



An Overview of Design of Public Seawalls within Victoria Harbour

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Civil Engineering and Development Department - Port Works Division





Outline

- 1) Functions and Design Considerations of Seawall
- 2) Typical Types of Seawalls
- 3) Overseas Seawall Examples
- 4) Current Situation in Hong Kong
- 5) Way Forward

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Functions of Seawall

To protect the existing hinterland or to form land by reclamation, it is necessary to build seawalls along the new coastline.

The main functions of seawalls are to serve as :

- a boundary of newly reclaimed land;
- a soil retaining structure of the reclamation; and
- a sea defense structure.

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Design Considerations of Seawall

The following main factors are to be considered :

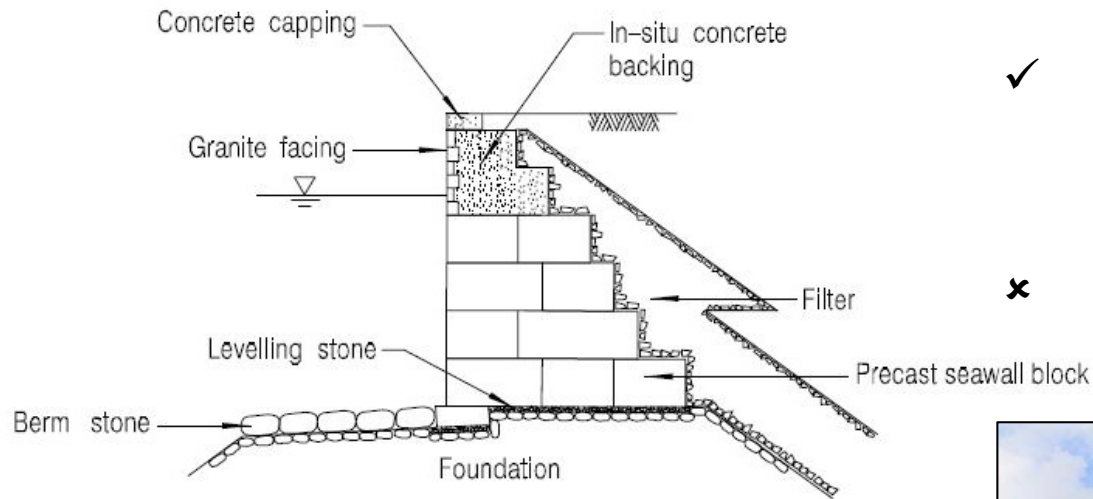
- Layout of coastal development;
- Environmental conditions;
- Operational conditions;
- Navigation and berthing requirements;
- Costs and time of construction;
- Maintenance requirements; and
- Statutory requirements.

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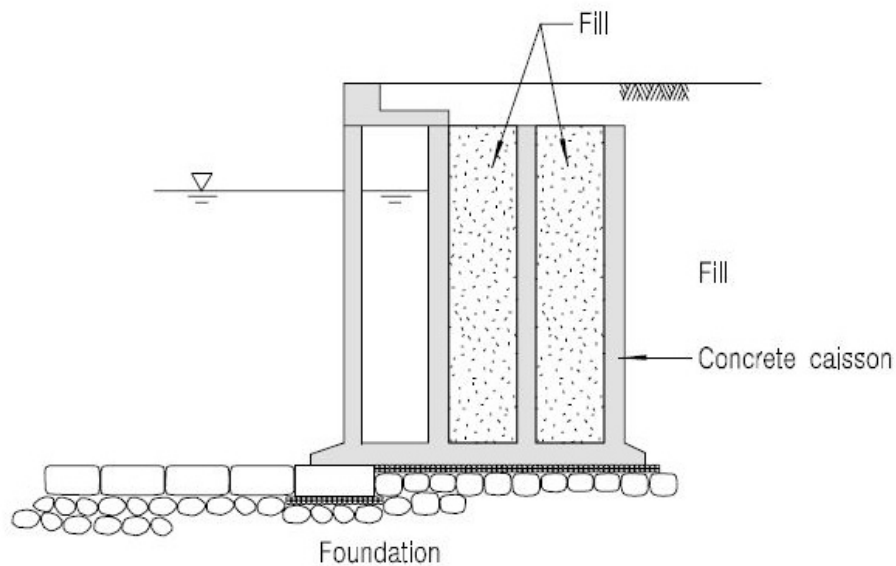
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Typical Vertical Seawall



