Memorandum

Originally Issued: June 8, 2021

Revised: April 2022 and February 2023

To:	Town of Wareham	Ref. No.:	11217251
From:	Marc Drainville, P.E. BCEE; Russ Kleekamp; Lenna Quackenbush	Tel:	774-470-1647
Subject:	**Memorandum of Capacity at the Wareham Water Pollution Control Facility**		

1. Introduction

The purpose of this memorandum is to provide information on the capacity at the Wareham Water Pollution Control Facility (WPCF). The memorandum discusses the high peak influent flow rates due to inflow and infiltration (I/I) and diversions that the plant has experienced as well as the committed flows and permit discharge levels for the of the facility.

1.1 Permit and Design Flow

The National Pollution Discharge Elimination System (NPDES) permit authorizes Wareham to discharge an average annual wastewater effluent flow of 1.56 million gallons per day (mgd) to the Agawam River. The permit is analyzed monthly and on a rolling 12-month period. When the average annual flow reaches 80% of the permitted flow rate in a calendar year, a plan of action is required to be submitted to the Department of Environmental Protection (DEP) by March 31st of the following year. The treatment plant is designed to be able to convey flow at an average daily flow of 2.00 mgd. The design and permitted flow rates are summarized in the table below and the NPDES permit is included as an attachment to this document.

Table 1.1 Design and Permitted Flow Rates

Parameter	Permitted Flow (mgd)
Permit	1.56
80% of Permit	1.25
WPCF Capacity	2.00

2. Peak Influent Flows and Non-Permitted Diversions at the WPCF

The WPCF has exceeded its capacity multiple times in the last three years. When the WPCF has sustained flows above the rate that the secondary treatment process can handle while its equalization basins are full, the plant diverts flow to an unlined depression on the site. These diversions are technically non-permitted

and must be reported to Mass DEP. A number of these diversions have taken place at the WPCF in the last three years including prolonged diversions in spring 2018 and spring 2019. A photograph of the diversion is presented below.

Figure 2.1 Non-Permitted Diversion at WPCF

The spring 2018 diversion led to the evaluation of and decision to increase the volume of equalization at the plant. The additional equalization basins that are scheduled to be constructed by spring/summer of 2021 will help to limit the future number of diversions at the plant. However, the additional equalization basins will not do anything to increase the capacity that the secondary treatment process can treat or the effluent flow that is able to be discharged to the Agawam River under the permit. The evaluation of the diversions during the March 2018 during the three Nor'easters that struck the area in that month (March 2nd, 7th, and 13th), concluded that 1.3 million gallons of additional equalization would have been necessary to keep the WPCF

from exceeding its capacity. The worst of the three Nor'easters in March delivered precipitation equivalent to a 24-hour 1.5-year magnitude storm. An additional capacity of 2.7 million gallons was designed into the new equalization basins to contain flow from a 1.5-year magnitude storm scaled to tolerate increases in precipitation that are projected to occur in 2050. A figure of the additional equalization basin layout is included as an attachment.

