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UTGCD Hydrogeologic Report Requirements for High-Volume Permits

Introduction

In accordance with the District Rules ("Rules") of the Upper Trinity Groundwater Conservation District ("District"), permit applicants seeking to obtain a High-Volume Permit must conduct, prepare and submit a hydrogeologic study and prepare, and submit to the District a current and professionally sealed Hydrogeological Report ("Report") addressing the potential impacts associated with the proposed groundwater production to be requested in a permit or permit amendment application. A High-Volume Permit is one for which the total cumulative volume requested in the application for the permit, including volumes proposed to be added by any subsequent amendments to said permit, exceeds 10,000,000 gallons per year for the Cross Timbers Aquifer, or 25,000,000 gallons for the Trinity Aquifer or as otherwise defined by the Rules.

The required aquifer test(s), study, and Report, must be performed, prepared, and sealed by a Texas licensed professional geoscientist or licensed professional engineer to assess the properties of an aquifer in a particular area where a well is proposed to be drilled and completed, and the response of an aquifer to pumping over time. The purpose of these requirements is to better inform the District about the potential for unreasonable impacts.

Hydrogeologic studies provide necessary background information regarding the geology and hydraulic properties of the permittee's project area. These guidelines are intended to instruct and assist the qualified parties conducting the studies by providing an outline of the District's requirements as they pertain to designing, conducting, and completing aquifer testing for preparation of a Report.

For the purpose of these requirements, an aquifer test requires at least one test well and at least three observation wells. Additionally, an aquifer test must be completed for each aquifer or layer of an aquifer (hereinafter "aquifer") that is intended to be utilized by the project, and a minimum of one aquifer test is required per 640 contiguous controlled acres that will be utilized under the requested permit. The number of tests may be reduced or modified if approved by the General Manager. In order to reduce the number of required aquifer tests to one (per aquifer) on a project site larger than 640 contiguous controlled acres, the applicant must, to the satisfaction of the General Manager, provide sufficient evidence that the aquifer parameters are consistent across the entirety of the project area.

The Report shall provide the study results and conclusions addressing the response to the proposed aquifer(s) outlined in these guidelines, including assessing impacts at various time durations, and assessment of the test results as it relates to the anticipated production of the project.

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Methods, instruments and operating procedures should be specified as Part of Phase 2. Aquifer test(s) results, methods and any departures from the workplan that were necessary during implementation of the workplan should be documented and provided to District staff during that phase as part of the approval to proceed.

If some method of data acquisition or aspect of the aquifer test(s), study or Report is deemed insufficient by the General Manager, the General Manager may require the applicant to re-assess until sufficient information exists for the District to make an informed assessment of the anticipated impacts of the proposed project. Permit applications may be deemed incomplete due to a Report that does not meet the District's minimum standards or deviate from these guidelines.

Upon completion of the Report, District staff will evaluate the Report to determine whether there is potential for unreasonable impacts (as defined by District Rule 2.6(b)) and produce a review of the findings.

Phase 1: Pre-Application Meeting

The project applicant will meet with District staff to discuss the requirements for the Report and will receive a deliverables list associated with those Report requirements. During this meeting, expectations on methodology will be discussed in detail, and the applicant will be made aware of the District's notice to proceed process and schedule. Failure to comply with a notice to proceed may result in the study being rejected, which in turn would lead to the permit application being deemed administratively incomplete.

Phase 2: Hydrogeological Site Model

All available information regarding the aquifer and the project site should be collected, included, and incorporated at the commencement of the test design phase. Category A is Administrative Information, Category B is Site Information, Category C is Well Design, and Category D is Aquifer Field Test Activities.

