

# Planning for Infrastructure Resilience

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Community Development Director



# Marquette

- ◆ Near 10 miles of Shoreline
- ◆ Majority in public ownership
- ◆ Formerly had multiple high-risk designated erosion areas (EGLE)
- ◆ Significant storm events have increased over time





# Damages in the MILLIONS



We survived and prospered...





1AB

2015 Great Lakes Restoration Initiative  
Reducing Runoff/Tree Planting  
2,500 trees planted (Approx. 737,500 gallons  
of stormwater captured)  
\$169,996 grant /\$17,204 match = 187,200 (SWP/City)

2

Coastal Wetland Mitigation  
Restored Approximately 2 acres  
City/Funded, SWP Planning Assistance

3AB

2016 Great Lakes Restoration Initiative  
Coastal Wetland Restoration  
9.5 acres wetland habitat enhanced  
2.5 acres coastal wetland restored  
15 acres in conservation easement  
2 acres beach restoration, 1000 trees planted  
\$199,451 grant /\$36,100 match = \$235,551 (SWP/City)

4

2017 Great Lakes Restoration Initiative  
Hawley Storm Drain Relocation  
Approx. 9.0 M gallons stormwater per year  
disconnected from Lake Superior  
\$288,500 grant /\$112,500 match = \$401,000 (SWP/City)

5

2012 Michigan Coastal Management Program  
Public Engagement and Coastal Planning:  
\$58,000 grant/\$59,990 match = \$117,990 (SWP/City)

6

2014 Michigan Coastal Management Program  
Coastal Engineering Design Review  
and Public Engagement:  
\$34,500 grant/\$36,381 match= \$70,881 (City/SWP)

7

2018 National Fish and Wildlife Foundation  
Coastal Resiliency, Shoreline Stabilization and  
Habitat Restoration  
\$2,500,000 grant/\$3,050,000 match= \$5,550,000 (SWP/City)

8

2018 FEMA Pre-Disaster Mitigation Program  
Lakeshore Boulevard Relocation  
\$2,700,000 grant /\$675,000 match  
= \$3,375,000

9

2020 Michigan Coastal Management Program  
9 acres of coastal habitat restored  
Improved resiliency 1,200 linear feet of shoreline  
\$200,000 grant/\$202,851 match = \$402,851

10

2014 Great Lakes Restoration Initiative  
Lakeview Storm Drain Improvements  
0.7 acres wetlands created (Lakeview storm drain)  
70% reduction in bacteria and pollutants  
\$179,700 grant funds/\$12,508 matching funds  
= \$192,208 (City/SWP)

11

Great Lakes Conservation Corps and Community Volunteers  
Beach grass planting, invasive plant removal,  
beach clean-ups, etc.  
Annually: City funded and SWP match

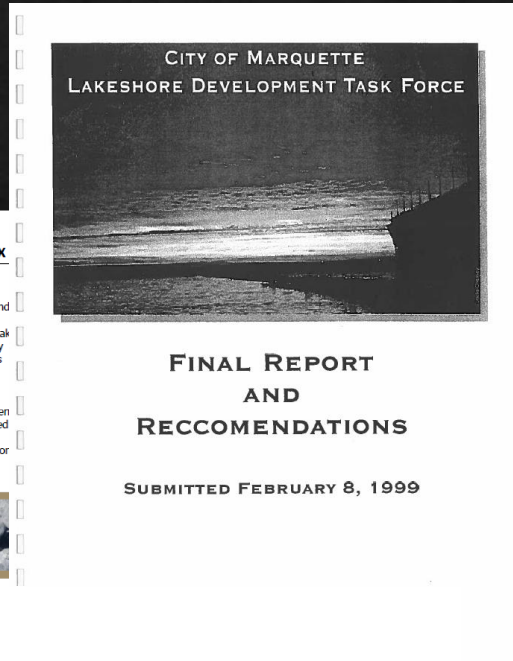
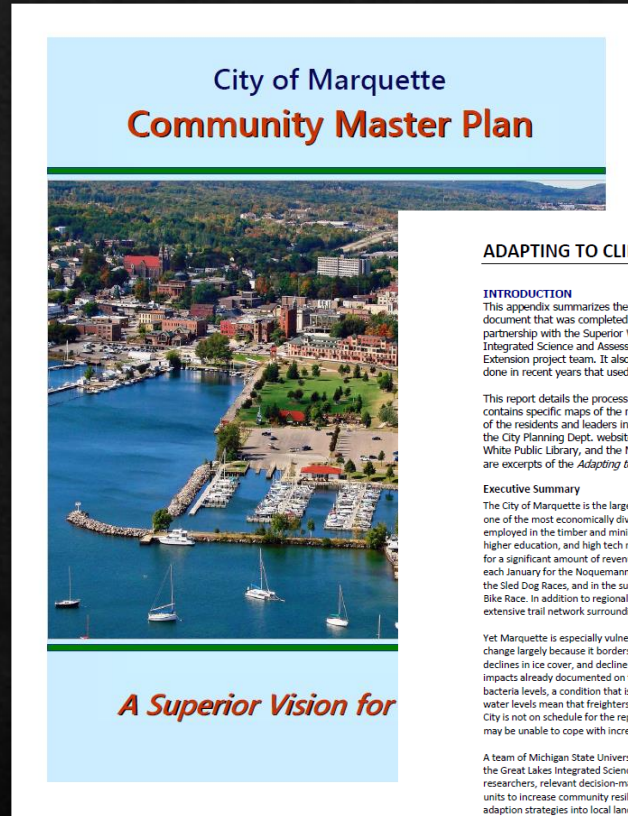
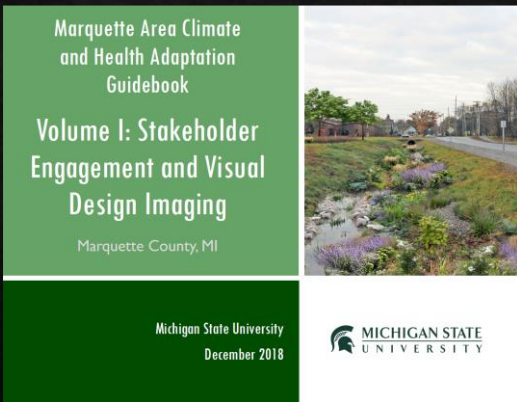
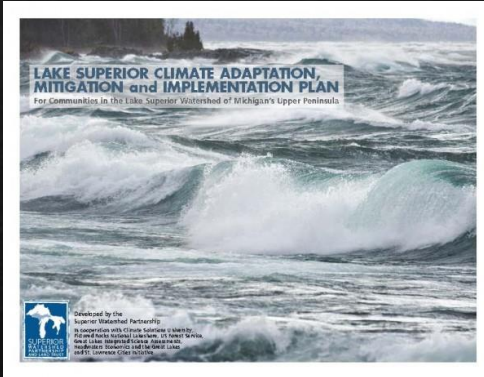
12

