

# FINAL

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## Pure Water Unit Costing Analysis

### Prepared For:

City of San Diego

Public Utilities Department

San Diego, California

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## Introduction

The City of San Diego (City) is currently in the process of constructing the Phase 1 facilities of the potable reuse system known as Pure Water San Diego. Additionally, the City is planning and evaluating alternative scenarios for Phase 2 of the Pure Water program involving construction of additional facilities to expand the potable reuse capacity in the City's system. Since the inception of the Pure Water program, the City has evaluated alternative scenarios for Pure Water Phase 1 and 2, looking at each option through the lens of unit costs and benefits. Over the course of this process, different methods of evaluation have been employed. This memo provides a recent update to the unit costs for fiscal year (FY) 2024, as well as a comparison to costs developed during the original Recycled Water Study in 2012 that launched the Pure Water program. The FY2024 unit costs take into account existing Phase 1 costs and funding data together with projections for Phase 2, and will result in 83 mgd production of purified water.

It should be noted that the results discussed herein are estimates developed to understand and compare lifecycle costs and benefits of the Pure Water program to 1) allow for comparisons of project alternatives, 2) track and compare costs over time as estimates change, and 3) generally understand the costs and benefits of the Pure Water program relative to alternative capital investments and/or sources of water supply. These results do not intend to estimate the "rate" (i.e., retail water rate) customers would pay for water produced by Pure Water facilities, nor do they directly align with elements of the Second Metro Wastewater System Amended and Restated Agreement (ARA) with respect to the Capital Expense Rate and Revenue Sharing calculations outlined in SARA Exhibit F.

## 2012 Analysis of Pure Water Phase 1 and Phase 2 Scenarios

The original financial analysis for the Pure Water program was conducted in 2012 to estimate the City's unit costs over a 50-year planning horizon. This initial analysis used the NPV method to evaluate the long-term costs and benefits of the program.

Multiple scenarios were evaluated at this early planning stage as the City considered alternative approaches to developing the Pure Water program. These alternatives included two primary scenarios, Alternative A and Alternative B, described below:

- **Alternative A** – Includes expansion of the North City plant to 45 MGD using the Morena Diversion, allowing for a smaller Harbor Drive Plant
- **Alternative B** – Maximizes use of the existing 30 MGD capacity at the North City Plant, requiring greater capacity at the Harbor Drive site

Additionally, three sub-alternatives looked at different siting options for the Harbor Drive Plant and advanced purification facility. The three sub-alternatives are described below:

- **Sub-alternative 1** – Splits the Harbor Drive reclamation facility and advanced water purification facility into two locations with advanced water purification treatment at the Camino Del Rio site.
- **Sub-alternative 2** – Combines water reclamation with advanced water purification all at the Harbor Drive Plant.
- **Sub-alternative 3** – Same as sub-alternative 2, except it includes a small plant in Mission Gorge to collect, treat and convey water to the San Vicente Reservoir.

All cash flows for the different alternatives were projected, including capital investments over multiple years of planning, design and construction and O&M costs upon initiation of production from the Pure Water facilities. Details of the capital costs and base year O&M costs are outlined below, expressed in 2012 dollars:

- \$1.985 billion to \$2.200 billion in total capital costs
  - \$100.8 million to \$104.5 million in annual O&M

Capital costs and O&M projections were factored into the forecast as pay as you go (PAYGO) cash-funded capital, debt service on financed capital investments, annual O&M expenses, and capital reductions resulting from potential grant funding. Assumptions about inflation; percentage of capital investments funded from cash, State Revolving Fund (SRF) loans, bonds and grants; borrowing terms; and other forecast drivers were required to project the cash flows over the fifty-year planning horizon. The analysis also accounted for cash flows required to maintain the City's reserve targets. These calculations yielded an annual revenue requirement, which could be discounted to calculate a single present value (PV) result of the costs of the system. When divided by the total volume of water expected to be produced over that same period, the PV could be converted into a unit PV for all capital and O&M costs.

