

## Methodology for Use of Reclaimed Water at Federal Locations



Fort Carson Golf Course, irrigated with reclaimed water.

Source: Scott Clark

The supply of freshwater has become a resource of concern on a global scale, whether because of future availability or projected economic reasons. In response to this expanding problem, the United States Federal Government requires the reduction of water consumed by domestic, industrial, landscaping and agricultural needs at Federal sites. Executive Order 13514 *Federal Leadership in Environmental, Energy, and Economic Performance* directs Federal agencies to identify, promote and implement water reuse strategies consistent with state laws that reduce water consumption. Reusing water is a large untapped alternative water source for many Federal sites that can help facilities meet their reduction goals by exchanging potable water, industrial, landscaping and agricultural water for reuse water.

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Water can be reused in three main ways:

1. **Water Recycle:** Discharge water from an application or process is used again in the same application, such as recycling the final laundry rinse water for the next cycle.
2. **On-site Water Reuse:** Discharge water from one application or process that is captured, minimally treated, and is utilized in another application. Examples include gray water<sup>(1)</sup> reused for toilet or urinal flushing.
3. **Water Reclaim:** Also termed, reclaimed wastewater, is effluent generated by a wastewater treatment facility that is treated to a level that is appropriate for use in another application. Examples include using reclaimed wastewater for landscape irrigation or cooling tower make-up.

This fact sheet lays out a step-by-step process to help Federal agencies understand the process involved to initiate a water reuse project using reclaimed wastewater. The use of reclaimed wastewater is regulated by local and state governments. To foster good stewardship between Federal sites and their neighbors, Federal agencies are encouraged to work with state and local departments to conform to local regulations and codes on reuse projects.

There are other legislative acts that Federal sites must comply with that do not delineate water reuse as a water source. To learn more about these policies, visit the FEMP website for additional reference documents to help facilitate meeting the water-related goals.

[www.femp.energy.gov/program/waterefficiency.html](http://www.femp.energy.gov/program/waterefficiency.html)

The steps covered in this fact sheet were developed based on information gathered from the EPA *Guidelines for Water Reuse*<sup>(2)</sup>. The guidelines provide detailed resources on water reuse across the country and on topics not covered in this fact sheet. This fact sheet distills information from the guidelines to help agencies sort through the complicated nature of developing reclaimed water projects.

### Step One: Understand State Laws – Contact State Regulatory Agencies

The first step in creating a water reuse project is to research current state and local laws pertaining to your Federal site. Currently, there are no Federal regulations for water reuse, individual states determine their water reuse status and water quality treatment standards. Not all states have regulations or guidance for water reuse and not all states that

(1) Gray water is defined as domestic wastewater composed of wash water from bathrooms and laundry sinks, tubs, and washers. It does not include water contaminated by food waste or pathogens. Gray water may be bound by the same regulations as reclaimed water. Facilities thinking about using gray water should follow the steps provided to understand how to follow local regulations and guidelines.

(2) [www.epa.gov/nrmrl/pubs/625r04108/625r04108.htm](http://www.epa.gov/nrmrl/pubs/625r04108/625r04108.htm)

have regulations and guidance allow all categories of water reuse. For example, currently the State of Connecticut does not allow water to be reused and the State of Alaska allows water to be reused only in the irrigation of agricultural non-food crops; while the State of Washington allows water to be reused in many applications. The EPA *Guidelines for Water Reuse* has compiled a list containing the state departments in charge of reuse water's regulation and their websites.

## Step Two: Classify Project Type

Where and how sites utilize reused water will help guide water managers in the right direction in terms of which state regulations exist for this use type and the level of treatment required. Projects must meet minimum water quality standards to utilize reuse water. Water managers need to investigate the state's water quality standards and the treatment options available to meet these requirements. The likelihood of human exposure to reclaimed water is the main concern of state regulating agencies. If human exposure is likely to be low, a lower quality of water may be approved by the state for the reuse application. For example, a public park will require a higher quality of water in most states than water reused in maintaining a wetland because of the greater potential of human exposure in a park setting. If there is a type of reuse that is not currently regulated by the state and there is a project that could use the unregulated water type, it is possible for a state to approve a variance. The types of water reuse categories as defined by the EPA are in the *Guidelines for Water Reuse*<sup>(3)</sup>.

