# TECHNICAL MEMORANDUM

## Site Hydraulic Study Plan

**TO:** Kristen Sealey, PE; Gainesville Regional Utilities

**FROM:** Wharton Smith Design Build Team (DB Team):
Alan Foley, PE, and John Horvath, PE; Jones Edmunds
Michelle Hays, MS, PG; Liquid Solutions Group
Amy Goodden, PE, ENV SP; Wetland Solutions, Inc.

**DATE:** October 27, 2023

**SUBJECT:** GRU Southwest Nature Park
Jones Edmunds Project No. 23620-008-01

# 1 PROJECT SUMMARY

Gainesville Regional Utilities (GRU) Water/Wastewater Engineering is planning to create a groundwater recharge wetland that will receive approximately 3 million gallons per day (MGD) of reclaimed water (RCW) from the GRU Kanapaha Water Reclamation Facility (KWRF). Future phases of the project will increase the recharge capacity of the site up to 5 MGD.

GRU is working with Alachua County Parks and Open Space to develop a passive recreation public access park that will integrate with the constructed recharge wetland facilities and serve as an amenity for the community. Alachua County Parks and Open Space will manage public access to the site.

The project site is in southwest Alachua County in Section 14, Township 10 South, Range 18 East. The site is within the Basin Management Action Plan (BMAP) for the Santa Fe River and is approximately 17 miles southeast of the Santa Fe River. The Florida Department of Environmental Protection developed the BMAP to address dissolved oxygen (DO) and nutrient impairment of the Lower Santa Fe River from River Rise westward to the Suwannee River.

The GRU purpose of the groundwater recharge park is to increase GRU's ability to beneficially reuse water from the KWRF and to recharge the aquifer. More specifically, the project objectives are to:

1) Construct a wetland system that will use natural wetland processes to further reduce nutrients in GRUs' high-quality, public-access RCW while simultaneously recharging groundwater.

2) Percolate approximately 3 MGD of RCW through the naturally sandy soils beneath the

constructed wetlands. The water will recharge the Upper Floridan Aquifer (UFA) and flow generally toward the springs along the Santa Fe and Ichetucknee Rivers, helping to restore flow to the rivers and their springs.

# 2 BACKGROUND

In December 2020, the Board of County Commissioners of Alachua County (BOCC) provided a special exception (Resolution Z-20-10) to allow a groundwater recharge park on 76.22 acres at 3602 SW 122nd Street on parcels 04433-000-000 and 04433-003-000. In 2022, the parcels were renumbered; the City of Gainesville's parcels are now 04433-000-000 and 04433-003-001. GRU contracted with the Wharton-Smith/Jones Edmunds Design Build Team (DB Team) to design, permit, and construct the wetland using a progressive design build project delivery approach.

Figure 1 is a site map that shows the site location. The site was surveyed by CHW on February 19, 2020. Land use near the project area includes residential (zoned agricultural) to the north, Parker Road and low-density residential areas to the east, Diamond Sports Park (zoned agricultural) to the south, and upland pasture (zoned agricultural) to the west.

**Figure 1 Site Location Map**

In preparation for the special exception, GSE completed a sinkhole susceptibility study and near surface geotechnical exploration of the site in July 2020. GSE completed 26 standard penetration test borings and 30 auger borings at the site. The borings generally encountered sands, sand with clay/silt, and silty sand in the upper 1.5 to 58.5 feet. The sandy layer was underlain by clayey to very clayey sand and interbedded clay-rich soils that overly limestone. The upper limestone surface was encountered at depths ranging from ground surface up to 93 feet below land surface (bls).

The ground surface at the site ranges between 74 to 89 feet National Geodetic Vertical Datum (NGVD). The UFA potentiometric surface is approximately 40 to 50 feet NGVD and is generally unconfined in the area. The depth-to-water at the site was measured between 30 to 40 feet bls. Shallower perched groundwater levels were measured at a couple of the soil boring locations; however, perched conditions are localized, and a continuous surficial aquifer does not exist at the site.

The soil boring and water-level data collected from the site were used to estimate the infiltration capacity at the site. However, the DB Team recommends conducting a hydraulic study at the site to determine the site-specific infiltration rates to better define the design parameters. This Technical Memorandum details the Study Plan for the proposed hydraulic load test.

# 3 SUMMARY OF PREVIOUS GEOTECHNICAL STUDY

The preliminary geotechnical investigation included:

- 9,930 linear feet (LF) of electrical resistivity imaging (ERI).
- Ground penetrating radar.
- Twenty standard penetration test borings.
- Thirty auger borings to obtain site-specific soil information.
- Six piezometers to monitor site water levels.
- Percent fines, grain-size analysis, natural moisture content, and vertical permeability testing on 30 samples.

