Milwaukee County
Flushing Channel Project
Public Information Presentation

January 2021

Milwaukee County Parks

Milwaukee County

Collins Engineers, Inc.

Milwaukee County Flushing Channel Project Team

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Milwaukee County Flushing Channel

Presentation Outline

- Provide history and overview of flushing channel site and existing conditions
- Review investigations of existing conditions and related findings
- Provide possible options for rehabilitation of flushing channel walls
- Review County's preferred options for wall rehabilitation and associated cost
- Receive public comments about the project

Milwaukee County Flushing Channel Project Location Map

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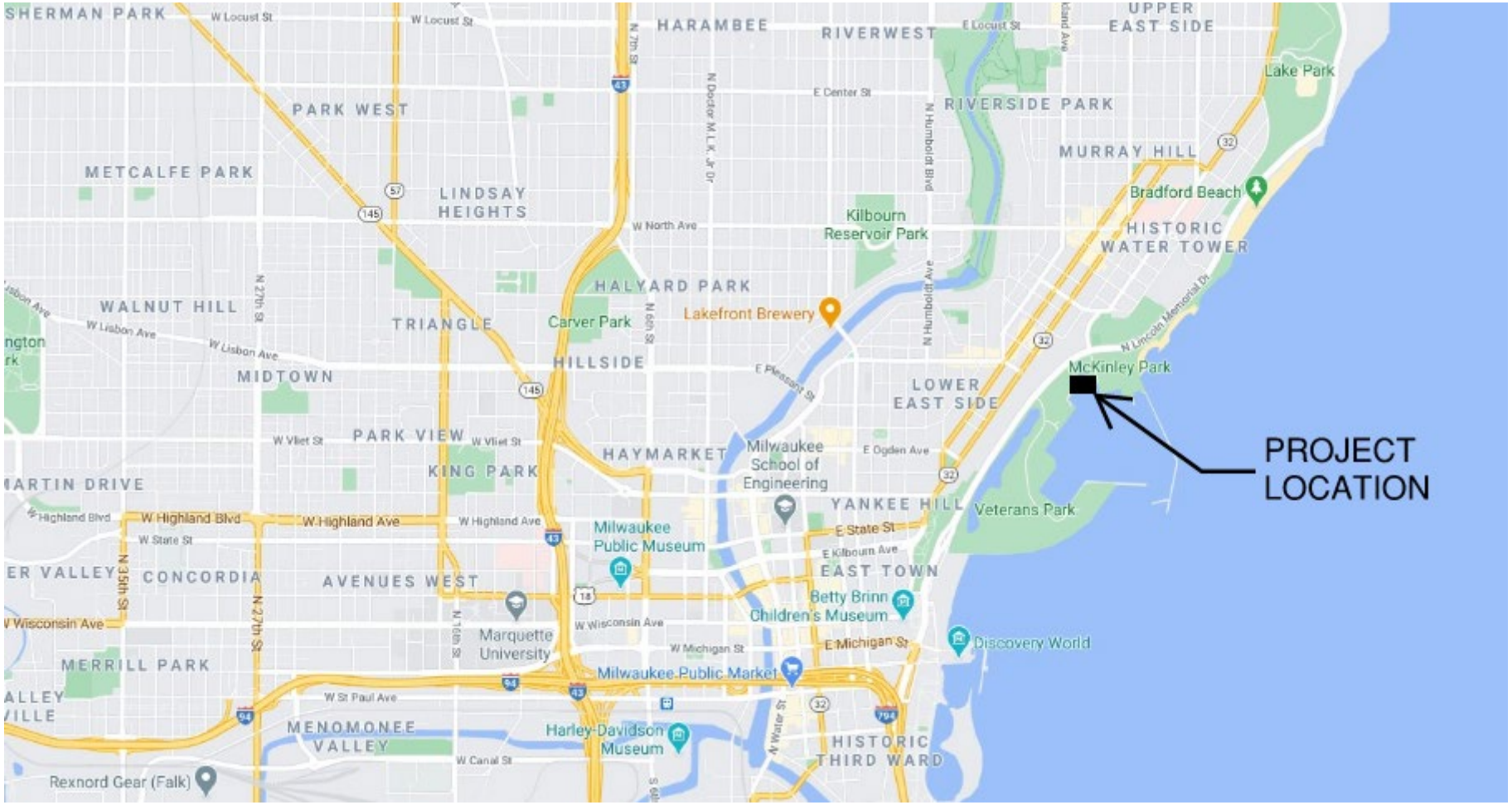