(a) Concrete Blockwork Seawall



(b) Caisson Seawall

- ✓ Provide marine frontage for vessel berthing and cargo handling
- ✗ Higher wave reflection



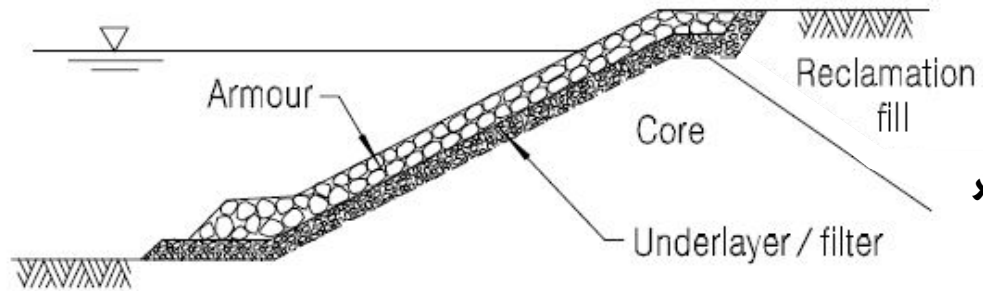
Kwun Tong Promenade

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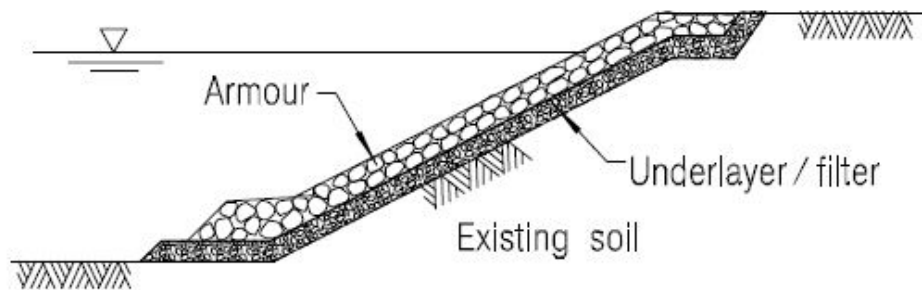
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Typical Sloping Seawall



(a) Rubble Mound Seawall for Reclamation



(b) Rubble Mound Seawall for Shore Protection

- ✓ Dissipate wave energy and reduce reflected wave agitation
- ✗ Require wider clearance and water space



Kai Tak Development

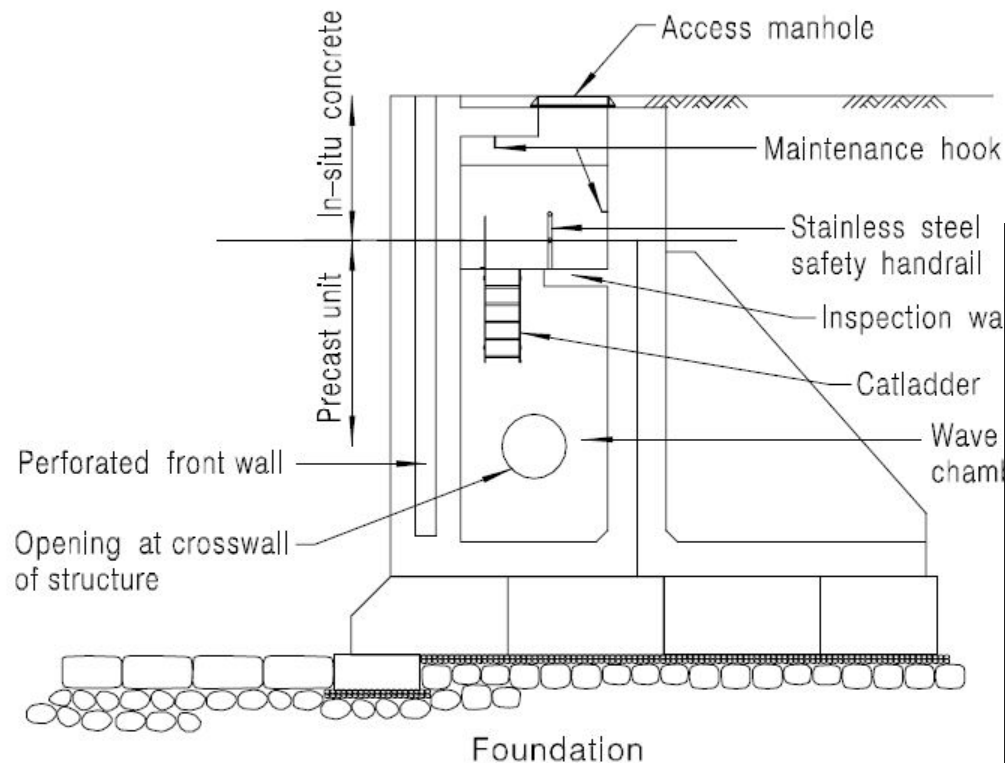
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Vertical Wave-absorbing Seawall

