



CIVIL CONSULTANTS, INC.

2024 to match PE stamp?

March 11, 2023

El Paso County
Planning & Community Development
2880 International Circle, Suite 110
Colorado Springs, CO 80910

Attn.: Project Manager

RE: Crossroads Mixed Use Filing No. 1
Private Detention/Stormwater Quality Pond

Dear Project Manager:

Per the approved construction drawings for "Crossroads Mixed Use Filing No. 1" improvements were made to construct a water quality facility in compliance with the current El Paso County Drainage Criteria and with the approved Final Drainage Report for this project. It should be noted that at the onset of construction, the Colorado Department of Transportation requested that all permanent drainage structures associated with the project be removed from the Highway 24 Rights-of-Way. The provided as-builts reflect the "field changes" associated with the revision. It should be noted that modification of the outlet works do not affect the intended functionality of the facility nor do they negatively affect downstream facilities and or water quality.

Based upon this information and periodic site visits to the project during significant/key phases of the stormwater BMP installation, M&S Civil Consultants, Inc. is of the opinion that the stormwater BMPs have been constructed in general compliance with the approved design plans, and specifications as filed with El Paso County.


Statement Of Engineer In Responsible Charge

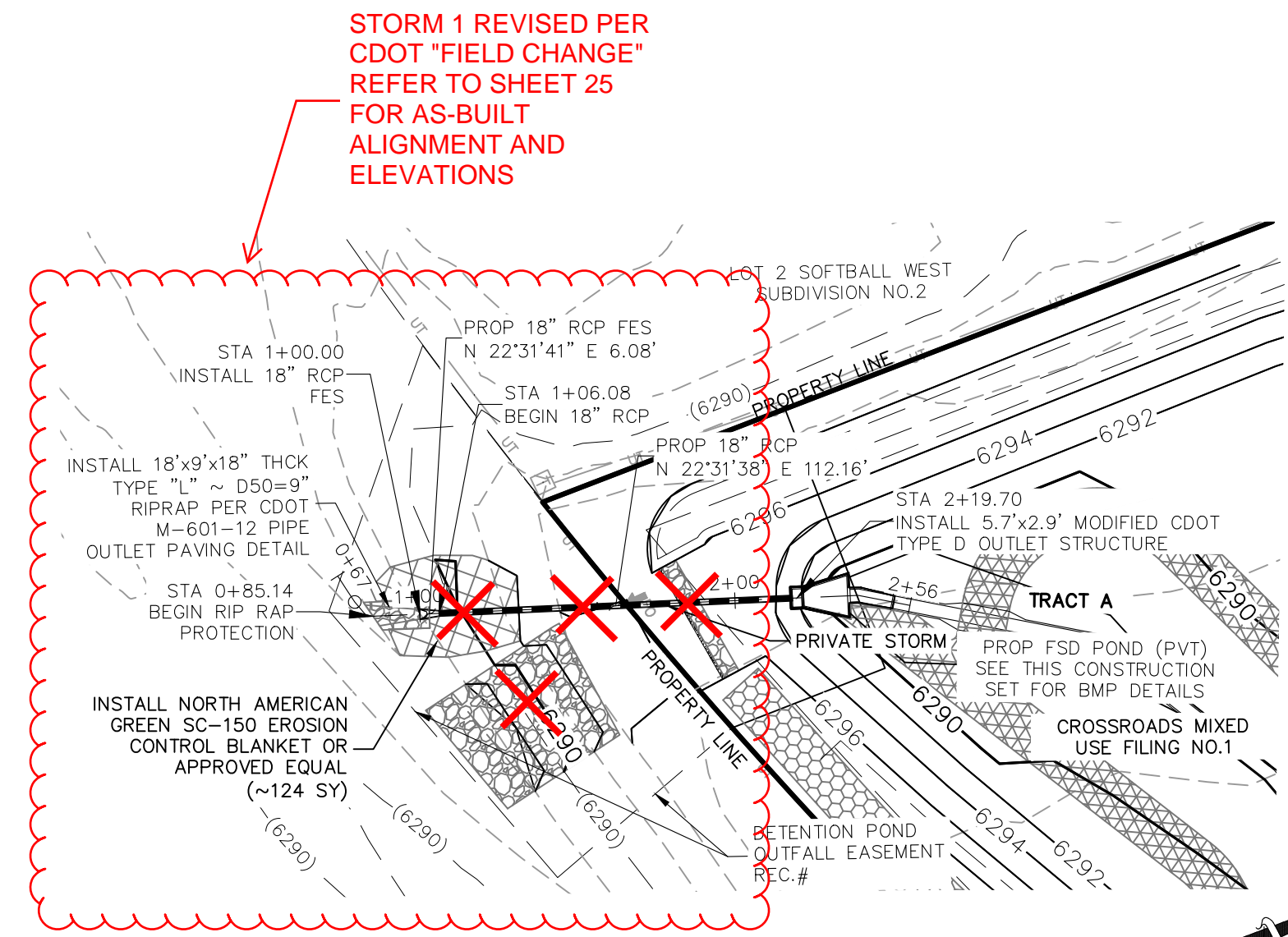
To the best of my knowledge, information and belief, for the referenced project above, the improvements have been constructed in general compliance with the approved design plans and specifications as filed with El Paso County to provide the required storage volume and meet the required release rates documented by the SDI design form, the stage areas, elevations and outlet dimensions. In addition, to the best of my knowledge, information and belief, for the referenced project above, the site and adjacent properties (as affected by work performed under the County permit) are stable with respect to settlement and subsidence, sloughing of cut and fill slopes, revegetation or other ground cover, and that the improvements (public improvements, common development improvements, site grading and paving) meet or exceed the minimum design requirements.



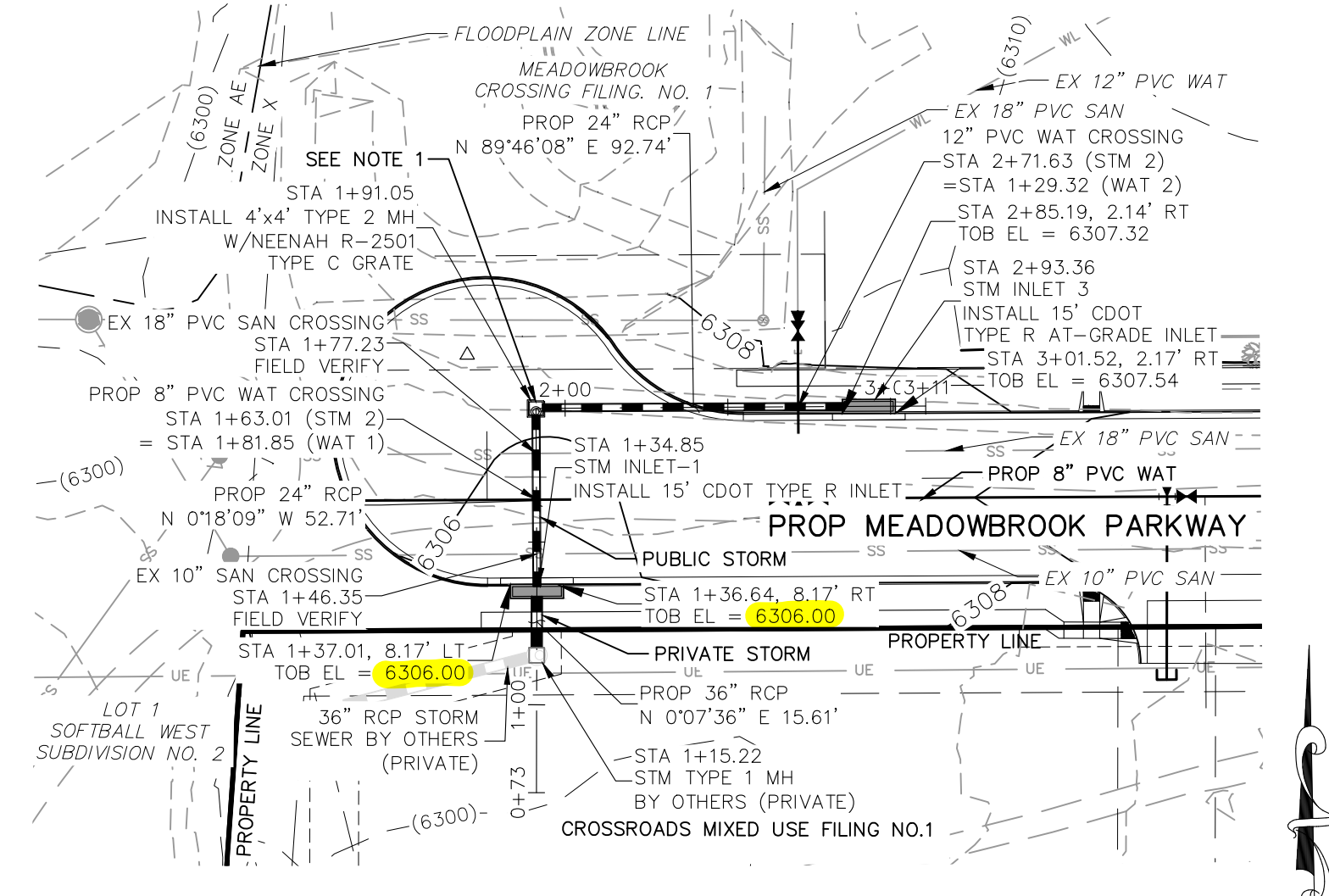
FOR LOCATING & MARKING GAS, ELECTRIC, WATER & TELEPHONE LINES
 FOR BURIED UTILITY INFORMATION
 48 HRS BEFORE YOU DIG
 CALL 1-800-922-1987

CROSSROADS MIXED USE FILING NO. 1
 STORM SEWER PLANS
 PROJECT NO. 18-003
 DATE: 04/20/2022
 SCALE: HORIZONTAL: 1"=50' VERTICAL: 1"=5'
 DESIGNED BY: GT
 DRAWN BY: GT
 CHECKED BY: VAS
 SHEET 15 OF 24
 ST01

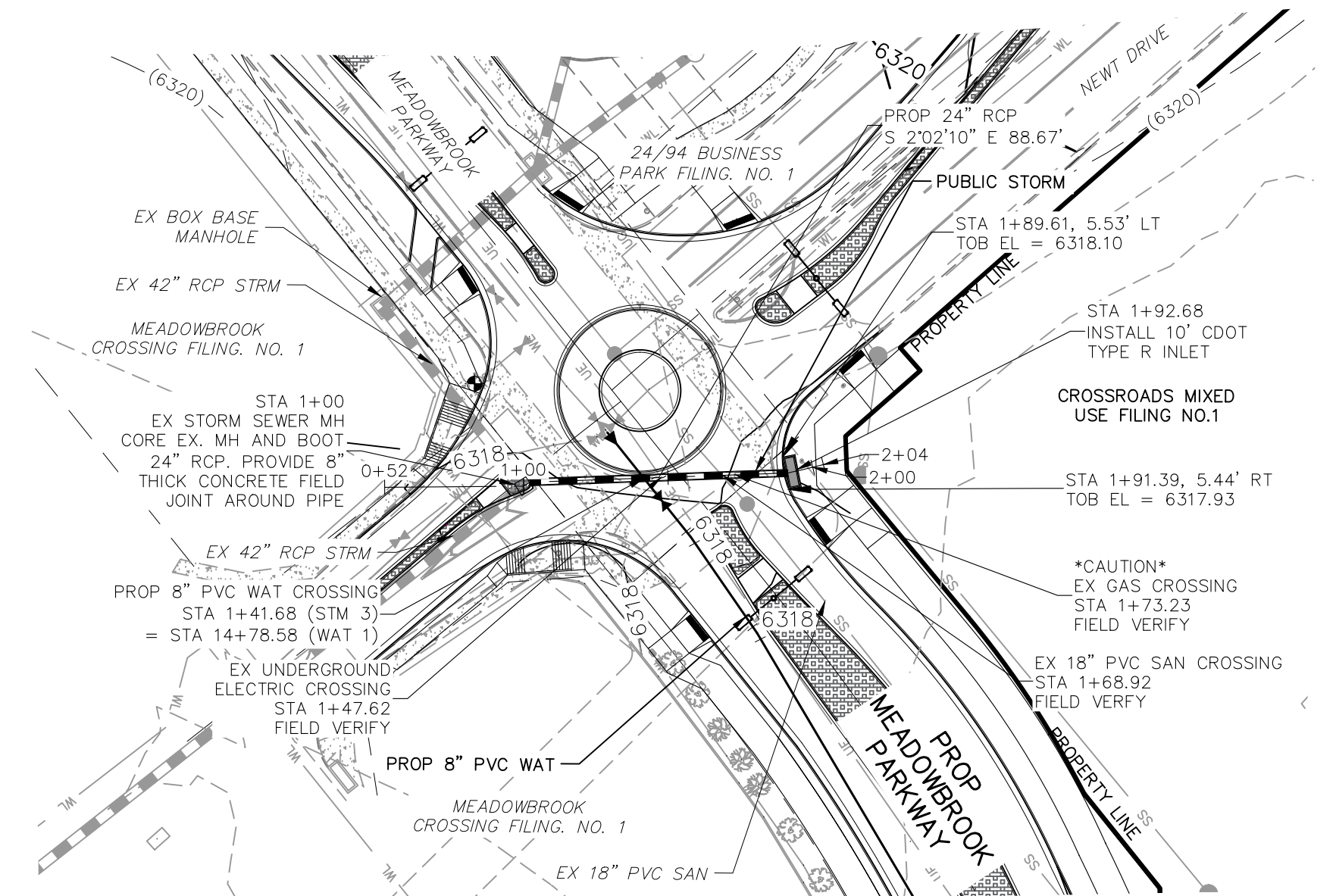
217 N. WAHATCH AVE., STE 305
 COLORADO SPRINGS, CO 80903
 PHONE: 719.555.5485

 CIVIL CONSULTANTS, INC.



STORM 1 FSD POND OUTFALL
STA 1+00.00 TO STA 2+19.70
(PUBLIC/PRIVATE)

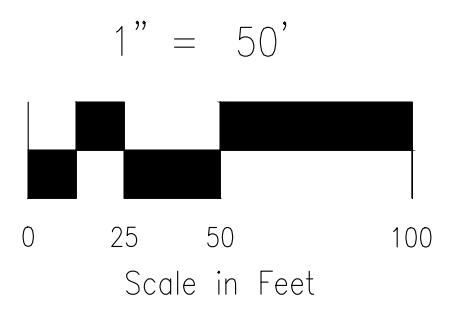


STORM 2
STA 1+15.22 TO STA 2+93.36
(PUBLIC/PRIVATE)



STORM 3
STA 1+00.00 TO STA 1+92.26
(PUBLIC)

AS-BUILT ENGINEERING RECORD DRAWINGS



- NOTE:
 1.) GRATED INLET TO BE REPLACED WITH CRUB FACE INLET AT TIME OF MEADOWBROOK PARKWAY EXTENSION
 2.) ALL PRIVATE STORM SEWER CONSTRUCTED WITH THESE PLANS TO BE MAINTAINED BY THE CROSSROADS METROPOLITAN DISTRICT NO. 1

STATION	EXISTING GRADE	PROPOSED GRADE	100YR HGL	DESCRIPTION
1+00	6300	6300	6300	STORM 1
2+00	6290	6290	6290	STORM 1
3+00	6280	6280	6280	STORM 1
1+00	6310	6310	6310	STORM 2
2+00	6300	6300	6300	STORM 2
3+00	6320	6320	6320	STORM 2
1+00	6310	6310	6310	STORM 3
2+00	6300	6300	6300	STORM 3

File: C:\18003A-Crossroads Mixed Use\Colorado Springs Equities LLC\dwg\Const\Draw\Storm Plans\ST01.dwg Plotstamp: 5/3/2022 12:50 PM



