



**NY Power
Authority**

**Canal
Corporation**

Canal's Earthen Embankment Integrity Program (EEIP)

Summary of Revisions to the Guidebook



Contents

1. Earthen Embankment Integrity Program overview
2. Overview of maintenance methodologies
3. Summary of Guide Book revisions specific to community aesthetic impacts

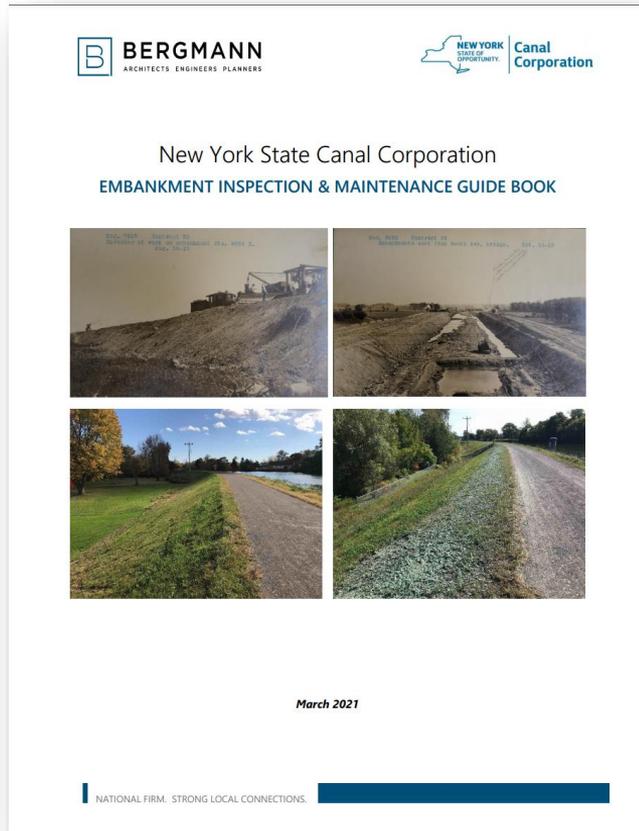
The Earthen Embankment Integrity Program

- The Earthen Embankment Integrity Program is also called the “**EEIP.**”
 - Canal Corporation's initiative to create a **comprehensive and programmatic approach** to restore, maintain and manage earthen embankments.
 - An “**earthen embankment**” is an engineered structure or dam wall of the canal which is made from soil, rock, clay, and other “earthen material” *and* impounds (holds) water for a prolonged period above the adjacent land surface elevation

EEIP: The
name of
the program



The Inspection and Maintenance Guide Book



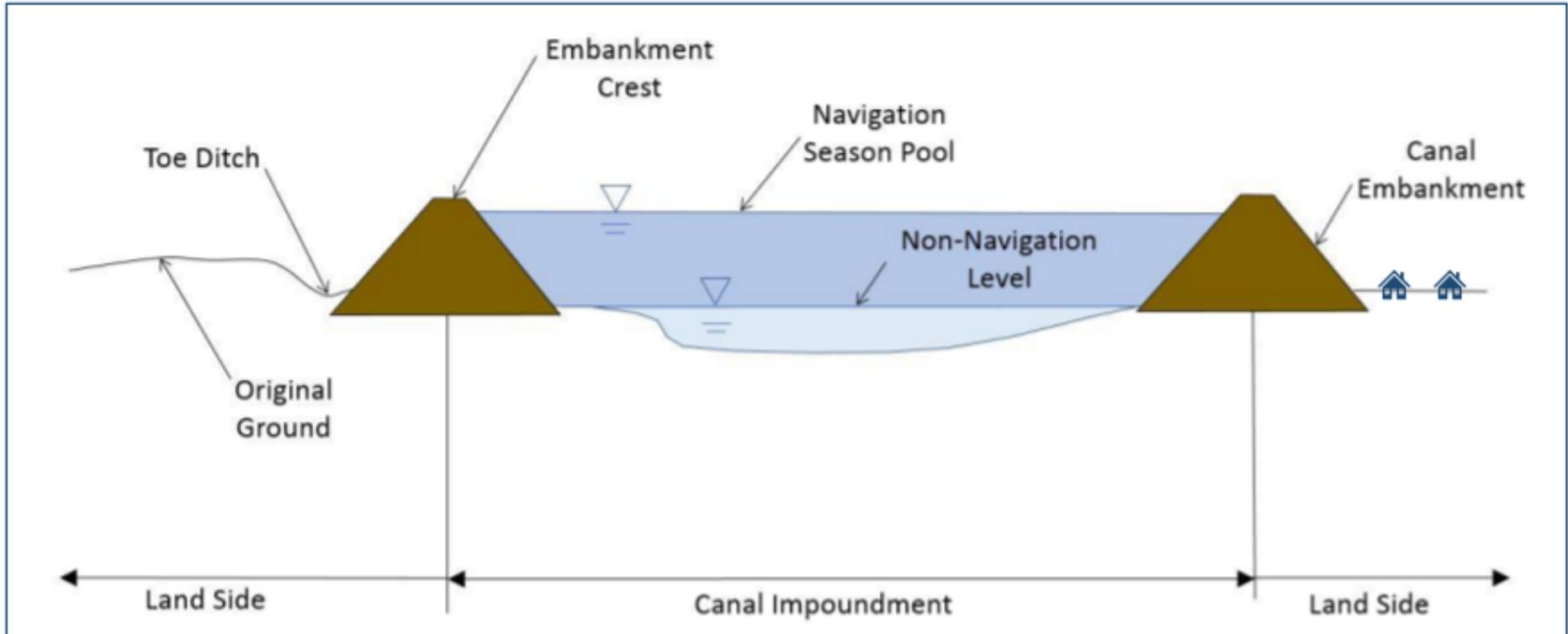
The Guide Book:

