Terms of Reference:

Hydrogeological Report

Description:

A Hydrogeological Report is a comprehensive review of the subsurface hydrogeologic and geologic conditions within an area to identify development suitability, constraints and mitigation measures to be implemented.

Development Application Stream(s):

A Hydrogeological Report may be required to:

- Assess existing hydrogeological conditions on-site and within the surrounding area.
- Evaluate potential impacts associated with the proposed development.
- Identify risks to both water quality and quantity.
- Propose effective mitigation measures to address identified risks.
- Ensure compliance with applicable regulatory requirements and industry best practices.

Prepared By:

The study shall be conducted by a Qualified Persons (QPs) with relevant experience in groundwater assessments. A QP is a licensed Professional Geoscientist (P.Geo.) or an exempted Professional Engineer (P.Eng.) as set out in the Professional Geoscientists Act of Ontario. The report must be stamped, dated and signed by the respective professional.

Rationale:

The Hydrogeological Report is required to assess groundwater conditions on a property to determine foundation construction and both temporary and permanent drainage requirements for development or redevelopment on a property, as well as identify the need for groundwater quality control measures.

Content:

The Hydrogeological Report must include, but is not limited to, the following components:

1. Introduction - Existing Conditions

The report should begin with an introduction that outlines key background information, including the site's location, ownership details, and land use classification. A description of the proposed development must be provided, along with a summary of relevant policies and regulations that apply to the site. Objectives of the study, the scope of work and methodologies used are to be clearly described.

2. Study Area Conditions

A detailed Study Area Map must be included, illustrating the locations of all on-site and off-site wells, boreholes, buildings, property boundaries, watercourses, and drainage features. The geological and hydrogeological setting should be described in detail, incorporating information on local and regional topography, drainage features, source water protection areas, underlying geology, and groundwater conditions.

3. Hydrogeological Assessment

A thorough site investigation is required, including borehole and/or test pit investigations. The report must justify the number and locations of test sites, accompanied by a figure illustrating test locations.

Monitoring Wells

At least three (3) monitoring wells must be installed to assess groundwater conditions. The assessment should include groundwater fluctuations, groundwater flow direction, aquifer properties, hydraulic gradient, and potential surface water connections. Groundwater levels must be monitored for a minimum of three (3) months, with at least three (3) monthly measurements. Professional judgment should be used to estimate the seasonally high groundwater levels within the development footprint. Monitoring wells must extend at least two (2) meters below the lowest elevation of proposed structures.

Aquifer Properties & Water Quality

Hydraulic conductivity and transmissivity should be assessed using pumping and/or slug tests. Baseline groundwater quality conditions must be established through laboratory analysis of unfiltered samples from on-site sources. Laboratory testing must be conducted by a Canadian laboratory accredited and licensed by the Standards Council of Canada or the Canadian Association for Laboratory Accreditation.

The analysis must include, at a minimum, the following parameters:

- Inorganic parameters
- Dissolved and total metals
- Sodium absorption ratio
- Electrical conductivity

If dewatering discharge to city sewers is required, additional testing must be conducted to ensure compliance with the City's ***Sewer Use By-law 90-75.***

4. Dewatering Requirements

The report must evaluate both short- and long-term dewatering needs for the construction and post-construction phases, including an evaluation of anticipated volumes requiring discharge to the City sewage system. Groundwater management strategies should be identified, including required permits and approvals. The maximum anticipated area of influence for water takings must be clearly defined.

5. Impact Assessment

A detailed impact assessment must be conducted to evaluate potential risks associated with the proposed development. The assessment should consider:

- **Water Supply Well Users**: Identification of risks to existing wells.
- **Groundwater Recharge**: Changes in pre-development and post-development interflow and recharge volumes. A water balance analysis should be conducted using the longest available local climate data in conjunction with a soil-moisture balance approach, such as Thornthwaite and Mather's method.
- **Ground Settlement**: Potential impacts related to changes in the water table.
- **Contaminant Movement**: Changes in groundwater flow and their potential to transport contaminants.
- **Groundwater Quality**: Risks to aquifer integrity.
- **Natural Features**: Impacts on wetlands, surface water bodies, and groundwater resources.
- **City sewage works**: Anticipated flow rates and volumes that may require discharge to the City sewers for short-term (construction dewatering) and long-term drainage of groundwater from on-site drainage systems.

6. Mitigation and Monitoring Requirements

The report must outline proposed mitigation strategies to address identified risks, considering both short- and long-term impacts. Additionally, a monitoring plan must be developed to:

- Assess the effectiveness of implemented mitigation measures.
- Provide contingency measures to address unforeseen impacts.

7. Summary and Recommendations

The report should conclude with a summary of key findings and highlight measures to minimize the proposed development's impacts. Recommendations must be clear, actionable, and aligned with regulatory and municipal requirements.

8. Supporting Documentation

The final report must include supporting documentation such as:

- **Figures**: Appropriately scaled maps and diagrams to illustrate site conditions.
- **References**: A list of all source materials, maps, and datasets used.
- **Appendices**:
  - Well records and borehole/test pit logs
  - Hydrogeological cross-section
  - Pumping and slug test data
  - Water level monitoring information
  - Hydraulic conductivity testing results
  - Soil analysis results
  - Water balance calculations
  - Laboratory water quality results

Additional Resources:

The City may request supplementary investigations based on site-specific conditions, constraints, or concerns. Proponents are encouraged to submit a Terms of Reference for City review prior to initiating the study. This ensures that all necessary hydrogeological components are included based on existing site conditions, proposed development activities, and potential impacts.