## Step Three: Purchase or Produce

When it comes to selecting the source of the reclaimed water there are two basic options to purchase reclaimed water from a local municipal wastewater treatment plant or a "mixing" facility, or to produce<sup>(4)</sup> reclaimed water on-site. Choosing the source of reclaimed water can range from simple to complex. Considerations

include connecting to an existing municipal distribution system (if available at the project location), extending an existing on-site system, or building a reclaimed system and infrastructure. Some parameters to consider when choosing the source of reclaimed water include the population of the site, the amount of reclaimed water to utilize on-site, and the purpose of the reclaimed water.

Typically, reclaimed water is less expensive than potable water sold from municipalities. However, the quoted cost for reclaimed water may not include all the cost that could be incurred. Delivery costs and cost associated with infrastructure upgrades must be considered for true cost comparison.

If the site is large enough and has an existing wastewater treatment facility, it may be an economical choice to designate some of the effluent stream as reclaimed water to be reused in on-site applications. However, if the site is small and does not treat its wastewater on-site, it is more practical to purchase the reclaimed water if available and upgrade the site's infrastructure to accommodate the reclaimed water. Examples of cities that sell reclaimed water include Olympia, Washington, Tampa, Florida, and Tucson, Arizona<sup>(4)</sup>.

## Step Four: Permit

Permitting a reclaimed water project may not be as complex as anticipated. Permitting is handled by a state agency, usually the State's Department of Environmental Quality or Department of Public Health. Permitting reclaimed water projects is intended to ensure that this water is safe to the public and will not harm the local environment. To initiate the permitting process, most states require submission of a Notice of Intent. If the project is accepted, then the state responds with a Notice of Authorization. Information generally required in the Notice of Intent may include the intended use for the reclaimed water, water quality

Information generally required in the Notice of Intent may include:

- The type of use intended for the reclaimed water
- Water quality standards
- Treatment process
- Location of supply water
- Reporting requirements
- Associated fees

standards that will be met, treatment process employed to meet these standards, source of reclaimed water, and associated fees to users. In receiving the Notice of Authorization, the site agrees to monitor the reuse water so that public safety is maintained and the environment is protected. For example, the State of Arizona requires sites reusing water to monitor nitrogen levels to ensure the health and safety of aquatic life. Both the State of Colorado and the State of Arizona require that the total volume of reuse water used at a site be reported in conjunction with annual permit reports submitted to the permitting agency.

## Step Five: Work with a Contractor

To ensure that your site meets all regulations and codes, site water managers may want to consider working with an experienced contractor. An experienced contractor should understand what site want to accomplish with the reclaimed water project, understand the state and local regulations and be familiar with installing water reuse systems. Using an experienced contractor may make the water reuse project process smoother because the contractor can walk the site through each step outlined in this fact sheet. Note, the contractor may not follow the steps exactly as outlined here in this fact sheet, but should get the site to the ultimate goal of developing a water reuse project. If the site needs to locate an experienced contractor, the site may want to start its search in the US General Services Administration (GSA) Federal

(3) Reclaimed water is produced by the advanced treatment of domestic wastewater. This advanced treatment may include additional filtration, additional nutrient removal, oxidation, reverse osmosis, treatment with ultraviolet disinfection, or ozone.

(4) [www.epa.gov/region9/waterinfrastructure/az-watersense-award.html](http://www.epa.gov/region9/waterinfrastructure/az-watersense-award.html)

Supply Schedule. Water managers may consider utilizing the American Water Works Association (AWWA) Sourcebook, which is an online resource of AWWA member contractors. The Sourcebook identifies contractors specially designated as “water reclamation and reuse”. Find more information at: [sourcebook.awwa.org/](http://sourcebook.awwa.org/)

The GSA Federal Supply Schedule<sup>(5)</sup> provides a contracting mechanism for Federal agencies to acquire products and services. The GSA eLibrary contains a list of all GSA schedules. From the main eLibrary list<sup>(6)</sup>, water managers can select facilities maintenance and management (Source 03FAC) or run a key word search with the terms “water efficiency” or “water reuse.” The GSA Schedule for Water Conservation is 871 210 and is in the facilities maintenance and management services<sup>(7)</sup>. Selecting the search category from the main source, GSA returns a list of contractors that are approved to work water efficiency contracts.

### Step Six: Communicate and Educate

An important step that must be taken in using a water reuse system is educating the people that will be exposed to the system. People that are exposed to the system include operation and maintenance staff, facilities personnel, and occupants in the buildings. For example, education can include placards outside restrooms indicating that reuse water is being used to flush toilets and urinals. Additionally, it may be beneficial for the site to publicize to the surrounding community that water reuse is on-site as a way to conserve the community’s drinking water.

The following flow chart (Figure 1) shows the beginning steps followed in this fact sheet.

