

Milwaukee County Flushing Channel Project Public Information Presentation

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COLLINS
ENGINEERS INC.

Milwaukee County Flushing Channel

Project Team



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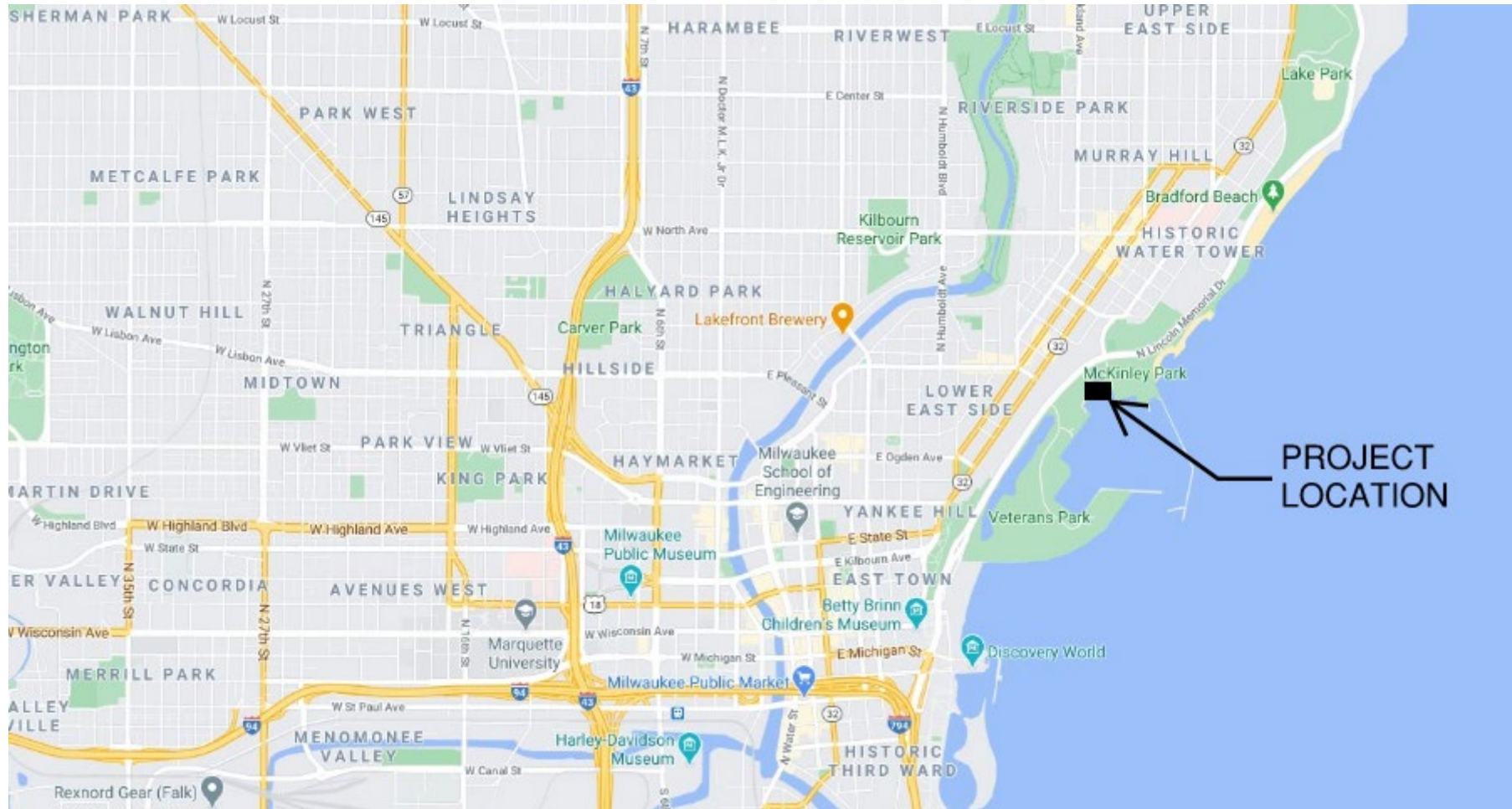
Milwaukee County Flushing Channel

