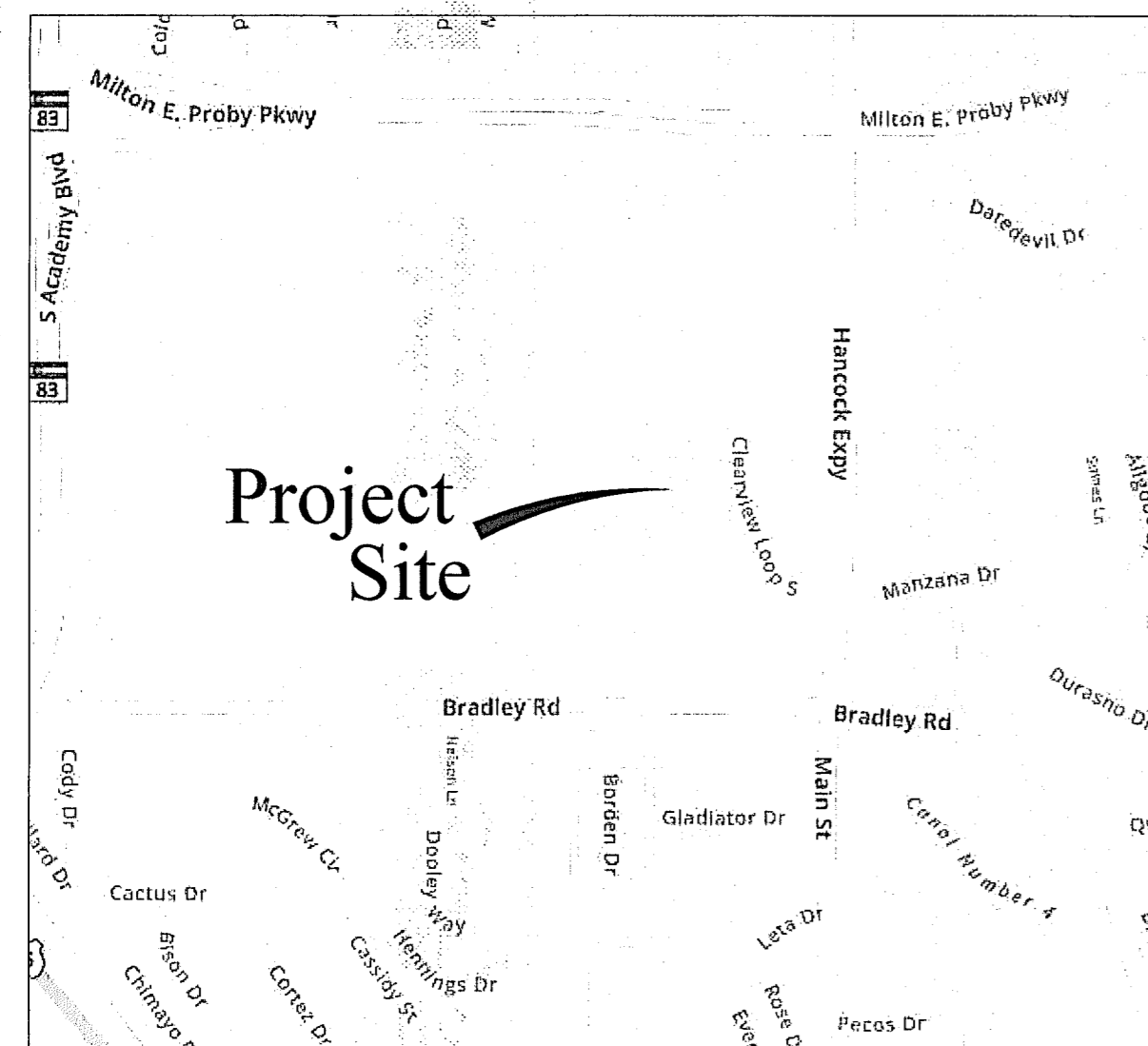


1-800-922-1987

CLEAR VIEW INDUSTRIAL PARK, FILING 2B

GRADING, STORM AND EROSION CONTROL PLANS

THE LOCATIONS OF EXISTING ABOVE GROUND AND UNDERGROUND UTILITIES ARE SHOWN IN AN APPROXIMATE WAY ONLY. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK. THE CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE CAUSED BY HIS FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL ABOVE GROUND AND UNDERGROUND UTILITIES.



VICINITY MAP
N.T.S.

El Paso County:

County plan review is provided only for general conformance with County Design Criteria. The County is not responsible for the accuracy and adequacy of the design, dimensions, and/or elevations which shall be confirmed at the job site. The County through the approval of this document assumes no responsibility for completeness and/or accuracy of this document.

Filed in accordance with the requirements of the El Paso County Land Development Code, Drainage Criteria Manual, Volumes 1 and 2, and Engineering Criteria Manual as amended.

In accordance with ECM Section 1.12, these construction documents will be valid for construction for a period of 2 years from the date signed by the El Paso County Engineer. If construction has not started within those 2 years, the plans will need to be resubmitted for approval, including payment of review fees at the Planning and Community Development Directors discretion.

Jennifer Irvine, P.E.
County Engineer/ECM Administrator



Owner/Developer's Statement:

I, the owner/developer have read and will comply with the requirements of the grading and erosion control plan and all of the requirements specified in these detailed plans and specifications.

Kevin J. Ferguson
Kevin J. Ferguson, Manager (Lots 1A, 2A, 4A)
Clear View Properties I, LLC
9720 Arroya Lane
Colorado Springs, CO 80908

3/19/2021
Date

Owner/Developer's Statement:

I, the owner/developer have read and will comply with the requirements of the grading and erosion control plan and all of the requirements specified in these detailed plans and specifications.

Robert C. Bullard
Robert C. Bullard, Manager (Lot 3A)
Dilligaf Leasing, LLC
3950 Clear View Loop
Colorado Springs, CO 80911

3/19/21
Date

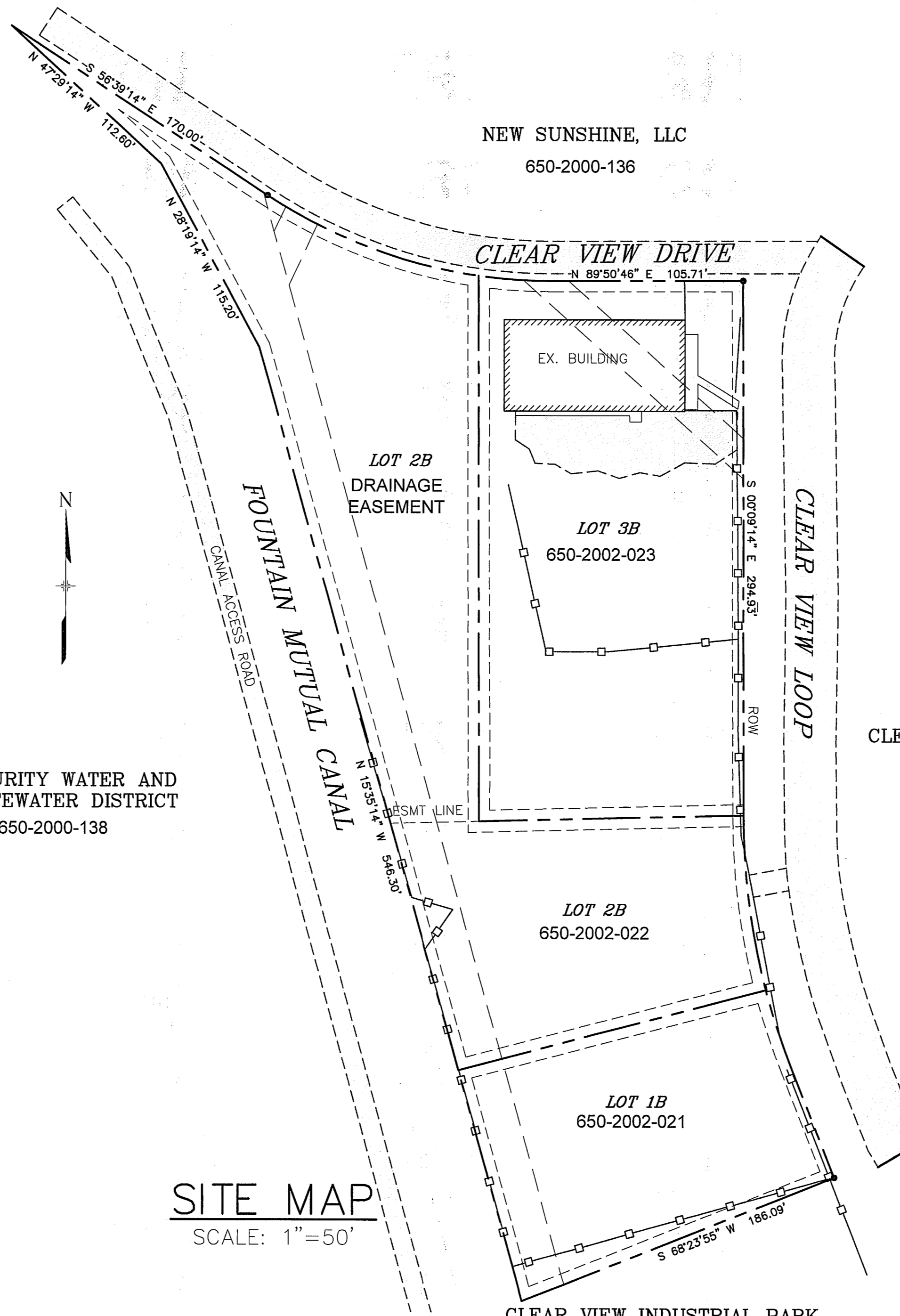
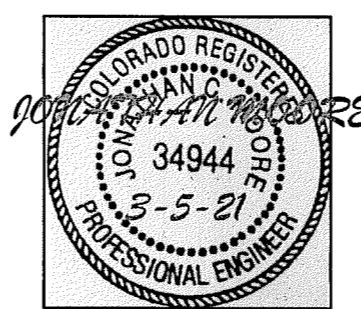
SECURITY WATER AND
WASTEWATER DISTRICT
650-2000-138

Design Engineer's Statement:

These detailed plans and specifications were prepared under my direction and supervision. Said plans and specifications have been prepared according to the criteria established by the County for detailed roadway, drainage, grading and erosion control plans and specifications, and said plans and specifications are in conformity with applicable master drainage plans and master transportation plans. Said plans and specifications meet the purposes for which the particular roadway and drainage facilities are designed and are correct to the best of my knowledge and belief. I accept responsibility for any liability caused by any negligent acts, errors or omissions on my part in preparation of these detailed plans and specifications.

Jonathan Moore
Jonathan Moore, P.E. #34944
For and Behalf of CTR Engineering, Inc.

3-5-21
Date



SITE MAP
SCALE: 1"=50'

CLEAR VIEW INDUSTRIAL PARK
FILING 1
650-2001-007

OWNER/DEVELOPER:
CLEAR VIEW PROPERTIES I, LLC
KEVIN FERGUSON, 719-337-3534
ENGINEER:
CTR ENGINEERING, INC.
JONATHAN MOORE, 719-964-6654
EL PASO COUNTY:
LUPE PACKMAN, 719-520-7550
SECURITY WAT. AND SAN. DISTRICT:
ROY HEALD, 719-392-3475
FOUNTAIN MUTUAL METRO. DISTRICT:
GARY BARBER, 719-598-0230

INDEX OF SHEETS

TITLE SHEET	1
GENERAL NOTES	2
SITE PLAN (EXISTING)	3
SITE GRADING (PROPOSED)	4
FMIC DETAILS	5
GRADING - POND DETAILS	6
GRADING - POND DETAILS (CONT.)	7
GRADING - POND OUTLET DETAILS	8
STORM PLAN AND PROFILE	9
NYLOPLAST DETAILS	10
GRADING AND E.C. PLAN	11
GRADING AND E.C. DETAILS	12-22

NO.	DATE	DESCRIPTION	BY
REVISIONS			
CTR Engineering, Inc.			
16392 TIMBER MEADOW DRIVE COLORADO SPRINGS, CO 80908 (719) 964-6654			
PROJECT: CLEAR VIEW INDUSTRIAL PARK FILING 2B			
BENCHMARK: Elevations are based upon FIMS monument DR02, a 2" aluminum cap, stamped "CSU FIMS CONTROL DR02", at the southeast corner of Monica Drive and Hancock Expressway (Elevation=5927.27 NGVD29)			
PROJECT TITLE: GRADING, WATER QUALITY POND AND EROSION CONTROL			
SHEET TITLE: TITLE SHEET			
DESIGNED BY: JCM	SCALE:	DATE ISSUED: MAR. 2021	
DRAWN BY: JCM	H:	SHEET NO. 1 OF 22 SHEETS	
CHECKED BY: JH	V:		
DWG: C:\Temp\CV\CAD\Grad\1 Title Sheet-Grad.dwg			

PCD FILE NO. SF2029



1-800-922-1987

CLEAR VIEW INDUSTRIAL PARK, FILING 2B

GRADING, STORM AND EROSION CONTROL PLANS

THE LOCATIONS OF EXISTING ABOVE GROUND AND UNDERGROUND UTILITIES ARE SHOWN IN AN APPROXIMATE WAY ONLY. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK. THE CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE CAUSED BY HIS FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL ABOVE GROUND AND UNDERGROUND UTILITIES.

STANDARD NOTES FOR EL PASO COUNTY GRADING AND EROSION CONTROL PLANS

<p>STANDARD NOTES FOR EL PASO COUNTY GRADING AND EROSION CONTROL PLANS</p> <p>Revised July 2019</p> <ol style="list-style-type: none"> Stormwater discharges from construction sites shall not cause or threaten to cause pollution, contamination, or degradation of State Waters. All work and earth disturbance shall be done in a manner that minimizes pollution of any on-site or off-site waters, including wetlands. Notwithstanding anything depicted in these plans in words or graphic representation, all design and construction related to roads, storm drainage and erosion control shall conform to the standards and requirements of the most recent version of the relevant adopted El Paso County standards, including the Land Development Code, the Engineering Criteria Manual, the Drainage Criteria Manual, and the Drainage Criteria Manual Volume 2. Any deviations to regulations and standards must be requested, and approved, in writing. A separate Stormwater Management Plan (SMWP) for this project shall be completed and an Erosion and Stormwater Quality Control Permit (ESQCP) issued prior to commencing construction. During construction the SMWP is the responsibility of the designated Qualified Stormwater Manager or Certified Erosion Control Inspector and shall be located on site at all times during construction and shall be kept up to date with work progress and changes in the field. Once the ESQCP is approved and a "Notice to Proceed" has been issued, the contractor may install the initial stage erosion and sediment control measures as indicated on the approved GEC. A Preconstruction Meeting between the contractor, engineer, and El Paso County will be held prior to any construction. It is the responsibility of the applicant to coordinate the meeting time and place with County staff. Control measures must be installed prior to commencement of activities that may contribute pollutants to stormwater. Temporary sediment and erosion control measures for all slopes, channels, ditches, or any disturbed land area shall be completed immediately upon completion of the disturbance. All temporary sediment and erosion control measures shall be maintained and remain in effective operating condition until permanent soil erosion control measures are implemented and final stabilization is established. All persons engaged in land disturbance activities shall assess the adequacy of control measures at the site and identify if changes to those control measures is needed to ensure the continued effective performance of the control measures. All changes to temporary sediment and erosion control measures must be incorporated into the Stormwater Management Plan prior to implementation. Temporary stabilization shall be implemented on disturbed areas and stockpiles where ground disturbing construction activity has permanently ceased or temporarily ceased for longer than 14 days. An area that is going to remain in an interim state for more than 60 days shall also be stabilized. 	<ol style="list-style-type: none"> Final stabilization must be implemented at all applicable construction sites. Final stabilization is achieved when all ground disturbing activities are complete and all disturbed areas either have a uniform vegetative cover with individual plant density of 70 percent of pre-disturbance levels established or equivalent permanent alternative stabilization method is implemented. All temporary sediment and erosion control measures shall be removed upon final stabilization and before permit closure. All permanent stormwater management facilities shall be installed as defined in the approved plans. Any proposed changes that effect the hydrology or hydraulics of a permanent stormwater management structures must be approved by the ECM Administrator prior to implementation. Any earth disturbance shall be conducted in such a manner so as to effectively minimize accelerated soil erosion and resulting sedimentation. All disturbances shall be designed, constructed, and completed so that the exposed area of any disturbed land shall be limited to the shortest practical period of time. Pre-existing vegetation shall be protected and maintained within 50 horizontal feet of a waters of the state, unless infeasible. Compaction of soil must be prevented in areas designated for infiltration control measures or where final stabilization will be achieved by vegetative cover. Areas designated for infiltration control shall also be protected from sedimentation during construction until final stabilization is achieved. Any temporary or permanent facility designed and constructed for the conveyance of stormwater around, through, or from the earth disturbance area shall be a stabilized conveyance designed to minimize erosion and the discharge of sediment off site. Concrete wash water shall be contained and disposed of in accordance with the SWMP. No wash water shall be discharged to or allowed to runoff to State Waters, including any surface or subsurface storm drainage system or facilities. Concrete washout shall not be located in an area where shallow groundwater may be present, or within 50 feet of a surface water body. Dewatering operations: uncontaminated ground water may be discharged on site, but may not leave the site in the form of surface runoff. Erosion control blanketing is to be used on slopes steeper than 3:1. Building, construction, excavation, or other waste materials shall not be temporarily placed or stored in the street, alley, or other public way, unless in accordance with an approved Traffic Control Plan. BMP's may be required by El Paso County Engineering if deemed necessary, based on specific conditions and circumstances. Vehicle tracking of soils and construction debris off-site shall be minimized. Materials tracked offsite shall be cleaned up and properly disposed of immediately. Contractor shall be responsible for the removal of all wastes from the construction site for disposal in accordance with local and State regulatory requirements. No 	<p>construction debris, tree slash, building material wastes or unused building materials shall be buried, dumped, or discharged at the site.</p> <ol style="list-style-type: none"> The owner, site developer, contractor, and/or their authorized agents shall be responsible for the removal of all construction debris, dirt, trash, rock, sediment, and sand that may accumulate in the storm sewer or other drainage conveyance system and stormwater appurtenances as a result of site development. The quantity of materials stored on the project site shall be limited, as much as practical, to that quantity required to perform the work in an orderly sequence. All materials stored on-site shall be stored in a neat, orderly manner, in their original containers, with original manufacturer's labels. No chemicals are to be used by the contractor, which have the potential to be released in stormwater unless permission for the use of a specific chemical is granted in writing by the ECM Administrator. In granting the use of such chemicals, special conditions and monitoring may be required. Bulk storage of petroleum products or other liquid chemicals in excess of 55 gallons shall have adequate secondary containment protection to contain all spills and prevent any spilled material from entering State Waters, including any surface or subsurface storm drainage system or facilities. No person shall cause the impediment of stormwater flow in the flow line of the curb and gutter or in the ditch flow line. Individuals shall comply with the "Colorado Water Quality Control Act" (Title 25, Article 8, CRS), and the "Clean Water Act" (33 USC 1344), in addition to the requirements included in the DCM Volume I and the ECM Appendix I. All appropriate permits must be obtained by the contractor prior to construction (NPDES, Floodplain, 404, fugitive dust, etc.). In the event of conflicts between these requirements and laws, rules, or regulations of other Federal, State, or County agencies, the more restrictive laws, rules, or regulations shall apply. All construction traffic must enter/exit the site at approved construction access points. Prior to actual construction the permittee shall verify the location of existing utilities. A water source shall be available on site during earthwork operations and utilized as required to minimize dust from earthwork equipment and wind. The soils report for this site has been prepared by <u>ENTECH ENG</u> and shall be considered a part of these plans. At least ten (10) days prior to the anticipated start of construction, for projects that will disturb 1 acre or more, the owner or operator of construction activity shall submit a permit application for stormwater discharge to the Colorado Department of Public Health and Environment, Water Quality Division. The application contains certification of completion of a stormwater management plan (SWMP), of which this 	<p>grading and erosion control plan may be a part. For information or application materials contact:</p> <p>Colorado Department of Public Health and Environment Water Quality Control Division WQCD - Permits 4300 Cherry Creek Drive South Denver, CO 80246-1530 Attn: Permits Unit</p>
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NO.	DATE	DESCRIPTION	BY
REVISIONS			

CTR Engineering, Inc.

16392 TIMBER MEADOW DRIVE
COLORADO SPRINGS, CO 80908
(719) 964-6654

PROJECT: **CLEAR VIEW INDUSTRIAL PARK FILING 2B**

BENCHMARK: Elevations are based upon FIMS monument DR02, a 2" aluminum cap, stamped "CSU FIMS CONTROL DR02", at the southeast corner of Monica Drive and Hancock Expressway (Elevation=5927.27 NGVD29)

PROJECT TITLE: **GRADING, WATER QUALITY POND AND EROSION CONTROL**

SHEET TITLE: **GENERAL NOTES**

DESIGNED BY: JCM	SCALE:	DATE ISSUED: MAR. 2021
DRAWN BY: JCM		
CHECKED BY: JH	V:	SHEET NO. 2 OF 22 SHEETS

EPC 3/22/21

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Standard Notes for El Paso County Construction Plans

- All drainage and roadway construction shall meet the standards and specifications of the City of Colorado Springs/El Paso County Drainage Criteria Manual, Volumes 1 and 2, and the El Paso County Engineering Criteria Manual.
- Contractor shall be responsible for the notification and field notification of all existing utilities, whether shown on the plans or not, before beginning construction. Location of existing utilities shall be verified by the contractor prior to construction. Call 811 to contact the Utility Notification Center of Colorado (UNCC).
- Contractor shall keep a copy of these approved plans, the Grading and Erosion Control Plan, the Stormwater Management Plan (SWMP), the soils and geotechnical report, and the appropriate design and construction standards and specifications at the job site at all times, including the following:
 - El Paso County Engineering Criteria Manual (ECM)
 - City of Colorado Springs/El Paso County Drainage Criteria Manual, Volumes 1 and 2
 - Colorado Department of Transportation (CDOT) Standard Specifications for Road and Bridge Construction
 - CDOT M & S Standards
- Notwithstanding anything depicted in these plans in words or graphic representation, all design and construction related to roads, storm drainage and erosion control shall conform to the standards and requirements of the most recent version of the relevant adopted El Paso County standards, including the Land Development Code, the Engineering Criteria Manual, the Drainage Criteria Manual, and the Drainage Criteria Manual Volume 2. Any deviations from regulations and standards must be requested, and approved, in writing. Any modifications necessary to meet criteria after-the-fact will be entirely the developer's responsibility to rectify.
- It is the design engineer's responsibility to accurately show existing conditions, both onsite and offsite, on the construction plans. Any modifications necessary due to conflicts, omissions, or changed conditions will be entirely the developer's responsibility to rectify.
- Contractor shall schedule a pre-construction meeting with El Paso County Planning and Community Development (PCD) - Inspections, prior to starting construction.

- It is the contractor's responsibility to understand the requirements of all jurisdictional agencies and to obtain all required permits, including but not limited to El Paso County Erosion and Stormwater Quality Control Permit (ESQCP), Regional Building Floodplain Development Permit, U.S. Army Corps of Engineers-issued 401 and/or 404 permits, and county and state fugitive dust permits.
- Contractor shall not deviate from the plans without first obtaining written approval from the design engineer and PCD. Contractor shall notify the design engineer immediately upon discovery of any errors or inconsistencies.
- All storm drain pipe shall be Class III RCP unless otherwise noted and approved by PCD.
- Contractor shall coordinate geotechnical testing per ECM standards. Pavement design shall be approved by El Paso County PCD prior to placement of curb and gutter and pavement.
- All construction traffic must enter/exit the site at approved construction access points.
- Sight visibility triangles as identified in the plans shall be provided at all intersections. Obstructions greater than 18 inches above flowline are not allowed within sight triangles.
- Signing and striping shall comply with El Paso County DOT and MUTCD criteria. [If applicable, additional signing and striping notes will be provided.]
- Contractor shall obtain any permits required by El Paso County DOT, including Work Within the Right-of-Way and Special Transport permits.
- The limits of construction shall remain within the property line unless otherwise noted. The owner/developer shall obtain written permission and easements, where required, from adjoining property owner(s) prior to any off-site disturbance, grading, or construction.

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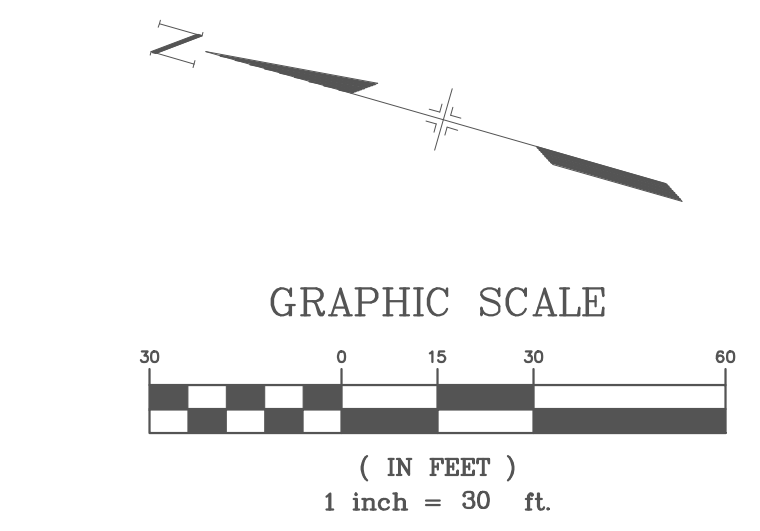
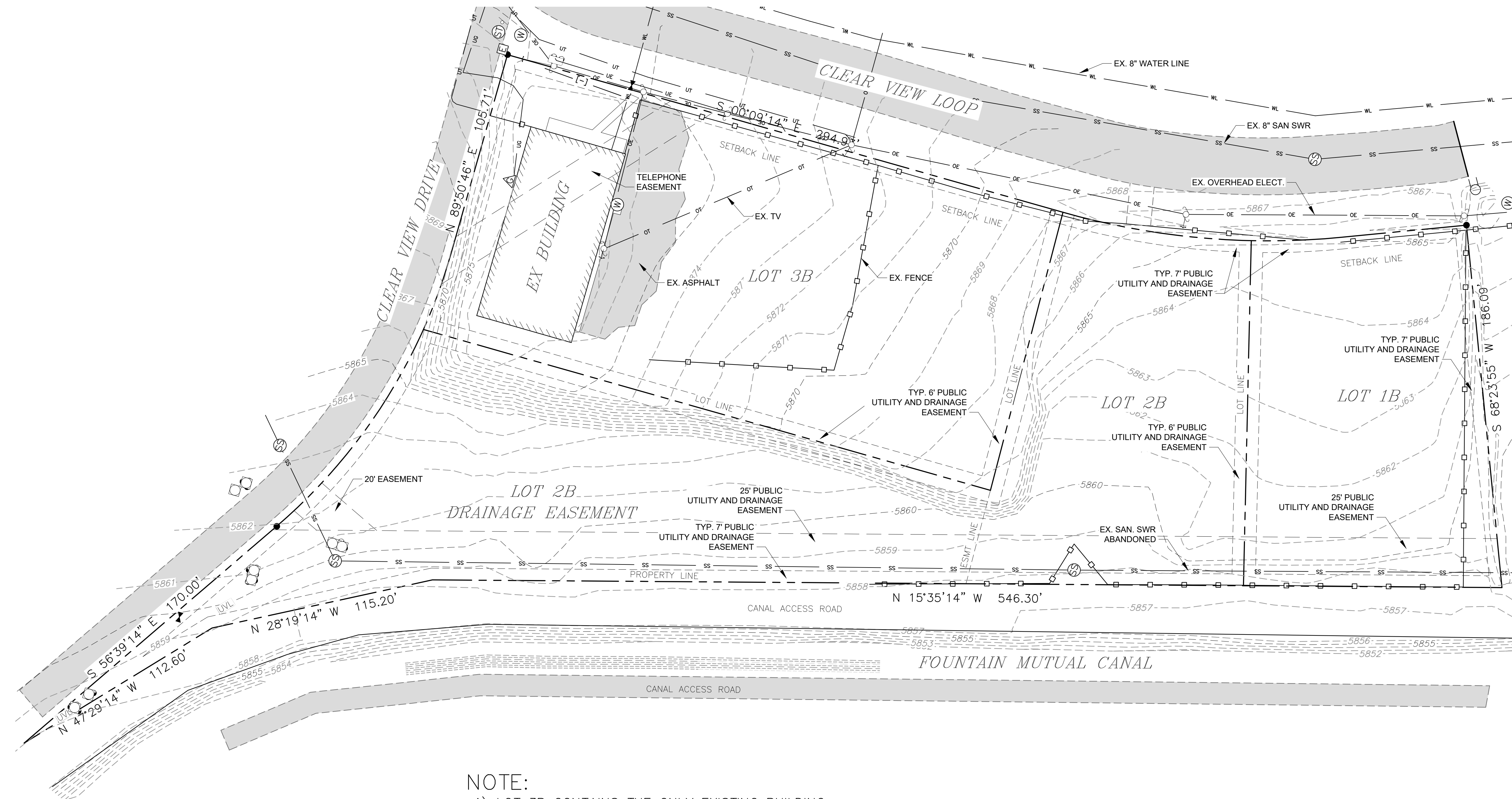


1-800-922-1987

CLEAR VIEW INDUSTRIAL PARK, FILING 2B

GRADING, STORM AND EROSION CONTROL PLANS

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LEGEND

- - - - - EXISTING CONTOURS
- - - - - EXISTING FENCE
- - - - - EXISTING LOTS LINES

NO.	DATE	DESCRIPTION	BY
REVISIONS			

CTR Engineering, Inc.
16392 TIMBER MEADOW DRIVE
COLORADO SPRINGS, CO 80908
(719) 964-6654

PROJECT:
CLEAR VIEW INDUSTRIAL PARK FILING 2B

BENCHMARK:
Elevations are based upon FIMS monument DR02, a 2" aluminum cap, stamped "CSU FIMS CONTROL DR02", at the southeast corner of Monica Drive and Hancock Expressway (Elevation=5927.27 NGVD29)

PROJECT TITLE:
GRADING, WATER QUALITY POND AND EROSION CONTROL

SHEET TITLE:
EXISTING SITE PLAN

DESIGNED BY: JCM SCALE: DATE ISSUED: MAR. 2021
DRAWN BY: JCM H: 1"=30'
CHECKED BY: JH V: SHEET NO. 3 OF 22 SHEETS

DWG:

NOTE:

- 1) LOT 3B CONTAINS THE ONLY EXISTING BUILDING
- 2) PART OF LOT 2B WILL BE DEDICATED AS A DRAINAGE EASEMENT WHICH WILL ONLY CONTAIN THE WATER QUALITY POND AND NO BUILDINGS.
- 3) LOTS 1B AND 2B WILL BE DEVELOPED AT A LATER DATE
- 4) LOT 1B AND 2B WILL SUBMIT INDIVIDUAL SITE DEVELOPMENT PLANS ONCE THEY ARE SOLD TO A BUILDER, THOSE LOTS WILL NEED THEIR OWN GEOTECHNICAL/FOUNDATION REPORT.
- 5) A GEOTECHNICAL REPORT BY ENTECH ENGINEERING ACCOMPANY THESE CONSTRUCTION DRAWINGS.

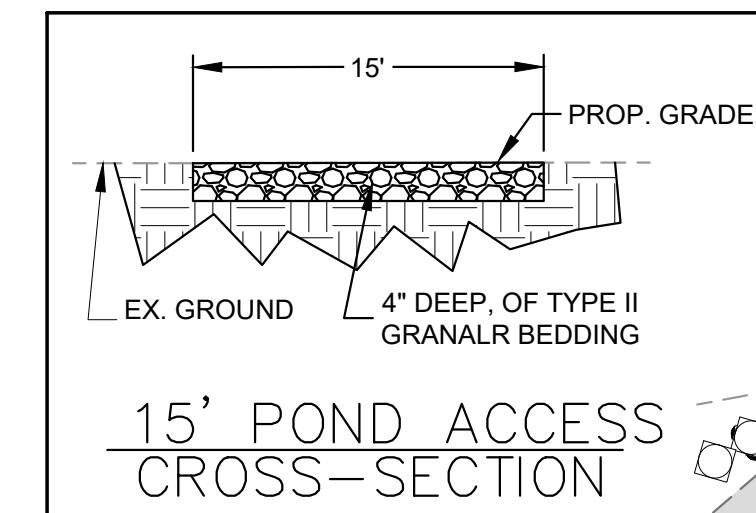
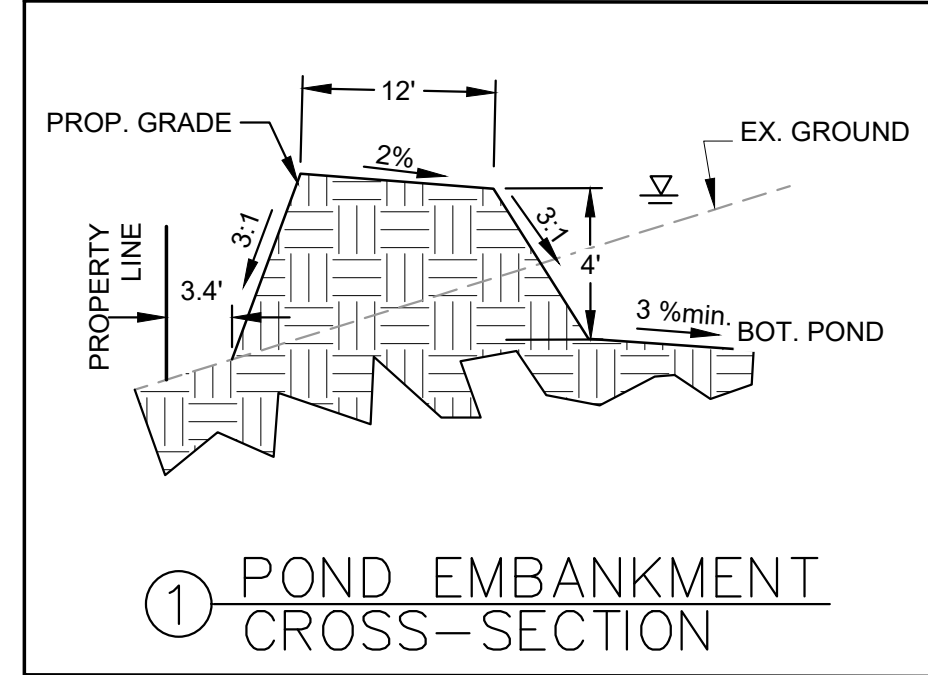


EPC 3/22/21

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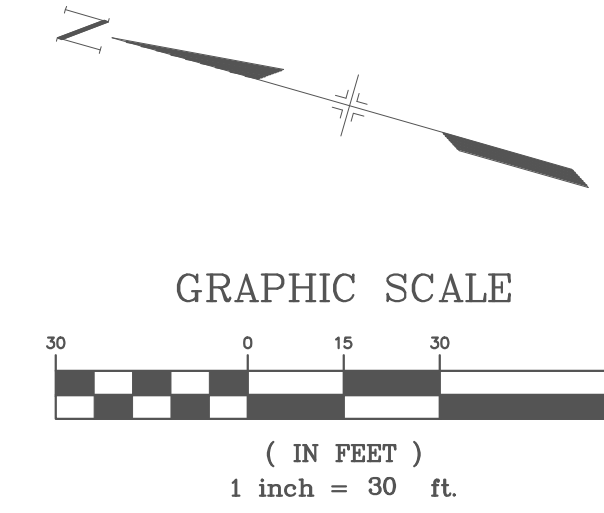
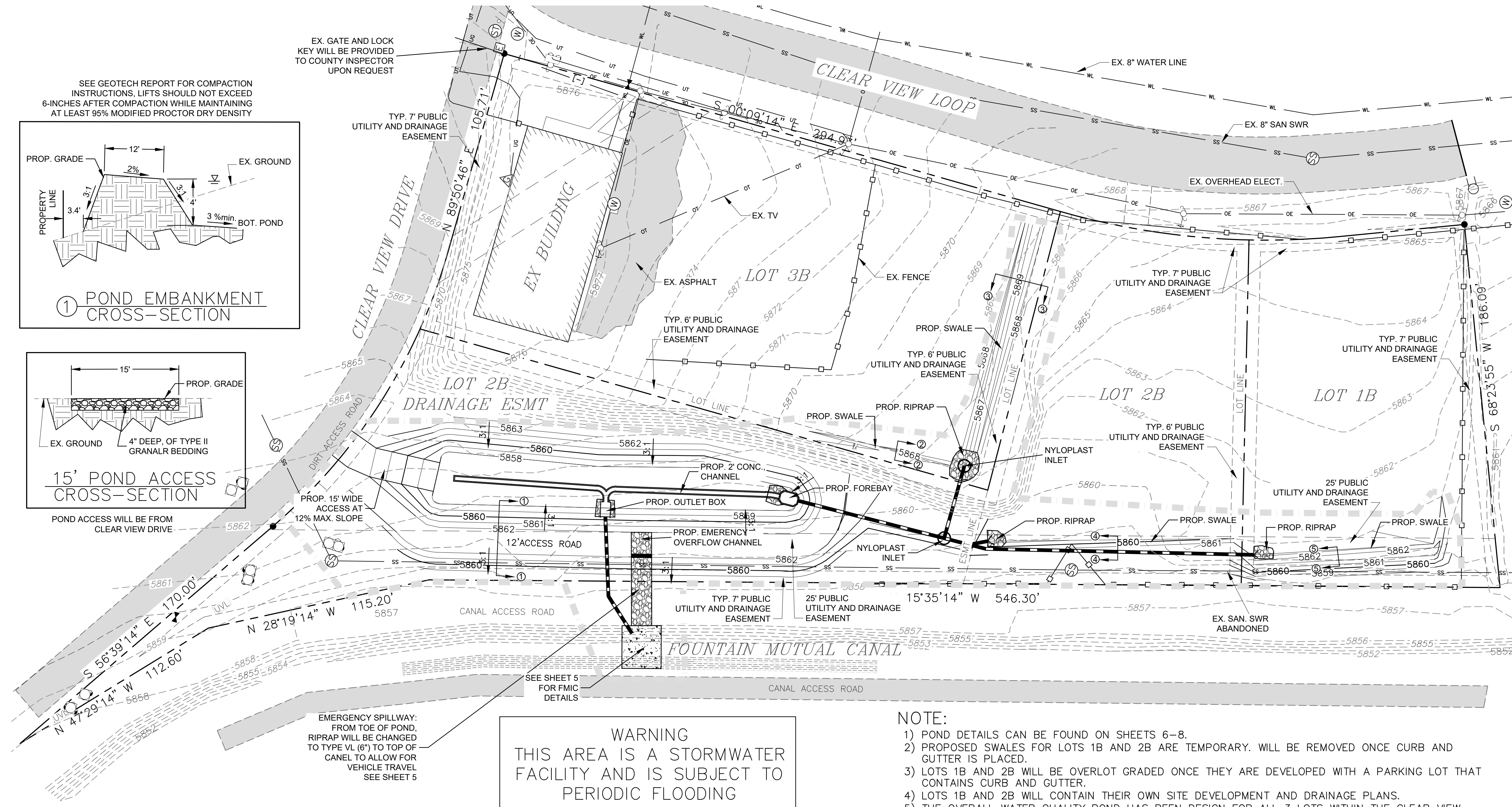
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SEE GEOTECH REPORT FOR COMPACTION INSTRUCTIONS. LIFTS SHOULD NOT EXCEED 6-INCHES AFTER COMPACTION WHILE MAINTAINING AT LEAST 95% MODIFIED PROCTOR DRY DENSITY



EX. GATE AND LOCK KEY WILL BE PROVIDED TO COUNTY INSPECTOR UPON REQUEST

TYP. 7' PUBLIC UTILITY AND DRAINAGE EASEMENT



LEGEND

- PROPOSED STORM LINE
- EXISTING CONTOURS
- PROPOSED CONTOURS
- EXISTING FENCE
- EXISTING LOTS LINES
- LIMITS OF DISTURBANCE/ LIMITS OF CONSTRUCTION

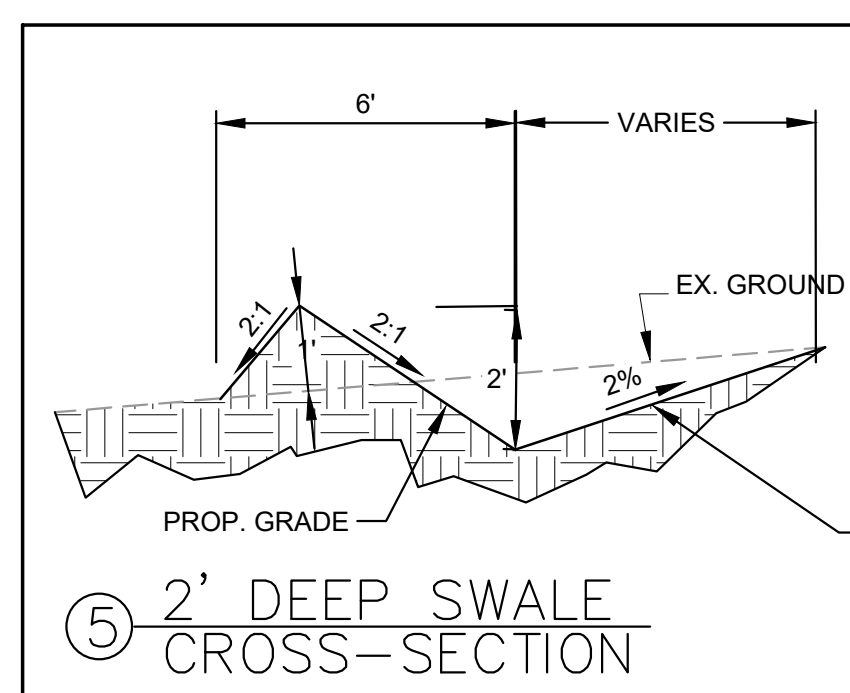
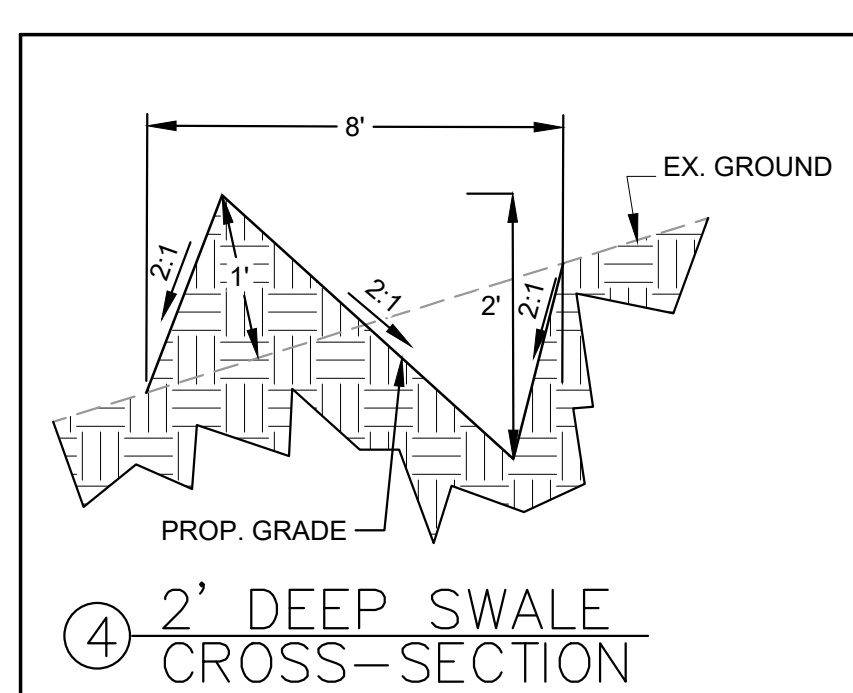
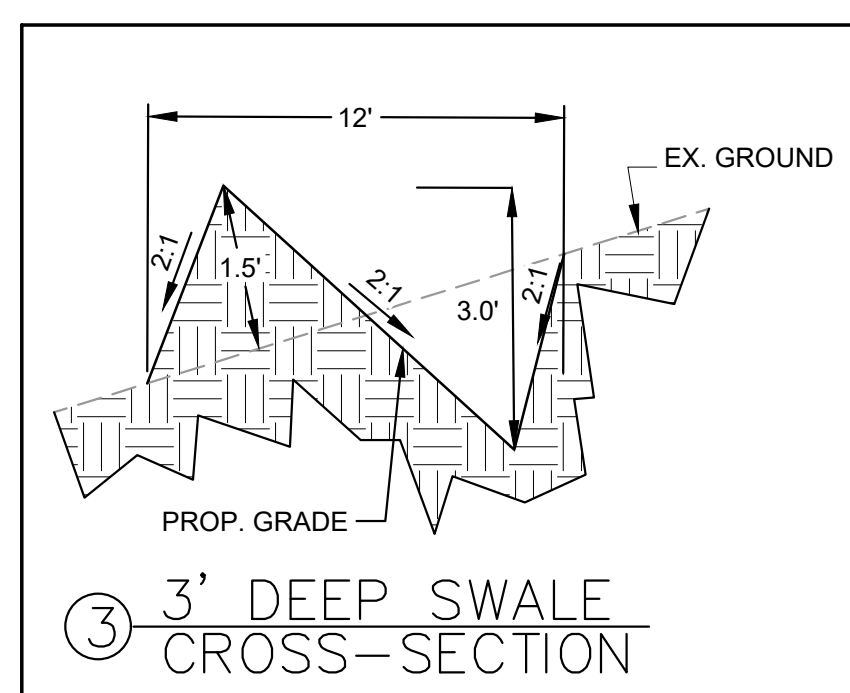
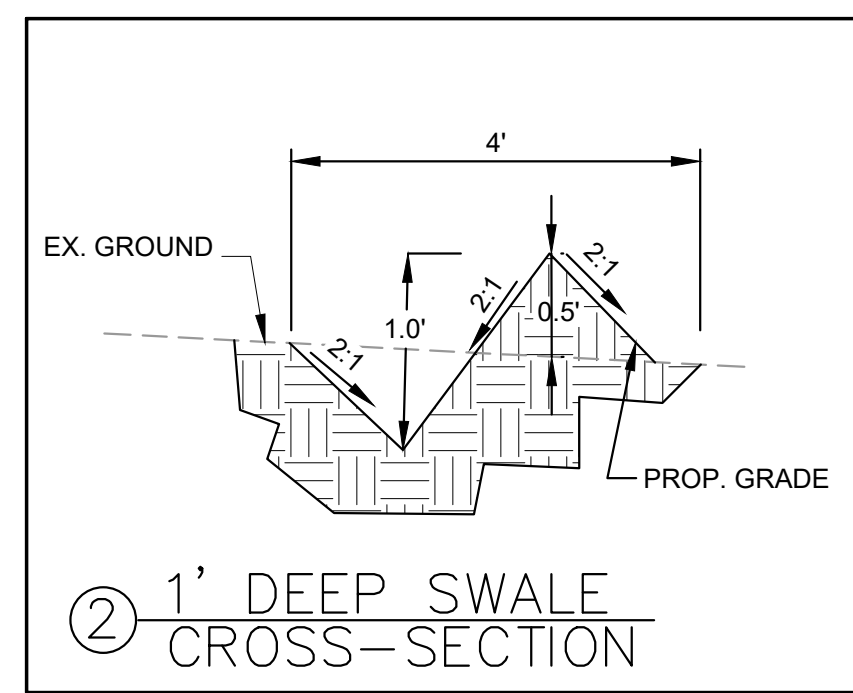
EMERGENCY SPILLWAY: FROM TOE OF POND, RIPRAP WILL BE CHANGED TO TYPE VL (6") TO TOP OF CANEL TO ALLOW FOR VEHICLE TRAVEL SEE SHEET 5

WARNING
THIS AREA IS A STORMWATER FACILITY AND IS SUBJECT TO PERIODIC FLOODING

DETENTION POND SIGN

NOTE:

- 1) POND DETAILS CAN BE FOUND ON SHEETS 6-8.
- 2) PROPOSED SWALES FOR LOTS 1B AND 2B ARE TEMPORARY. WILL BE REMOVED ONCE CURB AND GUTTER IS PLACED.
- 3) LOTS 1B AND 2B WILL BE OVERLOT GRADED ONCE THEY ARE DEVELOPED WITH A PARKING LOT THAT CONTAINS CURB AND GUTTER.
- 4) LOTS 1B AND 2B WILL CONTAIN THEIR OWN SITE DEVELOPMENT AND DRAINAGE PLANS.
- 5) THE OVERALL WATER QUALITY POND HAS BEEN DESIGN FOR ALL 3 LOTS WITHIN THE CLEAR VIEW INDUSTRIAL PARK, FILING 2B.
- 6) SIGNAGE - TWO SIGNS, EACH WITH A MINIMUM AREA OF 3 SQUARE FEET, SHALL BE PROVIDED AROUND THE PERIMETER OF ALL DETENTION FACILITIES. THE SIGNS SHALL BE FABRICATED OF DURABLE MATERIALS, SUCH AS METAL OR PLASTIC, USING RED LETTERING ON A WHITE BACKGROUND.

