Fact Sheet

Groundwater Protectiveness Demonstrations for UIC Permits

State of Oregon
Department of Environmental Quality

Underground Injection Control Program

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Purpose

The purpose of this fact sheet is to help UIC permit holders determine if a UIC is protective of groundwater. Specifically, the fact sheet helps UIC permit holders determine if they can use an existing study to demonstrate protectiveness, or if they need to conduct a new study to demonstrate protectiveness.

Background

A stormwater Underground Injection Control, known as UIC, is a well, improved sinkhole, subsurface fluid distribution system or other system used for the subsurface emplacement or discharge of stormwater. Examples of stormwater UICs are drywells, soakage trenches, drill holes, and infiltration galleries.

DEQ regulates UICs to ensure that they are constructed and operated in a manner that is protective of groundwater. Under the state and federal UIC rules, UICs are determined to be protective of groundwater if the discharges to the UIC do not endanger groundwater and do not violate the prohibition of fluid movement standard:

- **Endangerment** occurs if a discharge to a UIC results in polluting groundwater which supplies or can reasonably be expected to supply a public water system, if the presence of the pollutant results in the system violating primary drinking water regulations or adversely affecting public health.

- The **Prohibition of Fluid Movement** standard is violated when a UIC allows movement of fluid containing any pollutant into underground sources of drinking water, if the presence of the pollutant may cause a violation of any primary drinking water regulation under the federal Safe Drinking Water Act or may otherwise adversely affect public health.

In Oregon, UIC permittees are required to show that their UICs are protective of groundwater if a UIC is located within the 2-year time-of-travel zone of a public water supply well, as delineated by the Oregon Health Division, or closer than 500 feet to a public water supply well or domestic drinking water well, whichever is more protective. If protectiveness cannot be demonstrated, then the UIC must be decommissioned or structurally retrofit so that the UIC is protective.

Demonstrating groundwater protectiveness

As stormwater infiltrates through subsurface soils, concentrations of pollutants in stormwater decline because pollutants attach (sorb) to soils, are degraded by microbes, and are dispersed. After some transport distance, pollutant concentrations decline to zero. The distance required for pollutant concentrations to decline to zero depends on the hydrogeology where the UIC is located.

UIC owners demonstrate groundwater protectiveness by showing that the vertical separation distance (the distance between the bottom of a UIC and seasonal high groundwater) or horizontal separation distance (the distance between a UIC and a water well) is large enough that pollutants in stormwater do not endanger groundwater or violate the prohibition of fluid movement standard.

Existing groundwater protectiveness demonstrations

Several UIC owners have used pollutant fate and transport models to calculate horizontal and vertical separation distances that, if met, are protective of groundwater on the basis of the hydrogeology of the materials in which their UIC is located. These studies can be used to demonstrate that a UIC is protective of groundwater in accordance with Schedule A.7 of the General UIC Water Pollution Control Facilities Permit. These studies are summarized in Table 1, and can be downloaded here: https://www.oregon.gov/deq/wq/wqpermits/Pages/Groundwater-Protectiveness.aspx

Last Updated: 2/27/2020
By: David Palais

Table 1. Existing Groundwater Protectiveness Demonstrations.

Location	Geologic Units Or Hydrogeologic Equivalent*	Protective Vertical Separation Distance	Protective Horizontal Separation Distance	Reference(s)
City of Bend	Qbn, Qb, Qba, Qbapb, Qc, Tbab, Qsp, Qtt [1]	5 feet	NA	GSI (2011a)
City of Canby	Qfc [2]	2.5 feet	267 feet	GSI (2013d)
City of Eugene	Qoal [3]	4.9 feet	247 feet	GSI (2013a)
City of Gresham	Qfc, Qff, Qfg, QTt [2, 4]	5 feet	335 feet	GSI (2011c) GSI (2013f)
City of Keizer	Qalc [5]	2.5 feet	117 feet	GSI (2013e)
City of Milwaukie	Qfc, Qff [2]	5 feet	NA	GSI (2013c)
City of Portland	Qfc, Qff, Qfch, QTt [2, 6]	5 feet	275 feet	City of Portland BES (2008) GSI (2012)
City of Redmond	Qbn, Tbr, Tbdr, Tddf [1]	5 feet	NA	GSI (2011d)
City of Springfield	Qoal [3]	4.8 feet	262 feet	GSI (2013b)
City of Lebanon	Qg[1] Qalc [5]	5 feet	NA	GSI (2017)
City of Umatilla	Pscf, Tcem, Tcp, Tcu, Tcun[7]	5 feet	NA	GeoEngineers (2020)

