



# BEACH DRIVE COASTAL RESILIENCY PROJECT

COLLABORATIVE ACTION FOR LAKE MICHIGAN  
COASTAL RESILIENCY  
APRIL 21, 2023

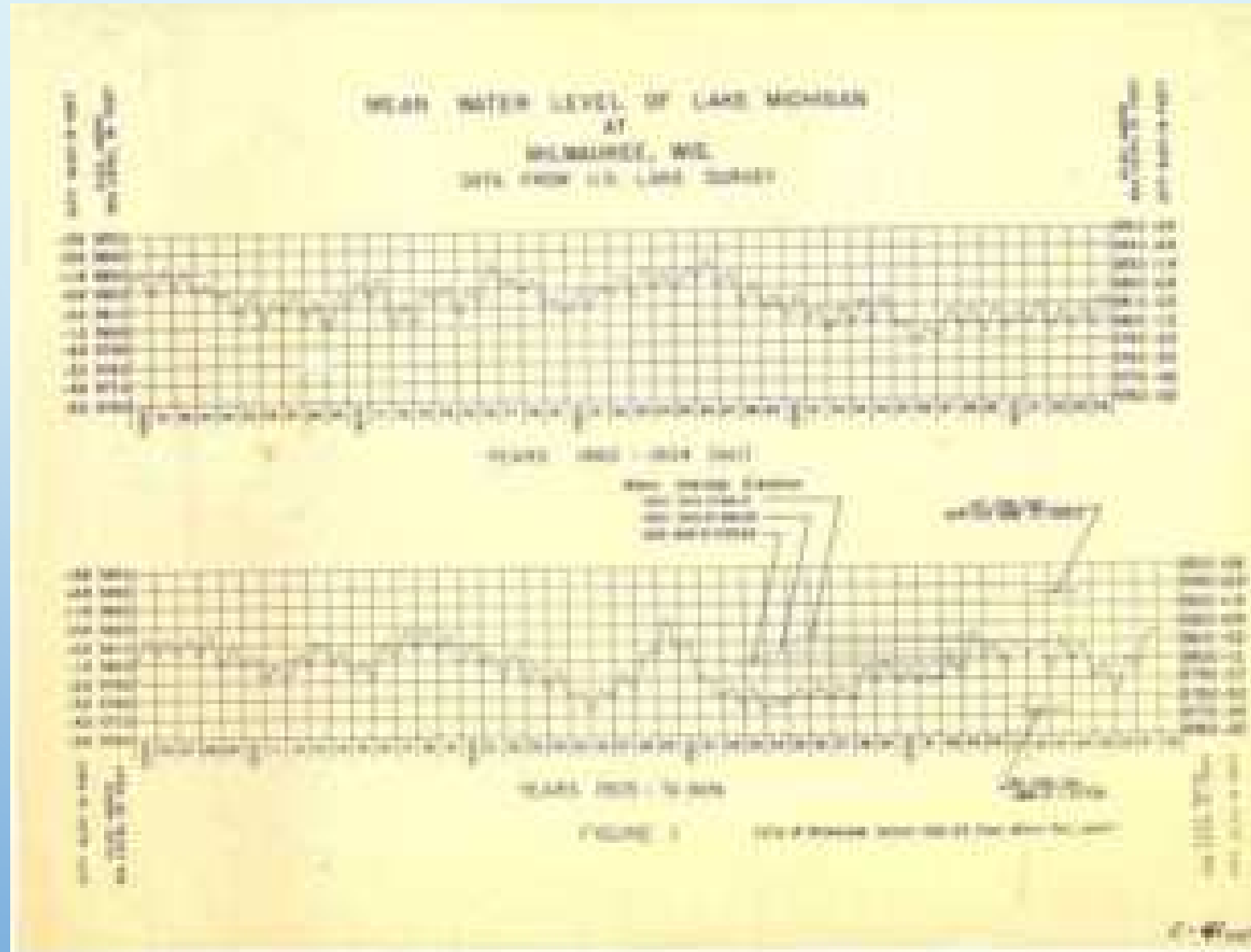
