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Appendix H

Summary Report on the Investigation of Additional Water Supply Options (Weber 2018)

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Technical Memorandum

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Southwest Florida Water Management District

From: **Chuck Weber, P.E.**
City of Tampa Water Department

Date: **October 30, 2018**

Subject: Summary Report on the Investigation of Storage or Additional Water Supply Options (H400)

The Cooperative Funding Agreement No. 10C00000087 for the Investigation of Storage or Additional Supply Options (H400) was executed between the Southwest Water Management District (District) and the City of Tampa (City) to review the status of the recovery projects that have been identified to meet the minimum flows of the Lower Hillsborough River, and consider additional recovery projects that may be needed. Figure 1 illustrates currently identified recovery projects. The status review of the existing recovery projects (tasks 1 through 3 in the agreement) was performed by the City's consultant, MWH Americas, Inc. and the technical memorandum entitled Lower Hillsborough River Recovery Strategy Projects Status and Minimum Flow Evaluation was submitted to the District in 2011.

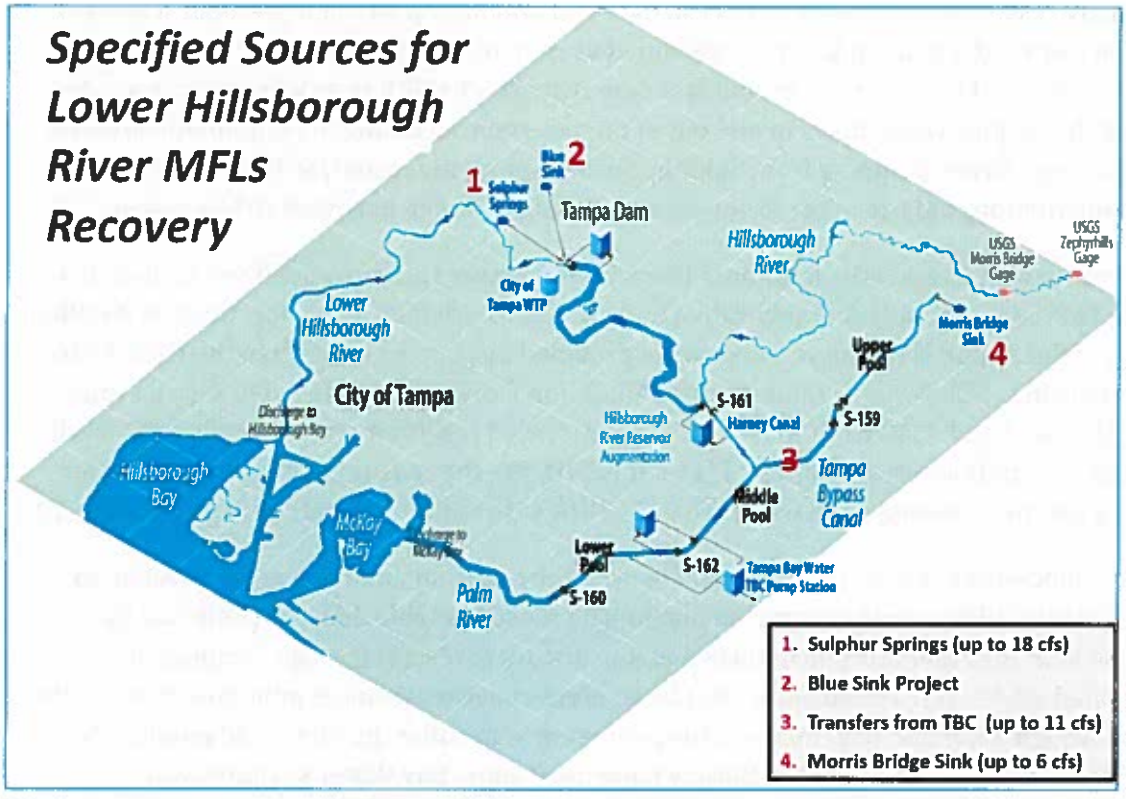

Figure 1. Identified Recovery Projects (Source: Southwest Florida Water Management District)

