Winnetka resident Charles H. Dowding, Professor Emeritus, Civil and Environmental Engineering, Northwestern University, created the Elder Now plan, which includes components specific to Elder Lane Beach and Centennial Beach. Presented during the Winnetka Park District's board of commissioners meeting August 25, 2022, the plan includes:

- **August 25 presentation**
  - **Summary: Slides 1–2**
  - **Plan Overview: Slide 3**
  - **Background: Slides 4-10**
  - **Plan views and costs: Slides 11-14**
  - **Details: 15-21**
- **Issues to be addressed and Dowding design principles: Slides 22-23**
- **Dowding response to Elder Now assessment from WPD commissioner Warren James: Slides 24–25**
- **Example of securing pipes to lake bottom with clamps: Slides 26-36**
- **Article containing cost estimate of clamp installation: Slides 37-46**
- **Examples of surf zone pipe clamp stabilization: Slides 47-48**

Why is Elder Now w/simple ADA access is a good solution

Costs under $6,000,000 using WPD cost estimates
Repositions and extends the storm water outfall pipe, which must be done under any plan
Includes enhanced ADA access, which should be included in any plan
Employs existing ramp for non motorized access
Follows the 2030 Waterfront plan recommendations of

1) minimal erosion protection and
2) heightened attention to aesthetics

Eliminates interaction with any other 3rd parties and thus simplifies permit application
Leverages existing and successful bluff erosion protection at both Elder and Centennial parks
Eliminates walls produced by the rubble stone breakwaters at normal lake water elevations
Provides 2 usable beaches with immediate water access at normal lake water elevations

Cost comparisons of ***Elder Now*** with Elder and Centennial Option 2s using WPD supplied cost estimates

Elder Now without rubble stone breakwater or ramp		3,028,000
Centennial without rubble stone breakwater with ADA access		1,660,000
Total	**4,688,000**	

Elder option 2 with rubble stone break water		6,972,000
Centennial option 2 with rubble stone break water		5,219,000
Total	**12,191,000**	

Elder Now Plan to produce swimmable beach without foreclosing options

Observations

I As a first step avoid use of stone breakwater by relying on the bluff stabilization devices now in place which withstood the last high lake level. With lake at its average level (580) there is less urgency than at Lloyd.

II Some/many feel that Lloyd has too much sand and the elevation 591 or even the proposed Elder 589, 300 foot long breakwater produce a 11 or 9 ft wall at the water's edge when at the average (and present) lake level of 580

III Is access ramp necessary to make Elder swimmable or use for non motorized water craft (Elder Now light)

Back to the Future – the 2030 Plan Considerations

Did not consider ramifications of a property swap

Reconstructed Lloyd allows assessment of rubble stone beach capture concept

Breakwater tapers at shore to minimize loss of beach

- A Rubble-mound breakwater structure
- B Stormwater management improvements
- C Secure non-motorized water craft storage
- D Existing boat house improvements
- E Boardwalk improvements
- F Dune landscape restoration
- G Bluff restoration
- H Expand surface parking
- I Nature based play area
- J Construct a new upper-level restroom building
- K Vehicular circulation improvements and retaining walls
- L Lifeguard stations
- M New sheet-pile groin
- N Renovate single-family home into new beachfront event space
- O New beach house

- A Rubble-mound breakwater structure
- B Stormwater management improvements
- C Secure non-motorized water craft storage
- D Existing boat house improvements
- E Boardwalk improvements
- F Vehicular circulation improvements and retaining walls
- G New sheet-pile groin
- H Bluff restoration
- I Nature based play area
- J Construct a new upper-level restroom building


Overfill Beach at Lloyd


Future Bowl Effect at Elder – Centennial
With Rubble Stone Breakwaters
587
Photo taken at Lloyd on 7 July
Lake at ~580

Breakwater notes indicate Minimization of shoreline protection Heightened consideration of aesthetics

Elder Lane Park & Beach: Program & Site Improvements Matrix

0 - $250,000 $$$$$$
$250,000 - $500,000 $$$$$$
$500,000 - $1,000,000 $$$$$$
$1,000,000 - $3,000,000 $$$$$$
$3,000,000 - $5,000,000 $$$$$$

"LAC Priority? (1 = highest priority)	Supports plan goals?		Cost (construction, soft costs)	Grant opportunity?	Partnership opportunity?	Revenue generator?	"Level of effort"	Dependent on shoreline improvements?	Notes
Elder Program and Operations Improvements									
1	√	Dedicate north half of beach as non-motorized boating beach	$$$$$$	√	√		low		Interim plan
1	√	Establish partnerships for environmental educational programming	$$$$$$	√	√		low		
2	√	Dedicate full beach as non-motorized boating beach	$$$$$$	√	√		low	√	
2	√	Expand program offerings and partnerships with local rowing / sailing clubs	$$$$$$		√	√	low		
2	√	Provide a rental program for non-motorized boats and paddle boards	$$$$$$		√	√	medium		Partnership with private operator, local preference
Elder General Site Improvements									
1	√	Sign program implementation (allowance)	$$$$$$	√			low		May be eligible for ICMP Sustainable Coastal Planning Grant, Illinois Transportation Enhancement Program (ITEP) funding*
1	√	Site furnishing and lighting program implementation (allowance)	$$$$$$				low		[WPD Operational budget item]
1	√	Stormwater management improvements Constructed wetland Storm sewer improvements	$$$$$$	√			medium		Requires partnership with Village.

*Grant source funded by State of Illinois

Elder Lane Park & Beach: Shoreline Improvements Matrix

0 - $250,000 $$$$$$
$250,000 - $500,000 $$$$$$
$500,000 - $1,000,000 $$$$$$
$1,000,000 - $3,000,000 $$$$$$
$3,000,000 - $5,000,000 $$$$$$

"LAC Priority? (1 = highest priority)	Supports plan goals?		Cost (construction, soft costs)	Grant opportunity?	Partnership opportunity?	Revenue generator?	"Level of effort"	Dependent on shoreline improvements?	Notes
Elder Shoreline Improvements									
1	√	Rubble-mound breakwater structure Remove existing stormwater outfall and pier Remove sheet pile groins Back-shore rubble-mound revetment Beach sand backfill	$$$$$$	√			high		PH 1 (north property line); includes minimum amount of shoreline structure required to replace existing structures, maintain beach and protect constructed improvements; requires sensitivity to aesthetics of structure; may be eligible for Great Lakes Fishery and Ecosystem Restoration (GLFER) Program funding (US Army Corps of Engineers); requires federal, state, and local permitting

*Grant source funded by State of Illinois

Centennial Park & Beach: Program & Site Improvements Matrix

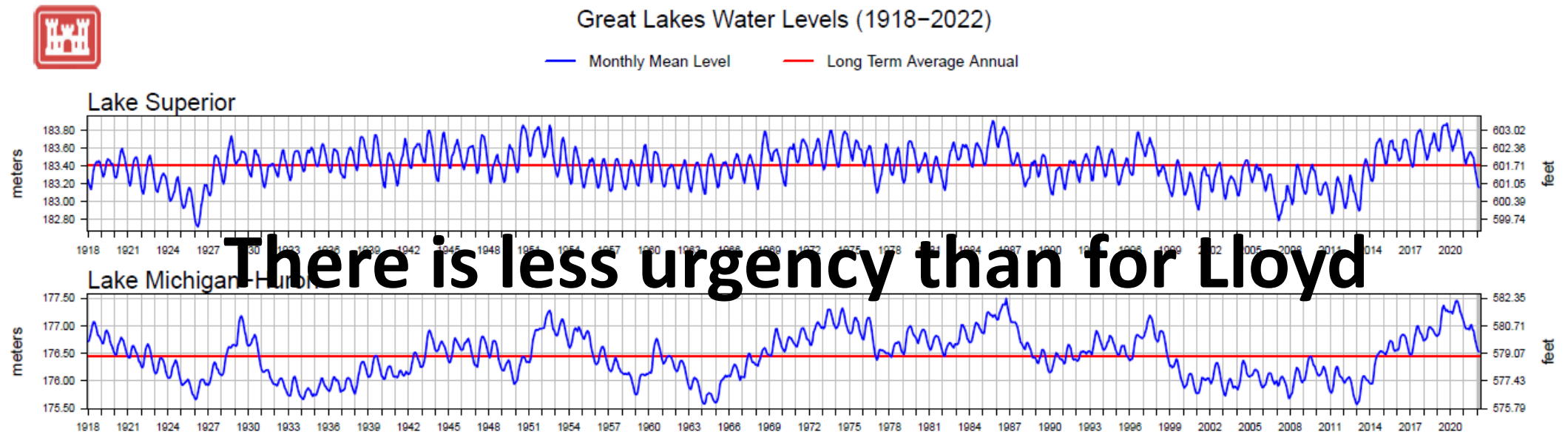
0 - $250,000 $$$$$$
$250,000 - $500,000 $$$$$$
$500,000 - $1,000,000 $$$$$$
$1,000,000 - $3,000,000 $$$$$$
$3,000,000 - $5,000,000 $$$$$$

"LAC Priority? (1 = highest priority)	Supports plan goals?		Cost (construction, soft costs)	Grant opportunity?	Partnership opportunity?	Revenue generator?	"Level of effort"	Dependent on shoreline improvements?	Notes
Centennial Program and Operations Improvements									
1	√	Property acquisition	$$$$$$	√	√		high		
1	√	Dedicate beach as swimming beach	$$$$$	√	√		medium		Requires relocation of dog run to alternate open space within the Village
Centennial General Site Improvements									
1	√	Sign program implementation (allowance)	$$$$$	√			low		May be eligible for ICMP Sustainable Coastal Planning Grant, Illinois Transportation Enhancement Program (ITEP) funding*
1	√	Site furnishing and lighting program implementation (allowance)	$$$$$				low		[WPD Operational budget item]

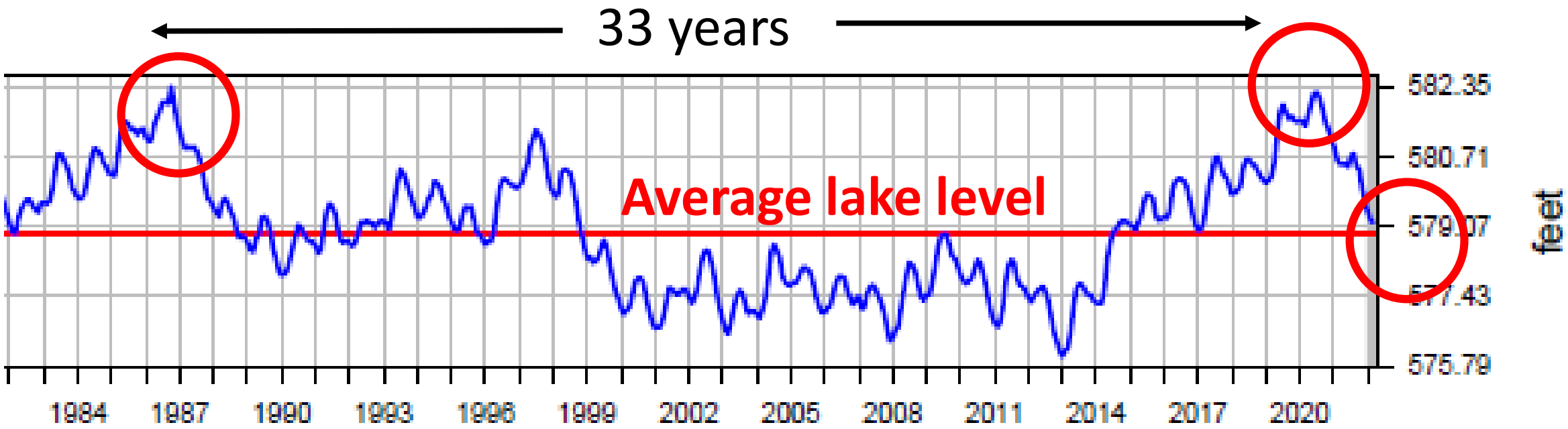
Centennial Park & Beach: Shoreline Improvements Matrix

0 - $250,000 $$$$$$
$250,000 - $500,000 $$$$$$
$500,000 - $1,000,000 $$$$$$
$1,000,000 - $3,000,000 $$$$$$
$3,000,000 - $5,000,000 $$$$$$

"LAC Priority? (1 = highest priority)	Supports plan goals?		Cost (construction, soft costs)	Grant opportunity?	Partnership opportunity?	Revenue generator?	"Level of effort"	Dependent on shoreline improvements?	Notes
Centennial Shoreline Improvements									
1	√	Rubble-mound breakwater structure - PH 1 improvement Remove sheet pile groins Back-shore rubble-mound revetment Beach sand backfille	$$$$$$	√			high		PH 1 (south property line); includes minimum amount of shoreline structure required to replace existing structures, improve beach and protect constructed improvements; requires sensitivity to aesthetics of structure; may be eligible for Great Lakes Fishery and Ecosystem Restoration (GLFER) Program funding (US Army Corps of Engineers); requires federal, state, and local permitting
1	√	New sheet-pile groin	$$$$$$	√			high		PH 1 (north property line); includes minimum amount of shoreline structure required to replace existing structures, improve beach and protect constructed improvements; requires sensitivity to aesthetics of structure; may be eligible for Great Lakes Fishery and Ecosystem Restoration (GLFER) Program funding (US Army Corps of Engineers); requires federal, state, and local permitting
2	√	Rubble-mound breakwater structure Remove sheet pile groins Back-shore rubble-mound revetment Beach sand backfill	$$$$$$	√			high		PH 2 (north property line); dependent on property acquisition; includes minimum amount of shoreline structure required to improve beach and protect constructed improvements; requires sensitivity to aesthetics of structure; may be eligible for Great Lakes Fishery and Ecosystem Restoration (GLFER) Program funding (US Army Corps of Engineers); requires federal, state, and local permitting