Category A - Administrative Information

The applicant shall provide the following information, including the name of the proposed project, any previous or other names which identify the tract(s) of land, the name, address, phone number and email address of the applicant submitting the permit application, the name, address, phone number, and email address of the property owner(s) (if different than the project applicant), the name, address, phone number, email address, and license number of the licensed professional engineer or professional geoscientist preparing the aquifer test(s), study and Report, the requested annual permit volume in gallons, the justification of the permit volume, as the applicant must provide a reasonable non-speculative demand, the size of the proposed project in contiguous controlled acres (applicant must provide any relevant applicable land surveys, deeds, leases, site plans, plats, etc.), and the purpose(s) of use for the requested permit volume.

Category B – Site Information

The following site information shall be gathered by the applicant.

This includes the identification of the proposed aquifer(s) of interest, estimated saturated thickness of the proposed aquifer(s) of interest, the presence and location of aquifer(s) boundaries, the presence and location of surface water bodies, including lakes, rivers, creeks, ponds and springs, the presence, location, and effects of all on-site wells and registered wells within a two-mile radius of the project boundaries, including, construction information, well reports, well logs, pumping schedules, etc., estimates or approximate values of regional aquifer parameters including hydraulic conductivity, specific storage, storativity, specific yield, transmissivity, anisotropy ratio, and porosity, detailed geology and hydrology information including the stratigraphy of the geologic formations underlying the project site, the lithology of the geologic strata, the geologic structure, the location of recharge and discharge boundaries, ambient water quality if available, proposed contractors to be utilized, and selected references utilized in model and Report design.

Category C – *Initial Well Design Information*

The following initial well design information shall be provided by the applicant.

This includes the quantity and location of pumping and observation wells with the configuration to be outlined to the satisfaction of the General Manager, proposed well configuration and orientation based on best available science (fully penetrating or partially penetrating) and justification as to the configuration.

The following anticipated construction information shall be provided by the applicant.

This includes borehole diameter (top and bottom depth), blank and screen inside diameters, drilling method, borehole completion method, filter pack intervals (including top and bottom depths, material, and size of the filter pack), sealed intervals (including construction, material type, method of placement, and thickness), packer type and presence if included, pump type and depth, elevation and well location (recorded as decimal degrees latitude/longitude and ASML), and casing information including presence and intervals, blank pipe, well screen length and slot size, material type, gauge, and diameter.

The applicant shall provide a proposed development method and plan, along with proposed well site coordinates and elevation (recorded as decimal degrees latitude/longitude and AMSL). See select resources *Hydrogeologic Evaluations: A Practical Guide to Groundwater Investigations and Resource Assessment in Texas* regarding development methods.

Category D – Aquifer Field Test Activities

The applicant shall develop a pre-test and post-test assessment plan to collect the following information.

This information includes baseline water levels in the pumping and observation wells taken both after development recovery and immediately prior to the initiation of the pump test (if these values differ the applicant is expected to provide an explanation as to why), determination of local pumping activities and nearby well schedules, barometric pressure trends, local activities that may impact aquifer testing including recharge, potential loading of the aquifer from nearby equipment or other activities, and a discharge management plan.

The applicant shall provide a step drawdown testing plan.

This information includes proposed step-drawdown rates and durations for test wells to determine specific capacity and maximum anticipated drawdown, the volumes and drawdown produced at certain pump speeds, determination that the observation wells are suitably located to provide usable data, and the rationale for the selection of pump rate and interval durations for testing based on aquifer conditions. See *Hydrogeologic Evaluations: A Practical Guide to Groundwater Investigations and Resource Assessment in Texas* for recommendations on step-drawdown testing procedures.

The step drawdown test must include a minimum of three (3) steps.

Regarding Existing Well Utilization

The applicant may not utilize existing wells for any portion of the aquifer test.

The applicant shall develop and provide an aquifer test plan.