SCOTT BRANDMEIER, VILLAGE OF FOX POINT

KATIE SOMMERS, WISCONSIN WEM

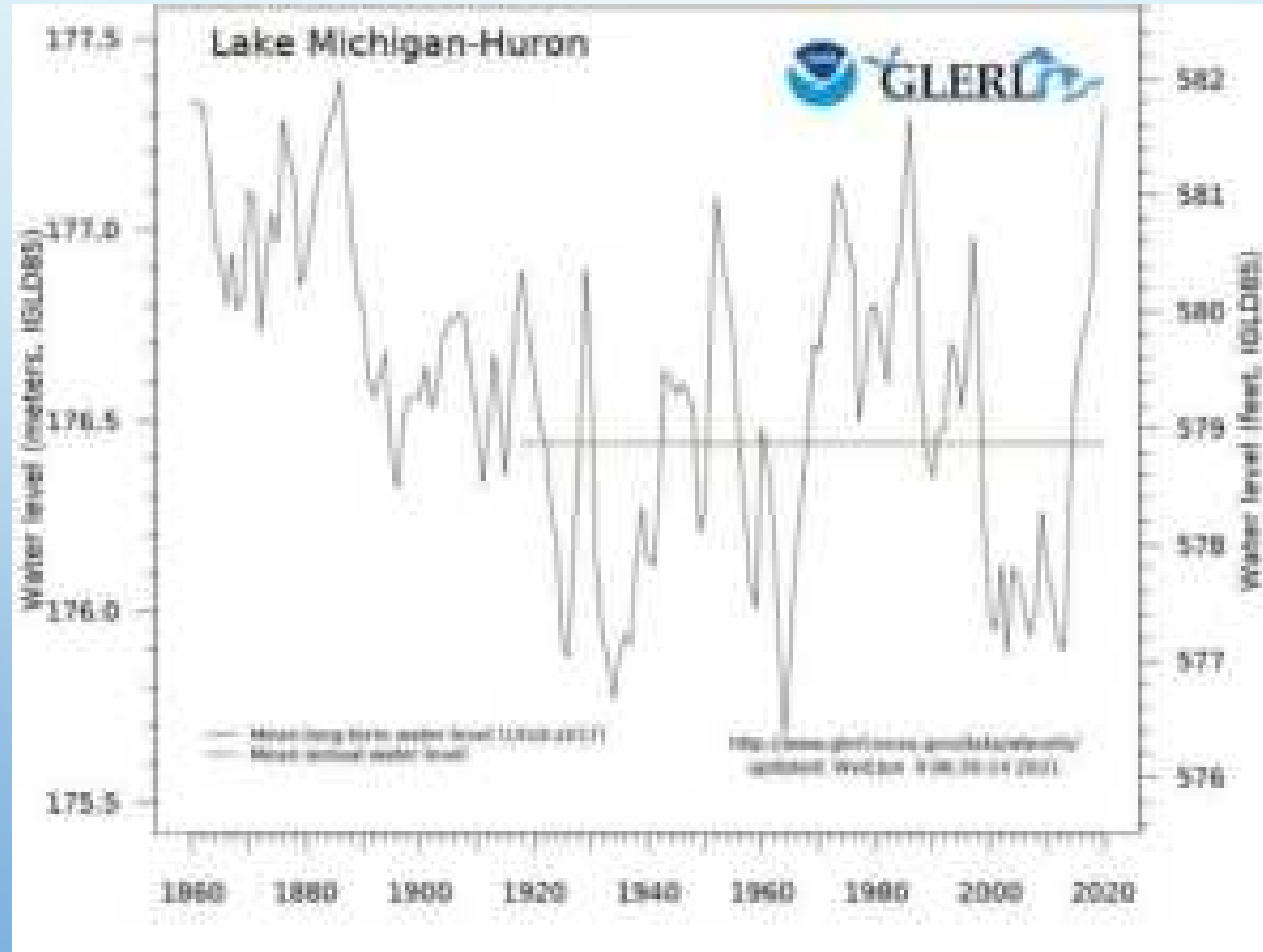
# COASTAL RESILIENCE IN THE 21<sup>ST</sup> CENTURY

- NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA) – “COASTAL RESILIENCE MEANS BUILDING THE *ABILITY OF A COMMUNITY TO ‘BOUNCE BACK’* AFTER HAZARDOUS EVENTS SUCH AS HURRICANES, COASTAL STORMS, AND FLOODING – RATHER THAN SIMPLY REACTING TO IMPACTS.”
- COASTAL RESILIENCE CENTER OF EXCELLENCE (CRC) AT THE UNIVERSITY OF NORTH CAROLINA – “THE MISSION OF THE COASTAL RESILIENCE CENTER OF EXCELLENCE (CRC) IS TO CONDUCT RESEARCH AND EDUCATION TO ENHANCE THE RESILIENCE OF THE NATION’S PEOPLE, INFRASTRUCTURE, ECONOMIES AND THE NATURAL ENVIRONMENT TO THE IMPACTS OF COASTAL HAZARDS SUCH AS FLOODS AND HURRICANES, INCLUDING THE EFFECTS OF FUTURE TRENDS.”
- MANY OTHERS ADDRESSING COASTAL RESILIENCE – UW MADISON/WISCONSIN SEA GRANT (CALM), USEPA, TEXAS A&M, NATIONAL FISH AND WILDLIFE FEDERATION, ETC.
- COASTAL IMPACTS CERTAINLY NOT LIMITED TO THE 21<sup>ST</sup> CENTURY BUT POPULATION TRENDS EXACERBATE THE PROBLEM AND EFFECTS.

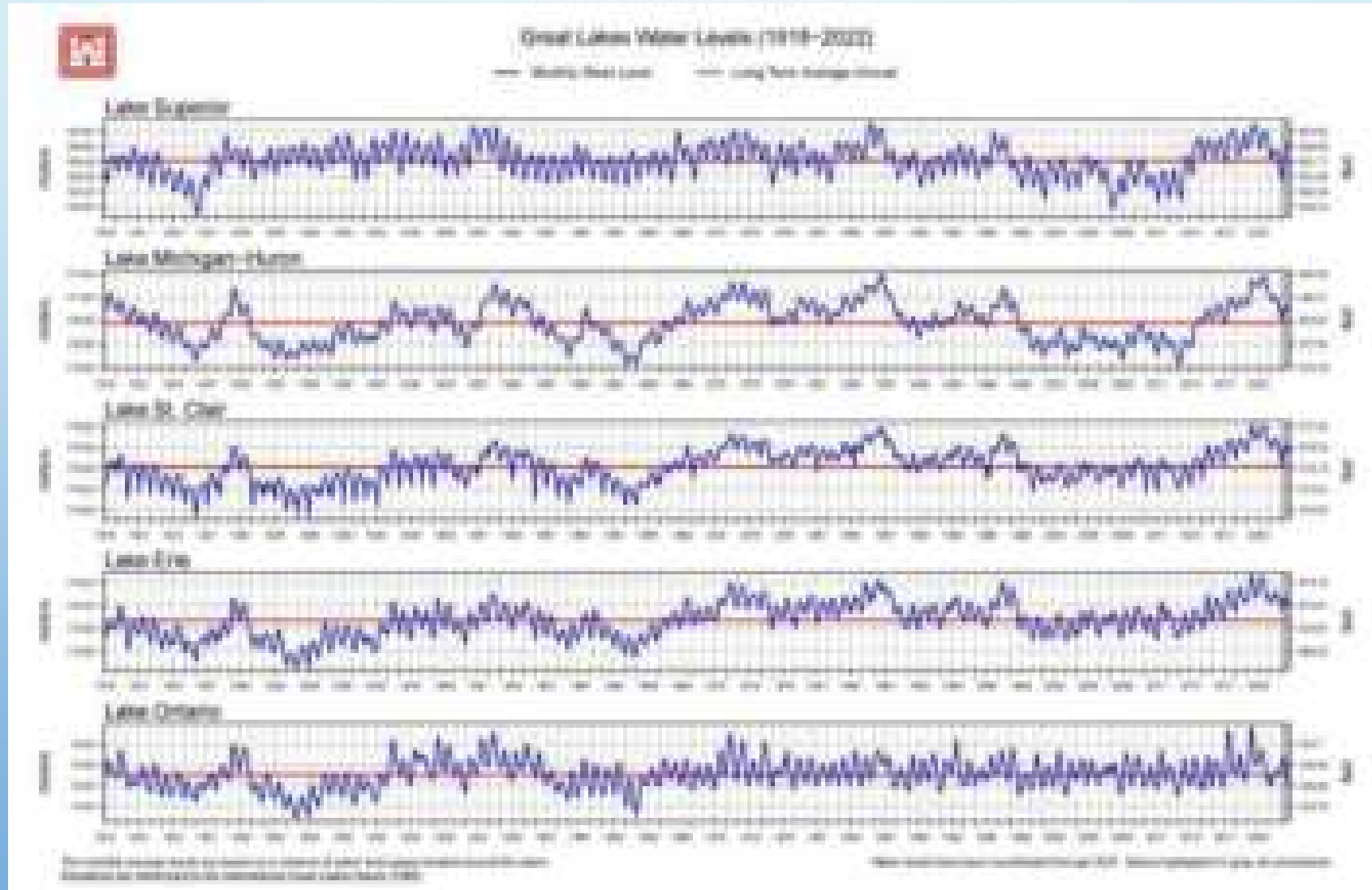
# MEAN WATER LEVEL OF LAKE MICHIGAN MILWAUKEE, WI 1860-1952



