Harrison Hot Springs Waterfront Flood Mitigation

Update to Council

December 9, 2025

Introductions
Project Team

Presenters:

Daniel Maldoff, MEng, PEng
Hydrotechnical Engineer, **NHC**

Graeme McAllister, PEng, MASc
Senior Geotechnical Engineer, **Thurber**

Project Team:

HARRISON HOT SPRINGS
Naturally Refreshed

Northwest Hydraulic Consultants
Hydrotechnical engineering
(Prime Consultant)

Space2place
Landscape architecture

Thurber Engineering
Geotechnical engineering

Legacy Environmental
Environmental/permitting

Presentation Outline

1. Project overview
2. Council direction and current objectives
3. Dike design update

Project Overview
Components

Wastewater Treatment Plant Road and Shoreline (Zones 1 and 2) – 0.6 km length
– Council has directed staff to proceed with design

Waterfront Dike (Zones 3, 4, 5, and 6) – 1.5 km length
– Design concepts under discussion

Regular Council Meeting, September 8, 2025

Motion carried:

THAT staff be directed to pursue a detailed design for a deployable dike system in Zones 3-6; and

THAT staff be directed to report back to Council at a future Committee of the Whole meeting regarding the financial implications, ability to deploy, storage and durability/longevity of a deployable dike system and any permanent features associated with the deployable dike.

Overview: Dike Performance Considerations

From 2015 Lower Mainland Dike Assessment:

- Crest Height
- Geometry
- Geotechnical
- Erosion Resistance
- Encroachments and Vegetation Management
- Appurtenant Structures
- Administrative Arrangements

Existing Dike Condition and Performance

Main concern: inadequate crest level

Upgrades contemplated in 1990s through Provincial Fraser River Flood Control Program

2015 Provincial Lower Mainland Dike Assessment

- **Crest elevation rating: 2 out of 4**
  "the dike does not meet minimum requirements"
- Overall condition rating: 2.63 out of 4

Limited geotechnical data available in 2015

- Current project included geotechnical investigations
  → Seepage mitigation recommended for upgraded dike

A Regional Issue

- Over 500 km of dikes in the Lower Mainland
  - Most built after 1948 flood and have not been tested by a large flood

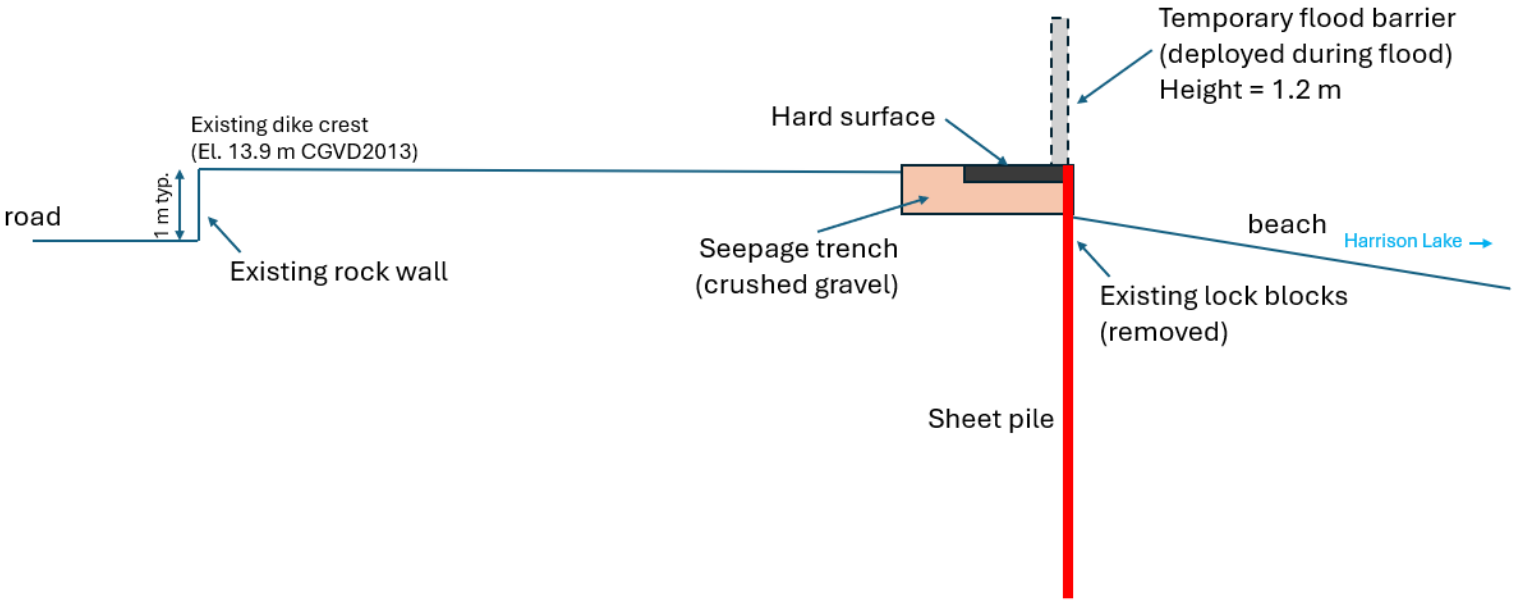
- 2015 Lower Mainland Dike Assessment:
  - **Crest height**
    - 54% of dikes had crest below design flood level
    - Only 4% fully met crest level standards
  - **Geotechnical**
    - 22% of dikes had insufficient geotechnical information – performance is unknown (*Harrison Hot Springs Dike was in this category)*
    - For dikes that could be assessed, about 1/3 had ratings of "poor" or "unacceptable" – can be expected to fail due to a geotechnical problem before overtopping

