

MUSKEGON LAKE NATURE PRESERVE MERES FISH AND WILDLIFE HABITAT RESTORATION PROJECT

100% CONSTRUCTION DOCUMENTS

January 27, 2020

PREPARED FOR:

WEST MICHIGAN SHORELINE REGIONAL DEVELOPMENT COMMISSION
316 MORRIS AVENUE, SUITE 340
MUSKEGON, MICHIGAN 49440

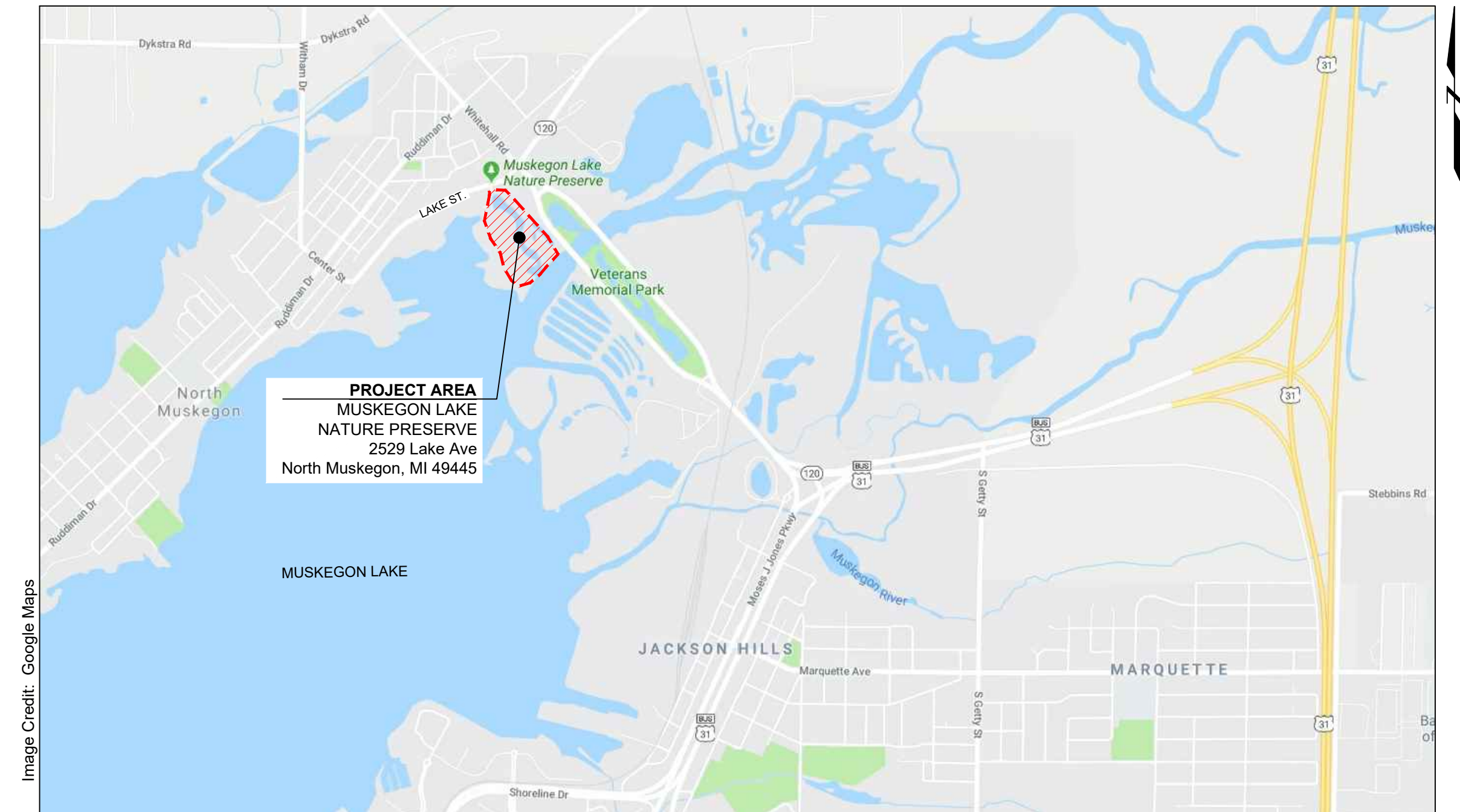


PREPARED BY:

GEI CONSULTANTS OF MICHIGAN, P.C.
5225 EDGEWATER DRIVE
ALLENDALE, MI 49401
(616)384-2710



PROJECT PARTNERS:



LOCATION MAP
NOT TO SCALE



PROJECT AREA
NOT TO SCALE



Muskegon County

MICHIGAN STATE MAP

NOT TO SCALE

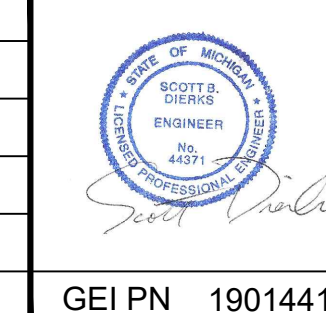
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NO.	DATE	ISSUE/REVISION	APP
3	1/27/20	100 % CONSTRUCTION DOCUMENTS - 2	WL
3	12/12/19	100 % CONSTRUCTION DOCUMENTS	WL
2	10/10/19	90 % CONSTRUCTION DOCUMENTS	WL
1	8/5/19	PRELIMINARY CONCEPTS	WL
NO.	DATE	ISSUE/REVISION	APP

Attention:
0 1"
If this scale bar does not measure 1" then drawing is not original scale.

Designed:	- BM
Checked:	- BM
Drawn:	- WL
Submitted By:	- BM
P.E. Number:	- 44371
Submittal Date:	- 1/27/20



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Muskegon Lake Nature Preserve
MERES Fish and Wildlife Habitat
Restoration Project
COVER SHEET

DWG. NO. **G1**
ISSUE **3**



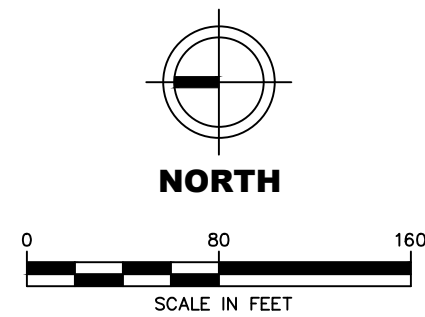
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EXISTING FEATURES LEGEND

- EX. WATER ELEV.
- EX. WATER ELEV. (MUSKEGON RIVER)
- ORDINARY HIGH WATER MARK (OHWM)
- MUSKEGON RIVER THALWEG
- DELINEATED WETLAND BOUNDARY
- MINOR CONTOUR
- MINOR CONTOUR
- WETLANDS
- CONCRETE / ASPHALT
- GRAVEL
- ▲ BENCHMARK

NOTES

- 1) Benchmark #4A elevation 592.97'. Location at southwest corner of 'Community Events' sign on Lake Ave, east of entrance to the nature preserve. NAVD88 Via VRS, OPUS & GPS OBSV.
- 2) Water elevation measured on 5/17/19 and 4/28/14. Water elevation varies depending on location.
- 3) OHWM elevation is 581.5'.
- 4) Muskegon River information from previous 2014 Project (F&V #819060).



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EXISTING CONDITIONS

DWG. NO. C1
 ISSUE 3

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ACCESS/STAGING LEGEND

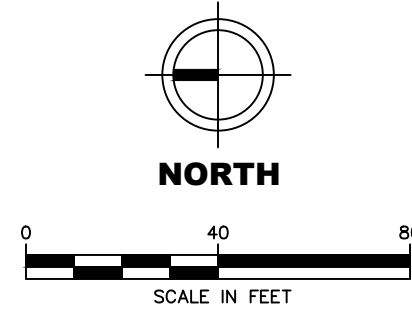
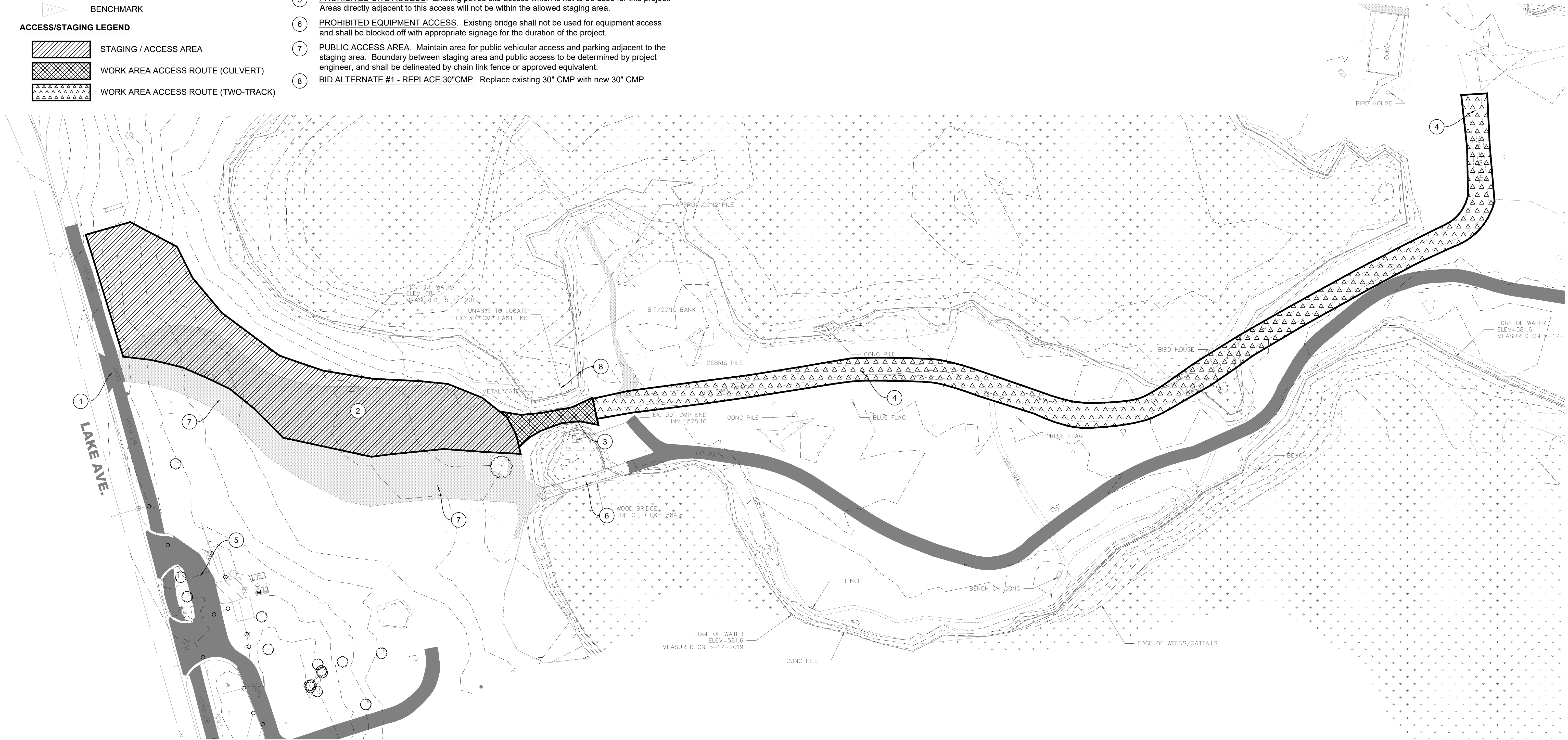
- STAGING / ACCESS AREA
- WORK AREA ACCESS ROUTE (CULVERT)
- WORK AREA ACCESS ROUTE (TWO-TRACK)

STAGING & ACCESS KEY

- 1 SITE ACCESS. Primary site access from Lake Ave.
- 2 STAGING AREA. Existing gravel drive and parking area to serve as primary access and staging area for this project. Maintain a minimum 15' buffer from existing wetlands, natural areas, and water bodies. Exact staging limits to be located in the field by the project engineer. Chain link fence shall be installed at the perimeter of the staging area adjacent to public right-of-way and public/private use areas.
- 3 WORK AREA ACCESS. Utilize existing dirt two-track road to access the work area for this project. Contractor to coordinate with the project engineer to confirm proposed construction equipment is appropriately sized relative to the size of the access route. The Contractor may be required to stabilize and support the access road in the area above the existing culvert to ensure the structural integrity of this area.
- 4 PRIMARY ACCESS ROUTE. Existing two-track path, improve route as necessary.
- 5 PROHIBITED SITE ACCESS. Existing paved site access which is not to be used for this project. Areas directly adjacent to this access will not be within the allowed staging area.
- 6 PROHIBITED EQUIPMENT ACCESS. Existing bridge shall not be used for equipment access and shall be blocked off with appropriate signage for the duration of the project.
- 7 PUBLIC ACCESS AREA. Maintain area for public vehicular access and parking adjacent to the staging area. Boundary between staging area and public access to be determined by project engineer, and shall be delineated by chain link fence or approved equivalent.
- 8 BID ALTERNATE #1 - REPLACE 30" CMP. Replace existing 30" CMP with new 30" CMP.

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Restoration Project

ACCESS & STAGING

DWG. NO. **C2**
ISSUE **3**

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EXISTING FEATURES LEGEND

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INVASIVE SPECIES REMOVAL PHASING

- PHASE 1: Remove any woody invasive species within proposed construction areas and directly adjacent to proposed construction areas, including previously treated area (AREA 'A'). Total Phase 1 treatment area is 6.2 acres.
- PHASE 2: Re-treatment of all Phase 1 areas (AREA 'A') and removal of all remaining invasive species within surveyed areas, including previously treated areas (AREA 'B'). Herbaceous treatments to occur in the 2020 growing season; Woody treatments to occur in fall/winter 2020/2021. Total Phase 2 treatment area is 10.3 acres.
- PHASE 3: Follow-up treatments to all treatment areas in growing season of 2021 (AREA 'A' & 'B').