- ✓ Reduce wave agitation and occupy less water space
- ✗ Higher maintenance and construction cost

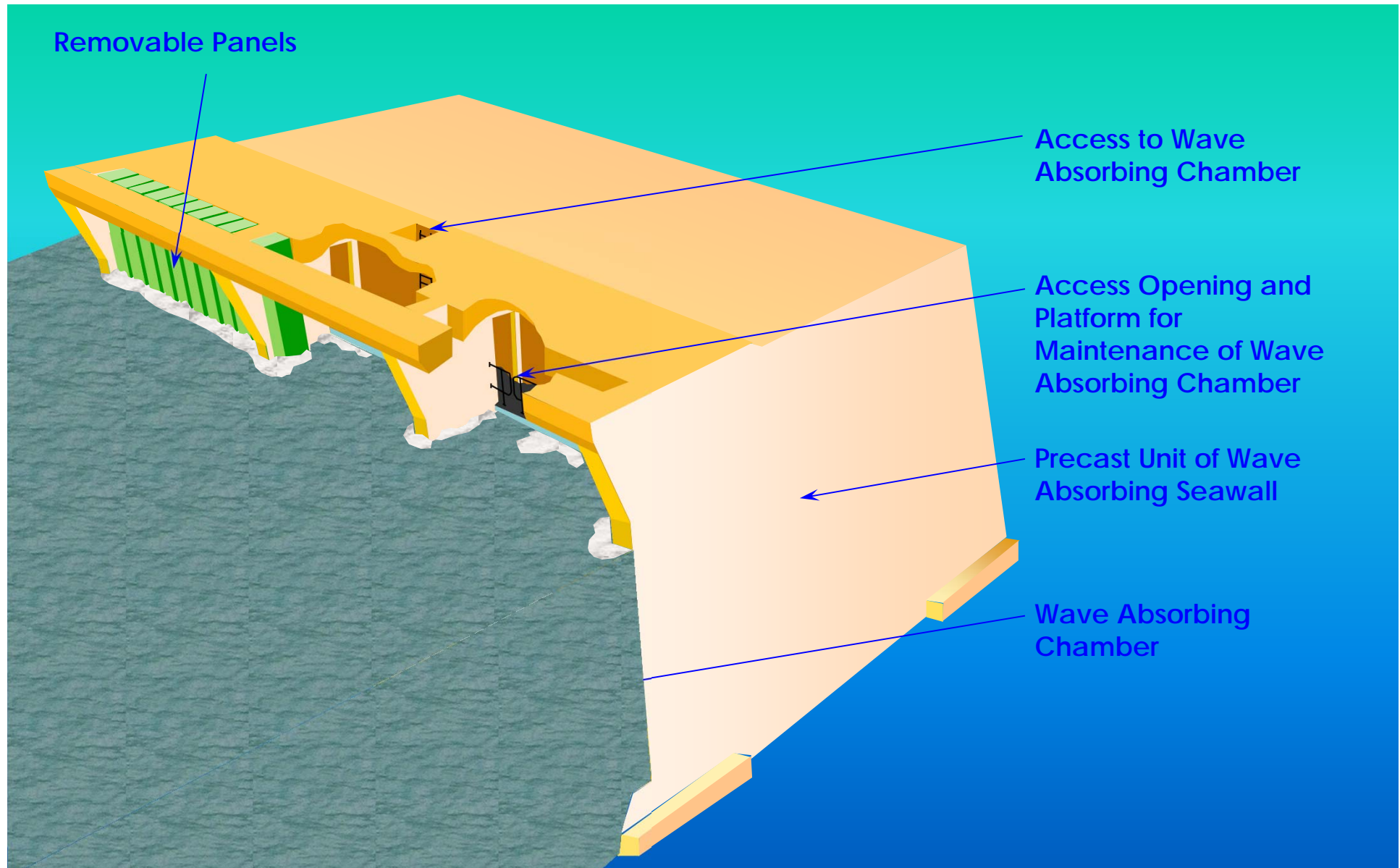


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Vertical Wave-absorbing Seawall

