

Desalination – a White Paper on the Garden Grove Perspective

OBJECTIVE

To provide the City Council with information and analysis regarding an ocean water desalination facility in Huntington Beach being proposed by the Poseidon Resources Corporation, a private company. The analysis will present costs and benefits as the project relates to the City of Garden Grove (City).

BACKGROUND

The Poseidon ocean water desalination project located at the AES power plant in Huntington Beach will deliver a maximum of 53,000 acre feet (AF) of water per year. Poseidon began soliciting interest from local water agencies for commitments to purchase desalinated water from the Huntington Beach Plant several years ago. In fact, the City entered into a non-disclosure agreement with Poseidon in 2010 to receive information on the project. Over the last few years, the City participated in a working group with other agencies interested in the Huntington Beach project. The group met on a regular basis at the Municipal Water District of Orange County (MWDOC) to review project study results and to discuss the proposed attributes and costs of the proposed project. Garden Grove participated in this process for a couple of years and announced its resignation in 2012 due to the high costs of the water from the project. The working group ended in 2013 with limited interest among agencies to participate in the project. Since then, the Orange County Water District (OCWD) has been exploring the project and is now in contract discussions.

Earlier this month the OCWD approved a non binding term sheet that establishes the framework of a contract that is due by December 31, 2016. The term sheet provides sufficient information to determine the financial impact to the City.

DISCUSSION

Desalination

The desalting or desalination process separates saline water into two streams: fresh water and water containing concentrated salts, or brine. Although there are many technologies that can be considered for desalination, the two most widely used desalting technologies are thermal (distillation) processes and membrane (filtration) processes, such as reverse osmosis (RO). Poseidon uses RO.

RO is a process where pressure is used to force water through a semi-permeable membrane that filters and removes up to 99% of the solids in the seawater, including the salts. Of all the available technologies, RO is considered the best available technology for desalination, due to high salt removal rate, lower waste stream volume, and lower energy consumption and capital costs. Following desalination treatment, the product water requires further post-treatment (pH

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stabilization and disinfection) to meet potable water standards and to be non-corrosive.

There are many applications of RO, including treatment of brackish and waste water and the costs for producing water from these sources is equal or below the cost for water from traditional sources. Advances in RO membrane and energy recovery system technologies have significantly reduced the capital and operating costs of seawater desalination projects over the past 30 years. However, the costs of desalting seawater remain significantly higher than more traditional water sources. Because of its high costs, large scale ocean desalination has only been used in areas where water supplies are extremely limited and expensive to procure. Continued dramatic cost reductions for RO treatment are not expected to continue because it appears that the most significant technological advances have already occurred in the membrane industry.

The following is a list of similar seawater reverse osmosis (SWRO) desalination projects that are currently in operation, under construction, or are being considered/proposed in the United States during the last decade:

- Marina Coast Water District, CA - 0.3 million gallons per day (MGD) in operation.
- Tampa Bay, FL - 25 MGD in operation.
- Cambria Community Services District, CA - 0.5 MGD in design, on hold
- Marin Municipal Water District, CA - considered 5 to 10 MGD, halted due to the voter approval requirement.
- Honolulu Board of Water Supply, HI - proposed 5 MGD, on hold due to conservation efforts.
- Long Beach, CA - proposed 9 MGD, determine not be cost effective.
- Carlsbad, CA – construction is nearing completion of 50 MGD. This is a Poseidon project.

City Water Program

The City is reliant on two primary sources of water, pumped and imported. On average, we are pumping 70% of our water from 13 City owned wells and we purchase import water for the remaining 30% from the Municipal Water District of Orange County (MWDOC). Our wells draw water from a basin that is under the management of the Orange County Water District (OCWD) and they are responsible for setting the pumping percentage, which is why we pump about 70%. The City wells are capable of delivering 100% of our water supply for limited periods of time, and we are one of two agencies that can pump all of our needs.

The City currently pays **\$294** per AF to OCWD for pumped water and we pay MWDOC **\$923** per AF for imported water. If the City were to pump over the set

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percentage we will have to pay **\$614** per AF from OCWD on the extra water making it equal to the cost of MWDOC imported water.

The Orange County Basin contains about 38 million AF of water. The OCWD has determined that the maximum dry storage (empty volume) of the basin should be limited to 500,000 AF. OCWD's goal is to operate the basin with 200,000 AF of dry storage which is within the safe operating range of 100,000 to 434,000 AF of available dry storage. Currently, the basin has 380,000 AF of dry storage available.

Last year the City used approximately **25,100** AF of water, which is down from a peak of **30,000** AF in 2005. The reason the City's usage has dropped lies in two recent pieces of legislation. Senate Bill x7-7 for water conservation, seeks to achieve a 20% statewide reduction in urban per capita water use by December 31, 2020, and an interim 10% goal by 2015. Additionally, Governor Brown has issued an emergency mandate for the City to reduce our water use by 28% of our 2013 water usage. Therefore, the City needs to reduce our usage by just over **7,000** AF by February of 2016. Consequently, the most pressing need for the City's water program at this time is the implementation of water conservation measures to achieve this goal and avoid any state fines for non-compliance.

