THURSTON COUNTY
WASHINGTON
SINCE 1852

COUNTY COMMISSIONERS
Carolina Mejia
District One
Gary Edwards
District Two
Tye Menser
District Three

PUBLIC HEALTH AND
SOCIAL SERVICES DEPARTMENT

David M. Bayne, MPH
Director
Dimyana Abdelmalek, MD, MPH
Health Officer

# Hydrogeologic Report & Assimilative Capacity Guidance

Thurston County is responsible for ensuring the antidegradation policy in state law is adequately applied to maintaining groundwater quality. Hydrogeological reports are required for new or expanding development to estimate the impacts of the proposed development on groundwater under the following circumstances:

- Projects where on-site sewage systems are proposed within a Critical Aquifer Recharge Area as defined by the Thurston County Critical Areas Ordinance [Except for projects of low densities of 1 unit per acre or less for single-family residential developments, wastewater flows less than 450 gallons per acre per day, or creating no more than two lots].
- Projects where any on-site sewage system will have design flows of 1,000 gallons of sewage per day within a Critical Aquifer Recharge Area regardless of the overall density of the project.
- Projects whose size or scope represent a potential risk to water resources regardless of wastewater treatment methods.

Thurston County uses a policy to interpret of hydrogeological reports, called the Assimilative Capacity Standard. Thurston County's Assimilative Capacity Standard is the primary standard for evaluating the projected impacts of land development proposals and contains three main requirements:

- All known available and reasonable method of prevention, control, and treatment (AKART) shall be used to mitigate pollution from development in areas where ground and surface water resources are vulnerable to pollution.
- A development will be considered unacceptable if a hydrogeological report indicates that a ground water Maximum Contaminant Level (MCL) will be violated due to proposed development.
- A development proposal will be unacceptable if a hydrogeological report concludes that it will reduce the Assimilative Capacity of the aquifer by more than 10 percent for a contaminant of concern.

Long term studies of contamination in Thurston County indicate that we are potentially overloading parts of our aquifer system. This can contaminate drinking water supplies, force supply wells to be drilled deeper, create surface seepage of wastes, reduce stormwater BMP contaminant capacity, impair surface water, and perhaps impact other receptors.

The Assimilative Capacity Standard requires that the proposed new waste system not overburden natural aquifer systems' capacity to assimilate waste. This is done by comparing background indicator substance concentrations in the water table aquifer to the loading caused by the proposed system(s). It focuses on the near-surface deposition of waste because Ecology regulates deeper injection of wastes through the Underground Injection Control (UIC) permit process.

The hydrogeologic report format must assure Thurston County that contamination from pre-existing and project-related waste will not force background concentrations above the Assimilative Capacity test criteria for the project site and for downstream parcels. The hydrogeological report must be prepared as outlined in Thurston County Code 24.35.030 and follow steps 1-6 below:

**Step #1: Obtain concurrence with Thurston County regarding the appropriate indicator substance, source concentration and source waste generation rate used for assessment.**

The applicant/consultant must pre-calculate the project wastewater generation rate in a manner acceptable to Thurston County. For most sites utilizing OSS/septic technology for residential waste streams, the indicator substance will be nitrate at a source concentration of 60 mg/L of septic tank effluent. The applicant/consultant must obtain approval from Thurston County regarding the analysis method and any needed correction for the molecular weight of the indicator using the proposed analytical method.

**Note:** The assessment of other substances may be required if Thurston County reasonably believes it is a better indicator of health or environmental risk based on the actual characteristics of the waste. For example: Thurston County may require assessment for 'non-septic' waste systems like land application of sludges or other non-OSS-derived waste streams.

**Step #2: Determine the background concentration of the indicator substance.**

**Option 1 Background Concentration: Use County mapping of calculated loading for the indicator substance.**

a) For nitrate, estimated loading under current conditions has been pre-calculated, and may also have been assessed by numerical modeling. The applicant/consultant may obtain the nitrate loading data from the County for locations upgradient and downgradient of the proposed site.
b) The applicant/consultant must update the loading data with any new waste source information since the County dataset was last revised.

