MEMORANDUM

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TO: **UTILITIES ADVISORY COMMISSION**

FROM: **UTILITIES & PUBLIC WORKS DEPARTMENTS**

DATE: **OCTOBER 3, 2018**

SUBJECT: **Discussion of Recycled Water Expansion and Other Water Reuse Opportunities**

RECOMMENDATION

This is an informational report to facilitate UAC discussion on recycled water expansion and other water reuse opportunities. There is no staff recommendation at this time because the Northwest County Recycled Water Strategic Plan (Strategic Plan) is not complete.

EXECUTIVE SUMMARY

The Regional Water Quality Control Plant (RWQCP) is a local source of drought-proof, sustainable water, of which only a small fraction is currently in use. Investments in pipeline expansions and/or additional treatment facilities would increase the RWQCP's ability to be a local water source to meet future non-potable and potable demands and decrease the City's dependence on imported Tuolumne River water. To the extent wastewater is recycled rather than being discharged to the Bay, it insures the RWQCP against potential additional treatment costs associated with stricter discharge regulations staff expects to be adopted in the future, costs that would be passed on to Palo Alto sewer customers. At its August 2018 meeting the UAC discussed a business plan for non-potable reuse for irrigation in Palo Alto, and now staff seeks to continue the discussion of water reuse opportunities by providing an overview of other alternatives as well as a briefing on preliminary results from the Strategic Plan. Because the Strategic Plan is not complete, there is no staff recommendation at this time. Staff's intention at the end of the Strategic Plan is to recommend a number of near-term actions and describe potential future alternative uses and the appropriate time when decisions should be made about which alternative(s) to pursue.

BACKGROUND

Council Policy

In November 2016 Council adopted the Sustainability and Climate Action Plan (S/CAP) Framework (Staff Report #7304) including four water-specific goals, all of which have implications for water reuse:

1. Utilize the right water supply for the right use;
2. Ensure sufficient water quantity and quality;
3. Protect the Bay, other surface waters, and groundwater; and
4. Lead in sustainable water management.

Two relevant strategies identified in the S/CAP are:

1. Verify ability to meet City's long term water needs; and
2. Investigate all potential uses of recycled water.

Palo Alto receives 100% of its potable water (about 11,000 acre-feet (AF)[1] per year) from the City and County of San Francisco's Regional Water System (RWS), operated by the San Francisco Public Utilities Commission (SFPUC). This supply is predominantly from the Sierra Nevada, delivered through the Hetch Hetchy aqueducts. About 85% of the supply on the RWS is from the Tuolumne River. On August 20, 2018, Council voted unanimously that the City of Palo Alto "express its support for the State Water Resources Control Board's (SWRCB) Bay Delta Plan to have 30-50% of unimpaired flow in the San Joaquin Valley enter the Delta from February to June and associated Southern Delta salinity objectives." Adoption of the Bay Delta Plan would reduce the amount of Tuolumne River water available to RWS customers, including Palo Alto, during dry years. The decision to support the Bay Delta Plan reaffirmed Council's commitment to reduce the City's dependence on imported water. Water reuse is one of a limited number of water supply alternatives to imported water.

Description of the RWQCP Water Resource

The RWQCP treats and discharges wastewater collected from the communities of Palo Alto, Mountain View, Stanford University, Los Altos, Los Altos Hills, and the East Palo Alto Sanitary District. In 2017, the RWQCP treated 23,056 AF, or 7,513 million gallons (MG) of wastewater, of which 97% was discharged to the Lower South San Francisco Bay and 3% was treated further to produce high-quality recycled water for non-potable reuse (NPR) in the City and Mountain View. The RWQCP currently has the treatment capacity to produce 5,040 acre-feet per year (AFY), or 4.5 million gallons per day (MGD) of NPR water, or 22% of the total wastewater treated in 2017. As a regional plant, only a portion of the total wastewater treated is owned and available for reuse by the City; this amount is equal to how much wastewater the City sent to the RWQCP for treatment. In 2017, this was 8,565 AF (2,791 MG) or 37% of the total flow. More of this wastewater could be used as a local source of sustainable water for the City.

