
Increasing Water Recycling: A Win-Win for Orange County



GRAND JURY 2014-2015

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EXECUTIVE SUMMARY

Given the series of droughts in California affecting both the Sierra Nevada water supply and Orange County's ground water supply, the 2014-2015 Grand Jury inventoried the volume of treated wastewater currently discharged into the ocean that could be recycled for beneficial use. Orange County has a long history of working to recycle treated wastewater; however, the County still discharges 147 million gallons per day of wastewater into the ocean (Table 1). This precious water has the potential to be reused or recycled (replacing imported water) for irrigation and in some cases for drinking water. The majority of the treated water costs less to produce than the cost of imported water by 43.5% (Table 2).

The Santa Ana River Basin water is a blend of "free" water (treated wastewater from Riverside and San Bernardino counties, rainfall water, and water runoff) with non-"free" water (recycled Orange County wastewater and imported water). The Grand Jury found that the blending of "free" water with expensive imported water and recycled water resulted in groundwater costing 58% less than imported water (Table 2). The County has wastewater available to recycle that would be cheaper than buying imported water during these years of continuing drought conditions.

BACKGROUND

Southern California is a semi-desert region, where the historical average rainfall is 12.8 inches a year (*State of Water*, 2013). In 2013, there were 3.6 inches of rainfall in Southern California. Rainfall in 2014 was only 4.7 inches (*State of Water*, 2013). If 2015 continues to have a shortage of rainfall, the amount of water retrieved from certain sources may need to be reduced or alternatives created. Water availability in Orange County (OC) depends on a diversified water supply portfolio. OC water supply comes from local and imported sources. Local water sources in OC include a mix of groundwater and recycled wastewater. The Metropolitan Water District of Orange County indicates that 45% of OC's water is imported (*State of Water*, 2013). The Metropolitan Water District of Southern California (MET) supplies imported water from the Colorado River and from the northern Sierra Nevada Mountains (*State of Water*, 2013). Many water distribution and wastewater recycling terms used in this report can be found in the Appendix.

As a result of the recent and drastic decreases in rainfall, water levels and availability of these local sources are quickly falling. When rainfall is below average, local water sources experience different impacts.

Groundwater comes from the local Santa Ana River groundwater basin (the Basin). This local source is always available, but the amount that can be extracted without adverse consequences is largely dependent on the annual rainfall received. The less rainfall, the less groundwater is available for extraction.

Recycled water is a relatively stable source because the amount of available recycled water remains fairly constant. When there is less rainfall, there is less groundwater, which causes more of a demand for putting water back into the Basin to resupply the ground water source. Groundwater recovery is the means by which

groundwater is kept at an acceptable level. The water storage is adversely affected because less rainfall results in less water to store. OC water is typically stored underground in the Santa Ana River Basin or in above ground catch basins, lakes, or ponds. Water storage is more limited in the southern portions of OC than in the northern and central regions. The storage is drawn down to critical levels when the rainfall is too low to replenish it.

Annual snowfall and rainfall also affect the two imported water sources. The northern Sierra Nevada Mountains provide water to OC from the snow accumulated during the winter months. The Colorado River Aqueduct System is one of the most dependable sources but it also has limitations. The Colorado River upstream water sources are also adversely affected by below- average rainfall. Even though it is less affected, the reliability of this source could also be reduced if the drought continues for years to come. Some areas in the southern part of the county depend as much as 95% on imported water for their potable water needs (*State of Water*, 2013).

OC is extremely fortunate to have the Basin and the Groundwater Replenishment System (GRS). The Basin and the GRS make OC less vulnerable to drought compared to other California communities. The Basin is the most cost effective source of water because most of the storage, some of the purification, and most of the replenishment are done by nature with very little human intervention. Again, rainfall does affect how much water can be pumped out of the Basin without replenishment. The GRS recycles wastewater and injects it into the Basin using various methods.

Since recycled water is a local source of water, it is the one part of the system that can be improved and provide economic savings. Recycled water is wastewater that has been treated to remove solids and impurities. The resulting water can be further processed and used to create potable water or used for sustainable landscape irrigation. This irrigation water is called “purple pipe” water.

