



Stony Creek Metropark Stormwater Management Plan

September 2019



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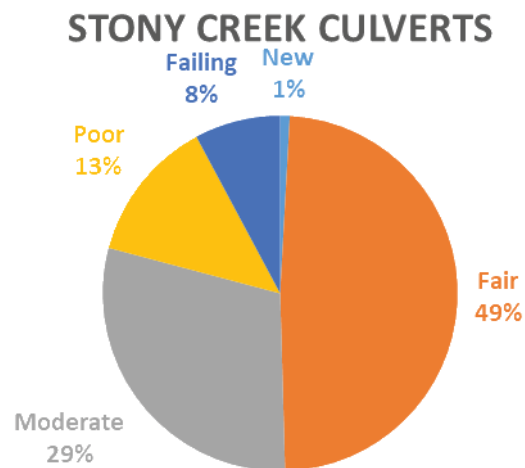
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Stony Creek Metropark Stormwater Structure Recommendations

Table 1. Summary of Stony Creek Culvert Inspection and Maintenance Needs

Culvert Rating	Number of Culverts	Culverts Needing Immediate Cleanout	Culverts Needing Future Cleanout	Culverts Needing Replacement or Repair
New	1	0	0	0
Fair	56	0	4	0
Moderate	34	6	17	0
Poor	15	7*	4*	15
Failing	9	2*	0	9
Total:	115	15*	25*	24
Repair Cost:		\$668	\$4,177	\$120,045

**Culvert may be replaced before it needs to be cleaned out.*



Left: Failing culvert in Stony Creek Metropark. Right: Proportion of culverts in each condition category.

Table 2. Individual Culvert Replacement Costs

Culvert ID	Diameter (in)	Length (ft)	Condition	Maintenance Need	Cost Opinion
CUL-STO-001	30	30	Fair	Future Cleanout	\$179
CUL-STO-004	12	13	Failing	Replacement	\$1,590
CUL-STO-005	18	112	Moderate	Future Cleanout	\$448
CUL-STO-006	18	51	Moderate	Future Cleanout	\$203
CUL-STO-007	15	16	Failing	Replacement	\$2,026
CUL-STO-008*	6	11	Poor	Replacement	\$1,140
CUL-STO-010	6	12	Moderate	Immediate Cleanout	\$43
CUL-STO-014	12	19	Moderate	Immediate Cleanout	\$68
CUL-STO-017*	16	59	Poor	Replacement	\$7,324
CUL-STO-022*	16	50	Poor	Replacement	\$6,304
CUL-STO-024	14	13	Moderate	Future Cleanout	\$44
CUL-STO-025	16	82	Moderate	Future Cleanout	\$330
CUL-STO-026	24	91	Moderate	Future Cleanout	\$454
CUL-STO-027	18	48	Moderate	Immediate Cleanout	\$194
CUL-STO-028*	12	19	Poor	Replacement	\$2,407
CUL-STO-029	6	15	Poor	Replacement	\$1,500
CUL-STO-034	12	36	Moderate	Future Cleanout	\$127
CUL-STO-035*	12	36	Poor	Replacement	\$4,558
CUL-STO-036*	12	24	Failing	Replacement	\$3,016
CUL-STO-037	12	57	Failing	Replacement	\$7,067
CUL-STO-038	12	56	Poor	Replacement	\$7,050
CUL-STO-039	18	38	Moderate	Future Cleanout	\$152
CUL-STO-042	18	19	Moderate	Immediate Cleanout	\$76
CUL-STO-044	24	50	Moderate	Future Cleanout	\$248
CUL-STO-046*	12	27	Poor	Replacement	\$3,328
CUL-STO-047	18	64	Moderate	Future Cleanout	\$257
CUL-STO-048	12	23	Poor	Replacement	\$2,857
CUL-STO-049	36	54	Failing	Replacement	\$16,117
CUL-STO-053	18	50	Fair	Future Cleanout	\$202
CUL-STO-057	6	36	Moderate	Immediate Cleanout	\$124
CUL-STO-058	20	49	Moderate	Future Cleanout	\$196
CUL-STO-059	30	55	Moderate	Future Cleanout	\$329
CUL-STO-061	8	40	Moderate	Future Cleanout	\$139
CUL-STO-062	12	22	Moderate	Future Cleanout	\$78
CUL-STO-063	20	41	Moderate	Immediate Cleanout	\$136
CUL-STO-065	12	44	Fair	Future Cleanout	\$153
CUL-STO-066*	12	38	Poor	Replacement	\$4,805
CUL-STO-078	12	16	Moderate	Future Cleanout	\$56
CUL-STO-079*	14	34	Poor	Replacement	\$4,263
CUL-STO-080	20	47	Moderate	Future Cleanout	\$188

*Culvert may be replaced before it needs to be cleaned out.

Culvert ID	Diameter (in)	Length (ft)	Condition	Maintenance Need	Cost Opinion
CUL-STO-085	16	15	Poor	Replacement	\$1,844
CUL-STO-086	12	24	Failing	Replacement	\$3,037
CUL-STO-090	14	63	Failing	Replacement	\$7,909
CUL-STO-091*	12	45	Poor	Replacement	\$5,651
CUL-STO-093*	12	45	Failing	Replacement	\$6,615
CUL-STO-105	36	19	Failing	Replacement	\$5,656
CUL-STO-106*	36	43	Poor	Replacement	\$13,026
CUL-STO-107	12	25	Moderate	Future Cleanout	\$87
CUL-STO-110	12	39	Moderate	Future Cleanout	\$137
CUL-STO-111*	12	16	Poor	Replacement	\$1,955
CUL-STO-115	16	43	Fair	Future Cleanout	\$173
Total:					\$124,890

*Culvert may be replaced before it needs to be cleaned out.

Table 3. Individual Stormwater Gravity Main Replacement Costs

Stormwater Gravity Main ID	Diameter (in)	Length (ft)	Maintenance Need	Cost Opinion
STG-STO-0001^	8	86	Full Liner	\$3,456
STG-STO-0004^	21	113	Full Liner	\$14,150
STG-STO-0006^	10	208	Partial Replacement	\$5,063
STG-STO-0008^	18	195	Full Liner	\$18,247
STG-STO-0009^	18	29	Full Liner	\$2,755
STG-STO-0013^	15	89	Partial Replacement, Monitor Closely	\$26,000
STG-STO-0018^	18	10	Cutting and Grouting	\$8,411
STG-STO-0025^	19	49	Cutting and Grouting	\$2,965
STG-STO-0029^	15	76	Cutting and Grouting	\$2,717
STG-STO-0030^	15	58	Cutting and Grouting	\$2,056
STG-STO-0031^	15	63	Full Liner	\$4,725
STG-STO-0032^	15	83	Full Liner	\$6,225
STG-STO-0035^	18	216	Cutting and Grouting	\$10,084
STG-STO-0040^	12	104	Full Liner	\$5,200
STG-STO-0041^	12	174	Spot Liner(s)	\$4,000
STG-STO-0042^	12	97	Spot Liner(s), Monitor Closely	\$4,000
STG-STO-0044^	12	48	Spot Liner(s)	\$8,000
STG-STO-0045^	12	132	Monitor Closely	\$0
STG-STO-0047^	12	164	Partial Replacement, Full Liner	\$13,790
STG-STO-0048^	12	29	Full Liner	\$1,440
STG-STO-0049^	12	120	Full Liner	\$5,980
STG-STO-0050^	12	28	Full Liner	\$1,400
STG-STO-0053^	12	144	Spot Liner(s)	\$4,000

Stormwater Gravity Main ID	Diameter (in)	Length (ft)	Maintenance Need	Cost Opinion
STG-STO-0055^	12	172	Full Liner	\$8,600
STG-STO-0056^	12	213	Full Liner	\$10,640
STG-STO-0062^	12	29	Complete Replacement	\$4,778
STG-STO-0065^	12	162	Monitor Closely	\$0
STG-STO-0067!^	12	70	Complete Replacement	\$12,304
STG-STO-0069!^	12	23	Complete Replacement	\$4,025
STG-STO-0070^	12	154	Cutting and Grouting	\$4,235
STG-STO-0071^	12	46	Spot Liner(s)	\$4,000
STG-STO-0072^	12	25	Cutting and Grouting	\$2,595
STG-STO-0073^	12	41	Cleaning	\$144
STG-STO-0112^	15	145	Full Liner	\$10,838
STG-STO-0113^	12	58	Full Liner	\$2,900
STG-STO-0114^	12	118	Full Liner	\$5,900
STG-STO-0117^	12	57	Full Liner	\$2,850
STG-STO-0118^	12	160	Full Liner	\$8,000
Total:				\$236,473

^Televised

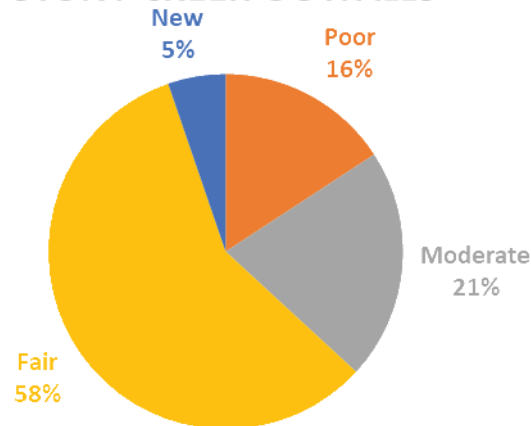
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Table 4. Summary of Stony Creek Outfall Inspection and Maintenance Needs

Outfall Rating	Number of Outfalls	Outfalls Needing Immediate Cleanout	Outfalls Needing Future Cleanout	Outfalls Needing Replacement or Repair
New	1	0	0	0
Fair	11	0	0	0
Moderate	4	0	2	0
Poor	3	0	1*	3
Failing	0	0	0	0
Total:	19	0	3	3
Repair Cost:		\$0	\$350	\$17,500

*Outfall may be replaced before it needs to be cleaned out.

STONY CREEK OUTFALLS



Left: Proportion of outfalls in each condition category. Right: Outfall in seawall in poor condition in Stony Creek Metropark.

Table 5. Individual Outfall Replacement Costs

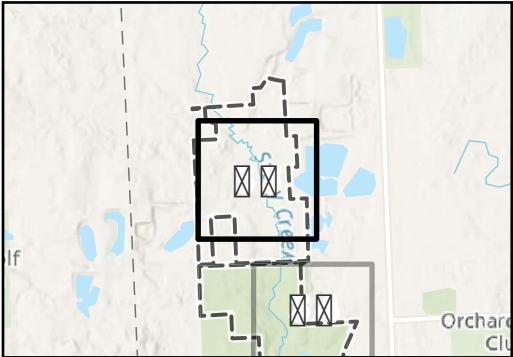
Outfall ID	Diameter (in)	Condition	Maintenance Need	Cost Opinion
SDC-STO-002	6	Poor	Replacement	\$5,000
SDC-STO-016	12	Moderate	Future Cleanout	\$175
SDC-STO-009	12	Poor	Replacement	\$6,250
SDC-STO-014	12	Moderate	Future Cleanout	\$175
SDC-STO-019	12	Poor	Replacement	\$6,250
Total:				\$17,850

*Outfall may be replaced before it needs to be cleaned out.

Stormwater Structure Ratings

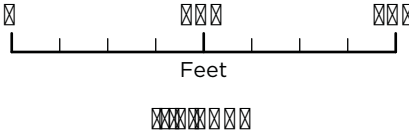
Stony Creek Metropark

Map Sheet: 33 of 48



Outfalls (Field Rating)	Gravity Main (Pipe Rating Index)
<div>Failing</div>	<div>1</div>
<div>Poor</div>	<div>2</div>
<div>Moderate</div>	<div>3</div>
<div>Fair</div>	<div>4</div>
<div>New</div>	<div>5</div>

Culverts (Field Rating)	Gravity Main (Other)
<div>Failing</div>	<div>Culvert (Other)</div>
<div>Poor</div>	
<div>Moderate</div>	
<div>Fair</div>	
<div>New</div>	
<div>(Not Rated)</div>	



Source: Data provided by Huron-Clinton Metroparks, State of Michigan, OHM Advisors, NearMap and ESRI. OHM Advisors does not warrant the accuracy of the data and/or the map. This document is intended to depict the approximate spatial location of the mapped features within the Community and all use is strictly at the user's own risk.

Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl.