The pumping phase of the aquifer test(s) shall be a minimum of 24 hours. If applicable, testing should be extended beyond the 24-hour minimum limit until a straight-line trend is observed. Water levels shall be collected every minute, for the duration of the test, in the test well and all observation wells. Water level recovery shall be obtained to verify the accuracy of the data obtained during the pumping portion of the test. Recovery measurements shall be initiated immediately at the conclusion of the pumping portion of the aquifer test and shall continue until water levels have recovered to at least 90% of pre-pumping levels in all well sites. If such recovery is not possible, time recovery measurement should continue until a consistent trend of recovery is observed. Water levels shall also be collected every minute during the recovery portion of the test.

The proposed initial test design and data acquisition plan shall include the following information for District staff.

The applicant shall identify the proposed well locations along with surface water bodies and existing wells, include the rationale on selection, measurement and utilization of the following aquifer testing equipment and include potential impacts to testing results: the power supply for testing, information on the pump and depth, information on the flow-rate

measurement equipment and constant rate management procedures, and information on equipment for continuous water level measurement. See the *Hydrogeologic Evaluations: A Practical Guide to Groundwater Investigations and Resource Assessment in Texas* for best management practices regarding equipment and measurement intervals. The applicant shall also provide how they intend to document all activities on site during aquifer testing, such as weather conditions, issues that occur in the field such as equipment malfunctions, and any events that may impact the test data. The proposed equipment plan and methodology shall be approved by the General Manager.

The applicant shall also provide a water quality sampling management plan, including confirmation that the samples will be taken at the end of the pumping phase of the aquifer test(s), as well as the proposed NELAC certified laboratory or laboratories for analysis. The district requires testing and assessment of water quality constituents outlined in Title 30, Texas Administrative Code, Chapter 230 ("Chapter 230"). Radionuclides shall be tested for if the project falls within a county where the Texas Commission on Environmental Quality requires such testing for public water supply wells. Other contaminant testing may be required by the General Manager depending on the project's location and any known groundwater contamination within two miles of the proposed project site.

The applicant shall provide their proposed solution method based on initial assessment of aquifer conditions, their proposed methodology for assessment of aquifer parameters, and what software is intended to be utilized for aquifer parameter analysis. The applicant shall also provide all publicly available databases coupled with field reconnaissance and/or survey investigations.

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Phase 3: Test Well + Producibles

Data and results collected during Phase 3 activities should be used to update the HGR Site Model.

During the drilling of the test well, the applicant shall collect, and then provide to the District, lithologic information as outlined in Chapter 230 related to Groundwater Availability Certifications.

The applicant shall provide the following geophysical information, in formats deemed satisfactory by the General Manager. The required logs include an electric log with shallow and deep investigative curves (16-inch short normal/64-inch long normal resistivity curves or induction log), a spontaneous potential curve log, a gamma ray log, and a caliper log. The raw data shall be provided from each log, including at a minimum a .las file and interpreted .wcl file.

Once the test well is complete, the applicant shall provide the following information related to the test well: construction information such as borehole diameter (top and bottom depth), drilling method, borehole development method (including duration, PSI, rate etc.), filter pack intervals including top and bottom depths, material and size of the filter pack, sealed interval construction (including material, method of placement, thickness, packer type and presence if included), placement and pump information, casing information including presence and intervals, blank pipe, well screen data and slot size, material type, gauge, and diameter.

The applicant shall also provide the results of step drawdown testing, including the quantity of steps (minimum of three steps), the target rate production, the duration of time per step, and the rate of each step performed. See *Hydrogeologic Evaluations: A Practical Guide to Groundwater Investigations and Resource Assessment in Texas* for resources related to step drawdown testing and design. The applicant will be responsible for identifying how this data influenced the placement and design of the observation wells.

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Phase 4: Observation Wells + Producibles

Data and results collected during Phase 3 activities should be used to update the HGR Site Model.

During the drilling of each observation well, the applicant shall collect, and then provide to the District, lithologic information as outlined in Chapter 230 related to Groundwater Availability Certifications.

