

J. Scott Kindred, PE, PG

Curriculum Vitae



Summary of Expertise

Scott Kindred is a licensed hydrogeologist and professional engineer with over 30 years of experience in hydrogeologic characterization, surface water-groundwater interactions, floodplain restoration, and stormwater infiltration. I specialize in the behavior of stormwater recharge in soils and how groundwater processes affect the design and implementation of stormwater infiltration facilities. With expertise in hydrogeology, contaminant fate and transport, geotechnical engineering, and civil stormwater design, I provide a unique multidisciplinary perspective in addressing the range of issues associated with stormwater infiltration. I have also developed innovative infiltration approaches to address challenging sites with relatively impermeable surface soils and have developed improved methods for infiltration testing. Finally, I am often hired to evaluate and solve drainage issues associated with shallow groundwater. I am able to quickly identify and assess potential shortcomings in stormwater designs related to groundwater processes and work closely with owners and designers to develop effective solutions.

Professional Registrations:

Licensed professional engineer in the State of Washington.

Licensed Hydrogeologist in the State of Washington.

Education

MS, Civil Engineering, Massachusetts Institute of Technology, 1987

BS, Geology, Brown University, 1983

Recent Articles and Presentations

Hydrogeology Journal, 2020, Using the borehole permeameter to estimate saturated hydraulic conductivity for glacially over-consolidated soils.

The 13th Washington Hydrogeology Symposium, 2022, *Advances in Infiltration Testing for Stormwater Management*.

StormCon, The North American Surface Water Quality Conference & Exposition, Conference Proceedings, 2017, *Improved Methods for Stormwater Infiltration Testing*

American Water Resources Association, Annual Water Resources Conference, 2017, *The Borehole Permeameter Approach for Stormwater Infiltration Testing*

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11th Washington Hydrogeology Symposium, 2017, *Estimating Hydraulic Conductivity in Unsaturated Soils and Predicting Performance of Stormwater Infiltration Facilities*

9th Washington Hydrogeology Symposium, 2013, *Evaluating the Potential for Stormwater Infiltration on a Basin Scale using GIS*

American Association of Civil Engineers, Seattle Geotechnical Symposium, 2012, *Stormwater Infiltration on Glacial Till*

American Water Resources Association, October 2011 Dinner Presentation, *Basin-Wide Infiltration Assessment using GIS Techniques*

8th Washington Hydrogeology Symposium, 2011, *Stormwater Impacts on Groundwater Quality: A Review of Available Information*

Seattle Daily Journal of Commerce, 2010, *Stormwater Runoff isn't a Problem, it's an Untapped Resource*

American Water Resources Association, 2009 Annual Conference, *Underground Injection Control (UIC) Wells for Stormwater Infiltration*

Professional Affiliations

American Water Resources Association, Former Board Member and President of the Board

American Public Works Association, Member of the Stormwater Manager's committee

American Society of Civil Engineers, Former Co-Chair of the Water Resources committee

Pacific Northwest Clean Water Association, Member of the Stormwater Committee and Awards Committee.

Employment History

Kindred Hydro, Inc., Principal Water Resources Engineer, 2014-Present

Aspect Consulting, Associate Water Resources Engineer, 2010 to 2014

Associated Earth Sciences, Inc., Senior Engineer/Hydrogeologist, 2003-2009

Matrix Scientific, President, 1995-2001

Golder Associates, Senior Hydrogeologist 1987-1995

Representative Project Experience

Hydraulic Assessment for Residential Sub-Division, Lynnwood, Washington

Scott conducted a hydrologic impacts assessment for a 5.6-acre site in Lynnwood, WA. Because the project directed runoff into two different basins, it was necessary to evaluate impacts to flow in the fish-bearing creek and wetlands downstream of the site. Scott evaluated the surface runoff both before and after site development, the hydrogeologic conditions at the site, and the hydrologic conditions in the downstream creek and wetlands. The assessment relied on previous hydrologic modeling conducted by the civil engineer for the project. The assessment concluded that site development would slightly increase flow in the affected portions of the downstream creek. This slight increase would not increase the likelihood of flooding and would improve fish and wetland habitat.

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Residential Flooding Assessment, Seattle, WA

Scott conducted a hydrologic assessment to determine the cause of basement flooding at a residence in north Seattle. The assessment included a review of topography and utility maps and discussions with the City. It was concluded that the flooding occurred due to a blocked stormwater drainage pipe outlet at the Sound Transit construction site near the residence. The drainage pipe outlet was covered with approximately 6 feet of fill, causing storm water runoff to back up in the pipe and exit from a storm drain in the parking lot above the residence. Based on this assessment, the owner negotiated a financial settlement with Sound Transit.

