Municipal Recycled Water Resource Management Strategy

Draft Memorandum

CALIFORNIA WATER PLAN UPDATE 2023

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1. Introduction

Municipal Recycled Water – purposely reusing treated wastewater from a municipal treatment plant – is becoming an increasingly important component of California's water supply. It accounted for about 7 percent of the developed urban water supply statewide in 2020 and 13 percent in the greater Los Angeles/San Diego area, where recycled water use is highest. In future years recycled water is expected to increase its contribution to urban and agricultural water supplies as recycled water regulations change and water supply uncertainties increase because of climate change.

This Resource Management Strategy (RMS) was last updated in 2013. Since then, there have been significant changes in regulations regarding the use of recycled water and public perception regarding it. This 2023 RMS describes the current status of recycled water in California, what some of the challenges are to increasing its use, and the resources needed to continue to increase recycled water use to meet demands and diversify regional and local water supplies.

Definition of Municipal Recycled Water

The California Water Code (CWC) defines recycled water as: "water which, as a result of treatment of waste, is suitable for a direct beneficial use or a controlled use that would not otherwise occur and is therefor [sic] considered a valuable resource" (CWC Section 13050(n)). "Recycled water" and "reclaimed water" have the same meaning and can be used interchangeably. The California Water Plan (CWP) and this RMS use the term "recycled water" to refer to municipal recycled water.

The term "recycled water" covers a wide range of water quality and, therefore, uses. This can create some confusion and so it is important to understand how different types of recycled water can be and are used in California. There are two categories of recycled water quality that govern what uses are acceptable: constituents that have public health effects (for example, bacteria) and constituents that have practical, non-health effects (for example, boron on crops or salts on industrial processes). This RMS will focus on public health-related water quality, which is the broadest category in governing how recycled water can be used.

In general, the higher the level of treatment, the broader the permitted uses. Wastewater that has been minimally treated (referred to as undisinfected secondary treatment) to enable it to be discharged within water or on land in the State of

California can be used to grow fodder crops or other vegetation that does not come into direct human contact. Wastewater that has been highly treated and disinfected to a level that enables it to be used to support human drinking water supplies is referred to as advanced treatment and has no limits on its use. This will be discussed further below and in Section 3.

In addition to treating water to an applicable quality for reuse, recycling of treated wastewater also is a strategy that must be planned and implemented to be considered "recycled water" as defined CWC. Wastewater that is fully treated and discharged to the environment according to the facility's permit is a benefit to the environment and may incidentally be reused by a downstream user. Treated wastewater effluent becomes recycled water when it is purposely conveyed from the point of treatment to the point of planned use.

In general, there are three ways treated wastewater is discharged or disposed within California: into a freshwater surface water body, into the ocean or other saline water body, or discharged onto land.

- River and stream discharge: Permitted disposal practices of treated wastewater comingles with the stream or river, becomes part of the stream or river, and then is considered waters of the State. Any subsequent extraction by a downstream user may be considered a beneficial use, but unless there is a legal contractual relationship between an upstream wastewater agency and a downstream customer (there are only two in California), it would be considered incidental and not municipal water recycling.

- Ocean or saline body discharge: Treated wastewater discharged to the ocean or other saline water bodies is considered no longer practically available for reuse and is referred to as "irrecoverable water." The State recognizes recycling projects that capture municipal wastewater in coastal areas that would otherwise become irrecoverable water as providing "new water" supply.

- Land application: In areas where treated wastewater cannot be discharged to a natural surface water body, discharge may take generally three forms: evaporation-percolation ponds, artificial wetlands, and lands fields.

Treated municipal wastewater that is recycled through planned projects are categorized as non-potable or potable.

- Non-potable recycling: any application not involving drinking water for human consumption, such as landscape or agricultural irrigation, commercial applications like car washes or toilet flushing in office buildings, or industrial process such as oil refineries or cooling towers.

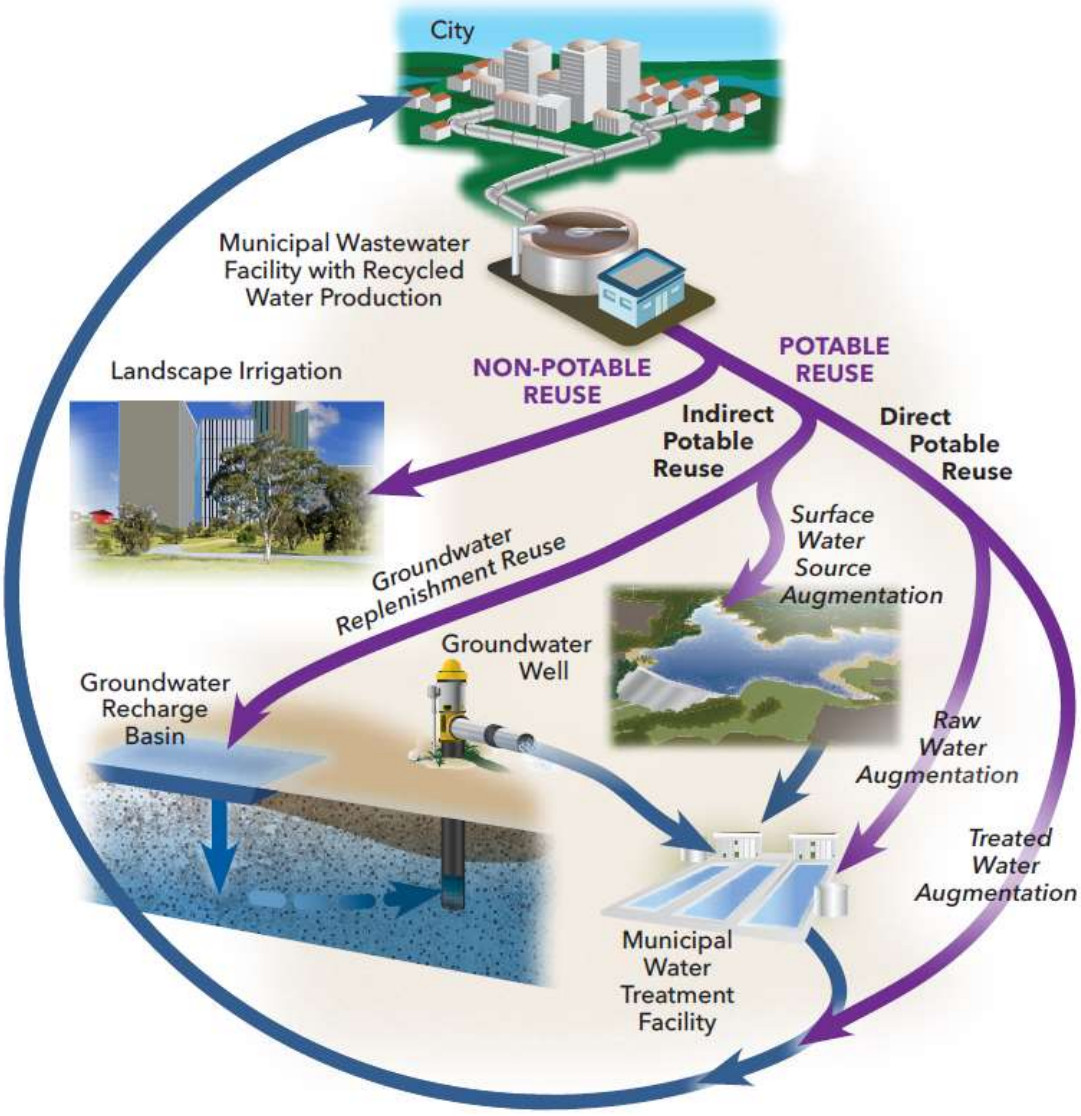
- Potable recycling: replenishes or augments drinking water supplies. It can be further distinguished as direct or indirect:

    - Direct potable reuse (DPR) is treated water conveyed directly from the wastewater treatment plant to raw or treated drinking water supply lines, a practice which is not currently occurring in California but will be possible under new regulations that are currently under public review. These regulations will be discussed further in Section 2.