2017 U.S. Army Corps of Engineers  
Preliminary Coastal Study: Funded  
Note: First step to additional coastal implementation funding  
\$100,000 grant/\$0 match (City/SWP)

\* Picnic Rocks to Dead River

How?





**ADAPTING TO CLIMATE CHANGE Appendix**

**INTRODUCTION**  
 This appendix summarizes the *Adapting to Climate Change and Variability* project and document that was completed in September 2013 for the City of Marquette, in partnership with the Superior Watershed Partnership and Land Trust, by the Great Lakes Integrated Science and Assessments Center (GLISA) and a Michigan State University Extension project team. It also provides information about two other climate studies done in recent years that used Marquette as a case study city.

This report details the process and results of this community-driven process. It also contains specific maps of the region that reflect the climate vulnerabilities and concern of the residents and leaders in the Marquette region. The full report may be accessed the City Planning Dept. website, at the City Planning office in City Hall, at the Peter White Public Library, and the NMU Lydia Olsen Library. The following three subsection are excerpts of the *Adapting to Climate Change and Variability* document.

**Executive Summary**  
 The City of Marquette is the largest city in the Upper Peninsula and one of the most economically diverse in the state. Residents are employed in the timber and mining industries, and in health care, higher education, and high tech manufacturing. Tourism accounts for a significant amount of revenue every year, with visitors coming each January for the Noquemann Ski Marathon, each February for the Sled Dog Races, and in the summer months for the Ore to Lake Bike Race. In addition to regional festivals, hiking and mount extensive-trail network surrounding the City.



Yet Marquette is especially vulnerable to environmental, eco change largely because it borders Lake Superior. Record high declines in ice cover, and decline of rare sub-arctic plant species impacts already documented on the Lake. In 2012, Marquette bacteria levels, a condition that is exacerbated by warmer water levels mean that freighters must reduce their tonnage. City is not on schedule for the replacement of roads, bridges, may be unable to cope with increased floods and a longer th

A team of Michigan State University Extension specialists and the Great Lakes Integrated Sciences and Assessments Center researchers, relevant decision-makers, and stakeholders in tv units to increase community resilience through incorporating adaption strategies into local land use master plans and polic City of Marquette, in partnership with the Superior Watershe Trust, because of the City's vulnerability, but also because of resources to support a climate adaptation plan.

The MSU Extension Project Team worked with the City, the S that enlisted community members to identify and prioritize t stakeholders in the agriculture, forestry, natural resources , h

City of Marquette • Community Master Plan



# Just a Sample of Adopted Plans

- ◇ Lakeshore Boulevard Task Force Report and Recommendation  
(City of Marquette)
- ◇ Coastal Zone Management Grant Phase I and II Workshops  
(SWP and City of Marquette)
- ◇ Lake Superior Climate Adaptation, Mitigation, and Adaptation Plan  
(SWP and partners)
- ◇ Marquette County Climate and Health Adaptation Guidebook  
(MSUE and County Partners, including City of Marquette)
- ◇ Adapting to Climate Change and Variability  
(MSUE and City of Marquette)
- ◇ Marquette County Community Resiliency Workshop  
(Climate Adaptation Task Force)
- ◇ Marquette Community Master Plan  
(City of Marquette)



