USGS National Ground Water Monitoring Network Final Technical Report -
St. Johns River Water Management District

Cover Page

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2. Agency Name: St Johns River Water Management District

3. Project Title: St. Johns River Water Management District
   New Data Provider to NGWMN

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6. End Date: July 14, 2022

7. Date of Final Report October 14, 2022

Project Accomplishments

The proposed and awarded Budget Year 1 (July 15, 2020 – July 14, 2021) work plan consisted solely of Objective 1 – Support to become a new data provider. 50 Sites were selected for the NGWMN; those sites were classified into Subnetworks and Monitoring categories. All the required elements were provided for the selected sites. Gaps in the Lithology and Construction portions of the data elements were identified. The NGWMN Well Registry was populated with site and network information. Agency databases were connected to the NGWMN Portal using web services. Data collection and data management protocols were documented and compiled. The Progress Report was submitted in May 2021.

Budget Year 2 (July 15, 2021 – July 14, 2022) consisted of Objective 2, Part A - Become a Data Provider and Support Persistent Data Services. The list of sites in NGWMN Well Registry has been kept up to date. One new site that replaced an inactivated site was classified according to Subnetwork and Monitoring Categories. The data elements for the new site were populated in agency databases and the NGWMN Well Registry. Site information on the existing sites has been kept updated in the Well Registry as new data became available. Web services connections to the NGWMN Portal have been maintained. Updates to web services were not necessary as there were no new elements required. NGWMN Data Portal Provider pages were reviewed and updated as needed. This Final Technical Report documenting persistent data service activities for this project is submitted here to document the completion of all proposed activities for this two-year grant proposal.

Detailed Description of work accomplished under each objective.

1. **Objective 1: Support to become a new data provider**

a. Select sites for the NGWMN:
   Fifty wells were selected based on their period of record, overall quality of data, and geographic separation from one another. The NGWMN Framework document, the Well Selection Criteria for Water Levels tip sheet, and the Minimum Data Requirements tip sheet were used as guidance during this process. A map of these selected wells appears in Appendix A, Figure 1.

b. Classify sites into Subnetworks and Monitoring Categories:
   Sites were classified as described in the NGWMN Framework document and Defining the Subnetwork and Defining Monitoring Categories tip sheets.

c. Provide required data elements for selected sites:
   Data elements were gathered in the Well Registry and through web services as described in the Minimum Data Requirements tip sheet. Some additional work was required to populate the “altitude” fields for sites, since SJRWMD collects and stores water level data in reference to sea level (NAVD88 datum) using discrete identifiable measuring points on wells as vertical reference points.

d. Identify any gaps in required data elements for selected sites:
   Some gaps in required data elements were discovered during the site classification and well registry population phases for some sites. Such gaps were in the Lithology and Construction portions of the data.

e. Populate the NGWMN Well Registry with site and network information:
   All fields were populated via the NGWMN template spreadsheet batch uploader and according to the Populating the Well Registry tip sheet.
f. Connect agency databases to the NGWMN Portal using web services:
   Applicable web services that have been developed include water level data, well construction data, and lithology data. Web services were set up according to the Web Service Development tip sheet. Prior to this project, SJRWMD was already utilizing a hydrologic database, Hydstra, that allowed for optional components to be added to allow the database to function as a web service. An additional copy of Hydstra was set up on another server to be available outside the SJRWMD firewall. Water level data are programmed to be instantaneously copied from the production Hydstra database to the new server whenever data files are modified or saved. This ensures that the data available to the NGWMN are as current as the production database. The crosswalk procedures with the NGWMN have been completed.
g. Document data collection and data management protocols:
   Current protocols regarding data collection, data processing, data QA/QC, and data management were assembled and updated so that NGWMN users can understand the quality of the SJRWMD's data. The assembled protocols are included below in Appendix B and Appendix C.
h. Prepare progress report:
   The progress report was submitted May 2021**.**

2. Objective 2, Part A - Become Data Provider, Support Persistent Data Services (Year 2)

a. Keep the list of sites in NGWMN Well Registry up to date:
   All 50 sites in the NGWMN Well Registry are checked quarterly to ensure the list is up to date. When one well within the network was inactivated and abandoned, a replacement was identified and added to the Well Registry.
b. Classify any new sites according to Subnetwork and Monitoring Categories:
   One new site has been classified according to Subnetwork and Monitoring Categories. A new well IR1195 in Fort Drum in Indian River County is a replacement for well OK0001 in Fort Drum in Okeechobee County.
c. Populate data elements for any new sites in agency databases and the NGWMN Well Registry:
   All data elements for the replacement site in Indian River County have been populated. The new site has been checked on the website and is displaying properly.
d. Keep site information on existing sites updated in the Well Registry as new data becomes available:
   All 50 existing sites, including the replacement site, have the same site information as when first entered in the Well Registry.
e. Maintain web services connections to the NGWMN Portal:
   As part of purchasing the Kisters web services module for Hydstra to become a data provider (Objective 1), an annual maintenance fee of $2,600 was purchased during this year to maintain this service.

f. Update web services to serve any new required elements:
   There have been no new required elements and therefore no web services updates.
g. Review NGWMN Data Portal Data Provider pages for your agency and provide updates to the NGWMN, as needed:
   The Data Portal pages were reviewed on a monthly basis. When occasional connectivity problems were found, they were addressed and resolved with USGS NGWMN personnel.
h. Prepare final report: Document persistent data services activities in final report for the project:
   The intent of this document is to complete this item.

