



Technical Memorandum

October 07, 2022

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Project Name	TOWN OF FALMOUTH SOUTH COAST EMBAYMENT		
Subject	Falmouth Green House Gas (GHG) Evaluation Memo – Great Pond TWMP		

1. Background for Climate Change / Greenhouse Gas Evaluation for Preferred Alternative – Section 6.1

To estimate the Greenhouse Gas Emissions for the Falmouth Wastewater Treatment Facility (WWTF) as part of the Great Pond Targeted Watershed Management Plan, the online program EPA Energy Star Portfolio Manager was used. This program was design to calculate the energy use and associated greenhouse gas emissions from any building using basic information about the building, including type of building, year of construction, zip code, percent occupancy, total square footage, electricity usage, water usage, and fuel usage, to name a few. Information about Energy Star Portfolio Manager can be found here: [Benchmark Your Building Using ENERGY STAR® Portfolio Manager® | ENERGY STAR.](#)

To analyze/estimate the change in greenhouse gas emissions from the Falmouth WWTF following the proposed upgrade, two building portfolios were created within the Energy Star program. One portfolio represented the WWTF’s current conditions and utilized previously reported available data as a basis for its analysis and the second portfolio represented the WWTF after the proposed upgrades are implemented. The second portfolio was based on the previously reported available data and estimated changes to this data due to the proposed upgrades.

Building specific information can be utilized to better estimate greenhouse gas emissions. For example, for the Falmouth Wastewater Treatment Facility, the following wastewater treatment facility specific information was added to the Energy Star program.

Table 1 Wastewater Treatment Facility Input Data

Parameter	Value for Existing WWTF	Value for Proposed Upgraded WWTF
Plant Design Flow Rate	0.71 MGD	1.21 MGD
Average Influent Biological Oxygen Demand (BOD5) ¹	228.98 mg/L	228.98 mg/L
Average Effluent Biological Oxygen Demand (BOD5) ¹	30 mg/L	30 mg/L

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Parameter	Value for Existing WWTF	Value for Proposed Upgraded WWTF
Fixed Film Trickle Filtration Process	No	No
Nutrient Removal	Yes	Yes
Notes:		
1. Average influent and effluent BOD5 were assumed to be the same between both portfolios.		

Monthly electricity bills comprised the majority of the available data for the Falmouth WWTF evaluation. The monthly electricity usage in kWh (thousand Watt-hours) and associated cost from April 2019 to April 2020 was entered directly into the existing WWTF portfolio. Due to the proposed upgrades, the treatment facilities equipment, and therefore electricity usage, was expected to change. To estimate this change, a list of new proposed equipment and equipment proposed to be removed was generated. For each piece of equipment, the average electricity usage and daily hours of use was utilized to estimate an average daily electricity usage (see Table 2 below). This average daily usage was then converted to an average monthly usage.

Table 2 New or Removed Equipment for the Proposed WWTF

Equipment	New Installation/ Demo	Electricity (KW)	Usage (hours)	Electricity Usage – Average Conditions for 24 hours (kWh)
SBR No. 3 Mixer	New	18.66	6	112
SBR Blower No. 4	New	74.63	6	448
Sludge Blend Tank No. 3 Mixer No. 1	New	4.48	24	107
Sludge Blend Tank No. 3 Mixer No. 2	New	4.48	24	107
Thickened Sludge Holding Tank No. 3 Mixer No. 1	New	4.48	24	107
Thickened Sludge Holding Tank No. 3 Mixer No. 2	New	4.48	24	107
Gravity Belt Thickener No. 1	New	2.24	6	13
Gravity Belt Thickener No. 2	New	2.24	0	0
Gravity Belt Thickener Booster Water Pump No. 1	New	3.73	6	22
Gravity Belt Thickener Booster Water Pump No. 2	New	3.73	0	0
Polymer Mixing Chamber	DEMO	0.75	6	4
Polymer Tote Mixer	DEMO	0.75	6	4
Polymer Feed System No. 1 Mixing Chamber	New	0.75	6	4
Polymer Feed System No. 1 Tote Mixer	New	0.75	6	4
Polymer Feed System No. 2 Mixing Chamber	New	0.75	0	0
Polymer Feed System No. 2 Tote Mixer	New	0.75	0	0

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Equipment	New Installation/ Demo	Electricity (KW)	Usage (hours)	Electricity Usage – Average Conditions for 24 hours (kWh)
SOMAT x 3 ¹	DEMO	11.19	6	67
Denitrification Filter Influent Pump 1	New	11.19	1	11
Denitrification Filter Influent Pump 2	New	11.19	0	0
Wastewater Influent Pump 1	New	14.93	12	179
Wastewater Influent Pump 2	New	14.93	0	0
Wastewater Influent Pump 1	DEMO	11.19	12	134
Wastewater Influent Pump 2	DEMO	11.19	0	0
Notes:				
1. Electricity values shown represent three SOMATs.				

This additional electricity usage was then added to the 2019 to 2020 electricity bills data to estimate a future monthly electricity usage following the proposed upgrades. Table 3 below lists the “existing” (2019-2020) electricity usage entered for the baseline condition and the estimated future electricity usage following the proposed upgrade.

Table 3 Electricity Usage for Existing and Proposed WWTF

Electricity Bill Start Date	Electricity Bill End Date	Existing Usage (kWh)	Proposed Usage (kWh)
4/29/2019	5/29/2019	87,240	117,665
5/29/2019	6/27/2019	87,360	117,785
6/27/2019	7/29/2019	111,360	141,785
7/29/2019	8/27/2019	99,840	130,265
8/27/2019	9/26/2019	94,920	125,345
9/26/2019	10/28/2019	90,720	121,145
10/28/2019	11/27/2019	85,560	115,985
11/27/2019	12/27/2019	83,400	113,825
12/27/2019	1/29/2020	93,480	123,905
1/29/2020	2/27/2020	82,200	112,625
2/27/2020	3/27/2020	79,920	110,345
3/27/2020	4/30/2020	86,400	116,825

The Energy Star Portfolio Manager program then generated the results shown below in Table 4. The energy values were then converted to more relevant units of kBtu/gpd/year since wastewater treatment facilities are more commonly referenced by flow vs. square footage. In addition, the CO2 values were converted from a kg

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per square footage per year to short tons per year. The values provided in the Great Pond TWMP Report (SECTION 6.1 TABLE 6.1) are listed in Table 5. All values generated by Energy Star are on a per year basis.

Table 4 Energy Star Output Values

WWTF Portfolio	Design Average Annual Flow (mgd)	Utility Benchmark Score	Site (kBTU/ft ² /year)	Source (kBTU/ft ² /year)	CO2 Emissions (kgCO ₂ e/ft ² /year)
Existing Facility	0.71	19	180.1	504.2	11.8
Proposed Upgraded Facility	1.21	19	241.4	676.0	15.8

Table 5 Final GHG Output Values (Converted)

WWTF Portfolio	Design Average Annual Flow (mgd)	Utility Benchmark Score	Site (kBTU/gpd/year)	Source (kBTU/gpd/year)	CO2 Emissions (short tons/year)
Existing Facility	0.71	19	5.17	14.49	265.3
Proposed Upgraded Facility	1.21	19	4.07	11.40	355.3

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Regards

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