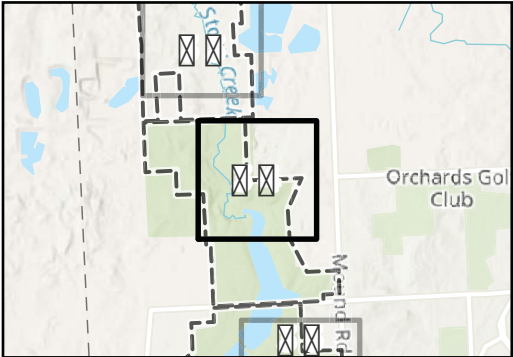
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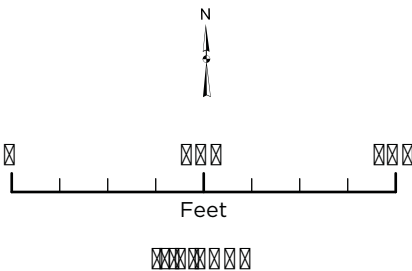
Stormwater Structure Ratings

Stony Creek Metropark

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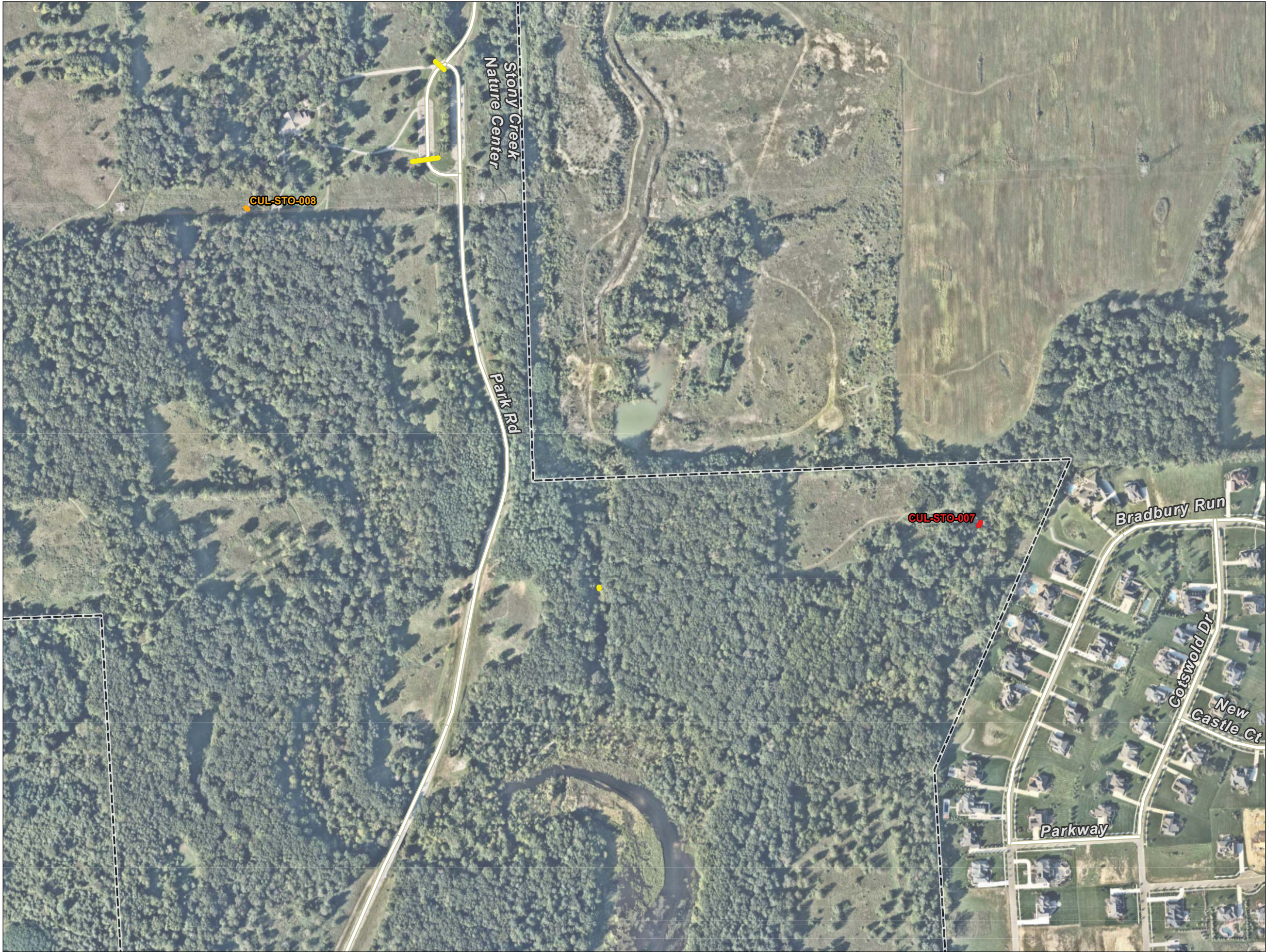
Outfalls (Field Rating)	Gravity Main (Pipe Rating Index)
<div>Failing</div>	<div>1</div>
<div>Poor</div>	<div>2</div>
<div>Moderate</div>	<div>3</div>
<div>Fair</div>	<div>4</div>
<div>New</div>	<div>5</div>
Culverts (Field Rating)	Gravity Main (Other)
<div>Failing</div>	Culvert (Other)
<div>Poor</div>	
<div>Moderate</div>	
<div>Fair</div>	
<div>New</div>	
<div>(Not Rated)</div>	



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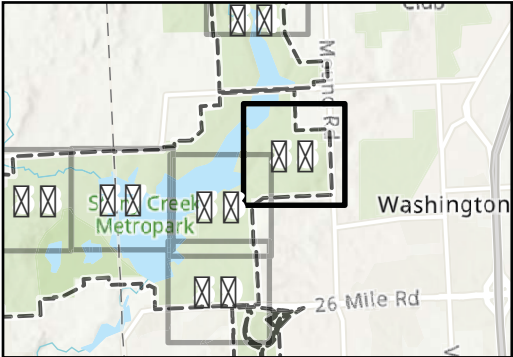
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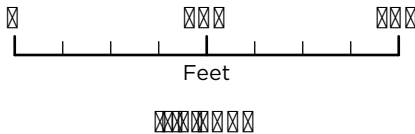
Stormwater Structure Ratings

Stony Creek Metropark

Map Sheet: 35 of 48



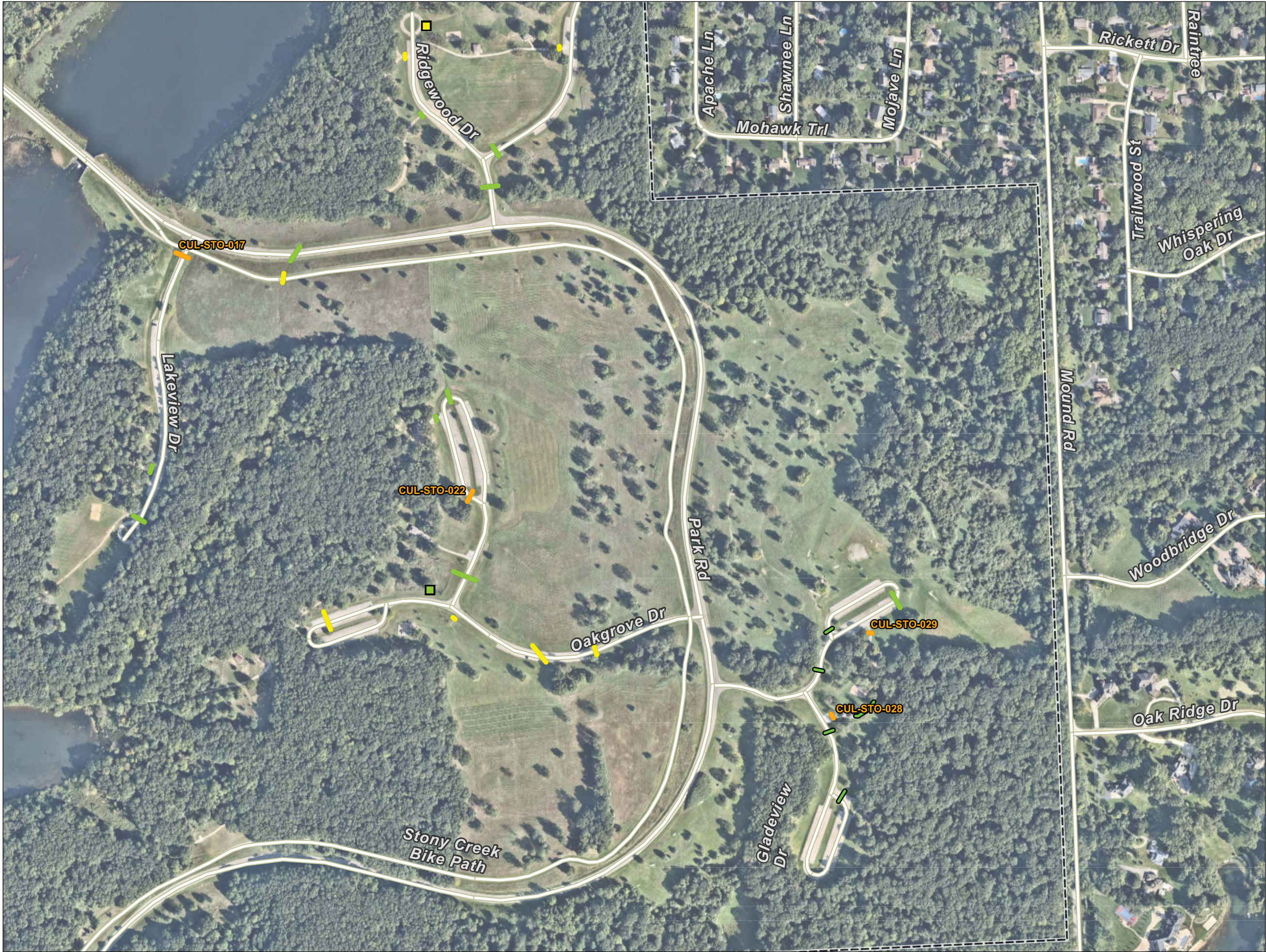
Outfalls (Field Rating)	Gravity Main (Pipe Rating Index)
Failing	1
Poor	2
Moderate	3
Fair	4
New	5
Culverts (Field Rating)	Gravity Main (Other)
Failing	Culvert (Other)
Poor	
Moderate	
Fair	
New	
(Not Rated)	



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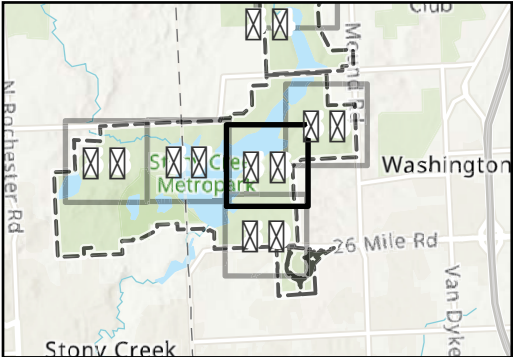




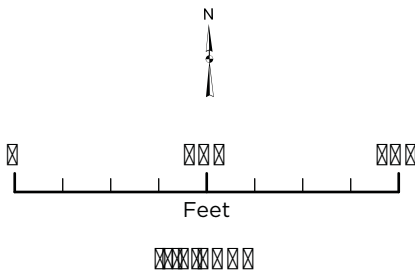
Stormwater Structure Ratings

Stony Creek Metropark

Map Sheet: 36 of 48



Outfalls (Field Rating)	Gravity Main (Pipe Rating Index)
■ Failing	■ 1
■ Poor	■ 2
■ Moderate	■ 3
■ Fair	■ 4
■ New	■ 5
	■ Gravity Main (Other)
	■ Culvert (Other)
Culverts (Field Rating)	Roads
■ Failing	■ Roads
■ Poor	■ Park Boundary
■ Moderate	
■ Fair	
■ New	
■ (Not Rated)	



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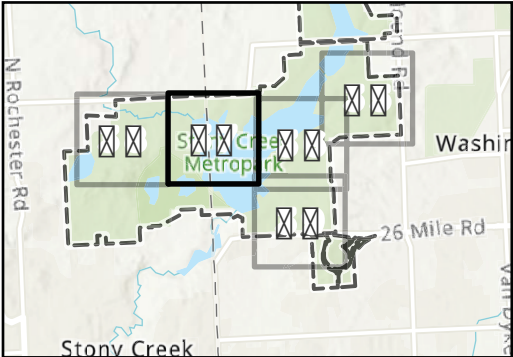
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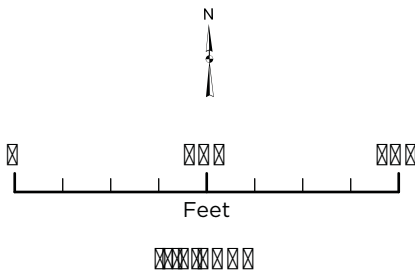
Stormwater Structure Ratings

Stony Creek Metropark

Map Sheet: 37 of 48



Outfalls (Field Rating)	Gravity Main (Pipe Rating Index)
Failing	1
Poor	2
Moderate	3
Fair	4
New	5
	Gravity Main (Other)
Culverts (Field Rating)	Roads
Failing	Roads
Poor	Park Boundary
Moderate	
Fair	
New	
(Not Rated)	