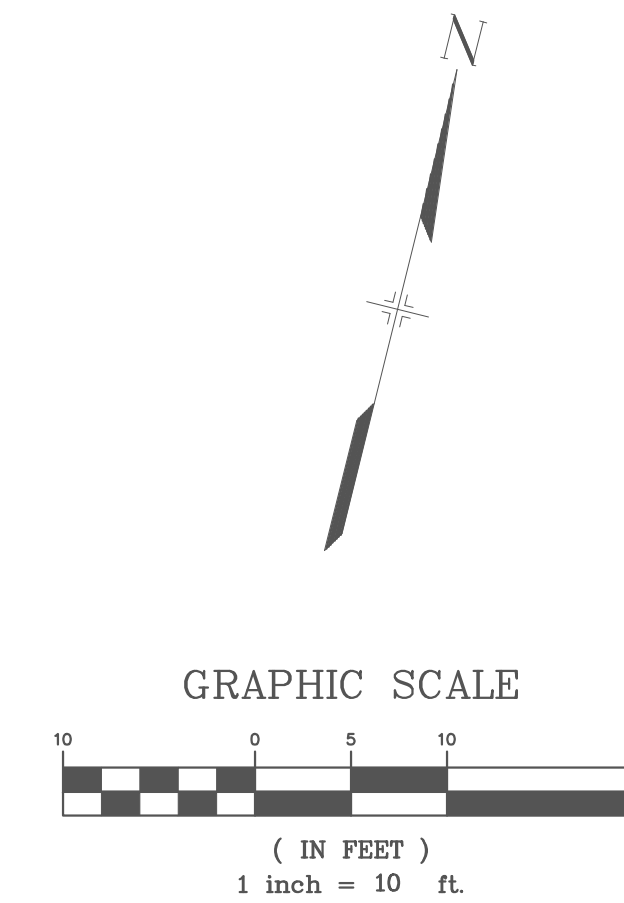
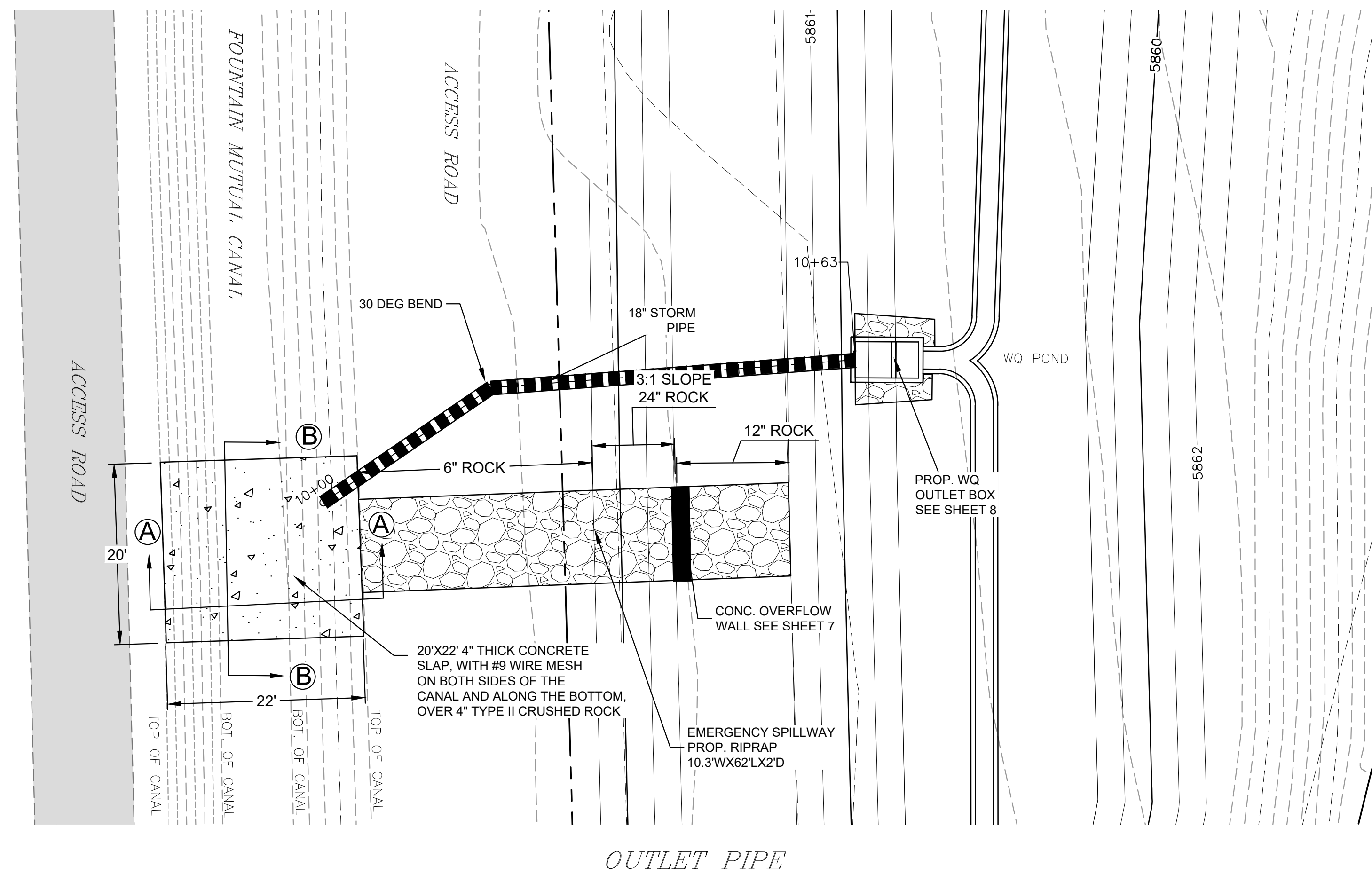


NO.	DATE	DESCRIPTION	BY
REVISIONS			
CTR Engineering, Inc.			
16392 TIMBER MEADOW DRIVE COLORADO SPRINGS, CO 80908 (719) 964-6654			
PROJECT: CLEAR VIEW INDUSTRIAL PARK FILING 2B			
BENCHMARK: Elevations are based upon FIMS monument DR02, a 2" aluminum cap, stamped "CSU FIMS CONTROL DR02", at the southeast corner of Monica Drive and Hancock Expressway (Elevation=5927.27 NGVD29)			
PROJECT TITLE: GRADING, WATER QUALITY POND AND EROSION CONTROL			
SHEET TITLE: PROP. GRADING PLAN			
DESIGNED BY: JCM	SCALE: 1"=30'	DATE ISSUED: MAR. 2021	
DRAWN BY: JCM	HH: V:	SHEET NO. 4 OF 22 SHEETS	
CHECKED BY: JH		DWG:	



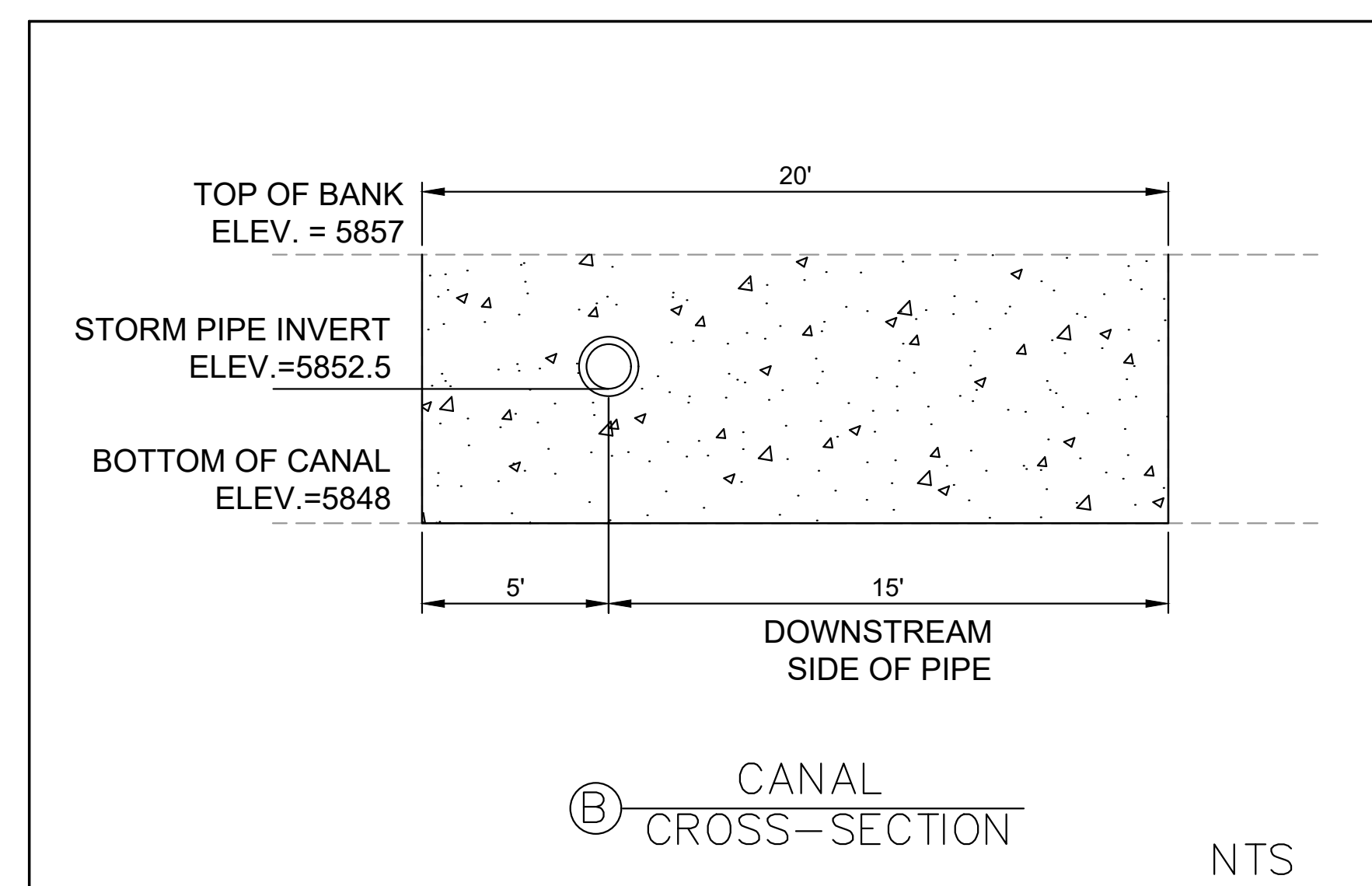
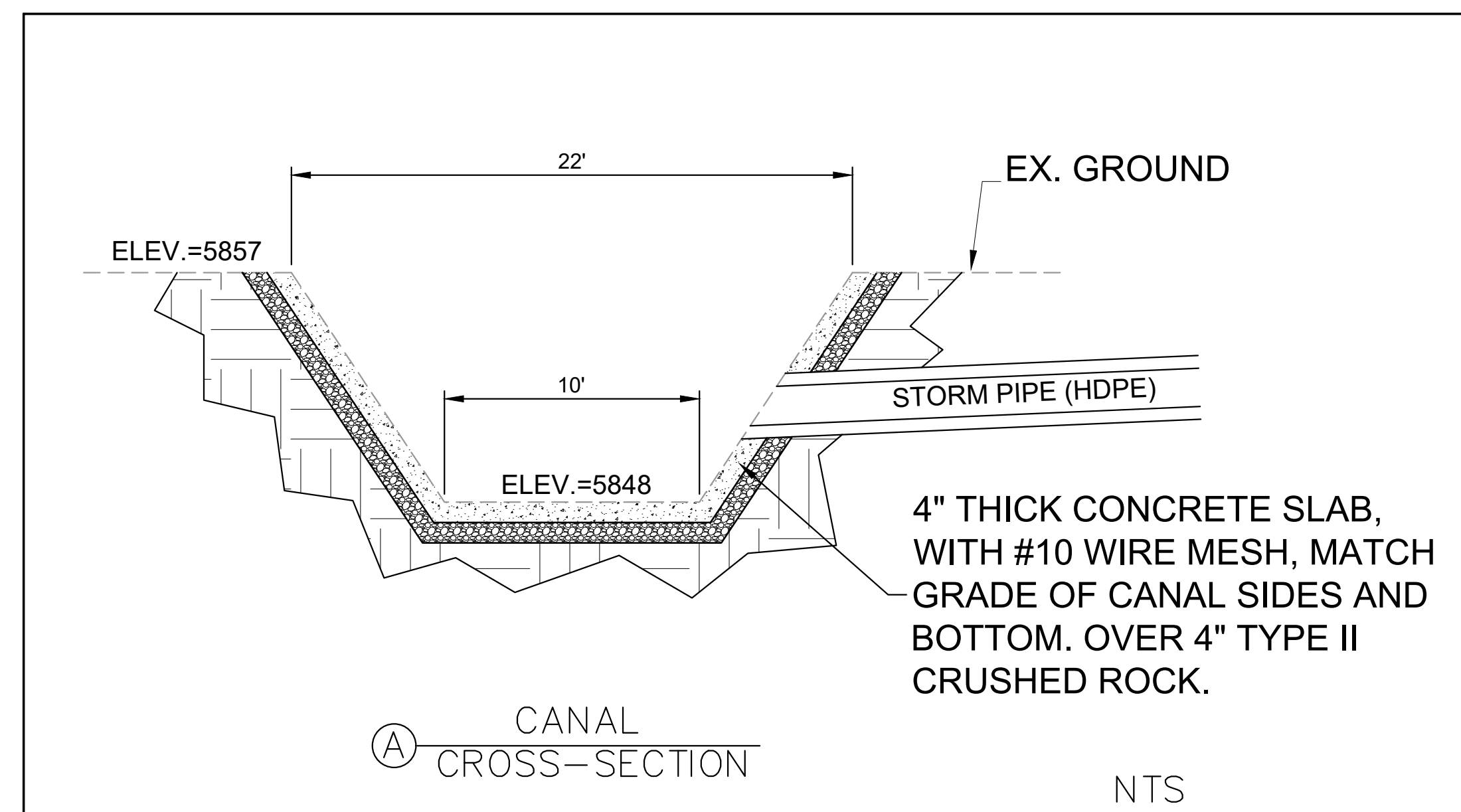
EPC 3/22/21

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LEGEND

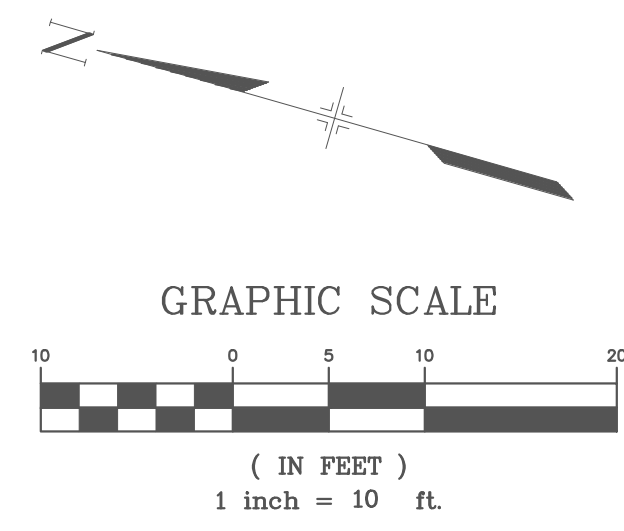
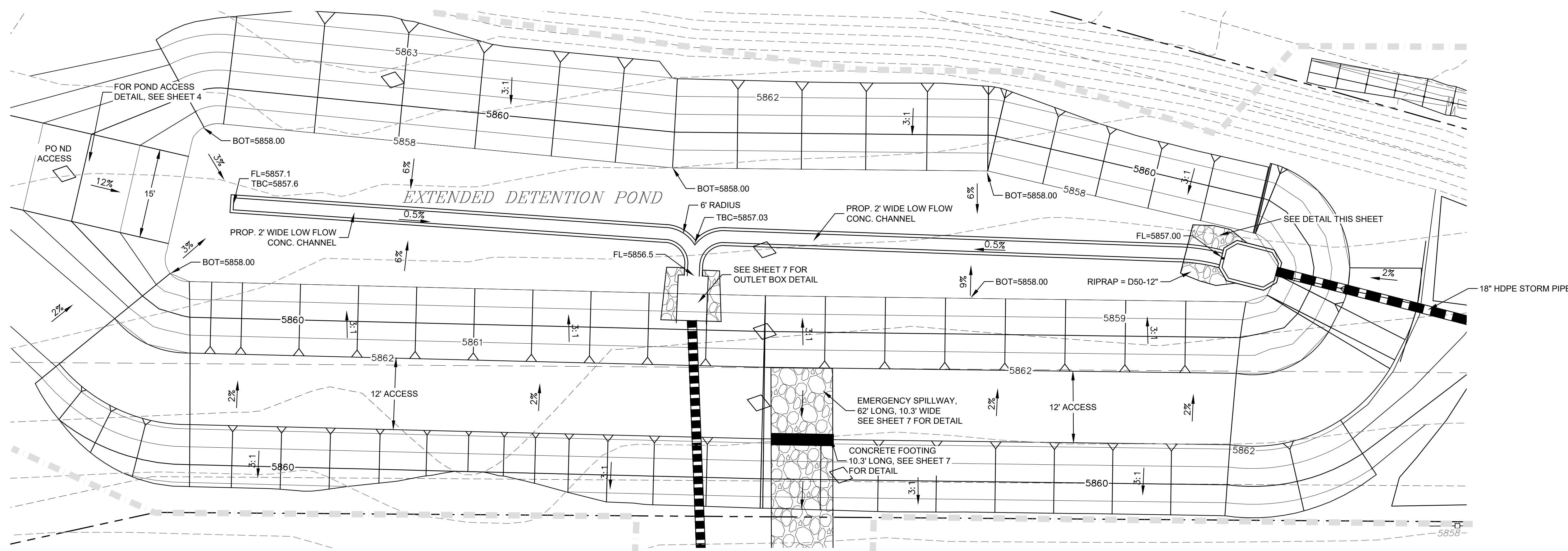
- PROPOSED STORM LINE
- EXISTING CONTOURS
- PROPOSED CONTOURS
- EXISTING FENCE
- EXISTING LOTS LINES
- HGL & EGL



NO.	DATE	DESCRIPTION	BY
REVISIONS			
CTR Engineering, Inc.			
16392 TIMBER MEADOW DRIVE COLORADO SPRINGS, CO 80908 (719) 964-6654			
PROJECT: CLEAR VIEW INDUSTRIAL PARK FILING 2B			
BENCHMARK: Elevations are based upon FIMS monument DR02, a 2" aluminum cap, stamped "CSU FIMS CONTROL DR02", at the southeast corner of Monica Drive and Hancock Expressway (Elevation=5927.27 NGVD29)			
PROJECT TITLE: GRADING, WATER QUALITY POND AND EROSION CONTROL			
SHEET TITLE: FMIC DETAILS			
DESIGNED BY: JCM	SCALE: 1"=10'	DATE ISSUED: MAR. 2021	
DRAWN BY: JCM		SHEET NO. 5 OF 22 SHEETS	
CHECKED BY: JH			
DWG:			



EPC 3/22/21



- LEGEND**
- PROPOSED STORM LINE
 - EXISTING CONTOURS
 - PROPOSED CONTOURS
 - EXISTING FENCE
 - EXISTING LOTS LINES
 - FLOW/DRAINAGE ARROWS
 - LIMITS OF DISTURBANCE/ LIMITS OF CONSTRUCTION

THICKNESS REQUIREMENTS FOR GRANULAR BEDDING

Minimum Bedding Thickness (Inches)

Riprap Designation	Fine Grained Soils* (Two Layer System)		Course Grained Soils** Type II
	Type I	Type II	
L, G, SM	4	4	6
M	4	4	6
H	4	6	8
VH	4	6	8

*May substitute one 12 inch layer of Type II bedding. Substitution of one layer of Type II bedding shall not be permitted at drop structures. Use of a combination of filter fabric and Type II bedding at drop structures is acceptable.

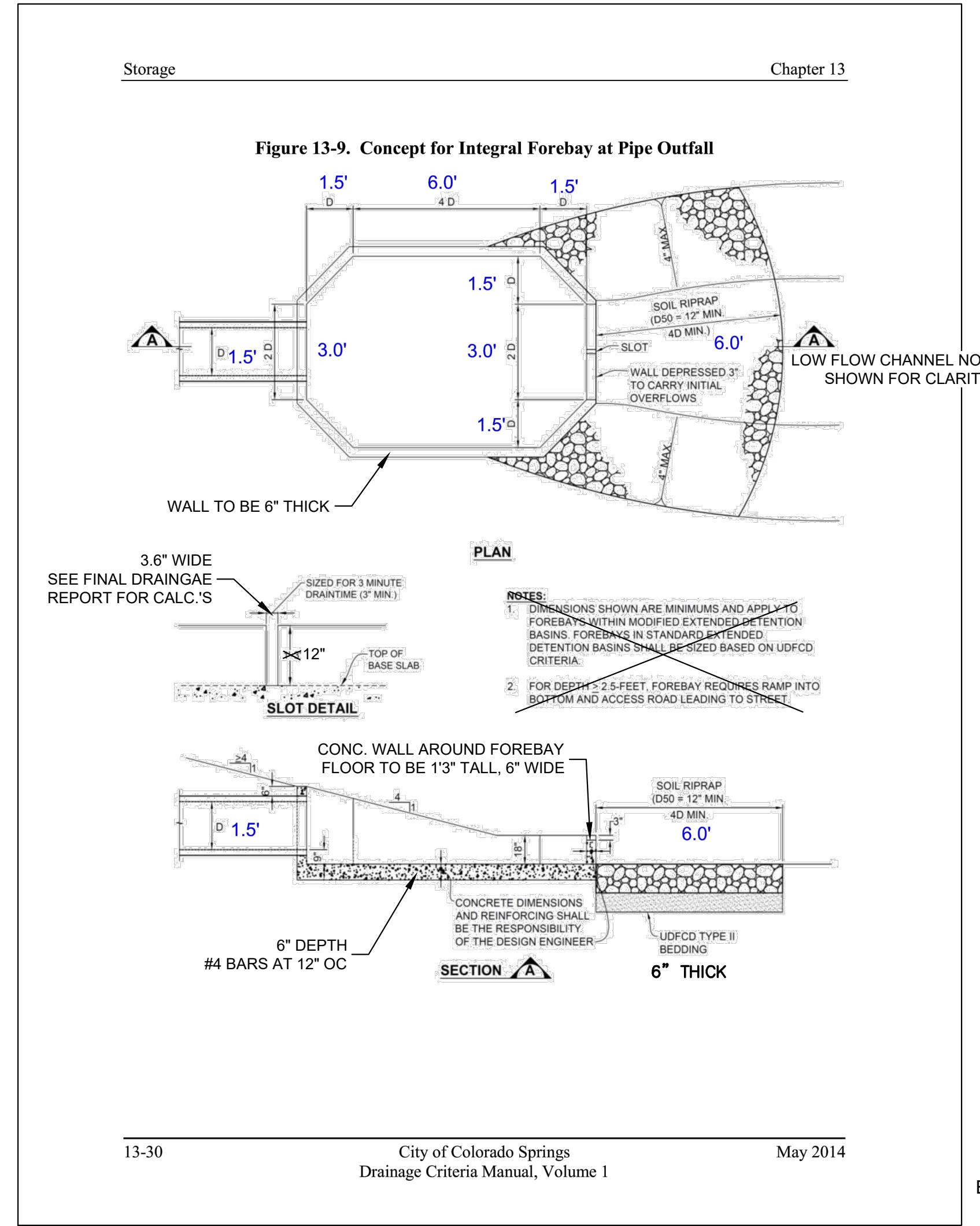
** Fifty percent or more by weight retained on the #40 sieve.

RIPRAP CLASSIFICATION

VL = D50 = 6"
 L = D50 = 9"
 M = D50 = 12"
 H = D50 = 18"
 VH = D50 = 24"

GRADATION FOR GRANULAR BEDDING

U.S. Standard Sieve Size	Percent Weight By Passing		Square Mesh Sieves
	Type I	Type II	
3"	-	-	90 - 100
1-1/2"	-	-	-
3/4"	-	-	20 - 90
3/8"	100	-	-
#4	95 - 100	-	0 - 20
#16	45 - 80	-	-
#50	10 - 30	-	-
#100	2 - 10	-	-
#200	0 - 2	-	0 - 3



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REVISIONS			
CTR Engineering, Inc. 16392 TIMBER MEADOW DRIVE COLORADO SPRINGS, CO 80908 (719) 964-6654			
PROJECT: CLEAR VIEW INDUSTRIAL PARK FILING 2B			
BENCHMARK: Elevations are based upon FIMS monument DR02, a 2" aluminum cap, stamped "CSU FIMS CONTROL DR02", at the southeast corner of Monica Drive and Hancock Expressway (Elevation=5927.27 NGVD29)			
PROJECT TITLE: GRADING, WATER QUALITY POND AND EROSION CONTROL			
SHEET TITLE: POND DETAILS			
DESIGNED BY: JCM	SCALE: 1"=10'	DATE ISSUED: MAR. 2021	
DRAWN BY: JCM			
CHECKED BY: JH		SHEET NO. 6 OF 22 SHEETS	
DWG:			

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Figure 13-12c. Emergency Spillway Protection

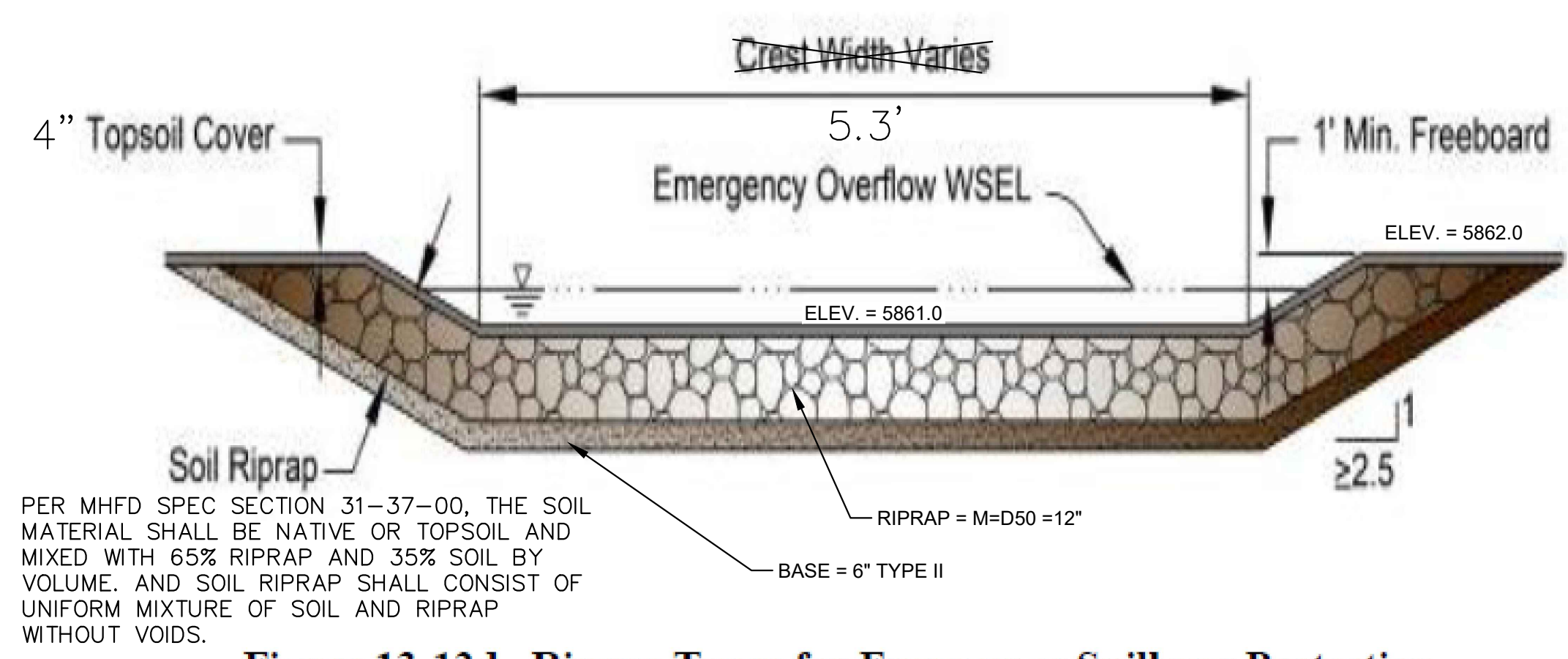
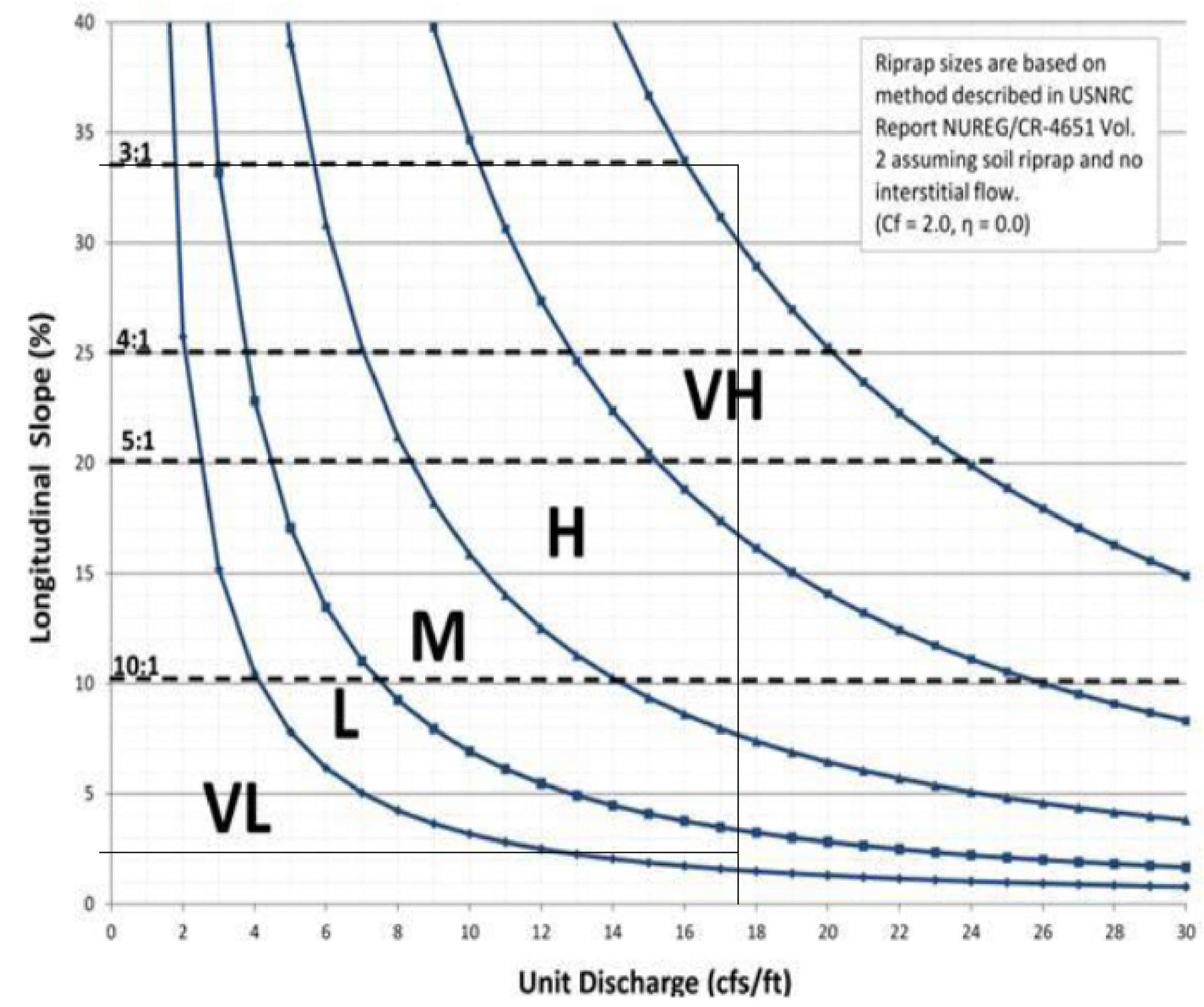


Figure 13-12d. Riprap Types for Emergency Spillway Protection



- VH = D50 = 24" FOR 3:1 SLOPE ONLY
- M = D50 = 12" EMERGENCY SPILLWAY ON TOP OF DAM.
- L = D50 = 9" FOR INLET PROTECTION.
- VL = D50 = 6" EMERGENCY SPILLWAY FROM TOE OF DAM TO EDGE OF CANAL.

