

IPZ: URBAN CLEAN WATER TECHNOLOGY ZONE (PIERCE COUNTY)

Clean Water Innovation Development and Technology Transfer Laboratory at UWT (\$2.0 million)

Purpose: To provide a shared-use facility where University and private-sector scientists and engineers collaborate to develop, evaluate, and bring to market innovative clean water technologies.

Need: Transfer of innovative science and engineering to marketable products requires a facility where development teams can design, fabricate, and test new technologies. Many firms which innovate in water treatment devices are relatively small, low-capital enterprises that lack access to design, fabrication, and testing facilities. The Wright Brothers had their bike shop and Hewlett and Packard their Palo Alto garage. Our vision is that this will be the ‘shop’ for our IPZ where a several development teams will share core facilities -- bench-scale testing space and diagnostic equipment, analytical facilities, computing design and control, fabrication -- to drive innovation in clean water technologies.

Strategy: Companies that develop and market innovative technologies to purify water rely on the effective migration of advances in fundamental science and engineering through proof of concept engineering studies and pilot-scale testing and evaluation. A core function of the Clean Water Technology Innovative Partnership Zone is to bridge the gap between research conducted within University laboratories and marketable products. Creating this Clean Water Innovation Development and Technology Transfer Laboratory will build on several local advantages:

- Tacoma and the University of Washington have made significant investments in laboratory infrastructure in the Center for Urban Waters, which houses one of the best equipped and staffed environmental analytical facilities in the Pacific Northwest.
- Current and anticipated research thrusts at UW Tacoma and by our collaborators at UW Seattle and WSU Puyallup provide the intellectual capital to advance critical science and engineering.

- The Washington Stormwater Center, located in our IPZ, operates the Technology Assessment Program-Ecology (TAPE), the nationally-recognized leader in certification of stormwater technologies.
- Experienced design and fabrication companies in our IPZ (e.g., Globe Manufacturing) are available to build prototypes and pilot-scale devices.
- A significant innovative customer base (City of Tacoma, Port of Tacoma, Joint Base Lewis-McChord) is prepared to drive demand for innovative clean water technologies, especially those focused on stormwater.

Implementation: Capital funds will be used to construct and equip the Clean Water Innovation Development and Technology Transfer Laboratory on the campus of the University of Washington Tacoma. Existing space at UWT will be converted from offices and computer space to engineering laboratories with adjacent offices and computer resources. The new laboratory space will mix UW Tacoma faculty engaged in clean water research with external partners in collaborative development teams focused on specific product development. The Clean Water Innovation Development and Technology Transfer Laboratory will be operated as a UW cost center, with development teams supporting centralized design, testing, and fabrication services through specific contracts.

Capital funds will be used to: Convert existing finished space at UWT into the Clean Water Innovation Development and Technology Transfer Laboratory. Costs include reconfiguring existing space, upgrading utilities, and purchasing laboratory casework and office furniture. (\$1.6M)

Purchase, install, and calibrate test equipment and diagnostic tools specific to clean water technologies. Costs include research-grade hydrodynamic sensors (pressure, velocimetry) and pilot-scale process control equipment. (\$0.3M)

Adapt existing computer laboratory space into a workspace to dedicated computer aided-design and manufacturing (CAD/CAM) and process modeling. Cost include computer hardware and software (\$0.1M).

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Enhanced Instrumentation to Support Commercial Development of Clean Water Technologies at Center for Urban Waters
(\$800,000)

Purpose: To equip a shared-use laboratory at the Center for Urban Waters available to assist entrepreneurs who are developing innovative clean water technologies.

Need: Many firms which innovate in water treatment devices are relatively small, low-capital enterprises that lack access to the research-grade laboratory instrumentation required to refine and validate new technologies. These firms often required specialized ‘boutique’ types of measurement not commonly available from commercial testing laboratories. This request will establish a dedicated facility at the Center for Urban Waters where clean water firms will collaborate with University scientists who develop specialized analytical techniques.

Strategy: The core function of this shared-use laboratory is to provide access to sophisticated analytical instrumentation and trained personnel to clean water firms located within our IPZ. This investment builds on those made by Tacoma and the University of Washington in laboratory infrastructure in the Center for Urban Waters, which houses one of the best equipped and staffed environmental analytical facilities in the Pacific Northwest. Analytical instrumentation and staff will be made available to firms on a cost basis, and the laboratory will be operated as a not-for-profit cost center within the University of Washington Tacoma. Recovered costs will be dedicated to staff support and instrument maintenance and replacement.

Implementation: Capital funds will be used to purchase the following equipment to support firms developing clean water technologies in our IPZ:

Particle analysis (\$200K): A significant issue addressed by clean water technologies is the removal of particles (soils, sediments, bacteria, manufactured materials) from water. Capital funds will be used to purchase, install, and calibrate (1) a laser *in situ* scattering transmissometer to make real-time measurements of suspended particle size distributions, and (2) an electrostatic mobility analyzer to measure the size and surface charge of particles isolated from wastewater streams.