B. New Data Providers Information:

a. Description of existing water-level and/or water-quality networks including the objectives of the networks

The hydrologic data collection program of the SJRWMD collects, processes, manages and disseminates hydrologic and meteorological data that are used for consumptive use permitting, water shortage management, establishment of minimum flows and levels, water supply planning and management, environmental protection and restoration projects, and operation of district flood control facilities. The program is staffed and managed by the Bureau of Water Resource Information.

The bureau operates and maintains 1,200 hydrologic monitoring stations throughout the district and processes data from approximately 200 additional sites collected by federal agencies, other districts and local governments, or by the U.S. Geological Survey under contract to the district. More than 16 million measurements are collected, verified, processed, and stored each year. These data are disseminated to district staff and are made available on the SJRWMD website.

Of these hydrologic monitoring stations, 752 currently monitor groundwater levels within the primary aquifers listed above. A map of these stations characterized into the three USGS principal aquifers is shown in Appendix A, Figure 2.

b. Description of site selection criteria and process

Not all the 752 active sites the SJRWMD maintains were selected for inclusion into the network. Wells that monitor the Floridan aquifer system, of which there are 401, were the center of focus due to the higher use and attention of this aquifer, appear in Appendix A, Figure 3. Of these wells, six were too new to have an archived (undergone quality control) period of record. From these remaining 395 wells, 50 were selected based on their period of record, overall quality of data, and geographic separation from one another. A map of these wells appears in Appendix A, Figure 1. The NGWMN Framework document, the Well Selection Criteria for Water Levels tip sheet, and the Minimum Data Requirements tip sheet were used as guidance during this process. A map of the 50 wells selected for this grant, including one additional well that replaced a well that was abandoned and inactivated, appear in Appendix A, Figure 4.

c. Description of process used to assign Subnetworks and Monitoring Categories for both water-level and water-quality networks (as appropriate for your Network)

Sites were classified as described in the NGWMN Framework document and Defining the Subnetwork and Defining Monitoring Categories tip sheets.

d. Description or link to Field techniques for water-level measurement.

The assembled list is included below in Appendix B.

e. Description of data management procedures in place. Describe data quality and Quality assurance processes.

The assembled list is included below in Appendix C.

f. List of minimum data elements and how they are provided to the Data Portal (via the Well Registry or web services).

Data elements were gathered in the Well Registry and through web services as described in the Minimum Data Requirements tip sheet. All fields were populated via the NGWMN template spreadsheet batch uploader and according to the Populating the Well Registry tip sheet. Web services were also developed to share well construction and well lithology data elements.

g. Notes on any sites that have missing required data elements.

Some gaps in required data elements were discovered during the site classification and well registry population phases for some sites. Such gaps were in the Lithology and Construction portions of the data. Although some sites contained all the required data elements, some sites were missing elements such as well casing and borehole information or lithologic descriptions. Internal discussions about how to address such missing information have begun.

h. Note any sites that do not meet requirements in Table 4.5.1.1 and/or 4.5.2.1 of the Framework Document.

All sites currently have continuous monitoring equipment that collects hourly water level measurements, so all requirements have been met.

i. A description of the web services used or installed for this project.

Applicable web services that have been developed include water level data, well construction data, and lithology data. Web services were set up according to the Web Service Development tip sheet. Prior to this project, SJRWMD was already utilizing a hydrologic database, Hydstra, that allowed for optional components to be added to allow the database to function as a web service. An additional copy of Hydstra was set up on another server to be available outside the SJRWMD firewall. Water level data are programmed to be instantaneously copied from the production Hydstra database to the new server whenever data files are modified or saved. This ensures that the data available to the NGWMN are as current as the production database.

j. Describe any work done under Objectives 2 or 3 as part of the initial project.

Work done under Objective 2 has been described above, in the detailed description of work accomplished under each objective. Objective 3 was not pursued during this two-year grant period.

