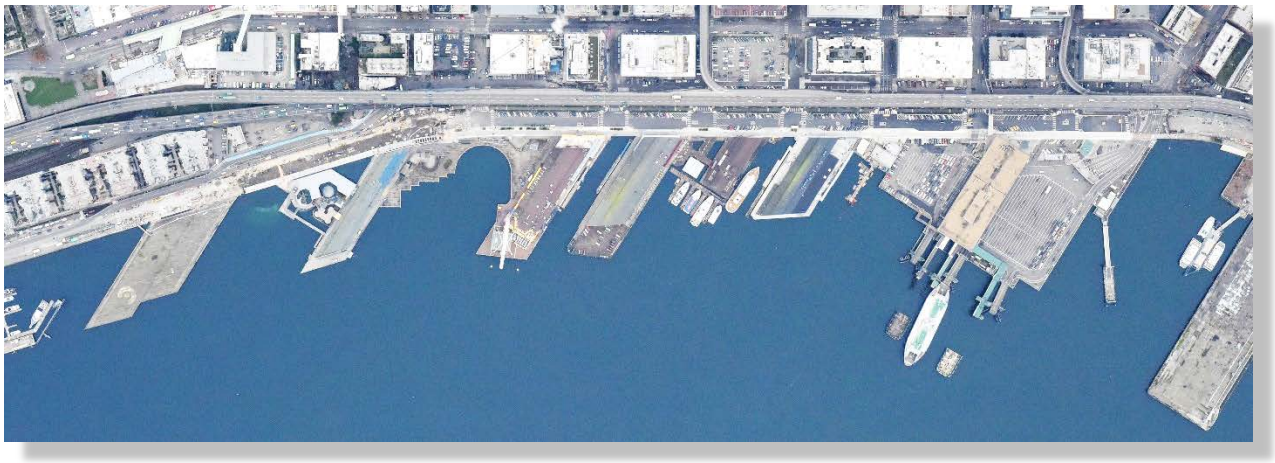
PROJECT OVERVIEW

The Elliott Bay Seawall Project (EBSP) will replace the existing seawall—from S. Washington Street to Broad Street—with a structure that meets current safety and design standards.



Aerial of the Seattle Waterfront, Elliott Bay Seawall Project under construction. *©12/14/16 sky-pix.com*
The Seawall extends the width of the photo and is located between the water and the land.

For more than 75 years, the original Seattle seawall built between 1916 and 1934, using 20,000 old-growth timber piles, protected the city's waterfront. Due to seismic vulnerability, aging, and the harsh marine environment, the structure had deteriorated and needed replacing.

The Elliott Bay Seawall Project is a critical public safety project. Failure of the seawall would have significant impacts to the public, the City of Seattle, the Puget Sound region, and Washington State. Protection from coastal storm damage and shoreline erosion is vital to preserving Seattle's downtown, its economy, and the region's quality of life and economic competitiveness.

The Elliott Bay Seawall:

- Protects Seattle's downtown waterfront from wind-driven storm waves and the erosive tidal forces of Puget Sound and Elliott Bay.
- Supports and protects major public and private utilities, including power for downtown Seattle and the western seaboard, natural gas, and telecommunications.
- Supports and protects State Route (SR) 99, the ferry terminal, and rail lines, all of which transport local commuters and visitors as well as local, regional, and international freight.

The project will replace the three types of deteriorated seawall structures along the waterfront, which range from approximately 15 feet to 60 feet wide and will be constructed in two phases.

The first construction phase, begun in the fall 2013, spanned a 3,720-foot-long south stretch of the waterfront — the most deteriorated section known as the central seawall. The central seawall is between South Washington Street (just south of the Washington Street Boat Landing) and Virginia Street (at the northern edge of Pier 62/63). The second phase replaces the northern seawall. The north seawall is from Virginia Street north to Broad Street (just south of Olympic Sculpture Park).

Both phases of the project will replace seawall structures along the waterfront. The phased construction prevented the simultaneous disruption of all the public and private facilities and allowed temporary improvements such as parking along the existing Alaskan Way roadway outside of the active construction area.

