Port of Walla Walla Tackles Wastewater Crossing

In an effort to promote economic growth in the region, the Port of Walla Walla endeavored to build a 120-acre business park in Burbank, Washington. However, lack of sufficient wastewater services in the area significantly limited economic growth opportunities. Because Burbank lacked a modern wastewater system, residences, schools, and industries had to rely on septic systems and drainfields to deal with wastewater, and years of septic system use had negatively impacted the groundwater.

Since discharge options would be very expensive and require the Port to manage a complex wastewater system, the Port’s preferred option was to discharge to the City of Pasco’s treatment facility, which was only 2.5 miles away. There was, however, one small obstacle standing in the way of this solution: the 2,000-foot wide Snake River. After exploring various alternatives, AP engineers designed a cost-effective solution to construct a pipeline through the basalt rock layer nearly 40 feet under the Snake River and 80 feet below ground level.

Understanding the potential risks associated with constructing the pipeline, the AP team developed plans, specifications, and contract documents that contained unique language to limit the Port’s exposure to contractor claims. AP’s foresight and approach to the project design and diligence during construction saved the Port several million dollars in potential contractor claims and allowed the project to be completed within budget. The completed project cleared the way for new industries, jobs, and commerce and helped improve the quality of the groundwater by eliminating nine of the area’s largest septic systems.

American Council of Engineering Companies of Oregon
As part of an effort to expand Lake Oswego’s drinking water infrastructure to serve both Lake Oswego and Tigard, a new 38 MGD intake pump station was constructed in the Clackamas River.

Designed to last at least 75 years, this unique and state-of-the-art facility provides the residents of Lake Oswego and Tigard with a resilient long-term source of water.

The facility satisfies a myriad of objectives for the client:
- Energy efficient
- Seismically resilient
- Architecturally unique
- Easy to maintain & operate

Cantilevered floors support functional operations while minimizing the river footprint.

River channelization and custom T-screens allow safe operation of the pump station under low river flows.

Access bridge specially anchored to land in order to provide restraint for the tower during large seismic events.

Safety provisions such as emergency flood hatchets ensure the long-term resilience of this essential facility.

Design innovations in every design discipline combined to produce a river intake pump station that met all operational objectives while simultaneously minimizing impacts to the environment and the surrounding neighborhood.

The new state-of-the-art intake (right) provides increased capacity, improved operations, and seismic resiliency compared to the now demolished old intake (left).

In-water construction was carefully orchestrated over three in-water work periods to meet environmental regulations.

Movable fish screens provide for safe and efficient maintenance and are designed to protect fish from entering the pump wet well.

Location:
Gladstone, OR

Entering Firms:
Black & Veatch » Lake Oswego, OR
OBEC Consulting Engineers » Lake Oswego, OR

Client and Owner:
Lake Oswego • Tigard Water Partnership

American Council of Engineering Companies of Oregon
Sellwood Landslide - A Slippery Slope
Cornforth tackles a bad actor prior to a major bridge replacement

Multnomah County is replacing the Sellwood Bridge within its existing footprint. The original bridge was built in 1925 on the site of an ancient landslide located along the west bank of the Willamette River. The landslide, approximately 800 feet long, 500 feet wide, and 50 feet deep, has moved in excess of three feet toward the river channel during the bridge’s 90 year history, which caused severe buckling and cracking problems for the old bridge. Cornforth Consultants designed a first-of-its-kind underground anchored shear pile system that applies a stabilizing thrust equal to 500 locomotives. The system also provides the necessary seismic resiliency to protect the bridge from a Cascadia Subduction Zone Earthquake. The design effort required intensive 3D modeling to ensure that the ground anchors were installed safely between a virtual forest of buried foundations and utilities. The landslide stabilization work was completed in 2015, and has been considered a great success.
915 Building Laser Scan

Client: Ankrom Moisan Architects

Location: Portland, Oregon

The 915 Building Laser Scanning Project brings cutting edge technology to the proposed renovation of this 120-year-old historic building in the downtown core. The highly accurate and interactive model created from the laser scan data allows the design team to understand and evaluate the building's structure and detail at a level that would not have been feasible with traditional methods. As the Architect moves through the design process, the laser scan data will serve as a source of comprehensive existing conditions data, saving the project budget many costly trips to the site to verify dimensions and details.