Milwaukee County Flushing Channel Location and Overview

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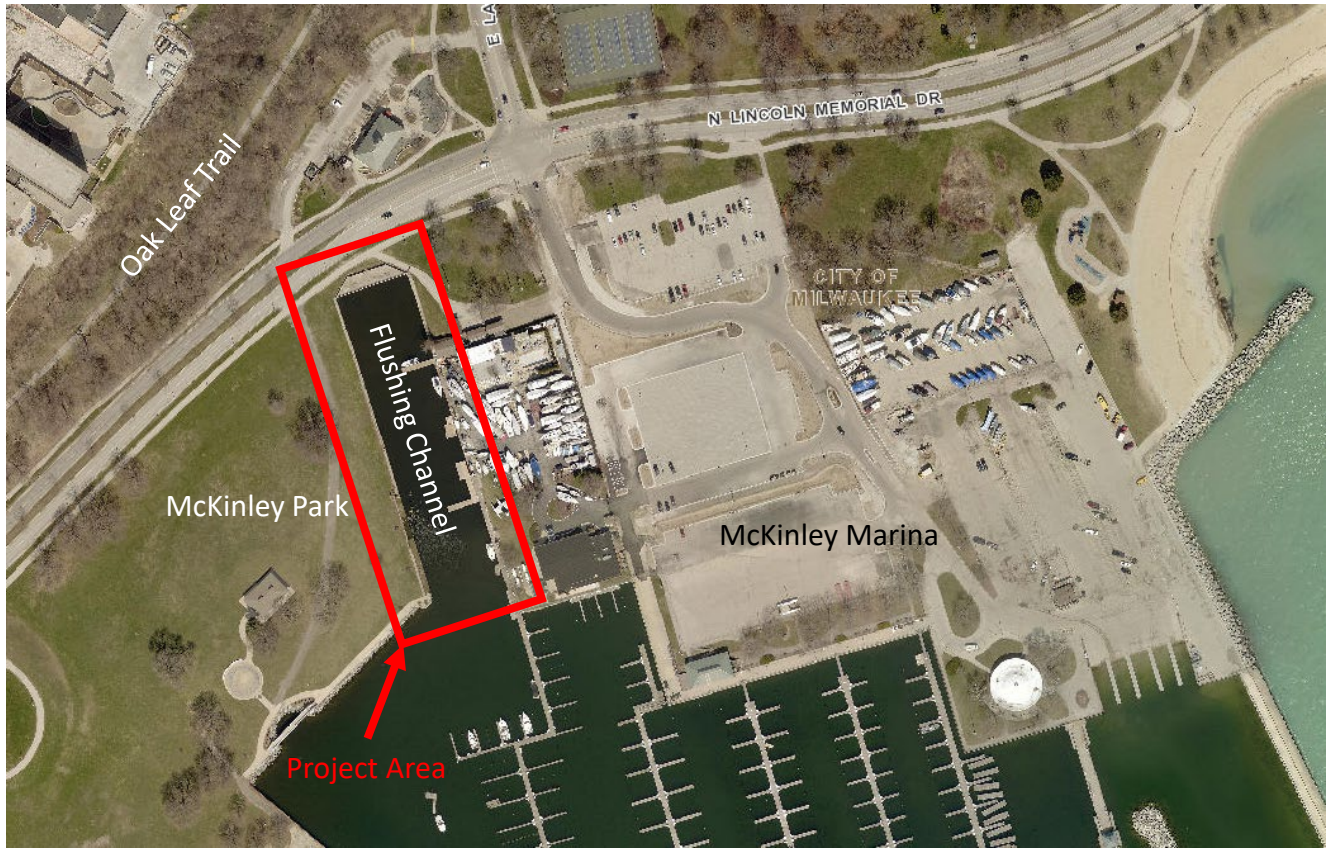
- Located in McKinley Park adjacent to Lincoln Memorial Drive and Milwaukee Yacht Club
- Headwall inlet structure is owned by the Milwaukee Metropolitan Sewerage District (MMSD) and is not a part of this project



Milwaukee County Flushing Channel Site History

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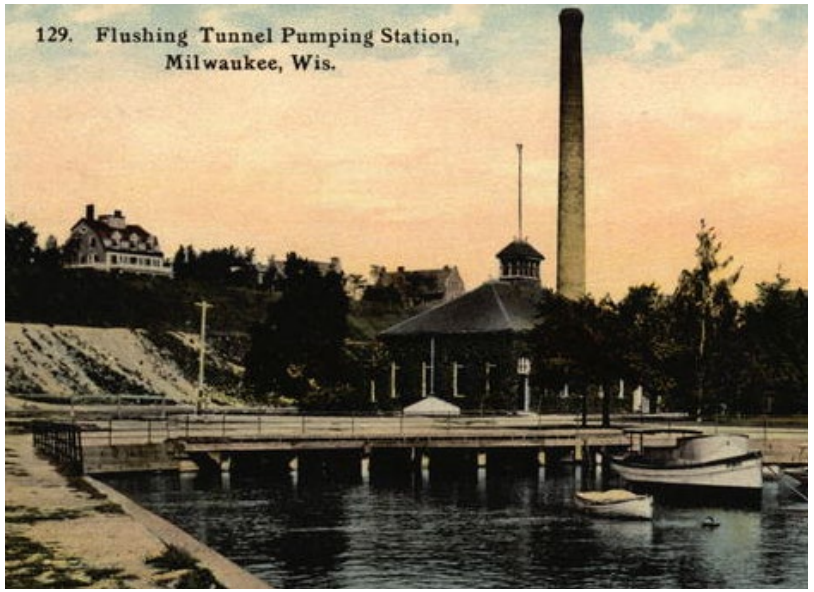
- **1888:** Flushing tunnel, channel, and pump station established
- **1955:** Ownership transferred from the City of Milwaukee to MMSD
- **1992:** Pump operations discontinued
- **PRESENT DAY:** Pump station now occupied by Collectivo Coffee and the channel is used for boat navigation



