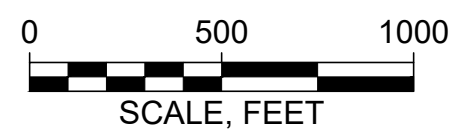




HEMAL LAURA, B:\Working\HURON-CLINTON METROPOLITAN AUTHORITY\2302140 Flat Rock - Huron Dam Removal Feasibility Study\00_CAD\Design\Sheets\01 - Existing Conditions - Plan Profile and Cross Section.dwg - 4/21/2024

OAKWOODS METROPARK EXTENTS
(SOURCE: HCMA PARK WEBSITE)



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

DRAFT

Designed: LH
Drawn: LH
Checked: SP
Approved: JM
P.E. No: 6201066931
GEI Project 2302140



FLAT ROCK/HUROC DAM DISPOSITION FEASIBILITY STUDY

FLAT ROCK, MI

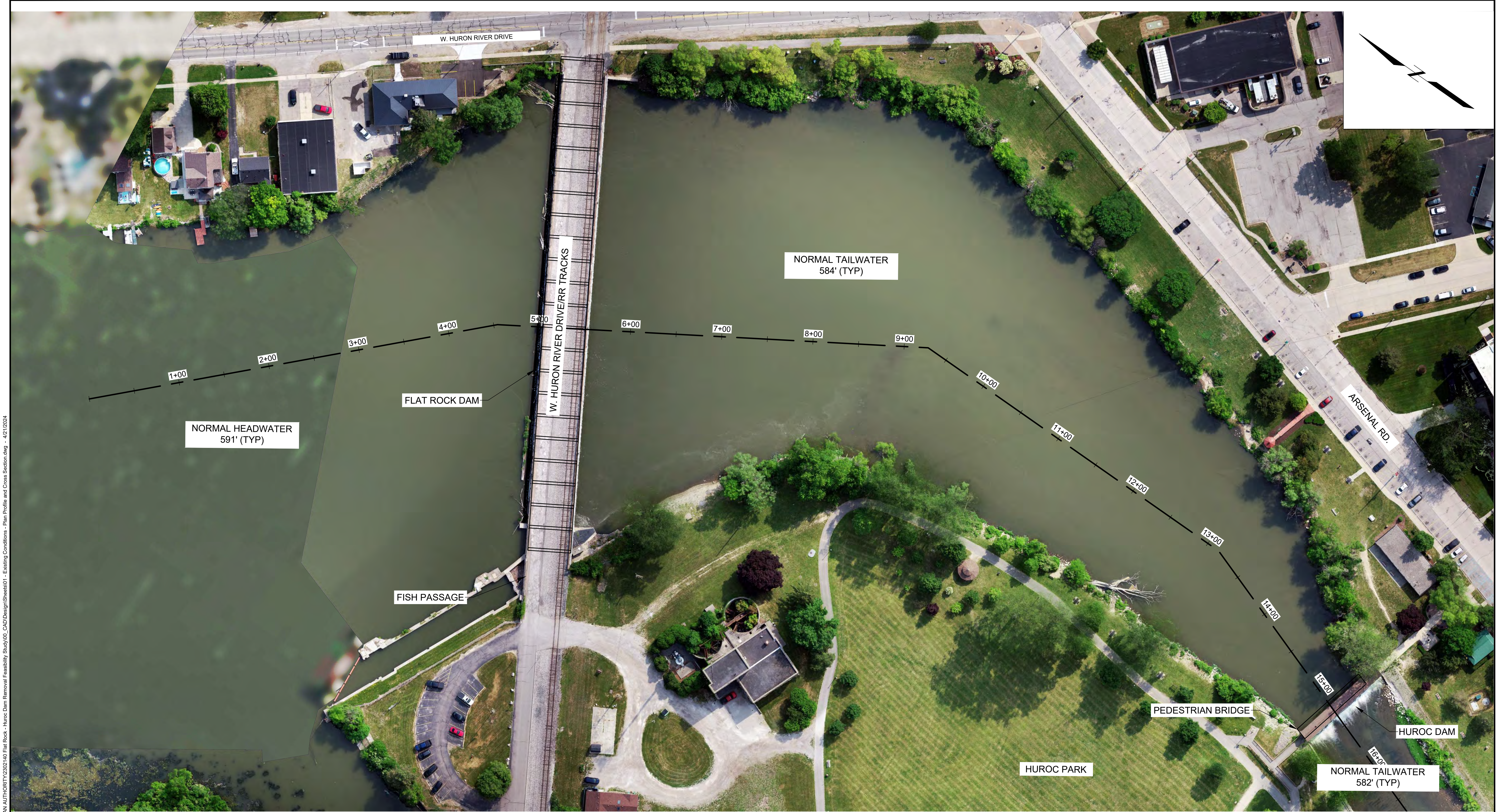
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NO	DATE	ISSUE/REVISION	APP

SHEET NAME
**EXISTING CONDITIONS
PLAN VIEW**

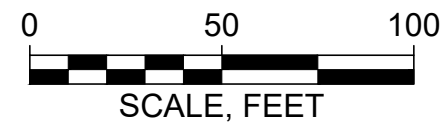
SHEET NO.

1

CONCEPTUAL



HEMAL LAURA, B:\Working\HURON-CLINTON METROPOLITAN AUTHORITY\2302140 Flat Rock - Huroc Dam Removal Feasibility Study\00_CAD\Design\Sheets\01 - Existing Conditions - Plan Profile and Cross Section.dwg - 4/21/2024



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

DRAFT

Designed: LH
Drawn: LH
Checked: SP
Approved: JM
P.E. No: 6201066931
GEI Project 2302140



FLAT ROCK/HUROC DAM
DISPOSITION FEASIBILITY
STUDY
FLAT ROCK, MI

0	4/19/2024	CONCEPTUAL	
NO	DATE	ISSUE/REVISION	APP

SHEET NAME
EXISTING CONDITIONS
PLAN VIEW

SHEET NO.
2

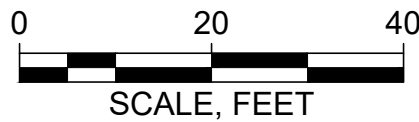
CONCEPTUAL

HEMAL LAURA, B:\Working\HURON-CLINTON METROPOLITAN AUTHORITY\2021\40 Flat Rock - Huron Dam Removal Feasibility Study\00_CAD\Design\Sheets\02 - Alt 1 - No Action, Fish Passage.dwg - 4/2/2024



NOTES:

- POOL SPACING AND DEPTHS WILL BE BASED ON SPECIES-SPECIFIC FISH PASSAGE NEEDS AND MAY VARY FROM THE CONCEPTUAL DESIGN.
- BOULDER SPACING AND SIZES WILL BE BASED ON HYDRAULIC AND FISH PASSAGE ANALYSIS AND MAY VARY FROM THE CONCEPTUAL DESIGN.
- ACCEPTABLE VELOCITIES BETWEEN WEIRS AND CHANNEL CROSS-SECTIONAL SHAPE WILL BE BASED ON HYDRAULIC AND FISH PASSAGE ANALYSIS.
- PRACTICALITY OF MODIFYING BOTTOM ELEVATION ON DOWNSTREAM END OF THE FISH PASSAGE TO BE DETERMINED BY FULL STRUCTURAL ANALYSIS.
- PRACTICALITY OF INCREASING THE FISH PASSAGE WIDTH TO INCREASE PASSAGE SUCCESS TO BE DETERMINED BY FULL STRUCTURAL ANALYSIS.



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

DRAFT

Designed: SP
Drawn: AP
Checked: SP
Approved: JMM
P.E. No: 6201066931
GEI Project 2302140



**FLAT ROCK/HUROC DAM
DISPOSITION FEASIBILITY
STUDY**
FLAT ROCK, MI

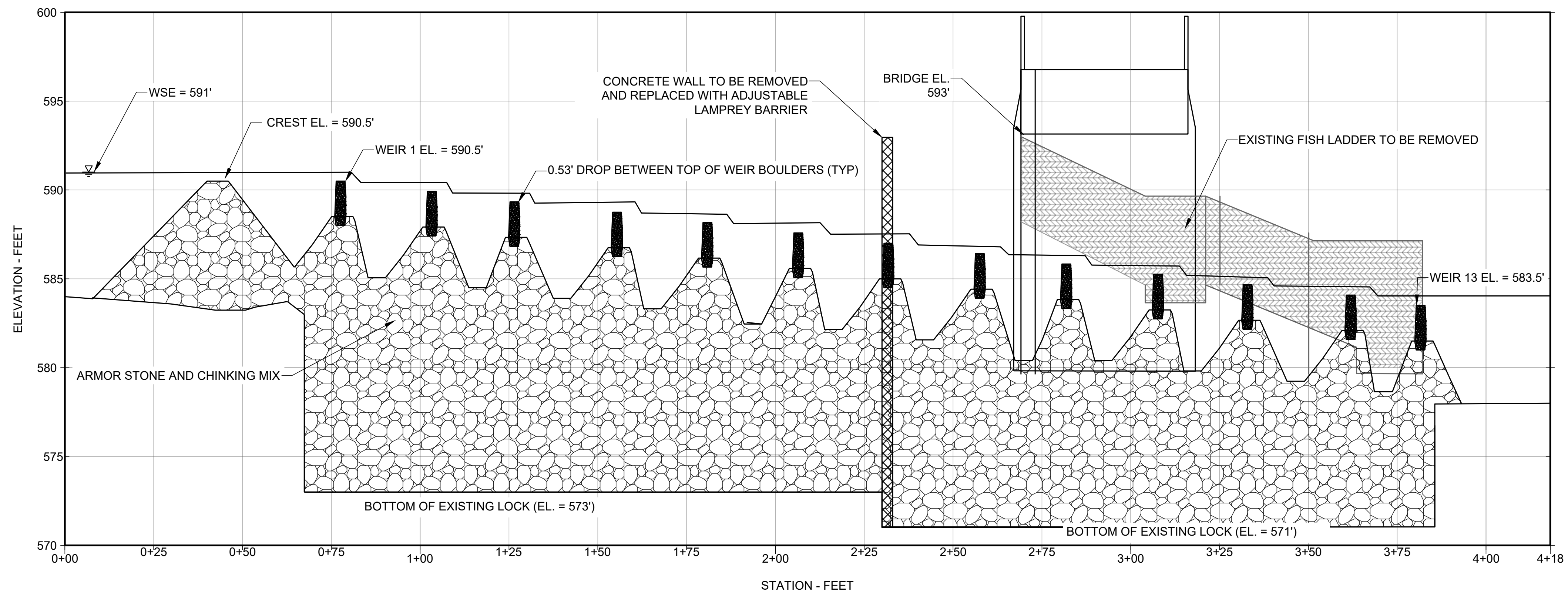
0	4/19/2024	CONCEPTUAL	
NO	DATE	ISSUE/REVISION	APP

SHEET NAME
**ALTERNATIVE 1
FISH PASSAGE
IMPROVEMENT
PLAN VIEW**

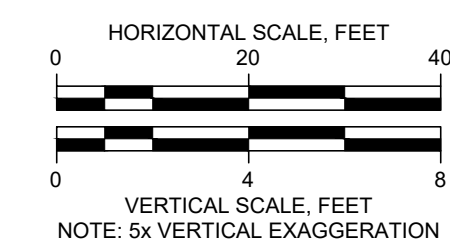
SHEET NO.