Appendix A: Figures

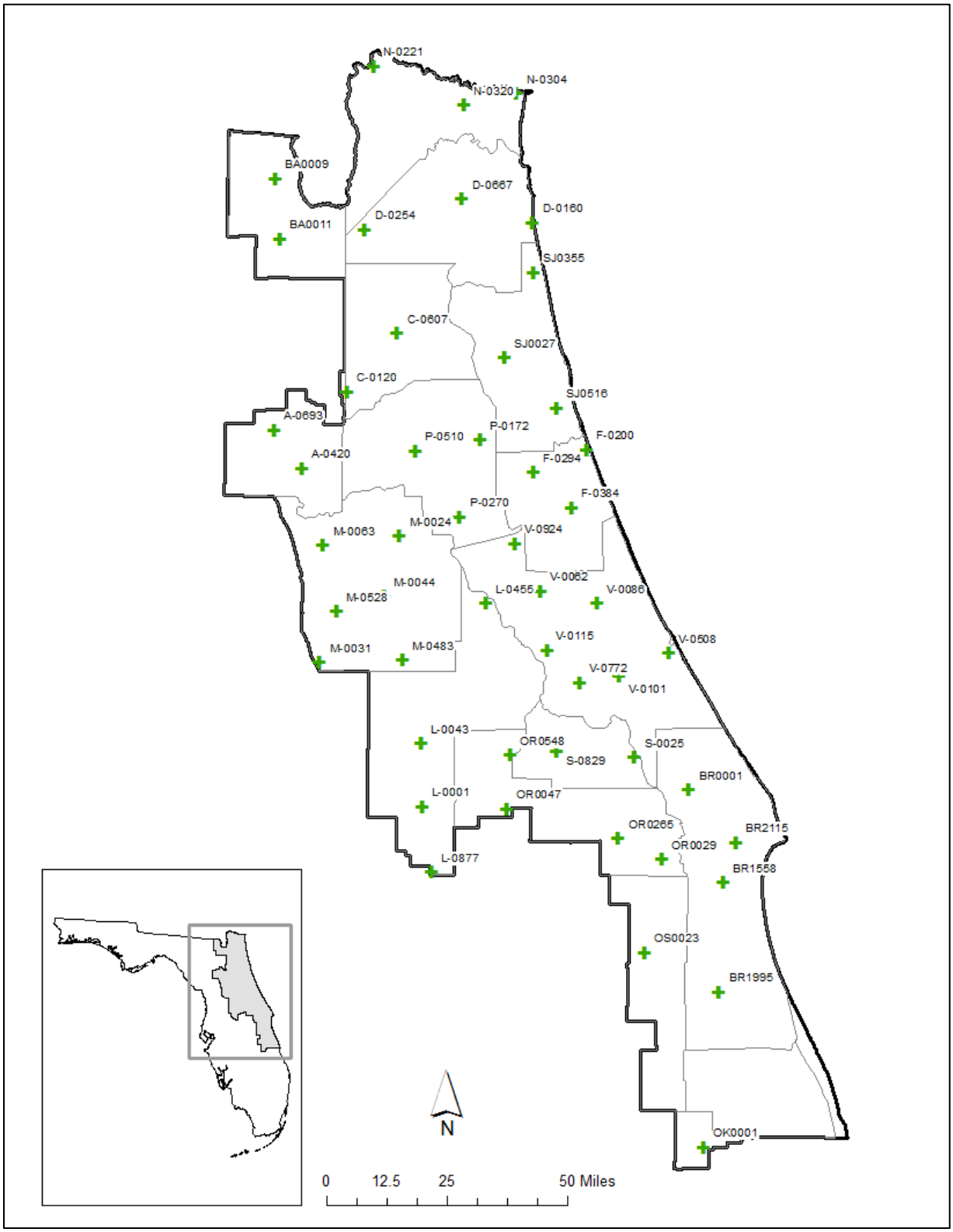

Figure 1: Map of the original 50 selected wells included in this grant

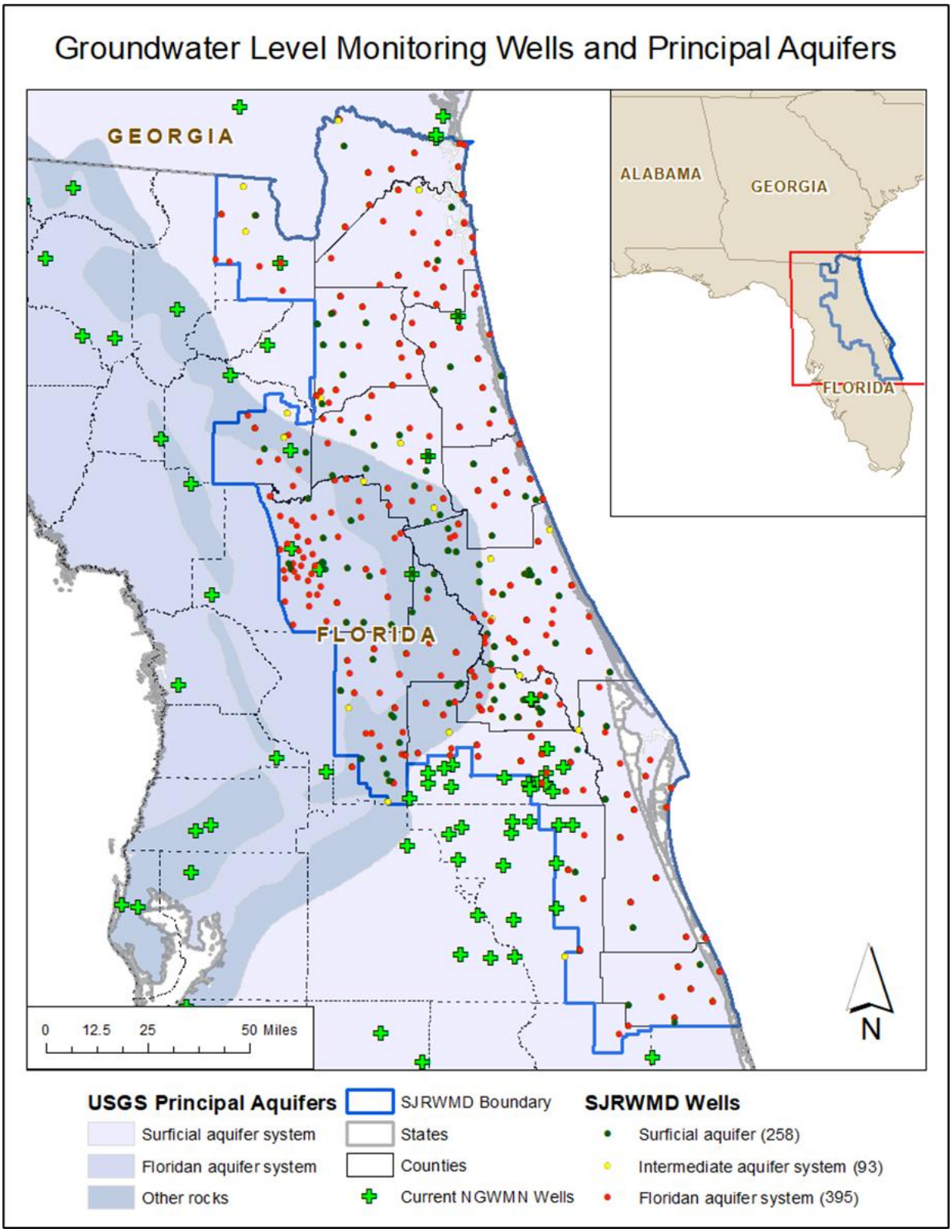

Figure 2: Map of SJRWMD groundwater level