Hydrogeological Study Standards and Guidance for Submitting Application for a Well Permit

EVERGREEN UNDERGROUND WATER CONSERVATION DISTRICT

Contents

Introduction

Hydrogeological studies are required by the Evergreen Underground Water Conservation District (the District) Rules to provide information regarding the hydrogeologic parameters of the aquifer and the impacts of the proposed pumping on the water resources of the District. This information allows the public and District Board of Directors to assess the impact of permit applications and is used to evaluate applications in the permitting process. The purpose of this document is to provide guidance on the content required for the Hydrogeological Study Type 1 and Hydrogeological Study Type 2 , with special instructions for Transport permits. This guidance establishes standards for the hydrogeologic assessments and the format of how the data and information is documented and presented within the permitting process.

Applicants developing a Hydrogeological study should coordinate with the District at the start of planning of the hydrogeological study. Consultation with the District prior to starting the hydrogeological study facilitates the execution and evaluation of the study. The District may exercise discretion in the application of the guidelines on an individual or site-specific basis. The exercise of this discretion in no way limits the authority of the District in any other matter.

As described in EUWCD Rule 7.2, a hydrogeological study shall be submitted that includes the following sections with the required information and deliverables in the formats specified. The report shall be signed and sealed by a qualified hydrogeological professional, either a professional engineer or geologist in good standing with the TBPELS or TBGS.

Hydrogeological Study Type 1

Section 1: Geological Setting and Well Location

Describe the hydrogeological setting of the proposed well(s), including identification of the depth interval and anticipated thickness of the water bearing zone, and whether the aquifer is confined or unconfined at the location of the proposed well(s).

Deliverables:

- Narrative of the hydrogeological conditions. Attribute the source of data and describe any assumptions or proposed modifications to the data.
- Exhibit(s) showing the location of the well in the context of property lines.

- Exhibit of the geologic cross section with the proposed well depth and screening interval.

Section 2: Projected Impacts of Groundwater Production

Estimate the drawdown caused by the pumping of the proposed well with 1 year and 10 years of pumping for a distance of 5 miles from the proposed well(s). The estimate can be developed using either a numerical or analytical well solution. Aquifer parameters shall be estimated from the district identified best available data, including but not limited to the most recent TWDB approved version of the GAM. Illustrate the drawdown with an exhibit(s) of the drawdown contours at 10-foot intervals for a minimum of 5 miles radius of the well.

Provide a table of each registered or permitted well screened in the same aquifer located within 1 mile of the proposed well(s). Include the well owner, well identifier, permit number, latitude, longitude, casing diameter, screen intervals and diameters, well depth, drawdown at 1 year of pumping, and drawdown at 10 years of pumping.

Deliverables:

- Technical narrative of approach, assumptions, data sources, and other information needed to document how the impacts of the groundwater production were estimated.
- Exhibits or maps of the drawdown for 5 miles from the wells, in 10-foot contours at 1 and 10 years of pumping. Include property lines, easements (of the applicant property), and the locations of registered and permitted wells. A map shall be provided showing the locations of the well(s) at a scale no greater than one-inch equals 1,000 feet.
- Excel Workbook with worksheet of Table of registered/permitted wells within the specified distance.
- Shapefile of drawdown contour lines, compatible with ArcGIS Pro

Hydrogeological Study Type 2

Section 1: Geological Setting

Describe the hydrogeological setting of the well(s) including the surface and subsurface geology . Include hydrologic and geologic features within 1 mile of the proposed well(s) such as the elevation, slope, soils, water features, and floodplains. Outline the stratigraphy of the well location, including the top and bottom elevations for the aquifer

with the proposed water bearing zone and zone thickness. Identify whether the proposed well location is in the unconfined or confined section of the aquifer.

Describe the aquifer and historical water level data for wells that are screened within the aquifer of interest in the area whether inside or outside the District.