4

CONCEPTUAL

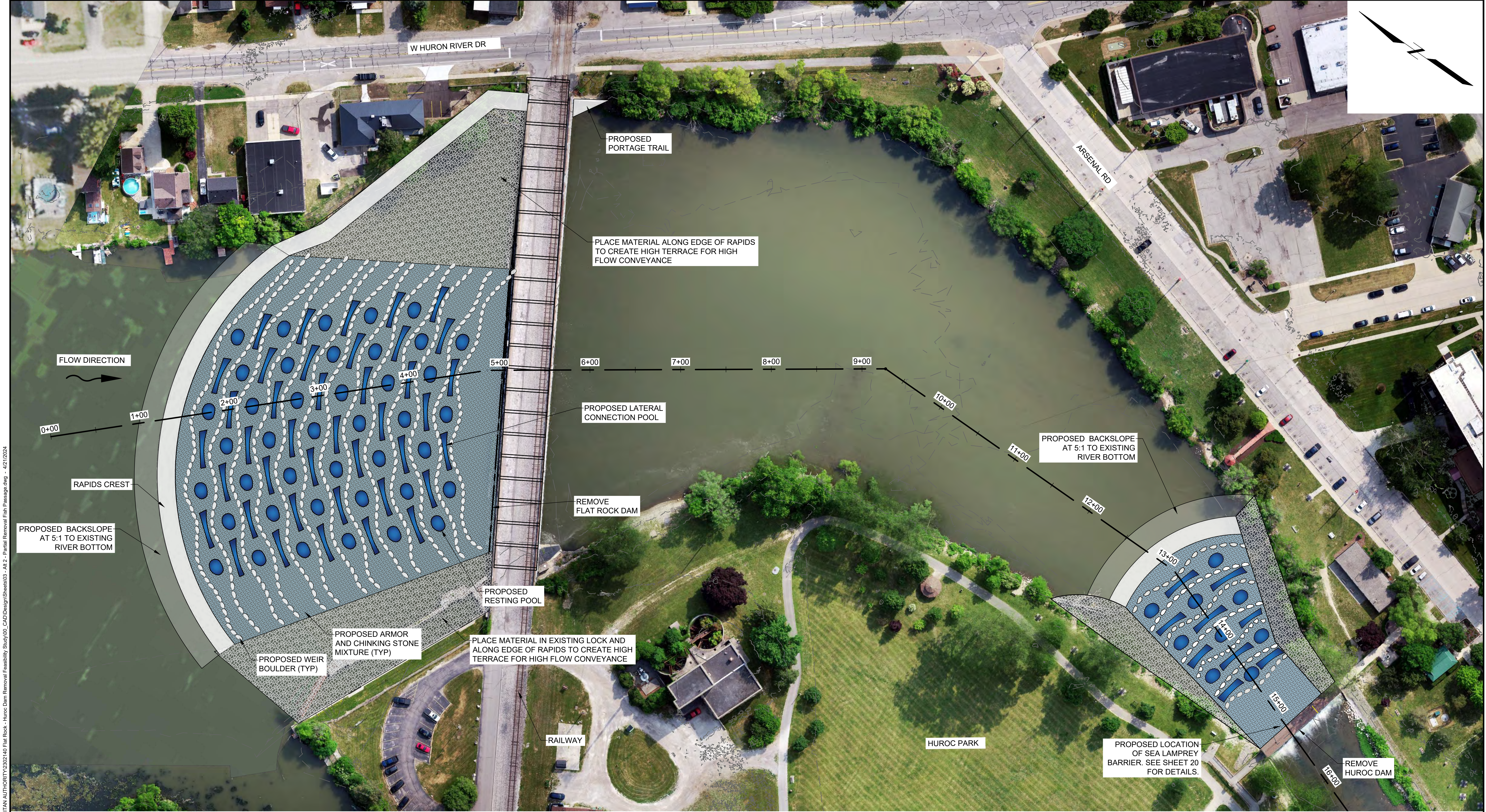


PROFILE VIEW



CONCEPTUAL

Attention: 01" If this scale bar does not measure 1" then drawing is not original scale.	DRAFT	Designed: SP	GEI Consultants GEI CONSULTANTS OF MICHIGAN, P.C. 9282 GENERAL DRIVE SUITE 180 PLYMOUTH, MI 48170 (734)680-1600 HURON-CLINTON METROPARKS	HURON-CLINTON METROPOLITAN AUTHORITY	FLAT ROCK/HUROC DAM DISPOSITION FEASIBILITY STUDY FLAT ROCK, MI					SHEET NAME ALTERNATIVE 1 FISH PASSAGE IMPROVEMENT PROFILE VIEW	SHEET NO. 5
		Drawn: AP									
		Checked: SP									
		Approved: JM									
		P.E. No: 6201066931									
		GEI Project 2302140									
		04/19/2024				CONCEPTUAL					
		NO DATE				ISSUE/REVISION	APP				



HEMAL LAURA, B/Worship-HURON-CLINTON METROPOLITAN AUTHORITY\202140 Flat Rock - Huroc Dam Removal Feasibility Study\00_CAD\Design\Sheets\03 - Alt 2 - Partial Removal Fair Passage.dwg - 4/21/2024

0 50 100
SCALE, FEET

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

Designed: SP
Drawn: LH
Checked: SP
Approved: JM
P.E. No: 6201066931
GEI Project 2302140

GEI Consultants
GEI CONSULTANTS OF MICHIGAN, P.C.
9282 GENERAL DRIVE
SUITE 180
PLYMOUTH, MI 48170
(734)680-1500

HURON-CLINTON
METROPOLITAN
AUTHORITY
**HURON-CLINTON
METROPARKS**

**FLAT ROCK/HUROC DAM
DISPOSITION FEASIBILITY
STUDY**
FLAT ROCK, MI

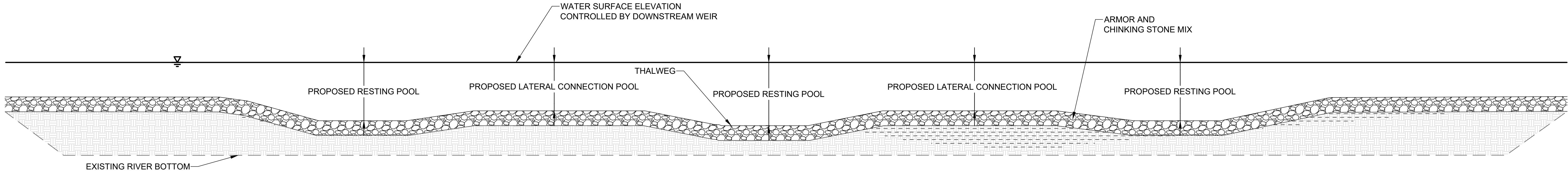
0	4/19/2024	CONCEPTUAL	
NO	DATE	ISSUE/REVISION	APP

SHEET NAME
**ALTERNATIVE 2
PARTIAL REMOVAL
PLAN VIEW**

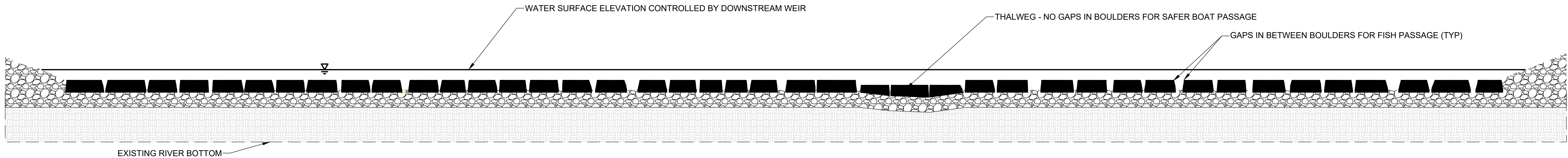
SHEET NO.
6

CONCEPTUAL

HEMAL LAURA, B|Working|HURON-CLINTON METROPOLITAN AUTHORITY|2302140 Flat Rock - Huron Dam Removal Feasibility Study|00_CAD Design|Sheet|03 - Alt 2 - Partial Removal Fish Passage.dwg - 4/21/2024



TYPICAL CROSS SECTION
POOLS IN BETWEEN ROCK WEIRS 1" = 10'

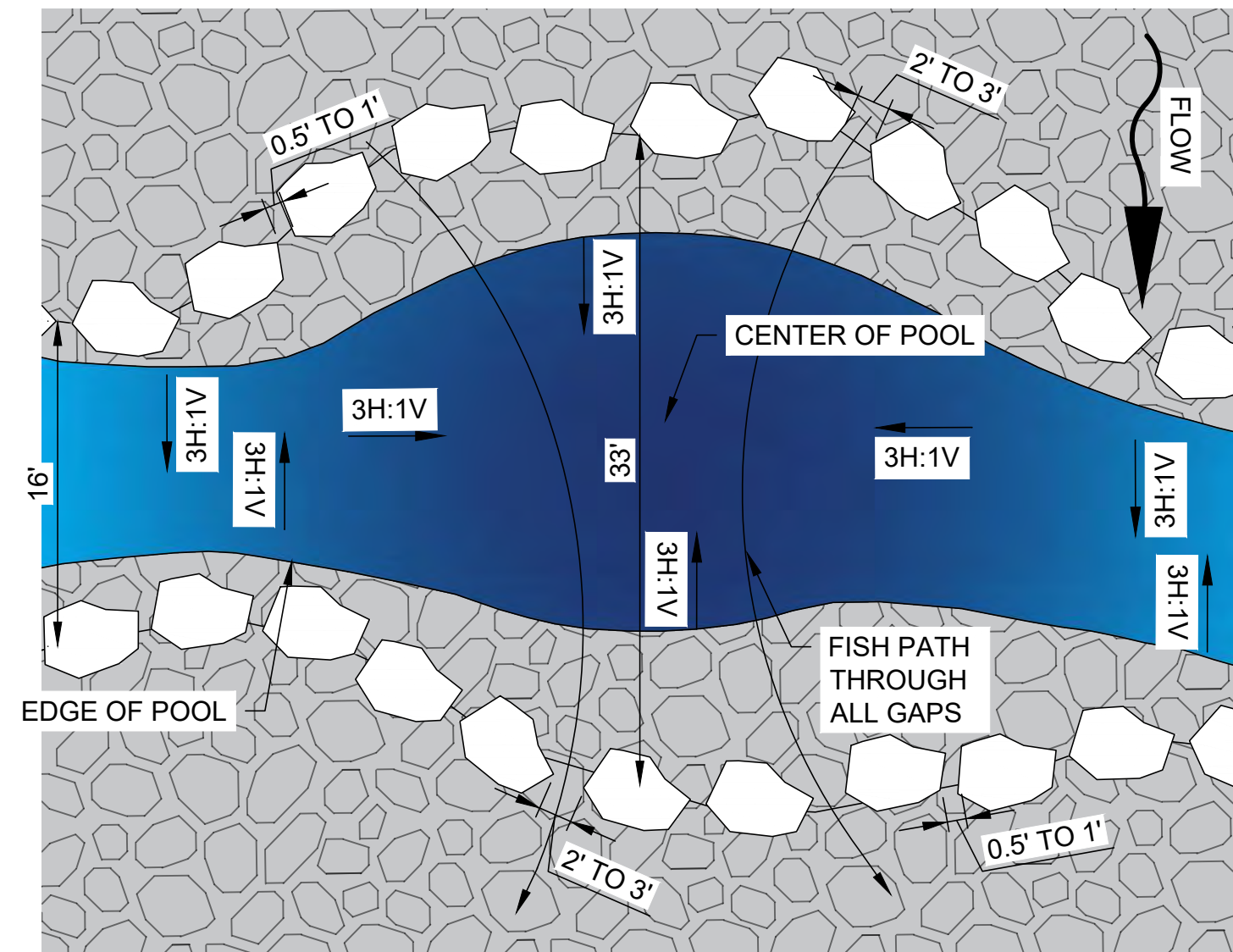


TYPICAL CROSS SECTION
ALONG ROCK WEIRS 1" = 10'

CONCEPTUAL

Attention: 01" If this scale bar does not measure 1" then drawing is not original scale.	DRAFT	Designed: SP	GEI Consultants GEI CONSULTANTS OF MICHIGAN, P.C. 9282 GENERAL DRIVE SUITE 180 PLYMOUTH, MI 48170 (734)680-1600	HURON-CLINTON METROPOLITAN AUTHORITY HURON-CLINTON METROPARKS	FLAT ROCK/HUROC DAM DISPOSITION FEASIBILITY STUDY FLAT ROCK, MI				SHEET NAME	SHEET NO.
		Drawn: LH								
		Checked: SP								
		Approved: JM								
		P.E. No: 6201066931								
		GEI Project 2302140								

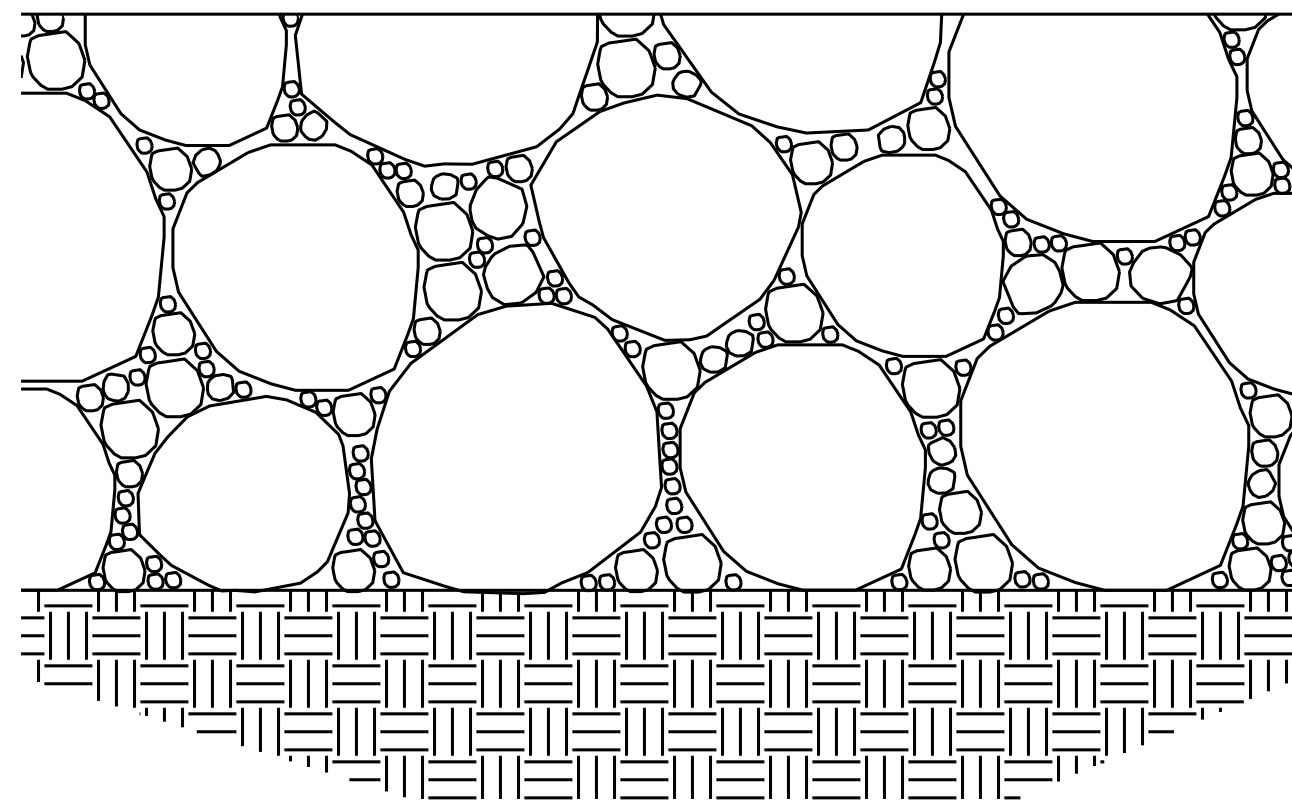
1	DETAIL	
-	BOULDER SIZING CHART	NOT TO SCALE