REASON FOR THE STUDY

Given the fact that California is facing a serious, extended drought, the guaranteed supply of imported water and local groundwater is very vulnerable. The primary purpose of this study was to compare the cost of recycling more water with the cost of buying imported water. The Grand Jury needed to research each wastewater processor to determine the volume of wastewater that might be available for recycling. Based on the possible availability of more wastewater to recycle, what plans does Orange County have to do more recycling of this precious resource rather than discharging it into the ocean?

METHODOLOGY

The Grand Jury gathered information for this report from interviews, site visits, district production reports, and research. On-site interviews were conducted at the Orange County Sanitation District (OCSD), the Orange County Water District (OCWD), the Irvine Ranch Water District, and the South OC Wastewater Authority. The Grand Jury conducted telephone interviews with the remaining water districts. Each interview was with the most senior executive, often followed up with an interview with the person

in charge of production. Production data and information were submitted to the Grand Jury by fax or email. Imported water rates came from the Municipal Water District of Orange County (Municipal, 2014).

INVESTIGATION AND ANALYSIS

OC water supply comes from local water sources and imported water sources. Local water sources in OC include a mix of groundwater and recycled wastewater. These local sources provide about one-half of OC’s water. The other half is imported and supplied to OC by the Metropolitan Water District of Southern California from the Colorado River and from the northern Sierra Nevada Mountains. Assuming the drought continues, OC will have to recycle more wastewater or buy more imported water, which may be much more expensive if all sources are adversely affected by the drought. An analysis of all the data shows that recycling more wastewater is less expensive and more dependable.

The Grand Jury obtained all of the production data from the agencies and analyzed and determined the amount of wastewater volumes and costs. A summary of results are provided in the tables below, with details presented in the following paragraphs.

Table 1: Wastewater Volume

| District/Authority | WW Volume In | | WW Volume Out | | |
|--|--------------------|-------------|-----------------|-----------------------|-------------------|
| | Total In (mgpd) | (%) | Ocean (mgpd) | Purple Pipe (mgpd) | Potable (mgpd) |
| El Toro Water District (ETWD) | 3.7 | 1.4% | 3.3 | 0.4 | |
| Irvine Ranch Water District (IRWD) | 21.9 | 8.4% | 1.7 | 20.2 | |
| Metropolitan Water District of SoCal (MET) | 0 | 0.0% | | | |
| Orange County Sanitation District (OCSD) *, ** | 198.0 | 75.6% | 121.0 | | |
| Orange County Water District (OCWD) *** | | | | 7 | 70 |
| City of San Clemente (SC) | 4.0 | 1.5% | 3.0 | 1.0 | |
| Santa Margarita Water District (SMWD) | 11.0 | 4.2% | 3.2 | 7.8 | |
| South OC Wastewater Authority (SOCWA) | 22.7 | 8.7% | 14.7 | 8 | |
| Trabuco Canyon Water District (TCWD) | 0.6 | 0.2% | | 0.6 | |
| TOTAL | 261.9 | 100% | 146.9 | 45.0 | 70 |

Notes:

mgpd = millions of gallons per day

* OCSD's Total In (198mgpd) = OCSD Plant 1 (96mgpd) + OCSD Plant 2 (102mgpd)

** OCSD's Total In (198mgpd) = OCSD ocean discharge (121mgpd) + OCWD purple pipe (7mgpd) + OCWD potable (70mgpd)

*** OCWD has 92mgpd (15mgpd + 7mgpd + 70mgpd) that is already accounted for in OCSD's throughput, including 15mgpd returned to OCSD for Ocean discharge

Table 2: Water Costs (\$/mg)

| | | |
|-----------------------|---------|--|
| IRWD Purple Pipe | \$1,653 | Cost to treat to purple pipe standards |
| OCSD Ocean Discharge | \$1,926 | Cost to treat for ocean discharge |
| OCWD Groundwater | \$1,083 | Cost of Santa Ana River Basin water |
| OCWD Purple Pipe | \$1,503 | Cost to treat to purple pipe standards |
| OCWD Potable | \$1,468 | Cost to treat to potable standards |
| SMWD Ocean Discharge | \$1,103 | Cost to treat for ocean discharge |
| SMWD Purple Pipe | \$1,488 | Cost to treat to purple pipe standards |
| SOCWA Ocean Discharge | \$2,655 | Cost to treat for ocean discharge |
| SOCWA Purple Pipe | \$3,326 | Cost to treat to purple pipe standards |
| MET Wholesale | \$2,601 | Cost of imported water |

