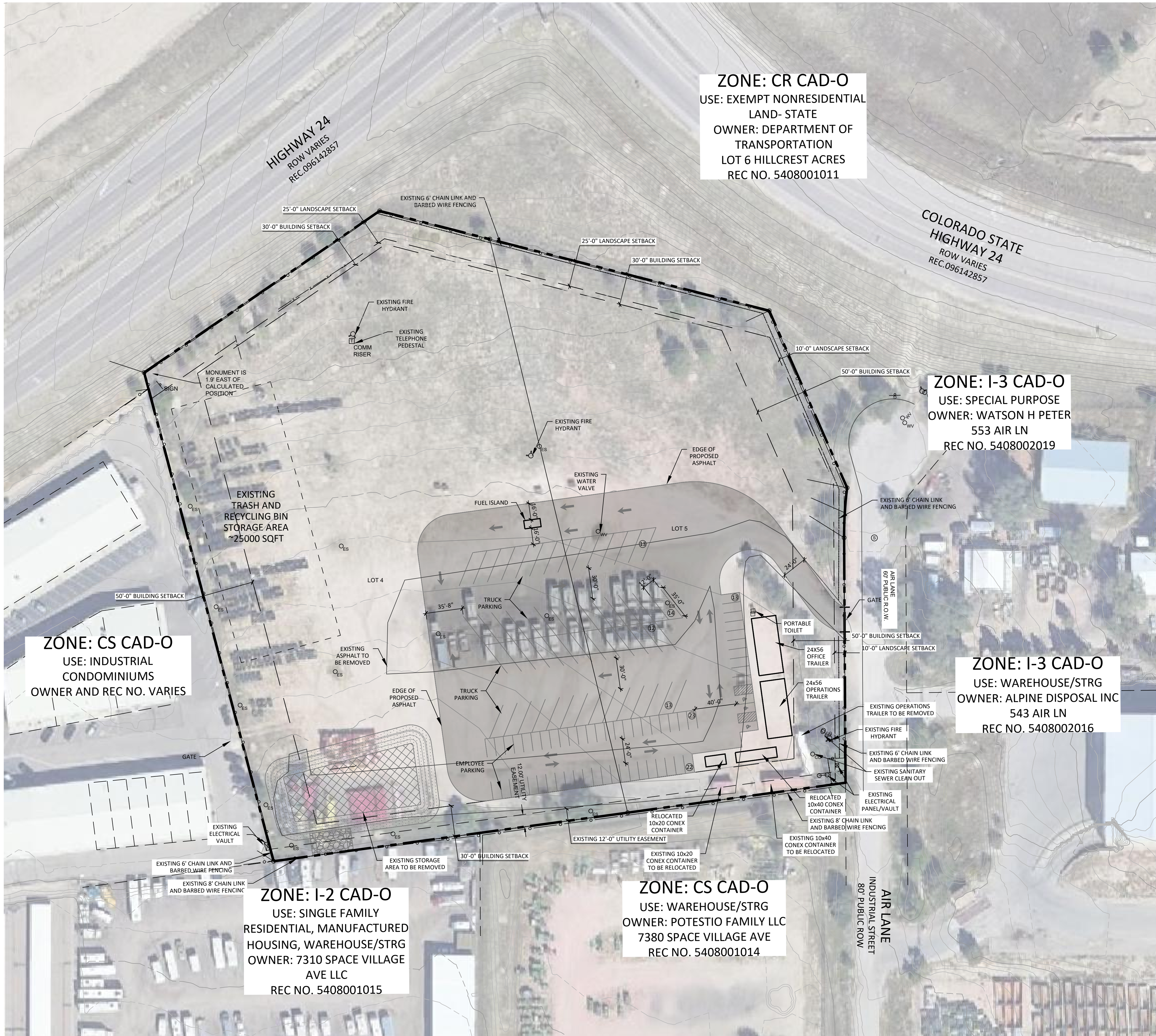
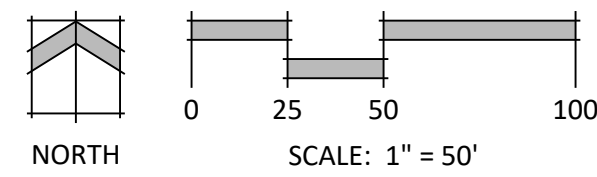


APEX WASTE SOLUTIONS - 560-570 AIR LANE

A PORTION OF THE SOUTHWEST QUARTER OF SECTION 15, TOWNSHIP 11 SOUTH,
RANGE 65 WEST OF THE 6TH P.M., EL PASO COUNTY, COLORADO
EL PASO COUNTY, COLORADO

SITE DEVELOPMENT PLAN

OVERALL SITE PLAN



ZONE: CR CAD-O
USE: EXEMPT NONRESIDENTIAL
LAND- STATE
OWNER: DEPARTMENT OF
TRANSPORTATION
LOT 6 HILLCREST ACRES
REC NO. 5408001011