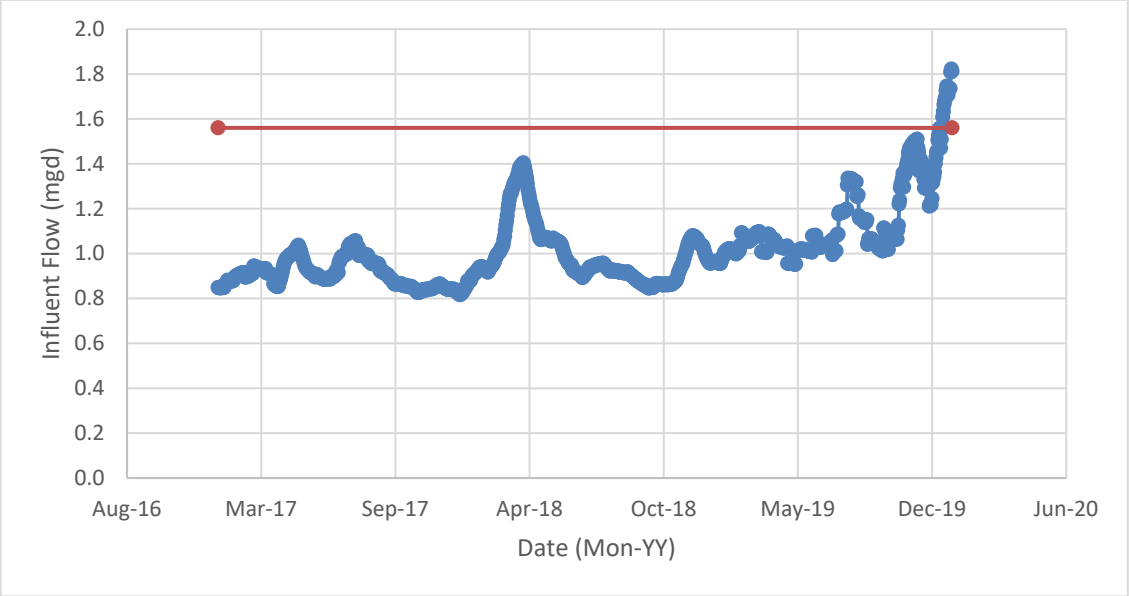
It should be stated that even with the new equalization basins there may be weather events that still result in a non-permitted discharge. However, we expect these events will have to be much larger than the events that have caused previous non-permitted diversions. If we were to design to the 50- or 100-year storm event, the required equalization would require many acres of new basins that would likely remain dry, except for once or twice every 100 years. However, in these larger events, regulatory agencies will likely understand that treatment plants cannot account for these storms.

3. Committed Future Flows and Effluent Discharge Permit

In addition to the diversions from peak influent flow events, the WPCF is also trending to exceed its discharge permit in the future.

3.1 Current Flows

The WPCF has been experiencing a trend of increasing influent flows in the past years. The figure below shows the rolling 30-day average influent flow rate for 2017 through 2019.



Note: The red horizontal line shows the 1.56 mgd permitted effluent discharge rate.

Figure 3.1 Average 30-Day Rolling Flow for January 2017 through December 2019

In the last three years (2017 through 2019) the influent flows have not exceeded the permit on a rolling annual basis. In the month of December 2019 the average influent flow rate was 1.82 mgd. This flow exceeded the monthly reporting value of 1.56 mgd and a letter was sent from the WPCF to the State notifying them. The maximum average rolling 365-day influent rate from the past three years occurred in

2019 and was 1.18 mgd. This flow represents 76 percent of the permitted discharge rate. When the 365-day rolling average of the flow exceeds 80% of the permitted discharge rate, a plan must be submitted to the State outlining a plan of action. While the chart seems to show that the plant did not exceed its capacity and require discharges during spring 2018, the plant did need to discharge flow because there where consecutive days where the capacity was exceeded but the average 30-day flow was still under the permitted flow.

3.2 Committed Future Flow Rates (as of June 8, 2021)

The town has committed to allowing for an increase in flows to the WPCF (see table below). Although these flows are not depicted in the flow data for 2017 through 2019, they need to be accounted for when planning for future flows and in analyzing the permit. These flows were initially presented in the Board of Selectmen presentation on February 11, 2020, they have been updated based on email from Mr. G. Campinha on May 13, 2021, and a meeting with Mr. G. Campinha May 25, 2021.