North & Central Orange County Wastewater Processing

OC Sanitation District

OC Sanitation District (OCSD) receives and processes the wastewater for all of the cities and unincorporated land in north and central OC, which represents 75.6% of all of OC’s wastewater. Last year it processed an average of 198 million gallons per day (mgpd) of wastewater. The OCSD’s treatment of wastewater results in a water product that meets federal water safety and state water quality standards for ocean discharge. OCSD also sends treated wastewater to the OC Water District (OCWD).

OC Water District

OCWD manages the Santa Ana River Basin Aquifer, which supplies groundwater for most of the cities and unincorporated areas in north and central OC. The Aquifer water comes from (1) rainfall captured in catch basins along the Santa Ana River, (2) river water flowing from San Bernardino and Riverside, (3) treated wastewater from outside of OC, (4) imported water, (5) recycled wastewater, and (6) a small amount of incidental runoff. OCWD receives 92 mgpd of recycled wastewater from OCSD and then further treats it for two valuable uses: irrigation (purple pipe water), or potable water (drinking water). The amount recovered from this processing or recycling is 7 mgpd of purple pipe water, 70 mgpd of potable water for replenishing the basin aquifer, and 15 mgpd as a byproduct of the treatment process. The majority of this byproduct is returned to OCSD for ocean discharge. OCWD is currently in the process of increasing their recycled potable water capacity from 70 mgpd to 100 mgpd. The capital cost of the project is \$142 million. The Grand Jury computed the amount of additional potable water this project could produce over 30 years and amortized the capital costs over the same period to find that recycled water would still cost far less than imported water.

South OC Wastewater Processing

South OC wastewater is processed by the El Toro Water District, the City of San Clemente, the Santa Margarita Water District, the South OC Wastewater Authority, and the Trabuco Water District. These entities processed an average of 42 mgpd last year, or 16% of OC's daily wastewater volume. From those 42 mgpd, they produced 17.2 mgpd of purple pipe water and discharged the remainder into the ocean.

Irvine Ranch Water District

The Irvine Ranch Water District (IRWD) processes 21.9 mgpd of wastewater. From those 21.9 mgpd, it produced 20.2 mgpd of purple pipe water and 1.7 mgpd of byproduct. IRWD is unique because in addition to using purple pipe water for landscape irrigation, it also uses it for industrial processes and toilet flushing via dual plumbing systems.

Costs and Measurements

The Grand Jury reviewed the various costs of imported water, recycled water, and groundwater. Since all wastewater must be treated before it can be discharged into the ocean, that cost is considered fixed and, while it is noted in Table 2, it is not used in this study. Water agencies and wastewater processors sometimes use different measuring nomenclature. This study uses one common measurement of million gallons (mg). Some production reports used Acre-Feet (AF). One AF equals 325,851 gallons.

FINDINGS

In accordance with California Penal Code sections 933 and 933.05, the 2014-2015 Grand Jury requires (or, as noted, requests) responses from each agency affected by the findings presented in this section. The responses are submitted to the Presiding Judge of the Superior Court.

Based on its investigation of Wastewater Processing in Orange County, the 2014-2015 Orange County Grand Jury has arrived at eight principal findings, as follows:

- F.1.** The Orange County Sanitation District processes an average of 198 million gallons per day of wastewater and sends 121 million gallons per day of secondary treated wastewater to the ocean.
- F.2.** The Orange County Water District receives an average of 92 million gallons per day of treated wastewater from Orange County Sanitation District and recycles 70 million gallons per day of water treated to potable water standards that is then returned to the groundwater basin aquifers.
- F.3.** From the 92 million gallons per day from Orange County Sanitation District the Orange County Water District recycles 7 million gallons per day of water treated to plant irrigation standards.
- F.4.** The Irvine Ranch Water District processes 21.9 million gallons per day of wastewater and recycles 20.2 million gallons per day for purple pipe use.