### Case Studies

Provided below are brief synopses of case studies at sites that reclaim wastewater

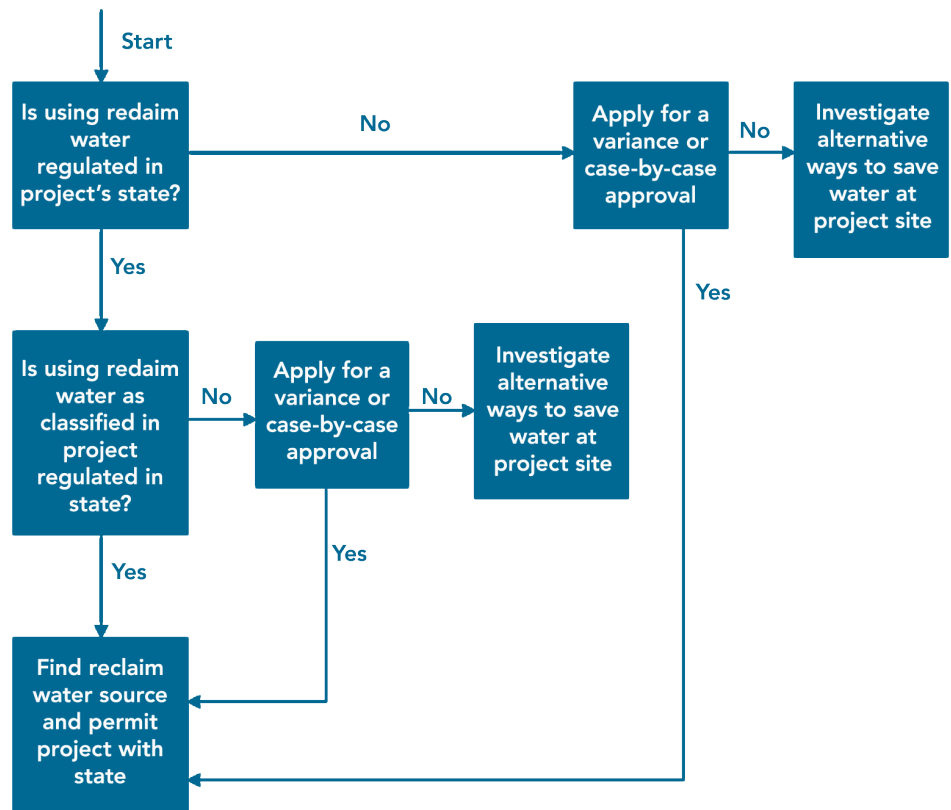


Figure 1. Water Reuse Project Steps.

for reuse on-site to serve as successful examples of sites described in this fact sheet.

Find FEMP Best Management Practices Case Studies on water reuse projects at: [www.femp.energy.gov/program/waterefficiency\\_csstudies.html](http://www.femp.energy.gov/program/waterefficiency_csstudies.html)

### Fort Carson, Colorado

US Army Fort Carson is located near Colorado Springs, Colorado. Colorado Springs receives an average precipitation of 16 inches per year, and the city is growing in population. The Fort and the Piñon Canyon Maneuver Site occupies 373,000 acres, of which 9 million square feet is facility space and 4 million square feet is family housing. It is within these constraints that Fort Carson treats their wastewater on-site. The treated water is reclaimed and then sent to the Fort Carson Golf Course to be used as irrigation water. The treated

water is stored in an on-site pond to meet peak season irrigation demands (see Figure 2). This pond is accessible to players as at least one fairway abuts the south side of the pond creating a golfing water hazard. Fort Carson recognized the benefits of reusing their treated effluent in the early 1970s, before the State of Colorado required permitting for reuse sites. Fort Carson was “grandfathered” into the State’s system but still maintains a Notice of Authorization with the Colorado Department of Public Health and Environment (CDPHE). The treated effluent is considered Category 2 water, which is defined by the state as water that receives secondary treatment with filtration and disinfection while meeting state set limits for additional parameters. The Notice of Authorization requires Fort Carson to monitor, record, and report as stipulated by the Water Quality Control Division of the CDPHE. General requirements in Colorado include the quality of water delivered, the total volume of water used, any violations of the Notice of Authorization, and documentation

(5) Find general information on the GSA Schedules at: [www.gsa.gov/Portal/gsa/ep/channelView.do?pageTypeld=17112&channelld=-24731](http://www.gsa.gov/Portal/gsa/ep/channelView.do?pageTypeld=17112&channelld=-24731)

(6) Search for specific water related services on the Schedule listing website: [www.gsaelibrary.gsa.gov/ElibMain/scheduleList.do](http://www.gsaelibrary.gsa.gov/ElibMain/scheduleList.do) and use key words such as “water efficiency” or “water reuse” for your search criteria.

