Four County Groundwater Quality Study

Prepared for

Victoria County GCD
Texana GCD
Calhoun GCD
Refugio GCD

Prepared by

DBS&A
a Geo-Logic Company

Texas Registered Engineering Firm F-286
Texas Registered Geoscience Firm No. 50045
12303 Technology Boulevard, Suite 930D
Austin, Texas 78727
www.dbstephens.com
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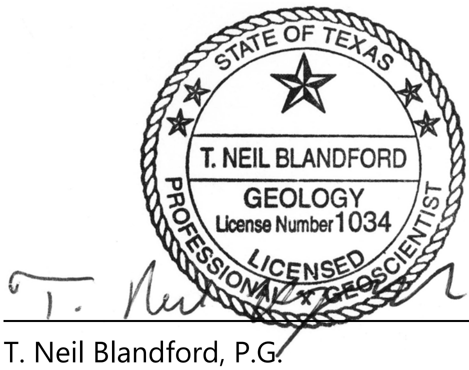
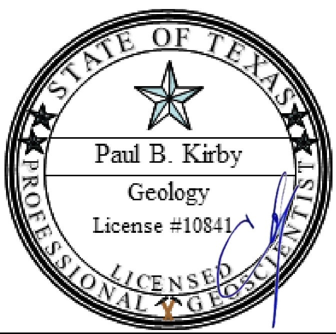
Signatures



T. Neil Blandford, P.G.



Paul B. Kirby, P.G.

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1. Introduction

Daniel B. Stephens & Associates, Inc. (DBS&A) has prepared this report documenting the results of a study to evaluate groundwater quality in Victoria, Calhoun, Refugio, and Jackson Counties, Texas (the study area) (Figure 1). The study was conducted on behalf of the Victoria County Groundwater Conservation District (GCD), the Texana GCD, the Calhoun County GCD and the Refugio GCD (the Districts). The purpose of the evaluation was to better understand natural groundwater conditions and changes in water quality within the Districts caused by groundwater pumping or other factors.

The study used total dissolved solids (TDS) measurements and the commonly applied surrogate, specific conductance (also called electrical conductance) (SC/EC), as the quantitative measure of water quality. The study focused on the two primary aquifers that occur in the Districts, the Chicot and the Evangeline, both of which constitute portions of the major Gulf Coast Aquifer as defined by the State of Texas.

The Districts requested that groundwater quality be evaluated at 5-year intervals over the period 2000 through 2020, and that changes in water quality over each 5-year interval be quantified. Unfortunately, the available groundwater quality data were insufficient to make 5-year determinations. Changes in water quality through time were evaluated by developing plots of TDS concentration through time at wells with multiple data points, and the spatial variation in water quality was determined by developing "current condition" TDS contour maps. All information referenced and presented in this report was provided to the Districts in electronic format.

2. Gulf Coast Aquifer Overview

The Gulf Coast Aquifer is a major aquifer as defined by the Texas Water Development Board (TWDB). Numerous publications document the geology and hydrogeology of the aquifer; this section provides only a brief summary to document the geologic formation and aquifer nomenclature relevant to the study area.

The Gulf Coast Aquifer parallels the Gulf of Mexico coastline, and consists of multiple aquifers, including (from oldest to youngest) the Jasper, Evangeline, and Chicot (Figure 2). The aquifer units are composed of discontinuous sand, silt, clay, and gravel beds of Miocene to Holocene age. All of the sedimentary units thicken toward the Gulf of Mexico. The Catahoula tuff forms a leaky confining layer at the base of the aquifer, and the Burkeville confining unit separates the Jasper Aquifer from the overlying Evangeline Aquifer (TWDB, 2016). The primary aquifers used for water supply in the study area are the Chicot Aquifer (shallow) and the Evangeline Aquifer (underlies the Chicot Aquifer) (Figure 2).

3. Data Compilation

Groundwater quality data from public sources were compiled and organized in a geodatabase for use in a project geographic information system (GIS). The two data sources relied upon were the online database maintained by TWDB and the groundwater quality database maintained by the Districts. Sections 3.1 and 3.2 provide an overview of these data sources and how they were applied for this project. The compiled GIS geodatabase was provided to the Districts.

3.1 TWDB Data

Water quality data from the TWDB online database were downloaded on July 7, 2025. Figure 3 shows the water quality data points (those with available TDS and SC/EC data) obtained from TWDB. Data adjacent to the study area was useful to assist with developing water quality contours near the study area boundary.

As explained in Section 2, the designated aquifers within the major Gulf Coast Aquifer consist of multiple geologic formations. Aquifer designations provided in Figure 3 are based on the aquifer listed in the TWDB database where an aquifer was identified. For some wells, one or more geologic formations are provided in the database rather than an aquifer name. For these wells, the aquifer was determined based on Figure 2. For example:

- A well completed in the “Beaumont Clay and Lissie Formation” is designated as a Chicot Aquifer well.
- A well completed in the “Goliad Sand” is designated as an Evangeline Aquifer well.
- A well completed in the “Lissie Formation and Goliad Sand” is designated as a Chicot and Evangeline Aquifer well.

Wells completed in the older geologic units of the Gulf Coast Aquifer, such as the Jasper Aquifer, are shown in Figure 3 but were not used in the study.

Although most of the TWDB database wells in Jackson County are identified as Gulf Coast Aquifer, most of these wells are believed to be completed in the Chicot Aquifer based on well depth and the aquifer designations for wells in adjacent counties.

3.2 District Data

Figure 4 shows well locations included in the groundwater quality monitoring programs of the Districts. The District data were provided as several downloads, with the most recent download provided on September 5, 2025. Some of the wells monitored by the Districts are also included in the TWDB database. Many of the water quality measurements reported by the Districts are values of SC/EC obtained in the field using a portable meter and groundwater samples taken at the wellhead. Values of SC/EC obtained in this manner are often referred to as field parameters. TDS data are also provided in the District data; however, the TDS measurements are often not laboratory values, but rather values calculated from a standard equation provided with the SC/EC field meter software. These non-laboratory District TDS values were not used in the study; the approach used to estimate TDS from District SC/EC data is presented in Section 4.

During review of the District data, it was discovered and later confirmed with the Districts that multiple units are used for some District database TDS concentration values. Some TDS values have concentration units of grams per liter (g/L), while some have concentration units of milligrams per liter (mg/L). Milligrams per liter is the standard unit of measure for TDS concentrations of fresh and brackish groundwater. TDS concentration values in the District data that appeared to be reported in g/L (based on the magnitude of the value) were changed to mg/L by multiplying the value by 1,000. A list of the data points where this unit adjustment was applied was provided to the Districts, and these data points are identified on the plots of TDS versus time.

4. Data Analysis

Prior to review of the spatial distribution of the water quality data, TDS concentrations were estimated for the SC/EC values that had no corresponding laboratory value of TDS. Most of the SC/EC data points were provided in the District monitoring data, but some points were also available from the TWDB data. TDS concentration was estimated from SC/EC values using linear regression equations determined from data points that had values for both SC/EC and laboratory measurements of TDS. There were 102 data pairs available for the analysis. These datapoints and the regression analysis are provided as Appendix A.

Initially, one regression equation was developed using all 102 data pairs. However, when the initial equation was used to estimate TDS from some of the lower values of SC/EC, unreasonably low estimates of TDS were obtained. To address this issue, two regression equations were developed, one for SC/EC values of 5,000 microsiemens per centimeter (µS/cm) or less (84 points), and the other for SC/EC values greater than 5,000 µS/cm (18 points). Both correlations are provided in Figure 5. For the case where SC/EC is lower than 5,000 µS/cm (Figure 5a), the coefficient of determination (R^2) value is 0.86. For the case where SC/EC is greater than 5,000 µS/cm (Figure 5b), the R^2 value is 0.97. R^2 is a statistical measure in a regression model that indicates the proportion of variance in the dependent variable that can be explained by the independent variable. Therefore, for the first case where R^2 is 0.86, 86 percent of the variance in the data can be accounted for by the linear regression equation, and the remaining 14 percent of the variance is attributable to other, undetermined factors. For the purposes of this study, R^2 values of 0.86 and 0.97 are sufficient to obtain reasonable estimates of TDS from SC/EC values.

Once TDS concentrations were estimated from the available SC/EC data, the available TDS data were plotted at 10-year increments (i.e., all available TDS data points within each 10-year period were plotted on a figure). These figures are provided in Appendix B. Figures were also made of TDS through time for wells that had three or more data points (Appendix C). Review of these figures indicated the following:

- Much of the available data were for early or recent dates.
- There were insufficient data to develop TDS contours for the study area for specific 5-year periods, such that the contours for multiple periods could be meaningfully compared to one another to evaluate changes in water quality over time.

Given that the Districts were most interested in relatively recent time (2000 through 2020), and at many locations, distinct upward or downward long-term trends in TDS concentration were not evident, it was decided to produce "current condition" TDS contour maps using recent data while also considering older data where trends in TDS concentration were not evident. The approach to developing the TDS concentration maps is presented in Section 5.

5. Groundwater Quality

This section details how maps of water quality (TDS distribution) were developed for the study area. As explained in Section 4, the contour maps are representative of what are referred to as current conditions, although TDS values from multiple dates are used to develop the maps as explained in Section 5.1.

5.1 Contouring Approach

Mathematical (or computer generated) contouring approaches using geostatistics or other methods were considered as an approach for contouring TDS within the study area, but ultimately were not used. The main reason for not using these approaches is that set numerical algorithms are not readily capable of simultaneous consideration of multiple site-specific conditions that affect contour delineation, such as well depth and aquifer identification, changes (or lack thereof) of TDS values through time, and multiple sources of salinity such as coastal and tidal waters and areas of groundwater contamination. Attempts could be made to adjust the TDS datasets through detrending, categorization of values, and assignment of confidence to data points, but these types of adjustments would be time-consuming and unlikely to lead to improved certainty in TDS contour delineation.

TDS contours were digitized from contours hand-drawn on multiple plates. Posted on each plate were well locations, the designated aquifer (including unknown), the well depth (if known), the most recent TDS value and date of measurement, whether the TDS value was from a laboratory measurement or was estimated from SC/EC, and whether multiple TDS values were available through time. Using this information, contours of TDS concentration were hand-drawn for the study area following these general guidelines:

- TDS concentration values for wells screened over multiple aquifer units (i.e., Chico and Evangeline) were generally not used to constrain the water quality contours.
- TDS concentration values from laboratory analysis were considered more reliable than TDS concentration values estimated from SC/EC.
- Priority was generally placed on recent TDS concentration values. In some regions, the only TDS concentration data available were from early data, such as the 1950s or 1960s. Where such early values were inconsistent with the locations of TDS contour lines based on more recent, adjoining data, the early TDS data point was ignored.

- In some regions where multiple TDS concentration values were available for a given well, the plots of TDS concentration through time were reviewed to consider possible TDS concentration trends while delineating the TDS concentration contours.
- Where the aquifer was unknown but well depth was available, the well depth was considered in conjunction with nearby wells to determine the likely aquifer tapped by the well.
- Where the well depth was unknown, the TDS concentration was considered in conjunction with the TDS concentrations of nearby wells to determine if the value would be honored in the contouring.

The resulting TDS contours are provided in Figures 6 and 7. The TDS contours in Figure 6, with the exception of the far northwestern portion of Victoria County, are representative of the Chicot Aquifer. The TDS contours generally portray the water quality in the groundwater system as would be expected, where TDS increases toward the coastline and tidal waters.

Review of the available data in Refugio County indicated two distinct categories of data. Shallow wells, typically about 100 to 300 feet deep, have reported water quality different than that of the deeper wells, which are typically about 800 to 1,000 feet deep. The shallower wells in Refugio County are believed to be representative of the Chicot Aquifer, and deeper wells are believed to be representative of the Evangeline Aquifer. TDS contours based on the shallow wells in Refugio County are provided in Figure 6. TDS contours based on deeper wells are provided in Figure 7. Wells shown in Figure 7 are Evangeline Aquifer wells or wells with no aquifer designation that are 400 feet or more in depth. Comparison of Figures 6 and 7 indicates that for a given location in Refugio County, water quality would generally be better (less saline) at depth.

Outside of Refugio County, the number of Evangeline Aquifer wells was insufficient to reasonably develop TDS contours, although in the northwestern corner of Victoria County the Chicot Aquifer pinches out and the 500 mg/L TDS contour is indicative of water quality in the Evangeline Aquifer. It was observed elsewhere in Victoria County that the TDS concentrations reported for many (but not all) of the Evangeline Aquifer wells are consistent with the TDS contours delineated for the Chicot Aquifer. In Jackson County, some of the deeper wells identified as Gulf Coast Aquifer wells may be Evangeline Aquifer wells (particularly in the northern portion of the county), but detailed evaluation of well completions was outside the scope of this study.

5.2 Contaminated Sites

Some of the monitor wells in the study area were (or are) used to monitor areas where groundwater contamination has likely occurred, as evidenced by recent large changes in water quality reported to the Districts by well owners. At these locations, a water quality contour was drawn around the approximate region of contamination, but more detailed contouring within the local contaminated region was not conducted. These locations appear as contour "bullseyes" on Figure 6, and are very small relative to the study area extent. These sites are as follows:

- The Serene Drive area of southern Victoria County (District monitor wells Victoria County GCD-NW-493, GW-509, GW-970, and GW-824).
- Several locations in the FM-446 area about 8 miles southwest of Victoria and south of U.S. Highway 59 (District monitor wells Victoria County GCD-NW-558, GW-699, GW-698, and GW-730).
- The Olivia area in Calhoun County (District monitor well GW-00094).
- The ALCOA site in southern Jackson County near the intersection of TX 172 and State Highway 35.
- The vicinity of the Boca Chica community in the far southeastern corner of Jackson County.

5.3 Water Quality Contour Accuracy

For the Chicot Aquifer, Victoria and Jackson Counties have the most complete coverage in terms of wells with water quality data, followed by Calhoun County and then Refugio County. The water quality contours are more representative of actual conditions where the density of data points is greatest. However, even in Victoria and Jackson Counties there are regions of many square miles where the distance between neighboring wells with water quality data is 5 miles or more.