In order to minimize disruptions to the adjoining public and private facilities within the active construction area; emergency, public and delivery access were maintained throughout each phase of construction. This was accomplished through a combination of longitudinal (along the seawall) and perpendicular (across the construction zone) access ways and/or bridges that were relocated as needed to maintain access and allow construction to continue. The accesses were configured to accommodate the necessary emergency accesses to each pier.

The new Elliott Bay Seawall is designed for a service life of 75 years.

The project was procured using the General Contractor/Construction Management (GC/CM) delivery method. The GC/CM method offers many potential benefits including:

- partnership between the designer and the contractor prior to start of construction;
- a shorter overall project completion duration;
- improved risk identification and mitigation responses;
- increased utilization of innovative design and construction techniques; and
- improved construction conflict identification and management.

COMPLETION DATE

Installing improved soil mass (ISM) foundation by jet grouting

The original contract completion date was May 2016. Due to excessive jet grout pressures experienced during jet grouting, operations were stopped and additional structural supports for the containment wall were designed and installed and the jet grout installation sequence was modified which extended the original completion date to March 2017.

The integrated team consisting of the designers, owners, and contractor, allowed an expedient solution to the problem to be developed and implemented.

A third extension was granted to incorporate additional ground improvements north of the original project limits shifting the final completion date to August 2017. As of December 2016, the project is 90% complete.

CONSTRUCTION SCHEDULE, MANAGEMENT, AND CONTROL

The project team utilized Primavera P6 Client as its scheduling software. Schedules were updated monthly using the weekly six-week look ahead planners.

To meet the aggressive schedule for this one-of-a-kind waterfront resiliency project, the Parsons' design team used their in-house construction resources to inform design decisions, means and methods, construction sequencing and staging, and estimating and risk evaluation.

This method provided the City of Seattle with quick access to independent construction expertise and a team focused on providing a full suite of services to ensure that all project elements were closely coordinated and delivered on schedule.

> This project was the first GC/CM project to build heavy civil infrastructure in the state of Washington.
>
> *Coordination of the project involves multiple stakeholders. Parsons, as the Engineer of Record, provides design and support services to the project team which includes the City of Seattle, Jacobs Engineering as the City's Construction Manager, and Mortenson/ Manson JV as the Contractor.*

The project was procured under the GC/CM contracting provisions and required a slightly different staffing and management plan than typical design-bid-build or design-build projects. This project was the first GC/CM project to build heavy civil infrastructure in the state of Washington. Coordination of the project involves multiple stakeholders. Parsons, as the Engineer of Record, provides design and support services to the project team which includes the City of Seattle, Jacobs Engineering as the City's Construction Manager, and Mortenson/Manson JV as the Contractor. During the project, Parsons manages 28 specialty sub-consultants providing services for design and construction.

Negotiated Support Services and Provisional Sum scopes required experienced staff to coordinate and incorporate design changes due to the uniqueness of the design elements. Design staff have remained on the project throughout the duration of construction and have been available to assist the Contractor with Engineering Services During Construction.

Many of the document control techniques for the project demonstrated a commitment to sustainability. All documents and sharing of information was stored in a virtual document control system. The use of email, on-site i-Pads, and photographs all contributed to minimizing the use of paper. A co-located office with Parsons, the City of Seattle, Jacobs, and Mortenson/Manson, allows collaboration amongst all the stakeholders, maximizing communication and expedient discussions of project concerns.

Sustainability on this project started with translating stakeholder objectives into goals that are compatible with social, economic, and environmental issues at play. Some of the sustainable practices on EBSP involved minimizing storm water demand and site runoff, minimizing construction dewatering to preserve groundwater, minimizing haul distances, using Warm Mix Asphalt (WMA) instead of Hot Mix Asphalt (HMA), establishing habitat along the seawall face and providing multimodal access provisions.

SAFETY PERFORMANCE

Mortenson/Manson has worked safely on the project with 0 lost time days. Their commitment to Safety has been a top priority with the project's exposure to public access through the construction zones.