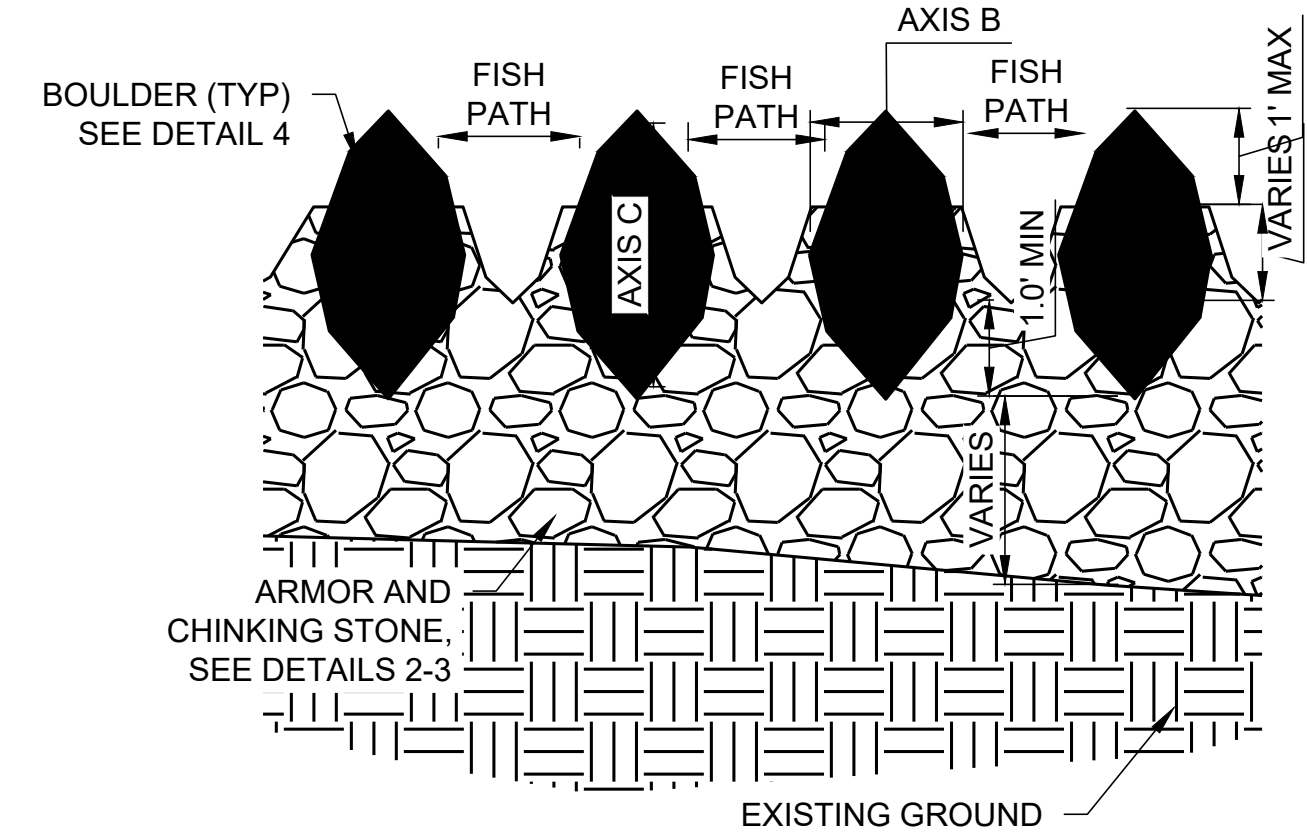
NOTES:

1. EACH WEIR IS TO HAVE 2-3 GAPS BETWEEN ADJACENT BOULDERS THAT MEASURE BETWEEN 2' AND 3'. ALL REMAINING BOULDER GAPS ARE TO MEASURE BETWEEN 0.5' AND 1'.

2 DETAIL
- POOL AND WEIR GAP CONFIGURATION NOT TO SCALE

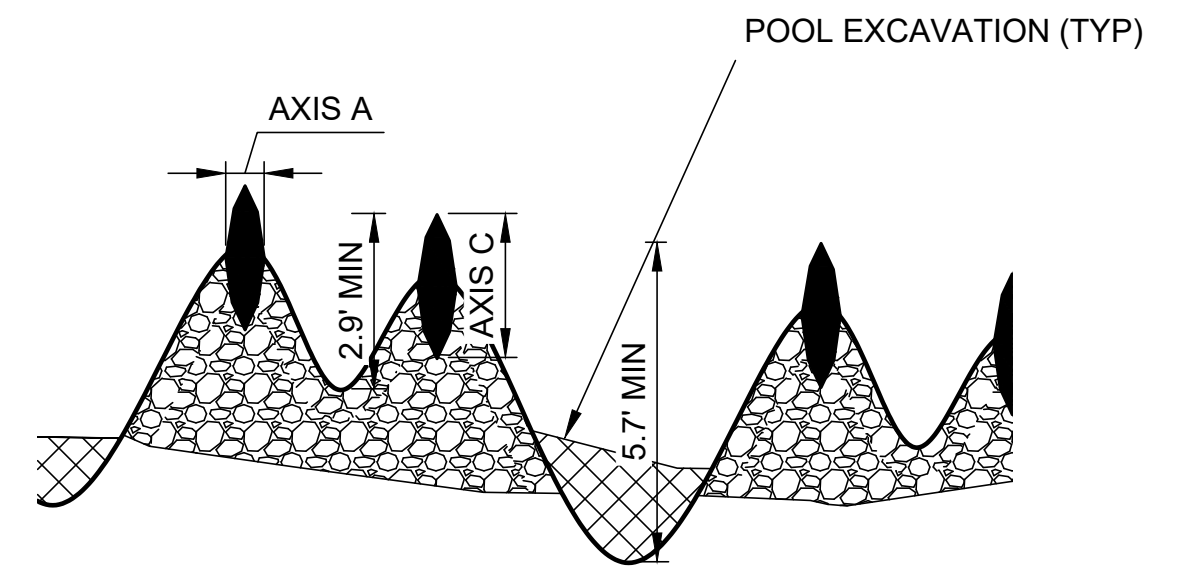


3	DETAIL	
-	LAYERING OF ARMOR AND CHINKING STONE	NOT TO SCALE

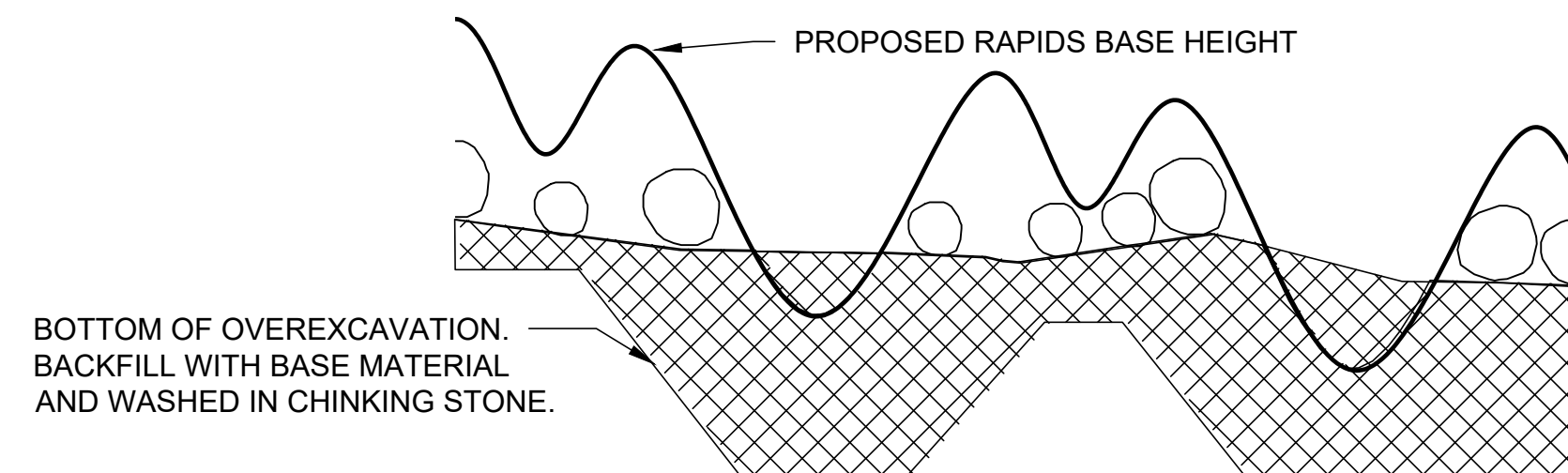


FISH PATH WIDTH VARIES FROM 0.5-1' TO 2-3'
DEPENDING ON LOCATION. SEE DETAIL 7.

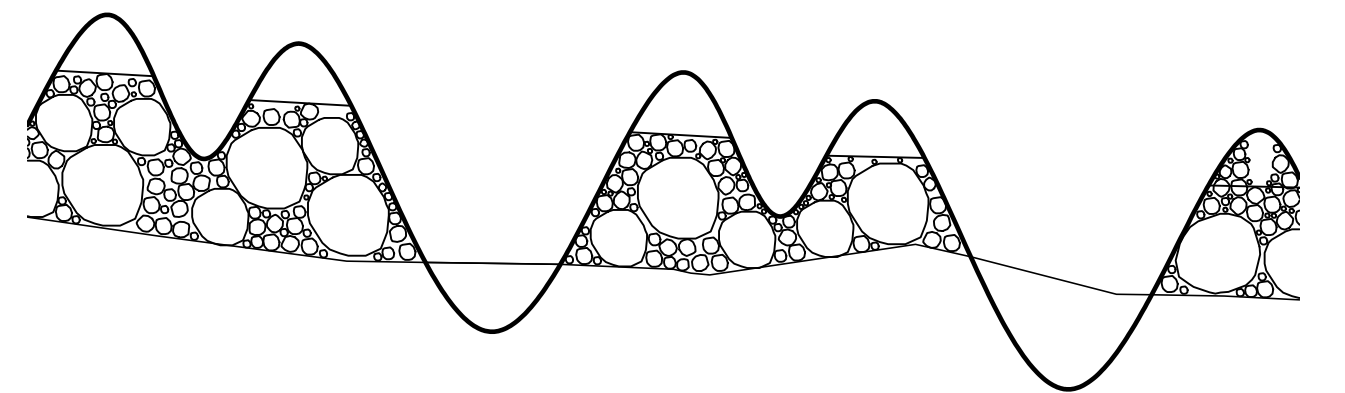
4	DETAIL	
-	BOULDER SIZING AND PLACEMENT IN CROSS SECTIONS	NOT TO SCALE



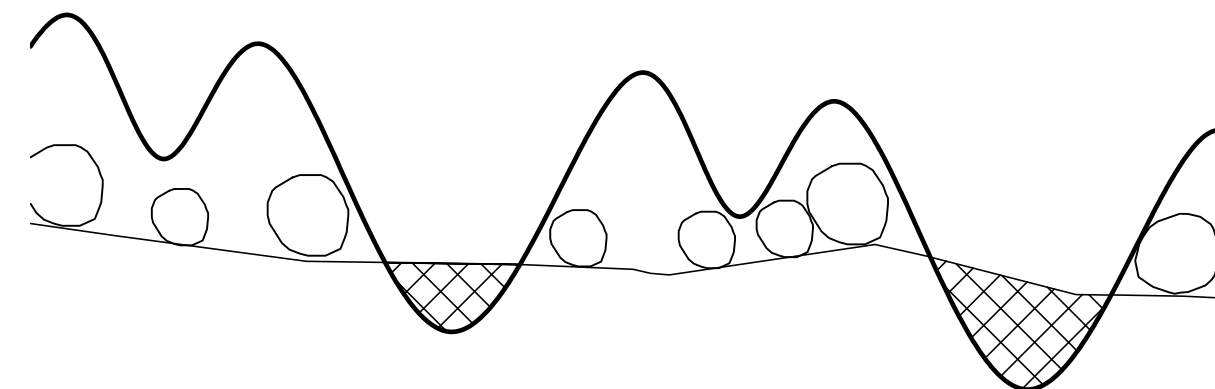
5	DETAIL	
-	BOULDER SIZING IN PROFILE	NOT TO SCALE