# Lakeshore Boulevard



**LAKE SUPERIOR'S QUEEN CITY.**  
**(MARQUETTE, MICH.)**  
 1897.

<p>1. Grand Rapids.                  2. J. M. Rogers Lumber Co. Plant.                  3. Marshall Mill Co. Mill.                  4. Marquette Ice Co. Works.                  5. J. S. &amp; A. C. Knight Hotel.                  6. Lake Superior Carriage Works.                  7. The Wood Block Plant.                  8. Marquette Hotel.                  9. W. Berry Hospital.                  10. H. Joseph Tavern.</p>	<p>11. St. Peter's Catholic.                  12. Marquette County Jail.                  13. Marquette County Jail House.                  14. Marquette County Jail House.                  15. St. A. S. and A. Thurgood Hotel.                  16. St. A. S. and A. Thurgood Hotel.                  17. St. A. S. and A. Thurgood Hotel.                  18. St. A. S. and A. Thurgood Hotel.                  19. St. A. S. and A. Thurgood Hotel.                  20. St. A. S. and A. Thurgood Hotel.                  21. St. A. S. and A. Thurgood Hotel.                  22. St. A. S. and A. Thurgood Hotel.                  23. St. A. S. and A. Thurgood Hotel.                  24. St. A. S. and A. Thurgood Hotel.                  25. St. A. S. and A. Thurgood Hotel.                  26. St. A. S. and A. Thurgood Hotel.                  27. St. A. S. and A. Thurgood Hotel.                  28. St. A. S. and A. Thurgood Hotel.                  29. St. A. S. and A. Thurgood Hotel.                  30. St. A. S. and A. Thurgood Hotel.</p>	<p>31. St. A. S. and A. Thurgood Hotel.                  32. St. A. S. and A. Thurgood Hotel.                  33. St. A. S. and A. Thurgood Hotel.                  34. St. A. S. and A. Thurgood Hotel.                  35. St. A. S. and A. Thurgood Hotel.                  36. St. A. S. and A. Thurgood Hotel.                  37. St. A. S. and A. Thurgood Hotel.                  38. St. A. S. and A. Thurgood Hotel.                  39. St. A. S. and A. Thurgood Hotel.                  40. St. A. S. and A. Thurgood Hotel.                  41. St. A. S. and A. Thurgood Hotel.                  42. St. A. S. and A. Thurgood Hotel.                  43. St. A. S. and A. Thurgood Hotel.                  44. St. A. S. and A. Thurgood Hotel.                  45. St. A. S. and A. Thurgood Hotel.                  46. St. A. S. and A. Thurgood Hotel.                  47. St. A. S. and A. Thurgood Hotel.                  48. St. A. S. and A. Thurgood Hotel.                  49. St. A. S. and A. Thurgood Hotel.                  50. St. A. S. and A. Thurgood Hotel.</p>	<p>51. St. A. S. and A. Thurgood Hotel.                  52. St. A. S. and A. Thurgood Hotel.                  53. St. A. S. and A. Thurgood Hotel.                  54. St. A. S. and A. Thurgood Hotel.                  55. St. A. S. and A. Thurgood Hotel.                  56. St. A. S. and A. Thurgood Hotel.                  57. St. A. S. and A. Thurgood Hotel.                  58. St. A. S. and A. Thurgood Hotel.                  59. St. A. S. and A. Thurgood Hotel.                  60. St. A. S. and A. Thurgood Hotel.                  61. St. A. S. and A. Thurgood Hotel.                  62. St. A. S. and A. Thurgood Hotel.                  63. St. A. S. and A. Thurgood Hotel.                  64. St. A. S. and A. Thurgood Hotel.                  65. St. A. S. and A. Thurgood Hotel.                  66. St. A. S. and A. Thurgood Hotel.                  67. St. A. S. and A. Thurgood Hotel.                  68. St. A. S. and A. Thurgood Hotel.                  69. St. A. S. and A. Thurgood Hotel.                  70. St. A. S. and A. Thurgood Hotel.</p>	<p>71. St. A. S. and A. Thurgood Hotel.                  72. St. A. S. and A. Thurgood Hotel.                  73. St. A. S. and A. Thurgood Hotel.                  74. St. A. S. and A. Thurgood Hotel.                  75. St. A. S. and A. Thurgood Hotel.                  76. St. A. S. and A. Thurgood Hotel.                  77. St. A. S. and A. Thurgood Hotel.                  78. St. A. S. and A. Thurgood Hotel.                  79. St. A. S. and A. Thurgood Hotel.                  80. St. A. S. and A. Thurgood Hotel.                  81. St. A. S. and A. Thurgood Hotel.                  82. St. A. S. and A. Thurgood Hotel.                  83. St. A. S. and A. Thurgood Hotel.                  84. St. A. S. and A. Thurgood Hotel.                  85. St. A. S. and A. Thurgood Hotel.                  86. St. A. S. and A. Thurgood Hotel.                  87. St. A. S. and A. Thurgood Hotel.                  88. St. A. S. and A. Thurgood Hotel.                  89. St. A. S. and A. Thurgood Hotel.                  90. St. A. S. and A. Thurgood Hotel.</p>
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# Funding Opportunities for Planning



