NORTHWEST
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Consulting in Hydrogeology

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Black Hills Audubon Society
PO Box 2524
Olympia, WA 98507

Patrick Williams
600 N. 36th St., Suite 228
Seattle, WA 98103

Dear Sam, Sue, Susan, Elizabeth, and Patrick:

This letter report identifies the potential impacts of development associated with NorthPoint's proposed logistics center at the 745-acre Port of Tacoma (POT) property and its traffic access corridor from I-5 (**Figure 1**). NorthPoint's proposal indicates that approximately 500 acres, which are currently vegetated, would be developed with large warehouses served by high-density truck traffic. Given NorthPoint's partnership with Burlington Northern Santa Fe (BNSF), use of the local railroad for intermodal transport is likely, pending infrastructure upgrades.

The NorthPoint proposal would convert the north and/or south tracts of the POT property to impervious surfaces—warehouses, roads, parking lots, etc. This will significantly alter hydrologic processes on, near, and downgradient from the POT property, and threaten the high-functioning ecosystem that people and wildlife depend on for clean water, recreation, and habitat.

The property development impacts fall under three main categories:

- Disruption of the natural hydrologic cycle—that is, the amount and timing of water that feeds wetlands, streams, lakes, ponds, and local drinking water wells. We estimate that the new impervious surfaces would generate approximately 430 million gallons of stormwater, annually, that would need to be managed.
- Impairment of habitat, especially habitat required by the Oregon spotted frog (OSF), a federally listed species under the Endangered Species Act (ESA), to support critical phases of its life cycle.
- Degradation of water quality by both catastrophic and long-term sources.

# IMPACTS OF THE PROPOSED POT PROPERTY DEVELOPMENT

## Disruption of the Natural Hydrologic Cycle

An average of 50 inches of rain falls on the POT property annually. Under the current, natural (undeveloped) conditions, some of this rain is intercepted by the vegetation and soil, with minimal runoff. About one-third is "lost" to evaporation and plant transpiration; the rest, about two-thirds, recharges the shallow aquifer, becoming groundwater that not only feeds wetlands, streams, lakes, and ponds, but also is the source for drinking water wells. This recharge occurs seasonally, following rainfall events.

These natural hydrologic processes would effectively be destroyed if the POT property is cleared of vegetation and covered by warehouses, roads, and parking lots, which form impervious surfaces that prevent rain from infiltrating into the ground. Instead, almost all rainfall will become surface water runoff. From the practical standpoint, this means:

- **A significant increase in stormwater runoff**, which will flow at rates and accumulate in volumes that are significantly higher than they are under current conditions. Seasonal storm flows will overwhelm the discharge locations, causing erosion and filling downstream creek reaches or wetlands with contaminated suspended sediments.
- **A reduction in seasonal flows to downstream water resources** that require reliable recharge for their health and proper hydrologic functioning.

### The Cost of Too Much Water

To estimate the magnitude of runoff that would need to be managed and treated for contaminants from NorthPoint's logistic center, we assumed conservatively low estimates of 400 acres of impervious surface and 40 inches of annual runoff. This results in 430 million gallons of stormwater, annually, that would need to be managed and treated in perpetuity. Peak storm events from the NorthPoint logistics center alone would generate storm flow rates that are the same order of magnitude as the entire Lacey-Olympia-Tumwater-Thurston County (LOTT) utility processes on an average day through their wastewater treatment facility.

### The Impacts of Too Little Water

Both the amount and timing of water delivered to surface features such as wetlands, streams, lakes, and ponds would be altered. The amount of water that recharges the aquifer would be substantially reduced, affecting downgradient areas that rely on this water—particularly, the extensive network of wetlands within, and surrounding, the two POT property tracts, as well as within the adjacent Washington State West Rocky Prairie Wildlife Area (WRPWA).

**Figure 2** shows these potentially impacted features, as determined based on their location, topographic elevation, and groundwater conditions. Water in these wetlands is intimately connected to rainfall that recharges the shallow aquifer beneath the POT property. These wetlands are also hydrologically connected to downstream creek reaches and lakes.

## Impairment of Habitat

The wildlife and plants in this area have adapted to, and rely upon, the seasonal hydrologic patterns. For certain species, having too much or not enough water can harm life-cycle events. For example, the OSF deposits (lays) its eggs in sub-areas of the WRPWA. In order to survive, the OSF depends on the reliable return of water to these sub-areas from February to April (**Figure 3**). During this period, the local groundwater-fed, open-water wetland must be inundated with clean, clear water within a narrow depth range of 2 to 6 inches. Runoff from impervious surfaces on the POT property may substantially change the timing of this inundation and render egg deposition impossible at sites used by the frog.

## Degradation of Water Quality

Runoff from the extensive new impervious surfaces proposed for the POT property will also create stormwater quantity and quality issues. Humans have historically been poor at managing stormwater to reproduce the vital, complex, and nuanced natural hydrologic processes that supply high-quality water to aquatic habitat and wells. This is particularly true in rural landscapes that have healthy ecosystems such as those found in the vicinity of Millersylvania State Park (SP) and the WRPWA.

### Contaminant Sources

Sources of water quality degradation may be long-term, occurring over decades, or catastrophic, occurring as the result of vehicle or equipment collisions and associated fuel spills or fires.

**Long term**. Decades of poor-quality runoff from impervious surfaces on the POT property and high-traffic roadways will degrade local wetlands and drinking water supplies. Runoff from roads, parking lots, and landscaping typically contain nitrogenous compounds, metals, herbicides, pesticides, fuels, and oils. Such long-term degradation would most likely occur within a zone that follows local groundwater movement. For the south POT tract, this is depicted as the red zone (**Figure 4**) based on groundwater contours[1] in the vicinity of the POT / WRPWA / Millersylvania SP properties. Note that water quality degradation would impact a community of families whose drinking water lies within this red zone. The proposed POT property development will also increase the amount of surface runoff into local creeks during storm events, increasing erosion and increasing the direct delivery of contaminants into downstream water bodies such as Deep Lake in Millersylvania SP.

