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When Creek Meets Valley Wall: Prioritizing Erosion Mitigation alongside the Oshawa Landfill

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TRIECA conference

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[1] Palmer Environmental Consulting Group Inc.

[2] Regional Municipality of Durham

PALMER ENVIRONMENTAL CONSULTING GROUP INC.

DURHAM REGION

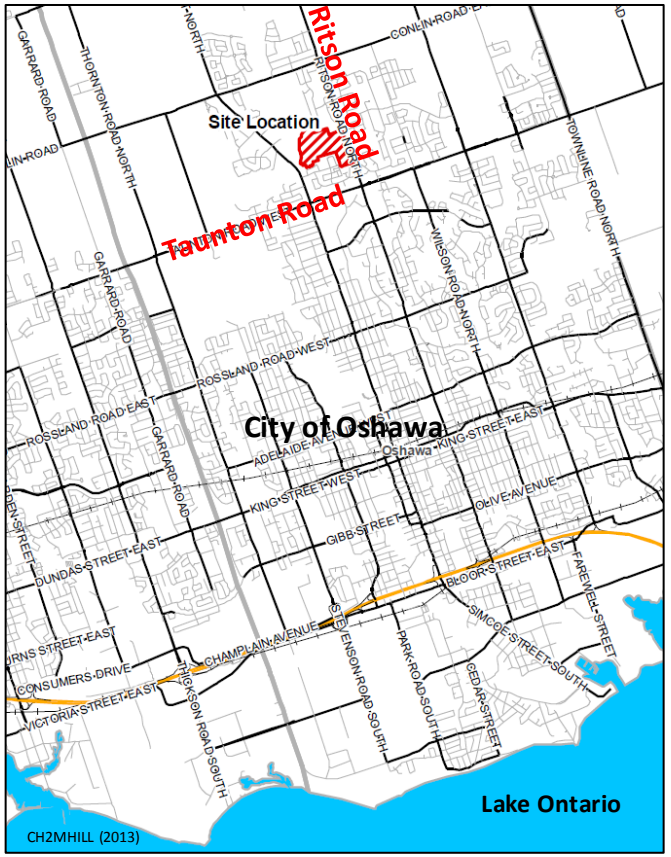
Outline

- Background
- Assessment approach
- Erosion site inventory
- Prioritization and design of mitigation

BACKGROUND

Oshawa Landfill

- Operational from 1960s until 1979
- Located in former sand/gravel pit
- Capped in 1980; now just site of transfer station



Oshawa Landfill

Durham's role

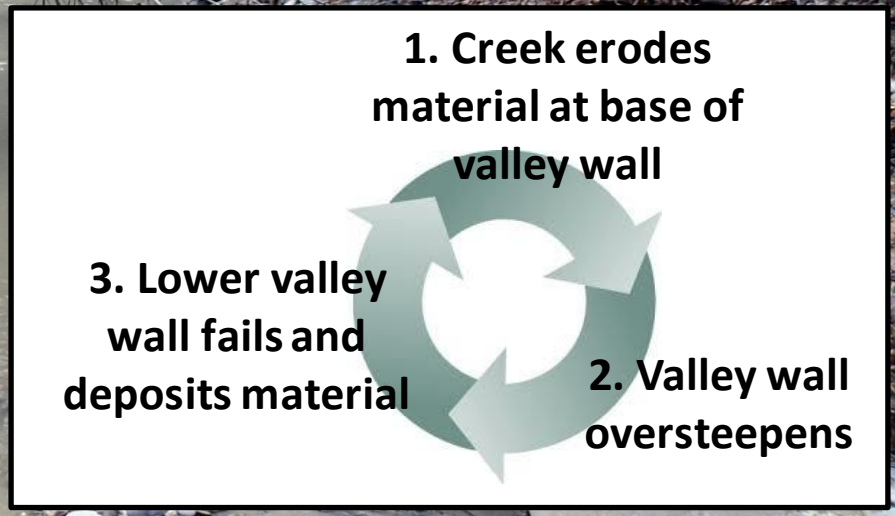
- Responsible for monitoring and maintenance since closure in 1979
  - Ensure continued protection of surrounding natural environment
- Durham/CLOCA identified local instabilities and seepage areas along Oshawa Creek and tributary
  - Seepage inventory
  - Isolated seepage mitigation and erosion protection works ("Green Wall")
- Recognized need to inventory, assess and mitigate erosion risks…