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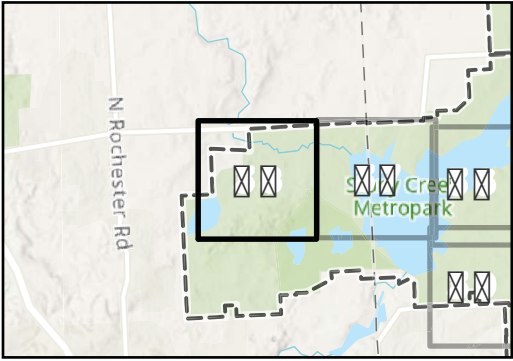




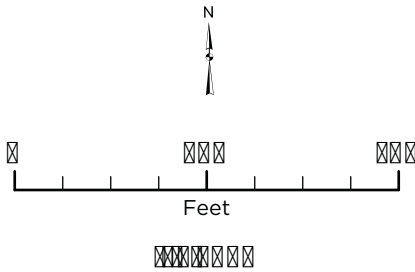
Stormwater Structure Ratings

Stony Creek Metropark

Map Sheet: 38 of 48



Outfalls (Field Rating)	Gravity Main (Pipe Rating Index)
Failing	1
Poor	2
Moderate	3
Fair	4
New	5
	Gravity Main (Other)
Culverts (Field Rating)	Roads
Failing	Roads
Poor	Park Boundary
Moderate	
Fair	
New	
(Not Rated)	



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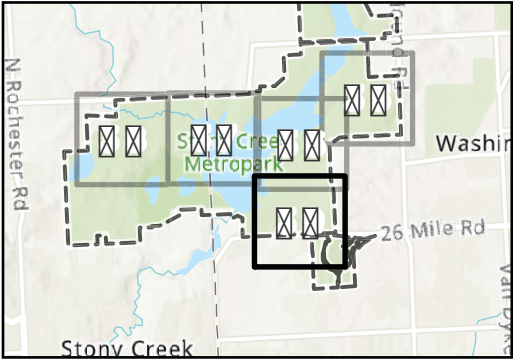
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Map Published: October 23, 2019

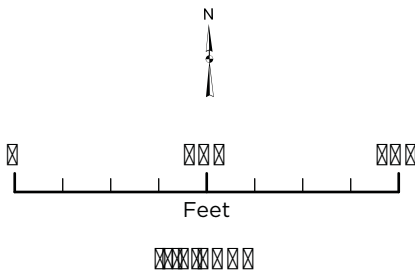
Stormwater Structure Ratings

Stony Creek Metropark

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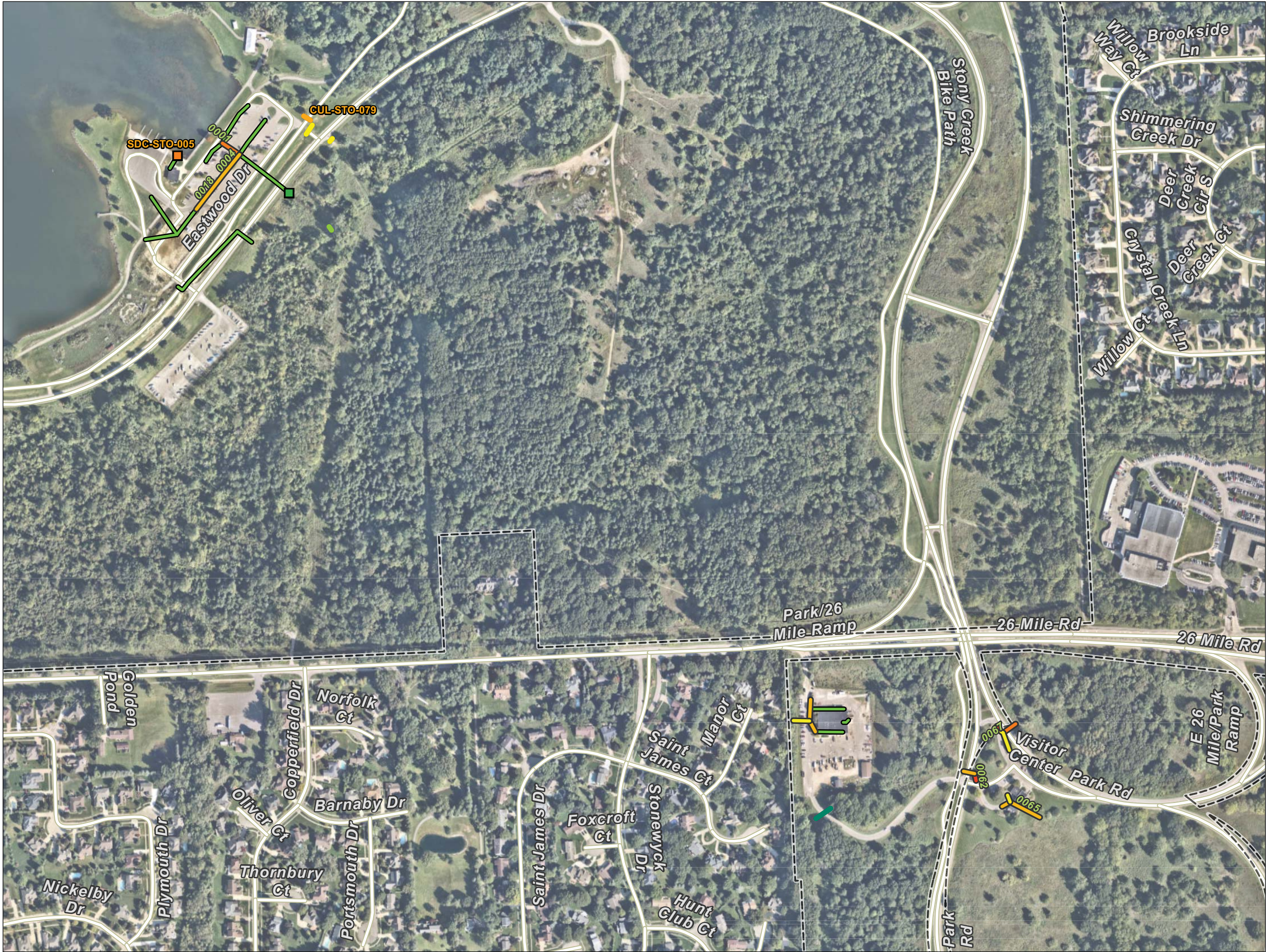
Outfalls	Gravity Main
(Field Rating)	(Pipe Rating Index)
Failing	1
Poor	2
Moderate	3
Fair	4
New	5
Culverts	Gravity Main (Other)
(Field Rating)	Culvert (Other)
Failing	Roads
Poor	Roads
Moderate	Park Boundary
Fair	
New	
(Not Rated)	



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Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl

Map Published: October 23, 2019

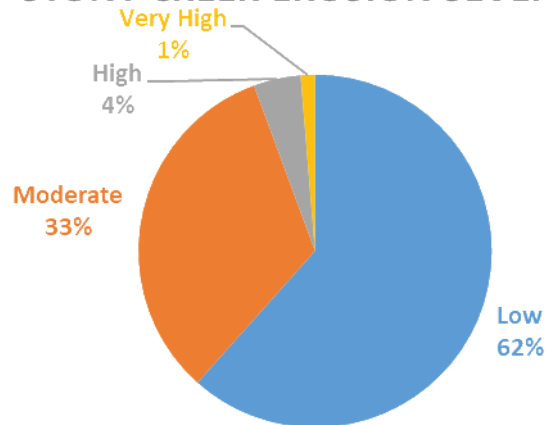


Stony Creek Metropark Streambank Summary and Recommendations

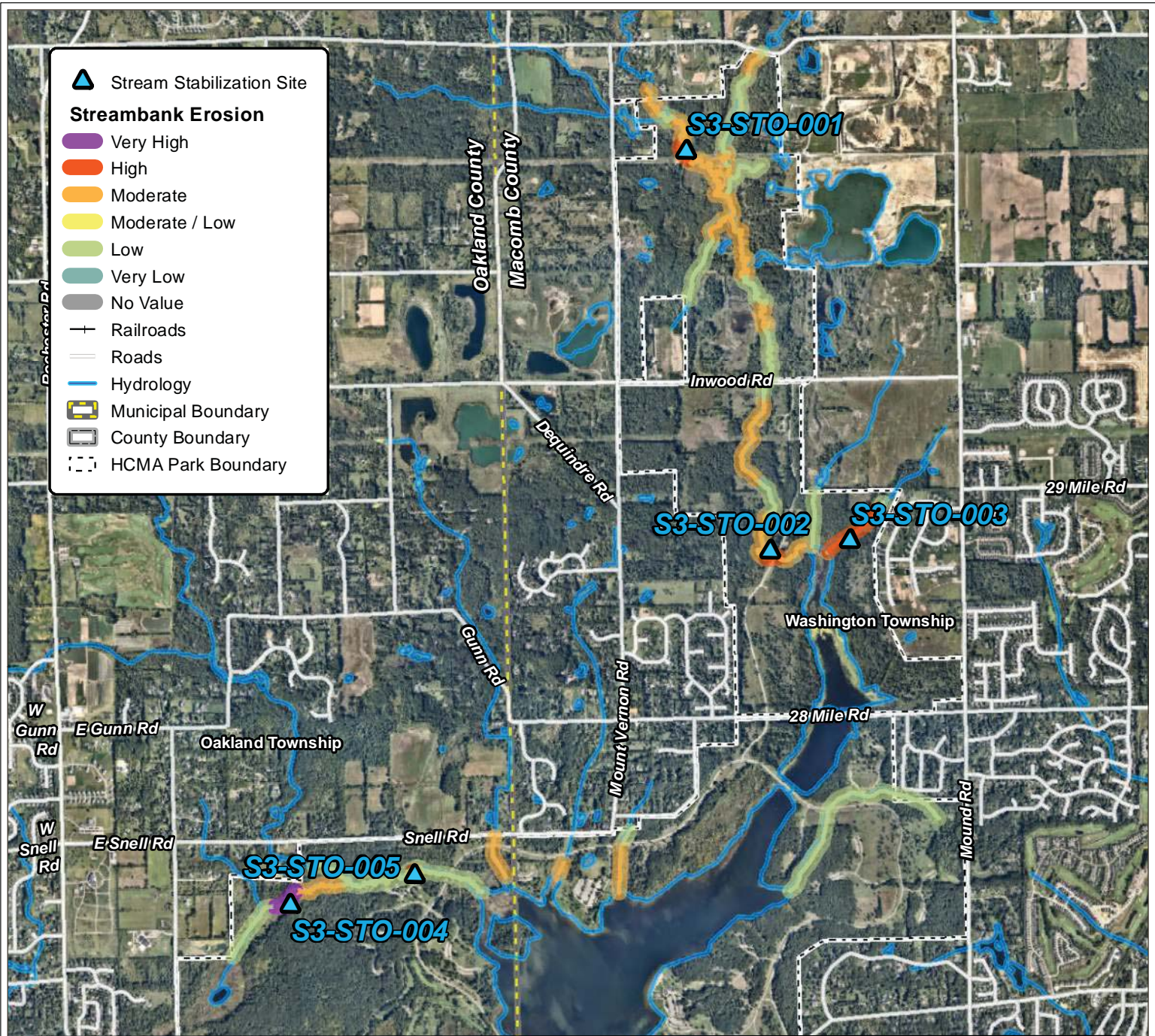
Table 6. Stony Creek Erosion Severity Summary

Erosion Condition	Feet of Streambank (miles)	Cost of Restoration
Very High	711 (0.13)	\$482,000
High	2,362 (0.45)	\$852,000
Moderate	17,906 (3.39)	
Low	33,647 (6.37)	
Very Low	0 (0.0)	
Total:	54,626 (10.35)	\$1,334,000

STONY CREEK EROSION SEVERITY



Left: Proportion of stream bank in each erosion category. Right: High erosion near a hiking trail in Stony Creek Metropark.



Stony Creek Metropark - Recommended Streambank Stabilization

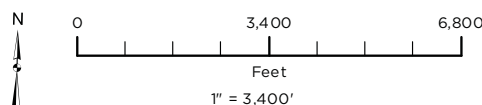
Site	Length, ft	Streambank Erosion	Rec Treatment	Unit Price, \$/ft	Cost
001	419.14	High	Soil Lifts with Live Stakes	678	\$285,000.00
002	359.24	High	Soil Lifts with Live Stakes	678	\$244,000.00
003	1,485.78	High	Coir Block with Live Stakes	172	\$256,000.00
004	710.65	Very High	Soil Lifts with Live Stakes	678	\$482,000.00
005	98.16	High	Soil Lifts with Live Stakes	678	\$67,000.00
Note: Includes cost to stabilize both banks					\$1,334,000.00

Stony Creek Metropark Streambank Stabilization Siting

Source: Data provided by OHM Advisors, Huron Clinton Metroparks and Near Map. OHM Advisors does not warrant the accuracy of the data and/or the map. This document is intended to depict the approximate spatial location of the mapped features within the Community and all use is strictly at the user's own risk.

Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl

Map Published: September 25, 2019



S3-STO-001

Length: 419.14 ft

Recommended Treatment: Soil Lifts with Live Stakes

Construction Cost: \$285,000

S3-STO-001

▲ Stream Stabilization Site

Streambank Erosion

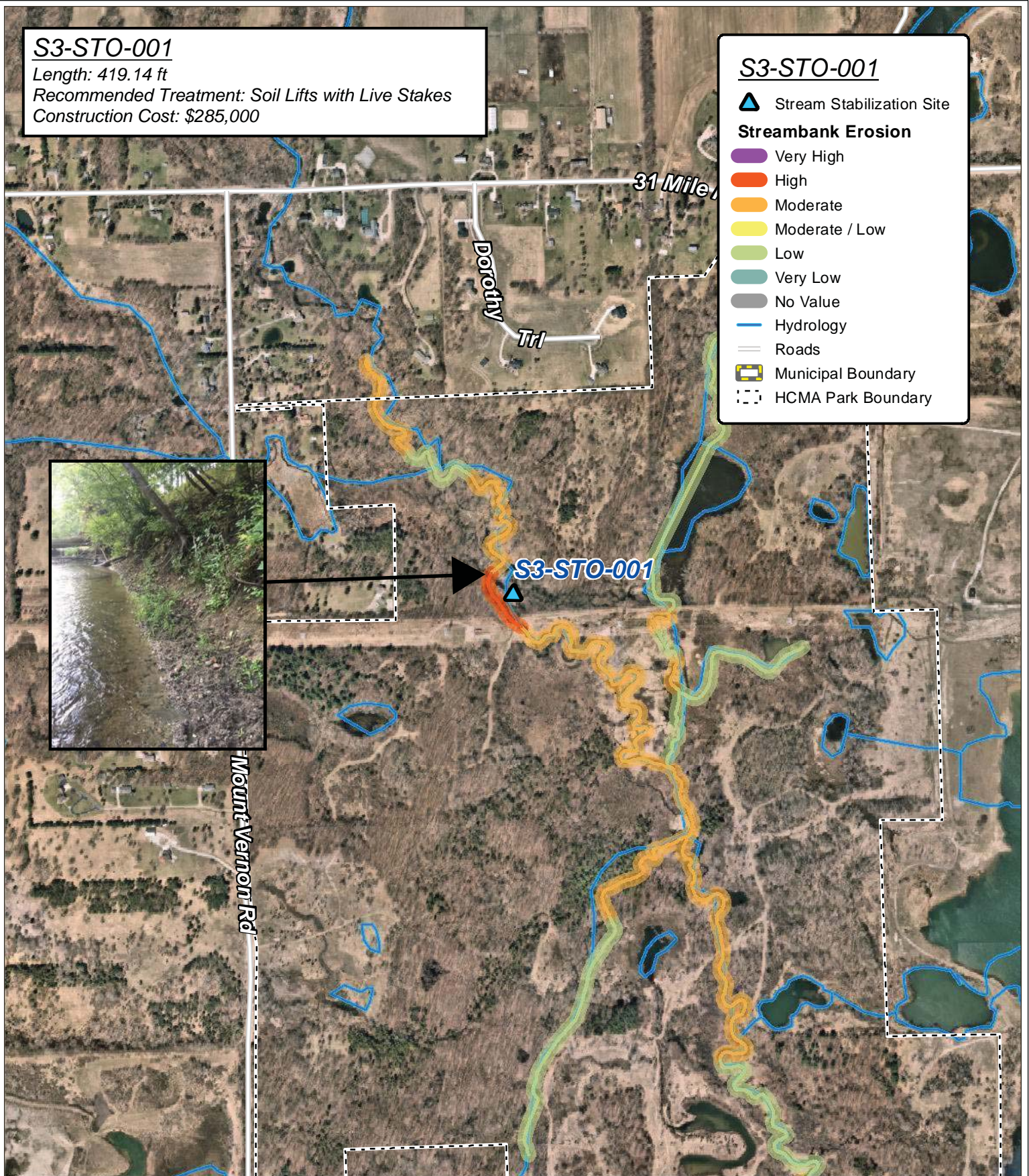
- Very High
- High
- Moderate
- Moderate / Low
- Low
- Very Low
- No Value

— Hydrology

— Roads

— Municipal Boundary

--- HCMA Park Boundary

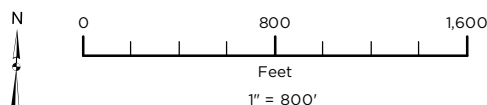


Stony Creek Metropark Streambank Stabilization Siting

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Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl

Map Published: June 13, 2019



S3-STO-002

Length: 359.24 ft

Recommended Treatment: Soil Lifts with Live Stakes

Construction Cost: \$244,000

S3-STO-002

Stream Stabilization Site

Streambank Erosion

- Very High
- High
- Moderate
- Moderate / Low
- Low
- Very Low
- No Value

Hydrology

Roads

Municipal Boundary

HCMA Park Boundary

S3-STO-002

S3-STO-003

Park Rd

Bradbury Run

Village Ct

North Ridge Trl

Ring Circle Trl

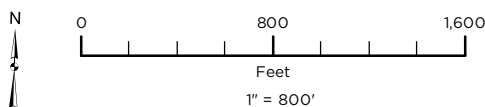
Country Lane Ct

Stony Creek Metropark Streambank Stabilization Siting

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Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl

Map Published: June 13, 2019



S3-STO-003

Length: 1,485.78 ft

Recommended Treatment: Coir Block with Live Stakes

Construction Cost: \$256,000

S3-STO-003

▲ Stream Stabilization Site

Streambank Erosion

- Very High
- High
- Moderate
- Moderate / Low
- Low
- Very Low
- No Value

— Hydrology

— Roads

— Municipal Boundary

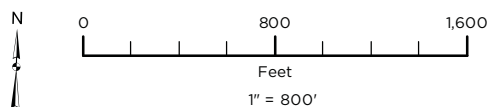
- - - HCMA Park Boundary

S3-STO-002

S3-STO-003



Stony Creek Metropark Streambank Stabilization Siting



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Map Published: June 13, 2019



S3-STO-004 **CRITICAL**

Length: 710.65 ft

Recommended Treatment: Soil Lifts with Live Stakes

Construction Cost: \$482,000

S3-STO-004

▲ Stream Stabilization Site

Streambank Erosion

- Very High
- High
- Moderate
- Moderate / Low
- Low
- Very Low
- No Value

— Hydrology

— Roads

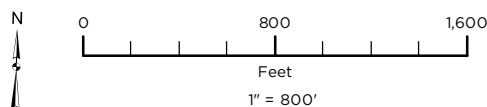
— Municipal Boundary

--- HCMA Park Boundary



**INFRASTRUCTURE IMPACTED
BY VERY HIGH EROSION
INDICATES CRITICAL CONDITON**

Stony Creek Metropark Streambank Stabilization Siting



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Map Published: June 13, 2019



S3-STO-005

Length: 98.16 ft

Recommended Treatment: Soil Lifts with Live Stakes

Construction Cost: \$67,000

S3-STO-005

▲ Stream Stabilization Site

Streambank Erosion

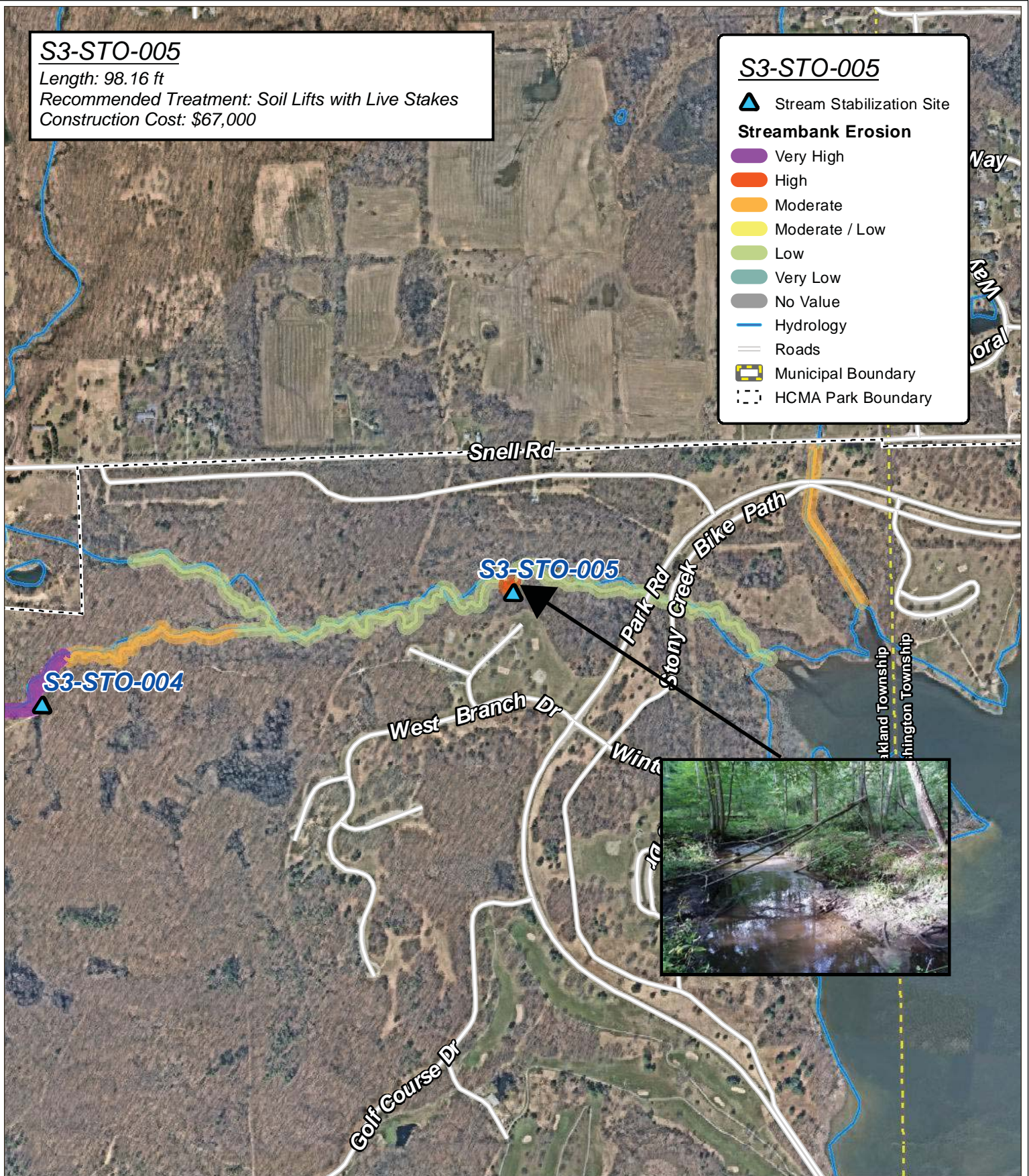
- Very High
- High
- Moderate
- Moderate / Low
- Low
- Very Low
- No Value

Hydrology

Roads

Municipal Boundary

HCMA Park Boundary

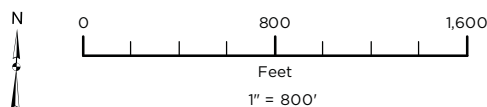


Stony Creek Metropark Streambank Stabilization Siting

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Map Published: June 13, 2019



Stony Creek Metropark Shoreline Summary and Recommendations

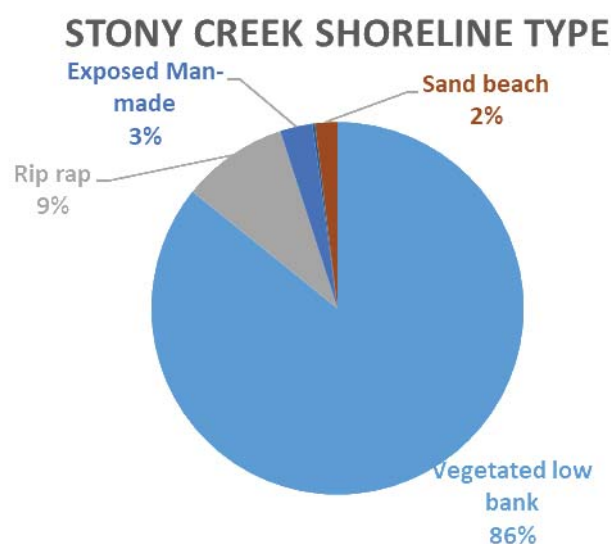


Major slumping in Stony Creek Metropark.