Water Reuse Planning

In December 2016, Council approved a contract with RMC Water and Environment (now Woodard and Curran) for the development of the Strategic Plan in collaboration with the Santa Clara Valley Water District (SCVWD) (Staff Report #7024). City staff from the Public Works and Utilities Departments have worked closely with the consulting team and the SCVWD to evaluate the most effective uses of recycled water inside Palo Alto as well as within the Regional Water Quality Control Plant (RWQCP) service area. All of the work under the Strategic Plan evaluates how best to implement the water-related sustainability goals adopted by the City in the December 2017 Sustainability Implementation Plan (Staff Report #8487).

[1] Large volumes of water are often measured in acre-feet (one acre of water one foot deep). One acre-foot is equal to 435.6 hundred cubic feet (CCF) of water or 325,828 gallons.

In parallel, the SCVWD has been developing a Countywide Water Reuse Master Plan. One alternative under consideration is a water transfer from the RWQCP to the SCVWD for use in other parts of the county. City staff and the SCVWD are collaborating on potential contract structures for such a transfer recognizing that no decision has been made regarding the use of that water within Palo Alto or by the other RWCQP partners.

Treatment Options

Investments in pipeline expansions and/or additional treatment facilities would increase demand and types of approved uses of the RWQCP recycled water, increasing the RWQCP's ability to be a local source to meet future non-potable and potable water demands. Since the construction of the current RWQCP recycled water treatment and transmission system, severe droughts and advances in treatment technology have driven regulatory support and municipal demand for the use of recycled water for potable reuse.[2] As expected, the treatment requirements for potable reuse are higher than that for non-potable reuse (Figure 1). Similarly, the regulatory framework for indirect potable reuse is further along than that for direct potable reuse.

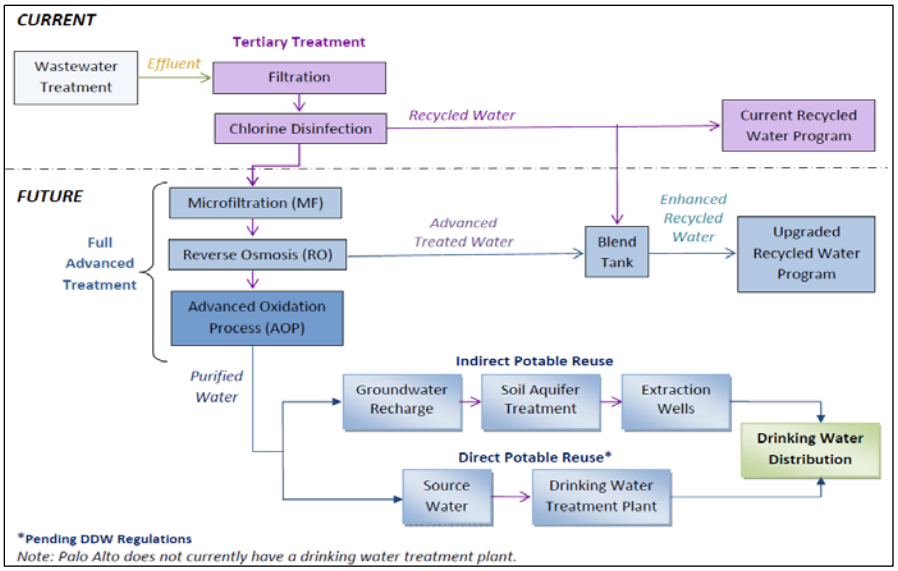

Figure 1: Treatment Requirements for Production of Different Types of Water Reuse

Recycled Water Distribution System Expansion and the Strategic Plan

In August 2018, the UAC was briefed on the Recycled Water Phase 3 Expansion Business Plan, as a possible expansion opportunity for non-potable reuse being evaluated under the Strategic Plan. Phase 3 is a non-potable water pipeline extending the current recycled water distribution system to the Stanford Research Park. No recommendation regarding Phase 3 was made because the project is only one of many water reuse alternatives being evaluated in the Strategic Plan.