Deliverable:

- Narrative of the hydrogeological conditions
- Exhibit of the geologic cross section with the proposed well(s) depth and screening interval.
- Spatial datasets extending three miles from the well or wells with a resolution matching or finer than the adopted Groundwater Availability Model grid resolution for:
    - Elevation
    - Groundwater bearing unit, top and bottom elevations, sand percentages

Section 2: Proposed Well(s)

General Description of Well Location

Describe the location of the proposed well(s), including the latitude and longitude; property address, legal description. Also include an exhibit illustrating how to access the well(s) location, including locations of gates, roads, or other access information. If monitoring wells are also to be implemented, include access routes to the monitoring wells. Provide the warranty deed and survey exhibits showing the property lines, easements, mandatory setbacks, rights-of-way, etc.

Well Description

Describe the proposed well(s) including _estimated casing diameter, screen diameter, casing and screen materials, estimated casing and screen setting depths and whether the well shall be gravel packed and the proposed pumping rate and power supply horsepower. Include a well construction cross-section drawing.

Identify the well driller contracted or identified to drill the proposed well. Include the active license number and license expiration date.

Potential Sources of Contamination / Potential Pollution Hazards

The applicant shall identify known and potential sources of groundwater contamination including On-Site Sewage Facilities, wastewater treatment facilities, floodplains, or spills on the property meeting notification or reporting requirements of TCEQ or the National Response Center, list of TCEQ registered Petroleum Storage Tanks with ¼ mile of the well, leaking underground storage tanks within 1 mile of the well location and toxic release inventory within ¼ (0.25) mile of the well location .

Resources:

- Groundwater Contamination Viewer - Texas Commission on Environmental Quality - www.tceq.texas.gov
- UST Finder
- Historical Resources Archives - EDRnet, All required search distances

Deliverable:

- Narratives of the Description of the Well Location, Well Characteristics, and potential sources of contamination on or near the well site.
- Warranty Deed for property on which the well will be located (PDF)
- Survey with field notes showing property lines, easements, mandatory setbacks, rights-of-way, etc. (PDF)
- Exhibit(s) showing the location of the well in the context of property lines
- Exhibit for well access instructions
- Preliminary construction documents including the plan set, construction notes, specifications of the proposed well and pump .
- Identification of the contracted driller and Driller License Number.
- Exhibit of map of well nearest onsite sewage facility if less than 0.25 miles, potential sources of contamination, floodplains, or other known sources of potential contamination (Map) – Can also be submitted as a Phase I Environmental Site Assessment OR environmental database report meeting all search distances.

Section 3: Projected Impacts of Groundwater Production

Evaluate the impact of the well(s) operation on nearby wells for the specified distances

- Production Permits- Within 1 mile of the proposed well(s)
- Large Production Permits-5 miles radius of the proposed well(s)_
- Transport Permits- 10 miles of the proposed well(s)

Estimate of water level drawdowns and/or artesian head declines in the aquifer at one year, ten years and thirty years caused by pumping the well(s) using the Districts adopted best available science groundwater availability model. Incorporate updated stratigraphy and geologic parameters as appropriate in consultation District personnel.

Describe the modeling approaching including the model used, assumptions, and technical notes necessary to evaluate the assessment. The model should be submitted in a stable format, able to run in Groundwater Vistas (version **8**). Spatial data should be compatible with ArcGIS Pro and projected in GCS NAD 1983_2011 (Albers). Identify any changes to the GAM in terms of parameterization or structure of the model and include shapefiles of the input data. Output data, including groundwater heads, drawdowns, and velocity vectors should be submitted as shapefiles.

Describe the change in water budgets within the District over 30 years of pumping the proposed wells for the following scenarios:

1. Proposed Well(s)
2. Current Pumping + Regional Plan Projects + Proposed Well(s)
3. Current Pumping at Full Permit Allocations within 10 miles of Proposed Well + Regional Plan + Proposed Well(s)

Drawdowns should be shown in terms of contours maps out to the required distances and average drawdown by County across the jurisdiction for decadal timesteps from 2030 through 2080.

For Transport Permits – Calculate the reduction in storage for the model area over 30 years of pumping the proposed well(s).