ZONE: I-3 CAD-O
USE: SPECIAL PURPOSE
OWNER: WATSON H PETER
553 AIR LN
REC NO. 5408002019

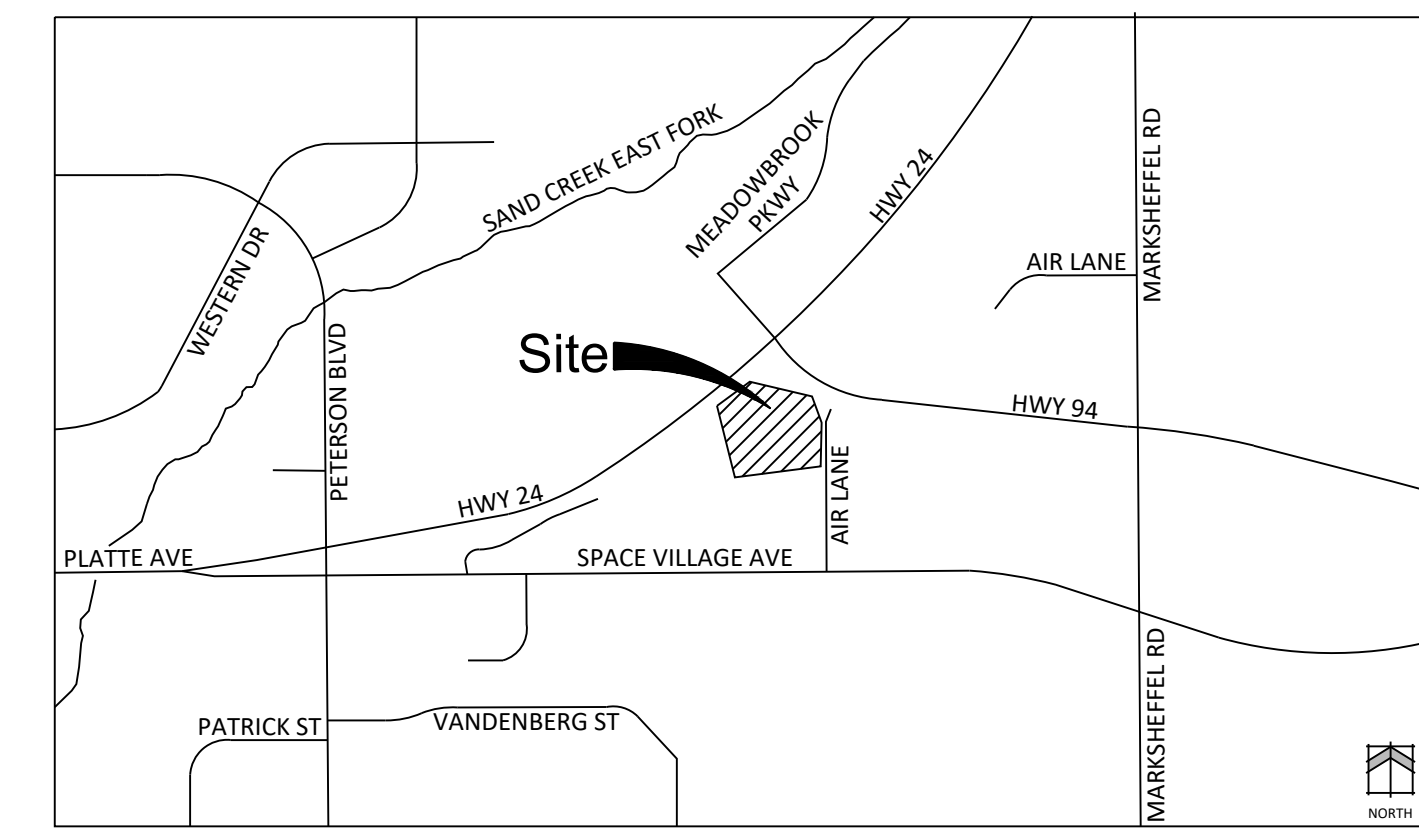
ZONE: CS CAD-O
USE: INDUSTRIAL
CONDOMINIUMS
OWNER AND REC NO. VARIES

ZONE: I-3 CAD-O
USE: WAREHOUSE/STRG
OWNER: ALPINE DISPOSAL INC
543 AIR LN
REC NO. 5408002016

ZONE: I-2 CAD-O
USE: SINGLE FAMILY
RESIDENTIAL, MANUFACTURED
HOUSING, WAREHOUSE/STRG
OWNER: 7310 SPACE VILLAGE
AVE LLC
REC NO. 5408001015

ZONE: CS CAD-O
USE: WAREHOUSE/STRG
OWNER: POTESIO FAMILY LLC
7380 SPACE VILLAGE AVE
REC NO. 5408001014

VICINITY MAP



LEGAL DESCRIPTION

LOT 4 HILLCREST ACRES, EX THAT PORTION CONV BY COURT ORDER CASE #94CV410 DESC AS FOLS, BEG AT A PT ON THE SWLY LN OF LOT 4 HILLCREST ACRES FROM WHICH THE SE COR OF LOT 5 BEARS S 59°41'19" E 790.82 FT, TH ALG SD SWLY LN OF LOT 4 N 14°49'12" W 31.21 FT TO A PT ON THE SELV R/W LN OF STATE HWY 24, TH N 53°33'32" E 390.00 FT, TH SELV 135.00 FT M/L, N 75°38'11" W 115.00 FT M/L, TH S 55°32'59" W 278.00 FT TO POB

LOT 5 HILLCREST ACRES, EX THAT PORTION CONV BY COURT ORDER CASE #94CV410 DESC AS FOLS, COM AT THE SW COR SD LOT 5, TH RUN NWLY 709.94 FT FOR POB, TH N 53°33'32" E 100.84 FT, TH ALG ARC OF CUR TO THE L HAVING A RAD OF 2921.28 FT WHICH CHORD BEARS N 52°22'34" E 120.67 FT, S 39°08'28" E 430.95 FT, S 35°58'59" W 5.50 FT, TH ALG ARC OF CUR TO THE L HAVING A RAD OF 368.53 FT WHICH CHORD BEARS S 21°27'47" W 180.44 FT, N 23°45'05" W 188.34 FT, TH N 75°38'11" W 280.00 FT M/L, TH RUN NWLY 135.00 FT M/L TO THE POB