a manual for how Canals and its contractors will administer inspections and maintenance under the Earthen Embankment Integrity Program



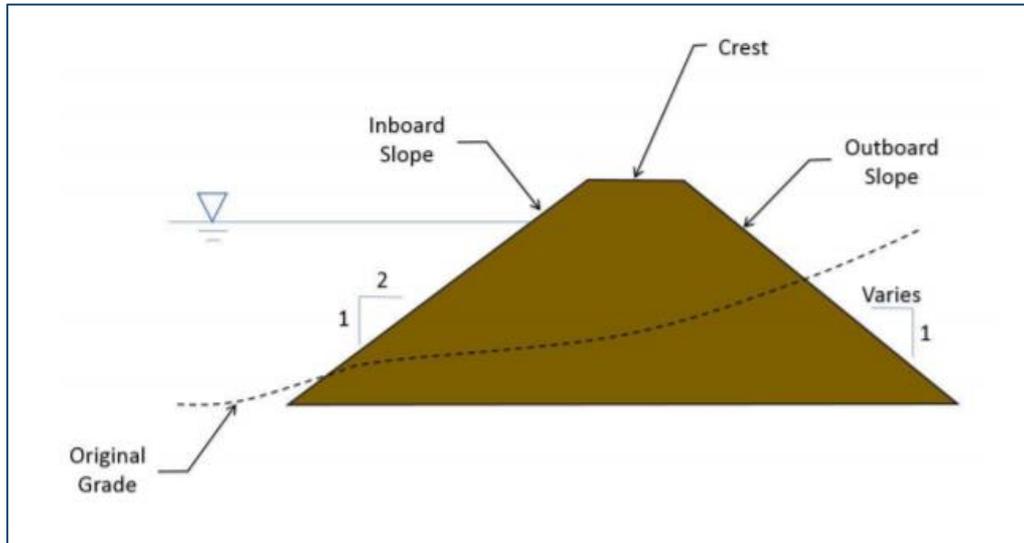
Components of Water-Retaining Earthen Embankments

Features of Canal Impoundments



Components of Water-Retaining Earthen Embankments

Canal Embankment Detail



Outboard Slope: Refers to the landward side of the embankment beginning at the top.

Inboard Slope: Refers to the water-ward side of the embankment, beginning at the top, water-ward crest edge.

Crest: Refers to the top, typically flat portion of the embankment.