Milwaukee County Flushing Channel

Existing Channel Wall Construction

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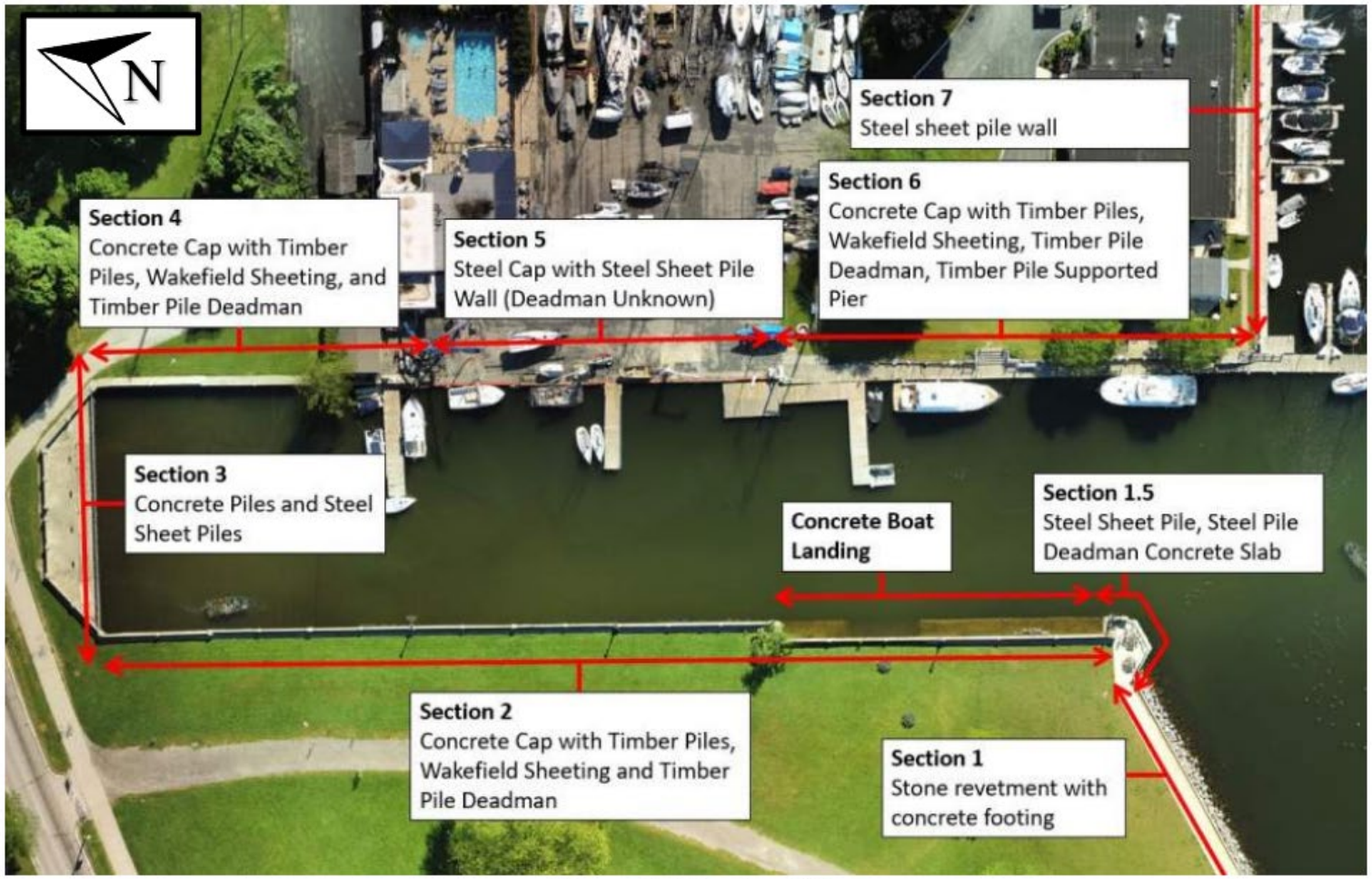

Milwaukee County Flushing Channel

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Purpose and Scope

- Existing walls have reached the end of their service life

- Material loss behind the wall poses a safety hazard

Milwaukee County Flushing Channel

Methods of Investigation

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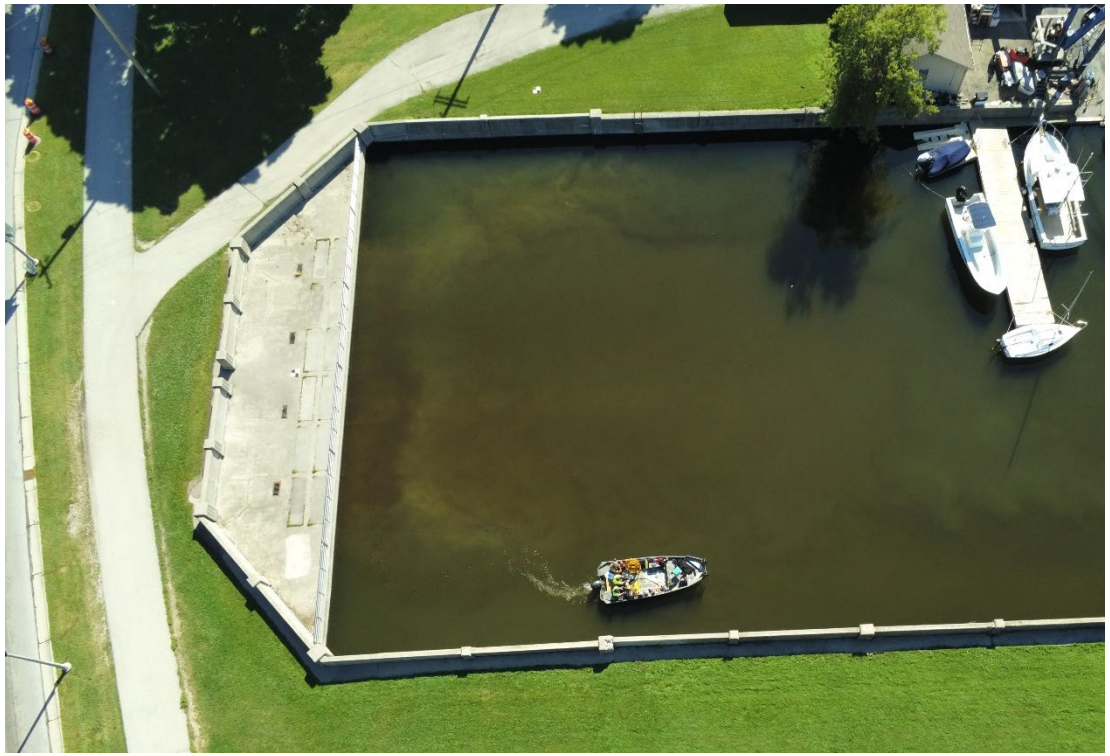
- Underwater Inspection:
  - Visual and tactile inspection of submerged sections
  - Cleaned and inspected sample areas approx. every 100 feet
  - Ultrasonic thickness readings were taken on steel sheet pile Hydrographic survey to obtain channel bottom elevations
- Above Ground Inspection:
  - Non-submerged wall sections inspected visually
  - UAS (drone) survey performed to collect existing terrestrial data
- Soil Borings
  - Soil borings taken to obtain geotechnical information
- Record Documents
  - Original design plans and record documentation was reviewed