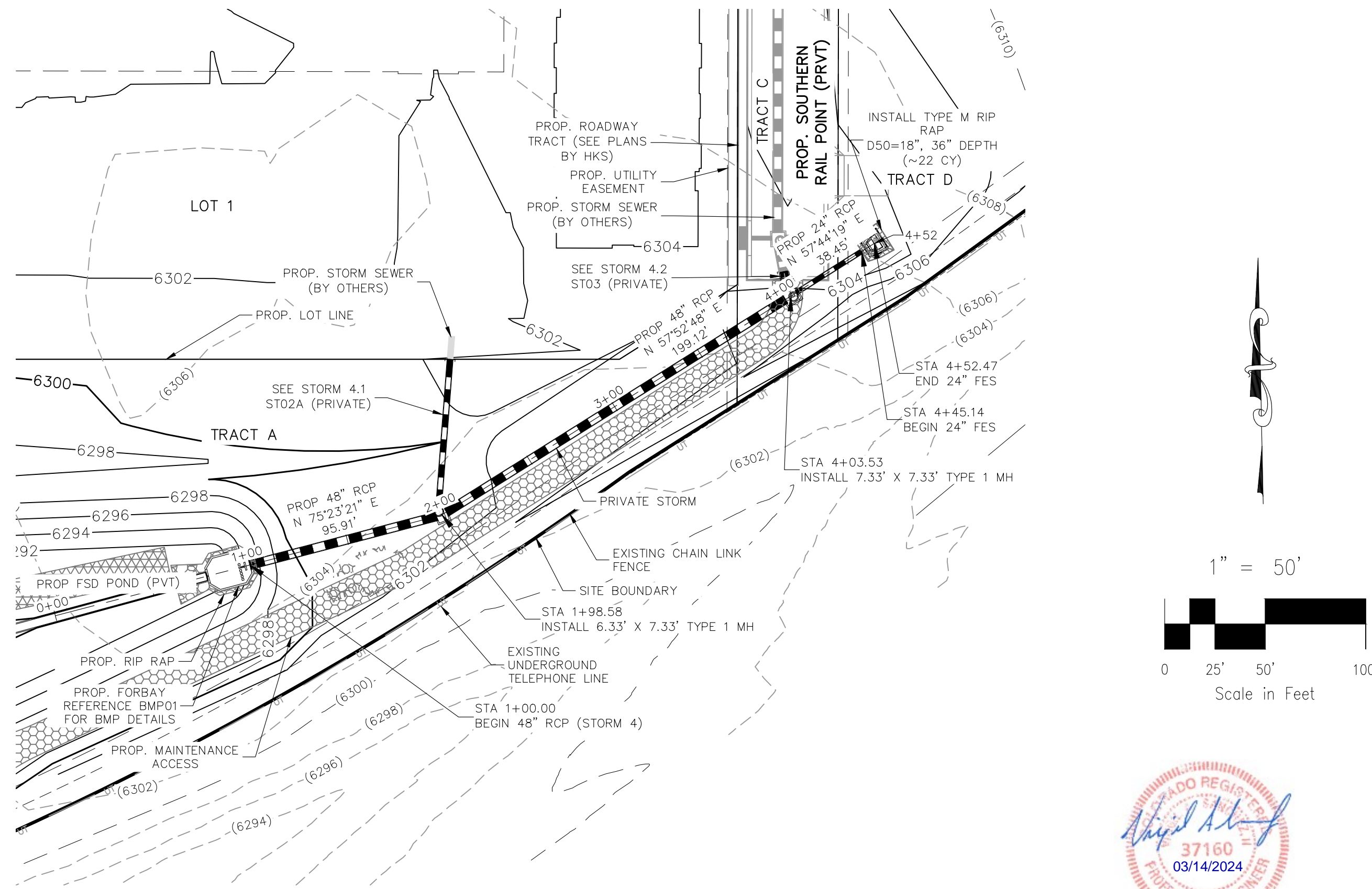
FOR AND ON BEHALF OF M&S CIVIL CONSULTANTS, INC.

NO.	DATE	BY	DESCRIPTION

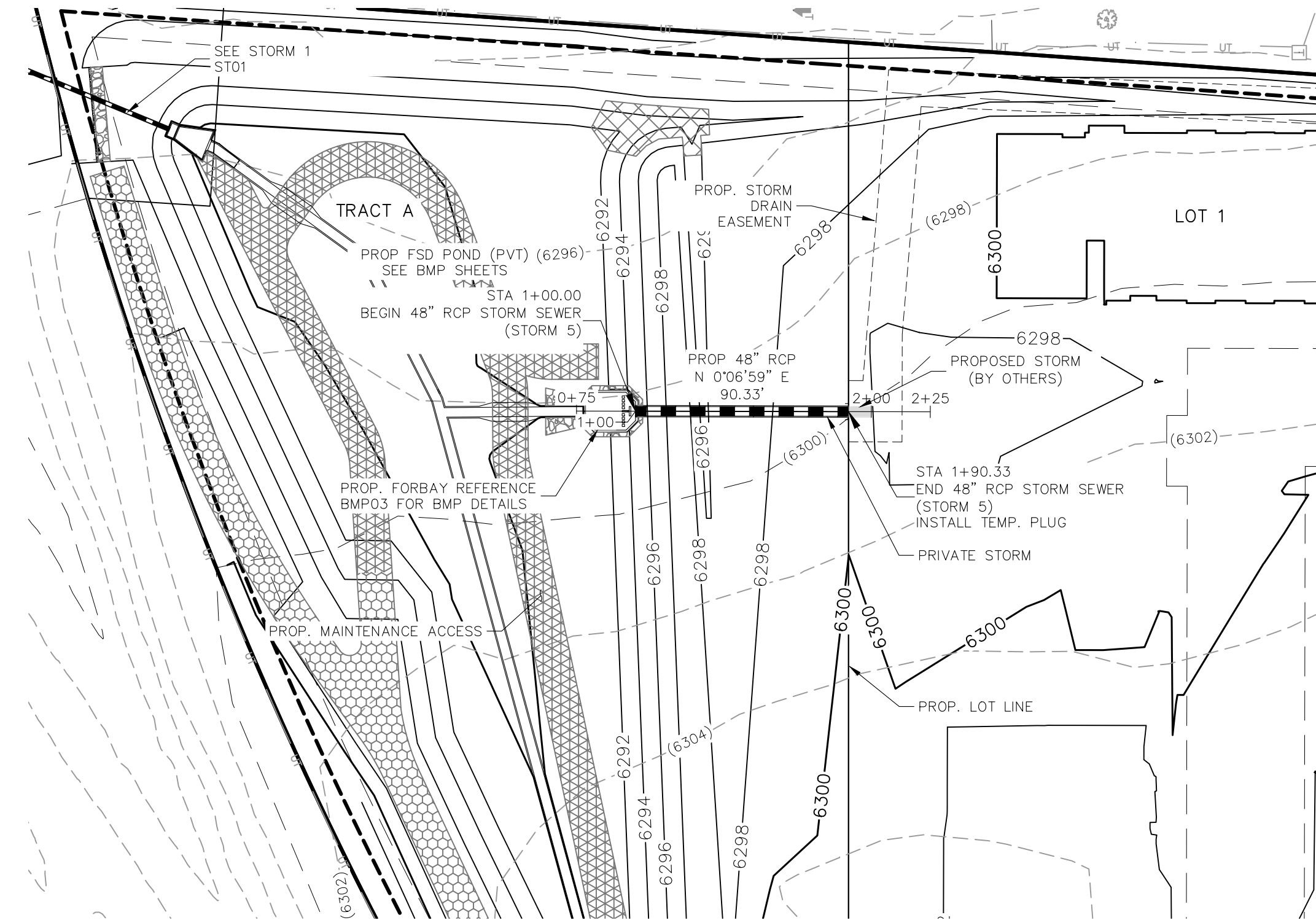
APPROVED BY: _____ DATE: _____

THE ENGINEER PREPARING THESE PLANS WILL NOT BE RESPONSIBLE, OR LIABLE FOR, UNAUTHORIZED CHANGES TO OR USES OF THESE PLANS. ALL CHANGES TO THE PLANS MUST BE IN WRITING AND MUST BE APPROVED BY THE PREPARE OF THESE PLANS.

CAUTION

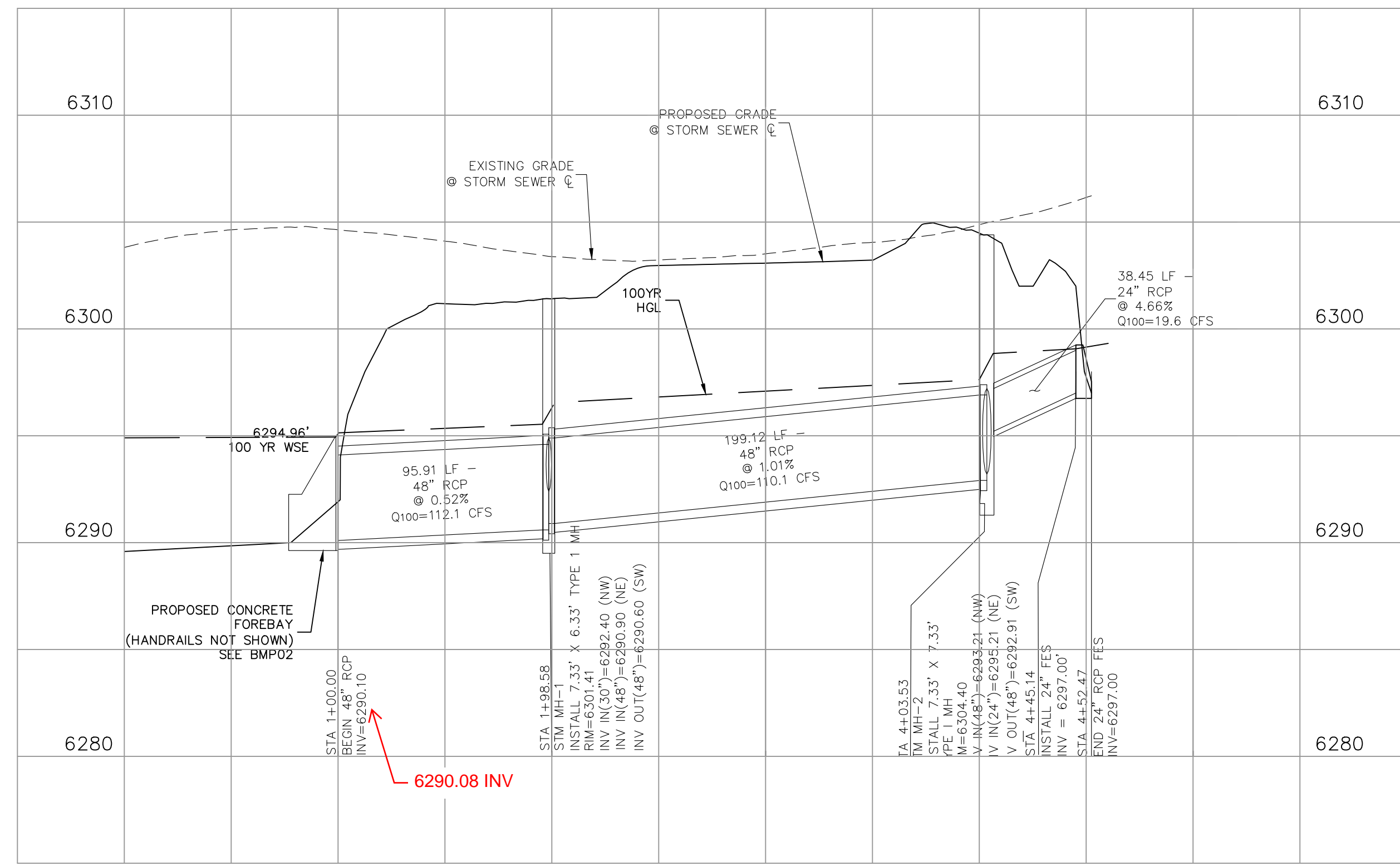


STORM 4 (PRIVATE)
STA 1+00.00 TO STA 4+52.47

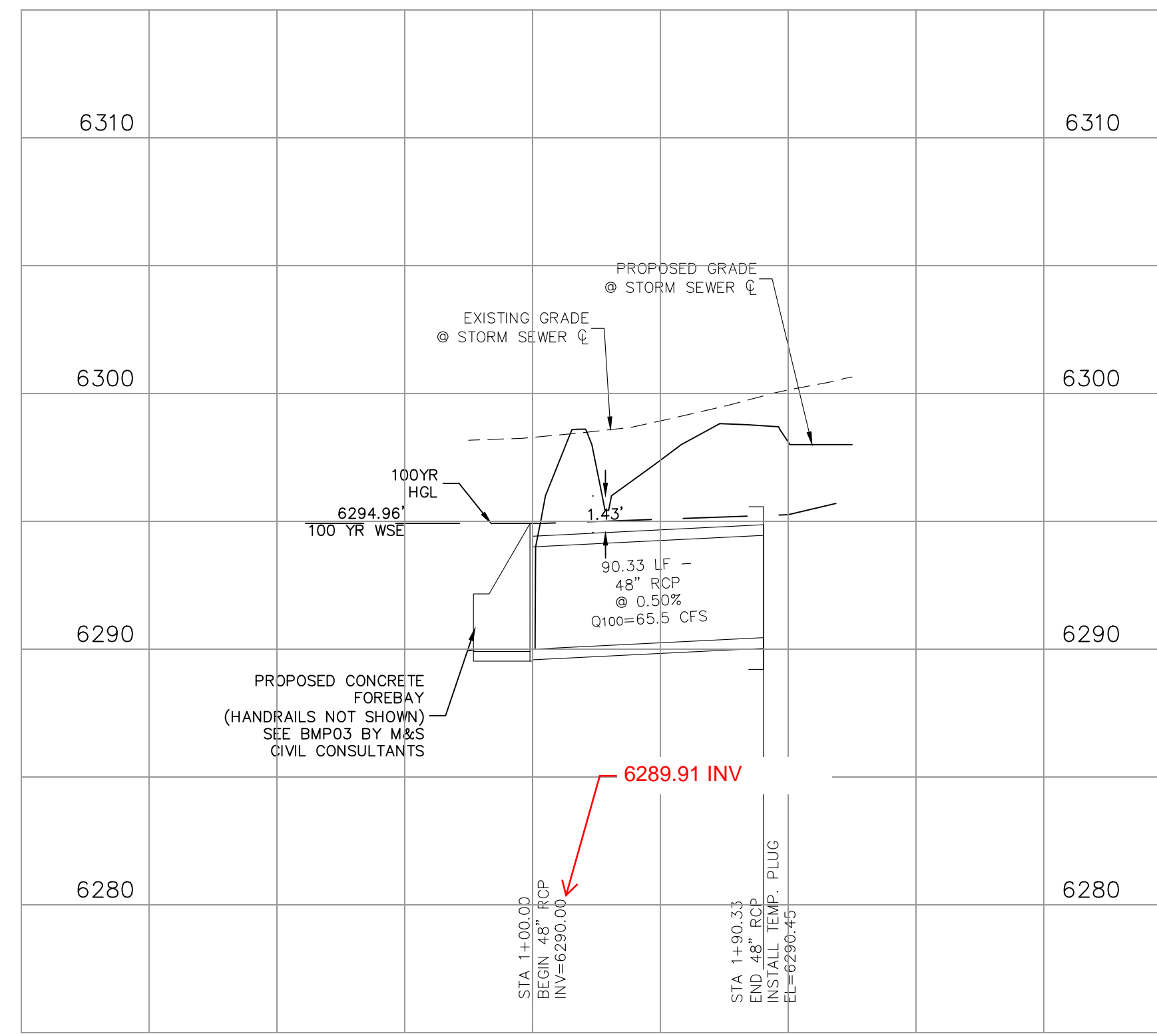


STORM 5 (PRIVATE)
STA 1+00.00 TO STA 1+90.33

AS-BUILT ENGINEERING RECORD DRAWINGS



STORM 4 (PRIVATE)



STORM 5 (PRIVATE)

NOTES:

ALL PRIVATE STORM SEWER CONSTRUCTED WITH THESE PLANS TO BE MAINTAINED BY THE CROSSROADS METROPOLITAN DISTRICT NO. 1

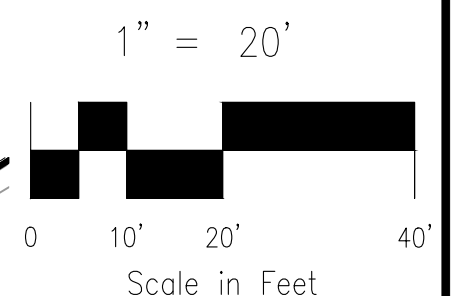
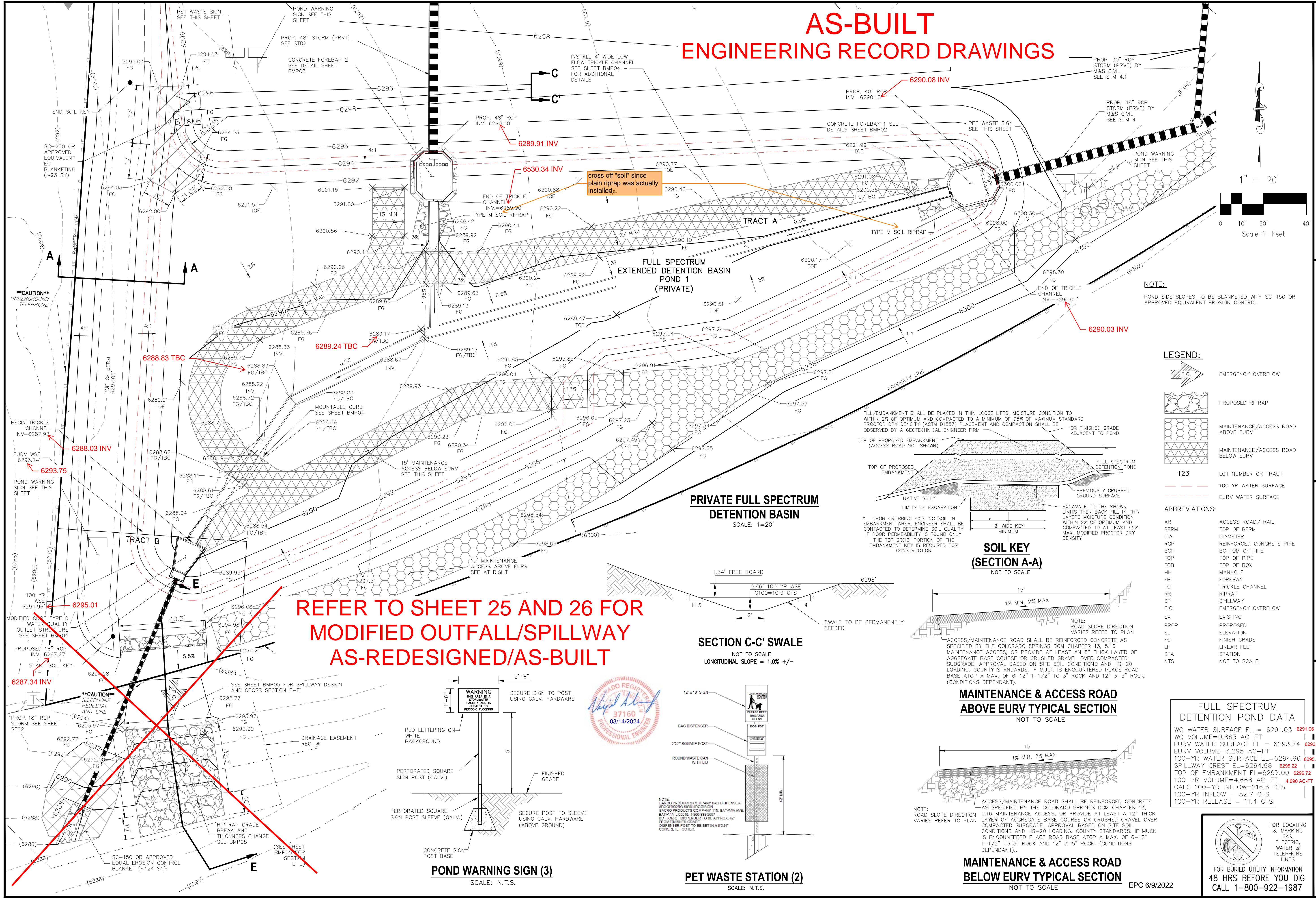
FOR LOCATING & MARKING GAS, ELECTRIC, WATER & TELEPHONE LINES

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CALL 1-800-922-1987



CROSSROADS MIXED USE FILING NO. 1	
STORM SEWER PLANS	DATE: 04/20/2022
PROJECT NO. 18-003	SCALE: HORIZONTAL: 1"=50' VERTICAL: 1"=5'
DESIGNED BY: CW	DRAWN BY: CW
CHECKED BY: VAS	SHEET 16 OF 24
ST02	
<p>217 N. WABATCH AVE, STE 305 COLORADO SPRINGS, CO 80903 PHONE: 719.555.5885</p> <p>CIVIL CONSULTANTS, INC.</p>	
<p>FOR AND ON BEHALF OF M&S CIVIL CONSULTANTS, INC.</p>	
REVISONS:	APPRO'D. BY:
NO. DATE:	DATE:
BY:	DESCRIPTION:
<p>THE ENGINEER PREPARING THESE PLANS WILL NOT BE RESPONSIBLE, OR LIABLE FOR, UNAUTHORIZED CHANGES TO OR USES OF THESE PLANS. ALL CHANGES TO THE PLANS MUST BE IN WRITING AND MUST BE APPROVED BY THE PREPARED OF THESE PLANS.</p>	
CAUTION	

AS-BUILT ENGINEERING RECORD DRAWINGS



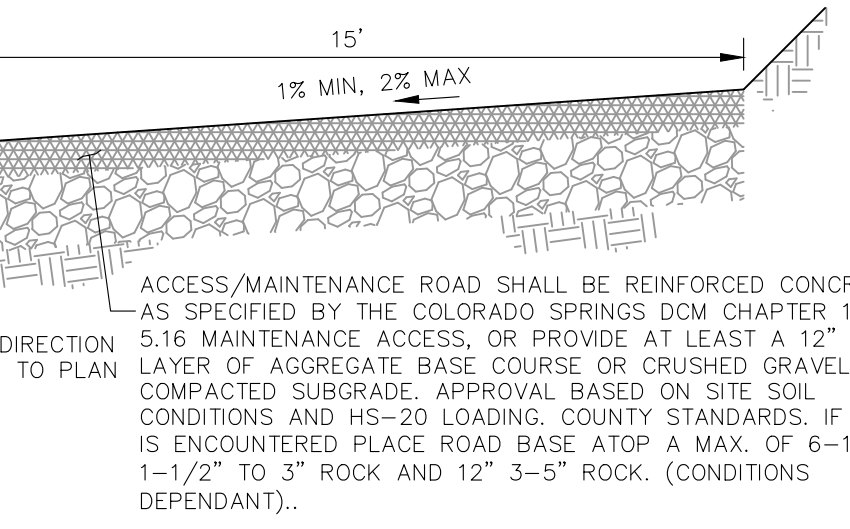
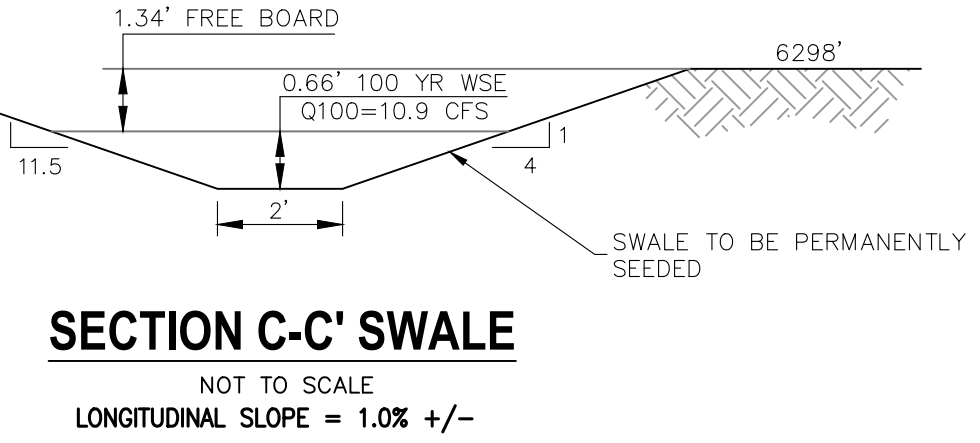
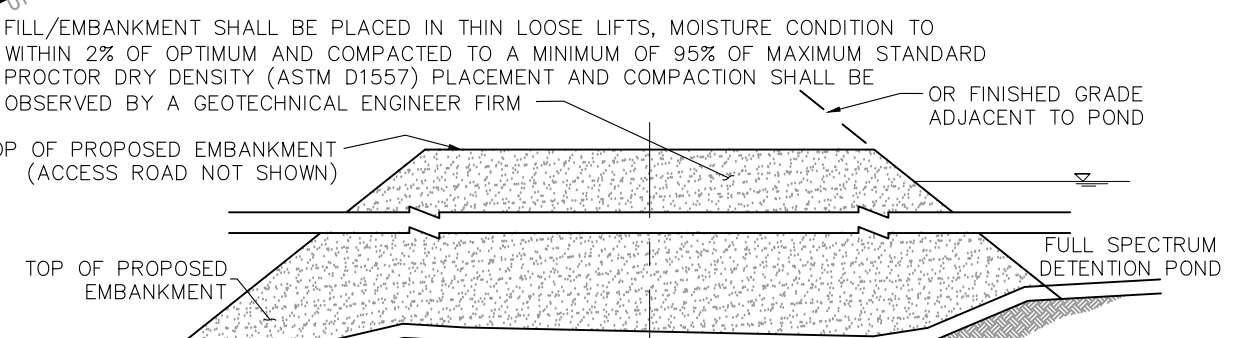
NOTE:
POND SIDE SLOPES TO BE BLANKETED WITH SC-150 OR APPROVED EQUIVALENT EROSION CONTROL

LEGEND:

	EMERGENCY OVERFLOW
	PROPOSED RIPRAP
	MAINTENANCE/ACCESS ROAD ABOVE EURV
	MAINTENANCE/ACCESS ROAD BELOW EURV
	123 LOT NUMBER OR TRACT
	100 YR WATER SURFACE
	EURV WATER SURFACE

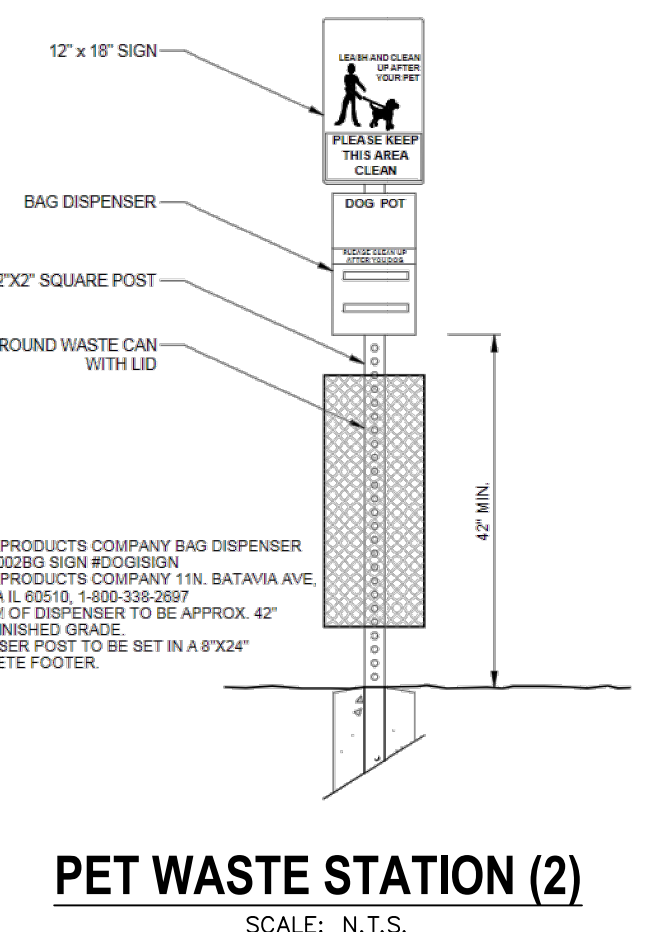
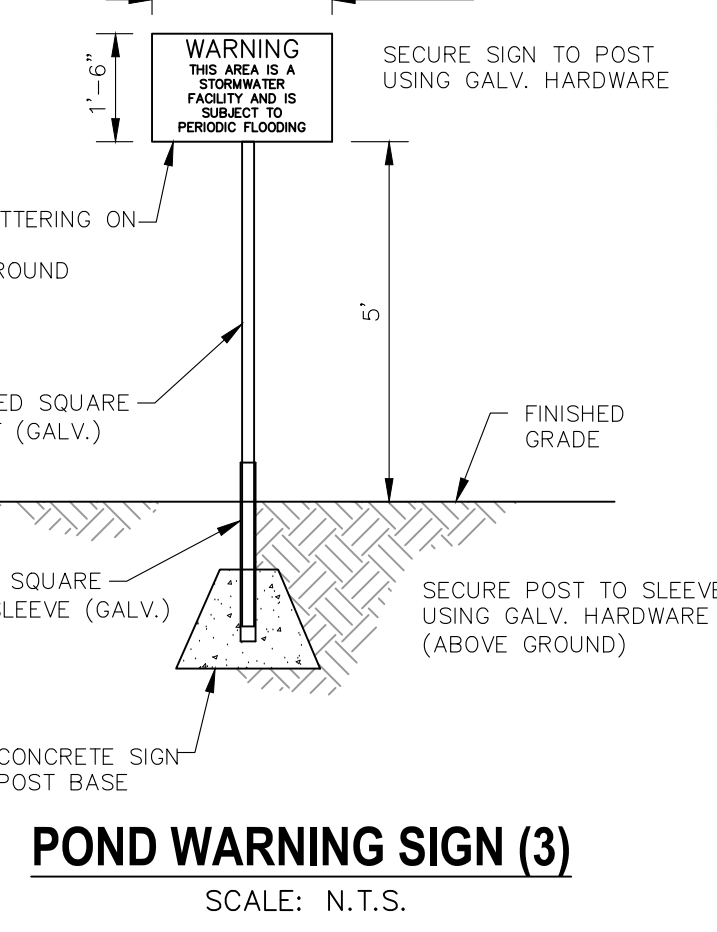
ABBREVIATIONS:

AR	ACCESS ROAD/TRAIL
BERM	TOP OF BERM
DIA	DIAMETER
RCP	REINFORCED CONCRETE PIPE
BOP	BOTTOM OF PIPE
TOP	TOP OF PIPE
TOB	TOP OF BOX
MH	MANHOLE
FB	FOREBAY
TC	TRICKLE CHANNEL
RR	RIPRAP
SP	SPILLWAY
E.O.	EMERGENCY OVERFLOW
EX	EXISTING
PROP	PROPOSED
EL	ELEVATION
FG	FINISH GRADE
LF	LINEAR FEET
STA	STATION
NTS	NOT TO SCALE



FULL SPECTRUM DETENTION POND DATA

WQ WATER SURFACE EL = 6291.03	6291.06
WQ VOLUME = 0.863 AC-FT	
EURV WATER SURFACE EL = 6293.74	6293.75
EURV VOLUME = 3.295 AC-FT	
100-YR WATER SURFACE EL = 6294.96	6295.01
SPILLWAY CREST EL = 6294.98	6295.22
TOP OF EMBANKMENT EL = 6297.00	6296.72
100-YR VOLUME = 4.668 AC-FT	4.690 AC-FT
CALC 100-YR INFLOW = 216.6 CFS	
100-YR RELEASE = 82.7 CFS	
100-YR RELEASE = 11.4 CFS	



CROSSROADS MIXED USE FILING NO. 1

PERMANENT BMP PLAN

PROJECT NO. 18-003
DATE: 04/20/2022
SCALE: HORIZONTAL: VERTICAL: N/A
DESIGNED BY: CWV
DRAWN BY: CWV
CHECKED BY: DLM

217 N. WAHATCH AVE., STE 305
COLORADO SPRINGS, CO 80903
PHONE: 719.555.5485

CIVIL CONSULTANTS, INC.

FOR AND ON BEHALF OF M&S CIVIL CONSULTANTS, INC.