[2] Recycled water can be treated to a level suitable for non-potable uses like irrigation or toilet flushing, which requires a separate distribution system (purple pipe). This is the most common use. Less commonly, it can be treated by reverse osmosis followed by ultraviolet disinfection and advanced oxidation to a level suitable for potable use. Best practices and regulations are less developed for potable reuse.

DISCUSSION

Key questions for the UAC to consider and discuss:

1. Will the Palo Alto community accept groundwater as a future potable supply if it would enable indirect potable reuse?
2. Is the Palo Alto community likely to accept purified water in a direct potable reuse project at some point in the future? If so, under what circumstances?
3. How much, if any, RWQCP treated wastewater should be preserved for Palo Alto use in the next 60 years?
4. Is Palo Alto open to a 60 year RWCQP treated wastewater transfer to other parts of the county?
5. Should Palo Alto pursue further non-potable project alternatives in the short-term with the knowledge that potable alternatives may be additionally implemented in the future, or should Palo Alto forego further non-potable projects now and wait for potable alternatives to become more feasible and more necessary to meet demands?
6. Should cost (as opposed to the non-cost criteria described) be the primary water reuse project evaluation criterion?

Preliminary evaluations under the Northwest County Recycled Water Strategic Plan as well as parallel work for the SCVWD Countywide Water Reuse Master Plan indicate that multiple water reuse opportunities are feasible for the City to meet both near and long term water demands (Table 1 and Figure 2). Near term projects that can be implemented within 5 years include a regional transfer and expanding the existing non-potable reuse program.

The City has been discussing a long term agreement with the SCVWD to transfer a portion of its recycled water allocation for eventual use in south Santa Clara County. A regional transfer would require, at a minimum, pipeline infrastructure to transfer the treated wastewater from the RWQCP to somewhere outside of the City. It may also include building a purification facility at the RWQCP that would further treat the recycled water prior to the transfer pipeline. However, a regional transfer would exclude City use of recycled water beyond non-potable reuse for the term of the agreement. Non-potable reuse program expansion would require additional pipeline infrastructure within the City as well as additional oversight of customer connections.

Long term opportunities that could be implemented within 10 – 40 years, include indirect and direct potable reuse. Preliminary results indicate that indirect potable reuse is feasible within the City, but requires a purification facility at the RWQCP, injection wells, and the routine use of groundwater. Similarly, preliminary results also indicate that direct potable reuse is feasible within the City, but requires a purification facility at the RWQCP. Preliminary results indicate that the City could reduce future reliance on water supplied by the RWS by more than 50% by investing in potable reuse. However, potable reuse (both indirect and direct) when compared to non-potable reuse requires large investments into additional treatment and distribution facilities and presents some public acceptance challenges.

As previously mentioned, one of the City's water-specific goals as outlined under the S/CAP is to utilize the right water supply for the right use. For recycled water, this would be applied by using the right quality of recycled water for the right purpose. Recycled water can be used for various demands based on its level of treatment. Non-potable reuse requires more treatment than typical wastewater that is discharged to the Bay; similarly, potable reuse requires significantly more treatment than non-potable reuse to ensure public safety when ingesting the water. Additional recycled water treatment is expensive and it would not be recommended to add these treatment processes if the water was to be used to meet irrigation, toilet flushing, and/or industrial process demands alone.

It should be noted that the near and long term solutions are not all explicitly distinct from each other; it may be possible to pursue a combination of near and long term solutions as shown in Figure 2. Both indirect and direct potable reuse opportunities within the City would require the full Palo Alto wastewater allocation and restrict a regional transfer of water.