[1] Contours from Layer 2, Thurston County Groundwater Model, November 2019

**Catastrophic**. Catastrophic contamination from truck crashes or a POT property fire would be devastating to local residents' water supply and/or wildlife aquatic habitat. **Figure 4** shows three potential scenarios:

- ***Truck crash on Maytown Road***. If trucks collide, any fuel spilling on both sides of Maytown Road (Hwy 121) would rapidly contaminate soil and shallow groundwater. Dissolved contaminants would move west, potentially affecting a larger number of water wells in the Maytown community, and water quality and salmon in Beaver Creek.

- ***Truck crash at the POT property entrance***. Trucks colliding at this location could contaminate several water resources in the area. Fuel spilled on the south side of the road would contaminate a local pond that has historically been used by OSF. If fuel were spilled to the north, groundwater would transport dissolved contaminants toward Deep Lake, potentially impacting the water supply for local residents. Contamination of Allen Creek could compromise Deep Lake water quality, impacting salmon and trout, as well as recreation opportunities for visitors to Millersylvania SP.

- ***Fire on the POT property***. Given the rural location of the POT property, fires would need to be extinguished using chemical foam agents. An extinguished fire would readily become a contaminant source of toxic, carcinogenic compounds that could migrate along groundwater pathways harming people, wildlife, and plants.

### Impacts to Drinking Water Supplies

The Newman family is one of many that pump groundwater for domestic use. They are very concerned about this proposed development because their water well lies directly downgradient from NorthPoint's proposed logistic center (**Figure 5**). This development could completely up-end the Newmans' way of life if their water supply becomes contaminated as a result of activities on or near the logistic center. It threatens three generations of people living together who have provided responsible stewardship for the land and its water resources.

## SUMMARY

Thurston County Commissioners face a profound decision that will affect the landscape, water resources, people, plants, animals, and habitat in this area—in perpetuity.

The POT property occupies a substantial area within a high-functioning ecosystem. Developing this property threatens this functioning, which supports both critical habitat for listed species, local drinking water supplies for nearby communities, and recreation within Millersylvania SP. Also threatened are the valuable "eco-services" provided by healthy wetlands, such as storing flood water and maintaining the natural water quality.

# LIST OF FIGURES



If you have any questions, feel free to contact me.

Sincerely,


**James T. Mathieu[2], LG, LHg**
**President, Principal Hydrogeologist**

[2] A resume for James T. Mathieu is included at the end of this PDF report.