    - Indirect potable reuse (IPR) is treated water from the wastewater treatment plant discharged into recharge basins to infiltrate into groundwater aquifers (Groundwater Replenishment Reuse Projects (GRRP)) or into surface water reservoirs used for drinking water supply (Surface Water Source Augmentation Projects (SWSAP)). Because seawater intrusion barriers typically result in groundwater recharge, they are considered a form of indirect potable reuse.

Figure 1 depicts planned recycled water projects developed by water and wastewater suppliers. The recycled water pathways shown in Figure 1 do not indicate the level of recycled water treatment. Existing California law specifies required treatment levels for designated uses.

Figure 1 Potable and Non-Potable Municipal Recycled Water



Classifications of Recycled Water in California

Recycled water is classified by the level of treatment provided by the wastewater treatment facility. Permitted water uses protective of human health are identified for each level of treatment. As indicated above, the higher the level of treatment, the wider the variety of ways it can be used. State regulations mandate that producers and users of recycled water comply with treatment and use restrictions to protect public health and water quality of receiving water bodies.

The term recycled water identifies water that is beneficially used after wastewater treatment. It does not indicate a certain level of treatment, such as "tertiary-treatment." Title 22, the regulation overseeing recycling of municipal wastewater,

uses level of treatment and bacteriological water quality standards to define what uses are legally allowed, based on the probability of public contact. Title 22 defines uses for water ranging from water that has had secondary wastewater treatment and is not disinfected to water that has undergone advanced treatment.

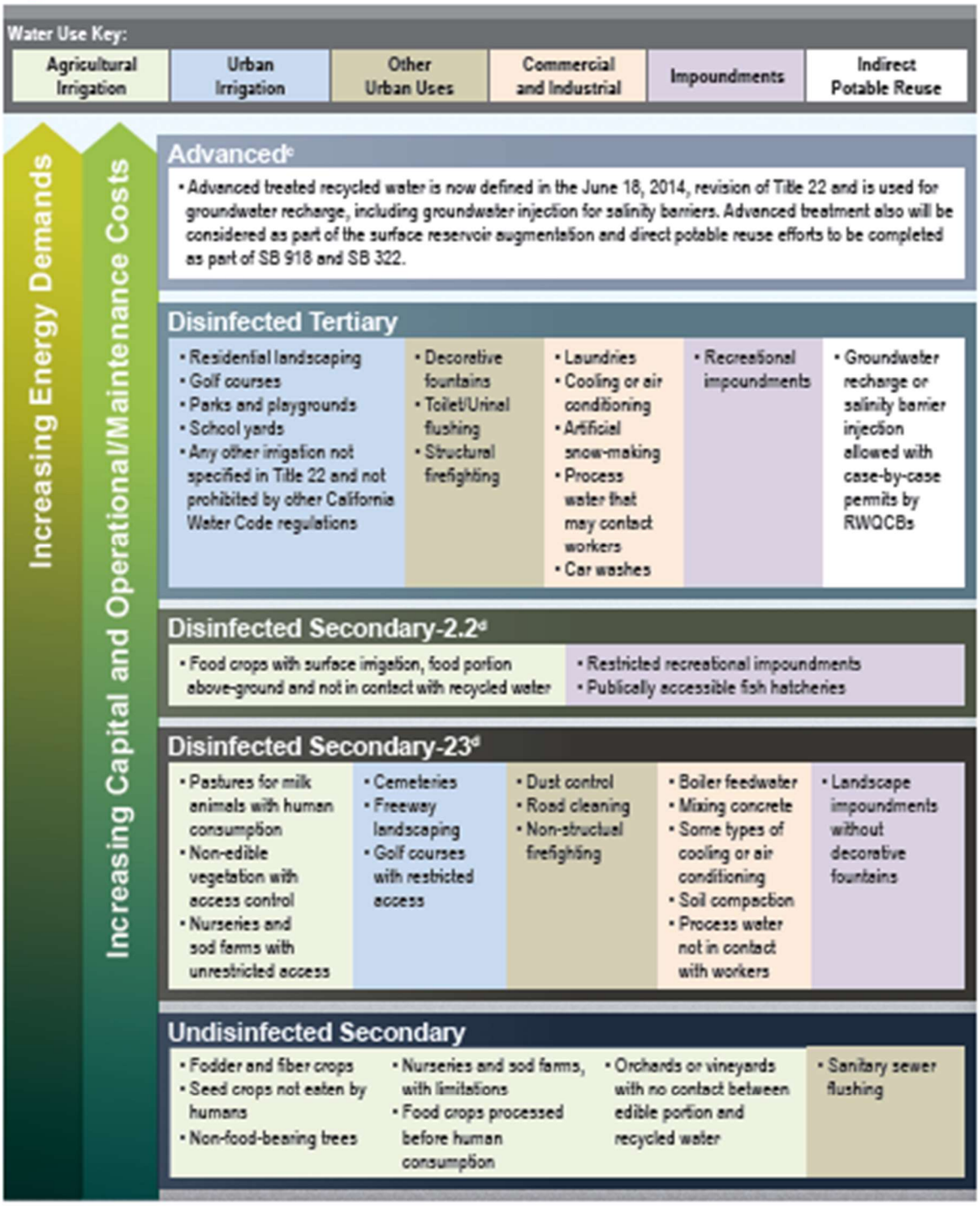
Wastewater generally is required to be treated to at least a secondary treatment level before it can be released to the environment. However, in some cases like seasonal discharge limits, tertiary treatment of wastewater discharge may required to protect public health or the environment.

Recycled water used for most urban applications requires tertiary treatment because of public health requirements. Tertiary treatment requires a greater amount of energy to produce and, therefore, produces more greenhouse gases (GHG). GHG savings can be realized in two ways – first, not overtreating water that can be beneficially reused at lower levels of treatment, and second, reusing wastewater for uses needing a lower level of treatment than would be required for discharge to the environment. Tertiary treatment has unrestricted use for everything other that potable applications.

In general, the levels of treatment for recycled water use are based on levels of human exposure and pathways of exposure leading to infection. The required levels of treatment are specified in Title 22 of the California Code of Regulations (CCR) (Division 4, Chapter 3, Section 60301 et seq.), as shown in Figure 2. The Title 22 regulations also specify monitoring and reporting requirements and on-site use area requirements. For example, municipal wastewater that has completed tertiary treatment can be used to irrigate school yards, parks, residential landscape, and food crops for human consumption that do not require further processing or washing, as well as industrial applications, or toilet and urinal flushing in office and institutional buildings. Wastewater that has been treated to secondary levels, and is undisinfected, is generally suitable for uses that do not include contact with people or unprocessed food crops, such as agricultural irrigation of animal feed crops.

Aside from the need to protect human health, there are special water quality needs for uses in agriculture or industry to grow crops or manufacture products. Higher levels of treatment may be needed for some industrial applications. Some agencies are able to provide multiple levels of recycled water treatment for various customer uses.

Figure 2 Title 22 Water Uses and Treatment Issues



a: Based on California Code of Regulations Title 22, Section 60001 et seq.

b: Uses for increasing levels of treatment also include all uses for lower treatment levels.

c: Wastewater treated with reverse osmosis and advanced oxidation processes.

d: Recycled water with a median concentration of total coliform bacteria not exceeding a most probable number of 2.2 or 23 per 100 milliliters (see California Code of Regulations, Title 22).

Recycled Water Use in California

Municipal recycled water use for agriculture and irrigation has successfully occurred in California for over 100 years. In 1910, 35 sites were using municipal recycled water for agriculture purposes and until the 1970's San Francisco's McQueen Treatment Plant supplied recycled water for irrigation in Golden Gate Park. Uses have broadened and expanded as treatment has improved, and it is now used by hundreds of agencies at thousands of sites for irrigation, industrial uses, and potable water supply augmentation.

Tracking Use

In 2019 the State Water Resources Control Board began requiring every wastewater and recycled water facility to annually report inflow, outflows and recycled water volumes (Figure 3). This changed how recycled water had been tracked since the 1970s, so statewide recycled water estimates from before 2018 do not directly relate to 2019 and beyond. The changes implemented by the Board in 2019 include:

- Tracking wastewater facilities only and not including data from water suppliers, which deliver about half of the recycled water in the state.