GENERAL NOTES

- ALL LIGHTING FIXTURES SHALL HAVE FULL CUT-OFF SHIELDING OR FIXTURES TO REDUCE OFF-SITE LIGHTING IMPACTS.
- ACCORDING TO THE CURRENT EFFECTIVE FEDERAL EMERGENCY MANAGEMENT AGENCY FLOOD INSURANCE RATE MAP (FIRM NO. 0804102754G DATED 12/7/2018), THE SUBJECT PROPERTY IS LOCATED OUTSIDE THE BOUNDARY OF THE 100 YEAR FLOODPLAIN.
- THE PARTIES RESPONSIBLE FOR THIS PLAN HAVE FAMILIARIZED THEMSELVES WITH ALL CURRENT ACCESSIBILITY CRITERIA AND SPECIFICATIONS AND THE PROPOSED PLAN REFLECTS ALL SITE ELEMENTS REQUIRED BY THE APPLICABLE ADA DESIGN STANDARDS AND GUIDELINES AS PUBLISHED BY THE UNITED STATES DEPARTMENT OF JUSTICE. APPROVAL OF THIS PLAN BY EL PASO COUNTY DOES NOT ASSURE COMPLIANCE WITH THE ADA OR ANY REGULATIONS OR GUIDELINES ENACTED OR PROMULGATED UNDER OR WITH RESPECT TO SUCH LAWS.
- THE OWNER AGREES ON BEHALF OF HIM/HERSELF AND ANY DEVELOPER OR BUILDER SUCCESSORS AND ASSIGNEES THAT SUBDIVIDER AND/OR SAID SUCCESSORS AND ASSIGNS SHALL BE REQUIRED TO PAY TRAFFIC IMPACT FEES IN ACCORDANCE WITH THE EL PASO COUNTY ROAD IMPACT FEE PROGRAM.
- RESOLUTION (RESOLUTION NO 19-471), OR ANY AMENDMENTS THERETO, AT OR PRIOR TO THE TIME OF BUILDING PERMIT SUBMITTALS. THE FEE OBLIGATION, IF NOT PAID AT FINAL PLAT RECORDING, SHALL BE DOCUMENTED ON ALL SALES DOCUMENTS AND ON PLAT NOTES TO ENSURE THAT A TITLE SEARCH WOULD FIND THE FEE OBLIGATION BEFORE SALE OF THE PROPERTY.

SITE SUMMARY

Property address:	560-570 Air Lane
Property tax schedule number:	5408001028, 5408001027
Total Area:	7.62 Acres
Existing Land use:	Industrial
Proposed land use:	Industrial (Garbage Service Facility)
Current Zoning:	I-2 CAD-O
Total gross building square footage:	2544 sqft
Land Percentage:	
Impermeable surface %:	87,906.7 / 331,927 = 26.5%
Open Space %:	73.5%
Lot Coverage Calculation:	3,416 / 331,927 = 1%
Maximum Allowed Building Height:	45 ft
Proposed Maximum Building Height:	14 ft
Building Setbacks:	
North (US 24 & CO-94):	30'
South:	30'
East (Air Lane):	50'
West:	50'
Landscape Setback:	
North (US 24 & CO-94):	25'
East (Air Lane):	10'
Parking:	
Formula:	1 space/750 sqft industrial use (fueling island, commercial vehicle parking area, areas encompassing trailers) = 41,128/750 = 55
Required:	55 spaces
ADA Required:	3 (1 van accessible)
Provided:	58 employee parking spaces, 3 van accessible

PROJECT TEAM

OWNER:	1111 Royer LLC PO Box 302 Colorado Springs, CO 80901
APPLICANT:	Apex Waste Solutions 11681 Progress Lane Parker, CO 80134
CONSULTANT:	N.E.S. Inc. 619 N. Cascade Ave., Suite 200 Colorado Springs, CO 80903
ENGINEER:	SMH Consultants 620 N Tejon St Unit 201 Colorado Springs, CO 80903

SHEET INDEX

Sheet 1 of 11:	Site Development Plan Cover
Sheet 2 of 11:	Grading and Erosion Control G.1
Sheet 3 of 11:	Grading and Erosion Control G.2
Sheet 4 of 11:	Grading and Erosion Control G.3
Sheet 5 of 11:	Grading and Erosion Control G.4
Sheet 6 of 11:	Grading and Erosion Control G.5
Sheet 7 of 11:	Grading and Erosion Control G.6
Sheet 8 of 11:	Grading and Erosion Control G.7
Sheet 9 of 11:	Landscape Plan
Sheet 10 of 11:	Lighting plan
Sheet 11 of 11:	Elevations and Floor Plans



N.E.S. Inc.
619 N. Cascade Avenue, Suite 200
Colorado Springs, CO 80903
Tel. 719.471.0073
Fax 719.471.0267
www.nescolorado.com