Sub-Division Flooding Assessment, Sammamish, WA

Scott conducted a hydrologic assessment to determine the cause of runoff from a park to a single-family residential development in Sammamish, WA. The assessment included a review of topography, surface water hydrology, groundwater hydrology, and the history of site development. Given the low-permeability soils at the park and observations during several site visits, the assessment concluded that runoff from the park occurred when surface soils became saturated due to heavy precipitation. These conditions occurred during the wet season for several decades before construction of the residential development and were not addressed during design of the development.

Flooding Assessment for Residential Sub-division, Pierce County, WA

This proposed 23-lot subdivision neighbors a floodplain and overlies highly permeable Steilacoom gravels that are typically more permeable than trench backfill. The County was concerned that fill placement and construction of roads and utilities could affect groundwater flow beneath the site and increase flood elevations. This assessment determined that fill placement and road construction would have no impact on groundwater flow but did identify that the sanitary sewer trench could extend into groundwater during floods and potentially impede groundwater flow. Based on this assessment, the utility trench was re-routed to minimize potential blockage and any trench backfill below the maximum water table was specified to be a washed free-draining granular material with permeability similar to the Steilacoom Gravels.

Drainage and Flooding Assessment, Friday Harbor, WA

Scott conducted a drainage assessment for the City of Friday Harbor to determine the cause of flooding in a residential neighborhood. This assessment evaluated runoff and hydrogeologic conditions before and after development at this bedrock site. The assessment concluded that removal of trees, vegetation, and topsoil without proper stormwater management controls significantly increased surface and near-surface runoff and resulted in downstream flooding. Recommendations for mitigating the flooding were provided to the City.

Residential Flooding Assessment, Burien, WA

Scott conducted a hydrologic assessment to determine the cause of flooding at a residence in Burien, WA. The assessment included a review of topography, hydrogeology, video documentation, and recent development activities near the residence. It was concluded that the flooding occurred due to demolition of buildings and stormwater infrastructure at a nearby site and conversion of the site to a park. Once the stormwater infrastructure was removed, the site was graded to direct runoff to nearby properties. The park property was underlain by low-permeability glacial till. During heavy rains, runoff from the park property flowed across a field and flooded the residence. Based on this assessment, the City is building new stormwater infrastructure to capture the runoff before it leaves park property.

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Development of New Infiltration Testing Methods – Washington State Department of Ecology

Mr. Kindred was the lead investigator for development of new infiltration testing methods to support design and sizing of stormwater infiltration facilities. These methods are suitable for a broad range of test geometries, ranging from excavated test pits to deep drilled test wells. Numerical simulations were conducted to calibrate the steady state methods and determine the effects of soil layering and shallow groundwater. Field infiltration testing was conducted to demonstrate the methods and help develop correction factors. This work has resulted in one published paper (Kindred and Reynolds 2020) and another paper that is currently under review.

Demonstration of Drywell Testing Methods – Safe, Clean, Water Program, Los Angeles County, CA

Under contract with California State Polytechnic University, Pomona, Mr. Kindred is providing technical support for a grant-funded study to investigate the potential for using infiltration test results in small-diameter test wells to predict the performance of large diameter drywells. This project is on-going.

Fall City Floodplain Restoration Groundwater Study, King County, WA

Under contract with the Snoqualmie Indian Tribe, Mr. Kindred is the principal investigator for a grant-funded project to evaluate the effects of a floodplain restoration project on groundwater flow dynamics. The project includes installation of 12 groundwater monitoring wells and tracking of temperature and groundwater elevations before and after implementation of the floodplain restoration project. After one year of monitoring, groundwater flow patterns during periods of flooding and drought have been well documented. Any changes in these patterns due to the project will be evaluated after the second year of monitoring.

Green Stormwater Infrastructure On-Call Services, King County

Scott was the hydrogeologic lead for an on-call services contract with King County to support green stormwater infrastructure. Task orders conducted under this contract was to conduct a preliminary infiltration feasibility assessment of two basins in south Seattle and develop a work plan to conduct field investigations and additional analysis to support conceptual design. This project was time-critical to meet project deadlines and Scott provided preliminary results during three meetings over a 4-week period to solicit and incorporate client feedback in a timely fashion and ensure the deliverables met project needs.