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



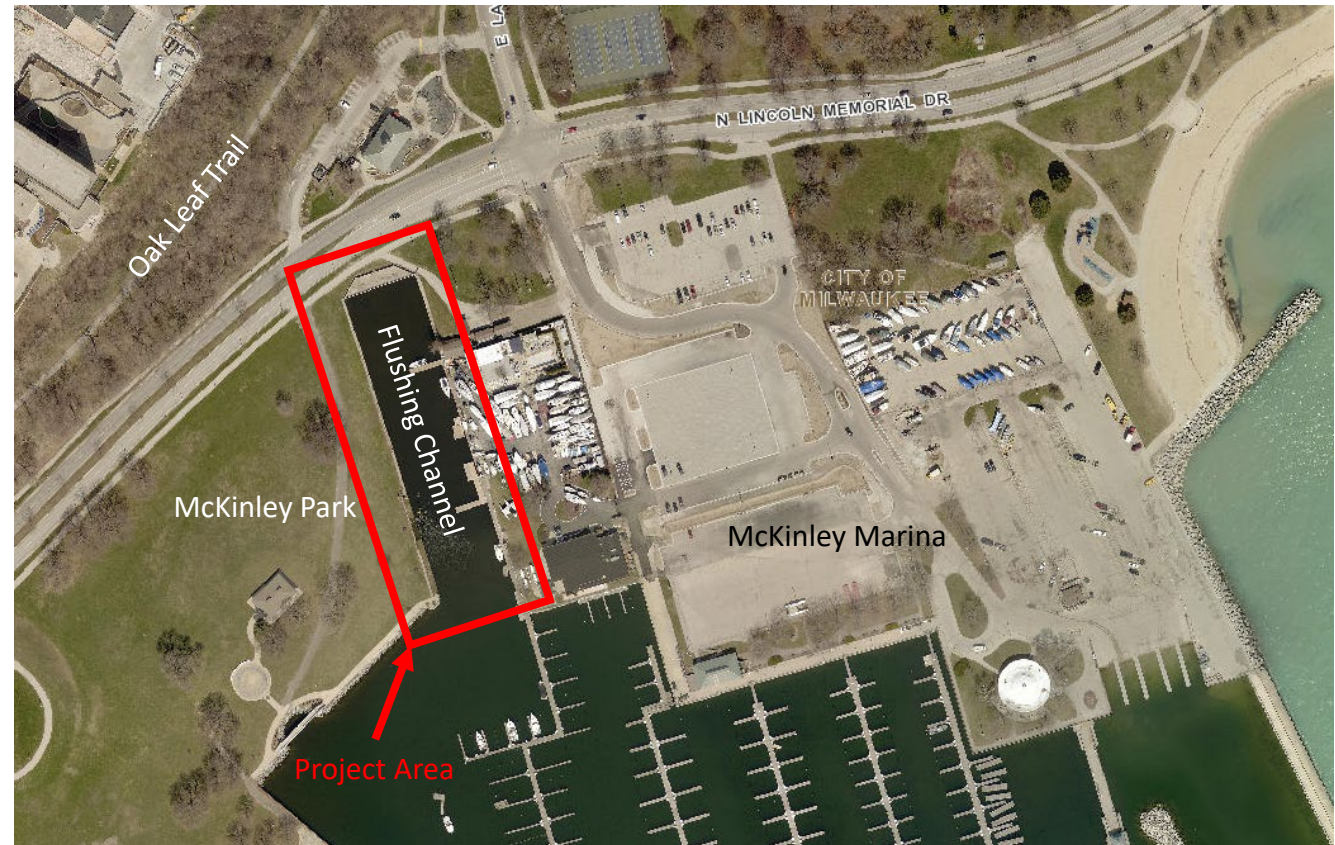
Milwaukee County Flushing Channel Project Location Map



Milwaukee County Flushing Channel

Location and Overview

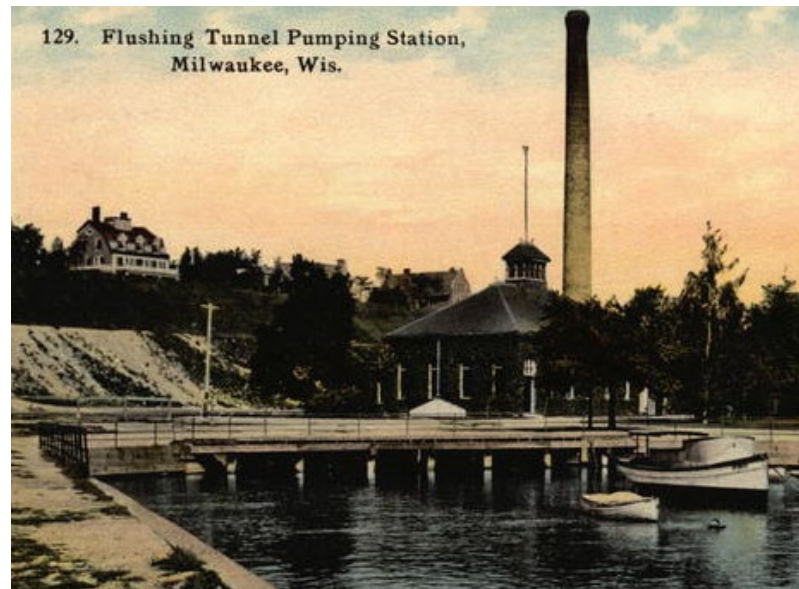
- Located in McKinley Park adjacent to Lincoln Memorial Drive and Milwaukee Yacht Club
- Headwall inlet structure is owned by the Milwaukee Metropolitan Sewerage District (MMSD) and is not a part of this project