PROJECT STATISTICS ARE:

1	Total Man hours November 2016:	1,119,592
2	Total Craft hours November 2016:	971,770
3	First Aid Cases:	53
4	Recordables:	14
5	Total Lost Days Away:	0

There were five major components to the overall project safety program:

- The Zero Injury Program Manual.
- The Integrated Work Plan which include Job Hazard Analysis.
- A Health & Safety Plan (HASP) prepared by a third-party and reviewed by a Certified Industrial Hygienist.
- Trade Partner Site Specific Safety Plans and Integrated Work Plans.
- Employee and Trade-Contractor Orientations

Daily safety components include the following:

- Stretch and Flex
- Work areas and safety concerns for the day

Weekly safety components include the following:

- Plan of the Day (POD) meetings to discuss the week's critical work.
- Job hazard analysis specific presentations.

Monthly:

- Third-party site safety walks and evaluations.
- Action items list and corrective action.

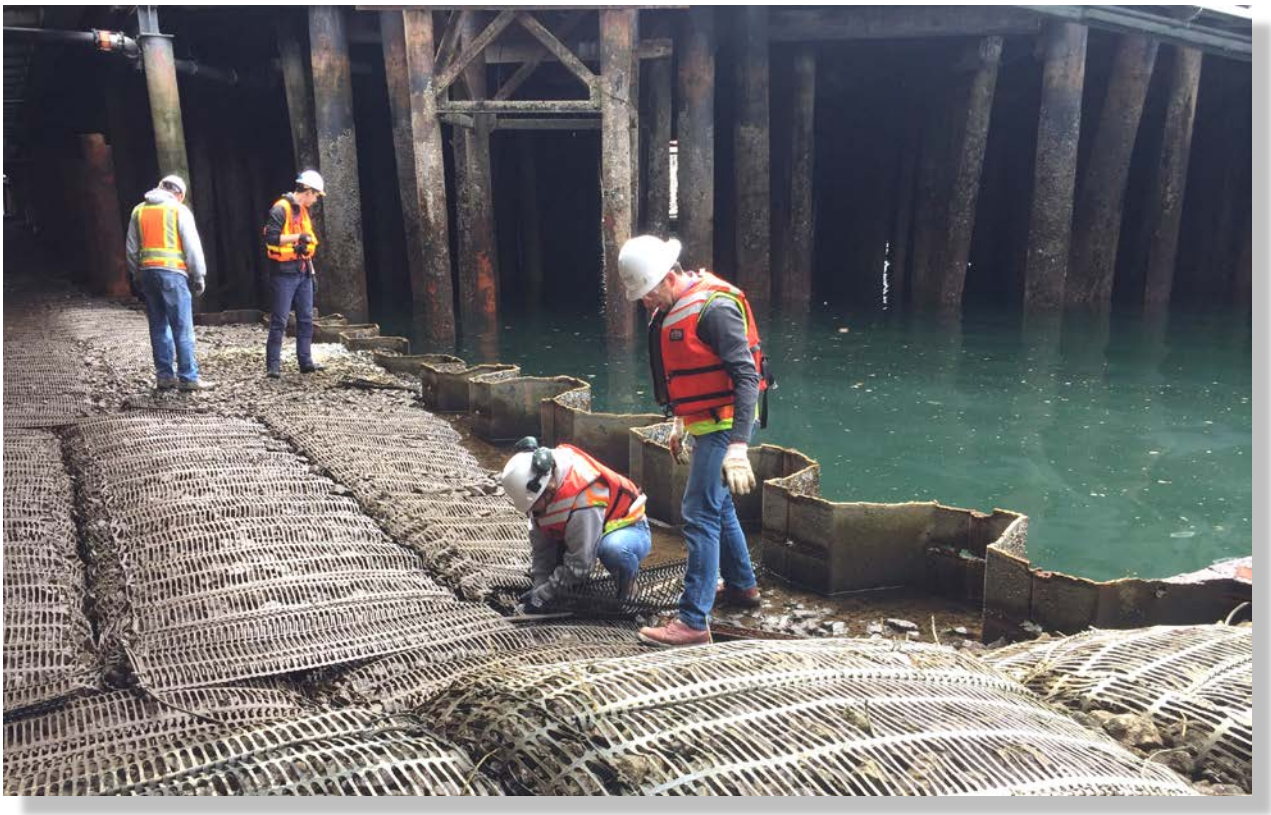
ENVIRONMENTAL CONSIDERATIONS

Environmental considerations including special steps were taken to preserve and protect the environment, endangered species, etc., during the construction phase.