Include a table of the registered/permitted wells within 1 mile of the proposed well(s) with the following attributes

- Well Identifier and Permit Number (if applicable)
- Name of Owner
- Current Mailing Address
- Casing Size
- Screening Interval
- Total Well Depth
- Groundwater Aquifer Screened
- Depth of Pump

- Head at 1 year of pumping the proposed well(s)
- Head at 10 year of pumping the proposed well(s)
- Head at 30 year of pumping the proposed well(s)
- Drawdown at 1 year of pumping the proposed well(s)
- Drawdown at 10 years of pumping the proposed well(s)
- Drawdown at 30 years of pumping the proposed well(s)

Deliverables:

- Modeling Approach narrative, including model used, assumptions, and data sources. Include all pertinent technical notes for evaluation of the model.
- All model files necessary to run the Groundwater Availability Model (GAM) within Groundwater Vistas version 8.
- Input data files including shapefiles of the model grid domain with the Top and Bottom Elevations of the layer of the aquifer of interest, the hydraulic conductivity, transmissivity and well file.
- Output model files, including the shapefiles of the model grid domain of the head, drawdown, and velocity vectors, of the layer of the aquifer of interest.
- Exhibits of maps of the drawdown for 5 miles from the wells or 10 miles for Transport Permits, in 10' contours at 1, 10, and 30 years of pumping. Include the locations of registered and permitted wells.
- Excel Workbook with worksheet of Table of registered/permitted wells within the specified distance and drawdown estimated to occur at the well location after 30 years of requested project pumping.
- Excel Workbook with the water budget for each timestep of the 30 year simulation
- Excel Workbook of the average drawdown by County within the District for each decade of the regional water plan for 2030 through 2080 caused by pumping the well(s)
- *For Transport Permits*- Include the reduction in storage over 30 years in the model area for each county, and in the jurisdiction. Perform this analysis for the baseline and each required scenario. *See https://www.twdb.texas.gov/groundwater/docs/GAMruns/Task13-036revised.pdf?d=32082 reference.*

Section 4: Submittals of Well Completion Data

Prior to starting construction, the permittee shall submit for District review

1. A pdf of the construction drawings, including the site plan view, well profile, well details, etc.
2. Well specifications.

After the well or wells are constructed, the well owner shall provide the District,

1. A pdf copy of any geophysical logs run in the pilot hole drilled for the well
2. An electronic copy of the pumping test data for the well following construction
3. A copy of chemical analyses performed on water samples from the well following construction and well development
4. Record drawings or construction red-lines, professionally signed and sealed by the engineer of record, of the construction drawings and well specifications.

Use of Water (reference Rule 7.2(15))

Describe the use of the water by the ultimate end user.

For public water supply : Describe the CCN or service area, including the specific area serviced by the well, with number and type of connections. Identify the current and projected water use statistics , including average connection annual water use, peaking factors, etc. Identify how water is metered throughout the system, including the proposed and existing locations of meters, and the type and precision of the meters. Outline the entity's leak detection and repair program, including specific measures for how leaks are detected and average response time.

Deliverable:

- Narrative of service area description, including map exhibits illustrating the area serviced by the well.
- Narrative of metering and entity water use statistics.
- Narrative of leak detection program.
- Shapefile of the CCN
- Shapefile of the Area serviced by the proposed well
- Shapefile of the locations of meters (well meters, zone meters, meters for measuring volume exported, etc).

Conservation Plan (reference Rule 7.2(14))

1. For Public Water Supply and Industrial Users: Enumerate Water Conservation Goals established by the permittee and end user with specific measures and the timeframe for implementation

The applicant shall describe their proposed conservation and drought contingency plans, outlining their conservation goals. Specific implementation actions shall be described with timeframes for implementation, triggers for implementation, and how progress will be measured and monitored. The applicant shall outline their enforcement plan and authority to enforce.

The Drought Contingency Plan shall align with Section 16 of the Evergreen UWCD Rules, detailing how the applicant will implement mandatory conservation measures upon the described triggers and thresholds of aquifer conditions as given in Section 16.

For Large Production Permits: The Conservation Plan shall also include actions and implementation measures aligned with the thresholds outlined in Rule 7.11.

For public water supply : The conservation plan shall be linked with the entity's most recent water loss audit.

Deliverable: Conservation Plan Narrative, Word Processing Document.