Proposed Design Approach

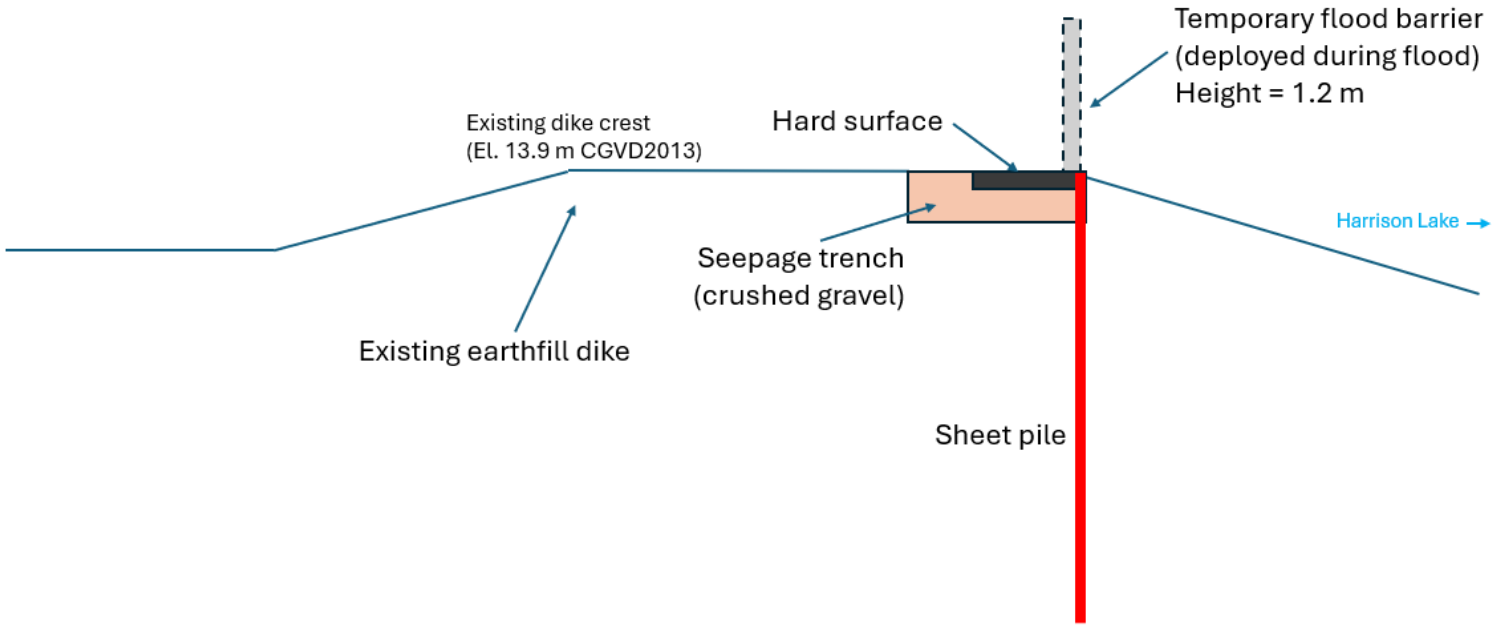
- **Wastewater Treatment Plant Road and Shoreline** (Zones 1 and 2)
  - Improve erosion protection
  - Raise embankment around wastewater treatment plant to El. 15.1 m
  - Upgrade road for access during and after the design flood