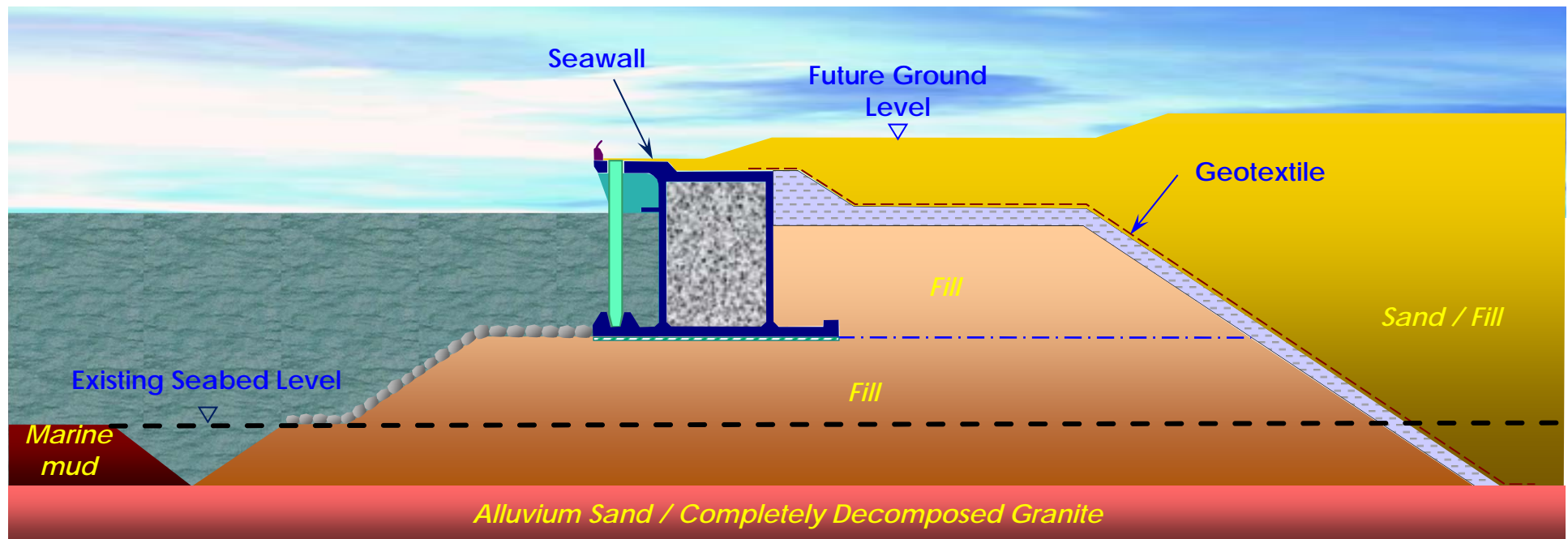


Vertical Wave-absorbing Seawall



Dredging for Seawalls

- For typical construction of seawalls, the existing marine mud at seabed is required to be dredged and then replaced by fill material as the foundation of seawalls. However, the large quantity of dredged material would occupy a lot of space of dumping pit, and hence not an environmental friendly and sustainable option.