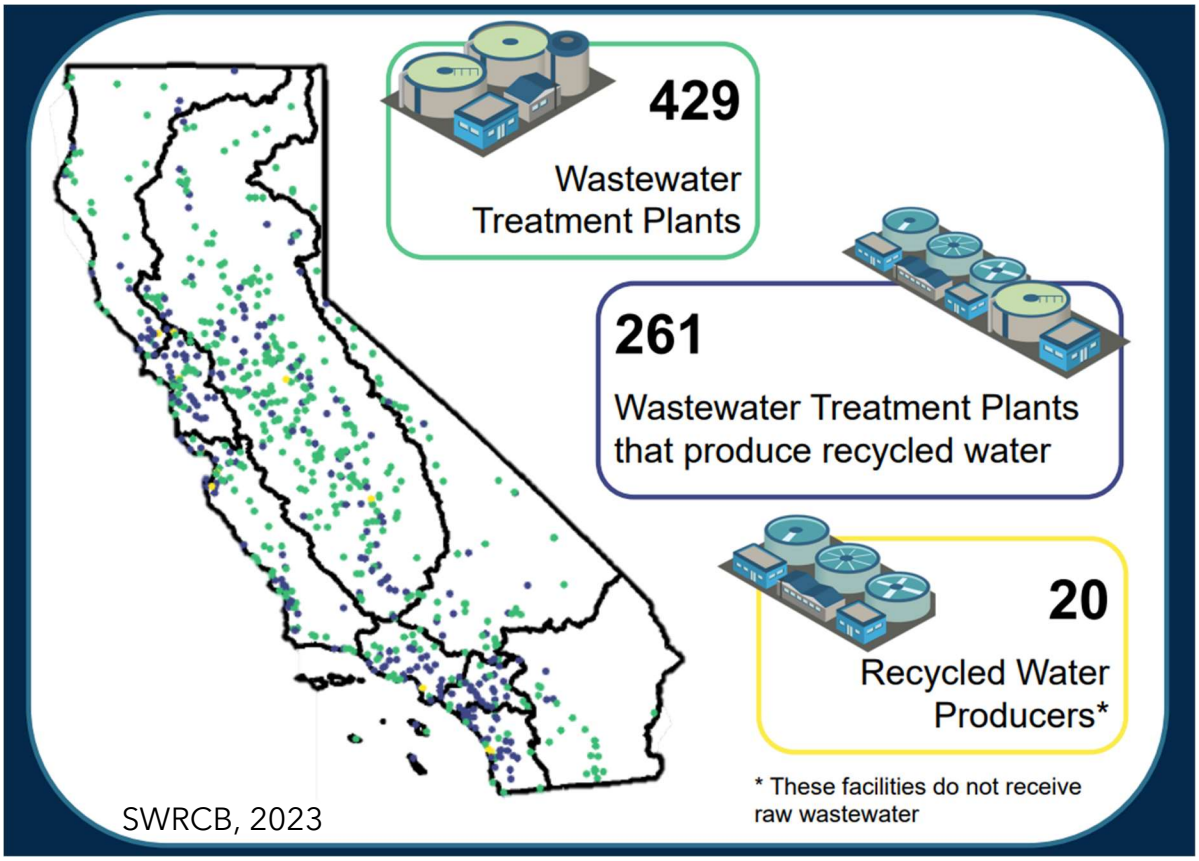
- Requiring that only water recycled under an Engineering Report be considered as "recycled water". In situations such as a small wastewater facility discharging treated wastewater to an agricultural field growing crops, in compliance with the facilities permit but without an Engineering Report, the use is considered by the Board to be waste discharge and not recycled water.

- Water which a wastewater facility purposely discharges to a wetland for environmental enhancement that is not required by the facilities permit is not considered recycled water.

- Reducing the number of recycled water categories because agencies had complained about the number of categories being tracked.

These changes resulted in a decline of recycled water reported in 2019 relative to 2015. This decline was not expected because the financial investment made in developing recycled water infrastructure during the 2014-2017 drought was expected to see increases in recycled water use in the state. The Board indicates that the decline may be a result of learning a new system because the results in 2020 were more similar to those in 2015.

Figure 3 Wastewater Facilities in California in 2020



2020 Recycled Water Use in California

2020 data will be discussed in this RMS because the 2023 Update to the California Water Plan (CWP) examines water data through 2020. This RMS is a supporting document for the 2023 CWP. For recycled water, data through 2021 are available and are presented in graphs for reference.

In 2020, the SWRCB reported 728,000 AF of recycled water beneficially reused in 2020. This is an increase of the 2019 reported volume of 686,000 AF and slightly lower than 2021 of 732,000 AF (Figure 4). Although not directly comparable, Figure 5 presents the recent data with historic data for reference.

Figure 4 State Water Resource Control Board Tabulation of 2019-2021 Recycled Water Use