MICHIGAN DEPARTMENT OF  
ENVIRONMENT, GREAT LAKES, AND ENERGY





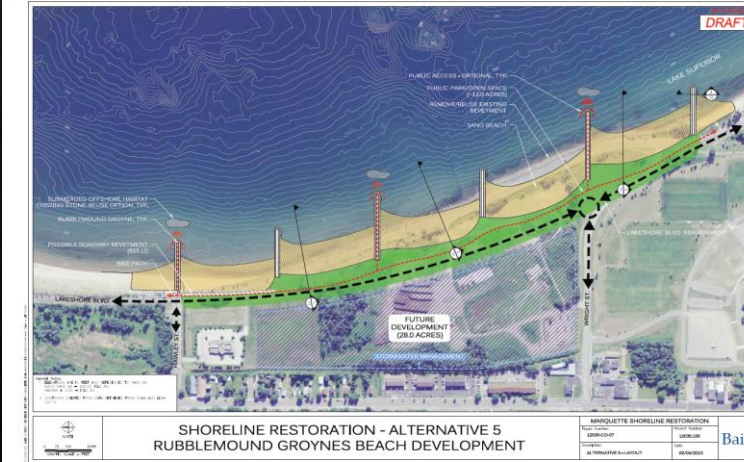
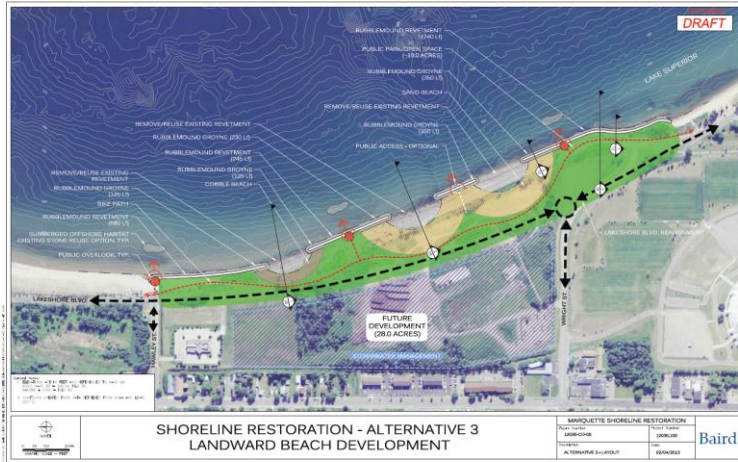
# Coastal Zone Management Grant Phase I and II

- ◇ SWP and City of Marquette were project partners
- ◇ Goal – Protect infrastructure while blending in natural shoreline attributes based upon previous community planning efforts
- ◇ Project spanned two years circa 2012
- ◇ Community Engagement
  - ◇ Multiple Community Forums
  - ◇ Written Comments
  - ◇ Community Survey
- ◇ Outcome was a preferred alternative in “shovel ready” form

# Phase I

- ◆ Grant Funded Project – MDEQ Coastal Zone Management
- ◆ Coastal Engineering Firm (BAIRD)
  - ◆ Analyze erosion
  - ◆ Draft alternatives based on Community Master Plan and natural science
- ◆ Five alternatives presented to the community at a public meeting on March 27, 2013





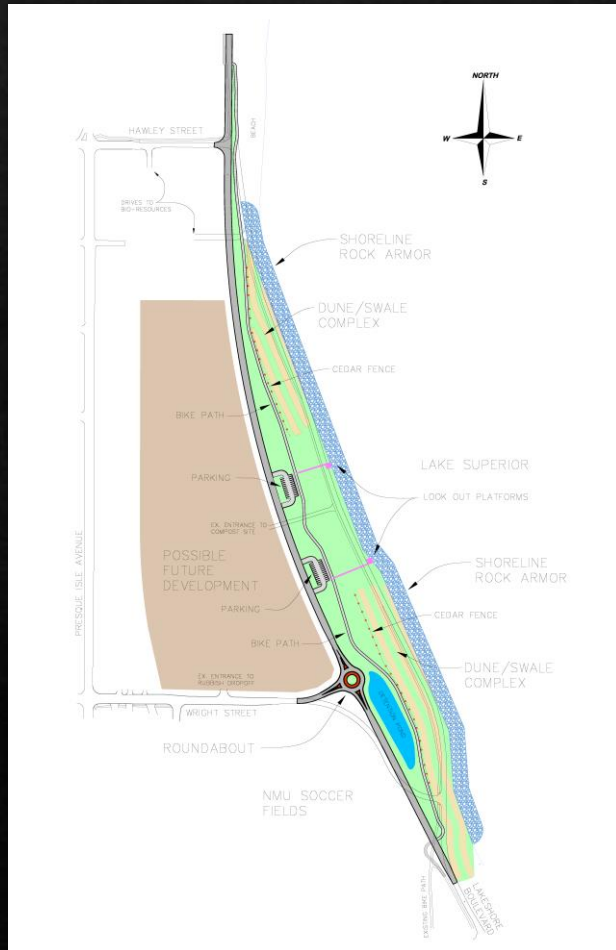


# Lakeshore Boulevard Relocation and Shoreline Restoration Project – Phase II

- ◆ MDEQ Coastal Zone Management Grant - \$34,500 grant for a \$69,250 project
- ◆ Conduct public engagement and develop a design for construction (shovel ready) based upon previous work by BAIRD
- ◆ Incorporate coastal restoration into man-made defense system (Dune and Swale complexes)
- ◆ Surveys and Public Meetings
- ◆ City Commission approved plans