In general, it can be expected that a new well drilled within the study area at a given location would have the approximate water quality indicated on Figures 6 and 7, within one-half of the contour interval value. For example, the contour interval in Victoria County is 250 mg/L. Therefore, a new well drilled directly on the 750 mg/L contour line as represented in Figure 6 would be expected to have a TDS concentration of 625 to 875 mg/L (i.e., 750 mg/L ± 125 mg/L, where 125 mg/L is one-half of 250 mg/L). In Refugio County, where the contour interval is

1,000 mg/L and data availability is sparse compared to the other counties, the expected accuracy would be ± 500 mg/L.

This concept is a general guideline to assist with a working knowledge on how the maps may be applied; larger variations in water quality may be delineated as additional data points become available and as more detailed maps are constructed in the future.

5.4 Water Quality Through Time

Plots were made of TDS concentration through time for wells with three or more data points (Appendix C). An electronic GIS tool was provided to the Districts where a well can be selected using the cursor and the plot of TDS concentration versus time will be displayed. In addition, all of the plots are provided as jpg files, named according to the monitor well identification number. Section 5.4.1 presents selected examples of water quality through time plots for each county, and Section 5.4.2 identifies monitor wells where TDS is increasing. The locations of the wells discussed in Sections 5.4.1 and 5.4.2 are provided in Figure 8.

5.4.1 Example Plots for Each County

Numerous wells with water quality through time are available for viewing in the GIS tool. The available plots were reviewed for each county, and a couple of wells were selected for each county that had a significant time period of available data. The selected plots for Victoria, Jackson, Calhoun, and Refugio Counties are provided in Figures 9 through 12, respectively.

Note that the y-axis (TDS concentration) scale changes for each plot. Also, each plot shows data points (if any) where the concentration units in the District database were converted from g/L to mg/L (green points) and TDS concentration values that are estimated from SC/EC using the regression equations presented in Section 4 (red points). In this manner, the various data points can be compared to the adjacent laboratory values of TDS concentration. For example, in Figure 11 for well 8026604 (lower figure), the one significant increase in TDS concentration, from about 600 mg/L to nearly 850 mg/L, is based on an estimated TDS data point. It is likely that a portion, if not most, of the increase may be due to the uncertainty in the estimation of TDS from SC/EC rather than an actual increase in salinity. Stated another way, if TDS concentration had been measured in the laboratory for this data point, it is suspected that it likely would have been a lower value.

The changes in TDS concentration over time in Figures 9 through 12 are believed to be what might be called “natural” fluctuations. There are no consistent changes of sufficient magnitude that would indicate, for example, seawater intrusion due to groundwater pumping.

5.4.2 Wells with Worsening Water Quality

The plots of water quality through time were reviewed to identify wells with worsening water quality, as indicated by a significant, discernable increase in TDS not believed to be attributable to natural variability or measurement technique (i.e., laboratory measurements of TDS concentration versus field SC/EC). The focus of this evaluation was approximately the past 20-year time period.

No wells were identified with worsening water quality in Calhoun and Refugio Counties. In Jackson County, monitor wells Texana GCD - GW-00092 and GW-00311 were identified as exhibiting worsening water quality over time (Figure 13). The TDS concentration at monitor well GW-00092 has increased from less than 2,500 mg/L in 2012 to over 4,000 mg/L in 2022, and appears to be in a region of groundwater contamination (Figure 13a). The TDS concentration at monitor well GW-000311, which is near the ALCOA site, has increased from less than 750 mg/L in 2014 to over 1,100 mg/L in 2023 (Figure 13b).

Four wells with worsening water quality were identified in Victoria County: Victoria County GCD wells GW-000235, GW-000237, GW-000489, and GW-000595. TDS concentration over time for these wells is provided in Figure 14. The TDS concentration at monitor well GW-000235 has increased from less than 1,250 mg/L in 2012 to just under 1,450 mg/L between 2012 and 2014. The most recent data indicate that TDS concentration at this well continues to increase. The TDS concentration at monitor well GW-000237 has exhibited a similar trend to that at monitor well GW-000235, although the TDS values were initially less than 980 mg/L and increased to approximately 1,100 mg/L. The TDS concentration at monitor well GW-000489 has increased from less than 1,000 mg/L over a 20-year period before approximately 2005, and District monitoring data indicates an increase to over 2,000 mg/L, with one value of about 3,500 mg/L over the period of 2012 to 2025. The TDS concentration at monitor well GW-000595 has steadily increased from less than 1,400 mg/L in 2013 to over 2,400 mg/L in 2021; this well is at a known site of groundwater contamination.

Investigation regarding the specific causes of the degradation of groundwater quality at wells that indicate worsening water quality was outside the scope if this study.

6. Recommendations

The following are recommendations that may be considered by the Districts to improve their water quality monitoring programs.

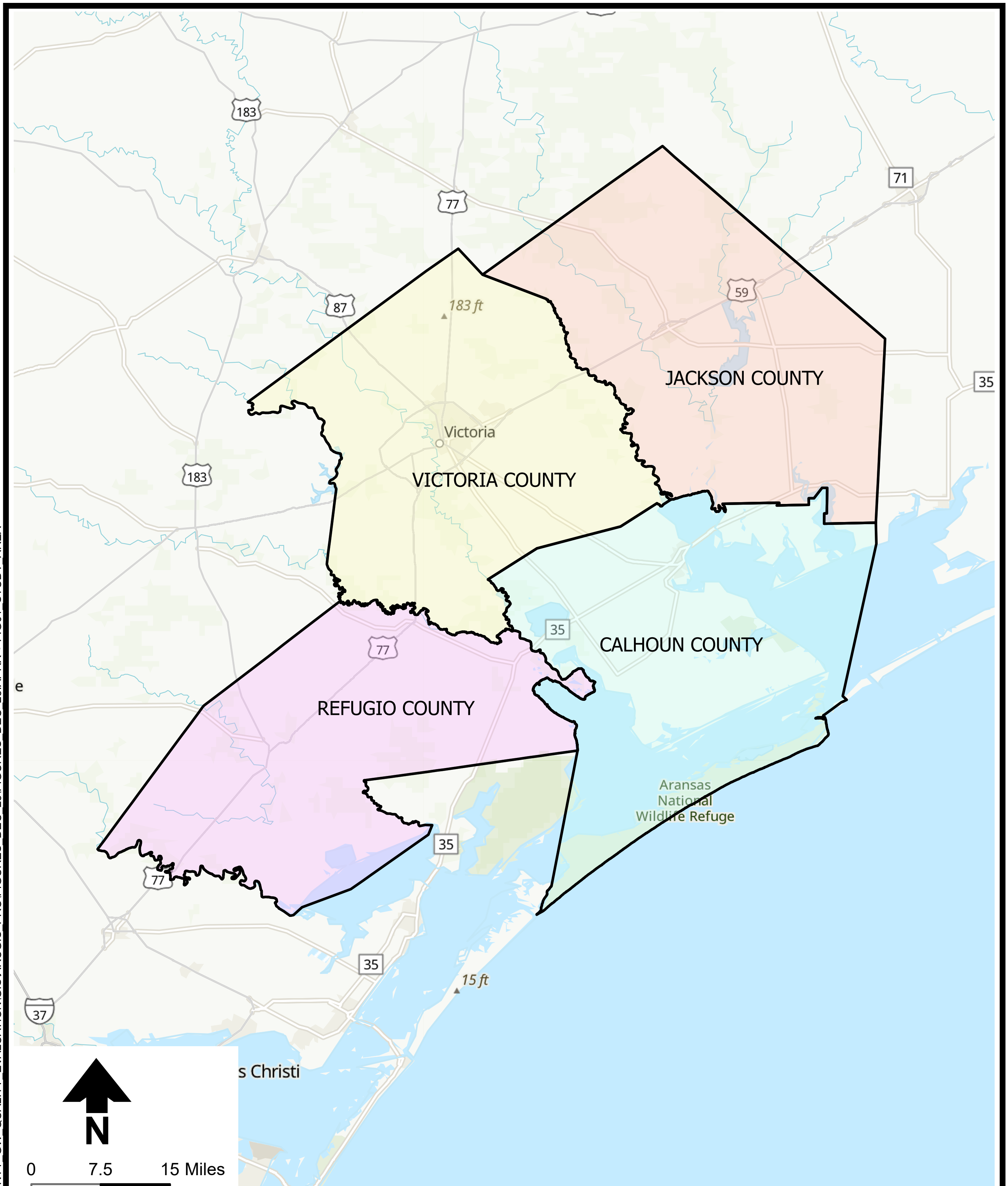
1. There are some database improvements that could be made with small effort. It would be useful to maintain consistent TDS concentration units of mg/L, and to convert all prior units of g/L. It would also be useful to have geologic formation and/or aquifer designations for all monitor wells, which should be relatively straightforward using the well depths.
2. The Districts may consider monitoring for chloride (Cl^-) in addition to (or eventually in lieu of) TDS. Chloride is the most commonly used measure of water quality in coastal areas because it is a non-reactive ion. TDS is a measure of total water salinity, and therefore includes all ions dissolved in the water. However, some ionic concentrations in water may be affected (and therefore changed) by various geochemical processes, whereas chloride is not. Correlations between SC/EC and chloride could also be developed over time.
3. There are a good number of water quality monitoring points in Victoria County, distributed across the entire county (Figure 4). Relative to monitoring specifically for seawater intrusion, greater emphasis may be placed in the southern portion of the county rather than the northern portion of the county.
4. Although additional data are always useful at any location, additional data points in both aquifers (shallow and deep) in Refugio County would be helpful in delineating the water quality there. In Victoria County, additional data points in the Evangeline Aquifer would allow for more detailed observation of water quality changes at depth.
5. Evaluation of existing and proposed groundwater pumping centers was outside the scope of this project. Near large pumping centers in coastal regions, water quality degradation may occur from the upward migration of poor-quality water rather than from the lateral migration of poor-quality water. Water quality monitoring at depth, and not only the same aquifer unit as the pumping, would be useful to consider in regions of substantial groundwater withdrawals.

References

Shi, J., R. Boghici, and R. Anaya. 2022. *Conceptual model report: Central and southern portions of Gulf Coast aquifer system in Texas.* Texas Water Development Board. April 19, 2022.

Texas Water Development Board (TWDB). 2016. *Texas aquifers study: Groundwater quantity, quality, flow, and contributions to surface water*. December 31, 2016.

Figures



Basemap: ESRI et al.

Explanation

- Calhoun County GCD
- Refugio GCD
- Texana GCD
- Victoria County GCD

FOUR COUNTY GROUNDWATER QUALITY EVALUATION

Four County Study Area

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3/17/2026 DB25.1087

Figure 1

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<tr><td>Paleogene</td><td>Oligocene</td><td>Catahoula Formation (sand)</td></tr>
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Source: Shi et al., 2022
Note: Model layers are not applicable to this study.

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FOUR COUNTY GROUNDWATER QUALITY EVALUATION
Geologic Formations and Corresponding Gulf Coast Aquifer Units

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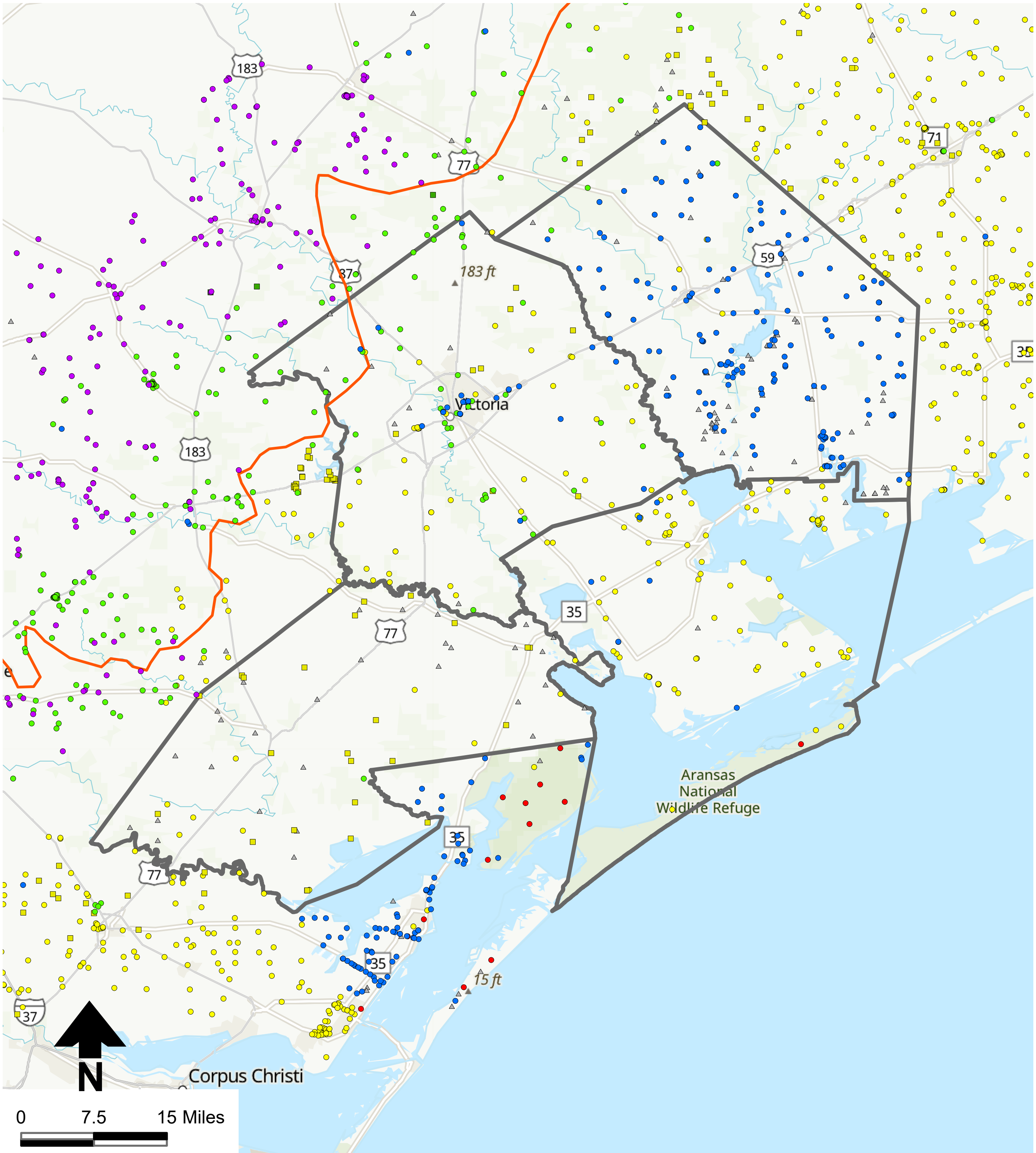
12/3/2025 DB25.1087

Figure 2



Basemap: ESRI et al.