The agreement also required evaluation of other projects such as aquifer storage and recovery, reservoir storage, and/or reclaimed water downstream augmentation (tasks 4 through 9). Two additional projects have the potential to augment fresh water flow to the Lower Hillsborough River and are listed below:

1) Tampa Augmentation Project
2) Hillsborough River Dam Low Flow Control Gate

The City had completed construction of the Hillsborough River Dam Low Flow Control Gate and is performing feasibility analysis on the Tampa Augmentation Project. These projects are further described below.

Tampa Augmentation Project

Since the completion of the Technical Memorandum in 2011, new opportunities have surfaced with incorporation of reclaimed water as a new water source. The City and the District executed the Cooperative Funding Agreement No. 16CF0000228 in 2016 for the Tampa Augmentation Project (TAP). Under this agreement, the City studied the feasibility of using natural treatment systems to enhance the quality of the reclaimed water currently being discharged from the City's Howard F. Curren Advanced Wastewater Treatment Plant (HFCAWTP) for delivery as a source of potable water. The first phase of TAP, which was completed in August 2018 (Carollo Engineers Inc., 2018), evaluated an additional 50 million gallons per day (MGD) of fresh water to the City's main source of drinking water, the Hillsborough River Reservoir (HRR). This evaluation included a modeling task that was used to predict the maximum amount of water that could be added to the HRR by calculating daily reservoir volumes on historical data and potential water management scenarios. The TAP reservoir model is an updated and modified version of the 2004 reservoir model that was used when City secured its water use permit from the District. The TAP reservoir model was used for managing the various water flows in and out of the reservoir including the Minimum Flows for Lower Hillsborough River, pumping from Sulphur Springs, pumping to and/or from the Harney Canal for augmentation, and use of the Rome Avenue Aquifer Storage Recovery (ASR) system.

In the reservoir modeling scenario, minimum flows for the Lower Hillsborough River included in District Rule 40D-8.041, Florida Administrative Code (F.A.C.) were met. Each day, the first 8 million gallons (MG) of the required minimum flows were provided by sources other than the HRR: 6 MG from Sulphur Springs (following Sulphur Springs Minimum Flows as established in District Rule 40D-8.041(3), F.A.C.) and 2 MG from Blue Sink. If the modeled reservoir water level is sufficiently above the historic minimum reservoir level (16.4 ft NGVD 29), the remaining minimum flows for that day were met by releasing extra water from the HRR with additional water provided from TAP.

Results of this modeling exercise presented in Figure 2 show that an annual average input of 28 MGD from TAP into HRR not only supported meeting increased potable demand projected for 2035, but also kept the reservoir much fuller than the historical reservoir stage. Keeping the reservoir topped off, i.e., full, would allow the City to more consistently meet minimum flows in the Lower Hillsborough River and may increase the amount of water that the City could potentially have available to the region through the Harney Canal for Tampa Bay Water's withdrawal.