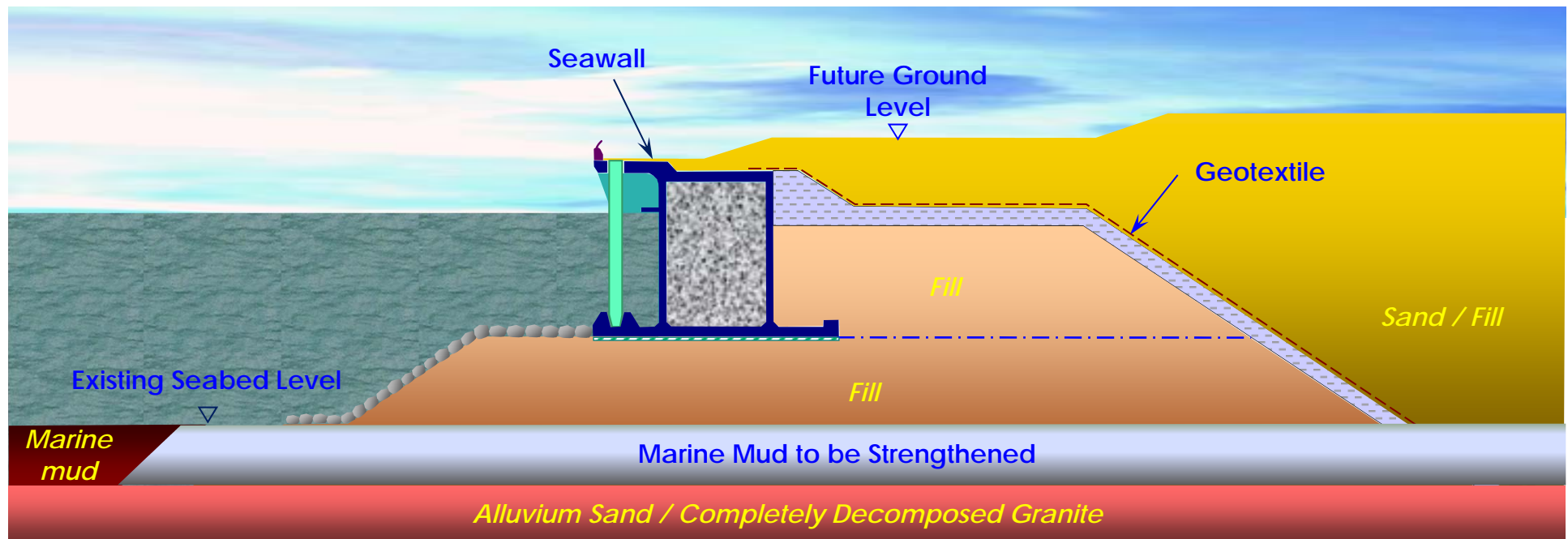
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Dredging for Seawalls

- Non-dredging techniques are being considered to reduce the quantity of disposal of material, and to minimize the environmental impact. However, the construction cost of non-dredging techniques is relatively high.



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Overseas Seawall Examples



← Parramatta River, Australia
Seawalls with mangroves planting

Quakers Hat Bay, Sydney, Australia →
Boulders have been added to the front of seawall to improve total habitat surface area



← Kogarah Bay, Australia
A step-type seawall with a bench of saltmarsh vegetation

Overseas Seawall Examples

Bobbin Head, Cowan Creek, Hawkesbury →
River New South Wales, Australia
A low-sloping seawall with a variety of habitats