**Option 2 Background Concentration: Use existing groundwater samples.**

Identify whether appropriate groundwater test results exist:

a) In the shallow aquifer receiving waste.
b) Upgradient of the site.
c) For locations that intercept groundwater below the site.
d) Downgradient of the site to identify receptor concentrations (i.e. contamination of adjacent land, or supply wells or surface water discharge). The wastewater generated by the proposed new development must not drain onto parcels where shallow groundwater might then exceed their Assimilative Capacity.

**Note:** A background determination will be rejected if it utilizes groundwater samples from a different aquifer from the waste source, or that is not representative of site conditions.

**Option 3 Background Concentration: Collect new groundwater samples.**

Install groundwater monitoring wells and sample to determine current background groundwater quality. We recommend applicants/consultants consult the County before installing monitoring wells to help assure that sample collection sites are:

a) In the shallow aquifer receiving waste.
b) Representative of upgradient groundwater below the site.
c) Downgradient of the site in a location that is likely identify receptor concentrations (i.e. adjacent parcels, or supply wells or surface water discharge).
d) Sufficient to determine aquifer properties.

**Step #3: Determine aquifer properties.**

The County has modeled aquifer properties that may be used, or site-specific data can be collected, including data from wells installed to collect groundwater samples. The applicant/consultant can contact the County for this information, or they can develop their own with concurrence from the County.

**Step #4: Calculate the proposed system's waste loading for the indicator substance.**

In most cases for residential wastewater systems, the County applies the modified Hantzsche and Finnemore (1992) steady-state analytical equation that assumes complete mixing and uniform source characteristics at infinite time:

$$N_r = \frac{In_w(1-d) + Rn_b}{(I+R)}$$

where $N_r$ = predicted nitrate content of the combined effluent + recharge water at the water table (ppm)
$I$ = volume of effluent entering the soil over the recharge area (gallons/year)
$n_w$ = effluent nitrogen concentration (ppm)
$d$ = fraction of nitrate loss due to denitrification in soil
$R$ = average recharge rate of rainfall (feet/year)
$n_b$ = background nitrate concentration of recharge water (ppm)

However, the County may require an alternative method, depending on the complexities of the project, that could include 3-dimentional numerical modeling using advanced contaminant transport properties. For example, more advanced assessments can be required when:

- Risks may exist to downgradient receptors that cannot be captured by the simplified method above.
- When the assumptions of this equation are inappropriate, such as in complex, multi-layer aquifers.

**Note:** The County may be able to provide pre-built MODFLOW/MT3D modeling and underlying datasets for the applicant's use/adaptation.

**Step #5: Calculate the Assimilative Capacity of the proposed project and its effects on downgradient receptors**

The new wastewater system or land use activity can 'use-up' no more than 10% of the available 'Assimilative Capacity', of the site. For nitrate, this is defined as 10% of the difference between groundwater background nitrate and the Federal Safe Drinking Water Act Maximum Contaminant Level (MCL) of 10 mg/L nitrate in groundwater. For indicator substances other than nitrate, the applicant should obtain from the Health Department the correct Assimilative Capacity standard (that may be different from the nitrate standard). Using the calculated site loading and background concentration, the applicant/consultant must determine if the site will exceed this threshold.
In addition, wastewater or pollutants generated by the proposed new project may flow onto or beneath adjacent parcels. The applicant must also determine if neighboring parcels' Assimilative Capacity will be exceeded.

**Step #6: Risk evaluation**

The final step in the review process is the evaluation of risks from the project. Initially, the following items must be addressed qualitatively. However, a quantitative assessment may be required if risks are judged to be considerable:

1. Cumulative effects of contamination at current zoning.
2. Effects from the migration of site contaminants.
3. Review of risks at nearby wells.
4. Assessment of nearby waters potentially affected by surface seepage of wastes.

**References**

Hantzsche, N.N., and Finnemore, E.J., 1992, Predicting groundwater nitrate-nitrogen impacts: Ground Water, v. 30, p. 490–499).