The analysis also accounted for benefits resulting from the investment. These were deducted from the capital and O&M costs to produce the NPV. Some of these benefits were straightforward financial benefits and could be treated as direct financial offsets to the costs of the system, such as payments to the City as part of the Local Resources Program (LRP) for surface water augmentation. Others were less direct cash flow benefits, such as avoided alternative capital investments, though these benefits are real and material as they would have been otherwise required if the Pure Water program were not to be completed. The details of these estimated benefits are outlined below, expressed in 2011 dollars:

- Participation in LRP and revenue from production of potable reuse water:
  - \$275 per AFY of production for 20 years
- Reduction in salt production and resulting O&M cost savings:
  - \$100 per AFY of production in savings
- Reduced secondary treatment upgrade investments at Point Loma Wastewater Treatment Plant (PLWTP) due to diversion of flows to other facilities:
  - Net savings of \$434.4 million in capital investment
  - Net savings of \$18.7 million in annual O&M costs
- Secondary Treatment upgrades net of Chemically Enhanced Primary Treatment upgrades at PLWTP:
  - Net savings of \$463.3 million in capital investment
  - Net savings of \$13.0 million in annual O&M costs
- Reduction in flow equalization investments (for process control, not for wet weather storage):
  - Net savings of \$123 million in capital investment
  - Net savings of \$6.2 million in annual O&M costs

Combining the elements described above, a total NPV and unit NPV expressed as dollars per acre-foot per year (\$/AFY) were both calculated. As described above, the model evaluated various alternatives to compare different approaches to executing the Pure Water program. Five combinations of the alternatives and sub-alternatives described above yielded a range of unit cost results presented in Table 1, which was extracted from the original report<sup>1</sup>. It should be reiterated that these results are expressed in 2011 dollars and do not account for inflation that has occurred since that time.

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<sup>1</sup> *Recycled Water Study*. Prepared for City of San Diego. Brown and Caldwell, Black & Veatch. July 2012.

**Table 1: Pure Water Cost Summary from 2012 Recycled Water Study**

Cost Summary (2011 \$/AF)				
Alternative	Average Gross Costs	Net Costs		
		Tier 1 - Direct Wastewater System Savings	Tier 2 - Salt Reduction Credit	Tier 3 - Indirect Wastewater System Savings
		<i>Remaining Point Loma capacity upgraded to Secondary</i>	<i>Water Quality Benefit to Water/Wastewater System</i>	<i>Remaining Point Loma capacity maintained at CEPT</i>
A1: North City 45 mgd; Split Harbor Dr. AWWP	\$1,900	\$1,300	\$1,200	\$800
A2: North City 45 mgd; Consolidated Harbor Dr. AWWP	\$1,900	\$1,300	\$1,200	\$800
B1: North City 30 mgd; Split Harbor Dr. AWWP	\$1,700	\$1,100	\$1,000	\$600
B2: North City 30 mgd; Consolidated Harbor Dr. AWWP	\$1,700	\$1,100	\$1,000	\$600
B3: North City 30 mgd; Consolidated Harbor Dr. AWWP; Mission Gorge AWWP	\$1,900	\$1,300	\$1,200	\$800

## Fiscal Year 2024 Analysis

Stantec supported the City in FY 2024 to update the unit cost estimates for the Pure Water San Diego Program. This analysis generally followed a similar approach to the 2012 NPV analysis; however, because Phase 1 of the Program is currently underway, alternative scenarios for Phase 1 were not evaluated, and more current and accurate capital and O&M cost estimates were used in the analysis. Additionally, the majority of funding for Phase 1 capital through State Revolving Fund (SRF) and the Water Infrastructure Finance and Innovation Act (WIFIA) through extremely low-interest loans (in the range of 0.8% to 1.82%) was also known and could be factored into the model for more accurate projections of capital funding combining PAYGO, grant, loan, and bond funding. The borrowing terms for the remaining funding for the overall program was assumed to be more in line with traditional financial expectations.