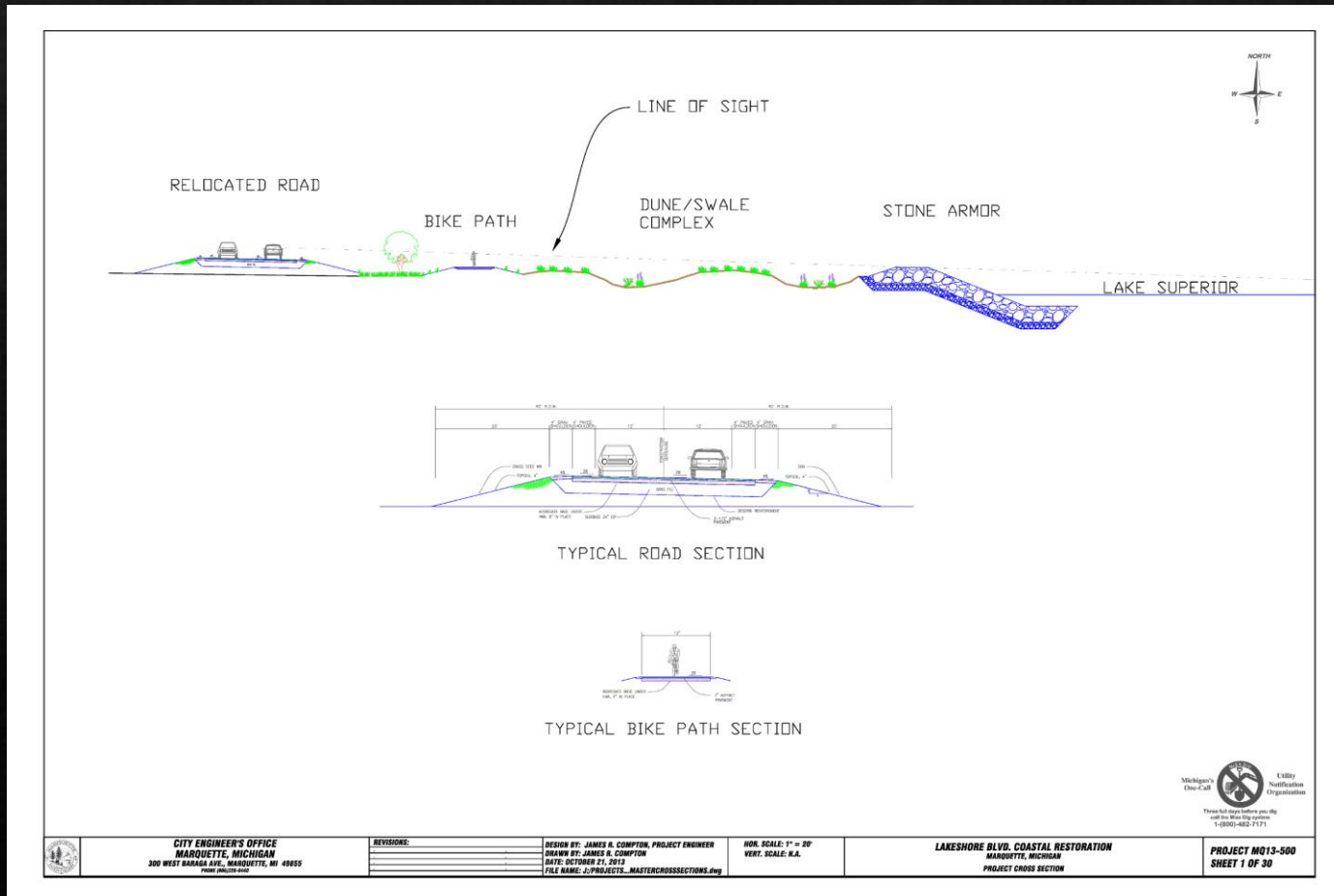
# City Commission Approved Design



- ◇ Shoreward Erosion Control – Stone Armor
- ◇ Shoreline Restoration – Dune/Swale Complex
- ◇ Multi-use pathway
- ◇ Two designated parking areas
- ◇ Two viewing platforms
- ◇ Asphalt street structure
- ◇ Roundabout at terminating vista

# City Commission Approved Design

- ◇ Stone Armor per U.S. Corps of Engineers design
- ◇ Street and multi-use pathway provide direct line of sight to lake
- ◇ Dune/Swale Complex – dune grass and native plants
- ◇ Street structure to incorporate geogrid reinforcement





## City Commission Approved Design - Cost Estimate

Description	Cost
Shoreline Rock Armor	\$5,100,000
Road Relocation + Utilities	\$2,800,000
Multi-use Pathway	\$1,015,000
Parking Lots/ADA Public Access	\$282,000
Dune Restoration/Coastal Wetland	\$513,000
Contingency (15%)	\$1,456,500
Total	\$11,166,500