*INVASIVE SPECIES REMOVAL NOTE: The invasive species removal acreage listed above corresponds with the invasive species areas within treatment areas 'A' and 'B', not the actual footprint of the treatment areas. The treatment areas are outlined to help the contractor identify the

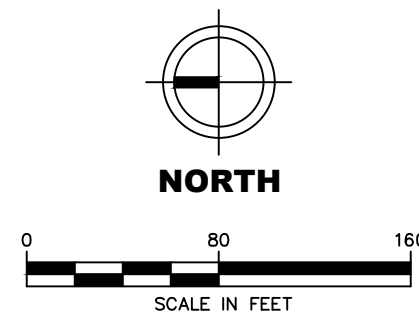
INVASIVE SPECIES REMOVAL LEGEND

- Bell's Honeysuckle (5.1 ac) - Untreated to Date
- Previously Treated Areas (2.8 ac)
- Proposed Construction Area Footprints to Treat (2.4 ac)
- Invasive Species Survey Point
- Invasive Species Survey Point Identification
- Area
- Density
- Species
- Point ID

Species Key

- Eu - Autumn Olive
- Lb - Bell's Honeysuckle
- A - Burdock
- Ap - Garlic Mustard
- Rj - Japanese Knotweed
- Lc - Motherwort
- Co - Oriental Bittersweet
- Vm - Periwinkle
- L - Privet
- Ls - Purple Loosestrife
- Cm - Spotted Knapweed

Density	Area
1 Sparse	Individual / Few / Several
2 Patchy	< 1,000 sqft
3 Dense	1,000 sqft to 0.5 acre
4 Monoculture	0.5 acre to 1 acre
5 -	> 1 acre



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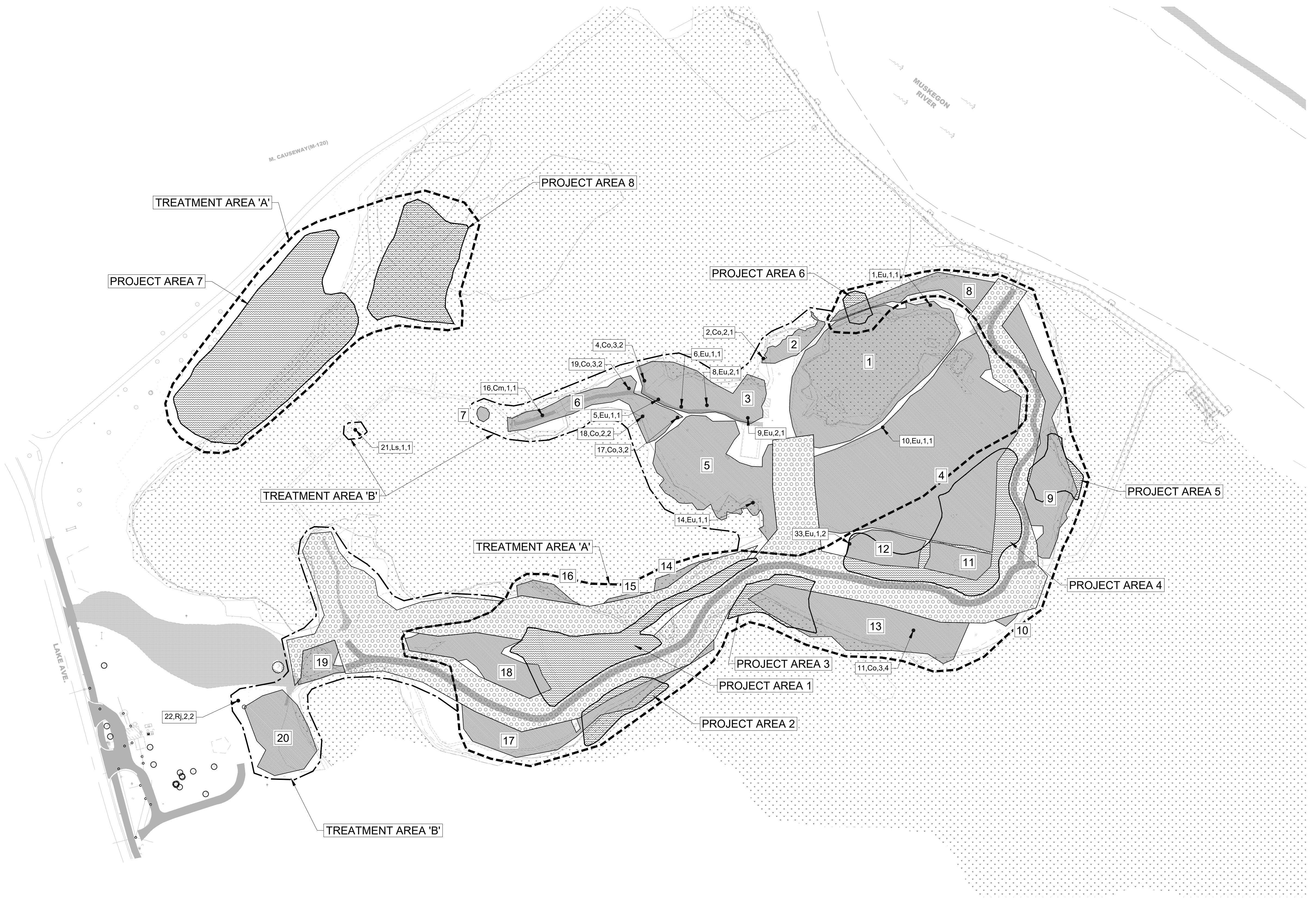
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Restoration Project
**INVASIVE SPECIES REMOVAL
PLAN**

DWG. NO.
C3
ISSUE
3



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OVERALL PROJECT EARTHWORK				
	VOL (CY)			
CUT	4,974			
FILL	1,487			
NET	3,487 CY CUT			
OVERALL PROJECT OHWM IMPACTS				
	VOL (CY)		AREA (SF)	
CUT	902		34,032	
FILL	35		821	
NET	867 CUT		-	
OVERALL PROJECT WETLAND IMPACTS				
	VOL (CY)		AREA (SF)	
CUT	1,437		44,334	
FILL	9		308	
NET	1,428 CUT		-	

*WETLAND CREATION (UPLAND GRADING):
28,578 SF (0.66 AC)

AREA 1 EARTHWORK				
	VOL (CY)		AREA (SF)	
CUT	848		-	
FILL	118		-	
NET	730 CUT		17,545	
AREA 1 OHWM IMPACTS				
	VOL (CY)		AREA (SF)	
CUT	0		0	
FILL	35		821	
NET	35 FILL		-	
AREA 1 WETLAND IMPACTS				
	VOL (CY)		AREA (SF)	
CUT	0		0	
FILL	9		308	
NET	9 FILL		-	

AREA 2 EARTHWORK				
	VOL (CY)		AREA (SF)	
CUT	288		-	
FILL	0		-	
NET	288 CUT		5,918	
AREA 2 OHWM IMPACTS				
	VOL (CY)		AREA (SF)	
CUT	71		2,991	
FILL	0		0	
NET	71 CUT		-	
AREA 2 WETLAND IMPACTS				
	VOL (CY)		AREA (SF)	
CUT	83		3,017	
FILL	0		0	
NET	83 CUT		-	

AREA 3 EARTHWORK				
	VOL (CY)		AREA (SF)	
CUT	258		-	
FILL	0		-	
NET	258 CUT		7,339	
AREA 3 OHWM IMPACTS				
	VOL (CY)		AREA (SF)	
CUT	57		2,642	
FILL	0		0	
NET	57 CUT		-	
AREA 3 WETLAND IMPACTS				
	VOL (CY)		AREA (SF)	
CUT	75		3,273	
FILL	0		0	
NET	75 CUT		-	

AREA 4 EARTHWORK				
	VOL (CY)		AREA (SF)	
CUT	1		-	
FILL	1,369		-	
NET	1,368 FILL		28,010	
AREA 4 OHWM IMPACTS				
	VOL (CY)		AREA (SF)	
CUT	0		0	
FILL	0		0	
NET	-		-	
AREA 4 WETLAND IMPACTS				
	VOL (CY)		AREA (SF)	
CUT	0		0	
FILL	0		0	
NET	-		-	

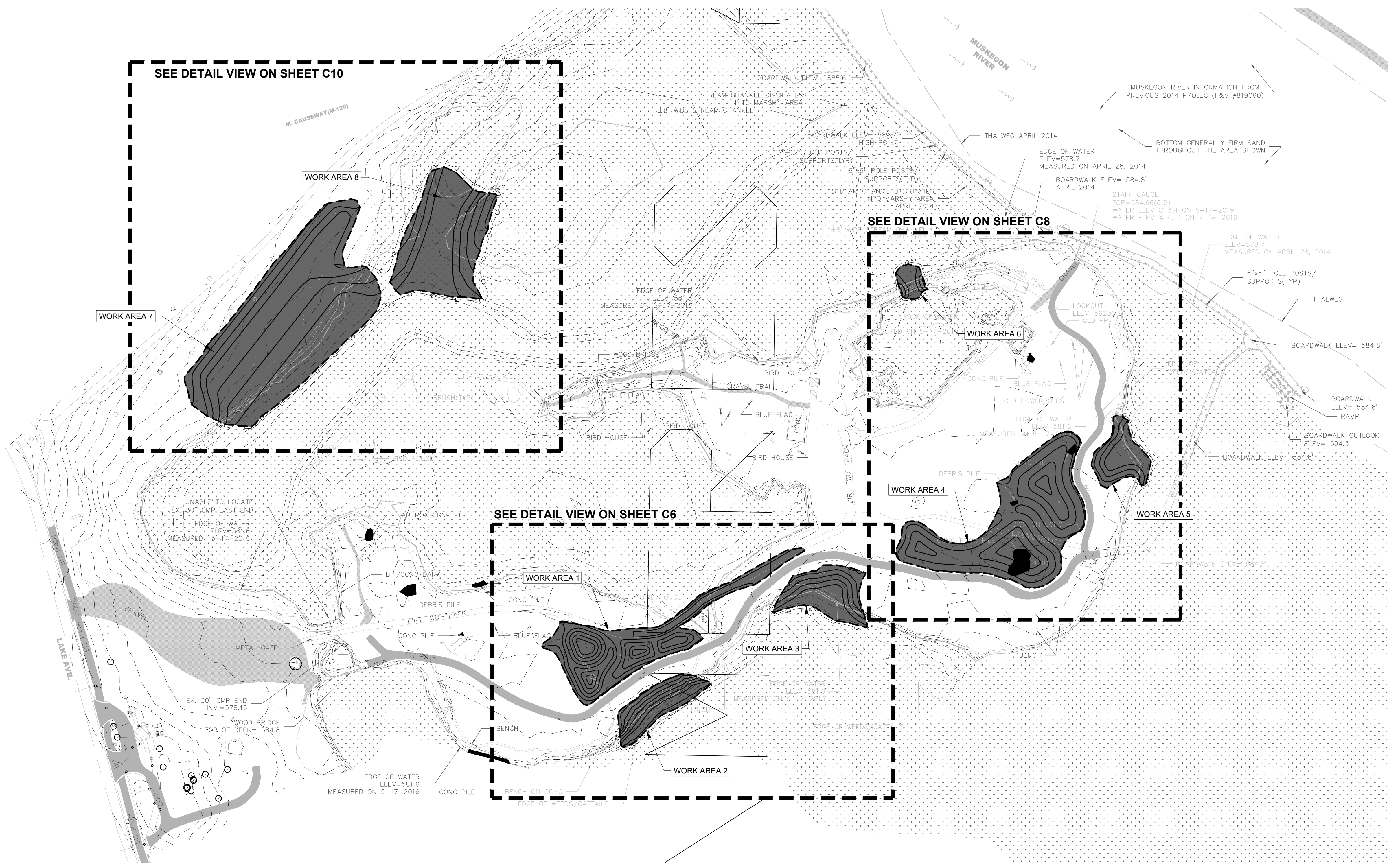
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- MINOR CONTOUR
- MINOR CONTOUR
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- GRAVEL
- BENCHMARK

PROPOSED FEATURES LEGEND

- GRADING LIMITS
- MAJOR CONTOUR
- MINOR CONTOUR
- PROJECT AREA FOOTPRINT

- NOTES**
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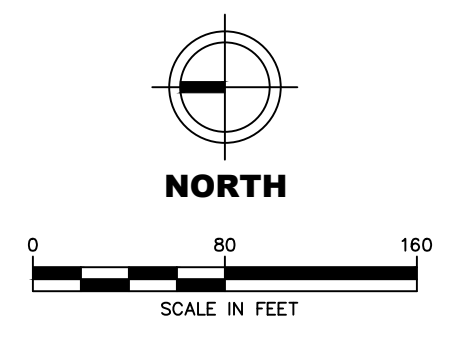


AREA 5 EARTHWORK				
	VOL (CY)		AREA (SF)	
CUT	235		-	
FILL	0		-	
NET	235 CUT		5,050	
AREA 5 OHWM IMPACTS				
	VOL (CY)		AREA (SF)	
CUT	28		1,360	
FILL	0		0	
NET	28 CUT		-	
AREA 5 WETLAND IMPACTS				
	VOL (CY)		AREA (SF)	
CUT	53		1,843	
FILL	0		0	
NET	53 CUT		-	

AREA 6 EARTHWORK				
	VOL (CY)		AREA (SF)	
CUT	45		-	
FILL	0		-	
NET	45 CUT		1,621	
AREA 6 OHWM IMPACTS				
	VOL (CY)		AREA (SF)	
CUT	17		1,105	
FILL	0		0	
NET	17 CUT		-	
AREA 6 WETLAND IMPACTS				
	VOL (CY)		AREA (SF)	
CUT	36		1,467	
FILL	0		0	
NET	36 CUT		-	