Table 7. Shoreline Inspection Summary

Erosion Condition	Length of Shoreline (feet)
Major	3,236.56
Minor	45,527.64
None	18,686.80
Total:	67,271.69
Restoration Cost:	\$55,068

Shoreline in Stony Creek Metropark consists of Stony Creek Lake and multiple small ponds.

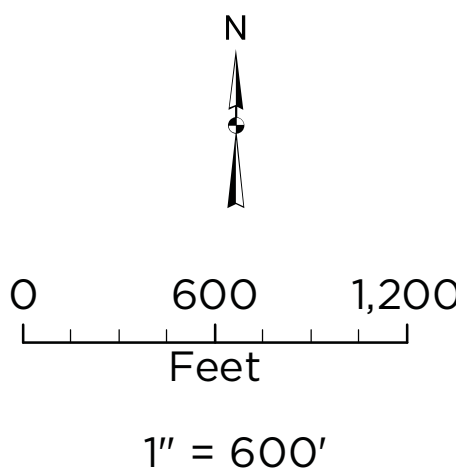


Proportion of each shoreline type present in Stony Creek Metropark.

Stony Creek Metropark

Shoreline Rehab Siting

- Invasive Vegetation Pt**
- Invasive Type**
- Black Alder
 - Cattail
 - Multiple
 - Other
 - Phragmites
- Invasive Density**
- 1 - IND/FEW/SEV
 - 2 - < 1000 SF
 - 3 - > 1000 SF
 - 4 - 0.5 - 1 AC
 - 5 - > 1 AC
- Shoreline Rehab Site
- Shoreline Condition**
- Slumping Severity**
- Major
 - Minor
 - None
- HCMA Park Boundary
- Municipal Boundary
- County Boundary
- Roads



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Map Published: June 13, 2019

Site	Length, Ft	Recommended Treatment	Unit Price	Construction Cost
SLR-STO-001	555	A	\$ 17.00	\$ 9,438.00
SLR-STO-002	1513	A + E	\$ 19.00	\$ 28,756.00
SLR-STO-003	300	A	\$ 17.00	\$ 5,100.00
SLR-STO-004	406	C + E	\$ 29.00	\$ 11,774.00
SLR-STO-005	3000	E	\$3,000/acre	NA
SLR-STO-006	500	E	\$3,000/acre	NA
SLR-STO-007	1500	E	\$3,000/acre	NA
SLR-STO-008	300	E	\$3,000/acre	NA
SLR-STO-009	3500	E	\$3,000/acre	NA
TOTAL				\$ 55,068.00

Stony Creek Metropark

Shoreline Rehab Siting

Oakland Township

Washington Township

City of Rochester Hills

Shelby Township

SLR-STO-001

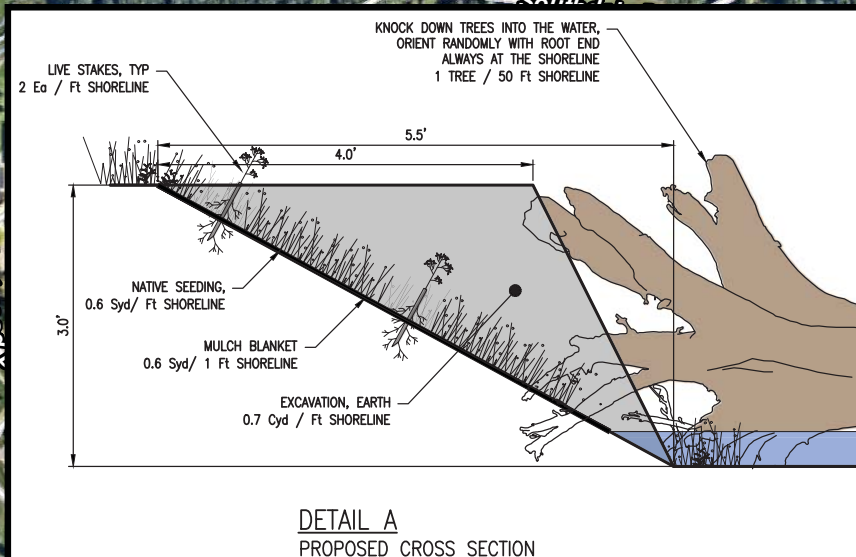
Length: 555 Ft

Recommended Treatment: A

Construction Cost: \$ 9438



SLR-STO-001



SLR-STO-001

Shoreline Rehab Site

Invasive Vegetation Pt

Invasive Type

- Black Alder
- Cattail
- Multiple
- Other
- Phragmites

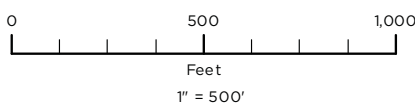
Shoreline Condition

Stumping Severity

- Major
- Minor
- None

- HCMA Park Boundary
- Roads
- Hydrology

Stony Creek Metropark Shoreline Rehabilitation Siting



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Map Published: October 22, 2019



SLR-STO-002

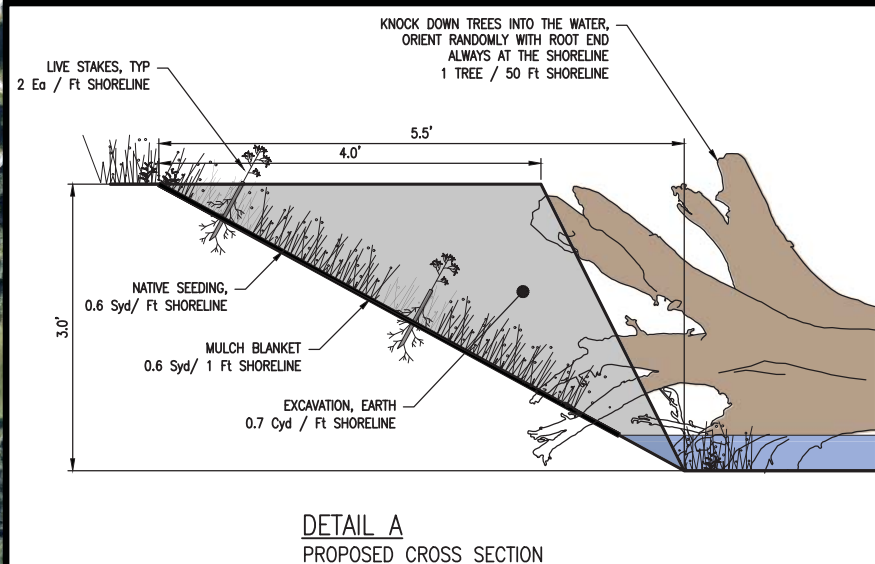
Length: 1513 Ft

Recommended Treatment: Detail A + E

Construction Cost: \$ 28,756



SLR-STO-002



SLR-STO-002

Shoreline Rehab Site

Invasive Vegetation Pt

Invasive Type

- Black Alder
- Cattail
- Multiple
- Other
- Phragmites

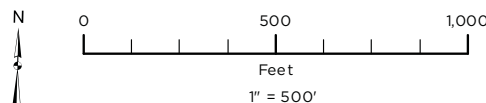
Shoreline Condition

Slumping Severity

- Major
- Minor
- None

- HCMA Park Boundary
- Roads
- Hydrology

Stony Creek Metropark Shoreline Rehabilitation Siting

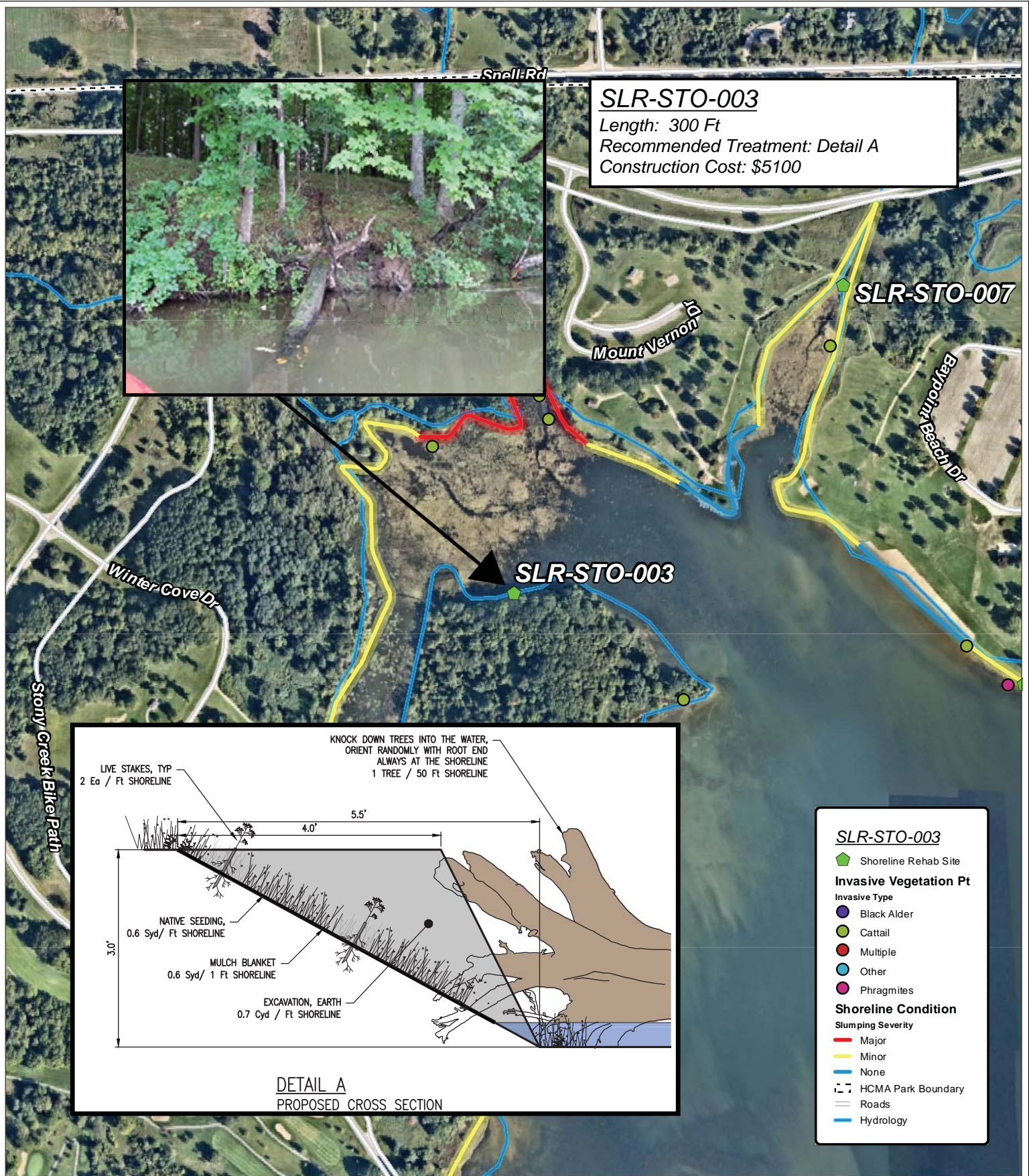


Source: Data provided by OHM Advisors, Huron Clinton Metroparks and Near Map. OHM Advisors does not warrant the accuracy of the data and/or the map. This document is intended to depict the approximate spatial location of the mapped features within the Community and all use is strictly at the user's own risk.