FIGURE 1

# Location Map

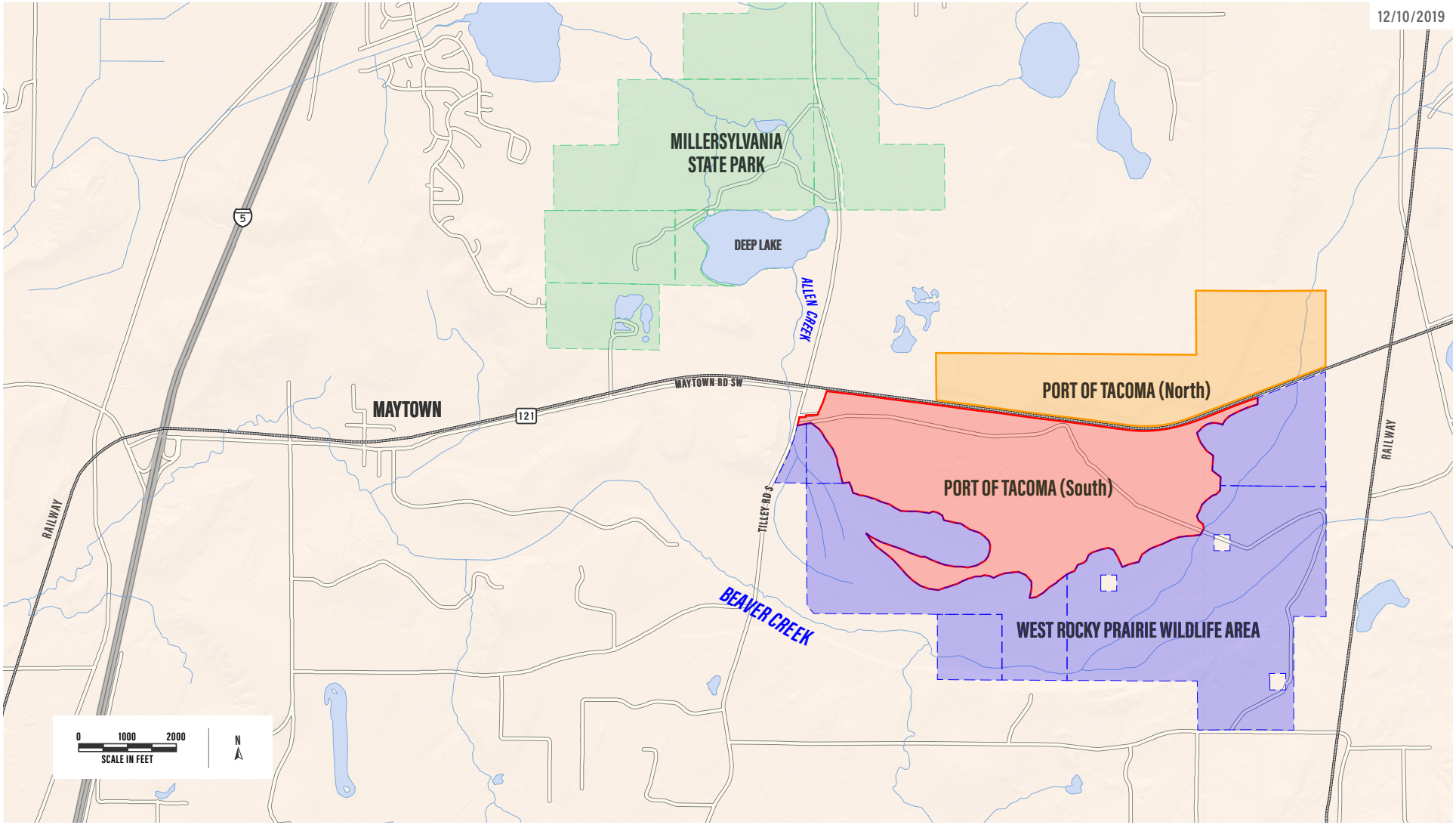
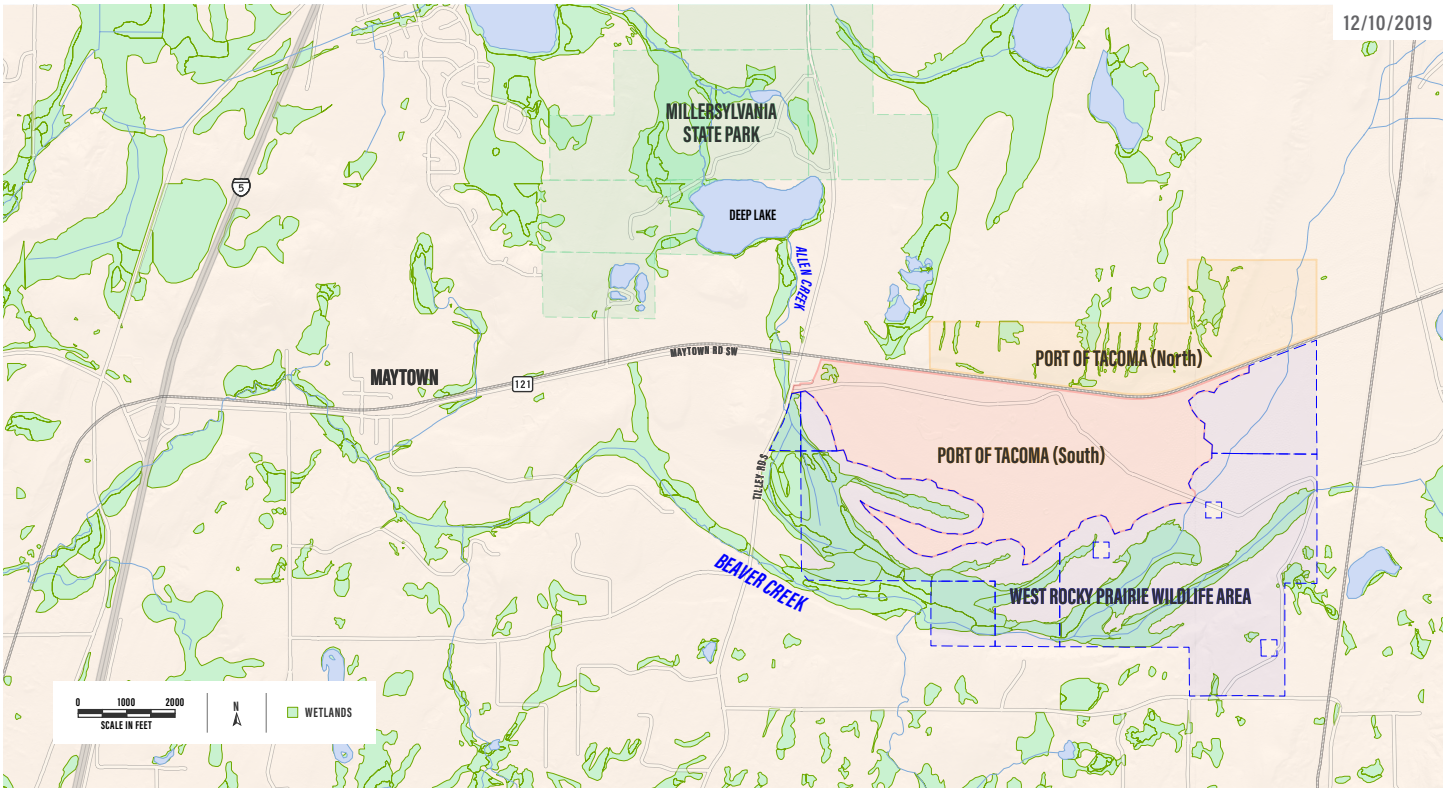