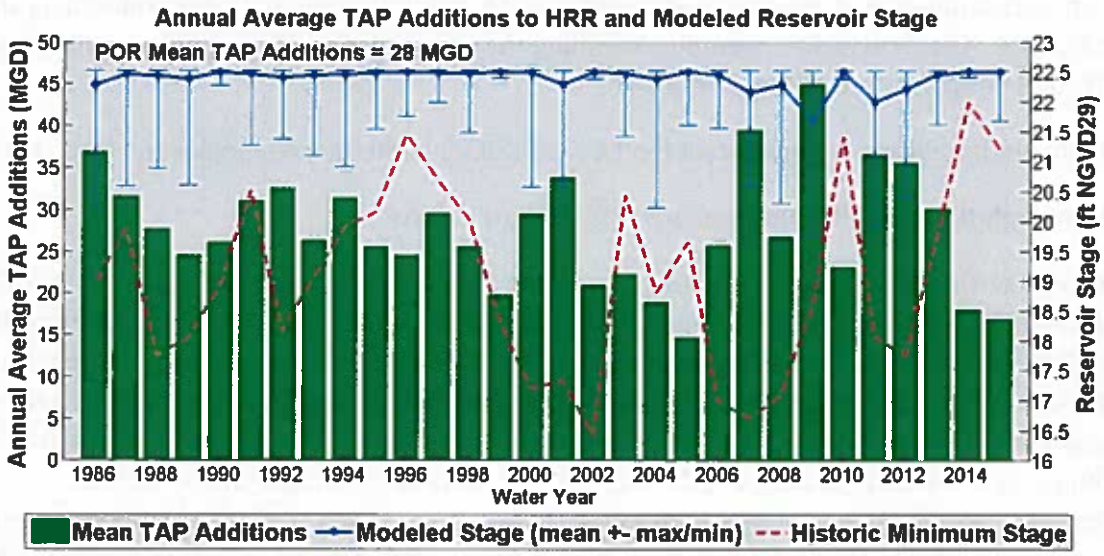

Figure 2. Annual Average TAP Additions to Hillsborough River Reservoir and Modeled Reservoir Stage (ASRus, LLC., 2018)

Figure 3 below from the HRR modeling effort (ASRus, LLC., 2018) shows that the City will be able to successfully achieve the Lower Hillsborough minimum flows with TAP as additional source of water. The simulated average discharge over the dam in the 2035 reservoir modeling scenario was 160 MGD. During relatively low flows over the dam (Q < 50 MGD), it is clear that the simulated discharge (green solid line) is higher than historical discharge (red dotted line). This increase in flow over the dam in the 2035 simulation was enough to meet the minimum flows 100% of the time. The modeled discharge never drops below the remaining minimum flows that have not already been met by Blue Sink and Sulphur Springs. This means Blue Sink, Sulphur Springs and discharge from the reservoir (with TAP as additional source of water) will be able to satisfy the Lower Hillsborough River minimum flows 100% of the time.

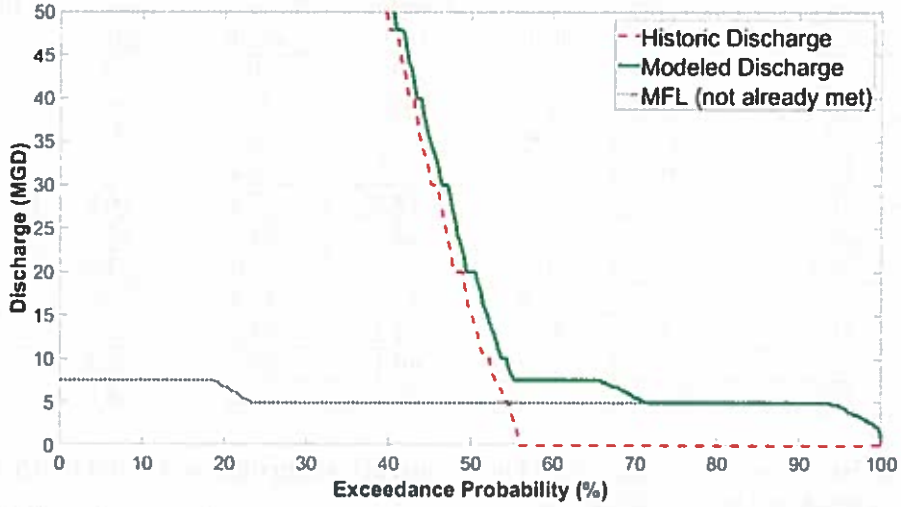

Figure 3. Zoomed in view of exceedance curves, including MFLs (black dotted line) that have not already been met by Blue Sink (2 MG) and Sulphur Springs (8 MG) (ASRus, LLC., 2018)

The City is continuing with its efforts with additional feasibility evaluation and preliminary design tasks for TAP. The District has committed funding the next phase of the feasibility evaluation with the FY2019 Cooperative Funding Initiative.