Chemical characterization (\$600K): To assess the effectiveness of water purification technologies, capital funds will be used to purchase and install a gas chromatograph/time-of-flight mass spectrometer (GC/TOF-MS) which is used to identify and quantify chemical contaminants in water and wastewater. This instrument complements recent acquisitions at the Center of Urban Waters of LC/MSMS and GC/MSMS instruments, thereby providing a comprehensive suite of analytical instrumentation capable of detecting a wide range of chemical pollutants.

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Washington State University Clean Water Technology Aquatic Toxicology Laboratory (\$800,000)

Purpose: To develop the existing WSU Puyallup Salmon Toxicology Laboratory (STL) into a shared-use research and technology transfer Aquatic Toxicology Laboratory (ATL) where university, government, and private-sector scientists and engineers collaborate to develop data on the effects of pollution and diseases on multiple species of fish, aquatic insects, and bivalves. This proposal complements the Clean Water Innovation Development and Technology Transfer Laboratory proposal put forward by UW-Tacoma.

Need: Water pollution is a major problem in the United States and stormwater runoff from roads, rooftops, landscaping, and other built areas is the major source for water pollution nationally. With a population increase of 1.5 million expected in the Puget Sound region by 2025, there is an immediate challenge to develop new and more effective stormwater management techniques for protecting our fresh and marine water systems. The presence of multiple pollutants and disease organisms in our surface water systems appears to be a problem for the health of salmon, but there is a lack of good scientific information on the effects of pollution on other fish species and other aquatic

organisms. Our vision is to house researchers, fisheries, and private businesses collaborating, testing and solving critical questions for Washington's multi-billion dollar commercial and tribal fishing and shellfish industry.

Strategy: The WSU Puyallup Salmon Toxicology Laboratory (STL) was established in 2005. Scientists from NOAA, Seattle, US Fish and Wildlife, and WSU have been evaluating the effects of common mixtures of pollutants on salmon health. However, species other than salmon are affected not only by toxicants, but also by disease. We propose to expand the WSU STL to a laboratory that evaluates the effects of toxicants and diseases on additional fish species, aquatic insects, and bivalves and in particular to evaluate new technologies from the TAPE program of the Washington Stormwater Center for their ability to reduce harm to aquatic organisms. This lab will be linked to the UW-T Clean Water Innovation Development and Technology Transfer Laboratory.

The ATL will work with salmon and other fish species easier to rear and with shorter life spans. Work will attract partnerships from fisheries, tribal hatcheries and private fishing companies.

- Bivalves are an important component of Washington State's economy and suffer from exposure to coliform bacteria. Our work would focus on mussels.
- The Washington Stormwater Center, located in our IPZ, operates the Technology Assessment Program-Ecology (TAPE), the nationally-recognized leader in certification of stormwater technologies. Experienced design and fabrication companies in our IPZ (*e.g.*, Globe Manufacturing) are available to build prototypes and pilot-scale devices. The ability of these devices to clean stormwater to the point that aquatic organisms are protected will be determined at the new WSU ATL. Removal of disease organisms such as coliform bacteria will also be determined. The new WSU Puyallup Aquatic Toxicology Laboratory will be a joint use facility that can be used by various universities, government agencies, and business interests.
- Although techniques have been developed to reduce pollutant loads in stormwater, there are new and emerging pollutants of concern. In addition, the true impacts of best management practices for stormwater runoff control have not been tested on aquatic organisms. The ATL would incorporate new and emerging research results from the Washington Stormwater Center's Low Impact Development Research and Demonstration Program also located on the WSU Puyallup campus.
- The new ATL will benefit the Clean Water Technology Innovative Partnership Zone because we will be able to train undergraduate and graduate students in aquatic toxicology making them employable by various environmental firms, universities and governments in

our area. We will also provide companies who develop innovative stormwater cleaning technologies a state of the art facility to test their products ability to protect aquatic organisms from stormwater pollutants and diseases.

Implementation: To create the new ATL, capital funds will be used to expand and equip the existing WSU STL. The building presently housing the STL needs to be modified. Only one third of the 4,866 square foot building is currently used for the STL. The remaining portions of the building (two large rooms) will need to be retrofitted, upgraded, and equipped with various tanks, chillers/heaters, pumps etc. so that we can expand the number of fish species, aquatic insects, and bivalves. Several offices will have to be built to house collaborators.

Costs include: Construction - upgrades of utilities, new lighting, new dry wall, 3 small offices (500 k).

Equipment – a series of small and large aquatic tanks, chillers/heaters, water quality analysis probes, pumps, and lights to house additional fish species, aquatic insects and bivalves (300 k).

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