FIGURE 2

# Wetlands, Creeks, and Lakes Impacted by POT Property Development

## NOW (2019)




## POST DEVELOPMENT

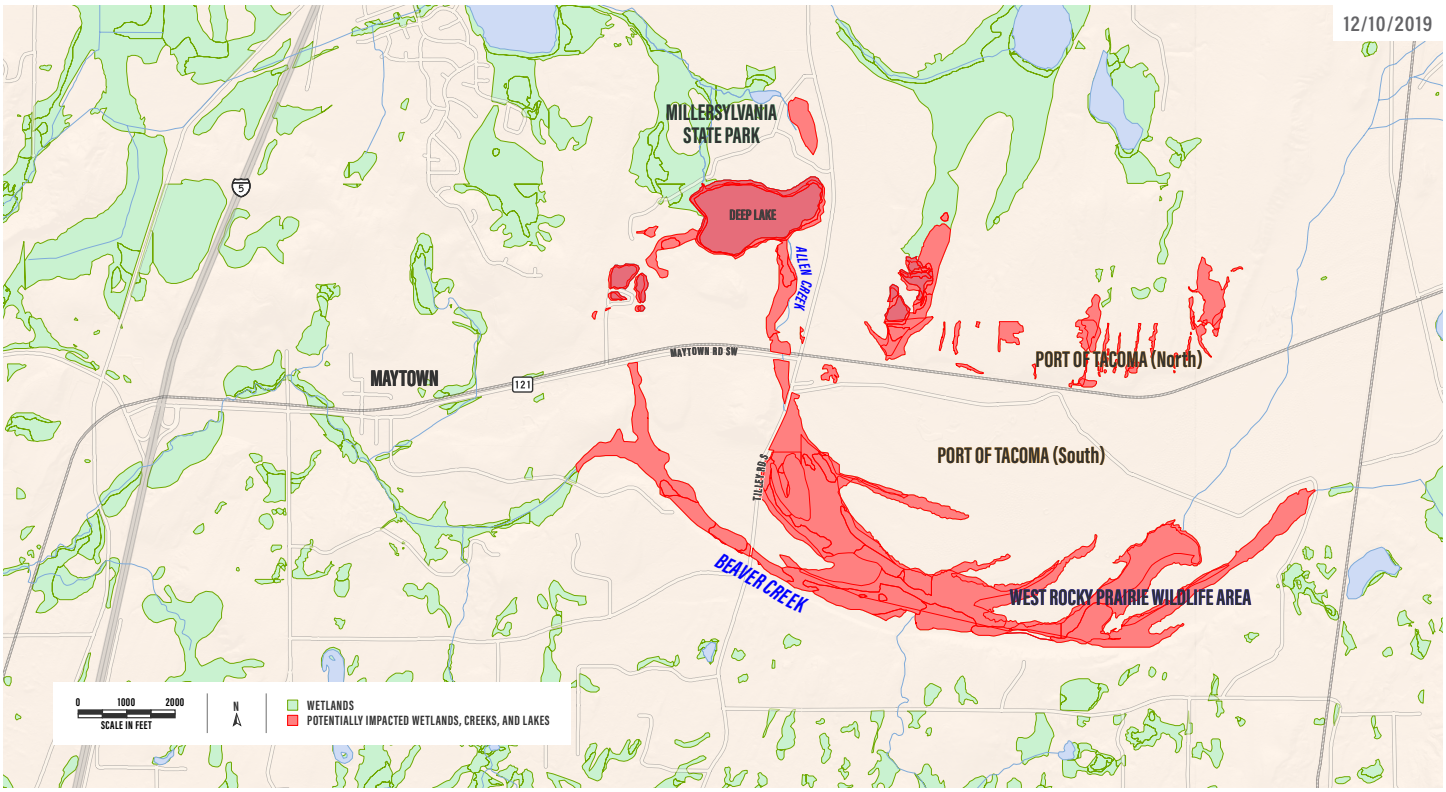
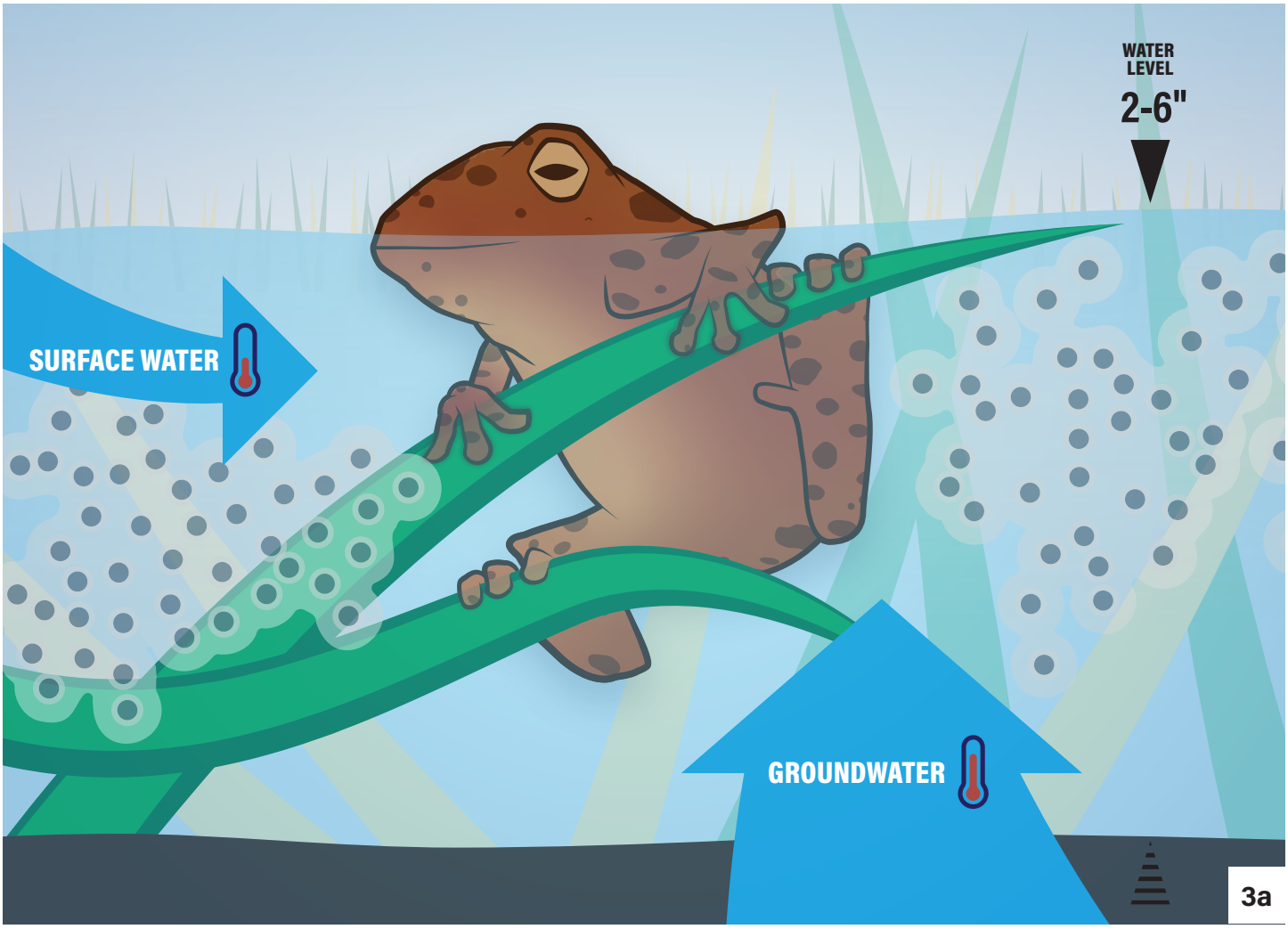
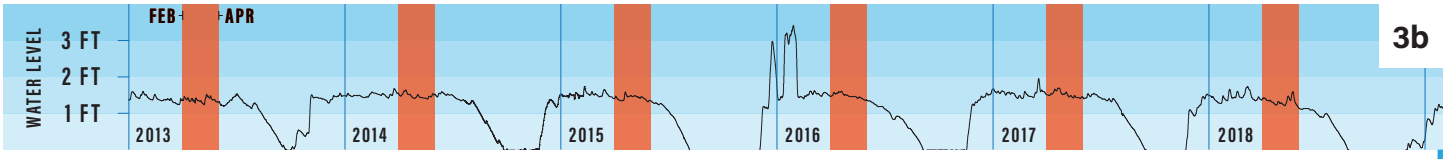