Aerial photo obtained from drone survey

Milwaukee County Flushing Channel Above Ground Inspection Findings

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- Settlement
- Concrete wall sections rotating towards the channel

- Deteriorated concrete with exposed steel reinforcement

Milwaukee County Flushing Channel Underwater Inspection Findings

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- Timber walls below water level are in severe deteriorated condition
- Sheet pile walls along east side exhibiting corrosion

- Holes in timber walls below water are causing sinkholes along the west side of channel

Milwaukee County Flushing Channel Design Considerations

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- Design loads and geotechnical factors
- Historically high water level in Lake Michigan
- Proximity of adjacent buildings and amenities
- Varying wall sections and alignments due to previous maintenance
- Milwaukee Yacht Club access and loading area
- Need to preserve historical elements

Milwaukee County Flushing Channel Design Considerations

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- Milwaukee Yacht Club Factors
  - Varying existing conditions and alignment
  - Existing crane operations
  - Structures/material behind existing sheet pile wall

Milwaukee County Flushing Channel Rehabilitation Alternative

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- Maintaining existing walls prohibitively expensive and will have a short service life

Milwaukee County Flushing Channel Replacement Alternatives

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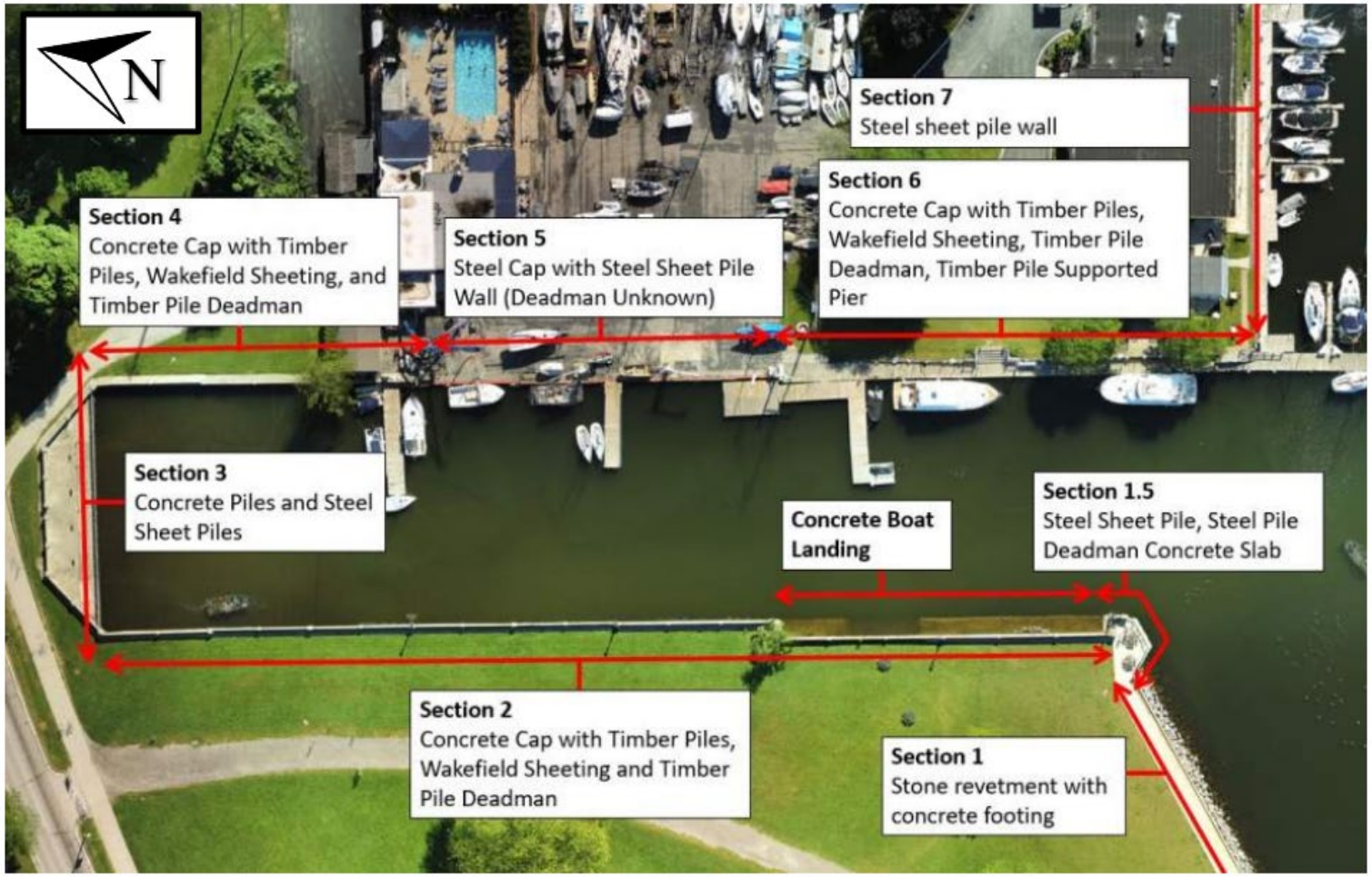