Explanation

- Four county study area
- Chicot Aquifer boundary

TWDB well with TDS (aquifer)

- Barrier Island
- Chicot Aquifer
- Chicot and Evangeline Aquifers
- Evangeline Aquifer
- Evangeline and Jasper Aquifers
- Gulf Coast Aquifer
- Jasper Aquifer
- Jasper Aquifer and Catahoula Sandstone
- Unknown
- TWDB well with SC/EC only

FOUR COUNTY GROUNDWATER QUALITY EVALUATION

Wells with Water Quality from the TWDB

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Figure 3

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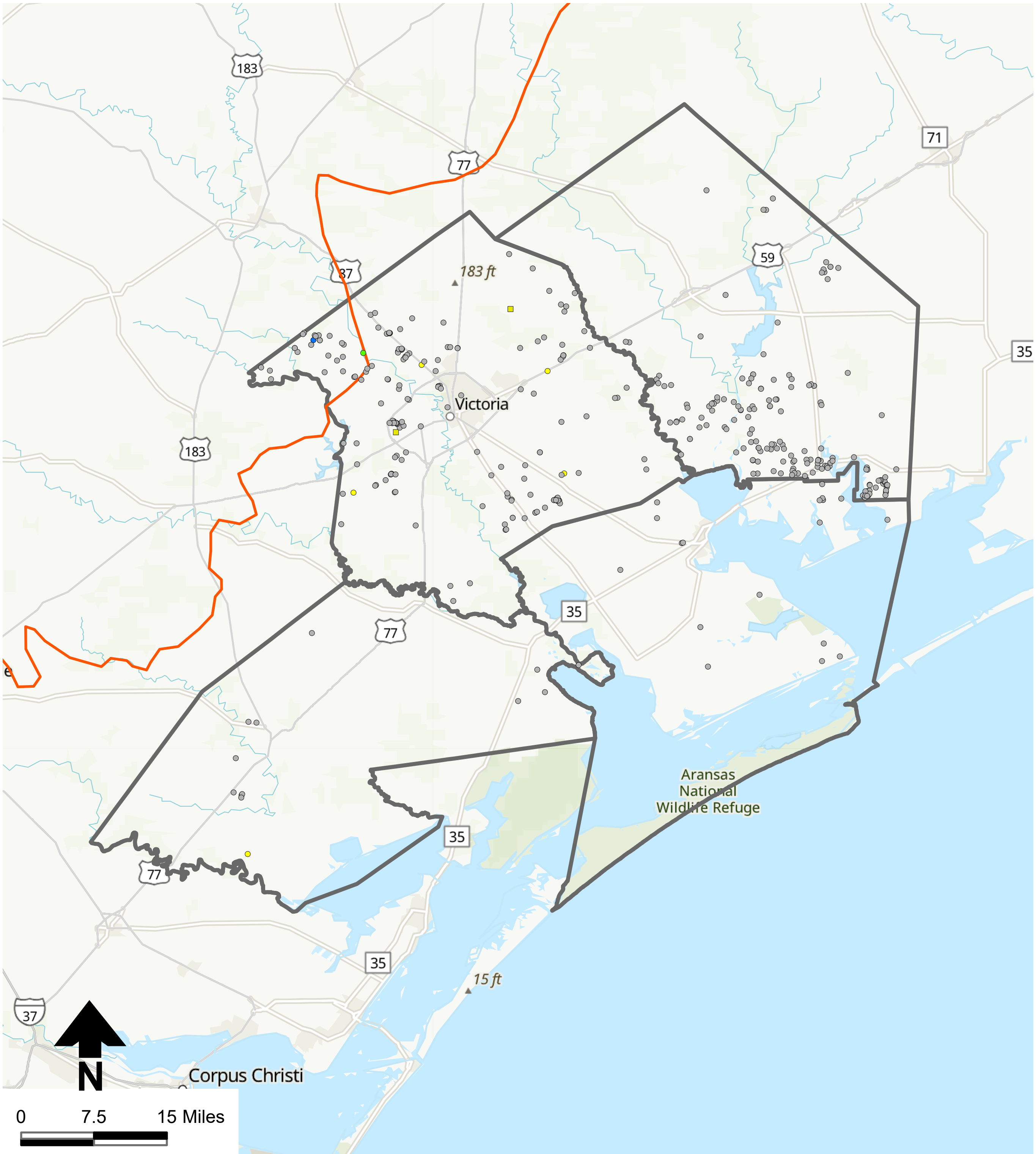

Explanation

- Four county study area
- Chicot Aquifer boundary

District monitoring program well with TDS (aquifer)

- Chicot Aquifer
- Chicot and Evangeline Aquifers
- Evangeline Aquifer
- Gulf Coast Aquifer
- Unknown

Basemap: ESRI et al.

FOUR COUNTY GROUNDWATER QUALITY EVALUATION

Wells Included in the District Monitoring Programs

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Figure 4

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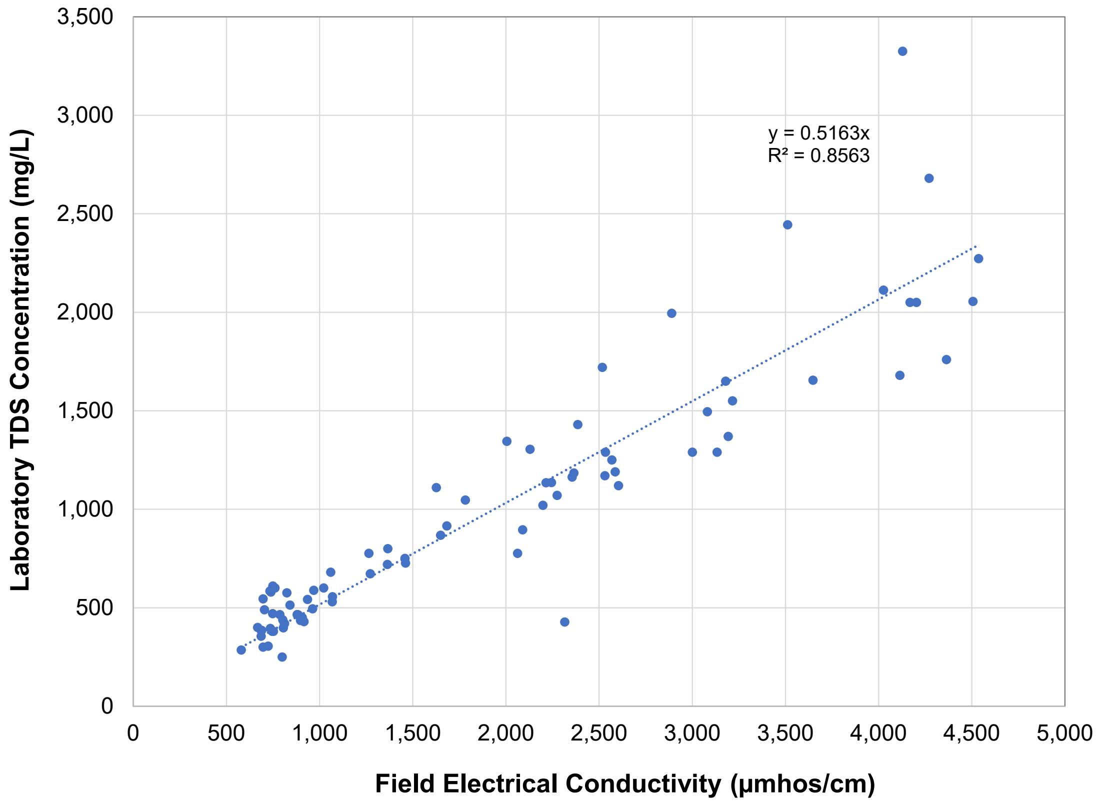
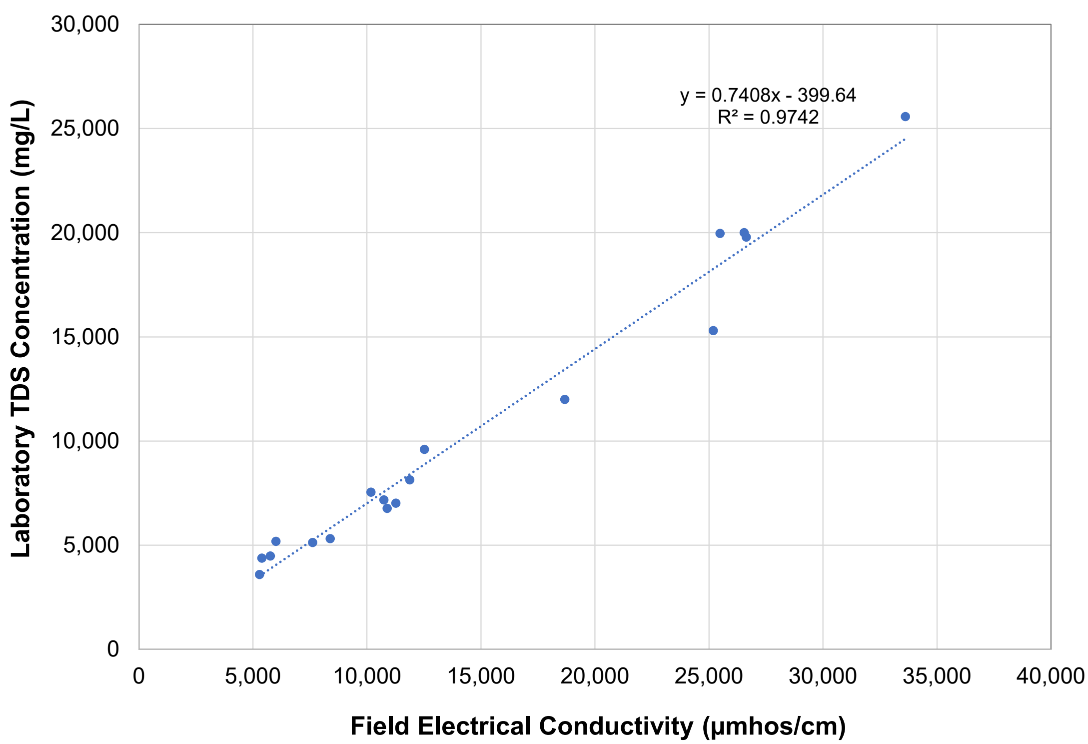


a. Regression for SC/EC of 5,000 µmhos/cm or less

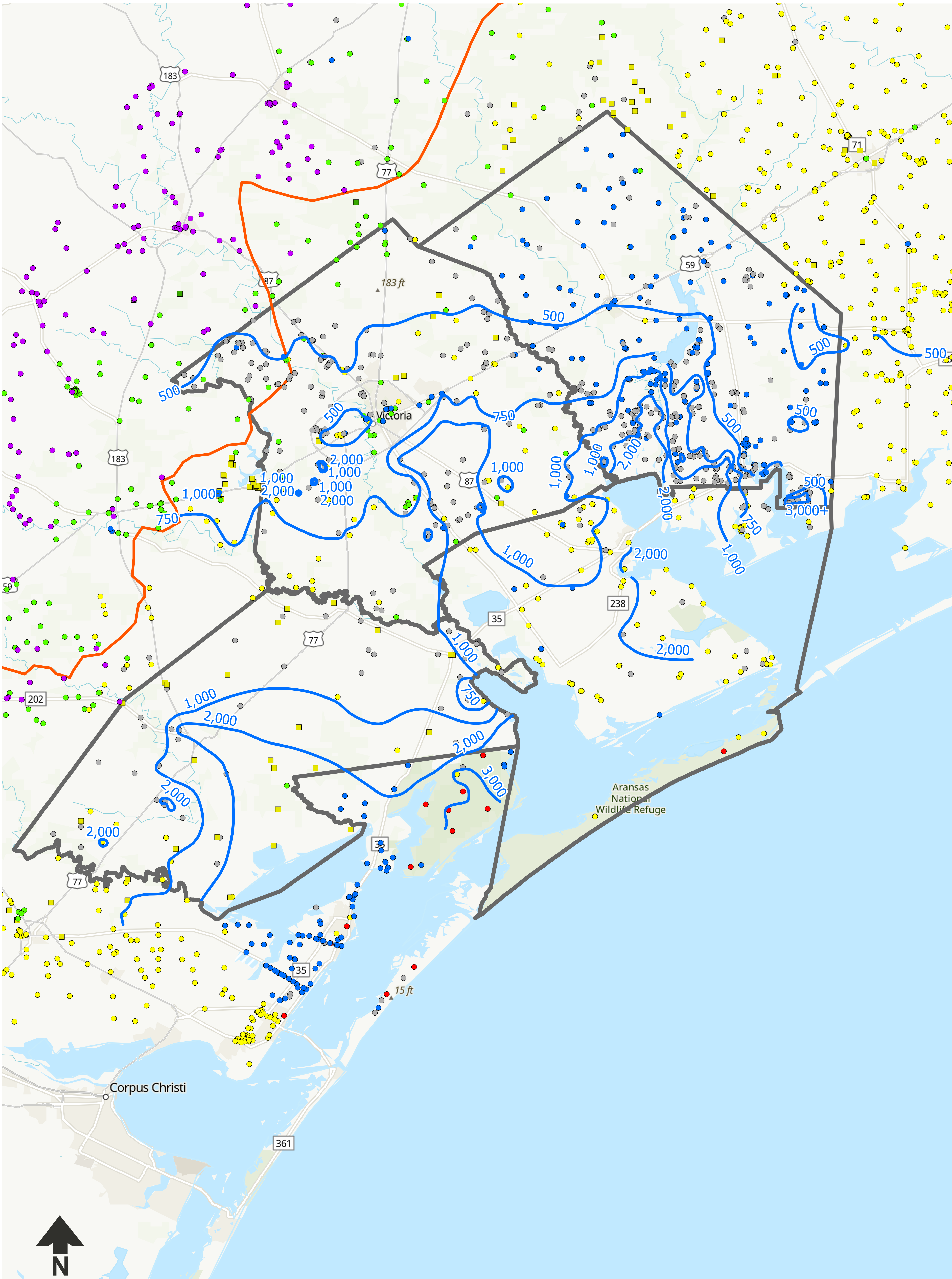


b. Regression for SC/EC greater than 5,000 µmhos/cm

Regressions of TDS vs. SC/EC

Figure 5

S:\PROJECTS\DB25.1087_FOUR_COUNTY_GW_QUALITY_EVALUATION\GIS\ARCGIS_PRO\FIGURES_DEC_25\FIGURES_DEC_25.APRX ● FIG06_TDS_CONTOURS_SHALLOW_11X17



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Basemap: ESRI et al.