The estimated preliminary capital cost for TAP is $250,720,000 (Carollo Engineers, Inc., 2018).

Hillsborough River Reservoir Dam Low Flow Control Gate

The City had originally planned to build a new pump station at the Tampa Bypass Canal (TBC) and build a siphon facility at the Hillsborough River Dam so that water can be transferred from TBC to the HRR then to the base of the dam to help meet the Lower Hillsborough River minimum flows. With TAP under consideration, the City quickly reassessed the recovery projects associated with transfer of water from TBC and implemented a cost-saving, more efficient alternative. Instead of building a siphon facility at the dam, the City, with cooperative finding from the District, constructed a low flow control gate with a flow range greater than the planned siphon, for releasing water from the HRR to the base of the dam. The increased flow capacity of the gate will allow release of the total flow needed to meet the minimum flows when flow is available from HRR. In the interim, and in compliance with the rule requirements of the Lower Hillsborough River recovery strategy, the City and the District executed a purchase agreement for the City to take ownership and manage operations of the District's pumps at the TBC. Construction of the low flow gate was completed in July 2018.

Post-construction flow testing was performed by the City's contractor and Table 1 below contains the flow and gate opening information in a table format for various reservoir stage. Figure 4 illustrates the relationship between the gate opening and corresponding flow as a function of reservoir stage.

Table 1. Hillsborough River Reservoir Dam Low Flow Control Gate Flow Rating Table

Gate Opening (%)	Flow (CFS) Reservoir @22.5'	Flow (CFS) Reservoir @22'	Flow (CFS) Reservoir @21'	Flow (CFS) Reservoir @20'	Flow (CFS) Reservoir @19'	Flow (CFS) Reservoir @18'	Flow (CFS) Reservoir @17'	Flow (CFS) Reservoir @16'
0	0	0	0	0	0	0	0	0
10	5.2	5.2	5.0	4.8	4.6	4.4	4.2	4.0
20	10.5	10.3	9.9	9.6	9.2	8.8	8.4	7.9
30	15.6	15.4	14.8	14.3	13.7	13.1	12.5	11.8
40	20.8	20.4	19.7	19.0	18.2	17.4	16.6	15.7
50	25.9	25.5	24.6	23.6	22.7	21.7	20.6	19.5
60	31.0	30.4	29.4	28.3	27.1	25.9	24.6	23.3
70	36.0	35.4	34.1	32.8	31.5	30.1	28.6	27.0
80	41.0	40.3	38.9	37.4	35.8	34.2	32.5	30.7
90	46.0	45.2	43.6	41.9	40.1	38.3	36.3	34.3
100	50.9	50.1	48.2	46.4	44.4	42.3	40.2	37.9

The overall cost of the Hillsborough River Dam Low Flow Control Gate project is $1,869,873.14 and the District's cooperative funding share is $797,732.