- Section 2 Alternatives:
  - Riprap revetment
  - New sheet pile bulkhead
- Sections 4, 5 & 6 Alternatives:
  - New sheet pile bulkhead with tiebacks or grouted anchors
- Additional Section 5 Alternative:
  - Fiber reinforced polymer (FRP) panels and cathodic protection.

Milwaukee County Flushing Channel Replacement Alternatives – Section 2

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- New Stone Revetment

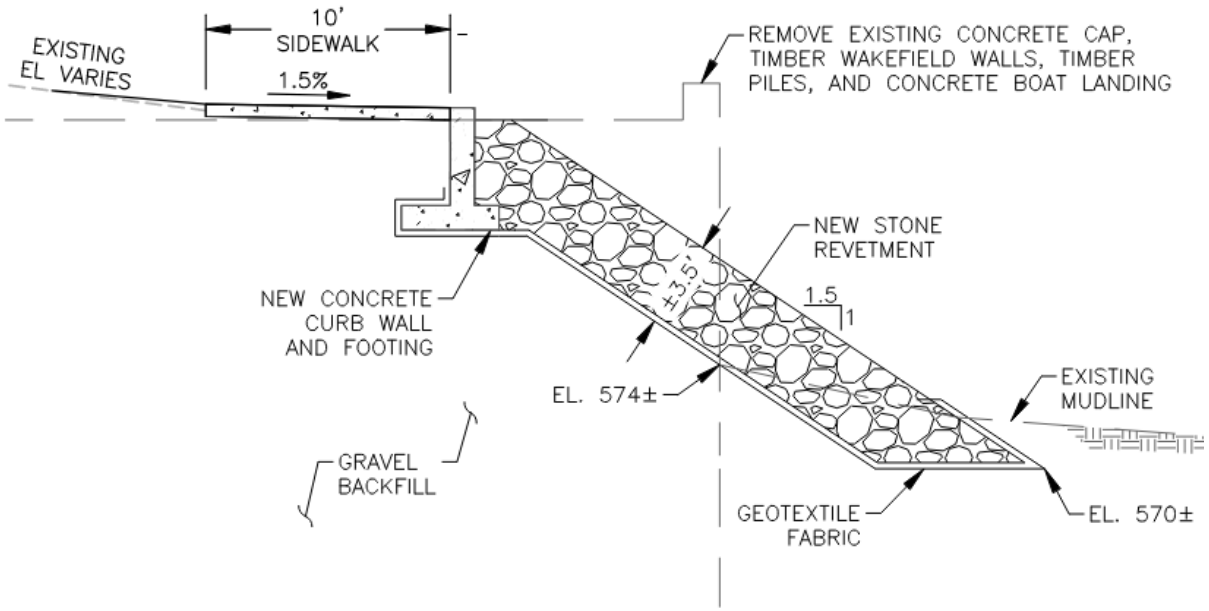

Diagram 3: Riprap Revetment

Advantages	Disadvantages
• Visually similar to recent project	• Shorter service life • High wave action can cause movement of riprap (maintenance) • Requires demolition of existing wall to mudline • Loss of land along wall • Installation of steel sheet pile still required near pavilion (Section 1.5) and MMSD headwall (Section 3) • Potential limitation to vessels utilizing the channel

Milwaukee County Flushing Channel Replacement Alternatives – Sections 4, 5, 6

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- New Steel Sheet Pile With Grouted Anchors