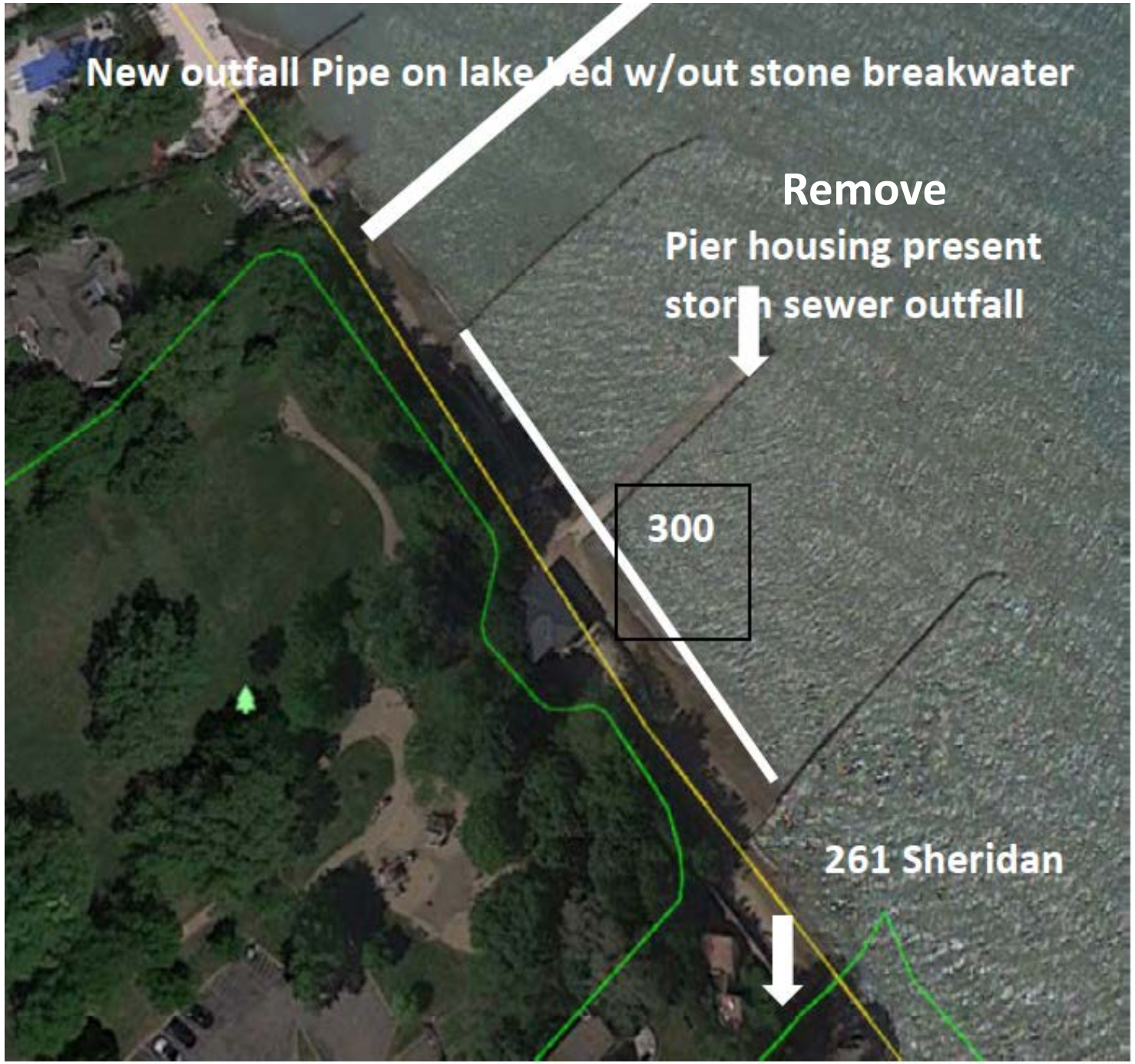


There is less urgency than for Lloyd



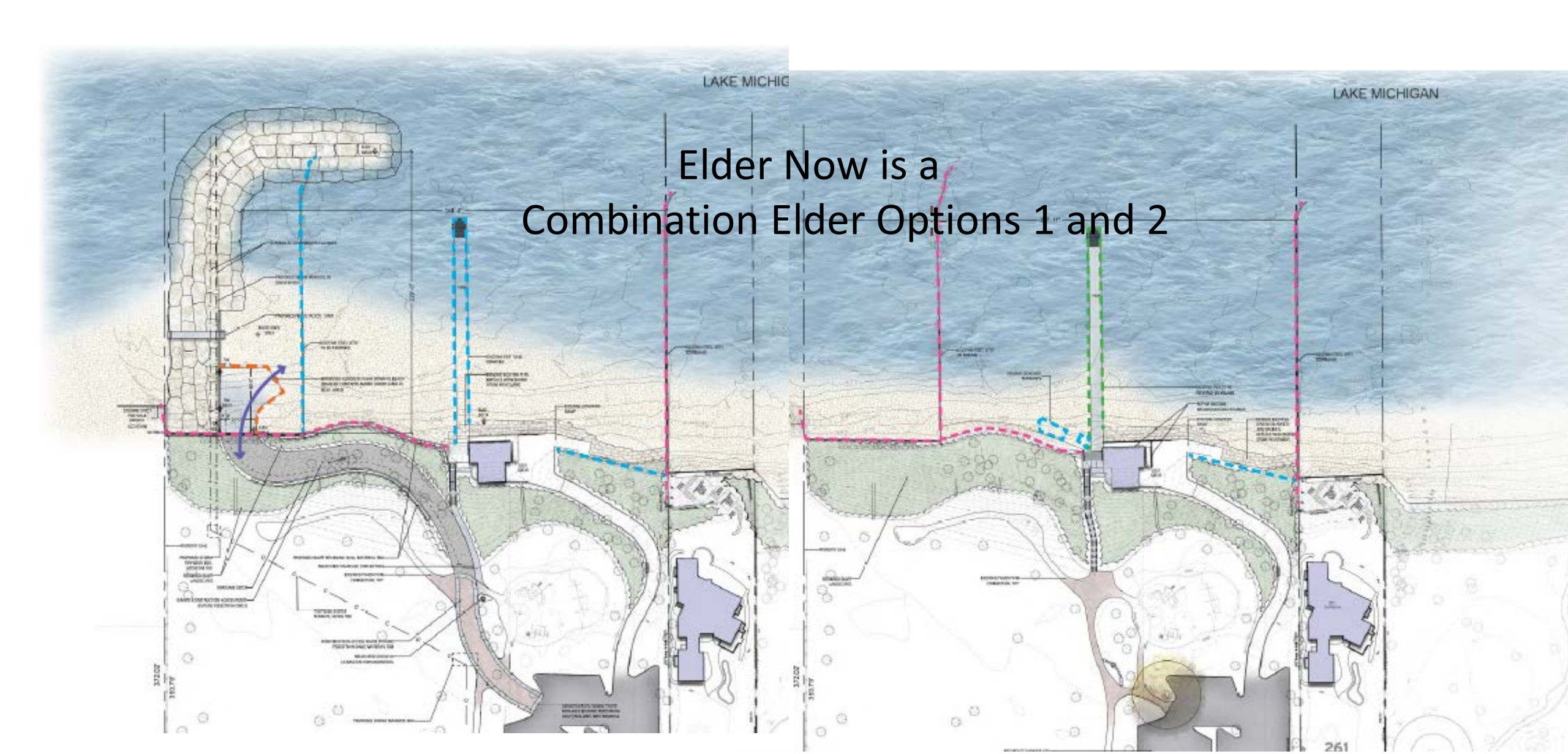

Elevation 590 sheet pile wall behind stairs installed before the recent high lake level remains stable
Thus planter boxes are not necessary
Beach Template Concept
Standing at ~ elevation 580 on 31 May


Elder Beach looking North
Photo taken on 22 June 2022
No need for stabilization of bluff
1980's sheet piles and gabions show no signs of instability

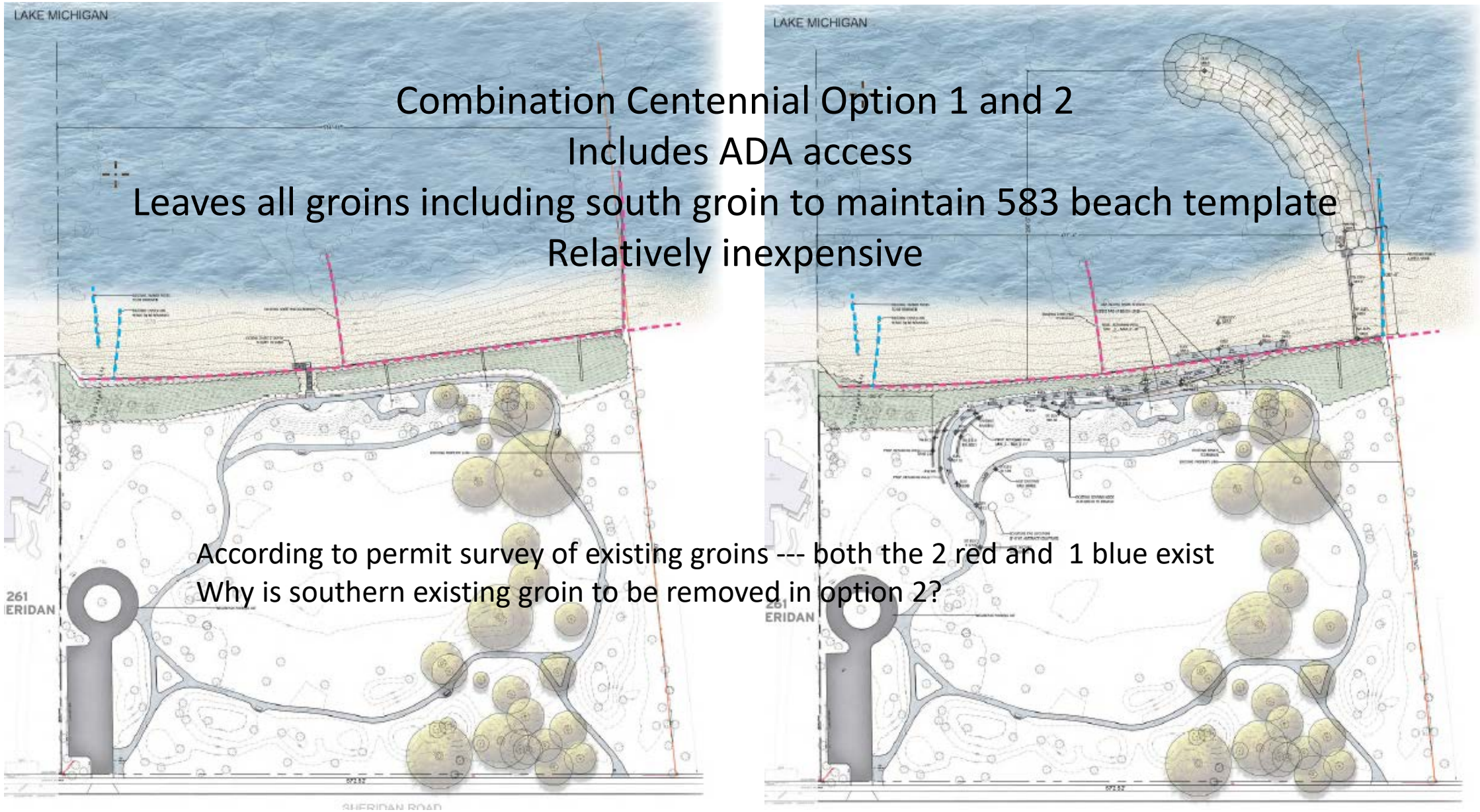


- Leave in place sheet pile groin at boundary between Elder/261 (elevation ~ 583) at southern end of 300 feet on drawing to left
- Build pollution reduction devices for Village storm sewer outfall already designed by Burke
- In surf zone, encase outfall pipe in sheet pile protection with maximum height of sheet piles equal to present groin height of 583.
- Beyond surf zone bury pipe in clay trench
  - 200 ft out as presently planned or
  - 350 ft to extend to deeper water

- Remove existing north sheet pile graoin
- Demolish pier housing present outfall pipe in middle of beach
- Now have some 400 ft beach to repurpose according to new post Lloyd use patterns
- Add beach sand if necessary
- Go swimming
- Add stone breakwater if necessary
- Add ramp later if necessary


LAKE MICHIG
LAKE MICHIGAN
Elder Now is a
Combination Elder Options 1 and 2

Element Description	Price	Qty	Units	Total	no new ramp use existing	with ramp
Mobilization	$ 600,000.00	1		$600,000.00	$600,000.00	$600,000.00
Buried Stone Revetment 12 ton per ft.	$2,500.00	175	ft	$437,500.00	$437,500.00	$437,500.00
Concrete demo/removal	$100.00	600		$60,000.00	$60,000.00	$60,000.00
Bluff Restoration	$ 150,000.00	1		$150,000.00	$150,000.00	$150,000.00
Sand Placement Mason Sand	$45.00	9600		$432,000.00		
Paving of Parking Lot	$6.00	26254		$157,524.00	$157,524.00	$157,524.00
35 ton per foot breakwater	$ 5,820.00 0	300		$1,746,000.00		
15 ton per foot 1/2 breakwater	$3,000.00	100		$300,000.00		
Stone Steps 35 Ton Breakwater	$55,000.00	1		$55,000.00		
Steel Sheet Piling 30' deep	$3,200.00	200		$640,000.00	$320,000.00	$640,000.00
Concrete for ramp	$100.00	1700		$170,000.00		$170,000.00
Access Roadway Stone w/Drainage	$250,000.00	1		$250,000.00		$250,000.00
Retaining Walls	$100,000.00	1		$100,000.00		$100,000.00
Relocated Stormwater Outfall	$600.00	500	L ft	$300,000.00	$300,000.00	$300,000.00
Relocated Stormwater Outfall 36"	$450.00	325	L ft	$292,500.00	$292,500.00	$292,500.00
Demo (steel, pier, misc.)	$220,000.00	1		$157,524.00	$157,524.00	$157,524.00
Total				$5,910,524.00	$2,475,048.00	$3,315,048.00
Soft Costs				$175,000.00	$175,000.00	$175,000.00
Thotal hard and soft costs				$6,085,524.00	$2,650,048.00	$3,490,048.00
Contingency (15%)				$886,578.60	$377,555.00	$545,250.00
Total				$6,972,102.60	$3,027,603.00	$4,035,298.00
Missing Considerations						
Pollution reduction devices not priced						
Differentiationg costs of pipes material and installetion						
Village requirement for enhanced outfall capacity -- what plans does Village have to increase upstream capacity and when?						



Combination Centennial Option 1 and 2

Includes ADA access

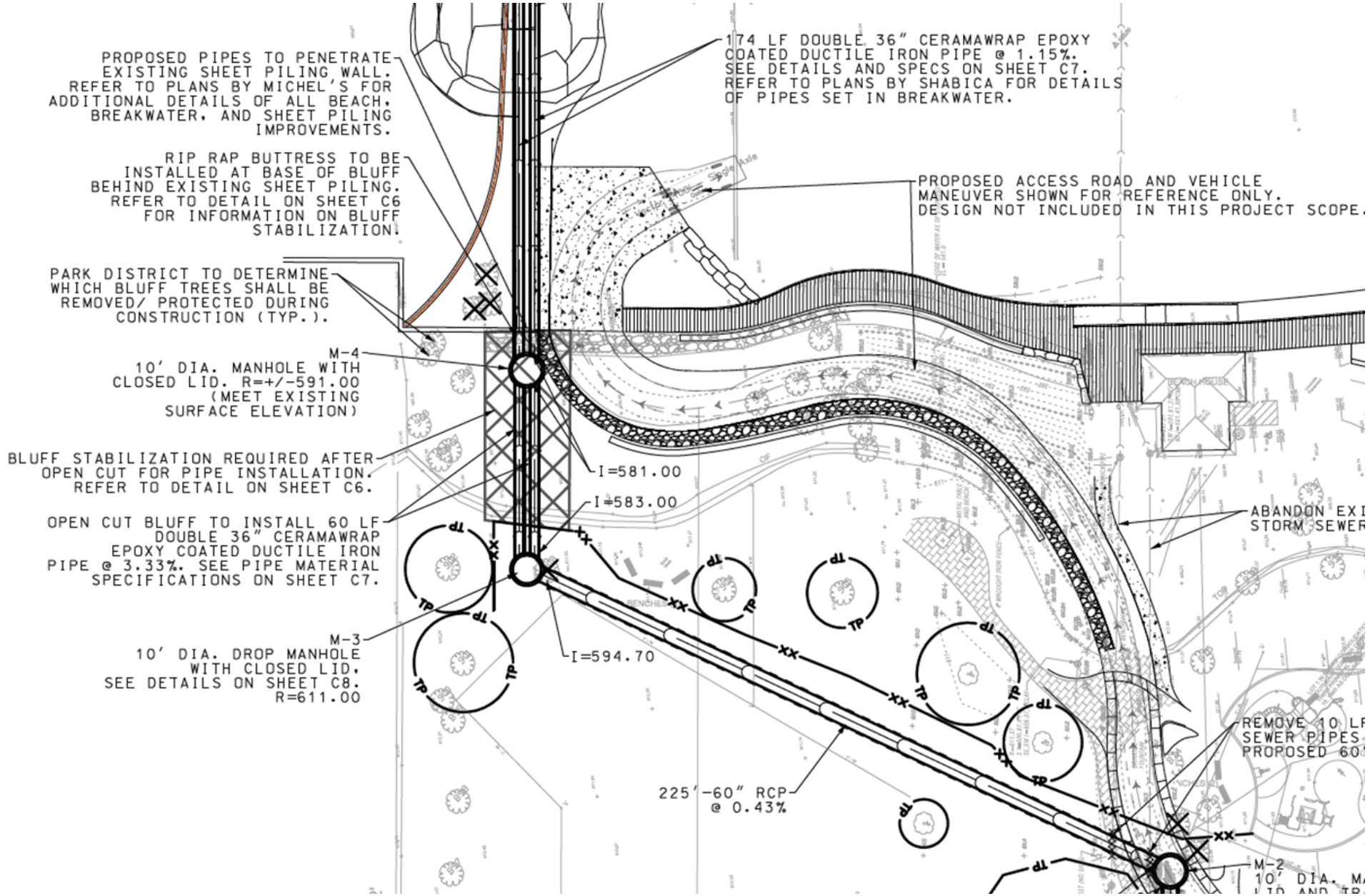
Leaves all groins including south groin to maintain 583 beach template

