

VEAL EXHIBIT 86

EDWARD J. McCARTHY

**9957 171 Avenue SE
Renton, WA 98059
Tel. (425)-271-5734**

PROFESSIONAL BRIEF

Dr. McCarthy has more than 25 years of experience in water resource engineering, hydrology, and hydraulics. His expertise includes:

- surface and groundwater resource evaluations
- hydrologic and hydraulic modeling
- water quality investigations
- watershed analysis and management
- low impact development
- floodplain analysis
- wetland hydrology
- stormwater management facility design and analysis
- erosion and sediment transport modeling

In past projects, Dr. McCarthy has evaluated the affects of land and road development, and other human activities on water resources including streams, lakes, wetlands, groundwater, and estuaries. In addition, he has designed, implemented, and monitored mitigation measures and strategies to reduce the impacts of development. Successful mitigations include developing designs for stream restoration and culvert replacements, designing stormwater management facilities for urban development, as well as designing stream and wetland restoration and construction projects. Monitoring projects have typically included measurement and evaluation of hydrology and parameters related to water quality.

EDUCATION

Ph.D. Water Resource Engineering, North Carolina State University
M.S. Agricultural Engineering, North Carolina State University
B.S. Forest Engineering, University of Maine

REGISTRATION

- Registered Professional Engineer, State of Washington

TRAINING

- Design and Retrofit of Culverts in the Northwest for Fish Passage
- DOE Western Washington Hydrology Model Workshop
- Construction Site Erosion and Sediment Control Certification Course
- HEC-6 Sedimentation Modeling
- Bridge Scour and Countermeasures
- XP-SWMM Hydraulic Modeling

MODELING EXPERTISE

Modeling expertise includes MGSFlood, WWHM, Stormshed, KCRTS, SWMM, HEC-RAS, HEC6T, MODRET. and ArcGIS.

PROJECT EXPERIENCE

Creekside Elementary School; Sammamish, Washington. Developed the drainage plan for this 9-acre elementary school site in the Pine Lake Watershed in King County. Site issues included downstream erosion hazards, wetlands, and steep slopes. The design elements of the drainage plan infiltrate 100 percent of the site's stormwater for up to at least the 100-year storm. The drainage plan implements a variety of Low Impact Development concepts including rain gardens, porous pavement, and dispersion. A total area of 1.14 acres of porous pavement will be used for construction of the fire access road loop and playground. Four rain gardens have also been included in the drainage plan to reduce runoff, increase infiltration, and conserve irrigation water for landscape plantings. In addition, Underground Injection Control (UIC) wells were included in the design to manage runoff from the site. The resulting drainage plan will reduce runoff rates and volumes below those that are predicted to occur under forested conditions.

Groundwater Mounding Analyses; King County Washington. Projects included Peace Lutheran Church site, 24424 Plat., West Brooke Plat, Lindsey Estates, and Hacheral Residence. Conducted assessments for urban stormwater infiltration ponds using the groundwater modeling program MODET to analyze the potential for groundwater mounding.

Stormwater Infiltration and Subsurface Drainage Design; King County Washington. Project dates: 2006-2014. Designed urban infiltration ponds, infiltration vaults, infiltration trenches, dispersion trenches, infiltration depressions, rain gardens, and subsurface drainage collection systems to manage stormwater on urban sites. Collected field data to assist in system design and assess system post-construction performance.

Water Table and Hydrology Evaluation for Onsite Sewage System Design; King and Pierce Counties, Washington. Developed a guidance document for assessing site hydrology for design of onsite sewage systems. Guidelines for evaluating water tables and site hydrology were based on data collected on sites in King and Pierce Counties. The study was conducted in coordination with Washington State University with a grant from the Centennial Clean Water Fund.

Thornton Creek Sediment Study; Seattle, Washington. Acted as technical lead in coordination with Seattle Public Utilities to assess sedimentation in Thornton Creek and Meadowbrook Pond. Developed sediment management strategies to reduce instream maintenance costs, decrease flooding risk, and improve habitat conditions. Developed a HEC-6 sediment model of the existing and proposed creek systems and conducted long-term simulations to refine the proposed design.

Swamp Creek Sediment Study; City of Shoreline, Washington. Acted as technical lead in developing a HEC-6 sediment model of the existing and creek and sediment pond in Wallace Park. Conducted long-term simulations to refine the management of sediment removal from the creek. Evaluated alternative sediment management strategies and design retrofits for the sediment pond in Wallace Park. The HEC-6 model assessed the performance of the modified pond designs over several years of varied hydrologic conditions.

Snohomish County Drainage Needs Reports; Snohomish County, Washington. Prepared drainage needs assessments for drainage basins in Snohomish County under the direction of Snohomish County Public Works. Reviewed background information including published reports, sensitive areas inventories and drainage complaints to identify stormwater flooding and conveyance problems. Identified problem locations and developed hydrology and hydraulic models to assess the problems identified. Developed alternative capital improvement projects to correct the drainage problems. Prepared cost opinions and documentation of

drainage improvement designs.

Wenatchee River Side Channel Design and Construction; *Wenatchee, Washington.* Served as the project engineer for this side channel design and construction project. The project added nearly 1,000 lineal feet of salmon stream habitat and refuge to the Wenatchee River by constructing a new side channel connected to the mainstem river. The project included hydraulic and sediment transport analysis, channel section design, and streambank stabilization design. Special problems included designing a stream section to split flows from the high energy flow system of the main channel to the new side channel and providing a system that adequately transported sediment loads.