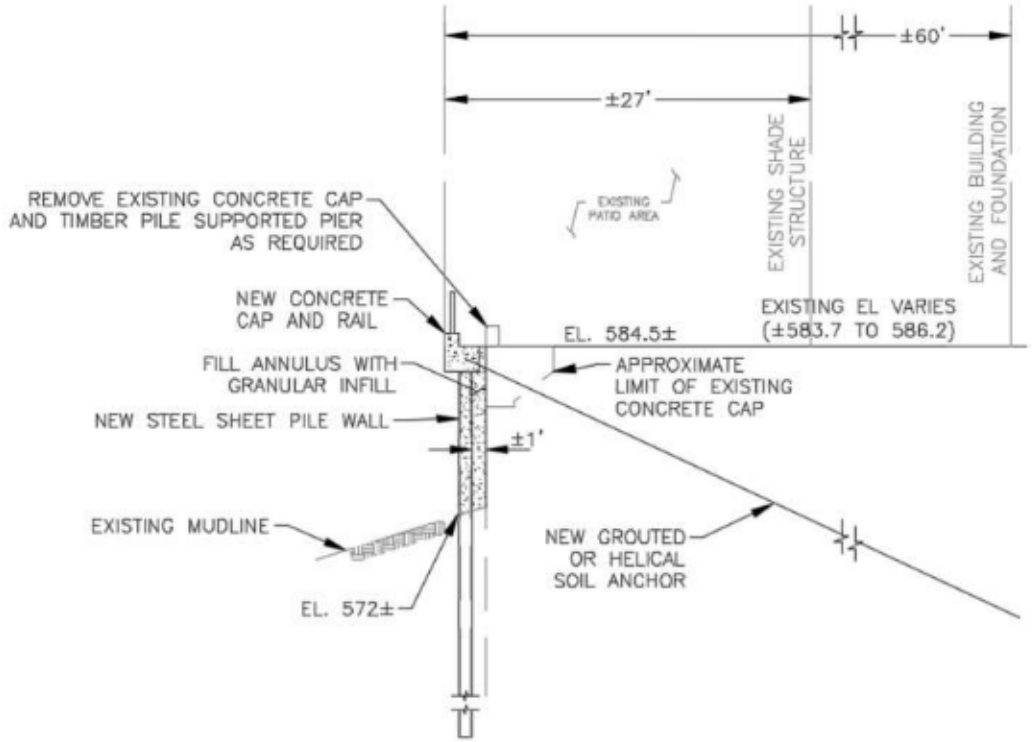

Diagram 4: Steel Sheet Pile with Grouted Anchors (in location of Clubhouse)

Advantages	Disadvantages
• Less disruptive to existing structures behind the wall	• Potential additional construction costs due to unknown conditions • Specialty contractor work • Typically more expensive than deadman tiebacks • May have more lateral movement than deadman tiebacks • Requires barge work to drill anchors from front face of wall

Milwaukee County Flushing Channel Replacement Alternatives – Sections 2, 4, 5, 6

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- New Steel Sheet Pile (SSP) Wall And Concrete Cap With Deadman Tie-back System

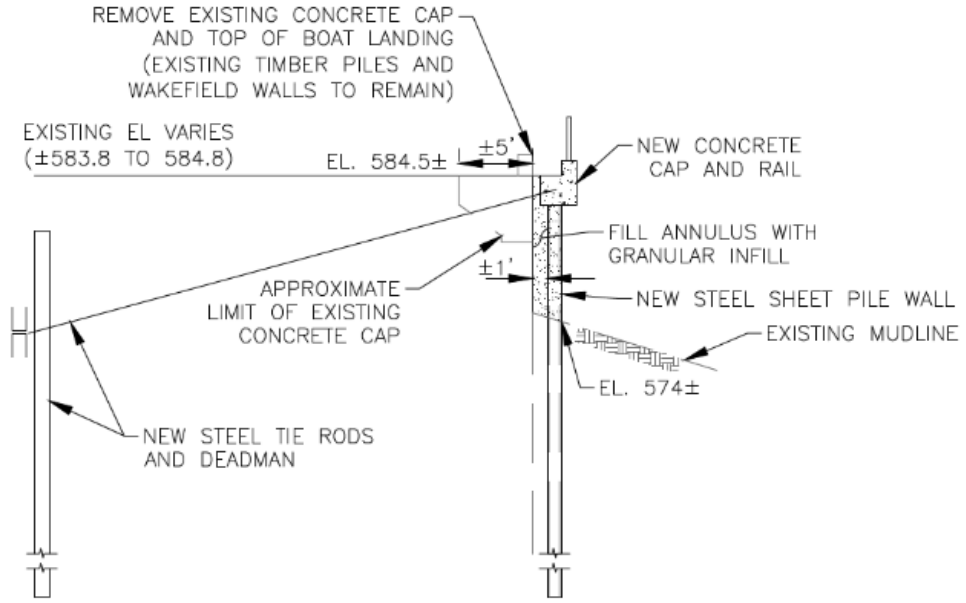

Diagram 2: Steel Sheet Pile with Deadman Tieback

Advantages	Disadvantages
• Longer service life • Requires less demolition • Maintains landside area in park • Public water access easy to maintain • Less long-term maintenance costs • Similar to existing wall with minimal channel disturbance	• Excavation may require dewatering

Milwaukee County Flushing Channel Replacement Alternatives – Section 5

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- Fiber Reinforced Polymer (FRP) Panels and Grout To Be Installed Only From Channel Bottom Up To Existing Wale

Advantages	Disadvantages
• Does not require crane relocation • Lower construction cost than new wall	• Limited case use history • Recommended inspection and maintenance of existing wale and tieback system • Service life may not be the same as a new steel sheet pile wall

Milwaukee County Flushing Channel Replacement Alternatives – Section 5

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- Cathodic Protection would consists of sacrificial anodes made of zinc alloy which are attached to the existing steel sheet piling.
- Widely use corrosion protection method.

Advantages	Disadvantages
• Does not require crane relocation • Does not require full rehabilitation of the sheet pile wall • Lower construction cost • Does not require maintenance within selected design life and anodes can be replaced	• Thorough underwater inspection necessary for design • Anodes should be routinely monitored • Will require eventual replacement of the steel sheet pile bulkhead