Table 3.1 Committed Flows

Committed Future Flows	Flow (gal per day)
Bourne (approximate remaining capacity)	100,000
Robertson Plaza/Delta Dental	6,000[1]
Bay Point	27,000[2]
Great Hill Park	20,000
Woodland Cove	32,000
Assisted Living Facility, Sandwich Road	10,140
Chapel Lane	1,700
Minot Forest Condominium's	1,320
Single Family Home – 240 Oak Street	330
Single Family Home – 14 Tremont Street	330
A.D. Makepeace (Rosebrook Building)	10,000[3]
Tom Knapp	1,320[5]
Brian Grady for TGCI Emnaca, LLC	6,600
Littleton Drive	15,875
Robinwood Road	3,000
First Hartford Realty Corp, 3013 Cran. Hwy	5,600
GAF Engineering, Tower Terrace	Tie property into sewer[6]
Greater Attleboro Regional Transit Authority (GATRA)	5,000
Total	**246,000[7,8]**

**Notes:*

1. *Was originally estimated at 12,000 gpd but was reduced to 6,000 gpd based on email from Mr. G. Campinha on May 13, 2021.*
2. *Was originally 37,000 gpd but was reduced to 27,000 gpd based on a meeting with Mr. G. Campinha May 25, 2021.*
3. *Was originally estimated at 60,000 gpd but was reduced to 10,000 gpd based on email from Mr. G. Campinha on May 13, 2021. Approximately 50,000 gpd from A.D. Makepeace was estimated to have been added to the collection system in 2020.*
4. *Value rounded to nearest hundred.*
5. *Flow was estimated assuming twelve units for a 40B based on email from Mr. G. Campinha on May 13, 2021.*

6. *Additional flow was not added for GAF engineering, Tower Terrace based on a meeting with Mr. G. Campinha May 25, 2021, the request for the property stated that GAF engineering "would like to run the pipe through the Decas property into Tower Terrace to tie into the sewer".*
7. *Was originally estimated at 275,000 gpd but was reduced to 246,000 gpd based on the estimated committed flow changes discussed in a meeting with Mr. G. Campinha May 25, 2021 and outlined in an email from Mr. G. Campinha on May 13, 2021.*
8. *Value is rounded to nearest thousand.*

3.3 Future Flows

The known committed future flows to the facility are 209,000 gpd and the committed flows are 37,400 gpd. If the known committed and committed flows are added to the facility, the influent flow rate could increase by 246,000 gallons per day. The committed future flows could be added at any point because these flows have already been approved and the Town has no control over the timing. The committed flows have not been approved due to the current moratorium on additional flows but have been requested to be added. The committed future flows have been considered for flow analysis. When the committed flows are added to the average annual influent flow rate for 2019 (per Section 3.1 above), the influent flow rate would increase to 1.43 mgd. The flow rate of 1.43 mgd represents 91% of the permitted effluent discharge rate. Any flow greater than 80 percent of the permitted flow (80% of 1.56 mgd or 1.25 mgd) would require the town to submit a plan of action to EPA, the entity which issued the permit. The NPDES permit requires that the WPCF submits the plan to EPA by March 31 of the calendar year following the 80% exceedance. The plan must describe further flow increases and how the WPCF will maintain compliance with all effluent and flow limits. Because the Town has been so close to exceeding the flow threshold, planning for additional flows and facility compliance has already commenced and must be completed as soon as possible.

In addition to the committed flows the Town of Wareham has also allowed A.D. Makepeace to connect to the sewer collection system. A.D. Makepeace has been allowed to contribute their full buildout flow through existing sewer connections. A.D. Makepeace has indicated that their likely flow will be an additional 500,000 gpd in the future, for the Business Development Overlay District (BDOD). The timeline for when the A.D. Makepeace flow would be added is not definite. However, when this flow is added with the additional committed flow the total flow is estimated to be 1.93 mgd. This flow would exceed the discharge limit and put the plant at 96% of design maximum flow capacity.