Laser Scanning enhances the overall project by providing a very large quantity of data in a very short period of time, moving the project forward quickly and economically in a manner never before possible. With the interior and exterior data stitched together in one cohesive model, three-dimensional aspects of the building—wall thicknesses on upper floors, window locations, modeling of building facades and other intricate details—are brought to life for design considerations, preservation, and, if necessary, for re-creation in making repairs to maintain the building's original appearance.

The Ancient Order of United Workmen Temple building is one of the few remaining works of Portland architect Justus F. Krumbein. Built in 1894, this building has been the subject of many undocumented uses and interior remodels.
Portland-Milwaukie Light Rail East Segment Alignment

The Portland-Milwaukie Light Rail Project is a 7.3-mile light rail alignment connecting downtown Portland with the city of Milwaukie. It is the final link in the South Corridor Plan. David Evans and Associates, Inc. led a diverse team of 23 subconsultants that provided final design services and construction support for the 6-mile East Segment, which starts in the heart of Portland’s innovation quadrant. Eight new stations link the Oregon Museum of Science and Industry; the Brooklyn, Island Station, and Oak Grove neighborhoods; and Clackamas County with TriMet’s transit network. Known as the Orange Line, the project’s design responds to the character and aspirations of surrounding neighborhoods while maintaining a system-wide identity that creates a safe, accessible transit experience. Each station showcases the character of its neighborhood using landscaping, public art, sustainability initiatives, and increased connectivity. This connectivity includes a vital link to the Trolley Trail system, a 6-mile regional bicycle and pedestrian artery, which connects with the Springwater Corridor and I-205 trails to make a 20-mile loop between Portland, Milwaukie, Gladstone, Oregon City, and Gresham. The complexities of designing, permitting, and constructing an LRT extension through multiple jurisdictions and diverse urban communities demanded that the project team work in collaboration to deliver the shared vision of TriMet and its project partners. Delivered on schedule and budget, TriMet now offers a multimodal transportation project that leverages multi-jurisdictional improvements, increases connections and access within neighboring communities, and thus benefits the whole region.

Client: TriMet
Location: Portland and Milwaukie, Oregon
One Route, Many Users

SW Multnomah Boulevard serves as a primary commuter route. The corridor is designated as a City Bikeway, but has a higher auto travel speed than is typical and, prior to implementation of the project, lacked sidewalks. The project goals were to improve pedestrian and bicycle facilities and provide stormwater treatment and conveyance. The design team worked with the City to analyze several different cross section alternatives to arrive at the final design that best blended the bicycle and pedestrian needs of the corridor with the surrounding topography and land use.

An Integrated Design Solution

Continuous pedestrian facilities were added in both directions and a raised westbound cycle track and a shared eastbound path were constructed. The eastbound path is separated from vehicular traffic by a linear stormwater facility that provides treatment and conveyance along the corridor.

As a relatively new tool for the City of Portland, implementation of the cycle track required innovative rethinking of standard elements such as emergency vehicle access, drainage, driveways and roadway cross sections.

The SW Multnomah Boulevard project furthered the City’s understanding of the potential to successfully integrate cycle tracks into the bicycle infrastructure system.
South Waterfront Greenway Park
Brownfield Redevelopment

Before

Project Location:
Portland, Oregon

Client Name:
Portland Parks & Recreation

Project Team:
HartCrowser
Walker Macy

After more than half a century as an industrial site, this stretch of the Willamette River required extensive cleanup and design to support the public space it is today. Functional elements—such as the retaining wall that served to create an endangered fish habitat, contain contaminants, and reshape and protect the shoreline—were integrated seamlessly with the aesthetic elements of the rest of the park.

