

Bluebonnet Groundwater Conservation District

Guidelines for Submitting Data and Information and the Preparation of Hydrogeologic Reports in Support of Applications for the Permitted Use Of Groundwater

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1.0 Introduction

1.1 Summary of Rule 8.5(F)

Rule 8.5(F) of the Bluebonnet Groundwater Conservation District (BGCD) outlines the requirements of data, information and hydrogeologic reports required for Non-Exempt wells with inside casing diameter of eight inches or greater.

Rule 8.5(F)(2) lists data requirements that are expected to be submitted as part of the application:

- Well coordinates.
- Well construction diagram.
- A map showing the location of the proposed well, all existing wells, hydrologic features, and geologic features located within ½ mile of the proposed well site.
- Proposed production of the well or wells.
- Proposed production rate for the well or wells.

The reporting requirements are split into Phase I reports and a Phase II report. In general, the Phase I report is intended to be a preliminary report that relies on existing regional information. The Phase I report is intended to evaluate the impacts of pumping using existing data and the existing regional groundwater flow model of the area for the aquifer in which the well is to be completed. The Phase II report is intended to be a final report that relies on site specific data, information, test results and analyses.

The required data and information associated with Rule 8.5(F)(2) and the information on the permit application forms will be used by the BGCD to prepare a Phase I hydrogeologic report using existing regional data and information. Applicants have the option to submit a Phase I report that meets all the requirements of this guideline document. Phase II reports are to be prepared by the applicant as detailed below.

As described in Rule 8.5(F)(4), Phase I-a reports will be completed if the annual proposed production rate is equal to or less than 200 million gallons. Phase I-b reports will be completed if the proposed production rate is greater than 200 million gallons. The scope of Phase II reports are independent of proposed production rate.

As described in Rule 8.5(F)(6), hydrogeologic reports, whether completed by BGCD or submitted by the applicant, must meet the standards set forth in these guidelines and must be sealed by a Professional Geoscientist (P.G.) or Professional Engineer (P.E.) licensed to practice in the State of Texas.

1.2 Objective

This guideline document is intended to set standards and expectations for the investigations and reports. The planning and implementation of investigations should be coordinated with BGCD to insure acceptability. BGCD may exercise discretion in the application of the guidelines on an individual and site-specific basis in order to allow a practicable application of the guidelines while ensuring a result yielding the information needed by BGCD to process the permit application. The exercise of this discretion by BGCD shall not be construed as limiting the authority of BGCD in any other matter. BGCD should be notified at least 24 hours in advance of the anticipated conduct of any test-hole drilling, well construction, or pumping test conducted as part of the hydrogeologic investigation performed to meet the requirements of these guidelines.

2.0 Phase I Reports

The Phase I report is intended to evaluate the impacts of pumping using existing data and the existing regional groundwater flow model of the area for the aquifer in which the well is to be completed. Phase I-a reports will be completed if proposed annual production is equal to or less than 200 million gallons. Phase I-b reports will be completed if proposed annual production is greater than 200 million gallons.

2.1 Phase I-a Report

As documented in Hutchison (2023), since this guideline document was updated in 2014, permit applications with “relatively low” proposed production rates yielded drawdown and subsidence results from HAGM simulations that were not considered significant.

The Phase I-a report uses the information provided by the applicant, the data the Excel spreadsheet *BGCD Parameters.xlsx* (Hutchison, 2023), and calculations of drawdown using the Theis equation (Hutchison, 2023) to estimate potential impacts of the proposed pumping. No HAGM simulation is required as part of a Phase I-a report.

The Phase I-a report consists of five required elements in the form of tables as documented in Hutchison (2023):

- Grid parameters
- HAGM parameters
- HAGM results
- Theis parameters
- Theis results

This report will be prepared by the District within 30 days of submission of a completed application with all the required elements from Rule 8.5(F)(2). The Phase I-a report is part of an administratively complete permit application.

2.2 Phase I-b Report

The Phase I-b report (required for proposed annual production greater than 200 million gallons) will include the five tables required for the Phase I-a report plus a HAGM simulation. The report shall include the results of a simulation using the Groundwater Availability Model for the area that adds the proposed well to the then most recent model run that was used to establish the desired future condition.

Results of the simulation must include:

- A drawdown hydrograph of the cell or cells in which pumping is proposed, including a comparison with the desired future condition drawdown of the subject cell or cells.
- A time series graph that compares maximum subsidence under the DFC condition and the maximum subsidence with the additional proposed pumping in the immediate area of the pumping.
- Tables of drawdown and subsidence at the locations of existing registered and permitted wells contained in the BGCD database.
- A county-aquifer level groundwater budget that includes a comparison of the HAGM simulation with the proposed well and the groundwater water budget of the desired future condition simulation.

The water budget requirement must use net flow values and separately identify net lateral flows to neighboring counties. A summary table of the groundwater budgets should be organized

substantially similar to the example presented below:

	DFC Run (2010 to 2080)	QV Sunterra Run (2010 to 2080)	Difference (AF/yr)	Difference (% of Pumping Increase)
Inflow				
Recharge and Net Surface Water Inflow (GHB Boundary)	41,382	41,757	374	12.2
Interbed Storage	2,956	3,089	133	4.3
From Austin County	6,232	6,304	71	2.3
From Grimes County	1,816	1,816	1	0.0
From Washington County	1,243	1,243	0	0.0
Total Inflow	53,629	54,209		
Outflow				
Pumping	55,495	58,564	3,070	100.0
To Fort Bend County	10,422	10,014	-408	13.3
To Harris County	4,157	2,644	-1,513	49.3
To Montgomery County	5,922	5,922	1	0.0
Total Outflow	75,996	77,145		
Inflow - Outflow	-22,367	-22,937		
Model Calculated Storage Change	-22,366	-22,936	-570	18.6
Model Error	-1	-1		

A discussion of the results of the simulations is required and should focus on recommendations regarding the design of a drilling and testing program that would be completed as part of the Phase II report.