# 4 HYDRAULIC LOAD STUDY

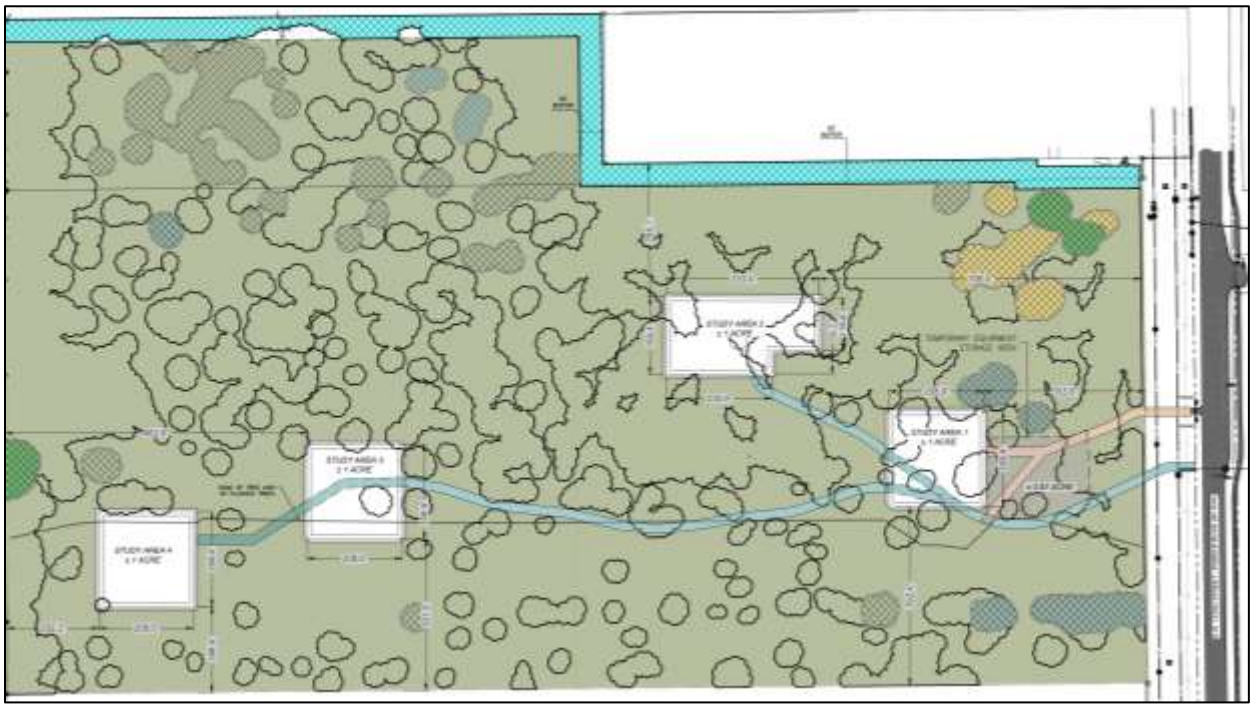
The hydraulic study will improve the estimates of percolation/infiltration rates for the site. Data collected during the study will be used to develop the wetland water balance, determine percolation rates, and evaluate the study area response. The percolation rates will be calculated using a daily water balance with the percolation calculated as the difference between the change in storage, rainfall, inflow, and estimated evapotranspiration.

## SITE PREPARATION

The proposed hydraulic study plan for the site includes up to four study areas – or cells – with an area of approximately 1 acre each. Figure 2 shows the proposed study areas and temporary piping locations. The study area locations were selected based on the data from

the geotechnical study described above to capture the range of subsurface conditions at the site. Locations were also selected to avoid heritage trees, gopher tortoise burrows, and achieve prescribed setbacks. The intent is to perform load tests at two study areas with the other two serving as backup in case results indicate that additional data are needed. Hydraulic loading will occur in one study area at a time.

**Figure 2 Proposed Study Areas and Temporary Piping Locations**



The study area will be cleared and grubbed before excavation to remove the topsoil and vegetation. The study areas will be constructed by excavating to an average depth of 2 to 3 feet. Excess material will be placed to form a low berm around the outside perimeter of the cell. The berm will provide freeboard for the study areas to accommodate rainfall events.