The FY 2024 update incorporated key assumptions to develop the NPV unit cost results. These assumptions are outlined in Table 2.

**Table 2: Assumptions for FY 2024 NPV Unit Cost Analysis**

Description	Assumption
<b>General Assumptions</b>	
Discount Rate	5.0%
Capital Escalation	3.0%
<b>Renewal &amp; Replacement</b>	
Assumed Useful Life	30
Percent Cash-Funded	20%
<b>Borrowing Terms</b>	
Amortization Period	30
Interest Rate	5.0%
Issuance Cost	2.5%
<b>Phase 2 Capital Funding</b>	
Pay-as-you-go (PAYGO) Capital	20%
State Revolving Fund (SRF) Loans	25% (up to \$50 million per year)
Grants	20%
Revenue Bonds	35%

Additionally, Phase 1 capital and O&M costs were updated to reflect current estimates, including higher power and labor costs, while Phase 2 capital and O&M costs were updated based on a Phase 2 facilities analysis conducted with the Metropolitan Wastewater Joint Powers Authority that was completed in 2021. Updated estimates for Phase 1 and 2 capital and O&M costs are outlined below, expressed in 2024 dollars:

- \$1.96 billion in capital costs for Phase 1
  - \$88.0 million in annual O&M for Phase 1 (\$53.7 million water, \$34.3 million wastewater)
- \$4.03 billion in capital costs for Phase 2
  - \$129.3 million in annual O&M for Phase 2 (\$78.2 million water, \$51.1 million wastewater)

The NPV analysis accounted for the timing of capital investments, the initiation of operations of the Pure Water facilities, and ramp-up in production of purified water. As described previously, the timing of capital investments and the initiation of production and O&M costs have an important impact on the results of an NPV analysis due to the relative weights of near-term and long-term cost and benefits by way of discounting future cash flows.

Finally, benefits similar to those included in the 2012 analysis were layered into the analysis. These again included both direct financial offsets such as revenue from the LRP, as well as benefits from avoided alternative capital investments that would have otherwise been required if not for the Pure Water program. These avoided capital costs include upgrades required at the PLWTP to bring the facility up to secondary treatment standards and the construction of additional equalization capacity to manage flows during peak flow events. The avoided O&M costs of upgrading the PLWTP to secondary treatment standards were also included as a benefit to the wastewater system. The avoided capital costs were distributed over the forecast period in alignment with the distribution of Pure Water Phase 1 capital costs, and the avoided O&M and R&R

costs commenced in the year following completion of Pure Water Phase 1. The details of these benefits are outlined below, expressed in 2024 dollars:

- Participation in LRP and revenue from production of potable reuse water:
  - \$340 per AFY of production for 25 years
- Reduced secondary treatment upgrade investments at PLWTP:
  - Savings of \$2.25 billion in capital investment
- Reduction in flow equalization investment needs:
  - Savings of \$2.62 billion in capital investment
- Avoided O&M costs of secondary treatment facilities at PLWTP:
  - Savings of \$39.4 million per year (escalated over the forecast at 4% per year)
- Cost savings from 102 MGD of reduced pumping at Pump Station 2:
  - Savings of \$8.8 million per year (escalated over the forecast at 4% per year)

It should be noted that the benefits described above would be realized to a lesser degree from the completion of Phase 1 without completion of Phase 2. The magnitude of the benefits would be less than those realized with full execution of Phase 1 and 2, but the benefits associated solely with Phase 1 have not been quantified.

The results of the updated unit cost analysis can be found in Table 3. The table presents the total unit cost as well as the unit costs broken down between water and wastewater, and for Phase 1 and the combined Phase 1 and 2. Additionally, the net unit costs after accounting for the benefits of avoided capital costs described above are shown for the Phase 1 and 2 results. The only benefits included in the Phase 1 results represent the direct benefits of LRP revenue. It should be noted that the benefits of avoided capital costs are solely benefits to the wastewater system as the avoided projects consist of otherwise necessary investments at the PLWTP.