Explanation

- TDS contour (mg/L)
- Four county study area
- Chicot Aquifer boundary

Well with TDS (aquifer)

- Barrier Island
- Chicot Aquifer
- Chicot and Evangeline Aquifers
- Evangeline Aquifer
- Evangeline and Jasper Aquifers
- Gulf Coast Aquifer
- Jasper Aquifer
- Jasper Aquifer and Catahoula Sandstone
- Unknown

STATE OF TEXAS
T. NEIL BLANDFORD
GEOLOGY
License Number 1034
LICENSED
PROFESSIONAL GEOSCIENTIST

Figure 6

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FOUR COUNTY GROUNDWATER QUALITY EVALUATION
Shallow (Chicot Aquifer) Water Quality

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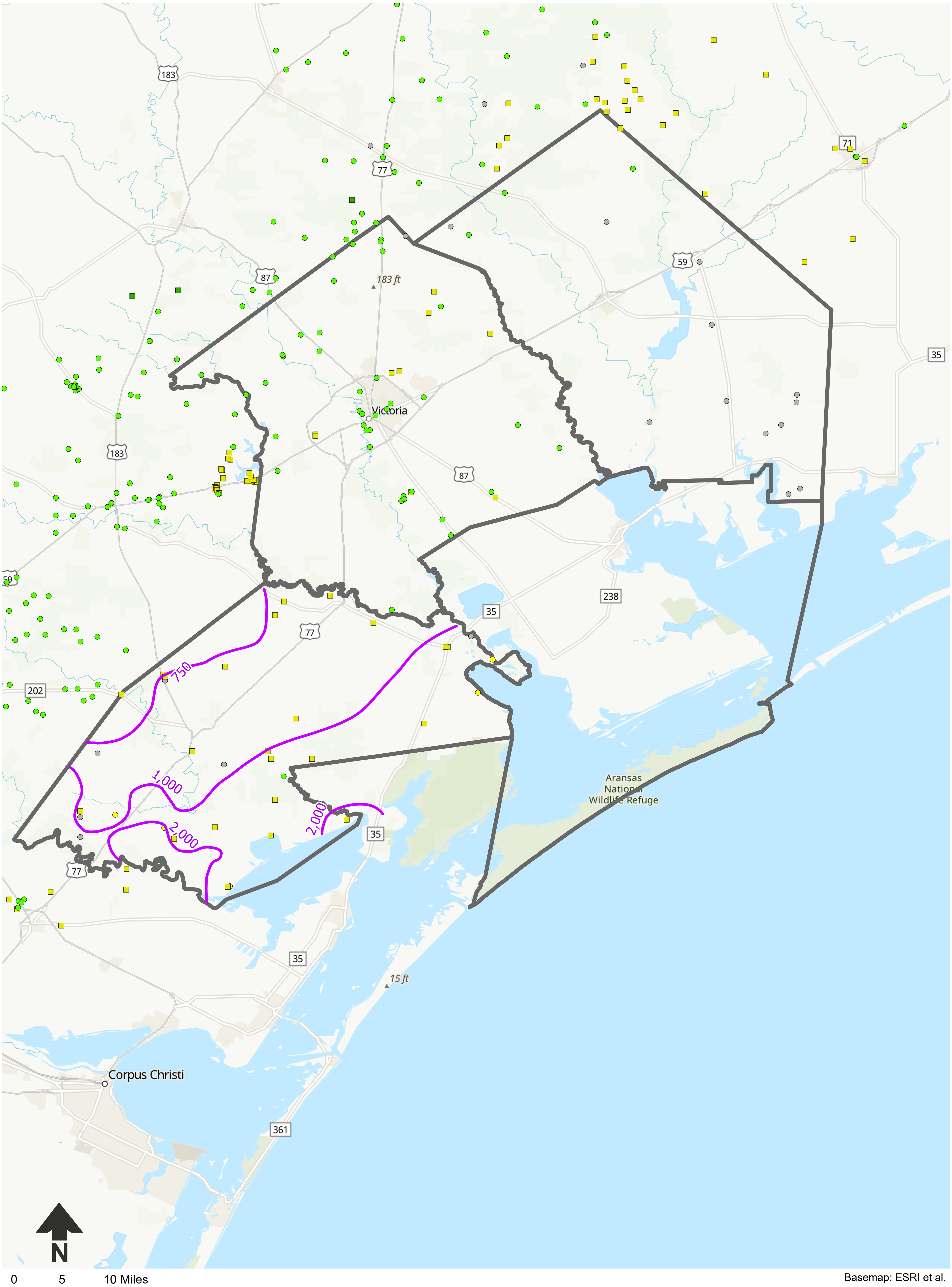
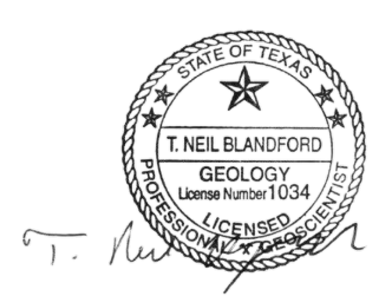


Basemap: ESRI et al.

Explanation

- TDS contour (mg/L)
- Four county study area
- Well with TDS (aquifer)
  - Chicot Aquifer
  - Chicot and Evangeline Aquifers
- Evangeline Aquifer
- Evangeline and Jasper Aquifers
- TDS value converted from SC



FOUR COUNTY GROUNDWATER QUALITY EVALUATION

Deep (Evangeline Aquifer)
Water Quality in Refugio County

Figure 7

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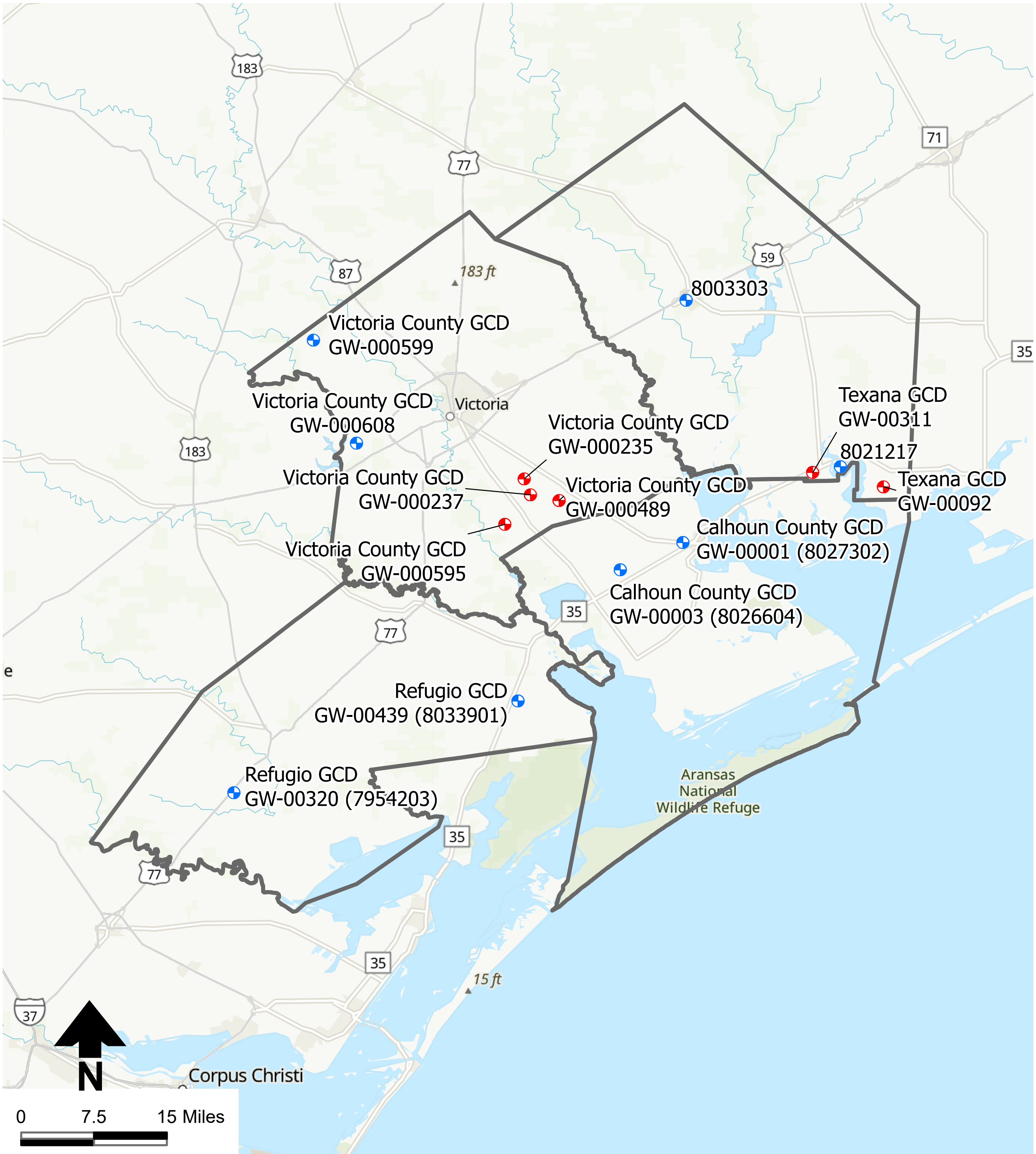

Explanation

Basemap: ESRI et al.

- Example well with water quality through time (8 wells)
- Well with worsening water quality (6 wells)
- Four county study area

S:\PROJECTS\DB25.1087 FOUR COUNTY GW QUALITY EVALUATION\GIS\ARCGIS PRO\FIGURES DEC 25\FIGURES DEC 25.APRX • FIG08 LOCATIONS OF WELLS DISCUSSED IN SECTION 5

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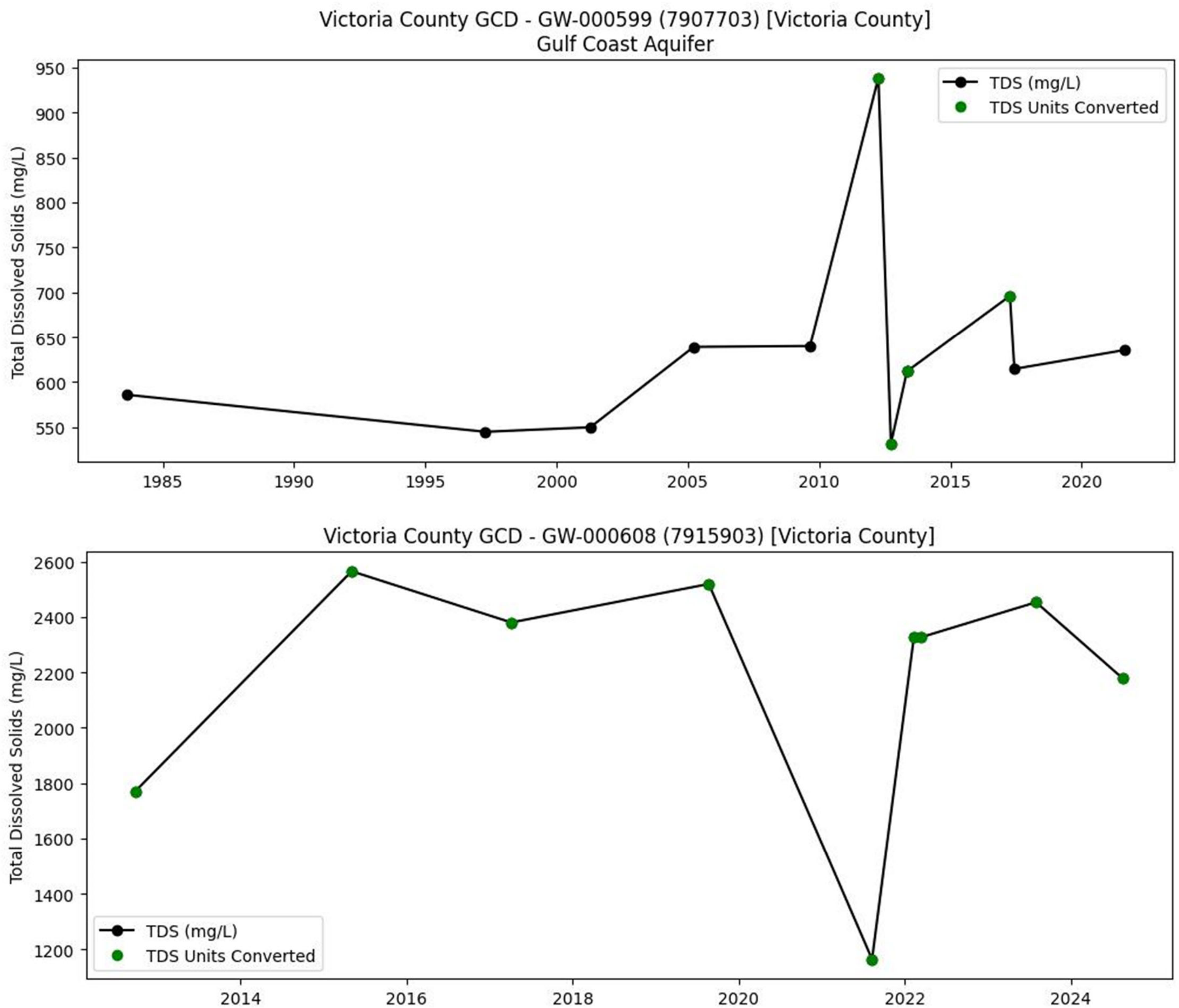
FOUR COUNTY GROUNDWATER QUALITY EVALUATION

