

Cost-Benefit Analysis “Reuse Water Polishing for Marco WWTP”

This financial analysis is based on the contents of the response to Marco Island RFI #2023-001 (October 7, 2022): Request for Information (RFI) related to the best value technology methods to reduce nitrogen and phosphorus in the Marco Island Wastewater Treatment Plant (WWTP) reuse water.

This analysis examines the addition of a nutrient “polishing” step at the end of the WWTP process prior to reuse water distribution. The polishing step achieves a 99% reduction of nutrients in the reuse water: TN < 0.2 mg/L and TP < 0.1 mg/L. Capital cost is estimated to be \$3,000,000 to \$5,000,000. This analysis assumes a 50% grant from FDEP Innovative Technology Grant Program.

Tangible benefits include: (a) reduction of 90% of bleach usage, (b) elimination of deep well injection power, (c) reduction in RO costs, (d) more reuse water available to sell, (e) increased property values and associated tax revenues.

SAVE 50% OF WQ TESTING COSTS = \$25K/YR

Operating cost increases are offset by operating cost reductions. Operating cost increases include 1) aluminum cell replacement, 2) electricity for the ammonia removal process, and 3) hydrogen peroxide if the TP concentration is above 3 ppm. Operating cost reductions include 1) reduction in bleach consumption for disinfection – the ammonia removal process makes its own bleach, 2) avoidance of deep well injection power, and 3) Increased life of the Bioreactor membranes – lower phosphorus load.

The technology examined was used by FDEP to clean the nutrients out of the Piney Point gypsum stacks which avoided an environmental disaster in Tampa Bay. SFWMD has used this technology in several demonstration projects.

Summary Cash Flow Based on RFI language

\$/year	Minimum Capital Estimate	Maximum Capital Estimate
Annual Debt Service	\$(71,122)	\$(118,536)
Operating Cost Increases	\$(640,000)	\$(640,000)
Operating Cost Reductions	\$640,000	\$640,000
Added Reuse Sales (165 MM GPY)	\$141,075	\$141,075
Property Tax Revenue Increase	\$911,000	\$911,000
Annual Cash Flow	\$980,953	\$933,539

Debt Service Calculation

	Minimum Capital	Maximum Capital
Initial Capital Cost	\$3,000,000	\$5,000,000
50% Grant	\$(1,500,000)	\$(2,500,000)
Net Initial Capital Cost	\$1,500,000	\$2,500,000
Term, months	360	360
Annual Interest rate	2.5%	2.5%
Annual Debt Service	\$(71,122)	\$(118,536)

Reuse Sales Value Estimate

Currently 15% or 165 MM GPY of excess reuse water is deep well injected. 85% of the reuse water or 935 MM GPY of reuse water is sold for \$800,000 per year, or \$855/MMG. This assigns a value of \$141,075/year to the clean reuse water that would be available for sale or release. FDEP permits would need to be revised.

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Property Tax Impact

There has long been a belief that there is a connection between home values and the quality and clarity of Florida waterways. Florida Realtors (March 2015) completed a study that showed a 15% increase in property values associated with a 1-foot increase in water clarity for waterfront homes: “The Impact of Water Quality on Florida’s Home Values.”

Benefits of clear and clean water include restoration of sea grass and oysters, return of aquatic life, bird life and animals. Less smelly water as algal blooms no longer occur. Greater enjoyment of the aquatic environment. Less concern regarding the toxicity of the algal blooms. People value clean waterways. There is also a tourism benefit that is not evaluated here.

	As-Is	With 15% increase
2023 Marco Assessed Value	\$13,650,399,579	\$15,697,959,515
2023 Marco Rate	1.4837	1.4837
Revenue	\$20,253,097	\$23,291,061
Revenue increase of \$3,037,964 per year		
Estimate 30% of homes are on the water; Net revenue increase of \$911,000 per year		

Summary Cash Flow – Disregarding Property Tax Revenue Impact

\$/year	Minimum Capital Estimate	Maximum Capital Estimate
Annual Debt Service	\$(71,122)	\$(118,536)
Operating Cost Increases	\$(640,000)	\$(640,000)
Operating Cost Reductions	\$640,000	\$640,000
Added Reuse Sales (165 MM GPY)	\$141,075	\$141,075
Property Tax Revenue Increase	0	0
Annual Cash Flow	\$69,953	\$22,539

Conclusion

If increased property tax revenue is included, there is a financial benefit to Marco Island of over \$900,000 per year from cleaning the nutrients out of the reuse water. Even disregarding the potential property tax revenue increase, the environmental damage from nutrient laden reuse water to Marco Island can be corrected with an associated annual cost reduction of \$22,539 to \$69,953 per year.

Engineering analysis may identify additional cost reductions, such as sale of recovered phosphorus and salvage of deep well injection equipment no longer needed.

This project represents an “upstream” approach to eliminating the harmful impact of reuse water nutrient pollution on the environment, as recommended by Collier County Pollution Control (April 2023).

\$1,800,000 is currently budgeted for this type of project FY28.