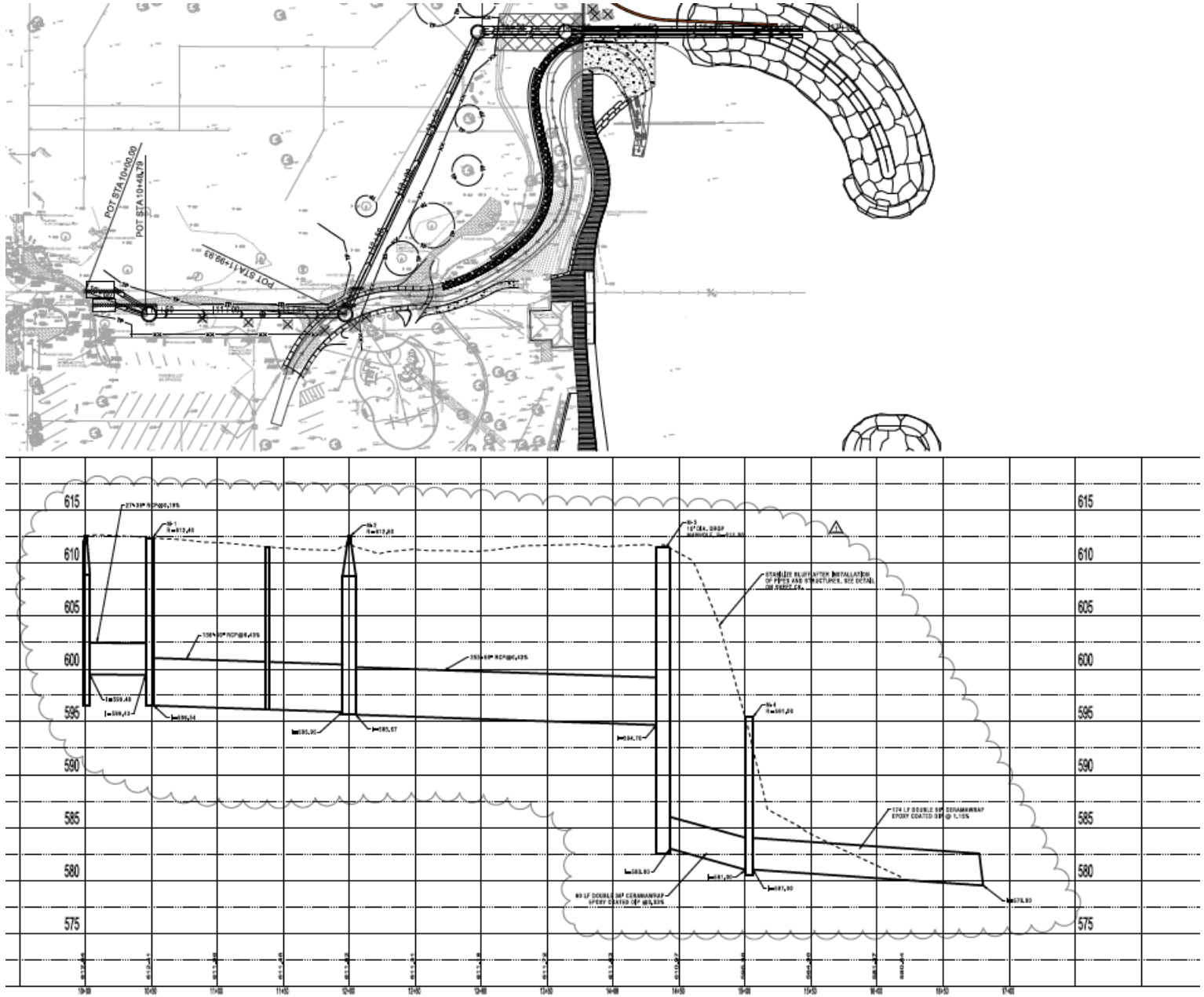
Relatively inexpensive

According to permit survey of existing groins --- both the 2 red and 1 blue exist

Why is southern existing groin to be removed in option 2?

Element Description		Price	Qty	Units	Total	no breakwater		
Mobilization		$ 600,000.00	1		$600,000.00	$600,000.00		
Demo (steel, fencing, wood piles)		$100,000.00	1		$100,000.00	$100,000.00		
Bluff Restoration		$ 150,000.00	1		$120,000.00	$120,000.00		
Sand Placement Mason Sand		$45.00	120000		$540,000.00			
Paving of Parking Lot		$6.00	6800		$40,800.00	$40,800.00		
35 ton per foot breakwater		$ 5,820.00 0	250		$1,455,000.00			
15 ton per foot 1/2 breakwater		$3,000.00	100					
Steel Staircase Lump Sum		$50,000.00	1		$50,000.00	$50,000.00		
Steel Sheet Piling 30' deep		$3,200.00	228		$729,600.00		leave exising	
Concrete for ramp		$100.00	812		$81,200.00	$81,200.00		
Access Roadway Stone w/Drainage TBD		$250,000.00	1		$250,000.00			
Retaining Walls		$120,000.00	1		$120,000.00			
ADA walkway and connection Lump Sum		$300,000.00	1		$300,000.00	$300,000.00		
Total					$4,386,600.00	$1,292,000.00		
Soft Costs					$175,000.00	$175,000.00		
Thotal hard and soft costs					$4,561,600.00	$1,467,000.00		
Contingency (15%)					$657,900.00	$193,800.00		
Total					$5,219,500.00	$1,660,800.00		
Missing Considerations								
Access roadway not on these plans								

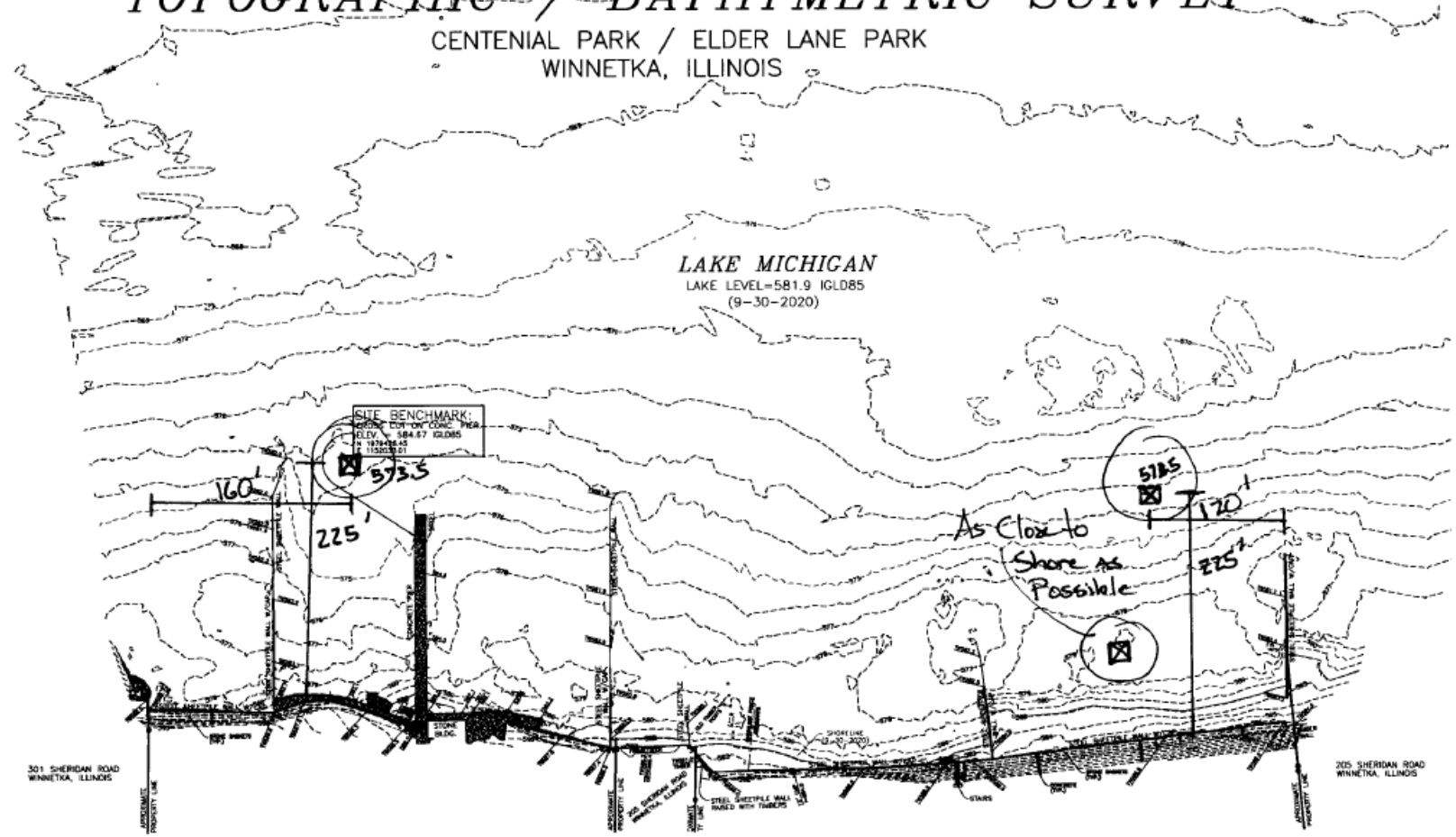

PROPOSED PIPES TO PENETRATE EXISTING SHEET PILING WALL. REFER TO PLANS BY MICHEL'S FOR ADDITIONAL DETAILS OF ALL BEACH, BREAKWATER, AND SHEET PILING IMPROVEMENTS.
RIP RAP BUTTRESS TO BE INSTALLED AT BASE OF BLUFF BEHIND EXISTING SHEET PILING. REFER TO DETAIL ON SHEET C6 FOR INFORMATION ON BLUFF STABILIZATION.
PARK DISTRICT TO DETERMINE WHICH BLUFF TREES SHALL BE REMOVED/ PROTECTED DURING CONSTRUCTION (TYP.).
M-4
10' DIA. MANHOLE WITH CLOSED LID. R=+/-591.00 (MEET EXISTING SURFACE ELEVATION)
BLUFF STABILIZATION REQUIRED AFTER OPEN CUT FOR PIPE INSTALLATION. REFER TO DETAIL ON SHEET C6.
OPEN CUT BLUFF TO INSTALL 60 LF DOUBLE 36" CERAMAWRAP EPOXY COATED DUCTILE IRON PIPE @ 3.33%. SEE PIPE MATERIAL SPECIFICATIONS ON SHEET C7.
M-3
10' DIA. DROP MANHOLE WITH CLOSED LID. SEE DETAILS ON SHEET C8. R=611.00
174 LF DOUBLE 36" CERAMAWRAP EPOXY COATED DUCTILE IRON PIPE @ 1.15%. SEE DETAILS AND SPECS ON SHEET C7. REFER TO PLANS BY SHABICA FOR DETAILS OF PIPES SET IN BREAKWATER.
PROPOSED ACCESS ROAD AND VEHICLE MANEUVER SHOWN FOR REFERENCE ONLY. DESIGN NOT INCLUDED IN THIS PROJECT SCOPE.
I=581.00
I=583.00
I=594.70
225'-60" RCP @ 0.43%
ABANDON EXI
STORM SEWER
REMOVE 10 LF
SEWER PIPES
PROPOSED 60
M-2
10' DIA. MA
LID AND TR
TP
XX


POT STA 10+00.00
POT STA 10+46.79
POT STA 11+99.93
615
610
605
600
595
590
585
580
575
STAINLESS BLUFF SETTER INSTALLATION OF PIPES AND STRUCTURES, SEE DETAIL ON SHEET C7A
574 LF DOUBLE 36" CERAMAWRAP EPOXY COATED SP @ 1.15%
60 LF DOUBLE 36" CERAMAWRAP EPOXY COATED SP @0.53%

