

# Royal Environmental Systems and Water Tectonics Design State-of-the-Art Stormwater Treatment System

## McRedmond Regional Water Quality Facility

### Challenge

Located 20 miles east of Seattle, Washington, Redmond is home to 50,000 residents and many high-tech and biomedical companies, including Microsoft. Redmond's downtown drainage area is dominated by commercial, industrial and roadway areas, with typical surface pavement contaminants such as metals, nutrients and sediments.

Redmond's stormwater flows into the Sammamish River and Lake Sammamish, important waterbodies for rearing and migrating salmon species. To help prevent stormwater runoff from harming these waterways, the City of Redmond developed stringent stormwater regulations and sought a permanent stormwater treatment system that exceeded existing environmental guidelines.



(above) This large water quality treatment train was easily installed in less than one day.

(right) Porous concrete revolutionizes stormwater filtration.



### Solution

The city selected Water Tectonics as the vendor to supply the permanent stormwater treatment system at the new McRedmond Regional Water Quality Facility, located on a 15.5-acre site in downtown Redmond. This system is a pilot study and part of a \$40 million, multi-phased, citywide stormwater infrastructure improvement program.

Water Tectonics, in conjunction with Royal Environmental Systems, designed a system to remove total and dissolved metals, phosphorus, and suspended sediments. The end product is one of the first of its kind in the country and is currently being monitored as part of a long-term evaluation study.

The McRedmond Regional Water Quality Facility incorporates two stormwater treatment technologies:

- **ecoStorm®**, a gross particle separator; and
- **ecoStorm plus®**, a stormwater filtration system installed in series to form a treatment train.

Stormwater initially flows into the ecoStorm, where >80% of floating pollutants, settleable solids, and litter are removed. The ecoStorm is designed to remove >80% of gross particulates in the stormwater. The effluent from the ecoStorm is sent to a splitter manhole to be distributed into four pipes that lead to four ecoStorm plus units. Sediments are further removed from the stormwater by gravitation using a hydrodynamic separator before flowing upward through the ecoStorm plus filter, where >80% of the remaining Total Suspended Solids (based on Sil-Co-Sil 106 particle size), metals, and phosphorus are removed through chemical transformation, precipitation, and sorption. The treated stormwater effluent flows from the ecoStorm plus units to the Sammamish River.

At the city's request, the system at the McRedmond Regional Water Quality Facility was oversized by a factor of two to study performance using a slower treatment rate to meet standards for infiltration to groundwater within a wellhead protection area. This system far exceeds the 1.3 cfs that the facility is required to treat. Typically, four ecoStorm plus units treat up to 3.2 cfs.

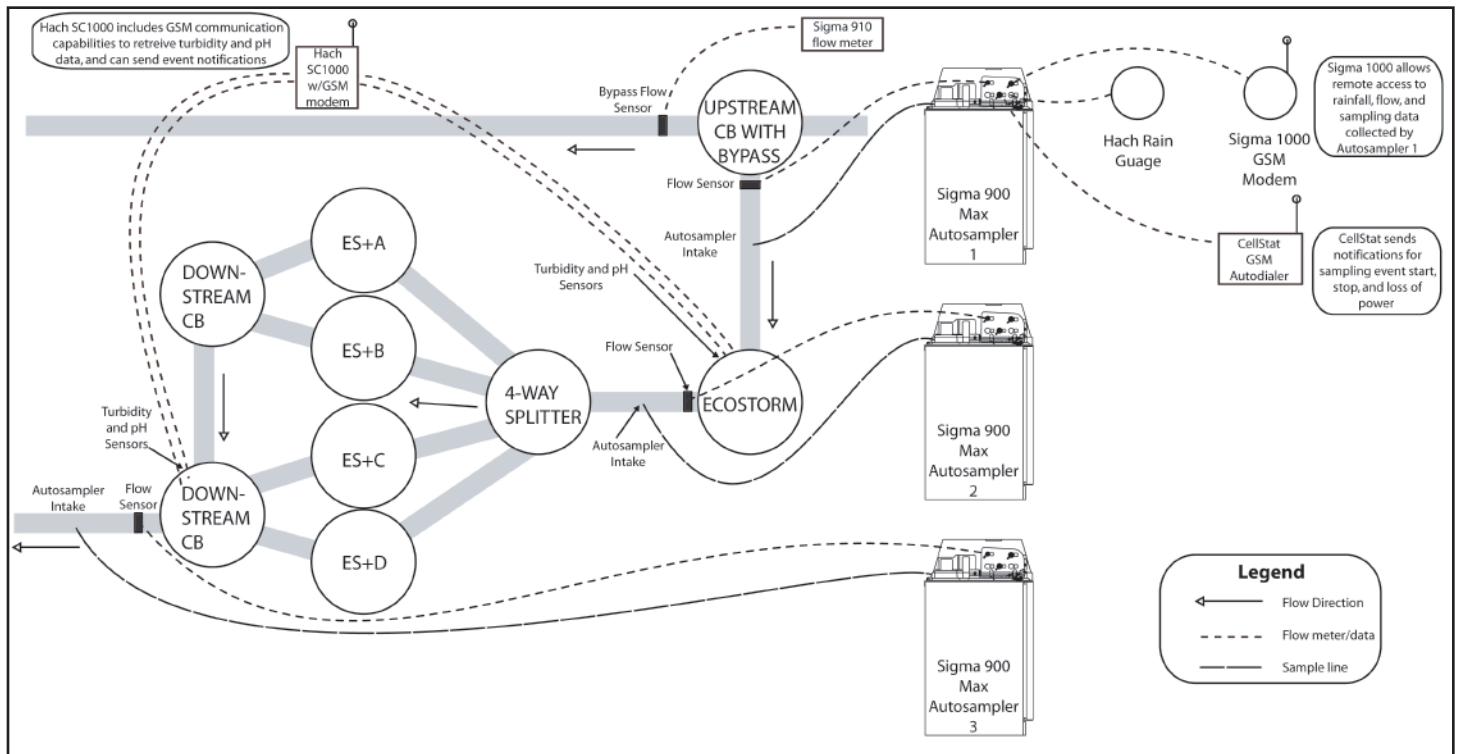
## Measuring Effectiveness

During a two-year study, the treatment facility's performance will be evaluated through online monitoring of rainfall, flow and turbidity with real-time remote monitoring capability. Rainfall and flow will also trigger flow-weighted auto-sampling to capture representative composite samples from individual storm events. Three auto-samplers will collect samples upstream of the ecoStorm, downstream of the ecoStorm and upstream of

the ecoStorm plus units, and downstream of the ecoStorm plus units. The auto-samplers are programmed to collect composite samples from events that meet the minimum requirements of a qualifying storm event. Sampling lines and cables are routed to a monitoring trailer through permanent conduit. The monitoring trailer contains all of the auto-samplers and online monitoring equipment.

Monitored parameters include total and dissolved metals (e.g., zinc, copper and lead), hydrocarbons, total phosphorus, orthophosphate, and particle size distribution. The sampling design also includes online monitoring of bypass flows and turbidity at the three sampling locations. This long-term monitoring is expected to provide a clear understanding of the effectiveness of the ecoStorm and ecoStorm plus treatment systems, and will be a model for future water quality treatment facilities.

## McRedmond Monitoring and Sampling



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