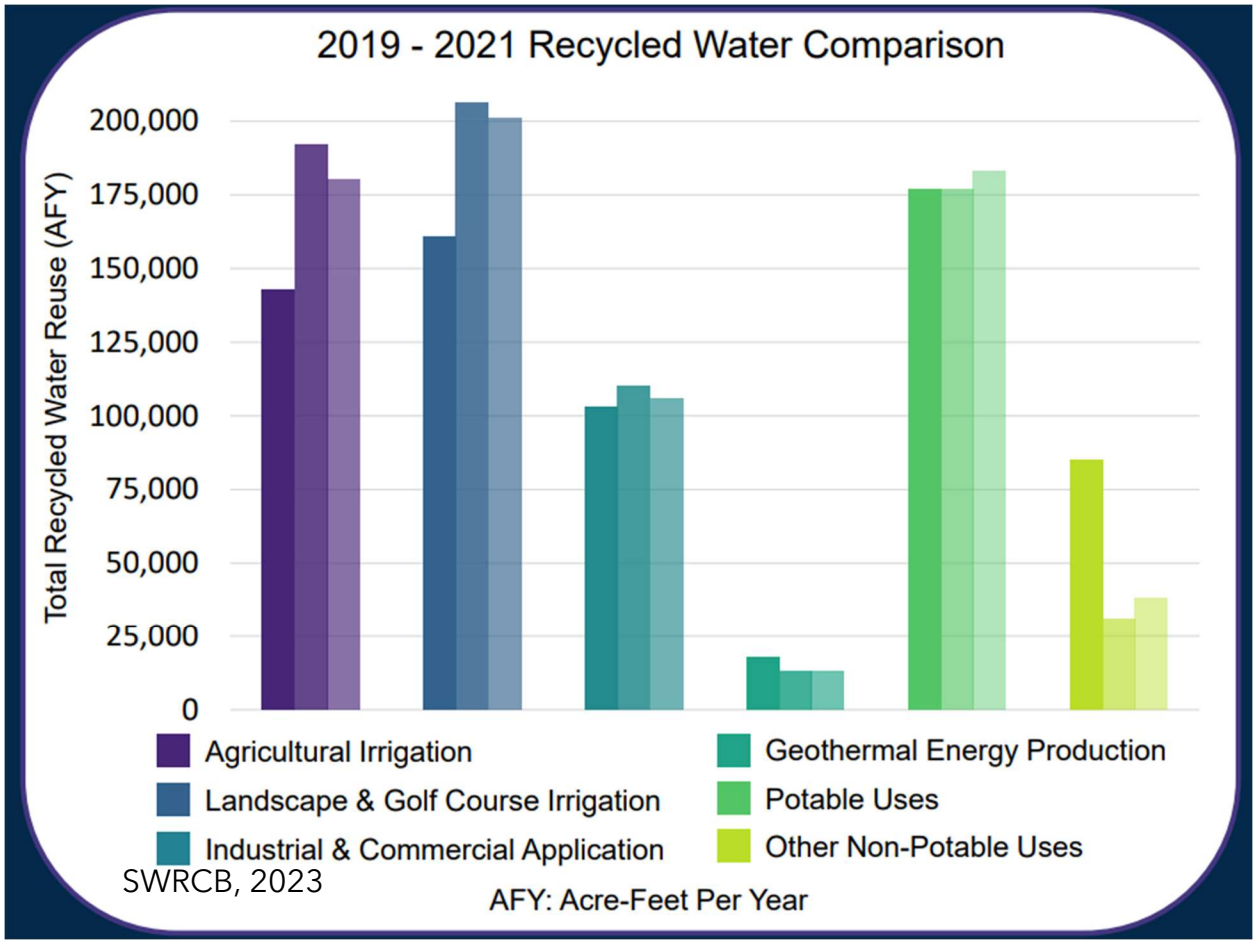


Figure 5 Municipal Recycled Water Use in California Since 1970

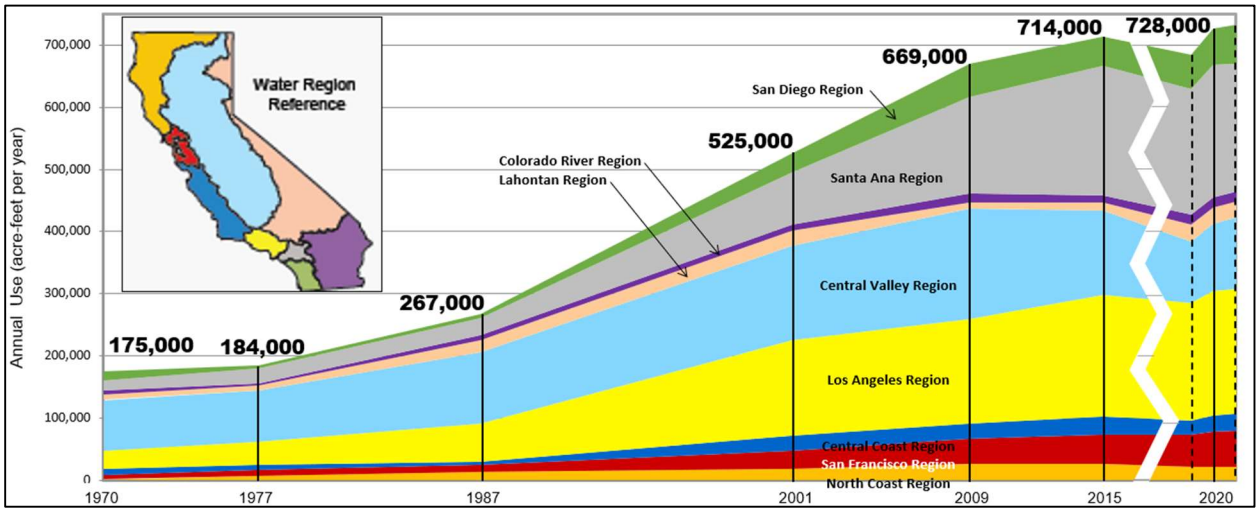


Figure 5 notes: (1) The break in the graph between 2015 and 2019 is because of changes made to recycled water data collection in 2019. (2) Dashed lines shown for 2019 and 2021 data are for reference.

The total amount of inflow in 2020 to wastewater treatment facilities was 3.4 million AF, excluding recycled water facilities that are treating effluent from a wastewater facility. Of this volume, 2.4 million AF was discharged as waste and 728,000 AF was beneficially recycled. The remaining volume of the 1 million AF difference between inflow and discharge not recycled was lost during treatment (biosolids, etc) or discharged to creeks, streams, and rivers to support environmental habitat, as required by wastewater facility operating permits. Environmental water, referred to as instream flow requirements, is not available for recycling.

The 2.4 million AF discharged as waste in California in 2020 was discharged to oceans, rivers/creeks, and surface water bodies. A portion of this water may be available for additional recycled water projects. Because the discharged treated wastewater may be captured by downstream users and reused, possible reduction of water discharged into streams because of new recycling could potentially adversely affect downstream water rights or instream beneficial uses. Recognizing this, the CWC requires that prior to making any change in the point of discharge, place of use, or purpose of use of treated wastewater, the SWRCB review potential changes to ensure potential impacts on beneficial uses are considered before authorizing a change in the permitted discharge of municipal wastewater (CWC Section 1211). The Board is currently funding a Water Research Foundation (WRF) project to evaluate how much water is available in California for future recycling projects. The findings of this report are expected later in 2023 and will help quantify future recycled water goals.

2030 and 2040 Goals Identified in the Water Supply Strategy

The 2022 document California's Water Supply Strategy, Adapting to a Hotter, Drier Future (WSS) updates state priorities to address current and anticipated water supply shortages due to long-term drought and the accelerating impacts of climate change. These goals are a part of a larger effort identified in the Water Reliance Portfolio (2020) to build California's water resilience to address anticipated water supply challenges.

The WSS identifies goals to increase annual recycled water use by an additional 800,000 AF by 2030 and 1.8 MAF over 2021 recycled water volumes. These goals will be balanced with the findings of the WRF report identifying how much water is available for recycling, as well as wastewater discharge needs for brine discharge and instream flow requirements. Lists of known planned recycled water projects are also in the process of being compiled to assess the potential for meeting the recycled water goals identified in the WSS. This will be discussed further in Section 5.

2. Benefits of Integrating Recycled Water into a Water Supply Portfolio

Water recycling provides many benefits to local and statewide water supply reliability. Municipal recycled water increases and diversifies local supplies, supports drought preparedness, provides environmental benefits, and can reduce energy consumption by lowering dependence on imported supplies. Municipal recycled water benefits the state and individual water users by reducing long-distance water conveyance needs, providing local water supplies that are generally a drought-resistant resource. Recycled water also supports climate change mitigation and adaptation strategies, which will be discussed further in Section 3.

Local Supply

Municipal recycled water has the advantage of being locally generated and reused. This provides a strong benefit for water suppliers that may be dependent upon water supplies conveyed over extended distances. This can provide these communities additional options for meeting water supply demands. Recycled water may also have lower GHG generation than water conveyed over a long distance, have a higher level of reliability during drought, and provide a higher level of control than imported water.

Drought Preparedness

Establishing recycled water capacity provides a more reliable water supply resource for water managers to access during drought cycles. Municipal recycled water as a water supply has less variability during drought than traditional groundwater or surface water resources because domestic water disposal continues even during droughts. Wastewater production will decrease during a drought as households and commercial and industrial facilities conserve, but some wastewater generation will still occur. For this reason, recycled water is referred to as drought-resistant – it has some impact from drought, but possibly not as severe as other supplies and it can recover more quickly after drought conditions lessen.

Energy Savings

Wastewater treatment serves two functions — it makes the water suitable for discharge to the environment and then makes it suitable for beneficial use. When projects are analyzed for energy impact, treatment energy is allocated to the two

functions. Wastewater treatment – and its required energy and GHG emissions – to protect the environment are allocated to pollution control. Any additional treatment necessary to enable the water to be used beneficially is allocated to water supply. When recycled water is used as a water supply source, the energy required above that required for discharge, plus the energy for distribution, is the allocation that would be compared for evaluation and comparison of alternative water supply options.

Implementing municipal water recycling could reduce energy consumption compared to fresh water sources, which may also support California's climate change mitigation efforts. The water sector uses a significant amount of energy to convey water from its source to its use. The State Water Project uses two to three percent of the total energy consumed in the state and is the single largest user of energy in California (Natural Resources Defense Council 2004). Water recycling can provide a lower-energy source of local water compared with importing water from other regions and desalination of ocean water or brackish waters. Energy savings are greatest when recycled water is used in close proximity to wastewater treatment sources and when additional treatment is not required beyond the treatment needed for wastewater disposal.

Energy savings realized by implementing a recycled water project depend on multiple factors, including whether the source of the water offset by the recycled water has a higher energy intensity, the amount of increased treatment above that already required for disposal needed to reuse the water, and distance to the point of recycled water use. Research is also ongoing to develop lower-energy recycling methods, which would in turn reduce the GHG generation during the water recycling process. Overall, it is assumed that implementing recycled water would provide an energy use benefit by developing local resources versus importing fresh water. This energy use benefit would also be realized by considering "fit for purpose" in recycled water use planning and by avoiding treating water to a higher level than is necessary for its planned reuse, thus improving energy resource efficiency.

Human Right to Water

Recycled water can support human right to water obligations by enabling recycled water to meet lower-water quality demands and diverting to potable use the water offset by recycled water use. This approach conserves higher-quality water for potable uses to maximize its use for human potable needs. If used for supporting potable water supplies, recycled water could also extend existing potable supplies.