4. Findings

The WPCF has experienced both an increasing number of peak flow events and an increasing trend in overall influent flow rates. In the last three years (2017-2019) the WPCF has had to discharge untreated wastewater multiple times due to these increasing flow rates combined with I/I flows. A previous study found that the WPCF lacked adequate equalization volume to handle peak influent flow rates during storms such as the 2018 March Nor'easters. Additional equalization basins are scheduled to be built and completed in calendar year 2021 to allow the WPCF to be able to handle high flows. The overall trend in influent flow rates has also been increasing; and with 246,000 gallons per day of additional committed flows, the WPCF is at risk of nearing its permitted discharge rate, but, more immediately, exceeding 80% of the permitted flow rate which requires submitting a plan of action to the State.

If, during this or a future calendar year, the Town exceeds 80% of the permitted discharge flow, the permit allows only three months between the exceedance of 80% of the discharge rate and date of plan submittal. For calendar year 2019 the Town was at 76% of their permitted discharge flow. If the 246,000 gpd of committed flows were online, the Town would have been at approximately 91% of the permitted discharge

flow for 2019, and the plan of action would have been due in March of 2020. Additionally, if all of the allowed A.D. Makepeace flow was also added the WPCF would exceed its discharge capacity and be at 96% of its design flow capacity.

While the commitments are not actual flows and do not trigger the required plan of action, the Town needs to start developing this plan of action, as the Town has committed well over 80% of their permitted discharge flow.

While the Wareham WPCF is designed to convey up to 2.0 MGD of wastewater, there are two processes that are undersized; the equalization basins, which were identified as being undersized in a previous study and may be further undersized as flows exceed the design average of 1.56 mgd, and denitrification filters, which are lacking a backup required by current standards. The flow diversions in the spring of 2018 and 2019 were a result of these two undersized processes flooding the WPCF grounds, and potentially resulting in a raw sewage spill to the Agawam River.

5. 2020 Update

The original draft of this memo did not include data from 2020. The following section was added after an analysis of the 2020 data was conducted. The year 2020 saw a significant drop in total precipitation in Wareham and a small decrease in influent flow to the WPCF as compared to 2019 flows. The total annual precipitation and average influent flow for the WPCF for the previous four years are presented in the following table.

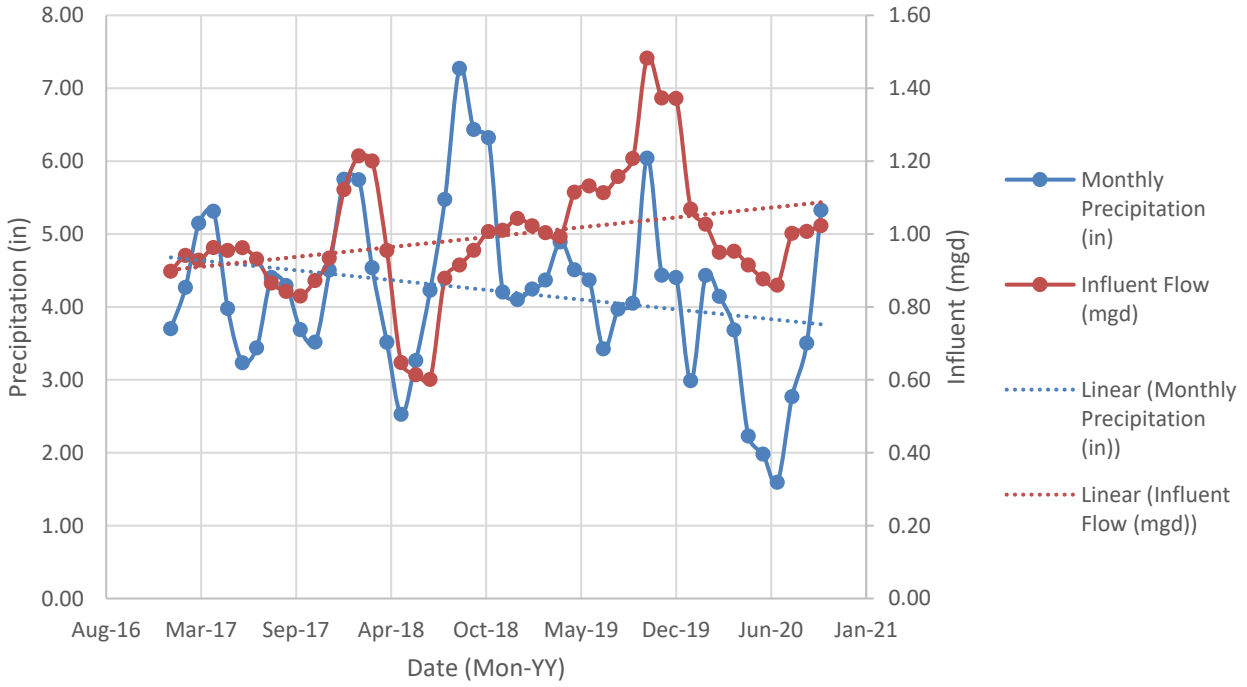
Table 5.1 Wareham Precipitation and Influent Flow