The DB Team plans to install the following equipment for the hydraulic load test:

- Two 2-inch-diameter monitoring wells installed next to each study area. One well will be installed into the Floridan aquifer to monitor mounding of the existing water table. A second well will be installed above the uppermost clay layer (if present) to monitor perched water-table conditions.
- One staff gauge installed in each cell.
- Pressure transducers installed in each monitor well and at the staff gauge location to continuously monitor water levels during testing.
- Temporary aboveground potable water piping, 10 to 18 inches, to feed the study area.
- A geotextile and riprap to minimize erosion at the water inlet.
- A flow meter.
- A solenoid valve.
- A rain gauge.

## WATER SOURCE

The hydraulic load study will use potable water from GRU's drinking water system. An 8-inch potable water line owned by GRU runs east-west along the north side of Terwilliger Elementary, with a hydrant at the corner near Parker Road. Temporary piping will be attached to the potable water line at this fire hydrant. Flexible hosing will be routed through an Alachua County-owned, 24-inch stormwater culvert under Parker Road (see Figure 3). The temporary piping will include quick connects on either side of the road so that personnel from the project team can disconnect and remove the pipe before a predicted storm event or in response to unforeseen conditions.

**Figure 3 Stormwater Culvert Under Parker Road**

## PHASE I: STEADY STATE

The goal of the first phase of the hydraulic load study is to achieve steady-state conditions and determine percolation rates that can be expected during normal operation. The study areas will be loaded with potable water with the intent to maintain the water depth between 8 to 12 inches.

Approximately 2 to 4 weeks of water loading are expected at each cell to develop a groundwater mound below the study area and achieve consistent percolation rates. Data will be collected in a test log (Attachment A) to develop a daily water balance for a minimum of 2 weeks of operation and will continue until percolation rates become steady. Once the system reaches steady-state conditions and has consistent percolation rates, the hydraulic load test will move into Phase II. If the system requires additional time to achieve steady-state conditions, data will be compiled weekly to evaluate the daily water balance until the percolation rates become consistent.

## PHASE II: STRESS TEST

After achieving steady-state conditions, the GRU project team will conduct a stress test on the study area to evaluate its response to additional loading and head. This test will help determine how the study area will respond during large storm events. The study area will be loaded with potable water to an average depth of approximately 2 feet for 7 days. A water balance will be performed to determine the percolation rates with the increased head condition. If the study area cannot be filled to an average depth of 2 feet due to high percolation rates, the study area will be loaded for 7 days with as much potable water as the system can deliver. The percolation rates will be calculated using a water balance as described above. The information obtained during the stress test will be used in a hydraulic model to simulate the design-storm events.

Additionally, if a significant storm event occurs during the hydraulic load testing, GRU can use the data collected during the event to evaluate the response of the study area and calculate percolation rates. This information will be used to support the hydraulic load test and design calculations.

## SINKHOLE RESPONSE PLAN

Based on GRU's experience operating RCW aesthetic water features since the 1990s, sinkholes may occur during the load test, particularly after the initial loading of the study area. Any sinkholes that form will be repaired using GRU's sinkhole response plan procedures (Attachment B). These procedures have been used successfully at GRU's infiltrating wetland systems since they were constructed in 2008 and 2009. As shown in the response plan, if a sinkhole or other karstic feature appears or is discovered in the pond at any time, before or after construction, remediation will be performed as follows:

- In the case of a shallow cavity, 5 feet or less in depth, the repair will be made by back-filling with clean sand with a permeability rate of 10 feet per day.
- In the case of a deep sinkhole or chimney, the fractured limestone will be excavated to bedrock and then plugged with large chunks of clean limestone, chert, broken concrete, or other similar material, followed by Florida Department of Transportation (FDOT) No. 57 stone up to the surface of the bedrock. The remainder of the cavity will be lined with a porous, non-woven geotextile and then backfilled with clean sand with permeability rate of 10 feet per day.

## ENVIRONMENTAL IMPACT AVOIDANCE AND MINIMIZATION

In 2020, as part of the Special Exception process, GRU contracted with CHW and Ecosystem Research Corporation to prepare an Environmental Resource Assessment of the property. The DB Team used their report and our own observations as the basis for the design of the study areas and temporary piping route, and our avoidance and minimization strategy.

## VEGETATION MANAGEMENT

The Alachua County Arborist visited the site in August 2023 and provided additional information regarding trees that must be protected – shown on the Preliminary

Development Plan as hatched areas. The DB Team designed the study areas and the proposed construction access to avoid the protected trees.