Figure 13-12b. Emergency Spillway Profile at Embankment

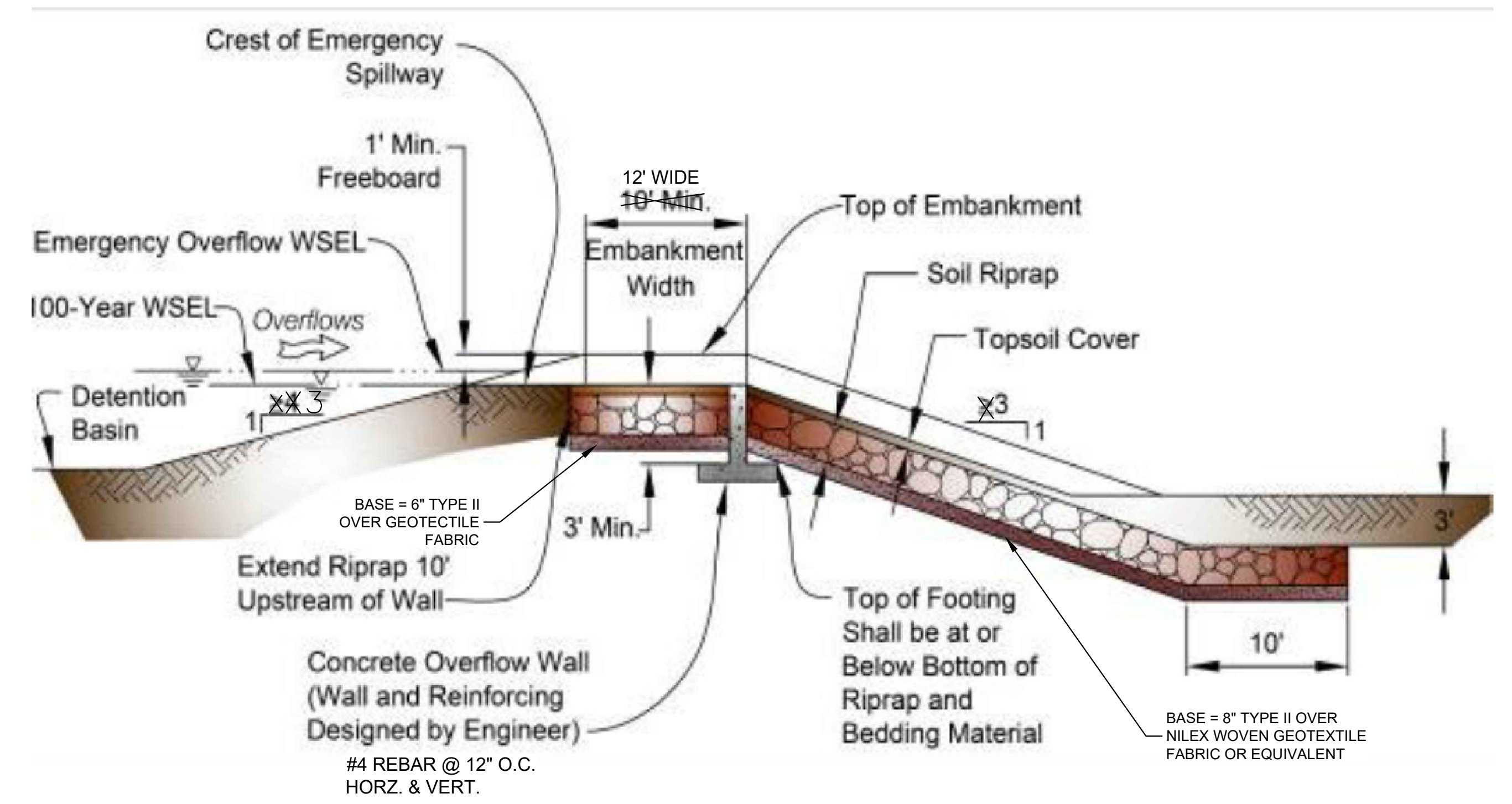
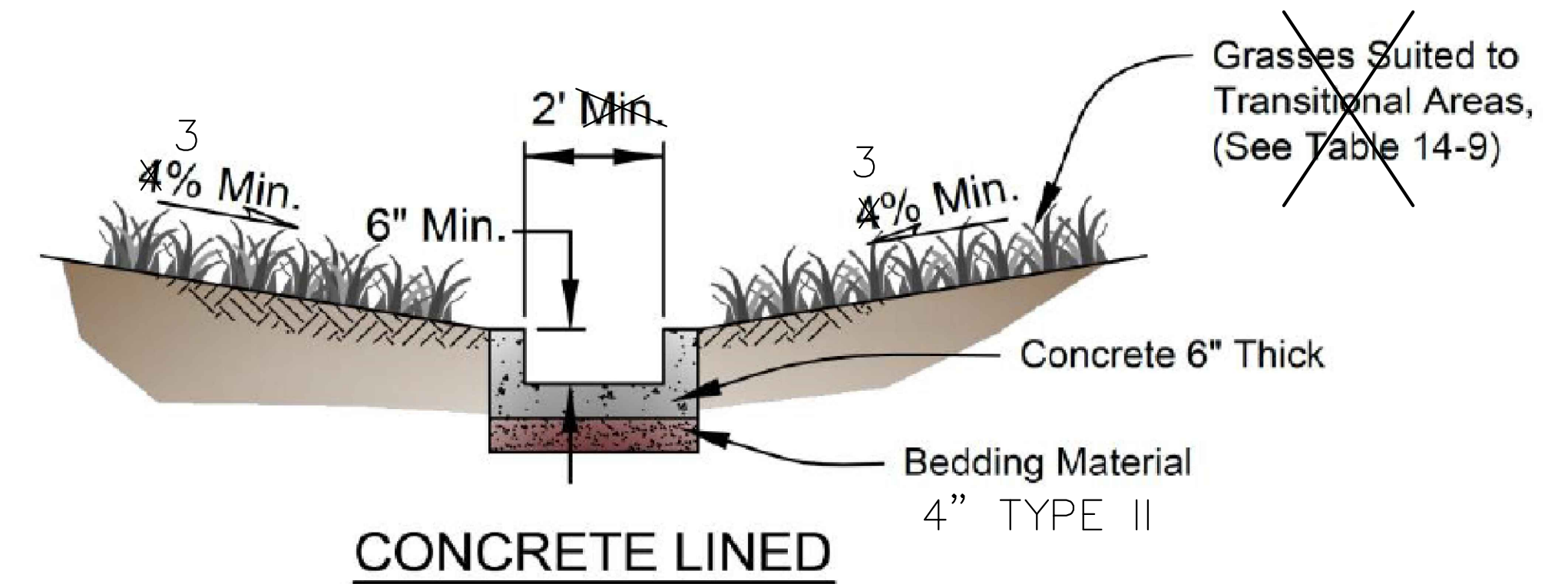


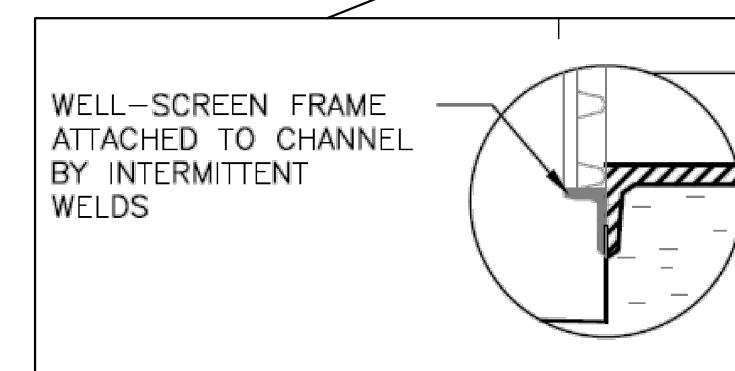
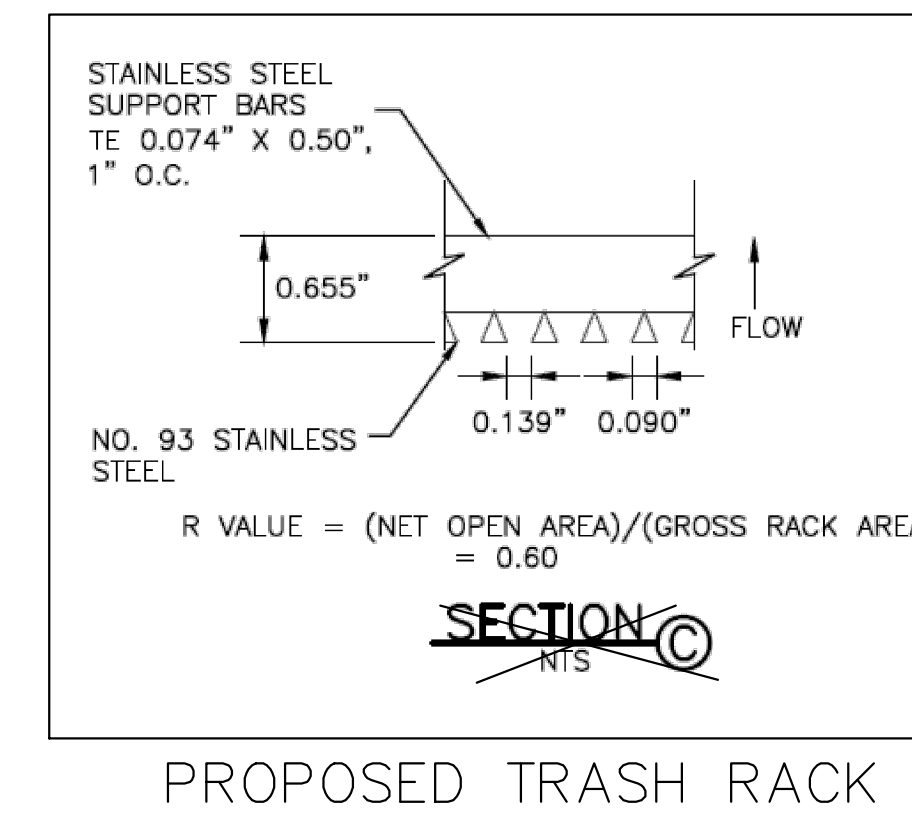
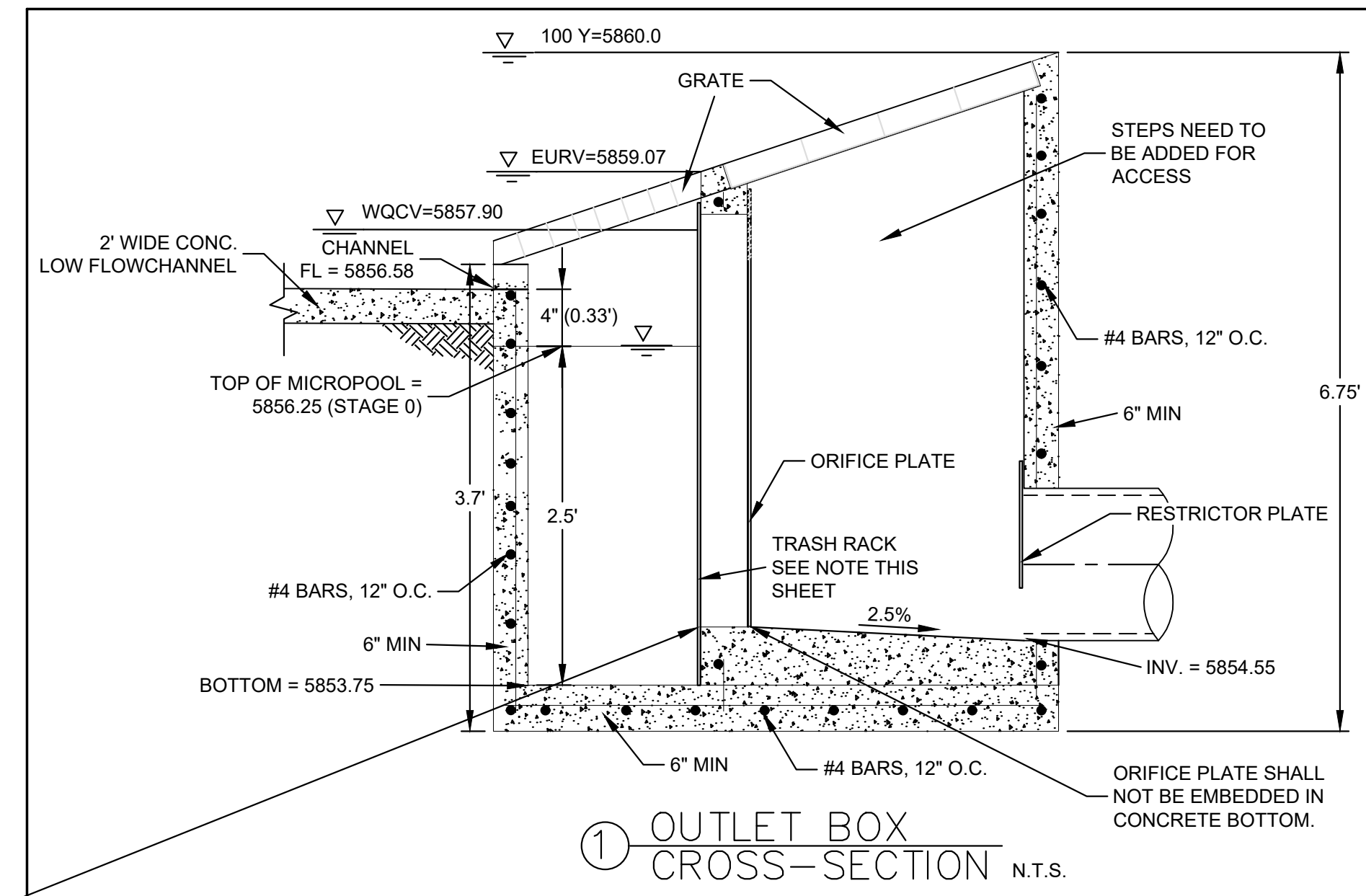
Figure 13-6. Typical Low-flow Channel Details



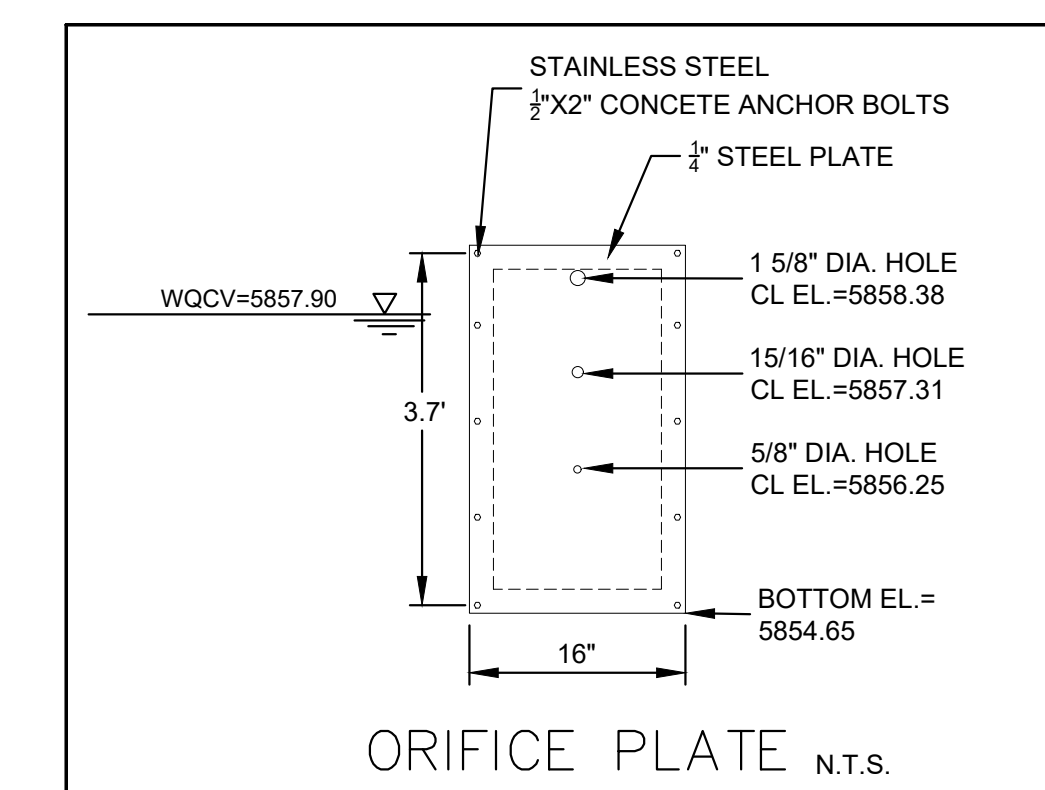
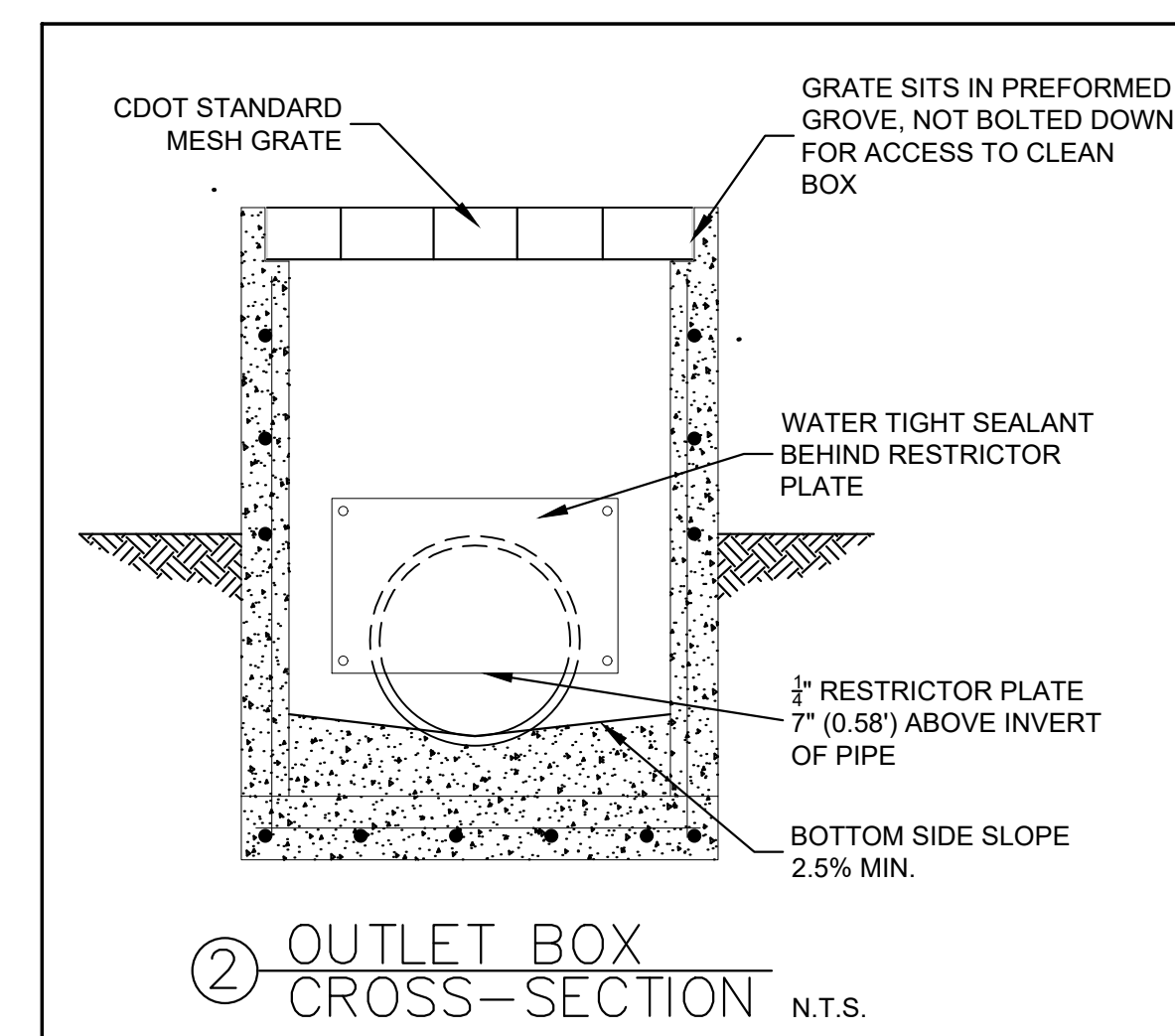
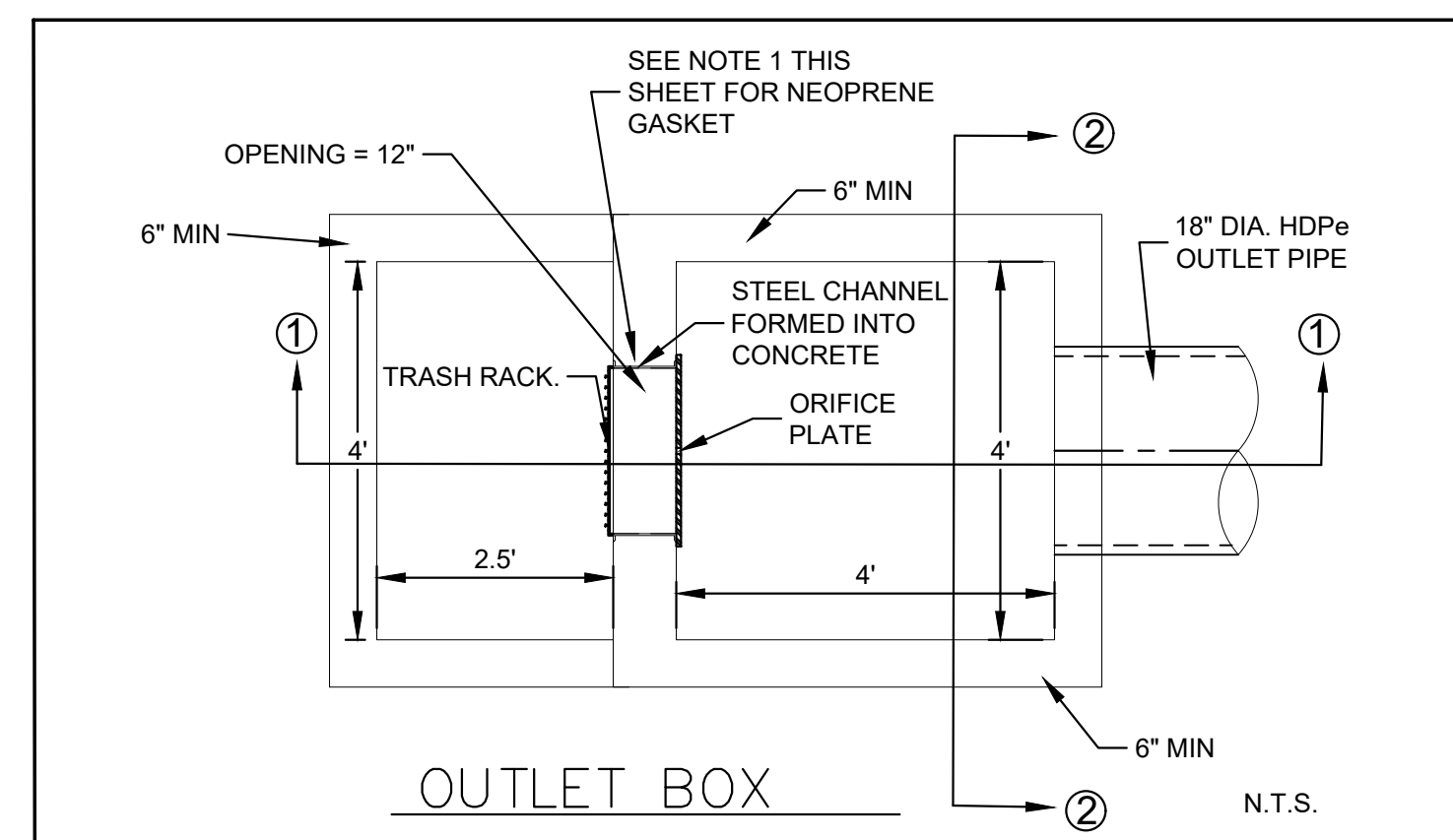
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REVISIONS			
CTR Engineering, Inc.			
16392 TIMBER MEADOW DRIVE COLORADO SPRINGS, CO 80908 (719) 964-6654			
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BENCHMARK: Elevations are based upon FIMS monument DR02, a 2" aluminum cap, stamped "CSU FIMS CONTROL DR02", at the southeast corner of Monica Drive and Hancock Expressway (Elevation=5927.27 NGVD29)			
PROJECT TITLE: GRADING, WATER QUALITY POND AND EROSION CONTROL			
SHEET TITLE: POND DETAILS (2)			
DESIGNED BY: JCM	SCALE: NTS	DATE ISSUED: MAR. 2021	
DRAWN BY: JCM	CHK: JH	SHEET NO. 7 OF 22 SHEETS	
CHECKED BY: JH	V: JH	DWG:	

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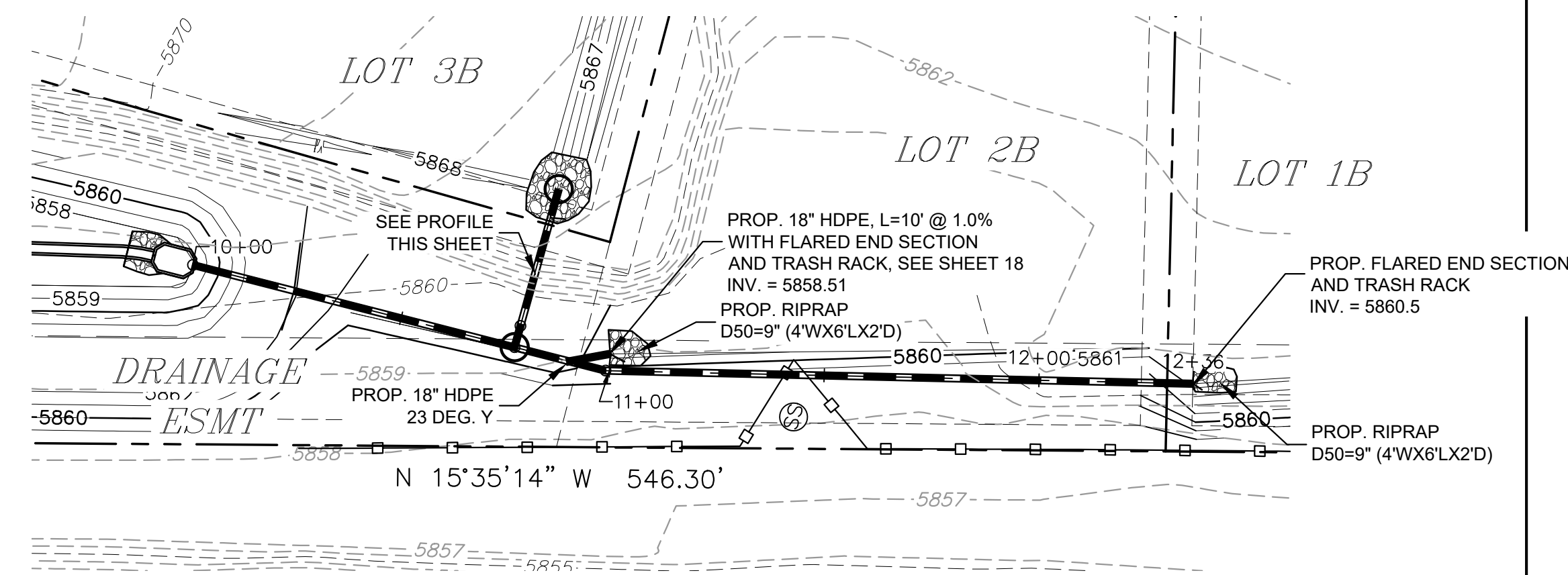
- NOTE:
- 1) PROVIDE CONTINUOUS NEOPRENE GASKET BETWEEN ORIFICE PLATE AND CONCRETE STRUCTURE.
 - 2) ALL EXTERIOR STEEL SHALL BE WITH STAINLESS OR HOT DIPPED GALVANIZED.
 - 3) ALL METAL SURFACES ARE TO BE COATED WITH ZRC COLD GALVANIZING COMPOUND.
 - 4) PER GEOTECH REPORT, ALL CONCRETE PLACED ON SITE IS TO USE TYPE II CEMENT.
 - 5) TRASH RACK: ACCEPTABLE ARE EITHER A NO. 93 JOHNSON VEE WIRE STAINLESS STEEL SCREEN OR AMICO KLEMP SR SERIES ALUMINUM BAR GRATE OR APPROVED EQUIVALENT.



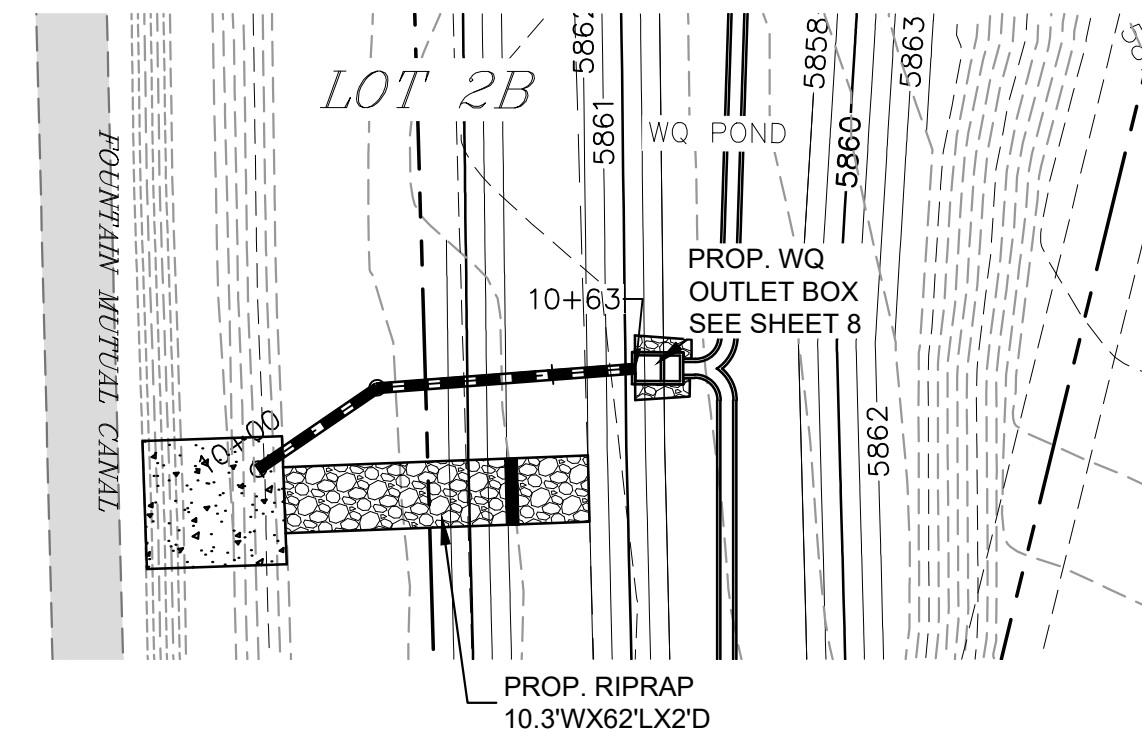
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REVISIONS			
CTR Engineering, Inc.			
16392 TIMBER MEADOW DRIVE COLORADO SPRINGS, CO 80908 (719) 964-6654			
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BENCHMARK: Elevations are based upon FIMS monument DR02, a 2" aluminum cap, stamped "CSU FIMS CONTROL DR02", at the southeast corner of Monica Drive and Hancock Expressway (Elevation=5927.27 NGVD29)			
PROJECT TITLE: GRADING, WATER QUALITY POND AND EROSION CONTROL			
SHEET TITLE: OUTLET BOX DETAILS			
DESIGNED BY: JCM	SCALE: NTS	DATE ISSUED: MAR. 2021	
DRAWN BY: JCM	INCHES: NTS	SHEET NO. 8 OF 22 SHEETS	
CHECKED BY: JH	VERTICAL: NTS		
DWG:			

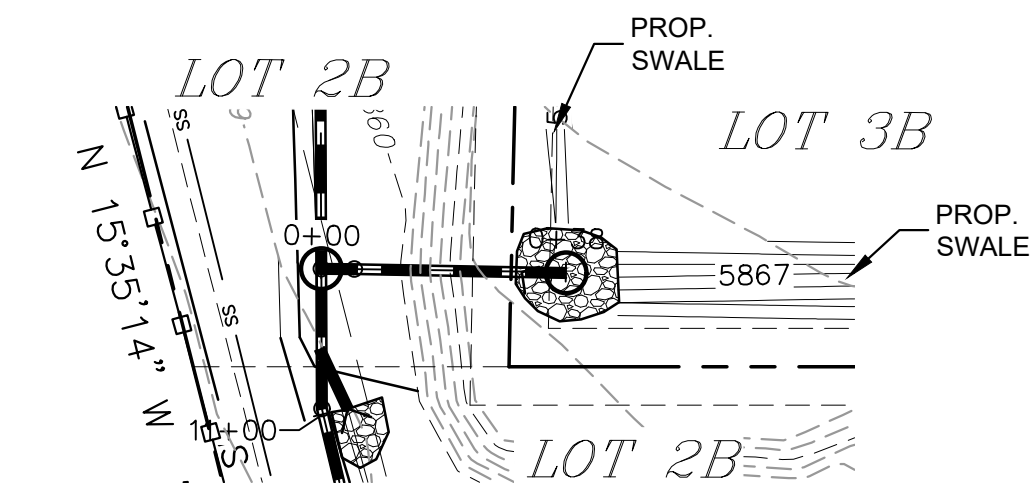
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STORM LINE TO POND

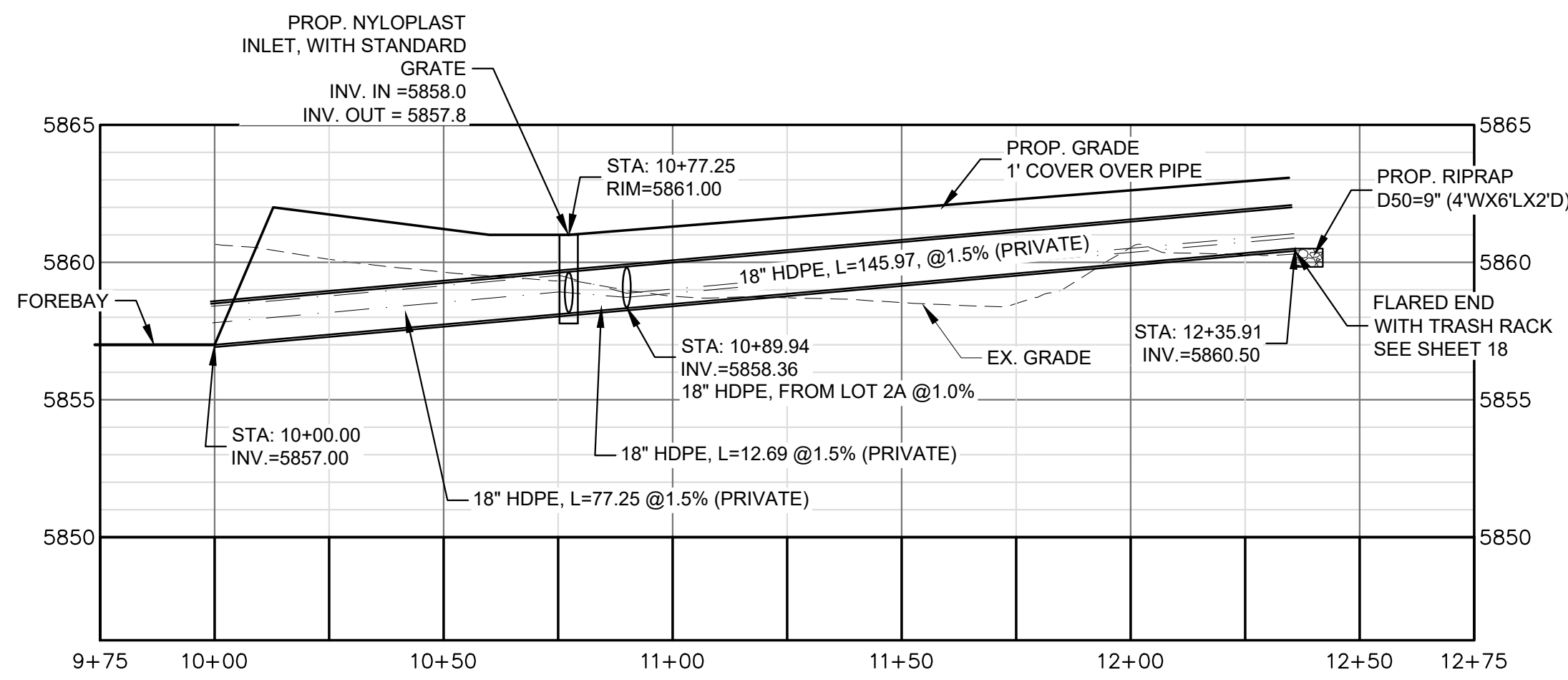


OUTLET PIPE



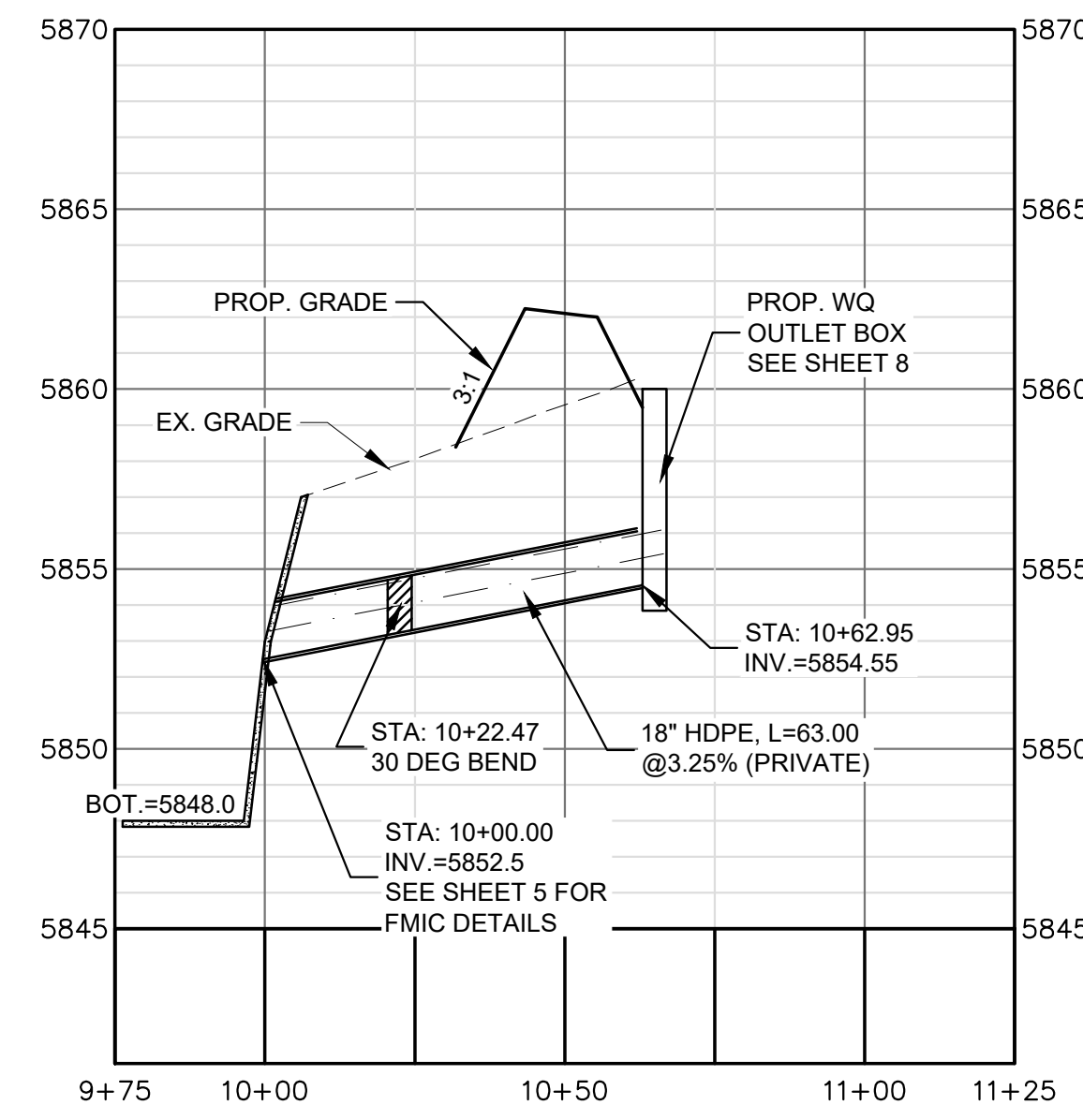
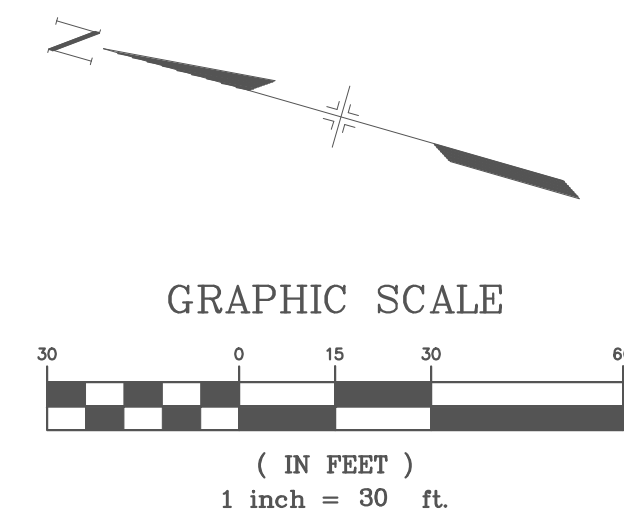
STORM PIPE FROM LOT 3B

NOTE:
 1) SEE SHEET 10 FOR NYLOPLAST DETAILS.
 2) SEE SHEET 18 FOR FLARED END SECTIONS AND TRASH GUARD.



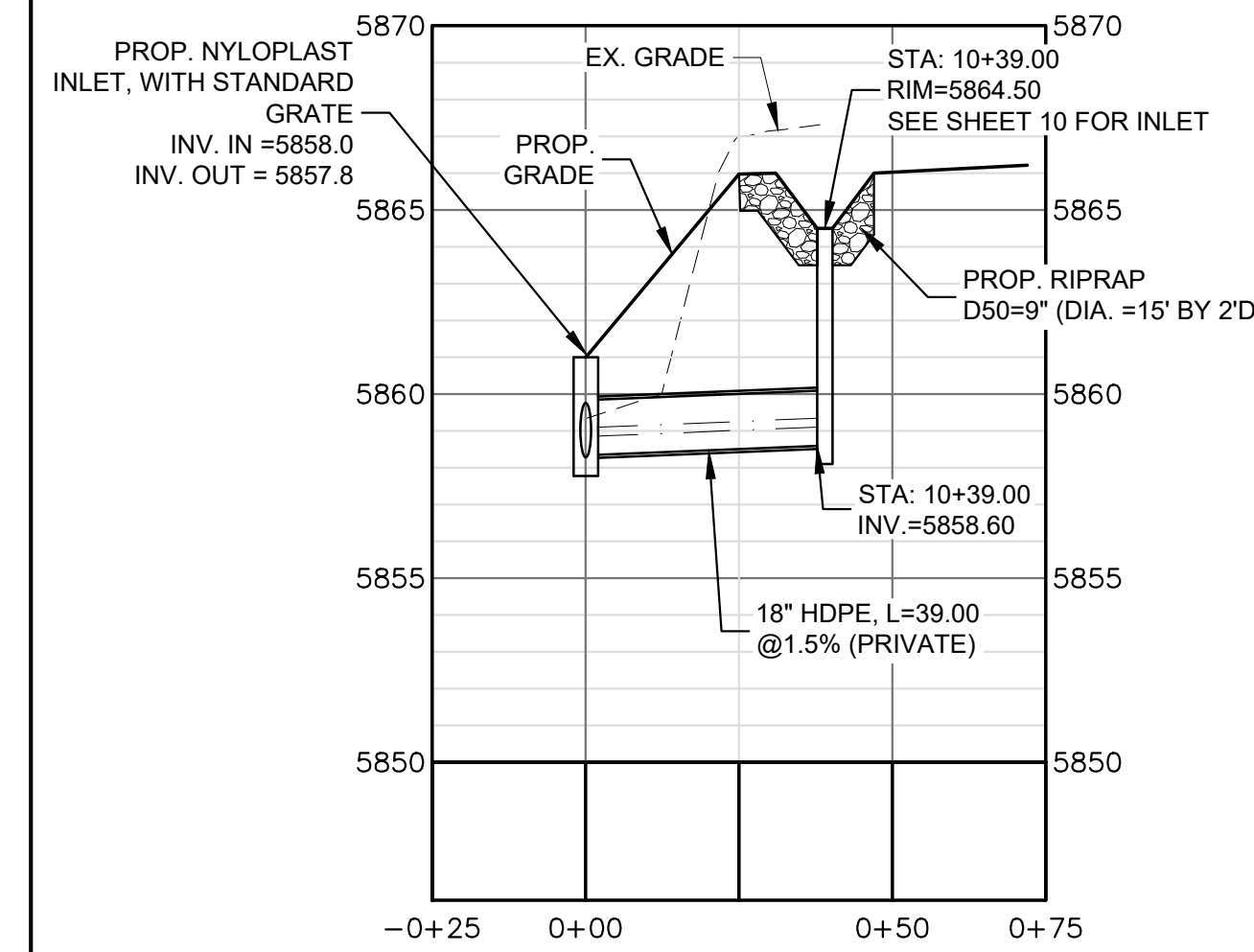
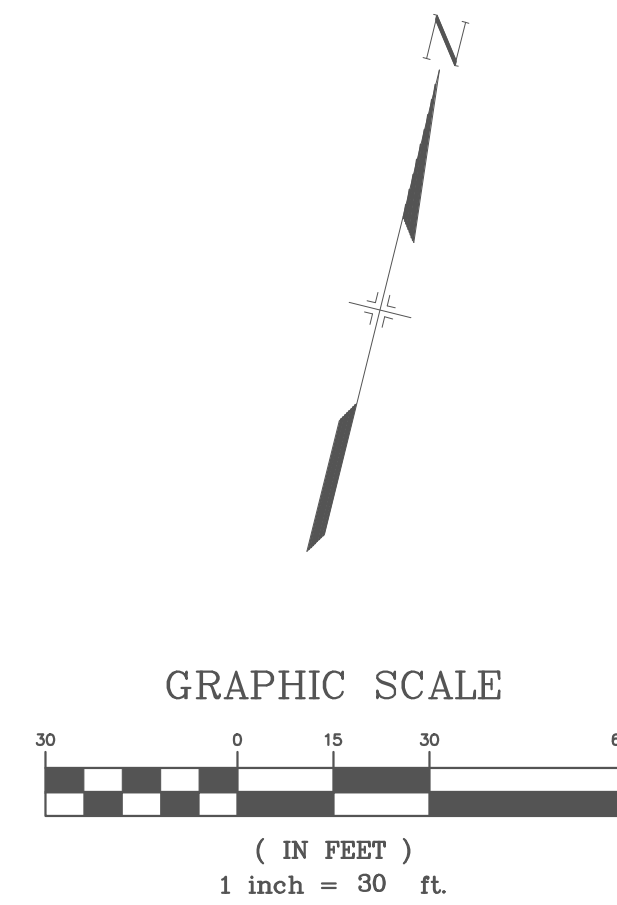
STORM PROFILE

HOR: 1"=30"
 VERT: 1"=5"



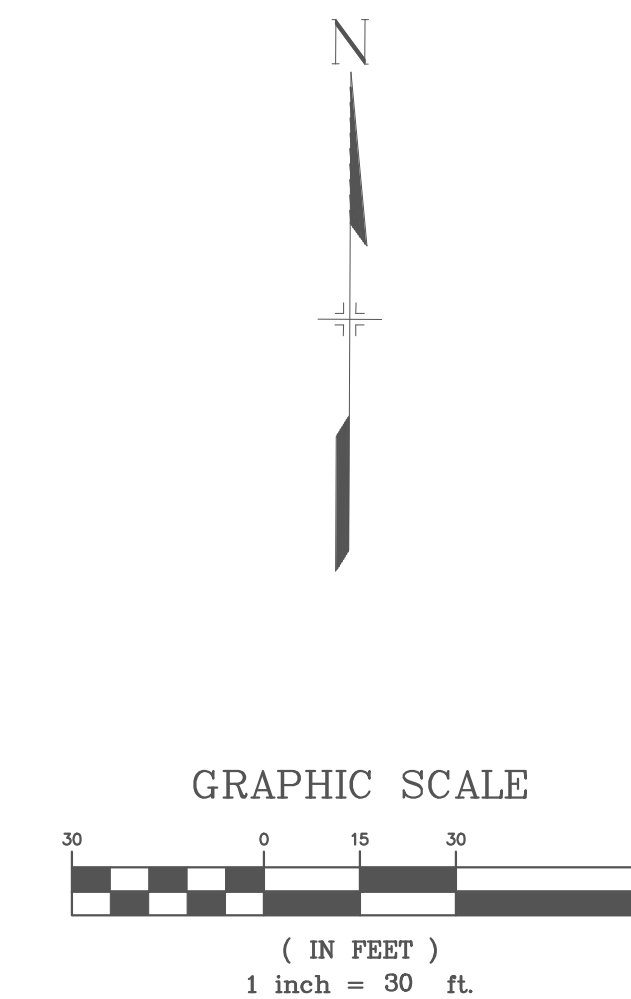
STORM PROFILE

HOR: 1"=30"
 VERT: 1"=5"



STORM PROFILE

HOR: 1"=30"
 VERT: 1"=5"



LEGEND

- PROPOSED STORM LINE
- EXISTING CONTOURS
- PROPOSED CONTOURS
- EXISTING FENCE
- EXISTING LOTS LINES
- HGL & EGL

NO.	DATE	DESCRIPTION	BY
REVISIONS			

CTR Engineering, Inc.