AREA 7 EARTHWORK				
	VOL (CY)		AREA (SF)	
CUT	2,570		-	
FILL	0		-	
NET	2,570 CUT		44,880	
AREA 7 OHWM IMPACTS				
	VOL (CY)		AREA (SF)	
CUT	229		8,711	
FILL	0		0	
NET	229 CUT		-	
AREA 7 WETLAND IMPACTS				
	VOL (CY)		AREA (SF)	
CUT	461		12,019	
FILL	0		0	
NET	461 CUT		-	

AREA 8 EARTHWORK				
	VOL (CY)		AREA (SF)	
CUT	744		-	
FILL	0		-	
NET	744 CUT		18,624	
AREA 8 OHWM IMPACTS				
	VOL (CY)		AREA (SF)	
CUT	492		14,624	
FILL	0		0	
NET	492 CUT		-	
AREA 8 WETLAND IMPACTS				
	VOL (CY)		AREA (SF)	
CUT	744		18,624	
FILL	0		0	
NET	744 CUT		-	



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DWG. NO. **C4**
ISSUE **3**

PROPOSED CONDITIONS

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- [Pattern] WETLANDS
- [Pattern] CONCRETE / ASPHALT
- [Pattern] GRAVEL
- [Symbol] BENCHMARK

DEBRIS REMOVAL LEGEND

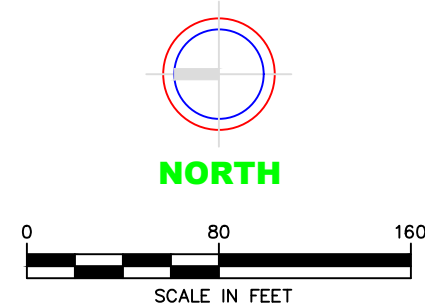
- [Symbol] SURVEYED DEBRIS PILE (9 TOTAL)

DEBRIS REMOVAL KEY

- 1) **CONCRETE / DEBRIS REMOVAL LOCATION.** Remove and dispose of identified piles, place clean topsoil level with adjacent grades (or as indicated on proposed grading plans) and plant with floodplain forest seed mix (see sheet D2). Number adjacent to the key call out to indicate specific debris piles.

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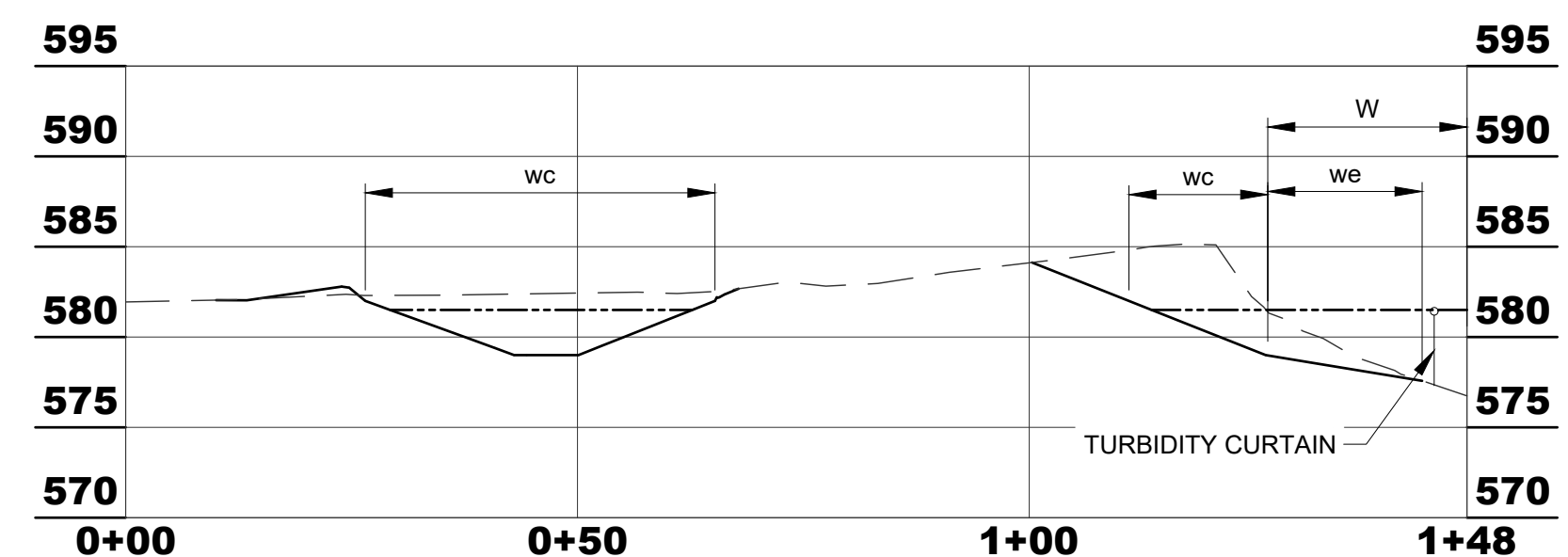
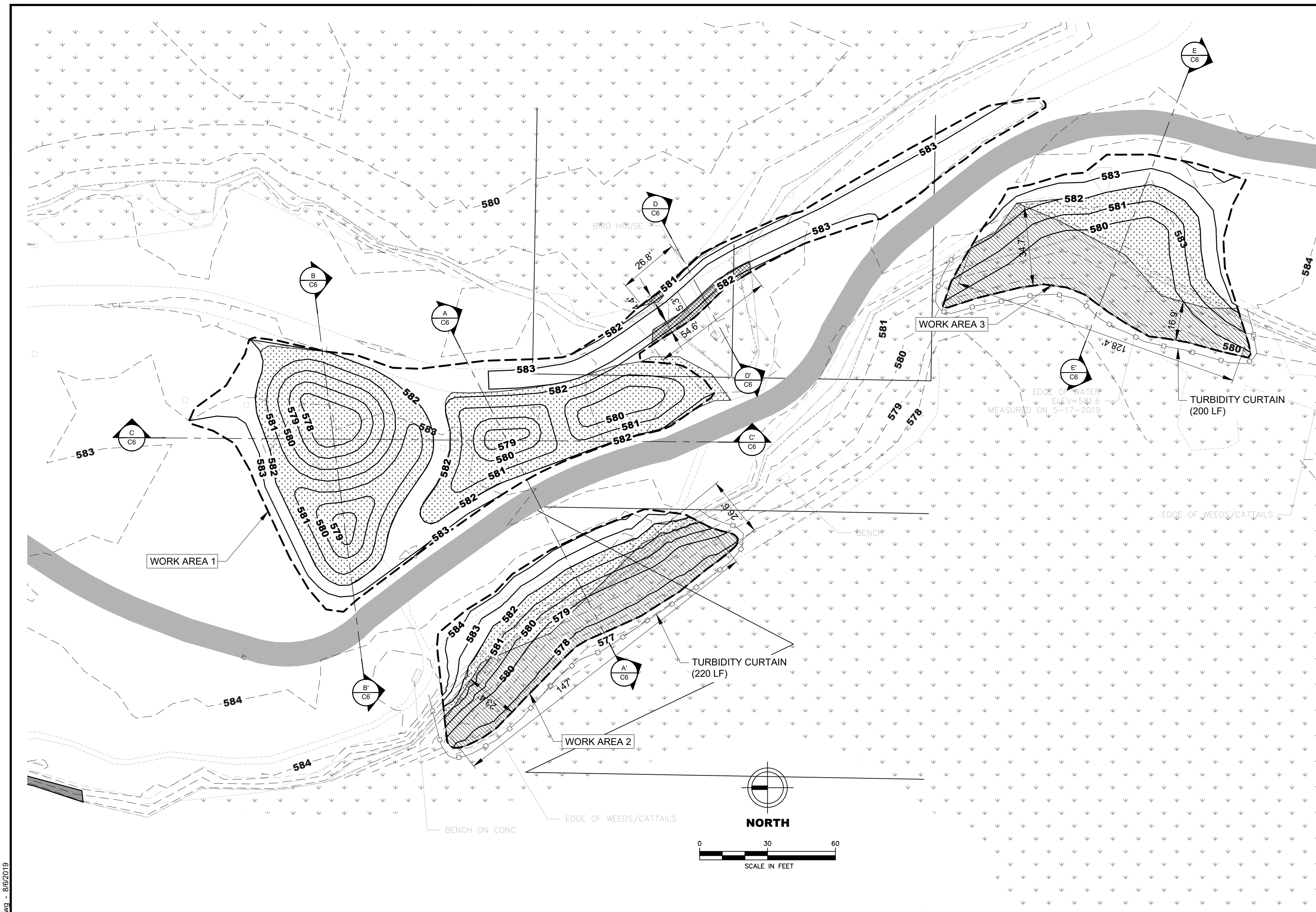
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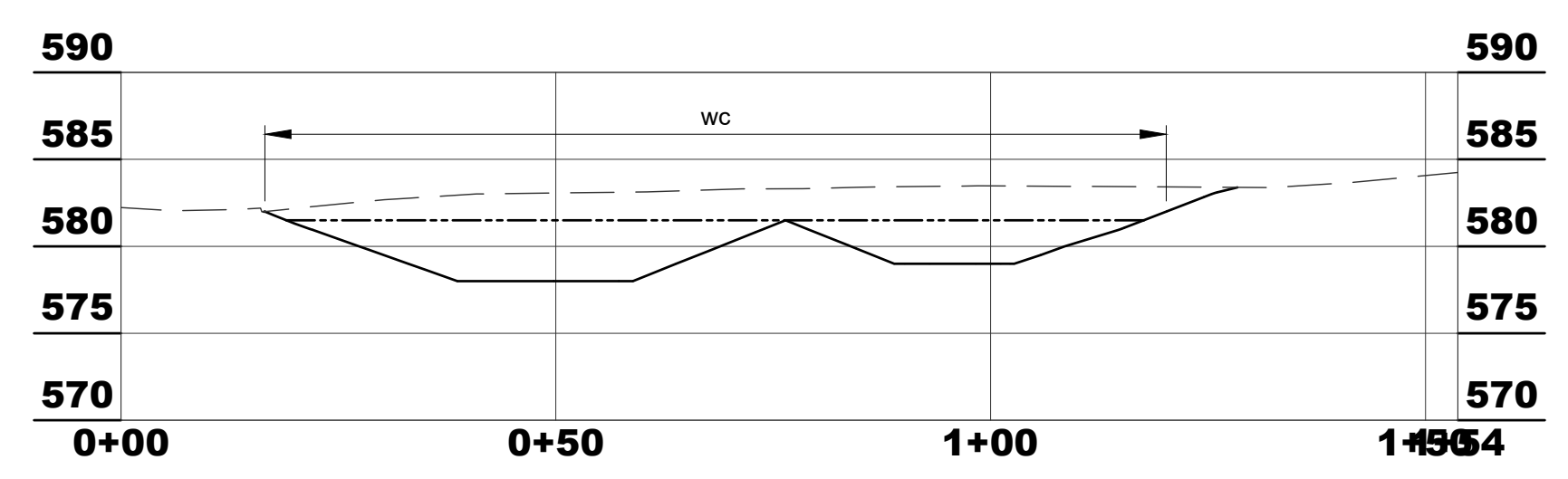
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DWG. NO.
C5
ISSUE
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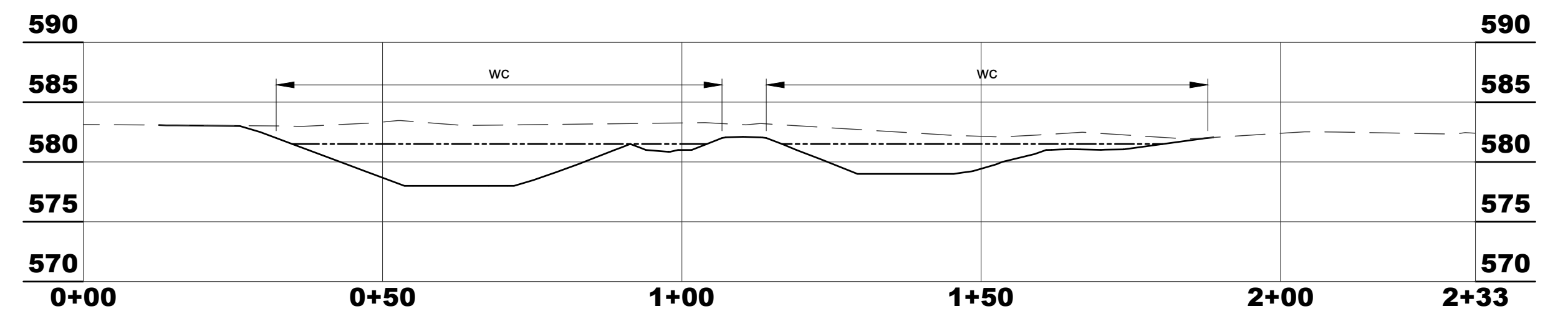
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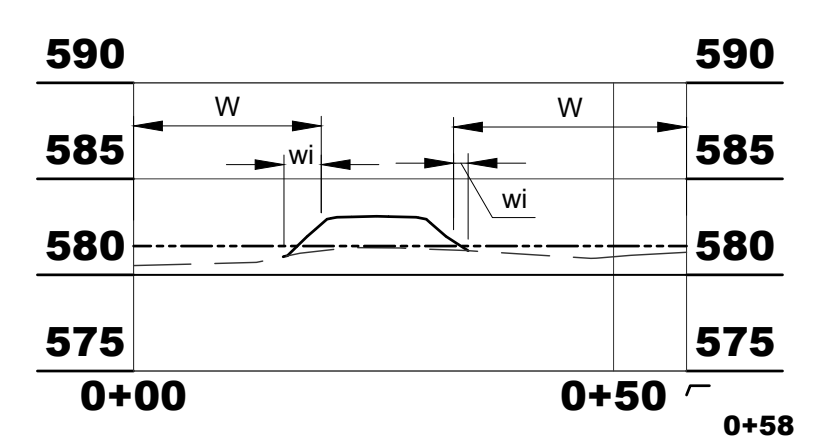
CROSS-SECTION A-A'
SCALE H: 1"=20' V: 1"=10'