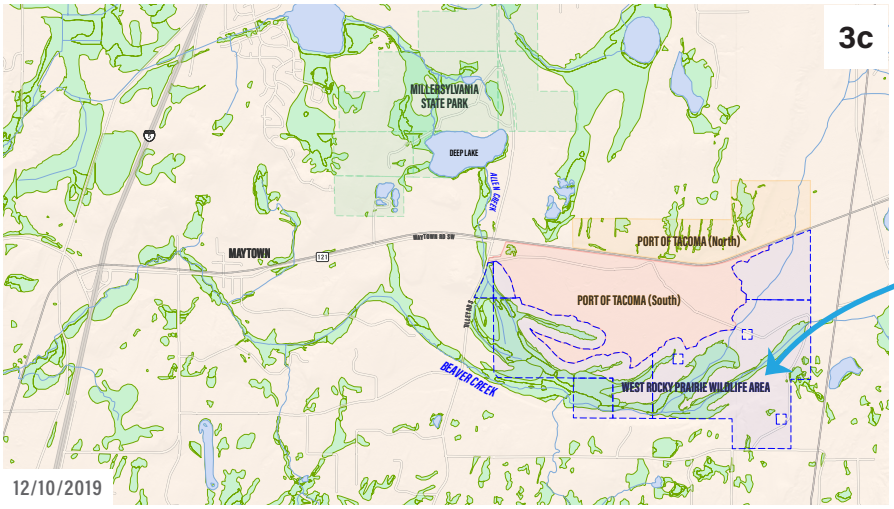
FIGURE 3

# Fragile Egg Laying Habitat of Oregon Spotted Frog

When and Where Life Starts




Feb to Apr critical water level—egg and embryo life-stage.

