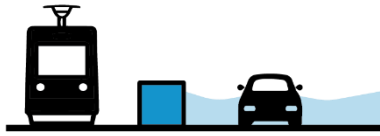


Raised Feature

Flood Adaptation Measure



PHYSICAL INFRASTRUCTURE



SHORELINE LOCATION:



Promenade Seawall in Morecambe, UK ©Atkins

DESIGN LIFE 50 - 100 years	ADAPTABILITY Varies	IMPACT ON THE WATERFRONT Minor Intervention	CONSTRUCTION COST TBD
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COASTAL FLOOD HAZARDS MITIGATED:



MEASURES COMPATIBILITY:		ECOSYSTEM SERVICES: Measure may affect these shoreline values			
Flood	Seismic	—	↑	↑	—
Levee	All	Aquatic Habitat	Terrestrial Habitat	Water Quality	Carbon Storage
Seawall		—	—	—	—
Raised Structures		—	—	—	—

DESCRIPTION:

A concrete wall can provide flood protection in upland areas. These walls can be integrated into the environment as planters or benches. The height will vary depending on existing grade. These features can be clad with architectural materials such as brick, stone, or metal. Existing concrete walls can also be raised by doweling new concrete into an existing concrete structure.

CONSIDERATIONS:

- Layout of features needs to accommodate circulation, access, and egress from buildings and public ways
- Height relative to adjacent grades should be considered in

ADVANTAGES:

- Permanent
- No operational cost
- No storage or deployment
- Habitat creation and aesthetics improvement

DISADVANTAGES:

- Maintenance required for plantings
- Higher construction cost compared to most deployable measures
- Restricts access and should be used in combination with gates

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relation to views, safety, and comfort

for roadway and pedestrian access points

- Limited to specific locations along the waterfront
- Customization required

CONSTRUCTION IMPACTS TO THE PUBLIC:

- Typical construction methods for installation of concrete features. Construction will require limited disruptions of pedestrian and vehicular traffic in area of construction.

SEA LEVEL RISE ADAPTATION OPPORTUNITIES:

- Once built, limited capacity to adapt to higher water levels

CASE STUDIES:

- Morecambe, UK

DESIGN OPPORTUNITIES:

Ecological Enhancements

- Raised features that are built as planters can provide vegetated habitat

Urban Design

- Can be designed as planters and benches to enhance the public realm

Form

- As long as the flood protection measure elevation is maintained these features can be designed in many forms and shape

DESIGN CONSIDERATIONS:

- Should be designed to withstand static and dynamic loads due to hydrostatic pressure, wind loads, debris impacts and seismic.
- Gradient and alignment are flexible.

ARCHITECTURAL CONSIDERATIONS:

- The spacing and location of permanent planters should be considered so that exit doors, stairs or ramps, and egress routes from buildings and public ways are not obstructed. Changes to existing level/grade and/or existing steps should be considered, as well as materials and their maintenance and repair; and their interaction with existing buildings, railings, and pier structures.

HISTORICAL RESOURCE CONSIDERATIONS:

- Raised planters should be located/attached in such a manner as to avoid physical damage to historic structures. When placed near historic structures, the design should be compatible with the character of the structure. Planters should not be fastened to existing historic building facades. If the system is deployed in pathways between historic structures, the joints or connections to the adjacent structures should be designed to avoid damage to the historic structures.

SITE-SPECIFIC CONSIDERATIONS:

- Consider using in combination with temporary deployable measures at pedestrian crossings and intersections along existing median.
- Could be used as an alternative to raising the existing seawall.

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URBAN DESIGN CONSIDERATIONS:

- Planting material should be adaptable to the local climate and easily maintained to ensure it is a positive aesthetic urban design element. Irrigation should be provided. As a solid material, the raised planter's height should be below 2 feet for as much of the length as possible to preserve views. Depending on the location, the barriers may restrict access and circulation. The raised planter should be of high quality and durable materials compatible with the urban context and resistant to the marine environment – the selection of concrete is appropriate for the context.

INSTALLATION AND CONSTRUCTABILITY CONSIDERATIONS:

- Typical construction of reinforced concrete or precast units anchored to the existing grade. Land-based work requiring disruptions to vehicular and pedestrian traffic in the area of construction for delivery and installation of materials. Demolition of existing surface may be required to install foundation. The general installation procedure includes: 1) preparation of existing grade, 2) installation of connections or foundation, 3) construction of watertight concrete box structure, and 4) placement of landscape or other aesthetic features.

OPERATION AND MAINTENANCE CONSIDERATIONS:

- Maintenance of the landscape elements included in the concrete box structure will vary depending on type. Regular inspection of the concrete and landscape elements will be required to address any vandalism or damage that occurs over time. If plantings are included, then irrigation would be required. Service life can be in excess of 50 years based on loads, design criteria and material used, as well as inspection and maintenance frequency.