# MEAN WATER LEVEL OF LAKES MICHIGAN & HURON 1860-2020



# GREAT LAKES WATER LEVELS 1918-2022



# TOP TEN HIGHEST AVERAGE LAKE LEVELS

YEAR	ANNUAL AVERAGE	HIGHEST LEVEL
2020	581.71	July – 582.22
1986	581.67	October – 582.35
1886	581.64	June – 582.25
1860	581.43	July – 581.88
1861	581.42	August – 582.11
1885	581.40	August – 581.99
1862	581.37	June – 581.77
1876	581.36	July – 582.24
2019	581.18	July – 581.92
1974	581.18	July – 581.75

# TOP TEN LOWEST AVERAGE LAKE LEVELS

YEAR	ANNUAL AVERAGE	LOWEST LEVEL
1964	576.46	February – 576.12
1934	576.54	March – 576.24
1933	576.85	December – 576.32
1926	576.89	January – 576.10
1935	576.93	January – 576.38
1925	576.97	December – 576.22
1932	577.04	December – 576.41
1937	577.05	December – 576.54
2003	577.07	March – 576.54
2013	577.08	January – 576.02

# FOX POINT'S PROBLEM

- SHORELINE WAS “BUTTRESSED” IN LATE 1980’S TO EARLY 1990’S
  - 1986 – LAKE LEVEL OF APPROXIMATELY 583.2
  - EXPERIENCING EROSION ALONG SHORELINE
  - DPW ACCEPTED BROKEN AND CRUSHED CONCRETE FROM SURROUNDING PROJECTS
  - PLACED THE CONCRETE RUBBLE ALONG THE SHORELINE
  - WORKED FINE . . . UNTIL
- LAKE LEVELS BEGAN RISING THROUGHOUT 2019
  - JANUARY 2019 – 580.09
  - SEPTEMBER 2019 – 581.63
- SHORELINE ALONG BEACH DRIVE RELATIVELY UNPROTECTED
  - ROAD ABUTS SHORELINE
  - SEPARATED BY APPROXIMATELY 20-30 FEET OF LAND BETWEEN ROAD AND SHORELINE
  - SANITARY INFRASTRUCTURE IMMEDIATELY ADJACENT TO SHORELINE
  - STORM SEWER EXTENDING INTO LAKE
- DEBRIS WASHING ASHORE AFTER STORMS
- LOST UP TO 7 FEET OF SHORE IN A SIX WEEK PERIOD