monitoring wells with USGS principal aquifers and existing NGWMN wells

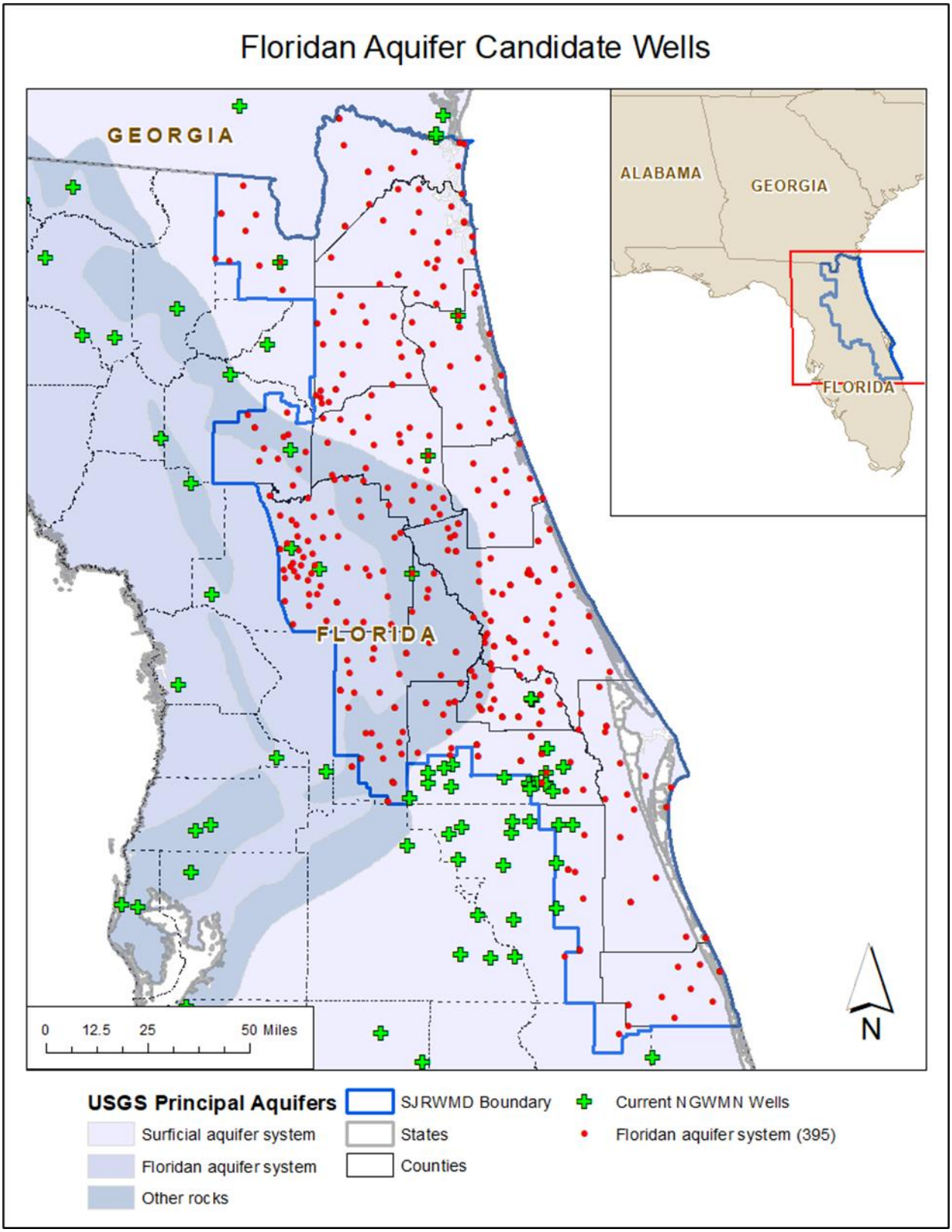

Figure 3: Map of the 395 SJRWMD candidate wells with USGS principal aquifers and existing NGWMN wells