This project transformed a quarter mile of inhospitable, contaminated riverbank into a beautiful public space with a trails network, access to the river, and an enhanced natural habitat. A definitive step in Portland’s initiative to restore the Willamette River waterfront and develop a pedestrian and bike trail that will run from the Sellwood Bridge to Downtown Portland.

Shallow Water Habitat
- Removed 35,000 tons of soil
  - Regraded to a more natural bank configuration
  - Created critical shallow water habitat for endangered species
- To control contaminant migration, we installed the largest Reactive Core Mat® in the lower Willamette
- Serves as compensatory mitigation for Tillicum Bridge Crossing

Retaining Wall
- Double utility vault wall
  - Reduces seismic hazards from liquefiable soil and fills
  - Barrier to contain soil contamination
- Used a unique tie-back anchor and elevated grade beam to allow high-water construction
- Allowed creation of shallow beach habitat
Grade-Separated Railroad Trench

This rail trench project is the most complex and important project that the Port has ever undertaken.

To relieve rail congestion at the Port of Vancouver, the Port selected the HDR and BergerABAM team to plan and design a grade-separated railroad trench on a narrow strip of land adjacent to the Columbia River. This grade-separated trench serves as the new rail entrance to the Port, allowing trains to travel under the historic BNSF Railroad Bridge, connect to the Port’s enhanced rail system, and bypass the mainline wye. HDR and BergerABAM used out-of-the box thinking to develop the partially elevated trench, a new way to separate railroad grades in an urban waterfront setting. Passing the rail underneath a BNSF bridge with a trench rather than over it saved the Port millions of dollars in property acquisition and structure costs.

The rail alignment was placed within a very narrow corridor along the river, below the 100-year flood elevation; the reinforced concrete structure and storm water pump station provide protection from major floods. This unique approach addressed the space limitations at the east end of the Port as well as potential flooding that might impact rail service, keeping freight moving even during a major flood.

Through careful design and a combination of innovative methods and technologies, this one-of-a-kind railroad trench structure was constructed with low life-cycle cost. The trench project was completed $6 million under budget and nearly two years ahead of schedule.

Category: H - Transportation
Client/Owner: Port of Vancouver USA
Location: Vancouver, WA
Firms: HDR & BergerABAM | Portland, OR

American Council of Engineering Companies of Oregon
NW FRIBERG STREET | NE GOODWIN ROAD

Client: City of Camas
Location: Camas, Washington

NW Friberg Street was a 20-foot-wide rural roadway, with ditches and no pedestrian facilities or shoulders, connecting NW Lake Road and NE Goodwin Road, two well-traveled arterials. The City wanted to provide safe pedestrian and bicycle facilities, improve the traffic flow and safety, increase the appeal of the undeveloped industrial-zoned property to the east, and address the expectations of local, long-term residents.

Meeting project objectives while minimizing impacts to right-of-way and adjacent private properties required a delicate balance. Wetlands on both sides of the roadway, high groundwater, high archaeological probability, and the potential for private property impacts all created design challenges. Mitigation measures included large watertight underground detention piping within the roadway, retaining walls to protect wetlands, and shifting of the roadway alignment. Inlets collect stormwater runoff directly to the 60-inch detention pipe under the roadway’s bike lanes.

This project demonstrates that roadway widening projects do not have to adversely impact the environment. The result is a visually pleasing 46-foot-wide roadway with bike lanes and separated sidewalks. The landscaped median islands create a park-like feel and the nearby hidden retaining walls protect the existing wetlands. While the road is expansive enough to increase the safe flow of traffic and provide safe pedestrian and bicycle facilities, it still has that uniquely local feel that makes driving through the City of Camas enjoyable.
HORSETAIL CREEK FLOODPLAIN RESTORATION

Inter-Fluve assisted the Lower Columbia Estuary Partnership and their partners to restore critical salmon habitat at the Horsetail Creek—Oneonta Creek floodplain near their confluence with the Columbia River. The primary goals of the project were to reduce thermal loading from a gravel borrow pond, and enhance floodplain habitat quality and access for ESA-listed salmonid juveniles.