**3a** Frog and its eggs

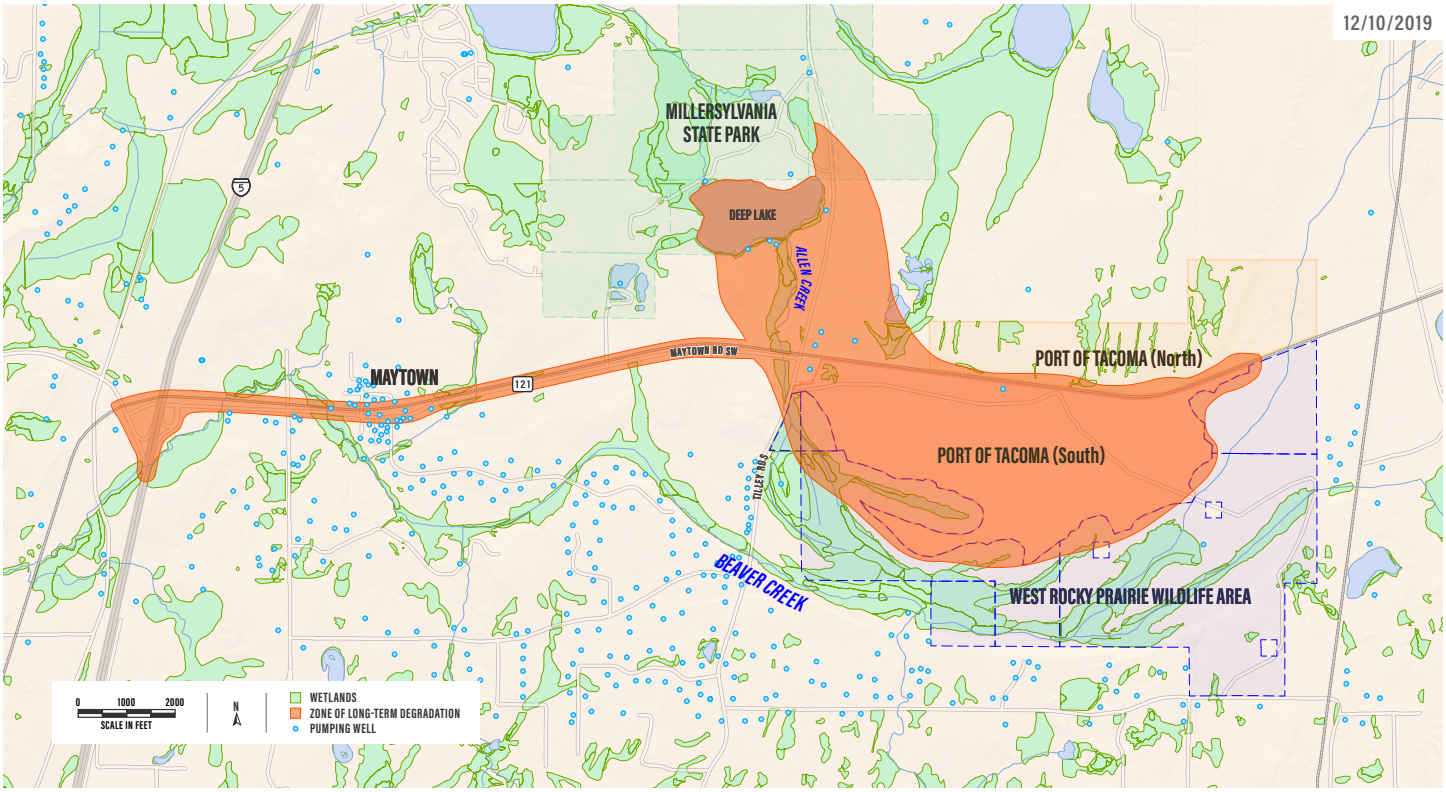
**3b** Recurring water pattern

**3c** WRPWA is frogs' home

FIGURE 4

# Future Degradation of Water Quality: Long-Term and Catastrophic

## LONG-TERM DEGRADATION




## CATASTROPHIC CONTAMINATION

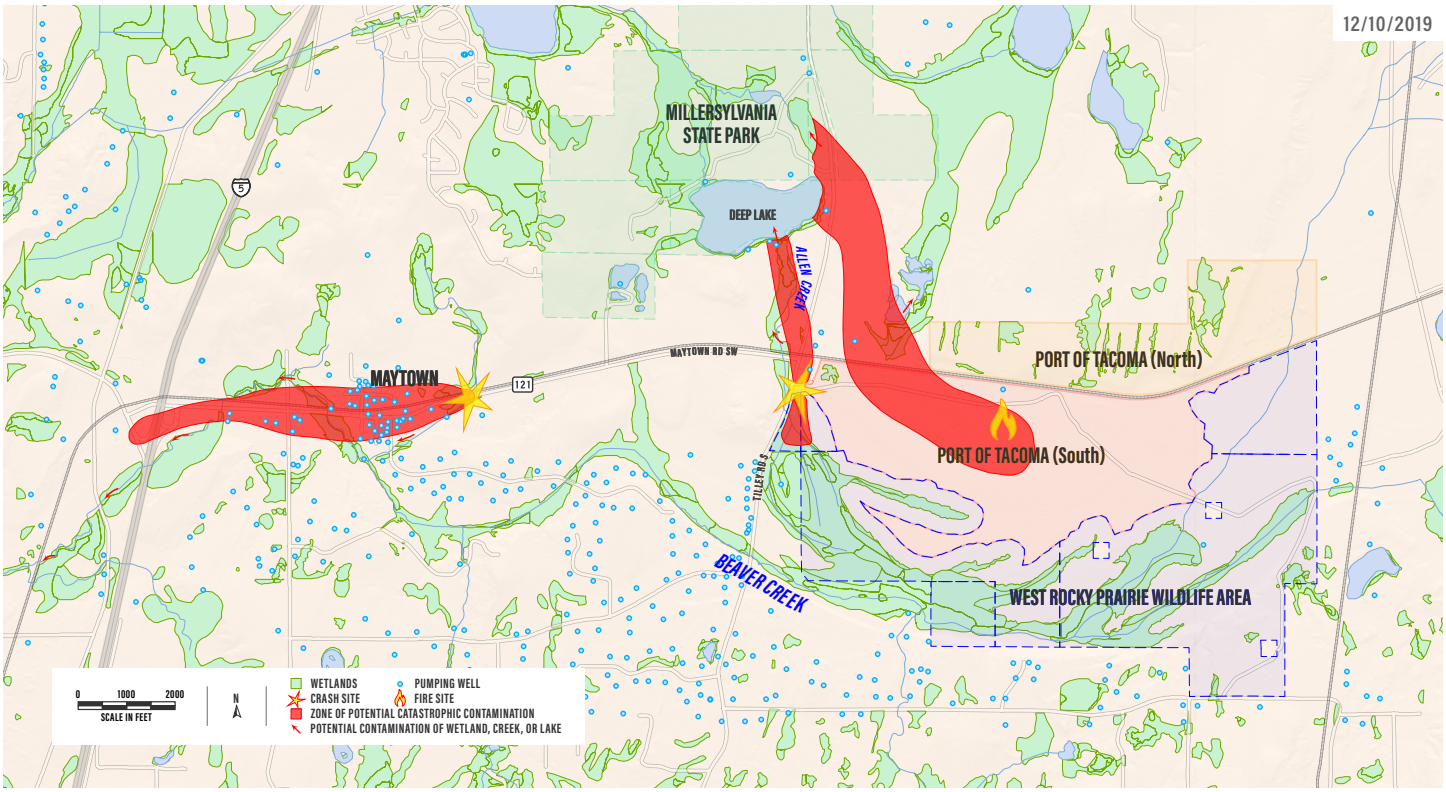
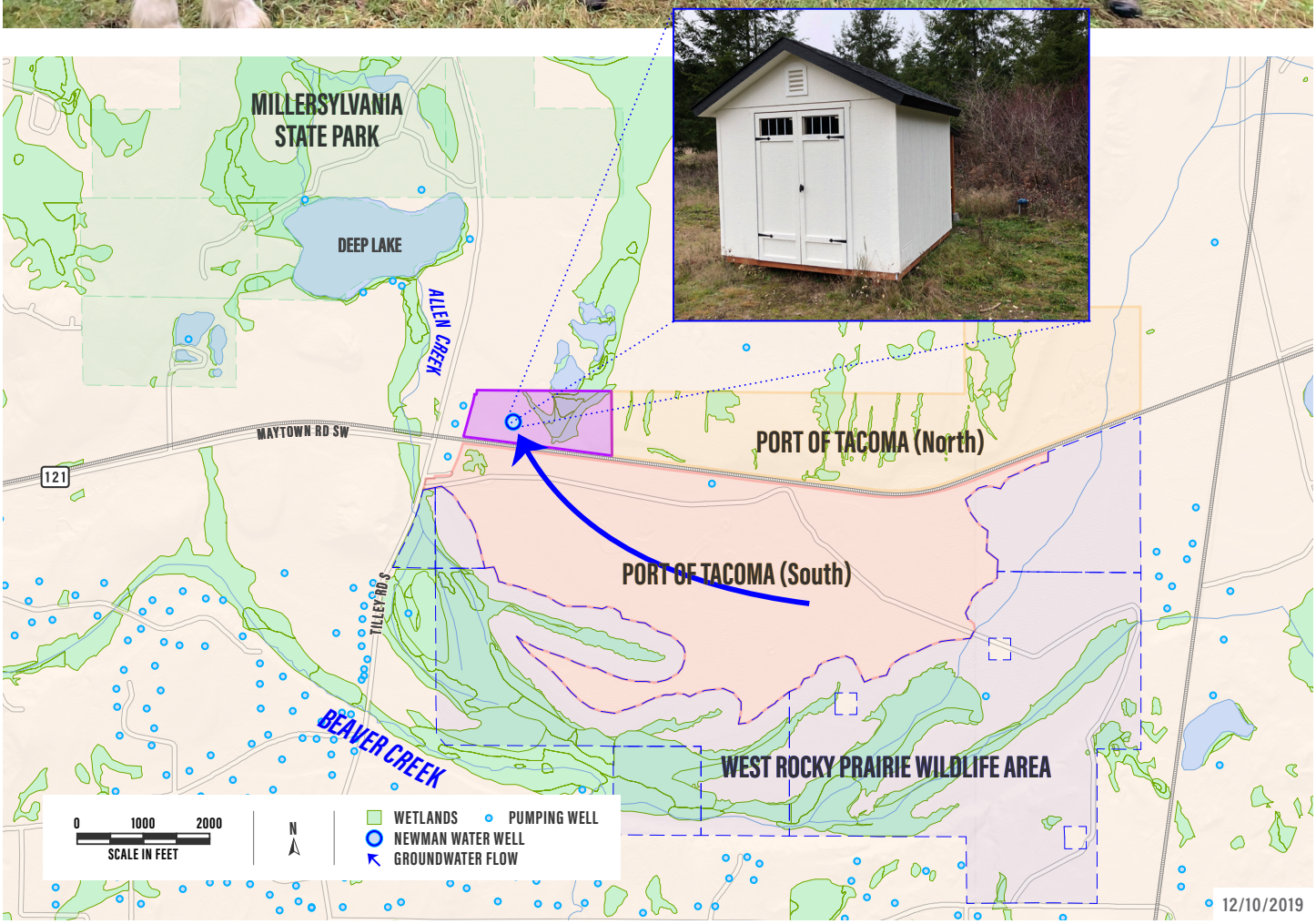