- **Waterfront Dike** (Zones 3, 4, 5, and 6)
  - Crest level to El. 15.1 m (+1.2 m) using deployable flood barrier
  - Mitigation of below-grade seepage concerns

Dike Upgrades Preliminary Design
Zone 4 (Commercial Waterfront) & Zone 5 (Lagoon)

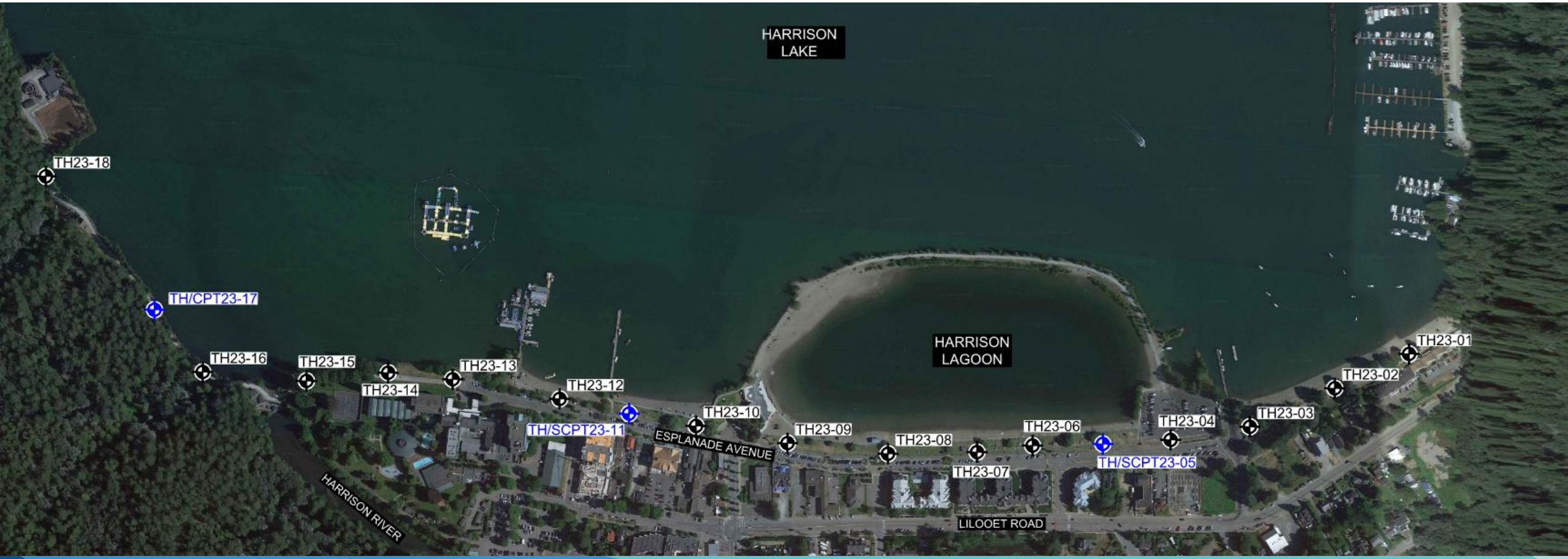


Dike Upgrades Preliminary Design
Zone 3 (Hot Springs Resort) & Zone 6 (Rendall Park)



Seepage Mitigation – Preliminary Design

- Geotechnical Conditions
  - Soils typically include sand and silty sand with occasional silt and sand and gravel layers.