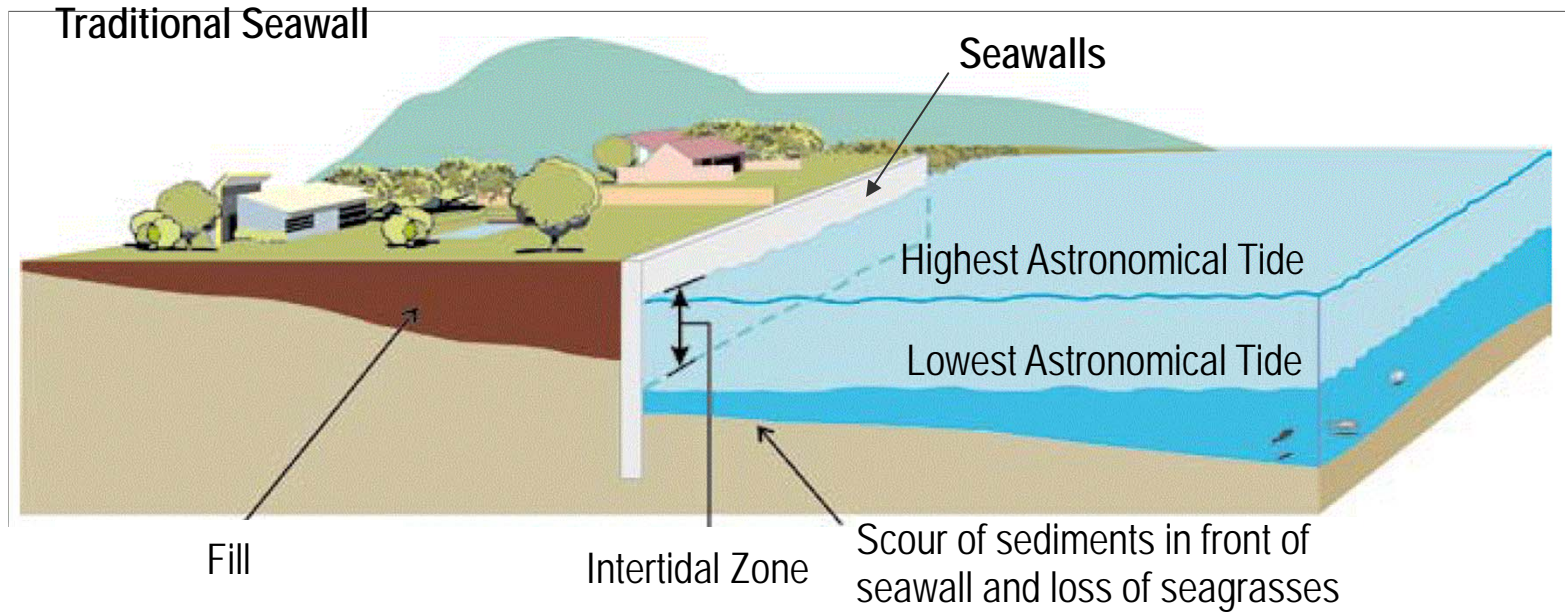


← McMahons Point, Sydney Harbour, Australia
Seawall with pools in the structure for habitat and boulders at toe for additional habitat

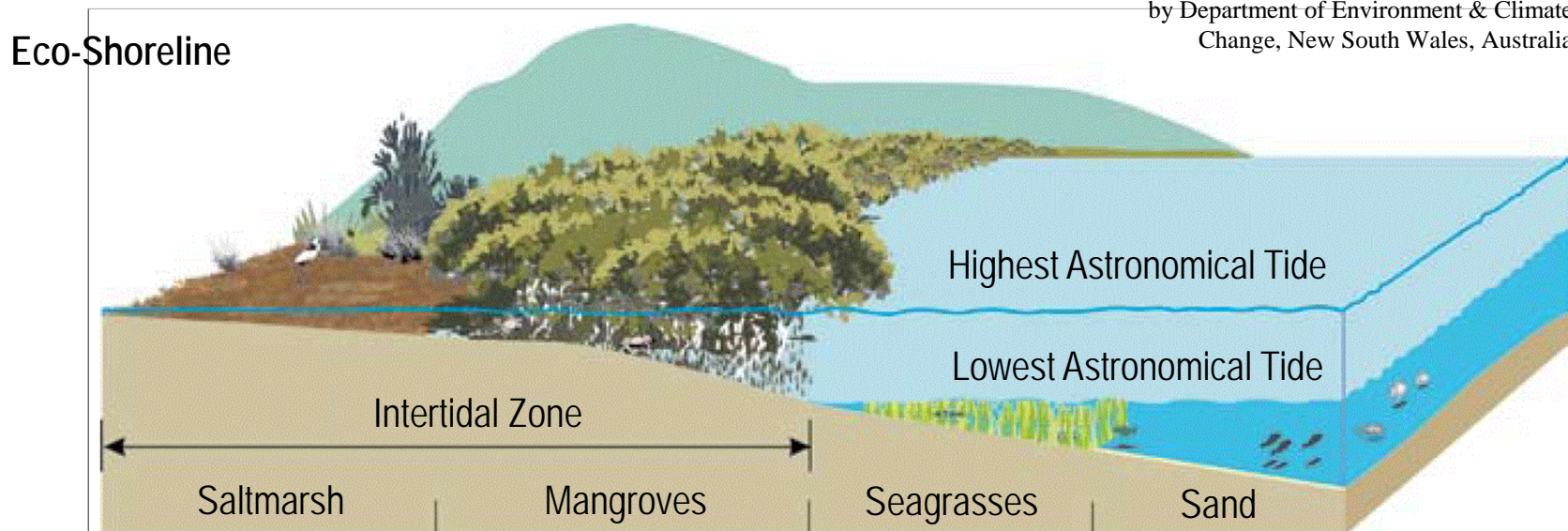
Gough Whitlam Park Cooks River, →
New South Wales, Australia
Seawalls with a native riparian vegetation buffer zone, benefits in bank stabilisation, water quality improvement and habilitate provision