The results of the hydraulic study will determine the design configuration of future facilities on the project site. The study areas included in this study are expected to become portions of the constructed wetland facilities as part of the future design. A complete planting and management plan will be developed as part of that design and included in future permit applications.

For this study phase we propose temporary vegetation establishment, where necessary, with approved seed sources for land cover such as brown-topped millet.

## GOPHER TORTOISES

The DB Team used the *2020 Gopher Tortoise Survey* to design the study areas and the proposed access road to avoid the identified burrows, which will be surrounded by a 25-foot buffer.

The Florida Fish and Wildlife Conservation Commission (FWC) requires that the gopher tortoise survey be updated no sooner than 90 days and no later than 72 hours before construction. This timeline overlaps with the Alachua Development and Review process. The DB Team will update the gopher tortoise survey before construction begins and may adjust the proposed layout in accordance with the following hierarchy:

- Trees identified by the Arborist may not be removed.
- The buffer shown on the Preliminary Site Plan may not be reduced.
- Gopher tortoises will be avoided during this testing phase.

Additionally, the following measures, as recommended by FWC, will be taken during construction to minimize secondary impacts to gopher tortoises:

- The outer perimeter of the construction area will be fenced with silt fence trench 8-inches deep and a minimum of 24-inches high. This is to prevent tortoises from burrowing under the fence or climbing over the fence and entering the construction area.
- The construction site entrance will be gated at night and during periods of inactivity with a gate that includes a fabric barrier extending to the ground.
- The construction team will be informed through signage regarding the procedure for notifying the on-call Gopher Tortoise Agent if a tortoise enters the construction area.

# Attachment A

# Test Log

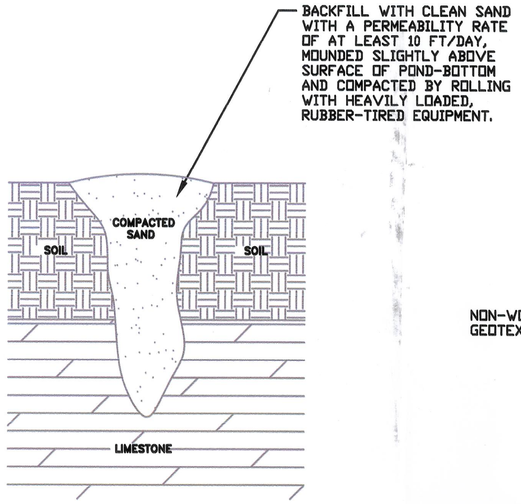
# LOAD TEST TESTING LOG

| Date | Time | Flow Meter Reading (gallons) | Flow Rate (gpm) | Cell Receiving Flow | Cell 1 Staff Gage (ft) | Cell 2 Staff Gage (ft) | Rainfall (cumulative inches/day) | Additional Notes |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