VIRGIL A. SANCHEZ, COLORADO, P.E. NO. 371160

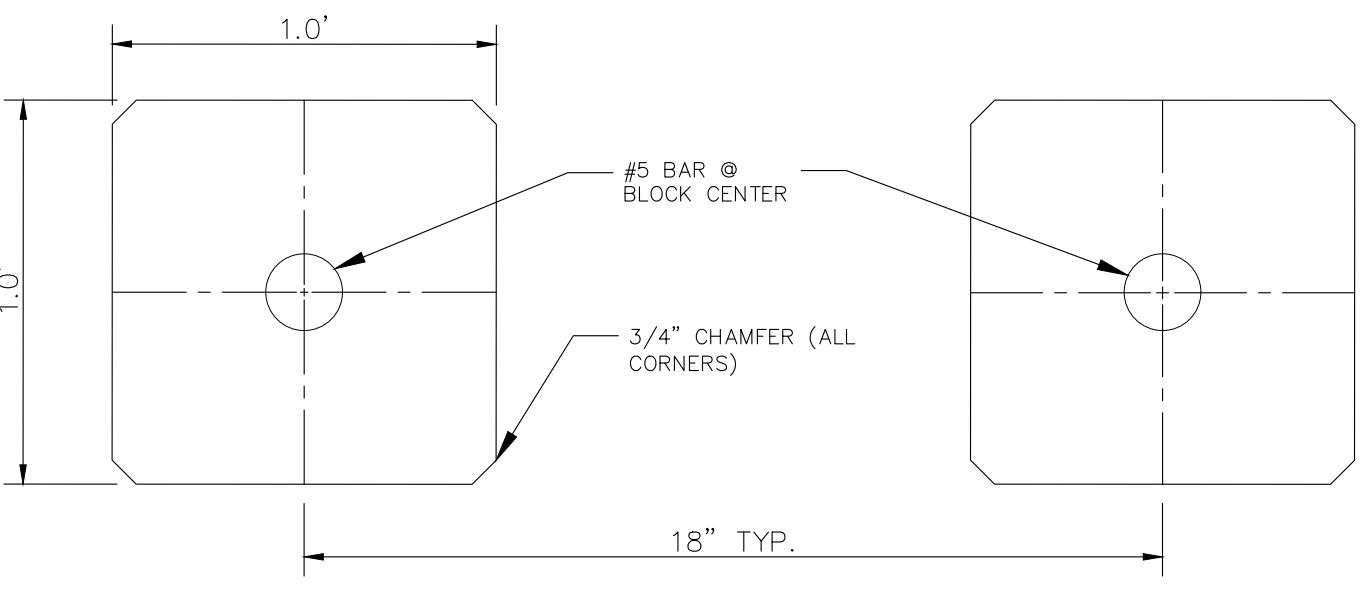
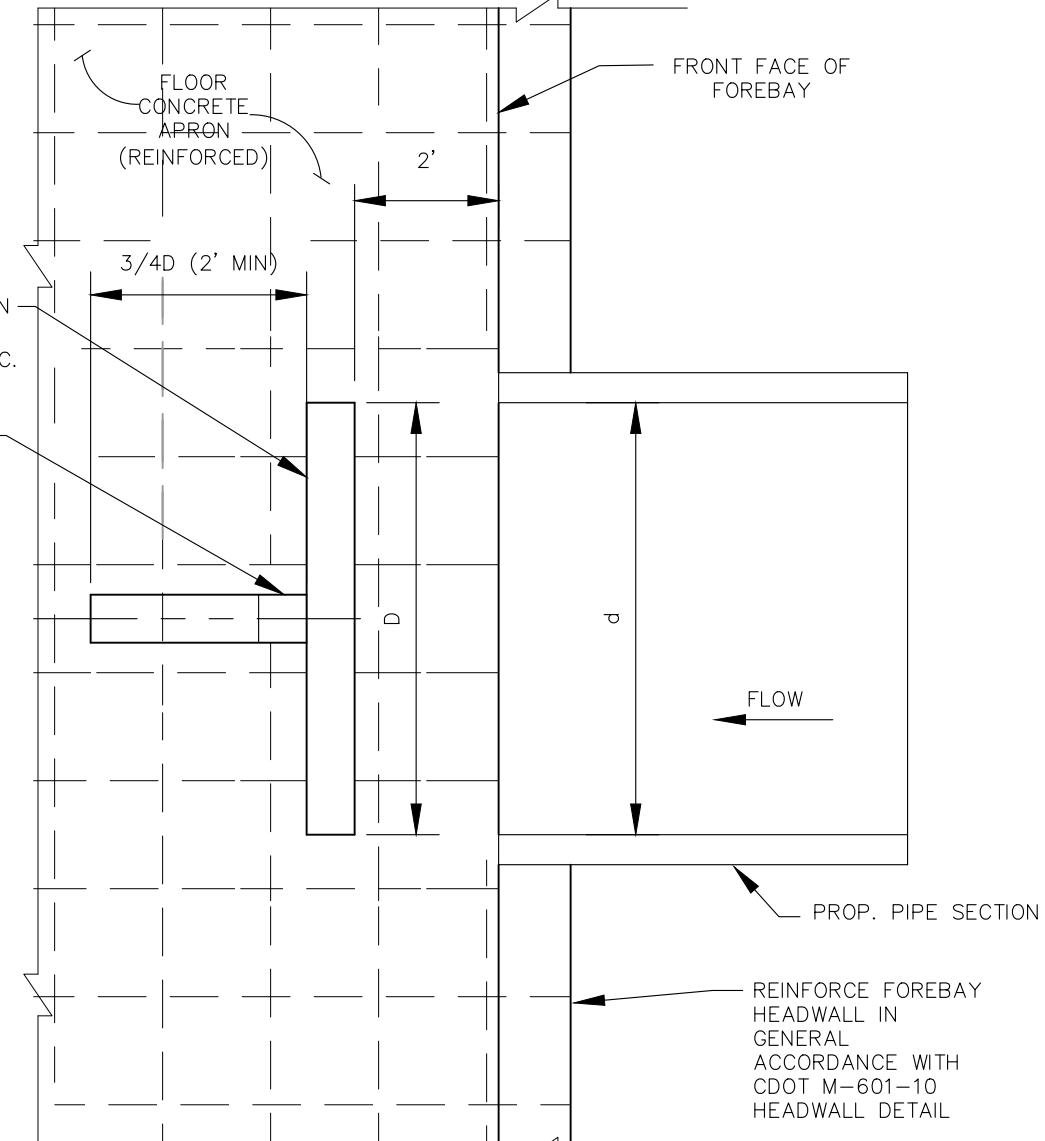
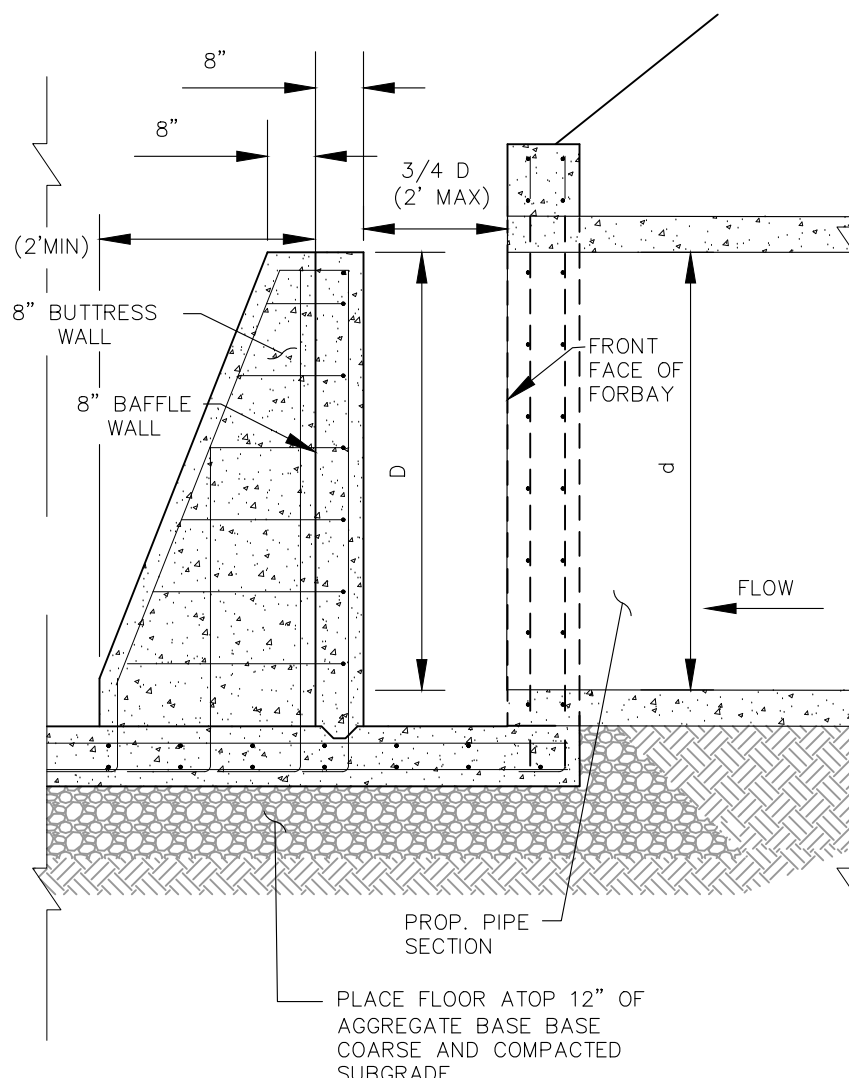
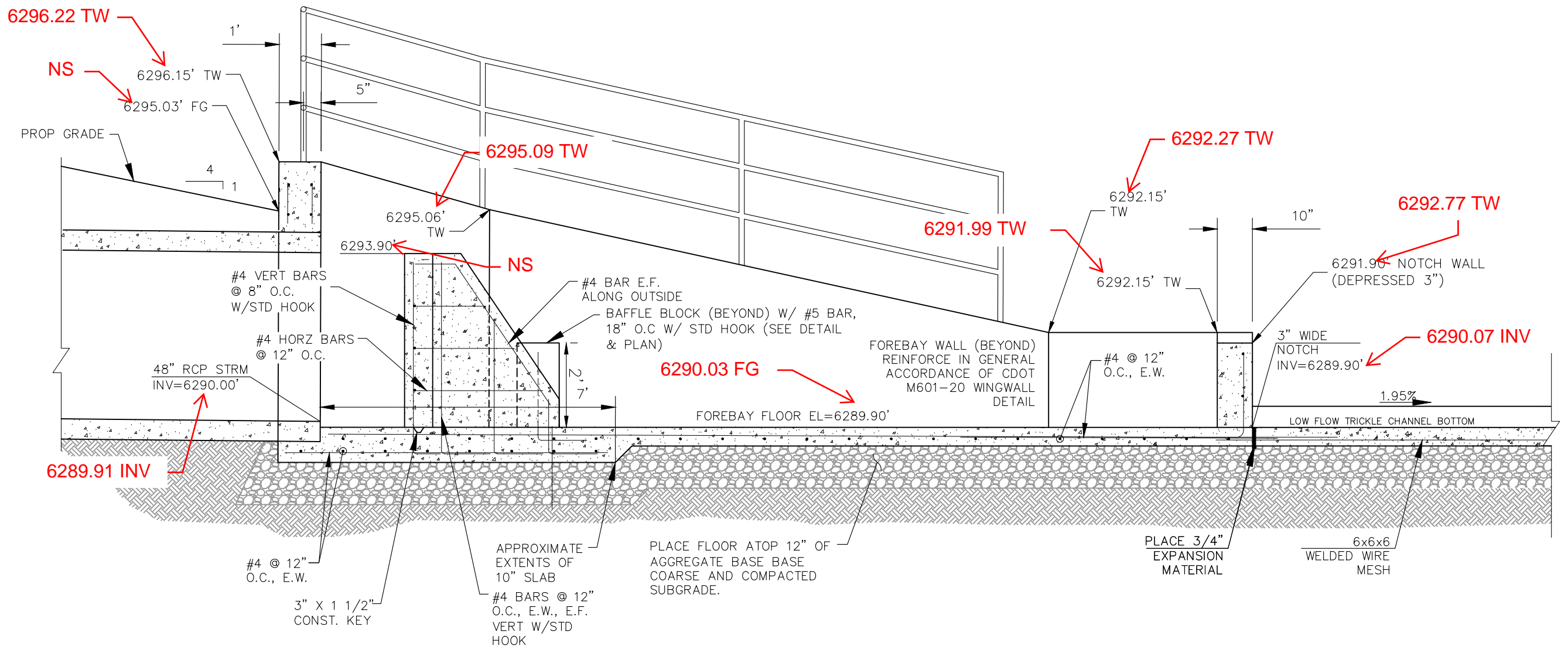
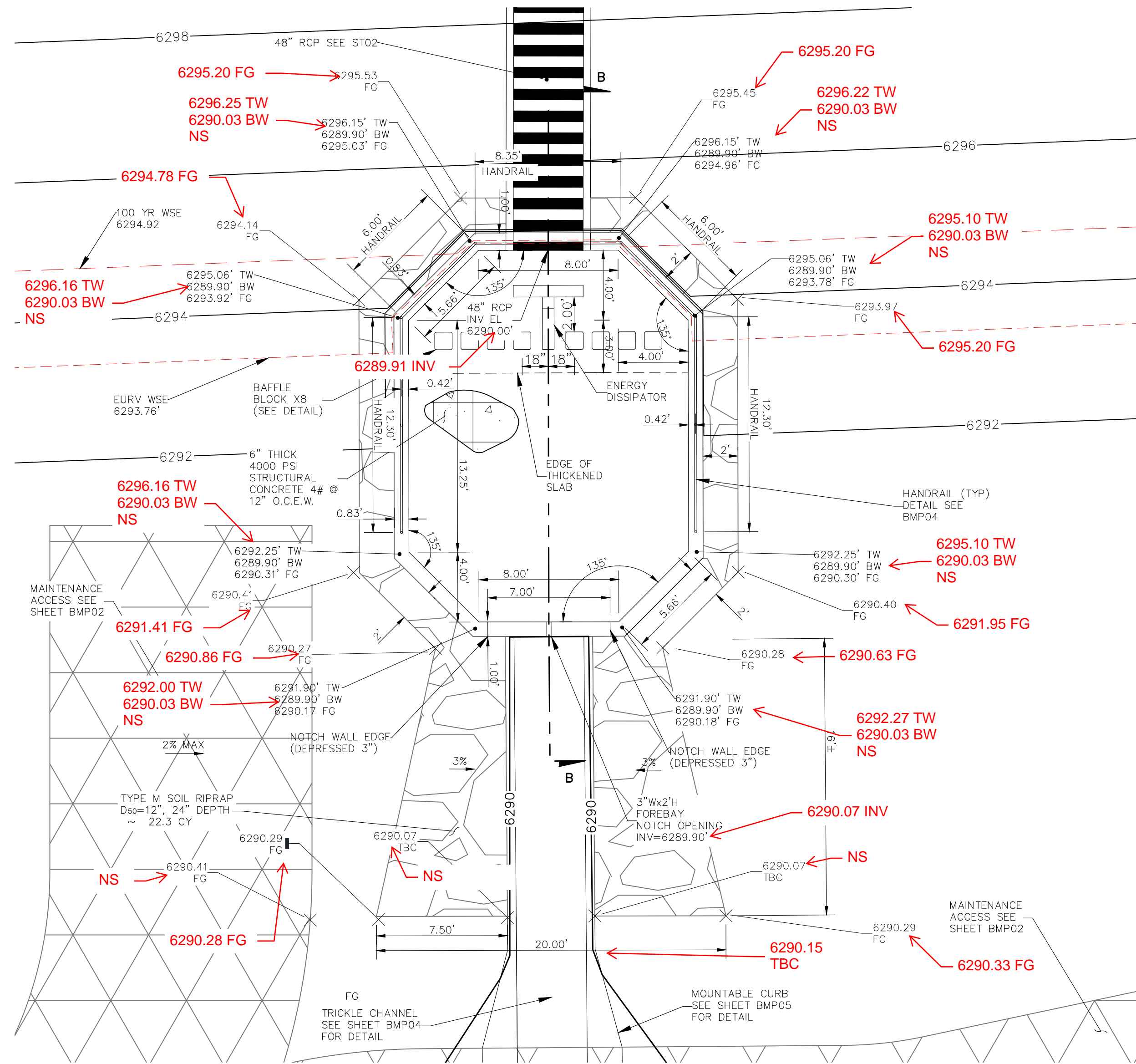
FOR BUREAU OF UTILITIES INFORMATION
48 HRS BEFORE YOU DIG
CALL 1-800-922-1987

REVISIONS: NO. DATE: BY: DESCRIPTION:

THE ENGINEER PREPARING THESE PLANS WILL NOT BE RESPONSIBLE, OR LIABLE FOR, UNAUTHORIZED CHANGES TO OR USES OF THESE PLANS. ALL CHANGES TO THE PLANS MUST BE IN WRITING AND MUST BE APPROVED BY THE PREPARER OF THESE PLANS.

CAUTION

File: C:\18003A-Crossroads Mixed Use\BMP Plans\18003A-BMP01.dwg Plotted: 4/14/2022 11:34 AM



AS-BUILT ENGINEERING RECORD DRAWINGS



EPC 6/9/2022

FOR LOCATING & MARKING GAS, ELECTRIC, WATER & TELEPHONE LINES

FOR BURIED UTILITY INFORMATION 48 HRS BEFORE YOU DIG CALL 1-800-922-1987

CROSSROADS MIXED USE FILING NO. 1

FOREBAY DETAILS

PROJECT NO. 18-003
DATE: 04/20/2022
SCALE: HORIZONTAL: N/A
VERTICAL: N/A
DESIGNED BY: CW
DRAWN BY: CW
CHECKED BY: DLM

217 N. WAHATCH AVE., STE 305
COLORADO SPRINGS, CO 80903
PHONE: 719.555.5485

CIVIL CONSULTANTS, INC.