Eco-shoreline



Source: "Environmentally Friendly Seawalls"
by Department of Environment & Climate
Change, New South Wales, Australia

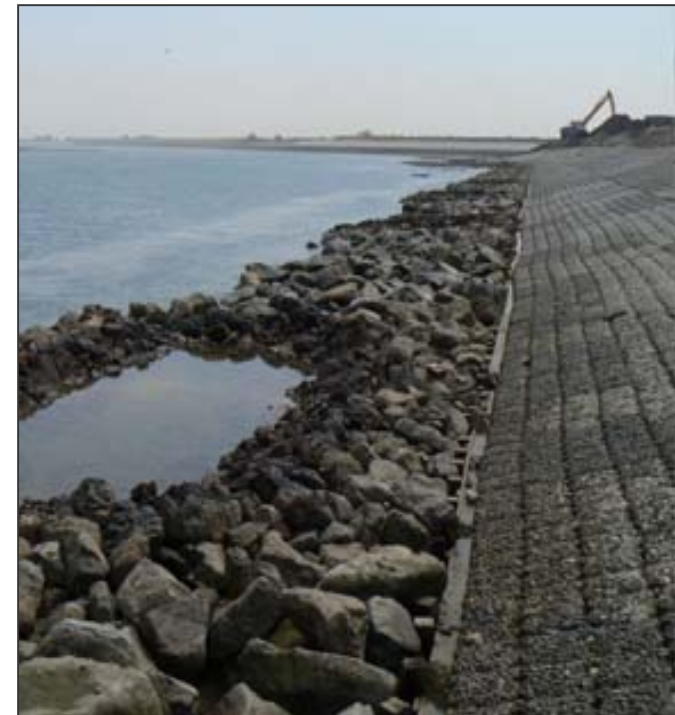


Other Eco-shoreline Examples



Source: Ecoshape (http://www.ecoshape.nl/en_GB/oyster-reefs-eastern-scheldt.html)

← Eastern Scheldt, the Netherlands
Oyster reefs to protect intertidal flats and create new habitats



Between Wemeldinge and Yerseke, →
the Netherlands
Water retaining pools are built in front of seawalls

Source: Deltares (<https://publicwiki.deltares.nl/display/BWN/Case+-+Rich+Revetment>)

Other Eco-shoreline Examples



An aerial photograph showing Pulau Sakeng and Pulau Semakau as viewed from the south. Pulau Bukom, Pulau Hantu and mainland Singapore are visible in the background.



A view of Pulau Sakeng in October 1996 shows the island enlarged to house the future landfill facilities.



Aerial view of construction in April 1997.



Aerial view in May 1998, showing the wharf construction, bund construction and ancillary buildings and structures.