Clay depth / Soil sample for testing

TOPOGRAPHIC / BATHYMETRIC SURVEY

CENTENIAL PARK / ELDER LANE PARK
WINNETKA, ILLINOIS

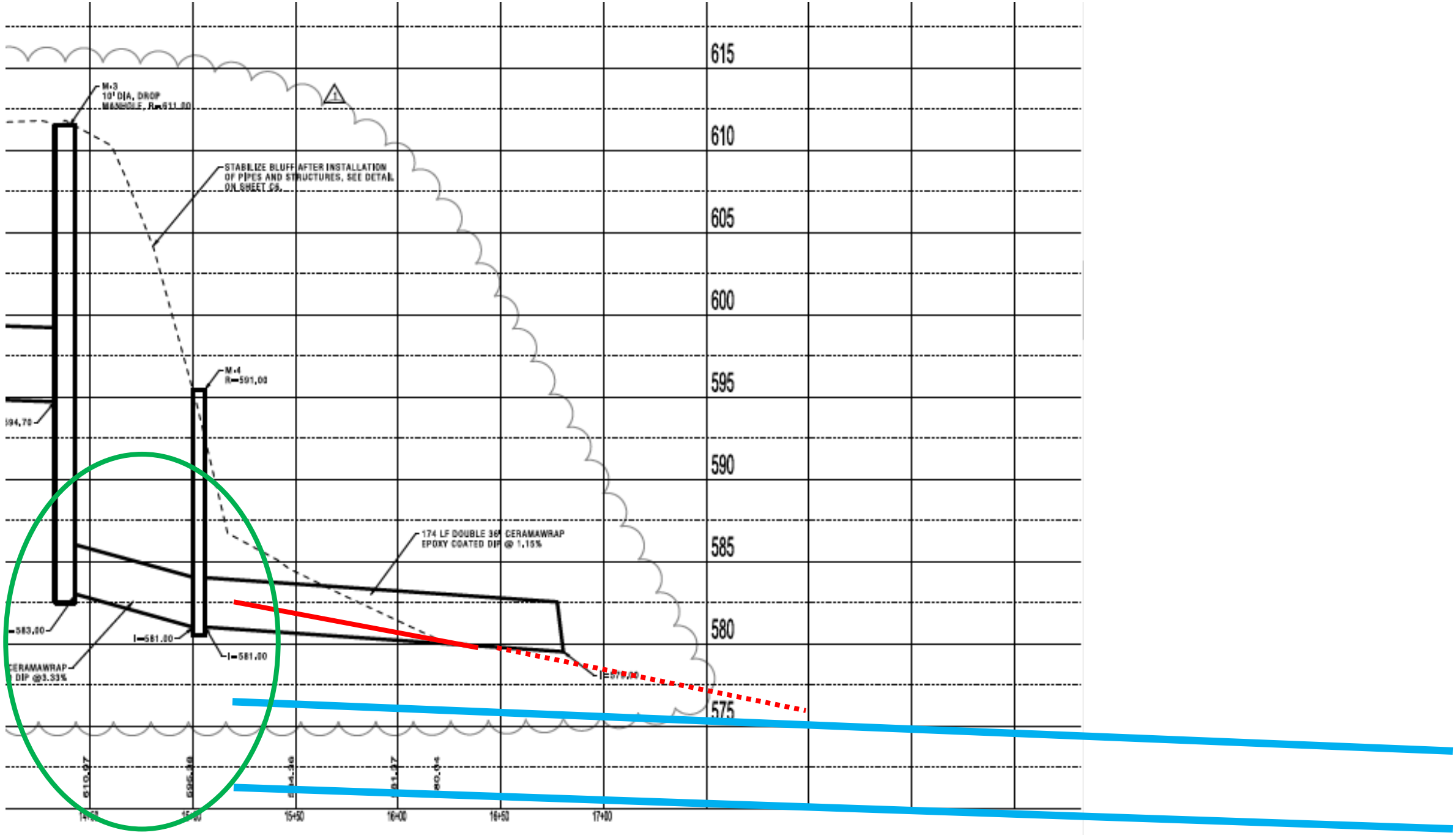


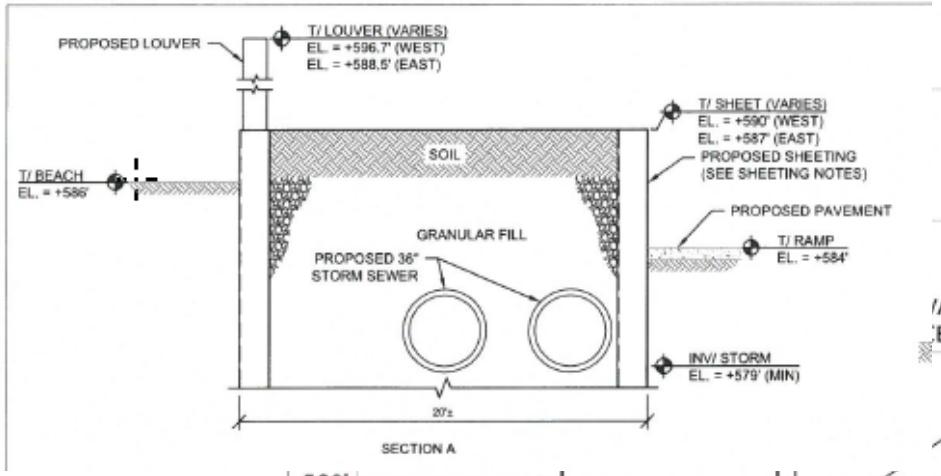
GRAPHIC SCALE
(30 FEET)
1 inch = 40 ft.

SCALE: 1" = 40'

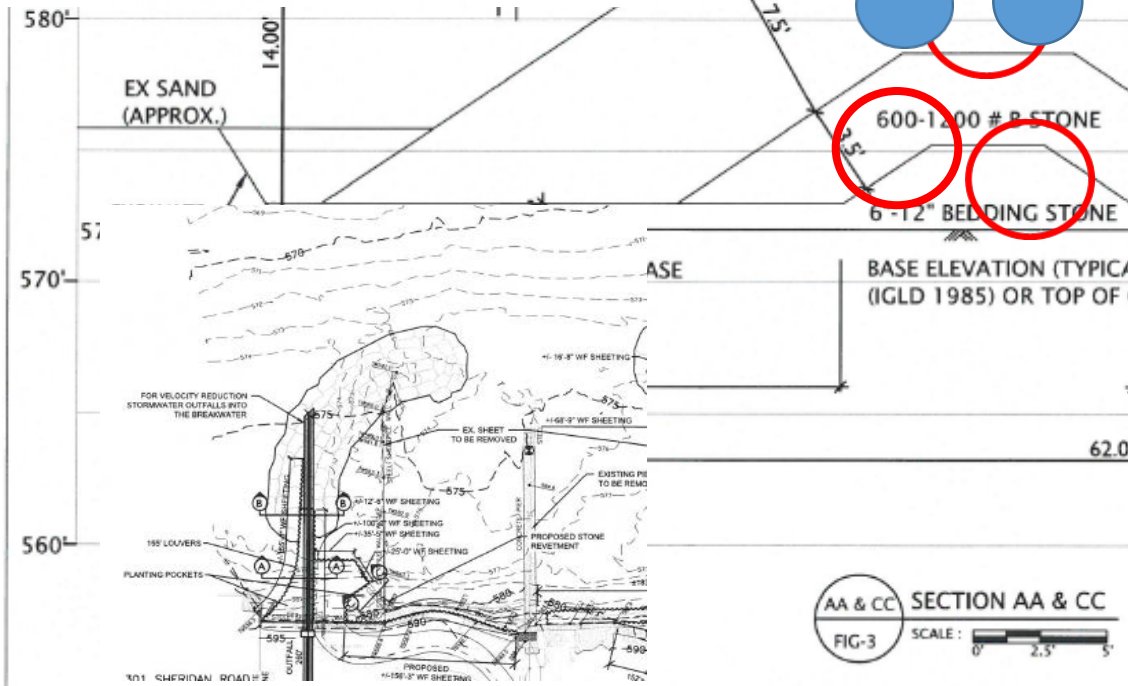
TERRA TECHNOLOGY
LAND SURVEYING, INC.
24198 ROSE AVE. LAKE ZURICH, ILLINOIS 60047
PHONE: (847) 540-8808 E-MAIL: TLS1958@SBCGLOBAL.NET

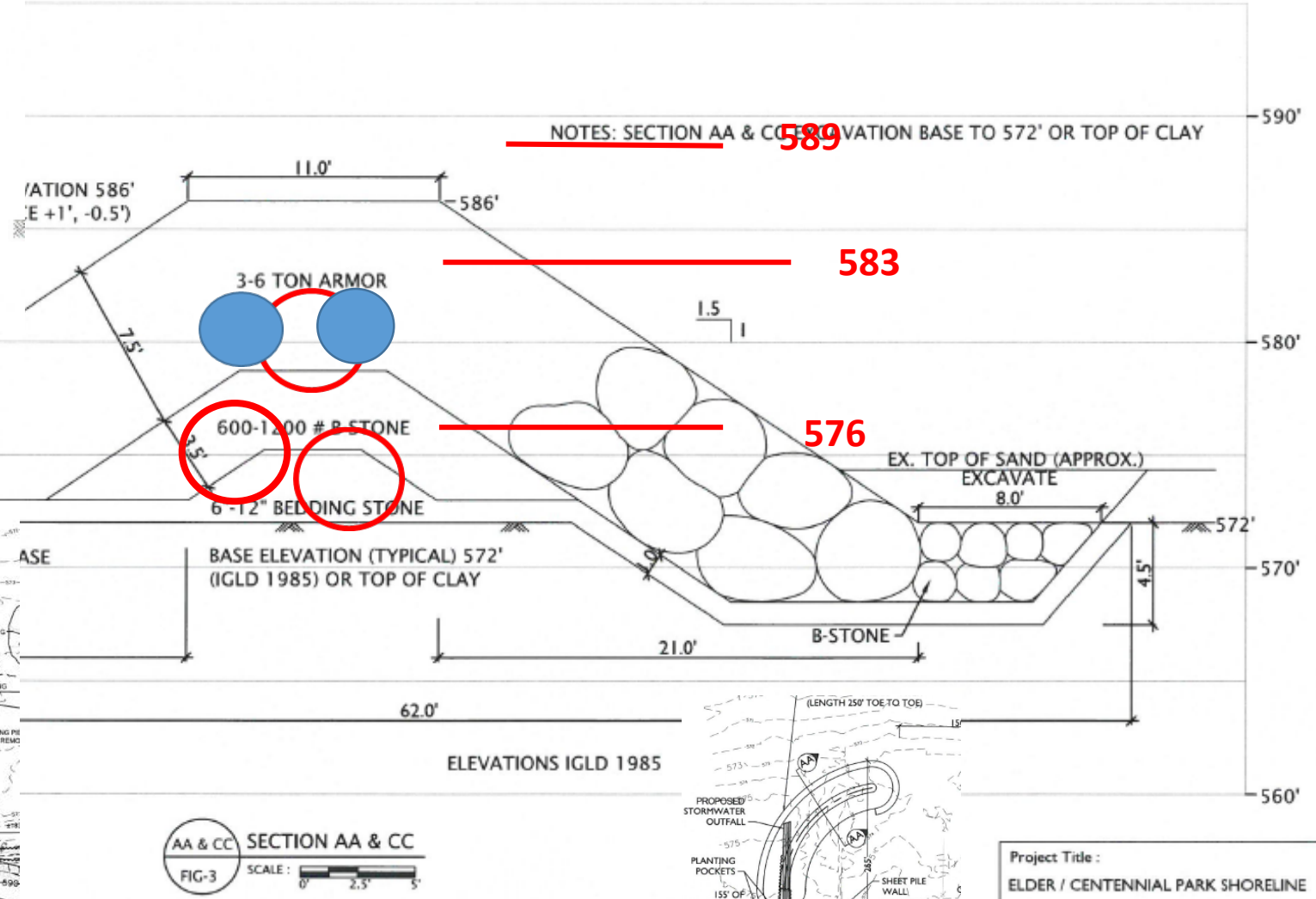
JOB NO.: 20-0078 SURVEY DATE: 09/30/2020
DRAWING FILE: DATA/20/0078/SITE.DWG


615
610
605
600
595
590
585
580
575
M-3
10' DIA. DROP
MANHOLE, R=611.80
STABILIZE BLUFF AFTER INSTALLATION
OF PIPES AND STRUCTURES, SEE DETAIL
ON SHEET C6.
M-4
R=591.00
194.70
I=583.80
I=581.80
I=581.80
CERAMAWRAP
DIP @3.33%
174 LF DOUBLE 36" CERAMAWRAP
EPOXY COATED DIP @ 1.15%
I=577.80
610.07
595.38
14+50
15+00
15+50
16+00
16+50
17+00



SECTION A





AA & CC FIG-3 SECTION AA & CC

SCALE : 0' 2.5' 5'

Project Title :
ELDER / CENTENNIAL PARK SHORELINE

Title :
SECTION AA & CC

Figure No. : 4

Date : 11 APRIL 2022

Scale : 0' 2.5' 5'

Element Description	What	Where	Source of Cost	Doc?	Price	Qty	Units	Total	no new ramp use existing	with ramp
Mobilization	General Contractor Cost	Elder			$ 600,000.00	1		$600,000.00	$600,000.00	$600,000.00
Buried Stone Revetment 12 ton per ft.					$2,500.00	175	ft	$437,500.00	$437,500.00	$437,500.00
Concrete demo/removal					$100.00	600		$60,000.00	$60,000.00	$60,000.00
Bluff Restoration	Vegetation restoration of bluff	bluff	Lakota		$ 150,000.00	1		$150,000.00	$150,000.00	$150,000.00
Sand Placement Mason Sand					$45.00	9600		$432,000.00		
Paving of Parking Lot					$6.00	26254		$157,524.00	$157,524.00	$157,524.00
35 ton per foot breakwater					$ 5,820.00 0	300		$1,746,000.00		
15 ton per foot 1/2 breakwater					$3,000.00	100		$300,000.00		
Stone Steps 35 Ton Breakwater					$55,000.00	1		$55,000.00		
Steel Sheet Piling 30' deep					$3,200.00	200		$640,000.00	$320,000.00	$640,000.00
Concrete for ramp					$100.00	1700		$170,000.00		$170,000.00
Access Roadway Stone w/Drainage					$250,000.00	1		$250,000.00		$250,000.00
Retaining Walls					$100,000.00	1		$100,000.00		$100,000.00
Relocated Stormwater Outfall	1 60" diameter on bluff	bluff			$600.00	500	L ft	$300,000.00	$300,000.00	$300,000.00
Relocated Stormwater Outfall 36"	2 36" diameter beach and lake	beach and lake			$450.00	325	L ft	$292,500.00	$292,500.00	$292,500.00
Demo (steel, pier, misc.)	Existing pier and outfall pipe				$220,000.00	1		$157,524.00	$157,524.00	$157,524.00
Total								$5,910,524.00	$2,475,048.00	$3,315,048.00
Soft Costs								$220,000.00	$220,000.00	$220,000.00
Engineering, plans/drawings, permit costs	Non construction costs -- in addition to $600,000 alrady spent							$175,000.00	$100,000.00	$100,000.00
Thotal hard and soft costs								$6,305,524.00	$2,795,048.00	$3,635,048.00
Contingency (15%)	Reserves for unexpected costs							$886,578.60	$377,555.00	$545,250.00
Total								$6,972,102.60	$3,172,603.00	$4,180,298.00
	Spend the remaining money upgrading Tower and making necessary repairs of Centennial									
	Do nothing at Centennial									
Missing Considerations										
Pollution reduction devices not priced										
Differentiationg costs of pipes material and installetion		bluff, bluff/beach slope, surf zone, lake bottom								
Village imposed requirement for enhanced outfall capacity -- what plans does Village have to increase upstream capacity what and when?										