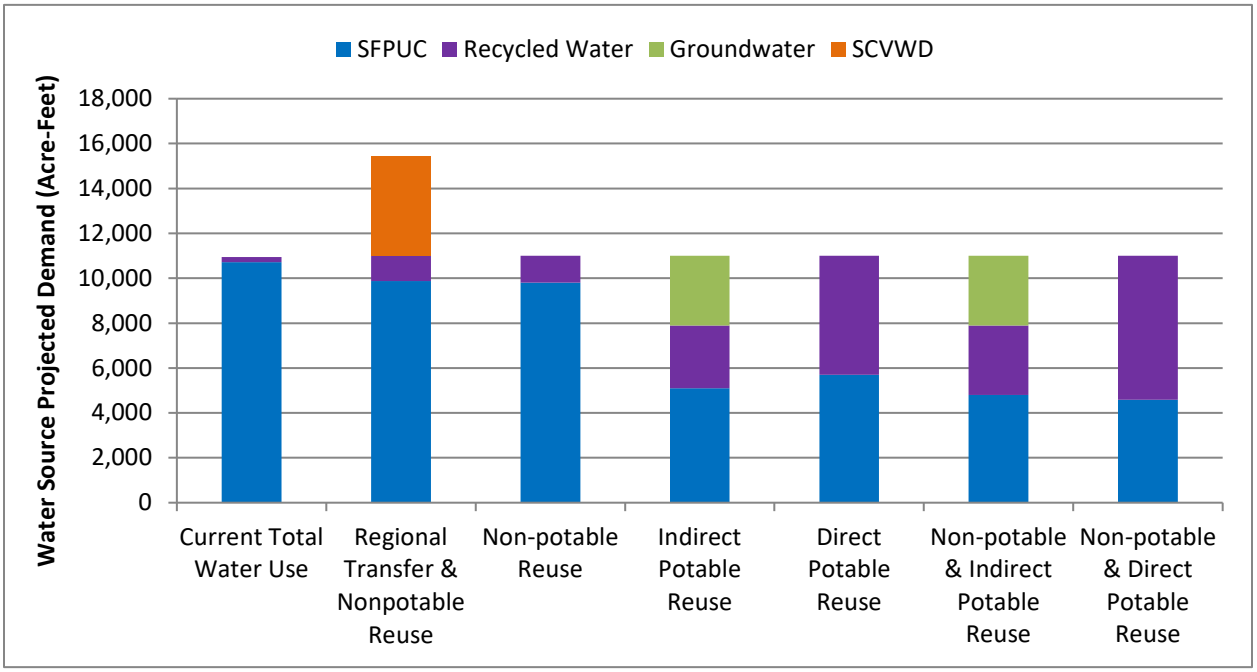

Figure 2: Palo Alto Water Source Changes Under Different Water Reuse Opportunities Being Evaluated Under the Northwest County Recycled Water Strategic Plan (*sources: Palo Alto 2015 Urban Water Management Plan & preliminary results from Northwest County Recycled Water Strategic Plan*).

Table 1: Summary of Palo Alto Water Reuse Opportunities for Further Discussion

TYPE OF WATER REUSE	REGIONAL TRANSFER	NON-POTABLE REUSE	INDIRECT POTABLE REUSE	DIRECT POTABLE REUSE
BRIEF DESCRIPTION	Transfer of RWQCP effluent or recycled water to the Santa Clara Valley Water District (SCVWD)	Enhanced recycled water used for irrigation and commercial uses.	Purified recycled water introduced into an environmental buffer, such as a groundwater basin, before being sent to the drinking water distribution system.	Purified recycled water introduced directly into the drinking water distribution system.
OPPORTUNITIES	• Near term implementation • Increases use of RWQCP recycled water regionally without City-funded infrastructure • No additional enforcement & administrative oversight of Palo Alto users • Reduced county-wide reliance on imported water, surface water, and/or groundwater	• Near term implementation • Clear regulatory obligations • Slightly reduce City reliance on RWS & Tuolumne River water	• Unlimited uses • Utilizes the RWQCP as a larger source of water • Clear regulatory obligations • No additional enforcement & administrative oversight of users • More potential to reduce City reliance on RWS & Tuolumne River water	• Unlimited uses • Utilizes the RWQCP as a larger source of water independent of groundwater use • No additional enforcement & administrative oversight of users • Significantly reduce City reliance on RWS & Tuolumne River water
OBSTACLES	• Significant amount of water would no longer be available for City use for contract term (20-30 years minimum)	• Limited uses per regulations • Requires significant pipeline infrastructure • Requires significant enforcement & administrative oversight of users	• Long term implementation • Requires significant additional RWQCP treatment processes • Requires the use of groundwater with different aesthetic properties than current sources	• Long term implementation • Requires significant additional RWQCP treatment processes • Requires significant engineered storage • Regulations not yet developed • Public acceptance