ASSESSMENT APPROACH

Objective

- To conduct an **integrated fluvial and slope erosion assessment** alongside the Oshawa Landfill as a basis for **inventorying, prioritizing and mitigating erosion sites** determined to pose long-term risk to integrity of landfill perimeter

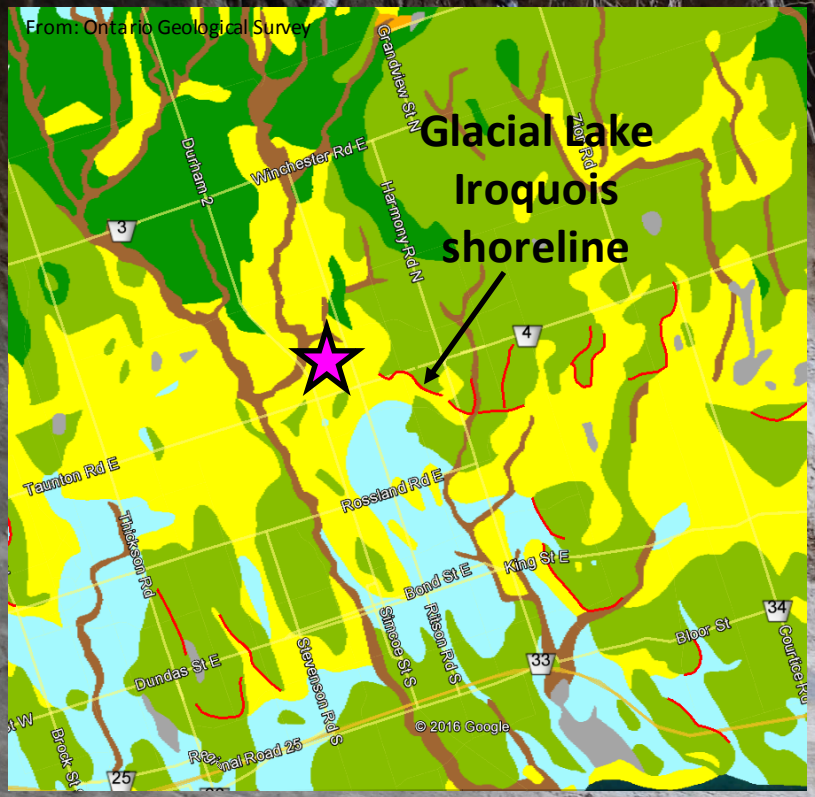
Channel-valley wall interaction