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560-570 AIR LANE

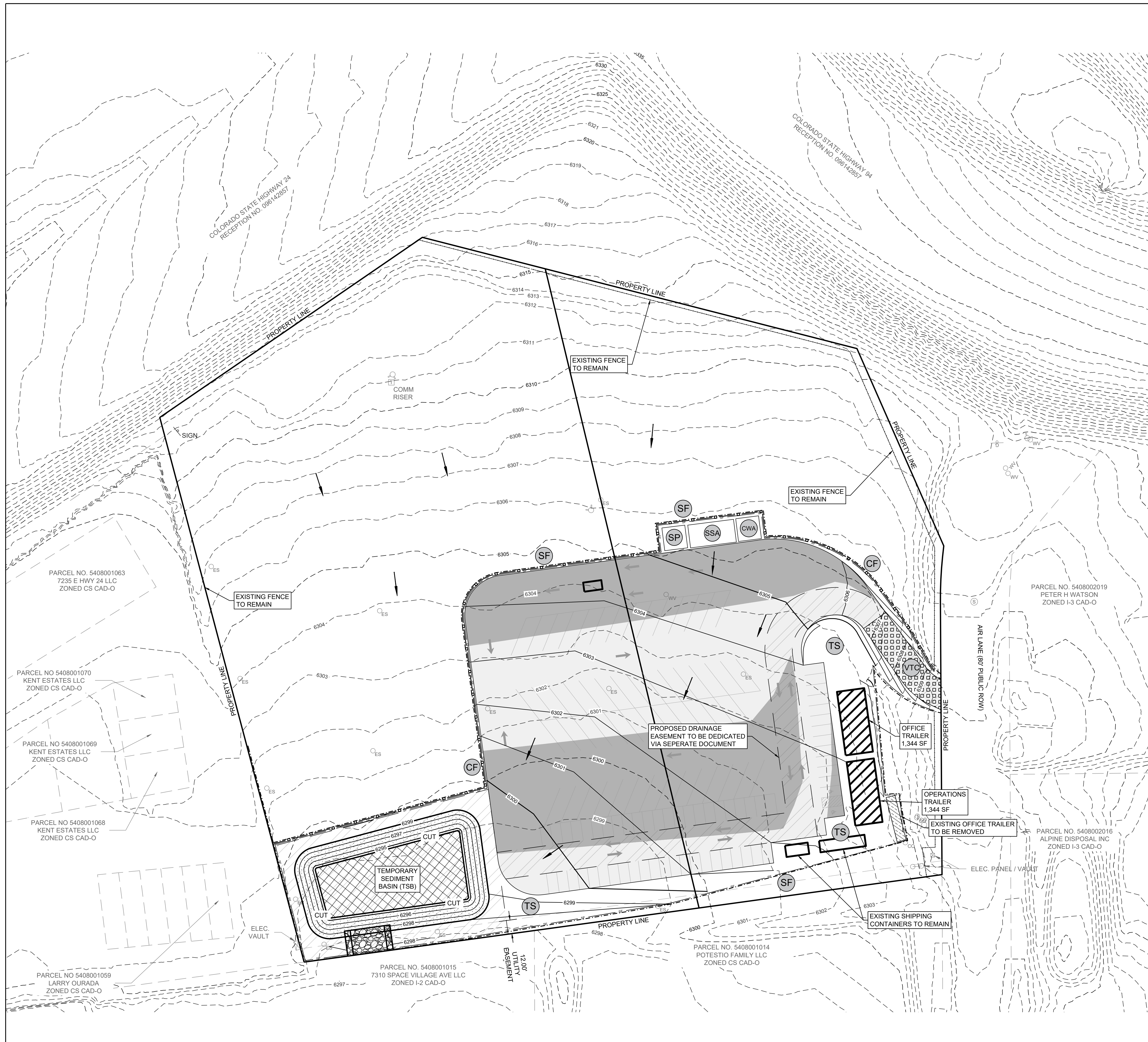
SITE DEVELOPMENT PLAN

9210 MORGAN RD
COLORADO SPRINGS
CO, 80908

DATE: 11/01/24
PROJECT MGR: K. JOHNSON
PREPARED BY: A. ROMAN

SITE DEVELOPMENT PLAN COVER

1
1 of 11



LEGEND

	LIMITS OF DISTURBANCE
	CONSTRUCTION FENCE
	EXISTING ASPHALT MILLINGS
	PROPOSED ASPHALT MILLINGS
	PROPOSED OFFICE TRAILER
	EXISTING OFFICE TRAILER TO BE REMOVED
	VEHICLE TRACKING CONTROL
	PROPOSED SAND FILTER BASIN
	SAND FILTER BASIN FILTER AREA
	PROPOSED RIPRAP
	PROPOSED DRAINAGE EASEMENT
	TEMPORARY SEEDING AND MULCHING
	PERMANENT SEEDING AND MULCHING
	SILT FENCE
	CONCRETE WASHOUT AREA
	STABILIZED STAGING AREA
	STOCKPILE PROTECTION
	FLOW ARROW
	EXISTING FENCE TO REMAIN
	EXISTING CONTOURS (1' AND 5')
	PROPOSED CONTOURS (1' AND 5')

UTILITY LEGEND

	SIGN
	FIBER OPTIC SIGN
	ELECTRIC SERVICE
	ELECTRIC VAULT / PANEL
	TELEPHONE PEDESTAL
	SANITARY SEWER MANHOLE
	SANITARY SEWER CLEANOUT
	WATER VALVE
	FIRE HYDRANT