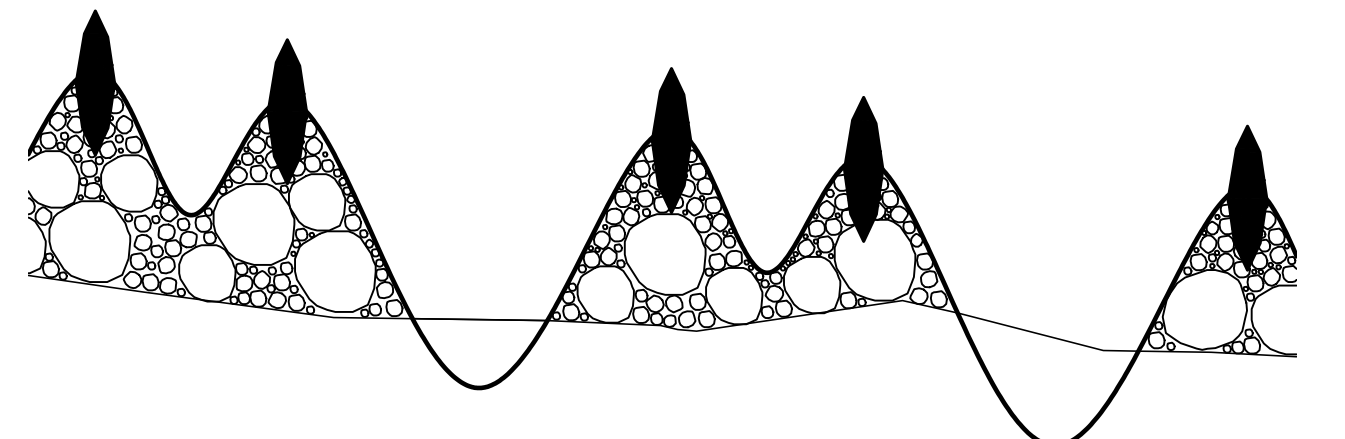
STEP 1: OVEREXCAVATE RIVER BOTTOM 3 FEET LOWER THAN PROPOSED RAPIDS BASE HEIGHT.



STEP 3: REPEAT STEPS 1 AND 2 UNTIL BOTTOM OF PROPOSED WEIR BOULDER ELEVATION IS REACHED.

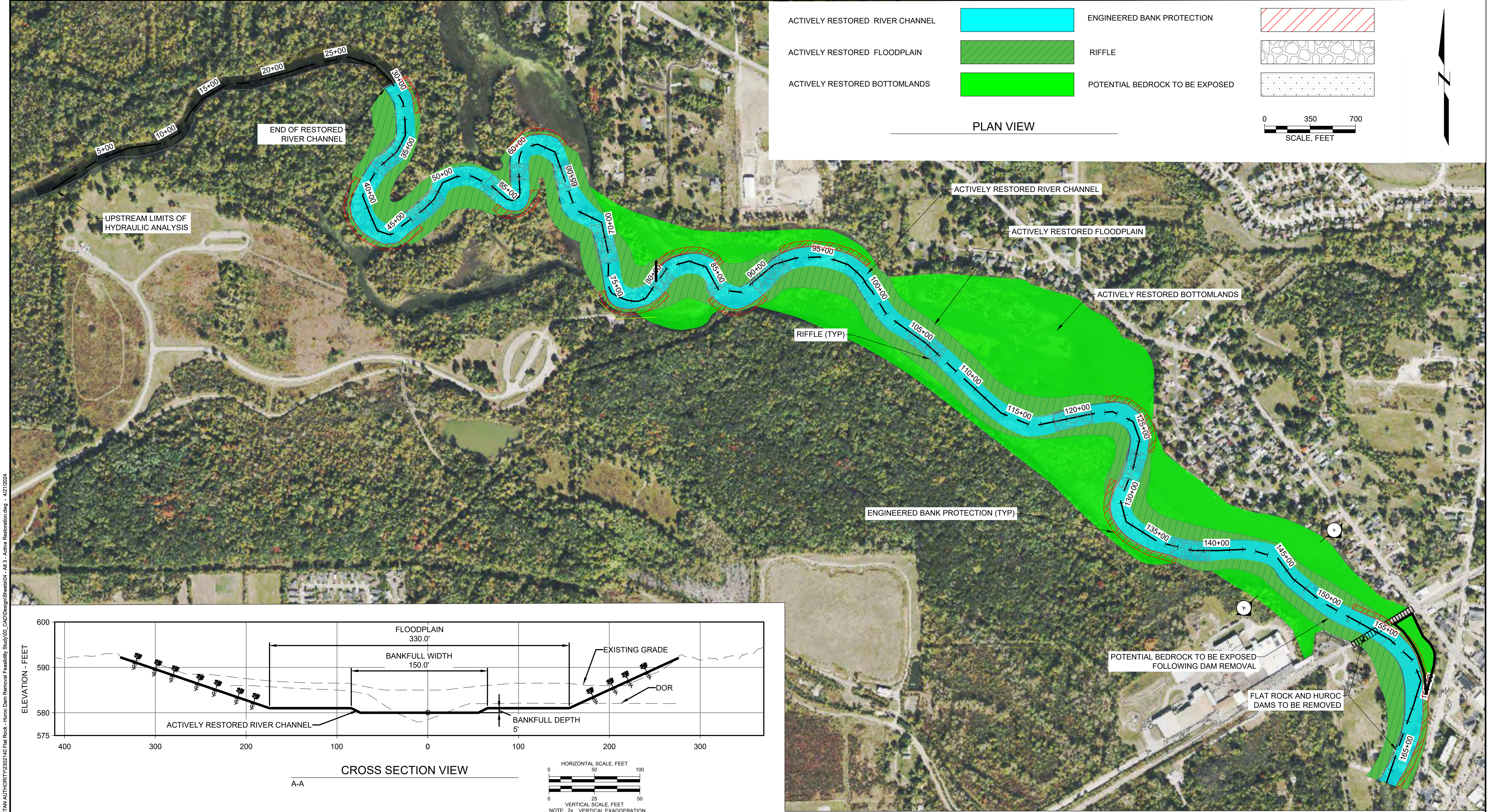


STEP 2: EXCAVATE POOLS AND PLACE 18-36" LAYERS OF ARMOR STONE.
WASH CHINKING STONE THOROUGHLY INTO EACH ARMOR STONE LAYER.



STEP 4: PLACE WEIR BOULDERS. ADD ARMOR AND CHINKING STONE AROUND BOULDER TO STABILIZE.

6	DETAIL	
-	STEPS FOR LAYERING OF ARMOR, CHINKING STONE AND WEIR BOULDER PLACEMENT	NOT TO SCALE



HEMAL LAURA, B:\Working\HURON-CLINTON METROPOLITAN AUTHORITY\2021\40 Flat Rock - Huroc Dam Removal Feasibility Study\00_CADD\Design\Sheets\04 - Alt 3 - Active Restoration.dwg - 4/21/2024

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

DRAFT

Designed: JM
Drawn: MG
Checked: SP
Approved: JM
P.E. No: 6201066931
GEI Project 2302140

GEI Consultants
GEI CONSULTANTS OF MICHIGAN, P.C.
9282 GENERAL DRIVE
SUITE 180
PLYMOUTH, MI 48170
(734)680-1500

HURON-CLINTON
METROPOLITAN
AUTHORITY

HURON-CLINTON
METROPARKS

**FLAT ROCK/HUROC DAM
DISPOSITION FEASIBILITY
STUDY**
FLAT ROCK, MI

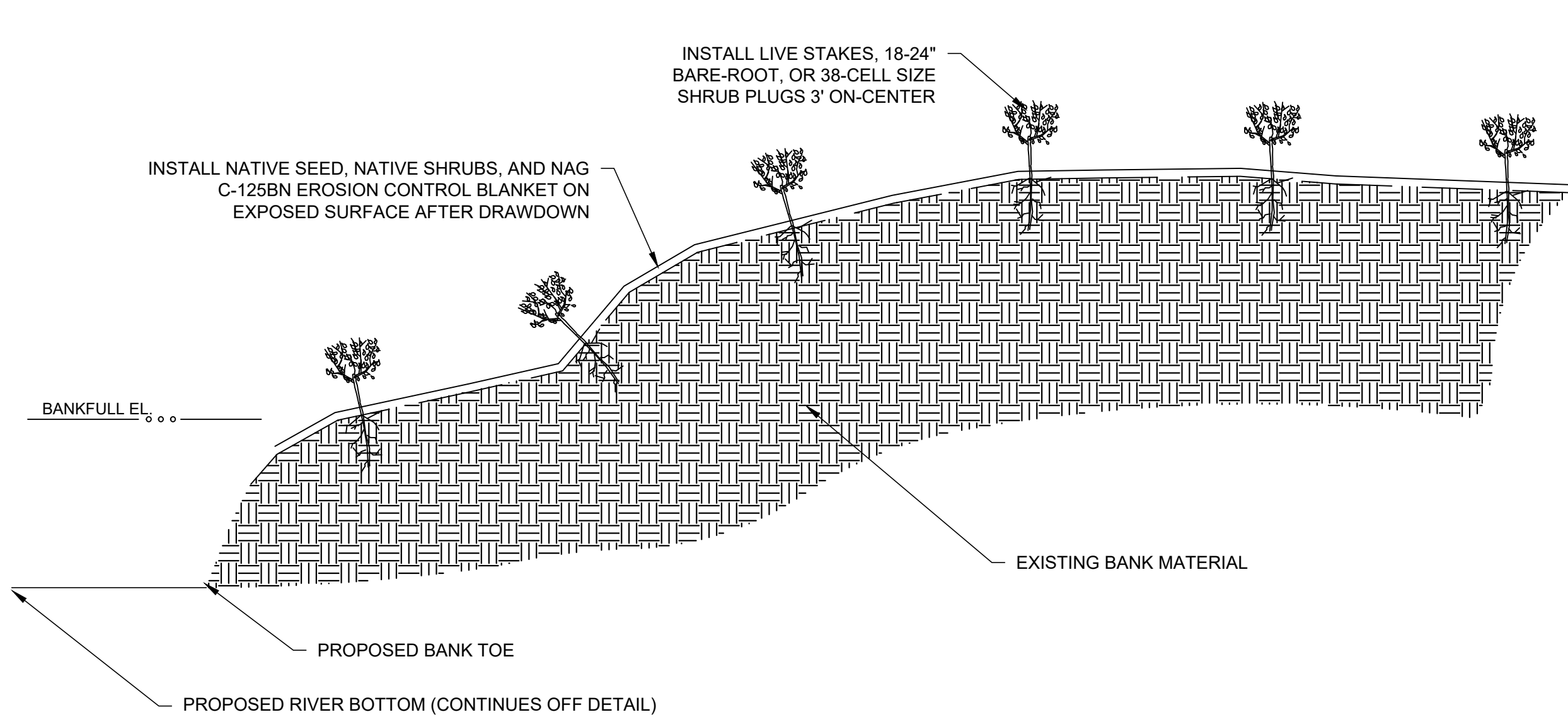
0	4/19/2024	CONCEPTUAL	
NO	DATE	ISSUE/REVISION	APP