Notes:
(1) See Sherrod et al. (2004) for geologic units
(2) See Ma et al. (2012) for geologic units
(3) See Frank (1973) for geologic units
(4) See Evarts and O'Conner (2008) for geologic units
(5) See O'Conner et al. (2001) for geologic units
(6) See Madin (1998) for geologic units
(7) See Grondin et al. (1995) Plate 2.2 for geologic units

(*) For UICs in geologic units not included in Table 1, applicants may still reference an existing Groundwater Protectiveness Demonstration if they can demonstrate to DEQ that the hydrogeologic characteristics of the geologic unit(s) in which their UICs are located are at least equivalent to, or more protective, of groundwater than those to which they are being compared. See, for example, GeoEngineers (2020)

How to determine if a study can be used to demonstrate protectiveness

There are three steps to determining if one of the studies above can be used to demonstrate that a UIC is protective of groundwater:

1. **Identify the geology where the UIC is located using a geologic map.** Many geologic maps for Oregon have been developed by the U. S. Geological Survey, and are available online at the U.S.G.S. Publications Warehouse: http://pubs.er.usgs.gov/.

2. **Identify the jurisdiction where the UIC is located using Table 1.** The table lists the geologies for which protectiveness has been demonstrated, as well as the vertical and horizontal protective separation distances.

3. **Determine whether a study in Table 1 can be used to demonstrate that a UIC is protective of groundwater.** If your UIC injects stormwater into the same geology as is listed in Table 1, then you can cite the study in Table 1 to demonstrate that the UIC is protective of groundwater. If the UIC does not inject stormwater into the same geology as is listed in Table 1, then you must conduct a new study to demonstrate the UIC is protective of groundwater. The study must be reviewed and approved by DEQ.

Example of how to cite a study in Table 1 to demonstrate protectiveness

The following is an example of how to cite a study in Table 1 to demonstrate that your UIC is protective of groundwater:

Vertical Separation Distance

The UICs are located in the _____ geologic unit (see Figure ___). The City of _____ has shown that UICs in this geologic unit are protective of drinking water if there are at least ____ feet of vertical separation between the bottom of the UIC and groundwater. There are ——feet of vertical separation between groundwater and the bottom of the UICs at the site. Therefore, the UICs at the site are protective of drinking water in accordance with permit requirements.

Horizontal Separation Distance

The UICs are located in the _____ geologic unit (see Figure ___). The City of _____ has shown that UICs in this geologic unit are protective of drinking water if there are at least ____ feet of horizontal separation between the bottom of the UIC and a water well. There are ____ feet of horizontal separation between groundwater and the water well nearest to the site. Therefore, the UICs at the site are protective of drinking water in accordance with permit requirements.

References

The following references can be used to determine the geology in the jurisdictions listed in Table 1. Most of the references are available online:

- Evarts, R. C. and J. E. O'Connor, 2008. Geologic Map of the Camas Quadrangle, Clark County, Washington, and Multnomah County, Oregon. U.S. Geologic Survey Scientific Investigations Map 3017. Available online at: http://pubs.usgs.gov/sim/3017/.

- Frank, F. J., 1973. Ground Water in the Eugene-Springfield Area, Southern Willamette Valley, Oregon. U.S. Geological Survey Water Supply Paper 2018, 74 p. Available online at: http://pubs.usgs.gov/wsp/2018/report.pdf.

- Ma, L., Madin, I. P., Duplantis, S., and K. J. Williams, 2012. Lidar-based surficial geologic map and database of the greater Portland area, Clackamas, Columbia, Marion, Multnomah, Washington, and Yamhill Counties, Oregon, and Clark County, Washington. 34 pp.