- GENERAL NOTES:**
- IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY THE EXISTENCE AND LOCATION OF ALL UNDERGROUND UTILITIES ADJACENT TO THE SITE. THE OMISSION FROM, OR INCLUSION OF, UTILITY LOCATIONS ON THE PLANS IS NOT TO BE CONSIDERED AS THE NON-EXISTENCE OF OR A DEFINITE LOCATION OF EXISTING UNDERGROUND UTILITIES.
 - THE CONTRACTOR SHALL TAKE THE NECESSARY PRECAUTIONS TO PROTECT EXISTING UTILITIES, BUILDINGS, FENCES, AND ROADWAYS FROM DAMAGE DUE TO THIS OPERATION. ANY DAMAGE TO THE ABOVE WILL BE REPAIRED AT THE CONTRACTOR'S EXPENSE, AND ANY SERVICE DISRUPTION WILL BE SETTLED BY THE CONTRACTOR.
 - GRADING SHALL BE COMPLETED TO A SUBGRADE TOLERANCE OF PLUS OR MINUS 0.2'.
 - CONTRACTOR SHALL OBTAIN COPIES OF THE SOILS REPORT FROM THE GEOTECHNICAL ENGINEER AND THEY SHALL BE KEPT ONSITE DURING ALL EARTHWORK.
 - THE SITE SHALL BE STRIPPED A MINIMUM OF 0.5' BELOW EXISTING GRADE, OR AS RECOMMENDED BY THE GEOTECHNICAL REPORT. ONLY APPLICABLE IN PREVIOUSLY UNDISTURBED AREAS.
 - DUST CONTROL SHALL BE SUPPLIED BY THE GRADING CONTRACTOR THROUGHOUT THE DURATION OF THE PROJECT PER THE COUNTY HEALTH DEPARTMENT SPECIFICATIONS.
 - LOCATION OF STORAGE FOR MAINTENANCE EQUIPMENT AND TEMPORARY DISPOSAL AREAS WILL BE ADDED TO THE GEC/SWMP BY CONTRACTOR.
 - ALL NON-STRUCTURAL CONTROL MEASURES SUCH AS STREET SWEEPING, GOOD HOUSEKEEPING, AND ETC. SHALL BE EMPLOYED BY THE CONTRACTOR AS NECESSARY AND OUTLINED IN THE SWMP.
 - MAXIMUM CUT/FILL SLOPES SHALL NOT EXCEED 4:1.
 - ALL FILL MATERIAL SHALL BE APPROVED BY A LICENSED ENGINEER.
 - ALL STRIPPED TOPSOIL SHALL BE STOCKPILED FOR RE-USE IF POSSIBLE.
 - LOCATION OF PORTABLE TOILET, STABILIZED STAGING AREA, AND SITE (CONTACTS AND PERMITS) AND WASHOUT POSTING TO BE ADDED TO THIS PLAN AND SWMP BY CONTRACTOR.
 - CONSTRUCTION DISTURBANCE LIMITS AND SILT FENCE OFFSET FOR CLARITY, CONTRACTOR TO ENSURE CCM'S ARE PLACED DOWNSTREAM OF DISTURBED AREAS TO PREVENT SEDIMENT FROM LEAVING SITE.
 - NO BATCH PLANTS WILL BE UTILIZED ON SITE.
 - ON-SITE VEGETATION IS NATIVE GRASSES AND WEEDS. THERE IS NO NOTABLE VEGETATION OTHERWISE.
 - CONTRACTOR SHALL PROTECT ALL AREAS OUTSIDE OF THE CONSTRUCTION LIMITS WITH SILT FENCE OR OTHER METHOD TO PROTECT UNDISTURBED AREAS FROM EROSION.
 - THERE ARE NO SPRINGS, STREAMS, WETLANDS AND OTHER SURFACE WATERS, INCLUDING AREAS THAT REQUIRE MAINTENANCE OF PRE-EXISTING VEGETATION WITHIN 50 FEET OF A RECEIVING WATER FOR THIS PROJECT.

SMH CONSULTANTS
 www.smhconsultants.com
 Civil Engineering • Land Surveying
 Landscape Architecture
 Manhattan, KS - HQ
 (785) 776-0541
 Dodge City, KS
 (620) 255-1952
 Kansas City
 (913) 444-9615
 Colorado Springs, CO
 (719) 465-2145

APEX WASTE SOLUTIONS
 PROGRESS DOCUMENTS - NOT FOR CONSTRUCTION
 EL PASO COUNTY, CO

INITIAL-INTERIM GRADING & EROSION CONTROL PLAN

REVISION DESCRIPTION (DESCRIPTION)	
REVISION DATE	
000000	

NORTH

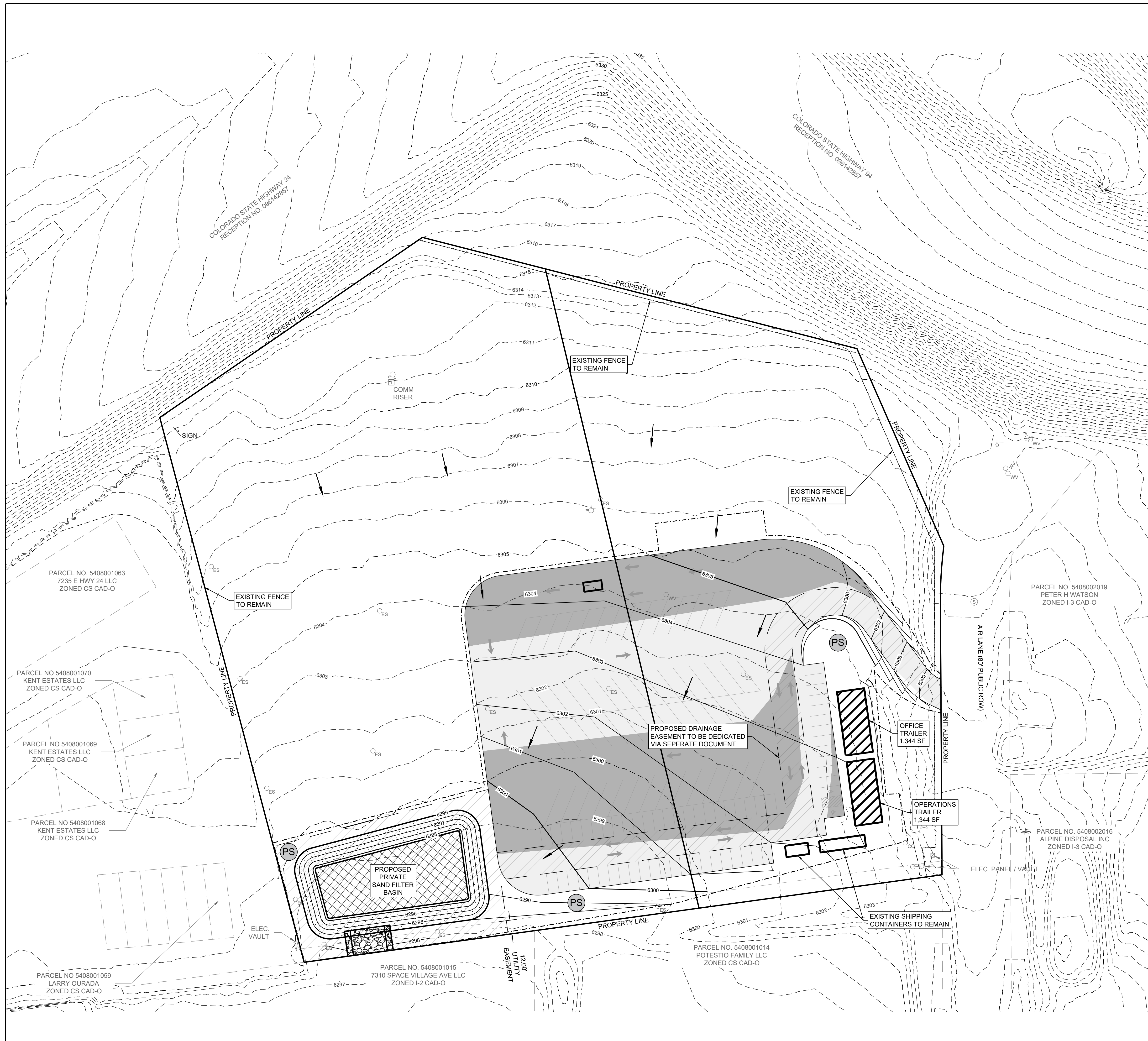
40' 20' 0' 40'
 SCALE: 1" = 40'