Fiscal Analysis

The total fiscal impact to Garden Grove's rate payers is difficult to assess at this time because of the following unresolved issues:

- The cost to distribute water - injected into the basin or distributed in upsized pipes to retailers. This cost is borne by the OCWD in the term sheet.
- Final disposition of MWDOC Local Resources Program (LRP) - a subsidy that will be passed to Poseidon thus lowering the cost to OCWD, thus lowering the cost to OCWD for the early years of the 50 year commitment.
 - Three options are available for payment. Currently Poseidon is leaning towards the largest that covers the first fifteen year of the project operation.
 - MWDOC could require a reduction in demand which in effect would cause OCWD to exchange high cost Poseidon water with MWDOC import.
- Additional costs that may be required for environmental mitigation, such as a new underground intake system.
- Financing for the project is not in place.

These preceding issues are important and have the ability to significantly increase the proposed cost of water detailed on the Poseidon term sheet. OCWD's independent financial analysis of the Poseidon estimates that groundwater pumping costs will increase 32.7% to cover the cost of the project. Using our existing

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pumping amounts and the additional amount of desalinated water available to use, we can determine that Garden Grove can expect to add between just over \$1M to just under \$2M per year in water costs. This will increase the average residential rate payer bill by \$6 to \$12 or from 6% -12%.

Alternatives

There are a few alternatives being suggested at this time. The following are possible fiscal impacts of Poseidon and of the recharging option being proposed by the Irvine Ranch Water District (IRWD):

- Purchase MWDOC water during “good times” and recharge the basin with 280,000 acre feet of water (equals Poseidon output for about 5 years and 3 months). These “good times” in the past included all but two years during nearly the last thirty years. This IRWD option would have provided a full basin at the beginning of this year at a ten year cost of over \$500 Million less than the Poseidon project and is environmentally friendly.
- Expand OCWD’s Ground Water Replenishment System (GWRS) again or construct a new facility. The successful ground water recharge system using treated sewage is already expanding and will be online by the end of 2015. The \$142.7 million project will create an additional 30 million gallons per day of new water supplies as compared to the Poseidon project that may produce 50 million gallons per day at an estimated cost of \$1 billion.
- Conservation and the price and impact to the environment are negligible and this option is immediately available to us with state and regional funds available to implement. It should be noted that this option will also assist the City in meeting our mandatory reduction mandate from the State.
- Construct additional measures within and adjacent to the local storm channel that will infiltrate storm water into the basin.
- Expand the recycled water system. This is the “purple line” that uses partially treated sewage to provide non-potable water for uses like irrigation. This option will also help the City meet our mandatory reduction goals.

Summary of Findings

Due to high capital and operational costs, and currently a non-existent need for additional water, desalination is not an option for immediate City water supply needs. Desalination may play a part in long-range planning (2025 -2035 timeframe), but probably under the circumstance that the project can obtain significant state and federal funding assistance. The proposed site is likely to remain available into the future.

The following are the advantages and disadvantages of a desalination program as compared to other options, such as a GWRS program.

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Advantages of a Desalination Facility:

- Less significant distribution pipeline system required when compared to non-potable water sources
- Desalination is a new source of potable water, which increases the City's flexibility for using this supply for any potable, irrigation or industrial use

Disadvantages of a Desalination Facility:

- Extensive environmental review process (full EIR) and permits still required with uncertain mitigations.
- Potential additional treatment for certain emerging contaminants due to the mixing of desalinated water with existing imported and groundwater supplies.
- Increased brine discharges to the ocean.
- Very high capital and operating costs and financial risk in the event of default, if OCWD finances the distribution system.
- Significant timeline for implementation (5-7 years from initiation).

OCWD already has implemented a recycled water and water conservation program. While the effectiveness of the conservation program is yet to be determined, the GWRS is recognized as an industry leading example.

SUMMARY

The City was hopeful when we entered into the 2010 agreement with Poseidon for a desalination water supply that could provide increased reliability to the City, especially during times of a drought. Unfortunately, the original promise of a new water supply at the same cost as imported water has been replaced with a project that will provide water at double the cost of imported water. The cost escalation is similar to the Poseidon project in San Diego. When compared to other options, a desalination facility is a relatively expensive option for a new potable water supply for the City of Garden Grove and will not immediately resolve the City water's conservation mandate.

However, the City should continue to be open to new sources of water and new ideas and urges OCWD to fully explore less expensive options currently available before proceeding with ocean desalination. In time, a project such as Poseidon may become economically viable and environmentally sound and it is unlikely that a decision to forego its implementation at this time will preclude its future use.