Milwaukee County Flushing Channel

Selected Alternatives

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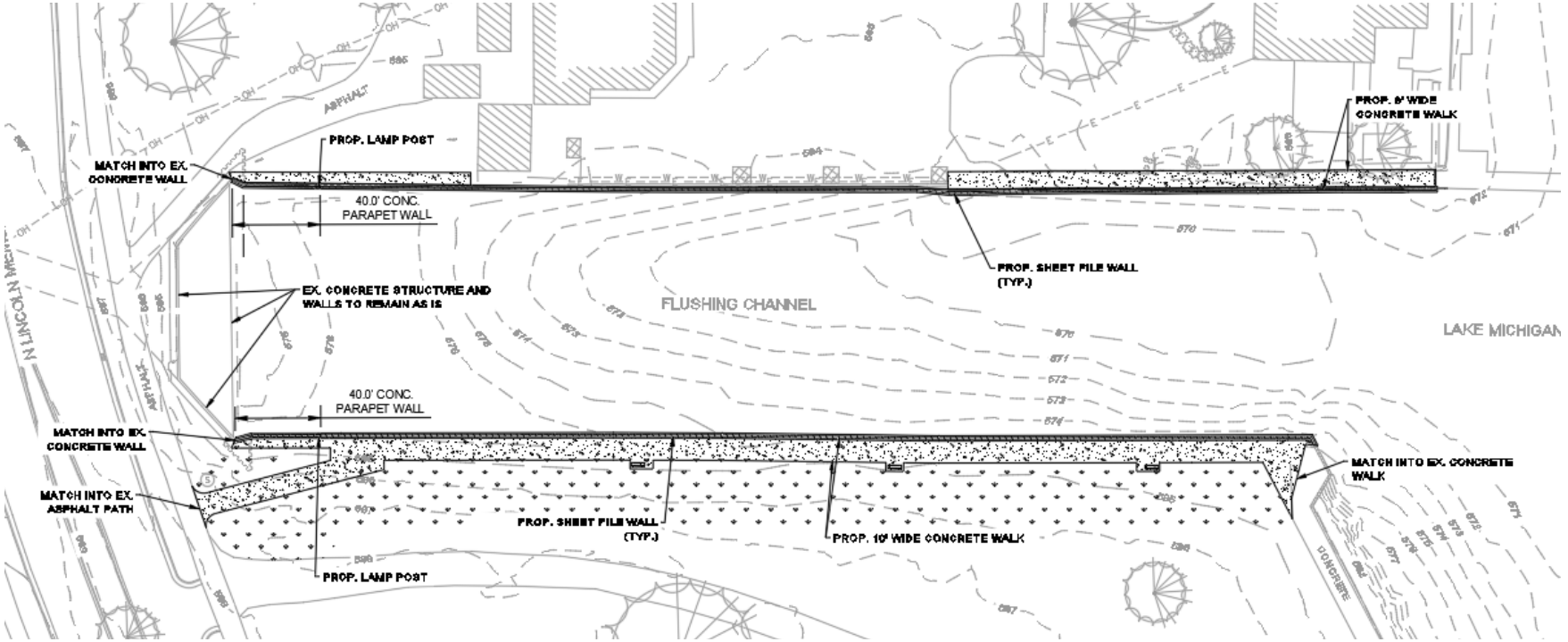
- **Sections 2, 4, & 6**
  - New steel sheet pile in front of existing wall with tieback anchors and concrete cap
  - New parapet walls near the MMSD headwall in Sections 2 and 4 with safety railings farther south
  - Concrete walk in Section 2
  - Yacht Club lot access to be maintained
- **Section 5**
  - FRP panels and grout on existing steel sheeting



Milwaukee County Flushing Channel Selected Alternatives

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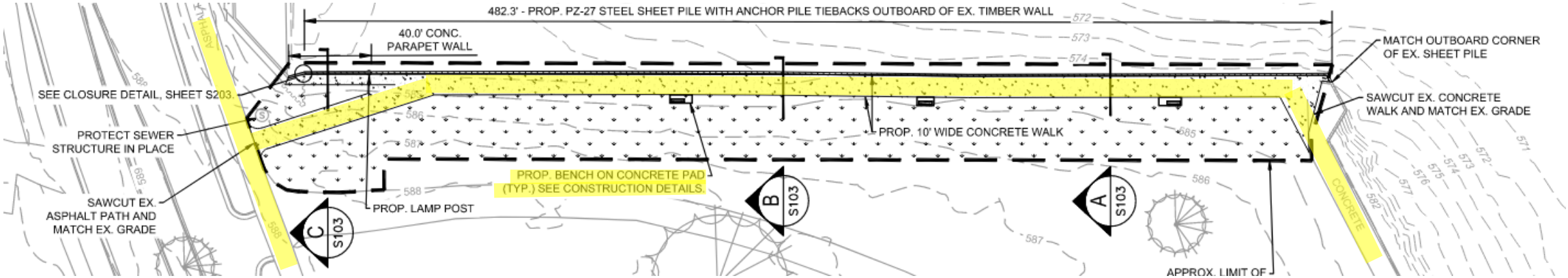

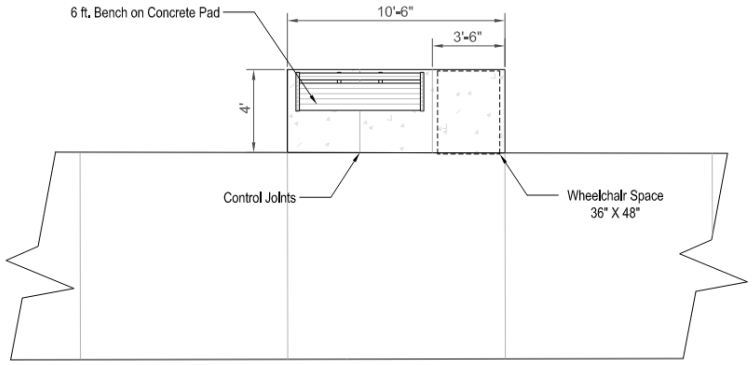

BENCH ON CONCRETE PAD WITH COMPANION WHEELCHAIR SPACE

- ADA access and accommodations will be included
- Pedestrian access extended to other walkways
- Benches with wheelchair space added along new walkway