History
Between 1900 and 1960 the site was transformed by the construction of Interstate 84 and the railroad, conversion of forested wetland to cattle grazing, gravel mining and straightening creek channels.

Using Natural Processes to Reclaim Salmon Habitat in an Altered Ecosystem
Stream habitat in naturally functioning stream systems is an outcome of episodic disturbances and dynamic stream processes such as erosion, sediment deposition, channel migration, and large wood recruitment. Inter-Fluve’s process-based approach to restoration aims to reestablish these same underlying physical and biological processes that create and sustain river and floodplain ecosystems.

Use of Large Wood
Historically, trees growing along the lower Columbia River were massive; when they fell into stream channels, they created log jams, side channels, mid-channel and point bars—all excellent ingredients for ideal salmon habitat. A Chinook helicopter was used as a low impact method to place large wood across the project site. Over 700 logs were used.

Columbia River Floodplain Reconnection
A primary goal of the project was to enhance connectivity between the Columbia River and the site to enable utilization by outmigrating juvenile salmonids. Understanding the complex hydrologic interactions between two unregulated and ungaged tributary streams and the tidally influenced, dam-controlled Columbia River was critical to developing the restoration approach.
Cleaning Up the Willamette River, One Source at a Time


Riverside industry that helped power the nation also left a legacy of chemical contamination. Early initiation of stormwater source control is a critical element for effective cleanup at contaminated sediment sites. At the former Arkema facility, part of the larger Portland Harbor Superfund site, DDT from past pesticide manufacturing remains in riverside soil potentially vulnerable to stormwater transfer to river sediment. Historical pesticide use in the Willamette Valley also left river water quality impaired by DDT. Stormwater source control measures implemented at the Arkema site have to meet both federal criteria for sediment cleanup and state ambient water quality standards in the part per trillion range — an ambitious challenge.

Goal
Eliminate DDT in stormwater discharges from the site to the Willamette River

Challenges
- No previous applications of passive treatment technologies for treating DDT in stormwater
- Must treat DDT to extremely low levels
- Effectively manage and treat storms up to 13,000 gpm

Success!
- Met regulatory time frame
- Greater than 96% reduction in DDT
- 100% of site stormwater treated
- Low O&M and power use
- DEQ commends collaborative effort

1. Detention Basin
   - 2-acre lined basin, 1.5 million gallon storage capacity, primary treatment to provide particle settling

2. Sand Filter
   - 0.5-acre sand filter, secondary treatment to provide filtration prior to discharge to river

3. Temporary Capping
   - 4 acres of paved soil capped, concrete sealed, and asphalt patched to prevent movement of soils to stormwater

4. Decommission Stormwater Lines
   - 6,600 linear feet of piping and three outfalls abandoned
SALMON HABITAT RESTORATION ON THE CLACKAMAS RIVER

An 1877 report from the US Fisheries Commission wrote of the Clackamas River “probably no tributary of the Columbia has abounded so profusely with salmon in past years as this river.” Since then, salmonid populations have been in decline due to a loss of suitable habitat and increased temperatures driven by substantial timber clearing, agricultural conversion, and creation of fish passage barriers. Design of the Milo McIver Park Fish Enhancement project on the Clackamas River was intended to increase juvenile salmon production with two 700-foot-long side channels that provide rearing and refuge for ESA protected populations of coho, Chinook, and steelhead.

Groundwater Collection Gallery
A 200-foot-long perforated pipe underground collects hyporheic flow (water moving through gravel bars) and deliver into a 700-foot-long side channel. Because the hyporheic flow mixes with groundwater, it provides salmonids cool water in the summer and warm water in the winter.

Log Jams & River Processes
Historically, large old growth trees would fall into our rivers, blocking and re-directing the river’s flow, creating side channels and islands. To recreate these processes, log jams were engineered and placed in the Clackamas to provide places for fish to hide during big floods, escape from predators, slow down flood waters, and to ‘catch’ river gravels that salmon need for spawning.