PROJECT #: 2403-0094
 CHECKED BY: BML
 DRAWN BY: EDM

DATE: 10/02/2024

SHEET # **G.2**

3 of 11



LEGEND

	LIMITS OF DISTURBANCE
	EXISTING ASPHALT MILLINGS
	PROPOSED ASPHALT MILLINGS
	PROPOSED OFFICE TRAILER
	PROPOSED SAND FILTER BASIN
	SAND FILTER BASIN FILTER AREA
	PROPOSED RIPRAP
	PROPOSED DRAINAGE EASEMENT
	PERMANENT SEEDING AND MULCHING
	FLOW ARROW
	EXISTING FENCE TO REMAIN
	EXISTING CONTOURS (1' AND 5')
	PROPOSED CONTOURS (1' AND 5')

UTILITY LEGEND

	SIGN
	FIBER OPTIC SIGN
	ELECTRIC SERVICE
	ELECTRIC VAULT / PANEL
	TELEPHONE PEDESTAL
	SANITARY SEWER MANHOLE
	SANITARY SEWER CLEANOUT
	WATER VALVE
	FIRE HYDRANT

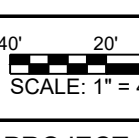
GENERAL NOTES:

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- GRADING SHALL BE COMPLETED TO A SUBGRADE TOLERANCE OF PLUS OR MINUS 0.2'.
- CONTRACTOR SHALL OBTAIN COPIES OF THE SOILS REPORT FROM THE GEOTECHNICAL ENGINEER AND THEY SHALL BE KEPT ONSITE DURING ALL EARTHWORK.
- THE SITE SHALL BE STRIPPED A MINIMUM OF 0.5' BELOW EXISTING GRADE, OR AS RECOMMENDED BY THE GEOTECHNICAL REPORT, ONLY APPLICABLE IN PREVIOUSLY UNDISTURBED AREAS.
- DUST CONTROL SHALL BE SUPPLIED BY THE GRADING CONTRACTOR THROUGH THE DURATION OF THE PROJECT PER THE COUNTY HEALTH DEPARTMENT SPECIFICATIONS.
- STOCKPILE LOCATION FOR THIS PROJECT TO BE LOCATED BY CONTRACTOR AND ADDED TO THE SWMP/GEC UPON DETERMINATION.
- LOCATION OF STORAGE FOR MAINTENANCE EQUIPMENT AND TEMPORARY DISPOSAL AREAS WILL BE ADDED TO THE GEC/SWMP BY CONTRACTOR.
- ALL NON-STRUCTURAL CONTROL MEASURES SUCH AS STREET SWEEPING, GOOD HOUSEKEEPING, AND ETC. SHALL BE EMPLOYED BY THE CONTRACTOR AS NECESSARY AND OUTLINED IN THE SWMP. MAXIMUM CUT/FILL SLOPES SHALL NOT EXCEED 4:1.
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REVISION	DESCRIPTION