FIGURE 5

# A Thurston County Family's Drinking Water: Three Generations Live Here



# James T. Mathieu, LG, LHg • Northwest Land & Water, Inc.

Jim Mathieu has 30 years of experience in water resource planning and management and technical study design. Much of his work has supported regional watershed plans and municipal water comprehensive plans, which have required the development of water budgets that consider population growth and climate variability as well as novel approaches to data collection and analysis.

**Education**: M.S. Hydrology, 1989 University of Arizona; B.A. Geology, 1984, University of California, Santa Barbara

**Professional Registration**: Licensed Geologist / Licensed Hydrogeologist, Washington

## Major Areas of Expertise

- Basin-scale hydrogeologic characterizations
- Groundwater – surface water interactions
- Watershed and water rights investigations
- Hydrogeologic site assessments
- Groundwater flow modeling and recharge analysis
- Wellhead protection area delineation
- Monitoring system design and implementation
- Water supply development
- Water well and well field design
- Aquifer testing and analysis
- Manage aquifer recharge (MAR)
- Aquifer storage and recovery (ASR)
- Artificial recharge and recovery (ARR)
- Hydrologic impact analysis

## Representative Project Experience

### On-farm ASR/ARR Investigation

*Walla Walla Basin Watershed Council, Eastside Milton-Freewater Area, OR*

Conducted a planning-level study to examine legal, technical, and cost considerations for on-farm basalt ASR and/or alluvial aquifer ARR. Investigated ASR / ARR suitability for diverting winter / early spring Walla Walla River water, storing it, and withdrawing it via pumping from spring through summer to leave water instream (as much as 10 cfs of water rights) for ecological benefit, including improved salmon and steelhead habitat.

### Monitoring Well Siting, Construction, & Instrumentation, Walla Walla Area MAR Basins & Infiltration Galleries

*Walla Walla Basin Watershed Council, OR/WA*

Collaborated with WWBWC staff to site and instrument monitoring wells near existing or new recharge infrastructure. Assessed the benefit of recharge on tributary creek flows and designed, constructed, and tested a monitoring well network to characterize shallow alluvial aquifer conditions for receiving diverted river during high spring runoff periods.

### Intrinsic Tracing of Recharge Water in the Eastside Alluvial Aquifer Adjacent to the Walla Walla River

*Walla Walla Basin Watershed Council, Eastside of Milton-Freewater Area, OR*

Engaged in tracing recharged river water using conductivity, temperature, and stable isotope data to assess feasible locations for recovery.

### Watershed Plan & Technical Support

*WRIA 14 Planning Unit, Kennedy-Goldsborough Watershed, WA*

Characterized sub-watersheds with the goal of understanding the impacts of future withdrawals from exempt and municipal wells on Johns Creek, which contains salmon habitat and is of high value to the local tribe and other community members.

### WRIA 14 Johns Creek Sub-basin Build-out

*WRIA 14 Planning Unit, Kennedy-Goldsborough Watershed, WA*

Estimated current and future consumptive water use and evaluated possible impacts to creek flow. Developed recommendations to assist planners in decisions about land and water.

### WRIA 14 Hydrogeologic Characterization

*WRIA 14 Planning Unit, Kennedy-Goldsborough Watershed, WA*

Conducted hydrogeologic characterization and field studies for a 60-square-mile study area using Viewlog and other GIS-based approaches. Developed a groundwater monitoring network to collect water level data. Synthesized data and reported findings and recommendations for resource planners and managers.

### Water Rights / Stream Restoration

*Washington Water Trust, WA*

Developed an extensive set of GIS maps and linked tables to display natural resource features and water

rights. Information was used to assess areas where water rights could be purchased and transferred into a trust program, thereby enhancing stream flows.

### Zylstra Lake Water Supply & Water Rights

*Washington Water Trust / San Juan Preservation Trust, San Juan Island, WA*

Developed key water budget components and assessed water rights within this watershed. Examined the impacts of drought on Zylstra Lake levels and its shoreline position.

### Parcel-scale Land & Water Development

*Private Landowner, WRIA 7, WA*

Following the Hirst decision, but prior to SB 6091 (now RCW 90.94), assisted a private property owner with a range of options to develop water. These options included connecting to a nearby Group B water system, installing a roof-rainwater catchment system, purchasing and transferring a local water right, and hauling water. Other novel approaches were discussed that included creative stormwater management to recharge water and offset groundwater use.