SHEET NAME
**ALTERNATIVE 3
DAM REMOVAL WITH
FULL RESTORATION
PLAN VIEW**

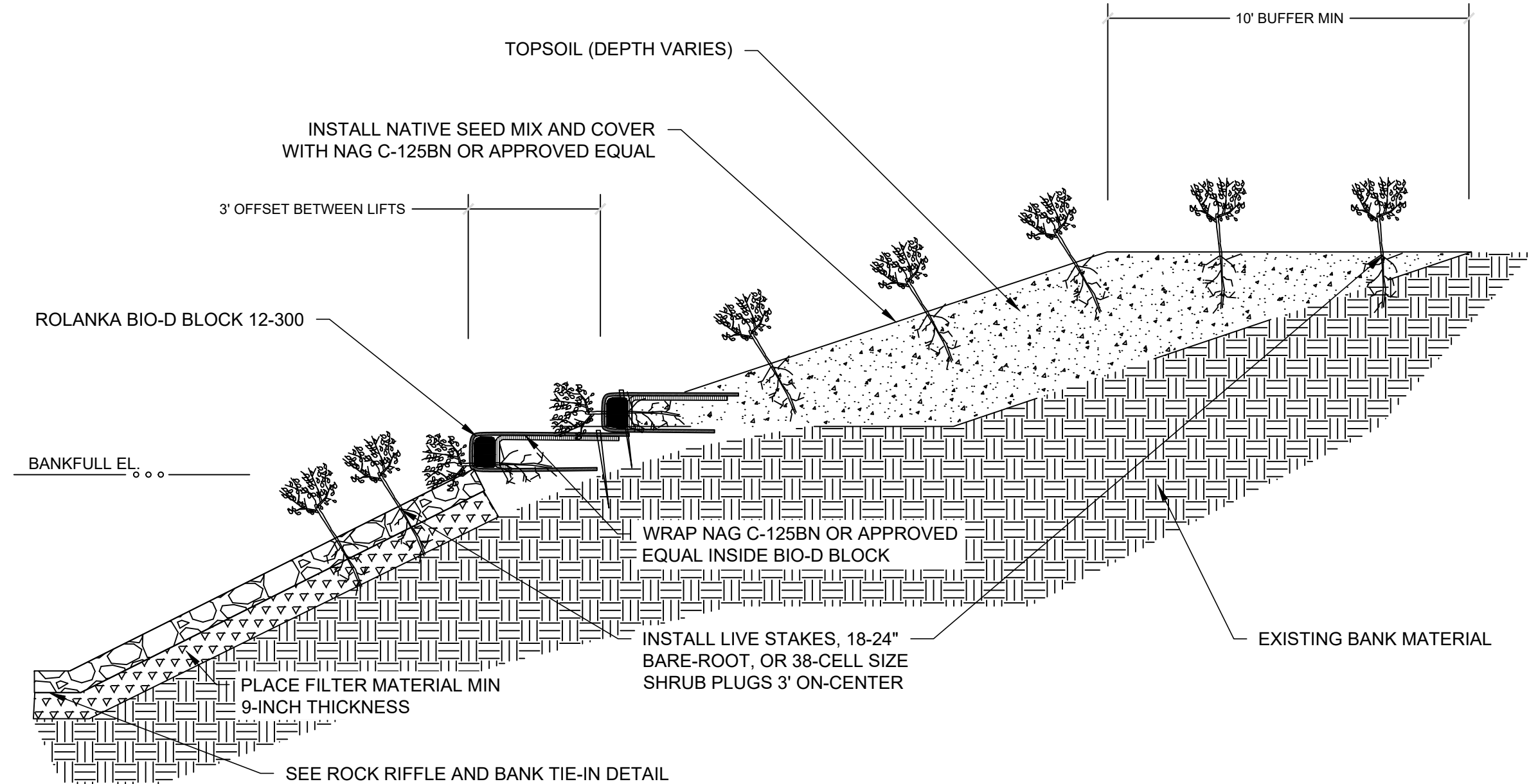
SHEET NO.

10

HEMAL LAURA, B:\Working\HURON-CLINTON METROPOLITAN AUTHORITY\2302140 Flat Rock - Huron Dam Removal Feasibility Study\00_CAD\Design\Sheets\04 - Alt 3 - Active Restoration.dwg - 4/21/2024



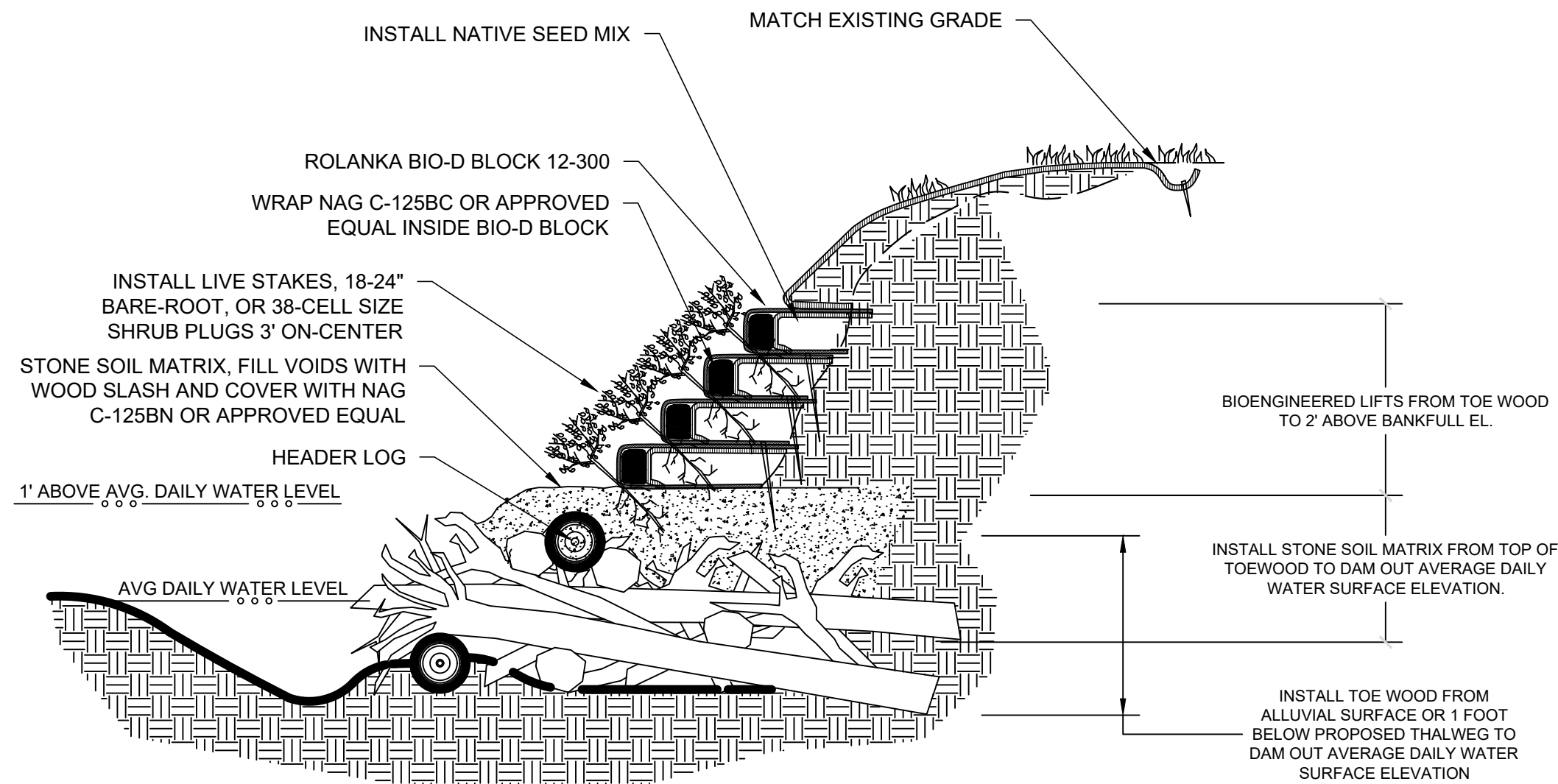
1 TYPICAL DETAIL
NON-ENGINEERED BANK PROTECTION NOT TO SCALE



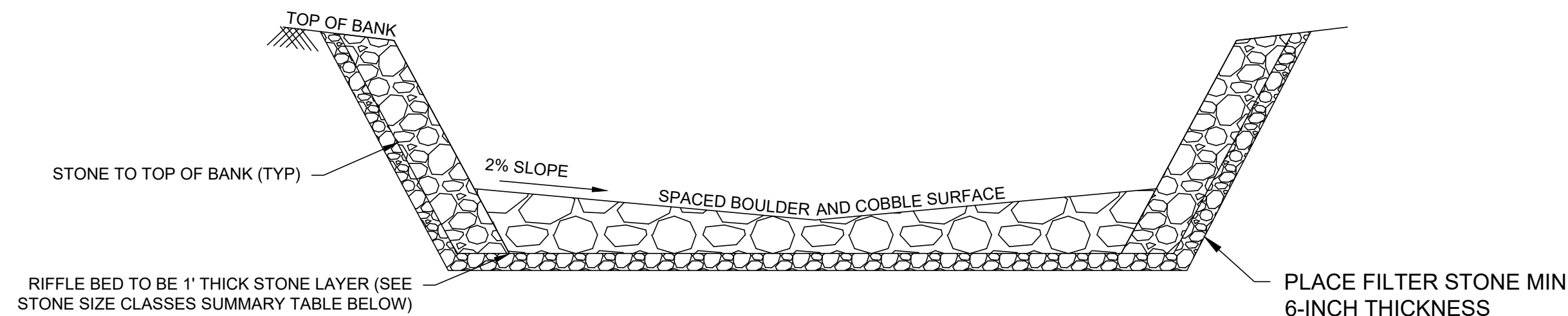
2 TYPICAL DETAIL
ENGINEERED BANK PROTECTION - OPTION 1 NOT TO SCALE

TOEWOOD NOTES:

1. STONE SOIL MATRIX SHALL CONSIST OF EXCAVATED MATERIAL FROM SITE. MAXIMIZE STONE CONTENT TO THE GREATEST EXTENT POSSIBLE. FILL VOIDS IN STONE SOIL MATRIX WITH WOOD SLASH FROM CLEARING AND GRUBBING OPERATIONS.
2. TOP OF SUBMERGED LARGE WOODY DEBRIS SHALL BE BELOW THE AVG. DAILY WATER LEVEL.
3. SUBMERGED LARGE WOODY DEBRIS SHALL BE SOUND AND CONTAIN MATERIAL WITH A DIAMETER GREATER THAN OR EQUAL TO 12" DIAMETER. ROOTWADS TO REMAIN ATTACHED TO LARGE WOODY DEBRIS FOR PLACEMENT.
4. STONE (MIN DIA. 12") SHALL BE INCORPORATED INTO 10%-15% OF SUBMERGED LARGE WOODY DEBRIS LAYER.



3 TYPICAL DETAIL
ENGINEERED BANK PROTECTION - OPTION 2 NOT TO SCALE



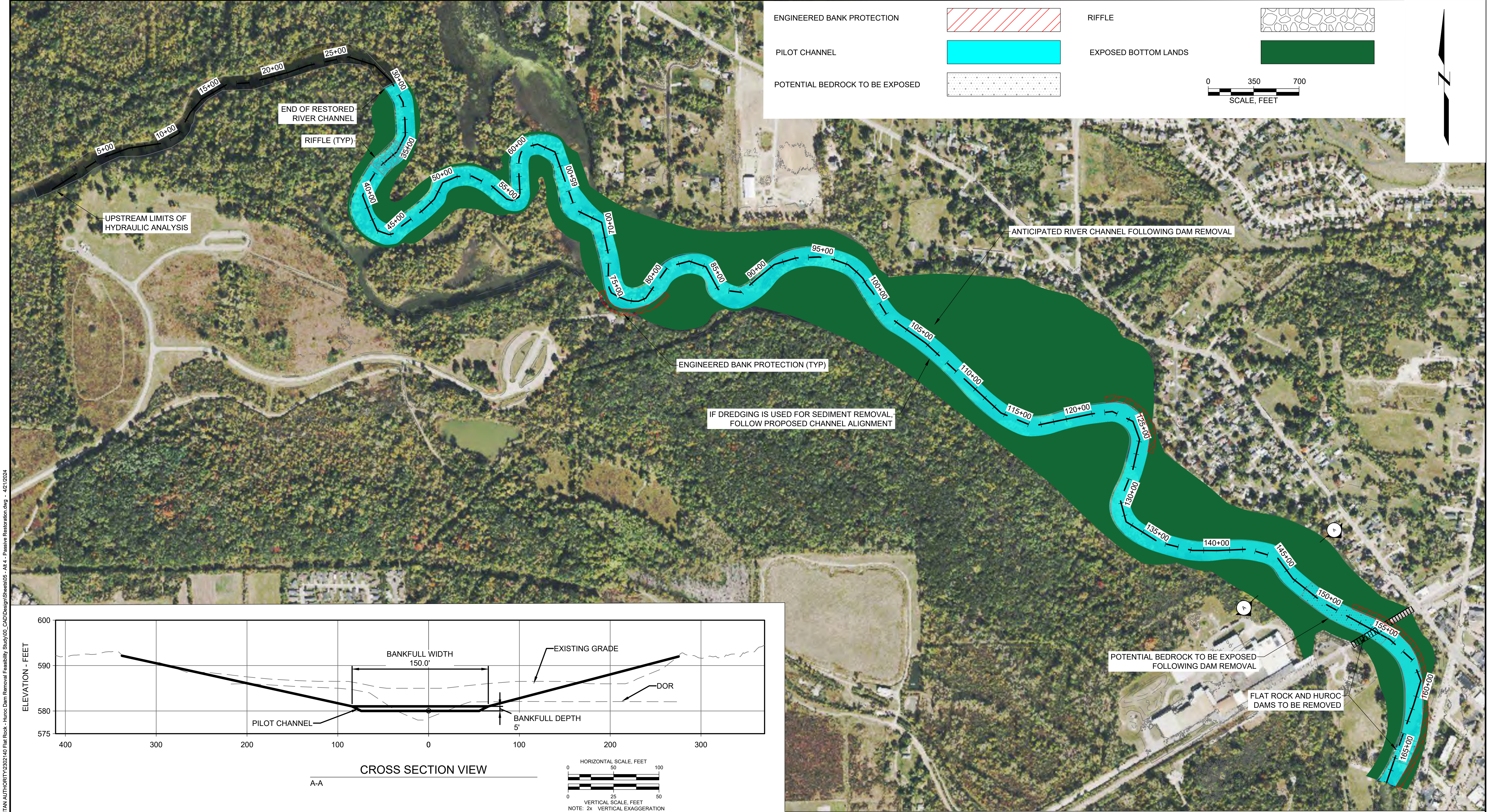
4 TYPICAL DETAIL
RIFLE DETAIL NOT TO SCALE

