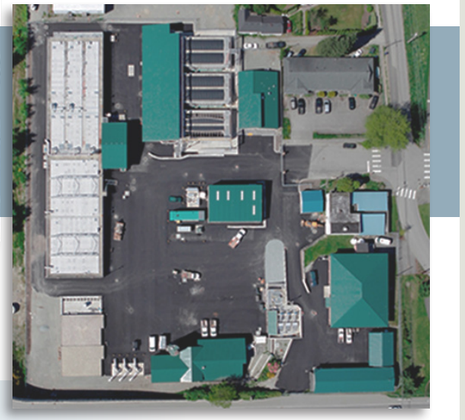
Before

After



Future Plans

- Equip Aeration Basin #3, MBR Tanks #5 and #6, and Aerobic Digester #2, to increase capacity to 4.0 MGD
- Divert Class A effluent during critical low-flow periods in the Stillaguamish River, to supplement constructed wetlands (primarily used for stormwater runoff), and remove temperature and nutrient loads from the river, preserving fish runs
- Additional planned uses of Class A reclaimed water include irrigation of parks, cemeteries, and agricultural lands; and for utility maintenance uses, such as jetting sewer lines, and providing dust control.

Construction Cost

$29.6M (22-month duration)

Capacity

2.67 MGD (Phase 1); 4.0 MGD under future Phase 2

Funding Sources

- 2007 Washington State PWTF loan
- 2010 Washington State Ecology SRF loan (ARRA funded)
- 2010 ARRA Green Project Reserve (50% forgivable principal)
- City rate revenue

Project Partners

- City of Arlington, Owner
- Kennedy/Jenks Consultants, Engineer
- IMCO Construction, Contractor
- Washington State Department of Ecology, Regulatory Agency
- Numerous Stillaguamish River stakeholders

Kennedy/Jenks Consultants

WASHINGTON STATE DEPARTMENT OF ECOLOGY

IMCO GENERAL CONSTRUCTION

Other Project Facts:

- A sensitivity analysis of the Stillaguamish River basin model, developed by Ecology, was used in a cost/benefit analysis to compare the effect on river quality under differing treatment technology and discharge flow rate scenarios (including zero discharge). The analysis conclusively showed that treatment of the City's wastewater alone would not solve water quality issues in the river.
- Satellite treatment within the City's collection system was considered to evaluate production of reclaimed water closer to potential large end users, but was determined to be infeasible.
- A cultural resources assessment discovered a "privy" site from old Arlington settlers. Mitigation work was necessary before construction of new WWTP facilities near this site was permitted!
- The MBR equipment package was pre-selected and pre-purchased at the 10% design level, with the contract being assigned to the General Contractor.
- Flat plate membranes were piloted at full scale, and retained to address short-term solids handling limitations, related to thickening. This gained operational experience with the technology that was chosen and installed in the expansion.
- Energy efficient design features allowed the City to obtain ARRA Green Project Reserve funding, 50% of which was granted through forgivable principal.
- Tertiary treated effluent is recycled, and used for WWTP process equipment rinsing and maintenance.

The Arlington Water Reclamation Facility

Protecting today's, and creating tomorrow's resources, within the Stilliguamish basin

Project Summary

Upgrade and Expansion of the City's WWTP, from an SBR-Based Treatment System to a Continuous Process, Implementing MBR Technology

The construction work sequence included necessary temporary facilities, to allow the plant to stay on-line continuously and within regulatory compliance, as construction and facility retrofitting occurred.

The work included:

- Modifying the headworks to expand capacity, and implement fine screening
- Reconfiguring two SBR basins as three aeration basin trains (designed for biological removal of both phosphorus and nitrogen), and two aerobic digesters
- Constructing new MBR tanks and new MBR support, lab/office, and equipment buildings
- Replacing/expanding the City's UV disinfection facilities, to allow treatment to meet Class A reclaimed water standards
- Expanding the solids handling building to increase capacity, and replacing a belt filter press with rotary fan press dewatering technology
- Constructing new biofilters for odor control

Project Drivers

- Stillaguamish River TMDLs, leading to more stringent future NPDES requirements (temperature, phosphorus, copper, and zinc)
- Development/growth, resulting in influent flows and loadings approaching facility capacity
- De-rating of the existing facility capacity to 2 MGD from a design capacity of 3 MGD, due to higher than anticipated influent concentrations, lower than anticipated settled sludge concentrations, and aeration limitations
- Inadequately sized sludge storage and dewatering equipment, as a result of higher than anticipated waste volumes
- Discontinued use of the City's composting facility, due to the odors associated with unaerated sludge (aeration of the sludge storage tanks was frequently turned off to help further thicken solids prior to dewatering)

For more information please call 360.403.3526

The Arlington Wastewater Treatment Plant

1 Headworks

Purpose: Remove trash, debris, and grit

Improvements:

- Expanded structure to retrofit finer, larger capacity screens
- New grit removal equipment

Benefits:

- Greater removal of trash and debris for protection of membranes
- Improved grit removal
- More hydraulic capacity

Major Equipment: Huber Rotomat® drum screens, with 3 mm perforated plates, and Smith & Loveless PISTA® grit system

2 Secondary Support Building

Purpose: House equipment associated with the aeration basins, and effluent disinfection

Improvements:

- Retrofitted existing blowers with adjustable frequency drives (AFDs)
- New electrical controls for aeration basin equipment
- New ultraviolet (UV) disinfection system
- Rehabilitated existing waste activated sludge (WAS) pumps, and upgraded the in-plant (No. 3) water system, to meet increased demands