16392 TIMBER MEADOW DRIVE
 COLORADO SPRINGS, CO 80908
 (719) 964-6654

PROJECT: CLEAR VIEW INDUSTRIAL PARK FILING 2B

BENCHMARK: Elevations are based upon FIMS monument DR02, a 2" aluminum cap, stamped "CSU FIMS CONTROL DR02", at the southeast corner of Monica Drive and Hancock Expressway (Elevation=5927.27 NGVD29)

PROJECT TITLE: GRADING, WATER QUALITY POND AND EROSION CONTROL

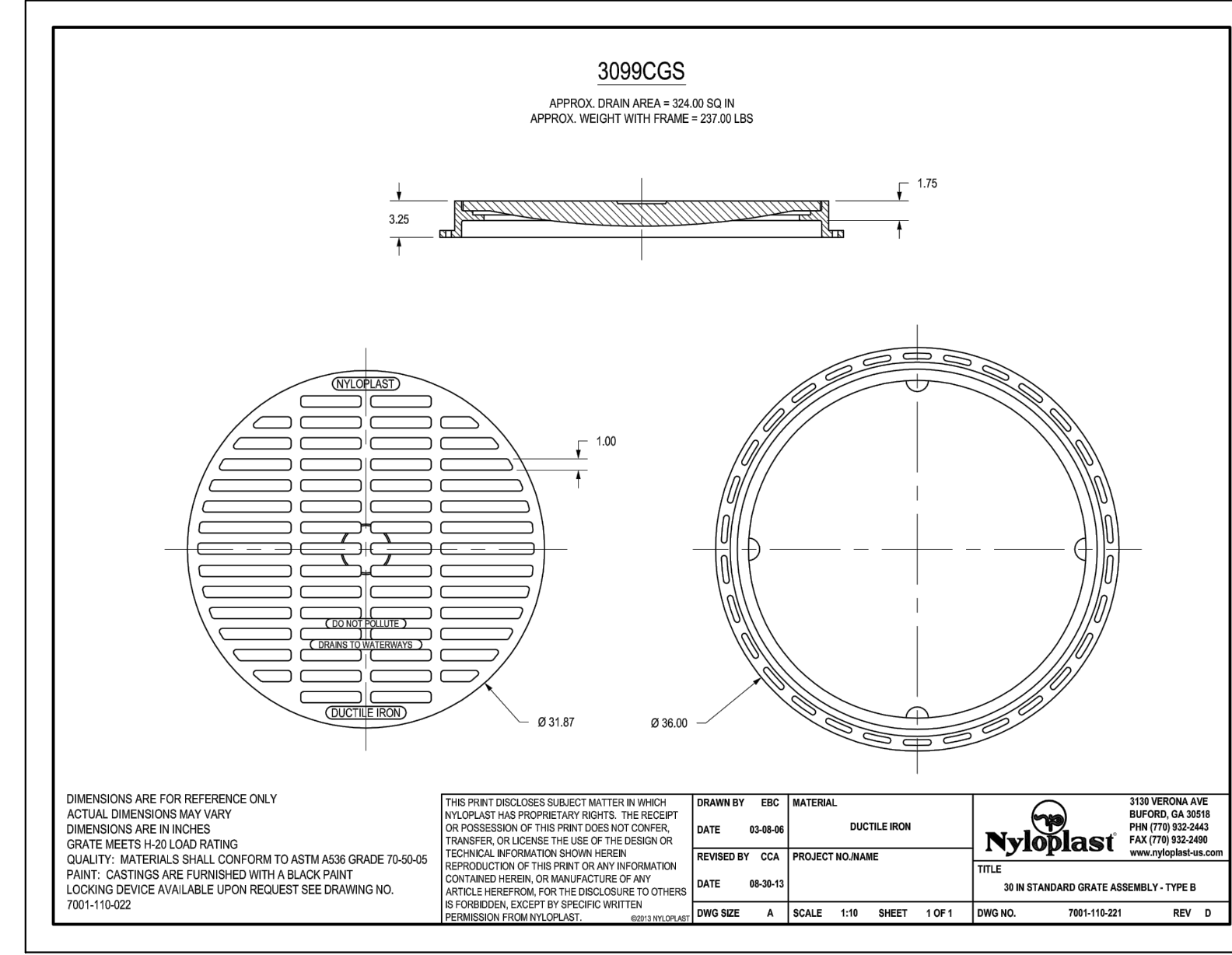
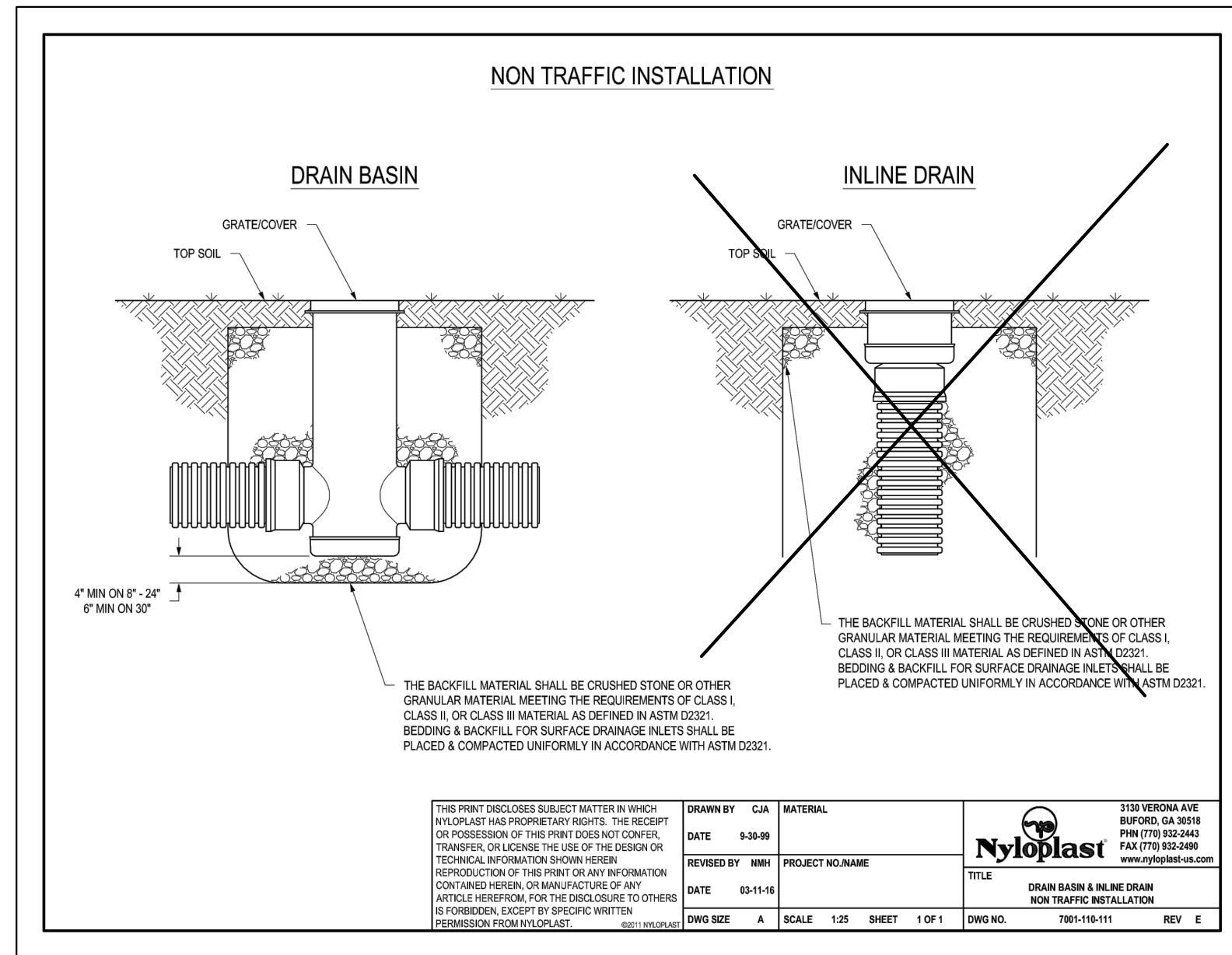
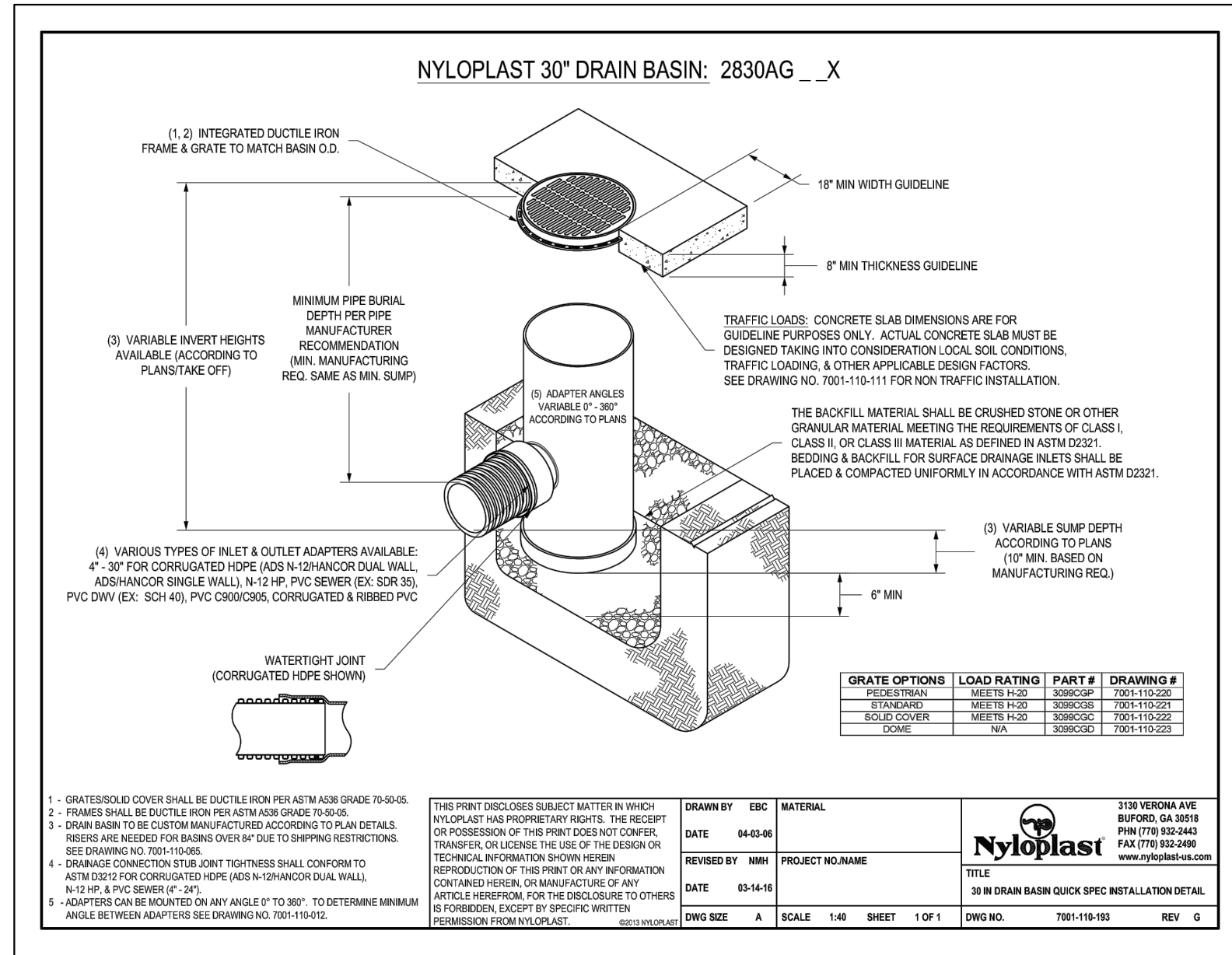
SHEET TITLE: STORM PLAN AND PROFILE

DESIGNED BY: JCM SCALE: DATE ISSUED: MAR. 2021
 DRAWN BY: JCM H: 1"=30' SHEET NO. 9 OF 22 SHEETS
 CHECKED BY: JH V:

DWG:

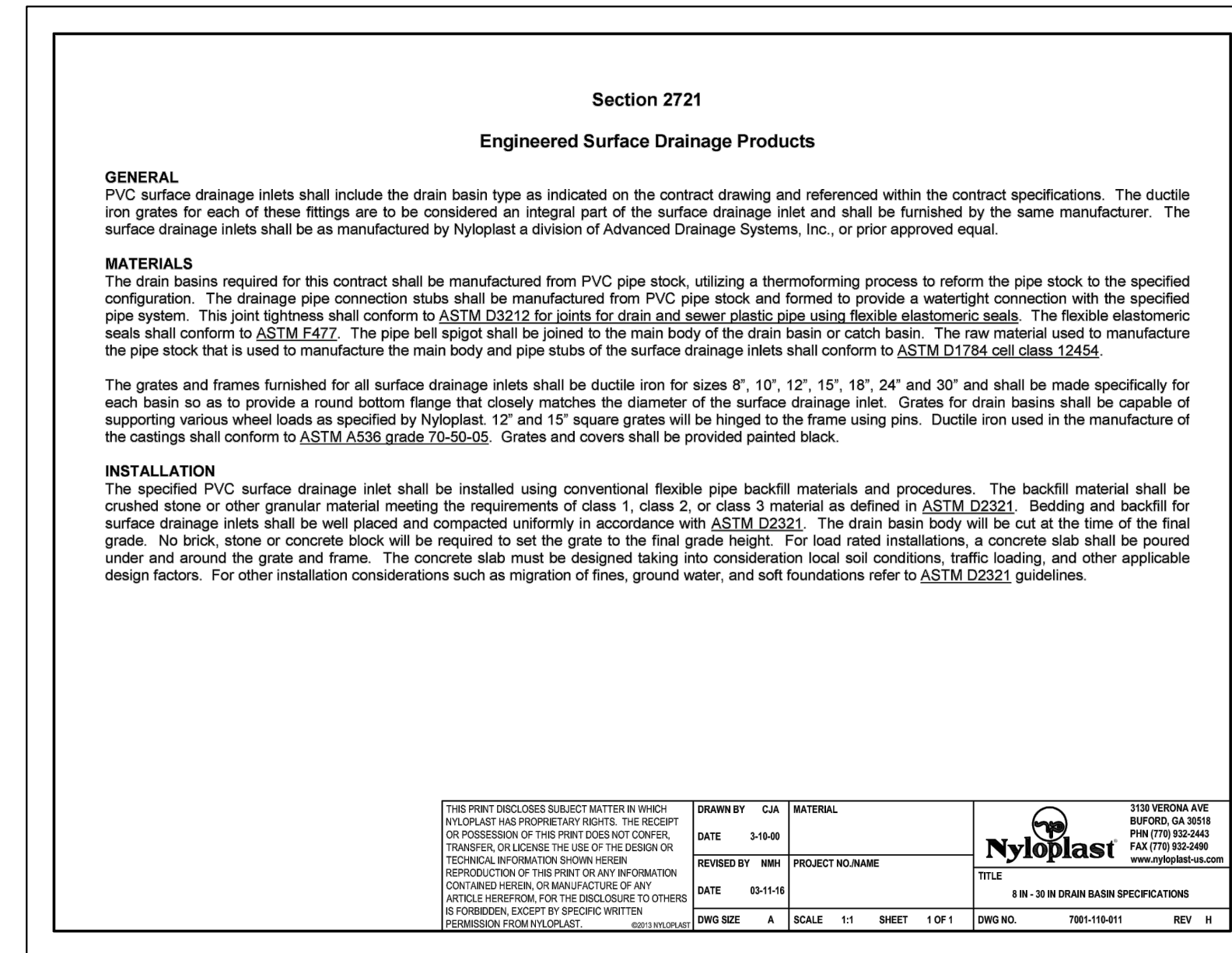
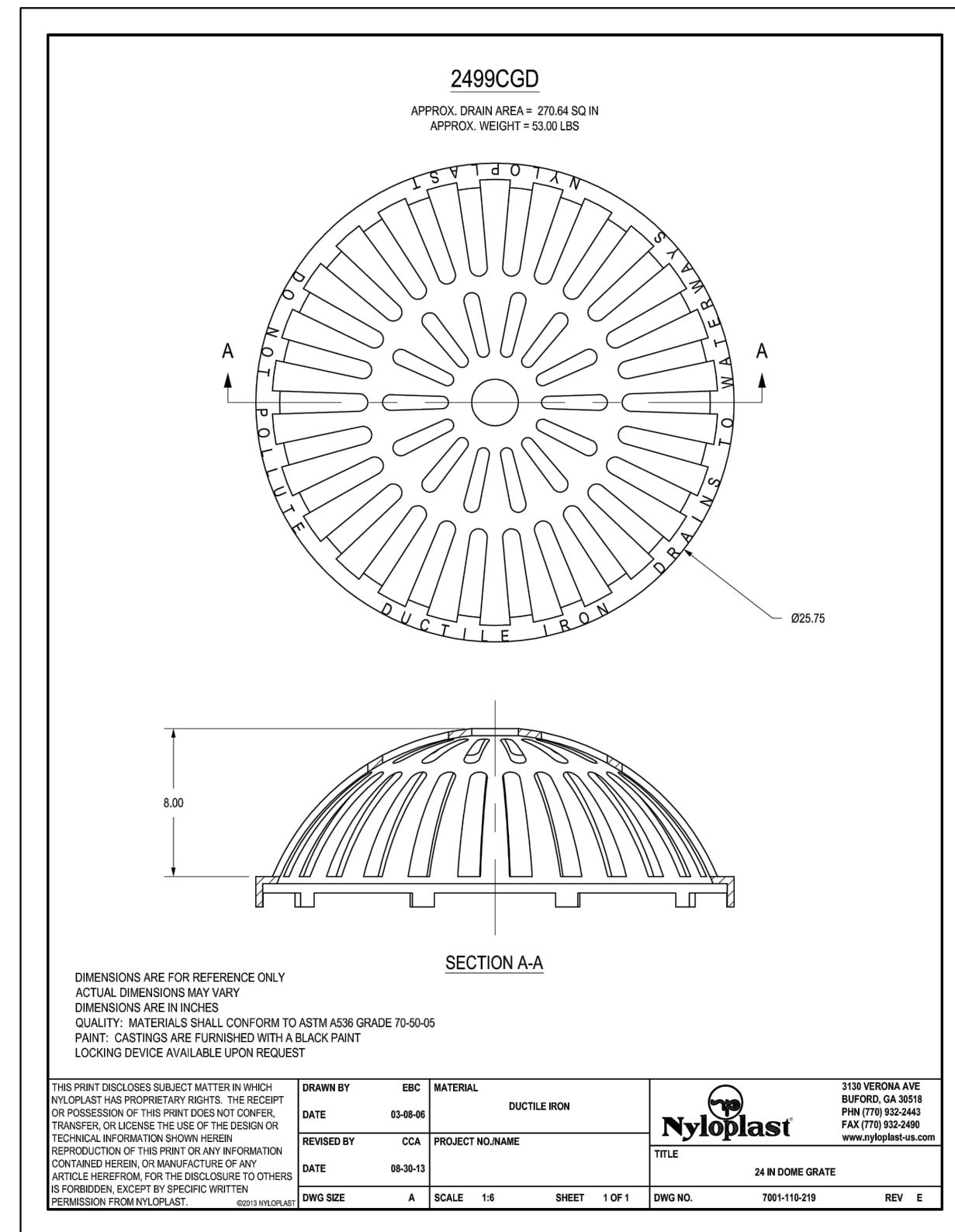
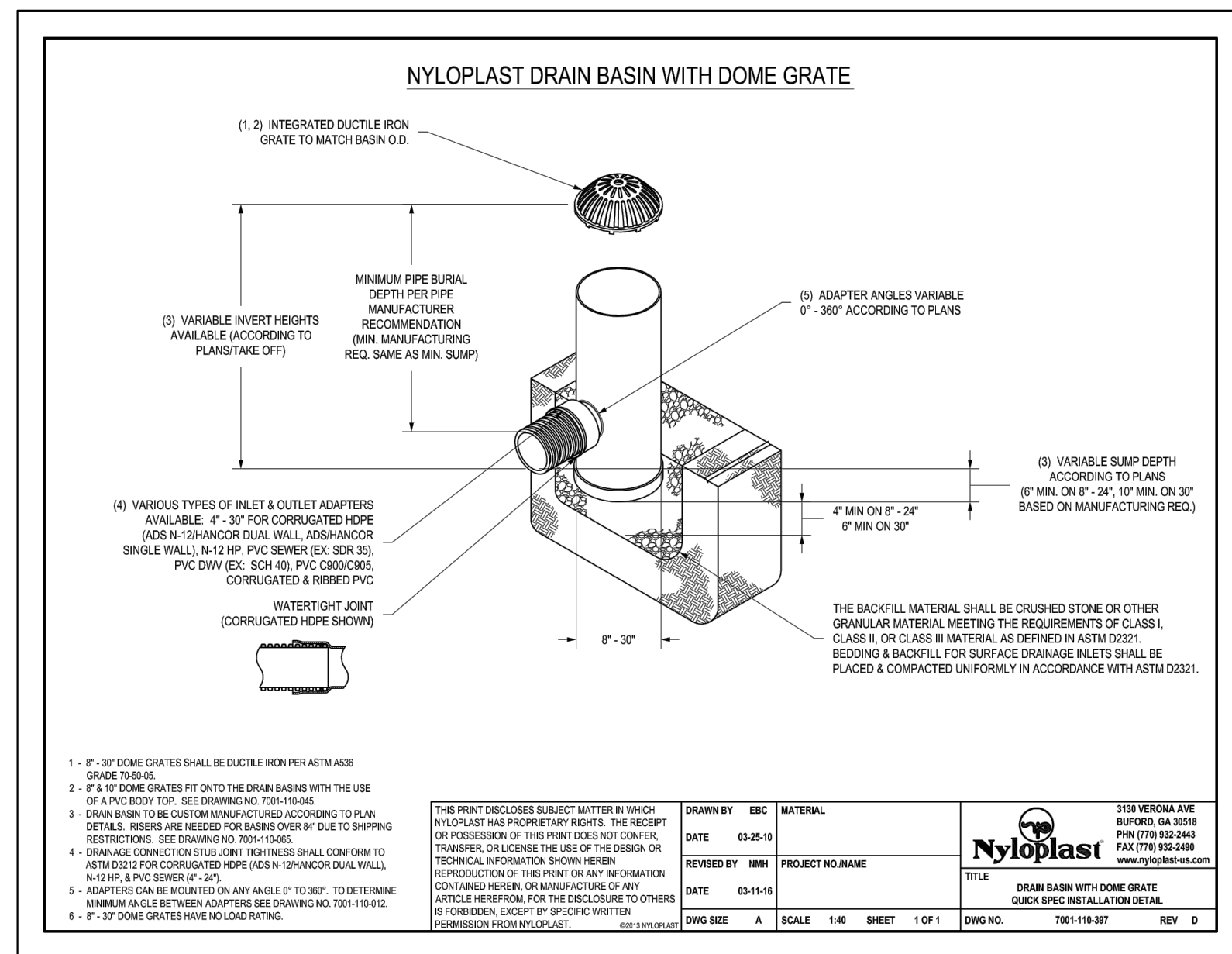


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INLINE STORM
STA: 10+77.30

LOT 3B



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16392 TIMBER MEADOW DRIVE COLORADO SPRINGS, CO 80908 (719) 964-6654			
PROJECT:	CLEAR VIEW INDUSTRIAL PARK FILING 2B		
BENCHMARK:	Elevations are based upon FIMS monument DR02, a 2" aluminum cap, stamped "CSU FIMS CONTROL DR02", at the southeast corner of Monica Drive and Hancock Expressway (Elevation=5927.27 NGVD29)		
PROJECT TITLE:	GRADING, WATER QUALITY POND AND EROSION CONTROL		
SHEET TITLE:	NYLOPLAST DETAILS		
DESIGNED BY: JCM	SCALE:	DATE ISSUED: MAR. 2021	
DRAWN BY: JCM	1: NA		
CHECKED BY: JH	V:	SHEET NO. 10 OF 22 SHEETS	
DWG:			

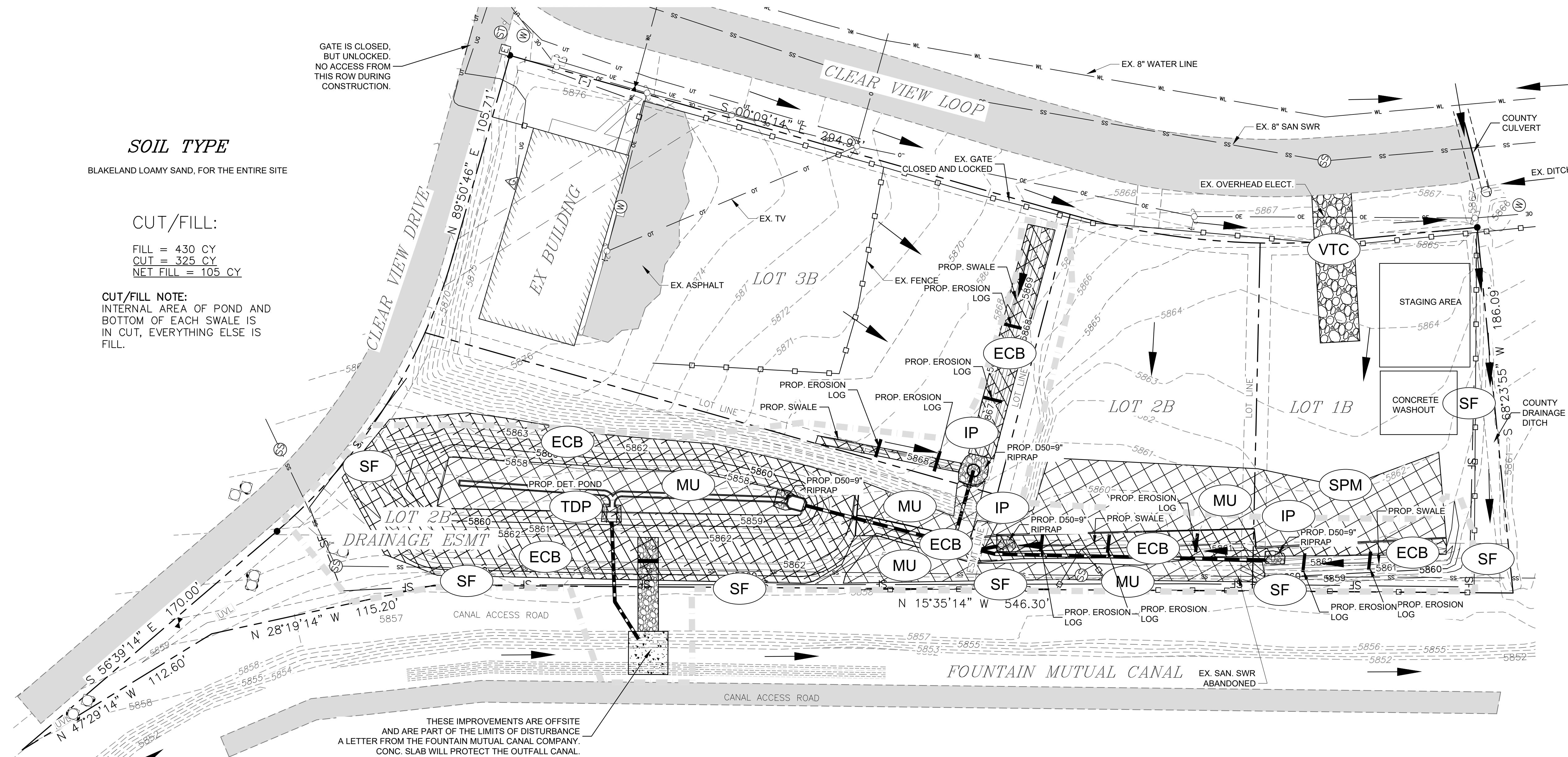
SOIL TYPE

BLAKELAND LOAMY SAND, FOR THE ENTIRE SITE

CUT/FILL:

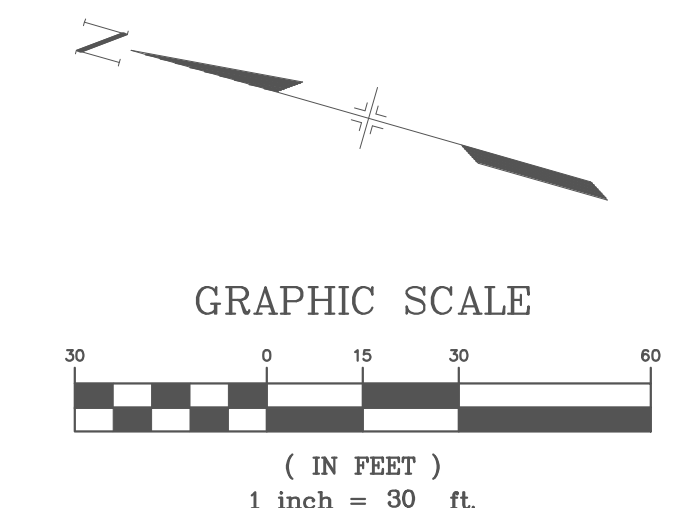
FILL = 430 CY
 CUT = 325 CY
 NET FILL = 105 CY

CUT/FILL NOTE:
 INTERNAL AREA OF POND AND
 BOTTOM OF EACH SWALE IS
 IN CUT, EVERYTHING ELSE IS
 FILL.



GATE IS CLOSED,
 BUT UNLOCKED.
 NO ACCESS FROM
 THIS ROW DURING
 CONSTRUCTION.

THESE IMPROVEMENTS ARE OFFSITE
 AND ARE PART OF THE LIMITS OF DISTURBANCE.
 A LETTER FROM THE FOUNTAIN MUTUAL CANAL COMPANY
 CONC. SLAB WILL PROTECT THE OUTFALL CANAL.



LEGEND

- PROPOSED STORM LINE
- EXISTING CONTOURS
- PROPOSED CONTOURS
- EXISTING FENCE
- EXISTING LOTS LINES
- PROPOSED FLOW ARROWS
- LIMITS OF DISTURBANCE/
LIMITS OF CONSTRUCTION

EROSION CONTROL PHASING

- INITIAL:** (VTC) (SF) (TDP)
- TEMP/INTERIM:** (MU) (IP)
- PERMANENT/FINAL:** (ECB) (SCL) INCLUDES DET. POND, AND FOREBAY
- (TDP) TEMPORARY SEDIMENT POND

TRIBUTARY AREA = 3.0 AC
 BASIN BOTTOM WIDTH = 28'
 LENGTH OF BASIN BOTTOM = 56'
 SEDIMENT POND DEPTH = 4'
 SEDIMENT POND MIN. VOLUME = 6,272 CUBIC FEET
 SPILLWAY CREST WIDTH = 5'
 HOLE DIAMETER FOR RISER PIPE = 12"
 SINGLE COLUMN OF HOLES ON RISER PIPE
 SEE DETAILS ON SHEET ---

LEGEND

- (VTC) VEHICLE TRACKING CONTROL
- (SF) SILT FENCE
- (SCL) SEDIMENT CONTROL LOG
- (ECB) EROSION CONTROL BLANKET, AREA OF CUT AND FILL, SOIL DISTURBANCE AREA
- (MU) SEEDING AND MULCHING, SOIL DISTURBANCE AREA
- (IP) INLET PROTECTION
- (SPM) STOCK PILE MANAGEMENT

NOTE:

- 1) EXISTING VEGETATION CONSISTS OF FEW WEEDS AS THE SITE WAS A USED CAR LOT.
- 2) FEMA 100-YEAR FLOOD PLAN MAP FOR THIS AREA IS 08041C0763G, DATED 12/7/18
- 3) NO CONSTRUCTION OUTSIDE THE SILT FENCE TO PROTECT EXISTING VEGETATION
- 4) NO OFFSITE GRADING IS PROPOSED, HOWEVER INSTALLATION OF THE OUTFALL PIPE WILL BE REQUIRED. THIS AREA WILL RECEIVE RIPRAP, SEEDING AND MULCHING. FMIC CANAL PROTECTION WILL ALSO BE COMPLETED.
- 5) NO CONSTRUCTION TRAILER WILL BE USED FOR THIS PROJECT.
- 6) TEMPORARY SEDIMENT POND WILL BE THE DETENTION POND UNTIL COMPLETION. NO DEWATERING IS ANTICIPATED FOR THIS SITE. GROUND WATER WAS NOT ENCOUNTERED UNTIL 11-12 FEET BELOW SURFACE. THE MAXIMUM CUTS IN THE POND ARE ONLY 5- FEET DEEP. IF GROUNDWATER IS ENCOUNTERED DURING CONSTRUCTION AND DEWATERING NEEDS TO TAKE PLACE, THE CONTRACTION MANAGER MUST FOLLOW SECTION 3.3.6C IN THE COUNTY ECM.
- 8) SEE SHEETS 12 THRU 22 FOR EROSION CONTROL DETAILS.
- 9) NO OFFSITE FLOWS WILL IMPACT THIS SITE.
- 10) THE LOCATION OF THE WASTE DISPOSAL BIN, PORTABLE TOILETS, AND SWMP BINDER WILL BE DETERMINED BY THE CONTRACTOR AND THE SWMP WILL BE MARKED-UP.
- 11) SINGLE AND DOUBLE LAYER E.C. BLANKETS WILL BE USED.



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PROJECT TITLE: GRADING, WATER QUALITY POND AND EROSION CONTROL			
SHEET TITLE: EROSION CONTROL PLAN			
DESIGNED BY: JCM	SCALE: 1"=30'	DATE ISSUED: MAR. 2021	
DRAWN BY: JCM	HH: 3-5-21	SHEET NO. 11 OF 22 SHEETS	
CHECKED BY: JH	V:		
DWG:			

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C:\Temp\CV\CAD\Grad\12 - 16 GRADING & EROSION CONTROL DETAILS.dwg, 3/7/2021 3:02:55 PM, DWG TO PDF.pcf

Silt Fence (SF) SC-1

Description

A silt fence is a woven geotextile fabric attached to wooden posts and trenched into the ground. It is designed as a sediment barrier to intercept sheet flow runoff from disturbed areas.

Appropriate Uses

A silt fence can be used where runoff is conveyed from a disturbed area as sheet flow. Silt fence is not designed to receive concentrated flow or to be used as a filter fabric. Typical uses include:

- Down slope of a disturbed area to accept sheet flow.
- Along the perimeter of a receiving water such as a stream, pond or wetland.
- At the perimeter of a construction site.

Design and Installation

Silt fence should be installed along the contour of slopes so that it intercepts sheet flow. The maximum recommended tributary drainage area per 100 lineal feet of silt fence, installed along the contour, is approximately 0.25 acres with a disturbed slope length of up to 150 feet and a tributary slope gradient no steeper than 3:1. Longer and steeper slopes require additional measures. This recommendation only applies to silt fence installed along the contour. Silt fence installed for other uses, such as perimeter control, should be installed in a way that will not produce concentrated flows. For example, a "J-hook" installation may be appropriate to force runoff to pond and evaporate or infiltrate in multiple areas rather than concentrate and cause erosive conditions parallel to the silt fence.

See Detail SF-1 for proper silt fence installation, which involves proper trenching, staking, securing the fabric to the stakes, and backfilling the silt fence. Properly installed silt fence should not be easily pulled out by hand and there should be no gaps between the ground and the fabric.

Silt fence must meet the minimum allowable strength requirements, depth of installation requirement, and other specifications in the design details. Improper installation of silt fence is a common reason for silt fence failure; however, when properly installed and used for the appropriate purposes, it can be highly effective.

Silt Fence	
Functions	
Erosion Control	No
Sediment Control	Yes
Site/Material Management	No

November 2010 Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual Volume 3 SF-1



Photograph SF-1. Silt fence creates a sediment barrier, forcing sheet flow runoff to evaporate or infiltrate.

SC-1 Silt Fence (SF)

Maintenance and Removal

Inspection of silt fence includes observing the material for tears or holes and checking for slumping fence and undercut areas bypassing flows. Repair of silt fence typically involves replacing the damaged section with a new section. Sediment accumulated behind silt fence should be removed, as needed to maintain BMP effectiveness, typically before it reaches a depth of 6 inches.

Silt fence may be removed when the upstream area has reached final stabilization.

Photograph SF-2. When silt fence is not installed along the contour, a "J-hook" installation may be appropriate to ensure that the BMP does not create concentrated flow parallel to the silt fence. Photo courtesy of Tom Gore.

SF-2 Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual Volume 3 November 2010



Photograph SF-2. When silt fence is not installed along the contour, a "J-hook" installation may be appropriate to ensure that the BMP does not create concentrated flow parallel to the silt fence. Photo courtesy of Tom Gore.

Silt Fence (SF) SC-1

SECTION A

SF-1. SILT FENCE

November 2010 Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual Volume 3 SF-3

SC-1 Silt Fence (SF)

SILT FENCE INSTALLATION NOTES

- SILT FENCE MUST BE PLACED AWAY FROM THE TOE OF THE SLOPE TO ALLOW FOR WATER PONDING. SILT FENCE AT THE TOE OF A SLOPE SHOULD BE INSTALLED IN A FLAT LOCATION AT LEAST SEVERAL FEET (2-5 FT) FROM THE TOE OF THE SLOPE TO ALLOW ROOM FOR PONDING AND DEPOSITION.
- A UNIFORM 6" x 4" ANCHOR TRENCH SHALL BE EXCAVATED USING TRENCHER OR SILT FENCE INSTALLATION DEVICE. NO ROAD GRADERS, BACKHOES, OR SIMILAR EQUIPMENT SHALL BE USED.
- COMPACT ANCHOR TRENCH BY HAND WITH A "JUMPING JACK" OR BY WHEEL ROLLING. COMPACTION SHALL BE SUCH THAT SILT FENCE RESISTS BEING PULLED OUT OF ANCHOR TRENCH BY HAND.
- SILT FENCE SHALL BE PULLED TIGHT AS IT IS ANCHORED TO THE STAKES. THERE SHOULD BE NO NOTICEABLE SAG BETWEEN STAKES AFTER IT HAS BEEN ANCHORED TO THE STAKES.
- SILT FENCE FABRIC SHALL BE ANCHORED TO THE STAKES USING 1" HEAVY DUTY STAPLES OR NAILS WITH 1" HEADS. STAPLES AND NAILS SHOULD BE PLACED 3' ALONG THE FABRIC DOWN THE STAKE.
- AT THE END OF A RUN OF SILT FENCE ALONG A CONTOUR, THE SILT FENCE SHOULD BE TURNED PERPENDICULAR TO THE CONTOUR TO CREATE A "J-HOOK". THE "J-HOOK" EXTENDING PERPENDICULAR TO THE CONTOUR SHOULD BE OF SUFFICIENT LENGTH TO KEEP RUNOFF FROM FLOWING AROUND THE END OF THE SILT FENCE (TYPICALLY 10' - 20').
- SILT FENCE SHALL BE INSTALLED PRIOR TO ANY LAND DISTURBING ACTIVITIES.

SILT FENCE MAINTENANCE NOTES

- INSPECT BMPs EACH WORKDAY, AND MAINTAIN THEM IN EFFECTIVE OPERATING CONDITION. MAINTENANCE OF BMPs SHOULD BE PROACTIVE, NOT REACTIVE. INSPECT BMPs AS SOON AS POSSIBLE (AND ALWAYS WITHIN 24 HOURS) FOLLOWING A STORM THAT CAUSES SURFACE EROSION, AND PERFORM NECESSARY MAINTENANCE.
- FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN BMPs IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
- WHERE BMPs HAVE FAILED, REPAIR OR REPLACEMENT SHOULD BE INITIATED UPON DISCOVERY OF THE FAILURE.
- SEDIMENT ACCUMULATED UPSTREAM OF THE SILT FENCE SHALL BE REMOVED AS NEEDED TO MAINTAIN THE FUNCTIONALITY OF THE BMP, TYPICALLY WHEN DEPTH OF ACCUMULATED SEDIMENTS IS APPROXIMATELY 6".
- REPAIR OR REPLACE SILT FENCE WHEN THERE ARE SIGNS OF WEAR, SUCH AS SAGGING, TEARING, OR COLLAPSE.
- SILT FENCE IS TO REMAIN IN PLACE UNTIL THE UPSTREAM DISTURBED AREA IS STABILIZED AND APPROVED BY THE LOCAL JURISDICTION, OR IS REPLACED BY AN EQUIVALENT PERIMETER SEDIMENT CONTROL BMP.
- WHEN SILT FENCE IS REMOVED, ALL DISTURBED AREAS SHALL BE COVERED WITH TOPSOIL, SEEDED AND MULCHED OR OTHERWISE STABILIZED AS APPROVED BY LOCAL JURISDICTION.

COURTESY FROM TOWN OF PARKER, COLORADO AND CITY OF AURORA, NOT AVAILABLE IN AURORA

NOTE: MANY JURISDICTIONS HAVE BMP DETAILS THAT VARY FROM LISTED STANDARD DETAILS. CONSULT WITH LOCAL JURISDICTIONS AS TO WHICH DETAIL SHOULD BE USED WHEN DIFFERENCES ARE NOTED.

SF-4 Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual Volume 3 November 2010



Mulching (MU) EC-4

Description

Mulching consists of evenly applying straw, hay, shredded wood mulch, rock, bark or compost to disturbed soils and securing the mulch by crimping, tackifiers, netting or other measures. Mulching helps reduce erosion by protecting bare soil from rainfall impact, increasing infiltration, and reducing runoff.

Although often applied in conjunction with temporary or permanent seeding, it can also be used for temporary stabilization of areas that cannot be reseeded due to seasonal constraints.

Mulch can be applied either using standard mechanical dry application methods or using hydromulching equipment that hydraulically applies a slurry of water, wood fiber mulch, and often a tackifier.

Appropriate Uses

Use mulch in conjunction with seeding to help protect the seedbed and stabilize the soil. Mulch can also be used as a temporary cover on low to mild slopes to help temporarily stabilize disturbed areas where growing season constraints prevent effective reseeding. Disturbed areas should be properly mulched and tacked, or seeded, mulched and tacked promptly after final grade is reached (typically within no longer than 14 days) on portions of the site not otherwise permanently stabilized.

Standard dry mulching is encouraged in most jurisdictions; however, hydromulching may not be allowed in certain jurisdictions or may not be allowed near waterways.

Do not apply mulch during windy conditions.

Design and Installation

Prior to mulching, surface-roughen areas by rolling with a crimping or punching type roller or by track walking. Track walking should only be used where other methods are impractical because track walking with heavy equipment typically compacts the soil.

A variety of mulches can be used effectively at construction sites. Consider the following:

Mulch	
Functions	
Erosion Control	Yes
Sediment Control	Moderate
Site/Material Management	No

June 2012 Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual Volume 3 MU-1



Photograph MU-1. An area that was recently seeded, mulched, and crimped.

EC-4 Mulching (MU)

- Clean, weed-free and seed-free cereal grain straw should be applied evenly at a rate of 2 tons per acre and must be tacked or fastened by a method suitable for the condition of the site. Straw mulch must be anchored (and not merely placed) on the surface. This can be accomplished mechanically by crimping or with the aid of tackifiers or nets. Anchoring with a crimping implement is preferred, and is the recommended method for areas flatter than 3:1. Mechanical crimpers must be capable of tacking the long mulch fibers into the soil to a depth of 3 inches without cutting them. An agricultural disk, while not an ideal substitute, may work if the disk blades are dull or blunted and set vertically; however, the frame may have to be weighted to afford proper soil penetration.
- Grass hay may be used in place of straw; however, because hay is comprised of the entire plant including seed, mulching with hay may seed the site with non-native grass species which might in turn out-compete the native seed. Alternatively, native species of grass hay may be purchased, but can be difficult to find and is more expensive than straw. Purchasing and utilizing a certified weed-free straw is an easier and less costly mulching method. When using grass hay, follow the same guidelines as for straw (provided above).
- On small areas sheltered from the wind and heavy runoff, spraying a tackifier on the mulch is satisfactory for holding it in place. For steep slopes and special situations where greater control is needed, erosion control blankets anchored with stakes should be used instead of mulch.
- Hydraulic mulching consists of wood cellulose fibers mixed with water and a tackifying agent and should be applied at a rate of no less than 1,500 pounds per acre (1,425 lbs of fibers mixed with at least 75 lbs of tackifier) with a hydraulic mulcher. For steeper slopes, up to 2000 pounds per acre may be required for effective hydrosceding. Hydromulch typically requires up to 24 hours to dry; therefore, it should not be applied immediately prior to inclement weather. Application to roads, waterways and existing vegetation should be avoided.
- Erosion control mats, blankets, or nets are recommended to help stabilize steep slopes (generally 3:1 and steeper) and waterways. Depending on the product, these may be used alone or in conjunction with grass or straw mulch. Normally, use of these products will be restricted to relatively small areas. Biodegradable mats made of straw and jute, straw-cocconut, coconut fiber, or excelsior can be used instead of mulch. (See the ECM/TRM BMP for more information.)
- Some tackifiers or binders may be used to anchor mulch. Check with the local jurisdiction for allowed tackifiers. Manufacturer's recommendations should be followed at all times. (See the Soil Binder BMP for more information on general types of tackifiers.)
- Rock can also be used as mulch. It provides protection of exposed soils to wind and water erosion and allows infiltration of precipitation. An aggregate base course can be spread on disturbed areas for temporary or permanent stabilization. The rock mulch layer should be thick enough to provide full coverage of exposed soil on the area it is applied.