Locations of Wells Discussed in Section 5

Figure 8



FOUR COUNTY GROUNDWATER QUALITY EVALUATION

Example Plots of Water Quality through Time for Victoria County

Figure 9

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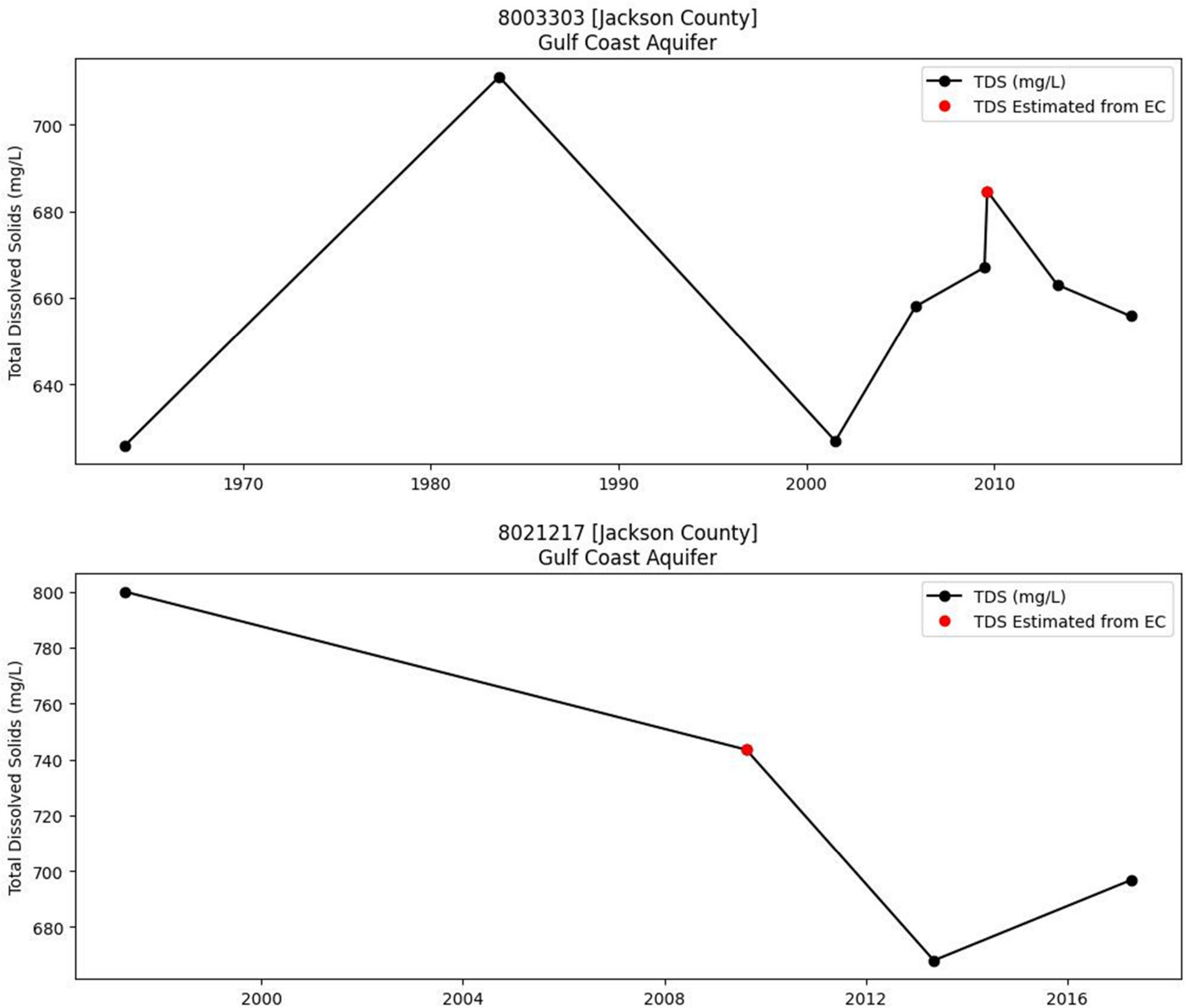
12/2/2025 DB25.1087



FOUR COUNTY GROUNDWATER QUALITY EVALUATION

Example Plots of Water Quality through Time for Jackson County

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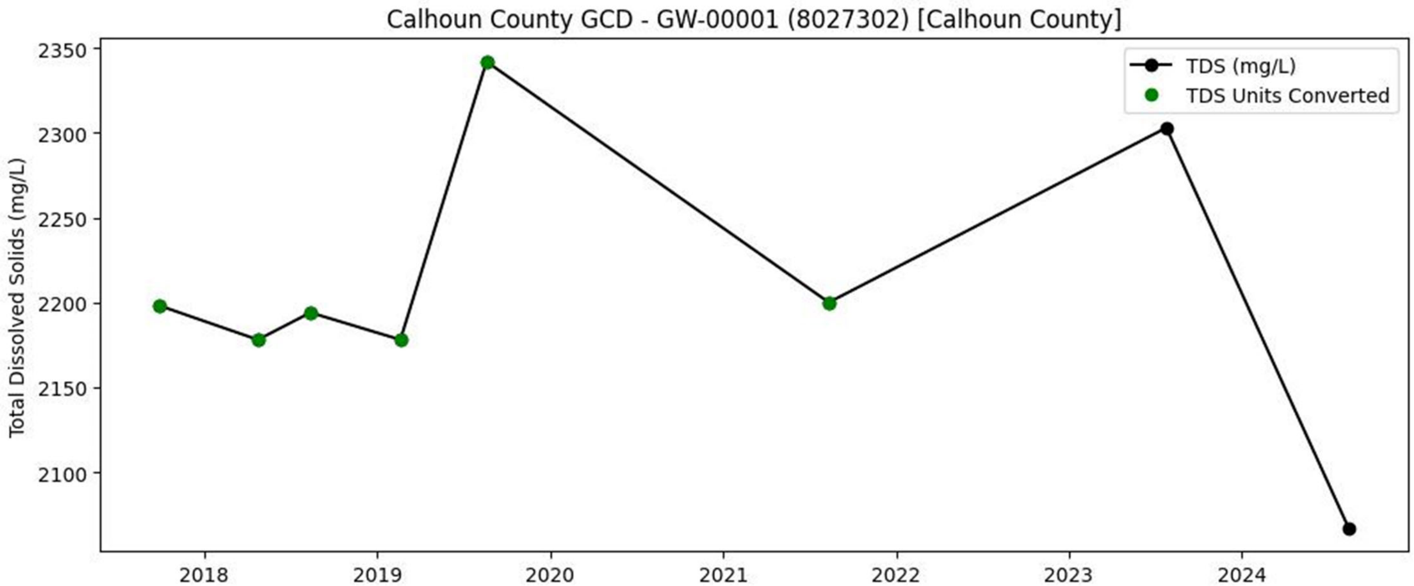
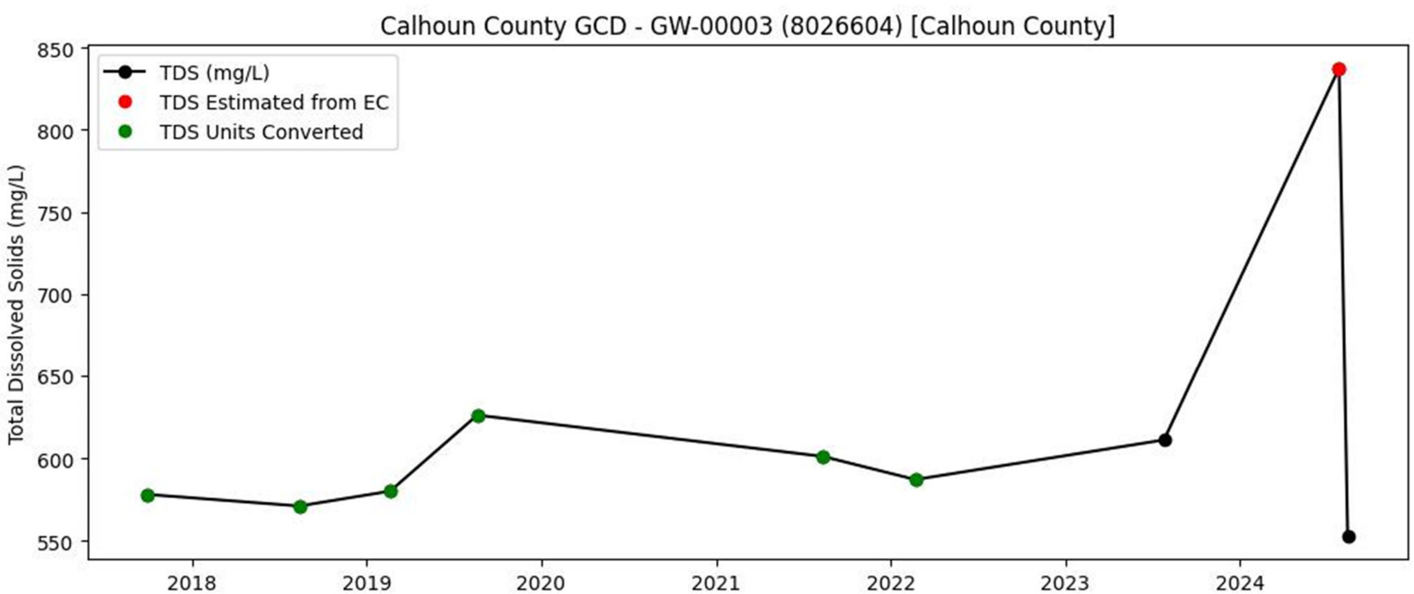
12/2/2025 DB25.1087

Figure 10





FOUR COUNTY GROUNDWATER QUALITY EVALUATION

Example Plots of Water Quality through Time for Calhoun County

Figure 11

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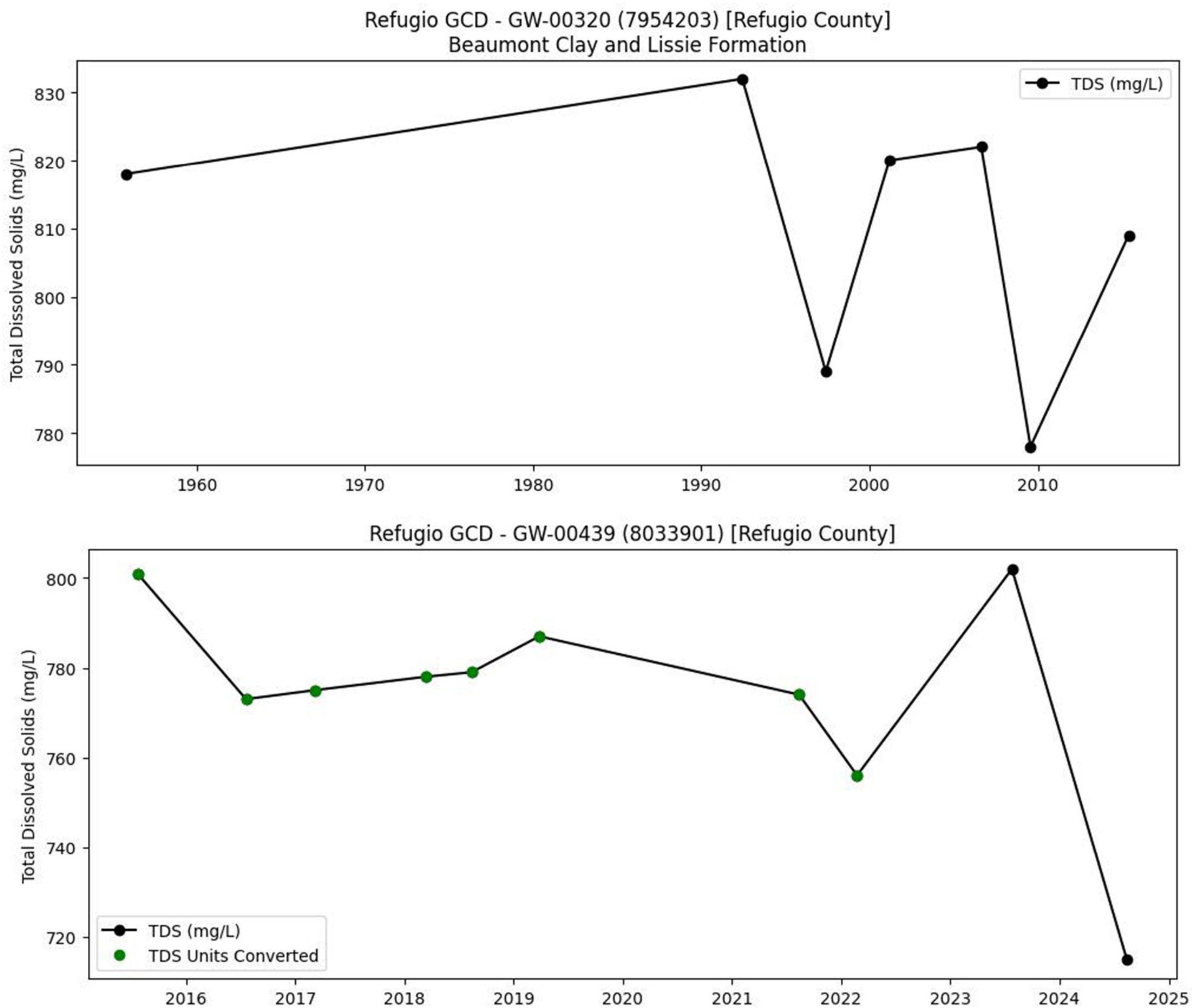