Habitat Restoration Best Practices
The Milo McIver project utilized industry best practices for engineering and design. Our data-driven approach estimates logjams will withstand 50-year floods, safe for recreational users and geomorphically appropriate for the system.
a mammoth task

Oregon Zoo's beloved Asian elephants were promised a spectacular new home in the Zoo's Comprehensive Capital Master Plan, by expanding their habitat from 1.5 to 4.25 acres. But creating one of the largest, most innovative outdoor elephant habitats in the country amid a massive, active landslide was no simple task. Executing improvements within this tightly developed hillside campus necessitated displacing existing facilities and extending into less desirable areas, requiring complex and innovative engineering solutions.

Despite the fact that the entire new exhibit and ancillary improvements border on nearly all other campus exhibits, the Zoo reported no dip in attendance or complaints during construction. The exhibit is projected to use 40% less energy and release 40% less carbon (double the Master Plan projection) than it would have if built to current Oregon standards. The design team's deep knowledge of the site and flexible, creative problem solving enabled the Zoo to fully realize its vision on an extremely challenging and constrained site.

American Council of Engineering Companies of Oregon
MALEFICENT DRAGON
Disney Festival of Fantasy Parade, Magic Kingdom® Park, Florida

transforming fantasy... into reality

Maleficent is an enormous Steampunk-inspired dragon parade float based on the villain from Sleeping Beauty. It debuted in March 2014 in the Festival of Fantasy Parade at Disney’s Magic Kingdom® Park in Florida. Maleficent stands 28 feet high and stretches 35 feet long, is by far the most detailed and impressive float in the parade, and is the only structure of its kind in existence.

Peterson Structural Engineers designed all structural elements and was charged with making Maleficent as light and as strong as possible without sacrificing functionality and safety. PSE helped designers determine the frame and chassis shape. Helped design the member sizes and assisted with designing the configuration of the connections so that actuators could get bolted in certain key places and loads could get passed through key nodes in the frame without causing huge stresses.

The design requirements for dynamic loading of a wheeled chassis vehicle that has articulating frames, cornering speeds, curb strike, emergency stop and wind loading made for a very complex project.

From Concept to Completion
The birth of the magnificent Maleficent Dragon brings thrills and evokes cheers from children and adults lining the parade route daily.

With the iconic Disney World Castle in the background, the fire breathing beast-of-a-machine makes her way slowly amid throngs of admiring park goers. Not only are the sights, sounds and looming evil of Maleficent Dragon part of the experience, guests can FEEL THE HEAT of her most ferocious weapon.

CLIENT: Michael Curry Design, Scappoose, OR
OWNER: The Walt Disney Company
ENTERING FIRM: Peterson Structural Engineers, Portland, OR

American Council of Engineering Companies of Oregon
HAZARDS AHEAD
How to build a highway through a Superfund site: A roadmap

A landslide hazard discovered on the east end would have increased costs for the planned route, but the team worked to alter the highway course in a safe and cost-effective way.

1. Superfund site, 6 Oregon DEQ cleanup sites, leaking underground storage tanks, and several industrial properties. The highway route featured “the worst of the worst” contamination. Coordinating construction around all of this required careful considerations and active problem solving.

Hazardous Materials Management and Geotechnical Design

ODOT’s new 2.5-mile expressway was built in a heavily industrialized and extremely contaminated area of Clackamas County. Early assessment of those hazards and communication of their potential impacts on design and construction yielded significant risk management benefits. Shannon & Wilson used extreme detail in tracking the myriad locations and types of contamination and geotechnical hazards, which helped avoid potential construction overruns or claims related to hazmat or subsurface issues—a major achievement, given the level and scope of pollution along the alignment.

OR 212/224: Sunrise Corridor JTA, Clackamas County, OR. Hazardous Materials Management & Geotechnical Design: Shannon & Wilson, Lake Oswego, OR. Civil Lead: CBEC Consulting Engineers, Eugene, OR. Owner: Oregon Dept. of Transportation, Region 1, Portland, OR.