Evaluation Criteria

In addition to cost, a number of non-cost criteria are being considered when evaluating the water reuse alternatives in the Strategic Plan. Non-cost criteria include:

1. Amount of water supplied – total recycled water demand;
2. Surety of demand – likelihood of potential customers accepting and continuing to use the water source;
3. Adaptability – ability to repurpose facilities;
4. Level of agency coordination – effort required by the lead agency;
5. Level of customer retrofits and/or coordination – customer improvement or retrofits required;
6. Regulatory complexity – permitting requirements;
7. Institutional complexity – number of local agencies involved in implementation and operation;
8. Regional perspective – number of agencies benefiting from project;
9. Social and economic benefit – positive community impacts; and
10. Environmental benefit – positive impact on local streams, Bay habitat, or other.

City and SCVWD staff developed the relative weight of the non-cost criteria shown in the table below. How to consider the non-cost criteria relative to cost is still under discussion.

No.	Criteria	Weight
1	Amount of water supplied	17%
2	Surety of demand	16%
3	Adaptability	10%
4	Level of agency coordination	8%
5	Level of customer retrofits/coordination	6%
6	Regulatory complexity	9%
7	Institutional complexity	8%
8	Regional perspective	7%
9	Social and economic benefit	10%
10	Environmental benefit	9%
		100%

NEXT STEPS

Staff will take results from this UAC discussion to a Council Study Session in the near future. Feedback received from UAC and Council will be incorporated into the Northwest County Recycled Water Strategic Plan. Staff will return to the UAC and Council with a recommendation regarding water reuse alternatives identified in the Strategic Plan including a recommendation regarding the Phase 3 Recycled Water Expansion Project. Staff will also make a recommendation regarding a RWCQP water supply transfer agreement with the SCVWD. The two recommendations are expected to be considered in tandem and will be made in 2019.

POLICY IMPLICATIONS

While there is no recommendation at this time, expanding the use of recycled water would be consistent with the Sustainability Climate Action Plan Framework (Staff Report #7304), the Sustainability Implementation Plan (Staff Report #8487), and the Council's decision to support the Bay Delta Plan.

ENVIRONMENTAL REVIEW

The UAC's review of the concepts in the forthcoming Northwest County Recycled Water Strategic Plan does not require California Environmental Quality Act review, because the review does not meet the definition of a project under Public Resources Code 21065.

ATTACHMENT

A. Recycled Water Reference Sheet

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RECYCLED WATER REFERENCE SHEET

(last updated 9/7/2016)

ATTACHMENT A

REGIONAL WATER QUALITY CONTROL PLANT

GLOSSARY

WATER TYPES AND QUALITY

EFFLUENT is the treated water leaving the wastewater treatment plant to be discharged to the San Francisco Bay. At the RWQCP, only some of the effluent is treated further to produce recycled water.

RECYCLED or RECLAIMED WATER is wastewater that has undergone secondary or tertiary treatment to allow for beneficial reuse. Recycled water produced at the RWQCP is treated to tertiary standards including disinfection.

SECONDARY TREATMENT is a process where dissolved and suspended biological matter (including suspended solids) is removed so that the water may be disinfected and discharged into a stream or river, or used for irrigation at controlled locations.

TERTIARY TREATMENT is an additional treatment process beyond secondary treatment, where water is further filtered and disinfected. It can also include treatment processes to remove nitrogen and phosphorus in order to allow discharge into a sensitive ecosystem.

ENHANCED RECYCLED WATER is recycled water blended with advanced treated water to support additional uses and reduce total dissolved solids (TDS).

ADVANCED TREATED WATER is water that has undergone additional treatment beyond tertiary treatment to reduce salts, nutrients, trace organics and constituents of emerging concern (CECs). Common treatments include microfiltration, reverse osmosis, and advanced oxidation.

PURIFIED WATER is recycled water that has been further treatment processes and has been verified through monitoring to be safe for augmenting drinking water supplies. Some of these processes include microfiltration, reverse osmosis, and if needed advanced oxidation.