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

DRAFT

Designed: SP	GEI Consultants GEI CONSULTANTS OF MICHIGAN, P.C. 9282 GENERAL DRIVE SUITE 180 PLYMOUTH, MI 48170 (734)680-1500	HURON-CLINTON METROPOLITAN AUTHORITY HURON-CLINTON METROPARKS	FLAT ROCK/HUROC DAM DISPOSITION FEASIBILITY STUDY FLAT ROCK, MI					SHEET NAME ALTERNATIVE 3 DAM REMOVAL WITH FULL RESTORATION DETAIL SHEET	SHEET NO. 13	
Drawn: LH										
Checked: SP										
Approved: JM										
P.E. No: 6201066931										
GEI Project 2302140				0	4/19/2024	CONCEPTUAL				
				NO	DATE	ISSUE/REVISION	APP			

CONCEPTUAL



HEMAL LAURA, B/WorkingHURON-CLINTON METROPOLITAN AUTHORITY2302140 Flat Rock - Huron Dam Removal Feasibility Study000_CADDDesign(Sheets)05 - Alt 4 - Passive Restoration.dwg - 4/21/2024

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

DRAFT

Designed: JM
Drawn: MG
Checked: SP
Approved: JM
P.E. No: 6201066931
GEI Project 2302140

GEI Consultants
GEI CONSULTANTS OF MICHIGAN, P.C.
9282 GENERAL DRIVE
SUITE 180
PLYMOUTH, MI 48170
(734)680-1500

HURON-CLINTON
METROPOLITAN
AUTHORITY

HURON-CLINTON
METROPARKS

**FLAT ROCK/HUROC DAM
DISPOSITION FEASIBILITY
STUDY**
FLAT ROCK, MI

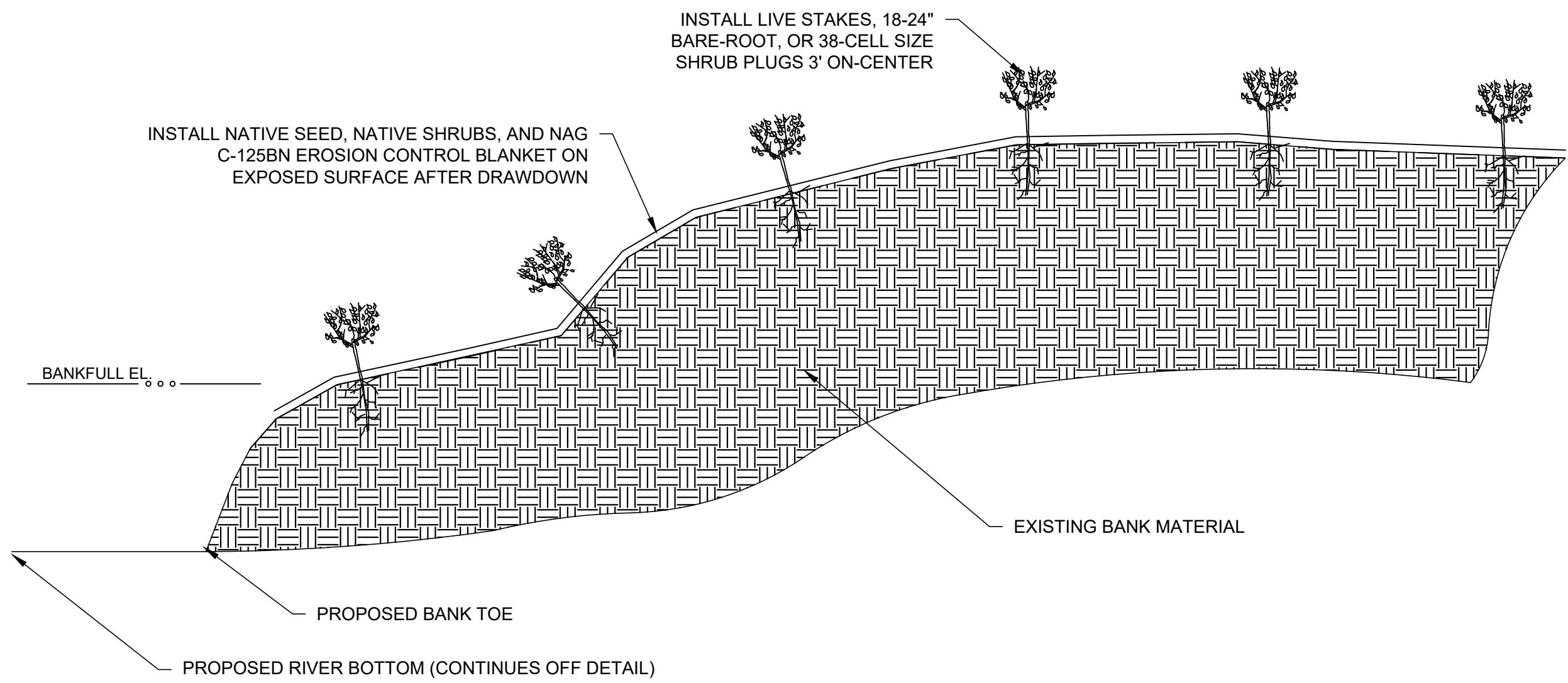
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NO	DATE	ISSUE/REVISION	APP

SHEET NAME
**ALTERNATIVE 4
DAM REMOVAL WITH
PASSIVE RESTORATION
PLAN VIEW**

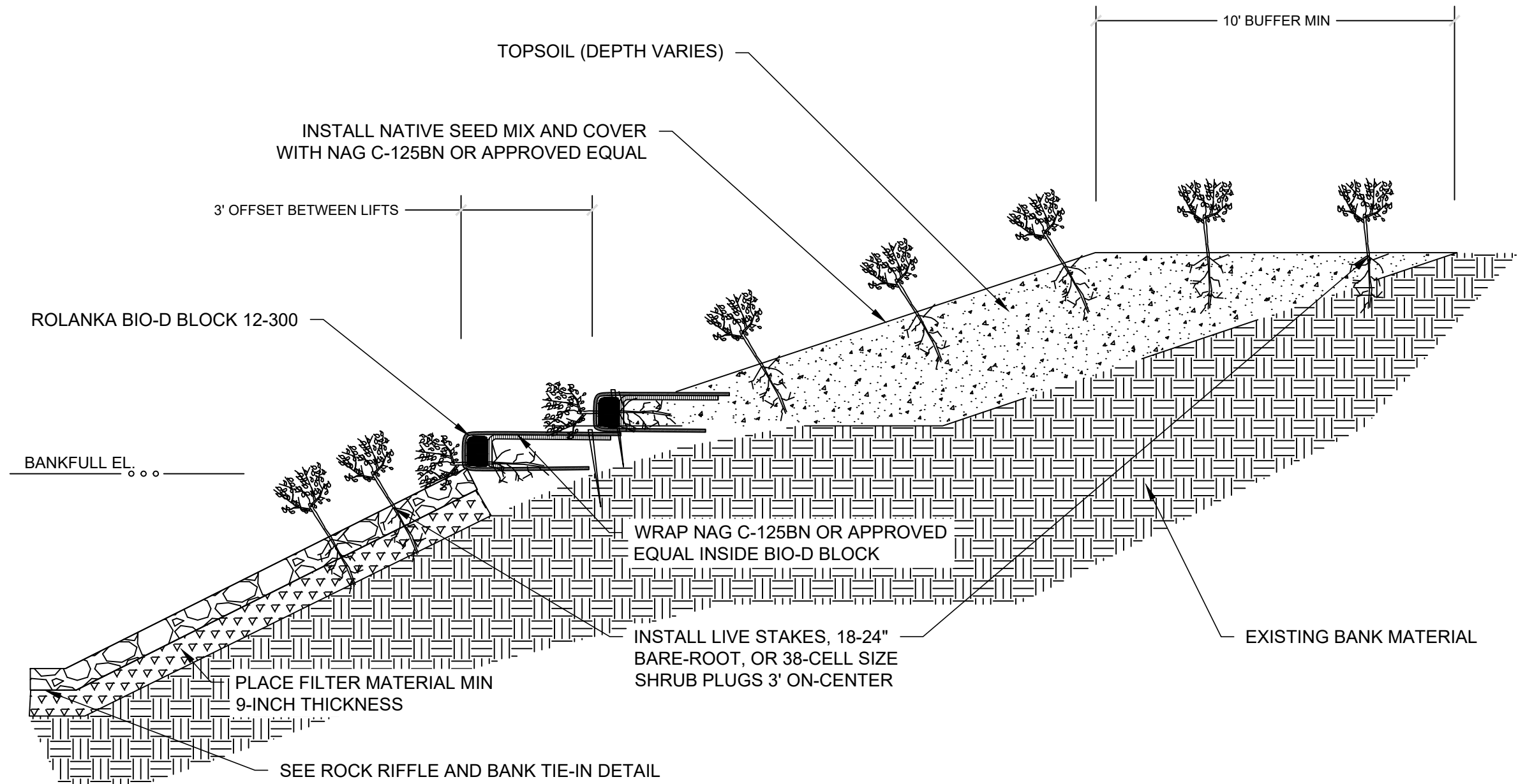
SHEET NO.

14

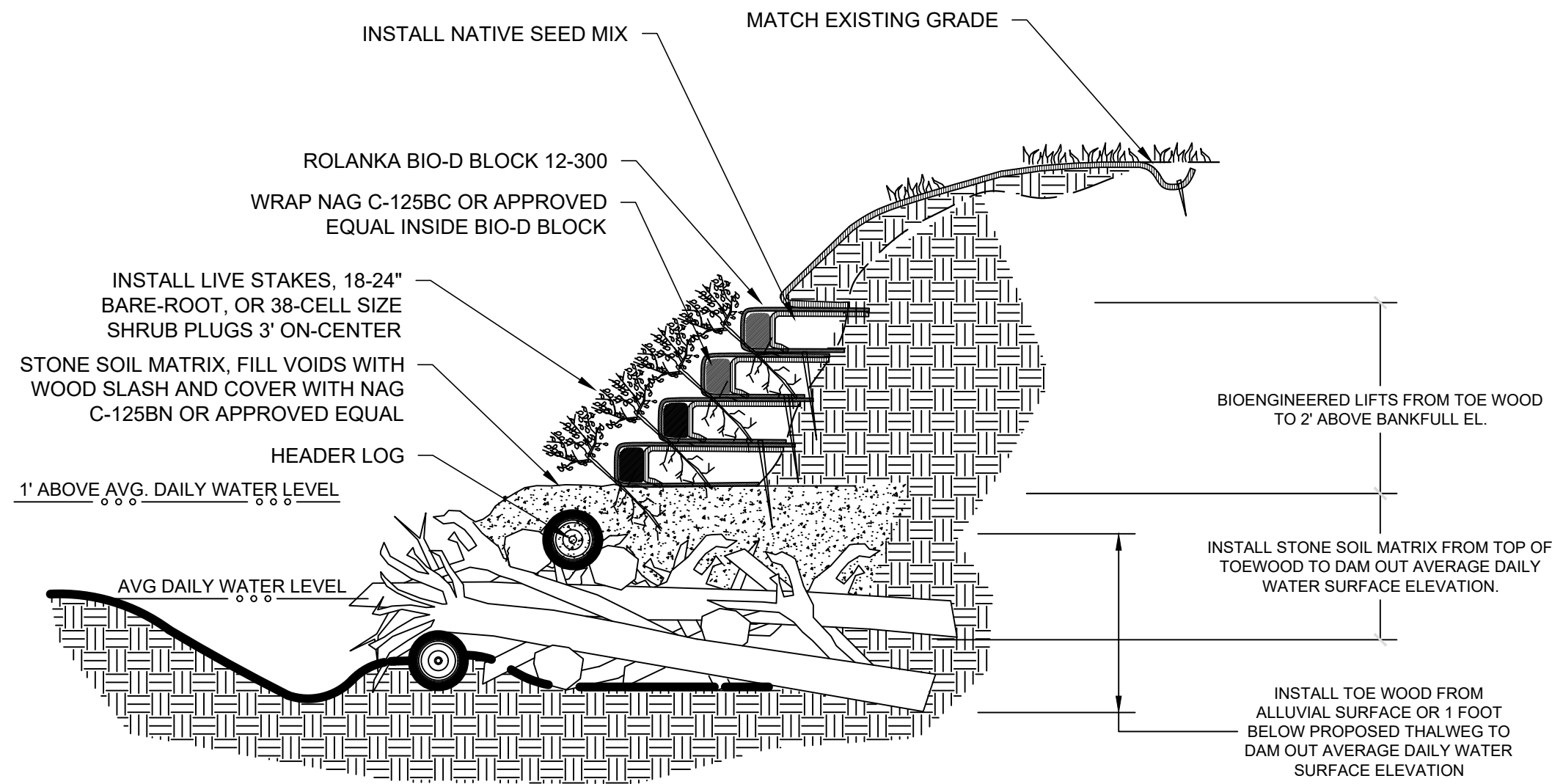
HEMAL LAURA, B|Working|HURON-CLINTON METROPOLITAN AUTHORITY\2302140 Flat Rock - Huron Dam Removal Feasibility Study\00_CAD\Design\Sheets\05 - Alt 4 - Passive Restoration.dwg - 4/21/2024