Element Description	What	Where	Source of	Doc?	Price	Qty	Units	Total	no breakwater		
Mobilization	General Contractor Cost	Elder			$ 600,000.00	1		$600,000.00	$600,000.00		
Demo (steel, fencing, wood piles)					$100,000.00	1		$100,000.00	$100,000.00		
Bluff Restoration	Vegetation restoration of bluff	bluff	Lakota		$ 150,000.00	1		$120,000.00	$120,000.00		
Sand Placement Mason Sand					$45.00	120000		$540,000.00			
Paving of Parking Lot					$6.00	6800		$40,800.00	$40,800.00		
35 ton per foot breakwater					$ 5,820.00 0	250		$1,455,000.00			
15 ton per foot 1/2 breakwater	Is this relpaced with the steel groin (11) ?				$3,000.00	100					
Steel Staircase Lump Sum					$50,000.00	1		$50,000.00	$50,000.00		
Steel Sheet Piling 30' deep					$3,200.00	228		$729,600.00		leave exising	
Concrete for ramp					$100.00	812		$81,200.00	$81,200.00		
Access Roadway Stone w/Drainage TBD	Where is this on the plan? Same as Elder Option 2				$250,000.00	1		$250,000.00			
Retaining Walls					$120,000.00	1		$120,000.00			
ADA walkway and connection Lump Sum					$300,000.00	1		$300,000.00	$300,000.00		
Total								$4,386,600.00	$1,292,000.00		
Soft Costs	Engineering, plans/drawings, permit costs, etc.)							$175,000.00	$175,000.00		
Thotal hard and soft costs								$4,561,600.00	$1,467,000.00		
Contingency (15%)	Reserves for unexpected costs							$657,900.00	$193,800.00		
Total								$5,219,500.00	$1,660,800.00		
Missing Considerations											
Access roadway not on these plans											

Questions and Issues related to an Elder Now plan

Questions and issues below have arisen during my investigation of the feasibility of the more detailed, Aug 8, Elder Now plan that accompanies this list of issues. I had submitted a less detailed plan to W. James and J. Peterson on 2 Aug. These issues are submitted in hopes that Costa Kutulas and I (and others if other alternative plans are submitted) can meet between the 18th and the 24th. A meeting beforehand could resolve some of these issues off line so that they do not obstruct progress at the workshop. I will be out of town from 11 to 24 August so my participation will have to be by zoom, which I can set up if necessary.
Chuck Dowding

Detailed Issues hopefully to be explored before workshop

1) Are there any borings in the lake/beach at Elder and Centennial to determine the elevation of the top of clay along the intended route of the storm water outfall pipe(s)?
2) The cross sections along the pipe route (AA and BB) of the permit application show the pipe invert (bottom) at 579. The lake bottom is at ~575.On what are they resting? There is no bottom to these cross sections – why?
3) Out fall pipe design and placement are critical to moving forward
    a. Has the village supplied flow rate estimates for the 5, 10, 20, 50 and 100 year storms?
    b. If there are only a 2.25 and 3 ft diameter inflow pipe, why are there two 3 ft diameter outfall pipes from the treatment boxes? The inflow pipe sizes pollution treatment facility will control the quantity of inflow water.
    c. A single 4 ft diameter pipe would allow a 14 % greater flow capacity over the inflow volumes. Two 3 ft diameter outfall pipes only supply a 28% greater flow capacity
4) Has narrow sheet pile surf zone protection of the out fall pipe been considered? Two possibilities are shown on drawing on the accompanying 8 Aug Elder Now plan.
5) Has a trenched into clay outfall pipe route been investigated?
    a. Outside the surf zone simple burial with top of pipe at lake bed surface would be sufficient according to the ACE Coastal Engineering Manual
    b. In the surf zone the pipe could be protected with a modification of the permit plan as shown by the drawing in the accompanying 8 Aug Elder Now plan.
    c. The pipe should be paced as deep as practicable (top as far below 583 as possible) for protection and to allow placement of low (max height 583-5) rubble stone breakwater at a later date.
    d. With or without a rubble stone cover, the pipe will have to be initially placed without cover before the rubble stone is placed.
6) There are 3 limestone quarries with docks for large ships on upper Lake Michigan. There are also quarries along the Illinois river that can barge limestone
    a. What are the prices for large rubble blocks from these quarries? These sources avoid/reduce road transport. Other contractors have used them.
7) Why are breakwaters needed?
    a. Elder and Centennial survived the last high water event without them.
    b. What is the cost of the repair of the gabions and sheet piles that severed so well?
8) Given that Elder and Centennial bluffs remained stable with existing protection devices, what is the justification for stone breakwaters to elevation 589?

Dowding Design Principles (2 Aug, 2022)

- Beginning construction to rejuvenate Elder in 2023 is important
- Recognize that the 2030 plan included development with and without ownership of 261
- Recognize that average lake level is 580
- Recognize that rejuvenated Lloyd beach breakwater with top elevation of 591 presents an 11 ft visual barrier when sitting at the average lake level – 580; a top elevation breakwater of 589 at E-C would present a 9 ft visual barrier.
- Recognize that Elder and Centennial bluffs already have adequate bluff erosion protection since they withstood the 2020 max elevation of 582.5.
- No plan will include landfills (misnamed planter pockets) of any size. They will be employed to grow plant based physical and visual barriers to public land. IDNR acceptance of land fill of Lake Michigan as erosion protection will allow riparian owners to reduce public access to public land along 64 miles of Illinois Lake Michigan shoreline.

Hi Warren
As you may have foreseen, Colleen shared your assessment of the Elder Now plan. Glad to see that we're in a dialog through Colleen and that you have reviewed my plan. My answers to your observations are presented below in **green.**

Cynthia sent to me a pipe stabilization design employed in Zion that simplifies pipe stabilization and clamps the outfall pipe with fewer piles. There is even a cost estimate from Zion for the clamps. See the attached permit application for a photo of the clamp (already deployed) and article with the costs. To be conservative, an additional cost of 8 of the Zion clamps (one every 25 feet assuming a 25 pipe section) could be added to my original estimate. The cost of clamps for Winnetka should be less because the clamps would be added during construction not after placement as is the case in Zion. Thus they do not need to be hinged and can be designed with smaller amounts of steel.

Warren James analysis of Dowding Elder Now plan

While I respect Chuck Dowding, his proposed "Elder Now" plan is flawed for a variety of reasons. In addition to being infeasible, his cost estimate is likely far from accurate based on the factors cited below.

Here's a short list of problems with "Elder Now" which would result in much higher cost without any attendant benefit of the proposed stone groin.

1. The Village will NOT accept a 48" diameter outfall pipe. They initially insisted on a 60" diameter pipe to replace the existing 54" diameter pipe but acquiesced to the pair of 36" diameter pipes recognizing that the wider diameter poses additional problems explained below. **My final plan included a 60 '' diameter pipe. The quantity of flow for 2, 36 in pipes (with the same head difference) is equivalent to one 51 in diameter pipe. The issue cannot be quantity of flow. I cannot find below the "technical" reason for Village acceptance of 2, 36 inch pipes. Did you mean the unnumbered paragraph at the end? If so, please identify the technical reason.**

2. The proposed plan was also discussed with the MWRD to ensure it would be processed under a maintenance permit. There's no guarantee Elder Now will satisfy the MWRD requirements. **Can you share this document? Issues that that are not identified cannot be addressed.**

3. Sheet pile cost estimates are $3200/lineal foot, thus two rows to protect the pipe as proposed in Elder Now costs $6400/lineal foot. Not only is the sheet pile more expensive than the $6000/lineal foot cost of a stone groin, the pipe will necessarily be much longer. **See the introduction to my response. Let's say that twice as many clamps are needed. That would be 32 piles. Assume that the steel clamp pile is the equivalent of 1.5 feet of sheet pile. That is 32x1.5=48 feet or a cost of 48x$3,200 ~ = $150,000.**

4. Burying the outfall pipe in a clay trench implies that the top of the pipe is well below the sand. The invert of the outfall pipe (being at least 3 feet lower than the top) requires the pipe to be extended further into the lake before it "daylights" above the existing sand elevations. Not only will this result in much greater initial cost due to the length of the pipe, but it will likely result in greatly increased maintenance costs due to the pipe silting in with sand. See the attached plan with lakebed contours and share it with an engineer. **This map was included in my plan**. I'm sure anyone that can read a topo will concur that a much longer pipe will be required if the pipe is intended to be buried in a clay trench.

There are many possible designs for the exit of the outfall pipe. **The pipe was to be buried for the first 100 ft in the surf zone. Further extension could be partially buried and clamped to the clay lake bottom to prevent sand erosion.**

5. The deeper/longer pipe will necessitate marine based construction as there will be no stone groin from which the excavator can operate when installing the pipe. **The construction should be marine based to reduce construction traffic on Sheridan Rd and potentially save money by acquiring stone from Quarries with barge access. I have a barge based pile driving price from a pile driving contractor with a marine division. 30 foot deep Z section sheet piles would cost $3,000 per lineal foot.**

The Elder 2 plan incorporates the pair of 36" diameter stormwater pipes within the stone groin. The end of the pipes will be above the sand elevation but below the top of the groin. This approach ensures protection of the pipes from the surf, while keeping the invert above the level of the lakebed to avoid ongoing maintenance costs. The ends of the pipes are covered by armor stone to dissipate the velocity of the stormwater discharging from the pipes which is also favored by the regulatory authorities. **I'd be interested in this communication from the regulatory agency. There are many means of ending the outfall pipe. Costa did not provide the diffuser design when we spoke several weeks ago.**

I'm sure Costa and Jon will have even more reasons that Elder Now is both infeasible and more expensive, but suffice to say that the board straw poll favored Elder 2 and your insistence on advancing Elder now is not in the community's best interest.

As stated in my 2 Sept letter to John and you requesting a workshop, in my opinion the board has not reviewed my (CHD's) plan.

The outfall pipe is only one component of the Elder now plan. The other components have not been addressed in these comments.

A workshop could/would have resulted in a melding of the plans. For instance, the outfall pipe could be incorporated in a less elevated (say 583 rather than 589) rubble stone breakwater or a pier structure as suggested by Katie Stevens.

Chuck Dowding

Illinois Department of
Natural Resources
One Natural Resources Way Springfield, Illinois 62702-1271
www.dnr.illinois.gov
JB Pritzker, Governor
Colleen Callahan, Director

Office of Water Resources, Michael A. Bilandic Building, 160 N. LaSalle St., S-703, Chicago, IL 60601

Illinois Department of Natural Resources, Office of Water Resources
Public Notice

Protection of an Existing Water Intake Pipe, in Lake Michigan, at 17th Street and Lake Michigan, Zion, IL 60099

The Lake County Public Water District, 500 17th Street, Zion, IL 60099 has applied for an Illinois Department of Natural Resources, Office of Water Resources permit for the installation of armor stone to protect its existing water intake pipe, in Lake Michigan, at 17th Street and Lake Michigan, Zion IL 60099.

The applicant proposes to prevent undercutting of an existing submerged water intake pipe by placing armor stone at two locations, Riser 1 and Riser 2. On the south side of Riser 1 approximately 74 tons of stone will be placed for 20 ft east and west of Riser 1, for a total length of approximately 40 ft. On the north side of Riser 1 approximately 230 tons of stone will be placed for 20 ft west of and 130 east of Riser 1, for a total of approximately 150 ft. On the north side of Riser 2 approximately 193 tons of stone will be placed for 20 ft west of and 106 ft east of Riser 2, for a total length of approximately 126 ft. All stone placements will have an approximate width of 6 ft and approximate height of 5 ft. The proposed project will be reviewed using the Department's Part 3704 Rules. A location map and plans are attached to this notice.

No work is to start on this project unless and until such a time that the permit is issued.

Plans for the work may be seen at the Office of Water Resources, Chicago Office, 100 W. Randolph Street 15th floor, Chicago, Illinois 60601. Inquiries and requests to review the plans may be directed to James Kessen of the Chicago Office at (312) 793-5947 or james.casey@illinois.gov. An expanded version of the public notice can be viewed at http://www.dnr.illinois.gov/WaterResources/Pages/PublicNotices.aspx. You are invited to send comments regarding the work to the Chicago Office through September 20, 2022.

August 22, 2022

JOINT APPLICATION FORM FOR ILLINOIS

ITEMS 1 AND 2 FOR AGENCY USE

1. Application Number	2. Date Received

3. and 4. (SEE SPECIAL INSTRUCTIONS) NAME, MAILING ADDRESS AND TELEPHONE NUMBERS

3a. Applicant's Name:	3b. Co-Applicant/Property Owner Name (if needed or if different from applicant):	4. Authorized Agent (an agent is not required):
Donald White Company Name (if any) : Lake County Public Water District Address: 500 17-th street Zion, IL 60099 Email Address:	Company Name (if any): Address: Email Address:	Company Name (if any): Address: Email Address:
Applicant's Phone Nos. w/area code Business: 847 746 2052 Residence: Cell: Fax:	Applicant's Phone Nos. w/area code Business: Residence: Cell: Fax:	Agent's Phone Nos. w/area code Business: Residence: Cell: Fax:

STATEMENT OF AUTHORIZATION

I hereby authorize, _____ to act in my behalf as my agent in the processing of this application and to furnish, upon request, supplemental information in support of this permit application.

_____ Applicant's Signature

_____ Date

5. ADJOINING PROPERTY OWNERS (Upstream and Downstream of the water body and within Visual Reach of Project)

Name	Mailing Address	Phone No. w/area code
a. Adeline Jay Geo-Karis Illinois Beach State Park		
b.		
c.		
d.		

6. PROJECT TITLE:
Ballast Stone placement

7. PROJECT LOCATION:

LATITUDE: 4227.85000 *N LONGITUDE: 8747.75400 °W	UTMs Northing: Easting:				
STREET, ROAD, OR OTHER DESCRIPTIVE LOCATION 17th street	LEGAL DESCRIPT	QUARTER	SECTION	TOWNSHIP NO.	RANGE
☒ IN OR ☐ NEAR CITY OF TOWN (check appropriate box) Municipality Name Zion, IL	WATERWAY			RIVER MILE (if applicable)	
COUNTY: Lake	STATE: IL	ZIP CODE: 60099			

Revised 2010

☐ Corps of Engineers ☐ IL Dep't of Natural Resources ☐ IL Environmental Protection Agency ☐ Applicant's Copy

8. PROJECT DESCRIPTION (Include all features):

a)74 tons of Stone is to be placed on the south side of riser #1 from station 8+35 east to Station 8+75. Distribute the stone evenly to obtain a width of 6 feet by 5 feet high by 40 feet in length from the centerline of riser #1.
b) Starting on the north side of the intake pipeline at approximately station 8+35 (approximately 20 feet west of riser #1) start placing the 230 tons of rip-rap on the north side of the intake pipeline to station 9+85 (approximately 130 feet to the east of riser #1). Again, distribute the stone so that it is about 150 long x 6 feet wide and 5 feet in height. riser #2 station 18+55 42 (GPS 42° 27.852 N 087° 47.536 W) on the North side there is 126 feet of pipeline exposed from approximately station 18+35 east to station 19+51. Along this stretch 194 tons of rip-rap stone is to be placed 126 ft long x 6 ft wide x 5 ft high

9. PURPOSE AND NEED OF PROJECT:

To protect the District's one raw water intake pipe in Lake Michigan. Loss(movement) of this pipe could keep the District's treatment plant from producing drinking water for 30,000 plus customers.

COMPLETE THE FOLLOWING FOUR BLOCKS IF DREDGED AND/OR FILL MATERIAL IS TO BE DISCHARGED

10. REASON(S) FOR DISCHARGE:

11. TYPE(S) OF MATERIAL BEING DISCHARGED AND THE AMOUNT OF EACH TYPE IN CUBIC YARDS FOR WATERWAYS:

TYPE:

AMOUNT IN CUBIC YARDS:

12. SURFACE AREA IN ACRES OF WETLANDS OR OTHER WATERS FILLED (See Instructions)

13. DESCRIPTION OF AVOIDANCE, MINIMIZATION AND COMPENSATION (See instructions)

14. Date activity is proposed to commence: ASAP

Date activity is expected to be completed: ASAP

15. Is any portion of the activity for which authorization is sought now complete? Yes [ ] No [X]
Month and Year the activity was completed

NOTE: If answer is "YES" give reasons in the Project Description and Remarks section.
Indicate the existing work on drawings.

16. List all approvals or certification and denials received from other Federal, interstate, state, or local agencies for structures, construction, discharges or other activities described in this application.