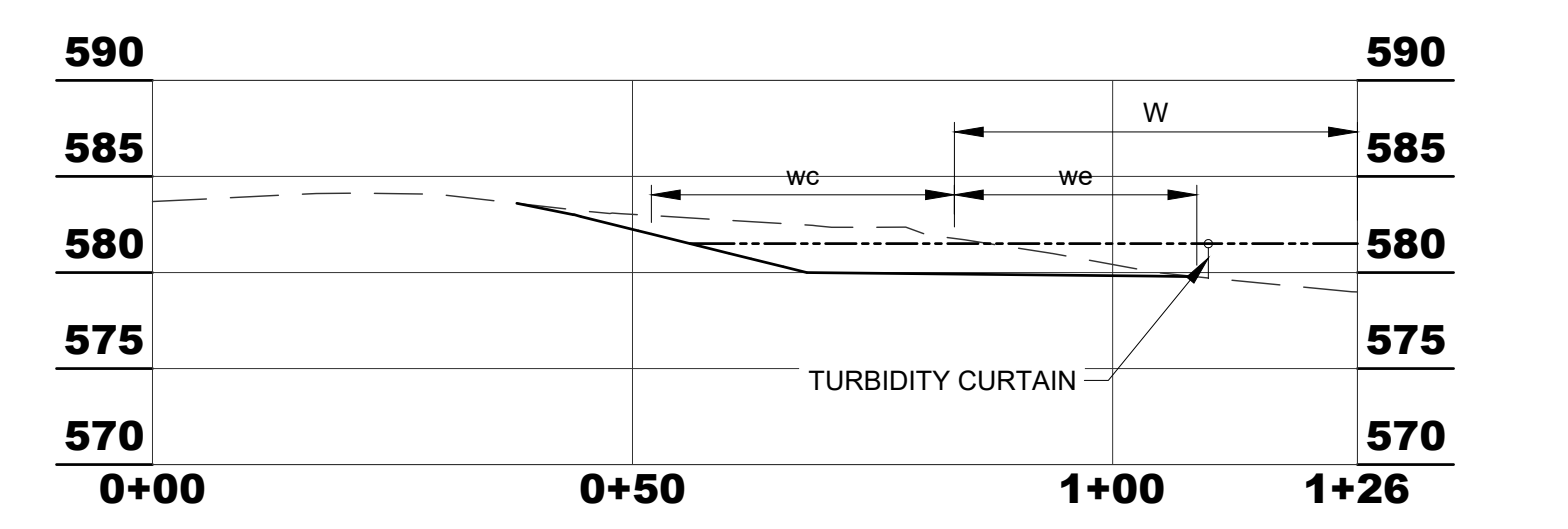
CROSS-SECTION B-B'
SCALE H: 1"=20' V: 1"=10'



CROSS-SECTION C-C'
SCALE H: 1"=20' V: 1"=10'



CROSS-SECTION D-D'
SCALE H: 1"=20' V: 1"=10'



CROSS-SECTION E-E'
SCALE H: 1"=20' V: 1"=10'

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PROPOSED FEATURES LEGEND

- GRADING LIMITS
- MAJOR CONTOUR
- MINOR CONTOUR
- TURBIDITY CURTAIN
- SECTION MARKER
- WETLAND IMPACT AREAS (FILL)
- WETLAND ENHANCEMENT AREAS (CUT)
- WETLAND CREATION AREAS (EXCAVATION IN UPLAND)
- DEBRIS PILE REMOVAL

NOTES

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- 3) OHWM elevation is 581.5'.
- 4) Muskegon River information from previous 2014 Project (F&V #819060).
- 5) Exact location and installation of turbidity curtain to be approved by project engineer prior to excavation activities.

AREA 1 EARTHWORK	
VOL (CY)	AREA (SF)
CUT	848
FILL	118
NET	730 CUT 17,545
AREA 1 OHWM IMPACTS	
VOL (CY)	AREA (SF)
CUT	0
FILL	35
NET	35 FILL
AREA 1 WETLAND IMPACTS	
VOL (CY)	AREA (SF)
CUT	0
FILL	9
NET	9 FILL

AREA 2 EARTHWORK	
VOL (CY)	AREA (SF)
CUT	288
FILL	0
NET	288 CUT 5,918
AREA 2 OHWM IMPACTS	
VOL (CY)	AREA (SF)
CUT	71
FILL	0
NET	71 CUT
AREA 2 WETLAND IMPACTS	
VOL (CY)	AREA (SF)
CUT	83
FILL	0
NET	83 CUT

AREA 3 EARTHWORK	
VOL (CY)	AREA (SF)
CUT	258
FILL	0
NET	258 CUT 7,339
AREA 3 OHWM IMPACTS	
VOL (CY)	AREA (SF)
CUT	57
FILL	0
NET	57 CUT
AREA 3 WETLAND IMPACTS	
VOL (CY)	AREA (SF)
CUT	75
FILL	0
NET	75 CUT

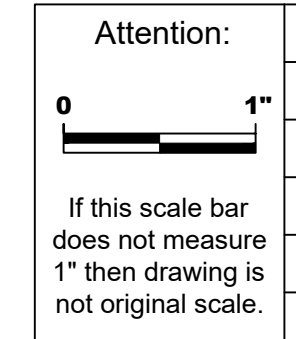
*WETLAND CREATION: 9,826 SF (0.23 AC)

*WETLAND CREATION: 1,310 SF (0.03 AC)

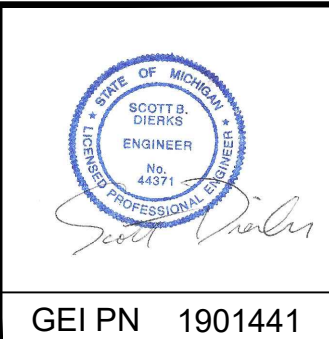
*WETLAND CREATION: 2,148 SF (0.05 AC)

CROSS-SECTION LEGEND

- EXISTING GRADE
- PROPOSED GRADE
- OHWM
- W EXISTING WETLAND
- wi WETLAND IMPACTS
- we WETLAND ENHANCEMENT
- wc WETLAND CREATION



NO.	DATE	ISSUE/REVISION	APP
3	1/27/20	100 % CONSTRUCTION DOCUMENTS - 2	WL
3	12/12/19	100 % CONSTRUCTION DOCUMENTS	WL
2	10/10/19	90 % CONSTRUCTION DOCUMENTS	WL
1	8/5/19	PRELIMINARY CONCEPTS	WL



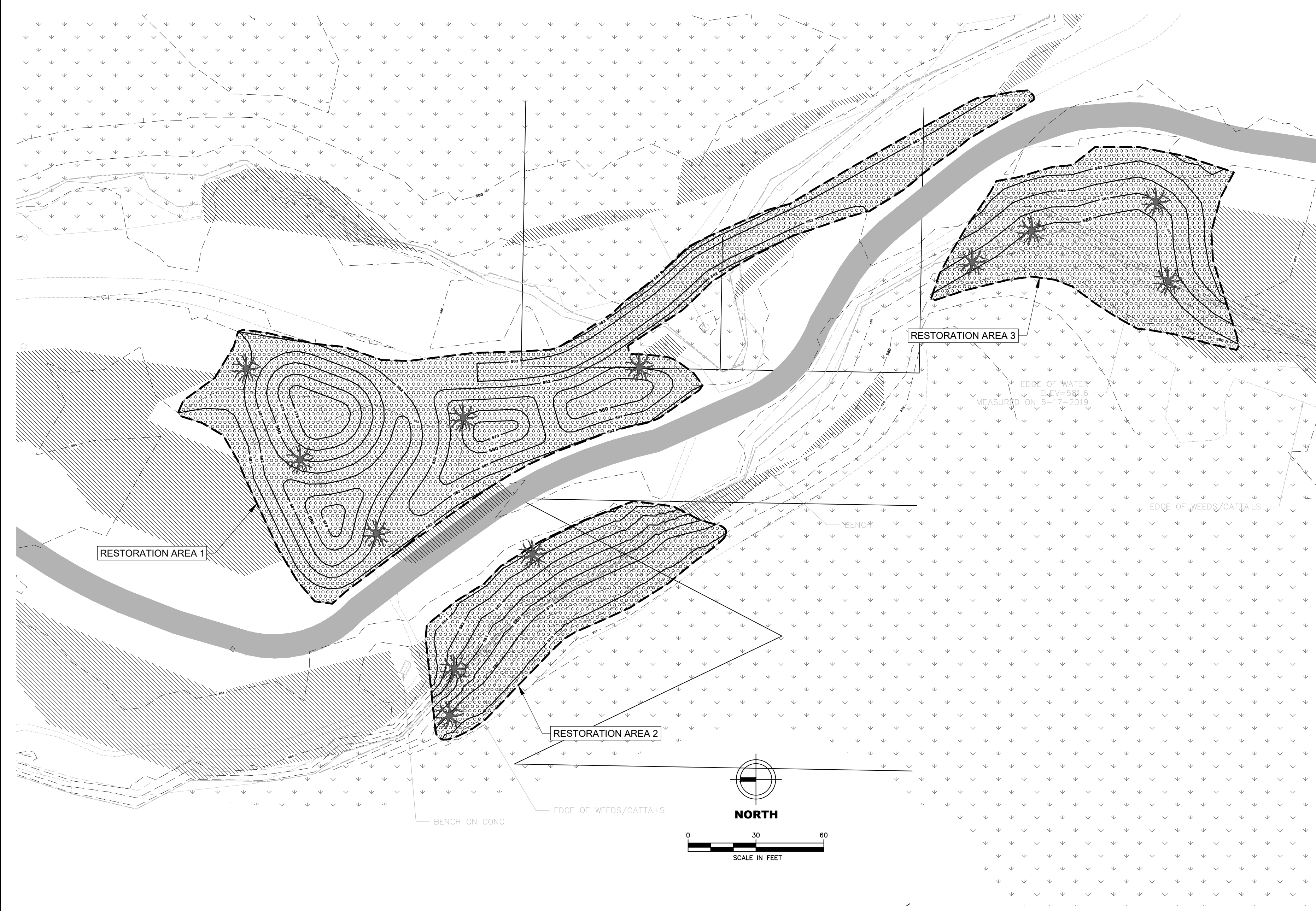
Designed: - BM
Checked: - BM
Drawn: - WL
Submitted By: - BM
P.E. Number: - 44371
Submittal Date: - 1/27/20



Muskegon Lake Nature Preserve
MERES Fish and Wildlife Habitat
Restoration Project
WORK AREAS 1, 2, & 3

DWG. NO.
C6
ISSUE
3

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EXISTING FEATURES LEGEND

- EX. WATER ELEV.
- EX. WATER ELEV. (MUSKEGON RIVER)
- ORDINARY HIGH WATER MARK (OHWM)
- MUSKEGON RIVER THALWEG
- DELINEATED WETLAND BOUNDARY
- MINOR CONTOUR
- MINOR CONTOUR
- WETLANDS
- CONCRETE / ASPHALT
- GRAVEL
- BENCHMARK

PROPOSED FEATURES LEGEND

- GRADING LIMITS
- MAJOR CONTOUR
- MINOR CONTOUR

RESTORATION AREAS LEGEND

- MESIC NORTHERN FOREST SEED MIX AREA
- FLOODPLAIN FOREST SEED MIX AREA

HABITAT STRUCTURES

- LARGE WOODY DEBRIS

NOTES

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- 3) OHWM elevation is 581.5'.
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RESTORATION NOTES

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1	8/5/19	PRELIMINARY CONCEPTS	WL

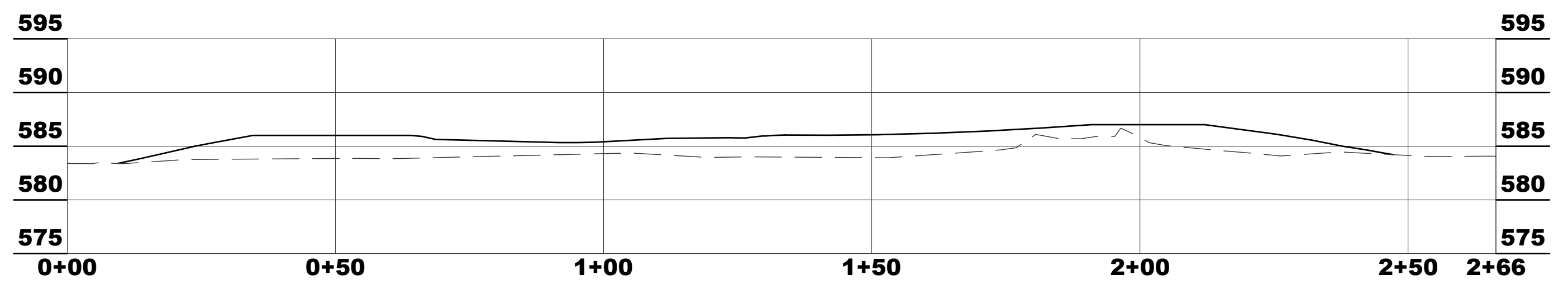
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GEI Consultants
5525 Edgewater Drive
Allendale, MI 49401