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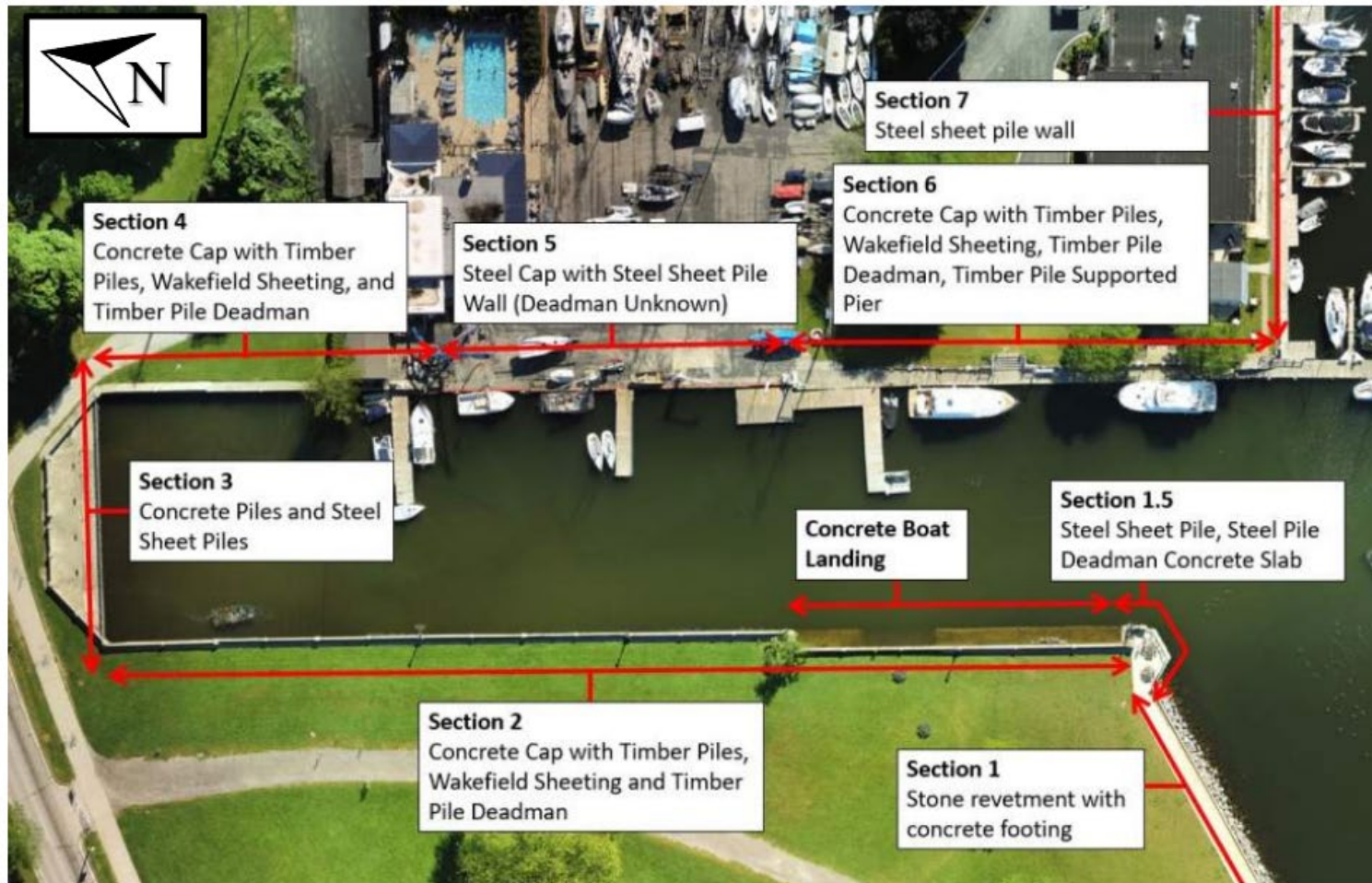
Site History

- **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



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Existing Channel Wall Construction