There were several environmental considerations for the project given its location along Elliott Bay. Two items that may be considered extra ordinary were: Marine Mammal Monitoring during sheet pile installation and entrapped fish release programs.

During each of the in-water-work window phases, sheet pile operations would require the monitoring of marine mammals within a prescribed geographic zone. If there was a siting of one of eight designated species, each with a specific exclusion zone, sheet pile installation would be stopped until there were no further sightings within the designated area.

During various phases of the project and due to the varying tides, fish would get caught between the debris/sediment boom and the construction areas. Plans were developed and implemented to properly capture and release these fish outside the construction zones. Fish exclusion experts used innovative sound techniques to drive fish out of the containment area before a section of containment wall was sealed. They then netted any fish that remained and periodically checked sealed areas for fish that eluded capture earlier and/or had grown enough over time to be spotted and netted.



Finished habitat bench at open water section

In addition to the environmental compliance during construction, one of the project goals was to enhance the marine environment to provide a safe and secure harbor for the juvenile salmonids to migrate away from predators in deeper waters. This goal culminated in the design of the Light Penetrating Surface (LPS) panels in the Cantilevered Sidewalk that provide an illuminated passage way under the sidewalk that attracts the juvenile fish to use and thrive during their annual migration.

Under the LPS panels, a habitat bench was constructed with specific rock that young fish are attracted to which was utilized and encased in scour protected rock. This marine environment is also enhanced by textured precast concrete shelves and face panels. The textured shelves vary in size from three feet to seven feet and are staggered vertically to promote marine growth. The marine growth promoted will provide food for the juvenile salmonids and others.

Designing and building a Habitat Bench was another special consideration on the project. Precast panels were designed that provided a conducive marine environment for the juvenile fish to thrive showcasing another example of sustainable considerations that EBSP not only protects the waterfront during earthquakes, but also enhances the marine environment.

COMMUNITY RELATIONS

Maintaining access to businesses on the piers during construction was vital to the local economy. The Seattle waterfront is a tourist destination with iconic attractions such as Ivars, the Great Seattle Wheel, Ye Olde Curiosity Shop, and the Seattle Aquarium just to name a few.

Due to the location of the project running adjacent to Colman Dock, the busiest ferry landing within Washington State, and businesses on the historic piers, the impacts to the public were a significant consideration from the start of design through the end of construction.

A temporary road was constructed to shift all vehicle traffic around the construction site. This provided a safe work environment for the trade-contractors and the movement of pedestrians to and from the individual piers.

To protect the public, the work zones along the seawall replacement were developed as discrete work areas with barriers and fencing, and gate staff to manage the construction traffic and pedestrian movements. In addition, special pedestrian bridges were installed to aid in the movement and safety of the pedestrians entering the piers.

To protect private property, a steel sheet pile containment wall was installed between the work zone and private piers. Substantial monitoring of the piers, viaduct and utilities for any type of movement was conducted throughout the duration of the project.

To communicate these precautions to the public and stakeholders, there were early outreach programs during design and pre-construction which continued through construction. Monthly progress reports were also made available to the public and stakeholders.

The public outreach team's social media efforts included a project Facebook page and a project Twitter account in addition to occasional blog posts by the Seattle Department of Transportation (SDOT). As a result, social media updates were made an average of four to five times a week. An

email update on the project was sent out weekly and the outreach team had an information booth at several area fairs and festivals to inform the public.

Also, while 2014 and 2015 construction progressed in front of the historic piers, work was halted during the high tourist season through the end of September to allow local businesses to be fully open.