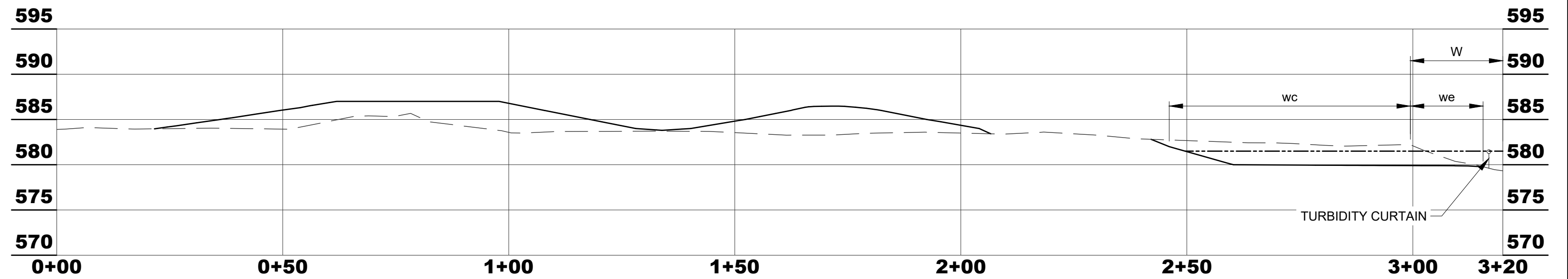
WMSRDC
WEST MICHIGAN SHORELINE
REGIONAL DEVELOPMENT COMMISSION
316 Morris Avenue, Suite 340
Muskegon, MI 49440

Muskegon Lake Nature Preserve
MERES Fish and Wildlife Habitat
Restoration Project
RESTORATION AREAS 1, 2, & 3

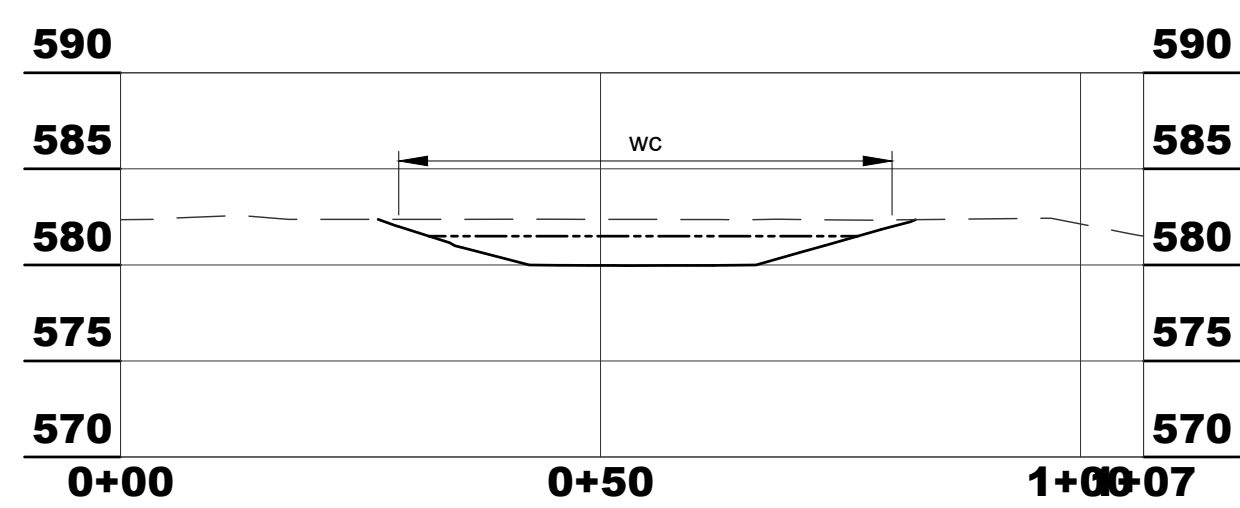
DWG. NO.
C7
ISSUE
3



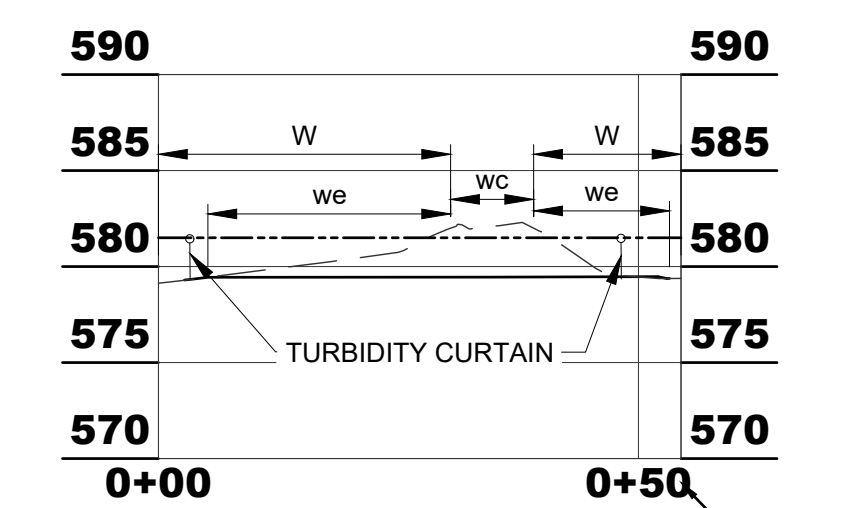
CROSS-SECTION F-F'
SCALE H: 1"=20' V: 1"=10'



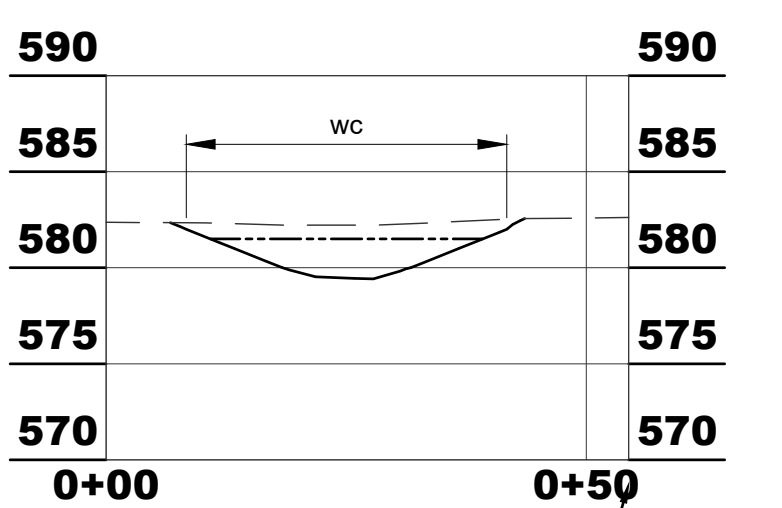
CROSS-SECTION G-G'
SCALE H: 1"=20' V: 1"=10'



CROSS-SECTION H-H'
SCALE H: 1"=20' V: 1"=10'



CROSS-SECTION I-I'
SCALE H: 1"=20' V: 1"=10'



CROSS-SECTION J-J'
SCALE H: 1"=20' V: 1"=10'

EXISTING FEATURES LEGEND

- EX. WATER ELEV.
- EX. WATER ELEV. (MUSKEGON RIVER)
- ORDINARY HIGH WATER MARK (OHWM)
- MUSKEGON RIVER THALWEG
- DELINEATED WETLAND BOUNDARY
- MINOR CONTOUR
- MINOR CONTOUR
- WETLANDS
- CONCRETE / ASPHALT

- GRAVEL
- BENCHMARK

- PROPOSED FEATURES LEGEND**
- GRADING LIMITS
 - MAJOR CONTOUR
 - MINOR CONTOUR
 - TURBIDITY CURTAIN
 - SECTION MARKER

- WETLAND IMPACT AREAS (FILL)
- WETLAND ENHANCEMENT AREAS (CUT)
- WETLAND CREATION AREAS (EXCAVATION IN UPLAND)
- DEBRIS PILE REMOVAL

CROSS-SECTION LEGEND

- EXISTING GRADE
- PROPOSED GRADE
- OHWM
- W EXISTING WETLAND
- wi WETLAND IMPACTS
- we WETLAND ENHANCEMENT
- wc WETLAND CREATION

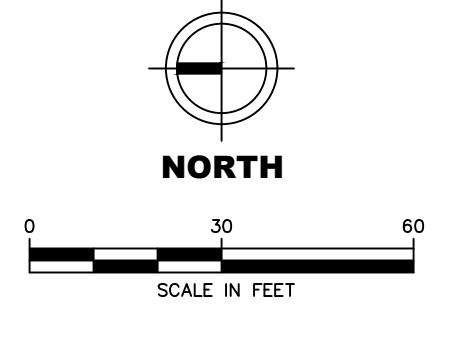
AREA 4 EARTHWORK			
	VOL (CY)	AREA (SF)	
CUT	1	-	
FILL	1,369	-	
NET	1,368 FILL	28,010	
AREA 4 OHWM IMPACTS			
	VOL (CY)	AREA (SF)	
CUT	0	0	
FILL	0	0	
NET	-	-	
AREA 4 WETLAND IMPACTS			
	VOL (CY)	AREA (SF)	
CUT	0	0	
FILL	0	0	
NET	-	-	

AREA 5 EARTHWORK			
	VOL (CY)	AREA (SF)	
CUT	235	-	
FILL	0	-	
NET	235 CUT	5,050	
AREA 5 OHWM IMPACTS			
	VOL (CY)	AREA (SF)	
CUT	28	1,360	
FILL	0	0	
NET	28 CUT	-	
AREA 5 WETLAND IMPACTS			
	VOL (CY)	AREA (SF)	
CUT	53	1,843	
FILL	0	0	
NET	53 CUT	-	

AREA 6 EARTHWORK			
	VOL (CY)	AREA (SF)	
CUT	45	-	
FILL	0	-	
NET	45 CUT	1,621	
AREA 6 OHWM IMPACTS			
	VOL (CY)	AREA (SF)	
CUT	17	1,105	
FILL	0	0	
NET	17 CUT	-	
AREA 6 WETLAND IMPACTS			
	VOL (CY)	AREA (SF)	
CUT	36	1,467	
FILL	0	0	
NET	36 CUT	-	

NOTES

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1	8/6/19	PRELIMINARY CONCEPTS	WL

Designed:	- BM
Checked:	- BM
Drawn:	- WL
Submitted By:	- BM
P.E. Number:	- 44371
Submittal Date:	- 8/6/19

GEI Consultants
5525 Edgewater Drive
Allendale, MI 49401

WMSRDC
WEST MICHIGAN SHORELINE
REGIONAL DEVELOPMENT COMMISSION
316 Morris Avenue, Suite 340
Muskegon, MI 49440

Muskegon Lake Nature Preserve
MERES Fish and Wildlife Habitat
Restoration Project

WORK AREAS 4, 5, & 6

DWG. NO. **C8**
ISSUE **3**



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- DELINEATED WETLAND BOUNDARY
- MINOR CONTOUR
- MINOR CONTOUR
- WETLANDS
- CONCRETE / ASPHALT
- GRAVEL
- △ BENCHMARK

PROPOSED FEATURES LEGEND

- GRADING LIMITS
- MAJOR CONTOUR
- MINOR CONTOUR

RESTORATION AREAS LEGEND

- MESIC NORTHERN FOREST SEED MIX AREA
- FLOODPLAIN FOREST SEED MIX AREA
- OAK-PINE BARRENS SEED MIX AREA

HABITAT STRUCTURES

- ★ LARGE WOODY DEBRIS

BEFORE YOU DIG CALL MISS DIG
CALL 3 FULL WORKING DAYS: 811
1-800-482-7171

NORTH

0 30 60
SCALE IN FEET

NO.	DATE	ISSUE/REVISION	APP
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MERES Fish and Wildlife Habitat
Restoration Project