- Madin, I. P. 1998. Earthquake-Hazard Geologic Maps of the Portland, Oregon, Metropolitan Area. In: Assessing Earthquake Hazards and Reducing Risk in the Pacific Northwest, Volume 2. Pgs. 355 – 372. U.S. Geological Survey Professional Paper 1560. Eds: Rogers, A. M., Walsh, T. J., Kockelman, W. J. and G. R. Priest. Available online at: http://pubs.er.usgs.gov/publication/pp1560.

- Grondin, G. H., Wozniak, K. C., Nelson, D. O., and Camacho, I., (1995). Hydrogeology, Groundwater Chemistry and Land Uses in the Lower Umatilla Basin Groundwater Management Area, Northern Morrow and Umatilla Counties, Oregon, (Final Review Draft), 591 pp. Available online at: https://people.wou.edu/~taylors/g473/AEG2016/16_Grondin_etal_1995_Umatilla_Hydrogeology.pdf

- O'Connor, J. E., Sarna-Wojcicki, A., Wozniak, K. C., Polette, D. J., and R. J. Fleck, 2001. Origin, Extent, and Thickness of Quaternary Geologic Units in the Willamette Valley, Oregon. U.S. Geological Survey Professional Paper 1620. Available online at: http://pubs.usgs.gov/pp/1620/.

- Sherrod, D. R., Taylor, E. M., Ferns, M. L., Scott, W. E., Conrey, R. M., and G. A. Smith. 2004. Geologic Map of the Bend 30- x 60-Minute Quadrangle, Central Oregon. U.S. Geologic Investigations Series I—2683. 49 pg. Available online at: http://pubs.usgs.gov/imap/i2683/.

The following references are the existing studies in Table 1 that demonstrate groundwater protectiveness. The studies are available online at: https://www.oregon.gov/deq/wq/wqpermits/Pages/Groundwater-Protectiveness.aspx

- City of Portland BES, 2008. Decision making framework for groundwater protectiveness demonstration, underground injection control system evaluation and response.

- GeoEngineers (2020). Revised Groundwater Protectiveness Evaluation, City of Umatilla, Umatilla, Oregon: prepared for: City of Umatilla, Oregon

- GSI, 2011a. Technical Memorandum, Pollutant Fate and Transport Model Results in Support of the City of Bend UIC WPCF Permit – Groundwater Protectiveness Demonstration and Proposed EDLs, Prepared for: City of Bend

- GSI, 2011c. Technical Memorandum, Pollutant Fate and Transport Model Results in Support of the City of Gresham UIC WPCF Permit – Proposed EDLs, prepared for: City of Gresham, Oregon

- GSI, 2011d. Technical Memorandum, Pollutant Fate and Transport Model Results in Support of the City of Redmond UIC WPCF Permit – Groundwater Protectiveness Demonstration and Proposed EDLs, prepared for: City of Redmond, Oregon

- GSI, 2012. Determination of Waste Management Areas at Wet Feet UICs by Numerical Simulation of Pollutant Fate and Transport. Prepared for: City of Portland BES. May 22.

- GSI, 2013a. Groundwater Protectiveness Demonstrations, prepared for: City of Eugene, Oregon

- GSI, 2013b. Groundwater Protectiveness Demonstrations, prepared for: Lane County, Oregon

- GSI, 2013c. Unsaturated Zone Groundwater Protectiveness Demonstration, prepared for: City of Milwaukie, Oregon
- GSI, 2013d. Groundwater Protectiveness Demonstrations and Risk Prioritization for Underground Injection Control (UIC) Devices, City of Canby, Oregon, prepared for: City of Canby, Oregon
- GSI, 2013e. Groundwater Protectiveness Demonstrations and Risk Prioritization for Underground Injection Control (UIC) Devices, City of Keizer, Oregon, prepared for: City of Keizer
- GSI, 2013f. Phase I UIC Evaluation. Prepared for: City of Gresham. January.
- GSI, 2017. Groundwater Protectiveness Demonstration for Underground Injection Control Facilities: City of Lebanon, Oregon. Prepared for: City of Lebanon, Oregon. February.

Alternative formats

Documents can be provided upon request in an alternate format for individuals with disabilities or in a language other than English for people with limited English skills. To request a document in another format or language, call DEQ in Portland at 503-229-5696, or toll-free in Oregon at 1-800-452-4011, ext. 5696; or email deqinfo@deq.state.or.us.