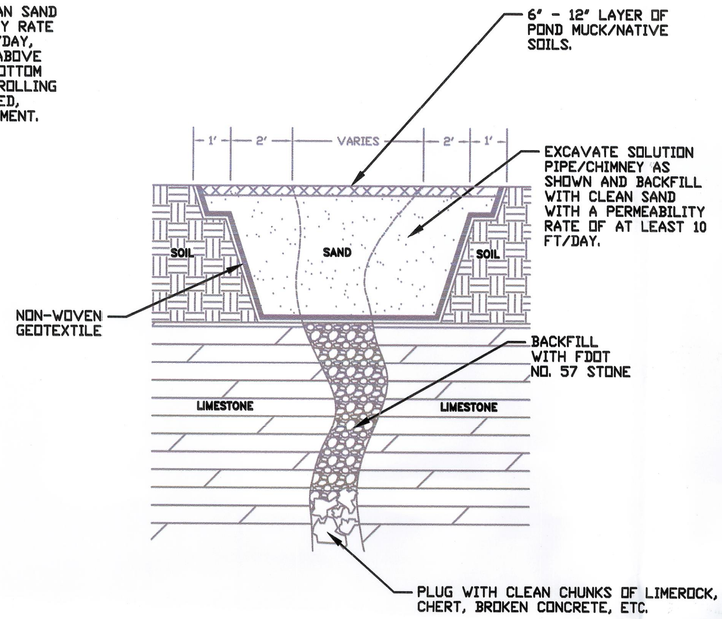
# Attachment B

# Sinkhole Response Plan

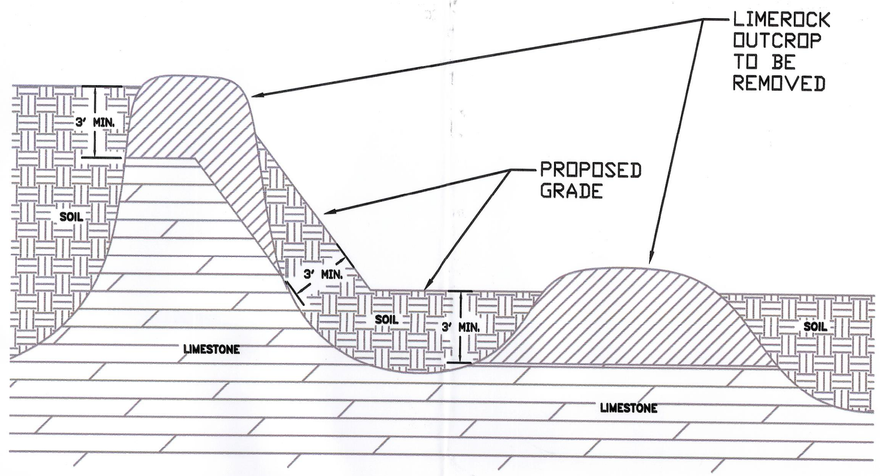
SHALLOW SINKHOLE/CAVITY REPAIR




DEEP SINKHOLE/CAVITY REPAIR




LIMEROCK OUTCROP REPAIR




## SHALLOW AND DEEP SINKHOLE/CAVITY REPAIR DETAILS

NOTES:

IF AT ANY TIME, BEFORE, DURING, OR AFTER CONSTRUCTION, A SINKHOLE, CAVITY, OR OTHER KARSTIC FEATURE IS DISCOVERED, REMEDIATION SHALL BE PERFORMED AS FOLLOWS (AFTER CONSULTING WITH THE WATER/WASTEWATER ENGINEERING DEPARTMENT):

1. IN THE CASE OF A SHALLOW CAVITY, 5' OR LESS IN DEPTH, REPAIR BY BACK-FILLING WITH CLEAN SAND WITH A PERMEABILITY RATE OF 10 FT/DAY. ROLL WITH HEAVILY LOADED, RUBBER-TIRED EQUIPMENT.

2. IN THE CASE OF A DEEP SINKHOLE OR CHIMNEY, FIRST EXCAVATE TO THE LIMESTONE BEDROCK, AS SHOWN ABOVE, THEN PLUG WITH LARGE CHUNKS OF CLEAN LIMESTONE, CHERT, BROKEN CONCRETE, OR OTHER SIMILAR MATERIAL, FOLLOWED BY FDOT NO. 57 STONE UP TO THE SURFACE OF THE BEDROCK. THE REMAINDER OF THE CAVITY SHALL BE LINED WITH A POROUS, NON-WOVEN GEOTEXTILE (MINIMUM TENSILE STRENGTH OF 160 LB/IN, MINIMUM PERMEABILITY OF 15,000 FT/DAY), THEN BACKFILLED AS DESCRIBED ABOVE FOR SHALLOW CAVITIES.

## LIMEROCK OUTCROP REPAIR

NOTES:

IF A LIMEROCK OUTCROP IS ENCOUNTERED DURING CONSTRUCTION, THE FOLLOWING STEPS SHALL BE TAKEN:

1. EXCAVATE THE LIMEROCK OUTCROP TO AN ELEVATION AT LEAST 3' BELOW THE PROPOSED GRADE.

2. BACKFILL THE EXCAVATED AREA WITH CLAYEY-SAND OR SANDY-CLAY (AASHTO SOIL GROUP - A2).

3. BACKFILL IN 6" LIFTS, ROLLING EACH LIFT WHITH HEAVILY LOADED, RUBBER-TIRED EQUIPMENT.

APPROVED
By: _____
Date: 8/20/15
ALACHUA COUNTY PUBLIC WORKS DEPT.

8/19/15

| | | | |
|---|---|---|---|
| SHEET 1 OF 1<br>AUTOCAD FILENAME<br>DATE 8/10/15 | W:\U0240\IngramRD\KMS INFILTRATING WETLANDS\SINKHOLE REPAIR.dwg<br>PLANS BY RUSS INGRAM | SINKHOLE & OUTCROP REPAIR DETAILS | WATER/WASTEWATER ENGINEERING DEPARTMENT<br>GAINESVILLE REGIONAL UTILITIES<br>PO BOX 147117<br>GAINESVILLE, FL 32614-7117 |

GRU More than Energy℠