RESTORATION AREAS 4, 5, & 6

DWG. NO. **C9**
ISSUE **3**

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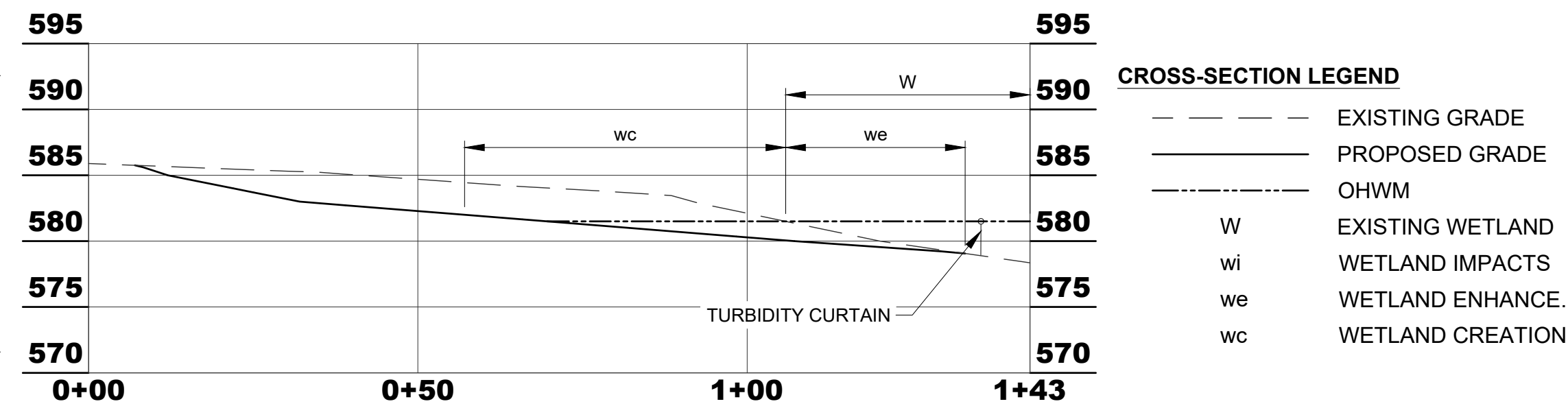
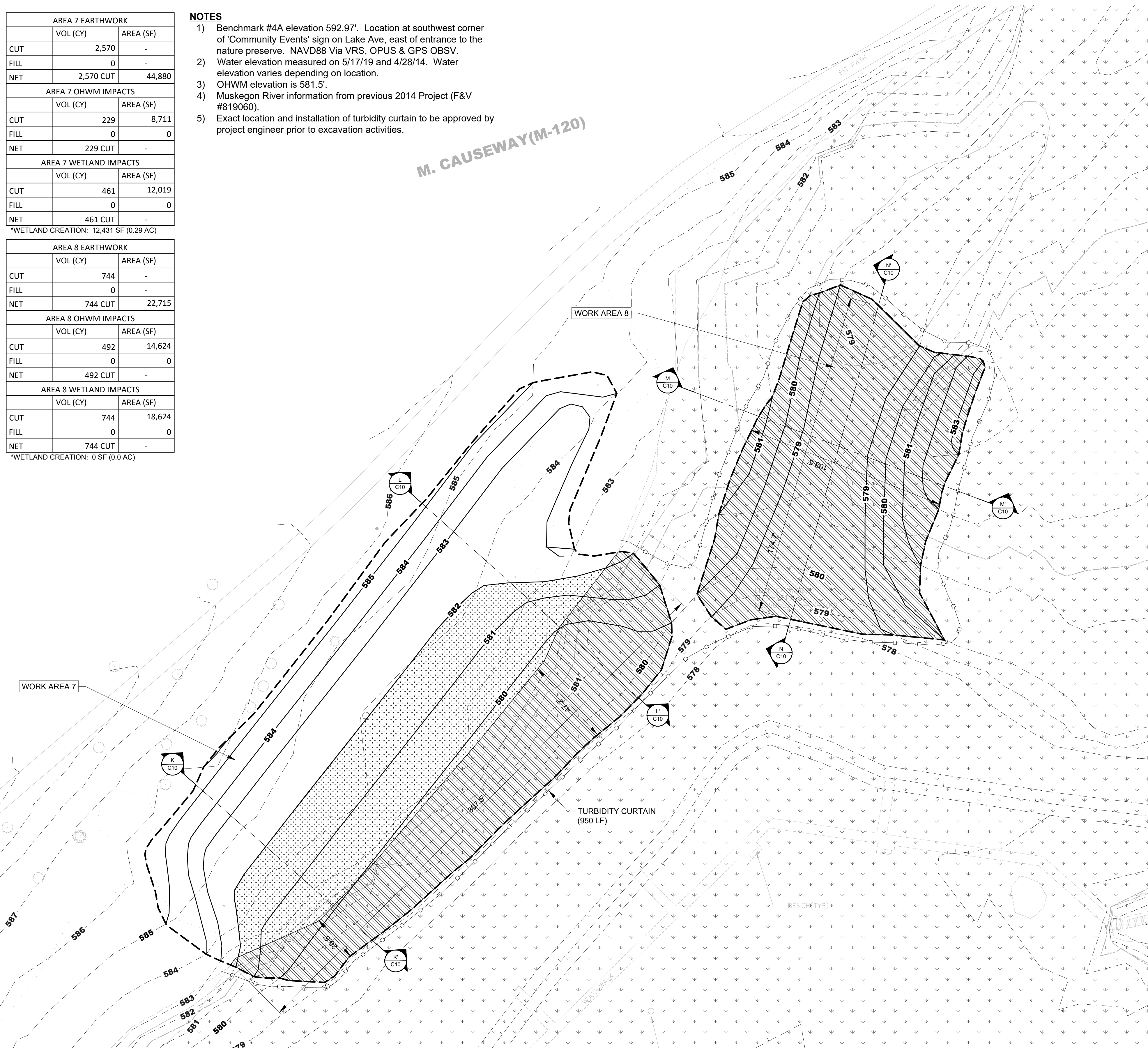
AREA 7 EARTHWORK		
	VOL (CY)	AREA (SF)
CUT	2,570	-
FILL	0	-
NET	2,570 CUT	44,880
AREA 7 OHWM IMPACTS		
	VOL (CY)	AREA (SF)
CUT	229	8,711
FILL	0	0
NET	229 CUT	-
AREA 7 WETLAND IMPACTS		
	VOL (CY)	AREA (SF)
CUT	461	12,019
FILL	0	0
NET	461 CUT	-
*WETLAND CREATION: 12,431 SF (0.29 AC)		

AREA 8 EARTHWORK		
	VOL (CY)	AREA (SF)
CUT	744	-
FILL	0	-
NET	744 CUT	22,715
AREA 8 OHWM IMPACTS		
	VOL (CY)	AREA (SF)
CUT	492	14,624
FILL	0	0
NET	492 CUT	-
AREA 8 WETLAND IMPACTS		
	VOL (CY)	AREA (SF)
CUT	744	18,624
FILL	0	0
NET	744 CUT	-
*WETLAND CREATION: 0 SF (0.0 AC)		

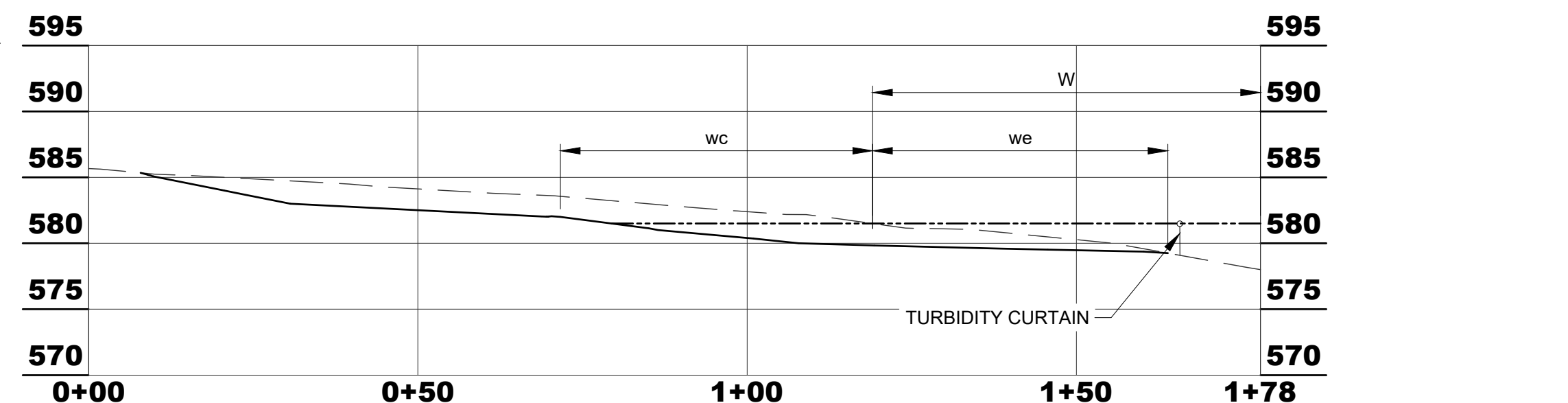
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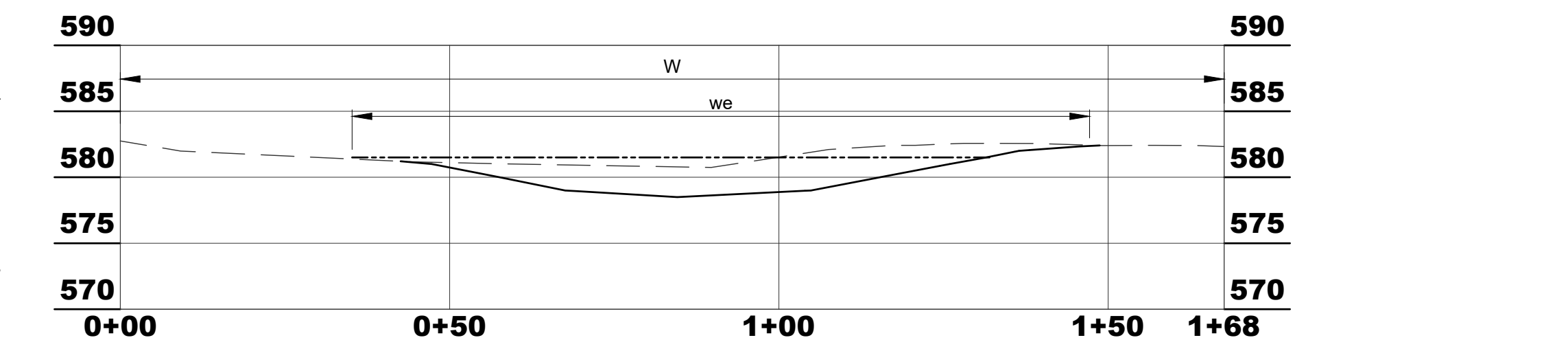
M. CAUSEWAY (M-120)



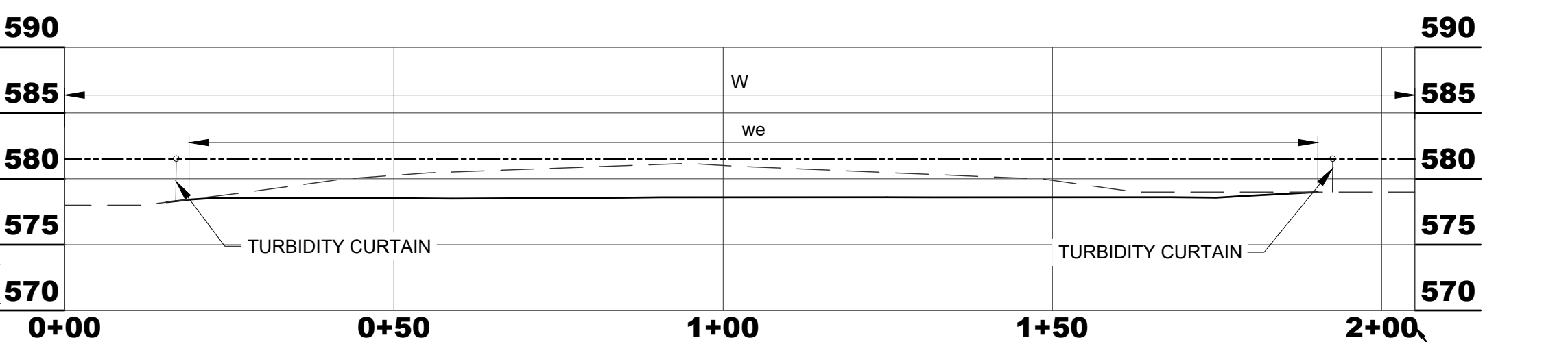
CROSS-SECTION K-K'
SCALE H: 1"=20' V: 1"=10'



CROSS-SECTION L-L'
SCALE H: 1"=20' V: 1"=10'



CROSS-SECTION M-M'
SCALE H: 1"=20' V: 1"=10'



CROSS-SECTION N-N'
SCALE H: 1"=20' V: 1"=10'

CROSS-SECTION LEGEND

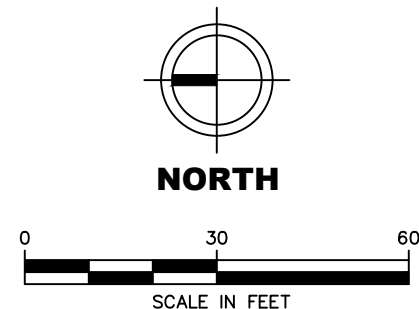
- EXISTING GRADE
- PROPOSED GRADE
- - - - OHWM
- W EXISTING WETLAND
- wi WETLAND IMPACTS
- we WETLAND ENHANCE.
- wc WETLAND CREATION