FOUR COUNTY GROUNDWATER QUALITY EVALUATION

Example Plots of Water Quality through Time for Refugio County

Figure 12

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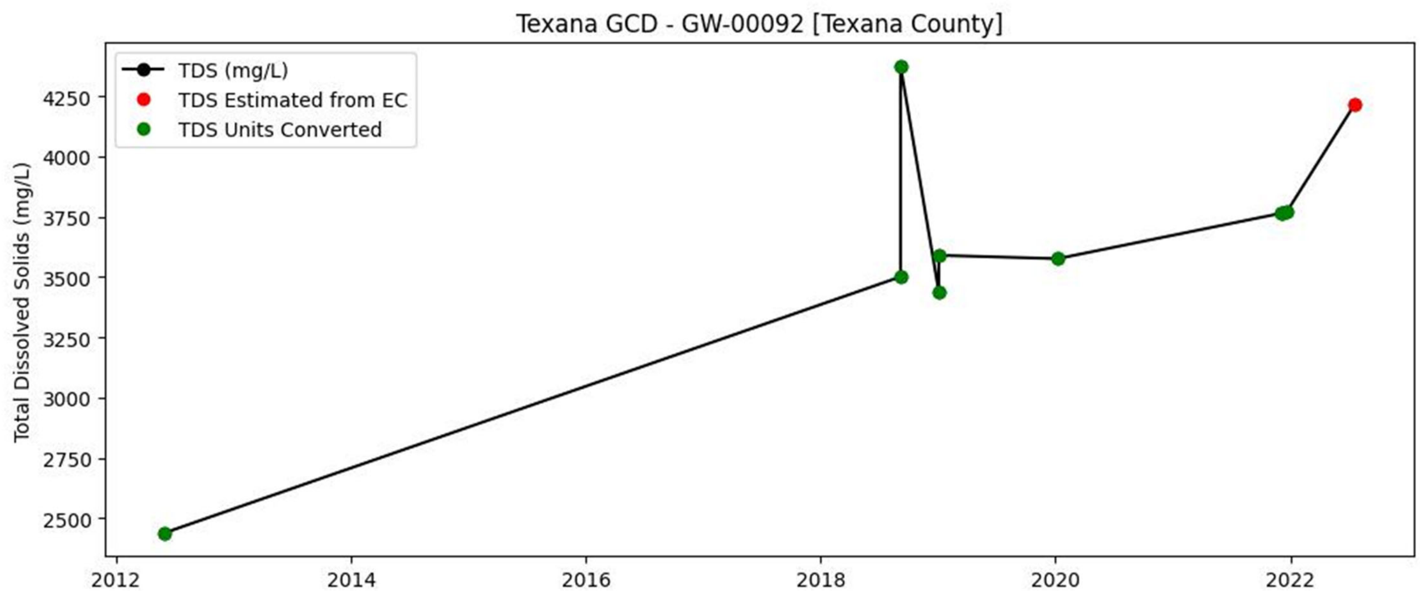

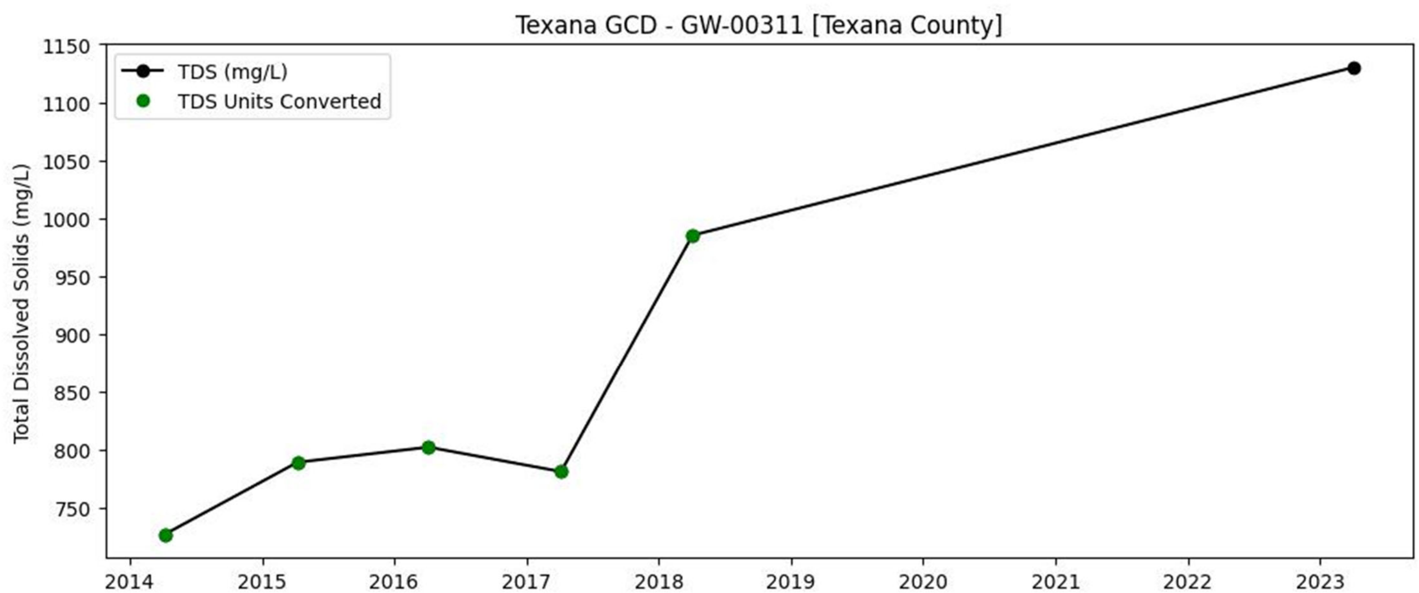

FOUR COUNTY GROUNDWATER QUALITY EVALUATION

Wells with Worsening Water Quality in Jackson County

Figure 13

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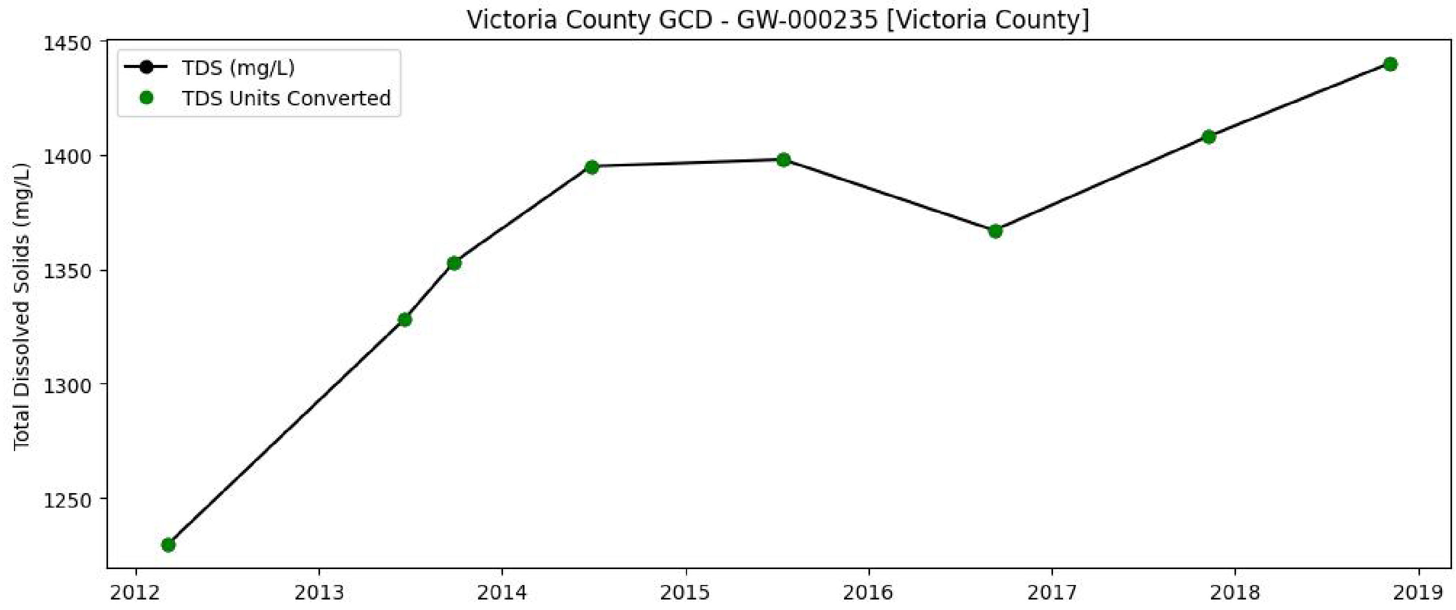