Maintenance and Removal

After mulching, the bare ground surface should not be more than 10 percent exposed. Reapply mulch, as needed, to cover bare areas.

MU-2 Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual Volume 3 June 2012

1/18/2021 El Paso County, CO Drainage Criteria Manual

TEMPORARY SWALE NOTES

INSTALLATION REQUIREMENTS

- TEMPORARY SWALES SHALL BE INSTALLED PRIOR TO ANY LAND DISTURBING ACTIVITIES.
- THE AREA UNDER WHICH THE EMBANKMENT IS TO BE INSTALLED SHALL BE CLEARED, GRUBBED, AND STRIPPED OF ALL VEGETATION AND ROOT MAT.
- EMBANKMENT MATERIAL SHALL CONSIST OF SOIL WITH A MINIMUM OF 75% PASSING A #100 SIEVE. EXCAVATED SOIL CAN BE USED IF IT MEETS THIS REQUIREMENT.
- EMBANKMENT IS TO BE COMPACTED TO AT LEAST 90% OF MAXIMUM DENSITY AND WITH 2% OF OPTIMUM MOISTURE CONTENT ACCORDING TO ASTM D 1557, METHOD A.
- SWALES WITH SLOPE > 2% SHALL BE LINED, SEE FIGURE TSW-3.
- SWALES ARE TO DRAIN INTO A SEDIMENT BASIN OR OTHER STABILIZED OUTLET.
- Z SHALL BE 3 OR GREATER.

MAINTENANCE REQUIREMENTS

- CONTRACTOR SHALL INSPECT SWALES AFTER EACH RAINFALL AT LEAST DAILY DURING PROLONGED RAINFALL AND WEEKLY DURING PERIODS OF NO RAINFALL.
- SWALES SHALL BE ROUTINELY CLEARED OF ANY DEBRIS OR ACCUMULATION OF SEDIMENT.
- EROSION OR DAMAGED OR DAMAGING LININGS SHALL IMMEDIATELY BE REPAIRED.
- TEMPORARY SWALES SHALL REMAIN OPERATIONAL AND PROPERLY MAINTAINED UNTIL THE SITE AREA IS PERMANENTLY STABILIZED WITH ADEQUATE VEGETATIVE COVERAGE FOR OTHER PERMANENT STRUCTURE AS APPROVED BY THE CITY.

City of Colorado Springs Stormwater Quality Figure TSW-2 Temporary Swales Construction Detail and Maintenance Requirements

64226

1/18/2021 El Paso County, CO Drainage Criteria Manual

SWALE LINING NOTES

INSTALLATION REQUIREMENTS

- REFER TO THE EROSION CONTROL BLANKETS FACTSHEET FOR PROPER INSTALLATION OF EROSION CONTROL FABRIC LINING.
- SWALES WITH EASILY ERODIBLE SOILS AND SLOPES GREATER THAN 6% SHALL BE LINED WITH RIP-RAP.

MAINTENANCE REQUIREMENTS

- CONTRACTOR SHALL INSPECT SWALE LININGS AFTER EACH RAINFALL AT LEAST DAILY DURING PROLONGED RAINFALL AND WEEKLY DURING PERIODS OF NO RAINFALL.
- DAMAGED LININGS SHALL IMMEDIATELY BE REPAIRED.
- REFER TO THE EROSION CONTROL BLANKETS FACTSHEET FOR PROPER MAINTENANCE.
- DISPLACED RIPRAP OR COARSE AGGREGATE IS TO BE REPLACED AS SOON AS POSSIBLE.
- SWALE LININGS ARE TO REMAIN IN PLACE AND BE MAINTAINED UNTIL THE TEMPORARY SWALE IS REMOVED.

City of Colorado Springs Stormwater Quality Figure TSW-3 Swale Linings Construction Detail and Maintenance Requirements

65226

NO.	DATE	DESCRIPTION	BY
REVISIONS			
CTR Engineering, Inc.			
16392 TIMBER MEADOW DRIVE COLORADO SPRINGS, CO 80908 (719) 964-6654			
PROJECT: CLEAR VIEW INDUSTRIAL PARK FILING 2B			
BENCHMARK: Elevations are based upon FIMS monument DR02, a 2" aluminum cap, stamped "CSU FIMS CONTROL DR02", at the southeast corner of Monica Drive and Hancock Expressway (Elevation=5927.27 NGVD29)			
PROJECT TITLE: GRADING, WATER QUALITY POND AND EROSION CONTROL			
SHEET TITLE: GRADING AND EROSION DETAILS			
DESIGNED BY: JCM	SCALE:	DATE ISSUED: MAR. 2021	
DRAWN BY: JCM	HH:	SHEET NO. 12 OF 22 SHEETS	
CHECKED BY: JH	V:		
DWG:			

Temporary and Permanent Seeding (TS/PS) EC-2

Description

Temporary seeding can be used to stabilize disturbed areas that will be inactive for an extended period.



Photograph TS/PS-1. Equipment used to drill seed. Photo courtesy of Douglas County.

Appropriate Uses

When the soil surface is disturbed and will remain inactive for an extended period (typically 30 days or longer), proactive stabilization measures should be implemented.

Typically, local governments have their own seed mixes and timelines for seeding. Check jurisdictional requirements for seeding and temporary stabilization.

Design and Installation

Effective seeding requires proper seedbed preparation, selection of an appropriate seed mixture, use of appropriate seeding equipment to ensure proper coverage and depth, and protection with mulch or fabric until plants are established.

The USDCM Volume 2 Revegetation Chapter contains detailed seed mix, soil preparations, and seeding and mulching recommendations that may be referenced to supplement this Fact Sheet.

Drill seeding is the preferred seeding method. Hydroseding is not recommended except in areas where steep slopes prevent use of drill seeding equipment, and even in these instances it is preferable to hand seed and mulch.

Seedbed Preparation

Prior to seeding, ensure that areas to be revegetated have soil conditions capable of supporting vegetation.

Table with 2 columns: Functions and Yes/No. Rows include Erosion Control, Sediment Control, and Site/Material Management.

June 2012 Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual Volume 3 TS/PS-1

EC-2 Temporary and Permanent Seeding (TS/PS)

soil amendments and rototill them into the soil to a depth of 6 inches or more.

Topsoil should be salvaged during grading operations for use and spread on areas to be revegetated later. Topsoil should be viewed as an important resource to be utilized for vegetation establishment, due to its water-holding capacity, structure, texture, organic matter content, biological activity, and nutrient content.

Where topsoil is not available, subsoils should be amended to provide an appropriate plant-growth medium. Organic matter, such as well digested compost, can be added to improve soil characteristics conducive to plant growth.

If the disturbed ground surface is compacted, rip or rototill the surface prior to placing topsoil. If adding compost to the existing soil surface, rototilling is necessary.

Prior to seeding, the soil surface should be rough and the seedbed should be firm, but neither too loose nor compacted. The upper layer of soil should be in a condition suitable for seeding at the proper depth and conducive to plant growth.

Seed Mix for Temporary Vegetation

To provide temporary vegetative cover on disturbed areas which will not be paved, built upon, or fully landscaped or worked for an extended period (typically 30 days or more), plant an annual grass appropriate for the time of planting and mulch the planted areas.

Seed Mix for Permanent Revegetation

To provide vegetative cover on disturbed areas that have reached final grade, a perennial grass mix should be established. Permanent seeding should be performed promptly (typically within 14 days) after reaching final grade.

If desired for wildlife habitat or landscape diversity, shrubs such as rubber rabbitbrush (Chrysothamnus nauseosus), flowering saltbush (Atriplex canescens) and skunkbrush sumac (Rhus trilobata) could be added to the upland seedmixes at 0.25, 0.5 and 1 pound PLS/acre, respectively.

TS/PS-2 Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual Volume 3 June 2012

Temporary and Permanent Seeding (TS/PS) EC-2

Seeding dates for the highest success probability of perennial species along the Front Range are generally in the spring from April through early May and in the fall after the first of September until the ground freezes.

Table TS/PS-1. Minimum Drill Seeding Rates for Various Temporary Annual Grasses

Table with 4 columns: Species* (Common name), Growth Season, Pounds of Pure Live Seed (PLS)/acre, and Planting Depth (Inches). Rows include Oats, Spring wheat, Spring barley, Annual ryegrass, Millet, Sudangrass, Sorghum, Winter wheat, Winter barley, Winter rye, and Triticale.

* Successful seeding of annual grass resulting in adequate plant growth will usually produce enough dead-plant residue to provide protection from wind and water erosion for an additional year.

Hydraulic seeding may be substituted for drilling only where slopes are steeper than 3:1 or where access limitations exist.

See Table TS/PS-3 for seeding dates. Irrigation, if consistently applied, may extend the use of cool season species during the summer months.

Seeding rates should be doubled if seed is broadcast, or increased by 50 percent if done using a Brillion Drill or by hydraulic seeding.

June 2012 Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual Volume 3 TS/PS-3

EC-2 Temporary and Permanent Seeding (TS/PS)

Table TS/PS-2. Minimum Drill Seeding Rates for Perennial Grasses

Table with 6 columns: Common Name, Botanical Name, Growth Season, Growth Form, Seeds/Pound, and Pounds of PLS/acre. Rows include Alkali Soil Seed Mix, Fertile Loamy Soil Seed Mix, High Water Table Soil Seed Mix, and Transition Turf Seed Mix.

TS/PS-4 Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual Volume 3 June 2012

Temporary and Permanent Seeding (TS/PS) EC-2

Table TS/PS-2. Minimum Drill Seeding Rates for Perennial Grasses (cont.)

Table with 6 columns: Common Name, Botanical Name, Growth Season, Growth Form, Seeds/Pound, and Pounds of PLS/acre. Rows include Blue grama, Camper litle bluestem, Prairie sandreed, Sand dropseed, Vaughn sideoats grama, Arriba western wheatgrass, Heavy Clay, Rocky Foothill Seed Mix, Ephraim crested wheatgrass, Oahu Intermediate wheatgrass, Vaughn sideoats grama, Lincoln smooth brome, and Arriba western wheatgrass.

* All of the above seeding mixes and rates are based on drill seeding followed by crimped straw mulch. These rates should be doubled if seed is broadcast and should be increased by 50 percent if the seeding is done using a Brillion Drill or is applied through hydraulic seeding.

June 2012 Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual Volume 3 TS/PS-5

EC-2 Temporary and Permanent Seeding (TS/PS)

Table TS/PS-3. Seeding Dates for Annual and Perennial Grasses

Table with 5 columns: Seeding Dates, Annual Grasses (Warm, Cool), and Perennial Grasses (Warm, Cool). Rows include January 1-March 15, March 16-April 30, May 1-May 15, May 16-June 30, July 1-July 15, September 1-September 30, and October 1-December 31.

Mulch

Cover seeded areas with mulch or an appropriate rolled erosion control product to promote establishment of vegetation. Anchor mulch by crimping, netting or use of a non-toxic tackifier.

Maintenance and Removal

Monitor and observe seeded areas to identify areas of poor growth or areas that fail to germinate. Reseed and mulch these areas, as needed.

An area that has been permanently seeded should have a good stand of vegetation within one growing season if irrigated and within three growing seasons without irrigation in Colorado.

Seeded areas may require irrigation, particularly during extended dry periods. Targeted weed control may also be necessary.

Protect seeded areas from construction equipment and vehicle access.

TS/PS-6 Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual Volume 3 June 2012

Stabilized Staging Area (SSA) SM-6

Description

A stabilized staging area is a clearly designated area where construction equipment and vehicles, stockpiles, waste bins, and other construction-related materials are stored.



Photograph SSA-1. Example of a staging area with a gravel surface to prevent mud tracking and reduce runoff.

Appropriate Uses

Most construction sites will require a staging area, which should be clearly designated in SWMP drawings. The layout of the staging area may vary depending on the type of construction activity.

Design and Installation

Stabilized staging areas should be completed prior to other construction activities beginning on the site. Major components of a stabilized staging area include:

- Appropriate space to contain storage and provide for loading/unloading operations, as well as parking if necessary.
A stabilized surface, either paved or covered, with 3-inch diameter aggregate or larger.
Perimeter controls such as silt fence, sediment control logs, or other measures.
Construction fencing to prevent unauthorized access to construction materials.
Provisions for Good Housekeeping practices related to materials storage and disposal, as described in the Good Housekeeping BMP Fact Sheet.
A stabilized construction entrance/exit, as described in the Vehicle Tracking Control BMP Fact Sheet, to accommodate traffic associated with material delivery and waste disposal vehicles.

Over-sizing the stabilized staging area may result in disturbance of existing vegetation in excess of that required for the project. This increases costs, as well as requirements for long-term stabilization following the construction period.

Table with 2 columns: Functions and Yes/No. Rows include Erosion Control, Sediment Control, and Site/Material.

November 2010 Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual Volume 3 SSA-1

SM-6 Stabilized Staging Area (SSA)

Minimizing Long-Term Stabilization Requirements

- Utilize off-site parking and restrict vehicle access to the site.
Use construction mats in lieu of rock when staging is provided in an area that will not be disturbed otherwise.
Consider use of a bermed contained area for materials and equipment that do not require a stabilized surface.
Consider phasing of staging areas to avoid disturbance in an area that will not be otherwise disturbed.

See Detail SSA-1 for a typical stabilized staging area and SSA-2 for a stabilized staging area when materials staging in roadways is required.

Maintenance and Removal

Maintenance of stabilized staging areas includes maintaining a stable surface cover of gravel, repairing perimeter controls, and following good housekeeping practices.

When construction is complete, debris, unused stockpiles and materials should be recycled or properly disposed. In some cases, this will require disposal of contaminated soil from equipment leaks in an appropriate landfill.

SSA-2 Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual Volume 3 November 2010



Table with 4 columns: NO., DATE, DESCRIPTION, BY. Header row includes REVISIONS.

CTR Engineering, Inc.

16392 TIMBER MEADOW DRIVE COLORADO SPRINGS, CO 80908 (719) 964-6654

PROJECT: CLEAR VIEW INDUSTRIAL PARK FILING 2B

BENCHMARK: Elevations are based upon FIMS monument DR02, a 2" aluminum cap, stamped "CSU FIMS CONTROL DR02", at the southeast corner of Monica Drive and Hancock Expressway (Elevation=5927.27 NGVD29)

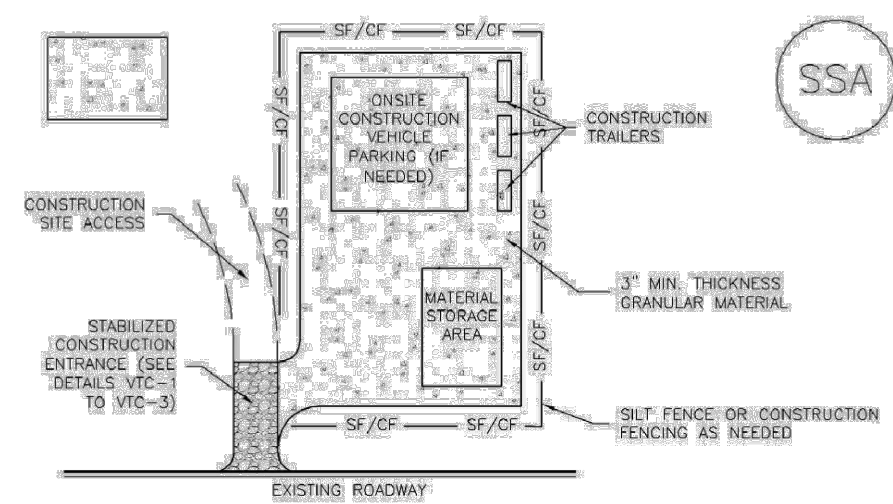
PROJECT TITLE: GRADING, WATER QUALITY POND AND EROSION CONTROL

GRADING AND EROSION DETAILS

DESIGNED BY: JCM SCALE DATE ISSUED: MAR. 2021 DRAWN BY: JCM HH: CHECKED BY: JH V: SHEET NO. 13 OF 22 SHEETS

DWG:

Stabilized Staging Area (SSA) SM-6



SSA-1. STABILIZED STAGING AREA

STABILIZED STAGING AREA INSTALLATION NOTES

1. SEE PLAN VIEW FOR:
 - LOCATION OF STAGING AREAS.
 - CONTRACTOR MAY ADJUST LOCATION AND SIZE OF STAGING AREA WITH APPROVAL FROM THE LOCAL JURISDICTION.
2. STABILIZED STAGING AREA SHOULD BE APPROPRIATE FOR THE NEEDS OF THE SITE. OVERSEEING RESULTS IN A LARGER AREA TO STABILIZE FOLLOWING CONSTRUCTION.
3. STAGING AREA SHALL BE STABILIZED PRIOR TO OTHER OPERATIONS ON THE SITE.
4. THE STABILIZED STAGING AREA SHALL CONSIST OF A MINIMUM 3" THICK GRANULAR MATERIAL.
5. UNLESS OTHERWISE SPECIFIED BY LOCAL JURISDICTION, ROCK SHALL CONSIST OF DOT SECT. #703, AASHTO #3 COARSE AGGREGATE OR 6" (MINUS) ROCK.
6. ADDITIONAL PERIMETER BMPs MAY BE REQUIRED INCLUDING BUT NOT LIMITED TO SEE FENCE AND CONSTRUCTION FENCING AS NEEDED.

STABILIZED STAGING AREA MAINTENANCE NOTES

1. INSPECT BMPs EACH WORKDAY, AND MAINTAIN THEM IN EFFECTIVE OPERATING CONDITION. MAINTENANCE OF BMPs SHOULD BE PROACTIVE NOT REACTIVE. INSPECT BMPs AS SOON AS POSSIBLE (AND ALWAYS WITHIN 24 HOURS) FOLLOWING A STORM THAT CAUSES SURFACE EROSION, AND PERFORM NECESSARY MAINTENANCE.
2. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN BMPs IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
3. WHERE BMPs HAVE FAILED, REPAIR OR REPLACEMENT SHOULD BE INITIATED UPON DISCOVERY OF THE FAILURE.
4. ROCK SHALL BE REAPPLIED OR REGRADED AS NECESSARY IF RUTTING OCCURS OR UNDERLYING SUBGRADE BECOMES EXPOSED.

SM-6 Stabilized Staging Area (SSA)

STABILIZED STAGING AREA MAINTENANCE NOTES

5. STABILIZED STAGING AREA SHALL BE ENLARGED IF NECESSARY TO CONTAIN PARKING, STORAGE, AND UNLOADING/LOADING OPERATIONS.
 6. THE STABILIZED STAGING AREA SHALL BE REMOVED AT THE END OF CONSTRUCTION (THE GRANULAR MATERIAL SHALL BE REMOVED OR, IF APPROVED BY THE LOCAL JURISDICTION, USED ON SITE AND THE AREA COVERED WITH TOPSOIL, SEEDS AND MULCHED OR OTHERWISE STABILIZED TO A MANNER APPROVED BY LOCAL JURISDICTION).
- NOTE: MANY MUNICIPALITIES PROHIBIT THE USE OF RECYCLED CONCRETE AS GRANULAR MATERIAL FOR STABILIZED STAGING AREAS DUE TO DIFFICULTIES WITH RE-ESTABLISHMENT OF VEGETATION IN AREAS WHERE RECYCLED CONCRETE WAS PLACED.
- NOTE: MANY JURISDICTIONS HAVE BMP DETAILS THAT VARY FROM USDCO STANDARD DETAILS. CONSULT WITH LOCAL JURISDICTIONS AS TO WHICH DETAIL SHOULD BE USED WHEN DIFFERENCES ARE NOTED.
- (DETAILS ADAPTED FROM COLORADO COUNTY COLORADO, NOT AVAILABLE IN AUTOCAD)

Vehicle Tracking Control (VTC) SM-4

Description

Vehicle tracking controls provide stabilized construction site access where vehicles exit the site onto paved public roads. An effective vehicle tracking control helps remove sediment (mud or dirt) from vehicles, reducing tracking onto the paved surface.



Photograph VTC-1. A vehicle tracking control pad constructed with properly sized rock reduces off-site sediment tracking.

Appropriate Uses

Implement a stabilized construction entrance or vehicle tracking control where frequent heavy vehicle traffic exits the construction site onto a paved roadway. An effective vehicle tracking control is particularly important during the following conditions:

- Wet weather periods when mud is easily tracked off-site.
- During dry weather periods where dust is a concern.
- When poorly drained, clayey soils are present on site.

Although wheel washes are not required in designs of vehicle tracking controls, they may be needed at particularly muddy sites.

Design and Installation

Construct the vehicle tracking control on a level surface. Where feasible, grade the tracking control towards the construction site to reduce off-site runoff. Place signage, as needed, to direct construction vehicles to the designated exit through the vehicle tracking control. There are several different types of stabilized construction entrances including:

VTC-1. Aggregate Vehicle Tracking Control. This is a coarse-aggregate surfaced pad underlain by a geotextile. This is the most common vehicle tracking control, and when properly maintained can be effective at removing sediment from vehicle tires.

VTC-2. Vehicle Tracking Control with Construction Mat or Turf Reinforcement Mat. This type of control may be appropriate for site access at very small construction sites with low traffic volume over vegetated areas. Although this application does not typically remove sediment from vehicles, it helps protect existing vegetation and provides a stabilized entrance.

Vehicle Tracking Control	
Functions	
Erosion Control	Moderate
Sediment Control	Yes
Site/Material Management	Yes

SM-4 Vehicle Tracking Control (VTC)

VTC-3. Stabilized Construction Entrance/Exit with Wheel Wash. This is an aggregate pad, similar to VTC-1, but includes equipment for fire washing. The wheel wash equipment may be as simple as hand-held power washing equipment to more advanced proprietary systems. When a wheel wash is provided, it is important to direct wash water to a sediment trap prior to discharge from the site.

Vehicle tracking controls are sometimes installed in combination with a sediment trap to treat runoff.

Maintenance and Removal

Inspect the area for degradation and replace aggregate or material used for a stabilized entrance/exit as needed. If the area becomes clogged and ponds water, remove and dispose of excess sediment or replace material with a fresh layer of aggregate as necessary.

With aggregate vehicle tracking controls, ensure rock and debris from this area do not enter the public right-of-way.

Remove sediment that is tracked onto the public right of way daily or more frequently as needed. Excess sediment in the roadway indicates that the stabilized construction entrance needs maintenance.

Ensure that drainage ditches at the entrance/exit area remain clear.

A stabilized entrance should be removed only when there is no longer the potential for vehicle tracking to occur. This is typically after the site has been stabilized.

When wheel wash equipment is used, be sure that the wash water is discharged to a sediment trap prior to discharge. Also inspect channels conveying the water from the wash area to the sediment trap and stabilize areas that may be eroding.

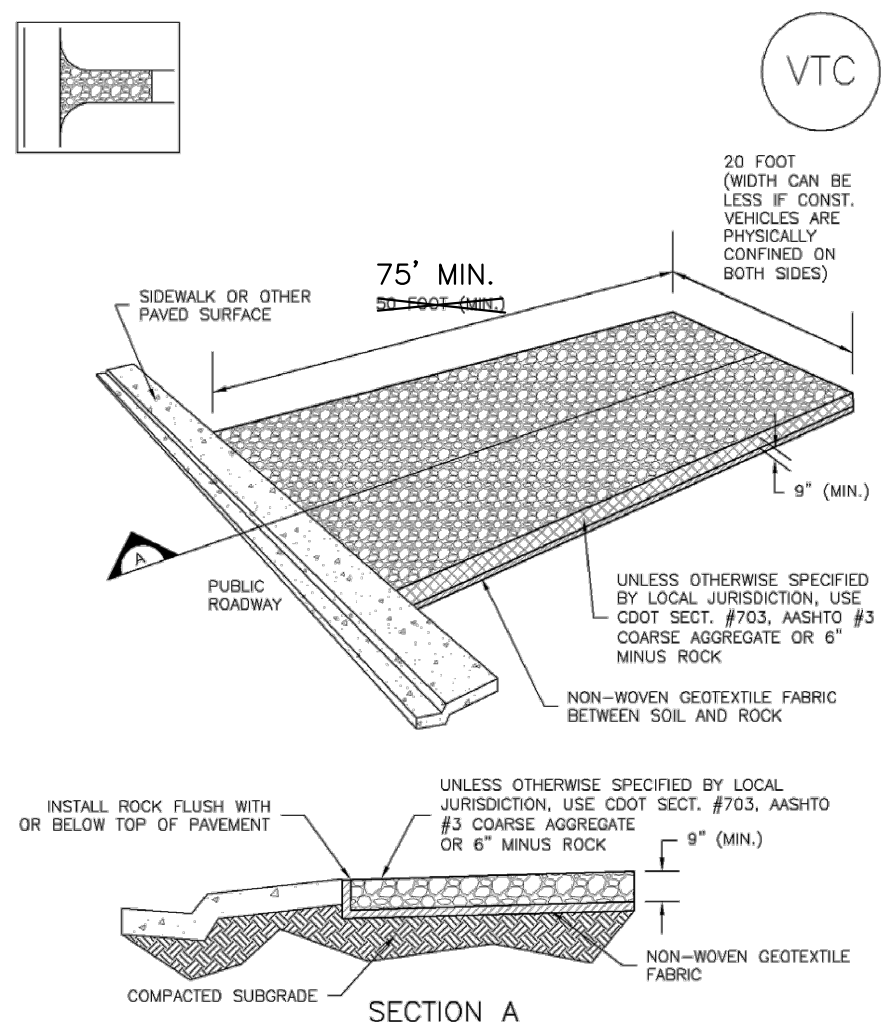
When a construction entrance/exit is removed, excess sediment from the aggregate should be removed and disposed of appropriately. The entrance should be promptly stabilized with a permanent surface following removal, typically by paving.



Photograph VTC-2. A vehicle tracking control pad with wheel wash facility. Photo courtesy of Tom Gore.

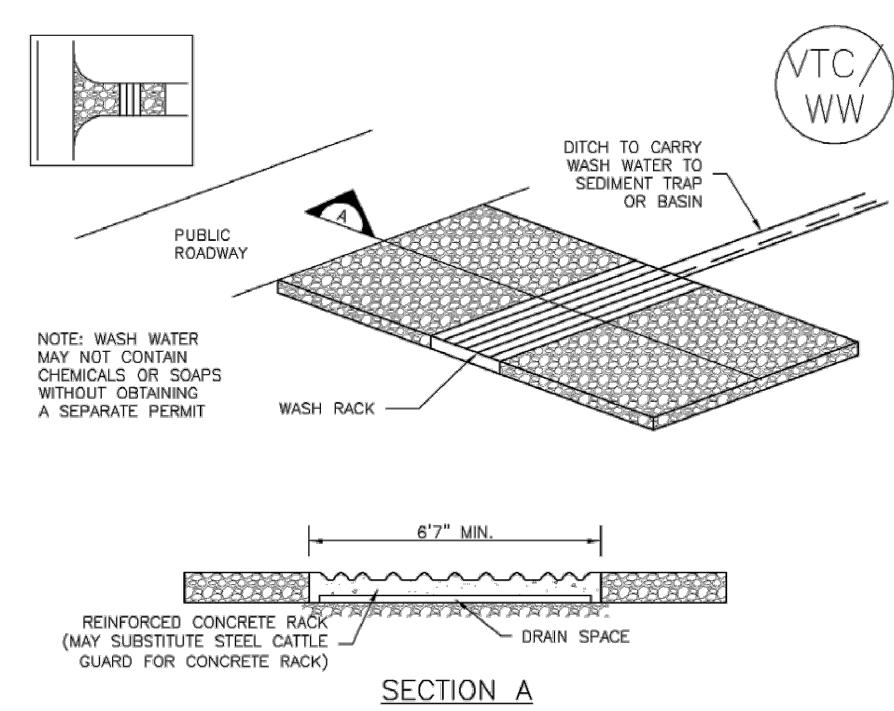


Vehicle Tracking Control (VTC) SM-4



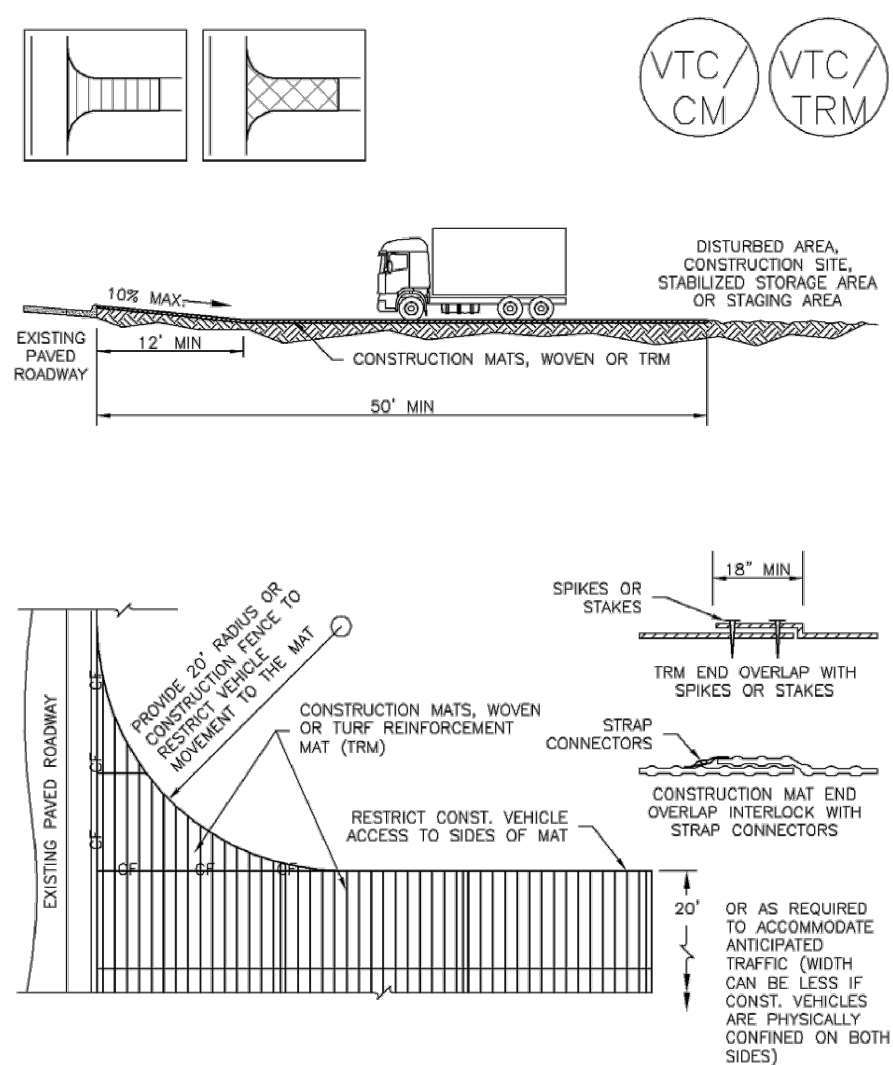
VTC-1. AGGREGATE VEHICLE TRACKING CONTROL

SM-4 Vehicle Tracking Control (VTC)



VTC-2. AGGREGATE VEHICLE TRACKING CONTROL WITH WASH RACK

Vehicle Tracking Control (VTC) SM-4



VTC-3. VEHICLE TRACKING CONTROL W/ CONSTRUCTION MAT OR TURF REINFORCEMENT MAT (TRM)

SM-4 Vehicle Tracking Control (VTC)

STABILIZED CONSTRUCTION ENTRANCE/EXIT INSTALLATION NOTES

1. SEE PLAN VIEW FOR:
 - LOCATION OF CONSTRUCTION ENTRANCE(S)/EXIT(S).
 - TYPE OF CONSTRUCTION ENTRANCE(S)/EXIT(S) (WITH/WITHOUT WHEEL WASH, CONSTRUCTION MAT OR TRM).
2. CONSTRUCTION MAT OR TRM STABILIZED CONSTRUCTION ENTRANCES ARE ONLY TO BE USED ON SHORT DURATION PROJECTS (TYPICALLY RANGING FROM A WEEK TO A MONTH) WHERE THERE WILL BE LIMITED VEHICULAR ACCESS.
3. A STABILIZED CONSTRUCTION ENTRANCE/EXIT SHALL BE LOCATED AT ALL ACCESS POINTS WHERE VEHICLES ACCESS THE CONSTRUCTION SITE FROM PAVED RIGHT-OF-WAYS.
4. STABILIZED CONSTRUCTION ENTRANCE/EXIT SHALL BE INSTALLED PRIOR TO ANY LAND DISTURBING ACTIVITIES.
5. A NON-WOVEN GEOTEXTILE FABRIC SHALL BE PLACED UNDER THE STABILIZED CONSTRUCTION ENTRANCE/EXIT PRIOR TO THE PLACEMENT OF ROCK.
6. UNLESS OTHERWISE SPECIFIED BY LOCAL JURISDICTION, ROCK SHALL CONSIST OF DOT SECT. #703, AASHTO #3 COARSE AGGREGATE OR 6" (MINUS) ROCK.

STABILIZED CONSTRUCTION ENTRANCE/EXIT MAINTENANCE NOTES

1. INSPECT BMPs EACH WORKDAY, AND MAINTAIN THEM IN EFFECTIVE OPERATING CONDITION. MAINTENANCE OF BMPs SHOULD BE PROACTIVE NOT REACTIVE. INSPECT BMPs AS SOON AS POSSIBLE (AND ALWAYS WITHIN 24 HOURS) FOLLOWING A STORM THAT CAUSES SURFACE EROSION, AND PERFORM NECESSARY MAINTENANCE.
 2. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN BMPs IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
 3. WHERE BMPs HAVE FAILED, REPAIR OR REPLACEMENT SHOULD BE INITIATED UPON DISCOVERY OF THE FAILURE.
 4. ROCK SHALL BE REAPPLIED OR REGRADED AS NECESSARY TO THE STABILIZED ENTRANCE/EXIT TO MAINTAIN A CONSISTENT DEPTH.
 5. SEDIMENT TRACKED ONTO PAVED ROADS IS TO BE REMOVED THROUGHOUT THE DAY AND AT THE END OF THE DAY BY SHOVELING OR SWEEPING. SEDIMENT MAY NOT BE WASHED DOWN STORM SEWER DRAINS.
- NOTE: MANY JURISDICTIONS HAVE BMP DETAILS THAT VARY FROM USDCO STANDARD DETAILS. CONSULT WITH LOCAL JURISDICTIONS AS TO WHICH DETAIL SHOULD BE USED WHEN DIFFERENCES ARE NOTED.
- (DETAILS ADAPTED FROM CITY OF BROWFIELD, COLORADO, NOT AVAILABLE IN AUTOCAD)

EPC 3/22/21

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REVISIONS			
CTR Engineering, Inc.			
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CHECKED BY: JH	V:	SHEET NO. 14 OF 22 SHEETS	
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Sediment Control Log (SCL) SC-2

Description

A sediment control log is a linear roll made of natural materials such as straw, coconut fiber, or compost. The most common type of sediment control log has straw filling and is often referred to as a "straw wattle." All sediment control logs are used as a sediment barrier to intercept sheet flow runoff from disturbed areas.

Appropriate Uses

Sediment control logs can be used in the following applications to trap sediment:

- As perimeter control for stockpiles and the site.
- As part of inlet protection designs.
- As check dams in small drainage ditches. (Sediment control logs are not intended for use in channels with high flow velocities.)
- On disturbed slopes to shorten flow lengths (as an erosion control).
- As part of multi-layered perimeter control along a receiving water such as a stream, pond or wetland.


Sediment control logs work well in combination with other layers of erosion and sediment controls.

Design and Installation

Sediment control logs should be installed along the contour to avoid concentrating flows. The maximum allowable tributary drainage area per 100 lineal feet of sediment control log, installed along the contour, is approximately 0.25 acres with a disturbed slope length of up to 150 feet and a tributary slope gradient no steeper than 3:1. Longer and steeper slopes require additional measures. This recommendation only applies to sediment control logs installed along the contour. When installed for other uses, such as perimeter control, it should be installed in a way that will not produce concentrated flows. For example, a "hook" installation may be appropriate to force runoff to pond and evaporate or infiltrate in multiple areas rather than concentrate and cause erosive conditions parallel to the BMP.

Sediment Control Log	
Erosion Control	Moderate
Sediment Control	Yes
Site/Material Management	No

November 2015 SCL-1
Urban Drainage and Flood Control District
Urban Storm Drainage Criteria Manual Volume 3



SC-2 Sediment Control Log (SCL)

Although sediment control logs initially allow runoff to flow through the BMP, they can quickly become a barrier and should be installed as if they are impermeable.

Design details and notes for sediment control logs are provided in the following details. Sediment logs must be properly installed per the detail to prevent undercutting, bypassing and displacement. When installed on slopes, sediment control logs should be installed along the contours (i.e. perpendicular to flow).

Improper installation can lead to poor performance. Be sure that sediment control logs are properly trenched (if lighter than 8 lb/foot), anchored and tightly jointed.

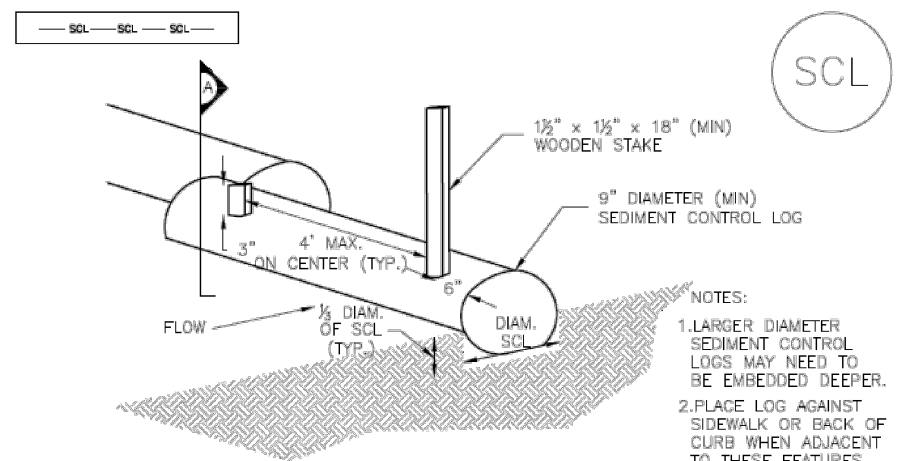
Maintenance and Removal

Be aware that sediment control logs will eventually degrade. Remove accumulated sediment before the logs may need to be seeded and mulched. Sediment control logs that are biodegradable may occasionally be left in place (e.g., when logs are used in conjunction with erosion control blankets as permanent slope breaks). However, removal of sediment control logs after final stabilization is typically appropriate when used in perimeter control, inlet protection and check dam applications. Compost from compost sediment control logs may be spread over the area and seeded as long as this does not cover newly established vegetation.

Once the upstream area is stabilized, remove and properly dispose of the logs. Areas disturbed beneath the logs may need to be seeded and mulched. Sediment control logs that are biodegradable may occasionally be left in place (e.g., when logs are used in conjunction with erosion control blankets as permanent slope breaks). However, removal of sediment control logs after final stabilization is typically appropriate when used in perimeter control, inlet protection and check dam applications. Compost from compost sediment control logs may be spread over the area and seeded as long as this does not cover newly established vegetation.

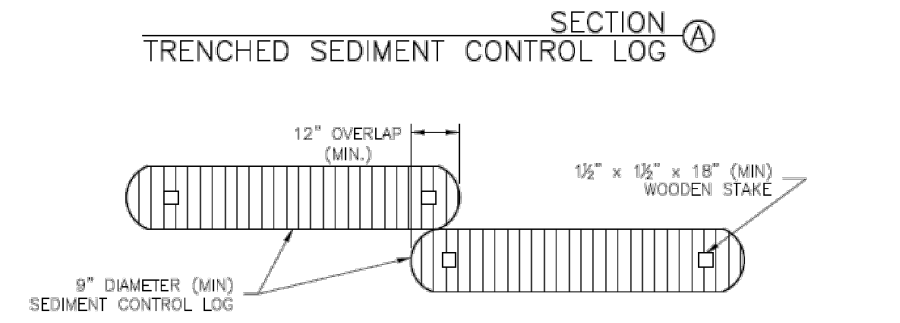
November 2015 SCL-2
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Urban Storm Drainage Criteria Manual Volume 3

Sediment Control Log (SCL) SC-2



TRENCHED SEDIMENT CONTROL LOG

SECTION A-A

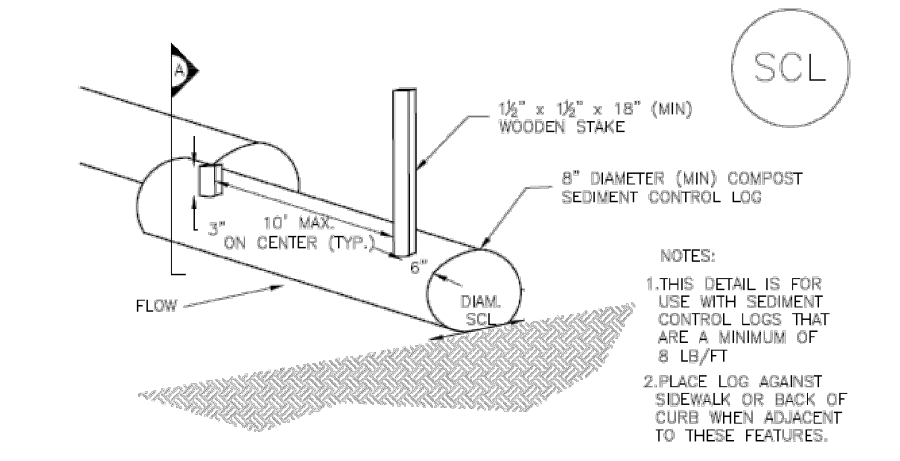


LOG JOINTS

SCL-1. TRENCHED SEDIMENT CONTROL LOG

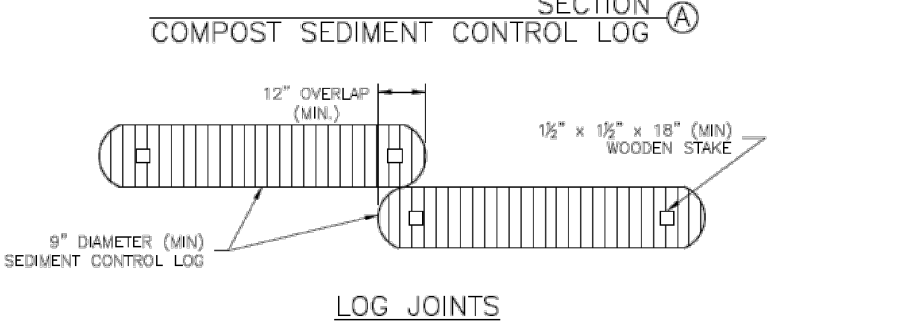
November 2015 SCL-3
Urban Drainage and Flood Control District
Urban Storm Drainage Criteria Manual Volume 3

SC-2 Sediment Control Log (SCL)



COMPOST SEDIMENT CONTROL LOG (WEIGHTED)

SECTION A-A



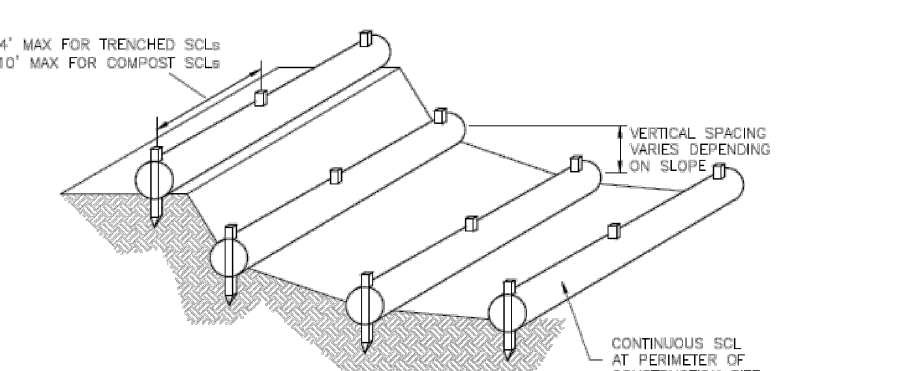
LOG JOINTS

SCL-2. COMPOST SEDIMENT CONTROL LOG (WEIGHTED)

November 2015 SCL-4
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Urban Storm Drainage Criteria Manual Volume 3



Sediment Control Log (SCL) SC-2



SCL-3. SEDIMENT CONTROL LOGS TO CONTROL SLOPE LENGTH

November 2015 SCL-5
Urban Drainage and Flood Control District
Urban Storm Drainage Criteria Manual Volume 3

SC-2 Sediment Control Log (SCL)

SEDIMENT CONTROL LOG INSTALLATION NOTES

- SEE PLAN VIEW FOR LOCATION AND LENGTH OF SEDIMENT CONTROL LOGS.
- SEDIMENT CONTROL LOGS THAT ACT AS A PERIMETER CONTROL SHALL BE INSTALLED PRIOR TO ANY UPGRADIENT LAND-DISTURBING ACTIVITIES.
- SEDIMENT CONTROL LOGS SHALL CONSIST OF STRAW, COMPOST, EXCELSSION OR COCONUT FIBER, AND SHALL BE FREE OF ANY NOXIOUS WEED SEEDS OR DEFECTS INCLUDING RIPS, HOLES AND OBVIOUS WEAR.
- SEDIMENT CONTROL LOGS MAY BE USED AS SMALL CHECK DAMS IN DITCHES AND SWALES. HOWEVER, THEY SHOULD NOT BE USED IN PERENNIAL STREAMS.
- IT IS RECOMMENDED THAT SEDIMENT CONTROL LOGS BE TRENCHED INTO THE GROUND TO A DEPTH OF APPROXIMATELY 1/3 OF THE DIAMETER OF THE LOG. IF TRENCHING TO THIS DEPTH IS NOT FEASIBLE AND/OR DESIRABLE, SHORT TERM INSTALLATION WITH DESIRE NOT TO DAMAGE LANDSCAPE) A LESSER TRENCHING DEPTH MAY BE ACCEPTABLE WITH MORE ROBUST STAKING. COMPOST LOGS THAT ARE 6 LB/FT DO NOT NEED TO BE TRENCHED.
- THE UPHILL SIDE OF THE SEDIMENT CONTROL LOG SHALL BE BACKFILLED WITH SOIL OR FILTER MATERIAL THAT IS FREE OF ROCKS AND DEBRIS. THE SOIL SHALL BE TIGHTLY COMPACTED INTO THE SHAPE OF A RIGHT TRIANGLE USING A SHOVEL OR WEIGHTED LAWN ROLLER OR BLOWN IN PLACE.
- FOLLOW MANUFACTURERS' GUIDANCE FOR STAKING. IF MANUFACTURERS' INSTRUCTIONS DO NOT SPECIFY SPACING, STAKES SHALL BE PLACED ON 4' CENTERS AND EMBEDDED A MINIMUM OF 6" INTO THE GROUND. 3" OF THE STAKE SHALL PROTRUDE FROM THE TOP OF THE LOG. STAKES THAT ARE BROKEN PRIOR TO INSTALLATION SHALL BE REPLACED. COMPOST LOGS SHOULD BE STAKED 10' ON CENTER.