Seepage Mitigation – Preliminary Design

- Seepage Considerations
  - High water conditions during floods cause seepage forces through dikes
  - Excessive seepage forces can cause internal erosion or soil heave on the landside of the dike
    - Applies to both earth dikes and deployable flood walls
  - Fine sand and silty sand can be particularly susceptible to seepage forces

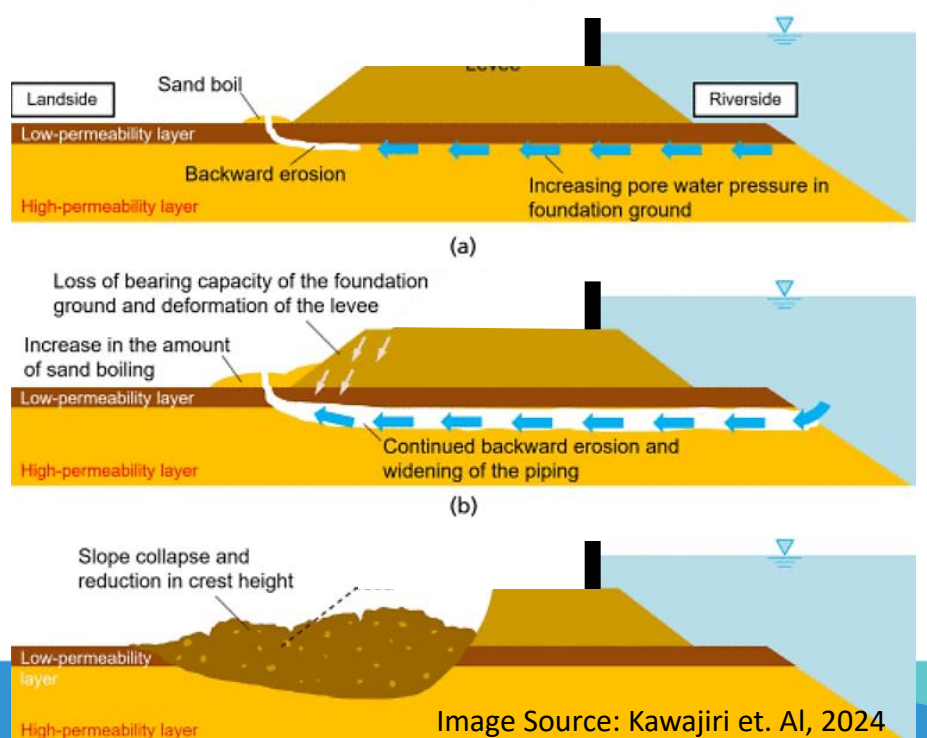
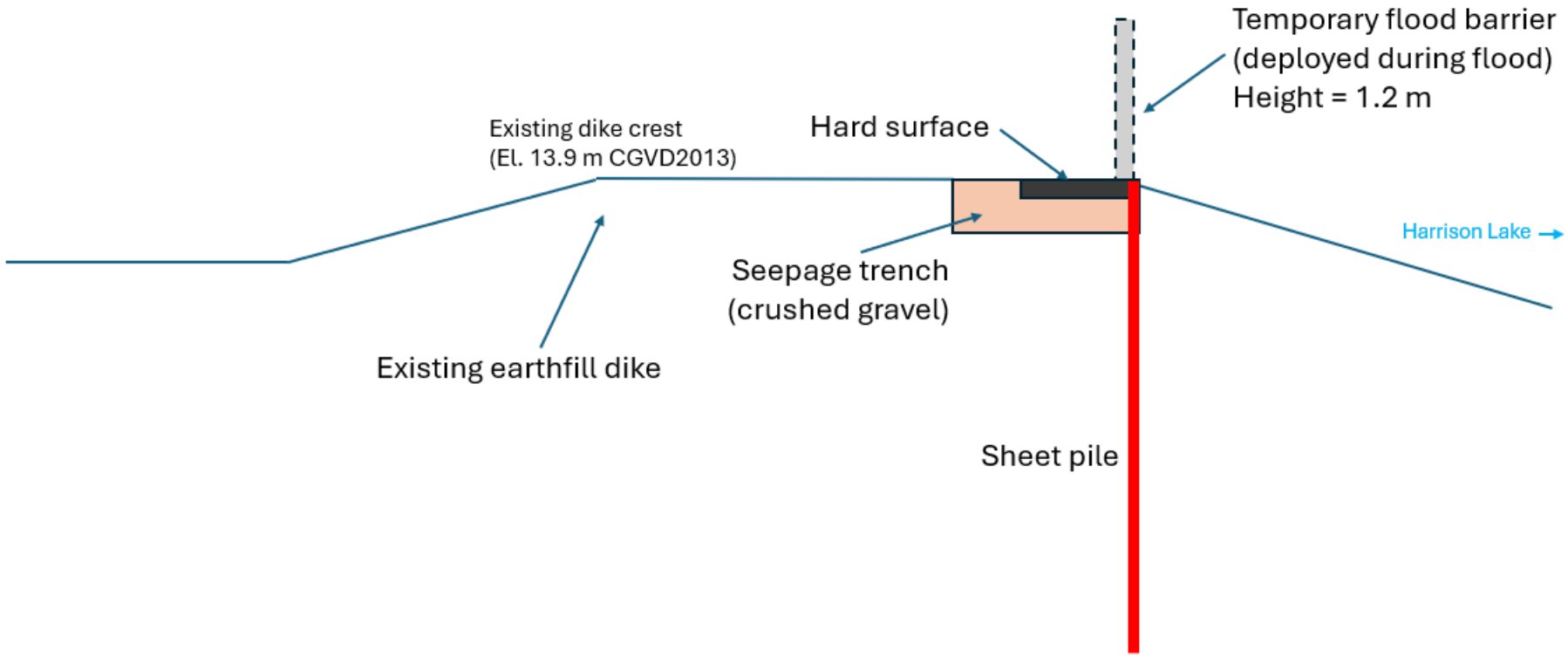