(7) Find specific information on GSA Water Conservation Schedule 871 210 and Facilities, Maintenance and Management Schedule 03FAC at [www.gsaelibrary.gsa.gov/ElibMain/scheduleSummary.do?scheduleNumber=03FAC](http://www.gsaelibrary.gsa.gov/ElibMain/scheduleSummary.do?scheduleNumber=03FAC)



Figure 2. Reclaim Water at Fort Carson.

that the system has been inspected. The plant's capacity is rated at 3 million gallons per day and saves approximately 100 million gallons annually.

To get more information on Fort Carson's water reclamation project, see the FEMP Case Study at: [www.femp.energy.gov/pdfs/water\\_fortcarson.pdf](http://www.femp.energy.gov/pdfs/water_fortcarson.pdf)

### Naval Air Station Jacksonville, Florida

Located south of downtown Jacksonville, Florida, Naval Air Station (NAS) Jacksonville was commissioned in October 1940 and is the home base of the commander, Navy Region Southeast. Drinking water for NAS Jacksonville comes from the Floridan aquifer, which underlies all of Florida and parts of neighboring states. NAS Jacksonville completed an economic and feasibility study of water reuse applications in renewing the domestic wastewater treatment plant's discharge permit with the Florida Department of Environmental Protection (FDEP) in 1994. The study's results identified the wastewater treatment plant as a key source for reclaimed water, which led to an investigation on how this water could be well utilized. The Timuquana Country Club (TCC) shares a fence line with NAS Jacksonville's plant, so the St. Johns River Water Management District approached NAS Jacksonville about working with the TCC to reuse the

plant's treated effluent to irrigate the golf course instead of withdrawing water from the aquifer. NAS Jacksonville agreed to the proposal and implemented the project. The partnership between the NAS Jacksonville and the TCC allowed this project's design, permitting and building to be financed by the TCC. In exchange, NAS Jacksonville supplies the reclaimed water to the TCC without cost. The reuse system began operations in 1998.

The TCC receives reclaimed water from the plant through a gravity pipeline to a two-acre holding pond (see Figure 3). The two-acre holding pond on the golf course is permitted at 300 kgal/day to meet fluctuating irrigation demands. Reclaimed water not used for filling the storage pond is discharged to the St. Johns River. If at any time the reuse parameters are not met, the plant's discharge goes to the river.



Figure 3. Holding Pond at Timuquana Country Club.

The reuse system has been a success for NAS Jacksonville and the TCC. The partnership between these two parties has saved the TCC from pumping between 73 and 110 million gallons annually from the aquifer. Recent permits from FDEP require the plant to increase nitrogen removal efficiency or reduce the daily flow from the plant into the St. Johns River or both in addition to continuing to supply the TCC with reclaimed water. To meet these requirements, the Navy

has chosen to pipe reclaimed water to the NAS Jacksonville golf course and install a spray field irrigation system to obtain zero discharge at the plant. The on-site golf course piping infrastructure is designed and permitted by FDEP, but was waiting on funding to be constructed as of May 2010.

### Additional Resources

The following websites have resources offering additional information on developing and implementing water reuse projects:

Alliance for Water Efficiency: [www.allianceforwaterefficiency.org/default.aspx](http://www.allianceforwaterefficiency.org/default.aspx) – This website contains specific information on water reuse and gray water in the "Resource Library" under "Alternate Water Supply"

American Water Works Association: [www.awwa.org/](http://www.awwa.org/) – AWWA provides useful materials on water reuse in the website's "Bookstore" and contact information on water reuse contractors in the website's "Sourcebook"

Environmental Protection Agency (EPA) Region 9: [www.epa.gov/region09/water/recycling](http://www.epa.gov/region09/water/recycling) – This website offers a general overview of water reuse, benefits of reuse, and treatment options.

EPA *Guidelines for Water Reuse*, 2004: [www.epa.gov/nrmrl/pubs/625r04108/625r04108.htm](http://www.epa.gov/nrmrl/pubs/625r04108/625r04108.htm) – This document provided the foundation for this Fact sheet, offering detailed information on water reuse and state by state guidance on water reuse regulations.

FEMP Water Efficiency: [www.femp.energy.gov/program/waterefficiency.html](http://www.femp.energy.gov/program/waterefficiency.html) – This website provides technical and legislative guidance on water management for Federal agencies.

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