Issaquah Creek, Squak Valley Park Floodplain Restoration; *Issaquah, Washington.* Served as the project engineer for this floodplain restoration and stream enhancement project. The project team worked closely with City of Issaquah staff to develop a plan to restore the floodplain and develop adjacent park infrastructure. Conducted hydraulic analyses to develop the floodplain restoration plan for this channelized reach of Issaquah Creek. The hydraulic assessment evaluated design alternatives to stabilize stream banks and provide fish habitat and refuge. An important criterion in the design was to maintain a zero rise in floodplain elevations due to flooding of adjacent residential properties.

Reecer Creek Flood Study; *Ellensburg, WA.* Evaluated the floodplain of Lower Reecer Creek in coordination with the City of Ellensburg and adjacent landowners. Delineated floodplain under existing and proposed developed conditions. Proposed developed conditions included construction of a residential development along the creek, replacement of Dolarway Bridge, and restoration of the floodplain downstream of Dolarway Road. Designed and simulated compensatory flood storage mitigations for the proposed residential development. The assessment of the floodplain restoration area included modeling the creek's hydraulics with the channel's existing levee removed and another levee constructed along the limits of the floodplain.

North Marysville Regional Stormwater Pond Design; *Marysville, Washington.* Led the technical efforts to design this regional stormwater pond to provide detention and treatment for 70 acres of commercial development in the Quilceda Creek watershed. Used the model MGS Flood to determine stormwater detention requirements. Obtained a Dam Safety Permit from Department of Ecology. Design challenges included flat topography, high water tables, downstream salmon habitat, wetlands, and localized flooding. This pond design and permitting was successfully completed on a 10-month timeframe.

Woodside Stormwater Design; *King County, Washington.* Developed the Master Drainage Plan for this single-family residential development in the Cedar River Watershed in southeast King County. Served as project engineer and lead designer on this large-scale stormwater detention and water quality project. The drainage design includes 5 large stormwater ponds, treatment wetponds, a sand filter, and a steep slope tightline. Involvement began at the conceptual design stage of project, included final design and construction observation, and ended with design and implementation of a 5-year water quality monitoring program. Site issues included protecting bogs, open water wetlands, steep ravines, salmonid streams, and the Cedar River. Conducted hydrologic and hydraulic modeling to evaluate the hydrologic and water quality impacts of the proposed development and surrounding watershed on a 16-acre bog and designed appropriate stormwater mitigations. Developed and implemented baseline and post-construction monitoring plan to assess the effectiveness of proposed mitigation measures on the downstream resources.

Maple Ridge Highlands Estates; *King County, Washington.* Developed the Master Drainage Plan for this single-family residential development in the Green River Watershed in southeast

King County. Served as lead designer on this large-scale stormwater detention and water quality project and was involved from conception through construction. Stormwater design includes seven stormwater ponds, water quality ponds, and a stormwater treatment wetland. Site issues included open-water wetlands, a salmonid stream, and a phosphorus-sensitive lake. Performed hydrologic evaluations for the proposed development. Designed road culverts for fish passage, infiltration ponds, and water quality treatment ponds. Developed and implemented baseline and post-construction monitoring plan to assess the effectiveness of proposed mitigation measures on water quality and the surrounding resources.

Muth Stormwater Pond; Kent, Washington. Developed stormwater design for this 5.5-acre stormwater detention and water quality pond that manages runoff from three tributary residential subdivisions. Served as lead designer and hydraulic engineer for the stormwater pond and was involved from conception through construction. The total developed area draining to the pond is 37.6 acres. The Muth pond site is located in the western portion of the Green River Valley bottom at the toe of the slope of the proposed developments. Conducted hydraulic assessments included dam break and inundation analysis in support of Dam Safety Permit application. The Muth pond consists of a treatment wetland, stream protection storage, 7-day flood storage. Design issues included constructing berms on peat soils, providing storage and release in accordance with the Green River Management Agreement, providing mitigation wetlands within the footprint of the pond, and designing the conveyance system to deliver stormwater to the pond.

Lakemont Estates; Bellevue, Washington. Prepared and managed implementation of the stormwater facility monitoring plan for this Centennial Fund project. Worked with Department of Ecology to develop a statistical sampling plan to meet the specific requirements of the project. Designed and installed five stage and flow monitoring stations. Collected and analyzed hydrology and water quality data and prepared statistical evaluations. The monitoring program was implemented for three years in effort to evaluate the effectiveness of the facility in treating stormwater.

McGarvey Park Drainage Study; King County, Washington. Developed the Master Drainage Plan for this site in the Cedar River Watershed in southeast King County. Site issues included bogs, open water wetlands, steep ravines, salmonid streams, and the Cedar River. Developed and implemented baseline and post-construction monitoring plan to assess the effectiveness of proposed mitigation measures on the surrounding resources. Three continuous stage recorders were installed to measure wetland stage and stream flow. Hydrology and water quality data were collected over a five-year period. Data were analyzed to evaluate the hydrologic impacts of the proposed development on a 16-acre bog.

Beebe Springs Stream Enhancement Project; Washington State Department of Fish and Wildlife, Chelan. Project engineer on design that realigned an 800-foot straightened agricultural ditch into a new 1800-foot stream channel with habitat features, including bank logs and spawning gravel. Oversaw development and reviewed bid-ready AutoCAD construction drawings and specifications for design and negotiations with contractors. Project offers new habitat to Columbia River salmonids.

Issaquah Creek, Squak Valley Park Floodplain Restoration; Issaquah, Washington. Conducted hydraulic analyses to develop floodplain restoration plan for this channelized reach of Issaquah Creek. Evaluated design alternatives to stabilize stream banks and provide fish habitat and refuge.