1 TYPICAL DETAIL
NON-ENGINEERED BANK PROTECTION NOT TO SCALE



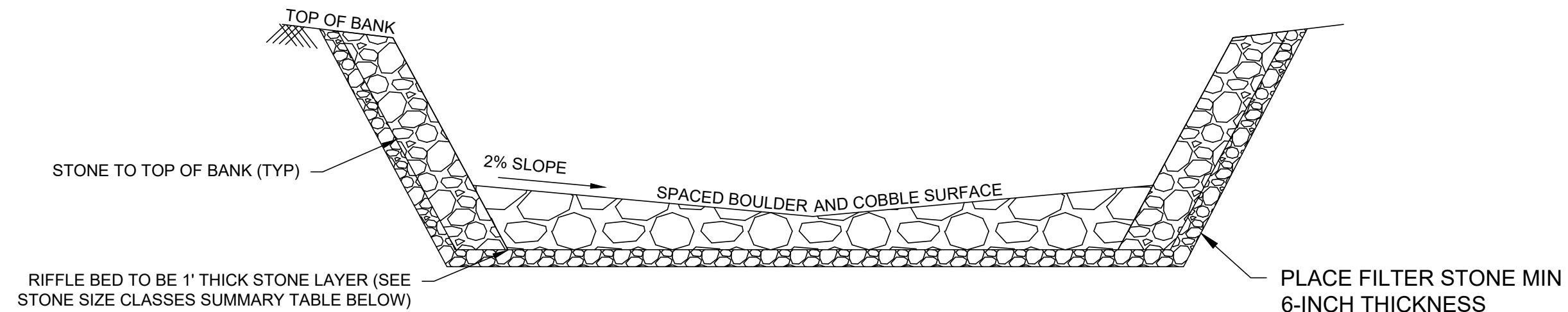
2 TYPICAL DETAIL
ENGINEERED BANK PROTECTION - OPTION 1 NOT TO SCALE



3 TYPICAL DETAIL
ENGINEERED BANK PROTECTION - OPTION 2 NOT TO SCALE

TOEWOOD NOTES:

1. STONE SOIL MATRIX SHALL CONSIST OF EXCAVATED MATERIAL FROM SITE. MAXIMIZE STONE CONTENT TO THE GREATEST EXTENT POSSIBLE. FILL VOIDS IN STONE SOIL MATRIX WITH WOOD SLASH FROM CLEARING AND GRUBBING OPERATIONS.
2. TOP OF SUBMERGED LARGE WOODY DEBRIS SHALL BE BELOW THE AVG. DAILY WATER LEVEL.
3. SUBMERGED LARGE WOODY DEBRIS SHALL BE SOUND AND CONTAIN MATERIAL WITH A DIAMETER GREATER THAN OR EQUAL TO 12" DIAMETER. ROOTWADS TO REMAIN ATTACHED TO LARGE WOODY DEBRIS FOR PLACEMENT.
4. STONE (MIN DIA. 12") SHALL BE INCORPORATED INTO 10%-15% OF SUBMERGED LARGE WOODY DEBRIS LAYER.



4 TYPICAL DETAIL
RIFLE DETAIL NOT TO SCALE

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

DRAFT

Designed: JM
Drawn: LH
Checked: SP
Approved: JM
P.E. No: 6201066931
GEI Project 2302140

GEI Consultants
GEI CONSULTANTS OF MICHIGAN, P.C.
9282 GENERAL DRIVE
SUITE 180
PLYMOUTH, MI 48170
(734)680-1500

HURON-CLINTON METROPOLITAN AUTHORITY

HURON-CLINTON METROPARKS

FLAT ROCK/HUROC DAM DISPOSITION FEASIBILITY STUDY
FLAT ROCK, MI

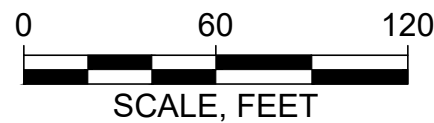
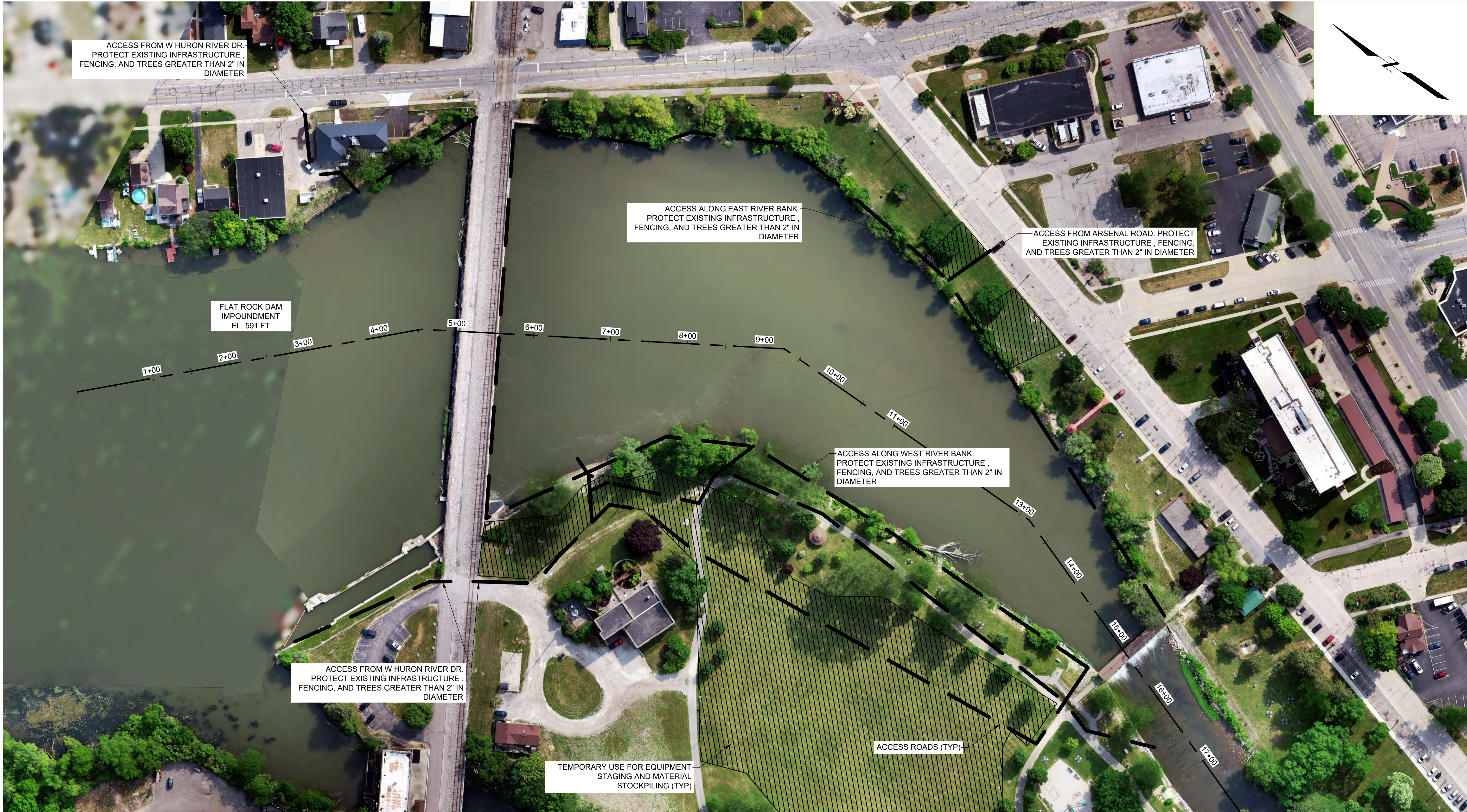
0	4/19/2024	CONCEPTUAL	
NO	DATE	ISSUE/REVISION	APP

SHEET NAME
ALTERNATIVE 4
DAM REMOVAL WITH
PASSIVE RESTORATION
DETAIL SHEET

SHEET NO.
17

CONCEPTUAL

HEMAL LAURA, B:\Working\HURON-CLINTON METROPOLITAN AUTHORITY\2021\40 Flat Rock - Huron Dam Removal Feasibility Study\00_CAD\Design\Sheets\01 - Existing Conditions - Plan Profile and Cross Section.dwg - 4/21/2024



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

DRAFT

Designed: SP
Drawn: ZC
Checked: SP
Approved: JM
P.E. No: 6201066931
GEI Project 2302140



FLAT ROCK/HUROC DAM
DISPOSITION FEASIBILITY
STUDY
FLAT ROCK, MI

0	4/19/2024	CONCEPTUAL	
NO	DATE	ISSUE/REVISION	APP

SHEET NAME

CONSTRUCTION
LAYDOWN AREAS

SHEET NO.

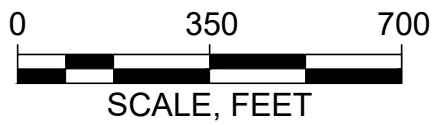
18

CONCEPTUAL



HEMAL LAURA, B:\Working\HURON-CLINTON METROPOLITAN AUTHORITY\2302140 Flat Rock - Huroc Dam Removal Feasibility Study\00_CAD\Design\Sheets\01_Existing Conditions_Plan Profile and Cross Section.dwg - 4/21/2024

OAKWOODS METROPARK EXTENTS
(SOURCE: HCMA PARK WEBSITE)



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

DRAFT

Designed:	JM
Drawn:	LH
Checked:	SP
Approved:	JM
P.E. No:	6201066931
GEI Project	2302140



**FLAT ROCK/HUROC DAM
DISPOSITION FEASIBILITY
STUDY**
FLAT ROCK, MI

0	4/19/2024	CONCEPTUAL	
NO	DATE	ISSUE/REVISION	APP

SHEET NAME	SHEET NO.
CONSTRUCTION LAYDOWN AREAS	19

CONCEPTUAL

HEMAL LAURA, B:\Working\HURON-CLINTON METROPOLITAN AUTHORITY\2202140 Flat Rock - Huroc Dam Removal Feasibility Study\00_CAD\Design\Sheets\05 - All 3 and 4 Full Removal Pass and Active Restoration_Sea Lamprey Alts.dwg - 4/21/2024