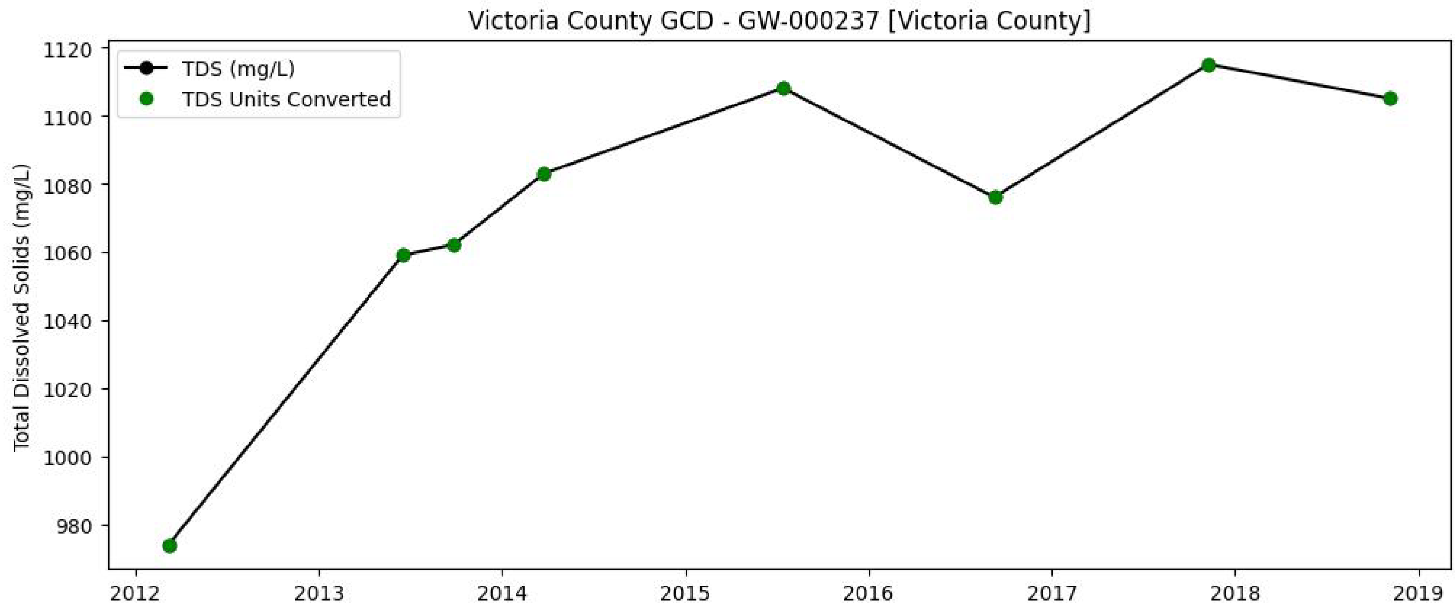

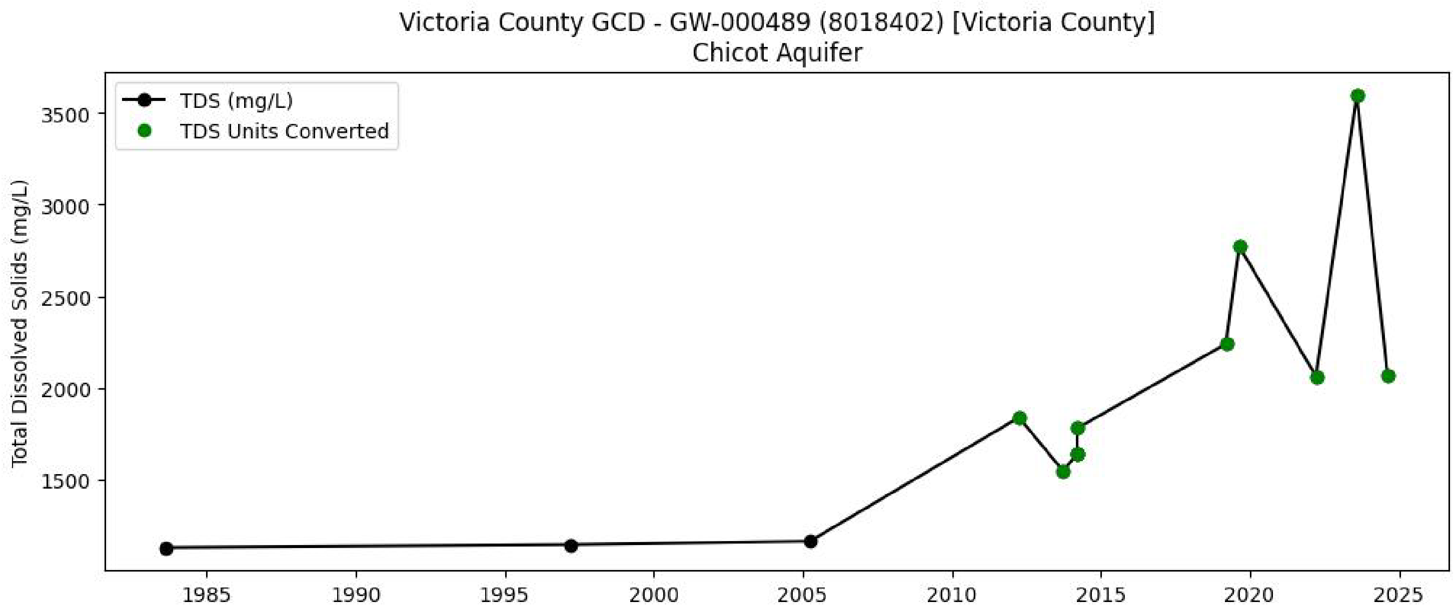

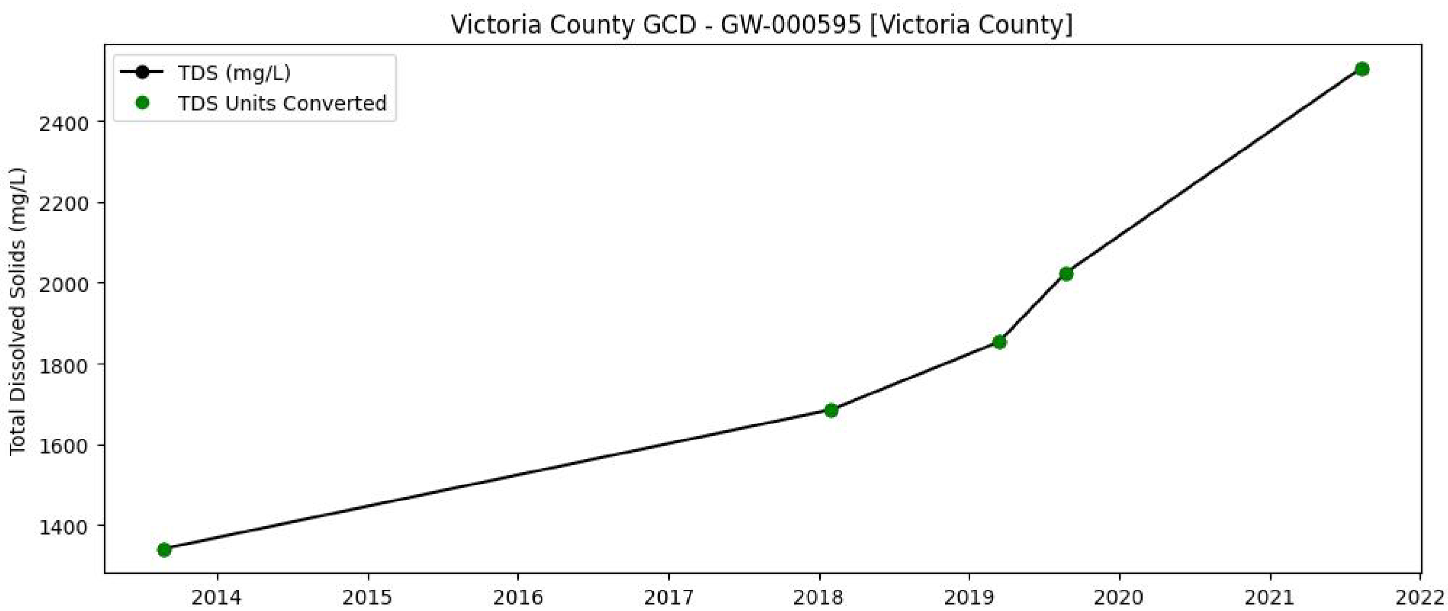

Figure 14

FOUR COUNTY GROUNDWATER QUALITY EVALUATION
Wells with Worsening Water Quality in Victoria County

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Appendix A

Correlations of SC/EC and TDS

This appendix provided electronically

Appendix B

TDS Data Points by Decade

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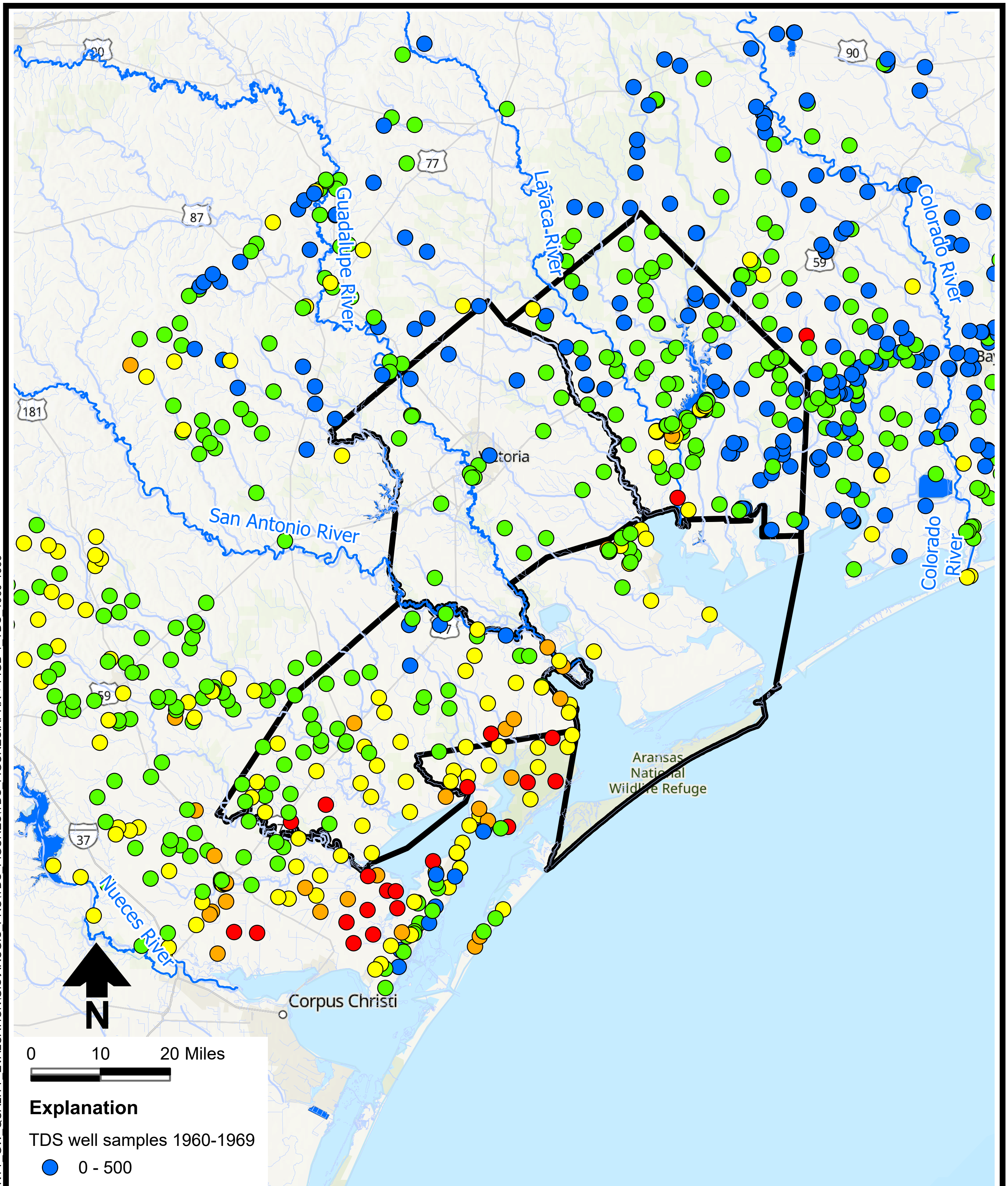


Basemap: ESRI et al.

S:\PROJECTS\DB25.1087 FOUR COUNTY GW QUALITY EVALUATION\GIS\ARCGIS PRO\TDS FIGURES\TDS FIGURES.APRX • FIGB-1 TDS 1960-1969

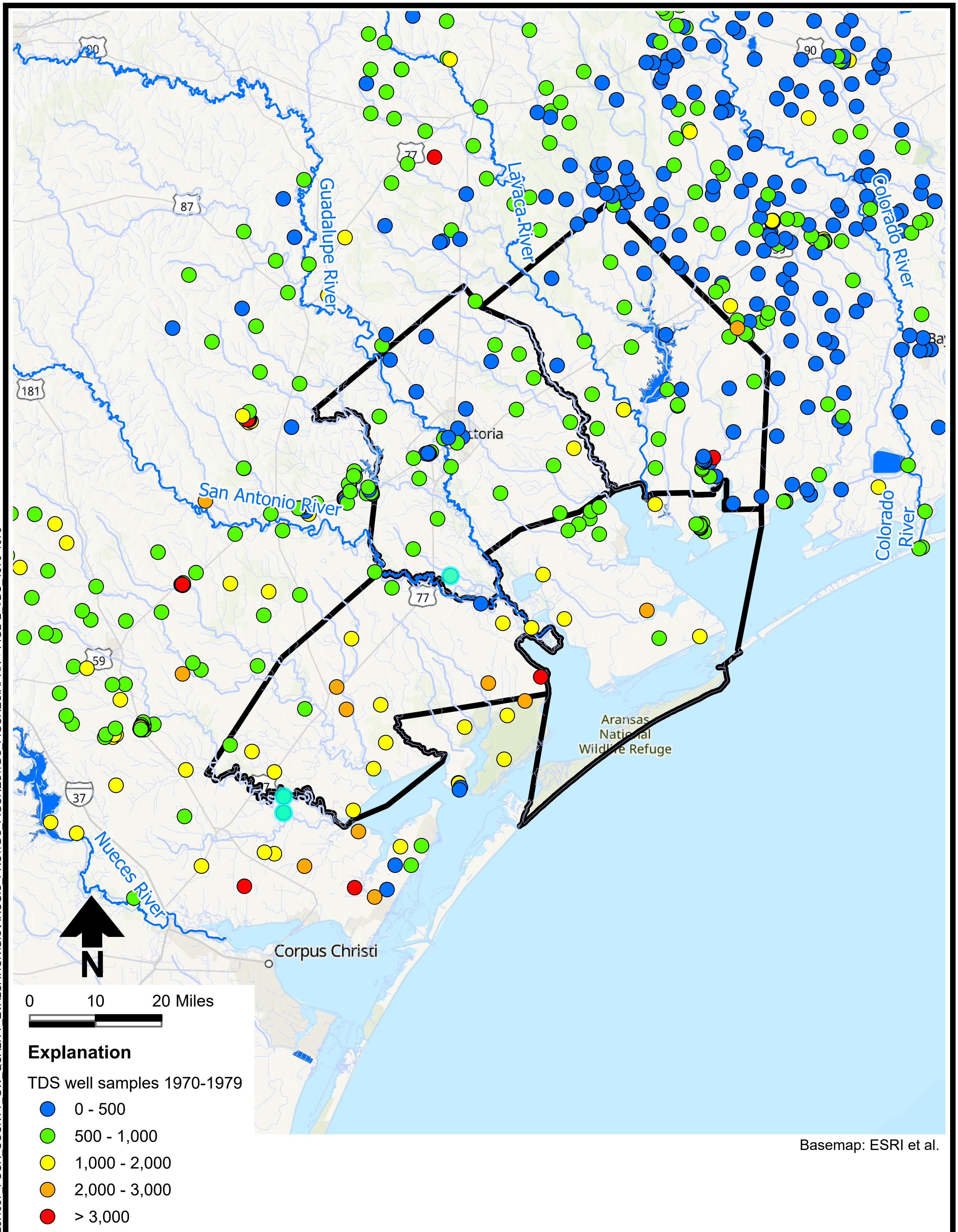
FOUR COUNTY GROUNDWATER QUALITY EVALUATION

Wells with TDS 1960-1969

DBS&A
a Geo-Logic Company

3/17/2026 DB25.1087

Figure B-1



Basemap: ESRI et al.

FOUR COUNTY GROUNDWATER QUALITY EVALUATION

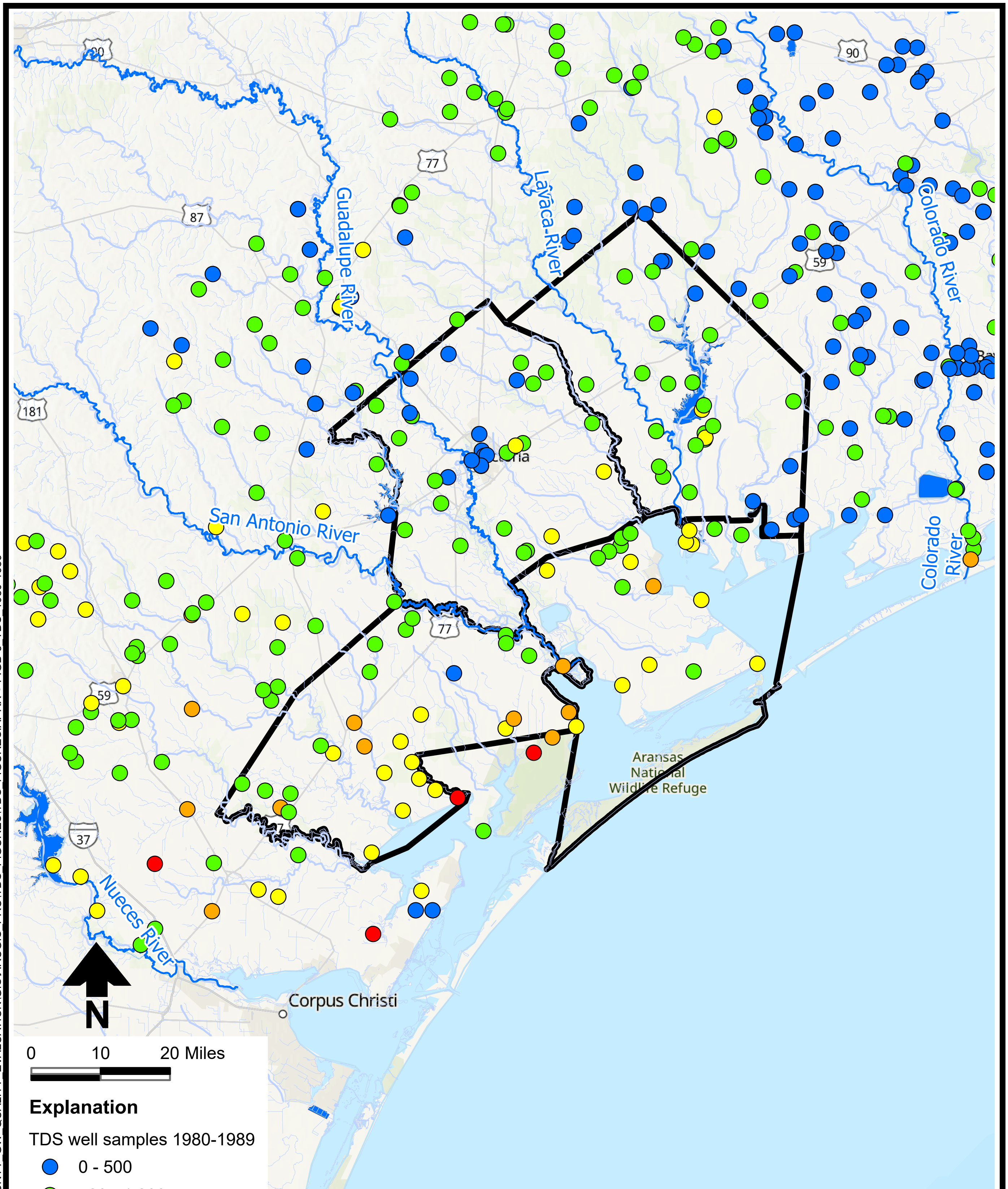
Wells with TDS 1970-1979

S:\PROJECTS\DB25.1087_FOUR_COUNTY_GW_QUALITY_EVALUATION\GIS\ARCGIS_PRO\TDS_FIGURES\TDS_FIGURES.APRX • FIGB-2_TDS_1970-1979

DBS&A a Geo-Logic Company

3/17/2026 DB25.1087

Figure B-2



Basemap: ESRI et al.