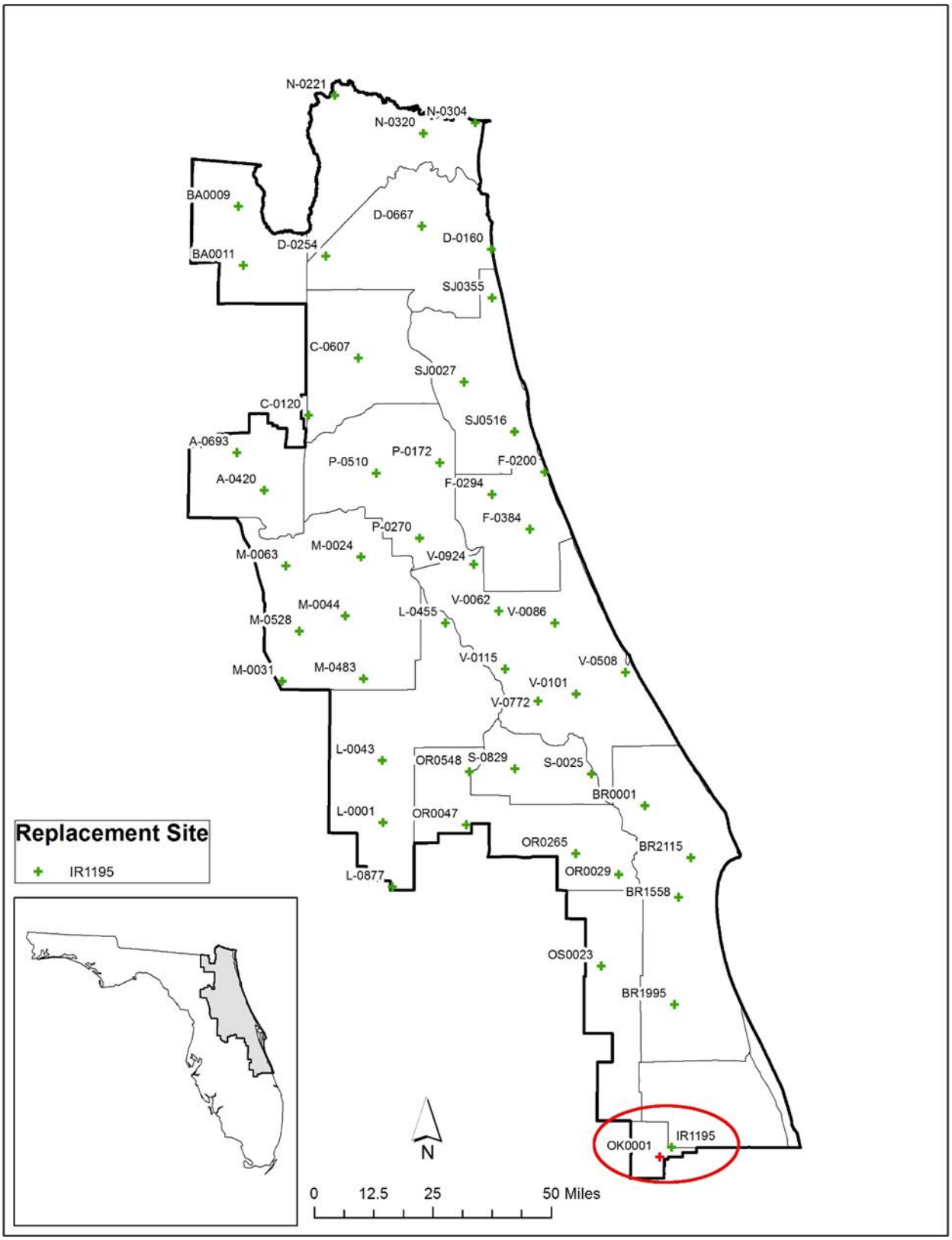

Figure 4: Map of the original 50 selected wells included in this grant, as well as one replacement well (circled in red)

Appendix B: Data collection and data management protocols

1. General Site Maintenance Procedures

Overview:

All data collection sites are maintained to ensure that good quality data is collected. Examples of site maintenance include calibration of sensors on scheduled trip runs, removal of debris and excessive vegetation, inspection of wiring and metal components for corrosion, keeping steel wells clean and painted blue, and keeping gate valves lubricated for easy operation. Any Non-access sites an email must be submitted to the Data Collection Supervisor on the day of the visit reporting the reason the site was not visited.

General Procedures:

1. Field folder: Includes a copy of the site description, level summary and an updated picture printed from the Electronic Content Management (ECM) database. If any changes occur at a site, make note and update the ECM database within 7 working days of completing the trip run.
2. Every site must have a WRI Data Collection sticker.
3. Inspect for wasp nests and other safety hazards.
4. Inspect ground rod, clamp and wire. Look for and fix loose connections and corrosion.
5. Properly note all discrepancies on QA form. (See SOP on QA forms)
6. Connect to data-logger and start filling out QA form.
7. If rain gage present, perform maintenance on TB 3 rain gauge. (See SOP for procedure)
8. Perform service to one sensor at a time. (See SOP for procedure) from the “As Found” to the “As Left” reading. (See SOP on measuring water level procedure) Note as found reading before opening shelter. Clean inside and outside of shelter prior to “As Left.”
9. Service the battery, spray the terminals with protective coating if needed. Inspect connections for corrosion & deteriorated insulation.
10. Inspect desiccant packs in the data-logger box to ensure that they are providing sufficient moisture protection, change as needed. (Put current date on new ones)
11. Wells that have KPSI transducers will need the desiccant in the tubes changed. Desiccant must be fully blue colored. Wells that have Rittmeyer transducers will need to have the small desiccant packages changed on each visit.
12. Clean solar panel and remove obstructions, if any to ensure sufficient sunlight.
13. Lubricate locks (Should be WRI brass locks), hasp and hinges as needed.
14. Check QA form to ensure all information is completed.
15. Prior to leaving site be sure all wires are connected, and shelters are closed and locked.
16. Pick up trash, or any other materials or equipment not being used at site.
17. Vegetation control: Remove the excess vegetation with the Weed Eater and spray weed control around the rain gage stand, well stations, antenna mast, evaporation pan, and the chain link fences.