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Purpose and Scope

- Existing walls have reached the end of their service life



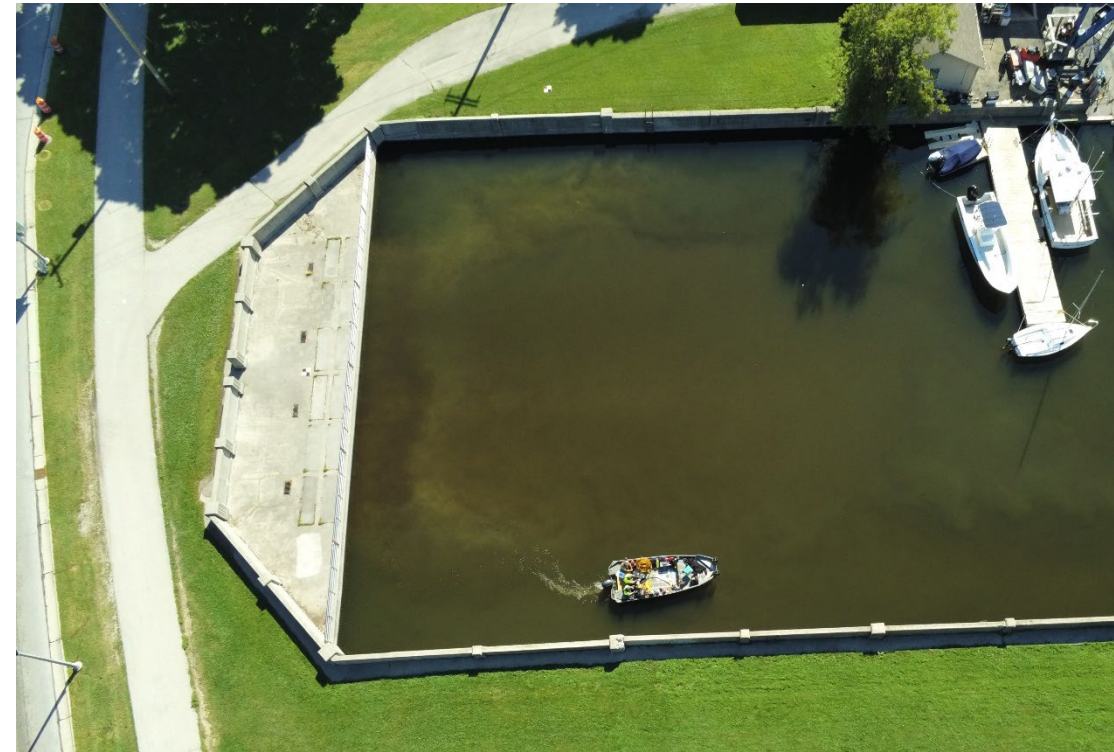
- Material loss behind the wall poses a safety hazard



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Methods of Investigation

- 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

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Above Ground Inspection Findings



- Settlement
- Concrete wall sections rotating towards the channel

- Deteriorated concrete with exposed steel reinforcement



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Underwater Inspection Findings



- 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



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Design Considerations

- 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



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Design Considerations



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



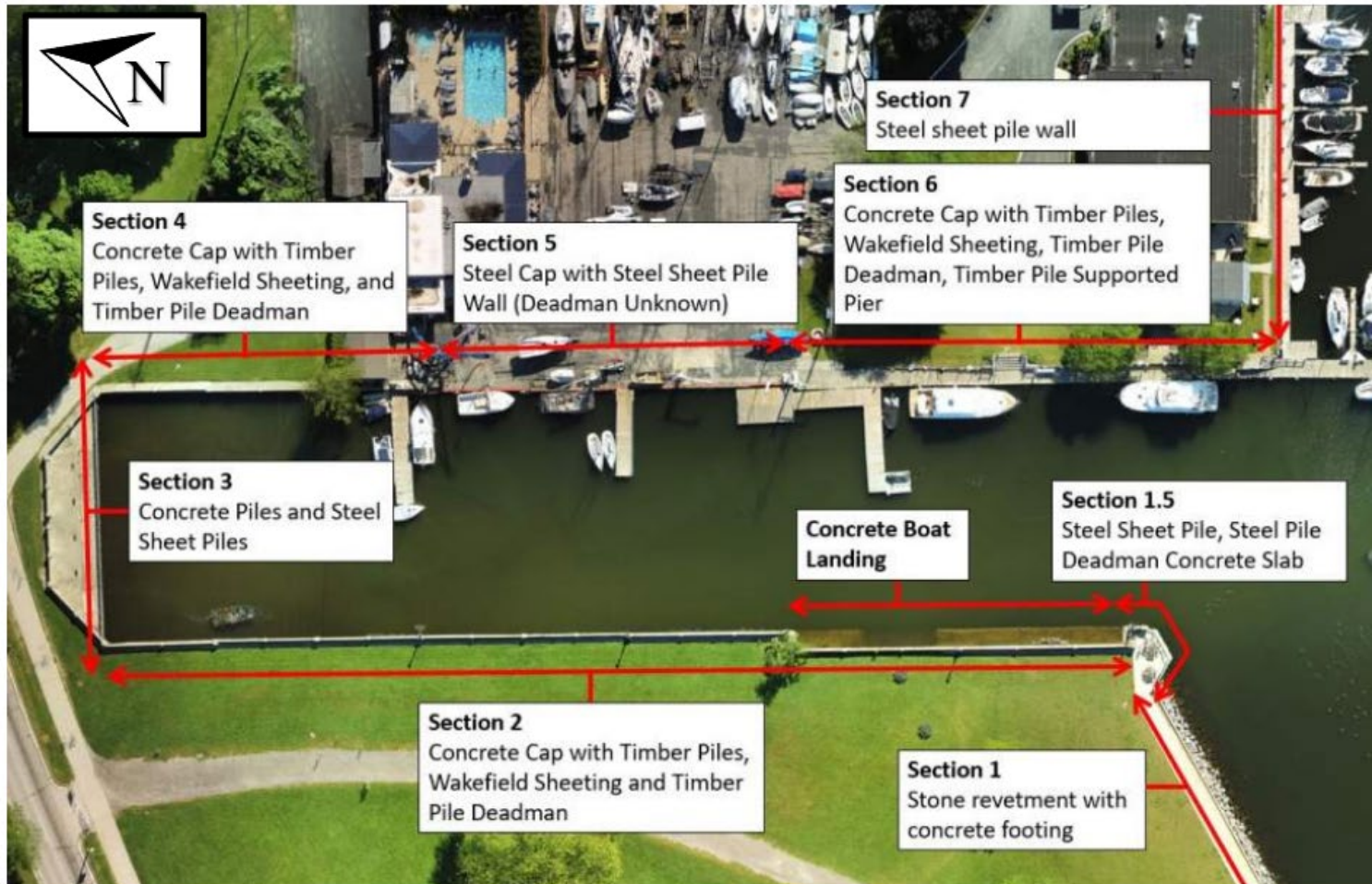
Milwaukee County Flushing Channel Rehabilitation Alternative