### WRIA 9 Strategic Assessment

*Sub-Consultant for King County, WRIA 9, WA*

Completed portions of a strategic assessment of the groundwater interaction with the Middle Green River. Compiled data from numerous sources and performed qualitative and GIS-based analyses to identify reaches with significant groundwater discharge to the stream and to assess the hydraulic connection between large wells and the Green River.

### Long-Term Hydrologic Monitoring & Land Development Review to Protect ESA-listed Frog

*Black Hills Audubon Society, in collaboration with the Washington Department of Fish & Wildlife, Thurston County, WA*

Implemented a water monitoring program for state land at West Rocky Prairie (WRP) to evaluate aquatic habitat for the Oregon spotted frog. The WRP management unit is located adjacent to a gravel mine that has the potential to impact hydrologic conditions and adversely impact active OSF restoration work by WDFW. Also, reviewed other future land use conditions to assess potential habitat impacts at another OSF site in Thurston County. Provided written opinions and testimony regarding habitat protection.

### Meridian Valley Creek Hydrogeologic Characterization

*City of Kent, WRIA 9, WA*

Characterized soil and shallow groundwater conditions using lithologic and hydraulic data from new wells and boreholes. Measured soil permeability, estimated creek flow gains and losses, and recommended creek realignment design features.

### Hydrogeologic Characterization

*City of Auburn, WRIAs 9 and 10, WA*

Compiled data to develop a comprehensive groundwater flow model and used the model to evaluate groundwater withdrawal impacts on streamflow and to define capture zones for wells. Developed long-term groundwater supply and mitigation scenarios.

### MODFLOW Model to Quantify Impacts & Develop a Mitigation Strategy

*City of Auburn, WRIAs 9 and 10, WA*

After a decade of hydrogeologic characterization, constructed and ran a multi-layer, regional-scale, transient numerical model to simulate new groundwater withdrawal scenarios. Quantified impacts for two major rivers and one creek and developed a palette of mitigation options to offset river/creek impacts.

### Blue Slough Habitat Restoration & Reconnection

*Private Landowner, WA*

Developed cross sections and monitored water levels in a former side channel of the North Fork Stillaguamish River to support the procurement of State funds for phase I restoration activities.

### Technical Support

*Spokane County Water Availability Advisory Group, Spokane County, WA*

Provided hydrogeologic technical support to the facilitator, advisory group, and County during stakeholder meetings. Interpreted pumping data on file with the County and improved data collection standards.

### Hydrogeology, Land Use, & Water Supply Study

*Spokane Conservation District, Hangman Creek Watershed (WRIA 56), WA*

Characterized hydrogeologic conditions using existing well log data, data from the construction and testing of new monitoring wells, and isotope and geochemical sampling and analyses. Improved the understanding of the hydraulic connectivity between the crystalline basement, Columbia River Basalts (CRB), and glaciofluvial aquifers, as well as the connectivity of aquifers to local creeks.

### Geochemical & Hydrogeologic Characterization

*Spokane County & Spokane Conservation District, West Plains & Hangman Creek (WRIA 54 & 56) Watersheds, WA*

Extended the WRIA 56 characterization into areas of the West Plains and adjacent Hangman Creek watershed where population growth is expected. Results showed both hydraulically distinct and interconnected water-bearing zones within the CRB, with some interconnected zones possibly as a result of commingling wells, and other CRB aquifers that may be hydraulically bounded, resulting in long-term "groundwater mining."

### Hydrogeologic Study

*Spokane Conservation District, Hangman Creek Watershed (WRIA 56), WA*

Planned, contracted, and directed drilling and construction of six monitoring wells in CRB Group aquifers to characterize the hydrostratigraphy, aquifer parameters, geochemistry, and groundwater level trends in a region with a substantial number of commingling wells. Careful attention was given to the proper sealing of shallow aquifers from intermediate and deep aquifers. Identified a deep unconfined aquifer with artificial recharge (AR) or ASR potential.

### Wellhead Protection Studies

*Cities of Lacey, Olympia, Tumwater, Fife & Auburn, WRIAs 9, 10, 11, 13, and 23, WA*

Designed and installed monitoring wells to collect data and establish wellhead protection programs. Analyzed test data to evaluate aquifer parameters and water quality conditions. Conducted modeling to delineate time-of-travel capture zones for supply wells. Developed and wrote plans integrating zoning, land use, and critical aquifer recharge areas. Also, designed ongoing monitoring programs, characterized the local hydrogeology, and managed field operations.

### Potable Water Exploration

*City of Lacey, Hawks Prairie Area, WA*

Managed a multi-year drilling and characterization project to investigate a deep groundwater supply source. Work included drilling test wells and a large-diameter production well, logging drill cuttings, designing and testing the well, and geochemical sampling. Developed monitoring recommendations for sustainable groundwater development.

### Test Well Construction

*City of Buckley, WA*

Logged, designed, and tested a 6-inch well to assess the potential for municipal water supplies. Evaluated aquifer parameters and potential yield and made recommendations for further testing, development, and monitoring.

### Beachcrest Wells 1 & 2 Rehabilitation

*City of Lacey, Beachcrest Area, WA*

Managed the rehabilitation of two production wells. This work involved testing, followed by downhole mechanical rehabilitation methods (including Hydropuls®) and post-rehab testing. The rehab work increased the total site yield.

## Professional Affiliations

- Geological Society of America
- American Water Resources Association

## Software Capabilities

- ArcGIS
- MODFLOW
- MODSURFACT
- MODPATH
- AQTESOLV
- Groundwater Vistas
- AutoCAD
- ViewLog

## Tools & Equipment Capabilities

- **Pressure transducers and dataloggers**: GEOKON®, Solinst®, INW™
- **Flow measurement**: Ultrasonic, non-invasive paddle wheel (analog and digital); orifice plate / manometer
- **Drilling and well development**: Cable tool, rotary, sonic, Hydropuls®, surge block, airlift-isolator, high resolution down-hole camera