Year	Total Precipitation (in)[1]	Average Influent Flow (mgd)[2, 3]
2017	48.4	0.91
2018	59.77	0.90
2019	55.36	1.16
2020	40.77	0.98

Notes:

1. *Precipitation provided as monthly summaries for coastal Massachusetts from the Southern Regional Climate Center.*
2. *Influent data provided by the Wareham WPCF.*
3. *Influent does not include septage.*

The total precipitation received in 2020 was 80 percent of the average precipitation received in Wareham over the last four years. However, the average influent flow was the second highest flow in the last four years, second only to 2019. The following graph (Precipitation and Influent 2017-2020) shows that in the last four years the influent flow has been trending upwards while the average precipitation has been trending downwards.



Note: Data shown using three-month rolling average to reduce monthly noise

Figure 5.1 Precipitation and Influent 2017-2020

As previously discussed in this memorandum the WPCF has been adding additional flow and has future committed flows. The influent trendline in the Precipitation and Influent 2017-2020 graph demonstrates that additional flow is being added to the facility. If 2021or a subsequent year has a precipitation trend that is on the increase, it is probable that the yearly influent flow rate will increase at a higher rate than the trends shown above, especially if new connections to the system increase at the same rate as they have in the past four years. This demonstrates the need to continue to pursue the recommendations in Section 6.

One additional factor to consider during analysis of the 2020 influent flow data is that the Town of Wareham was experiencing the Covid-19 pandemic during the majority of the year. The effects on wastewater due to the societal changes that occurred during the year are not known and the longevity of these changes is further unknown.

Given that 2020 was an unusual year with regard to the pandemic and low rainfall, we can provide recommendations based on 2019. As of 2019, the WPCF had 24% of the total capacity remaining. If the flow committed to Bourne is accounted for, that leaves 13% capacity remaining. The closer the Town gets to 100% of the flow, the riskier operations become with regard to meeting permit and permit exceedances. The Town has at most 180,000 gallons of capacity remaining as of 2019; it should be noted that as long as Bourne does not use the other half of their committed flow, the Town would be at 94% capacity if they used all 180,000 gallons but as the Town approaches its flow capacity, it would put the Town in a risky position with regard to continued permit compliance (and this does not include impacts from a rainier than normal year which could further erode the capacity of the facility). Pursuit of additional disposal capacity and an upgrade of the facility are strongly recommended. In addition, it should be noted that the Town has already committed well beyond the 180,000 gallons in capacity (as explained earlier in this memo) and these

commitments represent a further complication to the facility and are a further pressing reason to pursue additional disposal capacity and a plant expansion to accommodate future flows.

Moving forward, any additional flows from uncommitted connections will impact committed flows. It is also recommended that the Town re-evaluate the larger committed flows from housing developments and A.D. Makepeace to better determine when the total flows will be required for such development. For example, if a housing development is requesting 30,000 gpd of flow, is that immediately or over the course of 10 years? The longer-term commitments should be coordinated with future plant expansion plans so that smaller developments that have an immediate need for flow allocation can be connected right away, which will keep the Town's economic development flourishing rather than halting.

