

WORK AUTHORIZATION NO. 1

**PROJECT: Groundwater Services Relating to the Trinity Aquifer Within Williamson
County East of I-35**

This Work Authorization is made pursuant to the terms and conditions of the Williamson County Contract for Engineering Services, being dated **December 20, 2023** and entered into by and between Williamson County, Texas, a political subdivision of the State of Texas, (the "County") and **LRE Water, LLC** (the "Engineer").

Part 1. The Engineer will provide the following Engineering Services set forth in Attachment "B" of this Work Authorization.

Part 2. The maximum amount payable for services under this Work Authorization without modification is **\$357,703.00.**

Part 3. Payment to the Engineer for the services established under this Work Authorization shall be made in accordance with the Contract.

Part 4. This Work Authorization shall become effective on the date of final acceptance and full execution of the parties hereto and shall terminate on **December 31, 2024.** The Engineering Services set forth in Attachment "B" of this Work Authorization shall be fully completed on or before said date unless extended by a Supplemental Work Authorization.

Part 5. This Work Authorization does not waive the parties' responsibilities and obligations provided under the Contract.

Part 6. County believes it has sufficient funds currently available and authorized for expenditure to finance the costs of this Work Authorization. Engineer understands and agrees that County's payment of amounts under this Work Authorization is contingent on the County receiving appropriations or other expenditure authority sufficient to allow the County, in the exercise of reasonable administrative discretion, to continue to make payments under this Contract. It is further understood and agreed by Engineer that County shall have the right to terminate this Contract at the end of any County fiscal year if the governing body of County does not appropriate sufficient funds as determined by County's budget for the fiscal year in question. County may effect such termination by giving written notice of termination to Engineer.

Part 7. This Work Authorization is hereby accepted and acknowledged below.

EXECUTED this ____ day of _____, 20__.

FIRM:

LRE Water, LLC

By: _____

Signature

Jordan Furnans

Printed Name
Vice President - TX Operations

Title

COUNTY:

Williamson County, Texas

By: _____

Signature

Printed Name

Title

LIST OF ATTACHMENTS

Attachment A - Services to be Provided by County

Attachment B - Services to be Provided by Firm

Attachment C - Work Schedule

Attachment D - Fee Schedule

ATTACHMENT A
WORK AUTHORIZATION No. 1
PROJECT: 23RFSQ79

Services to be Provided by County:

None

ATTACHMENT B

WORK AUTHORIZATION No. 1

PROJECT: 23RFSQ79

Services to be Provided by Firm:

LRE Water, LLC (“The Firm”) will provide the following Professional Services, consisting of tasks that will collectively support the development of a hydrogeologic conceptual model of the aquifers within and underlying Williamson County. Individual subtasks include:

TASK 1A – LITERATURE REVIEW AND DATA COLLECTION

At project onset, select LRE Water team members will perform a comprehensive literature review that examines previously documented geology and groundwater data within Williamson County. Additionally, we will query the following state managed water well databases for all available water well data within Williamson County: TWDB GWDB, TDLR SDR, Texas Commission on Environmental Quality (TCEQ) Public Water Supply Database and TWDB Recorder Well database. We will access to the Bureau of Economic Geology Geophysical Log Facility and Well Record Library where we will obtain geophysical logs and exploratory oil and gas well reports that can be used to examine groundwater resources. The Subsurface Library and other geophysical log repositories within Texas will also be leveraged for additional data resources.

TASK 1B – DIGITIZE AND ASSEMBLE DATA

We will process data available and identified during Task 1A, including: 1) digitization of well reports and tables, 2) georeferencing of maps, and 3) the plotting of well locations based on Texas land survey data. All data will be digitized and projected using the TWDB GAM coordinate system. We will standardize the data by creating excel tables and GIS shapefiles and rasters. All data will be carefully documented and will include metadata which details the data origins and limitations. We will also produce and provide digital copies of all relevant materials.

TASK 1C – DEVELOP AQUIFER STRUCTURE AND STRATIGRAPHY

For the development of aquifer stratigraphy, we will develop the aquifer structure and stratigraphy underlying Williamson County, and will provide relevant details on both the Edwards and Trinity Aquifers. We will subdivide the Trinity Aquifer into corresponding Upper, Middle and Lower Trinity units, by defining the following stratigraphic units from available geophysical log data: Glen Rose Formation, Hensell Sand, Cow Creek Limestone, Pearsall, Hammett Shale, Sligo, and Hosston. We will define possible brackish aquifer units in western portions of the county, and the freshwater Carrizo-Wilcox Aquifer in eastern portions of the county. We will expand this study beyond the Trinity Aquifer to also include the following aquifers within Williamson County: the Edwards, the Hickory Sandstone, and the Carrizo-Wilcox aquifers. We will also review the shallow alluvial aquifer systems within the county and determine if there are other hydrogeologic units with local aquifer potential. We will also identify fault locations, where aquifer properties are likely to be observed.