# 2018 AERIAL



# 2020 AERIAL



# ACTIONS TAKEN

- BEGAN SURVEYING SHORELINE AFTER EVERY STORM EVENT
  - SURVEY BEGAN MID-OCTOBER
  - CONTINUED THROUGH DECEMBER
  - IN A SIX WEEK PERIOD, LOST UP TO 7 FEET OF SHORELINE
- START “SCRAMBLING”
  - REACHED OUT TO WISCONSIN SEA GRANT AND MILWAUKEE COUNTY OEM
  - ADDRESSED RESIDENT QUESTIONS AND CONCERNS ABOUT INTEGRITY OF ROAD
  - ATTENDED PRESENTATION BY ARMY CORPS OF ENGINEERS
  - BEGAN WORKING WITH WEM ON FEMA GRANT
- HIRED AN ENGINEER TO PROVIDE A SHORT TERM SOLUTION
  - RECOMMENDED PLACEMENT OF 2 FOOT BY 2 FOOT BY 6 FOOT CONCRETE BLOCK
  - INITIAL PLACEMENT ALONG SOUTHERN STRETCH WHERE ROAD WAS CLOSEST TO SHORE
  - AFTER THE DECEMBER STORMS, ADDED A SECOND LAYER ALONG ENTIRE SOUTHERN STRETCH
  - IN 2020, PLACED BLOCK ALONG THE NORTHERN STRETCH
- FEMA GRANT
  - DOCUMENTATION OF “INJURY” OR IMPACTS
  - BEACH DRIVE – ONE WAY IN AND OUT – LOSE THE ROAD AND RESIDENTS HAVE NO ACCESS TO THEIR HOMES
  - GATHER MORE DATA ON ESTIMATED COSTS, IMPACTS, CURRENT AND POTENTIAL DAMAGES, ETC.

# SURVEY DATA



# OCTOBER 4, 2019 STORM



# OCTOBER 4, 2019 STORM



# OCTOBER 21, 2019 VIDEO





# OCTOBER 21, 2019 VIDEO



# OCTOBER 21, 2019 STORM



# OCTOBER 21, 2019 STORM



# OCTOBER 21, 2019 STORM



# OCTOBER 21, 2019 STORM



# OCTOBER 21, 2019 STORM



# OCTOBER 21, 2019 STORM



# OCTOBER 21, 2019 STORM





DECEMBER 2, 2019



DECEMBER 2, 2019



# DECEMBER 12, 2019 – SHORT TERM SOLUTION



# DECEMBER 12, 2019 – SHORT TERM SOLUTION



JANUARY 10-11, 2020



JANUARY 10-11, 2020



# POST GRANT SUBMITTAL (JAN. 2020)

- FEMA GRANT
  - NOTIFIED IN LATE 2020 THAT FOX POINT RECEIVED IT
  - SUBMITTED SUPPLEMENTAL INFORMATION TO WEM AND FEMA LATE 2020 – EARLY 2021
  - HIRED MSA SPRING 2021
  - RECEIVED OFFICIAL APPROVAL TO PROCEED AUGUST/SEPTEMBER 2021
  - 24 MONTHS TO COMPLETE DESIGN AND CONSTRUCTION
- DESIGN FACTORS
  - DESIGN A SYSTEM TO BE COMPATIBLE WITH FLUCTUATING LAKE LEVELS
  - RECORD HIGH – 1986 – 582.35
  - JULY 2020 – 582.22
  - SEPTEMBER 2022 – 579.79
  - APRIL 2023 – 579.27
- MSA DESIGN
  - MINIMIZE HEIGHT OF REVETMENT
  - MAXIMIZE SLOPE OF REVETMENT
  - ATTEMPT TO GAIN BACK WHAT WAS LOST

# MSA AND ANCHOR QEA DESIGN

## Coastal Engineering – Crest Height, Width and Overtopping

Table 1  
Retainment stone sizing and crest elevations for a range of slopes

Design Slope (H:V)	Wave Slope (H:V)	Crest Elevation (ft. MSL)	Cover Stone Weight (lb)	Cover Stone Dia (ft)
1:1	1:1	594.07	4,000	1.5
2:1	1:1	597.71	1,400	1.1
2:1	1:1.5	597.20	2,400	1.4
2:1	1:2	591.51	2,300	1.4
4:1	1:1	595.88	1,700	1.3
5:1	5:1	595.24	1,400	1.1