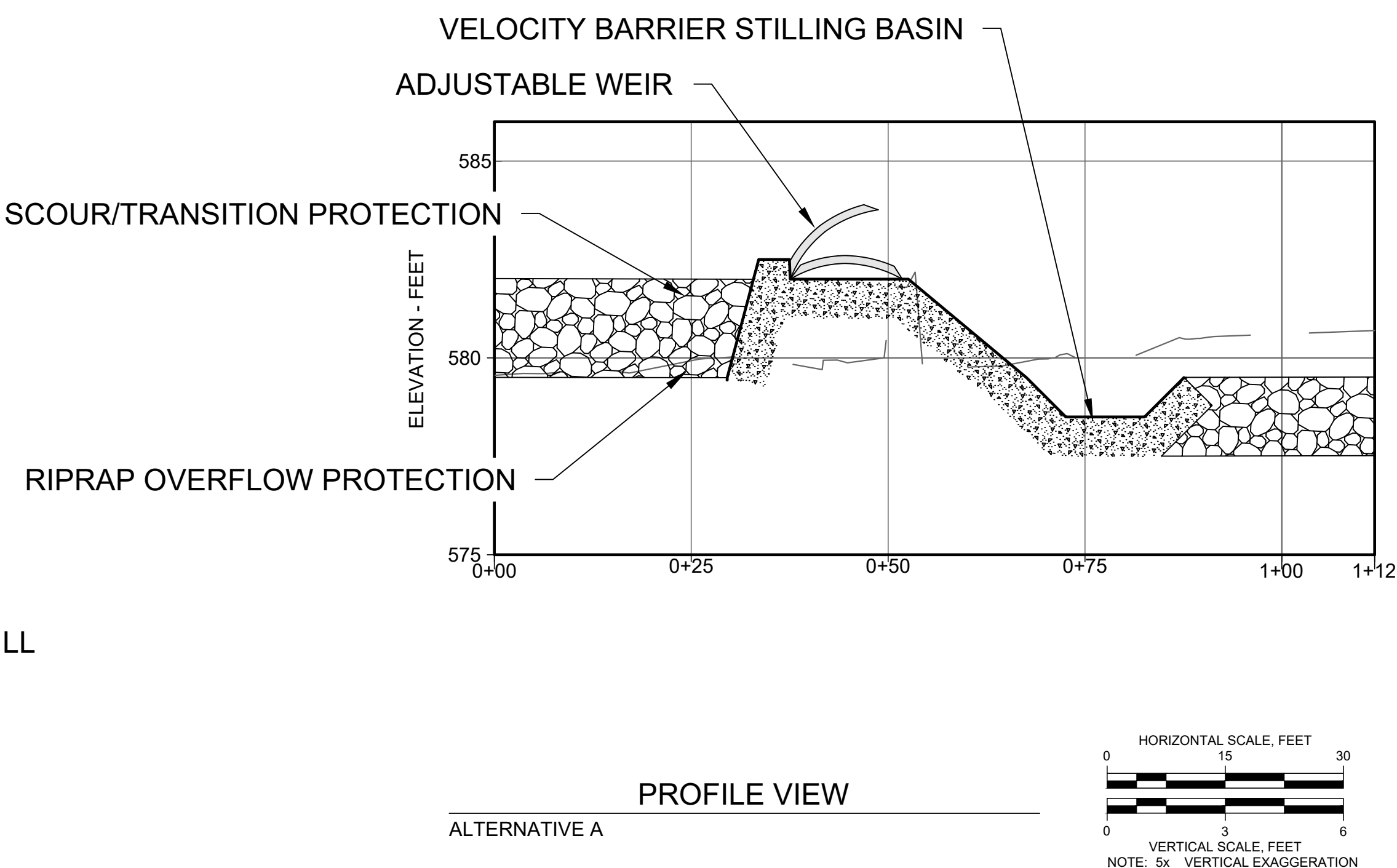
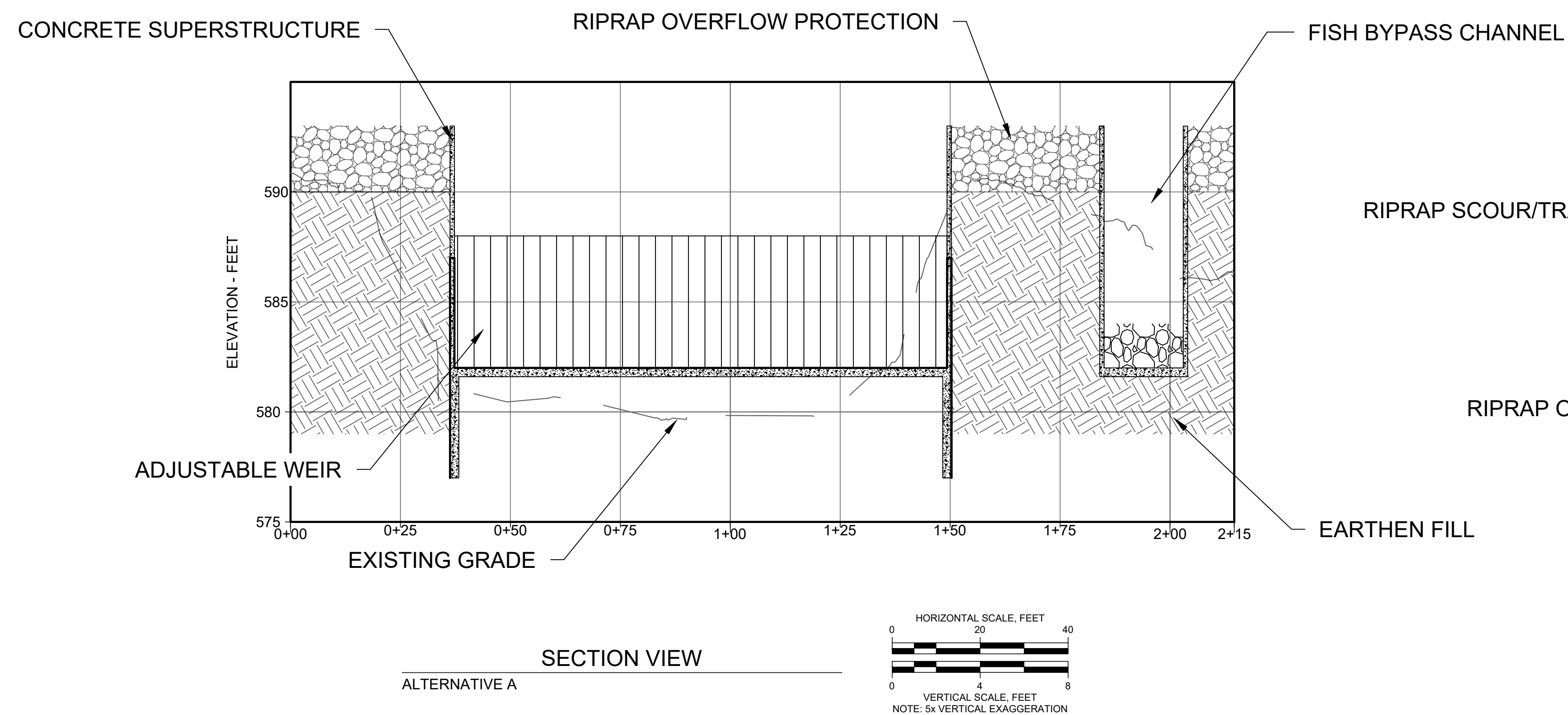


PLAN VIEW

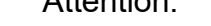


CONCEPTUAL

Attention: 01" If this scale bar does not measure 1" then drawing is not original scale.	DRAFT	Designed: MC	GEI Consultants GEI CONSULTANTS OF MICHIGAN, P.C. 9282 GENERAL DRIVE SUITE 180 PLYMOUTH, MI 48170 (734)680-1500	HURON-CLINTON METROPOLITAN AUTHORITY HURON-CLINTON METROPARKS	FLAT ROCK/HUROC DAM DISPOSITION FEASIBILITY STUDY FLAT ROCK, MI					SHEET NAME SEA LAMPREY BARRIER AT HUROC ALTERNATIVE A PLAN VIEW	SHEET NO. 20
		Drawn: SP									
		Checked: SP									
		Approved: JM									
		P.E. No: 6201066931									
		GEI Project 2302140									



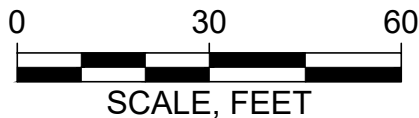
CONCEPTUAL

Attention:  If this scale bar does not measure 1" then drawing is not original scale.	DRAFT	Designed: MS	 HURON-CLINTON METROPOLITAN AUTHORITY 	FLAT ROCK/HUROC DAM DISPOSITION FEASIBILITY STUDY FLAT ROCK, MI							SHEET NAME SEA LAMPREY BARRIER AT HUROC ALTERNATIVE A SECTION AND PROFILE VIEW	SHEET NO. 21
		Drawn: MS										
		Checked: SP										
		Approved: JM										
		P.E. No: 6201066931										
		GEI Project 2302140										
							0	4/19/2024	CONCEPTUAL			
							NO	DATE	ISSUE/REVISION	APP		

HEMAL LAURA, B:\Working\HURON-CLINTON METROPOLITAN AUTHORITY\2302140 Flat Rock - Huroc Dam Removal Feasibility Study\00_CAD\Design\Sheets\08 - All 3 and 4 Full Removal Pass and Active Restoration_Sea Lamprey Alts.dwg - 4/21/2024



PLAN VIEW



CONCEPTUAL

Attention:

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

DRAFT

Designed:	MS
Drawn:	MS
Checked:	SP
Approved:	JM
P.E. No:	6201066931
GEI Project	2302140

GEI Consultants
GEI CONSULTANTS OF MICHIGAN, P.C.
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(734)680-1500

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METROPOLITAN
AUTHORITY

HURON-CLINTON
METROPARKS

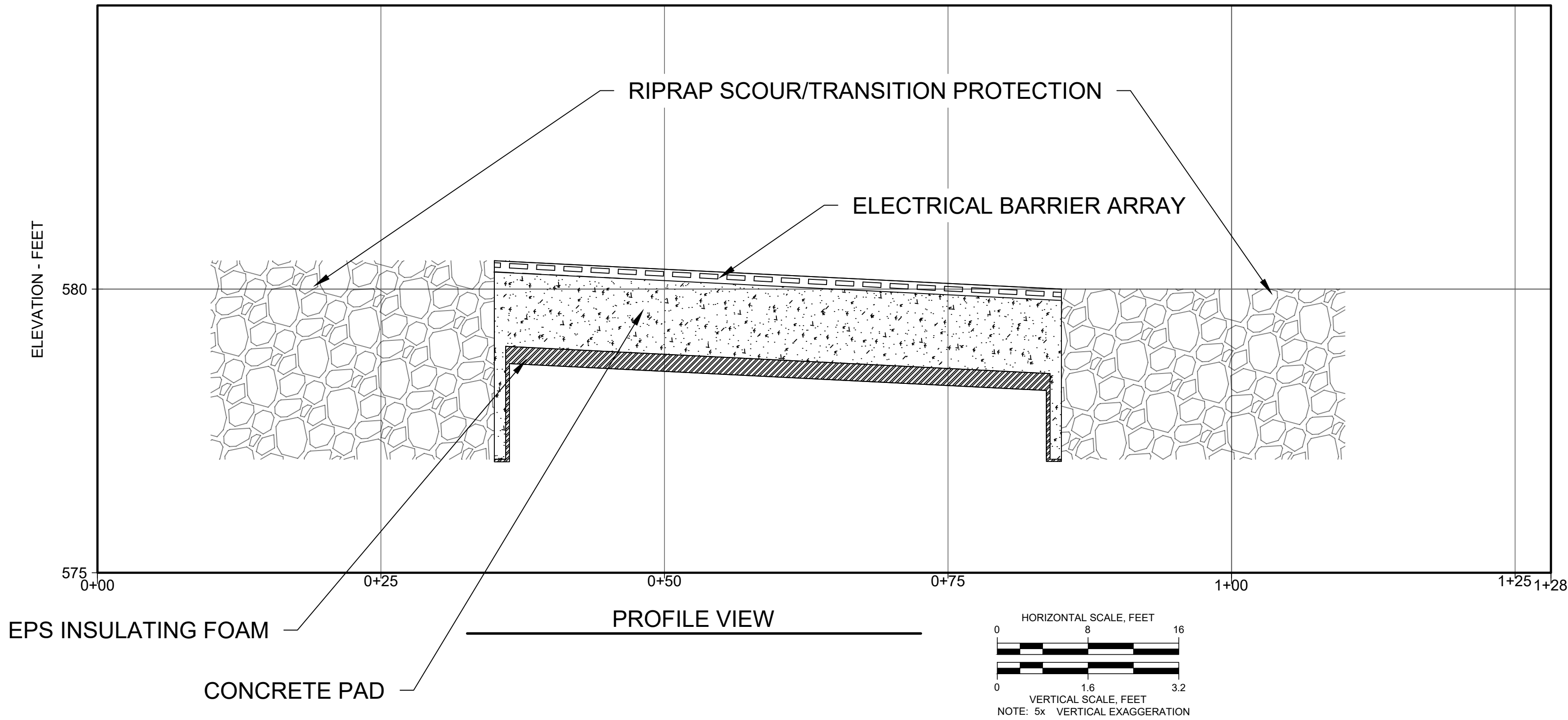
**FLAT ROCK/HUROC DAM
DISPOSITION FEASIBILITY
STUDY**

FLAT ROCK, MI

0	4/19/2024	CONCEPTUAL	
NO	DATE	ISSUE/REVISION	APP

SHEET NAME	SHEET NO.
SEA LAMPREY BARRIER ALTERNATIVE C PLAN VIEW	24

HEMAL LAURA, B|Working|HURON-CLINTON METROPOLITAN AUTHORITY|202140 Flat Rock - Huron Dam Removal Feasibility Study|00_CAD Design|Sheets|06 - All 3 and 4 Full Removal Pass and Active Restoration, Sea Lamprey Alts. dwg - 4/21/2024



CONCEPTUAL

Attention: 01" If this scale bar does not measure 1" then drawing is not original scale.	DRAFT	Designed: MS	GEI Consultants GEI CONSULTANTS OF MICHIGAN, P.C. 9282 GENERAL DRIVE SUITE 180 PLYMOUTH, MI 48170 (734)680-1500	HURON-CLINTON METROPOLITAN AUTHORITY HURON-CLINTON METROPARKS	FLAT ROCK/HUROC DAM DISPOSITION FEASIBILITY STUDY FLAT ROCK, MI					SHEET NAME SEA LAMPREY BARRIER ALTERNATIVE C PROFILE VIEW	SHEET NO. 25
		Drawn: MS									
		Checked: SP									
		Approved: JM									
		P.E. No: 6201066931									
		GEI Project 2302140									