Supports Environmental Enhancement

Recycled water can support environmental habitat. Wastewater facilities may be required to maintain certain discharges to a creek or river as part of its operating permit. Treated wastewater may also be discharged to wetlands to enhance local habitat.

Recycled water is used for groundwater injection barriers in several locations along the Pacific Ocean to protect potable water in coastal aquifers without natural barriers. This protects the potable water from seawater intrusion. A portion of the water injected for the seawater barrier will migrate into the aquifer, so seawater intrusion barriers provide the dual benefit of seawater intrusion protection as well as groundwater recharge.

Potable Reuse

Recycled water can directly or indirectly augment potable water supplies. This has multiple benefits. It expands locally available water supplies, it reduces wastewater discharge, and it maximizes the wastewater treatment investment for the local wastewater agency. Potable reuse requires additional treatment, extensive monitoring, and well-planned implementation to protect public health. Each of these requires extensive financial investment, technical and managerial capability, and commitment by the water supplier.

Indirect Potable Reuse

IPR requires an environmental barrier prior to the recycled water entering the potable system. This environmental barrier can be a groundwater basin or a surface water reservoir. The residence time of the recycled water within the basin or reservoir offers an opportunity for natural treatment to occur and provides a buffer between recycled water treatment and potable reuse if temporary lapses are identified in the prior treatment process.

Either tertiary-treated or advanced-treated water can be used for IPR, depending on the project type, planned residence time, availability of water that could be blended with recharge water, and the reservoir size. Tertiary-treated water has been safely used since the 1960's to recharge groundwater aquifers used as drinking water supplies.

Direct Potable Reuse

Draft regulations have been prepared by the Division of Drinking Water (DDW) of the SWRCB to enable advanced treated recycled water to directly support potable water supplies. The draft regulations propose to modify Title 22 and would establish minimum uniform water recycling criteria to adequately protect public health if a water supplier seeks plans to augment drinking water supplies with recycled water. The two approaches being considered with these regulations address:

- Raw water augmentations – adding recycled water immediately upstream of a public water system's water treatment plant.

- Treated water augmentation – adding recycled water directly into a water distribution system.

These regulations will go through public review and will be considered for adoption by the SWRCB at the conclusion of this review.

Variable Water Sources for Other Uses

A portion of the water a supplier provides to its customers may be used for non-potable purposes such as irrigation and some commercial and industrial uses. Water suppliers have the option of using recycled water to meet non-potable local water demands, or in the future, investing in additional treatment and monitoring to integrate it directly into potable supplies.

Alternative to Land Disposal

When a wastewater facility does not have a surface water body into which treated wastewater can be discharged, the facility may use land disposal or an evaporation pond. Purposely recycling this water can provide an alternative that can both offset local water use and reduce nitrate impact to local groundwater.

Land Application

A wastewater facility may have spray fields onto which treated wastewater is sprayed at a rate not to induce runoff. As an alternative to spraying wastewater onto a field without a resulting beneficial use, the land could be used for cattle grazing or growing crops, such as alfalfa or other fodder crops, which are both permitted under Title 22. Both approaches could reduce use of other available water supplies to meet those demands and provide economic benefit to the local agricultural community.

Growing crops provides an additional benefit of the agricultural crop utilizing the nitrates in the wastewater and reducing potential environmental nitrate impacts.

Currently, the RWQCBs categorize both grazing land and agricultural crop irrigation with treated wastewater to be disposal unless an Engineering Report for the Production, Distribution and Use of Recycled Water (Engineering Report) has been submitted to and approved by DDW. Because of the time and expense to prepare these reports many smaller wastewater facilities have not prepared an Engineering Report and are practicing agricultural use of recycled water in compliance with the facilities waste discharge requirements (WDR). These facilities are not credited with agricultural use of recycled water. This underestimates how much agricultural land is being successfully irrigated with treated wastewater and it does not provide state incentive to support the reuse of treated wastewater as a resource and not a waste. If this practice could be recognized and expanded, it could beneficially support the agricultural community in areas where local groundwater levels may be declining and provide needed fodder crop products to support local livestock.

Evaporation-Percolation Ponds

Wastewater facilities that are not able to discharge treated wastewater to local water bodies usually maintain basins, which may also be referred to as holding, evaporation, or percolation basins. In situations where these usually unlined basins contain secondary effluent, which may have elevated levels of nitrates, the percolation of this water into the underlying groundwater basin may negatively impact groundwater quality. In some cases, these wastewater facilities are reported in UWMPs to percolate water, which is incidentally beneficially recharging the underlying aquifer. However, to be classified as a groundwater recharge project the treated effluent must be intended to recharge groundwater and is required to be treated to at least tertiary levels.

As an alternative to evaporation or holding ponds for secondary effluent where there is no planned use of this water, this water could be effectively used to irrigate local fodder crops, as other wastewater agencies are doing. The state could develop an agricultural support plan to provide funds to wastewater agencies to purchase nearby land and install the needed conveyance to implement onsite agricultural use of treated effluent. This would result in the beneficial reuse of water now lost to evaporation or adversely impacting local groundwater quality.

Beneficial Use of Low-quality Water

As shown in Figure 2, increasing the treatment of recycled water to expand reuse opportunities increases energy needs and GHG production associated with treatment. In more rural areas, where agricultural land is adjacent to urban areas or the wastewater plant, the lower quality effluent can be used for agricultural irrigation, usually without increasing treatment levels. This enables higher quality surface water or groundwater, that the recycled water replaces, to be used for potable supply. This approach to using the treated water for uses that align with its level of treatment is referred to as Fit for Purpose.

3. The Cost of Inaction and Investment Needs

There are multiple reasons more treated wastewater isn't reused in California, primarily associated with funding and misconceptions about recycled water. Current practices of considering treated wastewater as a waste and not a reusable resource results in the loss of usable water and taxpayer dollars that have been spent to treat wastewater for discharge. As climate change impacts water supplies, recycled water offers an opportunity to support water supply diversification and reliability.

Changing Water Supplies

Reliance on traditional surface and groundwater supplies is expected to be more difficult in the future, in part because of climate change and regional infrastructure limitations. Treated wastewater offers an opportunity for access to an alternate water supply available near most urban centers. Diversification of water supply options will be a critical component of future water supply reliability.

Recycled water has been a component of California's water supplies for over 100 years, but as shown in Figure 5, it wasn't until about the year 2000 that recycled water use supplied more than 500,000 AF of water in the state. Recycled water in the southern portions of the state has become a widely-used component of water supply and supports both potable and non-potable uses. In Orange County, a national leader in the use of recycled water to support potable water supply, the Groundwater Replenishment System (GWRS), as of 2023 is recycling 100 percent of the reclaimable wastewater from the county's sanitation district. The GWRS provides additional treatment to the secondary effluent produced at the adjacent wastewater treatment facility so that the recycled water is safe for its subsequent reuse (Figure 6).

Figure 6 Reverse Osmosis at the Groundwater Replenishment System

Recycled water is not a drought-proof resource. In 2015, when then-Governor Jerry Brown required urban water users to reduce water use by 25 percent, wastewater flows to treatment plants were also reduced. This reduction resulted in lower recycled water availability. During discussions with wastewater plants conducted as part of the survey of how much recycled water was used in 2015, several times it was reported to DWR that a facility had not been able to supply the usual volume of recycled water or had not been able to supply any at all. Future efforts to reduce urban water use are expected to impact wastewater flows and the amount of available recycled water.

Recycled water is expected to increase in use as agencies consider implementing DPR. Although only a few agencies indicated in 2020 Urban Water Management Plans (UWMP) that DPR will be a component of its water supply by 2040, many agencies informally are reportedly evaluating DPR feasibility for potential future use.