**Table 3: Updated FY 2024 Pure Water Unit Costs**

	Phase 1 Only	Phase 1 & 2
Present Value Unit Costs <sup>2</sup>	Unit Cost (\$/AF)	Unit Cost (\$/AF)
Total Unit NPV	\$3,547	\$3,527
Water Unit NPV	\$2,069	\$2,105
Wastewater Unit NPV	\$1,478	\$1,422
Present Value Unit Costs Net of Capital Benefits	Unit Cost (\$/AF)	Unit Cost (\$/AF)
Total Unit NPV Accounting for Capital Benefits	N/A	\$1,715
Water Unit NPV Accounting for Capital Benefits	N/A	\$2,105
Wastewater Unit NPV Accounting for Capital Benefits	N/A	\$(390)

## Conclusions

Table 4 shows summary results for Phase 1 only. As noted above, the completion of Phase 1 will result in avoided capital costs benefits; however, the magnitude of those benefits have not been quantified in the absence of completing Phase 2 of the program, and the total unit cost for Phase 1 projects does not include any benefits of avoided capital costs.

**Table 4: Updated FY 2024 NPV Pure Water Phase 1 Unit Costs**

	Phase 1 Only
Present Value Unit Costs	Unit Cost (\$/AF)
Total Unit NPV	\$3,547
Water Unit NPV	\$2,069
Wastewater Unit NPV	\$1,478

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<sup>2</sup> Differences between the sum of water and wastewater unit NPVs and the total unit NPV are due to rounding.

Table 5 shows unit cost results from the completion of both Phase 1 and 2 of City's Pure Water Program. The table also reflects the additional benefits and avoided costs realized through the completion of Phase 1 and 2. These avoided costs result from reduced future investment needs in secondary treatment and flow equalization facilities due to the additional capacity and operational efficiencies provided by the full program.

**Table 5: Updated FY 2024 NPV Pure Water Unit Costs for Phases 1 and 2**

	Phase 1 & 2
Present Value Unit Costs	Unit Cost (\$/AF)
Total Unit NPV	\$3,527
Water Unit NPV	\$2,105
Wastewater Unit NPV	\$1,422
Present Value Unit Costs Net of Capital Benefits	Unit Cost (\$/AF)
Total Unit NPV Accounting for Capital Benefits	\$1,715
Water Unit NPV Accounting for Capital Benefits	\$2,105
Wastewater Unit NPV Accounting for Capital Benefits	(\$390)

The total program unit cost for the City's Pure Water program has been a key data point throughout the planning process. These analyses help to frame the net costs and benefits to the City and its rate payers by pursuing this plan to address regional wastewater treatment needs in tandem with providing water supply benefits. The planning scenarios and alternatives to execute the Pure Water program have evolved over time, and the analyses have followed different methodologies at different stages of the planning effort; however, to the extent that these approaches can be compared, it is beneficial to evaluate the evolution of these unit cost estimates over the program's history. Table 6 summarizes the unit cost estimates; both as estimated at the time of the original evaluation in 2012 and adjusted to account for inflation from the date of the analyses to 2024.

**Table 6: Comparison of Pure Water Unit Costs Across Estimates Over Time**

All-In Unit Cost Comparison (\$/AFY)	2012 NPV Analysis (Midpoint Estimate)	2024 NPV Analysis
Total Pure Water Unit Cost Estimate (Original Dollars)	\$1,800	\$3,527
Inflation Adjustment <sup>3</sup>	1.698	1.000
Total Pure Water Unit Cost Estimate (2024 Dollars)	\$3,057	\$3,527

This comparison shows that the program unit costs have remained relatively constant throughout the planning process when adjusting for inflation. The current estimates of Pure Water unit costs will continue to be evaluated as information is updated and plans for Pure Water Phase 2 are refined.

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<sup>3</sup> Bureau of Labor Statistics. *Water & Sewer Maintenance Series*. Series ID: CUUR0000SEHG01. April 2024.