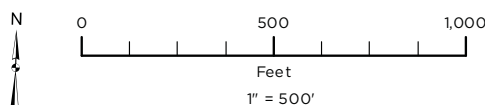
Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl

Map Published: October 22, 2019





Stony Creek Metropark Shoreline Rehabilitation Siting

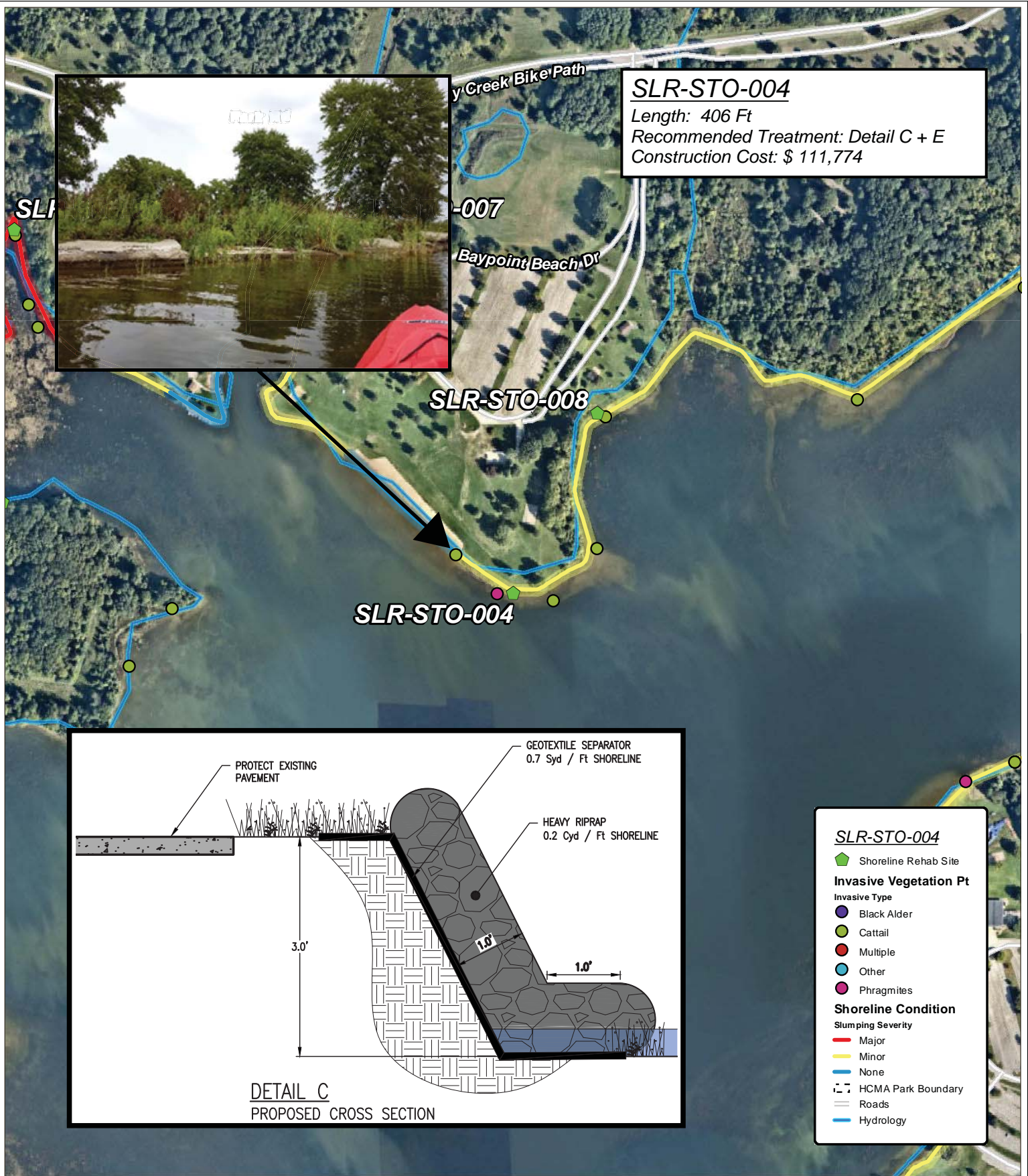


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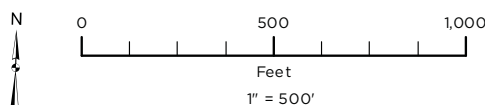
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Stony Creek Metropark Shoreline Rehabilitation Siting



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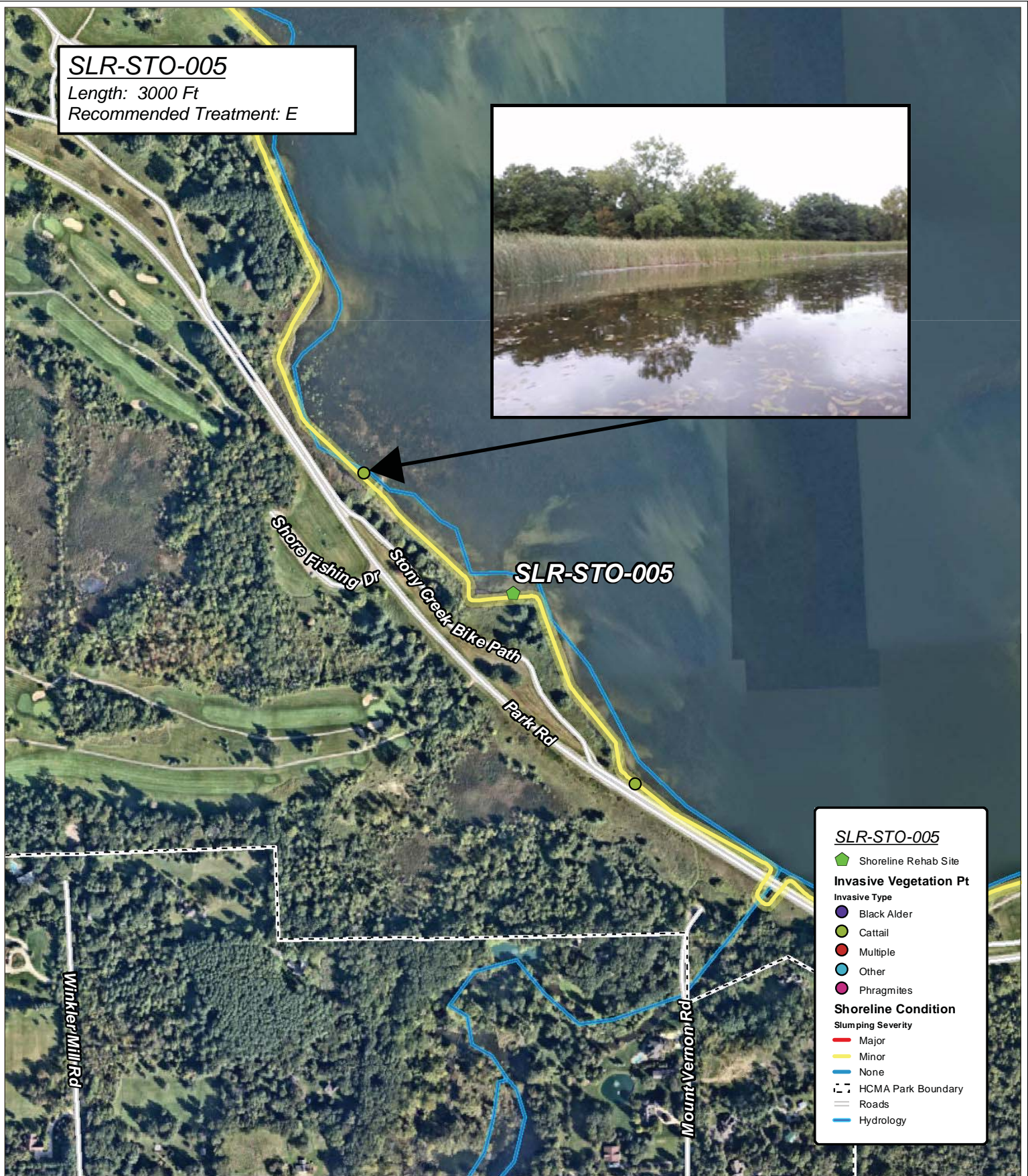
Map Published: October 22, 2019



SLR-STO-005

Length: 3000 Ft

Recommended Treatment: E



SLR-STO-005

Shoreline Rehab Site

Invasive Vegetation Pt

Invasive Type

- Black Alder
- Cattail
- Multiple
- Other
- Phragmites

Shoreline Condition

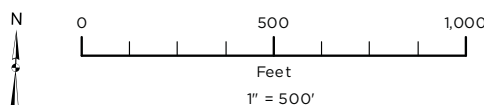
Stumping Severity

- Major
- Minor
- None

HCMA Park Boundary

- Roads
- Hydrology

Stony Creek Metropark Shoreline Rehabilitation Siting

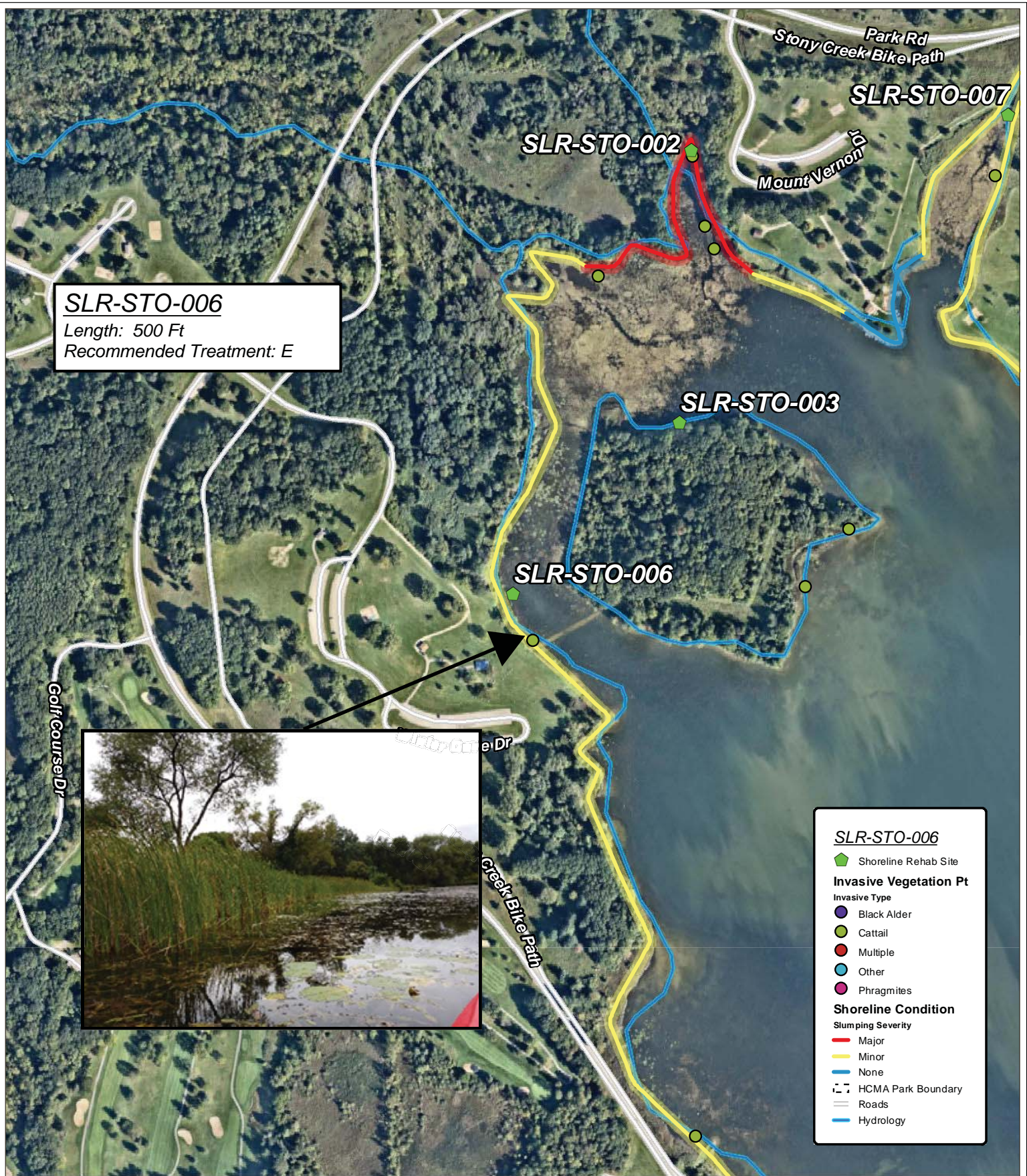


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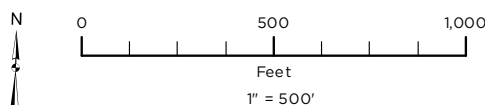


Stony Creek Metropark Shoreline Rehabilitation Siting

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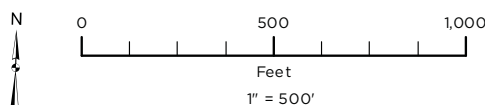
Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl

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Stony Creek Metropark Green Infrastructure Recommendations

In Stony Creek, the green infrastructure practices listed in Table 1 are recommended to improve water quality and ameliorate flooding issues in the park where feasible. These practices are also outlined on the attached green infrastructure maps.