Why Agencies are Not Recycling Treated Wastewater

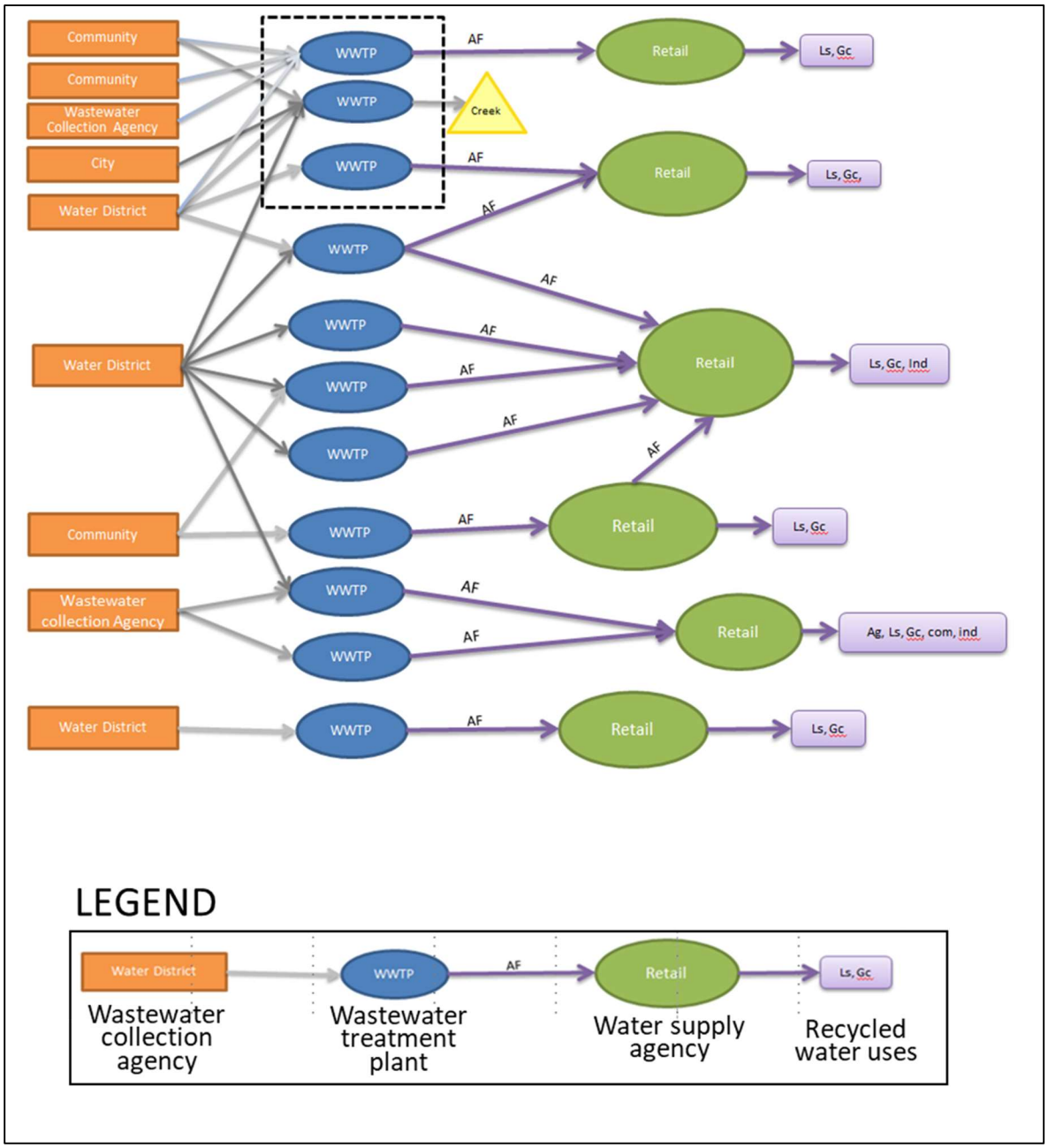
UWMPs submitted to DWR every 5 years discuss wastewater and recycled water use within their service areas. If a water supplier neither currently is nor plans to reuse

treated wastewater in the future, the water supplier is to indicate why. In the 2020 UWMPs, the most common reasons cited by UWMP preparers include:

- Lack of conveyance or treatment infrastructure.
- Wastewater doesn't meet Title 22 standards (discussed 'Education' discussion below).
- There are no customers for recycled water.
- Water demands are sufficiently met with potable water.

Of the 410 water supply agencies that prepared 2020 UWMPs, 46 percent do not include recycled water in current or future supply planning through 2040. Of the 690 wastewater plants responding to the SWRCB's 2020 data request, 38 percent of them are directly or indirectly beneficially reusing treated wastewater. The two data sets have key differences. The SWRCB's data set is from wastewater agencies, both large and small. These facilities are the generators of treated wastewater that can be recycled. However, wastewater facilities may not have the ability to distribute recycled water. The UWMPs are prepared by larger water suppliers and include wastewater information and recycled water distributed within their service areas. In UWMPs, recycled water is considered a water supply. Aligning the data from the two sources can be challenging, as indicated by the actual example shown in Figure 7, but it provides a complete picture of recycled water generation and use within California.

Figure 7 Complexity of Tracking Recycled Water Generation and Use



The common message within both the SWRCB and UWMP data sets is that recycled water use is underutilized. There is a basic misunderstanding about what recycled water is and how it can be used even within the water and wastewater industry. Many agencies do not consider wastewater to be a resource that can be utilized for beneficial uses to meet water needs, even as climate change impacts the availability of traditional supply sources. One approach to addressing this issue is for new WDRs issued by the RWQCBs to require a wastewater provider to thoroughly assess if treated wastewater could be used in ways other than directly discharging to waste.

This assessment could also include the cost to implement needed conveyance, treatment upgrade, or land purchase. Currently, state funds to support recycled water use are applied for by agencies and distributed to qualifying applicants. However, small agencies that do not have the staff or financial support to submit applications or Engineering Reports usually don't. A change to be considered would be for some state funds to be set aside for recycled water projects that are identified during WDR updates that would add certain thresholds of new recycled water to state supplies and would provide additional water resiliency for smaller communities.

The Cost of Inaction

Recycled water is the most widely available alternate water supply to augment locally available resources. Wastewater treated at almost all facilities in California is beneficially usable without additional treatment. As water suppliers search for additional or replacement water supplies an option to consider would be reusing treated wastewater to offset existing uses and then redirecting the offset water to potable supplies. These efforts would take planning and coordination but could be evaluated as an alternative when assessing options. As indicated in the preceding section, this additional planning could be done as part of WDR updates. An additional approach would be to require UWMP preparers to provide additional information, beyond the current simple statements or tables, as to why recycled water is not being considered for implementation in future years. These simple actions could help improve California's ability to support water supply challenges during expected water supply challenges resulting from climate change.

Climate Change (Vanessa)

Adaptation

(Building resilience.)

Mitigation

(GHG reduction.)

Investment Needs

The State of California has invested billions of dollars in the form of grants and loans to water agencies to develop recycled water projects. However, the volume of total recycled water beneficially reused in the state has increased less than 3 percent since 2015, when both drought funds and Proposition 1 funds were directed to increasing

recycled water use in the state. The survey of recycled water use conducted in 2015 was considered to be a 'baseline' survey because it was a drought year and there had not been enough time for the directed recycled water funds to begin producing water. As the State evaluates what investment is needed and how to implement this investment, approaches to improve funding distribution should be considered to expand additional water supply and to support agencies that may not have benefited from state funding.

Infrastructure

Infrastructure improvement is a critical path to increasing recycled water use. The two key areas to be considered are treatment improvements and conveyance improvement. Key consideration for infrastructure improvements regards the beneficial users and users/owners of the water. There have been cases where developers or groups needing additional water have provided funds for recycled water infrastructure or conveyance improvements in exchange for the offset higher quality water being directed towards the new project. Ownership of the water and customer issues will be discussed further in Section 4.

Treatment Improvements. If a water supplier determines that there are not identified water needs that can be met with the existing quality of recycled water available, there may be discussion about wastewater treatment improvement and how it could be funded.

As indicated earlier, aligning water quality with water needs is fundamental, especially when considering minimizing additional capital expenditures, facility operations and maintenance, or GHG emissions. If there are no identified agricultural users in the area, reusing undisinfected secondary water may not be possible. Or, agricultural needs may be tree crops, which requires a higher secondary level of treatment. Analysis of matching level of treatment with potential uses is essential when considering treatment improvements.

The feasibility of direct potable reuse will also be considered by water suppliers. This assessment will include what additional plant improvements are needed, considering additional treatment, higher qualifications and pay for required staffing, and additional monitoring to assess and document water quality protections.