Maintenance Measures and Methods

Earthen Embankment Maintenance

Routine Measures

- Operations: reduced water levels
- Grout: Fill animal burrows and voids from overturned trees
- Erosion control: Slope repair, vegetation removal, and turf establishment
- Seepage mitigation: Filter blanket installation
- Monitoring: weir boxes and piezometers

Engineered Solutions

- Clay cutoff walls
- Sheet piling
- Polyurethane grouting

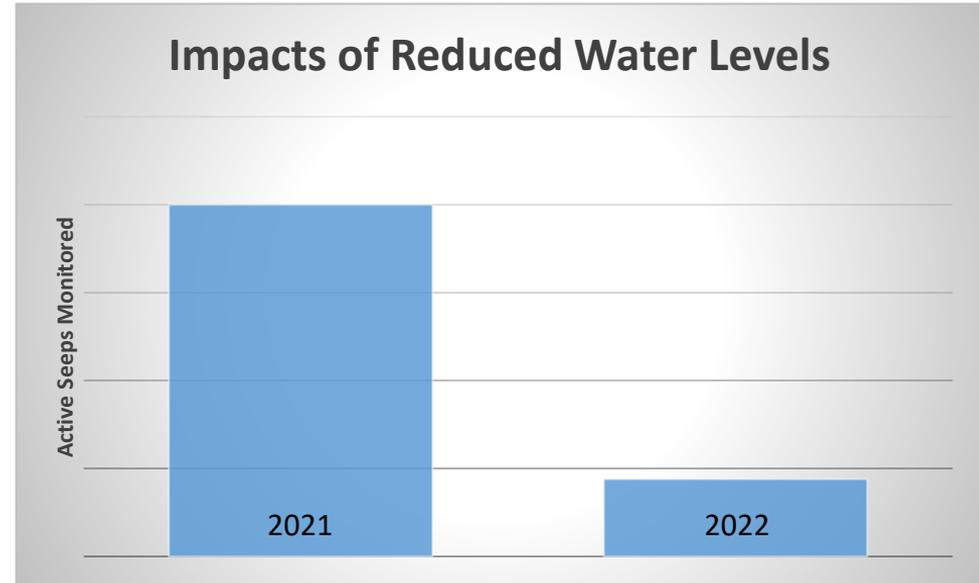


Reduced Water Levels

An operational measure that can significantly reduce seepage

- **Measures taken:**
 - Average depth reduced by 12" in 77-mile segment of Canal
 - Increased seep monitoring to daily inspections
- **Results:**
 - Active seeps reduced by 78% compared to known active seeps in 2021
 - In 2021, there were over 200 active seeps in the Western NY region
 - Risk of **pipng*** is greatly reduced

***Piping:** internal erosion that takes place when water that seeps through the dam carries soil particles away from the embankment. Piping can occur when woody roots decompose and create voids.



Effective as a temporary risk reduction measure



NY Power Authority

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Earthen Embankment Maintenance

Vegetation Removal in Royalton:

Before



After



Earthen Embankment Maintenance

Filter Blanket Installation

Royalton



Albion



Earthen Embankment Maintenance

Sinkhole and Clay Cut-Off Wall Solution

Sinkhole



Clay Cut-Off Wall Installation



Earthen Embankment Maintenance

2021 Sheet Pile Installation in Brockport (result of a seep that became a boil):



Earthen Embankment Maintenance

2021 Polyurethane Grouting in Lockport (active seep for 20 years):



Guide Book Revisions

Community Thresholds

Regulatory (R) and Community (C) Thresholds

Could EEIP activities negatively impact any of the following?



R - Sites with Federal or State rare, threatened, or endangered plant species



R - Occupied habitats of any rare, threatened or endangered species



R - Sites with Critical Environmental Areas designations



R - Wetlands in the Montezuma Marshes National Natural Landmark



C - The aesthetic, historic or recreational functions of any local parks



R - Sites on the State or National Registers of historic places that would be adversely affected by EEIP activity



C - The aesthetic resource of local importance has been documented in an adopted plan or zoning and EEIP maintenance activities would damage aesthetic character