SEDIMENT CONTROL LOG MAINTENANCE NOTES

- INSPECT BMPs EACH WORKDAY, AND MAINTAIN THEM IN EFFECTIVE OPERATING CONDITION. MAINTENANCE OF BMPs SHOULD BE PROACTIVE, NOT REACTIVE. INSPECT BMPs AS SOON AS POSSIBLE (AND ALWAYS WITHIN 24 HOURS) FOLLOWING A STORM THAT CAUSES SURFACE EROSION, AND PERFORM NECESSARY MAINTENANCE.
- FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN BMPs IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
- WHERE BMPs HAVE FAILED, REPAIR OR REPLACEMENT SHOULD BE INITIATED UPON DISCOVERY OF THE FAILURE.
- SEDIMENT ACCUMULATED UPSTREAM OF SEDIMENT CONTROL LOG SHALL BE REMOVED AS NEEDED TO MAINTAIN FUNCTIONALITY OF THE BMP. TYPICALLY WHEN DEPTH OF ACCUMULATED SEDIMENTS IS APPROXIMATELY 1/2 OF THE HEIGHT OF THE SEDIMENT CONTROL LOG.
- SEDIMENT CONTROL LOG SHALL BE REMOVED AT THE END OF CONSTRUCTION. COMPOST FROM COMPOST LOGS MAY BE LEFT IN PLACE AS LONG AS BASES REMOVED AND THE AREA SEEDS. IF DISTURBED AREAS EXIST AFTER REMOVAL, THEY SHALL BE COVERED WITH TOP SOIL, SEEDS AND MULCHED OR OTHERWISE STABILIZED IN A MANNER APPROVED BY THE LOCAL JURISDICTION.

(DETAILS ADAPTED FROM TOWN OF PARKER, COLORADO, JEFFERSON COUNTY, COLORADO, DOUGLAS COUNTY, COLORADO, AND CITY OF AURORA, COLORADO, NOT SHOWN IN ACTUAL)

NOTE: MANY JURISDICTIONS HAVE BMP DETAILS THAT VARY FROM USDC STANDARD DETAILS. CONSULT WITH LOCAL JURISDICTIONS AS TO WHICH DETAIL SHOULD BE USED WHEN DIFFERENCES ARE NOTED.

November 2015 SCL-6
Urban Drainage and Flood Control District
Urban Storm Drainage Criteria Manual Volume 3

NO.	DATE	DESCRIPTION	BY
REVISIONS			
CTR Engineering, Inc.			
16392 TIMBER MEADOW DRIVE COLORADO SPRINGS, CO 80908 (719) 964-6654			
PROJECT:		CLEAR VIEW INDUSTRIAL PARK FILING 2B	
BENCHMARK:		Elevations are based upon FIMS monument DR02, a 2" aluminum cap, stamped "CSU FIMS CONTROL DR02", at the southeast corner of Monica Drive and Hancock Expressway (Elevation=5927.27 NGVD29)	
PROJECT TITLE:		GRADING, WATER QUALITY POND AND EROSION CONTROL	
SHEET TITLE:		GRADING AND EROSION DETAILS	
DESIGNED BY: JCM	SCALE:	DATE ISSUED: MAR. 2021	
DRAWN BY: JCM	JH:	SHEET NO. 15 OF 22 SHEETS	
CHECKED BY: JH	V:		
DWG:			

Compost Blanket and Filter Berm (CB) EC-5

Description

A compost blanket is a layer of compost uniformly applied to the soil in disturbed areas to control erosion, facilitate revegetation, and retain sediment resulting from sheet-flow runoff.

A compost filter berm is a dike of compost or a compost product that is placed perpendicular to runoff to control erosion in disturbed areas and retain sediment. Compost berms can be placed at regular intervals to help reduce the formation of rill and gully erosion when a compost blanket is stabilizing a slope.



Photograph CB-1. Application of a compost blanket to a disturbed area. Photo courtesy of Cattaraugus.

Appropriate Uses

Compost blankets can be used as an alternative to erosion control blankets and mulching to help stabilize disturbed areas where sheet flow conditions are present. Compost blankets should not be used in areas of concentrated flows. Compost provides an excellent source of nutrients for plant growth, and should be considered for use in areas that will be permanently vegetated.

Design and Installation

See Detail CB-1 for design details and notes.

Do not place compost in areas where it can easily be transported into drainage pathways or waterways. When using a compost blanket on a slope, berms should be installed periodically to reduce the potential for concentrated flow and rilling. Seeding should be completed before an area is composted or incorporated into the compost.

Compost quality is an important consideration when selecting compost blankets or berms. Representative product quality factors include pH, salinity, moisture content, organic matter content, stability (maturity), and physical contaminants. The compost should meet all local, state, and federal quality requirements. Biosolids compost must meet the Standards for Class A biosolids outlined in 40 CFR Part 503. The U.S. Composting Council (USCC) certifies compost products under its Seal of Testing Assurance (STA) Program. Compost producers whose products have been certified through the STA Program provide customers with a standard product label that allows comparison between compost products. Only STA certified, Class I compost should be used.

Compost Blankets and Berms	
Functions	
Erosion Control	Yes
Sediment Control	Moderate
Site/Material Management	No

November 2010 Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual Volume 3 CB-1

EC-5 Compost Blanket and Filter Berm (CB)

Maintenance and Removal

When rills or gullies develop in an area that has been composted, fill and cover the area with additional compost and install berms as necessary to help reduce erosion.

Weed control can be a maintenance challenge in areas using compost blankets. A weed control strategy may be necessary, including measures such as mechanical removal and spot application of targeted herbicides by licensed applicators.

For compost berms, accumulated sediments should be removed from behind the berm when the sediments reach approximately one third the height of the berm. Areas that have been washed away should be replaced. If the berm has experienced significant or repeated washouts, a compost berm may not be the appropriate BMP for this area.

Compost blankets and berms biodegrade and do not typically require removal following site stabilization.

CB-2 Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual Volume 3 November 2010

Compost Blanket and Filter Berm (CB) EC-5

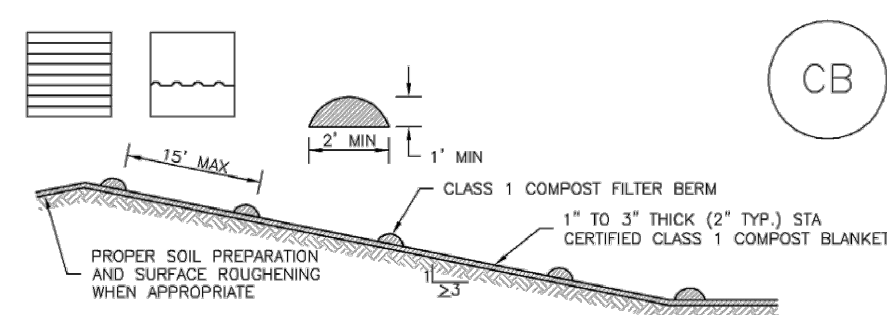


TABLE CB-1. CLASS 1 COMPOST

PARAMETERS	CHARACTERISTIC
MINIMUM STABILITY INDICATOR	STABLE TO VERY STABLE
SEDLUBLE SALTS	MAXIMUM 5 mmhos/cm
pH	6.0 – 8.0
AZ INDEX	> 10
MATURITY INDICATOR EXPRESSED AS PERCENTAGE OF GERMINATION/VIGOR	80+/80+
MATURITY INDICATOR EXPRESSED AS AMMONIA N/ NITRATE N RATIO	< 4
MATURITY INDEX AS CARBON TO NITROGEN RATIO	20:1
TESTED FOR CLOSTRIDIA	YES/NEGATIVE RESULT
MOISTURE CONTENT	30-60%
ORGANIC MATTER CONTENT	25-45% OF DRY WEIGHT
PARTICLE SIZE DISTRIBUTION	3" (75mm) 100% PASSING
PRIMARY, SECONDARY NUTRIENTS, TRACE ELEMENTS	MUST BE REPORTED
TESTING AND TEST REPORT SUBMITTAL REQUIREMENTS	STA + CLOSTRIDIA
ORGANIC MATTER PER CUBIC YARD	MUST REPORT
CHEMICAL CONTAMINANTS	COMPLY WITH US EPA CLASS A STANDARD, 40 CFR 503.1 TABLES 1 & 3 UNLESS
MINIMUM MANUFACTURING/PRODUCTION REQUIREMENT	FULLY PERMITTED UNDER COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT, HAZARDOUS MATERIALS AND WASTE MANAGEMENT DIVISION
RISK FACTOR RELATING TO PLANT GERMINATION AND HEALTH	LOW

CB-1. COMPOST BLANKET AND COMPOST FILTER BERM

November 2010 Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual Volume 3 CB-3

EC-5 Compost Blanket and Filter Berm (CB)

COMPOST FILTER BERM AND COMPOST BLANKET INSTALLATION NOTES

- SEE PLAN VIEW FOR
-LOCATION OF COMPOST FILTER BERM(S).
-LENGTH OF COMPOST FILTER BERM(S).
- COMPOST BERMS AND BLANKETS MAY BE USED IN PLACE OF STRAW MULCH OR GEOTEXTILE FABRIC IN AREAS WHERE ACCESS TO LANDSCAPING IS DIFFICULT DUE TO LANDSCAPING OR OTHER OBJECTS OR IN AREAS WHERE A SMOOTH TURF GRASS FINISH IS DESIRED.
- FILTER BERMS SHALL RUN PARALLEL TO THE CONTOUR.
- FILTER BERMS SHALL BE A MINIMUM OF 1 FEET HIGH AND 2 FEET WIDE.
- FILTER BERMS SHALL BE APPLIED BY PNEUMATIC BLOWER OR BY HAND.
- FILTER BERMS SHALL ONLY BE UTILIZED IN AREAS WHERE SHEET FLOW CONDITIONS PREVAIL AND NOT IN AREAS OF CONCENTRATED FLOW.
- COMPOST BLANKETS SHALL BE APPLIED AT A DEPTH OF 1 - 3 INCHES (TYPICALLY 2 INCHES). FOR AREAS WITH EXISTING VEGETATION THAT ARE TO BE SUPPLEMENTED BY COMPOST, A THIN 0.5-INCH LAYER MAY BE USED.
- SEEDING SHALL BE PERFORMED PRIOR TO THE APPLICATION OF COMPOST. ALTERNATIVELY, SEED MAY BE COMBINED WITH COMPOST AND BLOWN WITH THE PNEUMATIC BLOWER.
- WHEN TURF GRASS FINISH IS NOT DESIRED, SURFACE ROUGHENING ON SLOPES SHALL TAKE PLACE PRIOR TO COMPOST APPLICATION.
- COMPOST SHALL BE A CLASS 1 COMPOST AS DEFINED BY TABLE CB-1.

COMPOST FILTER BERM MAINTENANCE NOTES

- INSPECT BMPs EACH WORKDAY, AND MAINTAIN THEM IN EFFECTIVE OPERATING CONDITION. MAINTENANCE OF BMPs SHOULD BE PROACTIVE, NOT REACTIVE. INSPECT BMPs AS SOON AS POSSIBLE (AND ALWAYS WITHIN 24 HOURS) FOLLOWING A STORM THAT CAUSES SURFACE EROSION, AND PERFORM NECESSARY MAINTENANCE.
 - FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN BMPs IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
 - WHERE BMPs HAVE FAILED, REPAIR OR REPLACEMENT SHOULD BE INITIATED UPON DISCOVERY OF THE FAILURE.
 - COMPOST BERMS AND BLANKETS SHALL BE REAPPLIED OR REGRADED AS NECESSARY IF RILLING IN THE COMPOST SURFACE OCCURS.
- (DETAILS ADAPTED FROM ANNEBORO COUNTY, COLORADO, NOT AVAILABLE IN AUTODOCS)
- NOTE: MANY JURISDICTIONS HAVE BMP DETAILS THAT VARY FROM LUFDC STANDARD DETAILS. CONSULT WITH LOCAL JURISDICTIONS AS TO WHICH DETAIL SHOULD BE USED WHEN DIFFERENCES ARE NOTED.

CB-4 Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual Volume 3 November 2010



Rolled Erosion Control Products (RECP) EC-6

Description

Rolled Erosion Control Products (RECPs) include a variety of temporary or permanently installed manufactured products designed to control erosion and enhance vegetation establishment and survivability, particularly on slopes and in channels. For applications where natural vegetation alone will provide sufficient permanent erosion protection, temporary products such as netting, open weave textiles and a variety of erosion control blankets (ECBs) made of biodegradable natural materials (e.g., straw, coconut fiber) can be used. For applications where natural vegetation alone will not be sustainable under expected flow conditions, permanent rolled erosion control products such as turf reinforcement mats (TRMs) can be used. In particular, turf reinforcement mats are designed for discharges that exert velocities and shear stresses that exceed the typical limits of nature natural vegetation.



Photograph RECP-1. Erosion control blanket protecting the slope from erosion and providing favorable conditions for revegetation.

Appropriate Uses

RECPs can be used to control erosion in conjunction with revegetation efforts, providing seedbed protection from wind and water erosion. These products are often used on disturbed areas on steep slopes, in areas with highly erosive soils, or as part of drainage stabilization. In order to select the appropriate RECP for site conditions, it is important to have a general understanding of the general types of these products, their expected longevity, and general characteristics.

The Erosion Control Technology Council (ECTC 2005) characterizes rolled erosion control products according to these categories:

- Mulch control netting:** A planar woven natural fiber or extruded geosynthetic mesh used as a temporary degradable rolled erosion control product to anchor loose fiber mulches.
- Open weave textile:** A temporary degradable rolled erosion control product composed of processed natural or polymer yarns woven into a matrix, used to provide erosion control and facilitate vegetation establishment.
- Erosion control blanket (ECB):** A temporary degradable rolled erosion control product composed of processed natural or polymer fibers which are mechanically, structurally or chemically bound together to form a continuous matrix to provide erosion control and facilitate vegetation establishment. ECBs can be further differentiated into rapidly degrading single-net and double-net types or slowly degrading types.

Rolled Erosion Control Products	
Functions	
Erosion Control	Yes
Sediment Control	No
Site/Material Management	No

November 2010 Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual Volume 3 RECP-1

EC-6 Rolled Erosion Control Products (RECP)

- Turf Reinforcement Mat (TRM):** A rolled erosion control product composed of non-degradable synthetic fibers, filaments, nets, wire mesh, and/or other elements, processed into a permanent, three-dimensional matrix of sufficient thickness. TRMs, which may be supplemented with degradable components, are designed to impart immediate erosion protection, enhance vegetation establishment and provide long-term functionality by permanently reinforcing vegetation during and after maturation. Note: TRMs are typically used in hydraulic applications, such as high flow ditches and channels, steep slopes, stream banks, and shorelines, where erosive forces may exceed the limits of natural, unreinforced vegetation or in areas where limited vegetation establishment is anticipated.

Tables RECP-1 and RECP-2 provide guidelines for selecting rolled erosion control products appropriate to site conditions and desired longevity. Table RECP-1 is for conditions where natural vegetation alone will provide permanent erosion control, whereas Table RECP-2 is for conditions where vegetation alone will not be adequately stable to provide long-term erosion protection due to flow or other conditions.

Tables RECP-1 and RECP-2 provide guidelines for selecting rolled erosion control products appropriate to site conditions and desired longevity. Table RECP-1 is for conditions where natural vegetation alone will provide permanent erosion control, whereas Table RECP-2 is for conditions where vegetation alone will not be adequately stable to provide long-term erosion protection due to flow or other conditions.

Rolled Erosion Control Products (RECP) EC-6

Table RECP-1. ECTC Standard Specification for Temporary Rolled Erosion Control Products (Adapted from Erosion Control Technology Council 2005)

Product Description	Slope Applications*		Channel Applications* Max. Shear Stress ^{4,5}	Minimum Tensile Strength ⁶	Expected Longevity
	Maximum Gradient	C Factor ³			
Mulch Control Nets	5:1 (H:V)	≤0.10 @ 5:1	0.25 lbs/ft ² (12 Pa)	5 lbs/ft (0.073 kN/m)	Up to 12 months
Netless Rolled Erosion Control Blankets	4:1 (H:V)	≤0.10 @ 4:1	0.5 lbs/ft ² (24 Pa)	5 lbs/ft (0.073 kN/m)	
Single-net Erosion Control Blankets & Open Weave Textiles	3:1 (H:V)	≤0.15 @ 3:1	1.5 lbs/ft ² (72 Pa)	50 lbs/ft (0.73 kN/m)	
Double-net Erosion Control Blankets	2:1 (H:V)	≤0.20 @ 2:1	1.75 lbs/ft ² (84 Pa)	75 lbs/ft (1.09 kN/m)	24 months
Mulch Control Nets	5:1 (H:V)	≤0.10 @ 5:1	0.25 lbs/ft ² (12 Pa)	25 lbs/ft (0.36 kN/m)	
Erosion Control Blankets & Open Weave Textiles (slowly degrading)	1.5:1 (H:V)	≤0.25 @ 1.5:1	2.00 lbs/ft ² (96 Pa)	100 lbs/ft (1.45 kN/m)	
Erosion Control Blankets & Open Weave Textiles	1:1 (H:V)	≤0.25 @ 1:1	2.25 lbs/ft ² (108 Pa)	125 lbs/ft (1.82 kN/m)	36 months

* C Factor and shear stress for mulch control nettings must be obtained with netting used in conjunction with pre-applied mulch material. (See Section 3.3 of Chapter 7 Construction BMPs for more information on the C Factor.)

¹ Minimum Average Roll Values, Machine direction using ECTC Mod. ASTM D 5035.

² C Factor calculated as ratio of soil loss from RECP protected slope (tested at specified or greater gradient, H:V) to ratio of soil loss from unprotected (control) plot in large-scale testing.

³ Required minimum shear stress RECP (unvegetated) can sustain without physical damage or excess erosion (> 12.7 mm (0.5 in) soil loss) during a 30-minute flow event in large-scale testing.

⁴ The permissible shear stress levels established for each performance category are based on historical experience with products characterized by Manning's roughness coefficients in the range of 0.01 - 0.05.

⁵ Acceptable large-scale test methods may include ASTM D 6459, or other independent testing deemed acceptable by the engineer.

⁶ Per the engineer's discretion. Recommended acceptable large-scale testing protocol may include ASTM D 6460, or other independent testing deemed acceptable by the engineer.

November 2010 Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual Volume 3 RECP-3

RECP-2 Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual Volume 3 November 2010

NO.	DATE	DESCRIPTION	BY
REVISIONS			
CTR Engineering, Inc.			
16392 TIMBER MEADOW DRIVE COLORADO SPRINGS, CO 80908 (719) 964-6654			
PROJECT:		CLEAR VIEW INDUSTRIAL PARK FILING 2B	
BENCHMARK:			
Elevations are based upon FIMS monument DRO2, a 2" aluminum cap, stamped "CSU FIMS CONTROL DRO2", at the southeast corner of Monica Drive and Hancock Expressway (Elevation=5927.27 NGVD29)			
PROJECT TITLE:		GRADING, WATER QUALITY POND AND EROSION CONTROL	
SHEET TITLE:			
GRADING AND EROSION DETAILS			
DESIGNED BY:	JCM	SCALE:	DATE ISSUED:
DRAWN BY:	JCM	HT:	MAR. 2021
CHECKED BY:	JH	V:	SHEET NO. 16 OF 22 SHEETS
DWG:			

EC-6 Rolled Erosion Control Products (RECP)

Table RECP-2. ECTC Standard Specification for Permanent¹ Rolled Erosion Control Products
(Adapted from: Erosion Control Technology Council 2005)

Product Type	Slope Applications	Channel Applications	Minimum Tensile Strength ^{2,3}
TRMs with a minimum thickness of 0.25 inches (6.35 mm) per ASTM D 6525 and UV stability of 80% per ASTM D 4355 (500 hours exposure).	0.5:1 (H:V)	6.0 lbs/ft ² (288 Pa)	125 lbs/ft (1.82 kN/m)
	0.5:1 (H:V)	8.0 lbs/ft ² (384 Pa)	150 lbs/ft (2.19 kN/m)
	0.5:1 (H:V)	10.0 lbs/ft ² (480 Pa)	175 lbs/ft (2.55 kN/m)

¹ For TRMs containing degradable components, all property values must be obtained on the non-degradable portion of the matting alone.
² Minimum Average Roll Values, machine direction only for tensile strength determination using ASTM D 6818 (Supersedes Mod. ASTM D 5035 for RECPs)
³ Field conditions with high loading and/or high survivability requirements may warrant the use of a TRM with a tensile strength of 44 kN/m (3,000 lb/ft) or greater.
⁴ Required minimum shear stress TRM (fully vegetated) can sustain without physical damage or excess erosion (> 12.7 mm (0.5 in.) soil loss) during a 30-minute flow event in large scale testing.
⁵ Acceptable large-scale testing protocols may include ASTM D 6460, or other independent testing deemed acceptable by the engineer.

Design and Installation

RECPs should be installed according to manufacturer's specifications and guidelines. Regardless of the type of product used, it is important to ensure no gaps or voids exist under the material and that all contact of the material is secured using stakes and trenching. Continuous contact between the product and the soil is necessary to avoid failure. Never use metal stakes to secure temporary erosion control products. Often wooden stakes are used to anchor RECPs; however, wood stakes may present installation and maintenance challenges and generally take a long time to biodegrade. Some local jurisdictions have had favorable experiences using biodegradable stakes.

This BMP Fact Sheet provides design details for several commonly used ECB applications, including:

- ECB-1 Pipe Outlet to Drainageway
- ECB-2 Small Ditch or Drainageway
- ECB-3 Outside of Drainageway

RECP-4 Urban Drainage and Flood Control District
Urban Storm Drainage Criteria Manual Volume 3 November 2010

EC-6 Rolled Erosion Control Products (RECP) EC-6

Staking patterns are also provided in the design details according to these factors:

- ECB type
- Slope or channel type

For other types of RECPs including TRMs, these design details are intended to serve as general guidelines for design and installation; however, engineers should adhere to manufacturer's installation recommendations.

Maintenance and Removal

Inspection of erosion control blankets and other RECPs includes:

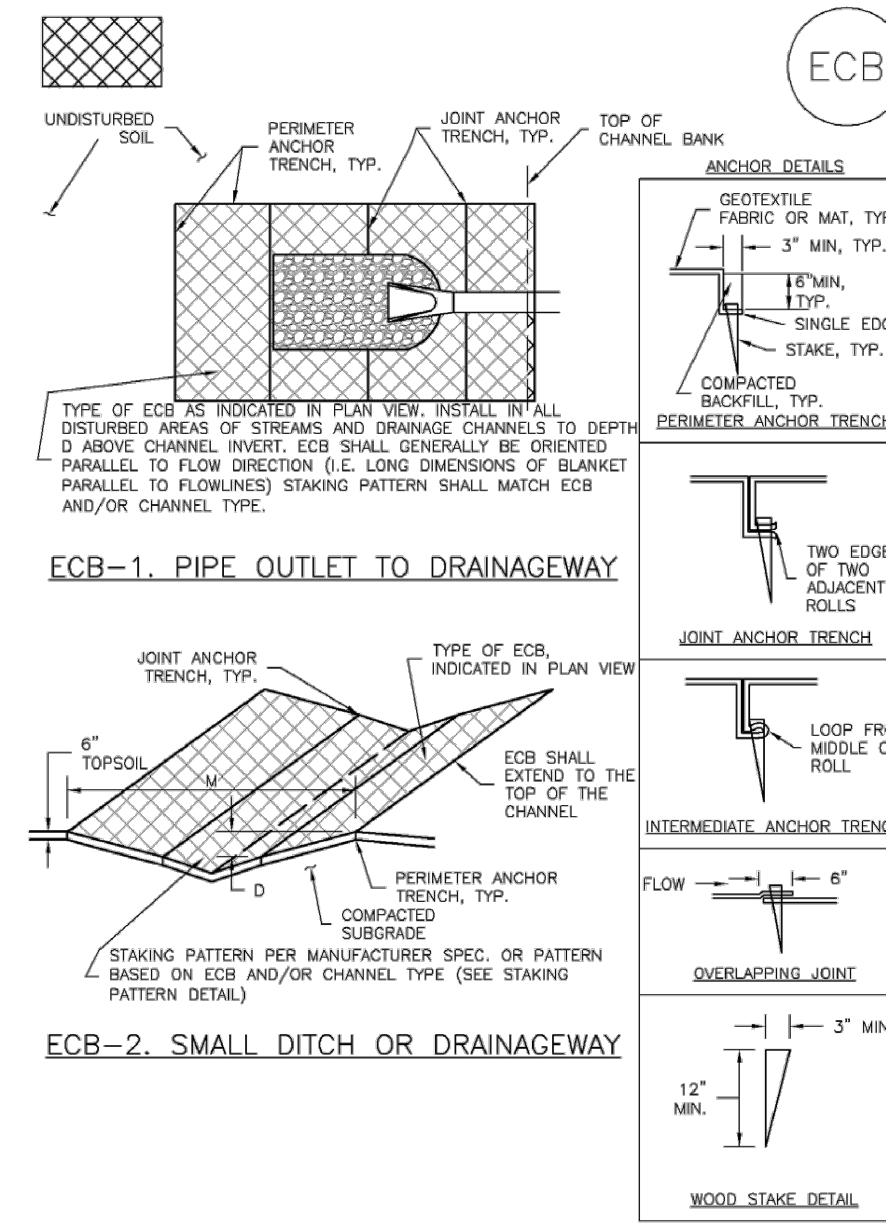
- Check for general signs of erosion, including voids beneath the mat. If voids are apparent, fill the void with suitable soil and replace the erosion control blanket, following the appropriate staking pattern.
- Check for damaged or loose stakes and secure loose portions of the blanket.

Erosion control blankets and other RECPs that are biodegradable typically do not need to be removed after construction. If they must be removed, then an alternate soil stabilization method should be installed promptly following removal.

Turf reinforcement mats, although generally resistant to biodegradation, are typically left in place as a dense vegetated cover grows in through the mat matrix. The turf reinforcement mat provides long-term stability and helps the established vegetation resist erosive forces.

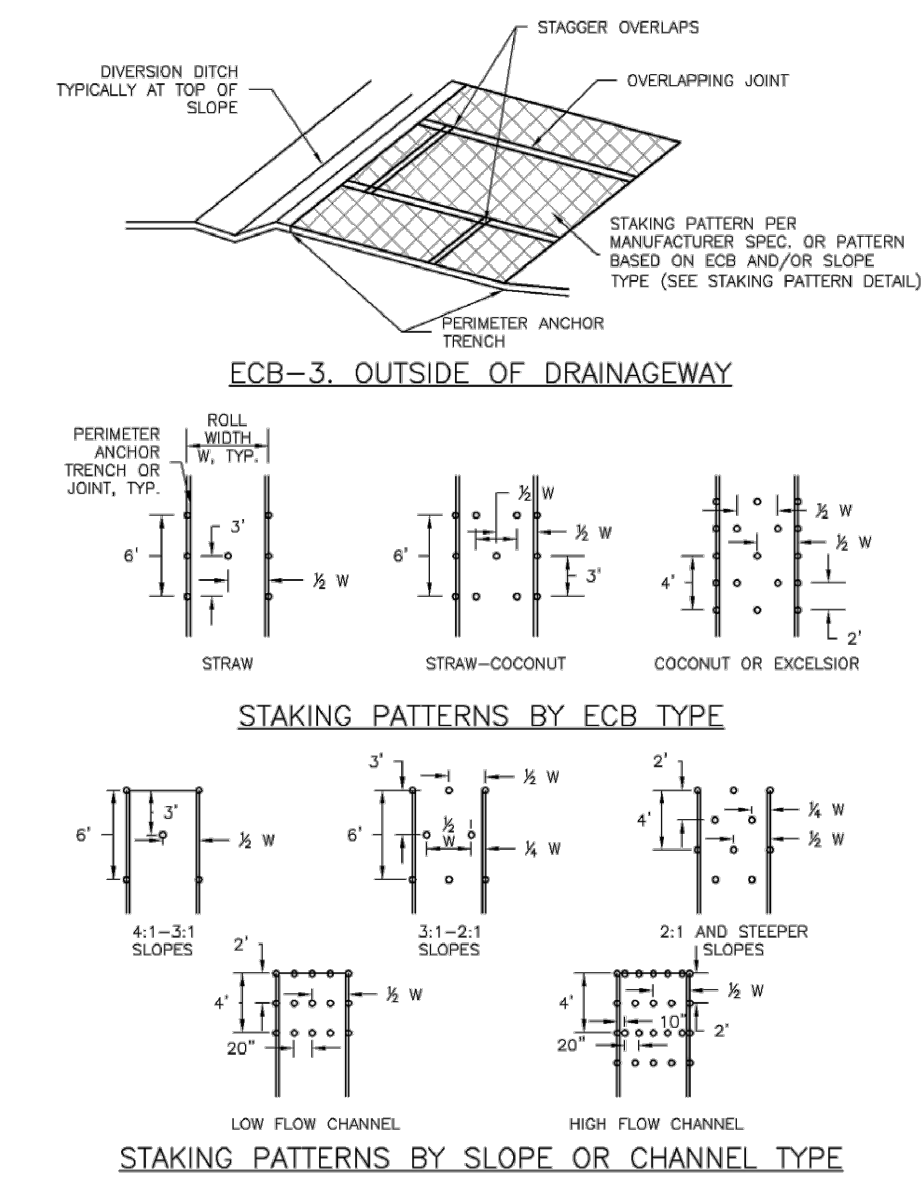
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Urban Storm Drainage Criteria Manual Volume 3 RECP-5

EC-6 Rolled Erosion Control Products (RECP)



RECP-6 Urban Drainage and Flood Control District
Urban Storm Drainage Criteria Manual Volume 3 November 2010

EC-6 Rolled Erosion Control Products (RECP) EC-6



RECP-7 Urban Drainage and Flood Control District
Urban Storm Drainage Criteria Manual Volume 3 November 2010

EC-6 Rolled Erosion Control Products (RECP)

EROSION CONTROL BLANKET INSTALLATION NOTES

- SEE PLAN VIEW FOR:
 - LOCATION OF ECB
 - TYPE OF ECB (STRAW, STRAW-COCOONUT, COCONUT, OR EXCELSIOR)
 - AREA, A, IN SQUARE YARDS OF EACH TYPE OF ECB
- 100% NATURAL AND BIODEGRADABLE MATERIALS ARE PREFERRED FOR RECP, ALTHOUGH SOME JURISDICTIONS MAY ALLOW OTHER MATERIALS IN SOME APPLICATIONS.
- IN AREAS WHERE ECBs ARE SHOWN ON THE PLANS, THE PERMITEE SHALL PLACE TOPSOIL AND PERFORM FINAL GRADING, SURFACE PREPARATION AND SEEDING AND MULCHING. SUBGRADE SHALL BE SMOOTH AND MOST PRIOR TO ECB INSTALLATION AND THE ECB SHALL BE IN FULL CONTACT WITH SUBGRADE. NO GAPS OR Voids SHALL EXIST UNDER THE BLANKET.
- PERMETER ANCHOR TRENCH SHALL BE USED ALONG THE OUTSIDE PERMETER OF ALL BLANKET AREAS.
- JOINT ANCHOR TRENCH SHALL BE USED TO JOIN ROLLS OF ECBs TOGETHER (LONGITUDINALLY AND TRANSVERSELY) FOR ALL ECBs EXCEPT STRAW WHICH MAY USE AN OVERLAPPING JOINT.
- INTERMEDIATE ANCHOR TRENCH SHALL BE USED TO SPACING OF ONE-HALF ROLL LENGTH FOR COCONUT AND EXCELSIOR ECBs.
- OVERLAPPING JOINT DETAIL SHALL BE USED TO JOIN ROLLS OF ECBs TOGETHER FOR ECBs ON SLOPES.
- MATERIAL SPECIFICATIONS OF ECBs SHALL CONFORM TO TABLE ECB-1.
- ANY AREAS OF SEEDING AND MULCHING DISTURBED IN THE PROCESS OF INSTALLING ECBs SHALL BE RESEEDED AND MULCHED.
- DETAILS ON DESIGN PLANS FOR MAJOR DRAINAGEWAY STABILIZATION WILL GOVERN IF DIFFERENT FROM THOSE SHOWN HERE.

TYPE	COCONUT CONTENT	STRAW CONTENT	EXCELSIOR CONTENT	RECOMMENDED NETTING*
STRAW	—	100%	—	DOUBLE/NATURAL
STRAW-COCOONUT	30% MIN	70% MAX	—	DOUBLE/NATURAL
COCONUT	100%	—	—	DOUBLE/NATURAL
EXCELSIOR	—	—	100%	DOUBLE/NATURAL

*STRAW ECBs MAY ONLY BE USED TO STAKE AND ANCHOR CHANNELS.
 *ALTERNATE NETTING MAY BE ACCEPTABLE IN SOME JURISDICTIONS.

RECP-8 Urban Drainage and Flood Control District
Urban Storm Drainage Criteria Manual Volume 3 November 2010

EC-6 Rolled Erosion Control Products (RECP) EC-6

EROSION CONTROL BLANKET MAINTENANCE NOTES

- INSPECT BMPs EACH WORKDAY, AND MAINTAIN THEM IN EFFECTIVE OPERATING CONDITION. MAINTENANCE OF BMPs SHOULD BE PROACTIVE, NOT REACTIVE. INSPECT BMPs AS SOON AS POSSIBLE (AND ALWAYS WITHIN 24 HOURS) FOLLOWING A STORM THAT CAUSES SURFACE EROSION, AND PERFORM NECESSARY MAINTENANCE.
- FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN BMPs IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
- WHERE BMPs HAVE FAILED, REPAIR OR REPLACEMENT SHOULD BE INITIATED UPON DISCOVERY OF THE FAILURE.
- ECBs SHALL BE LEFT IN PLACE TO EVENTUALLY BIODEGRADE, UNLESS REQUESTED TO BE REMOVED BY THE LOCAL JURISDICTION.
- ANY ECB PULLED OUT, TORN, OR OTHERWISE DAMAGED SHALL BE REPAIRED OR REINSTALLED. ANY SUBGRADE AREAS BELOW THE GEOTEXTILE THAT HAVE ERODED TO EXPOSED Voids UNDER THE BLANKET, OR THAT REMAIN DEVOID OF GRASS SHALL BE REPAIRED, RESEEDED AND MULCHED AND THE ECB REINSTALLED.

NOTE: MANY JURISDICTIONS HAVE BMP DETAILS THAT VARY FROM UFGCD STANDARD DETAILS. CONSULT WITH LOCAL JURISDICTIONS AS TO WHICH DETAIL SHOULD BE USED WHEN DIFFERENCES ARE NOTED.

(DETAILS ADAPTED FROM DOUGLAS COUNTY, COLORADO AND TOWN OF PARKER, COLORADO, NOT AVAILABLE IN AUTOCAD)

November 2010 Urban Drainage and Flood Control District
Urban Storm Drainage Criteria Manual Volume 3 RECP-9

1/18/2021

EI Paso County, CO Drainage Criteria Manual

RECOMMENDED ANNUAL GRASSES				
SPECIES (COMMON NAME)	GROWTH SEASON	SEEDING DATE	FOURDS OR PURE LIVE SEED (PLB) (PLB/ACRE)	PLANTING DEPTH (INCHES)
1. OATS	COOL	MARCH 15 - APRIL 30	30-40	1-2
2. SPRING WHEAT	COOL	MARCH 15 - APRIL 30	25-35	1-2
3. SPRING BARLEY	COOL	MARCH 15 - APRIL 30	25-35	1-2
4. ANNUAL RYEGRASS	COOL	MARCH 15 - JUNE 30	10-15	1/2
5. MALLETT	WARM	MAY 15 - JULY 15	5-10	10-34
6. BROMUS	WARM	MAY 15 - JULY 15	5-10	10-34
7. BROMUS	WARM	MAY 15 - JULY 15	5-10	10-34
8. WINTER WHEAT	COOL	SEPTEMBER 1 - 30	20-30	1-2
9. WINTER BARLEY	COOL	SEPTEMBER 1 - 30	20-30	1-2
10. WINTER RYE	COOL	SEPTEMBER 1 - 30	20-30	1-2
11. TRITICALE	COOL	SEPTEMBER 1 - 30	20-40	1-2

THIS TABLE WAS TAKEN FROM UFGCD FOR RECOMMENDED ANNUAL GRASSES FOR THE DENVER METROPOLITAN AREA. THIS TABLE MAY BE USED UNLESS A SITE-SPECIFIC SEED MIX IS REQUESTED AND APPROVED.

TABLE TS-1

TEMPORARY SEEDING NOTES

- | | |
|--|---|
| <p>INSTALLATION REQUIREMENTS</p> <ol style="list-style-type: none"> DISTURBED AREAS ARE TO BE SEEDDED WITHIN 21 DAYS AFTER CONSTRUCTION ACTIVITY OR GRADING ENDS IF SEASON ALLOWS. IF NECESSARY, SOIL IS TO BE CONDITIONED FOR PLANT GROWTH BY APPLYING TOPSOIL, FERTILIZER, OR LIMING. SOIL IS TO BE FILLED IMMEDIATELY PRIOR TO APPLYING SEEDS. COMPACT SOILS ESPECIALLY NEED TO BE LOOSENEED. SEEDING DEPTH IS TO BE 4 INCHES FOR SLOPES FLATTER THAN 2:1, AND 1 INCH FOR SLOPES STEEPER THAN 2:1. ANNUAL GRASSES LISTED IN TABLE TS-1 ARE TO BE USED FOR TEMPORARY SEEDING. SEED MIXES ARE NOT TO CONTAIN ANY NOXIOUS WEED SEEDS INCLUDING RUSSIAN OR CANADIAN THISTLE, HANDED, PURPLE LOOSESTRIFE, EUROPEAN BRANCHED BURDECK, AND LARK SPURGE. TABLE TS-1 ALSO PROVIDES REQUIREMENTS FOR SEEDING RATES, SEEDING DATES, AND PLANTING DEPTHS FOR THE APPROVED TYPES OF ANNUAL GRASSES. SEEDING IS TO BE APPLIED USING MECHANICAL TYPE DRILLS EXCEPT WHERE SLOPES ARE STEEP OR ACCESS IS LIMITED THEN HYDRAULIC SEEDING MAY BE USED. ALL SEEDDED AREAS ARE TO BE MULCHED (SEE FACTSHEET ON MULCHING). IF HYDRAULIC SEEDING IS USED THEN HYDRAULIC MULCHING SHALL BE DONE SEPARATELY TO AVOID SEEDS BECOMING ENCAPSULATED IN THE MULCH. | <p>MAINTENANCE REQUIREMENTS</p> <ol style="list-style-type: none"> REGULAR INSPECTIONS ARE TO BE MADE OF ALL SEEDDED AREAS TO ENSURE GROWTH. AREAS WHERE GROWTH IS NOT OCCURRING QUICKLY OR THE MULCH HAS BEEN REMOVED SHALL BE RE-SEEDDED AS SOON AS POSSIBLE AND RE-MULCHED IF NEEDED. SEEDDED AREAS ARE NOT TO BE DRIVEN OVER WITH CONSTRUCTION EQUIPMENT OR VEHICLES. |
|--|---|

City of Colorado Springs
Stormwater Quality

Figure TS-1
Temporary Seeding
Construction Detail and Maintenance Requirements

Temporary Swale

6/1/2016



NO.	DATE	DESCRIPTION	BY
REVISIONS			
CTR Engineering, Inc.			
16392 TIMBER MEADOW DRIVE COLORADO SPRINGS, CO 80908 (719) 964-6654			
PROJECT:	CLEAR VIEW INDUSTRIAL PARK FILING 2B		
BENCHMARK:	Elevations are based upon FIMS monument DR02, a 2" aluminum cap, stamped "CSU FIMS CONTROL DR02", at the southeast corner of Monica Drive and Hancock Expressway (Elevation=5927.27 NGVD29)		
PROJECT TITLE:	GRADING, WATER QUALITY POND AND EROSION CONTROL		
SHEET TITLE:	GRADING AND EROSION DETAILS		
DESIGNED BY:	JCM	SCALE:	DATE ISSUED:
DRAWN BY:	JCM	HT:	MAR. 2021
CHECKED BY:	JH	V:	SHEET NO. 17 OF 22 SHEETS
DWG:			

Concrete Washout Area (CWA) MM-1

Description

Concrete waste management involves designating and properly managing a specific area of the construction site as a concrete washout area. A concrete washout area can be created using one of several approaches designed to receive wash water from washing of tools and concrete mixer chutes, liquid concrete waste from dump trucks, mobile batch mixers, or pump trucks. Three basic approaches are available: excavation of a pit in the ground, use of an above ground storage area, or use of prefabricated haul-away concrete washout containers.



