

Lake City Recharge Wetland Expansion

The City of Lake City has demonstrated their commitment to improving water quality and increasing recharge in the Ichetucknee Springshed with development and operation of the Ichetucknee Springs Water Quality Improvement Project (ISWQIP). The ISWQIP project, constructed in 2015-16, has provided nitrogen reduction and enhanced recharge for more than a billion gallons of effluent since the project became operational in 2017. During this period the project has reduced total nitrogen concentrations in the City's treated wastewater from 6.9 mg/L to an average of 1.9 mg/L in recharged water. Nitrate-nitrite (NO_x-N) concentrations in this infiltrated water were reduced to an average of 0.29 mg/L in the infiltrated water, lower than the springs numeric nutrient criteria for NO_x-N of 0.35 mg/L.

This project proposes to expand groundwater recharge treatment wetlands as a part of Lake City's wastewater disposal through the conversion of a third Lake City sprayfield, the "South" field. This conversion will provide improved quality in water recharged to the Upper Floridan Aquifer (UFA) and will increase recharge when compared to current recharge on the sprayfield. This conversion is expected to replace the existing sprayfield and will include a multi-cell wetland that receives water from the existing sprayfield facilities and provides enhanced treatment and recharge to the UFA. Benefits of this conversion will accrue to the Ichetucknee Priority Focus Area and are expected to increase recharge volumes by reducing evapotranspiration while improving water quality in infiltrated water. This project will eliminate the City's third and final sprayfield allowing for all wastewater treated by the City to be polished and recharged through groundwater recharge wetlands.

This project proposes to direct an average flow of 1.6 MGD to a multi-cell groundwater recharge wetland designed on the footprint of the existing South sprayfield. Treated effluent entering the wetland will have water treated to achieve a TN of less than 3 mg/L in the wetland's first two cells. These cells will be lined with onsite clayey soils to reduce infiltration. This will allow for the water to achieve the advanced wastewater treatment standard of 3 mg/L for TN prior to water being recharged in higher infiltration cells. This project is being engineered to increase the disposal capacity of this field by approximately 50% or more through the combination of ponding water within the wetland and enhancing recharge through soil modification. Historical discharge to this field was approximately 1.0 MGD.

The City's wastewater facilities (St. Margarets [FLA113956] and Kicklighter [FLA758353]) currently have a combined permitted capacity of 5.95 MGD with 3.0 MGD of available disposal capacity on the existing sprayfields and groundwater recharge wetland. While the initial ISWQIP has increased disposal capacity on the wetland area, there remains the need to increase disposal to provide capacity for the permitted flow rates of both existing wastewater facilities. The need for this capacity is also being accelerated by extensive development occurring within and around Lake City. Conversion of the third City sprayfield will further enhance the City's disposal capacity while reducing nitrogen loading to the Ichetucknee PFA.

Water quality benefits of this project were estimated based on bypassing the reservoir, a project is currently underway to convert the wetland to gravity flow and that project is expected to be complete before this project would begin. The incoming total nitrogen concentration was estimated to be 9.8 mg/L based on flow-weighted average concentrations from the St. Margarets and Kicklighter facilities. Based on an inflow rate of 1.6 MGD, the estimated inflow total nitrogen load is about 47,700 lbs/yr. Wetland process modeling estimated that the concentration in water infiltrated from the project will average less than 1.5 mg/L, an 85% reduction. This concentration reflects the spatially averaged surface

water concentration prior to infiltration and results in the removal of approximately 40,400 lbs /yr of nitrogen. Infiltration through the carbon rich, anaerobic sediments is expected to further reduce nitrogen concentrations before the water mixes with native groundwater. For Fiscal Year 2023 applications, the FDEP has provided a spreadsheet tool (LCRWSouth_TN calc and cost eff Rev1.xlsx) for calculating nitrogen reduction which has been used to estimate the cost-effectiveness for this project over a 30-year period. The FDEP spreadsheet does not have the flexibility needed to accurately compare the proposed recharge wetland project to the baseline condition. The FDEP spreadsheet estimated load reduction for this project is 12,895 lbs/yr. When combined with the estimated project cost (\$11.3 million), the 30-yr estimated unit cost for nitrogen removal is \$29.21 per pound.