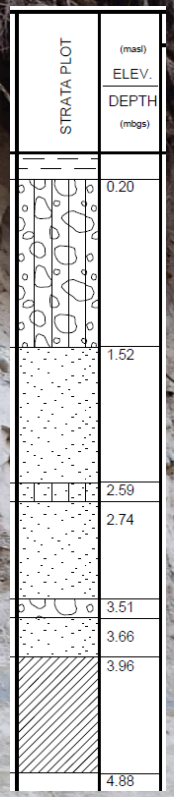


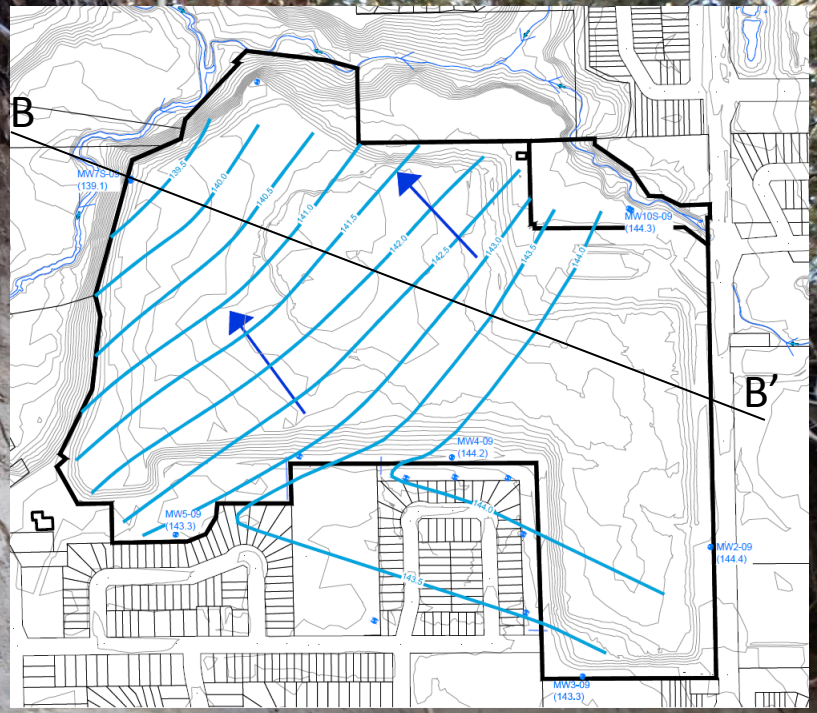
Procedure

1. Background review
   - Surficial geology mapping, borehole logs, groundwater data
   - Historical and recent aerial photography
   - Reach delineation

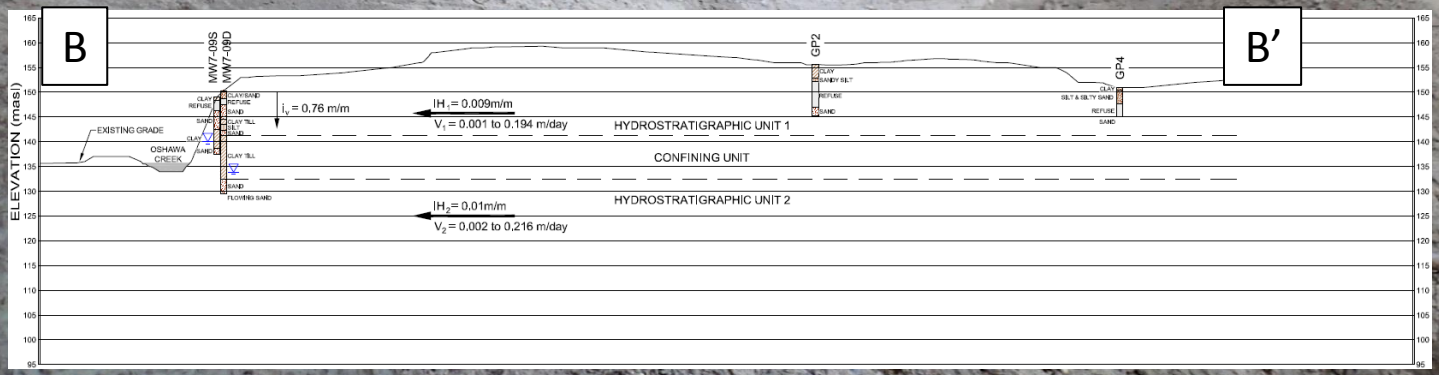
Geological setting







From: CH2MHILL (2013)