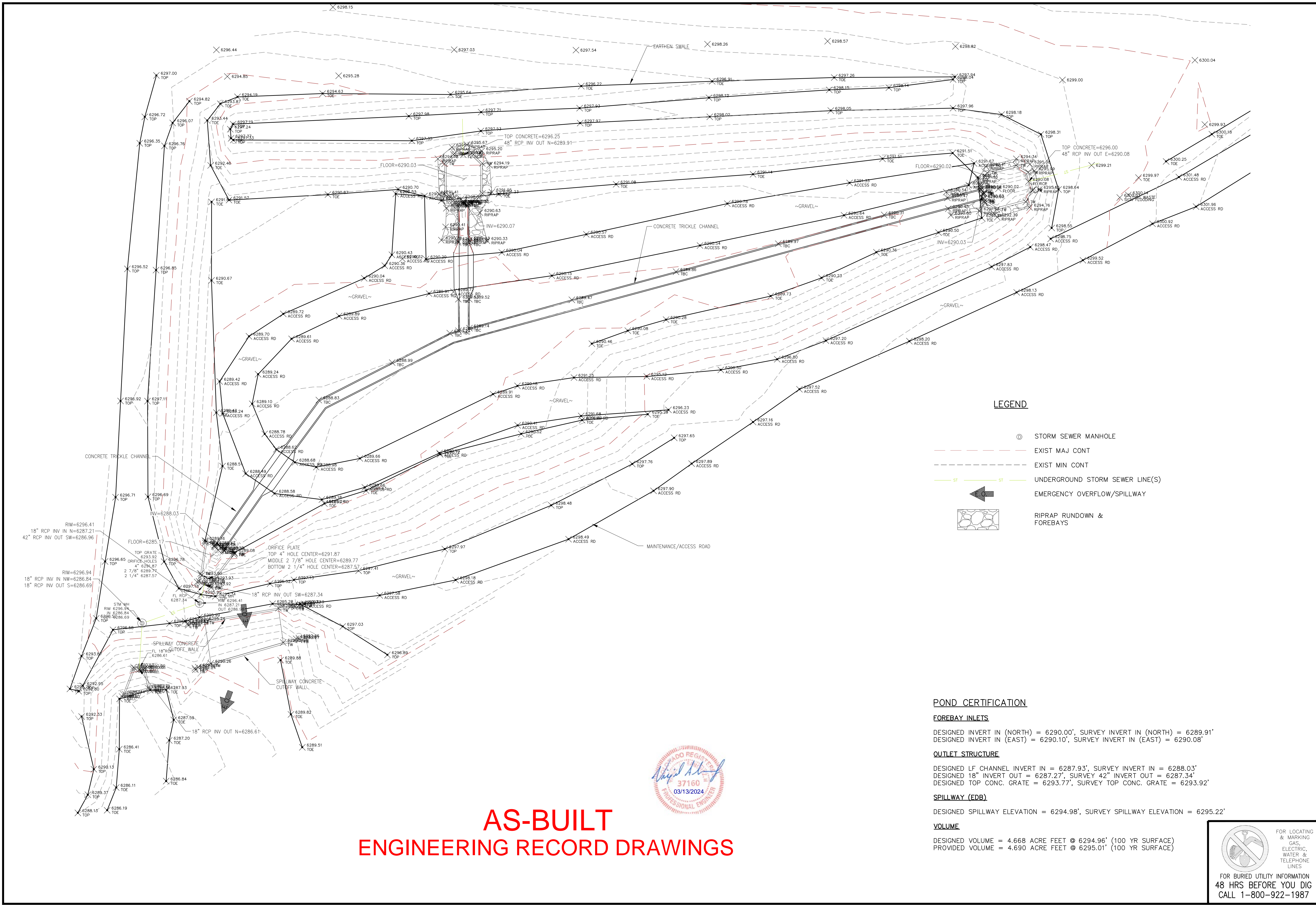
FOR AND ON BEHALF OF MRS. CIVIL CONSULTANTS, INC.

PROFESSIONAL ENGINEER
37160
0505122

REVISIONS:
NO. DATE BY DESCRIPTION

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CAUTION



LEGEND

- ⊙ STORM SEWER MANHOLE
- EXIST MAJ CONT
- EXIST MIN CONT
- UNDERGROUND STORM SEWER LINE(S)
- ← EMERGENCY OVERTFLOW/SPILLWAY
- ⊘ RIPRAP RUNDOWN & FOREBAYS

POND CERTIFICATION

FOREBAY INLETS
 DESIGNED INVERT IN (NORTH) = 6290.00', SURVEY INVERT IN (NORTH) = 6289.91'
 DESIGNED INVERT IN (EAST) = 6290.10', SURVEY INVERT IN (EAST) = 6290.08'

OUTLET STRUCTURE
 DESIGNED LF CHANNEL INVERT IN = 6287.93', SURVEY INVERT IN = 6288.03'
 DESIGNED 18" INVERT OUT = 6287.27', SURVEY 42" INVERT OUT = 6287.34'
 DESIGNED TOP CONC. GRATE = 6293.77', SURVEY TOP CONC. GRATE = 6293.92'

SPILLWAY (EDB)
 DESIGNED SPILLWAY ELEVATION = 6294.98', SURVEY SPILLWAY ELEVATION = 6295.22'

VOLUME
 DESIGNED VOLUME = 4.668 ACRE FEET @ 6294.96' (100 YR SURFACE)
 PROVIDED VOLUME = 4.690 ACRE FEET @ 6295.01' (100 YR SURFACE)



**AS-BUILT
 ENGINEERING RECORD DRAWINGS**

CROSSROADS MIXED USE FILING NO. 1	
PERMANENT BMP PLAN	
PROJECT NO. 18-003	DATE: 04/14/2022
DESIGNED BY: CW	HORIZONTAL: N/A
DRAWN BY: CW	VERTICAL: N/A
CHECKED BY: DLM	BMP01
SHEET 20 OF 24	

212 N. WAHATCH AVE, STE 305
 COLORADO SPRINGS, CO 80903
 PHONE 719.555.5485

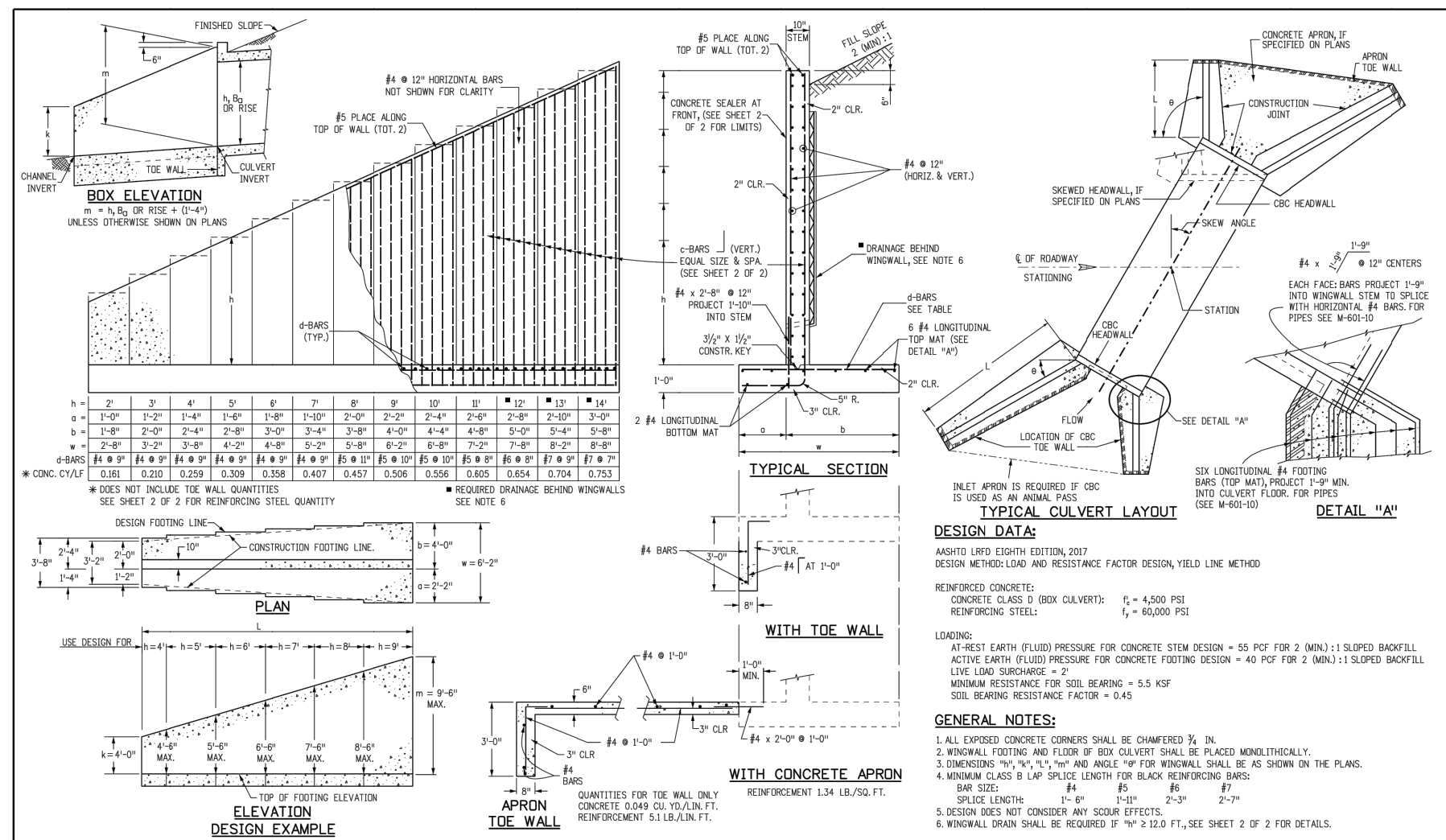
FOR AND ON BEHALF OF
 MRS. CIVIL CONSULTANTS, INC.

VIRGIL A. SANCHEZ, COLORADO P.E. NO. 37160	DATE: _____
APPROV'D. BY: _____	DATE: _____
DESCRIPTION: _____	DATE: _____
NO. _____	DATE: _____

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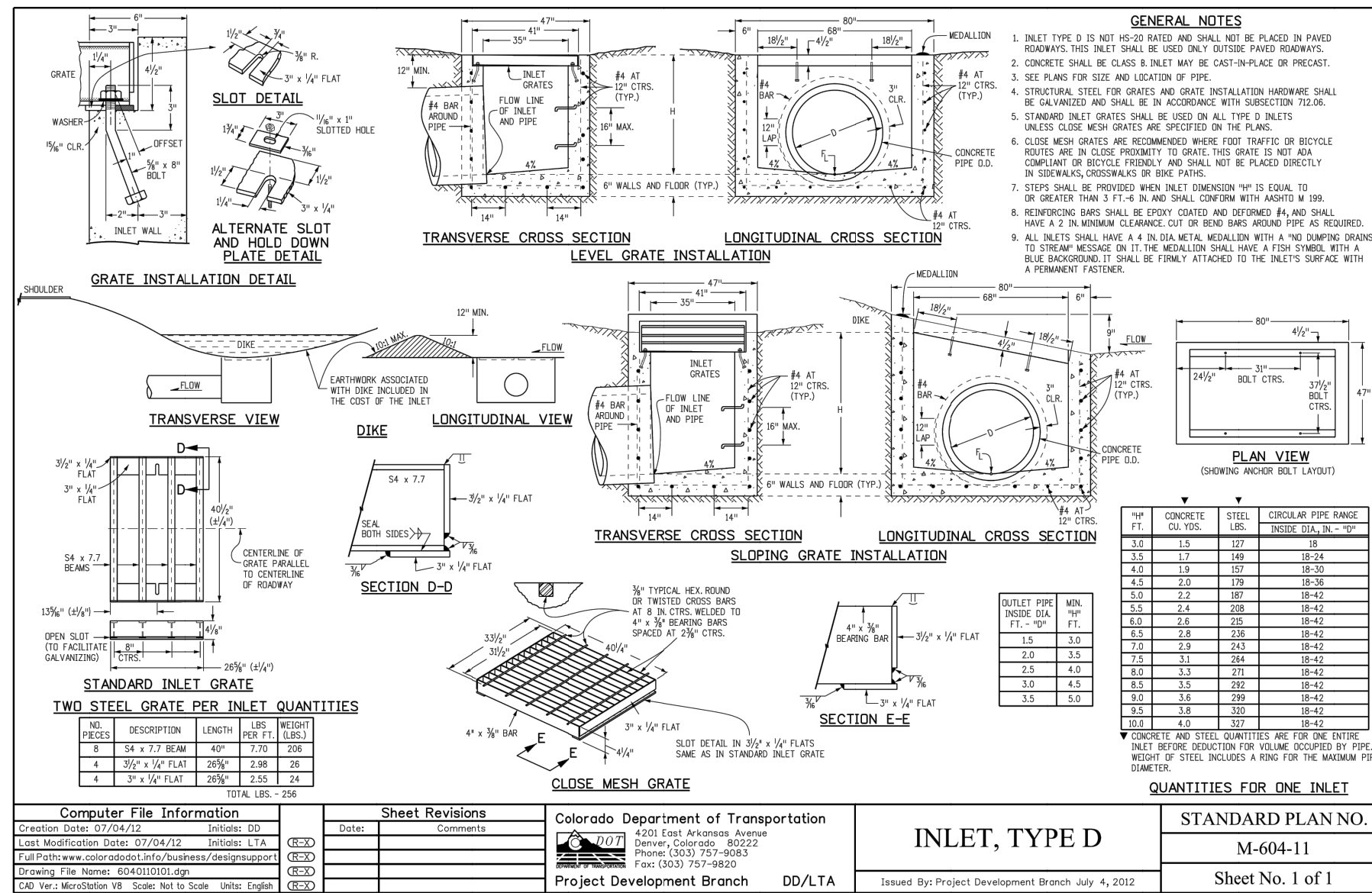
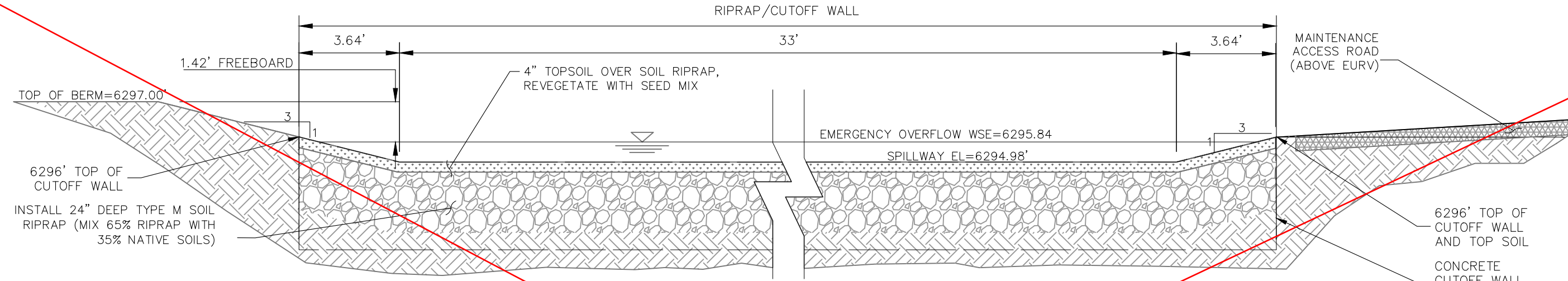
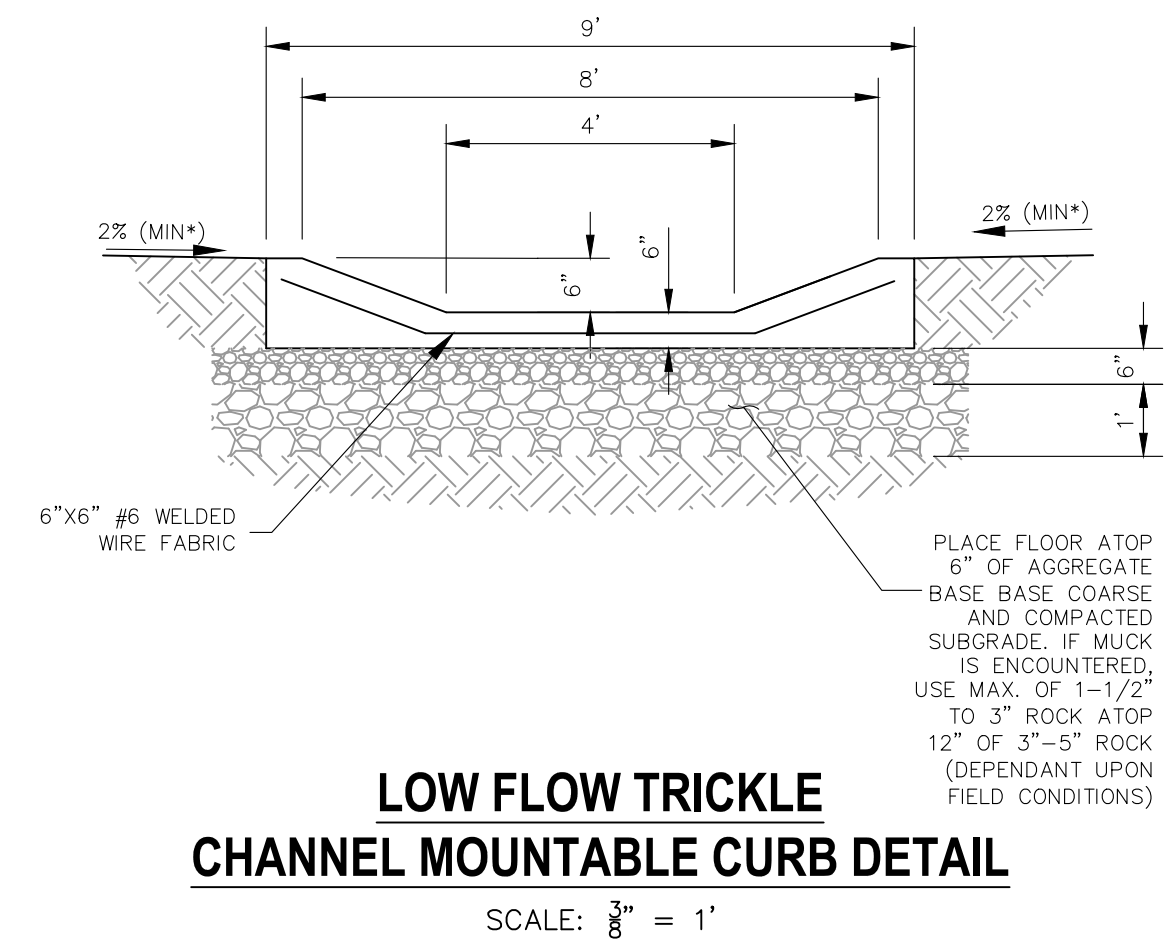
**FOR BURIED UTILITY INFORMATION
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CAUTION