Image Source: Kawajiri et. Al, 2024

FEMA P-1032, 2015

Seepage Mitigation – Preliminary Design

- The proposed design addresses seepage by including:
  - Below grade sheet pile cut off walls to extend the seepage path and reduce seepage force
  - Seepage trenches to control seepage where it exits the landside of the dike



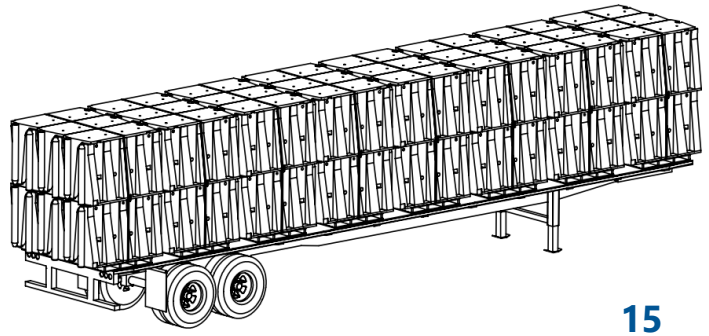
Deployable Flood Barrier
Modular Water-Filled LDPE Barrier

- e.g. Muscle Wall
- 1.2 m high units, 0.6 m high extender available

Flood Protection Performance	• High • Good precedent for use
Pre-Flood Deployment	• Can be deployed within 2-3 days • Equipment: forklift or excavator with forks, and water source • Requires a level surface
Post-flood Removal	• Quickly demountable
Storage	• 500 m^2 (23 m x 23 m) for 1.5 km length if single-stacked; less if double-stacked
Lifespan	• Reusable • Lasts longer if stored out of sun
Cost	• Moderate, relative to other options


Image source: Muscle Wall


Image source: Muscle Wall



Cost Implications

- $11M in grant funding available for project
- High-level cost estimate*

Item	Cost, Unfactored	Cost, Including 20% Contingency
WWTP and road upgrades	$3,800,000	$4,500,000
Dike – geotechnical upgrades	$3,100,000	$3,700,000
Dike – deployable flood barrier	$1,400,000	$1,700,000
Grading and landscaping	$750,000	$900,000
TOTAL	**$9,100,000**	**$10,800,000**

*Cost Assumptions and Limitations

- Includes engineering and environmental
- Preliminary, based on current design information

Thank you

Questions and Discussion