Milwaukee County Flushing Channel Selected Alternatives

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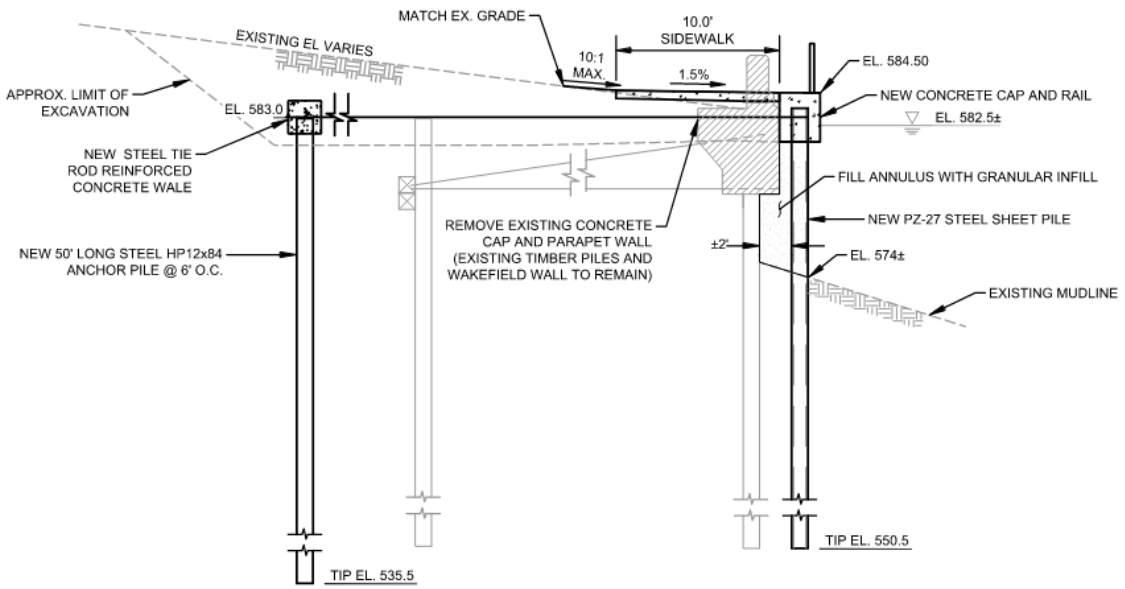
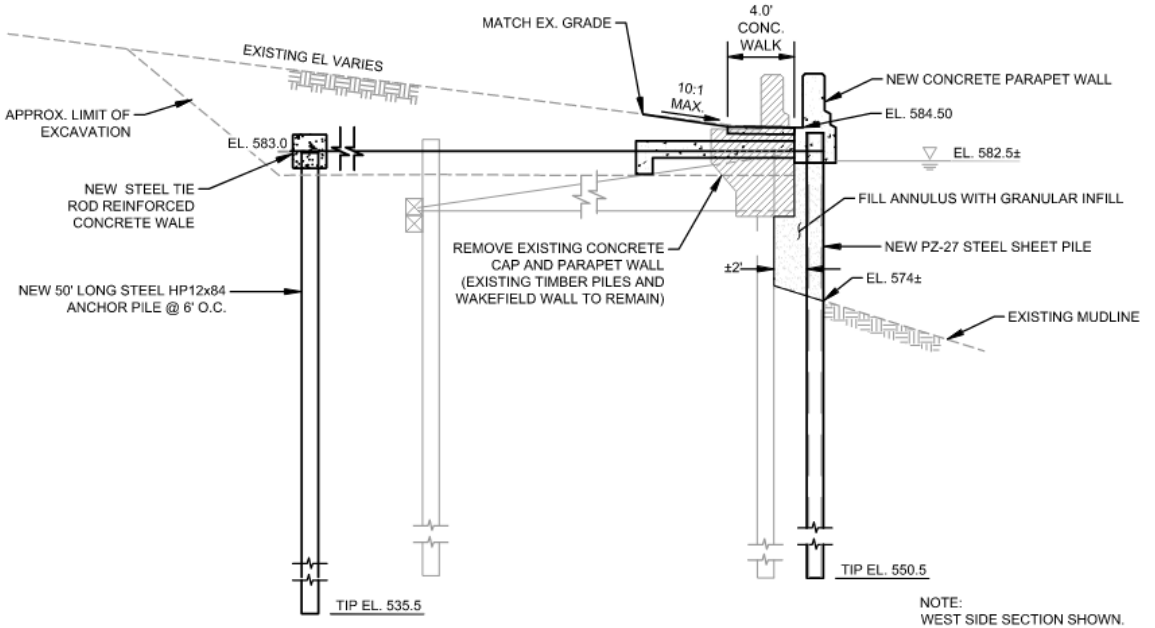


C401 B PROP. WEST WALL SECTION

NOT TO SCALE



C401 C PROP. CONCRETE PARAPET WALL SECTION

NOT TO SCALE

Milwaukee County Flushing Channel Selected Alternatives

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- Historic preservation of flushing channel
- New concrete parapet wall will extend approximately 40 feet from existing headwall
- New parapet wall will reflect the design of the existing headwall

EXISTING HEADWALL AND PARAPET WALL

Milwaukee County Flushing Channel Architectural Renderings

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Milwaukee County Flushing Channel Architectural Renderings

COLLINS ENGINEERS INC.

Milwaukee County Flushing Channel Schedule and Estimated Cost

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- Final Design Completed – Early 2021
- Advertised For Bid – To Be Determined
- Construction – To Be Determined
- Total Estimated Construction Cost $3,750,000.

Thank you.
Questions and comments may be submitted via website

COLLINS ENGINEERS INC.