Issuing Agency	Type of Approval	Identification No.	Date of Application	Date of Approval	Date of Denial

17. CONSENT TO ENTER PROPERTY LISTED IN PART 7 ABOVE IS HEREBY GRANTED. Yes [X] No

18. APPLICATION VERIFICATION (SEE SPECIAL INSTRUCTIONS)

Application is hereby made for the activities described herein. I certify that I am familiar with the information contained in the application, and that to the best of my knowledge and belief, such information is true, complete, and accurate. I further certify that I possess the authority to undertake the proposed ac

Signature of Applicant or Authorized Agent — Date: 7/1/2022

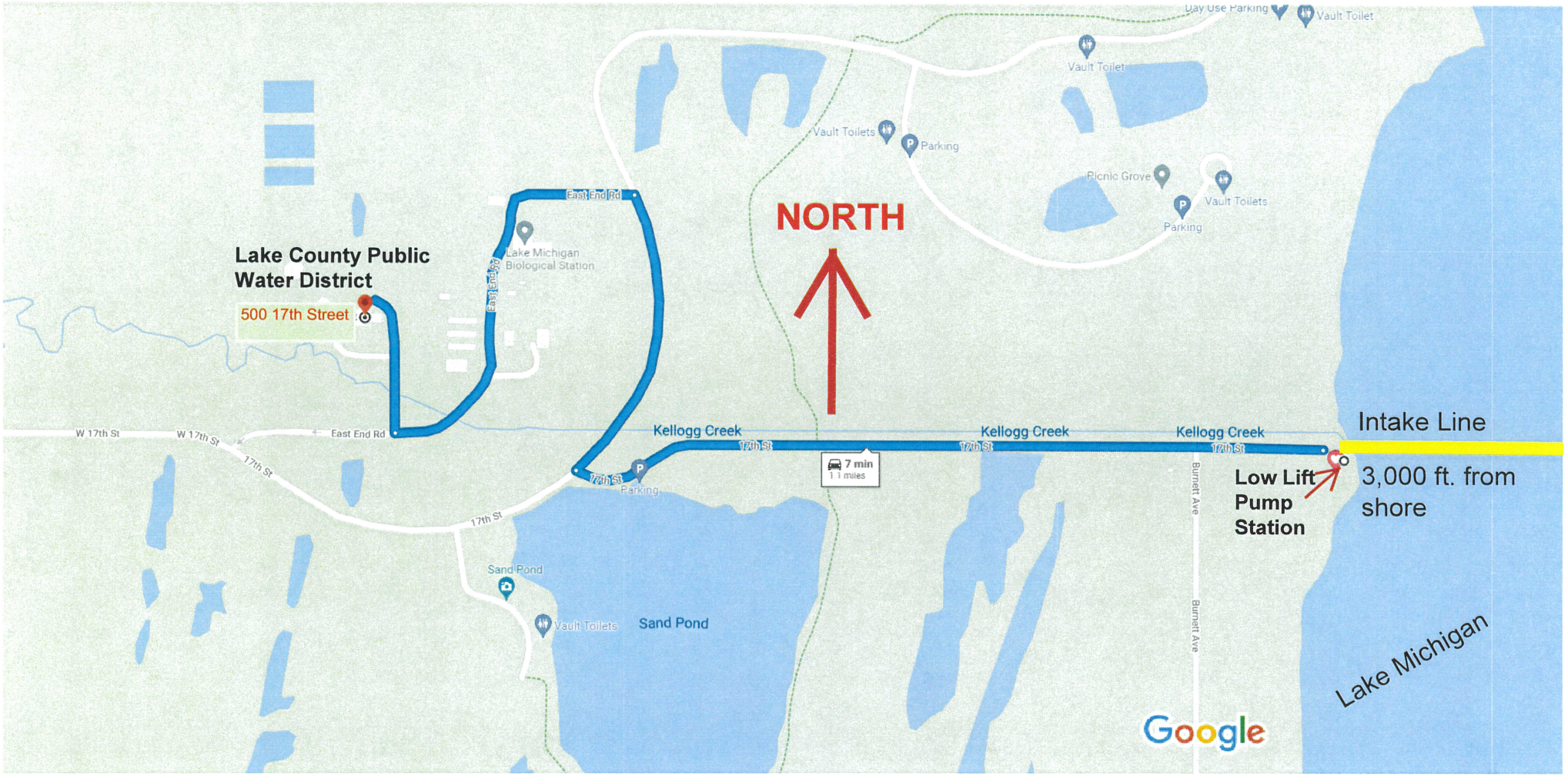
Signature of Applicant or Authorized Agent — Date

Signature of Applicant or Authorized Agent — Date

[X] Corps of Engineers Revised 2010 [X] IL Dep't of Natural Resources [X] IL Environmental Protection Agency [X] Applicant's Copy

SEE INSTRUCTIONS FOR ADDRESS

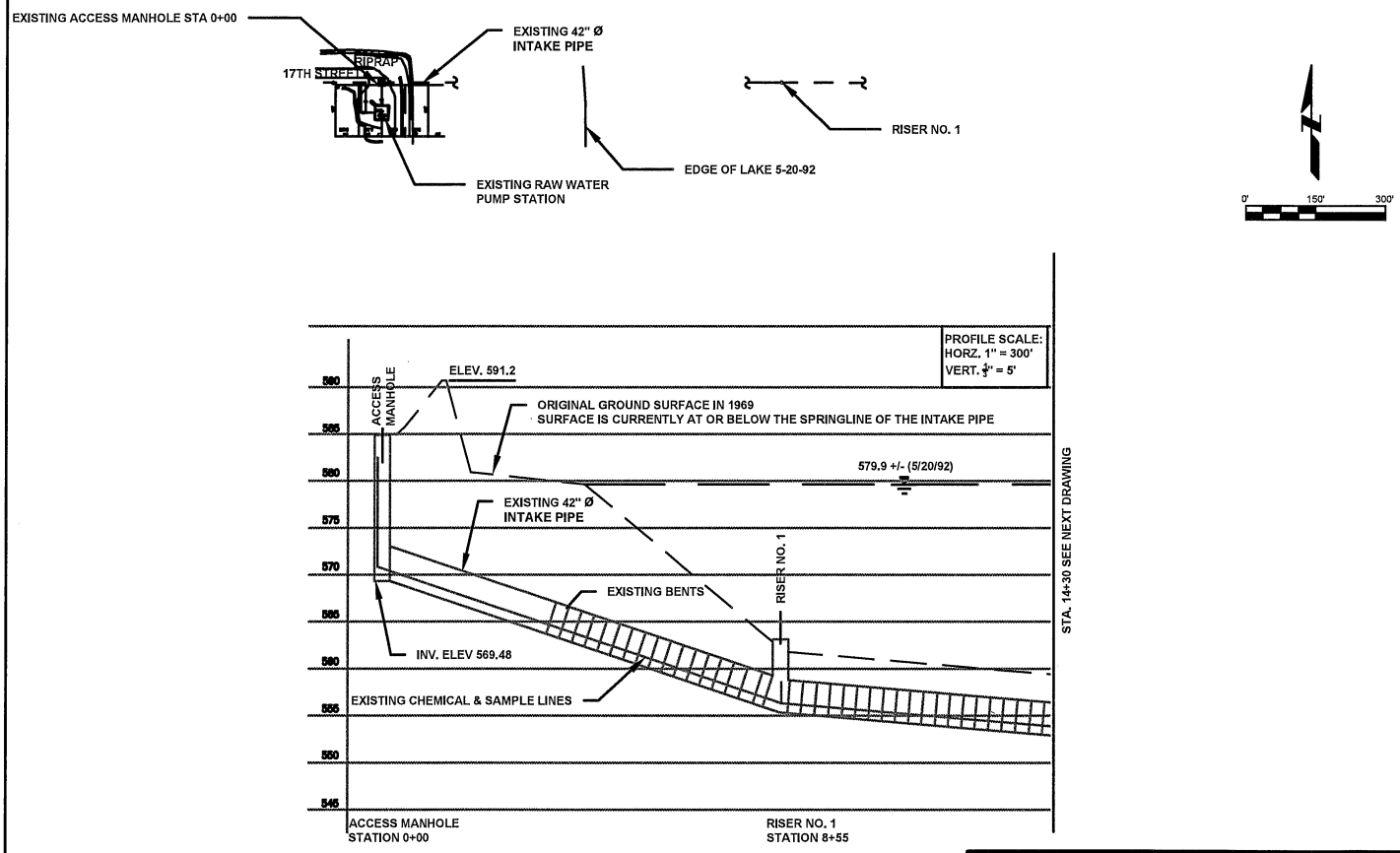
Google Maps Lake County, Illinois 60099 to 500 17th St, Zion, IL 60099 Drive 1.1 miles, 7 min



via 17th St and E End Rd 7 min

Fastest route now due to traffic conditions 1.1 miles

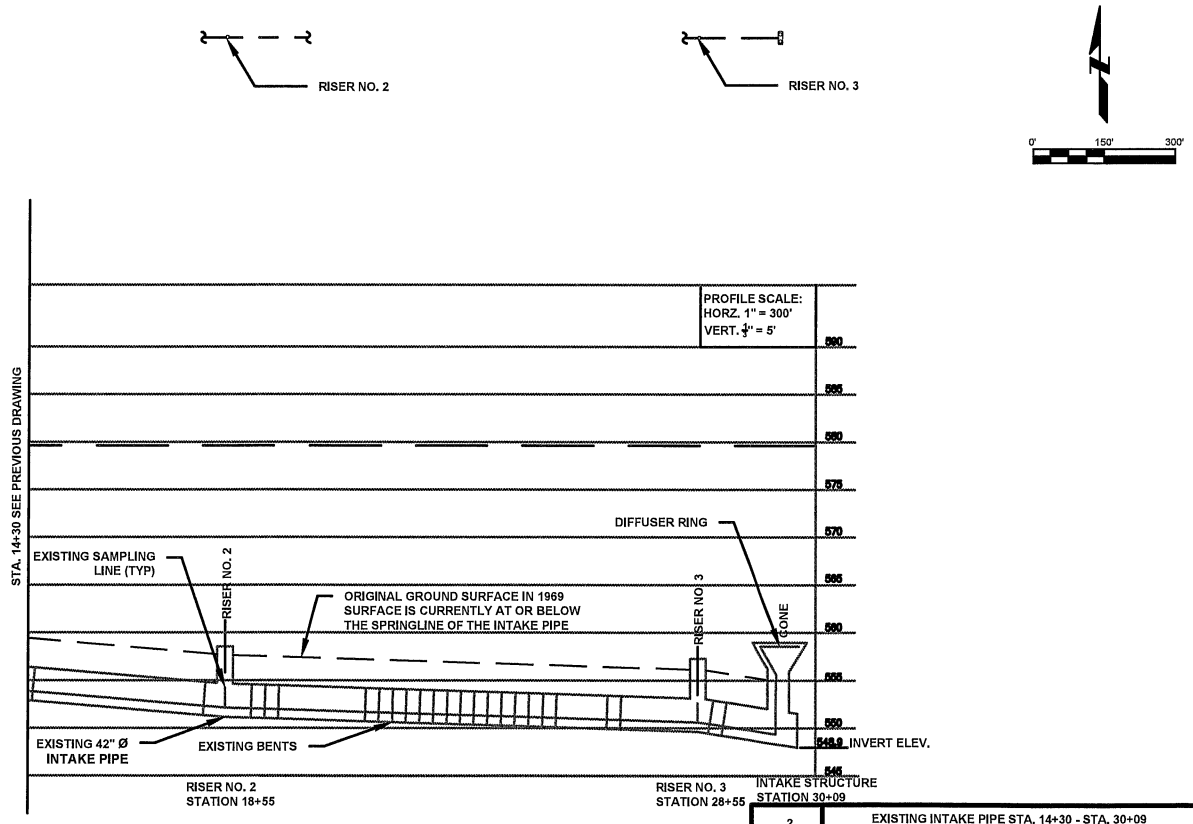
⚠ This route has restricted usage or private roads.



1	EXISTING INTAKE PIPE STA. 00+00 - STA. 14+30

ClarkDietz

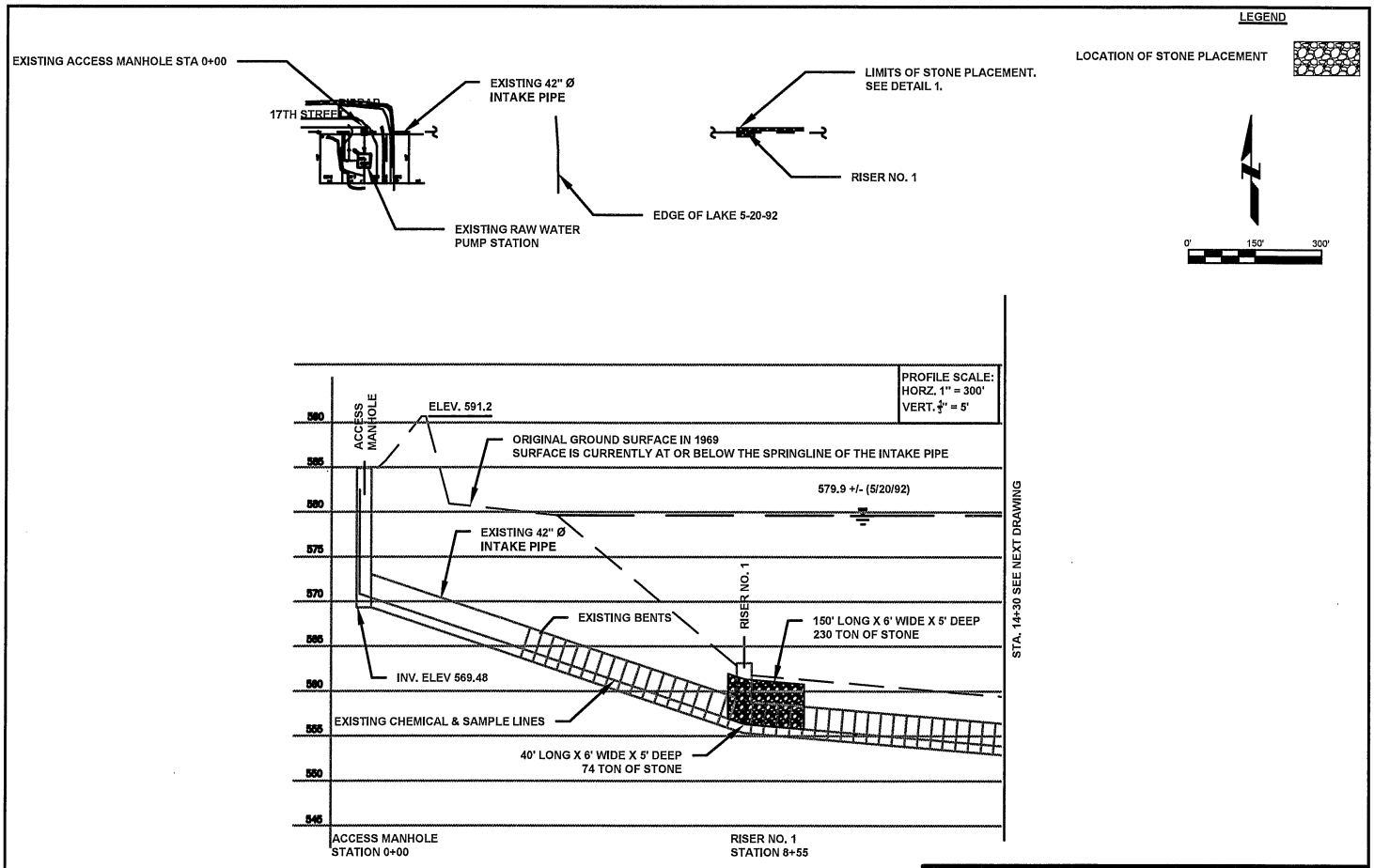
625 57TH STREET
6TH FLOOR
KENOSHA, WI 53140
PHONE : 262.657.1550
WWW.CLARKDIETZ.COM



2	EXISTING INTAKE PIPE STA. 14+30 - STA. 30+09

ClarkDietz

625 57TH STREET
6TH FLOOR
KENOSHA, WI 53140
PHONE : 262.657.1550
WWW.CLARKDIETZ.COM



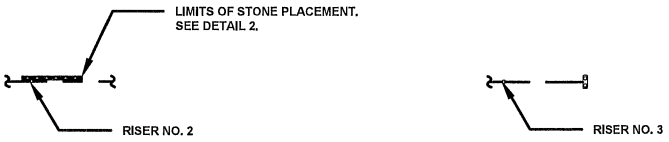
3	PROPOSED STONE PLACEMENT STA. 0+00 - STA. 14+30