2. Tri-Annual Site Visit Procedures

Overview:

All data collection sites must be visited during their scheduled routine trip run, unless it is within 40 days from the start of the trip, which is noted in the Canvas report for you.

Procedures:

1. All sites must be visited during the scheduled trip. Every attempt must be made to access a site. If a site is ultimately inaccessible, an Electronic Quality Assurance (EQA) form must be submitted clearly documenting the reason, including photos.
2. Surroundings, review for any unsafe conditions and vegetation growth.
3. All trash, or any other materials or equipment not being used at site must be removed.
4. Vegetation and growth must be maintained within a 10ft radius of each station (weed eating or spraying)
5. Ensure SDMS site memo(s) are up to date with correct documentation about the site, directions, special needs and access requirements. Document any required changes or updates on paper files or if time allows, through Canvas.
6. Document any access issues or other needed work orders (Spray, Bush hog, Clear) through Canvas. Make all efforts to gain access, update Contact information if needed.
7. Properly connect laptop to data logger and start filling out EQA form.
8. Enclosure data logger boxes - clean, seal and supply with fresh desiccant packs (as needed). Ensure all equipment, wiring, cables, ground rod are properly mounted. Any discrepancies must be noted; repair or correct if time permits.
9. Check Power system: solar panel, charge controller, battery, wires and terminal strips must be cleaned from debris and corrosion.
10. Perform maintenance and calibration to one sensor at a time. All sensors must be calibrated and maintained as described in the applicable SOP standards. (SOP 102-22, SOP 141-22, SOP 151-22)
11. All structure and hardware materials must be secure, lubed and updated. (Not rotten or rusted)
12. Check EQA form to ensure all information is completed.
13. Prior to leaving site ensure all wires are connected and shelters are closed and locked.
14. Pictures should be taken for the following conditions:
    a. Unsafe
    b. Bush hogging
    c. Weed Control
    d. Tree trimming
    e. Changes to the site

Additional Yearly Service Procedures:

1. Devices used for manual measurement are calibrated yearly.
    a. Electronic measuring tapes
    b. Digital Pressure Gauge
    c. PSP calibrator Hand held
2. Enclosure and Data Logger
    a. The desiccant packs are replaced (annually at least).
    b. Inside is cleaned and weather seal is wiped down.
    c. The Lithium battery is checked in the data logger, if below 3.0 volts replace the data logger.
3. Battery, Solar and regulator
    a. Solar panel is washed.

b. Check the azimuth to ensure facing due south.
c. Check charge controller for corrosion and sprayed with corrosion spray.
d. Battery terminals are sprayed and recoated.

4. Wires and cables:
    a. Inspect from connection to connection.
    b. Threaded fittings, ensure for tight fit.
    c. Secure properly.
5. Monitoring wells and Stilling wells with encoders.
    a. Use a flashlight to look down the well to ensure no obstructions,
    b. Inspect the float tape for any kinks or twists. (Replace if so)
    c. Clean float tape with a wet towel two to three feet each side of wheel.
6. Monitoring wells and stilling wells with transducers.
    a. Ensure transducer is properly secured.
7. Monitoring flowing wells.
    a. All steel gate valves are lubricated at shaft and turned.
    b. Note if Valves need to be painted with Rust-Oleum paint.
8. Staff gages with clear hoses or PVC.
    a. All hoses or PVC are drained, cleaned and readable.
    b. Clean staff gauge
9. Measuring Points, Datums and elevations
    a. Verify that measuring point/datum description matches (EQA/SDMS)
    b. Ensure that measuring points are accessible and clearly marked
    c. Verify that reference marks, reference points, benchmarks etc. have not been disturbed
10. Gate valves
    a. Quarter to half turn
    b. Lubricate
    c. Document repair/replacement needs for work order to Hydrogeo Services group

3. Field Manual Measurement Procedure

Overview:

The documentation identifies the measuring device that is used for the purpose to prove that the data collection instrument is working properly. This will also keep track of how long the measuring device were used and when it needs to be tested for re-calibration check. The instrument used must be identify by its serial number documented on the Quality Assurance forms, Discharge forms Miscellaneous field note forms.