This report will be prepared by the District within 30 days of submission of a completed application with all the required elements from Rule 8.5(F)(2) and the completed HAGM simulation. The Phase I-b report is part of an administratively complete permit application.

2.3 Option for Applicant Submittal of Phase I Reports

An applicant has the option to submit a Phase I-a or Phase I-b report (depending on the proposed annual production rate) with the permit application. The submitted report must meet all requirements of these guidelines and Rule 8.5(F). BGCD review of a submitted Phase I-a or Phase I-b report will be completed within 30 days of submittal.

3.0 Phase II Report

Phase II reports are to be completed after an approved program of drilling and aquifer testing have been completed. The data obtained from the drilling and aquifer testing shall be used in the analyses of the Phase II report. The Phase II report shall be submitted to BGCD in accordance with Rule 8.5(F)(8). As provided in Rule 8.5(F)(9), the information in the Phase II report can be used as a basis for modifying the permitted production rate or result in special conditions on the permit.

3.1 Completed Well Construction Diagram

A diagram of the as-built completion details of all production and monitoring wells must be included that shows, at a minimum, well depths, borehole and casing diameters, depth interval of well screens, and gravel pack design. The State of Texas Water Well Report (Drillers Log) shall

also be included but should not be used as a substitute for the more detailed requirements listed above.

3.2 Results of Borehole Drilling and Well Construction

The following data and analyses must be included in the report:

- Geologist logs of all boreholes
- Geophysical logs of all boreholes
- Estimates of clay thickness and clay percentage for each borehole calculated based on model layer intervals for comparison to regional data.

3.3 Results of Aquifer Tests

In general, the aquifer tests shall consist of a pre-test phase where the static water levels of the test and monitor wells are measured on a regular basis for 24 hours prior to the test, a constant pumping phase of not less than 24 hours and a recovery phase of a period sufficient for a 90% recovery of beginning water levels the test and monitor well locations or at least a 24-hour period, unless an alternative procedure is found acceptable by BGCD. Existing private wells within ½ mile of the test location or otherwise acceptable to BGCD may be used as monitor wells for the pumping test.

The following data and analyses must be included in this report:

- A map giving the location and elevation above mean sea level (NGVD 1929 or NAVD 1988) of the test well, any existing or newly constructed monitor wells and all surrounding wells that exist within a ½ mile radius of the test well. The map shall include streets, roads and the bounds of land tracts sufficient to determine the location of the test well within the tract of land on which it is located. The map shall also include recharge features, geologic features, other water system features (e.g. storage tanks, existing wells), and potential sources of contamination.
- Narrative describing the aquifer test (dates and times run, pumping rate, wells monitored during test, method of data collection, etc.).
- A discussion of the conduct of the test giving details of the significant events of the test, any equipment failures and any contingency measures that may have been employed.
- Analyses of the test results, including the method(s) of analysis, the calculated aquifer parameters should include the transmissivity, hydraulic conductivity and storage coefficient (storativity) values.
- A table giving the water-level drawdown and recovery data from the test and monitor wells, and figures giving the water level recovery curves from which the aquifer parameters were calculated.
- A discussion of the conclusions drawn from the analytical results of the calculation of the aquifer parameters at the test location including and the effects of any boundary conditions identified during the test.
- A discussion comparing the parameters calculated from the analyses of the test to HAGM data from the Phase I report.

In addition, electronic versions of all test data shall be submitted to BGCD as part of the report.

3.4 Water Quality

The report shall include:

- A table of specific conductance, temperature, and pH measurements taken at regular intervals during the aquifer test giving the measured value and time of the measurement.
- Laboratory analysis of a water sample taken at the end of the pumping phase of the aquifer test.
- A discussion of the water quality analysis stating whether the sample was of a quality to meet Texas Commission on Environmental Quality Primary Drinking Water Standards.
- A discussion of expected changes in water quality that may be anticipated from future pumping either at the proposed well or any existing registered or permitted well within 1 mile of the proposed well.

3.5 Updated Simulation of Pumping

The objective of the updated simulations of the proposed pumping is to update the Phase I analytical calculation of drawdown with the local scale information developed from the drilling and testing program. Depending on the results of the aquifer test analyses, this updated simulation may be run using analytical methods or numerical methods. The scope and time frame of the analysis should be the same as the time frame of the simulation completed in Phase I to discuss and analyze a comparison of the results.

The report shall include the results of a simulation using a local scale analytical or numerical model, and the results compared to the results from the Phase I analytical results. This section of the Phase II report must include:

- A discussion of the specific method used, and the associated assumptions associated with the method.
- A drawdown hydrograph at the location of the pumping well(s) and any monitoring wells used during the test.
- Comparison of the results with the Phase I analytical results.
- Tables of updated drawdown and subsidence at the locations of existing registered and permitted wells contained in the BGCD database.

4.0 References

Hutchison, W.R., 2023. Documentation Associated with Updated Guidelines for Preparation of Hydrogeologic Reports in Support of Applications for the Permitted Use of Groundwater. Report prepared for Zach Holland, General Manager of the Bluebonnet Groundwater Conservation District. April 14, 2023, final.