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- DEBRIS PILE REMOVAL



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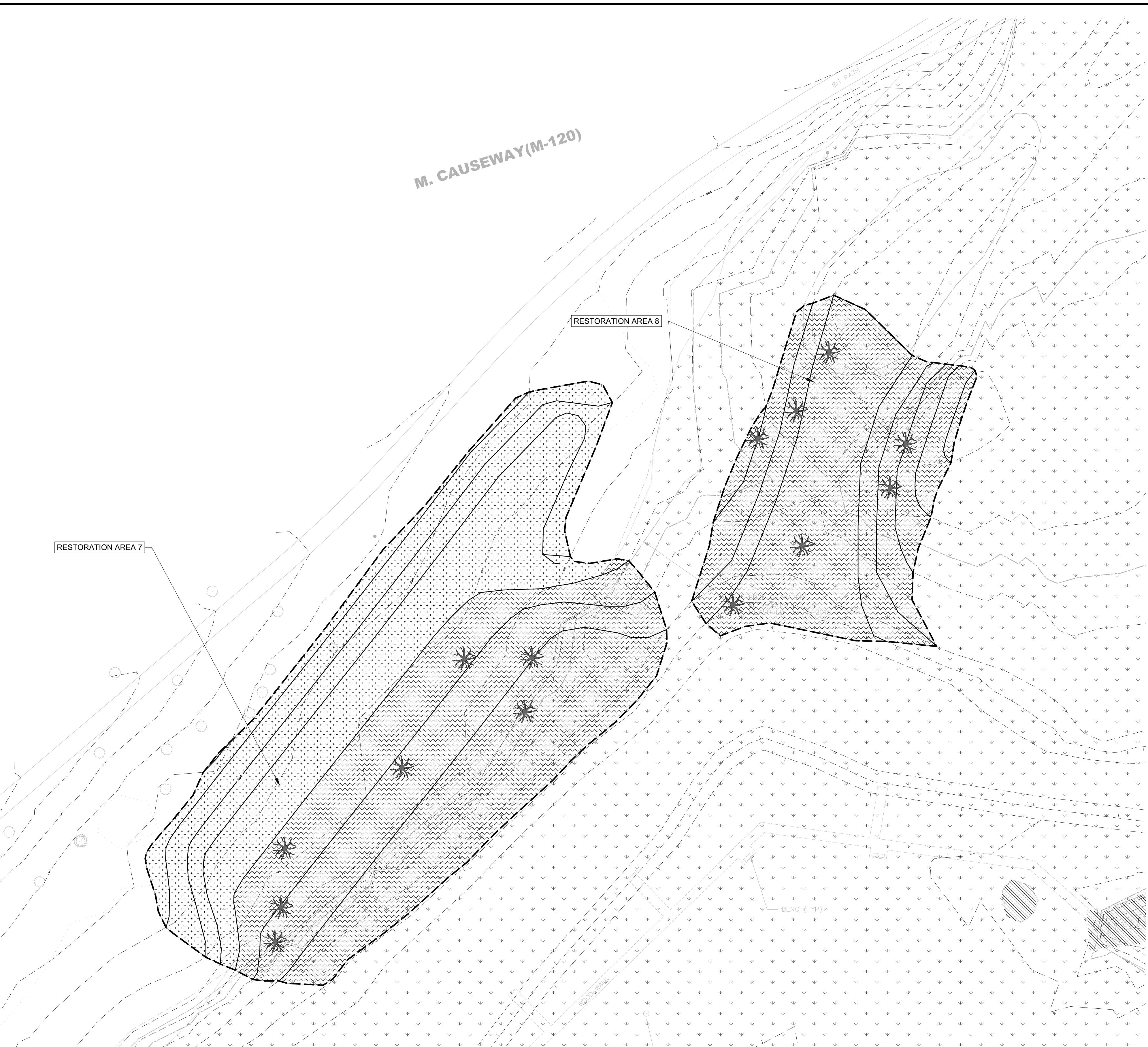
GEI Consultants
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WEST MICHIGAN SHORELINE
REGIONAL DEVELOPMENT COMMISSION
316 Morris Avenue, Suite 340
Muskegon, MI 49440

Muskegon Lake Nature Preserve
MERES Fish and Wildlife Habitat
Restoration Project
WORK AREAS 7 & 8

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C10
ISSUE
3

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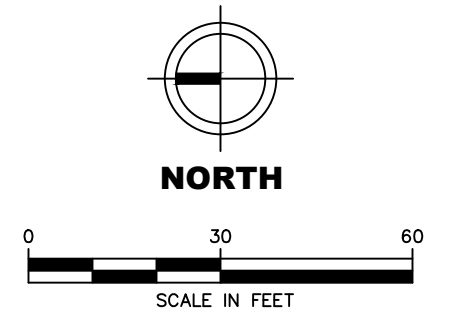
PROPOSED FEATURES LEGEND

- GRADING LIMITS
- MAJOR CONTOUR
- MINOR CONTOUR

RESTORATION AREAS LEGEND

- MESIC NORTHERN FOREST SEED MIX AREA
- FLOODPLAIN FOREST SEED MIX AREA
- OAK-PINE BARRENS SEED MIX AREA
- GREAT LAKES MARSH SEED MIX AREA

- HABITAT STRUCTURES**
- LARGE WOODY DEBRIS



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Designed: - BM
Checked: - BM
Drawn: - WL
Submitted By: - BM
P.E. Number: - 44371
Submittal Date: - 1/27/20

Scott D. Walker
ENGINEER

GEI PN 1901441

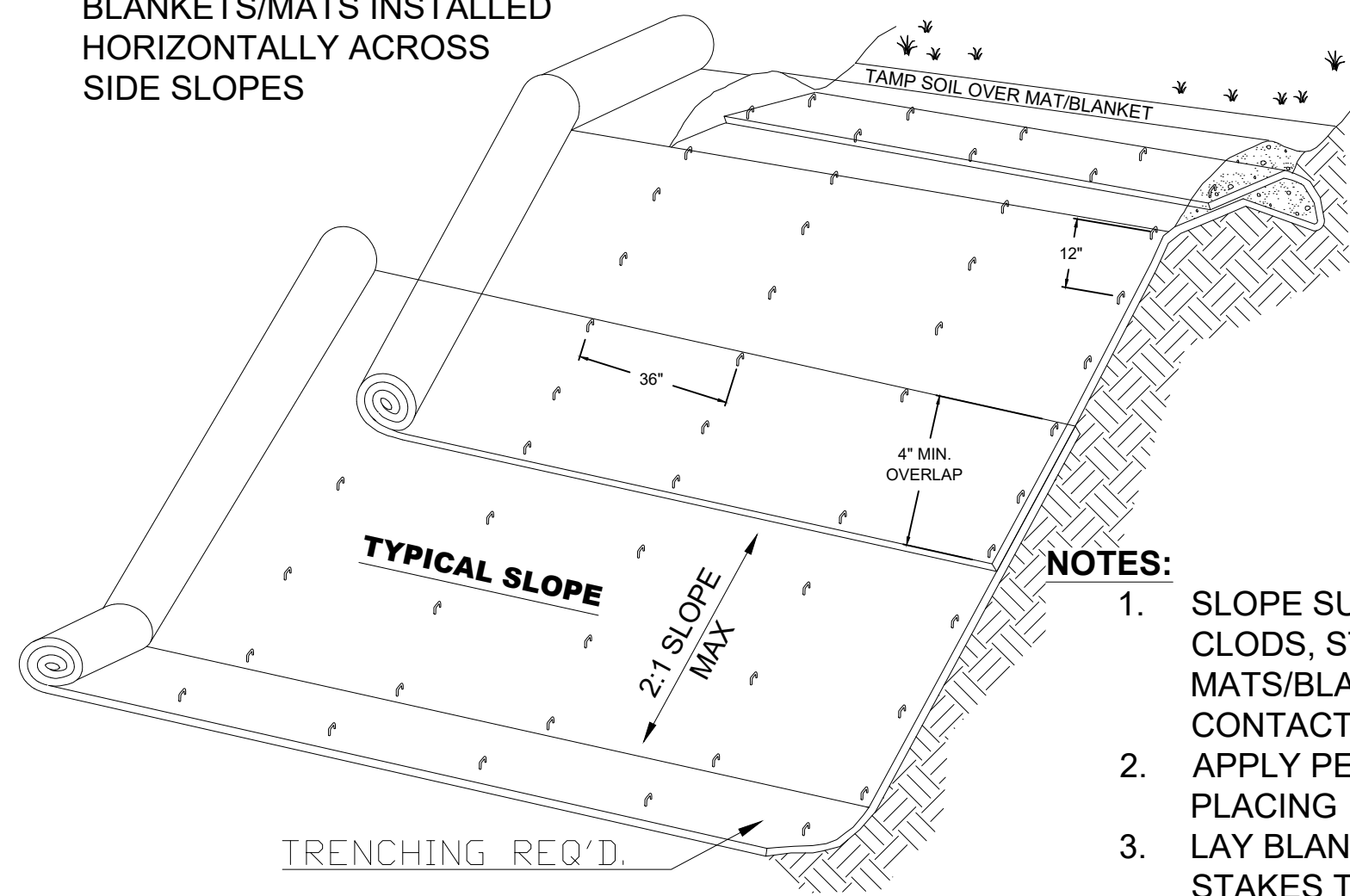
GEI Consultants
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Allendale, MI 49401

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REGIONAL DEVELOPMENT COMMISSION
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Muskegon, MI 49440

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MERES Fish and Wildlife Habitat
Restoration Project
RESTORATION AREAS 7 & 8

DWG. NO. **C11**
ISSUE **3**

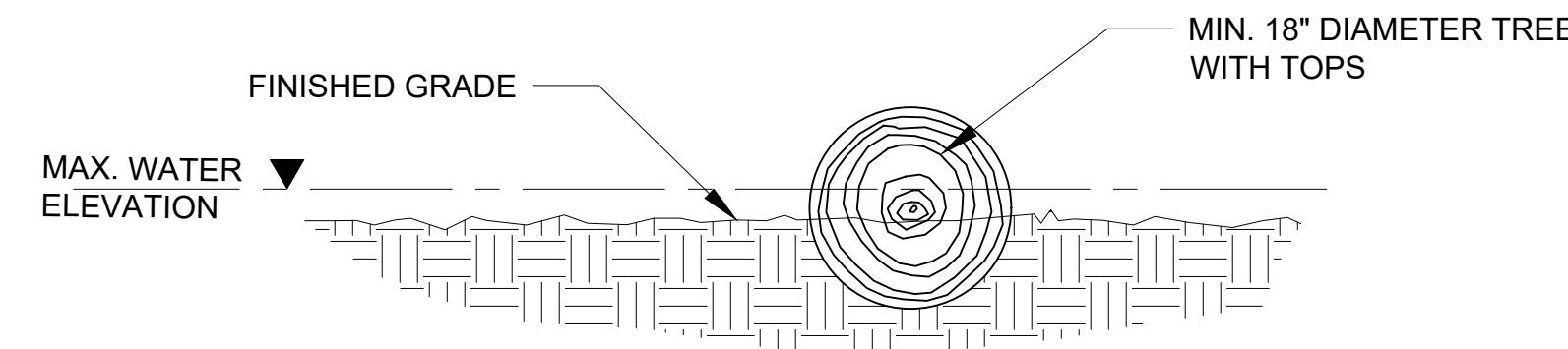
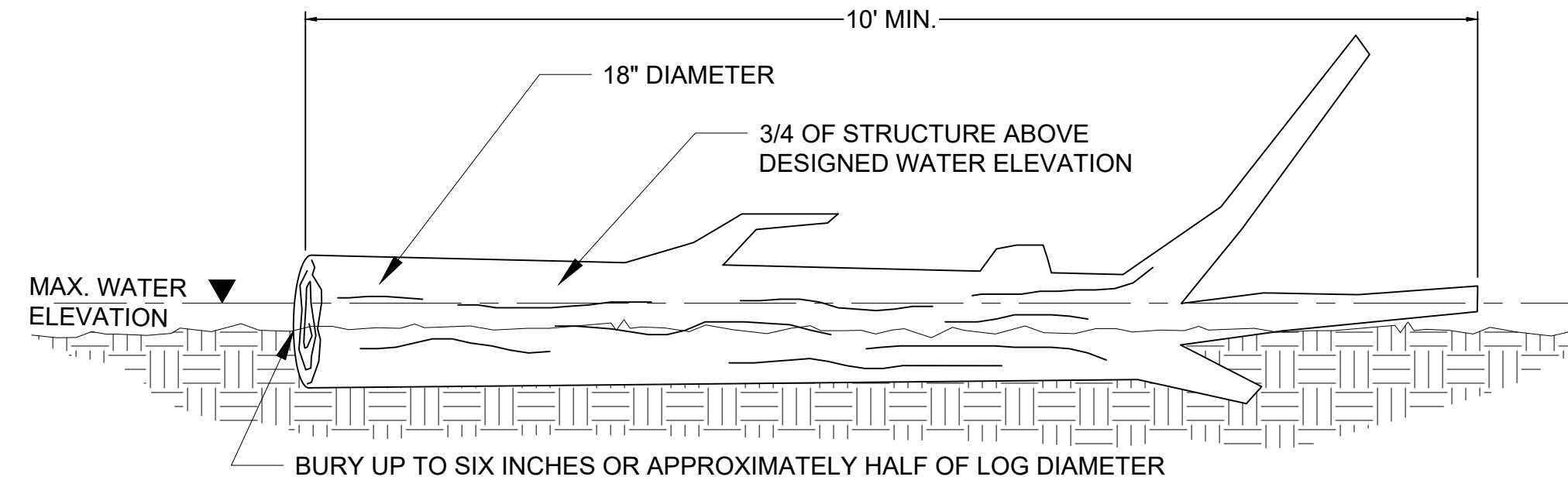
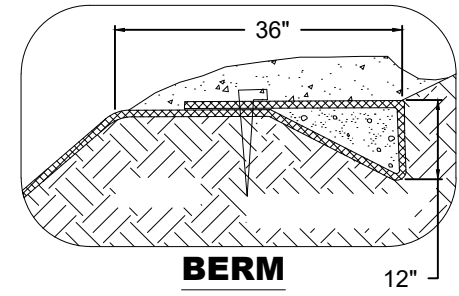
BLANKETS/MATS INSTALLED
HORIZONTALLY ACROSS
SIDE SLOPES



NOTES:

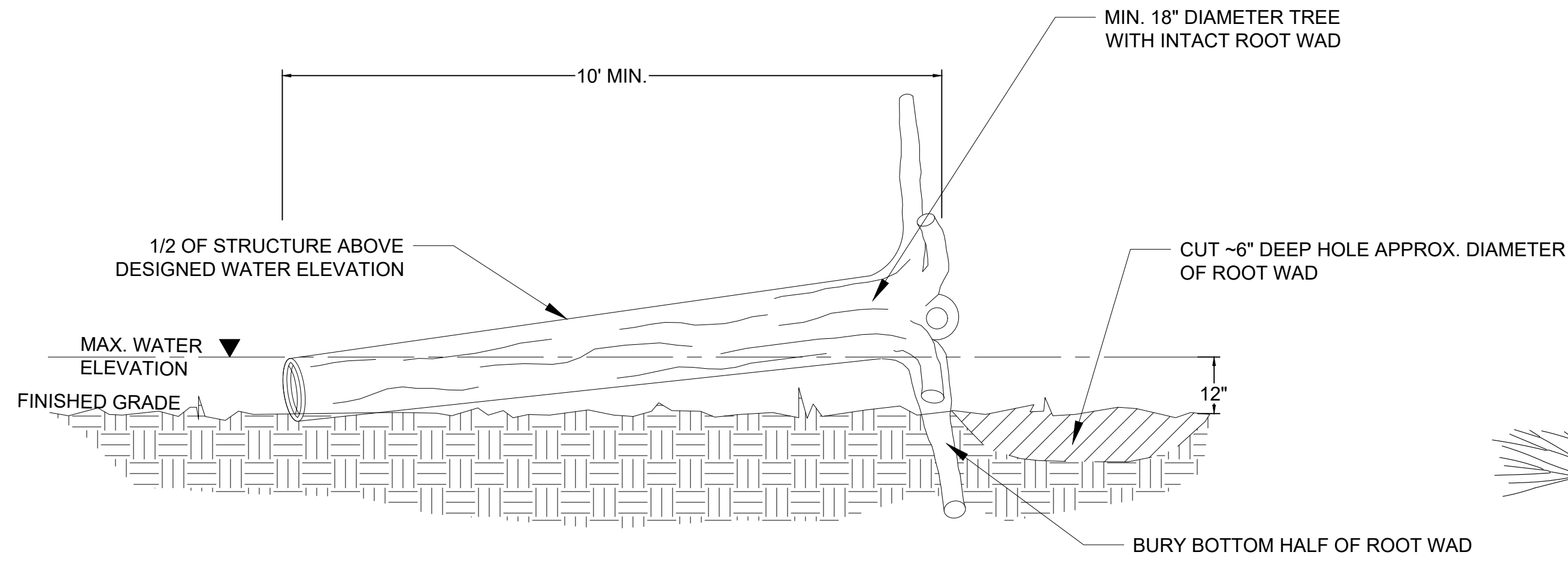
1. SLOPE SURFACE SHALL BE FREE OF ROCKS, CLODS, STICKS AND GRASS. MATS/BLANKETS SHALL HAVE GOOD SOIL CONTACT.
2. APPLY PERMANENT SEEDING BEFORE PLACING BLANKETS
3. LAY BLANKETS LOOSELY AND USE WOODEN STAKES TO MAINTAIN DIRECT CONTACT WITH THE SOIL. DO NOT STRETCH.

STAPLES



EROSION CONTROL BLANKET

NOT TO SCALE

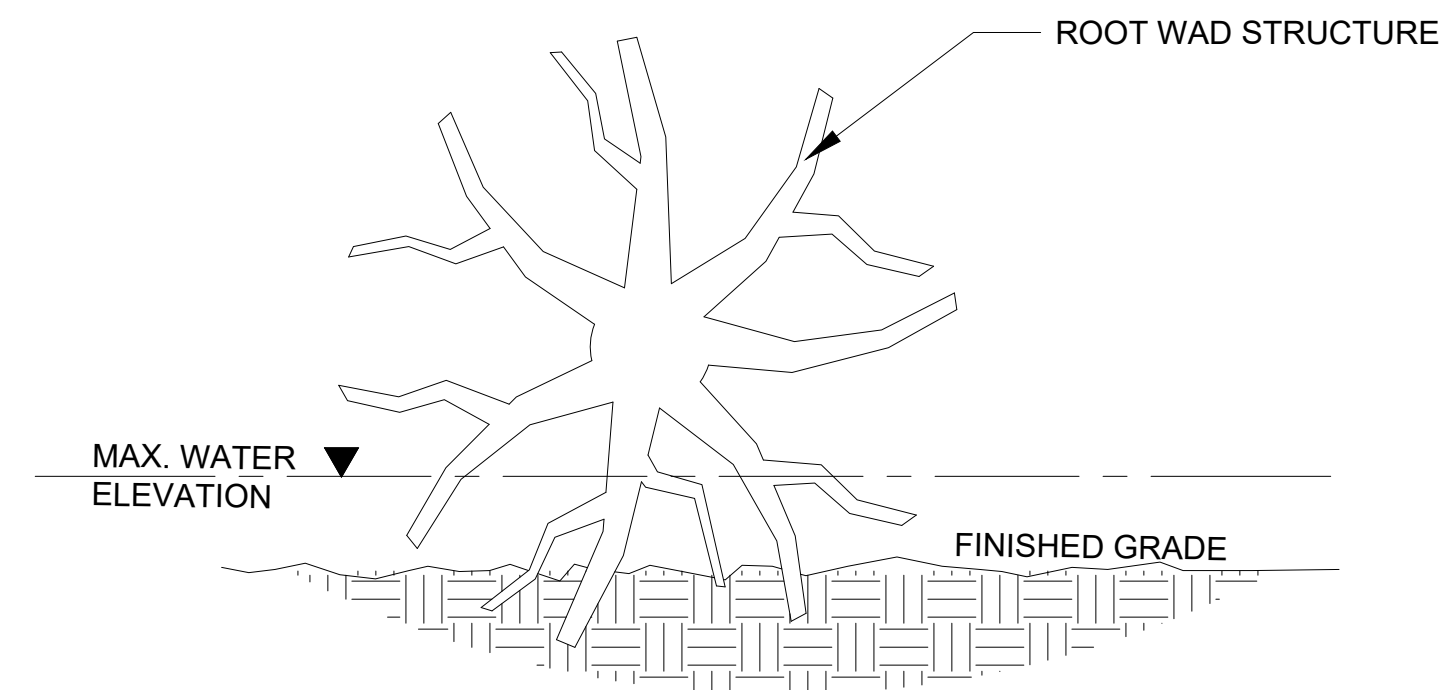


HABITAT ROOT WAD STRUCTURE - SIDE VIEW

NOT TO SCALE

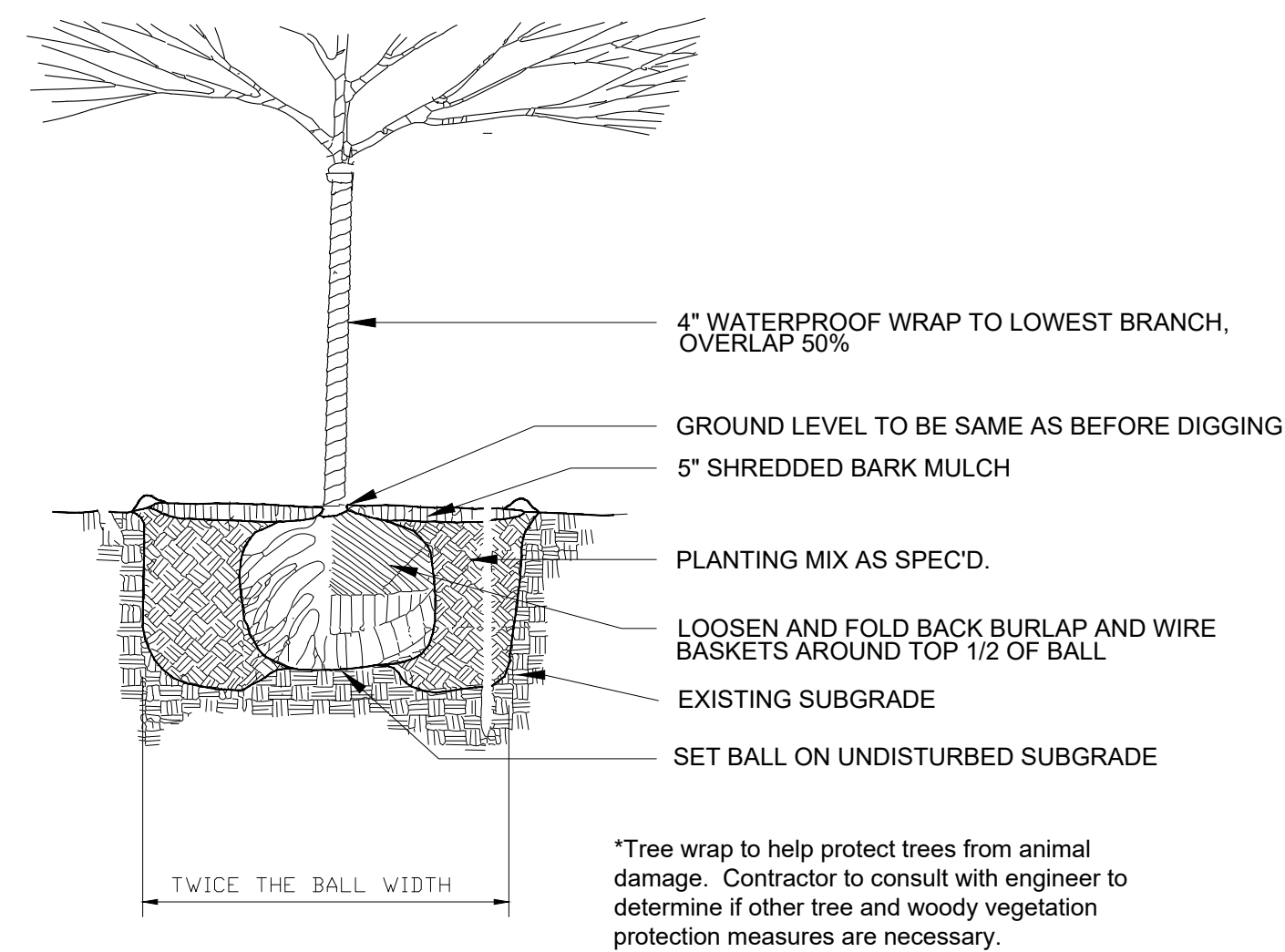
HABITAT STRUCTURE NOTES

- 1) Habitat structures to be constructed from durable hardwood species such as oak or maple. Other tree species for habitat structures to be approved by the engineer.
- 2) Root wads and snags should have fine branches left in tact when they are placed in the water for fish habitat and egg laying substrate for amphibians. This is especially important for logs placed in vernal pools.



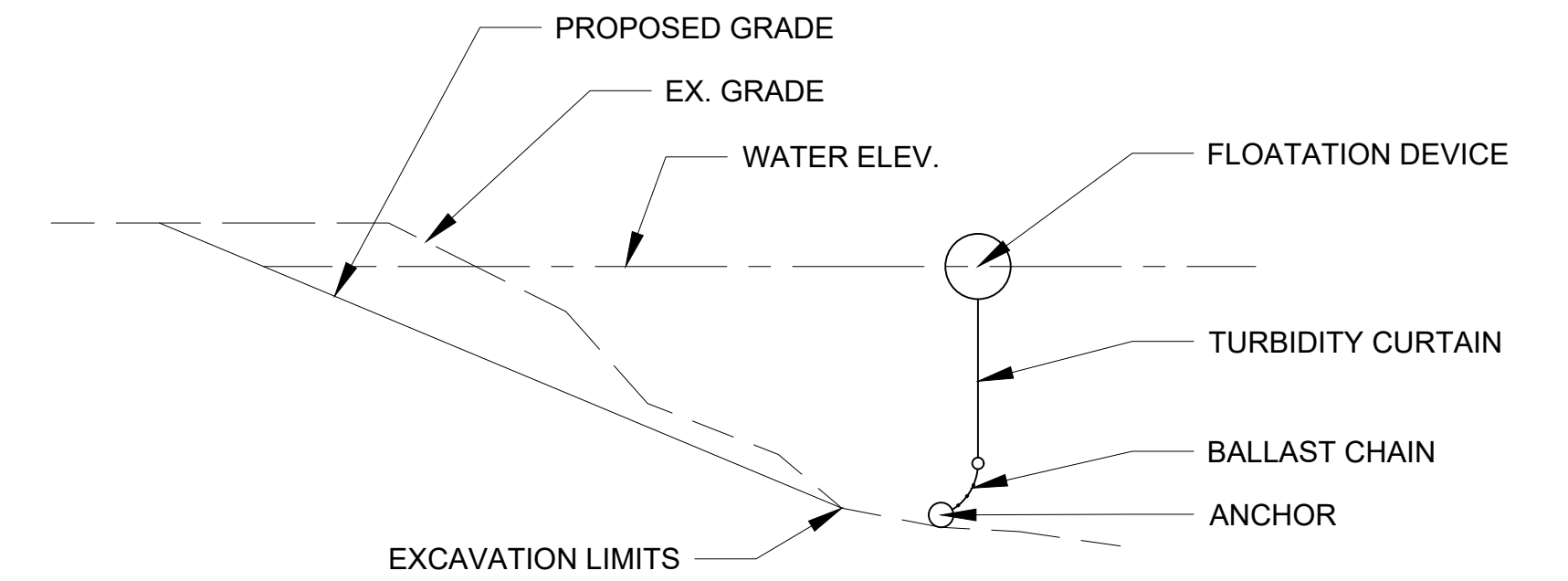
HABITAT ROOT WAD STRUCTURE - LOOKING AT ROOTS

NOT TO SCALE



BALLED AND BURLAPPED (B&B) TREE PLANTING DETAIL

NOT TO SCALE



TURBIDITY CURTAIN DETAILS

NOT TO SCALE

NO.	DATE	ISSUE/REVISION	APP
3	1/27/20	100 % CONSTRUCTION DOCUMENTS - 2	WL
3	12/12/19	100 % CONSTRUCTION DOCUMENTS	WL
2	10/10/19	90 % CONSTRUCTION DOCUMENTS	WL
1	8/5/19	PRELIMINARY CONCEPTS	WL
NO.	DATE	ISSUE/REVISION	APP

Designed:	- BM
Checked:	- BM
Drawn:	- WL
Submitted By:	- BM
P.E. Number:	- 44371
Submittal Date:	- 1/27/20

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REGIONAL DEVELOPMENT COMMISSION
316 Morris Avenue, Suite 340
Muskegon, MI 49440

Muskegon Lake Nature Preserve
MERES Fish and Wildlife Habitat
Restoration Project
DETAILS

DWG. NO.
D1
ISSUE
3

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