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



Milwaukee County Flushing Channel Replacement Alternatives



- 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

- New Stone Revetment

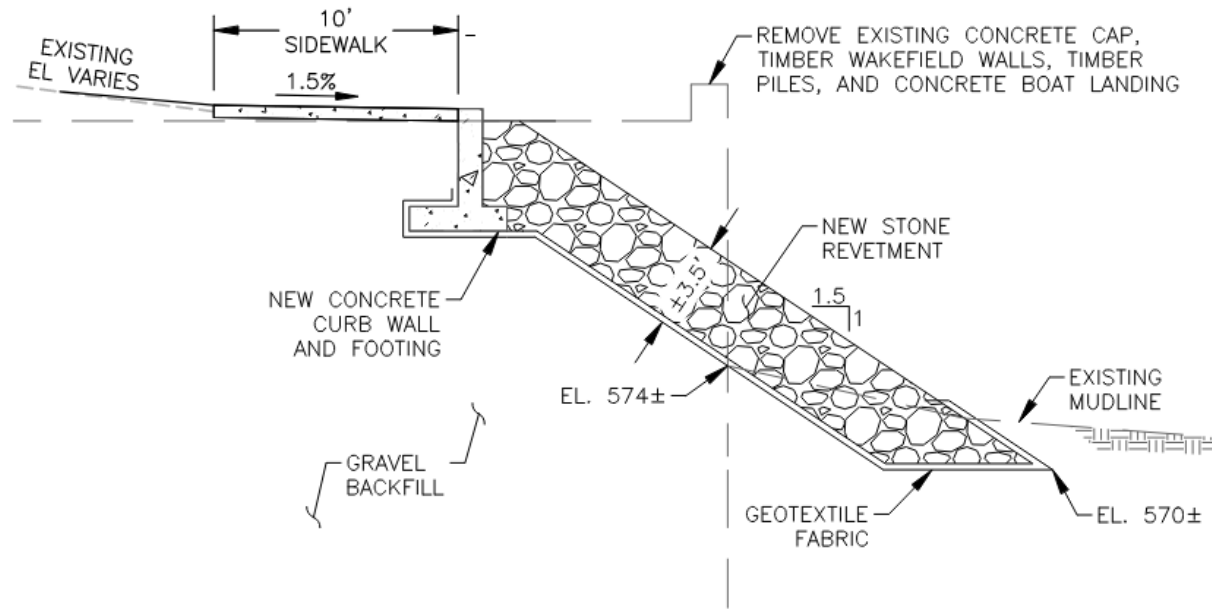


Diagram 3: Riprap Revetment

Advantages	Disadvantages
<ul style="list-style-type: none"> • Visually similar to recent project 	<ul style="list-style-type: none"> • 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

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Replacement Alternatives – Sections 4, 5, 6