Table 8. Stony Creek Green Infrastructure Recommendations

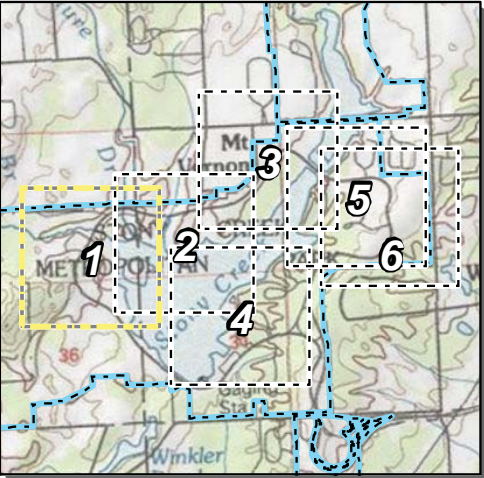
Site ID	Site	Practice Type	Treatment Surface Area (ft ²)	Cost Opinion	Cost per sq ft of Treatment Area (\$/ft ²)
GI-STO-01	Main Park Rd Traffic Circle	Naturalized Swale	3,772	\$6,412	\$1.70
GI-STO-02	Eastwood Beach Parking	Bioswale	10,800	\$85,800	\$7.94
GI-STO-03	Southdale Dr Parking	Naturalized Swale	1,480	\$2,516	\$1.70
GI-STO-04	Northdale Dr Parking	Bioswale	1,280	\$10,169	\$7.94
GI-STO-05	Park Rd and Northdale Dr	Naturalized Swale	4,212	\$7,160	\$1.70
GI-STO-06	Oakgrove Dr	Naturalized Swale	4,686	\$7,966	\$1.70
GI-STO-07	Oakgrove Dr Parking South	Naturalized Swale	3,992	\$6,786	\$1.70
GI-STO-08	Oakgrove Dr Parking North	Naturalized Swale	4,473	\$7,604	\$1.70
GI-STO-09	Oakgrove Dr Parking North	Naturalized Swale	3,447	\$5,860	\$1.70
GI-STO-10	Gladeview Dr Parking South	Bioswale	4,150	\$32,969	\$7.94
GI-STO-11	Eastwood Beach Parking	Bioswale	9,100	\$72,294	\$7.94
GI-STO-12	Gladeview Dr Parking North	Bioswale	2,500	\$19,861	\$7.94
GI-STO-13	Gladeview Dr Parking North	Bioswale	2,500	\$19,861	\$7.94
GI-STO-14	Ridgewood Dr	Naturalized Swale	12,589	\$21,401	\$1.70
GI-STO-15	Park Rd S of 28 Mile Rd	Naturalized Swale	1,118	\$1,901	\$1.70

Site ID	Site	Practice Type	Treatment Surface Area (ft ²)	Cost Opinion	Cost per sq ft of Treatment Area (\$/ft ²)
GI-STO-16	Eastwood Beach Shore	Native Landscaping	14,447	\$60,677	\$4.20
GI-STO-17	Eastwood Beach Parking	Bioswale	3,450	\$31,308	\$9.07
GI-STO-18	Baypoint Beach Parking	Bioswale	10,942	\$102,528	\$9.37
GI-STO-19	Mt Vernon Dr Parking	Bioswale	5,000	\$39,722	\$7.94
GI-STO-20	Winter Cove	Stormwater Treatment Wetland	7,949	\$87,267	\$10.98
GI-STO-21	West Branch Dr Parking	Naturalized Swale	2,093	\$3,558	\$1.70
GI-STO-22	West Branch Dr Parking	No Mow	10,655	\$0.00	\$0.00
GI-STO-23	Winter Cove Parking	Bioswale	4,750	\$37,736	\$7.94
GI-STO-24	Winter Cove	Naturalized Swale	3,216	\$5,467	\$1.70
GI-STO-25	Winter Cove	Stormwater Treatment Wetland	25,286	\$277,582	\$10.98
GI-STO-26	Gladeview Dr Parking South	Bioswale	4,400	\$34,956	\$7.94
GI-STO-27	Gladeview Dr Parking South	Bioswale	2,300	\$18,272	\$7.94
GI-STO-28	Eastwood Beach Parking	Bioswale	4,950	\$45,175	\$9.13
GI-STO-29	Eastwood Beach Parking	Bioswale	6,746	\$59,443	\$8.81
GI-STO-30	Eastwood Beach Parking	Bioswale	5,550	\$49,942	\$9.00
GI-STO-31	Winter Cove Parking	Bioswale	5,250	\$41,708	\$7.94
GI-STO-32	Winter Cove Parking	Bioswale	4,150	\$32,969	\$7.94
GI-STO-33	Baypoint Beach Parking	Bioswale	13,867	\$126,936	\$9.15
Total:			202,600	\$1,363,806	

Stony Creek Metropark









Green Infrastructure
Recommendation Areas

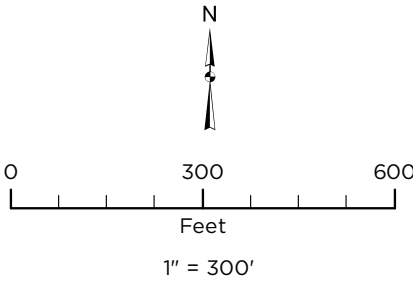
Area: 1 of 6



Recommendation Area

GSI Type

-  Bioswale (4)
-  No-Mow (1)
-  Naturalized Swale (2)
-  Stormwater Treatment Wetland (2)
-  Stormwater Gravity Main
-  Culvert (22)
-  HCMA Park Boundary
-  Roads



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Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 IntlFeet

Map Published: October 1, 2019

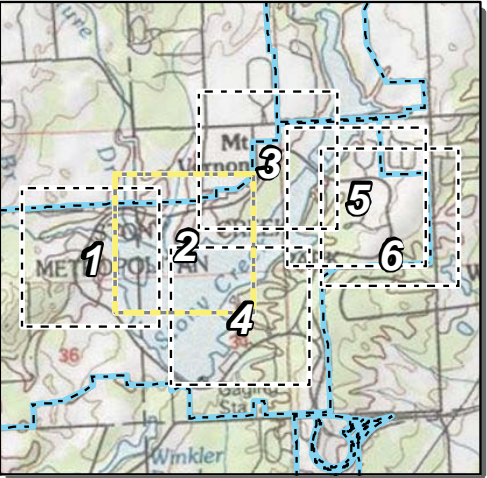




Stony Creek Metropark

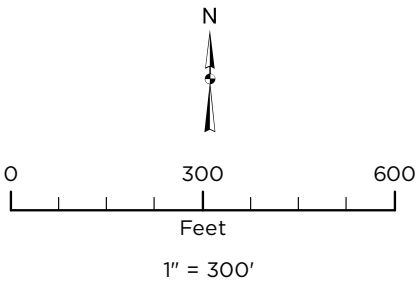
Green Infrastructure Recommendation Areas

Area: 2 of 6



Recommendation Area

- GSI Type**
- Bioswale (3)
 - Stormwater Gravity Main
 - Culvert (15)
 - HCMA Park Boundary
 - Roads



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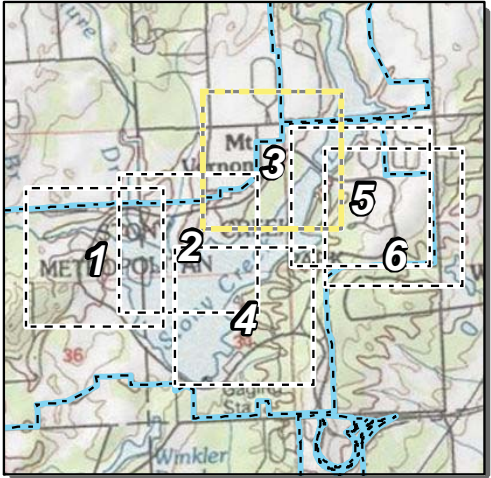
Map Published: October 1, 2019



Stony Creek Metropark






Green Infrastructure
Recommendation Areas

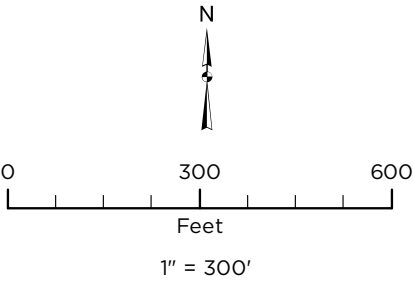
Area: 3 of 6



Recommendation Area

GSI Type

-  Naturalized Swale (1)
-  Stormwater Gravity Main
-  Culvert (2)
-  HCMA Park Boundary
-  Roads



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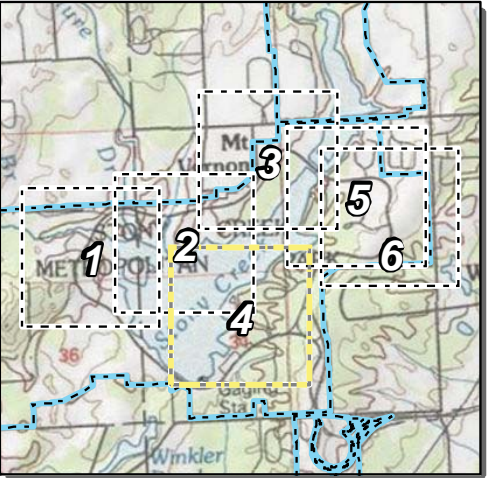
Map Published: October 1, 2019



Stony Creek Metropark








Green Infrastructure Recommendation Areas

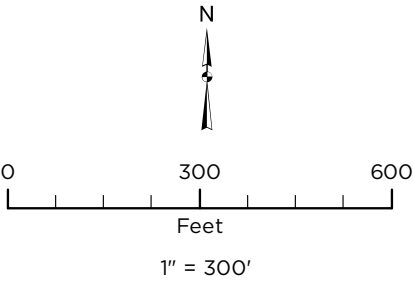
Area: 4 of 6



Recommendation Area

GSI Type

-  Bioswale (6)
-  Native Landscaping (1)
-  Naturalized Swale (2)
-  Stormwater Gravity Main
-  Culvert (16)
-  HCMA Park Boundary
-  Roads



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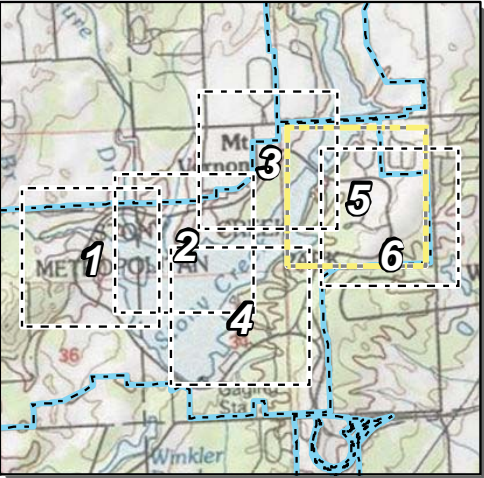
Map Published: October 1, 2019



Stony Creek Metropark

Green Infrastructure
Recommendation Areas

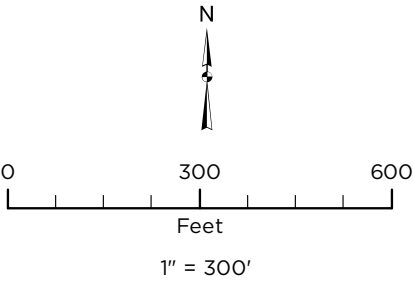
Area: 5 of 6



Recommendation Area

GSI Type

-  Bioswale (2)
-  Naturalized Swale (5)
-  Stormwater Gravity Main
-  Culvert (21)
-  HCMA Park Boundary
-  Roads



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Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 IntlFeet

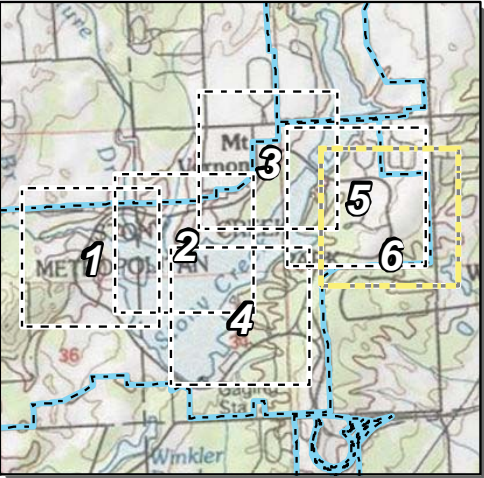
Map Published: October 1, 2019



Stony Creek Metropark

Green Infrastructure Recommendation Areas

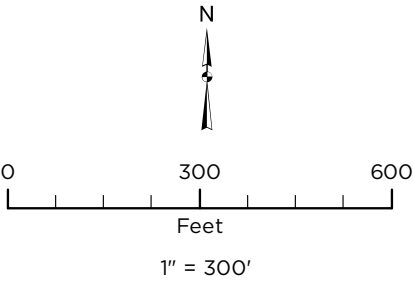
Area: 6 of 6



Recommendation Area

GSI Type

-  Bioswale (5)
-  Naturalized Swale (4)
-  Stormwater Gravity Main
-  Culvert (13)
-  HCMA Park Boundary
-  Roads



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Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 IntlFeet

Map Published: October 1, 2019



Stony Creek Metropark Recommendation Prioritization

Each table in this section is prioritized, with the most urgent projects listed first. Projects with **red** Site IDs need immediate attention. Projects with **green** Site IDs can be accomplished by HCMA staff. **Bold** projects may be eligible for grant funding. Underlined projects may be good volunteer or education opportunities. All other projects will likely require annual budget allocations to complete.

