Lack of centralized sewage collection and treatment had limited growth and forestalled development plans within the City of Carnation, Washington. To enable Carnation to grow according to their Comprehensive Plan, the City partnered with King County Department of Natural Resources and Parks (King County) to provide local wastewater treatment. King County selected Carollo to provide planning, design, and construction-related services for the Carnation Treatment Plant.

The City of Carnation is located in the Snoqualmie Valley, a pristine rural area on the eastern edge of metropolitan King County. The nearby Snoqualmie River is home to spawning chinook and coho salmon, which are listed as endangered species. Stakeholders were concerned about the preservation of wildlife habitats, as well as maintaining current property values and ensuring public health. The team began the project by proactively working with stakeholders to gain initial support and continued to work with environmental groups to integrate the treatment system into the community culture.

Advanced Treatment

During planning, King County made a commitment to the Carnation community that the facility design would provide highly treated effluent capable of meeting the stringent water quality discharge requirements to the sensitive surroundings. Additionally, King County was committed to using reclaimed water as a resource, which led to Carollo’s recommendation for design of a facility capable of meeting the Washington State Class A reclaimed water standards.

To this end, Carollo designed wastewater treatment processes including fine rotary drum screens, zoned activated sludge basins providing biological nutrient removal, membrane facilities, and in-vessel ultraviolet disinfection modules. The Carnation facility design provides the automated reliability and redundancy necessary to produce reclaimed water and is capable of receiving flow from the City’s collection system at all times.

Sustainable Solutions

Sustainability was an issue from the very start. With the new treatment plant located in such an environmentally sensitive area, and with such high standards set for the water produced by the plant, it was consistent with King County’s ordinance for green building to design the plant’s Operations Building in a way that strives to minimize the building impact on the environment. One step in this process was to utilize the design and construction standards set forth under the Leadership in Energy and Environmental Design (LEED™) system. Numerous LEED™ methods were utilized to achieve this goal, including:

- Reduction of building energy consumption;
- Using building materials with low or no volatile organic compounds;
- Using materials with high recycled contents and products that are manufactured locally within a 500 mile radius of the project site;
- Using a roofing system with high emissivity coatings;
- Recycling construction waste;
- Providing high windows for daylighting; and
- Using high efficiency water fixtures, and irrigation system heads.

Several elements of the Operations Building were designed to achieve a LEED™ certification.
Wetland Enhancement
Another sustainable element of the Carnation project is reclaiming the water for wetland enhancement. This project will aid in improving the environmental conditions of a nearby wetland in the Chinook Bend Natural Area. Designated for open space and habitat protection, King County has been restoring the area since 2000.

The wetland design focuses on enhancing native plantings and controlling invasive species in the existing degraded wetland through the use of a water control structure, which allows for moist soil management as well as fish passage. The new water control structure restores natural overland flow and connectivity to the Snoqualmie River. Restoring hydrologic connectivity to the river will greatly benefit spawning and rearing salmonids, particularly Coho salmon. Expansion of the wetlands improves terrestrial and amphibian habitat. Blocking outflow from the culvert provides a back channel refuge environment for salmonids.

The size of the wetland will be increased from its current 2 to 3 acres, to nearly four acres, benefiting wildlife and enhancing opportunities for passive recreation at Chinook Bend. Reclaimed water-enabled enhancements will provide valuable environmental improvements for the wetlands, the river, salmon, and other species that rely on this critical natural resource. Hydrologically, the wetland is fed from many sources including groundwater seeps, storm water, and soon up to 0.5 cubic feet per second of non-chlorinated Class A water.

Interagency Partnerships
Since 2003, King County has been in partnership with the City of Carnation to centralize and treat the City’s wastewater, replacing failing septic systems. In 2006 King County developed a formal partnership with Ducks Unlimited to complete the wetland discharge project and further reduce costs. Ducks Unlimited, a national, non-profit corporation dedicated to wetland conservation, has provided their engineering and wetland enhancement expertise.

This solid partnership then worked with environmental groups, the local community, the local Snoqualmie and Tulalip Tribes, the state legislature, regulatory agencies, and other stakeholders to evaluate environmental impacts and provide a supported design for discharge of the reclaimed water to enhance the natural wetland at Chinook Bend. The strong interagency partnerships developed through this overall project, were based on shared goals to successfully meet obligations and regulatory requirements while providing wildlife benefits and enhancing passive recreation opportunities in a forested wetland.

Sixteen funding partners from federal, state and local government levels contributed grants and loans to ensure completion of the project.

Recognition
The Carnation Treatment Plant was recently honored with the 2008 Small Project of the Year award given by the WateReuse Association. The project was recognized for its advancements in the water reuse industry.