# Funding Partnerships for Implementation



FEMA





# Phase I - Road Relocation



# FEMA

- ◆ Hazard Mitigation Grant
- ◆ \$1.9 M with a \$1.1M match
- ◆ Relocation of Lakeshore Boulevard landward

























# Phase II - Shoreline Protection and Restoration



NFWF



Great Lakes  
RESTORATION



**Baird.**  
Innovation Engineered.



# Awarded Funding

- ◆ National Fish and Wildlife Foundation – National Coastal Resilience Fund
  - ◆ Grant Amount: \$2,500,000
  - ◆ Local Match: \$3,050,000 (includes \$50,000 in match from SWP)
  - ◆ Timeline: November 2018 – October 2021 (Extended to 2024)
  - ◆ Submitted By: Superior Watershed Partnership and Land Conservancy
  - ◆ Supported by Keweenaw Bay Indian Community



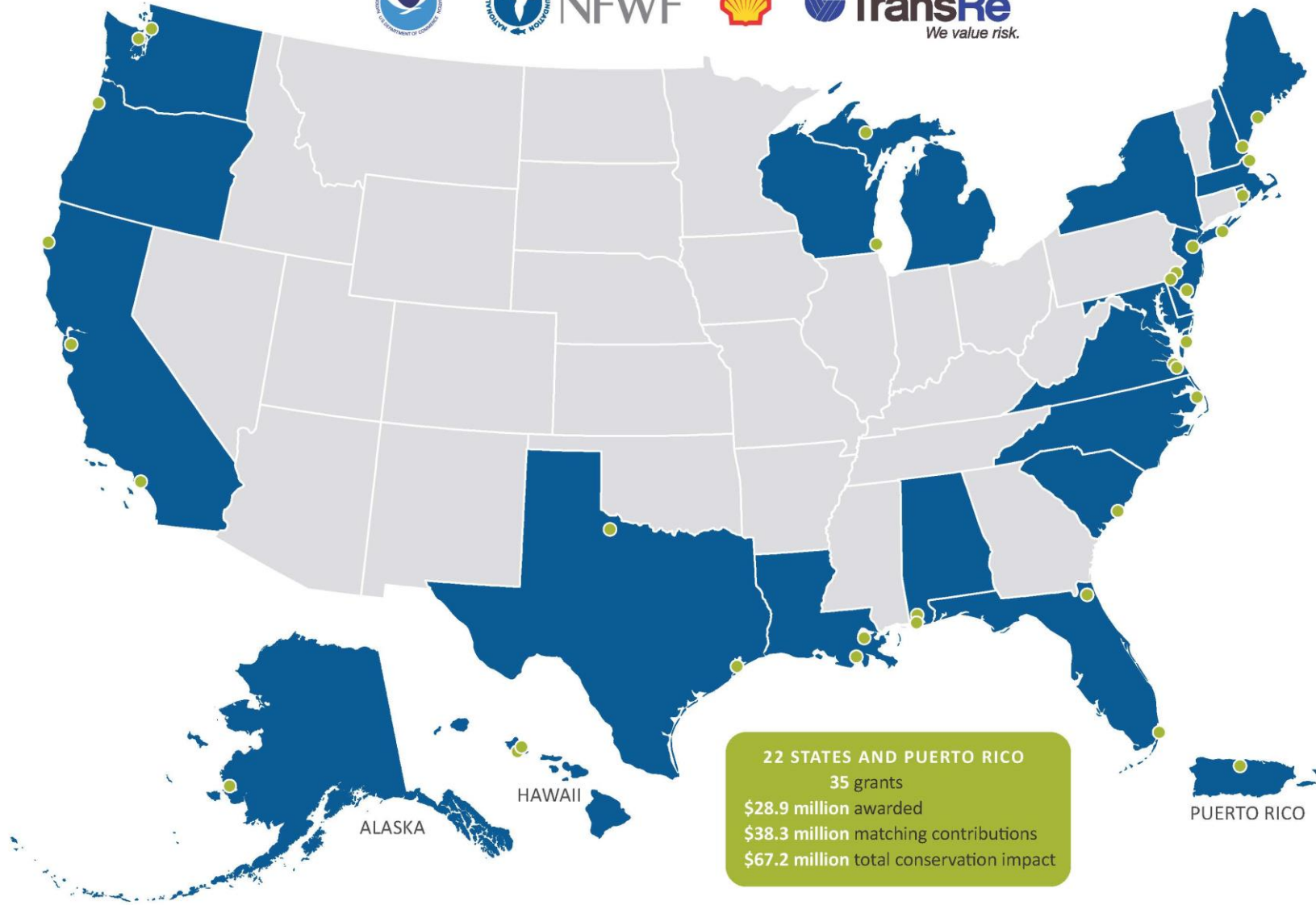
# NATIONAL COASTAL RESILIENCE FUND 2018 GRANTS