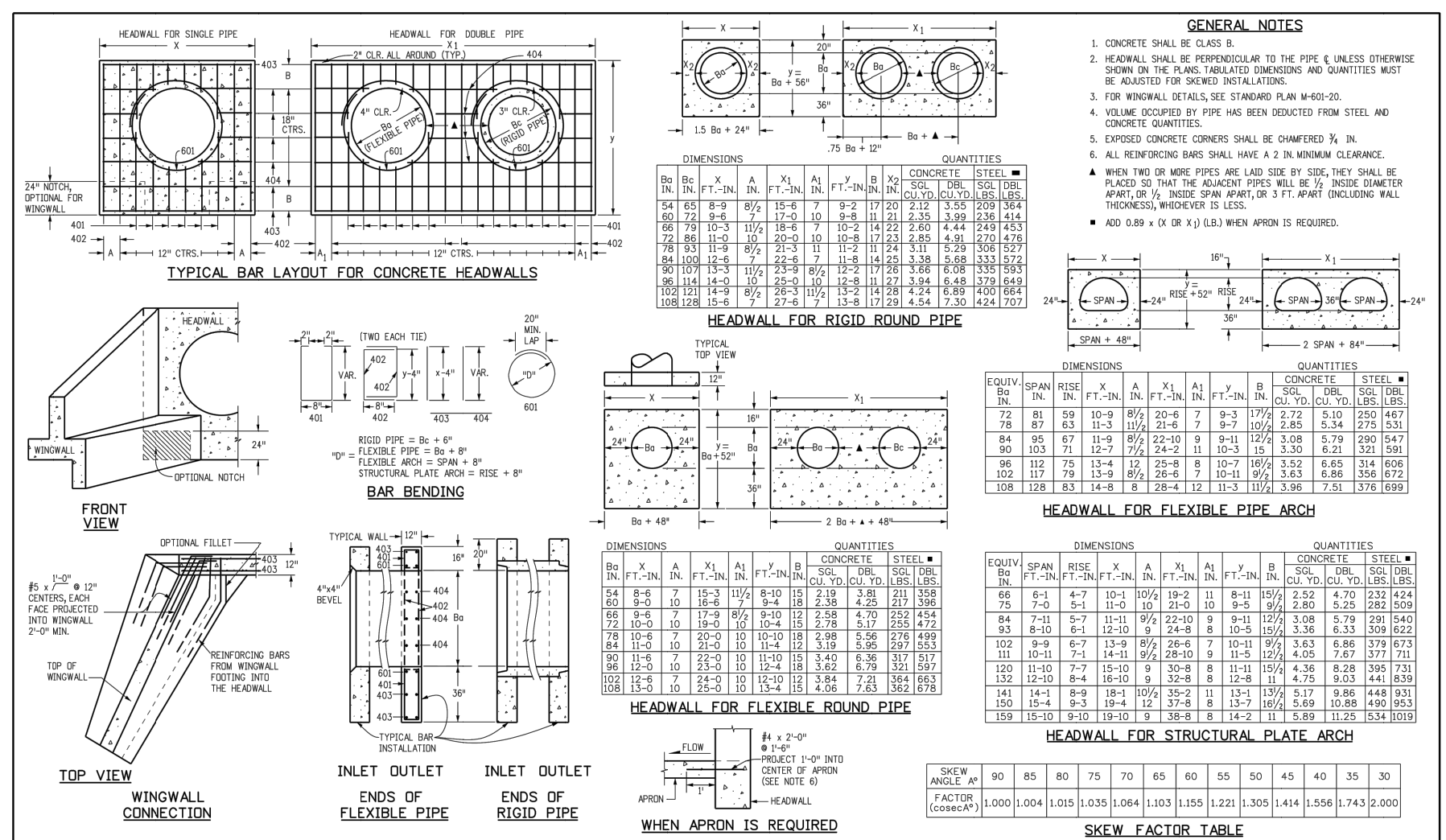
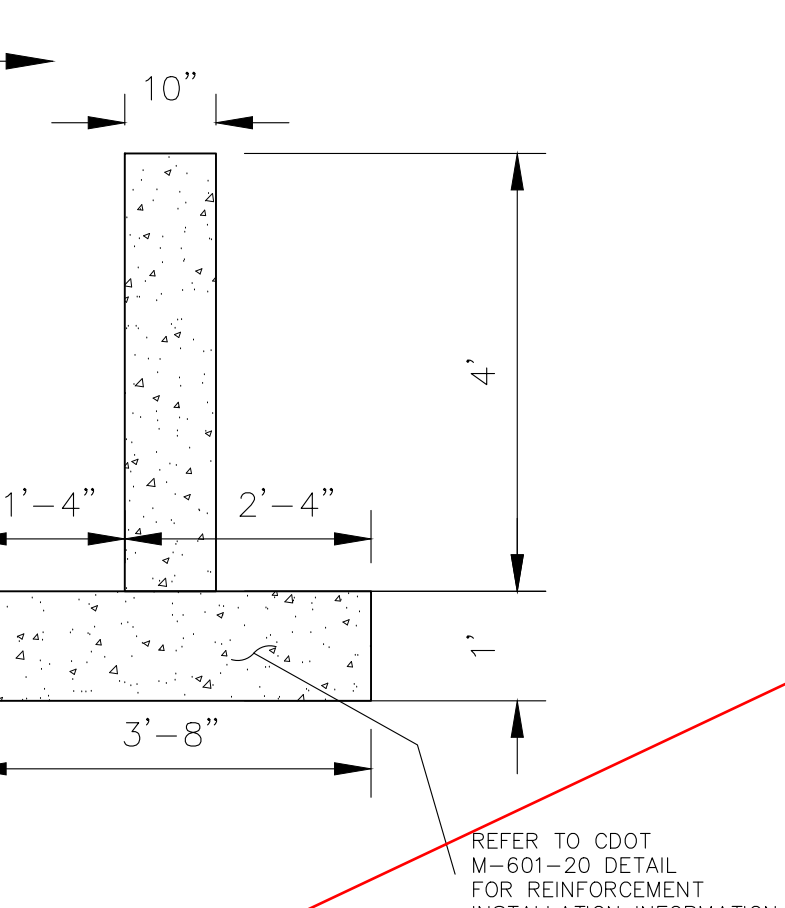


Computer File Information	Sheet Revisions	Colorado Department of Transportation	STANDARD PLAN NO.
Creation Date: 07/20/22	01	215 West Nevada Ave	M-601-20
Designer: JKB	Comments	Denver, CO 80202	Standard Sheet No. 1 of 2
Checker: LTA		Phone: 303-757-9023 FAX: 303-757-9988	Project Sheet Number:
CDOT No. M-601-20		Project Development Branch	

- SOIL RIPRAP NOTES:**
1. THE SOIL MATERIAL SHALL BE NATIVE OR TOPSOIL AND MIXED WITH SIXTY FIVE PERCENT (65%) RIPRAP AND THIRTY FIVE PERCENT (35%) SOIL BY VOLUME.
 2. SOIL RIPRAP SHALL CONSIST OF A UNIFORM MIXTURE OF SOIL AND RIPRAP WITHOUT VOIDS.
 3. CONTRACTOR SHALL COOPERATE WITH ENGINEER IN OBTAINING AND PROVIDED SAMPLES OF ALL SPECIFIED MATERIALS.
 4. CONTRACTOR SHALL SUBMIT CERTIFIED LABORATORY TEST CERTIFICATES FOR ALL ITEMS REQUIRED FOR SOIL RIPRAP.
 5. RIPRAP USED SHALL BE THE TYPE DESIGNATED ON THE DRAWINGS AND SHALL CONFORM TO TABLE SHOWN TO THE RIGHT.
 6. THE RIPRAP DESIGNATION AND TOTAL THICKNESS OF RIPRAP SHALL BE AS SHOWN ON THE DRAWINGS. THE MAXIMUM STONE SIZE SHALL NOT LARGER THAN THE THICKNESS OF THE RIPRAP.
 7. NEITHER WIDTH NOR THICKNESS OF A SINGLE STONE OF RIPRAP SHALL BE LESS THAN ONE-THIRD ($\frac{1}{3}$) OF ITS LENGTH.
 8. THE SPECIFIC GRAVITY OF THE RIPRAP SHALL BE TWO AND ONE-HALF (2.5) OR GREATER.
 9. MINIMUM DENSITY FOR ACCEPTABLE RIPRAP SHALL BE ONE HUNDRED AND SIXTY FIVE (165) POUNDS PER CUBIC FOOT.
 10. RIPRAP SPECIFIC GRAVITY SHALL BE ACCORDING TO THE BULK-SATURATED, SURFACE-DRY BASIS, IN ACCORDANCE WITH AASHTO T85.
 11. BROKEN CONCRETE OR ASPHALT PAVEMENT SHALL NOT BE ACCEPTABLE FOR USE IN THE WORK.
 12. ROUNDED RIPRAP (RIVER ROCK) IS NOT ACCEPTABLE, UNLESS SPECIFICALLY DESIGNATED ON THE DRAWINGS.



Computer File Information	Sheet Revisions	Colorado Department of Transportation	STANDARD PLAN NO.
Creation Date: 07/20/22	01	215 West Nevada Ave	M-604-11
Designer: JKB	Comments	Denver, CO 80202	Project Sheet Number:
Checker: LTA		Phone: 303-757-9023 FAX: 303-757-9988	
CDOT No. M-604-11		Project Development Branch	



Computer File Information	Sheet Revisions	Colorado Department of Transportation	STANDARD PLAN NO.
Creation Date: 07/20/22	01	215 West Nevada Ave	M-601-10
Designer: JKB	Comments	Denver, CO 80202	Project Sheet No. 1 of 1
Checker: LTA		Phone: 303-757-9023 FAX: 303-757-9988	Project Sheet Number:
CDOT No. M-601-10		Project Development Branch	

REFER TO SHEET X FOR MODIFIED SPILLWAY AS-DESIGNED/AS-BUILT



AS-BUILT ENGINEERING RECORD DRAWINGS

EPC 6/9/2022

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CROSSROADS MIXED USE FILING NO. 1

MISCELLANEOUS DETAILS

PROJECT NO. 18-003 DATE: 04/20/2022

DESIGNED BY: CWV HORIZONTAL: N/A

DRAWN BY: CWV VERTICAL: N/A

CHECKED BY: DLM

BMP05

212 N WAHATCH AVE, STE 305
COLORADO SPRINGS, CO 80903
PHONE 719.555.5485

CIVIL CONSULTANTS, INC.

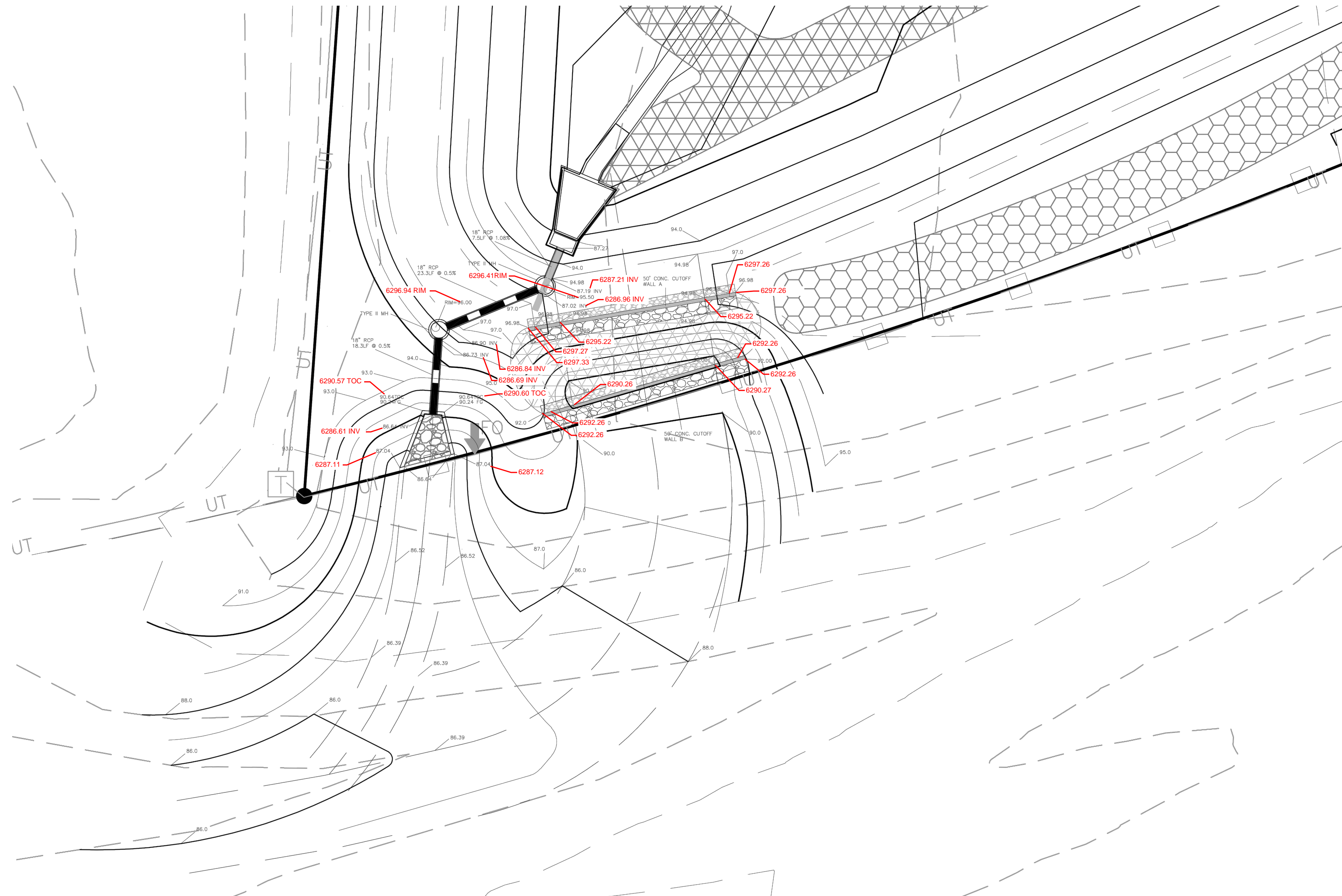
FOR AND ON BEHALF OF M&S CIVIL CONSULTANTS, INC.