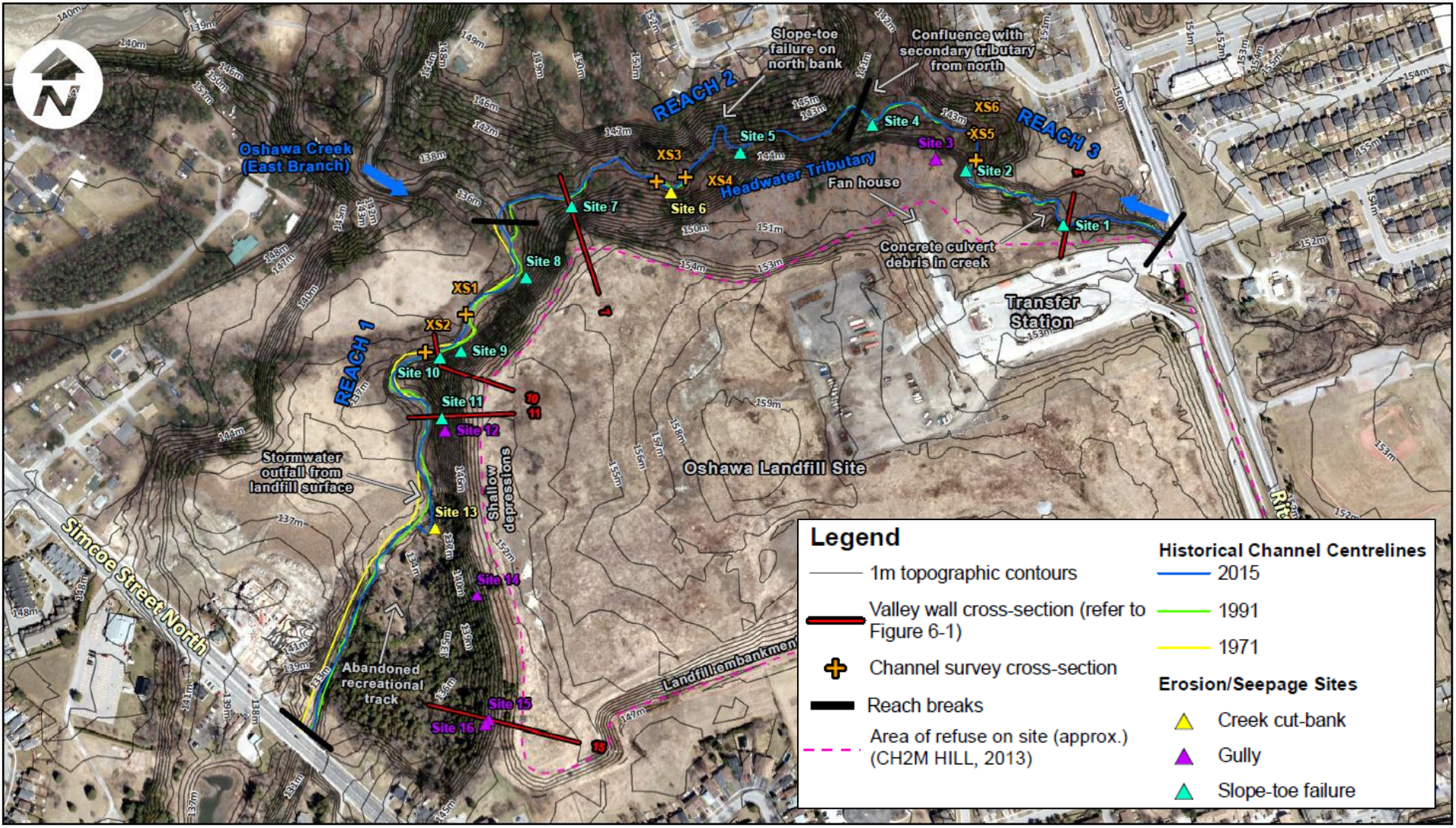


Procedure

1. Background review
   - Surficial geology mapping, borehole logs, groundwater data
   - Historical and recent aerial photography
   - Reach delineation
2. Reach-scale field reconnaissance
   - Fluvial processes focus, modes of adjustment, erosion site identification, channel stability assessment
3. Site-specific investigations
   - Examination and characterization of contributory failure mechanisms (e.g. seepage/undercutting)
   - Measurement of failure geometry

EROSION SITE INVENTORY

Erosion site inventory



Erosion site inventory

- 16 sites, representing three forms of instability
  - 2 creek cut-banks
  - 9 slope-toe failures
  - 5 gullies
- Principal drivers of instability
  - Channel down-cutting and migration
  - Groundwater seepage and piping of fine sediments
  - Uncontrolled surface runoff

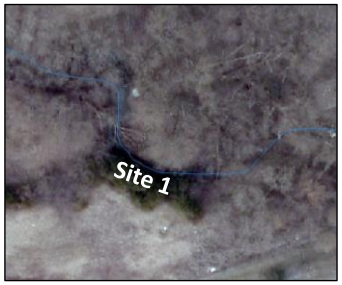
Erosion = lateral + vertical

Site-specific data summaries

SITE CHARACTERISTICS	SLOPE EROSION DIMENSIONS
Type Toe-slope failure	**Slope failure width (m)** 20
Proximity to approx. refuse limit (m) 13	**Slope failure height (m)** 2.8
Property Region	**Slope failure steepness (º)** 45
Material Interbedded outwash sand/gravel	**Gully top width (m)** n/a
Seepage influence Moderate [Seep B (i), (ii)]	**Gully depth (m)** n/a
Watercourse Reach 3 - Headwater Tributary (Upper)	**Gully bottom steepness (º)** n/a
Bankfull channel dimensions (m) 3.7 (W) & 0.9 (D)	**Gully length (m)** n/a

Description

Undercutting of the toe of the valley wall, along the outer bank of a meander, has led to shallow slumping within interbedded glaciofluvial sands and gravels underlain by laminated glaciolacustrine silt. Groundwater seeps from the bank at the contact between the glaciofluvial and glaciolacustrine sediments. Without intervention, continued erosion of the valley wall may pose a risk to landfill embankment stability.



