

## Olympic Sculpture Park Innovation Description

BRIEF PROJECT DESCRIPTION: Olympic Sculpture Park (OSP) is a new 8.5-acre park on Seattle's downtown waterfront that features a 2,200-foot, continuously sloping Z-shaped path reconnecting "mountains to sea." The park's site was complex, with contaminated soils from 60 years as an oil storage terminal; a 40-foot elevation change; three separate parcels, bisected by active rail and street rights-of-way; a decaying seawall at water's edge; stringent Washington State laws regarding waterfront work complicated by listed endangered species; and location in one of the world's most active seismic zones. Ultimately, over 200,000 cubic yards of soil were imported to form the park's complex planes while capping contaminated materials below. Among MKA's restorative engineering solutions for OSP were two notable innovations:

### INNOVATION: "Decoupled" Earth-Retention Solution

Key to creating the sculpted planes of the park was keeping the 200,000+ cubic yards of imported soil in place—in an active earthquake zone! A 40-foot-tall hillside of soil, with slashes of retention up to 36 feet high, had to be precisely retained to achieve the architect's vision and support the priceless works of art, as well as protect the site's adjacent streets, train tracks, bike paths, walkways, and visitors. A conventional mass-concrete approach would have been costly to build, difficult to maintain on the site's settlement-prone soils, aesthetically unappealing, resource-intensive, and impossible without stirring up existing underlying contamination during excavation.

MKA developed a new "decoupled" mechanically stabilized earth (MSE) solution that considers the geotextile stabilization materials separately from the overlaying fascia, providing complete flexibility and artistic freedom. Instead of massive concrete or a small-block "Home Depot" look typical of MSE systems, MKA's decoupled approach opens the door to *any* type of precast finish, at *any* size or angle!

The panels were individually dimensioned for each of the 305 locations, then erected in an overlapping "fish scale" pattern to avoid gapping over time due to settlement. MKA's idea of extending the fascia panels slightly beyond the earth's surface allowed them to serve double-duty as guard rails, eliminating the expense, construction process, and artistic discord inherent in a separate guard rail system. An MSE approach was also used for the Elliott Avenue bridge crossing, avoiding the use of deep foundations while still accommodating the heavy loads, required geometries, and earthquake potential.

Mechanically stabilized earth (MSE) systems are cost effective, flexible, and easy to construct, but until now they have been provided as a complete system with little choice in exterior finish. MKA's decoupled solution provides complete flexibility for wall height and angle, is easily constructible, costs less than concrete foundations, accommodates settling soils, minimizes excavation, eliminates gapping over time or in the event of an earthquake, and can take on any look depending on fascia selected. The potential applications for this first-of-its-kind earth-retention system are limitless, from small installations to large-scale freeway embankments.

### INNOVATION: Combination Seawall Reinforcement/Salmon Habitat Bench

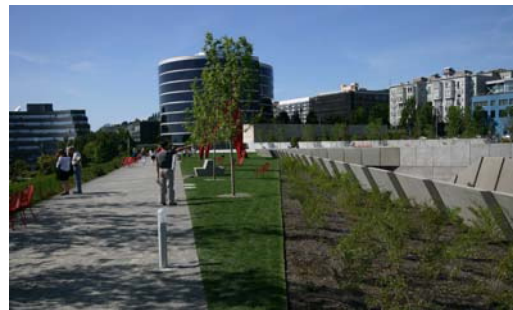
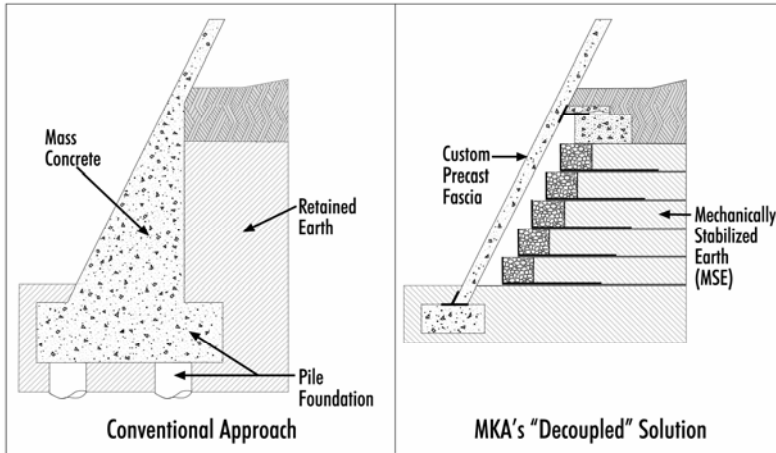
Seattle's downtown shoreline is rimmed by 8,000 feet of aging seawall badly in need of repair and slated by the City for mitigation (with a new shoring wall behind the existing one) at a cost upwards of \$60,000 per foot. As the design of OSP progressed, the City's need for future disruptive repair access to the 800-foot portion of seawall on park property began to greatly concern the owner and the design team. In a breakthrough concept, MKA proposed buttressing the existing seawall *from the water side* using materials that could also create new salmon habitat. After generating input and buy-in at a worksession for regulating agencies, MKA led a team of specialized consultants in the analysis of salmon bench depth and width, local wind and wave implications, type and sizing of materials, etc.

The final engineered solution, constructed by placing 68,000 tons of imported rock, buttresses the City's aging seawall and restores the park's shoreline into a marine-friendly environment, all at *one-tenth the cost* of the City's \$50 million estimate!

Many seaside cities across the United States and worldwide are faced with aging seafront structures in need of repair. Yet the typical solution of rebuilding or replacing massive concrete bulkheads with more of the same is costly, disruptive, and environmentally counterintuitive. MKA's seawall solution is location-adaptable and serves double duty, reinforcing the existing wall at a cost ten times less than traditional methods and creating a marine-friendly environment that encourages return of salmon and other creatures. The incorporation of a fish habitat into a seawall reinforcement solution makes in-water work in sensitive areas eminently permissible by the resource agencies.

The future value to the engineering profession is readily apparent in the greatly reduced cost, simplified construction, system flexibility, and minimized disruption, but the true benefit lives in the positive impact on the natural environment and the literal "softening at the edges" of the built world. The City of Seattle is now considering MKA's solution for portions of the remaining 7,200 feet of downtown seawall, representing a potential 90% savings in cost per linear foot repaired!

“DECOUPLED” EARTH-RETENTION INNOVATION



COMBINATION SEAWALL REINFORCEMENT/SALMON HABITAT BENCH INNOVATION