REGISTERED PROFESSIONAL ENGINEER
37160
05/03/22

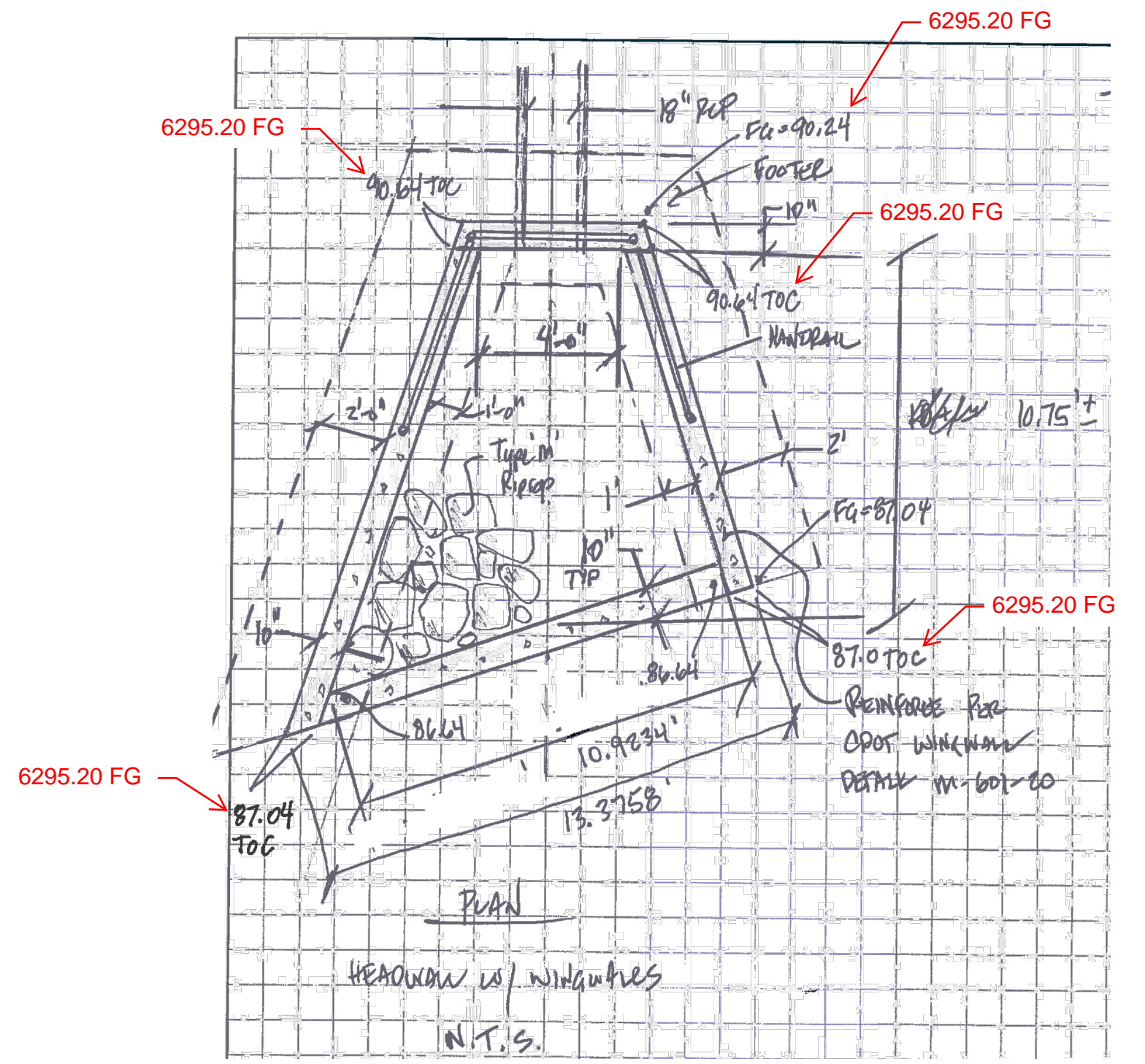
REVISIONS: NO. DATE: BY: DESCRIPTION:

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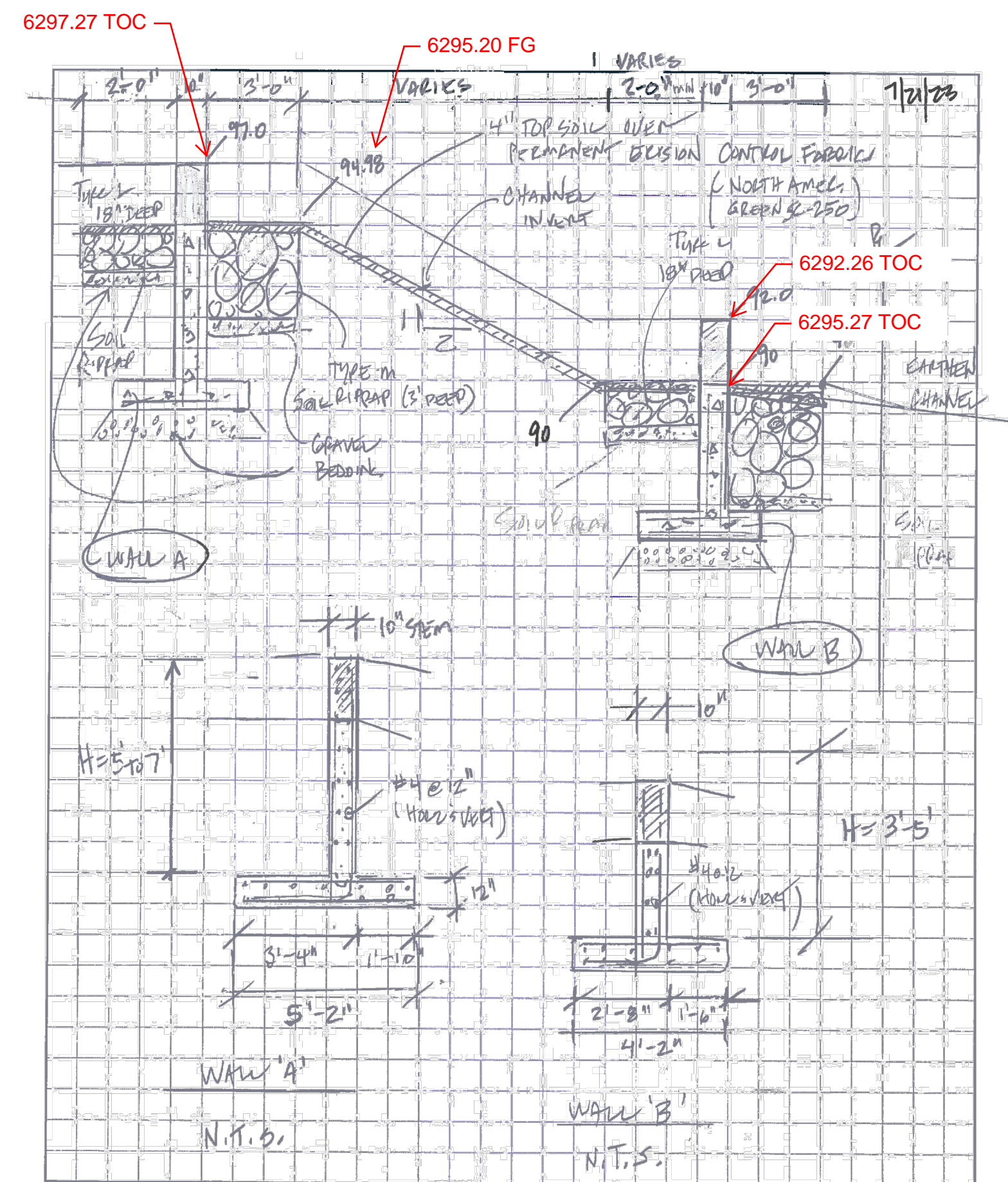
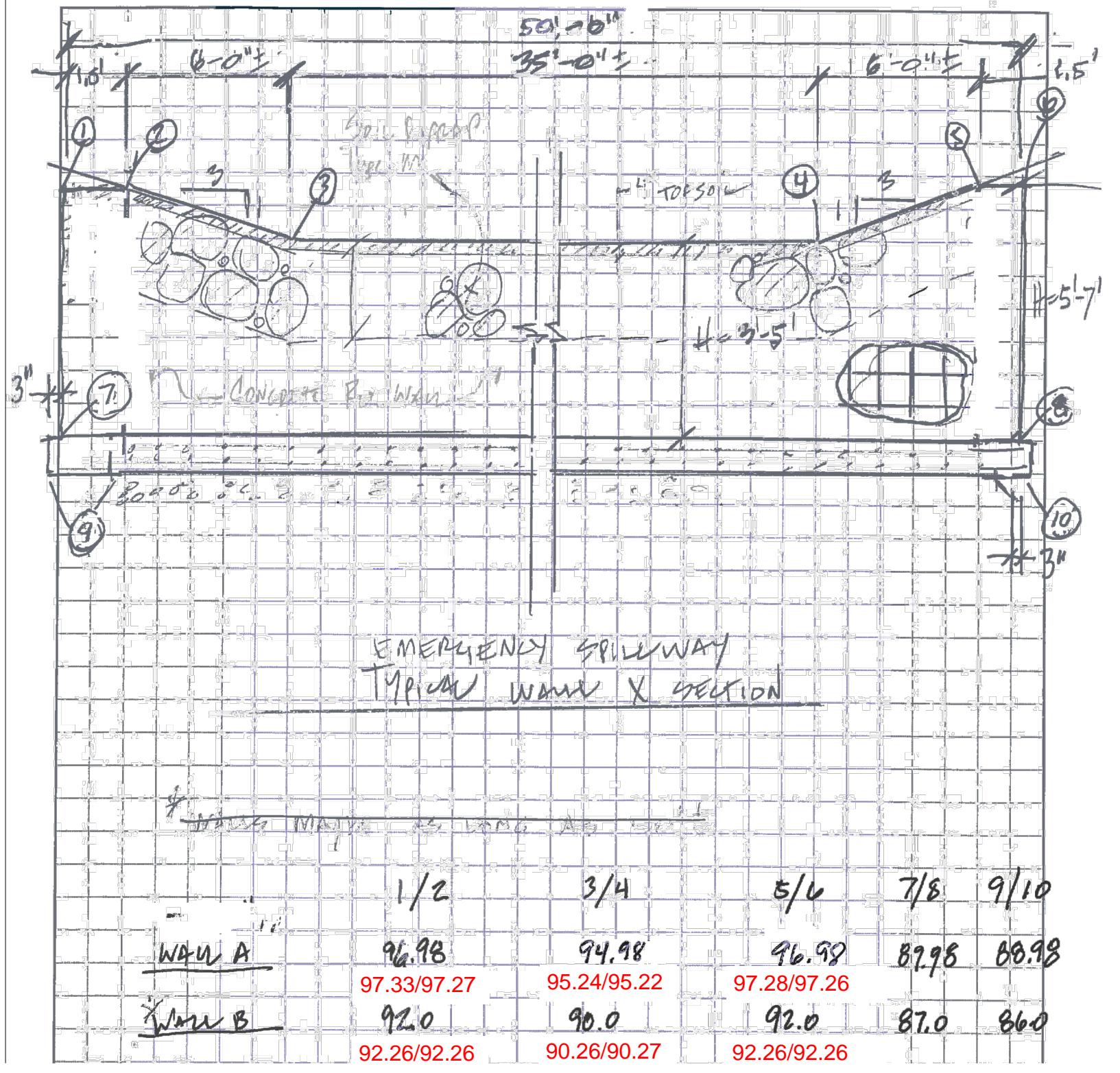
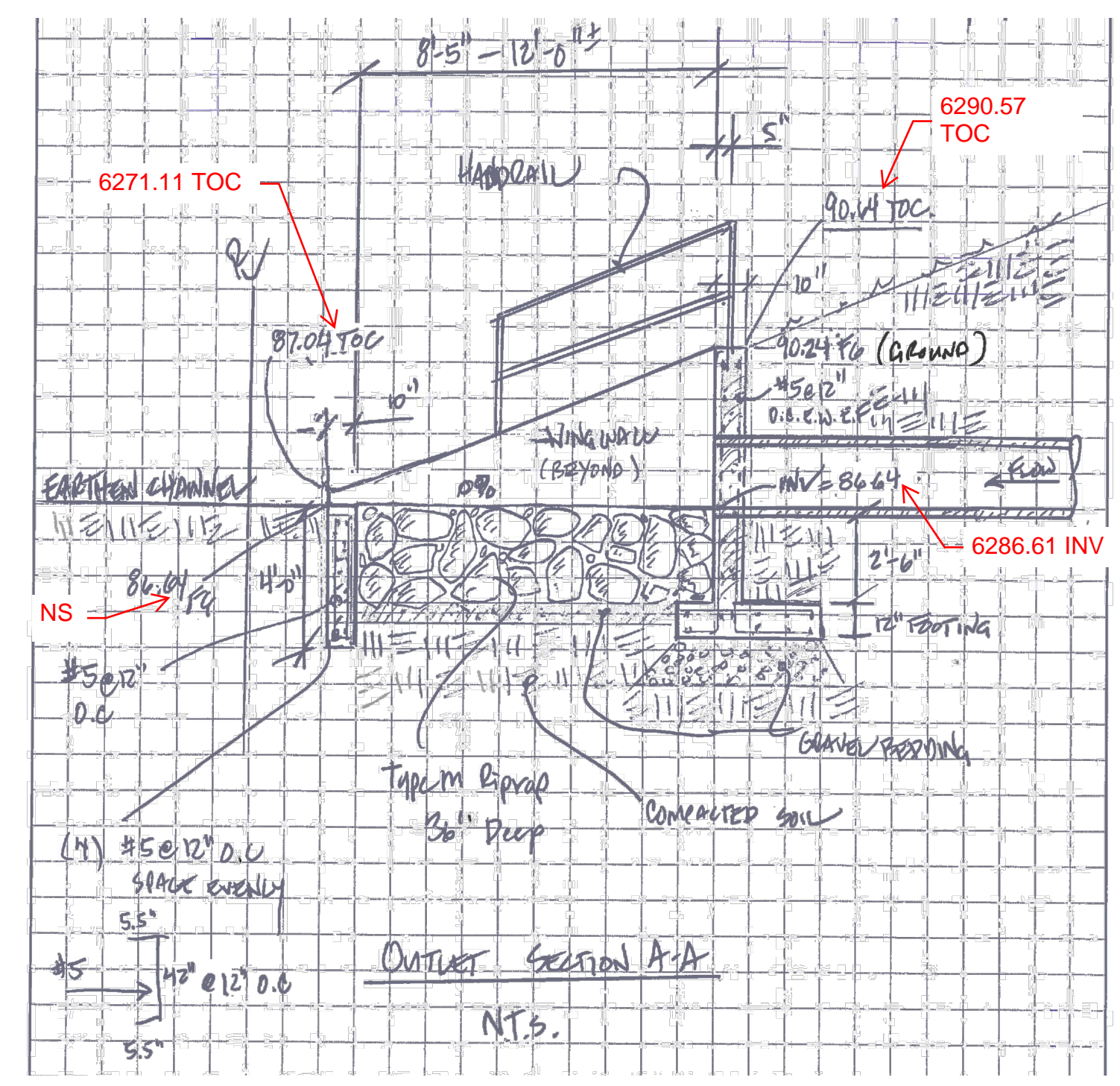
CAUTION



OUTLET REDESIGN PER CDOT REQUEST TO REMOVE ALL IMPROVEMENTS FROM RIGHT-OF-WAY



AS-BUILT ENGINEERING RECORD DRAWINGS



CROSSROADS MIXED USE FILING NO. 1
PERMANENT BMP PLAN
PROJECT NO. 18-003
SCALE: HORIZONTAL: DATE: 04/14/2022
DESIGNED BY: CW
DRAWN BY: CW
CHECKED BY: DLM
VERTICAL: N/A

210 N. WAHATCH AVE., STE. 305
COLORADO SPRINGS, CO 80903
PHONE 719.555.5885

FOR AND ON BEHALF OF
MRS. CIVIL CONSULTANTS, INC.