NFWF



TransRe  
*We value risk.*



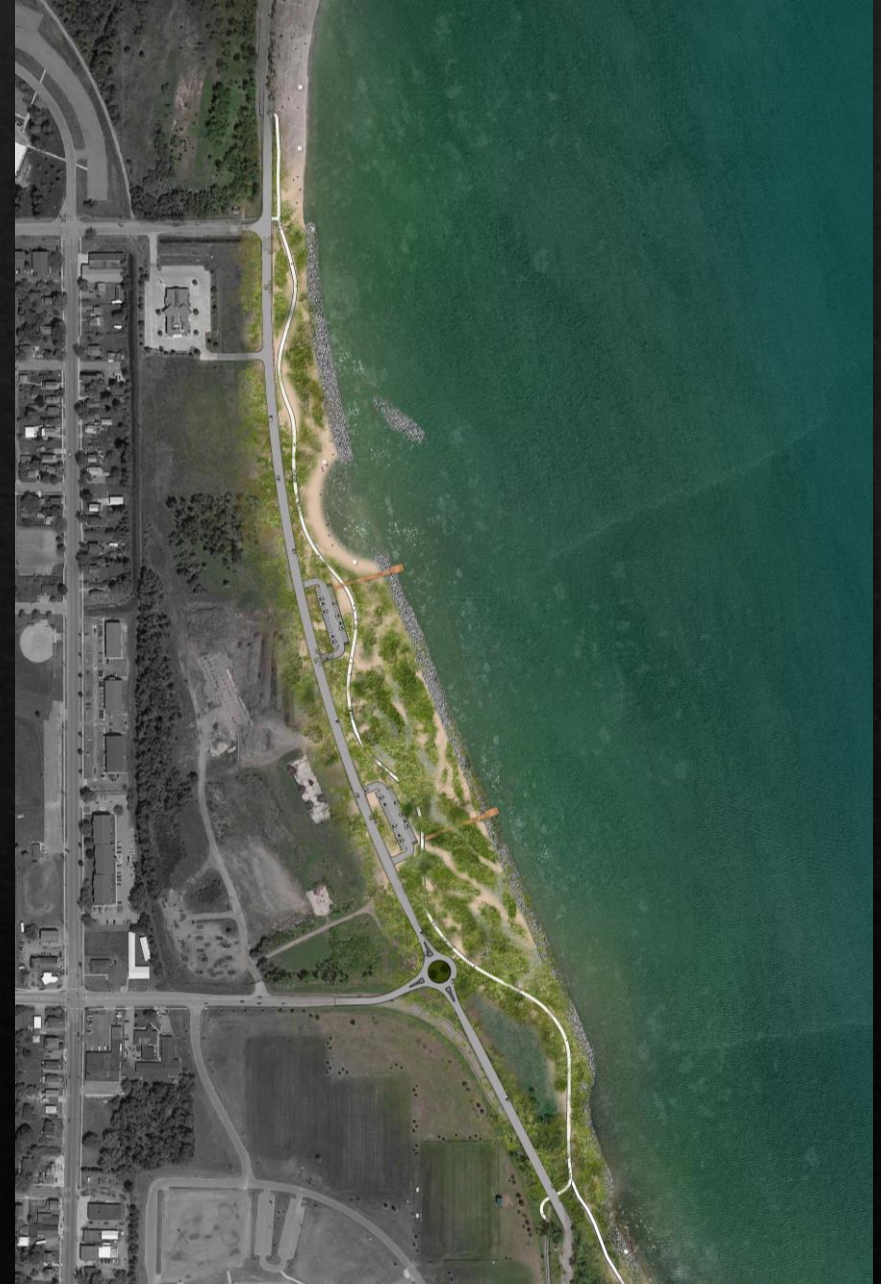
# Awarded Funding

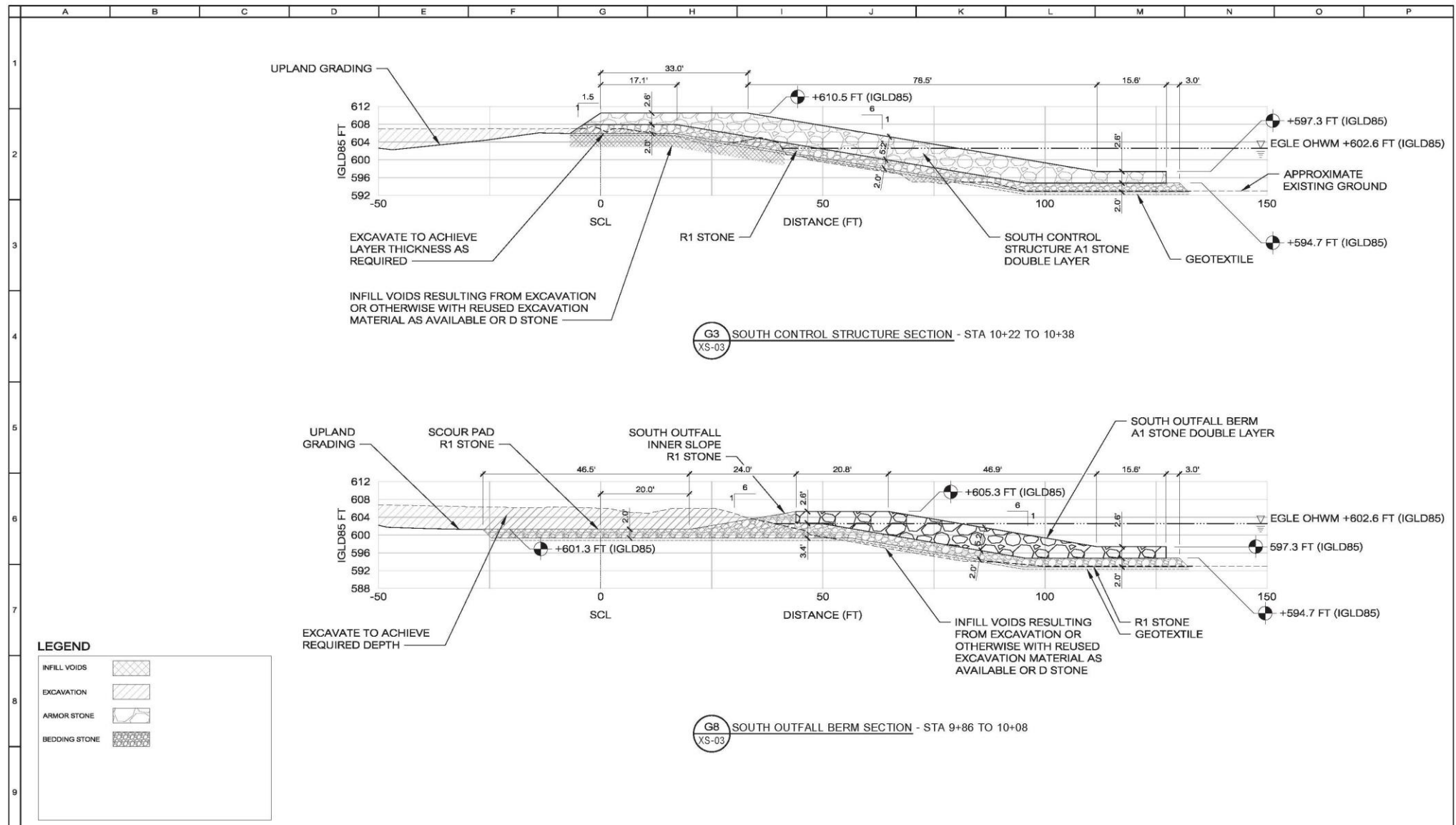
- ◆ USDA Forest Service – Green Infrastructure to Intercept Stormwater Runoff
  - ◆ Grant amount \$116,475
  - ◆ Local match \$30,849
  - ◆ Timeline: January 2021 – December 2024 (extended)
  - ◆ Submitted by Superior Watershed Partnership and Land Conservancy
  - ◆ Climate adaptive plantings – stabilize upland shoreline and intercept an estimated 258,695 gallons of stormwater runoff from entering Lake Superior each year



# Overview

- ◆ Provide Shoreline Protection
- ◆ Sustainable Design
- ◆ Man-made, yet as natural as possible
- ◆ Minimal maintenance
- ◆ Public access





G3 SOUTH CONTROL STRUCTURE SECTION - STA 10+22 TO 10+38  
XS-03

G8 SOUTH OUTFALL BERM SECTION - STA 9+86 TO 10+08  
XS-03

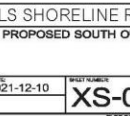
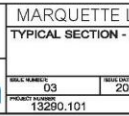
**LEGEND**

- INFILL VOIDS
- EXCAVATION
- ARMOR STONE
- BEDDING STONE



PERMIT DRAWINGS  
NOT FOR CONSTRUCTION

		REVISIONS																					
(PH) PHASE OF ISSUE:		(A) PRELIMINARY			(B) DESIGN			(C) PERMIT			(D) TENDER			(E) CONSTRUCTION			(F) RECORD						