SURFACE WATER is water stored in a reservoir typically conveyed from another surface water source via pipelines or aqueducts.

RAW WATER is surface or groundwater that has not gone through an approved water treatment process.

GRAYWATER is water segregated from a domestic wastewater collection system and reused on site for nonpotable uses, it can come from showers, bathtubs, washing machines, and bathroom sinks, but not toilets or kitchen sinks.

BLACKWATER is untreated wastewater from kitchen sinks, toilets, and other polluting activities.

WATER REUSE OPTIONS

NONPOTABLE REUSE is the beneficial reuse of recycled water for irrigation, industrial uses, or other non-drinking water purposes.

POTABLE REUSE is the use of recycled water for potable uses, such as drinking. This recycled water is purified to meet or exceed federal and state drinking water standards.

INDIRECT POTABLE REUSE (IPR) refers to the use of recycled water that has been further treated and introduced into an environmental buffer such as a surface water reservoir (through augmentation), or groundwater basin (through recharge), before being used for potable purposes. IPR regulations are specified in Title 22, Chapter 3, Division 4 of the California Code of Regulations (CCR).

DIRECT POTABLE REUSE (DPR) refers to the use of purified recycled water distributed directly into the raw water supply upstream of a drinking water treatment plant. In California, DPR regulations have not been adopted or specified in the CCR.

TREATMENT TECHNOLOGY

DUAL MEDIA FILTRATION (DMF) refers to the removal of particles in the water using two different types of filter media, usually sand and finely granulated anthracite (a type of coal). DMF can remove turbidity and suspended solids as small as 10-20 microns under high filtration rate conditions.

GRANULAR ACTIVATED CARBON (GAC) is a form of carbon that is processed to be porous, with large surface area for adsorption and used to remove dissolved contaminants. GAC can remove halogenated compounds containing chlorine and fluorine, organic contaminants, odor, and taste.

MICROFILTRATION (MF) is an advanced treatment process that removes contaminants from water using semi-permeable membranes. MF membranes can remove contaminants as small as 0.08 microns such as bacteria. Ultrafiltration (UF) membranes have smaller pore sizes and can remove contaminants as small as 0.005 microns such as viruses and proteins.

REVERSE OSMOSIS (RO) is an advanced treatment process that removes dissolved salts and trace contaminants from water. High pressure forces the water through a semi-permeable membrane, while filtering most contaminants. RO membranes have much smaller pore sizes than microfiltration and ultrafiltration membranes and can remove contaminants as small as 0.0001 microns.

- **RO PERMEATE** is the treated water that passes through the RO membrane.
- **RO CONCENTRATE** is the by-product from the RO process. It contains a high concentration of salts and other contaminants from the source water.

ADVANCED OXIDATION PROCESS (AOP) is a chemically reactive process that breaks down trace organic contaminants as well as pathogens in the water by oxidation. AOPs typically use hydrogen peroxide (H_2O_2) and ultraviolet (UV) light.

SOIL AQUIFER TREATMENT (SAT) is the natural process that occurs when water travels through the ground and is purified by the physical and biological processes that naturally occur in the soil.