Conveyance Improvements. A common issue for increasing the use of recycled water is moving the water from treatment to the location of use. Usually there are extensive challenges associated with conveyance, including installing and

maintaining it. Some water suppliers have been successful in identifying existing conveyance that is no longer being used because of other system improvements. Conveyance challenges will be discussed in Section 4.

User Site Requirements. There are facilities requirements on sites where recycled water is used. The primary objective is protecting public health from misuse of the recycled water and cross-connections between recycled water, potable water, graywater, and other non-potable water supplies that may be on the use sites. In addition to the costs of the facilities, there are periodic costs for inspections and testing for cross-connections. These requirements are included in Titles 17 and 22 of the Code of Regulations and the California Plumbing Code, which also has the force of regulations.

Education

There is a misconception of "Title 22 standards" that sometimes occurs - that Title 22 requires tertiary treatment for reuse. Tertiary-treated water is one type of recycled water discussed in Title 22, which presents requirements and uses of treatment levels ranging from undisinfected secondary to advanced treatment. However, this reason might be applicable if there are no potential uses allowed by Title 22 within a reasonable vicinity of the current treatment plant. Educating water and wastewater professionals regarding the correct terminology to be used and what current regulations address relative to recycled water will support expanding recycled water's future use because they will understand the uses of their existing resource.

A potential source of future misunderstanding may be how to refer to recycled water when discussing direct potable reuse projects. It will be important for customers to understand that the recycled water used for direct potable reuse is of higher quality than recycled water for irrigation. It may be that as direct potable reuse becomes discussed by water suppliers, another term could be uniformly used to support common understanding, although there would have to be consensus among suppliers and users for this approach.

Agriculture

As discussed above, reuse of treated wastewater for agricultural benefit may be among the easiest projects to implement because they frequently do not involve upgrading treatment and adding conveyance in rural areas is usually not as technically difficult as in urban areas. However, wastewater agencies have reported challenges in local agricultural communities not "wanting the water" because it has

limitations with the types of crops that can be grown and requires special handling and signage (Figure 8).

Agencies currently recycling water for agricultural reuse have implemented a variety of methods to encourage the practice, including lease agreements and gifting the water. One successful approach is for the wastewater agency to own the land, which enables a wastewater facility to have security that the practice will be able to continue without having uncertainties resulting from land ownership transfer. The state could develop a targeted fund to enable wastewater agencies to purchase land or install conveyance to support agricultural reuse and develop a program that would provide outreach to and support of agencies seeking financial support. This program could also support wastewater agencies with secondary effluent evaporation or recharge ponds.

Figure 8 Agricultural Reuse Signage

4. Barriers to Implementing Municipal Recycled Water

As indicated in the introduction of this RMS, recycled water use is increasing and is expected to continue to increase. However, there are multiple challenges to expanding use, as discussed below. Some of these issues have been presented earlier in this RMS, but they are presented again here to consolidate challenge discussion.

Challenges

There are a variety of reasons a customer begins to use recycled water. It can be because there are financial incentives such as cheaper water or more reliable supply. Some of these reasons are easy to address, others may be more difficult.

Water Ownership or Control

Recycled water is distributed by both wastewater and water agencies, which may not be under the same organization, such as a city or county. When wastewater and water agencies are completely separate entities, there can be challenges related to customer base. Geographic jurisdiction and the legal functions of agencies (e.g., wastewater treatment and disposal or water supply) can hinder planning and present institutional challenges to constructing and implementing a recycled water project.

Supplying water to a customer generates revenue for a water supply agency. If a customer switches to recycled water supplied by a separate entity, the water supplier may lose revenue. There may be additional water supply availability for the water supplier, but there may be short-term budgetary impacts. This may require cooperation and collaboration between the organizations.

Delivery of recycled water may also be an issue that needs to be resolved with legal agreements. Wastewater agencies may not legally be able to deliver recycled water directly to a customer. In these situations, the water and wastewater agencies may work together so that the recycled water is generated by one agency and delivered by another.

Another issue associated with ownership can occur if an organization provides financial assistance to upgrade a facility or install conveyance. There may agreements

on requirements to deliver water to a party that has made investment to receive recycled water. This can cause complications during periods of limited water availability or competing water interests.

Conveyance Challenges

The costs and challenges of maintaining a third infrastructure system, separate from potable water delivery and wastewater collection, which can be challenging. Issues such as rights-of-way, maintaining necessary spacing with other infrastructure, protecting against and monitoring for cross-connections, and pumping requirements for water movement within the system all may be associated with installing and maintaining infrastructure to deliver recycled water. For these reasons, some agencies have not been as aggressive at expanding recycled water conveyance infrastructure. Figure 5 shows that the rate of expansion of recycled water use after 2010 slowed when compared to earlier rates of expansion. Specific reasons for this slow-down are not known, but anecdotal information is that maintaining a separate infrastructure system is a component.

User On-Site Facility Modifications

Switching from potable to recycled water for irrigation, commercial, or industrial uses usually requires some change in operation or facility modification. Irrigation may have to occur at off-hours where people are not present. Commercial or industrial facilities may have to be replumbed or processes modified because of lower quality water or human exposure potential. These changes require financial and operational commitment on the part of both the supplier and the user of the water.

Energy

As the level of treatment of recycled water increases, the energy demands of adding additional treatment steps increases and, therefore, GHG production. These are decisions each supplier of recycled water makes as the costs and benefits are analyzed for recycled water programs.

Changing Ownership

Ownership of use sites can change recycled water use. This can be true of a wide range of facility types including industrial facilities or irrigated lands. For example, a wastewater facility was providing water to a farmer, who then sold the land. The new owner would not accept the recycled water and the wastewater facility was in a difficult situation.

Public Acceptance

As public awareness of recycled water use has increased through signage, fill stations during drought, and news and social media, it has become more widely accepted. The successful long-term potable water augmentation of the groundwater basin in Orange County (a GRRP) has also contributed significantly to public understanding and acceptance. The next step forward will be DPR. Several surveys have been conducted over the past several years to gauge public acceptance and agencies have conducted tours of facilities to support public education. As the proposed DPR regulations are reviewed, possibly modified, and implemented, it will be important for agencies to continue public outreach and demonstrate public health protection.

Terminology

The term recycled water refers to a wide range of water types which are defined by water quality and the level or degree of treatment. This can be confusing because of the wide range of applications of recycled water are controlled by treatment level, but the single term can be confusing. Water professionals need to be clear in use of the term and avoid using the term Title 22 water to indicate a particular level of recycled water. Correct terminology or clarification of the type of recycled water being used is important for public understanding and acceptance.

Potential Streamflow Reduction

Increasing direct municipal recycled water use can reduce the volume of water discharged into streams. This may impact downstream users or instream beneficial uses. CWC Section 1211 requires that prior to making any change in the point of discharge, place of use, or purpose of use of treated wastewater, the SWRCB review potential changes to ensure potential impacts on beneficial uses are considered before authorizing a change in the permitted discharge of municipal wastewater.

Environmental Justice

Environmental justice considerations for recycled water primarily involve the location of treatment facilities. The types of uses and use practices of recycled water, when conducted in accordance with regulations, are protective of public health; therefore health considerations should not result in environmental justice issues.

Costs

Expanding water supply reliability by adding recycled water to a portfolio of water supplies will require some additional cost. Costs will depend on the level of recycled

water to be incorporated and needed conveyance or treatment infrastructure. It is up to the water and wastewater suppliers to assess options, coordinate with potential recycled water customers, consider potential climate change impacts, and then make the appropriate decisions based on customer needs and rate impacts.

The list of known future projects and potential information from current and future UWMPs could provide an indication of the costs association with expansion of recycled water use.

Regulatory Oversight

A key factor in maintaining public support for recycled water use is confidence in the safety of recycled water and in the regulatory oversight provided at the state and local levels to ensure compliance with regulations. There is a cost to maintain the regulatory structure. At the state level, adoption of regulations and permitting of wastewater and potable and recycled water agencies is primarily financed by agency permit fees to cover costs borne by the RWQCBs and the DDW of the SWRCB. However, a reliable and dedicated source of funding is not provided to the DWR to maintain and update the California Plumbing Code to meet the needs of recycled water agencies and local officials who enforce the Plumbing Code and support and promote the inclusion of recycled water within the State's water supplies. The effectiveness in applying the Plumbing Code to protect occupants on recycled water use sites and supporting future water supply planning are hampered by this lack of reliable funding source.