The applicant shall conduct a open-hole geophysical log of each observation well, prior to the installation of casing, utilizing, at a minimum, an electric log with shallow and deep investigative curves (16-inch short normal/64-inch long normal resistivity curves or induction log), a spontaneous potential curve log, a gamma ray log, and a caliper log. The applicant shall also provide the following geophysical information, in formats deemed satisfactory by the General Manager. The raw data shall be provided from each log, including at a minimum .las file and interpreted .wcl file. This information shall be used by the applicant to determine how to complete each observation well, in order to ensure that the observation wells are completed into the same geologic stratum as the test well.

Once the observation well is complete, the applicant shall provide the following information related to the observation well: construction information such as borehole diameter (top and bottom depth), drilling method, borehole development method (including duration, PSI, rate etc.), filter pack intervals including top and bottom depths, material and size of the filter pack, sealed interval construction (including material, method of placement, thickness, packer type and presence if included), casing information

including presence and intervals, blank pipe, well screen data and slot size, material type, gauge, and diameter.

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Phase 5: Aquifer Test + Producibles

Upon completion of the aquifer test, the applicant will provide all pre- and post-test data collection from previous project phases, the applicant's raw, unedited data related to aquifer testing, continuous water level monitoring data in all wells, continuous flow rate measurements in all test well(s), barometric pressure trends related to testing, log books and/or documentation detailing field activities during aquifer testing, the trend corrected data set and methods intended to be utilized for aquifer parameter analysis, and an overview of the water quality sampling procedures utilized on-site.

The pumping phase of the aquifer test(s) shall be a minimum of 24 hours. If necessary, testing should be extended beyond the 24-hour minimum limit until a straight-line trend is observed. Water levels shall be collected every minute, for the duration of the test, in the test well and all observation wells. Water level recovery shall be obtained to verify the accuracy of the data obtained during the pumping portion of the test. Recovery measurements shall be initiated immediately at the conclusion of the pumping portion of the aquifer test and shall continue until water levels have recovered to at least 90% in all well sites. If such recovery is not possible, time recovery measurement should continue until a consistent trend of recovery is observed. Water levels shall also be collected every minute during the recovery portion of the test.

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Phase 6: Final Report + Producibles

The applicant shall provide a final Report including the following information: the testing results, a summary and conclusion of the study, a description and review of the permit request, aquifer(s) of interest, use type, volume, and other relevant factors. As part of the final Report, the applicant shall include a figure providing a description of the map and project area, the location of the test and observation well sites, surface water resources (including but not limited to springs, streams, surface water bodies) and existing wells within the two-mile project radius.

The final Report shall also include all well inventories, drilling and geophysical logs, pump depths, casing/annular seal specifications, state well reports, numerical modeling, dye tracing, surface geophysics, downhole camera surveys, water quality results from a certified NELAC laboratory, identification of any constituents that exceed primary and

secondary drinking water quality standards, any qualifiers received on the submitted water quality resultant documentation, chain of custody documentation including water sampling transport and delivery. These and all other relevant records utilized in the Report should be included in the appendices. The applicant should provide any additional changes that were made to corrected dataset submitted in Phase 5.

As part of the aquifer parameter analysis, the applicant shall provide their curve matching graphical solution(s), calculated aquifer parameters as listed previously, annotated hydrographs (arithmetic and semi-log) of water level elevations versus time for all test and observation wells, annotated hydrographs (arithmetic and semi-log) of drawdown versus time for all test and observation wells, drawdown impacts based on the proposed production permit request of the proposed project on existing surface water resources, any existing on-site water wells, all registered wells within the two-mile radius of the project boundary, and at the project boundaries for the following time durations: one year, 10 years, 30 years and 50 years.

Upon final review by the District staff, the applicant will meet with the General Manager to discuss the results. The General Manager may develop a recommendation different than what the applicant has requested, including potential mitigation, if it is determined that the project would cause unreasonable impacts to any surface water resources, groundwater resources, or any registered well in the project area or as otherwise appropriate to comply with the Rules.