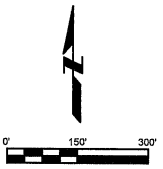
ClarkDietz

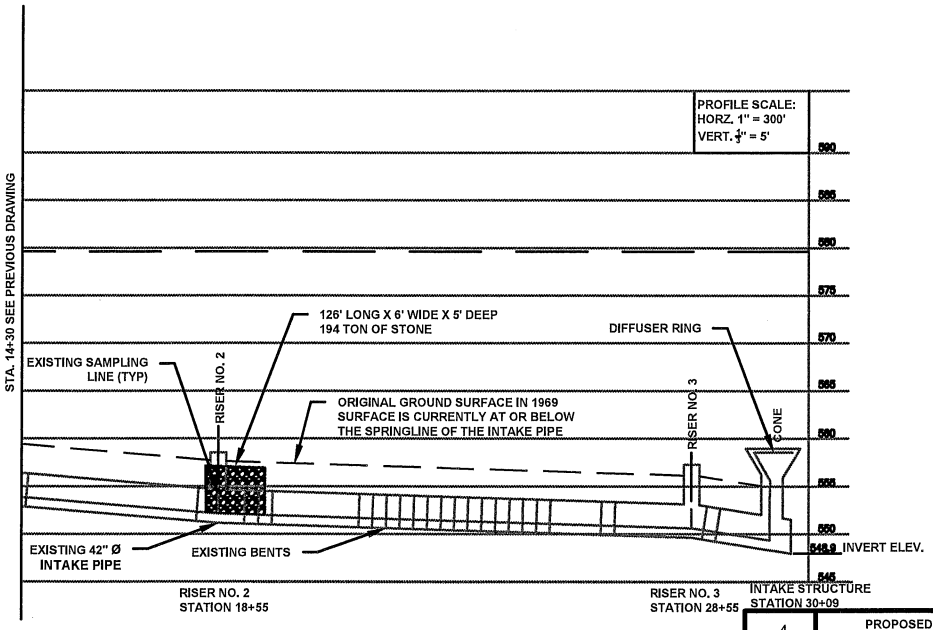
625 57TH STREET
6TH FLOOR
KENOSHA, WI 53140
PHONE : 262.657.1550
WWW.CLARKDIETZ.COM

LEGEND

LOCATION OF STONE PLACEMENT







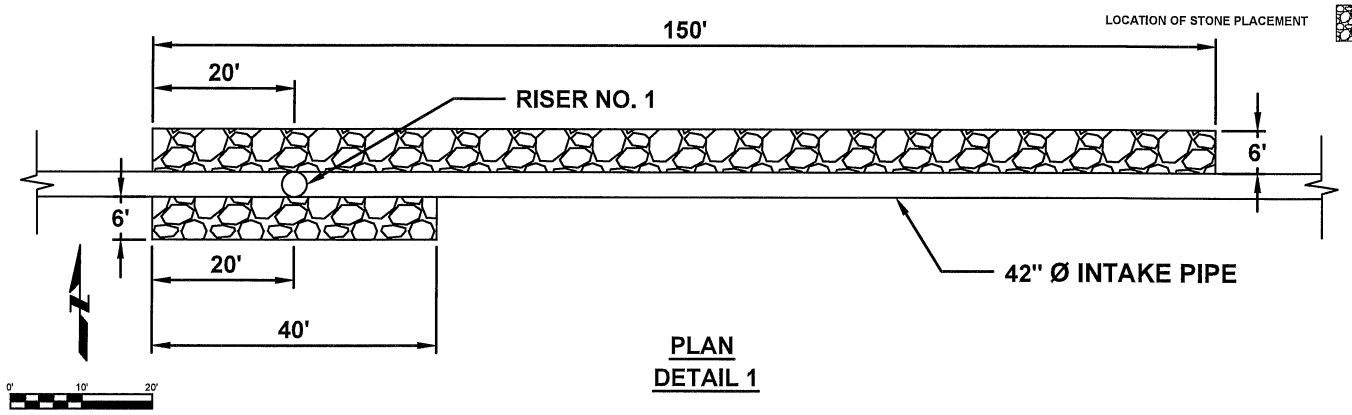
4	PROPOSED STONE PLACEMENT STA. 14+30 - STA. 30+09

ClarkDietz

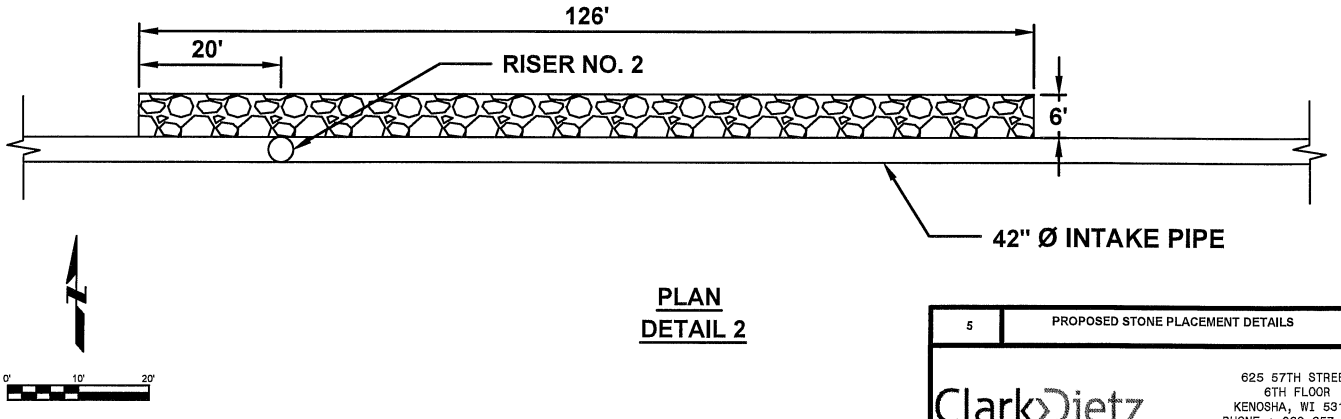
625 57TH STREET
6TH FLOOR
KENOSHA, WI 53140
PHONE : 262.657.1550
WWW.CLARKDIETZ.COM

LEGEND

LOCATION OF STONE PLACEMENT



PLAN
DETAIL 1



PLAN
DETAIL 2

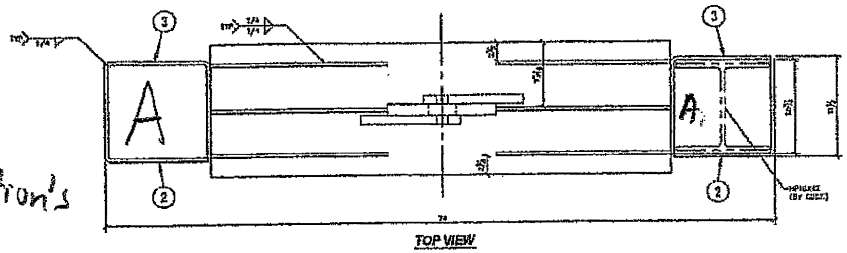
5	PROPOSED STONE PLACEMENT DETAILS

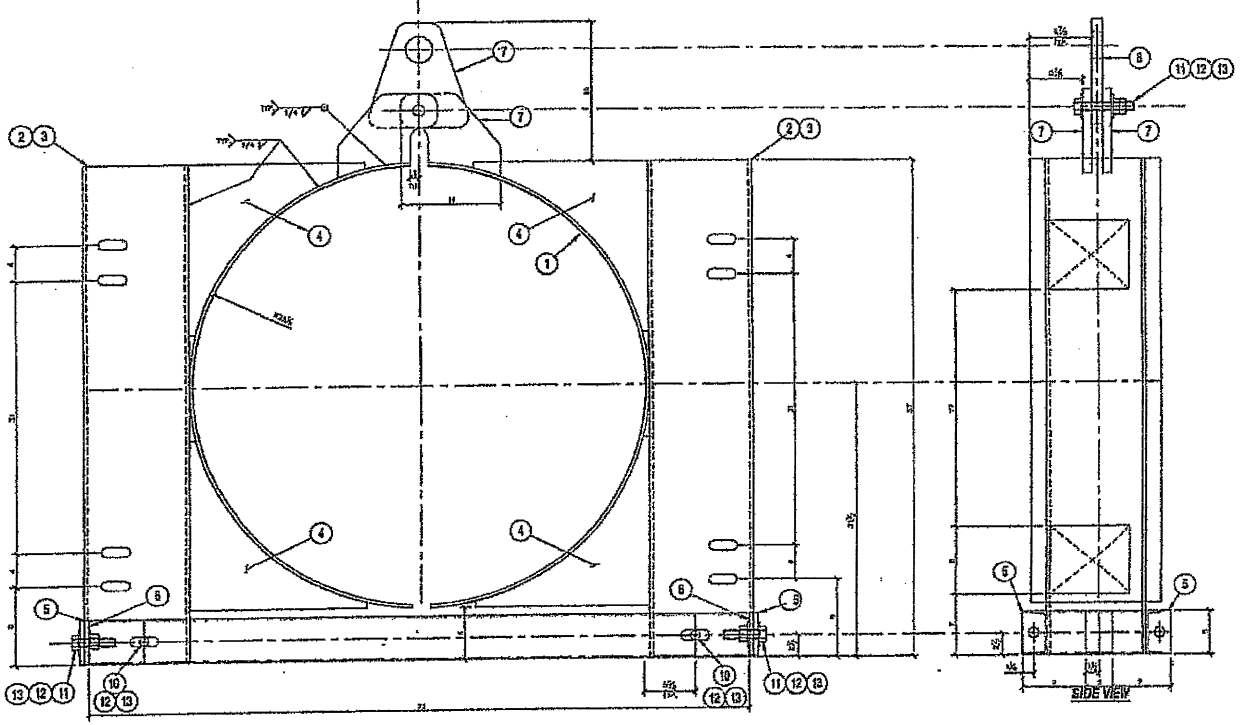
ClarkDietz

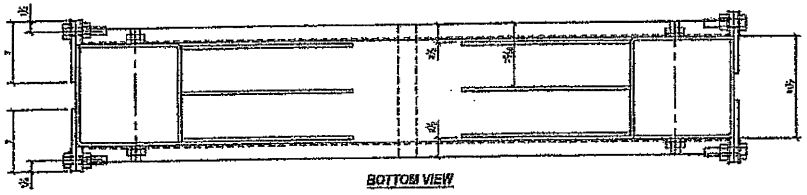
625 57TH STREET
6TH FLOOR
KENOSHA, WI 53140
PHONE : 262.657.1550
WWW.CLARKDIETZ.COM

Clam Shell Bent as designed by Jere Lapish 2011

(A) pile Location's







MATERIAL LIST

QTY.	DESCRIPTION	LENGTH	GRADE	NOTES	ITEM
1	PL 1/4 X 15	10"	A36	-	1
2	PL 1/4 X 21 1/2	64 3/4	A36	-	2
2	PL 1/4 X 21 1/2	64 3/4	A36	-	3
12	PL 1/4 X 15 3/4	15 3/4	A36	-	4
4	PL 1/4 X 8	7	A36	-	5
4	PL 1/4 X 2 3/4	8	A36	-	6
2	PL 1 1/4 X 10 1/2	9 3/4	A36	-	7
1	PL 1 1/4 X 11	12	A36	-	8
2	C10X15.3	23	A36	-	9
4	1"DIA. FULL THREADED STUD	1 1/2	A36	-	10
28	1"DIA. HEXNUT 8 THREAD	4 1/2	GR5	-	11
28	1"DIA. FLAT WASHER		FLAT	-	12
28	1"DIA HEXNUT		GR5 PLAT	-	13

APPROVER'S SIGNATURE

BY SIGNING ABOVE TO ASSURE THAT THE DRAWINGS ARE CORRECT TO THE BEST OF YOUR KNOWLEDGE WHICH INCLUDE, BUT NOT LIMITED TO ALL DIMENSIONS, MATERIAL, GRADE, FINISH ETC.

DRAWING ISSUED FOR	REV #	DATE	DESCRIPTION	BY
APPROVAL	-	-	-	-
CONSTRUCTION	1	5-23-11	GENERAL REVISIONS	RCD
FIELD USE	⚠	-	-	-

MATERIAL:	- A36 OR EQUAL
HOLES:	- 13/16"Ø U.N.O.
WELD:	- E70XX
FINISH:	- NO PAINT

LAKESIDE STEEL & MFG. CO.

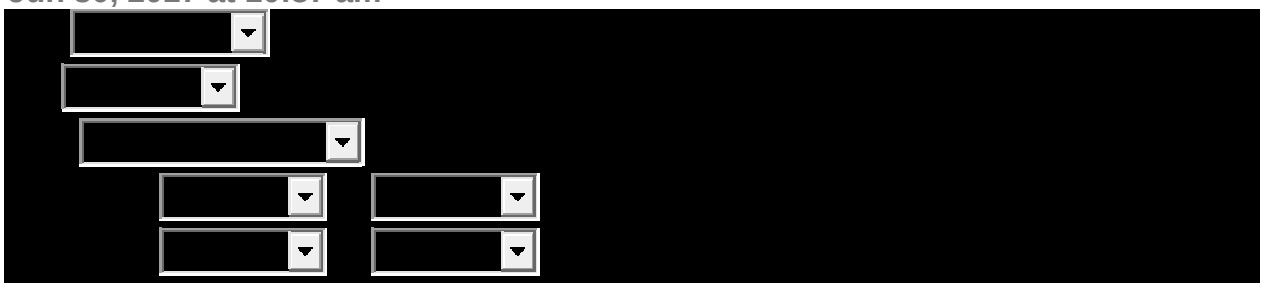
PURCHASE ORDER #:	31113001
CUSTOMER:	- LAKE COUNTY FUEL/WATER DISTRICT
LOCATION OF WORK:	-
DESCRIPTION	- PIPE SUPPORT COLLAR WITH PILE BOXES

DRAWN BY:	RCD	DATE:	7-25-11	JC31269-AS1
CHECKED:	-	JOB NUMBER:	JC31269	
APPROVED:	-	REV. NUMBER:	-	

The picture shows the Bent open for lowering the Bent on the Pipeline, note The Pad Eyes on the bottom of the Pile Guide Boxes, this is where the Five Inch Channels are attached and bolted up tight to hold Bents closed and also Support the pipe. Note the holes cut through the Boxes to Bolt the Piling to the Bent.

North Shore communities find combating loss of sand a costly undertaking

By Tony Briscoe
Chicago Tribune
•
Jun 30, 2017 at 10:37 am



The movement of sand along the Illinois shore has costs to industry, tourism and habitat. (Chris Walker/Chicago Tribune) (Chris Walker/Chicago Tribune)

Illinois' northern lakefront is a tale of haves and have-nots when it comes to sand. Decades of human interference have turned the seemingly mundane task of maintaining local beaches into a complex and costly undertaking.