- New Steel Sheet Pile With Grouted Anchors

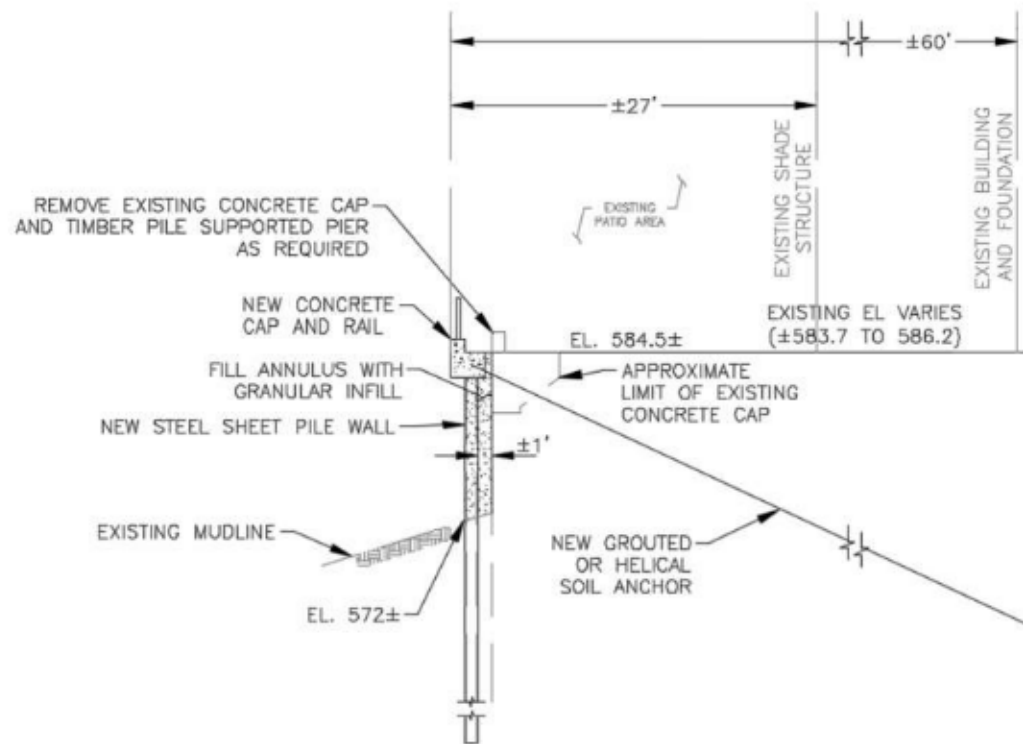


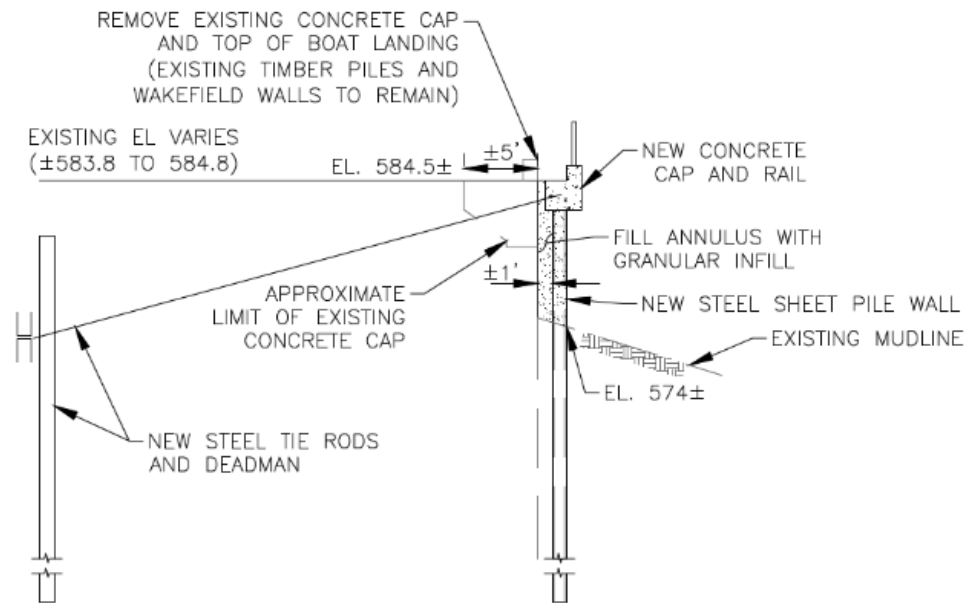
Diagram 4: Steel Sheet Pile with Grouted Anchors (in location of Clubhouse)

Advantages	Disadvantages
<ul style="list-style-type: none"> • Less disruptive to existing structures behind the wall 	<ul style="list-style-type: none"> • 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

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



Advantages	Disadvantages
<ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • Excavation may require dewatering

Diagram 2: Steel Sheet Pile with Deadman Tieback

Milwaukee County Flushing Channel Replacement Alternatives – Section 5

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

Advantages	Disadvantages
<ul style="list-style-type: none">• Does not require crane relocation• Lower construction cost than new wall	<ul style="list-style-type: none">• 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

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Replacement Alternatives – Section 5

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



anode

Advantages	Disadvantages
<ul style="list-style-type: none">• 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	<ul style="list-style-type: none">• Thorough underwater inspection necessary for design• Anodes should be routinely monitored• Will require eventual replacement of the steel sheet pile bulkhead