Photograph CWA-1. Example of concrete washout area. Note gravel tracking pad for access and sign.

Appropriate Uses

Concrete washout areas must be designated on all sites that will generate concrete wash water or liquid concrete waste from onsite concrete mixing or concrete delivery.

Because pH is a pollutant of concern for washout activities, when unlined pits are used for concrete washout, the soil must have adequate buffering capacity to result in protection of state groundwater standards; otherwise, a liner/containment must be used. The following management practices are recommended to prevent an impact from unlined pits to groundwater:

- The use of the washout site should be temporary (less than 1 year), and
- The washout site should be not be located in an area where shallow groundwater may be present, such as near natural drainages, springs, or wetlands.

Design and Installation

Concrete washout activities must be conducted in a manner that does not contribute pollutants to surface waters or stormwater runoff. Concrete washout areas may be lined or unlined excavated pits in the ground, commercially manufactured prefabricated washout containers, or aboveground holding areas constructed of berms, sandbags or straw bales with a plastic liner.

Although unlined washout areas may be used, lined pits may be required to protect groundwater under certain conditions.

Do not locate an unlined washout area within 400 feet of any natural drainage pathway or waterbody or within 1,000 feet of any wells or drinking water sources. Even for lined concrete washouts, it is advisable to locate the facility away from waterbodies and drainage paths. If site constraints make these

Concrete Washout Area	
Functions	
Erosion Control	No
Sediment Control	No
Site/Material Management	Yes

November 2010 Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual Volume 3 CWA-1

MM-1 Concrete Washout Area (CWA)

setbacks infeasible or if highly permeable soils exist in the area, then the pit must be installed with an impermeable liner (16 mil minimum thickness) or surface storage alternatives using prefabricated concrete washout devices or a lined aboveground storage area should be used.

Design details with notes are provided in Detail CWA-1 for pits and CWA-2 for aboveground storage areas. Pre-fabricated concrete washout container information can be obtained from vendors.

Maintenance and Removal

A key consideration for concrete washout areas is to ensure that adequate signage is in place identifying the location of the washout area. Part of inspecting and maintaining washout areas is ensuring that adequate signage is provided and in good repair and that the washout area is being used, as opposed to washout in non-designated areas of the site.

Remove concrete waste in the washout area, as needed to maintain BMP function (typically when filled to about two-thirds of its capacity). Collect concrete waste and deliver offsite to a designated disposal location.

Upon termination of use of the washout site, accumulated solid waste, including concrete waste and any contaminated soils, must be removed from the site to prevent on-site disposal of solid waste. If the wash water is allowed to evaporate and the concrete hardens, it may be recycled.



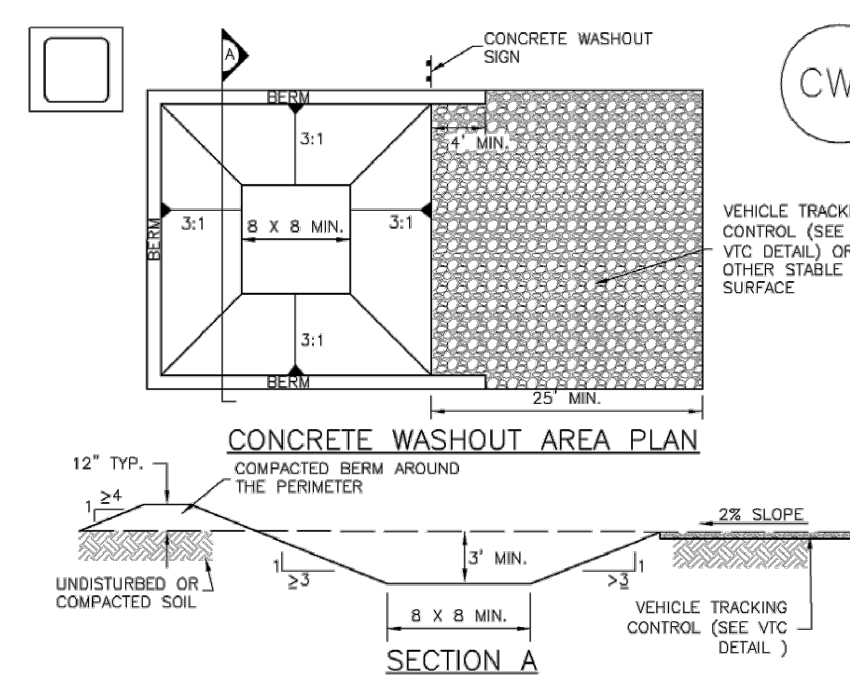
Photograph CWA-2. Prefabricated concrete washout. Photo courtesy of CDOT.



Photograph CWA-3. Earthen concrete washout. Photo courtesy of CDOT.

CWA-2 Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual Volume 3 November 2010

Concrete Washout Area (CWA) MM-1



CWA-1. CONCRETE WASHOUT AREA

- CWA INSTALLATION NOTES**
- SEE PLAN VIEW FOR:
 - CWA INSTALLATION LOCATION.
 - DO NOT LOCATE AN UNLINED CWA WITHIN 400' OF ANY NATURAL DRAINAGE PATHWAY OR WATERBODY. DO NOT LOCATE WITHIN 1,000' OF ANY WELLS OR DRINKING WATER SOURCES. IF SITE CONSTRAINTS MAKE THIS INFEASIBLE, OR IF HIGHLY PERMEABLE SOILS EXIST ON SITE, THE CWA MUST BE INSTALLED WITH AN IMPERMEABLE LINER (16 MIL MIN. THICKNESS) OR SURFACE STORAGE ALTERNATIVES USING PREFABRICATED CONCRETE WASHOUT DEVICES OR A LINED ABOVE GROUND STORAGE ARE SHOULD BE USED.
 - THE CWA SHALL BE INSTALLED PRIOR TO CONCRETE PLACEMENT ON SITE.
 - CWA SHALL INCLUDE A FLAT SUBSURFACE PIT THAT IS AT LEAST 8" BY 8" SLOPES LEADING OUT OF THE SUBSURFACE PIT SHALL BE 3:1 OR FLATTER. THE PIT SHALL BE AT LEAST 3' DEEP.
 - BERM SURROUNDING SIDES AND BACK OF THE CWA SHALL HAVE MINIMUM HEIGHT OF 1'.
 - VEHICLE TRACKING PAD SHALL BE SLOPED 2% TOWARDS THE CWA.
 - SIGNS SHALL BE PLACED AT THE CONSTRUCTION ENTRANCE AT THE CWA AND ELSEWHERE AS NECESSARY TO CLEARLY INDICATE THE LOCATION OF THE CWA TO OPERATORS OF CONCRETE TRUCKS AND PUMP TRUCKS.
 - USE EXCAVATED MATERIAL FOR PERIMETER BERM CONSTRUCTION.

November 2010 Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual Volume 3 CWA-3

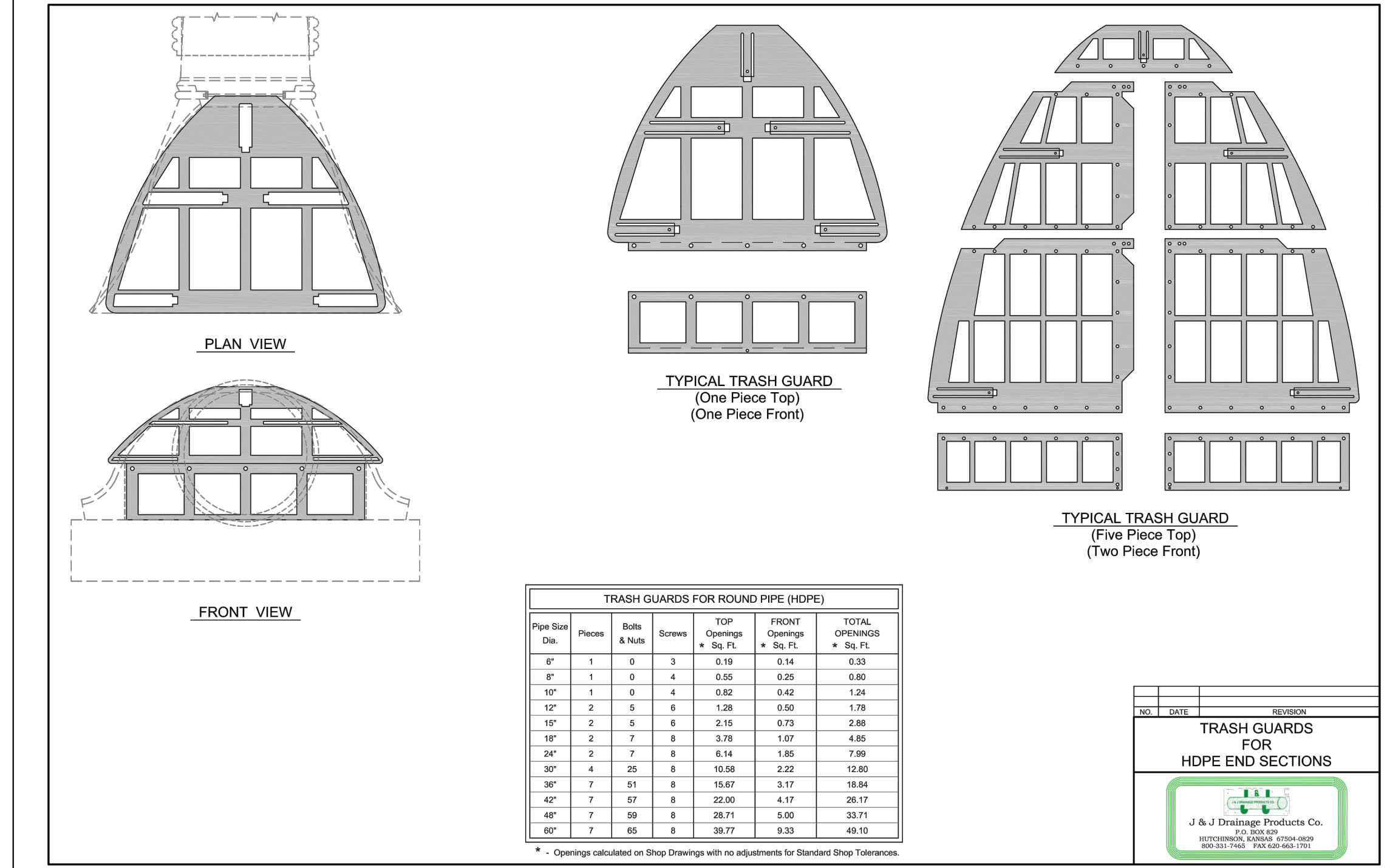
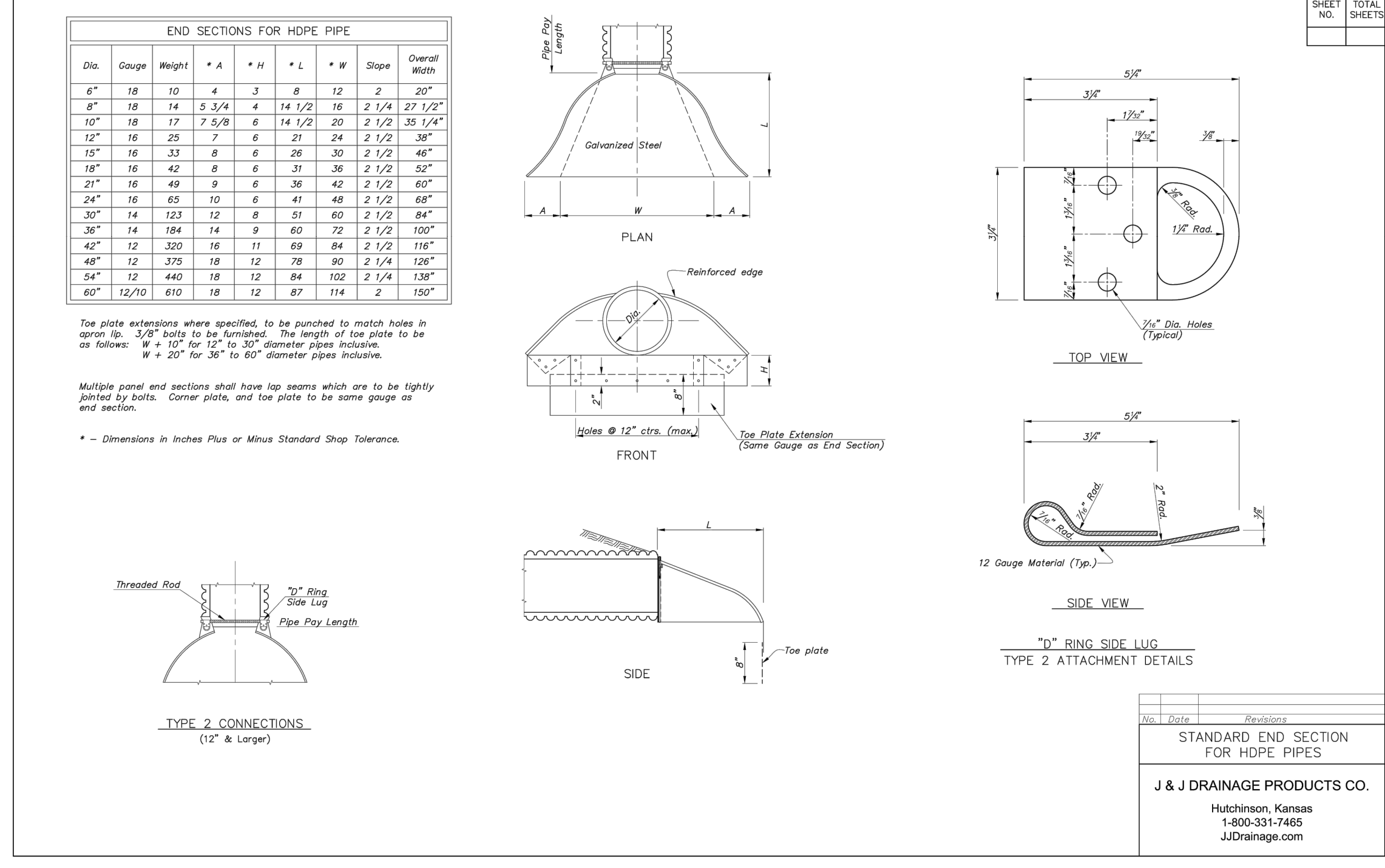
MM-1 Concrete Washout Area (CWA)

CWA MAINTENANCE NOTES

- INSPECT BMPs EACH WORKDAY, AND MAINTAIN THEM IN EFFECTIVE OPERATING CONDITION. MAINTENANCE OF BMPs SHOULD BE PROACTIVE, NOT REACTIVE. INSPECT BMPs AS SOON AS POSSIBLE (AND ALWAYS WITHIN 24 HOURS) FOLLOWING A STORM THAT CAUSES SURFACE EROSION, AND PERFORM NECESSARY MAINTENANCE.
- FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN BMPs IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
- WHERE BMPs HAVE FAILED, REPAIR OR REPLACEMENT SHOULD BE INITIATED UPON DISCOVERY OF THE FAILURE.
- THE CWA SHALL BE REPAIRED, CLEANED, OR ENLARGED AS NECESSARY TO MAINTAIN CAPACITY FOR CONCRETE WASTE. CONCRETE MATERIALS, ACCUMULATED IN PIT, SHALL BE REMOVED ONCE THE MATERIALS HAVE REACHED A DEPTH OF 2'.
- CONCRETE WASHOUT WATER, WASTED PIECES OF CONCRETE AND ALL OTHER DEBRIS IN THE SUBSURFACE PIT SHALL BE TRANSPORTED FROM THE JOB SITE IN A WATER-TIGHT CONTAINER AND DISPOSED OF PROPERLY.
- THE CWA SHALL REMAIN IN PLACE UNTIL ALL CONCRETE FOR THE PROJECT IS PLACED.
- WHEN THE CWA IS REMOVED, COVER THE DISTURBED AREA WITH TOP SOIL, SEED AND MULCH OR OTHERWISE STABILIZED IN A MANNER APPROVED BY THE LOCAL JURISDICTION.

(DETAIL ADAPTED FROM DOUGLAS COUNTY, COLORADO AND THE CITY OF PARKER, COLORADO, NOT AVAILABLE IN AUTOCAD).
NOTE: MANY JURISDICTIONS HAVE BMP DETAILS THAT VARY FROM USDCD STANDARD DETAILS. CONSULT WITH LOCAL JURISDICTIONS AS TO WHICH DETAIL SHOULD BE USED WHEN DIFFERENCES ARE NOTED.

CWA-4 Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual Volume 3 November 2010



NO.	DATE	DESCRIPTION	BY
REVISIONS			
CTR Engineering, Inc.			
16392 TIMBER MEADOW DRIVE COLORADO SPRINGS, CO 80908 (719) 964-6654			
PROJECT: CLEAR VIEW INDUSTRIAL PARK FILING 2B			
BENCHMARK: Elevations are based upon FIMS monument DR02, a 2" aluminum cap, stamped "CSU FIMS CONTROL DR02", at the southeast corner of Monica Drive and Hancock Expressway (Elevation=5927.27 NGVD29)			
PROJECT TITLE: GRADING, WATER QUALITY POND AND EROSION CONTROL			
SHEET TITLE: GRADING AND EROSION DETAILS			
DESIGNED BY: JCM	SCALE:	DATE ISSUED: MAR. 2021	
DRAWN BY: JCM	HH:		
CHECKED BY: JH	V:	SHEET NO. 18	OF 22 SHEETS
DWG:			

EPC 3/22/21

Sediment Basin (SB)

SC-7

Description

A sediment basin is a temporary pond built on a construction site to capture eroded or disturbed soil transported in storm runoff prior to discharge from the site. Sediment basins are designed to capture site runoff and slowly release it to allow time for settling of sediment prior to discharge. Sediment basins are often constructed in locations that will later be modified to serve as post-construction stormwater basins.



Photograph SB-1. Sediment basin at the toe of a slope. Photo courtesy of WVE.

Appropriate Uses

Most large construction sites (typically greater than 2 acres) will require one or more sediment basins for effective management of construction site runoff. On linear construction projects, sediment basins may be impractical; instead, sediment traps or other combinations of BMPs may be more appropriate.

Sediment basins should not be used as stand-alone sediment controls. Erosion and other sediment controls should also be implemented upstream.

When feasible, the sediment basin should be installed in the same location where a permanent post-construction detention pond will be located.

Design and Installation

The design procedure for a sediment basin includes these steps:

- Basin Storage Volume:** Provide a storage volume of at least 3,600 cubic feet per acre of drainage area. To the extent practical, undisturbed and/or off-site areas should be diverted around sediment basins to prevent "clean" runoff from mixing with runoff from disturbed areas. For undisturbed areas (both on-site and off-site) that cannot be diverted around the sediment basin, provide a minimum of 500 ft³/acre of storage for undeveloped (but stable) off-site areas in addition to the 3,600 ft³/acre for disturbed areas. For stable, developed areas that cannot be diverted around the sediment basin, storage volume requirements are summarized in Table SB-1.

- Basin Geometry:** Design basin with a minimum length-to-width ratio of 2:1 (L:W). If this cannot be achieved because of site space constraints, buffering may be required to extend the effective distance between the inflow point(s) and the outlet to minimize short-circuiting.

Sediment Basins	
Functions	
Erosion Control	No
Sediment Control	Yes
Site/Material Management	No

- Dam Embankment:** It is recommended that embankment slopes be 4:1 (H:V) or flatter and be steeper than 3:1 (H:V) in any location.

August 2013 Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual Volume 3 SB-1

SC-7 Sediment Basin (SB)

- Inflow Structure:** For concentrated flow entering the basin, provide energy dissipation at the point of inflow.

Table SB-1. Additional Volume Requirements for Undisturbed and Developed Tributary Areas Draining through Sediment Basins

Imperviousness (%)	Additional Storage Volume (ft ³) Per Acre of Tributary Area
Undeveloped	500
10	800
20	1230
30	1600
40	2030
50	2470
60	2980
70	3560
80	4360
90	5300
100	6460

- Outlet Works:** The outlet pipe shall extend through the embankment at a minimum slope of 0.5 percent. Outlet works can be designed using one of the following approaches:

- Riser Pipe (Simplified Detail):** Detail SB-1 provides a simplified design for basins treating no more than 15 acres.
- Orifice Plate or Riser Pipe:** Follow the design criteria for Full Spectrum Detention outlets in the EDB Fact Sheet provided in Chapter 4 of this manual for sizing of outlet perforations with an emptying time of approximately 72 hours. In lieu of the trash rack, pack uniformly sized 1/4- to 2-inch gravel in front of the plate or surrounding the riser pipe. This gravel will need to be cleaned out frequently during the construction period as sediment accumulates within it. The gravel pack will need to be removed and disposed of following construction to reclaim the basin for use as a permanent detention facility. If the basin will be used as a permanent extended detention basin for the site, a trash rack will need to be installed once contributing drainage areas have been stabilized and the gravel pack and accumulated sediment have been removed.
- Floating Skimmer:** If a floating skimmer is used, install it using manufacturer's recommendations. Illustration SB-1 provides an illustration of a Faircloth Skimmer Floating Outlet™, one of the more commonly used floating skimmer outlets. A skimmer should be designed to release the design volume in no less than 48 hours. The use of a floating skimmer outlet can increase the sediment capture efficiency of a basin significantly. A floating outlet continually decants cleanest water off the surface of the pond and releases cleaner water than would discharge from a perforated riser pipe or plate.

SB-2 Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual Volume 3 August 2013

Sediment Basin (SB) SC-7

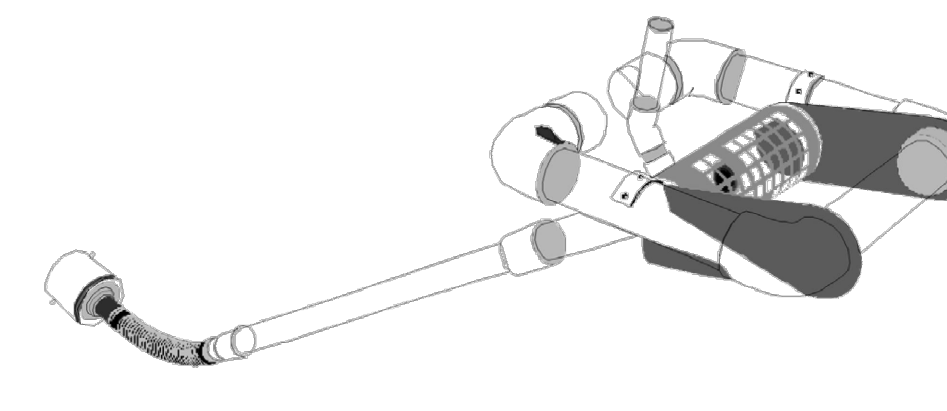


Illustration SB-1. Outlet structure for a temporary sediment basin - Faircloth Skimmer Floating Outlet. Illustration courtesy of J. W. Faircloth & Sons, Inc. FairclothSkimmer.com.

- Outlet Protection and Spillway:** Consider all flow paths for runoff leaving the basin, including protection at the typical point of discharge as well as overtopping.

- Outlet Protection:** Outlet protection should be provided where the velocity of flow will exceed the maximum permissible velocity of the material of the waterway into which discharge occurs. This may require the use of a riprap apron at the outlet location and/or other measures to keep the waterway from eroding.
- Emergency Spillway:** Provide a stabilized emergency overflow spillway for rainstorms that exceed the capacity of the sediment basin volume and its outlet. Protect basin embankments from erosion and overtopping. If the sediment basin will be converted to a permanent detention basin, design and construct the emergency spillway(s) as required for the permanent facility. If the sediment basin will not become a permanent detention basin, it may be possible to substitute a heavy polyvinyl membrane or properly bedded rock cover to line the spillway and downstream embankment, depending on the height, slope, and width of the embankments.

August 2013 Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual Volume 3 SB-3

SC-7 Sediment Basin (SB)

Maintenance and Removal

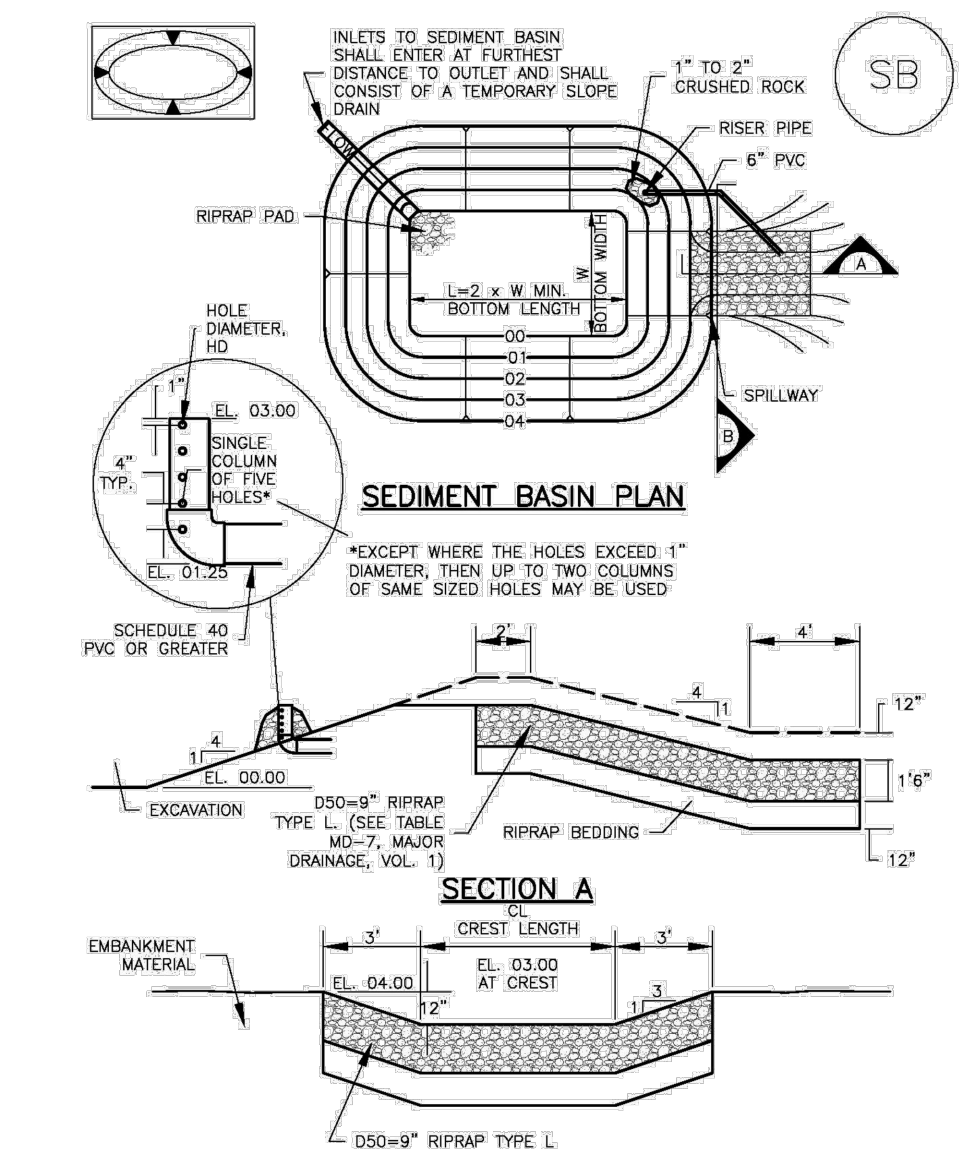
Maintenance activities include the following:

- Dredge sediment from the basin, as needed to maintain BMP effectiveness, typically when the design storage volume is no more than one-third filled with sediment.
- Inspect the sediment basin embankments for stability and seepage.
- Inspect the inlet and outlet of the basin, repair damage, and remove debris. Remove, clean and replace the gravel around the outlet on a regular basis to remove the accumulated sediment within it and keep the outlet functioning.
- Be aware that removal of a sediment basin may require dewatering and associated permit requirements.
- Do not remove a sediment basin until the upstream area has been stabilized with vegetation.

Final disposition of the sediment basin depends on whether the basin will be converted to a permanent post-construction stormwater basin or whether the basin area will be returned to grade. For basins being converted to permanent detention basins, remove accumulated sediment and reconfigure the basin and outlet to meet the requirements of the final design for the detention facility. If the sediment basin is not to be used as a permanent detention facility, fill the excavated area with soil and stabilize with vegetation.

SB-4 Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual Volume 3 August 2013

Sediment Basin (SB) SC-7



August 2013 Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual Volume 3 SB-5

SC-7 Sediment Basin (SB)

Upstream Drainage Area (rounded to nearest acre), (ac)	Basin Bottom Width (ft)	Spillway Crest Length (ft), (L)	Pipe Diameter (ft), (D)
1	12 1/2	2	3/4
2	21	4	1 1/4
3	33 1/2	6	1 3/4
4	42	8	1 3/4
5	48 1/2	9	1 3/4
6	51	10	1 3/4
7	47 1/2	11	1 3/4
8	50	12	1 3/4
9	51	12	1 3/4
10	56 1/4	13	1 3/4
11	61	14	1 3/4
12	64	16	1 3/4
13	67 1/2	19	1 3/4
14	70 1/2	21	1 3/4
15	73 1/4	22	1 3/4

SEDIMENT BASIN INSTALLATION NOTES

- SEE PLAN VIEW FOR:
 - LOCATION OF SEDIMENT BASIN.
 - TYPE OF BASIN (STANDARD BASIN OR NONSTANDARD BASIN).
 - FOR STANDARD BASIN, BOTTOM WIDTH W, CREST LENGTH CL, AND HOLE DIAMETER, HD.
 - FOR NONSTANDARD BASIN, SEE CONSTRUCTION DRAWINGS FOR DESIGN OF BASIN INCLUDING RISER HEIGHT H, NUMBER OF COLUMNS N, HOLE DIAMETER HD AND PIPE DIAMETER D.
- FOR STANDARD BASIN, BOTTOM DIMENSION MAY BE MODIFIED AS LONG AS BOTTOM AREA IS NOT REDUCED.
- SEDIMENT BASINS SHALL BE INSTALLED PRIOR TO ANY OTHER LAND-DISTURBING ACTIVITY THAT RELIES ON OR BASINS AS A STORMWATER CONTROL.
- EMBANKMENT MATERIAL SHALL CONSIST OF SOIL FREE OF DEBRIS, ORGANIC MATERIAL, AND ROCKS OR CONCRETE GREATER THAN 3 INCHES AND SHALL HAVE A MINIMUM OF 15 PERCENT BY WEIGHT PASSING THE NO. 200 SIEVE.
- EMBANKMENT MATERIAL SHALL BE COMPACTED TO AT LEAST 95 PERCENT OF MAXIMUM DENSITY IN ACCORDANCE WITH ASTM D698.
- PIPE SCH 40 OR GREATER SHALL BE USED.
- THE DETAILS SHOWN ON THESE SHEETS PERTAIN TO STANDARD SEDIMENT BASIN(S) FOR DRAINAGE AREAS LESS THAN 15 ACRES. SEE CONSTRUCTION DRAWINGS FOR EMBANKMENT, STORAGE VOLUME, SPILLWAY, OUTLET, AND OUTLET PROTECTION DETAILS FOR ANY SEDIMENT BASIN(S) THAT HAVE BEEN INDIVIDUALLY DESIGNED FOR DRAINAGE AREAS LARGER THAN 15 ACRES.

SB-6 Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual Volume 3 August 2013

Sediment Basin (SB) SC-7

SEDIMENT BASIN MAINTENANCE NOTES

- INSPECT BMPs EACH WORKDAY, AND MAINTAIN THEM IN EFFECTIVE OPERATING CONDITION. MAINTENANCE OF BMPs SHOULD BE PROACTIVE, NOT REACTIVE. INSPECT BMPs AS SOON AS POSSIBLE (AND ALWAYS WITHIN 24 HOURS) FOLLOWING A STORM THAT CAUSES SURFACE EROSION, AND PERFORM NECESSARY MAINTENANCE.
- FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN BMPs IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
- WHERE BMPs HAVE FAILED, REPAIR OR REPLACEMENT SHOULD BE INITIATED UPON DISCOVERY OF THE FAILURE.
- SEDIMENT ACCUMULATED IN BASIN SHALL BE REMOVED AS NEEDED TO MAINTAIN BMP EFFECTIVENESS, TYPICALLY WHEN SEDIMENT DEPTH REACHES ONE FOOT (I.E., TWO FEET BELOW THE SPILLWAY CREST).
- SEDIMENT BASINS ARE TO REMAIN IN PLACE UNTIL THE UPSTREAM DISTURBED AREA IS STABILIZED AND GRASS COVER IS ACCEPTED BY THE LOCAL JURISDICTION.
- WHEN SEDIMENT BASINS ARE REMOVED, ALL DISTURBED AREAS SHALL BE COVERED WITH TOPSOIL, SEEDS AND MULCHED OR OTHERWISE STABILIZED AS APPROVED BY LOCAL JURISDICTION.

(DETAILS ADAPTED FROM BOULDER COUNTY, COLORADO)
NOTE: MANY JURISDICTIONS HAVE BMP DETAILS THAT VARY FROM IUD/CD STANDARD DETAILS. CONSULT WITH LOCAL JURISDICTIONS AS TO WHICH DETAIL SHOULD BE USED WHEN DIFFERENCES ARE NOTED.

August 2013 Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual Volume 3 SB-7




NO.	DATE	DESCRIPTION	BY
REVISIONS			
CTR Engineering, Inc.			
16392 TIMBER MEADOW DRIVE COLORADO SPRINGS, CO 80908 (719) 964-6654			
PROJECT: CLEAR VIEW INDUSTRIAL PARK FILING 2B			
BENCHMARK: Elevations are based upon FIMS monument DR02, a 2" aluminum cap, stamped "CSU FIMS CONTROL DR02", at the southeast corner of Monica Drive and Hancock Expressway (Elevation=5927.27 NGVD29)			
PROJECT TITLE: GRADING, WATER QUALITY POND AND EROSION CONTROL			
SHEET TITLE: GRADING AND EROSION DETAILS			
DESIGNED BY: JCM	SCALE:	DATE ISSUED: MAR. 2021	
DRAWN BY: JCM	HH:		
CHECKED BY: JH	V:	SHEET NO. 19 OF 22 SHEETS	
DWG:			

Inlet Protection (IP) **SC-6**

Description

Inlet protection consists of permeable barriers installed around an inlet to filter runoff and remove sediment prior to entering a storm drain inlet. Inlet protection can be constructed from rock socks, sediment control logs, silt fence, block and rock socks, or other materials approved by the local jurisdiction. Area inlets can also be protected by over-excavating around the inlet to form a sediment trap.



Appropriate Uses

Install protection at storm sewer inlets that are operable during construction. Consider the potential for tracked-out sediment or temporary stockpile areas to contribute sediment to inlets when determining which inlets must be protected. This may include inlets in the general proximity of the construction area, not limited to downgradient inlets. Inlet protection is not a stand-alone BMP and should be used in conjunction with other upgradient BMPs.

Design and Installation

To function effectively, inlet protection measures must be installed to ensure that flows do not bypass the inlet protection and enter the storm drain without treatment. However, designs must also enable the inlet to function without completely blocking flows into the inlet in a manner that causes localized flooding. When selecting the type of inlet protection, consider factors such as type of inlet (e.g., curb or area, sump or on-grade conditions), traffic, anticipated flows, ability to secure the BMP properly, safety and other site-specific conditions. For example, block and rock socks will be better suited to a curb and gutter along a roadway, as opposed to silt fence or sediment control logs, which cannot be properly secured in a curb and gutter setting, but are effective area inlet protection measures.

Several inlet protection designs are provided in the Design Details. Additionally, a variety of proprietary products are available for inlet protection that may be approved for use by local governments. If proprietary products are used, design details and installation procedures from the manufacturer must be followed. Regardless of the type of inlet protection selected, inlet protection is most effective when combined with other BMPs such as curb socks and check dams. Inlet protection is often the last barrier before runoff enters the storm sewer or receiving water.

Design details with notes are provided for these forms of inlet protection:

Functions	Inlet Protection (various forms)	
	Erosion Control	No
IP-1. Block and Rock Sock Inlet Protection for Sump or On-grade Inlets	Sediment Control	Yes
IP-2. Curb (Rock) Socks Upstream of Inlet Protection, On-grade Inlets	Site/Material Management	No

August 2013 IP-1
Urban Drainage and Flood Control District
Urban Storm Drainage Criteria Manual Volume 3

SC-6 **Inlet Protection (IP)**

IP-3. Rock Sock Inlet Protection for Sump/Area Inlet
IP-4. Silt Fence Inlet Protection for Sump/Area Inlet
IP-5. Over-excavation Inlet Protection
IP-6. Straw Bale Inlet Protection for Sump/Area Inlet
CIP-1. Culvert Inlet Protection

Proprietary inlet protection devices should be installed in accordance with manufacturer specifications. More information is provided below on selecting inlet protection for sump and on-grade locations.

Inlets Located in a Sump

When applying inlet protection in sump conditions, it is important that the inlet continue to function during larger runoff events. For curb inlets, the maximum height of the protective barrier should be lower than the top of the curb opening to allow overflow into the inlet during larger storms without excessive localized flooding. If the inlet protection height is greater than the curb elevation, particularly if the filter becomes clogged with sediment, runoff will not enter the inlet and may bypass it, possibly causing localized flooding, public safety issues, and downstream erosion and damage from bypassed flows.

Area inlets located in a sump setting can be protected through the use of silt fence, concrete block and rock socks (on paved surfaces), sediment control logs/straw wattles embedded in the adjacent soil and stacked around the area inlet (on pervious surfaces), over-excavation around the inlet, and proprietary products providing equivalent functions.

Inlets Located on a Slope

For curb and gutter inlets on paved sloping streets, block and rock sock inlet protection is recommended in conjunction with curb socks in the gutter leading to the inlet. For inlets located along unpaved roads, also see the Check Dam Fact Sheet.

Maintenance and Removal

Inspect inlet protection frequently. Inspection and maintenance guidance includes:

- Inspect for tears that can result in sediment directly entering the inlet, as well as result in the contents of the BMP (e.g., gravel) washing into the inlet.
- Check for improper installation resulting in untreated flows bypassing the BMP and directly entering the inlet or bypassing to an unprotected downstream inlet. For example, silt fence that has not been properly trenched around the inlet can result in flows under the silt fence and directly into the inlet.
- Look for displaced BMPs that are no longer protecting the inlet. Displacement may occur following larger storm events that wash away or reposition the inlet protection. Traffic or equipment may also crush or displace the BMP.
- Monitor sediment accumulation upgradient of the inlet protection.

August 2013 IP-2
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Urban Storm Drainage Criteria Manual Volume 3

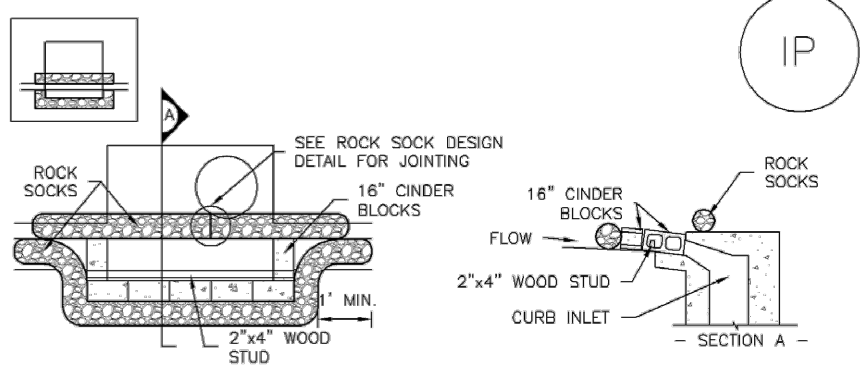
Inlet Protection (IP) **SC-6**

- Remove sediment accumulation from the area upstream of the inlet protection, as needed to maintain BMP effectiveness, typically when it reaches no more than half the storage capacity of the inlet protection. For silt fence, remove sediment when it accumulates to a depth of no more than 6 inches. Remove sediment accumulation from the area upstream of the inlet protection as needed to maintain the functionality of the BMP.
- Proprietary inlet protection devices should be inspected and maintained in accordance with manufacturer specifications. If proprietary inlet insert devices are used, sediment should be removed in a timely manner to prevent devices from breaking and spilling sediment into the storm drain.

Inlet protection must be removed and properly disposed of when the drainage area for the inlet has reached final stabilization.

August 2013 IP-3
Urban Drainage and Flood Control District
Urban Storm Drainage Criteria Manual Volume 3

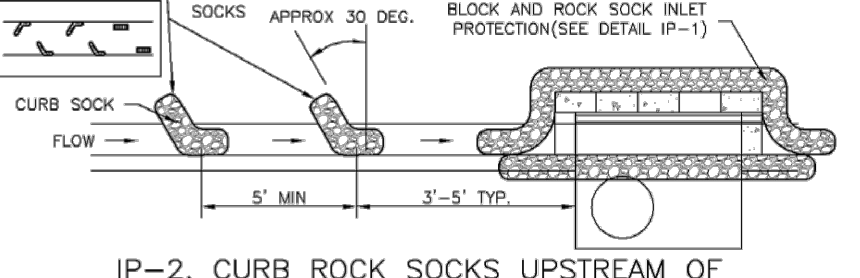
SC-6 **Inlet Protection (IP)**



IP-1. BLOCK AND ROCK SOCK SUMP OR ON GRADE INLET PROTECTION

BLOCK AND CURB SOCK INLET PROTECTION INSTALLATION NOTES

- SEE ROCK SOCK DESIGN DETAIL FOR INSTALLATION REQUIREMENTS.
- CONCRETE "TAPERED" BLOCKS SHALL BE Laid ON THEIR SIDES AROUND THE INLET IN A SINGLE ROW, ABUTTING ONE ANOTHER WITH THE OPEN END FACING AWAY FROM THE CURB.
- GRAVEL BAGS SHALL BE PLACED AROUND CONCRETE BLOCKS, CLOSELY ABUTTING ONE ANOTHER AND JOINTED TOGETHER IN ACCORDANCE WITH ROCK SOCK DESIGN DETAIL.



IP-2. CURB ROCK SOCKS UPSTREAM OF INLET PROTECTION

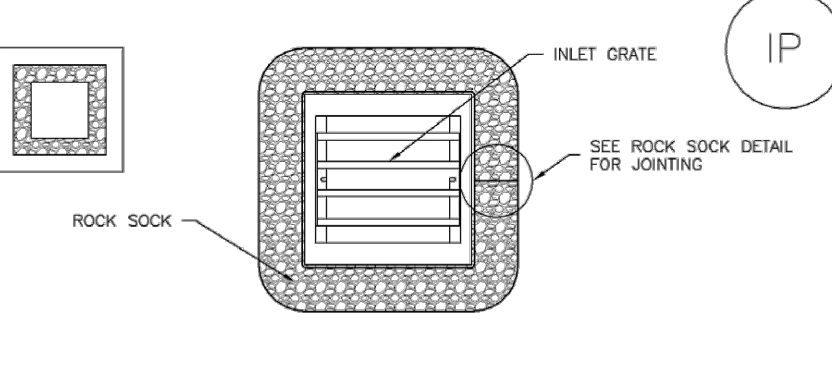
CURB ROCK SOCK INLET PROTECTION INSTALLATION NOTES

- SEE ROCK SOCK DESIGN DETAIL INSTALLATION REQUIREMENTS.
- PLACEMENT OF THE SOCK SHALL BE APPROXIMATELY 30 DEGREES FROM PERPENDICULAR IN THE OPPOSITE DIRECTION OF FLOW.
- SOCKS ARE TO BE FLUSH WITH THE CURB AND SPACED A MINIMUM OF 5 FEET APART.
- AT LEAST TWO CURB SOCKS IN SERIES ARE REQUIRED UPSTREAM OF ON-GRADE INLETS.

