measures were taken?
6. Were there broken or otherwise faulty drip irrigation system emitters or spray irrigation sprinklers? Were they repaired, replaced?

7. Has your designated Site Supervisor changed in the past year? Who has been appointed? When and where did they attend a Recycled Water Site Supervisor Training Workshop?
8. What corrective actions have been (or are being) taken to correct any problems noted above?

A typical inspection checklist—courtesy of Otay Water District—is shown on the following page. This checklist is used by water agency staff to ensure compliance with applicable regulations and prevention of unsafe conditions. This checklist may be used as an example for reference and possible use in the field.

Inspection Checklist Items:

- Copies of approved plans are on file
- Adequate separations have been provided
- Crossings have been sleeved
- Valves are tagged
- Signs are installed according to plan
- All facilities and appurtenances are properly color-coded
- Appropriate backflow prevention devices are installed
- Quick couplers valves and risers are properly installed
- Hose bibs on reclaimed water systems are eliminated
- Irrigation control valves are properly tagged (bilingual)
- Irrigation control valve boxes are properly identified
- Irrigation controllers (time clocks) are properly identified
- Color-coded maps for each controller (time clock)
- Appropriate signs are installed
- Recycle cross connection test has been completed
- Potable cross connection test has been completed
- Irrigation coverage test has been completed
- Minimum distances are maintained
- Designated eating areas are protected from over spray
- Drinking fountains are protected from over spray
- Runoff and ponding are kept to a minimum
- Site Supervisor has been identified, trained, and certified
- Correction of deficiencies noted by the County DOEH

SOURCE: Adapted from Otay Water District

Transfer of Property/ Ownership

If the property is transferred to a new owner or tenant, or a new Site Supervisor or landscape company becomes responsible for system maintenance, the customer must notify the water agency within 30 days, providing the names and telephone numbers of the new Site Supervisors. It is recommended that Recycled Water Site Supervisors attend and complete the training workshop at least once every five years.



Purple-colored pipes, valves, meter boxes, sprinkler heads, signs, tags, etc. are standard at recycled water sites.

PART 5. USEFUL NUMBERS AND CONTACTS

For Program Information:

Contact

San Diego County Water Authority

4677 Overland Avenue

San Diego, CA 92123

(858) 522-6600

Fax: (858) 522-6568

For Training Workshops:

<http://www.sdcwa.org/manage/recycled-training.phtml>

For Regulatory Issues

Contact

San Diego County Department of

Environmental Health: (619) 338-2222

California Department of Public Health,

San Diego District: 619-525-4159

San Diego Regional Water Quality Control
Board—Region 9: (858) 467-2952

For General Water Recycling Information:

www.watereuse.org

For Landscape Irrigation with Recycled Water and Management of Salts:

Request a free copy of this interactive CD,
produced by the University of California,
Davis Prof. Ken Tanji *et al.* *This highly
useful tool for managing recycled water in
the landscape can be obtained from*
www.WateReuse.org.

For Water Recycling Criteria

Visit the California Department of Public
Health Website at

<http://www.cdph.ca.gov/HealthInfo/environhealth/water/Pages/Waterrecycling.aspx>

San Diego County Water Authority

For Your Water Purveyor

Carlsbad, City of	(760) 438-2722
Carlsbad Municipal Water District	(619) 944-1186
Escondido, City of	(760) 839-6223
Olivenhain MuW.D.	(760) 753-6466
Otay W.D.	(619) 670-2245
Padre Dam M.W.D.	(619) 258-4731
Poway, City of	(858) 668-4735
Ramona M.W.D.	(760) 788-2274
Rincon Del Diablo M.W.D.	(760) 745-5522
San Diego, City of	(619) 533-7504
San Elijo Joint Powers Authority	(760) 753-6203
Santa Fe I.D.	(858) 756-2424x18



Secondary treatment—biological disintegration of organic matter

Your Site Information

Site Name: _____

Site Supervisor: _____

Workshop Completion ID Number: _____

Your Local Water Agency(ies)

Agency: _____

Contact: _____

Telephone No: _____

Agency: _____

Contact: _____

Telephone No: _____

Agency: _____

Contact: _____

Telephone No: _____

Agency: _____

Contact: _____

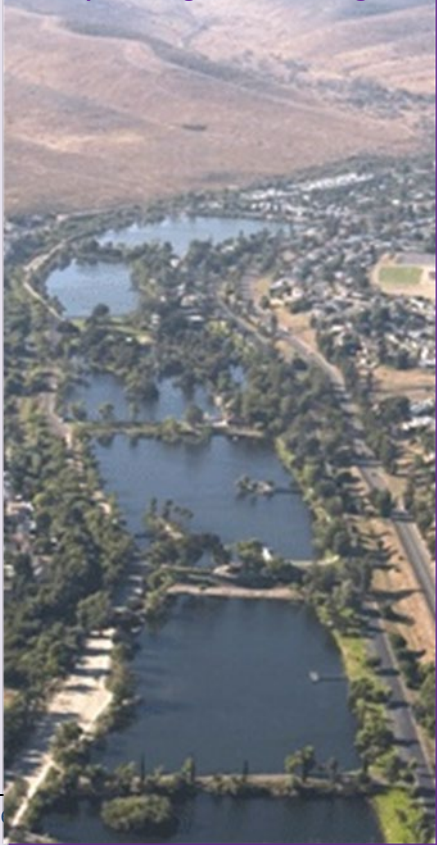
Telephone No: _____

Agency: _____

Contact: _____

Telephone No: _____

Santee Lakes Recreation Preserve
where recycled water provides for
year-round boating, fishing, swimming
and picnicking for all San Diegans.





San Vicente Golf Course is drought proofed with recycled water

Recycled Water Site Supervisor Handbook



The USA Olympic Training Center is irrigated with recycled water