REVISION DATE: 00/00/00

NORTH

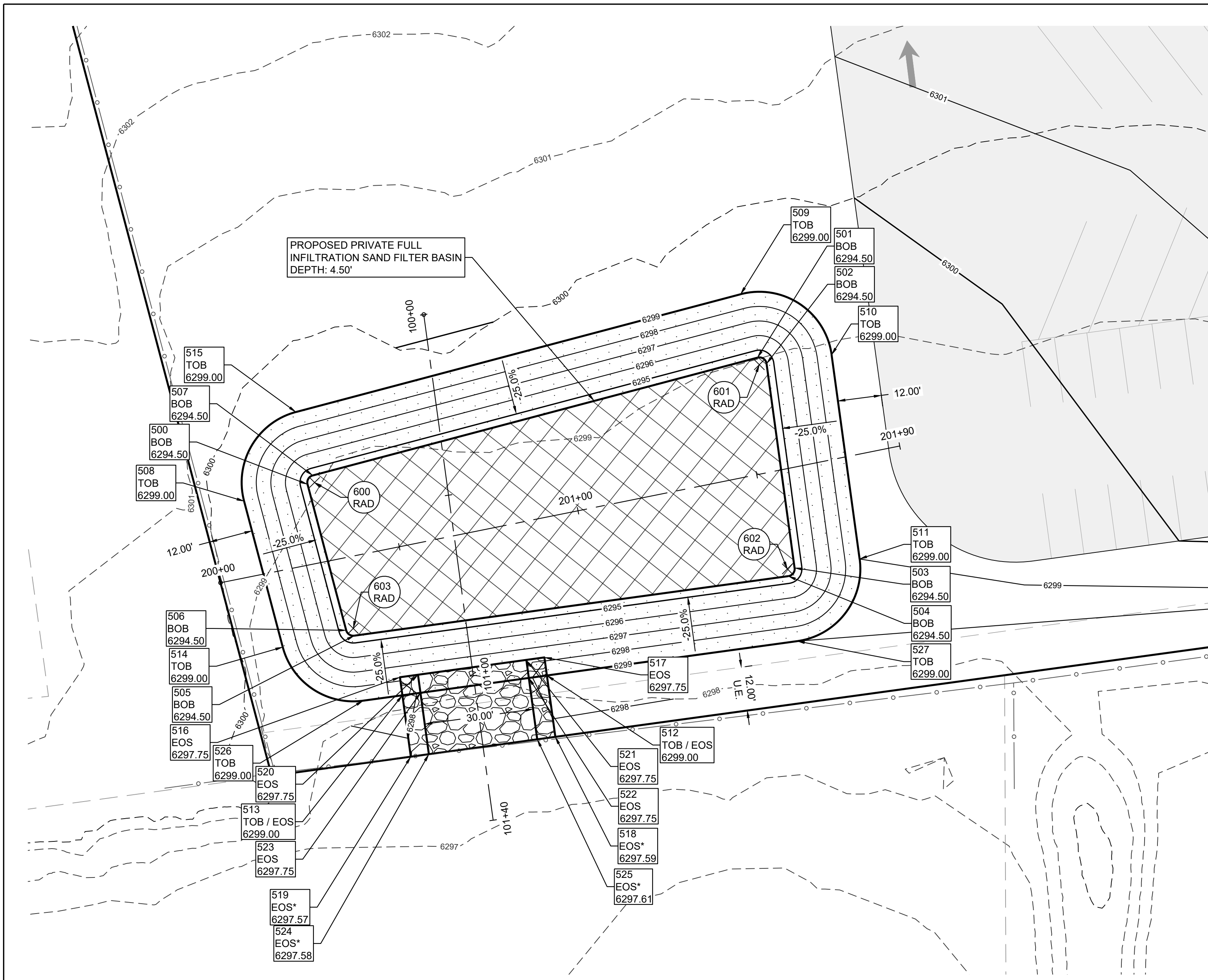


PROJECT #: 2403-0094
CHECKED BY: BML
DRAWN BY: EDM

DATE: 10/02/2024

SHEET #

G.3