S:\PROJECTS\DB25.1087_FOUR_COUNTY_GW_QUALITY_EVALUATION\GIS\ARCGIS_PRO\TDS_FIGURES\TDS_FIGURES.APRX • FIGB-3_TDS_1980-1989

FOUR COUNTY GROUNDWATER QUALITY EVALUATION

Wells with TDS 1980-1989

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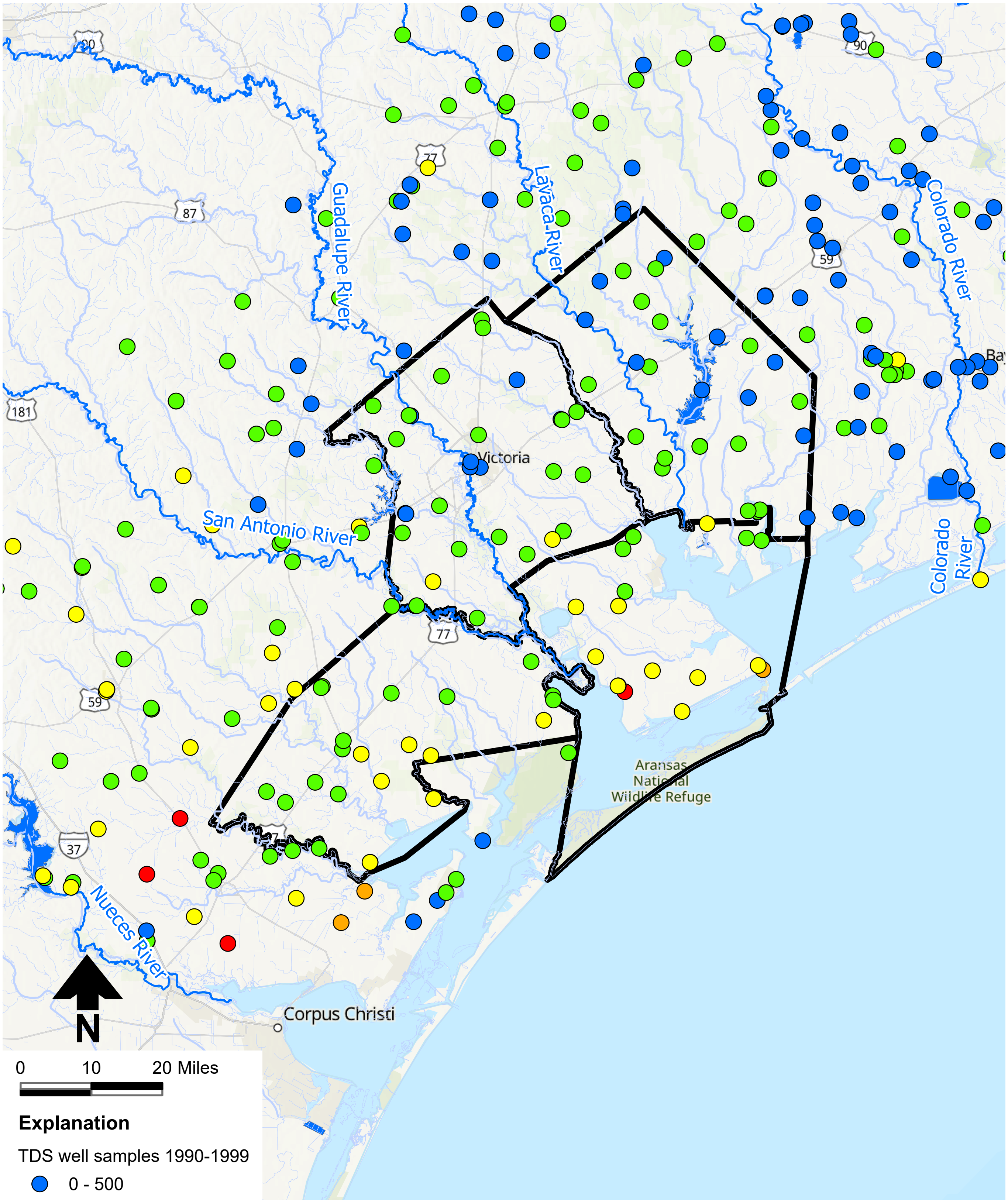
Figure B-3



Basemap: ESRI et al.

FOUR COUNTY GROUNDWATER QUALITY EVALUATION

Wells with TDS 1990-1999

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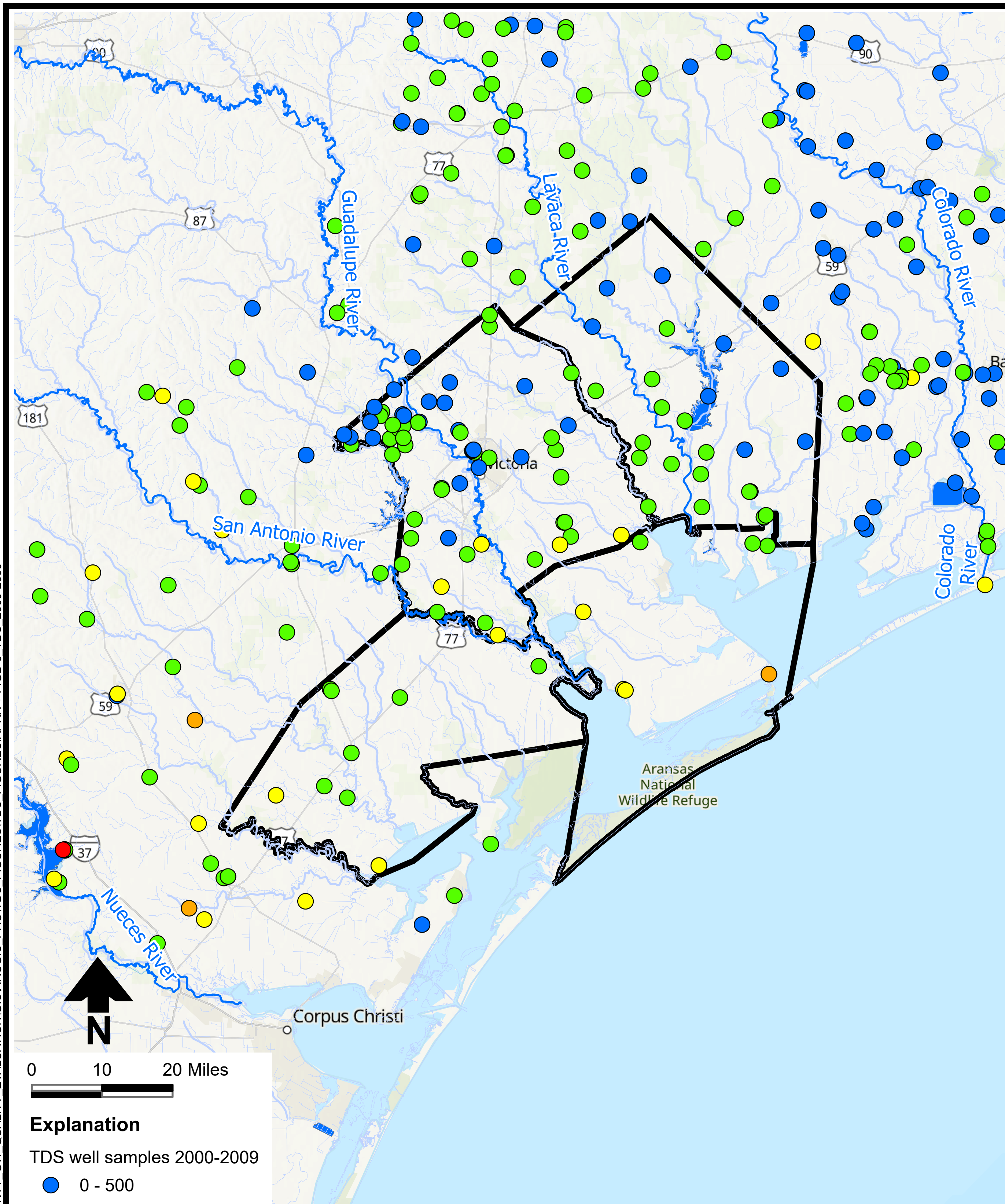
Figure B-4

S:\PROJECTS\DB25.1087_FOUR_COUNTY_GW_QUALITY_EVALUATION\GIS\ARCGIS_PRO\TDS_FIGURES\TDS_FIGURES.APRX • FIGB-4_TDS_1990-1999



Basemap: ESRI et al.

FOUR COUNTY GROUNDWATER QUALITY EVALUATION

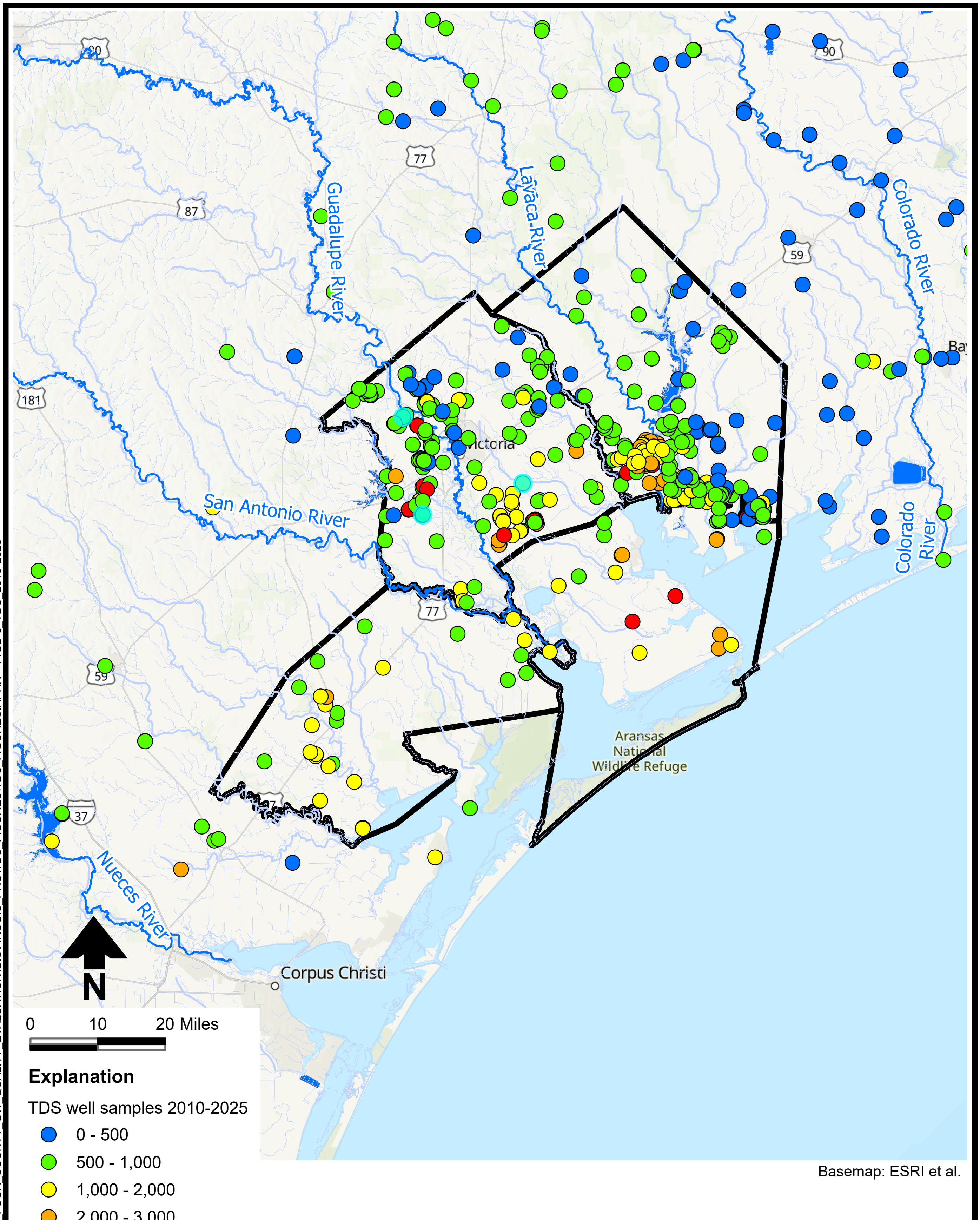
Wells with TDS 2000-2009

DBS&A
a Geo-Logic Company

3/17/2026 DB25.1087

Figure B-5

S:\PROJECTS\DB25.1087_FOUR_COUNTY_GW_QUALITY_EVALUATION\GIS\ARCGIS_PRO\TDS_FIGURES\TDS_FIGURES.APRX • FIGB-5_TDS_2000-2009



S:\PROJECTS\DB25.1087_FOUR_COUNTY_GW_QUALITY_EVALUATION\GIS\ARCGIS_PRO\TDS_FIGURES\TDS_FIGURES.APRX • FIGB-6_TDS_2010-2025

FOUR COUNTY GROUNDWATER QUALITY EVALUATION

Wells with TDS 2010-2025

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Figure B-6

Appendix C

TDS vs. Time at Wells with Three or More Data Points

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