Overlake Neighborhood LID/Bioretenention Retrofit, Redmond

Scott conducted an evaluation of the infiltration feasibility for a series of bioretention facilities in the Overlake neighborhood. This neighborhood is characterized by dense retail development and close to 100 percent impervious coverage. The assessment included subsurface explorations using a Vactor truck to minimize cost and damage to existing roadways. Our assessment concluded that the infiltration capacity was generally low and highly variable over short distances. Based on this assessment, the bioretention facilities were constructed with underdrains to maximize the treatment capacity.

City of Olympia Boulevard and 22nd Roundabout, Olympia

Scott conducted an infiltration assessment to support roundabout design in the City of Olympia. The City's conceptual design included construction of a new infiltration pond; providing an accurate infiltration rate was important for sizing the new pond. Scott's assessment included drilling of two wells and calculation of the infiltration rate based on grainsize analysis. Scott recommended installing gravel-filled drains in the existing pond to allow water to bypass the low-permeability soils and improve the infiltration rate.

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SPU Knickerbocker Floodplain Restoration, Seattle

Scott provided hydrogeologic and geotechnical services to support design of floodplain restoration within a stretch of Thornton Creek that was eroded and incised due to past channelization. Service provided included groundwater modeling of hyporheic cells (submerged gravel structures) to optimize through-flow and development of specifications for various aggregates used in construction.

Ballard Bioretention Facilities, Seattle Public Utilities, Seattle

Scott provided hydrogeologic services related to assessment and re-design of slow-draining bioretention facilities in the Ballard neighborhood. This work identified shallow perched groundwater and low-permeability surface soils as the cause of the slow-draining bioretention facilities. Scott worked with the project team to identify remedial actions for each of the bioretention facilities and assisted in the design of some of the underdrain systems.

Duwe'iq Stormwater Treatment Facility, Kitsap County

Scott provided geotechnical services in support of this constructed wetlands project to treat 17 acres of runoff from an existing retail development. Scott installed wells and conducted explorations to characterize subsurface conditions and provided geotechnical and hydrogeologic recommendations for the project. This work identified a confined aquifer beneath the site that needed to be considered in design.

Jamestown S'Klallam Tribe 7 Cedars Casino Large Onsite Sewage System, Sequim

Scott has provided hydrogeologic services related to development of a Large Onsite Sewage System (LOSS) for the 7 Cedars Casino. Based on hydrologic characterization of the site, Scott provided design parameters for a 20-25 foot deep curtain drain to intercept subsurface seepage and lower groundwater levels. The curtain drain was constructed and monitoring results demonstrated that groundwater levels were sufficiently lowered to permit use of the site.

University Basin Infiltration Assessment

Mr. Kindred has provided infiltration assessment services for the 6,000-acre University combined sewer basin in north Seattle for the King County Wastewater Treatment Division since 2014. The initial screening-level infiltration assessment identified five target areas that were most suitable for green stormwater infrastructure (GSI) and stormwater infiltration. Shallow infiltration feasibility was evaluated using a Vactor truck to excavate 45 explorations and conduct 42 borehole infiltration tests. The deep infiltration assessment included 15 borings, 12 of which were completed as test wells. The subsurface exploration and testing program confirmed the feasibility of stormwater infiltration.

The results of the infiltration assessment were used to prepare a conceptual design for a GSI alternative that would reduce the required storage volume in half. The County proceed with the GSI alternative and awarded the design contract to a consultant team including Kindred Hydro, Inc. During initial pre-design phases of the project Mr. Kindred has completed another field investigation program including 25 vactor explorations, 16 drilled borings, and infiltration testing in 15 of the vactor explorations. This work was used to develop the alternative that will be carried into design.

West Duwamish Infiltration Assessment

Kindred Hydro conducted an infiltration assessment for the west Duwamish project area for the King County Wastewater Treatment Division. The project area included the South Park and

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Highland Park neighborhoods in south Seattle. The hydrogeology in the Highland Park neighborhood consists of glacial till and advance outwash soils with deep groundwater. Installation of two monitoring wells confirmed the feasibility of deep infiltration in the neighborhood. The hydrogeology of the South Park neighborhood consists of alluvial soils with shallow groundwater. A series of field investigations, including ten pilot infiltration tests and three groundwater monitoring wells, were conducted to confirm the infiltration feasibility in the basin. Groundwater modeling was conducted to estimate the rise in groundwater associated with widespread stormwater infiltration.