VIRGIL A. SANCHEZ, COLORADO, P.E. NO. 37160

NO. DATE: BY: DESCRIPTION: APPROV. BY: DATE:

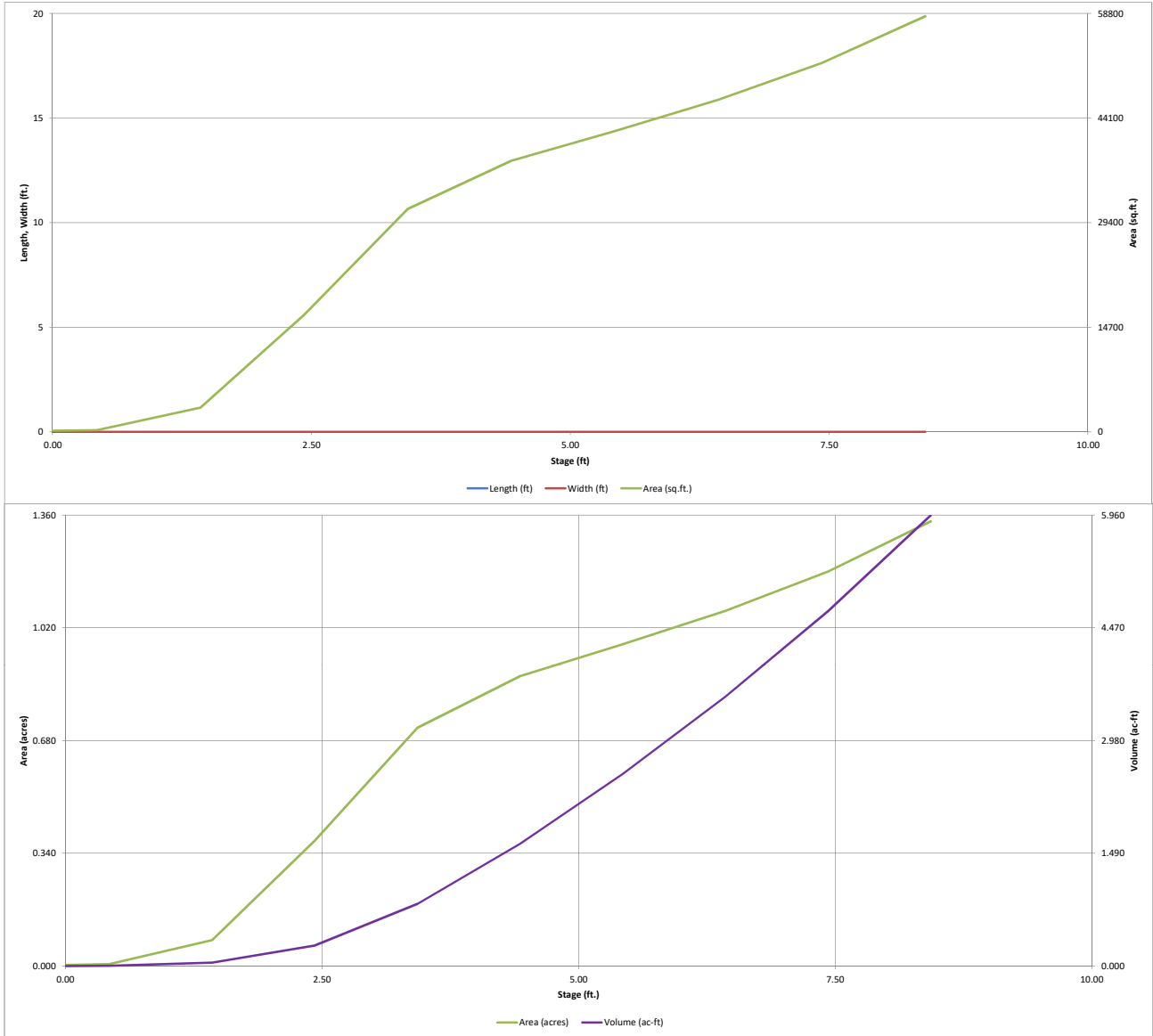
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CAUTION



DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)

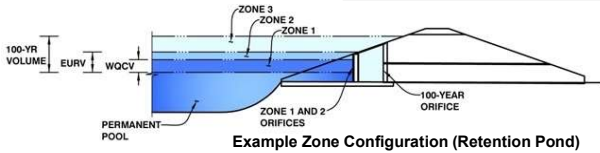


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.03 (May 2020)

Project: CROSSROADS MIXED USE

Basin ID: POND 1



	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.49	0.859	Orifice Plate
Zone 2 (EURV)	6.18	2.433	Orifice Plate
Zone 3 (100-year)	7.46	1.430	Weir&Pipe (Restrict)
Total (all zones)		4.723	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)
Underdrain Orifice Diameter =	N/A	inches

Calculated Parameters for Underdrain

Underdrain Orifice Area =	N/A	ft ²
Underdrain Orifice Centroid =	N/A	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	6.18	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	N/A	inches
Orifice Plate: Orifice Area per Row =	N/A	inches

Calculated Parameters for Plate

WQ Orifice Area per Row =	N/A	ft ²
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
Elliptical Slot Area =	N/A	ft ²

4.3 per redlines on Sht 23 of as-built CDs

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	2.20	4.10					
Orifice Area (sq. inches)	3.98	6.49	12.57					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =	N/A	N/A	inches

Calculated Parameters for Vertical Orifice

	Not Selected	Not Selected	
Vertical Orifice Area =	N/A	N/A	ft ²
Vertical Orifice Centroid =	N/A	N/A	feet

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir (and No Outlet Pipe))

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	6.35	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	5.71	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V
Horiz. Length of Weir Sides =	2.91	N/A	feet
Overflow Grate Open Area % =	70%	N/A	%, grate open area/total area
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected	
Height of Grate Upper Edge, H _u =	6.35	N/A	feet
Overflow Weir Slope Length =	2.91	N/A	feet
Grate Open Area / 100-yr Orifice Area =	13.16	N/A	
Overflow Grate Open Area w/o Debris =	11.63	N/A	ft ²
Overflow Grate Open Area w/ Debris =	5.81	N/A	ft ²

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.23	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	18.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	9.00		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	0.88	N/A	ft ²
Outlet Orifice Centroid =	0.43	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	1.57	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage =	7.65	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	33.00	feet
Spillway End Slopes =	3:00	H:V
Freeboard above Max Water Surface =	1.00	feet

Calculated Parameters for Spillway

Spillway Design Flow Depth =	0.85	feet
Stage at Top of Freeboard =	9.50	feet
Basin Area at Top of Freeboard =	1.34	acres
Basin Volume at Top of Freeboard =	5.96	acre-ft

35 per redlines on Sht 25 of as-built CDs

Routed Hydrograph Results

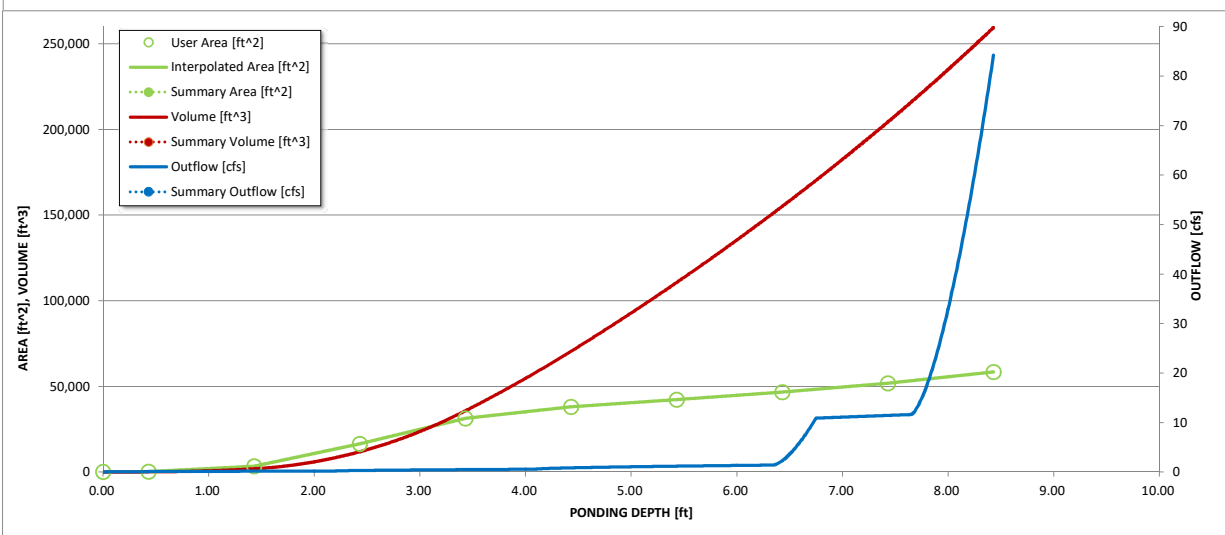
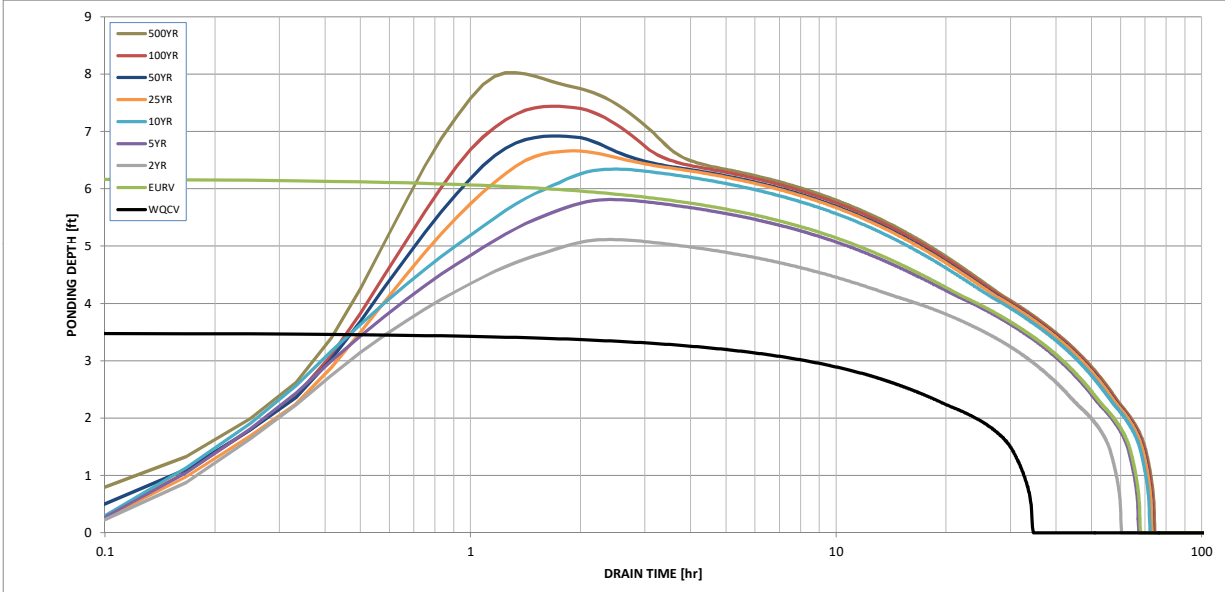
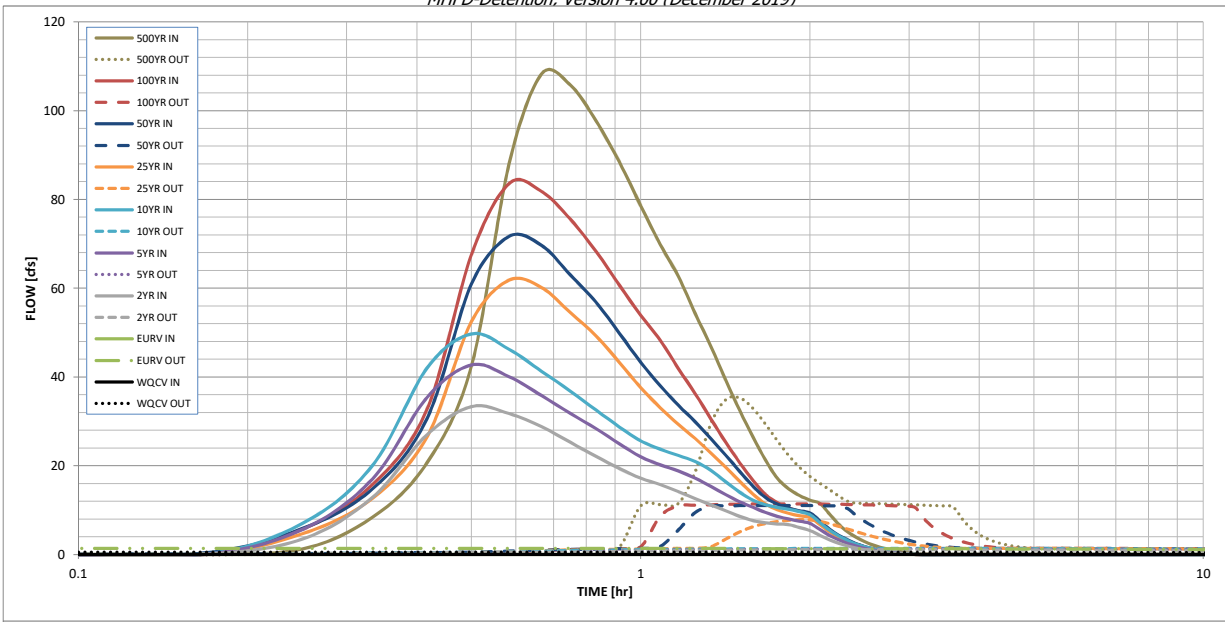
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
CUHP Runoff Volume (acre-ft) =	0.859	3.293	2.407	3.122	3.696	4.394	5.058	5.833	7.551
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	2.407	3.122	3.696	4.394	5.058	5.833	7.551
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.2	0.3	0.5	5.1	9.2	14.8	26.5
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.01	0.01	0.16	0.29	0.46	0.82
Peak Inflow Q (cfs) =	N/A	N/A	33.3	42.7	49.7	61.8	71.7	83.5	108.3
Peak Outflow Q (cfs) =	0.5	1.4	1.1	1.3	1.4	7.9	11.0	11.4	35.3
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	3.8	3.0	1.5	1.2	0.8	1.3
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Plate	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	0.6	0.8	0.8	0.9
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	32	60	54	60	64	63	62	61	59
Time to Drain 99% of Inflow Volume (hours) =	34	65	58	64	69	69	69	69	68
Maximum Ponding Depth (ft) =	3.49	6.18	5.11	5.81	6.34	6.66	6.92	7.44	8.03
Area at Maximum Ponding Depth (acres) =	0.73	1.05	0.94	1.01	1.06	1.10	1.13	1.19	1.28
Maximum Volume Stored (acre-ft) =	0.863	3.295	2.233	2.915	3.464	3.809	4.088	4.690	5.419

MHFD guidance states that WQCV should drain over a 40hr period. Please try to adjust this spreadsheet and then make subsequent changes in the field to get this value to 40hrs.

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.00 (December 2019)



S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename: _____

Inflow Hydrographs

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

Time Interval	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.39	0.04
	0:15:00	0.00	0.00	3.46	5.62	6.96	4.67	5.89	5.69	8.36
	0:20:00	0.00	0.00	12.83	16.99	20.01	12.66	14.80	15.76	20.62
	0:25:00	0.00	0.00	26.94	35.34	41.95	26.44	30.57	32.65	42.44
	0:30:00	0.00	0.00	33.30	42.69	49.70	52.46	60.93	67.51	88.01
	0:35:00	0.00	0.00	31.75	40.04	46.24	61.83	71.65	83.54	108.32
	0:40:00	0.00	0.00	28.76	35.78	41.26	60.15	69.62	81.73	105.76
	0:45:00	0.00	0.00	25.24	31.76	36.81	54.48	62.96	75.48	97.70
	0:50:00	0.00	0.00	22.08	28.32	32.53	49.25	56.81	68.18	88.41
	0:55:00	0.00	0.00	19.37	24.91	28.73	43.27	49.85	60.62	78.63
	1:00:00	0.00	0.00	17.17	22.01	25.61	37.64	43.31	53.86	69.88
	1:05:00	0.00	0.00	15.76	20.18	23.73	33.08	38.03	48.24	62.68
	1:10:00	0.00	0.00	14.15	18.82	22.31	29.32	33.64	41.85	54.29
	1:15:00	0.00	0.00	12.58	17.18	20.93	26.15	29.93	36.21	46.84
	1:20:00	0.00	0.00	11.18	15.31	18.94	22.83	26.07	30.49	39.31
	1:25:00	0.00	0.00	9.82	13.47	16.35	19.64	22.38	25.23	32.44
	1:30:00	0.00	0.00	8.59	11.88	14.02	16.49	18.74	20.67	26.49
	1:35:00	0.00	0.00	7.63	10.64	12.22	13.63	15.45	16.69	21.29
	1:40:00	0.00	0.00	7.11	9.47	11.22	11.37	12.85	13.51	17.17
	1:45:00	0.00	0.00	6.88	8.60	10.60	10.09	11.39	11.68	14.80
	1:50:00	0.00	0.00	6.73	7.98	10.16	9.28	10.46	10.53	13.28
	1:55:00	0.00	0.00	6.06	7.51	9.68	8.74	9.85	9.74	12.24
	2:00:00	0.00	0.00	5.38	7.00	8.94	8.35	9.41	9.17	11.49
	2:05:00	0.00	0.00	4.29	5.61	7.16	6.74	7.58	7.28	9.11
	2:10:00	0.00	0.00	3.29	4.28	5.47	5.12	5.76	5.45	6.80
	2:15:00	0.00	0.00	2.52	3.28	4.17	3.90	4.38	4.10	5.11
	2:20:00	0.00	0.00	1.92	2.49	3.15	2.95	3.32	3.11	3.88
	2:25:00	0.00	0.00	1.45	1.87	2.35	2.21	2.49	2.35	2.92
	2:30:00	0.00	0.00	1.08	1.37	1.74	1.63	1.84	1.75	2.17
	2:35:00	0.00	0.00	0.79	0.99	1.28	1.20	1.34	1.29	1.60
	2:40:00	0.00	0.00	0.57	0.72	0.95	0.90	1.01	0.96	1.20
	2:45:00	0.00	0.00	0.39	0.50	0.66	0.64	0.72	0.69	0.85
	2:50:00	0.00	0.00	0.24	0.33	0.43	0.43	0.48	0.46	0.57
	2:55:00	0.00	0.00	0.13	0.20	0.25	0.26	0.29	0.27	0.34
	3:00:00	0.00	0.00	0.06	0.10	0.12	0.13	0.14	0.14	0.17
	3:05:00	0.00	0.00	0.02	0.03	0.04	0.04	0.05	0.04	0.05
	3:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	