Procedure:

1. Steel Tape and Chalk:
    a. Chalk approx. 2-3 feet of tape at the beginning of the tape.
    b. Lower tape into well. Hold tape at MP elevation (Hold Value).
    c. Pull tape out of well and read water line on tape (Cut Value).
    d. Subtract Cut point from Hold point. This will give you your Down To Water (DTW). Document in EQA.
    e. To ensure the water level is correctly measured, this procedure must be repeated until water level readings are within 0.02.

    f. Repeat steps 2-4 (do not hold the same point).
    g. If the two readings are more than +/- 0.02 hundredths a third reading is required and repeated until two readings are within +/- 0.02 hundredths.
2. Electronic Measuring Tape:
    a. Note: The sensitivity adjustment is designed to compensate for variations in the conductivity of the water. For higher conductivity water, use a lower sensitivity setting. Readings can be verified with a steel tape and chalk. Water with conductivity outside of the threshold of the electric tape should be measured with a steel tape and chalk.
    b. Set Electronic Tape sensitivity to according to manufactures directions.
    c. Lower probe down into well until it beeps and take reading at MP.
    d. Lift probe at least three feet, then document the depth to water on EQA form and time in EST.
    e. For the second measurement repeat steps 2 & 3
    f. If the two readings differ more than +/- 0.02 a reading from the data logger is required to determine if the water level is moving.
    g. If water level has changed, continue making manual measurements until you get two measurements within +/- 0.02
3. Digital Pressure Gauge:
    a. Pressure gauge must be sent for calibration every two years.
    b. If the water level is above 8 feet and you cannot use ruler & hose, then use your pressure gauge.
    c. Attach the clear hose to the well fitting.
    d. Turn on Pressure Gauge and push “zero” button while holding at measuring point.
    e. Get WL reading from logger and document “as found” value on EQA form.
    f. Turn on water going thru clear hose to evacuate any air in line.
    g. Evacuate any air in the Pressure Gauge by using the flowing water from the clear hose.
    h. Hold or set Pressure Gauge at its calibrated point at the MP elevation until pressure gauge reading stabilizes.
    i. NOTE: IF WELL IS NOT VENTED THEN ANOTHER WATER LEVEL READING FROM THE DATA LOGGER IS REQUIRED. Reflagged water levels must be documented in the comments in EQA.
    j. Take second water level reading and then after until two water levels are within +/- 0.02
4. Staff Gauge:
    a. After cleaning staff gauge, take a reading then document on EQA form. Take another reading. Two consecutive readings should be within .02 hundredths. Note if windy and you have wave action note it on EQA form. (Example reading wave action 3.46 +/- .04)
5. Clear Hose and Ruler or staff gage:

a. If the flowing well water level is eight feet or below you are required to use a clear hose and ruler or staff gage reading. (It can be more than eight feet and still use hose & ruler) This well must be vented.
b. Attach the clear hose to the fitting and turn on the water.
c. Use a ruler in hundredths to read water level in clear hose holding the ruler on top of the MP or on the staff gage section to get a staff gage reading. (Note the staff gage must have an official Datum set by the Survey Bureau)
d. You may have to wait until water stabilizes to get a good reading, document reading on form, and then take another reading. Both readings should be within .02 hundredths.
e. If the two readings are more than .02 hundredths, then a third reading is required and repeated until two consecutive readings are within .02 hundredths.
f. Note: All water level readings above MP are to have a minus sign in front of the reading. (Example –3.50)

4. Reporting Datum and Measuring Point Changes Procedure

Overview:

The Division of Water Resource Information collects and reports water level data as elevations referenced to NAVD of 1988. The Measuring Points (MPs) and datums are the primary reference point from where all data are calculated. Any change to the MP or datum that is not reported to supervisors and QA staff in a timely manner will result in errors in the calculation of water levels. This SOP outlines the procedure to report well MP and staff gauge datum changes.

For any new well or staff gauge, the specialist will use an assumed MP and datum of 500.00 and request a survey. E-mail is sent to the Supervisors if the situation changes.

Procedures:

1. Ground-water Gages
    a. The Surveying Division will conduct the initial survey of a well to determine the official elevation of an MP. Location of MP will be on Top of Casing (TOC).
    b. WRI personnel will re-establish the MP for a repaired well or upgrade to site. The Survey Division has established a benchmark (BM) or reference monument (RM) at each well. The MP for the well can normally be determined by measuring the distance from the BM or MP to the TOC using a ruler and carpenter's level. If a ruler and carpenter's level cannot be used, levels can be run and used as the new official MP.
1. Processing
    a. All MP and datum updates completed by WRI personnel will be reported by completing and submitting the MPDatum Change form and submitting through the DC and QA supervisors, no later than the start of the day after the survey was made. SDMS will be updated and QA Specialist will update Hydstra. The QA Specialist will update the Level Summary.
    b. Updates to a datum or MP received from the Surveying Division by Data Management Specialist will be recorded in SDMS and scanned in ECM. Data Management Specialist will notify DC and QA personnel of the updates.

Appendix C: Processing and archiving water level data from a continuous recorder

1. Processing and archiving water level data from a continuous recorder

Overview:

QA staff process provisional data from electronic data loggers to a verified state for archiving in the HYDSTRA database. The WRI network uses data loggers, both stand-alone and telemetry, to collect water levels throughout the District. DC staff visit each data logger at least once every three months for maintenance and take two manual measurements during the visit. Comparison of the manual measurements to the values recorded by the data logger determines if data adjustments are required. The most common adjustments are made for instrument drift of offsets due to jumps in the data. If an instrument is found to be out of calibration by + or – 0.03, then one needs first to look for an obvious jump in the data that is almost equal to the difference. Often, small differences cannot be detected by a single jump, in which case the data will need to be drifted. Typically, large differences are obvious, requiring an offset to fix the problem. If data appears to be questionable, then QA staff will have to use sound reasoning to determine what may have happened.