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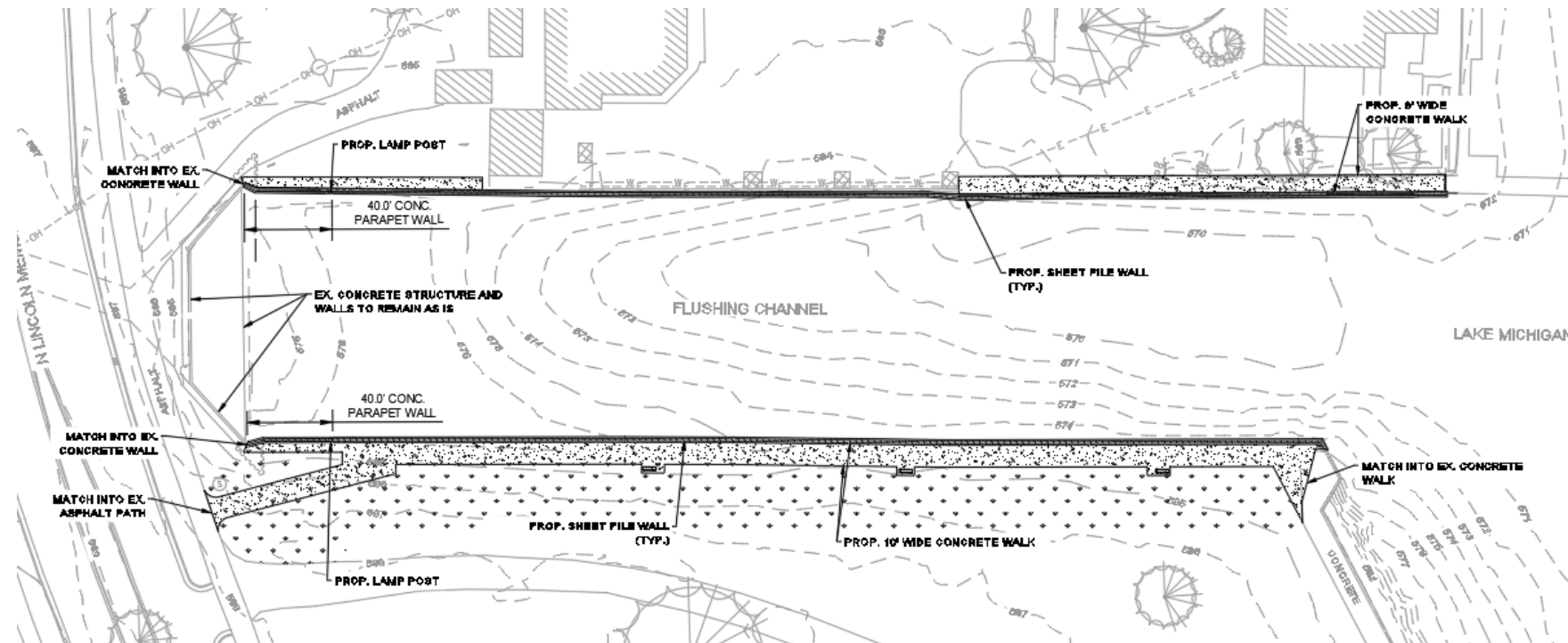
Selected Alternatives

- 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

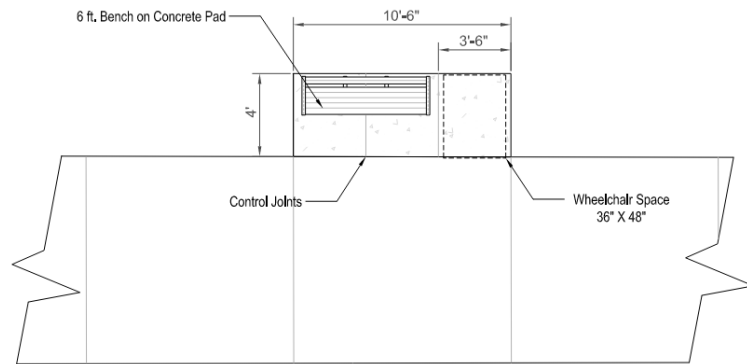
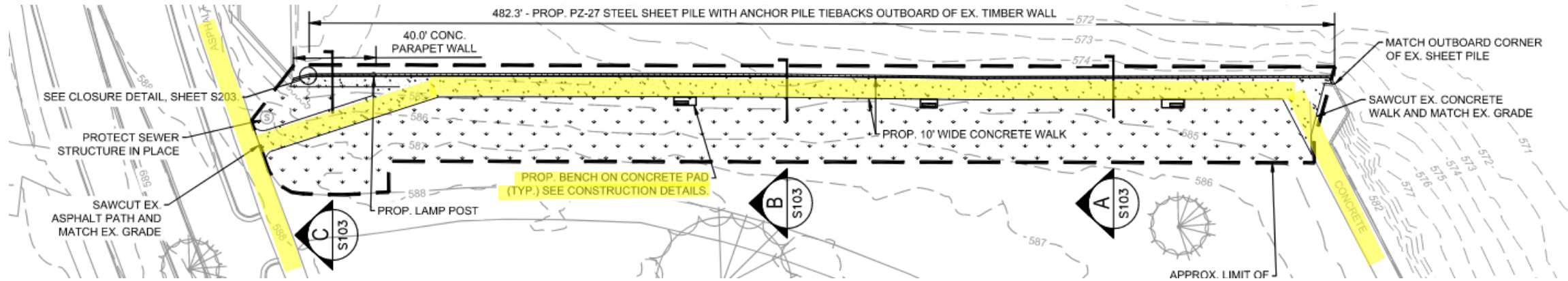
- Section 5