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PALMER ENVIRONMENTAL CONSULTING GROUP INC.

DURHAM REGION

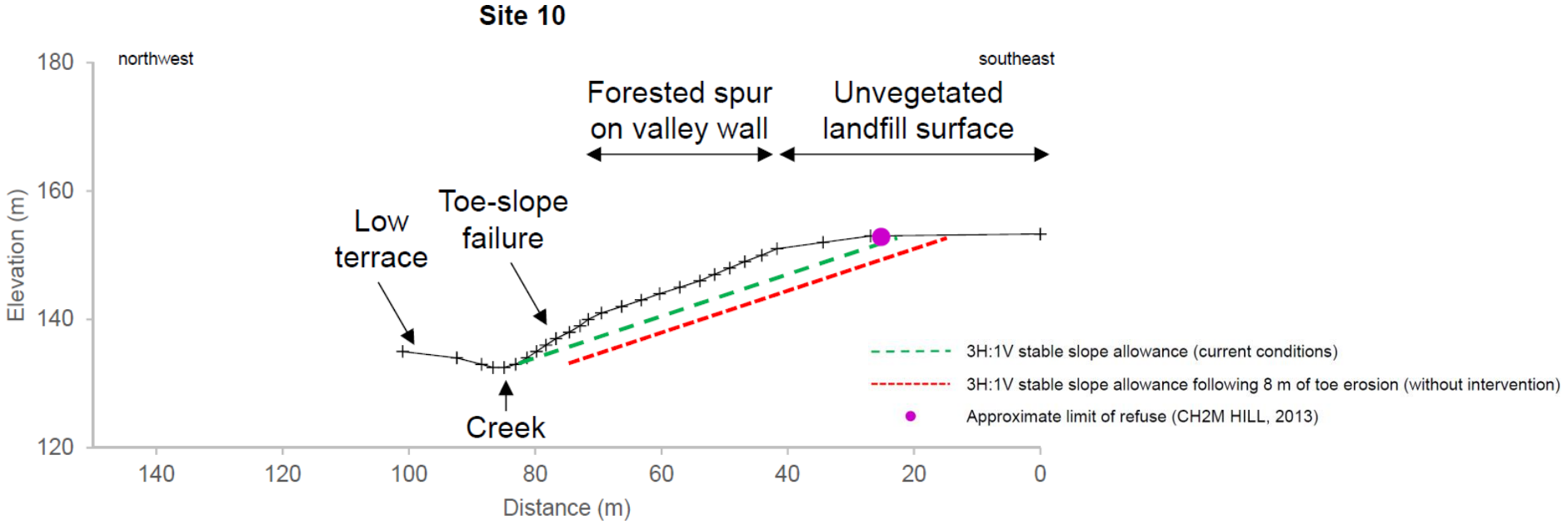
Project: Oshawa Landfill Erosion Mitigation
Project number: 160031
Client: Regional Municipality of Durham

Site 1

PRIORITIZATION AND DESIGN OF MITIGATION

Basis for prioritization

- Proximity to refuse limit
- Severity of slope erosion
- Valley wall cross-sectional geometry



5 high-priority sites

Design criteria

- Ensure long-term stability of valley wall surrounding landfill
  - Arrest existing erosion
  - Avoid exacerbating or triggering new erosion (as consequence of mitigative works)

- Minimize impacts to, or enhance, aquatic and riparian ecosystems

Evaluation of alternatives

- 3 alternatives per site + ‘do nothing’
- Evaluation criteria
  - In-stream and floodplain hydraulics
  - Fluvial processes and slope erosion
  - Valley wall seepage and aesthetics
  - Ecological sensitivities
  - Environmental permitting requirements
  - Capital and maintenance costs