- F.5.** The South OC Wastewater Authority (SOCWA) processes 22.7 million gallons per day of wastewater, treats 8 million gallons per day to purple pipe standards, and sends 14.7 million gallons per day to the ocean.
- F.6.** The El Toro Water District, the City of San Clemente, the Santa Margarita Water District and the Trabuco Canyon Water District process a combined average total of 19.3 million gallons per day and send to the ocean 9.5 million gallons per day. The remaining 9.8 million gallons per day are used for landscape irrigation.
- F.7.** In north and central Orange County, the cost to create potable recycled water is \$1,468 per million gallons or \$1,133 less than the current cost per million gallons of imported water.
- F.8.** The South OC Wastewater Authority (SOCWA) cost to recycle wastewater currently exceeds the cost of imported water, however the Grand Jury believes that the cost of imported water will increase.

RECOMMENDATIONS

In accordance with California Penal Code sections 933 and 933.05, the 2014-2015 Grand Jury requires (or, as noted, requests) responses from each agency affected by the recommendations presented in this section. The responses are submitted to the Presiding Judge of the Superior Court.

Based on its investigation of Wastewater Processing in Orange County, the 2014-2015 Orange County Grand Jury makes the following four recommendations:

- R.1.** Orange County Sanitation District should conduct a study of possible methods of increasing the amount of processed wastewater sent to Orange County Water District, including timelines and noting any barriers that may prevent increasing flow, and implement the most cost effective method to reduce the amount of imported water to Orange County. (F.1.) (F.2.) (F.7.)
- R.2.** Orange County Water District should conduct a study of possible methods of increasing the amount of processed wastewater and implement the most cost effective method to reduce the amount of imported water to Orange County. (F.2.) (F.3.) (F.7.)
- R.3.** South Orange County Wastewater Authority should conduct a study of possible methods of increasing the amount of processed wastewater and implement the most cost effective method to reduce the amount of imported water to Orange County. (F. 5.) (F. 8.)
- R.4.** The El Toro Water District, the City of San Clemente, the Santa Margarita Water District, and the Trabuco Canyon Water District should conduct a study of possible methods of increasing the amount of processed wastewater and implement the most cost effective method to reduce the amount of imported water to Orange County. (F.6.)

REQUIRED RESPONSES

The California Penal Code section 933 requires the governing body of any public agency which the Grand Jury has reviewed, and about which it has issued a final report, to comment to the Presiding Judge of the Superior Court on the findings and recommendations pertaining to matters under the control of the governing body. Such comment shall be made no later than 90 days after the Grand Jury publishes its report (filed with the Clerk of the Court). Additionally, in the case of a report containing findings and recommendations pertaining to a department or agency headed by an elected County official (e.g. District Attorney, Sheriff, etc.), such elected official shall comment on the findings and recommendations pertaining to the matters under that elected official's control within 60 days to the Presiding Judge with an information copy sent to the Board of Supervisors.

Furthermore, California Penal Code section 933.05 (a), (b), (c), details, as follows, the manner in which such comment(s) are to be made:

(a) As to each Grand Jury finding, the responding person or entity shall indicate one of the following:

(1) The respondent agrees with the finding

(2) The respondent disagrees wholly or partially with the finding, in which case the response shall specify the portion of the finding that is disputed and shall include an explanation of the reasons therefore.

(b) As to each Grand Jury recommendation, the responding person or entity shall report one of the following actions:

(1) The recommendation has been implemented, with a summary regarding the implemented action.

(2) The recommendation has not yet been implemented, but will be implemented in the future, with a time frame for implementation.

(3) The recommendation requires further analysis, with an explanation and the scope and parameters of an analysis or study, and a time frame for the matter to be prepared for discussion by the officer or head of the agency or department being investigated or reviewed, including the governing body of the public agency when applicable. This time frame shall not exceed six months from the date of publication of the Grand Jury report.

(4) The recommendation will not be implemented because it is not warranted or is not reasonable, with an explanation therefore.

(c) If a finding or recommendation of the Grand Jury addresses budgetary or personnel matters of a county agency or department headed by an elected officer, both the agency or department head and the Board of Supervisors shall respond if requested by the Grand Jury, but the response of the Board of Supervisors shall address only those budgetary /or personnel matters over which it has some decision making authority. The

response of the elected agency or department head shall address all aspects of the findings or recommendations affecting his or her agency or department.

