Toronto Port Lands Flood Protection

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Presentation Outline

1. Port Lands Flood Protection overview
2. Flood protection strategy
3. 2D hydraulic modelling
4. Lessons learned
Overview – Port Lands Flood Protection

• The Port Lands Flood Protection and Enabling Infrastructure (PLFPEI) Project is a comprehensive plan to flood protect 290 hectares of urban area in Toronto.

• Design is supported by the Don Mouth Naturalization and Port Lands Flood Protection Project Environmental Assessment and the Lower Don Lands Master Plan Class Environmental Assessment.

• Project will remove Special Policy Area designation and unlock area for revitalization and private development.
Overview – Port Lands Flood Protection

• Waterfront Toronto implementing the solution in close partnership with TRCA, City of Toronto, and other stakeholders

• Project allocated $1.25 billion of funding from all three levels of government to implement solution

• Phase 1 construction underway, detailed design for remaining stages

• Target date for full flood protection is 2023
Flood Protection Design

- Strategy mainly relies on flood conveyance improvements but also involves flood protection landforms and valley wall features to block flow
- 0.5 m freeboard requirement (above typical 0.3 m) to account for uncertainty
Flood Remediation Design – More Detailed (EA)

1) Flood Protection Landforms
2) Longer Crossing
3) Valley Wall Feature
4) New River Valley
5) Sediment and Debris Management Area
6) Adjustable Weir
7) Channel Improvements
8) New Crossings
9) New River Outlets

Toronto and Region Conservation Authority
Flood Remediation Design

- Design of flood protection done using 2D hydraulic modelling package MIKE 21
- Past models included DHM, DELFT 3D – each progressive model more refined
- Iterative design process as changes to one component of the design can effect upstream and downstream flood elevations
Flood Remediation Design

Some flood protection design considerations include:

- Achieving freeboard targets around existing sensitive areas
- Directing base flow to new river while diverting high flows to the Keating Channel
- Coordinating with planned infrastructure i.e. new Gardiner alignment
- Dredging and disposal of 25,000+ m³ of sediment each year
Flood Remediation Design

Some flood protection design considerations include:

- Avoiding existing utilities and dock walls
- Ship Channel outlet can only receive flow in excess of the 25-year storm event
- Managing debris and ice
- River bank and bed scour protection
- Interfacing flood protection landforms and valley wall feature with roads, utilities, and existing grading
Flood Remediation Design – Key Areas

- Keating Channel Narrows
- Sediment and Debris Management Area / Flow Split
- Wetland Levee
Flood Remediation Design

- Hydraulically the most constrained area is around Lake Shore Blvd East / Sediment Debris Management Area
- Causes measurable impact to upstream flood elevations where another flood protection EA is underway
- 2D flow situation where flow is split between Keating Channel and the new river mouth
- Freeboard is limited by existing bridge and surrounding grades
- Site of existing and future from Gardiner Highway to DVP
- Need to maintain dredging to achieve river depth for flood conveyance
Flood Remediation Modelling

- Modelling done using high resolution flexible mesh
- Quasi-steady flow to be conservative
- 2D model is necessary to model flow split and flow around piers and weirs
- Only bridge piers are modelled - no pressure flow
Flood Remediation Design – Managing Interim Risk

- Modelling required to quantify and demonstrate that existing flood risk during construction isn’t increased to unacceptable levels
- Detailed results reveal areas of depth change throughout model domain
Flood Remediation – Revising Assumptions

- Two bridges are adjacent to each other
- Assumed local impacts to floodplain at EA stage
- EA model could not represent bridges
- Enbridge has plans to remove or modify their concrete bridge
- Plans to remove steel truss bridge by Waterfront Toronto
Lessons Learned – Hydraulic Model

- Double check LiDAR data
- Confirm where grading plan extents are valid before importing into model bathymetry
- Mesh models can run significantly faster – good for scenario testing
Moving Forward

- Integrated design process that continues to be refined
- Continue to coordinate with various stakeholders
- Many other important design components - Contaminated soil remediation, geotechnical, ecological, public realm etc.
Thank You

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