Procedure:

1. If no adjustment required:
    a. Login to HYDSTRA.
    b. Go to the Workbench and enter Hydron# for station you are working on.
    c. Open the .A file. Click the Blocks Tab and select the last block. Click the Text Tab and find the last recorded value. Write down the time, date and value for later reference. Close the .A file.
    d. Make a copy of the current data file (X, V etc.). This is your working copy.
    e. Open the work file you created and find the date and time that you recorded from the .A file. If it is not the first reading, you will need to highlight the date and time and split the block by clicking the Split block button.
    f. Click the Blocks Tab and delete to the split block. Join the other blocks by selecting all blocks and clicking the Join button.
    g. On the Text Tab, find the last value prior to your QA visit. Highlight that reading and split the block.
    h. On the Blocks Tab, delete the block after your QA visit (future data).
    i. While on the Blocks Tab, check that the data set you have now is what you need to process your data
    j. Look at the Summary tab to see if there is any missing record, 151 code. If there is missing record, you must verify it is missing by looking in Table Monitor If the record is missing in table Monitor process the data. If the record is present in Table Monitor, you must load it to Hydstra before processing the data.
    k. Compare the “As Found” recorded value on your QA form with the manual measurement on the QA form.
    l. If the difference is within + or – 0.02 no adjustment is required.
    m. Click the Graph Tab and view the graph for any irregular data points.
    n. Click the Summary Tab to see if there are any quality codes other than 140.
    o. (If numbers 11, 12 and 13 apply, see section II below).

p. On the Text Tab, highlight the last value; drag the slide bar to the top, click the Edit Data Point button to open the Edit Data Point Window.
q. Click Add Standard Comment - No Adjustment Required, enter date and time back to beginning of file. Enter your name and date of process. Click Ok to close the text box.
r. After processing all data, click Selection - Select All, Click Selection – Refine Selection. This opens a text box that allows you change only the 140 codes. Delete all Created by Comments. Save your work.

2. If an adjustment is required – Data Drift:
    a. Prepare the data following steps 1-10 in Section I.
    b. Compare the "As found" recorded value on your QA form with the manual measurement on the QA form. If the difference is not within + or – 0.02, an adjustment is required.
    c. Calculate the difference between your manual measurement and the recorded "As Found" value on your QA log; this difference is the adjustment that will be used to drift the data.
    d. Click the Summary Tab to see if there are any quality codes other than 140.
    e. Click on Selection - Select all, and then click Filter – Adjust. Set the bottom value based on your calculations in step 11. Click OK to close the text box and drift the data.
    f. Click the Graph Tab to view the data before and after the drift. You can graph the data with comparable stations in the area.
    g. Click the Text Tab and highlight the last value.
    h. Drag the slide bar to the top and click the Edit Data Point button.
    i. Click Add Standard Comment – Data Drift – OK. Enter the time and date back to the beginning of the file. Enter your name, date of processing and click OK to close the text box.
    j. Click Selection - Select All, Click Selection - Refine Selection. This opens a text box that allows you change only the 140 codes.
    k. Click the quality Edit button and change the Quality Codes to 2. Leave all other codes as is. Delete all Created by comments and save your work.
3. Special considerations after water quality visits:
    a. Prepare the data following steps 1-10 in Section I.
    b. Compare the "As found" recorded value and the manual measurement on the Contractor's Water Quality form. If the difference is not within + or – 0.02, an adjustment is required.
    c. Note: If the WQ sample starts in one hour and stops in another hour, you will need to delete all recorded WLs between the start and stop times for the WQ sample from the workbench. You will need to enter the as found manual water level from the QA form before the WQ sample. This value will be coded 1 and the comment "Manual WL from QA form before WQ sample" will be added. You will also need to enter the as left manual water level from the QA form after the WQ sample. This value will be coded 1 and the comment "Manual WL from QA form after WQ sample" will be added. One second before the as left WL, another WL will need to be added and will be coded 150 with the comment "Station disabled for WQ".

d. After processing all data, click Selection - Select All, Click Selection – Refine Selection. This opens a text box that allows you to change only the 140 codes.
e. Click the quality Edit button and change the Quality Codes to 1or 2 if data was drifted. Leave all other codes as is. Save your work.
f. Highlight the last value; drag the slide bar to the last WQ point and click the
g. Edit Point button.
h. Click the Add Standard Comment button and Select the No adjustment or Data drift comment. Enter time and date back to the last QA point and the + or - amount if you drifted the data. Enter your name and date of process. Delete all Created by comments. Save your work.
i. All manual WLs from the QA form will be added to the W file with comments added that the WL is before and after WQ sample.

4. Processing data that has lost its offset:
    a. Look at the previous QA form to find the offset value that was lost. Write this value on the QA form that you used to restore the lost offset. Add the lost offset value to your As Found WL and write this on the QA form. Compare this corrected As Found value to your manual WL to determine if a drift is required.
    b. Open your work file in Hydstra.
    c. Select only the data that has the missing offset.
    d. Select Filter, and then Adjust. Enter the value of the lost offset. Code this data with a Quality Code of 2. Select standard comment Data Offset and comment accordingly.
    e. Drift the entire data set if required and code and comment.