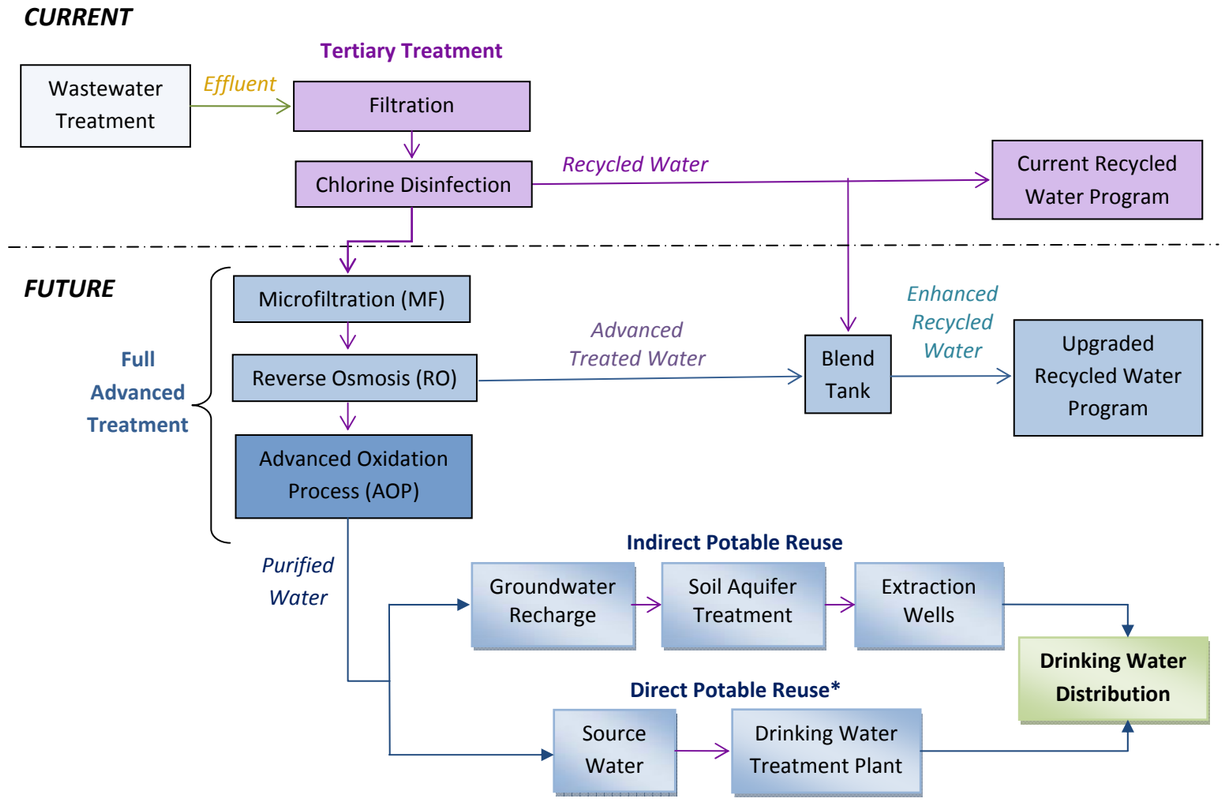
STATE REGULATIONS

TITLE 22 STANDARDS are requirements established by the State Water Resources Control Board Division of Drinking Water for the production, distribution, and use of drinking water and recycled water. Recycled water standards are covered under Chapter 3, Division 4 of the California Code of Regulations, which outlines the different levels of treatment required for allowable uses of recycled water.

SALINITY

TOTAL DISSOLVED SOLIDS (TDS) is a measurement of salinity: the amount of salts, ions, and dissolved minerals per volume of water. The RWQCP aims to produce recycled water with a TDS of 600 mg/L and is moving towards developing advanced treatment in collaboration with the Santa Clara Valley Water District and the City of Mountain View to produce enhanced water with a TDS of approximately 450 mg/L for use on salt-sensitive species.

GENERAL TREATMENT PROCESSES



***Pending DDW Regulations**

Note: Palo Alto does not currently have a drinking water treatment plant.

ALLOWABLE USES

Recycled Water

- Irrigation of:
  - Parks, playgrounds, schools
  - Residential & commercial landscapes
  - Cemeteries
  - Golf courses
  - Food crops, orchard, vineyard, pastures
  - Ornamental nursery & sod farm
- Impoundments & fish hatcheries
- Flushing toilets & urinals
- Decorative fountains
- Commercial laundries
- Street cleaning, dust control, soil compaction
- Boiler feed and cooling towers
- Flushing sanitary sewers
- Other uses approved under Title 22 Standards

Enhanced Recycled Water

- All uses listed under Recycled Water
- Irrigation of salt-sensitive species (e.g. Redwoods Trees)
- Sensitive industrial uses

Purified Water

- All uses listed under Enhanced Water
- Indirect potable reuse
- Direct potable Reuse

STANDARD UNITS

MGD – Million Gallons per Day
PPM – Parts Per Million
mg/L – Milligrams per Liter

Palo Alto Recycled Water Delivery and Expansion