Dewatering for a utility trench required detailed risk management to minimize impacting a contaminated groundwater plume. Advanced 3-D modeling helped predict how PCE contaminants would migrate during and after pumping.

American Council of Engineering Companies of Oregon
RECOVERY OF SUSTAINABLE SALMONID POPULATIONS

Land development and levees in the Columbia River estuary have led to degradation and reductions in habitat and shifts in food sources necessary for the growth and survival of historically self-sustaining populations of salmonids. A longtime link exists between the health of native salmon populations and of traditional and contemporary Pacific Northwest cultures and economies. The impacts to ecological functions and processes present significant hurdles towards the recovery of threatened and endangered fish. Restoration efforts are challenged to balance engineering design and habitat enhancement in a manner that restores natural functions and processes, while rejuvenating dynamic cycles and kick-starting growth and survival improvements of juvenile salmonids. The Karlson Island Tidal Wetland Restoration Project required collaboration amongst a multidisciplinary scientific and engineering team to evaluate constructible alternatives and cost/benefits to maximize Off-Channel Access and availability of macrodrifters for Food Web Cycling. This successful project highlights the approach of blending multidisciplinary knowledge, creating a practical design, constructing in a challenging tidal environment, and achieving significant fish benefits.

SOLUTIONS – DESIGN
- Utilized input and collaboration from a multidisciplinary science and engineering staff and the client to evaluate and select the best habitat restoration measure.

- 320 acres of tidal wetland enhancement
- 9 Levee breaches spanning 2,050 feet to increase food web cycling and off-channel fish access
- 9 acres of invasive plants removed and replaced by 6 acres of native plants
- 38 pieces of large wood

IMPLEMENTATION – FIELD
- Surveying
- Hydraulic Modeling
- Alternatives Analysis
- Cost Benefit Analysis for Levee Breach & Habitat Enhancement
- Conceptual through Final Design
- Large Wood Design
- Planting Plan Development
- Permitting Support
- Construction Inspection

LESSONS LEARNED – REVIEW
- Post-implementation project monitoring findings enabled the project team to assess degree of ecological uplift and kick-start of natural processes. Provided valuable opportunity to verify effectiveness of restoration approach and build on knowledge for future project designs and construction.

Client: The Columbia River Estuary Study Taskforce | Astoria, OR
Firm: Tetra Tech | Portland, OR
Owner: U.S. Fish & Wildlife Service
Location: Knappa, OR

American Council of Engineering Companies of Oregon
Tilikum Crossing, Bridge of the People spans the Willamette River in Portland, Oregon, as a critical transportation link for the city’s new $1.19 billion, 7.3 mile-long Portland-Milwaukie Light Rail Project. The 1,720 foot-long signature structure is the nation’s largest transom-only bridge, carrying only light rail trains, buses, cyclists, pedestrians, and eventually streetcars, but no private vehicles. Its purpose is to relieve traffic congestion and accommodate the multimodal transportation needs of the Tri-County Metropolitan Transportation District of Oregon (TriMet). As Engineer of Record, T.Y. Lin International (TYLI) worked in close partnership with the Design-Build Contractor, Kiewit Infrastructure West, Co. (Kiewit). An extensive public outreach process drove bridge type selection, resulting in stringent design, operational, and seismic requirements. The first cable-stayed bridge constructed in Portland, the structural system for Tilikum Crossing required a unique design that differed from traditional cable-stayed systems. A cost-effective structural solution was used to stabilize soil on the west bank and restrict the potential spread of hazardous materials. Intensive coordination between TYLI, Kiewit, TriMet, and numerous agencies not only streamlined completion of all in-water work in the first 10 months, but the Design-Build Team also successfully enabled the rail systems contractor to begin work six weeks ahead of schedule. Blending beautifully with its urban environment, Tilikum Crossing stands as a beacon to bridge design aesthetics and the future of multimodal transportation planning. The success of this project is due to innovative design engineering and construction solutions, and the highly collaborative "project first" commitment demonstrated by TriMet and the Design-Build Team.