Communication with CLOCA

Central Lake Ontario Conservation

- Early engagement (study approach)
- Key findings and report available
- Detailed and simplified evaluation tables
- Concept plans → detailed designs

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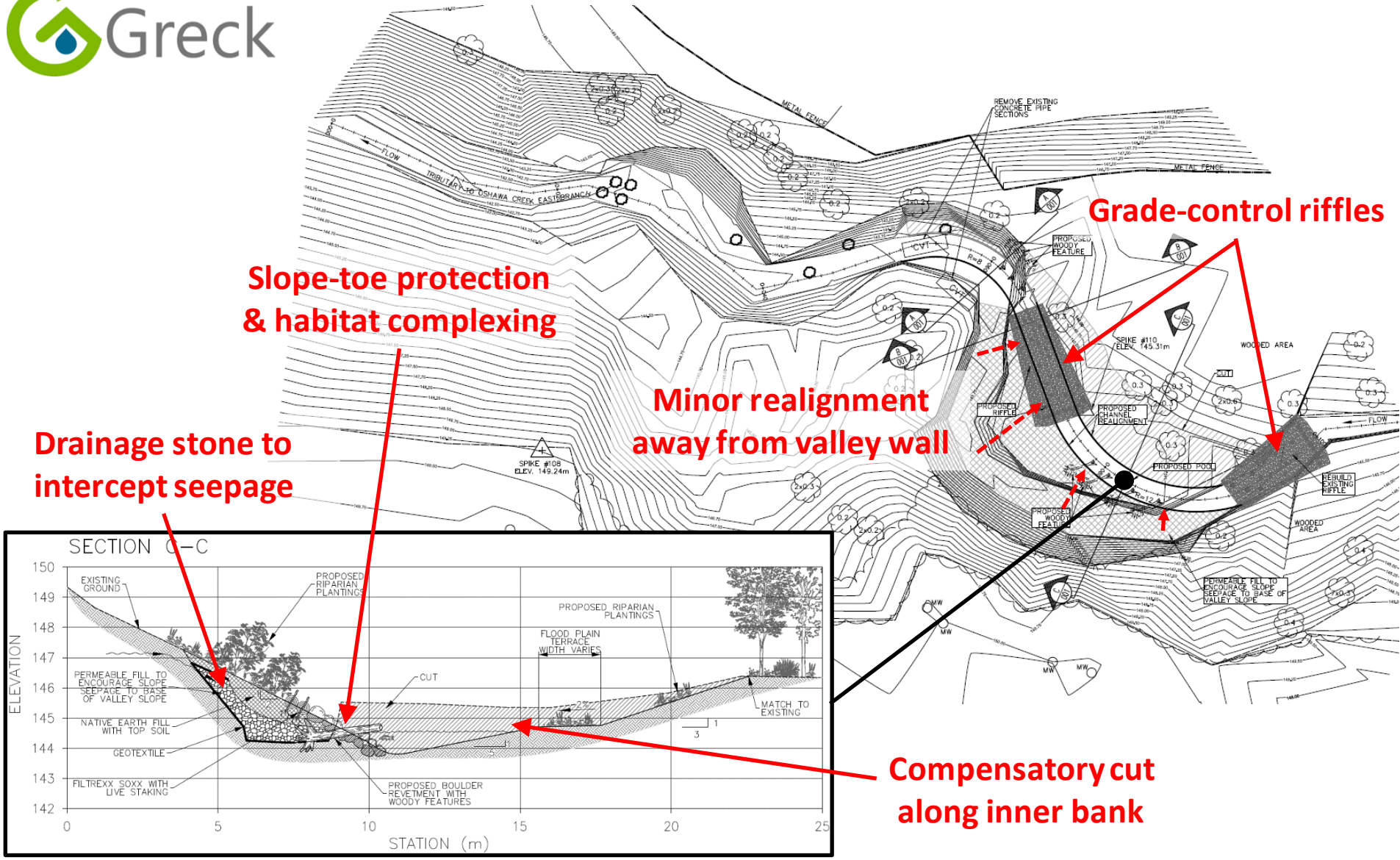
Greck

Site 1 – concept plan



Next steps

- Detailed design, permitting & tendering
  - Underway
- Implementation
  - Summer 2017 construction – Sites 1, 10 & 11?
  - Summer 2018 – Sites 7 & 15?
- Construction supervision

Questions?

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