PH	REV	DESCRIPTION	DRN	DSN	APR	QCM	YYYY-MM-DD	PH	REV	DESCRIPTION	DRN	DSN	APR	QCM	YYYY-MM-DD	PH	REV	DESCRIPTION	DRN	DSN	APR	QCM	YYYY-MM-DD
C	1	PERMIT DRAWINGS	PFY	MAC	MAC	C	2021-12-10																
C	1	REVISED PERMIT DRAWINGS	PFY	MAC	MAC	C	2022-01-28																



**MARQUETTE LS SHORELINE RESTORATION**  
TYPICAL SECTION - PROPOSED SOUTH OUTFALL

SCALE NUMBER: 03	ISSUE DATE: 2021-12-10	SHEET NUMBER: XS-03
PROJECT NUMBER: 13290.101		

PROJECT: MARQUETTE LAKE SUPERIOR SHORELINE RESTORATION (ON-LEASING) PERMIT/SCALE 10:1 (REVISED)

PLOT PAPER SIZE: ANSI D - 22" X 34" (TYPICAL)



# Challenges

- ◇ EGLE Permit
  - ◇ State Bottomlands – concern with creating upland area to accommodate the revetment slope
  - ◇ Concern from regulators about the living revetment concept – more comfortable with standard designs (armored revetment)
- ◇ Appeal of Permit Denial
- ◇ Outcome - mutual agreement prior to contested case hearing









# Take Home

- ◆ Plan long before the need
- ◆ Utilize NOAA/CZM/GLRI and local partners to seek funding for planning – it is available!
- ◆ Take a “natural systems” approach, it’s more attractive for funding and for your community (Concrete versus Paradise)
- ◆ Have shovel-ready plans