Table 9. Stony Creek Culvert Repair Priorities

Culvert ID	Diameter (in)	Length (ft)	Condition	Maintenance Need	Cost Opinion
CUL-STO-049	36	54	Failing	Replacement	\$16,117
CUL-STO-105	36	19	Failing	Replacement	\$5,656
CUL-STO-090	14	63	Failing	Replacement	\$7,909
CUL-STO-037	12	57	Failing	Replacement	\$7,067
CUL-STO-093	12	45	Failing	Replacement	\$6,615
CUL-STO-007	15	16	Failing	Replacement	\$2,026
CUL-STO-036	12	24	Failing	Replacement	\$3,016
CUL-STO-086	12	24	Failing	Replacement	\$3,037
CUL-STO-004	12	13	Failing	Replacement	\$1,590
CUL-STO-106	36	43	Poor	Replacement	\$13,026
CUL-STO-017	16	59	Poor	Replacement	\$7,324
CUL-STO-022	16	50	Poor	Replacement	\$6,304
CUL-STO-038	12	56	Poor	Replacement	\$7,050
CUL-STO-079	14	34	Poor	Replacement	\$4,263
CUL-STO-091	12	45	Poor	Replacement	\$5,651
CUL-STO-066	12	38	Poor	Replacement	\$4,805
CUL-STO-035	12	36	Poor	Replacement	\$4,558
CUL-STO-046	12	27	Poor	Replacement	\$3,328
CUL-STO-085	16	15	Poor	Replacement	\$1,844
CUL-STO-048	12	23	Poor	Replacement	\$2,857
CUL-STO-028	12	19	Poor	Replacement	\$2,407
CUL-STO-111	12	16	Poor	Replacement	\$1,955
CUL-STO-029	6	15	Poor	Replacement	\$1,500
CUL-STO-008	6	11	Poor	Replacement	\$1,140
CUL-STO-026	24	91	Moderate	Future Cleanout	\$454
CUL-STO-059	30	55	Moderate	Future Cleanout	\$329
CUL-STO-005	18	112	Moderate	Future Cleanout	\$448
CUL-STO-025	16	82	Moderate	Future Cleanout	\$330
CUL-STO-047	18	64	Moderate	Future Cleanout	\$257
CUL-STO-006	18	51	Moderate	Future Cleanout	\$203
CUL-STO-063	20	41	Moderate	Immediate Cleanout	\$136

Culvert ID	Diameter (in)	Length (ft)	Condition	Maintenance Need	Cost Opinion
CUL-STO-027	18	48	Moderate	Immediate Cleanout	\$194
CUL-STO-042	18	19	Moderate	Immediate Cleanout	\$76
CUL-STO-014	12	19	Moderate	Immediate Cleanout	\$68
CUL-STO-057	6	36	Moderate	Immediate Cleanout	\$124
CUL-STO-010	6	12	Moderate	Immediate Cleanout	\$43
CUL-STO-044	24	50	Moderate	Future Cleanout	\$248
CUL-STO-058	20	49	Moderate	Future Cleanout	\$196
CUL-STO-080	20	47	Moderate	Future Cleanout	\$188
CUL-STO-039	18	38	Moderate	Future Cleanout	\$152
CUL-STO-110	12	39	Moderate	Future Cleanout	\$137
CUL-STO-034	12	36	Moderate	Future Cleanout	\$127
CUL-STO-107	12	25	Moderate	Future Cleanout	\$87
CUL-STO-062	12	22	Moderate	Future Cleanout	\$78
CUL-STO-061	8	40	Moderate	Future Cleanout	\$139
CUL-STO-024	14	13	Moderate	Future Cleanout	\$44
CUL-STO-078	12	16	Moderate	Future Cleanout	\$56
CUL-STO-001	30	30	Fair	Future Cleanout	\$179
CUL-STO-053	18	50	Fair	Future Cleanout	\$202
CUL-STO-115	16	43	Fair	Future Cleanout	\$173
CUL-STO-065	12	44	Fair	Future Cleanout	\$153
Total:					\$124,890

Table 10. Stony Creek Outfall Repair Priorities

Outfall ID	Diameter (in)	Condition	Maintenance Need	Cost Opinion
SDC-STO-019	12	Poor	Replacement	\$6,250
SDC-STO-009	12	Poor	Replacement	\$6,250
SDC-STO-002	6	Poor	Replacement	\$5,000
SDC-STO-016	12	Moderate	Future Cleanout	\$175
SDC-STO-014	12	Moderate	Future Cleanout	\$175
Total:				\$17,850

Table 11. Stony Creek Stormwater Gravity Main Repair Priorities

Stormwater Gravity Main ID	Diameter (in)	Length (ft)	Maintenance Need	Cost Opinion
STG-STO-0067	12	70	Complete Replacement	\$12,304
STG-STO-0069	12	23	Complete Replacement	\$4,025
STG-STO-0008	18	195	Full Liner	\$18,247
STG-STO-0004	21	113	Full Liner	\$14,150
STG-STO-0112	15	145	Full Liner	\$10,838

Stormwater Gravity Main ID	Diameter (in)	Length (ft)	Maintenance Need	Cost Opinion
STG-STO-0056	12	213	Full Liner	\$10,640
STG-STO-0055	12	172	Full Liner	\$8,600
STG-STO-0118	12	160	Full Liner	\$8,000
STG-STO-0032	15	83	Full Liner	\$6,225
STG-STO-0049	12	120	Full Liner	\$5,980
STG-STO-0114	12	118	Full Liner	\$5,900
STG-STO-0040	12	104	Full Liner	\$5,200
STG-STO-0031	15	63	Full Liner	\$4,725
STG-STO-0009	18	29	Full Liner	\$2,755
STG-STO-0113	12	58	Full Liner	\$2,900
STG-STO-0117	12	57	Full Liner	\$2,850
STG-STO-0001	8	86	Full Liner	\$3,456
STG-STO-0048	12	29	Full Liner	\$1,440
STG-STO-0062	12	29	Complete Replacement	\$4,778
STG-STO-0050	12	28	Full Liner	\$1,400
STG-STO-0041	12	174	Spot Liner(s)	\$4,000
STG-STO-0047	12	164	Partial Replacement, Full Liner	\$13,790
STG-STO-0006	10	208	Partial Replacement	\$5,063
STG-STO-0053	12	144	Spot Liner(s)	\$4,000
STG-STO-0013	15	89	Partial Replacement, Monitor Closely	\$26,000
STG-STO-0042	12	97	Spot Liner(s), Monitor Closely	\$4,000
STG-STO-0044	12	48	Spot Liner(s)	\$8,000
STG-STO-0071	12	46	Spot Liner(s)	\$4,000
STG-STO-0035	18	216	Cutting and Grouting	\$10,084
STG-STO-0070	12	154	Cutting and Grouting	\$4,235
STG-STO-0025	19	49	Cutting and Grouting	\$2,965
STG-STO-0029	15	76	Cutting and Grouting	\$2,717
STG-STO-0030	15	58	Cutting and Grouting	\$2,056
STG-STO-0073	12	41	Cleaning	\$144
STG-STO-0072	12	25	Cutting and Grouting	\$2,595
STG-STO-0018	18	10	Cutting and Grouting	\$8,411
STG-STO-0065	12	162	Monitor Closely	\$0
STG-STO-0045	12	132	Monitor Closely	\$0
Total:				\$236,473

Table 12. Stony Creek Green Infrastructure Installation Priorities

Site ID	Site	Practice Type	Treatment Surface Area (ft ²)	Cost Opinion	Cost per sq ft of Treatment Area (\$/ft ²)
GI-STO-04	Northdale Dr Parking	Bioswale	1,280	\$10,169	\$7.94
GI-STO-22	West Branch Dr Parking	No Mow	10,655	\$0.00	\$0.00
GI-STO-14	Ridgewood Dr	Naturalized Swale	12,589	\$21,401	\$1.70
GI-STO-06	Oakgrove Dr	Naturalized Swale	4,686	\$7,966	\$1.70
GI-STO-08	Oakgrove Dr Parking North	Naturalized Swale	4,473	\$7,604	\$1.70
GI-STO-05	Park Rd and Northdale Dr	Naturalized Swale	4,212	\$7,160	\$1.70
GI-STO-07	Oakgrove Dr Parking South	Naturalized Swale	3,992	\$6,786	\$1.70
GI-STO-01	Main Park Rd Traffic Circle	Naturalized Swale	3,772	\$6,412	\$1.70
GI-STO-09	Oakgrove Dr Parking North	Naturalized Swale	3,447	\$5,860	\$1.70
GI-STO-24	Winter Cove	Naturalized Swale	3,216	\$5,467	\$1.70
GI-STO-21	West Branch Dr Parking	Naturalized Swale	2,093	\$3,558	\$1.70
GI-STO-03	Southdale Dr Parking	Naturalized Swale	1,480	\$2,516	\$1.70
GI-STO-15	Park Rd S of 28 Mile Rd	Naturalized Swale	1,118	\$1,901	\$1.70
GI-STO-16	Eastwood Beach Shore	Native Landscaping	14,447	\$60,677	\$4.20
GI-STO-33	Baypoint Beach Parking	Bioswale	13,867	\$126,936	\$9.15
GI-STO-18	Baypoint Beach Parking	Bioswale	10,942	\$102,528	\$9.37

Site ID	Site	Practice Type	Treatment Surface Area (ft ²)	Cost Opinion	Cost per sq ft of Treatment Area (\$/ft ²)
GI-STO-02	Eastwood Beach Parking	Bioswale	10,800	\$85,800	\$7.94
GI-STO-11	Eastwood Beach Parking	Bioswale	9,100	\$72,294	\$7.94
GI-STO-29	Eastwood Beach Parking	Bioswale	6,746	\$59,443	\$8.81
GI-STO-30	Eastwood Beach Parking	Bioswale	5,550	\$49,942	\$9.00
GI-STO-31	Winter Cove Parking	Bioswale	5,250	\$41,708	\$7.94
GI-STO-19	Mt Vernon Dr Parking	Bioswale	5,000	\$39,722	\$7.94
GI-STO-28	Eastwood Beach Parking	Bioswale	4,950	\$45,175	\$9.13
GI-STO-23	Winter Cove Parking	Bioswale	4,750	\$37,736	\$7.94
GI-STO-26	Gladeview Dr Parking South	Bioswale	4,400	\$34,956	\$7.94
GI-STO-32	Winter Cove Parking	Bioswale	4,150	\$32,969	\$7.94
GI-STO-10	Gladeview Dr Parking South	Bioswale	4,150	\$32,969	\$7.94
GI-STO-17	Eastwood Beach Parking	Bioswale	3,450	\$31,308	\$9.07
GI-STO-12	Gladeview Dr Parking North	Bioswale	2,500	\$19,861	\$7.94
GI-STO-13	Gladeview Dr Parking North	Bioswale	2,500	\$19,861	\$7.94
GI-STO-27	Gladeview Dr Parking South	Bioswale	2,300	\$18,272	\$7.94

Site ID	Site	Practice Type	Treatment Surface Area (ft ²)	Cost Opinion	Cost per sq ft of Treatment Area (\$/ft ²)
GI-STO-25	Winter Cove	Stormwater Treatment Wetland	25,286	\$277,582	\$10.98
GI-STO-20	Winter Cove	Stormwater Treatment Wetland	7,949	\$87,267	\$10.98
Total:			202,600	\$1,363,806	

Table 13. Stony Creek Stream Stabilization Priorities

Stream Stabilization Site ID	Length (ft)	Erosion Severity	Recommended Treatment	Unit Cost (\$/ft)	Cost Opinion
S3-STO-004	710.65	Very High	Soil Lifts with Live Stakes	\$678	\$482,000
S3-STO-003	1,485.78	High	Coir Block with Live Stakes	\$172	\$256,000
S3-STO-001	419.14	High	Soil Lifts with Live Stakes	\$678	\$285,000
S3-STO-002	359.24	High	Soil Lifts with Live Stakes	\$678	\$244,000
S3-STO-005	98.16	High	Soil Lifts with Live Stakes	\$678	\$67,000
Total:					\$1,334,000

Table 14. Stony Creek Shoreline Rehabilitation Priorities

Shoreline Restoration Site ID	Length (ft)	Recommended Treatment	Unit Cost (\$/ft)	Cost Opinion
SLR-STO-005	3,000.00	E (Invasive Species Removal)	\$3,000/acre	NA
SLR-STO-006	500.00	E (Invasive Species Removal)	\$3,000/acre	NA
SLR-STO-007	1,500.00	E (Invasive Species Removal)	\$3,000/acre	NA
SLR-STO-008	300.00	E (Invasive Species Removal)	\$3,000/acre	NA
SLR-STO-009	3,500.00	E (Invasive Species Removal)	\$3,000/acre	NA
SLR-STO-004	406.00	C+E (Riprap and Invasive Species Removal)	\$29	\$11,774
SLR-STO-002	1,513.00	A (Tree Removal, Excavation, Plant Restoration, and Invasive Species Removal)	\$19	\$28,756
SLR-STO-001	555.00	A (Tree Removal, Excavation, and Plant Restoration)	\$17	\$9,438
SLR-STO-003	300.00	A (Tree Removal, Excavation, and Plant Restoration)	\$17	\$5,100