TASK 1D – DEVELOP THREE-DIMENSIONAL MODEL

Using Leapfrog geologic modeling software, we will develop an interactive three-dimensional model for Williamson County. This model will include the stratigraphic structure developed under Task 1C and also incorporate water well and water level data developed through Task 1B and 1E. This model will provide an additional layer of quality assurance by demonstrating the spatial distribution of aquifer data in a three-dimensional workspace which simultaneously increases data transparency

TASK 1E – DETERMINE WELL COMPLETION

We will review well and aquifer data and determine well completion and screen intervals included within across the water well databases reviewed and assembled in Task 1A and 1B. With this well information, we will use the three-dimensional model (from Task 1D) to efficiently assign the appropriate aquifer to every existing water well across the County. The properly georeferenced and attributed water wells will become part of the Three-Dimensional Model developed under Task 1D.

TASK 1F – AQUIFER HYDRAULIC PROPERTIES

We will gather publicly available test data for wells completed in the Trinity and Edwards aquifers. In addition, we will request data from public water systems in Williamson County with wells completed in the studied aquifers. Additional data may also be available from Certification of Groundwater Availability reports previously submitted to Williamson County with proposed plats. We will analyze the accumulated data to develop estimates of the aquifer conductivity, thickness, and storativity at the locations of wellsites for which such data is available. To develop estimates of aquifer properties for the entire extent of Williamson County, we will utilize interpolation methods.

TASK 1G – WATER LEVELS

Based on the TWDB GWDB, there are 587 water wells with historic water level measurements in Williamson County. LRE Water will compile this data and develop decadal water level data (maps, rasters, and contour surfaces) including the most recent water level measurement on every well in this database. Water levels will be assigned an aquifer based on the results from Task 1E.

TASK 1H – RECHARGE AND EVAPOTRANSPIRATION

Under this task, we will estimate and quantify historical recharge and evapotranspiration across the county. We will utilize methods recently developed by the TWDB and by entities updating the groundwater model spanning the entire GMA-8 region (in which Williamson County is included). We will investigate the applicability of these established recharge models for application in Williamson County, make appropriate updates, and incorporate the results as part of our conceptual model development.

TASK 1I – ESTIMATE PUMPAGE

We will investigate various sources of historical pumpage data from wells within Williamson County to inform our understanding and quantification of the historical pumping timing, locations, and amounts. To develop the pumping datasets for the conceptual model, we will draw upon our team's previous and ongoing experience with TWDB Water Use Survey data, pumping data from local entities, and estimation of pumping from publicly available datasets. For future modeling purposes, we will apply and further refine pumping estimation methods that are based on the publicly available data.

TASK 1J – SURFACE WATER & SPRING FLOW

Spring locations and discharge will be estimated based on information in the TWDB GWDB, a US Geological Survey database of Texas springs (Heitmuller and Reece, 2003; Brune, 1975), and Brune (1975). Recent aerial imagery will be used to confirm spring locations and estimate if they are still active based on vegetation or other indicators, and limited field visits will be made (where access is granted) to confirm location, current condition and estimate flow rate. Cross-formational flow between the Edwards and Trinity aquifers through the Balcones Fault Zone is probable within the study area; we will review the geochemical model and determine where cross-formational flows are occurring in Williamson County

TASK 1K – WATER QUALITY

We will review data from the 449 TWDB GWDB wells for which water chemistry information is provided, as well as review data from other sources identified under Task 1A. We will also review and incorporate into the conceptual model results and conclusions drawn from published hydrogeochemical models for the region. Our team will assess this data and determine if water chemistry data can be correlated to individual aquifer units, determine if there are variations within aquifer units, and define freshwater and brackish water limits discernible throughout the county.

TASK 1L – DEVELOP GEODATABASE AND SUPPLEMENTAL DATA

We will create and provide the County with a geodatabase to serve as the data repository for material developed under this Work Authorization. All digital format data with geographic coordinates or spatial representation developed from Task 1A – 1K will be compiled into a geodatabase. Additional supplemental data as related to rainfall, physiography and climate, soil, and surface hydrology will also be acquired and included in the geodatabase during this task. The geodatabase will conform to the TWDB Geodatabase/Data Model Requirements. We will also follow the Federal Geographic Data Committee recommendations for the reporting of metadata.