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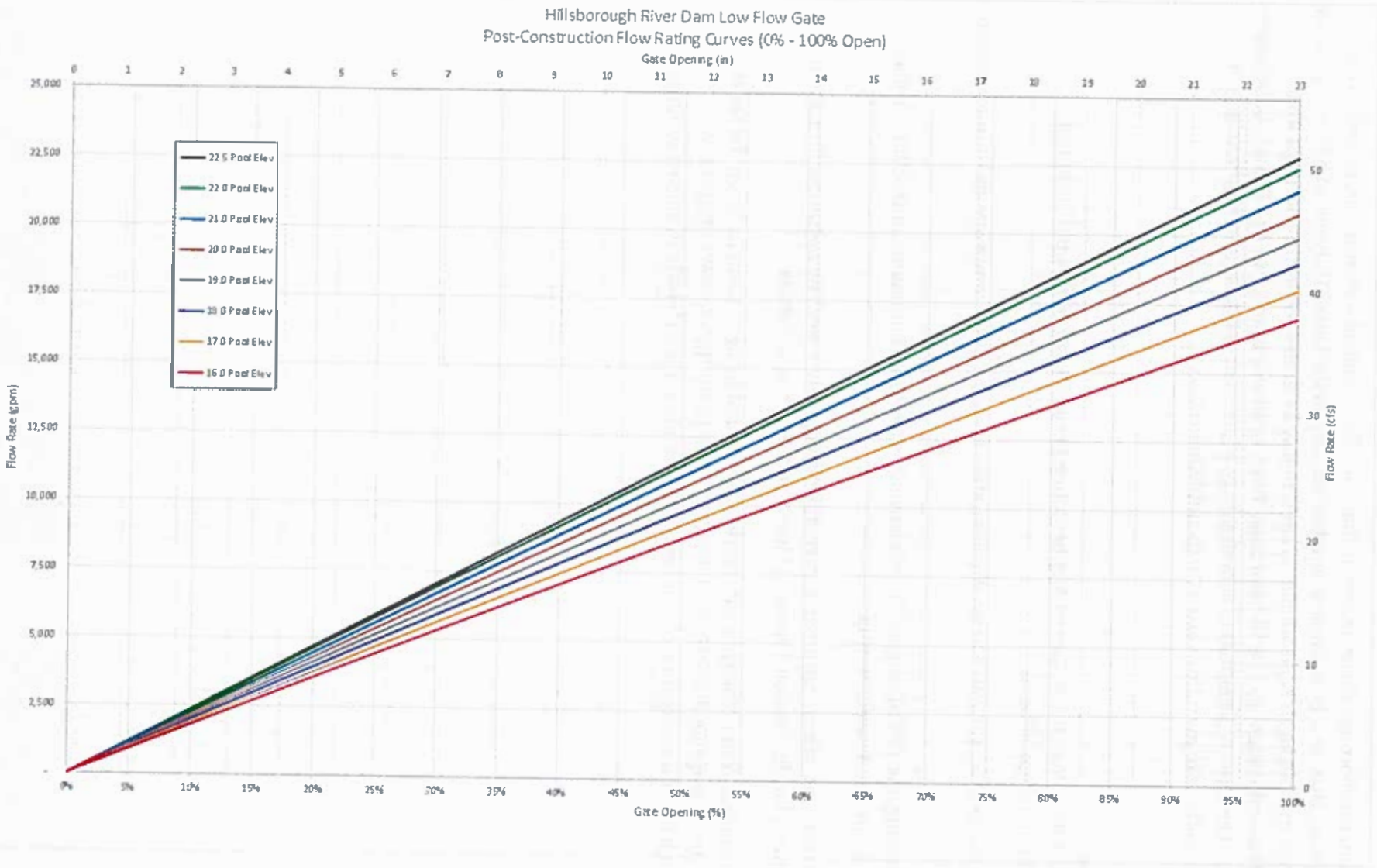

Figure 4. Flow Rating Curves for the Hillsborough River Reservoir Dam Low Flow Control Gate Gannett Fleming, 2018)

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Summary

With TAP and Hillsborough River Reservoir Dam Low Flow Control Gate projects, as well as the original projects that have been implemented as outlined in the Lower Hillsborough River Recovery Strategy, the City believes it is positioned to consistently meet the Lower Hillsborough River minimum flows consistently. The Hillsborough River Reservoir Dam Low Flow Control Gate project is complete. The City is committed to completing an evaluation of the feasibility of TAP and, if feasible, to continue to move forward with its implementation.

References

ASRus, LLC. (2018, March 19). Tampa Augmentation Project Reservoir Model Technical Memorandum. Tampa, Florida

Carollo Engineers, Inc. (2018). Tampa Augmentation Project Phase I summary and Implementation Plan Report

Gannett Fleming, Inc. (2018, August 9). Hillsborough River Dam Minimum Control Gate Project Flow Rating Curves. Tampa, Florida

MHW Americas, Inc. (2011, April 18). Lower Hillsborough River Recovery Strategy Projects Status and Minimum Flow Evaluation Technical Memorandum. Tampa, Florida.

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