Benefits:

- AFDs for variable blower output, reduced energy use
- UV disinfection system provides increased capacity and higher level of treatment, to produce Class A reclaimed water, for wetland and irrigation uses
- Rehabilitation of existing WAS pumps avoided expensive and complicated retrofit of new pumps

Major Equipment: Aquionics InLine 16000+ UV disinfection system

3 Aeration Basins

Purpose: Use bacterial microorganisms to remove biochemical oxygen demand (BOD) and nutrients (i.e., nitrogen and phosphorus)

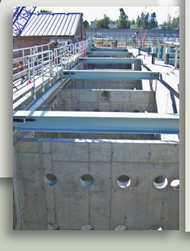
Improvements:

- Reconfigured existing 1.3 million gallon SBR tank as three aeration basins, each partitioned into multiple zones (anaerobic, anoxic, swing, and aerobic zones), for removal of BOD and nutrients
- High efficiency strip diffusers used for aeration

Benefits:

- Phosphorus removal increased by an order of magnitude, providing higher quality effluent for protection of the Stillaguamish River
- Reuse of existing structure and aeration blowers saved millions of dollars

Major Equipment: Aerostrip® diffusers, and Wilo mixers and recycle pumps.



4 MBR Support Building

Purpose: House equipment associated with MBR and chemical systems, supporting biological treatment process

Improvements:

- Constructed new building adjacent to the new MBR tanks
- Space available to add equipment in supporting two future MBR tanks

Benefits:

- Sodium hypochlorite primarily used for membrane cleaning and control of bacterial populations in the biological treatment process
- Magnesium hydroxide primarily used as supplemental alkalinity, to buffer pH drop in the aerobic digesters
- Provisions in place to dose aluminum sulfate, to further enhance removal of phosphorus, if necessary

Major Equipment: Aerzen Series GM positive displacement blowers, Gorman Rupp Super T Series® permeate pumps, and Watson-Marlow Bredel chemical feed pumps

5 MBR Tanks

Purpose: Separate bacterial microorganisms and inert particles from effluent

Improvements:

- Constructed six new membrane bioreactor (MBR) tanks
- Four tanks equipped with membranes; remaining two for future expansion

Benefits:

- Microfiltration membranes remove nearly all suspended particles and bacteria, and a significant amount of viruses, producing very clear, high quality effluent

Technology Selection: Membranes are commonly provided as either hollow fibers, or flat plates. Flat plate membranes were chosen for this application to eliminate the need for a large flow equalization tank, a second stage of fine screens, and continuous pumping of permeate. The selected flat plate membranes are capable of filtering the entire peak flow, without equalization, functioning reliably with a single stage of 3mm screening, and facilitating gravity flow of permeate through the membranes, under all but peak flow, and/or high river stage conditions, for which pumps are available.

Major Equipment: Ovivo's Enviroquip® MBR System, with RW400 membranes, and ITT Flygt N-Pumps, for return activated sludge pumping

6 Aerobic Digesters

Purpose: Stabilize WAS, and reduce level of pathogens

Improvements:

- Reconfigured second existing 1.3 million gallon SBR tank as two tanks, for aerobic digestion of WAS
- High efficiency strip diffusers used for aeration

Benefits:

- Increased retention time provides greater storage and stabilization of WAS
- Reuse of existing structure saved approximately $2 million dollars

Major Equipment: Aerostrip® diffusers

7 Solids Handling Building

Purpose: House equipment associated with aerobic digesters, and for dewatering digested sludge

Improvements:

Expanded existing Solids Handling Building to include:

- New blowers, for aerobic digesters
- New rotary fan press, for sludge dewatering
- Rehabilitated existing digested sludge pumps

Benefits:

- Sludge dewatering process reduced volume of sludge transported by approximately one-third
- Rehabilitation of existing digested sludge pumps avoided expensive and complicated retrofit of new pumps

Technology Selection: A number of different dewatering technologies (e.g., centrifuge, belt filter press, screw press, rotary fan press, etc.) are available. A rotary fan press was selected for this application, because of its small footprint, low polymer consumption, low operating speed and power use, and its ability to run reliably, without frequent operator attention.

Major Equipment: Aerzen Series GM positive displacement blowers and Fournier rotary fan press

8 Odor Control System

Purpose: To contain, collect, and treat odorous air

Improvements:

- All facilities enclosed or fitted with covers
- Biofilter fans pull odorous air from many locations, and push it through wood chip biofilters

Benefits:

- Covers help contain odorous air, protect membranes from airborne debris (leaves, cottonwood seeds, etc.), and reduce loading from solar radiation
- Biofilters grow bacteria on wood chip media, which biologically removes odorous compounds from air

Major Equipment: Hartzell biofilter fans

9 Lab/Office Building

Purpose: Integrate and enlarge laboratory and office spaces

Improvements:

- Constructed new combined Laboratory/ Office Building

Benefits:

- Provides additional space for operating personnel and laboratory work
- Integration of spaces improves coordination and communication

Major Equipment: None

10 Equipment Building

Purpose: Provide shop space and parking for City vehicles

Improvements:

- Constructed new pre-engineered metal building
- Installed new 1.5 megawatt generator, and new non-potable (No. 2) water pump station near building

Benefits:

- Provides needed shop space and sheltered parking for maintenance work
- Generator provides backup power for entire plant
- No. 2 water pump station provides air gap for physical separation from potable (No. 1) water system, for cross-connection control

Major Equipment: Cummins/Onan diesel generator, and American-Marsh vertical turbine pumps