Comments to the Presiding Judge of the Superior Court in compliance with Penal Code section 933.05 are required from:

Responses Required:

1. Responses to Findings F.1., F.2. and Recommendation R.1. are required from the Board of Directors of the Orange County Sanitation District.
2. Responses to Findings F.1., F.3., F.7., and Recommendation R.2. are required from the Board of Directors of the Orange County Water District.
3. Responses to Findings F.5., F.8., and Recommendation R.3. are required from the Board of Directors of the South Orange County Wastewater Authority.
4. Responses to Findings F.6., and Recommendation R.4. are required from the Board of Directors of the El Toro Water District.
5. Responses to Findings F.6., and Recommendation R.4. are required from the Mayor of the City of San Clemente.
6. Responses to Findings F.6., and Recommendation R.4. are required from the Board of Directors of the Santa Margarita Water District.
7. Responses to Findings F.6., and Recommendation R.4. are required from the Board of Directors of the Trabuco Canyon Water District.
8. Response to Finding F.4. is required from the Board of Directors of the Irvine Ranch Water District.

COMMENDATIONS

The 2014-2015 Grand Jury commends the OC Sanitation District and the OC Water District for the partnership they developed to recycle wastewater for the beneficial use of north and central OC residents. Last year's average of 77 mgpd of recycled water reduces dependence on more expensive imported water at a time when the amounts of external water supplies are stressed by the State's prolonged drought.

The 2014-2015 Grand Jury commends the Irvine Ranch Water District for the years of recycling water for landscape irrigation leadership. Last year they recycled over 92% of the wastewater they received.

REFERENCES

State of water, summer 2013: A call for investing in reliability.[Pamphlet]. (2013). Municipal Water District of Orange County.

Municipal Water District of Orange County (2014). *Water rates and charges*. Retrieved from http://www.mwdoc.com/pages.php?id_pge=166

APPENDIX: GLOSSARY

AF. Acre-Foot. The amount of water needed to cover an acre (approximately a football field) one foot deep, or 325,900 gallons. One acre-foot can support the annual indoor and outdoor needs of between one and two households per year, and, on average, three acre-feet are needed to irrigate one acre of farmland.

Aquifer. A geologic formation of sand, rock and gravel through which water can pass and which can store, transmit, and yield significant quantities of water to wells and springs.

Groundwater. Water that occurs beneath the land surface and fills partially or wholly pore spaces of the alluvium, soil, or rock formation in which it is situated. Does not include water which is being produced with oil in the production of oil and gas or in a bona fide mining operation.

Groundwater basin. A groundwater reservoir defined by all the overlying land surface and the underlying aquifers that contain water stored in the reservoir. Boundaries of successively deeper aquifers may differ and make it difficult to define the limits of the basin.

Groundwater Replenishment System (GRS). An OCWD/OCSD joint project being developed to provide up to 100,000 acre-feet of reclaimed water annually for groundwater replenishment. Treated wastewater will undergo further treatment at OCWD-using the same technology as bottled water companies-before it is piped northward along the Santa Ana River to replenish the groundwater basin in the inland part of the county. Visit the GWR System website (<http://www.gwrssystem.com>).

Imported water. Water that has originated from one hydrologic region and is transferred to another hydrologic region. Metropolitan Water District of Southern California(MET) imports water from the Colorado River and Northern California. MET's agency in OC is the Municipal Water District of OC (MWDOC).

Potable water. Suitable and safe for drinking.

Primary treated water. First major treatment in a wastewater treatment facility, usually sedimentation removal but not biological oxidation.

Recycling. A type of reuse, usually involving running a supply of water through a closed system again and again. Legislation in 1991 legally equates the term "recycled water" to reclaimed water.

Santa Ana River Basin Aquifer. That portion of the Santa Ana River that is located within OC.

Secondary Treatment. Generally, a level of treatment that produces 85 percent removal efficiencies of biological oxygen demand and suspended solids. Usually carried out through the use of trickling filters or by the activated sludge process.

Tertiary treatment. The treatment of wastewater beyond the secondary or biological stage. Normally implies the removal of nutrients, such as phosphorous and nitrogen, and a high percentage of suspended solids.

Wastewater. Water that has been previously used by municipality/residences, industry or agriculture and has suffered a loss of quality as a result of use.