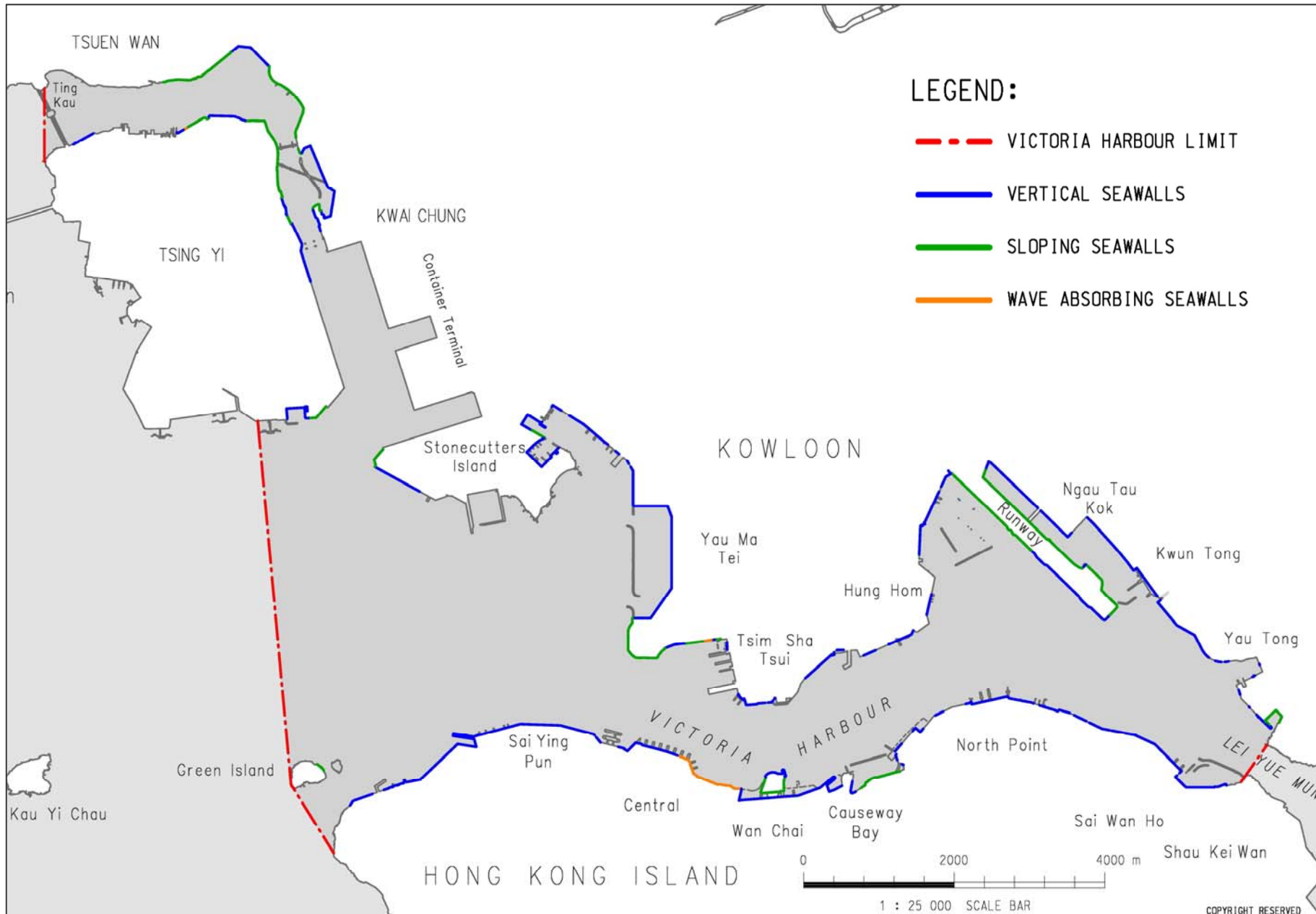
Semakau Landfill at completion in April 1999.



Source: "Habitats in Harmony: The Story of Semakau Landfill" published by National Environment Agency (2009)



Public Seawalls within Victoria Harbour





Constraints in Victoria Harbour

- Victoria Harbour is one of the busiest sections of harbour in the world;
- Structural stability and elevation of seawalls are always key concerns when designing seawalls;
- Most of land behind seawalls has been fully developed into commercial, residential, industrial and recreational areas;
- Adaptation of overseas design in existing and new seawalls may not be feasible and cost-effective.
- For public landings, no flexibility is allowed to provide landing to vertical seawall at a later stage without involving large scale partial reconstruction.

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Protection of the Harbour Ordinance

- Over-riding public need should be established for any reclamation within Victoria Harbour;
- Must be a compelling and present need with no reasonable alternative to reclamation;
- A project of reconstructing seawall without a planned reclamation development will prove to be uneconomical and unjustified;
- No planned seawall reconstruction work in the near future within Victoria Harbour.

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Way Forward

Public Seawalls

Innovative design of seawalls adopting elements of eco-shoreline is being studied for incorporation into the new seawall design for the proposed reclamations outside Victoria Harbour. It can :

- enhance the ecological function of seawalls; and
- restore the damaged soft shore such as sandy shore and mud flat to improve the marine environment and to allow public enjoyment.

Public Landings

For innovative design of landings which could be installed on existing seawalls, design proposals to relevant Government departments for consideration and advice are always welcome.

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Examples of Landings - Pontoon



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End

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