TASK 1M – QUALITY ASSURANCE AND QUALITY CONTROL

For all efforts under this Work Authorization, we will implement quality assurance/quality control (QA/QC) procedures that expedite data extraction and processing but also serve to remove opportunities for error introduction. Quality control will be reinforced by implementing statistical data models which identify outlier data points and by reserving budget and staff time to carefully review the deliverables associated with each task.

TASK 1N – DATA DOCUMENTATION (TASK 1 REPORT)

We will develop a conceptual model report that details our Task 1A – 1L analysis and follows the TWDB Conceptual Model Report checklist. We will provide the County with a draft report, and provide the County with 30 days to review the report and provide comments. We will then incorporate all comments into a final conceptual model report (and geodatabase), which will be of form and content suitable for acceptance by TWDB. (Note: we will not submit the report to TWDB for review, unless so directed by the County).

Work Authorization 1 Deliverables:

Leapfrog Three-Dimensional Model

- Leapfrog project file used to develop the Leapfrog viewer module (freeware), with detailed data documentation.
- Leapfrog viewer module, with the following:
 - » (3) reference layers: aerial, streets and political boundaries and surface geology
 - » Hydrogeologic framework as defined by Task 1C.
 - » Water well locations defined by Task 1A with well completion intervals defined by Task 1D.
 - » Current water level and potentiometric surfaces as defined by Task 1G.
- A user manual developed by LRE Water specifically for Williamson County.
 - » (1) in-person or online training session for County staff.

Geodatabase

- (1) Geodatabase as described by Task 1L.

Conceptual Model Report

- Summarizes the project with relevant items discussed in Task 1A – 1L according to the TWDB conceptual model report checklist.
- Provided in electronic format (PDF)

ATTACHMENT C

WORK AUTHORIZATION No. 1

PROJECT: 23RFSQ79

Work Schedule

Tasks performed under Work Authorization 1 will commence immediately upon receipt of notice to proceed. All task efforts shall be completed no later than August 31, 2024, with a draft report provided to the County no later than June 30, 2024.

ATTACHMENT D

WORK AUTHORIZATION No. 1

PROJECT: 23RFSQ79

Fee Schedule

The project budget for Work Authorization No 1. is \$357,703.

Expenses will be based on hours worked by project staff, per the hourly rates listed below.

Note: LRE Water Staff listed below are those most likely to work on the Williamson County Groundwater Services Project. We will utilize other staff (as needed), possibly including staff not hired as of 1/16/2024, and will provide such staff names, classifications, and hourly rates as needed.

<u>Primary LRE Water Staff – TX Operations</u>		
<u>Name</u>	<u>Classification</u>	<u>Rate (\$/hr)</u>
Furnans, Jordan	Project Manager	\$225
Clause, Vince	Senior Project Geologist	\$200
Budd, Theresa	Staff Geologist III	\$185
Darling, Wallace	Staff Geologist I	\$143
Schellhorn, Alex	Project Geologist	\$176
Standen, Allan	Senior Project Geologist	\$220
Swientek, Lauren	Staff Geologist I	\$143
Wade, Kacey	Staff Geologist I	\$137
Wong, Stephanie	Staff Geologist II	\$153
<u>Project Support Staff – TX Operations</u>		
<u>Name</u>	<u>Classification</u>	<u>Rate (\$/hr)</u>
Gilliom, Ryan	Project Geologist	\$169
D' Ambra, Lauren	Staff Geologist I	\$135
Fullmer, Tucker	Technology Specialist II	\$141
Salazar, Tim	Data Scientist II	\$169
Barry, Michael	Project Developer	\$183
Anderson, Hanna	Project Engineer	\$185
Weil, Page	Project Manager	\$220
Bauer, Jacob	Project Geologist	\$220
Barber, Joel	Project Engineer	\$215
Stokes, Scott	Staff Geologist II	\$142

Subcontractor Staff – Staff Rates

<u>Name</u>	<u>Firm/Affiliation</u>	<u>Classification</u>	<u>Rate (\$/hr)</u>
Keester, Mike	KT Groundwater	Senior Geologist	\$250
Webster, Paul	KT Groundwater	Geologist	\$150
Joe Yelderman	Baylor University	Technical Advisor	\$250
Hunt, Brian	UT BEG	Technical Advisor	\$250
Scanlon, Bridget	UT BEG	Technical Advisor	\$250
Nicot, Jean-Phillippe	UT BEG	Technical Advisor	\$250
Flaig, Peter	UT BEG	Technical Advisor	\$250