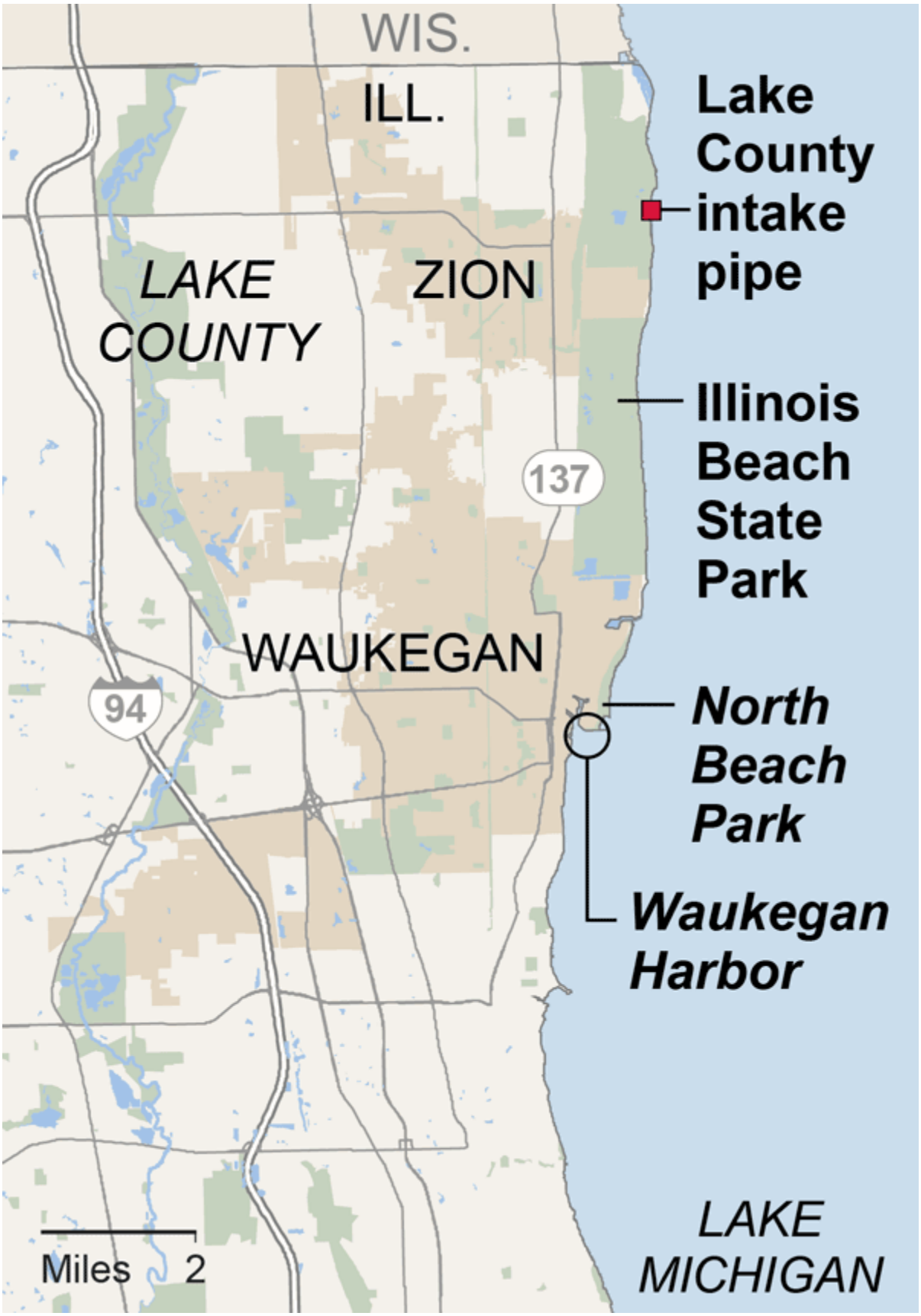
Nowhere is this more evident than the 7-mile stretch of lakefront between Zion and Waukegan -- microcosms of two different predicaments -- where shoreline communities are learning an overabundance or scarcity of sand isn't just a problem for beachgoers.

In Zion, accelerated beach erosion has threatened infrastructure that provides neighboring communities with drinking water, possibly costing millions of dollars to repair, and has endangered globally rare wildlife at Illinois Beach State Park.

Meanwhile, in Waukegan, the build-up of sand has dramatically hampered its shipping industry, trapping so much sand near the approach to Waukegan Harbor that the port has closed temporarily during five of the past eight years, increasing the cost of business for some companies and threatening jobs.

From Wisconsin to Indiana, the culprits behind many of these issues are man-made structures that trap sand, said Donald White, general manager of the Lake County Public Water District.

"You can't point fingers at any one party, because everyone's guilty of the same things," he said. "We have to figure out a solution."


WIS.
ILL.
Lake County intake pipe
LAKE COUNTY
ZION
Illinois Beach State Park
137
WAUKEGAN
94
North Beach Park
Waukegan Harbor
Miles 2
LAKE MICHIGAN

Infrastructure threatened

When the Lake County water district had an intake pipeline installed in 1970, about 4 feet of backfilled sand anchored the vital piece of infrastructure, which extends about 3,000 feet into Lake Michigan from Zion.

Two decades ago, the pipeline's safeguard appeared to be vanishing as consultants noticed sand levels had dropped beneath the pipe at some points and declined to the halfway mark at others, leaving it susceptible to being moved by currents or waves, White said.

In the years since, dive inspections have continued to find areas along the pipeline where sand levels are "dangerously low," White said.

In a worst-case scenario, a pipeline break could leave 30,000 residents in Zion, Winthrop Harbor and Illinois Beach State Park without water. Even a small breach could affect water supply and compromise quality.

As a quick fix, the water district tried to fortify the pipe by surrounding it with large stones.

Seeking a more permanent solution, it launched a project three years ago to fasten the intake pipeline to the lake floor with large clamps, and by year's end, more than half of it will be secured. But the costs raise questions about future work.

The water district raised rates to pay for clamps on the first leg of the project and later issued a $2.5 million bond.

Trustees were torn about the bond issue, White said. "However, if the infrastructure is not maintained, water quality standards cannot be met, or if the intake is lost, (there would be) no water."

Of the 100 clamps required to stabilize the entire pipeline, 41 more are needed at an estimated cost of $1.5 million to $2.3 million, White said.

The entrance to Waukegan Harbor has been plagued by building sand in recent years as beaches farther north have faced erosion problems. (Chris Walker/Chicago Tribune)

In addition to the pipeline, the Zion pumping station is also at risk.

Between 2014 and 2016, erosion fueled by severe storms and an unprecedented rise in lake levels swallowed 184 feet of beach outside the tiny brick building that delivers the town's water supply.

Powerful storms, not unusual in the fall and winter, could flood the building and interrupt service.

Last year, as a precaution, the water district had a 5-foot stone barrier built along the northeast shoreline of the pumping station, but eventually consultants believe they will have to move the building farther inland.

While many residents are familiar with the devastating effects of erosion, few are aware of how it may be hitting their wallets.

Kathy Champine, who has lived in Zion for 25 years, regularly walks along the shoreline in the morning, a walk that has become increasingly difficult.

"There's no beach," Champine said "When I walk, I wade through ankle-deep water. The walk between 21st Street and Hosah Park, the water is right up to the bluff. You see the erosion from the bluff falling in, the (exposed) gas lines and pipes from homes that were here 50 years ago."

Champine knew her water rates went up but didn't realize the increase was funding a shoreline project of such scope.

"Everything goes up," she said. "Water rates are going up. Taxes have gone up tremendously. I guess it just got buried in all of that."

Habitat loss

For thousands of years, sand has slowly drifted south from Wisconsin to Indiana, the process that eventually brought sprawling dunes from southern Wisconsin to present-day Illinois Beach State Park. Today, the 4,100-acre park contains diverse habitats, including the state's only system of beach ridges and swales.

But as shoreline infrastructure, like harbors and piers, was built into Lake Michigan, it began inhibiting the natural movement of sand along the shoreline. As a result, Illinois Beach State Park's mostly natural shoreline continues to surrender copious amounts of sand each year while it receives a dismal amount from southern Wisconsin's developed lakefront.

"We don't have hard numbers, but when you lose several acres over the years, you're bound to lose scores of endangered species," said Paul Kakuris, president of the Illinois Dunesland Preservation Society. "That's the most tragic part of all of this."

Aerial photography shows the park's northern shoreline has receded by more than 600 feet since 1939, meaning less habitat for endangered species, like marram grass. The relatively common dune grass would help retain the sand but has become a rarity in Illinois as beaches have disappeared.

"They come out of the dunes, and they really stabilize the beach itself, because they grow quickly and have a root system that spreads out and holds it all to together," said Diane Tecic, director of the Illinois Department of Natural Resources' coastal management program. "But with the erosion undercutting it, that destabilizes it all."

While the northern end of the park has lost acres of beach habitat, the southern tier has gained some beach. However, the unstable growth has presented a problem for wildlife, including the federally endangered piping plover, a shorebird known for nesting near the water.

"What's happening on the south end is not as much erosion as it is an overwash of sand," state coastal geologist Ethan Theuerkauf said. "All that sand coming in and then during a storm, it's actually being deposited up onto the dune, and it can actually bury these nests."

The state park is home to more than 650 plant and 300 animal species native to the area. Many, like the plover, are protected by state or national regulations.

A heavy equipment operator moves through a gypsum pile at National Gypsum Co. at Waukegan's port. (Chris Walker/Chicago Tribune)

Shipping industry losses

Much of the sand lost from Illinois Beach State Park has washed south onto the shores of Waukegan, where rambling sand dunes have emerged on the city's historically industrial lakefront because of a breakwater installed in the late 1920s. The structure, which protects the shoreline from pounding waves, extends about 1,900 feet into the lake, due north of the city's historic harbor. It has trapped roughly 6 million cubic yards of sand, resulting in 130 acres of new beachfront at what is now North Beach Park, according to the Army Corps of Engineers.

But the breakwater appears unable to capture any more sand. Evidence suggests sand is now drifting around the structure and funneling into the approach channel of Waukegan Harbor, where the amount of sand has sharply risen in past years.

"This harbor didn't have to be dredged until 1977. We almost had 100 years before we had to dredge," said David Bucaro, of the Army Corps of Engineers Chicago District.

Now, sand builds up in the approach channel regularly, requiring dredging almost every year. Since 2008, there have been five years when sand rose to 9 feet or higher, causing the port to be closed to large commercial shipping vessels.

According to a 2015 Army Corps report, if the harbor isn't maintained, it puts at risk $9.5 million in annual revenue and 300 jobs.

With a now perennial sand blockade shortening the shipping season, the amount of material moving through the harbor has dramatically dropped. Until 2008, the harbor, historically known for importing cement and gypsum, moved an average of 595,000 tons of cargo a year. Between 2009 and 2013, the average amount declined to 165,000 tons, as the harbor was beset by a combination of sand accumulation and low lake levels. Lake levels rebounded in 2014, but the sand remains.

No longer able to rely on the harbor to stay open, longtime Waukegan businesses like cement companies Lafarge and St. Marys Cement resorted to shipping their commodities to neighboring harbors and trucking them the rest of the way to their facilities. But the 60 employees of National Gypsum Co., the only company that still receives cargo through the harbor, are dependent on a long-term plan to keep the harbor open.

"If it doesn't get done, we can't ship gypsum rock," said Rich Romanek, plant manager at National Gypsum. "That's our vital material to make drywall, which comes from a quarry in Tawas City, Mich. It's just not economical for us to ship it by truck."

Historical dredging amounts

Cubic yards of sediment dredged at Waukegan Harbor from 1977 to 2015

Sand (cubic yards)Year1977198519911996199920022008201120150k100k200k

In response, the Waukegan Port District, city officials and the Army Corps, in a 2016 report outlined three potential options: extending the existing Waukegan breakwater; installing a sand trap at the southern end of Illinois Beach State Park or, perhaps the most controversial idea, excavating a portion of North Beach Park.

These options would reduce the amount of dredging that might be required in a given year but wouldn't eliminate the need completely, Bucaro said.

Waukegan Harbor is the only deep-draft harbor between Milwaukee and Chicago. In trying to provide funds to keep it open, the Army Corps has cited its importance as a harbor of refuge for passing vessels in the event of sudden storms on the lake.

But low-tonnage harbors like Waukegan's are considered low priorities, and the Army Corps spends over $1 million on dredging nearly every year.

The agency has emphasized that even if it finds one of the proposals economically feasible and enters into a cost-sharing agreement with the city and the Port District, there's no way to guarantee federal funds will be available for dredging, leaving the city to pick up that tab.

"With budgetary restrictions and priorities, I don't know what will happen in the future as it becomes more difficult to maintain," Bucaro said.

Waukegan alternative options and costs

No dredgingExcavate beachModify breakwaterSediment trap

No changed action

No action would be taken to change current dredging patterns. About 40,000 cubic yards of sand would be dredged annually, resulting in a total of 800,000 cubic yards of sediment dredged by 2039.

Sand (cubic yards)Year20192020202120222023202420252026202720282029203020312032203320342035203620382039
0k200k400k600k

Costs for Waukegan Harbor's alternative options, over 20 years

Total costs for each of the options below include any initial construction costs (like the sediment trap or breakwater modification), as well as dredging costs over 20 years of preliminary analysis. This is not a comprehensive nor a detailed assessment of actual costs.

	Initial construction costs	Dredging costs	Totals:
			$17,849,000
			$21,825,000
			$29,313,000
			$28,344,000

TrapModifyExcavateNone$0m$5m$10m$15m$20m$25m$30m

Beachgoers return to the parking lot June 13, 2017, at Municipal Beach in Waukegan. (Chris Walker/Chicago Tribune)

Public health

In an ironic twist, while the Waukegan breakwater formed North Beach Park, the city's municipal beach south of the structure has diminished because its supply of sand has been cut off.

With less natural sand migrating, the beach has become abnormally flat, causing water to pool in some spots. Those areas are susceptible to collecting animal waste or stormwater runoff, prompting the beach to sometimes be closed due to E. coli.

To address the problem, Waukegan last year purchased equipment to groom and clean the beach with funds from the U.S. Environmental Protection Agency.

All of these problems -- like most involving sand -- require more research before a remedy can be developed. Otherwise, researchers say they fear they could be culpable in taking the same hasty actions that produced the problems.

Theuerkauf recently assembled a team of volunteers from the community to regularly monitor elevation at the municipal beach, while Waukegan officials hope to begin work next year on one of the proposals that will help reduce harbor closures.

In Zion, officials may have to figure out how to pay for pipeline and pumping station upgrades as state and federal funding appears unlikely. But there's a possibility the

state DNR will be able to protect some of the shoreline habitat at Illinois Beach State Park against erosion if its EPA grant application is approved.

"It's really amazing," said Tecic, the DNR program director. "When I first came into this, I was just naive enough to say, 'There appears to be a problem here. We should get on this.' The problem we continue to grapple with is it's really complicated, and there's so many factors involved. But we have to come through this with a core of information to solve some of these problems."

Sources: US Army Corps of Engineers

tbriscoe@chicagotribune.com, @_TonyBriscoe

Charting by Nausheen Husain, @NausheenHusain

pipe installation in surf zone

https://www.google.com/search?q=sewer+pipe+installation+in+surf+zone&tbm=isch&ved=2ahUKEwjo8J709PT5AhUzFVkFHTzDALEQ2-cCegQIABAA&oq=sewer+pipe+installation+in+surf+zone&gs_lcp=CgNpbWcQAzoICAAQsQMQgwE6CAgAEIAEELEDOgUIABCABDoECAAQQzoLCAAQgAQQsQMQgwE6BwgAELEDEEM6BggAEB4QBToGCAAQHhAIOgQIABAYOgQIABAeUNEKWLGvAWCbvAFoAnAAeAKAAcYBiAH1JJIBBDcxLjKYAQCgAQGqAQtnd3Mtd2l6LWltZ7ABAMABAQ&sclient=img&ei=hlYRY-iVJrOq5NoPvIaDiAs&bih=577&biw=1280&rlz=1C1ASVC_enUS923US923#imgrc=OmyfQaABxXnBVM&imgdii=BsUd8D4I9K7QkM

https://isco-pipe.com/large-diameter/