Note:

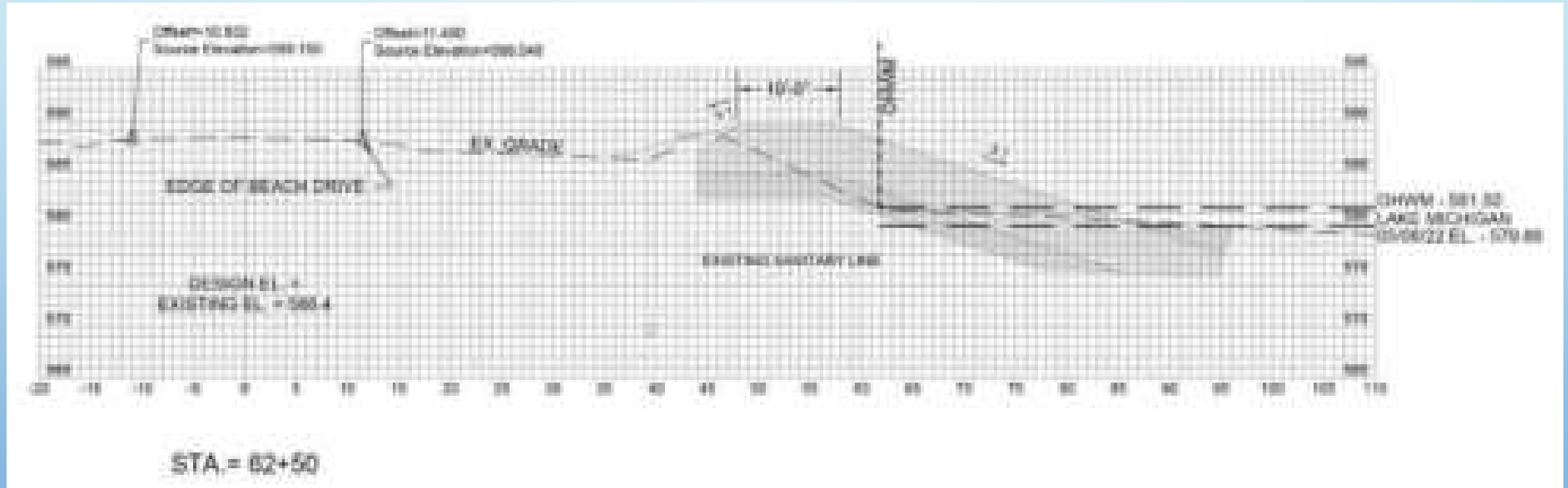
- Splash Apron Width Double to Reduce Height to Elev. 589.5
- Existing Temporary Concrete Block Wall is at Elev. 590







# MSA AND ANCHOR QEA DESIGN





# CONSTRUCTION



# CONSTRUCTION



# CONSTRUCTION



# LESSONS LEARNED

- DNR AND ARMY CORPS PERMITTING TOOK LONGER THAN ANTICIPATED
- RIPARIAN OWNERS MAY BE CHALLENGING TO WORK WITH
- COMMUNICATION KEY TO A SUCCESSFUL PROJECT
- REVISIT YOUR COST ESTIMATE MULTIPLE TIMES
  - SUBMITTED \$2.2 MILLION COST ESTIMATE TO WEM/FEMA JANUARY 2020
  - MARCH 2020 – COUNTRY (WORLD) PRACTICALLY SHUT DOWN
  - 2021 – INFLATION, LABOR MARKET, SUPPLY CHAIN ISSUES AND FUEL INCREASES
  - 2022 – COST ESTIMATE NOW AT \$4.5 MILLION
  - BID - \$3.6 MILLION TO \$6.1 MILLION
  - NO OPPORTUNITY TO REVISE THE AWARD

# CONCLUSION, QUESTIONS AND CONTACT INFO

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**Fox Point Project  
StoryMap**

<https://arcg.is/1uP89C>