6. April 2022 Update

The total average daily flow to the Wareham WPCF in 2021 was 1.034 mgd, see updated flow table below. This information is based on the DMR provided by the Town of Wareham.

Table 6.1 Updated Wareham Influent Flow

Year	Average Influent Flow (mgd)[1, 2]
2017	0.91
2018	0.90
2019	1.16
2020	0.98
2021	1.03

Notes:

1. *Influent data provided by the Wareham WPCF.*
2. *Influent does not include septage.*

12 MONTH AVERAGE INFLUENT FLOW	
21-Jan	0.9080
21-Feb	0.8751
21-Mar	0.9380
21-Apr	0.8727
21-May	0.9836
21-Jun	1.0078
21-Jul	1.2352
21-Aug	1.3430
21-Sep	1.3972
21-Oct	1.2044
21-Nov	0.8612
21-Dec	0.7821
AVERAGE:	1.0340

The revised project committed flow list in the following Table 6.2 indicates the Town has committed to approximately 250,000 gallons of future flow for recognized projects. This amount does not include any consideration for future flow from A.D. Makepeace and the Business Development Overlay District.

Combining the current committed flows and 2021 average daily flow totals 1.28 mgd. This volume exceeds 80% of the WPCF discharge capacity by approximately 34,000 gpd.

Table 6.2 Updated April 2022 Committed Flow List

Committed Future Flows	Flow (gal per day)
Bourne (approximate remaining capacity)	100,000
Bay Point	27,000[1]
Great Hill Park	20,000
Woodland Cove	32,000
Assisted Living Facility, Sandwich Road	10,140
Chapel Lane	1,920
Minot Forest Condominium's	1,320
Single Family Home – 240 Oak Street	330
Single Family Home – 14 Tremont Street	330
A.D. Makepeace (Rosebrook Building)	10,000[2]
52 Main	5,000
"Lateral" Properties	*Unk.*[3]
• *Tom Knapp*	*1,320*[5]
• *Brian Grady for TGCI Emnaca, LLC*	*6,600*
• *Littleton Drive*	*15,875*
• *Robinwood Road*	*3,000*
• *First Hartford Realty Corp, 3013 Cran. Hwy*	*5,600*
• *GAF Engineering, Tower Terrace*	*Tie property into sewer*[6]
• *Crumpet Factory*	*Unk.*
• *434 Main Street*	*3,850*
• *76 Main Street*	*3,500*
Total	**248,000**[7]

**Notes:*

1. *Was originally 37,000 gpd but was reduced to 27,000 gpd based on a meeting with Mr. G. Campinha May 25, 2021.*
2. *Was originally estimated at 60,000 gpd but was reduced to 10,000 gpd based on email from Mr. G. Campinha on May 13, 2021. Approximately 50,000 gpd from A.D. Makepeace was estimated to have been added to the collection system in 2020.*
3. *Properties within sewered areas that have not been connected to the sewer system, but have the ability to at any time as they are within the areas of planned growth under the previously approved CWMP and have an existing sewer lateral in place.*
4. *Value rounded to nearest hundred.*
5. *Flow was estimated assuming twelve units for a 40B based on email from Mr. G. Campinha on May 13, 2021.*
6. *Additional flow was not added for GAF engineering, Tower Terrace based on a meeting with Mr. G. Campinha May 25, 2021, the request for the property stated that GAF engineering "would like to run the pipe through the Decas property into Tower Terrace to tie into the sewer".*
7. *Value is rounded to nearest thousand.*

7. February 2023 Update

An update on flows at the existing WPCF is as follows. The average flow for calendar year 2022 was 0.86 mgd. The committed flow (as updated in February and shown in the table below) is 247,000. Together, current existing flows and committed flow put the facility at slightly more than 70% capacity. However, another wet year like 2019 will place the facility at risk of being at 90% capacity.