Miller Walker Basin LID Stormwater Retrofit Planning, King County

Scott led a desktop-level stormwater infiltration feasibility assessment to support identification and conceptual-level design of potential stormwater retrofit projects in the Miller Walker Basin. The assessment was based on (GIS) mapping of multiple factors (e.g., slope, geology, landslide hazard, and floodplains) and an evaluation of the infiltration feasibility associated with each unique combinations of these factors. This assessment benefited from a detailed hydrogeologic assessment for SeaTac airport, which lies within the basin. The final work product included maps of feasibility for both shallow and deep infiltration. These maps were used to help identify six potential sites for LID stormwater retrofit projects. Vector explorations were conducted at the six sites to collect site-specific subsurface information and support conceptual design.

145th Place Stormwater Facilities, Bellevue

Under provided infiltration design support to the City of Bellevue for bioretention facilities included in this roadway project. Under subcontract to HDR, Scott reviewed previous infiltration testing, observed soil conditions during construction, and provided recommendations for design modifications. Based on the low-permeability glacial till soils observed at the site, Scott recommended the addition of an underdrain connected to the existing storm system to mitigate the potential for shallow groundwater mounding and poor drainage of the bioretention facilities.

Illahee Stormwater Retrofit, Kitsap County

Scott conducted an infiltration feasibility assessment to support design of a stormwater retrofit project for the Illahee Creek Basin. The initial desktop assessment for this basin identified the potential for deep stormwater infiltration to reduce peak flows discharging to Illahee Creek. Based on this initial assessment, a field exploration program was conducted to assess subsurface conditions. The field program, which included two deep borings/monitoring wells to evaluate the potential for deep infiltration and a series of shallow explorations using the County's vector truck, determined that deep infiltration was not feasible and shallow infiltration was not cost effective due to the presence of shallow perched groundwater. The recommended stormwater approach was detention and treatment.

Urban Growth Area Sewer Feasibility Study, Carlsborg

Scott assisted the Clallam County PUD with design infiltration testing to determine appropriate infiltration rates for a potential sewer project. The project involves management of Class A treated effluent as a resource within the Dungeness River watershed area.

Craft Cottages Residential Development, Sequim

Scott was the project manager for this soil and groundwater assessment to support conceptual design of this 40-unit residential development. The assessment included testpit explorations across the site to characterize subsurface soil and groundwater conditions across the site to identify suitable conditions for locating a large onsite sewage system (LOSS) and support

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geotechnical recommendations. The groundwater assessment included an evaluation of the existing on-site water supply well and recommendations for development of the water supply for the development, including options for obtaining a water right.

Dosewallips State Park Hydrogeologic Support for Rapid Infiltration Basins, Brinnon

Scott conducted a hydrogeologic assessment to support design and permitting of a sewage treatment facility using a Membrane Bioreactor and groundwater recharge of the treated effluent. The assessment included review of existing hydrogeologic information, installation of three monitoring wells and one water supply well, and an infiltration test to support sizing of the Rapid Infiltration Basins (RIBs). Scott also provided geotechnical recommendations and a seismic assessment for other projects at the site.

Community Center and Senior Housing Site Infiltration Assessment, Kingston

Scott evaluated site soil and groundwater conditions for the feasibility for LID stormwater disposal including options for on-site disposal through use of permeable pavement, rain garden infiltration.

Silverdale/Ridgetop LID Retrofit Project, Kitsap County

Scott conducted a desktop assessment of infiltration feasibility for LID retrofit of the approximately 3,000 acre drainage Silverdale basin. Based on this assessment, Ridgetop Boulevard was identified as a good target area for infiltration. Scott conducted a number of vector explorations along the alignment to provide a screening-level understanding to infiltration feasibility. Based on positive results provided by the vector explorations, more extensive explorations (including pilot infiltration tests and drilled boreholes) were conducted. These investigations clearly delineated areas suitable for either shallow and/or deep infiltration.

East Bremerton/East Port Orchard LID Retrofit Project, Kitsap County

Scott conducted an infiltration assessment for the East Bremerton/East Port Orchard areas of unincorporated Kitsap County. Scott assisted in preparation of a desktop assessment of infiltration feasibility and conducted field visits for 10 potential project locations. Based on this review, Scott provided an initial assessment of infiltration feasibility at the ten sites. Based on this information and other criteria, the client/consultant team selected three project locations for infiltration field assessments. Scott conducted vector explorations and infiltration testing at 13 locations within the selected project locations. The field investigations were conducted using Kitsap County crews and provides site-specific infiltration information at a reasonable cost.