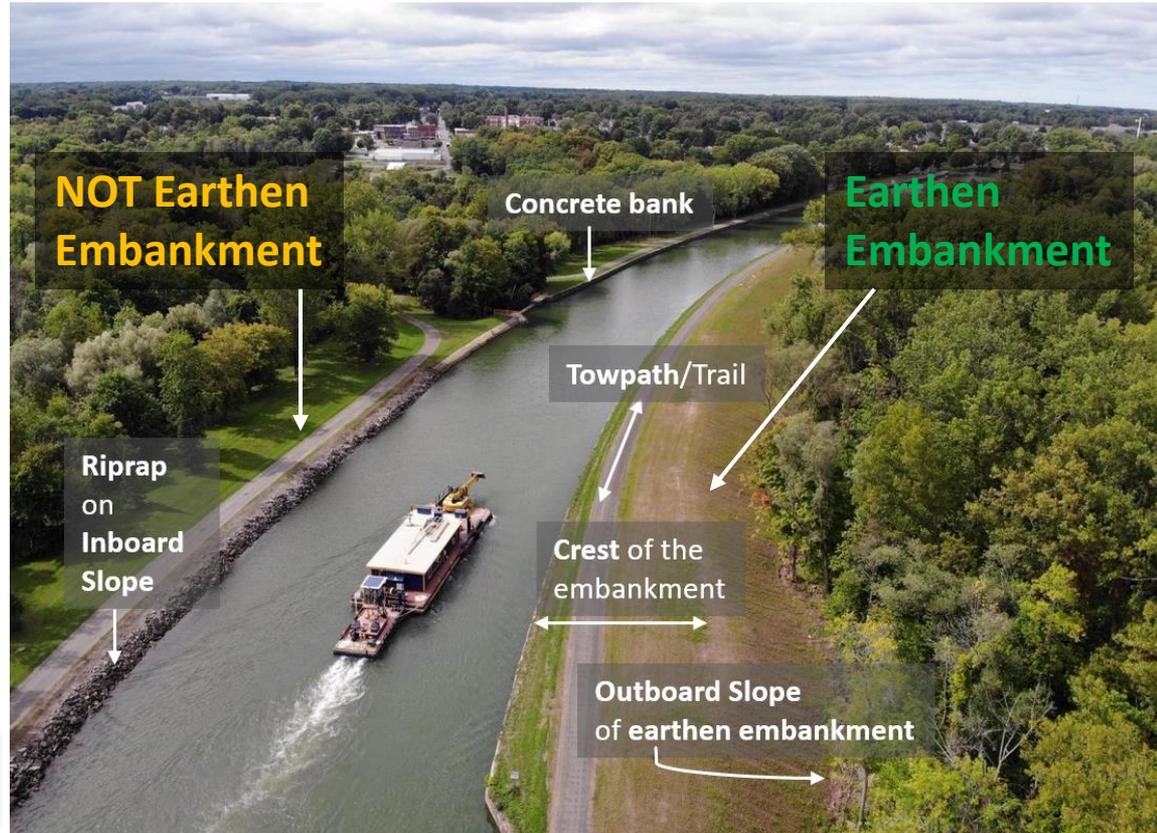


C - Inconsistent with an approved Local Waterfront Revitalization Program (LWRP).

Where the EEIP Does NOT Apply

- About 12% of the NYS Canal System is made of elevated earthen embankments.
- The remaining 88% are comprised of non-earthen embankments including:
 - Land cut sections where adjacent lands are higher than the impounded canal water
 - “Riverine” sections and lakes

A searchable map is now available for the public to see where embankments are located.
<https://www.nyscanalintegrity.org/>



Community Threshold Exceeded

- When a project is identified adjacent to a park, within a Local Waterfront Development Area, or under other conditions that **exceed Community Thresholds**:
 - An *arborist* and a *landscape architect* will participate in the development of conceptual design alternatives
 - In addition to design aligned with best management practices, a **minimum of two alternatives** will be presented to the impacted community



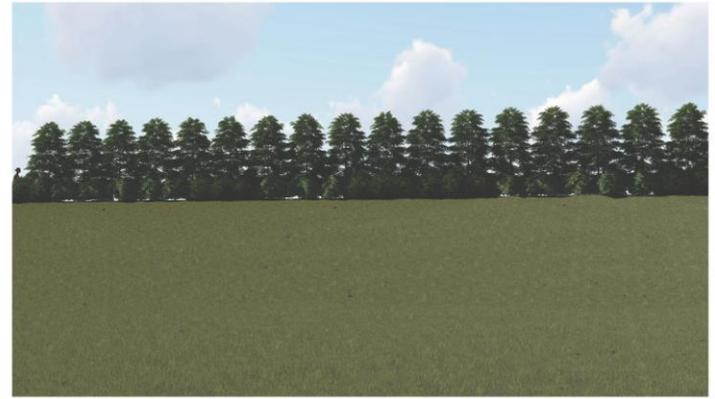
Photo Credit: Wachtel Tree Science

Compatible Vegetation

Each project will include a design aligned with best management practices.