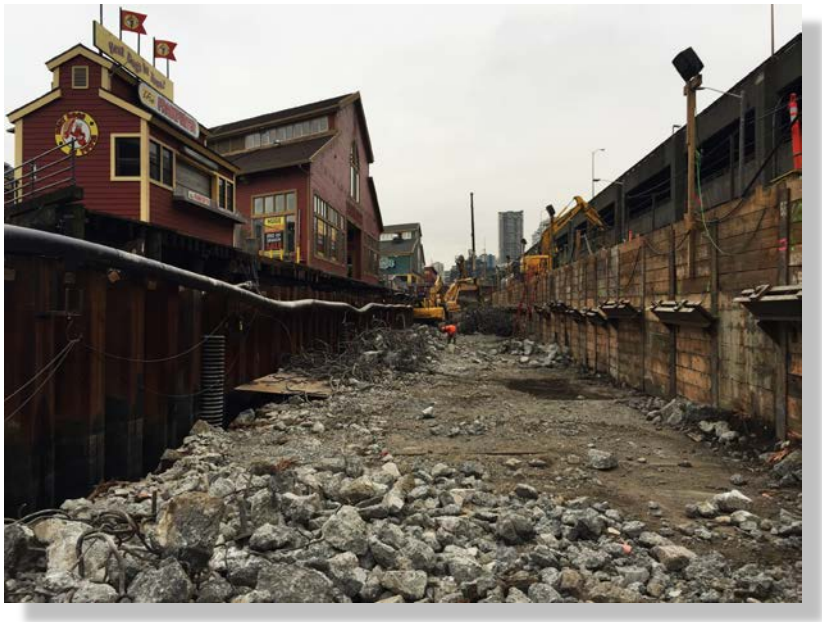
UNUSUAL ACCOMPLISHMENTS UNDER ADVERSE CONDITIONS

The ability to perform the massive soil improvement scope which provided the life safety requirements for the project in the occurrence of another earthquake was monumental.

The ever changing soil conditions coupled with the large amount of utilities and obstructions provided challenges to the project team. The ability to manage pressures during the soil improvement process, and to ensure the containment wall maintained its design intent, was an ongoing challenge.

ADDITIONAL CONSIDERATIONS

The new seawall is a gravity structure that combines a soil-cement improvement and seawall superstructure into a single structural system. Soil-cement, constructed using jet grout to stabilize liquefiable soils vulnerable to seismic events, was designed and built in a cellular pattern to stabilize the ground and serve as the new seawall's foundation. The seawall was designed in pre-cast units and cast-in-place slab; together, the soil improvements and seawall elements behave as a single structural system. The habitat improvements incorporate light penetrating sidewalk panels that allow sunlight to reach the marine mattresses constructed below. Together, the elevated mattresses and the light will enhance salmon migration and the habitat near Elliott Bay's shoreline.



Before - - Demolition of existing seawall, shoring wall on right, containment wall and Pier on left.

In addition to the innovative, single-structure system, the project design ensures that the replacement seawall is a sustainable asset with flexibility to accommodate future phases. This sustainability and flexibility enable the City to make

additional changes to a waterfront with a harsh and unyielding environment prone to change, while still enhancing the marine wildlife habitat.

One of the largest challenges on the project was maintaining public access to the local businesses that found themselves isolated by the construction zones. The project was staged with shorter zones to minimize the amount of businesses impacted during construction. Additionally, the smaller construction zones allowed the Contractor to focus their efforts on a smaller specific area and complete the zone in a more expedient manner.

After - - Finished habitat bench at under pier section showing amount of light.

Working with waterfront businesses provided unique challenges for each business. Public access was key to project success from the businesses' point of view. The Project Team collaborated with the Seattle Aquarium, waterfront tourism businesses and the Colman dock ferry terminal to ease any issues surrounding construction work. It was also critical to work with the Seattle Fire Department to keep the local fire station open and functioning. During construction, efforts were made to keep surrounding traffic patterns operational.