5. Municipal Recycled Water and the Water Resilience Portfolio

California's WSS was issued in August 2022. The WSS provides specific actions and goals to support developing new water supplies and managing existing ones to prepare for changing climatic conditions. The WSS clarifies actions in the Water Resilience Portfolio (WRP, 2020), which is considered to be the state's master plan for water, because climate-related impacts are already evident.

Both the WSS and the WRP identify recycled water as a key component to increasing water supply resources in California. The 2020 WRP, prepared under then-Governor Jerry Brown, identified recycled water as the focus of the fourth action state agencies will implement to support supply diversification.

> *4. Support local and regional agencies to recycle or reuse at least 2.5 million acre-feet a year in the next decade.*

The WRP then describes 4 specific actions state agencies are to take to achieve the identified action. These actions address funding for projects, DPR regulations, water quality standards for onsite collection and potable reuse, and updating purple pipe regulations. Recycled water conveyance piping is usually purple to help distinguish that the water is non-potable and to help protect against mistaking the pipes for potable water lines if repairs have to be made.

The 2022 WSS, prepared under Governor Gavin Newsom, continues the importance of recycled water to future water supply. Under the objective to Develop New Water Supplies, action 1.1 is:

> *1.1 Reuse at least 800,000 acre-feet of water per year by 2030 and 1.8 million acre-feet by 2040, with most of that additional recycling involving direct wastewater discharges that are now going to the ocean.*

The WSS identifies 6 implementation steps addressing funding, tracking and supporting projects, and DPR.

Large urban water suppliers in Los Angeles, San Diego, and the San Francisco Bay Area are developing and implementing significant projects to more fully integrate recycled water into their water supply portfolios. These projects will support local reliability and reduce the amount of recycled water being discharged into the Pacific Ocean and San Francisco Bay. The State will also be working with other suppliers to support urban and agricultural recycled water projects.

The Recycled Water Policy is another important document directing recycled water use in California. As stated in the Recycled Water Policy, its intent is "to encourage the safe use of recycled water" and provide "direction to the regional water quality control boards (regional water boards), proponents of recycled water projects, and the public regarding the methodology and appropriate criteria for the State Water Resources Control Board (State Water Board) and the regional water boards to use when issuing permits for recycled water projects." Last updated in 2018, it identifies (Section 3.1.1.) annual goals for recycled water use on a statewide basis to be to increase the use of recycled water from 714,000 AF in 2015 to 1.5 million AF by 2020 and to 2.5 million AF by 2030. This document also initiated the annual reporting requirement for wastewater treatment facilities.

6. Recommendations

The following recommendations are proposed to support facilitating increased use of recycled water in integration into water supply portfolios.

1. Plan an update of the Engineering Report for Production, Distribution and Use of Recycled Water requirements with the objective of assisting small agencies and frontline communities to implement recycled water projects, including public outreach in drafting the update and clear language for facilitating preparation of reports for frontline communities implementing land application. Establish a fund or an alternative method to support smaller agencies and frontline communities with preparing recycled water programs/engineering report. This would also create a repository of successful agricultural reuse and enable other water suppliers to gain from that experience. The SWRCB recently updated the requirements for preparation of an engineering report for the Production, Distribution and Use of Recycled Water, but it is not clear if this revision facilitated smaller agencies using land application to be able to include their practices as beneficially reusing recycled water, particularly for the agricultural reuse of treated wastewater in lieu of disposal.

2. Establish a fund for small wastewater facilities with percolation or evaporation ponds to enable purchase of land to redirect the treated wastewater to agricultural reuse for greater water resources benefit. This practice would:

    A. Reduces nitrate loading to the groundwater by supporting agricultural uptake of nitrates.
    B. Increases recycled water use without increasing GHGs by implementing Fit for Purpose practices.
    C. Supports local agriculture and potentially reduces local groundwater use or enables it to be used for potable supp.

3. Establish a funding source for DWR to fund one person to maintain recycled water expertise to support its use as a water supply. This person could work with SWRCB to review water supply benefits of regulatory actions and financial assistance applications in SWRCB funding programs.

4. Conduct an in-depth study on how recycled water can be used to support agriculture in the Central Valley.

5. Assess what the potential costs are for advanced treated water for DPR. Identify GHG emissions for comparison to SWP and Colorado River conveyance and desalination.

6. For each new WDR prepared by the RWQCB, require an assessment of recycled water use potential to support and encourage beneficial reuse.

7. In the 2025 UWMP for agencies currently not nor planning to use recycled water in the future, require additional discussion of why the agency is not supporting recycled water use, what it has done to evaluate incorporating recycled water use, and provide specific requirements for what would be needed to implement recycled water use.

8. Establish a reliable funding source to support DWR to maintain and update the California Plumbing Code, perhaps by integrating fees into the existing permit fee structures used by the SWRCB.

6. References

7. Related Resource Management Strategies

The following RMSs have linkages to municipal recycled water. These RMSs may not directly mention municipal recycled water, but there are common issues.

- **Agricultural Water Use Efficiency.** Depending on the level of treatment, recycled water can be used to irrigate any crop.
- **Conveyance – Regional/Local.** Distribution of recycled water is planned and implemented on local and regional levels with local conveyance systems.
- **Drinking Water Treatment and Distribution.** In the future, recycled water may be distributed via potable water distribution systems.
- **Economic Incentives.** Loans, Grants, and Water Pricing" – Economic incentives are commonly used to facilitate initiation of recycled water projects, enable infrastructure development, or support the use of lower quality water.
- **Ecosystem Restoration.** Recycled water is often a water supply for ecosystem restoration projects.
- **Land Use Planning and Management.** Use of recycled water can be constrained by the availability of sites suitable for recycled water. Successful local planning can encourage locating potential recycled water users where recycled water is available, as well as planning infrastructure needs to support future growth.
- **Matching Water Quality to Use.** Recycled water could replace many instances where potable water is currently being used for non-potable applications.
- **Outreach and Engagement.** Introduction of recycled water as a local water supply resource requires extensive public outreach and education regarding its uses, as well as addressing local water quality and health effect concerns.
- **Recharge Area Identification, Utilization, and Protection.** Recycled water can be used for groundwater recharge.
- **Salt and Salinity Management.** Use of recycled water may have an overall impact on salinity of the underlying groundwater basin. As a result, the Recycled Water Policy includes provisions for preparation of salt and nutrient management plans. Recycled water production also may result in brine generation. Discharges of salts and chemicals into sewers from water softeners can increase wastewater salinity and negatively affect municipal recycling.

- **Urban Stormwater Runoff Management.** Stormwater can be used as a water supply mixing source for projects where recycled water is used for groundwater recharge.
- **Urban Water Use Efficiency.** Recycled water can be used for landscape irrigation and commercial or industrial applications. Gray water is discussed in this RMS.

8. References

To be completed for final

9. Useful Web Links

ADA accessibility requires that electronic documents incorporate "meaningful web links." For example, when including in the body text the title of another published document, the title itself is hyperlinked to the source of that document. Under "Useful Web Links," the full title of the document (not linked) is followed by its URL. This allows audience members who are reading the document (say, this RMS) in printed form to access the other document by typing its URL into a browser. Another advantage of employing such a section is that it keeps URLs out of body text; they are quite unwieldy in body text, often creating exaggerated line breaks and otherwise making reading more difficult.

Water Boards Recycled Water Policy and Regulations and annual recycled water reporting
Water Boards Recycled Water Policy and Regulations | California State Water Resources Control Board

California Water Plan Update 2018
https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/California-Water-Plan/Docs/Update2018/Final/California-Water-Plan-Update-2018.pdf

Recycled Water Policy Update 2018
Water Quality Control Policy for Recycled Water (ca.gov)

Water Supply Strategy
CA-Water-Supply-Strategy.pdf

Water Resilience Portfolio
Water Resilience Portfolio (ca.gov)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