This may include mitigative plantings including the following:

- Pollinator gardens or meadows
- Native plantings including trees, shrubs, and grasses with shallow root systems (detailed in the Guide Book)



Example: screening vegetation at embankment crest



Example: mature pollinator meadow

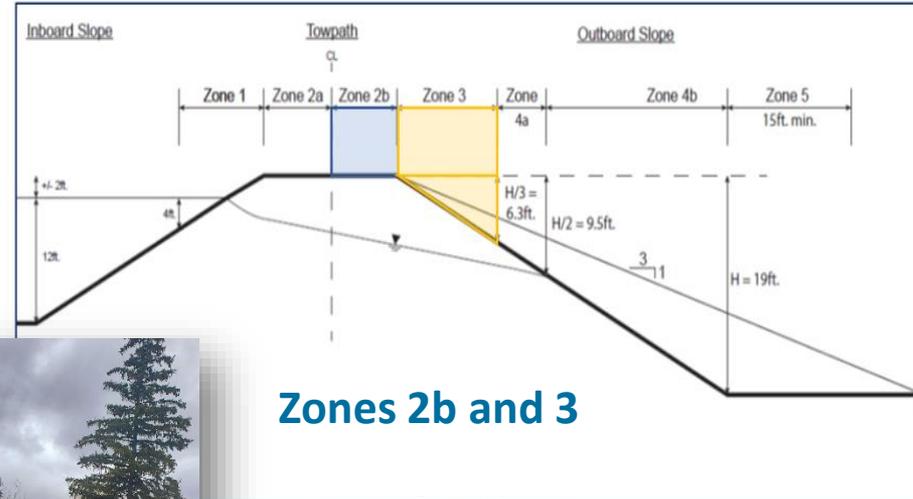
Example: Greece Canal Park



Conceptual Design Alternative #1

The community is presented with a design alternative which leaves healthy, mature trees in Zones 2B and 3.

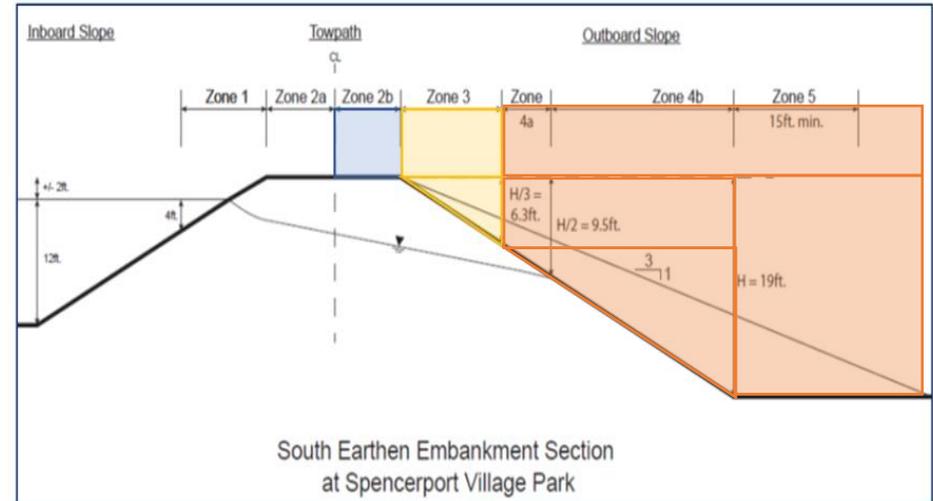
The **arborist** and the **landscape architect** participate in the alternative design to ensure health of trees and aesthetic qualities of the design.