Well Closure Plan (reference Rule 7.2(21))

A well closure plan outlining the proposed plan and measures to decommission the well as necessary. The plan shall meet the standards of Texas Department of Licensing and Regulation (TDLR) and TCEQ guidelines for well closure.

Deliverable: Conservation Plan Narrative, Word Processing Document

Additional Items For Transport Permits

Section 1- Subsidence Monitoring

The applicant shall review current reports in order to document the risk of subsidence (https://www.twdb.texas.gov/groundwater/models/research/subsidence/subsidence.asp) in the location and depth and groundwater proposed for production. If the probability is low identify the four nearest potential benchmark locations (North, South, East, and West of the well location(s). Provide a statement of opinion of the risk resulting from the operation of the proposed well(s). If the probability of subsidence in the vicinity of the well is medium

or greater, or the well is located within the Yegua-Jackson Aquifer, identify benchmark locations and provide baseline measurements of ground elevation. The permittee will be required to conduct measurements at the benchmark locations at renewal of the operations permit.

Section 2 – Mitigation Plan

The applicant shall coordinate with the District to develop an acceptable mitigation plan. Provide a description of specific measures that the applicant will undertake in order to address and mitigate adverse impacts of the production of groundwater on nearby wells (reference 11.3(b)(4)).

Deliverable:

- Narrative and any supporting documents describing the mitigation plan.

Section 3- Regional Water Plan and District Management Plan Considerations

The applicant shall describe how the proposed transport is addressed in any approved regional water plan(s), and the approved District Management Plan.

Deliverable:

- Narrative and any supporting documents identifying the proposed transport project within the regional water plan and the District Management Plan.
- Identify if the project has been modified as "MAG Limited" within the regional water plan, and how it will impact operation of the project.

Additional Items For Large Capacity Permits (Rule 7.11)

Section 1- Monitoring Wells

The applicant shall provide a monitoring plan identifying the location of monitor wells according to Rule 7.11. The applicant shall also provide the District a copy of the plans for the monitor wells for review.

Deliverable:

- Exhibit of Map of Monitoring well locations with property lines and proposed production wells denoted.
- Well /drawings for proposed monitoring wells.
- Signed monitoring agreement for District access to monitoring wells

Section 2- Access Agreement

The applicant will be required to execute an Access Agreement with the District to provide continuous access to all wells and groundwater monitoring wells. The access agreement will identify routes of ingress/egress, provide access arrangements, such as gate codes, points of contact, etc .

Deliverable:

- Draft Access Agreement

Additional Items For Brackish Permits for the Carrizo-Wilcox Aquifer (Rule 10.1)

Section 1- Water Quality and Chemical Analysis

The District will conduct water quality and chemical analysis of the groundwater in order to assess the salinity of the produced groundwater in conformance with Rule 10.1. Provide any background information that will assist the District with this process.

The applicant will be required to execute a Brackish Groundwater Production Study Agreement with the District and coordinate access to the groundwater well(s) to District staff or contractors as needed to conduct the study.

Section 2- Monitoring Wells

The applicant shall provide a monitoring plan according to Rule 10.1 (b), including the location, and specifications of the monitoring well and water level data logger to continuously monitor the water level. The monitoring plan shall also include a plan for a fluorescent dye tracer study after 6 months of sustained production.

Deliverable:

- Monitoring Plan
- Water level data logger specifications
- Monitoring Well specifications

Other Resources

GAM Projection

PROJCS["New Projected Coordinate System_2",GEOGCS["GCS_NAD_1983_2011",DATUM["D_NAD_1983_2011",SPHEROID["GRS_1980",6378137.0,298.257222101]],PRIMEM["Greenwich",0.0],UNIT["Degree",0.0174532925199433]],PROJECTION["Albers"],PARAMETER["False_Easting",4921250.0],PARAMETER["False_Northing",19685000.0],PARAMETER["Central_Meridian",-100.0],PARAMETER["Standard_Parallel_1",27.0],PARAMETER["Standard_Parallel_2",35.0],PARAMETER["Latitude_Of_Origin",31.25],UNIT["Foot",0.3048]]