Updated February 2023 Project List

Committed Future Flows	Flow (gal per day)
Bourne (approximate remaining capacity)	100,000
Bay Point	27,000[1]
Great Hill Park	20,000
Woodland Cove	32,000
Assisted Living Facility, Sandwich Road	10,140
Chapel Lane	1,920
Minot Forest Condominium's	1,320
Single Family Home – 240 Oak Street	330
Single Family Home – 14 Tremont Street	330
A.D. Makepeace (Rosebrook Building)	10,000[2]
52 Main	5,000
"Lateral" Properties	*Unk.*[3]
• *Brian Grady for TGCI Emnaca, LLC*	*6,600*
• *Littleton Drive*	*15,875*
• *Robinwood Road*	*3,000*
• *First Hartford Realty Corp, 3013 Cran. Hwy*	*5,600*
• *Crumpet Factory*	*Unk.*
• *434 Main Street*	*3,850*
• *76 Main Street*	*3,500*
Total	**247,000[7]**

**Notes:*

8. *Was originally 37,000 gpd but was reduced to 27,000 gpd based on a meeting with Mr. G. Campinha May 25, 2021.*
9. *Was originally estimated at 60,000 gpd but was reduced to 10,000 gpd based on email from Mr. G. Campinha on May 13, 2021. Approximately 50,000 gpd from A.D. Makepeace was estimated to have been added to the collection system in 2020.*
10. *Properties within sewered areas that have not been connected to the sewer system, but have the ability to at any time as they are within the areas of planned growth under the previously approved CWMP and have an existing sewer lateral in place.*
11. *Value rounded to nearest hundred.*
12. *Flow was estimated assuming twelve units for a 40B based on email from Mr. G. Campinha on May 13, 2021.*
13. *Additional flow was not added for GAF engineering, Tower Terrace based on a meeting with Mr. G. Campinha May 25, 2021, the request for the property stated that GAF engineering "would like to run the pipe through the Decas property into Tower Terrace to tie into the sewer".*
14. *Value is rounded to nearest thousand.*

The primary risk faced by the town when flows exceed 80% of the rated capacity is that the town will need to submit a plan for how it intends to address flows as it approached its design capacity. As of July of 2022, the town has initiated a comprehensive wastewater management plan (CWMP). This planning process is intended to address the issues associated with a wastewater facility approaching its design capacity, among other issues. Thus, the town is being proactive by initiating this planning process.

For the past 5 years, the closest the facility would have come to its capacity rating when actual flow and committed flow are considered is 90%. Based on this analysis and the fact that the town has initiated

wastewater planning, an additional 50,000 gallons per day of flow could be allowed into the facility. It should be noted that the initiation of the town's wastewater planning process (CWMP) is the driver behind this additional flow being allowed and implementation of the recommended plan will be critical to future increases in flow.

8. Recommendations

Our recommendations are based on managing the risks associated with the flow conditions at the Wareham WPCF. Having documented known non-permitted diversions with MassDEP, certain actions must be initiated at the WPCF, and several have been including the new equalizations basins and planning for a new denitrification filter. Once these improvements are online, the risk of non-permitted diversion will still exist, however at a reduced level. It is our goal to recommend a flow management policy that will allow the Town to grow while minimizing risks of non-permitted diversion. However, some immediate actions are strongly recommended:

- This memorandum does not include any wastewater flows from future development of the Tremont Nail Factory.
- The Town should complete the Comprehensive Wastewater Management Plan (CWMP) update which would include projections for future flows. These projections are critical for planning associated with future effluent discharge sites or permit flow expansions, cost-effective upgrades at the WPCF, and responses to EPA if the WPCF exceeds it permitted flow. Additionally, completion of the CWMP is one of five requirements to receive 0% financing through the State's Revolving Fund program (for example, a 2% loan for 20 years is roughly $180,000 for every $1M of loaned monies).