Conceptual Design Alternative #2

Community Impact Cannot be Mitigated

- If the **alternative designs do not satisfy community aesthetic impacts**, they may elect to forego an immediate repair
- In this case, healthy, mature trees would be preserved on the *entire outboard slope* with limited exceptions for installation of filter blankets
- Embankment segment would be closely monitored for a period of **five years**
- Monitoring equipment like **piezometers** or **weir boxes** may be installed
- Water levels *may* be reduced



NYS Canal Integrity.org



Key terminology

Earthen Embankment

An **earthen embankment** is an engineered structure or dam wall of the canal, which is made from soil, rock, clay, and other "earthen material" and impounds (holds) water for a prolonged period above the adjacent land surface elevation.

[View some examples of embankments here.](#)

Hazard classification

Refers to the damage or hazard that may be posed by the failure of a dam. The Hazard Classifications are:

- Class "A" (low hazard);
- Class "B" (intermediate hazard);
- Class "C" (high hazard); and

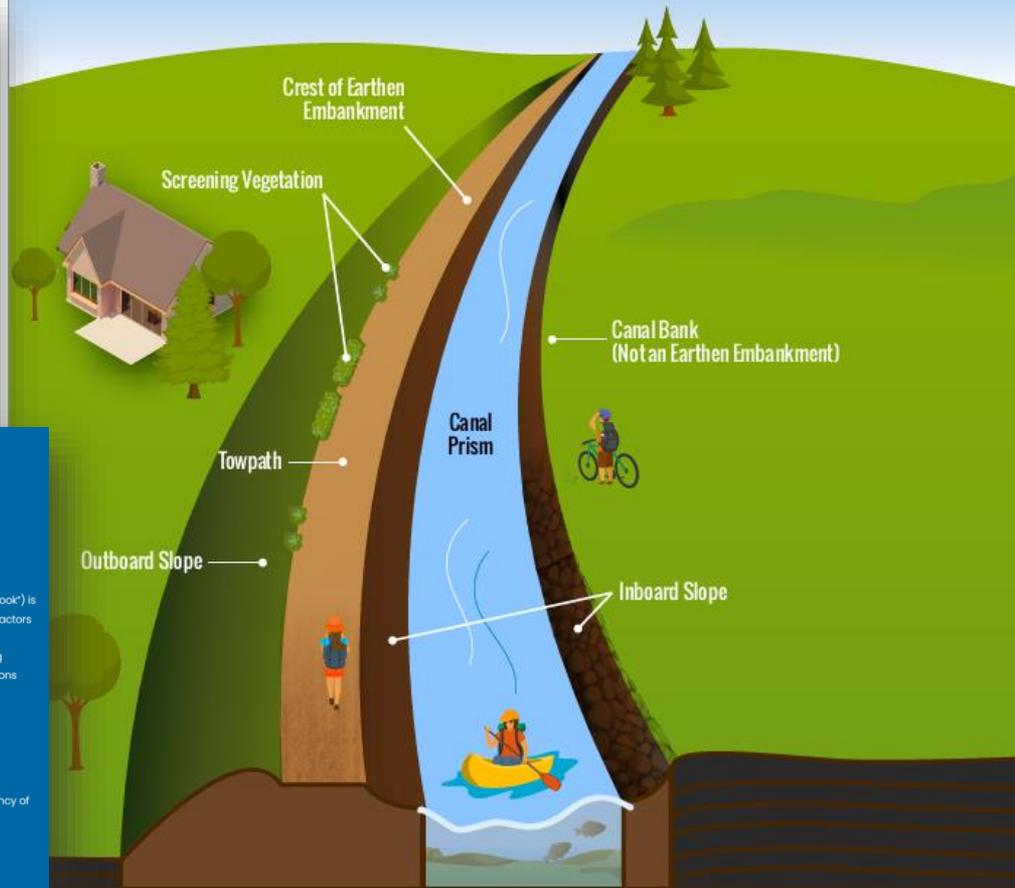
The Guidebook

The draft **Embankment Management Guidebook** (the "Guidebook") is a manual or playbook that the Canal Corporation staff or contractors will use when they inspect, restore and maintain engineered embankments, including repairing seeps (leaks) and managing vegetation on certain portions of the embankments so inspections can be performed. [The Guidebook can be found here.](#)

Condition Rating

A numeric system that rates the level of deterioration or deficiency of an earthen embankment dam.

- The Condition Ratings are:
- "1" (serious/emergency);





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