**City of Palm Coast Dynamic Reinvestment in Piping Systems (DRiPS) for Wastewater Energy Efficiency and Climate Resiliency Project Technical Appendix**

**High Level Overview:** To measure how the GHG reduction measures from the activities from the City of Palm Coast DRiPS programs, a technical spreadsheet was created to estimate the reduction quantity for the three implementation measures. It is estimated to reduce Greenhouse Gas (GHG) emissions of 399 MTCO2e by 2030 and 1,571 MTCO2e by 2050.

Information regarding rainfall exceeding 1 inch in the year 2023 within the City of Palm Coast was sourced from the National Oceanic and Atmospheric Administration (NOAA) database. Additionally, data pertaining to a specific rainfall event surpassing 1 inch and the average energy consumption in kilowatt-hours (KWH) emitted from the affected pump stations were acquired from the Palm Coast Wastewater Department. Emissions reductions were estimated using the FRCC CO2e assessment from NREL and were adjusted every two years out to 2050 based on the predictions in this source.

* **Pump Station Energy Reductions**

To determine the greenhouse gas (GHG) reduction potential for twelve pump stations, including PS 39-1 and PS 57-4 and ten other affected stations (CP-1, 19-1, 20-1, 20-2, 32-2, 24-2, OKR Master, 57-1, 57-2, and 57-3), a systematic approach was implemented. The aim was to evaluate the impact of lining existing clay sanitary pipes on reducing energy consumption caused by stormwater and groundwater intrusions, thereby minimizing the operational runtime of pumps to avoid overworking and overloading. For comparison, the analysis included PS 22-2 and MPS-B, recently installed pumps utilizing PVC pipes, serving as benchmarks due to minimal groundwater intrusion. By assessing annual spike energy usage and comparing it with average yearly consumption, along with determining the percentage increase during spike events compared to daily averages, insights were gained into performance variations among the three pumps. PS 39-1 and PS 57-4 were the target pumps, while PS 22-2 and MPS-B acted as comparison pumps with newly lined infrastructure. The calculated percent reduction range had an upper limit of 25%. To establish the lower limit, daily average energy usage during wetter months, notably spike events, was contrasted with that during drier months, with the difference yielding the lower limit set at 10%. Incorporating a conservative approach, wherein a more cautious range of 5%-12% was applied to the remaining affected pumps, ensured a careful estimation of potential energy reduction across all stations. This approach allowed for a balanced assessment of GHG reduction potential, taking into account the variations in infrastructure and environmental conditions among the pump stations. Subsequently, energy reduction within the calculated ranges was applied to all affected pump stations, with appropriate CO2e emission rates assigned to projections for GHG reduction by 2030 and 2050.

* **Tank Trucks Reductions**

To calculate the total CO2 emissions resulting from diesel fuel consumption during big storm events, first, determine the total gallons of diesel fuel used per year based on the number of trucks deployed, their operational hours, and fuel consumption rates. Then, apply the EPA-provided conversion factor of 10,180 grams of CO2 per gallon of diesel, which is equivalent to 10.180 × 10^-3 metric tons of CO2 per gallon of diesel, to convert the total gallons of diesel fuel to metric tons of CO2 emissions. This conversion equation, Total CO2 Emissions (metric tons) = Total Gallons of Diesel × 10.180 × 10^-3, allows for an accurate estimation of the environmental impact of truck operations. To quantify the CO2 emissions specifically within the targeted areas served by PS 39-1 and 57-4, we recognized the necessity of isolating the impact within the specific geographical bounds of pump 39-1 and 57-4's service areas. Through the analysis of land area ratios, we determined that this targeted area represents approximately 10 % of the total land area affected by storm events. Consequently, we applied this ratio to the calculated total CO2 emissions attributable to fuel consumption by tank trucks during big storm events. Appropriate CO2e emission rates assigned to projections for GHG reduction by 2030 and 2050.