- FRP panels and grout on existing steel sheeting



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Selected Alternatives

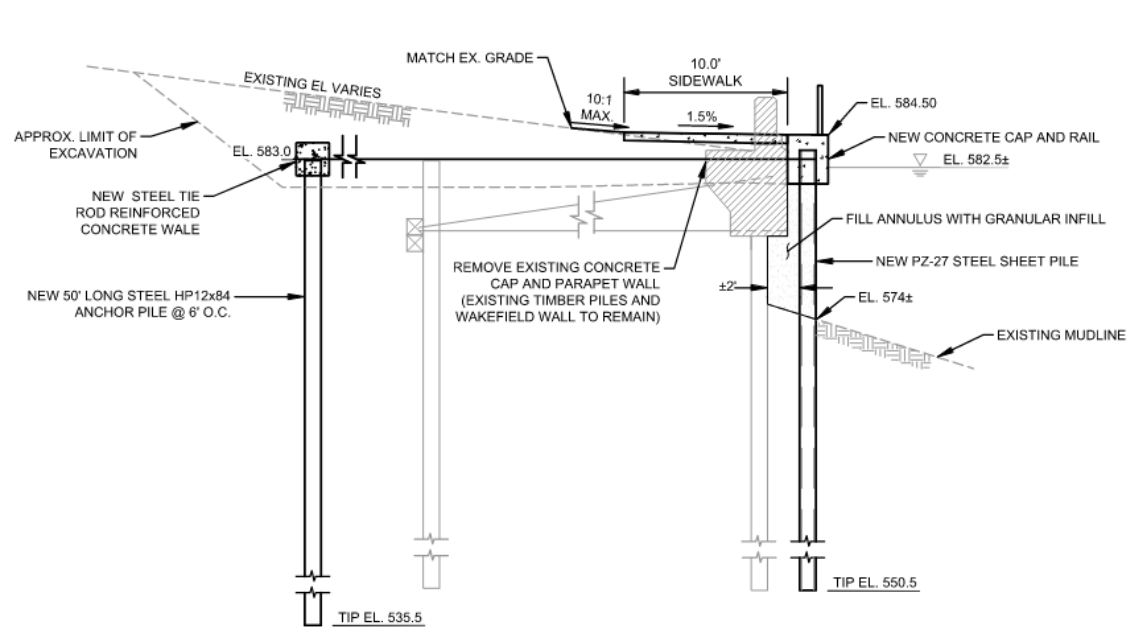


BENCH ON CONCRETE PAD WITH COMPANION WHEELCHAIR SPACE

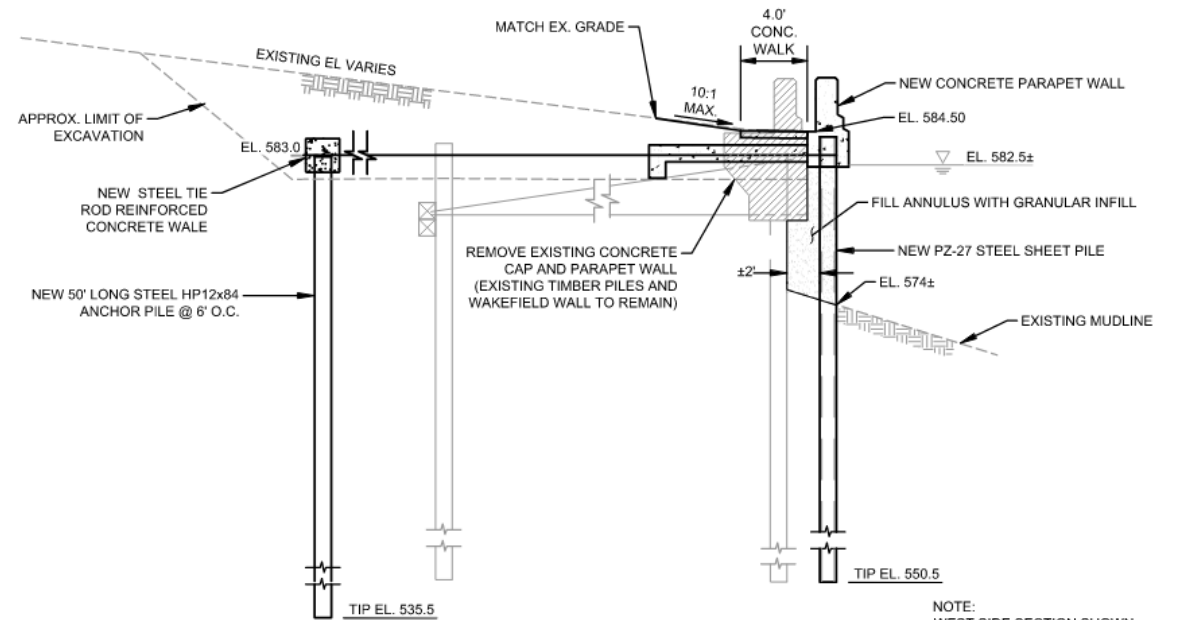
- ADA access and accommodations will be included
- Pedestrian access extended to other walkways
- Benches with wheelchair space added along new walkway

Milwaukee County Flushing Channel

Selected Alternatives



C401 **B** PROP. WEST WALL SECTION
NOT TO SCALE



C401 **C** PROP. CONCRETE PARAPET WALL SECTION
NOT TO SCALE

NOTE:
WEST SIDE SECTION SHOWN.
EAST SIDE SIMILAR EXCEPT FOR
GROUTED ANCHOR INSTEAD OF
TIEBACK SYSTEM.

Milwaukee County Flushing Channel

Selected Alternatives

- 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

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Milwaukee County Flushing Channel

Schedule and Estimated Cost

- 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**