August 2013 IP-4
Urban Drainage and Flood Control District
Urban Storm Drainage Criteria Manual Volume 3



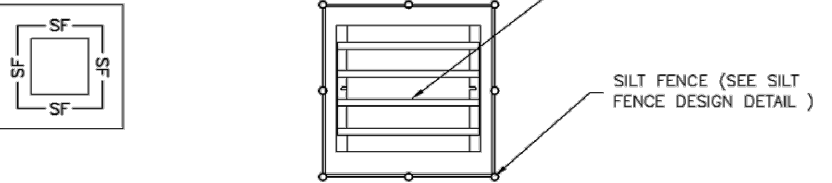
Inlet Protection (IP) **SC-6**



IP-3. ROCK SOCK SUMP/AREA INLET PROTECTION

ROCK SOCK SUMP/AREA INLET PROTECTION INSTALLATION NOTES

- SEE ROCK SOCK DESIGN DETAIL FOR INSTALLATION REQUIREMENTS.
- STRAW WATTLES/SEDIMENT CONTROL LOGS MAY BE USED IN PLACE OF ROCK SOCKS FOR INLETS IN PERVIOUS AREAS. INSTALL PER SEDIMENT CONTROL LOG DETAIL.



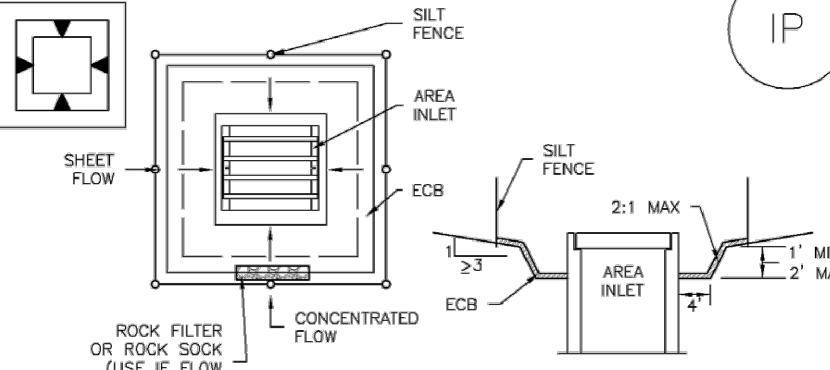
IP-4. SILT FENCE FOR SUMP INLET PROTECTION

SILT FENCE INLET PROTECTION INSTALLATION NOTES

- SEE SILT FENCE DESIGN DETAIL FOR INSTALLATION REQUIREMENTS.
- POSTS SHALL BE PLACED AT EACH CORNER OF THE INLET AND AROUND THE EDGES AT A MAXIMUM SPACING OF 3 FEET.
- STRAW WATTLES/SEDIMENT CONTROL LOGS MAY BE USED IN PLACE OF SILT FENCE FOR INLETS IN PERVIOUS AREAS. INSTALL PER SEDIMENT CONTROL LOG DETAIL.

August 2013 IP-5
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Urban Storm Drainage Criteria Manual Volume 3

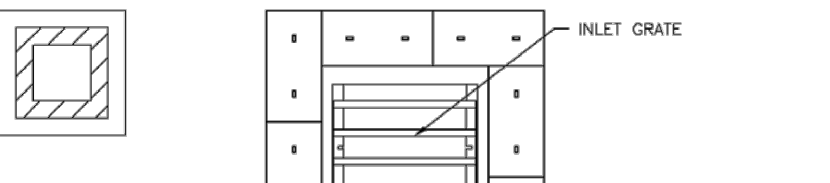
SC-6 **Inlet Protection (IP)**



IP-5. OVEREXCAVATION INLET PROTECTION

OVEREXCAVATION INLET PROTECTION INSTALLATION NOTES

- THIS FORM OF INLET PROTECTION IS PRIMARILY APPLICABLE FOR SITES THAT HAVE NOT YET REACHED FINAL GRADE AND SHOULD BE USED ONLY FOR INLETS WITH A RELATIVELY SMALL CONTRIBUTING DRAINAGE AREA.
- WHEN USING FOR CONCENTRATED FLOWS, SHAPE PAIN IN 2:1 RATIO WITH LENGTH ORIENTED TOWARDS DIRECTION OF FLOW.
- SEDIMENT MUST BE PERIODICALLY REMOVED FROM THE OVEREXCAVATED AREA.



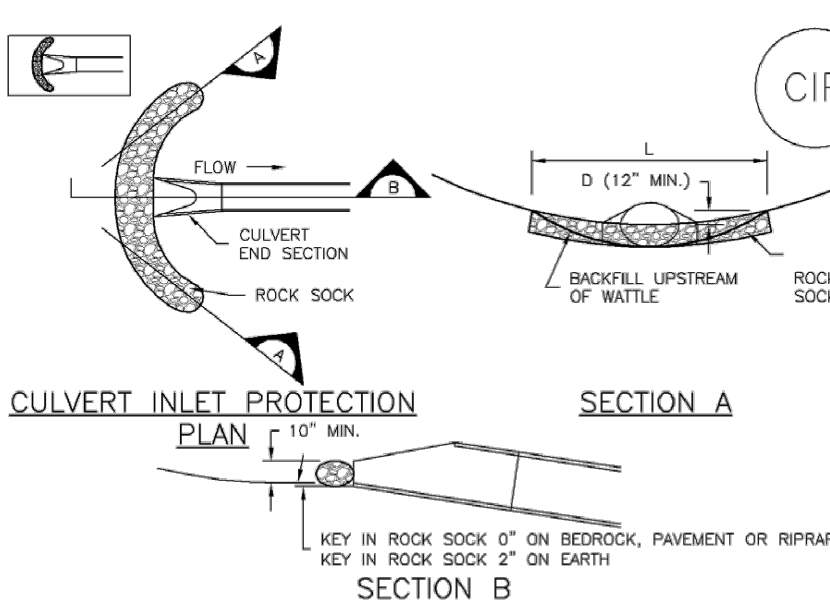
IP-6. STRAW BALE FOR SUMP INLET PROTECTION

STRAW BALE BARRIER INLET PROTECTION INSTALLATION NOTES

- SEE STRAW BALE DESIGN DETAIL FOR INSTALLATION REQUIREMENTS.
- BALES SHALL BE PLACED IN A SINGLE ROW AROUND THE INLET WITH ENDS OF BALES TIGHTLY ABUTTING ONE ANOTHER.

August 2013 IP-6
Urban Drainage and Flood Control District
Urban Storm Drainage Criteria Manual Volume 3

Inlet Protection (IP) **SC-6**



CIP-1. CULVERT INLET PROTECTION

CULVERT INLET PROTECTION INSTALLATION NOTES

- SEE PLAN VIEW FOR -LOCATION OF CULVERT INLET PROTECTION.
- SEE ROCK SOCK DESIGN DETAIL FOR ROCK GRADATION REQUIREMENTS AND JOINTING DETAIL.

CULVERT INLET PROTECTION MAINTENANCE NOTES

- INSPECT BMPs EACH WORKDAY, AND MAINTAIN THEM IN EFFECTIVE OPERATING CONDITION. MAINTENANCE OF BMPs SHOULD BE PROACTIVE, NOT REACTIVE. INSPECT BMPs AS SOON AS POSSIBLE (AND ALWAYS WITHIN 24 HOURS) FOLLOWING A STORM THAT CAUSES SURFACE EROSION, AND PERFORM NECESSARY MAINTENANCE.
- FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN BMPs IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
- WHERE BMPs HAVE FAILED, REPAIR OR REPLACEMENT SHOULD BE INITIATED UPON DISCOVERY OF THE FAILURE.
- SEDIMENT ACCUMULATED UPSTREAM OF THE CULVERT SHALL BE REMOVED WHEN THE SEDIMENT DEPTH IS 1/2 THE HEIGHT OF THE ROCK SOCK.
- CULVERT INLET PROTECTION SHALL REMAIN IN PLACE UNTIL THE UPSTREAM DISTURBED AREA IS PERMANENTLY STABILIZED AND APPROVED BY THE LOCAL JURISDICTION.

August 2013 IP-7
Urban Drainage and Flood Control District
Urban Storm Drainage Criteria Manual Volume 3

SC-6 **Inlet Protection (IP)**

GENERAL INLET PROTECTION INSTALLATION NOTES

- SEE PLAN VIEW FOR -LOCATION OF INLET PROTECTION. -TYPE OF INLET PROTECTION (IP-1, IP-2, IP-3, IP-4, IP-5, IP-6)
- INLET PROTECTION SHALL BE INSTALLED PROMPTLY AFTER INLET CONSTRUCTION OR PAVING IS COMPLETE (TYPICALLY WITHIN 48 HOURS). IF A RAINFALL/RUNOFF EVENT IS FORECAST, INSTALL INLET PROTECTION PRIOR TO ONSET OF FLOW.
- MANY JURISDICTIONS HAVE BMP DETAILS THAT VARY FROM UDFCD STANDARD DETAILS. CONSULT WITH LOCAL JURISDICTIONS AS TO WHICH DETAIL SHOULD BE USED WHEN DIFFERENCES ARE NOTED.

INLET PROTECTION MAINTENANCE NOTES

- INSPECT BMPs EACH WORKDAY, AND MAINTAIN THEM IN EFFECTIVE OPERATING CONDITION. MAINTENANCE OF BMPs SHOULD BE PROACTIVE, NOT REACTIVE. INSPECT BMPs AS SOON AS POSSIBLE (AND ALWAYS WITHIN 24 HOURS) FOLLOWING A STORM THAT CAUSES SURFACE EROSION, AND PERFORM NECESSARY MAINTENANCE.
- FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN BMPs IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
- WHERE BMPs HAVE FAILED, REPAIR OR REPLACEMENT SHOULD BE INITIATED UPON DISCOVERY OF THE FAILURE.
- SEDIMENT ACCUMULATED UPSTREAM OF INLET PROTECTION SHALL BE REMOVED AS NECESSARY TO MAINTAIN BMP EFFECTIVENESS, TYPICALLY WHEN STORAGE VOLUME REACHES 50% OF CAPACITY, A DEPTH OF 6" WHEN SILT FENCE IS USED, OR 1/2 OF THE HEIGHT FOR STRAW BALES.
- INLET PROTECTION IS TO REMAIN IN PLACE UNTIL THE UPSTREAM DISTURBED AREA IS PERMANENTLY STABILIZED, UNLESS THE LOCAL JURISDICTION APPROVES EARLIER REMOVAL OF INLET PROTECTION IN STREETS.
- WHEN INLET PROTECTION AT AREA INLETS IS REMOVED, THE DISTURBED AREA SHALL BE COVERED WITH TOP SOIL, SEEDS AND MULCHED, OR OTHERWISE STABILIZED IN A MANNER APPROVED BY THE LOCAL JURISDICTION.

(DETAILS ADAPTED FROM TOWNS OF PARKER, COLORADO AND CITY OF AURORA, COLORADO, NOT AVAILABLE IN AUTOCAD)

NOTE: MANY JURISDICTIONS HAVE BMP DETAILS THAT VARY FROM UDFCD STANDARD DETAILS. CONSULT WITH LOCAL JURISDICTIONS AS TO WHICH DETAIL SHOULD BE USED WHEN DIFFERENCES ARE NOTED.

NOTE: THE DETAILS INCLUDED WITH THIS FACT SHEET SHOW COMMONLY USED, CONVENTIONAL METHODS OF INLET PROTECTION IN THE DENVER METROPOLITAN AREA. THERE ARE MANY PROPRIETARY INLET PROTECTION METHODS ON THE MARKET. UDFCD NEITHER ENDORSES NOR DISCOURAGES USE OF PROPRIETARY INLET PROTECTION; HOWEVER, IN THE EVENT PROPRIETARY METHODS ARE USED, THE APPROPRIATE DETAIL FROM THE MANUFACTURER MUST BE INCLUDED IN THE SUMP AND THE BMP MUST BE INSTALLED AND MAINTAINED AS SHOWN IN THE MANUFACTURER'S DETAILS.

NOTE: SOME MUNICIPALITIES DISCOURAGE OR PROHIBIT THE USE OF STRAW BALES FOR INLET PROTECTION. CHECK WITH LOCAL JURISDICTION TO DETERMINE IF STRAW BALE INLET PROTECTION IS ACCEPTABLE.

August 2013 IP-8
Urban Drainage and Flood Control District
Urban Storm Drainage Criteria Manual Volume 3

NO.	DATE	DESCRIPTION	BY
REVISIONS			
CTR Engineering, Inc.			
16392 TIMBER MEADOW DRIVE COLORADO SPRINGS, CO 80908 (719) 964-6654			
PROJECT:	CLEAR VIEW INDUSTRIAL PARK FILING 2B		
BENCHMARK:	Elevations are based upon FIMS monument DR02, a 2" aluminum cap, stamped "CSU FIMS CONTROL DR02", at the southeast corner of Monica Drive and Hancock Expressway (Elevation=5927.27 NGVD29)		
PROJECT TITLE:	GRADING, WATER QUALITY POND AND EROSION CONTROL		
SHEET TITLE:	GRADING AND EROSION DETAILS		
DESIGNED BY:	JCM	SCALE:	DATE ISSUED: MAR. 2021
DRAWN BY:	JCM	HH:	
CHECKED BY:	JH	V:	SHEET NO. 20 OF 22 SHEETS
DWG:			

Earth Dikes and Drainage Swales (ED/DS) EC-10

Description

Earth dikes and drainage swales are temporary storm conveyance channels constructed either to divert runoff around slopes or to convey runoff to additional sediment control BMPs prior to discharge of runoff from a site. Drainage swales may be lined or unlined, but if an unlined swale is used, it must be well compacted and capable of resisting erosive velocities.



Photograph ED/DS-1. Example of an earth dike used to divert flows at a construction site. Photo courtesy of CDOT.

Appropriate Uses

Earth dikes and drainage swales are typically used to control the flow path of runoff at a construction site by diverting runoff around areas prone to erosion, such as steep slopes. Earth dikes and drainage swales may also be constructed as temporary conveyance features. This will direct runoff to additional sediment control treatment BMPs, such as sediment traps or basins.

Design and Installation

When earth dikes are used to divert water for slope protection, the earth dike typically consists of a horizontal ridge of soil placed perpendicular to the slope and angled slightly to provide drainage along the contour. The dike is used in conjunction with a swale or a small channel upslope of the berm to convey the diverted water. Temporary diversion dikes can be constructed by excavation of a V-shaped trench or ditch and placement of the fill on the downslope side of the cut. There are two types of placement for temporary slope diversion dikes:

- A dike located at the top of a slope to divert upland runoff away from the disturbed area and convey it in a temporary or permanent channel.
- A diversion dike located at the base or mid-slope of a disturbed area to intercept runoff and reduce the effective slope length.

Depending on the project, either an earth dike or drainage swale may be more appropriate. If there is a need for cut on the project, then an excavated drainage swale may be better suited. When the project is primarily fill, then a conveyance constructed using a berm may be the better option.

Earth Dikes and Drainage Swales	
Function	
Erosion Control	Yes
Sediment Control	Moderate
Site/Material Management	No

All dikes or swales receiving runoff from a disturbed area should direct stormwater to a sediment control BMP such as a sediment trap or basin.

November 2010 Urban Drainage and Flood Control District ED/DS-1
Urban Storm Drainage Criteria Manual Volume 3

EC-10 Earth Dikes and Drainage Swales (ED/DS)

Unlined dikes or swales should only be used for intercepting sheet flow runoff and are not intended for diversion of concentrated flows.

Details with notes are provided for several design variations, including:

- ED-1. Unlined Earth Dike formed by Berm
- DS-1. Unlined Excavated Swale
- DS-2. Unlined Swale Formed by Cut and Fill
- DS-3. ECD-lined Swale
- DS-4. Synthetic-lined Swale
- DS-5. Riprap-lined Swale

The details also include guidance on permissible velocities for cohesive channels if unlined approaches will be used.

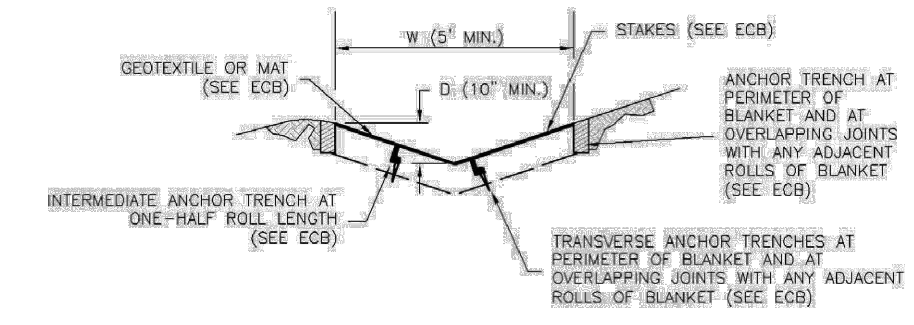
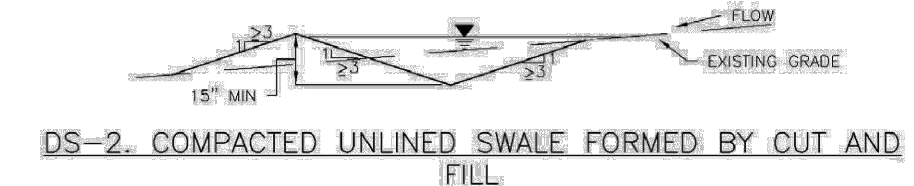
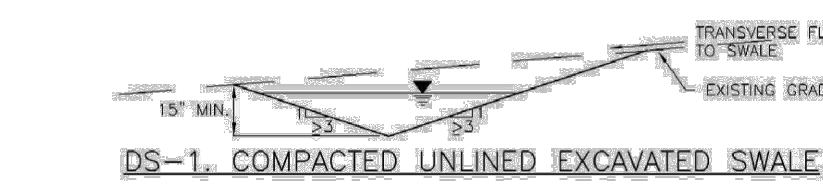
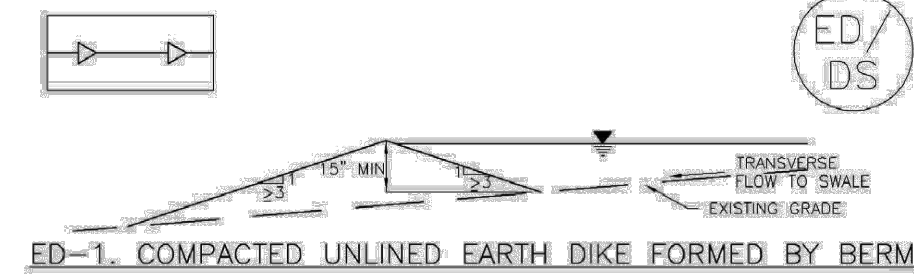
Maintenance and Removal

Inspect earth dikes for stability, compaction, and signs of erosion and repair. Inspect side slopes for erosion and damage to erosion control fabric. Stabilize slopes and repair fabric as necessary. If there is recurring extensive damage, consider installing rock check dams or lining the channel with riprap.

If drainage swales are not permanent, remove dikes and fill channels when the upstream area is stabilized. Stabilize the fill or disturbed area immediately following removal by revegetation or other permanent stabilization method approved by the local jurisdiction.

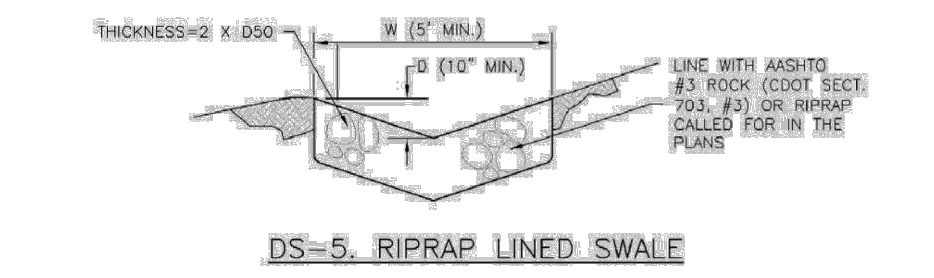
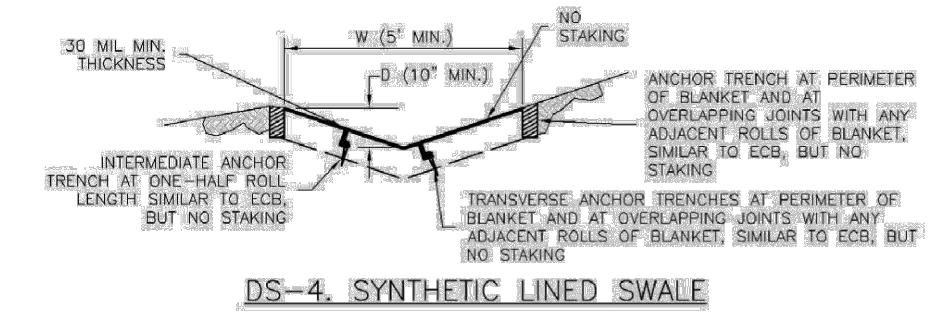
ED/DS-2 Urban Drainage and Flood Control District November 2010
Urban Storm Drainage Criteria Manual Volume 3

Earth Dikes and Drainage Swales (ED/DS) EC-10



November 2010 Urban Drainage and Flood Control District ED/DS-3
Urban Storm Drainage Criteria Manual Volume 3

EC-10 Earth Dikes and Drainage Swales (ED/DS)



EARTH DIKE AND DRAINAGE SWALE INSTALLATION NOTES

- SEE SITE PLAN FOR:
 - LOCATION OF DIVERSION SWALE
 - TYPE OF SWALE (UNLINED, COMPACTED/ANY/ORN LINED)
 - LENGTH OF EACH SWALE
 - DEPTH, D, AND WIDTH, W, DIMENSIONS
 - FOR ECD/TRIM LINED DITCH, SEE ECD DETAIL
 - FOR RIPRAP LINED DITCH, SIZE OF RIPRAP D50
- SEE SWALE/BERM FOR DETAILS OF PERMANENT CONVEYANCE FACILITIES AND/OR DIVERSION SWALES EXCEEDING 2-YEAR FLOW RATE OR 10 CFS.
- EARTH DIKES AND SWALES INDICATED ON SWMP PLAN SHALL BE INSTALLED PRIOR TO LAND-DEVELOPING ACTIVITIES IN PROXIMITY.
- EMBANKMENT IS TO BE COMPACTED TO 90% OF MAXIMUM DENSITY AND WITHIN 2% OF OPTIMUM MOISTURE CONTENT ACCORDING TO ASTM D698.
- SWALES ARE TO DRAIN TO A SEDIMENT CONTROL BMP.
- WHEN CONSTRUCTION TRAFFIC MUST CROSS A DIVERSION/SWALE, INSTALL A TEMPORARY CULVERT WITH A MINIMUM DIAMETER OF 12 INCHES.

ED/DS-4 Urban Drainage and Flood Control District November 2010
Urban Storm Drainage Criteria Manual Volume 3

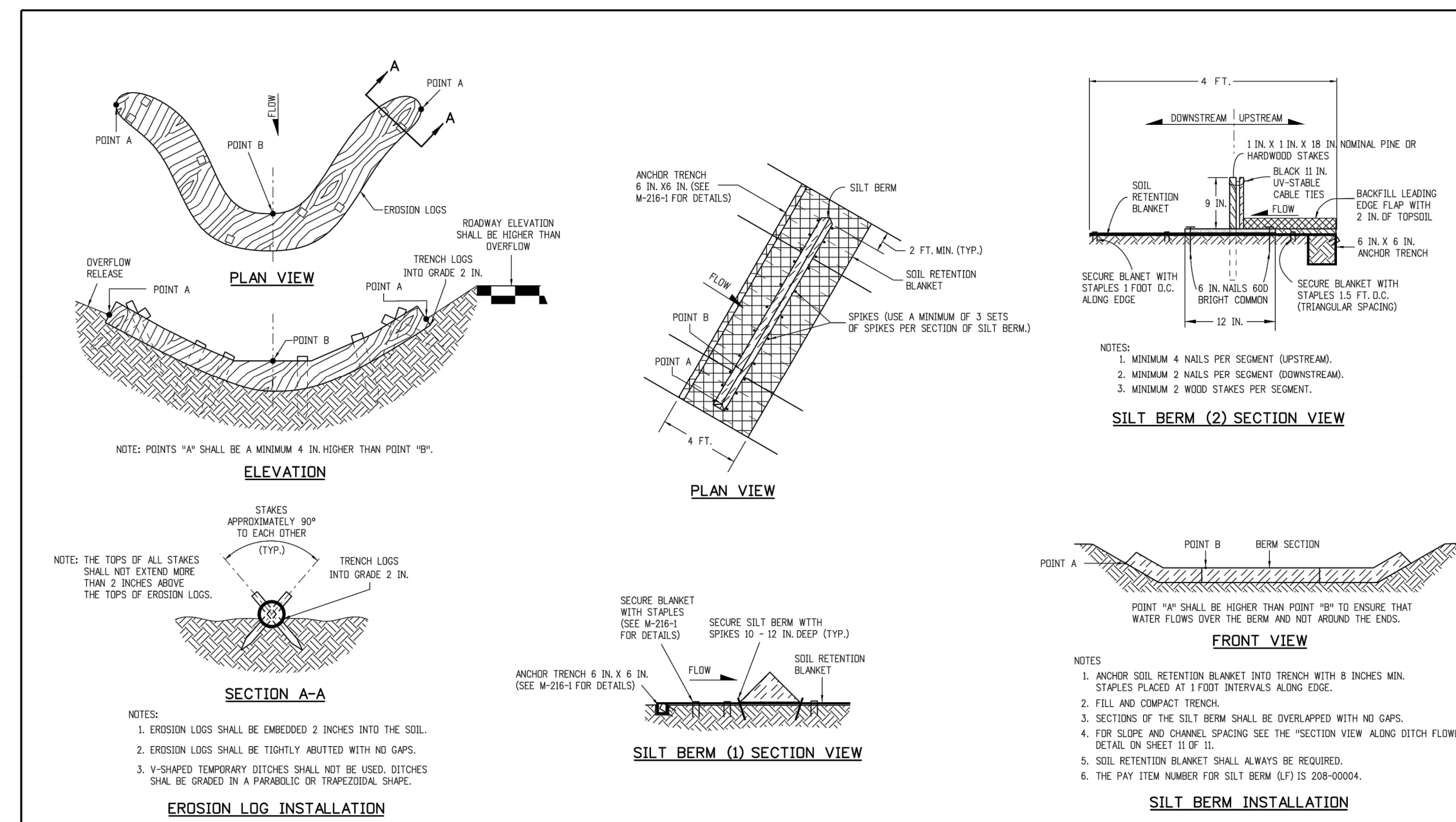


Earth Dikes and Drainage Swales (ED/DS) EC-10

EARTH DIKE AND DRAINAGE SWALE MAINTENANCE NOTES

- INSPECT SWALES EACH WORKDAY, AND MAINTAIN THEM IN EFFECTIVE OPERATING CONDITION. MAINTENANCE OF SWALES SHOULD BE PROACTIVE, NOT REACTIVE. INSPECT SWALES AS SOON AS POSSIBLE (AND ALWAYS WITHIN 24 HOURS) FOLLOWING A STORM THAT CAUSES SURFACE EROSION, AND PERFORM NECESSARY MAINTENANCE.
 - FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN SWALES IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
 - WHERE SWALES HAVE FAILED, REPAIR OR REPLACEMENT SHOULD BE INITIATED UPON DISCOVERY OF THE FAILURE.
 - SWALES SHALL REMAIN IN PLACE UNTIL THE END OF CONSTRUCTION IF APPROVED BY LOCAL JURISDICTION. SWALES MAY BE LEFT IN PLACE.
 - WHEN A SWALE IS REMOVED, THE DISTURBED AREA SHALL BE COVERED WITH TOPSOIL, SEEDS, AND MULCHED, OR OTHERWISE STABILIZED IN A MANNER APPROVED BY LOCAL JURISDICTION.
- DETAIL ADAPTED FROM DOUGLAS COUNTY, COLORADO AND THE CITY OF COLORADO SPRINGS, COLORADO, NOT AVAILABLE IN APPROX.
- NOTE: MANY JURISDICTIONS HAVE BMP DETAILS THAT VARY FROM USFCD STANDARD DETAILS. CONSULT WITH LOCAL JURISDICTIONS AS TO WHICH DETAIL SHOULD BE USED WHEN DIFFERENCES ARE NOTED.

November 2010 Urban Drainage and Flood Control District ED/DS-5
Urban Storm Drainage Criteria Manual Volume 3



Computer File Information		Sheet Revisions		Colorado Department of Transportation		TEMPORARY EROSION CONTROL		STANDARD PLAN NO.	
Creation Date:	07/31/19	Date:		2829 West Howard Place		M-208-1		Standard Sheet No. 6 of 11	
Designer:	JMK	Comments:		3007 1/2, 3rd Floor		Denver, CO 80204		Project Sheet Number:	
Last Modification:	07/31/19			Phone: 303-757-9001		FAX: 303-757-9968			
Detailer:	LTA			Project Development Branch		JMK		Issued by the Project Development Branch July 31, 2019	
CAD File:	M:\InStation 18_Scale: Not to Scale - Units: English								

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CTR Engineering, Inc.			
16392 TIMBER MEADOW DRIVE COLORADO SPRINGS, CO 80908 (719) 964-6654			
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EPC 3/22/21

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Stockpile Management (SP) MM-2

Description

Stockpile management includes measures to minimize erosion and sediment transport from soil stockpiles.

Appropriate Uses

Stockpile management should be used when soils or other erodible materials are stored at the construction site. Special attention should be given to stockpiles in close proximity to natural or manmade storm systems.



Photograph SP-1. A topsoil stockpile that has been partially revegetated and is protected by silt fence perimeter control.

Design and Installation

Locate stockpiles away from all drainage system components including storm sewer inlets. Where practical, choose stockpile locations that that will remain undisturbed for the longest period of time as the phases of construction progress. Place sediment control BMPs around the perimeter of the stockpile, such as sediment control logs, rock socks, silt fence, straw bales and sand bags. See Detail SP-1 for guidance on proper establishment of perimeter controls around a stockpile. For stockpiles in active use, provide a stabilized designated access point on the upgradient side of the stockpile.

Stabilize the stockpile surface with surface roughening, temporary seeding and mulching, erosion control blankets, or soil binders. Soils stockpiled for an extended period (typically for more than 60 days) should be seeded and mulched with a temporary grass cover once the stockpile is placed (typically within 14 days). Use of mulch only or a soil binder is acceptable if the stockpile will be in place for a more limited time period (typically 30-60 days). Timeframes for stabilization of stockpiles noted in this fact sheet are "typical" guidelines. Check permit requirements for specific federal, state, and/or local requirements that may be more prescriptive.

Stockpiles should not be placed in streets or paved areas unless no other practical alternative exists. See the Stabilized Staging Area Fact Sheet for guidance when staging in roadways is unavoidable due to space or right-of-way constraints. For paved areas, rock socks must be used for perimeter control and all inlets with the potential to receive sediment from the stockpile (even from vehicle tracking) must be protected.

Maintenance and Removal

Inspect perimeter controls and inlet protection in accordance with their respective BMP Fact Sheets. Where seeding, mulch and/or soil binders are used, reseed or reapplication of soil binder may be necessary.

When temporary removal of a perimeter BMP is necessary to access a stockpile, ensure BMPs are reinstalled in accordance with their respective design detail section.

Stockpile Management	
Erosion Control	Yes
Sediment Control	Yes
Site/Material Management	Yes

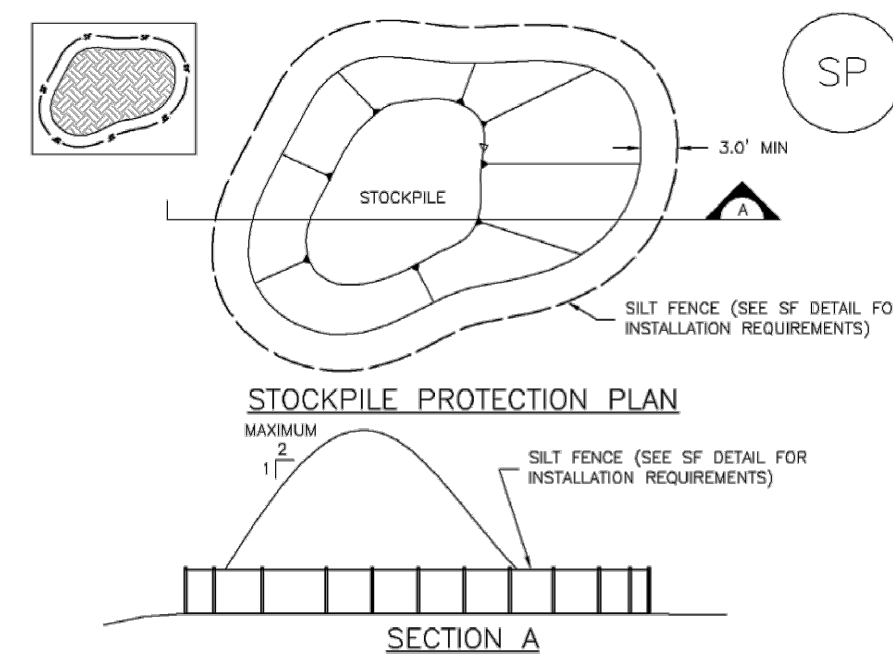
November 2010 Urban Drainage and Flood Control District SP-1
Urban Storm Drainage Criteria Manual Volume 3

MM-2 Stockpile Management (SM)

When the stockpile is no longer needed, properly dispose of excess materials and revegetate or otherwise stabilize the ground surface where the stockpile was located.

SP-2 Urban Drainage and Flood Control District November 2010
Urban Storm Drainage Criteria Manual Volume 3

Stockpile Management (SP) MM-2



SP-1. STOCKPILE PROTECTION

STOCKPILE PROTECTION INSTALLATION NOTES

- SEE PLAN VIEW FOR:
 - LOCATION OF STOCKPILES.
 - TYPE OF STOCKPILE PROTECTION.
- INSTALL PERIMETER CONTROLS IN ACCORDANCE WITH THEIR RESPECTIVE DESIGN DETAILS. SILT FENCE IS SHOWN IN THE STOCKPILE PROTECTION DETAILS; HOWEVER, OTHER TYPES OF PERIMETER CONTROLS INCLUDING SEDIMENT CONTROL LOGS OR ROCK SOCKS MAY BE SUITABLE IN SOME CIRCUMSTANCES. CONSIDERATIONS FOR DETERMINING THE APPROPRIATE TYPE OF PERIMETER CONTROL FOR A STOCKPILE INCLUDE WHETHER THE STOCKPILE IS LOCATED ON A PAVED OR IMPERVIOUS SURFACE, THE RELATIVE HEIGHTS OF THE PERIMETER CONTROL AND STOCKPILE, THE ABILITY OF THE PERIMETER CONTROL TO CONTAIN THE STOCKPILE WITHOUT FAILING IN THE EVENT THAT MATERIAL FROM THE STOCKPILE SHIFTS OR SLUMPS AGAINST THE PERIMETER, AND OTHER FACTORS.
- STABILIZE THE STOCKPILE SURFACE WITH SURFACE ROUGHENING, TEMPORARY SEEDING AND MULCHING, EROSION CONTROL, BLANKETS, OR SOIL BINDERS. SOILS STOCKPILED FOR AN EXTENDED PERIOD (TYPICALLY FOR MORE THAN 60 DAYS) SHOULD BE SEEDING AND MULCHED WITH A TEMPORARY GRASS COVER ONCE THE STOCKPILE IS PLACED (TYPICALLY WITHIN 14 DAYS). USE OF MULCH ONLY OR A SOIL BINDER IS ACCEPTABLE IF THE STOCKPILE WILL BE IN PLACE FOR A MORE LIMITED TIME PERIOD (TYPICALLY 30-60 DAYS).
- FOR TEMPORARY STOCKPILES ON THE INTERIOR PORTION OF A CONSTRUCTION SITE, WHERE OTHER DOWNGRADIENT CONTROLS, INCLUDING PERIMETER CONTROL, ARE IN PLACE, STOCKPILE PERIMETER CONTROLS MAY NOT BE REQUIRED.

November 2010 Urban Drainage and Flood Control District SP-3
Urban Storm Drainage Criteria Manual Volume 3

MM-2 Stockpile Management (SM)

STOCKPILE PROTECTION MAINTENANCE NOTES

- INSPECT BMPs EACH WORKDAY, AND MAINTAIN THEM IN EFFECTIVE OPERATING CONDITION. MAINTENANCE OF BMPs SHOULD BE PROACTIVE, NOT REACTIVE. INSPECT BMPs AS SOON AS POSSIBLE (AND ALWAYS WITHIN 24 HOURS) FOLLOWING A STORM THAT CAUSES SURFACE EROSION, AND PERFORM NECESSARY MAINTENANCE.
- FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN BMPs IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
- WHERE BMPs HAVE FAILED, REPAIR OR REPLACEMENT SHOULD BE INITIATED UPON DISCOVERY OF THE FAILURE.

STOCKPILE PROTECTION MAINTENANCE NOTES

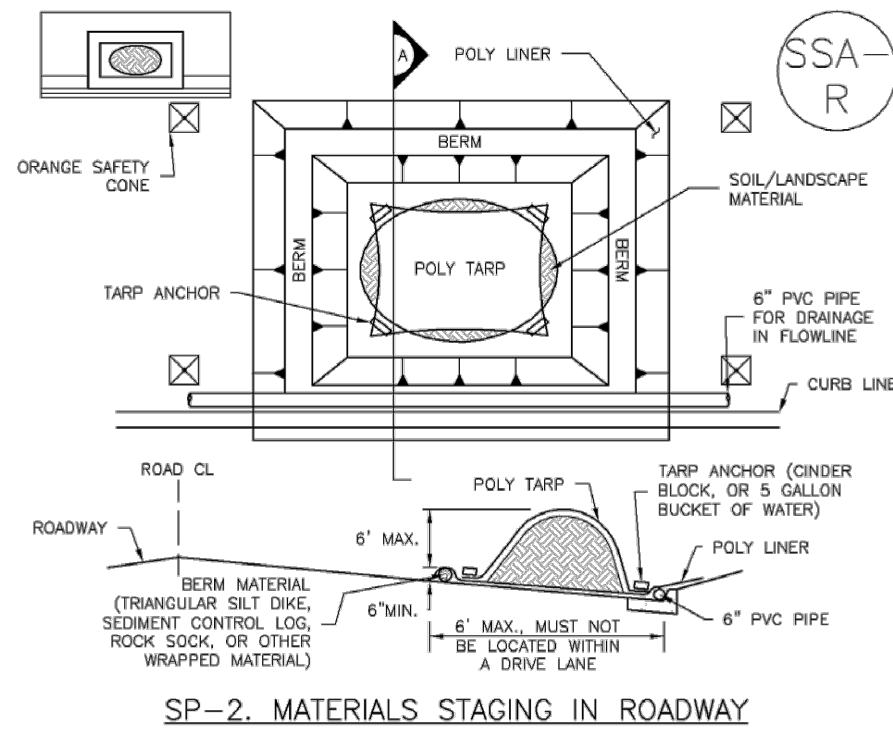
- IF PERIMETER PROTECTION MUST BE MOVED TO ACCESS SOIL STOCKPILE, REPLACE PERIMETER CONTROLS BY THE END OF THE WORKDAY.
- STOCKPILE PERIMETER CONTROLS CAN BE REMOVED ONCE ALL THE MATERIAL FROM THE STOCKPILE HAS BEEN USED.

(DETAILS ADAPTED FROM PARKER, COLORADO, NOT AVAILABLE IN AUTOCAD)
NOTE: MANY JURISDICTIONS HAVE BMP DETAILS THAT VARY FROM UDFCD STANDARD DETAILS. CONSULT WITH LOCAL JURISDICTIONS AS TO WHICH DETAIL SHOULD BE USED WHEN DIFFERENCES ARE NOTED.

SP-4 Urban Drainage and Flood Control District November 2010
Urban Storm Drainage Criteria Manual Volume 3



Stockpile Management (SP) MM-2



SP-2. MATERIALS STAGING IN ROADWAY

MATERIALS STAGING IN ROADWAYS INSTALLATION NOTES

- SEE PLAN VIEW FOR:
 - LOCATION OF MATERIAL STAGING AREA(S).
 - CONTRACTOR MAY ADJUST LOCATION AND SIZE OF STAGING AREA WITH APPROVAL FROM THE LOCAL JURISDICTION.
- FEATURE MUST BE INSTALLED PRIOR TO EXCAVATION, EARTHWORK OR DELIVERY OF MATERIALS.
- MATERIALS MUST BE STAGED ON THE POLY LINER. ANY INCIDENTAL MATERIALS DEPOSITED ON PAVED SECTION OR ALONG CURB LINE MUST BE CLEANED UP PROMPTLY.
- POLY LINER AND TARP COVER SHOULD BE OF SIGNIFICANT THICKNESS TO PREVENT DAMAGE OR LOSS OF INTEGRITY.
- SAND BAGS MAY BE SUBSTITUTED TO ANCHOR THE COVER TARP OR PROVIDE BERMING UNDER THE BASE LINER.
- FEATURE IS NOT INTENDED FOR USE WITH WET MATERIAL THAT WILL BE DRAINING AND/OR SPREADING OUT ON THE POLY LINER OR FOR DEMOLITION MATERIALS.
- THIS FEATURE CAN BE USED FOR:
 - CULITY REPAIRS.
 - WHEN OTHER STAGING LOCATIONS AND OPTIONS ARE LIMITED.
 - OTHER LIMITED APPLICATION AND SHORT DURATION STAGING.

November 2010 Urban Drainage and Flood Control District SP-5
Urban Storm Drainage Criteria Manual Volume 3

MM-2 Stockpile Management (SM)

MATERIALS STAGING IN ROADWAY MAINTENANCE NOTES

- INSPECT BMPs EACH WORKDAY, AND MAINTAIN THEM IN EFFECTIVE OPERATING CONDITION. MAINTENANCE OF BMPs SHOULD BE PROACTIVE, NOT REACTIVE. INSPECT BMPs AS SOON AS POSSIBLE (AND ALWAYS WITHIN 24 HOURS) FOLLOWING A STORM THAT CAUSES SURFACE EROSION, AND PERFORM NECESSARY MAINTENANCE.
 - FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN BMPs IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
 - WHERE BMPs HAVE FAILED, REPAIR OR REPLACEMENT SHOULD BE INITIATED UPON DISCOVERY OF THE FAILURE.
 - INSPECT PVC PIPE ALONG CURB LINE FOR CLOGGING AND DEBRIS. REMOVE OBSTRUCTIONS PROMPTLY.
 - CLEAN MATERIAL FROM PAVED SURFACES BY SWEEPING OR VACUUMING.
- NOTE: MANY JURISDICTIONS HAVE BMP DETAILS THAT VARY FROM UDFCD STANDARD DETAILS. CONSULT WITH LOCAL JURISDICTIONS AS TO WHICH DETAIL SHOULD BE USED WHEN DIFFERENCES ARE NOTED.
- (DETAILS ADAPTED FROM AURORA, COLORADO)

SP-6 Urban Drainage and Flood Control District November 2010
Urban Storm Drainage Criteria Manual Volume 3

NO.	DATE	DESCRIPTION	BY
REVISIONS			
CTR Engineering, Inc.			
16392 TIMBER MEADOW DRIVE COLORADO SPRINGS, CO 80908 (719) 964-6654			
PROJECT: CLEAR VIEW INDUSTRIAL PARK FILING 2B			
BENCHMARK: Elevations are based upon FIMS monument DR02, a 2" aluminum cap, stamped "CSU FIMS CONTROL DR02", at the southeast corner of Monica Drive and Hancock Expressway (Elevation=5927.27 NGVD29)			
PROJECT TITLE: GRADING, WATER QUALITY POND AND EROSION CONTROL			
SHEET TITLE: GRADING AND EROSION DETAILS			
DESIGNED BY: JCM	SCALE:	DATE ISSUED: MAR. 2021	
DRAWN BY: JCM	JH:	SHEET NO. 22 OF 22 SHEETS	
CHECKED BY: JH	V:		
DWG:			