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**From:** Benjamin C. Turnage, Project Director, Ardurra

**Date:** May 19, 2022 (Revision #1)

**RE:** Phase 3C – Fruitville Pump Station Hydraulic Design

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## Background

This memo serves as supplemental information to the *Regional Integrated Loop Phase 3C Pipeline: Feasibility and Route Study* completed in March 2022 for the Peace River Manasota Regional Water Supply Authority's (Authority). That study identified the proposed route for the Phase 3C Regional Interconnect and the need for a storage tank and booster pump station near Fruitville Road and Lorraine Road. The purpose of this memorandum is to provide additional details on the proposed location of and design criteria for the pumping station.

The Phase 3C Regional Interconnect project will include the extension of a 42-inch transmission main from the terminus of the Phase 3B transmission main on Clark Road, northwards to the proposed Fruitville Pump Station. From there, the booster pump station (Fruitville Pump Station) will repump water to a connection point with Sarasota County, delivering a proposed maximum day flow of 6 million gallons per day (MGD).

The Phase 3C Extension project will extend a transmission main northward, and possibly westward, to serve Manatee County. In a worst-case scenario (i.e., Lake Manatee Water Treatment Plant (WTP) taken out of service), approximately 20 to 24 MGD could be delivered to Manatee County via the Fruitville Pump Station.

## Storage

Based on a recommended storage volume of 6 to 8 hours during maximum day flow, a buildout storage volume of up to 10 million gallons is recommended. Construction of one 5-million gallon (MG) ground storage tank (GST) during the first phase of the project would provide approximately 20 hours of storage of Sarasota County's initial 6 MGD demand and would allow attenuation of peak and minimum flows. Addition of a second 5-million gallon tank as part of the Phase 3C Extension project would provide the optimum use of available space for tank storage on the target site. As discussed in the *Regional Integrated Loop Phase 3C Pipeline: Water Quality Considerations Technical Memo*, flows to the Sarasota County Lorraine Road point of connection generally maintain an appropriate water age in the pipeline and initial 5-MG storage tank. However, after future extension of the pipeline to Manatee County, additional flows to Manatee County, which would then be returned to Sarasota County through a "water swap" agreement as described in the *Route Study*, may be required to maintain appropriate water age in the two

5-MG tanks and downstream pipeline. A flow to Manatee County of 3 to 5 MGD is recommended (in the Route Study and Water Quality Memo) in order to maintain an optimum water age.

## Hydraulic Conditions

It is currently assumed that the Authority will operate the station as a re-pump system, discharging flows into the tank (with a pressure sustaining valve upstream), and pulling flows from the tank for re-pumping. This operation requires the more conservative pump design, as the pumps will observe a lower head condition on the suction side; the pump design point should be based on the minimum tank level.

All model scenarios indicate that a 75 psi discharge pressure from the new pump station would be adequate to satisfy the minimum flow and pressure requirements (65 psi, contractually) at both the Sarasota and Manatee County downstream delivery points. Based on a re-pump type of operation, a minimum tank level in the 5-MG tanks will be required in order to provide positive pressure on the suction side of the pumps. However, for the purposes of this analysis, the head available in the tank is ignored and the pumps are sized to provide the full **75 psi** pressure boost under each of the flow conditions shown in the table below:

|  | <b>2025 Max Day (MGD)</b> | <b>2040 Max Day (MGD) Normal Conditions</b> | <b>2040 Max Day (MGD) Emergency Conditions</b> |
|--|---------------------------|---|--|
| <b>Sarasota (Fruitville at Lorraine)</b> | 6.0                       | 6.0   | 6.0  |
| <b>Manatee</b>                           | 0.0                       | 1.67 (3 to 5*)                              | 24.17  |
| <b>TOTAL (from Fruitville PS)</b>        | <b>6.0</b>                | <b>7.67 (9 to 12*)</b>                      | <b>30.17</b>                                   |

\* Flow recommended to be maintained at 3 to 5 MGD minimum to maintain water age in the Phase 3C Extension pipeline.

## Pumping Equipment

Based on the similar flows required for the "2025 Max Day" and "2040 Normal Conditions" scenarios, it is recommended to construct the pump station for an initial capacity of **10 MGD**. It is recommended that a minimum of two (2) duty (plus one standby) pumps be installed initially. The final buildout conditions would be met by four duty pumps (plus one standby), while maintaining one or more of the original pumps for minimum flows. Consideration for an additional pump in the construction of the piping assemblies is recommended, in the event the area experiences higher growth than projected.

Pumps will be operated on variable frequency drives (VFDs), and motors should be rated appropriately. In general, variable speed pumps are designed to achieve maximum performance at approximately 90% speed – thus horsepower selections at the next available motor size should be considered. The table below summarizes the recommended typical pumping requirements for each scenario.

|  | <b>Initial Construction</b> | <b>Buildout</b> |
|--|-----------------------------|-----------------|
| <b>Design Flow (MGD)</b>                           | 10.0                        | 30.17           |
| <b>Design Head (ft)</b>                            | 173                         | 173             |
| <b>Total HP<br/>(Hydraulic, 100% Efficiency)</b>   | 306                         | 925             |
| <b>Total Brake HP<br/>(85% Efficiency)</b>         | 360                         | 1090            |
| <b># Duty Pumps<br/>(excluding jockey pumping)</b> | <b>2</b>                    | <b>4</b>        |
| <b>Est. HP, Each Pump</b>                          | <b>200</b>                  | <b>300</b>      |

## Flow Monitoring

An effluent flow meter from the pump station should be included, and an influent meter into the tank may be desirable for additional control. Flows at final buildout will require a 30" or 36" flow meter (based on final pump selections and capacities), but prior to extension of the Phase 3C Extension to Manatee County, it would be recommended to downsize the flow meters to 16" diameter to achieve more accurate readings.