Suncadia Resort Development Hydrogeologic and Geotechnical Support, Cle Elum

As project manager, Mr. Kindred provided hydrogeologic and geotechnical support for this 3,000-acre resort development in central Washington State. The main challenge at this site was to comply with the requirement in the site development permit to infiltrate 100 percent of stormwater runoff. In one portion of the site, Mr. Kindred developed an innovative approach that utilized a series of 70-foot deep underground injection control wells. The client was pleased with the small footprint and reasonable cost of this approach and implemented similar solutions on other portions of the site.

North Fort Lewis Hydrogeologic Assessment and Storm Water Infiltration, Fort Lewis

Mr. Kindred was the hydrogeologic consultant on the design-build team responsible for construction of a large detention and infiltration facility for North Fort Lewis. The Pierce County Health District and the Department of Ecology were concerned that the infiltration facility would

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cause a rise in groundwater levels that would increase concentrations of landfill constituents down gradient from the landfill. Mr. Kindred designed and conducted an infiltration test to obtain aquifer parameters that were used to predict the amount of water level rise beneath the nearby landfill using ModRet. Mr. Kindred's technical analysis and clear presentation of the results were deemed satisfactory by the agencies without any revisions and allowed the project to remain on schedule.

Low-Income Housing Re-Development and Landfill Assessment and Closure, Bremerton Housing Authority, Bremerton

Project manager for re-development of low-income housing in Bremerton Washington. Services included landfill assessment and closure, hydrogeology assessment, and geotechnical assessment. Initial phases of project were fast-tracked and over \$400K in work was completed within four months. Responsible for characterization and closure of municipal landfill located within the development, including landfill gas assessment. Working with the Kitsap County Health District to design a closure plan that will protect proposed housing around the landfill.

Harper Church Park and Ride Infiltration Assessment and Design, Kitsap Transit, Kitsap County

Project Manager and Technical Lead for a project to expand an existing park and ride from 2.0 acres to 8.7 acres without increasing runoff from the site. As technical lead for this project Mr. Kindred was responsible for design and testing of an innovative trench infiltration facility that included approximately 150 dug drains with depths of 20 to 30 feet. Mr. Kindred developed a model of the trench system to simulate performance during actual storm events and demonstrate that the system provided the necessary flow control objectives. The infiltration approach developed by Mr. Kindred eliminated the need for an expensive detention vault or a large detention pond that would have significantly reduced the number of available parking spaces.

Bremerton Motorsports Park, Bremerton Motorsports Park Board, Kitsap County

Mr. Kindred was the infiltration lead for this planned motorsports park southwest of Bremerton. The goal was to either infiltrate or disperse all stormwater runoff at the site. The subsurface exploration program, which included borings, testpits, and infiltration testing, demonstrated the feasibility of stormwater infiltration across the majority of the site. Groundwater modeling was conducted to demonstrate that the increased groundwater recharge would not adversely impact the nearby landfill waste, the large onsite sewage drainfield, or to wetland hydrology at the lower end of the property.

Prospector Reach Geotechnical and Stormwater Infiltration Assessment, Bennett Homes, Cle Elum

Mr. Kindred was the project manager for this 89-lot subdivision within the Suncadia Resort. Subsurface explorations indicated that the thicknesses of glacial till ranged from zero to more than 25 feet across the site. Based on this information, portions of the development relied on infiltration of roof and driveway runoff into dug drains while other portions of the development relied on sheet flow dispersion.

Previous Litigation Support

Litigation support, including testimony at trial, for damage to a house associated with construction of a nearby stormwater detention pond.

Litigation support in a case related to construction of a water well. Included a deposition and resulted in negotiated settlement out of court.

Litigation support in a case related to changes in groundwater flow due to highway construction resulting in water quality and quantity impacts to a groundwater well. Resulted in negotiated settlement out of court.

Litigation support for seepage downhill of a new housing development and associated stormwater infiltration facility. Worked with engineer for housing development to design a cut-off trench to intercept and redirect groundwater seepage.

Litigation support for flooding damage to a residence due to a fill placement that blocked a storm sewer line. Resulted in negotiated settlement out of court.

Litigation support, including testimony at trial, for seepage of stormwater and septic discharge into client's property.

Numerous initial assessments for potential legal action related to adverse impacts from groundwater and surface water runoff.