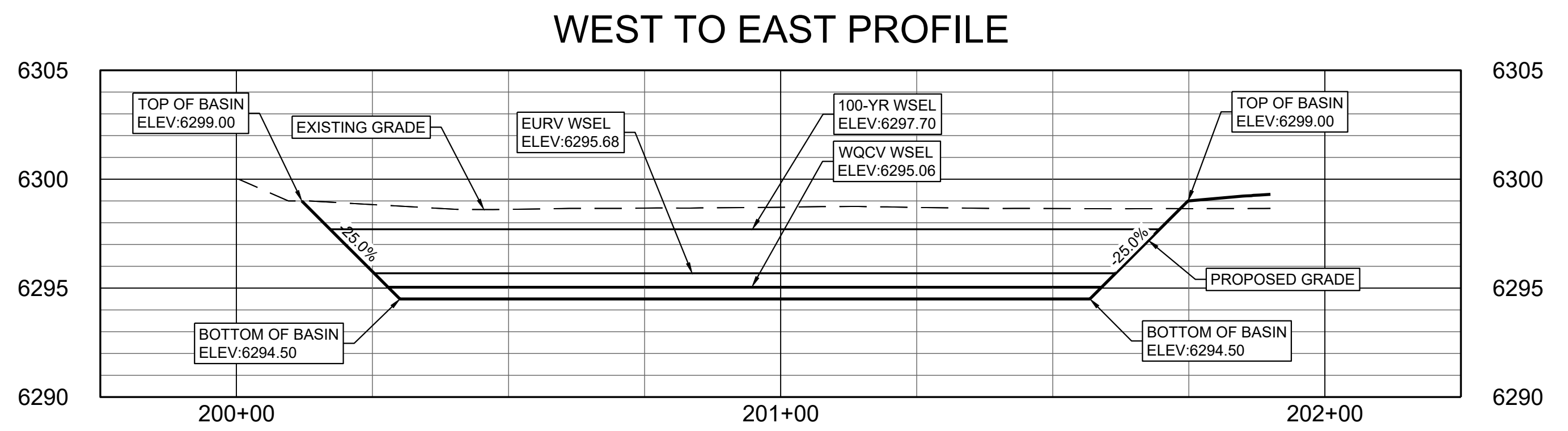
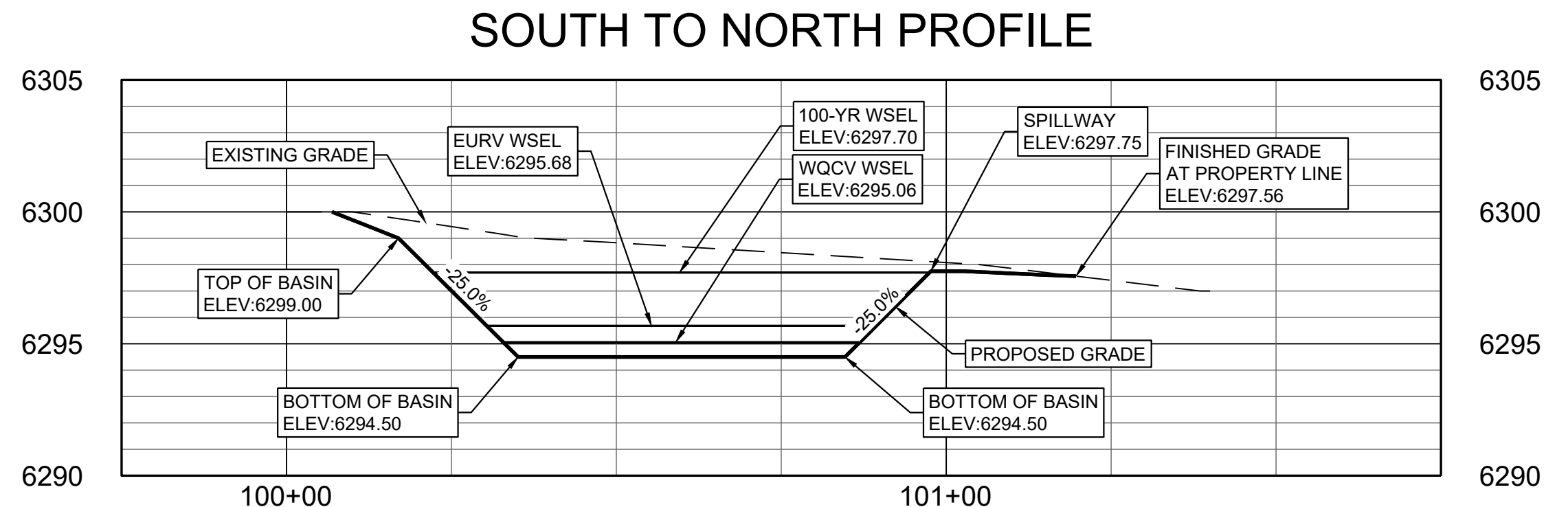
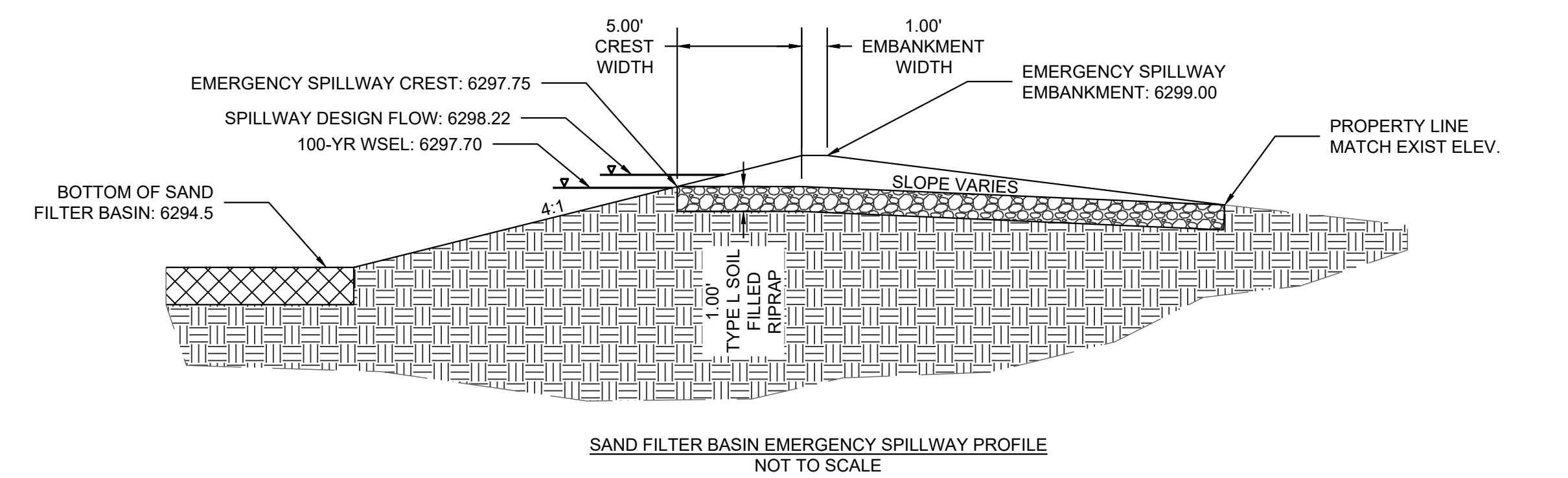
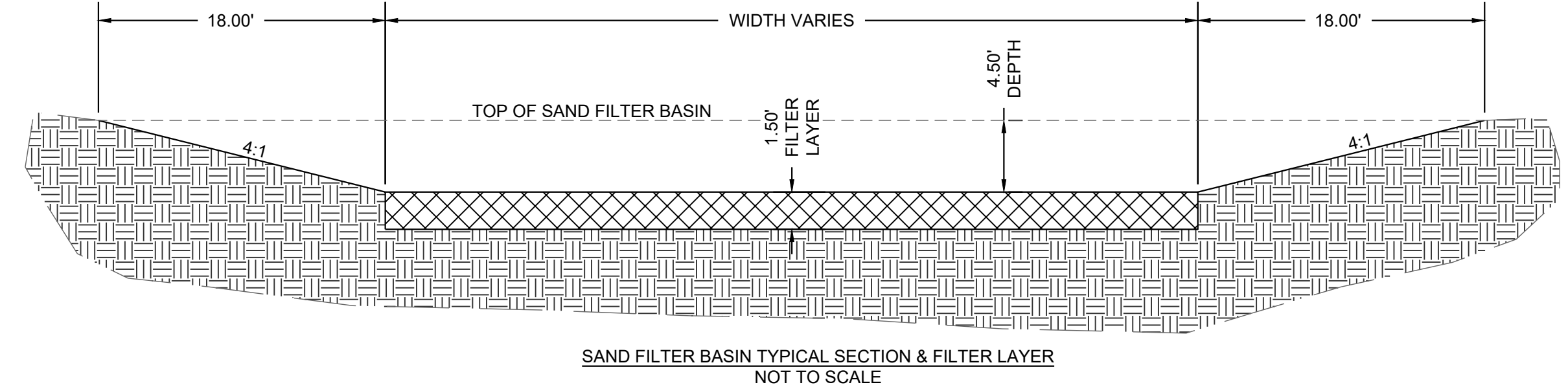
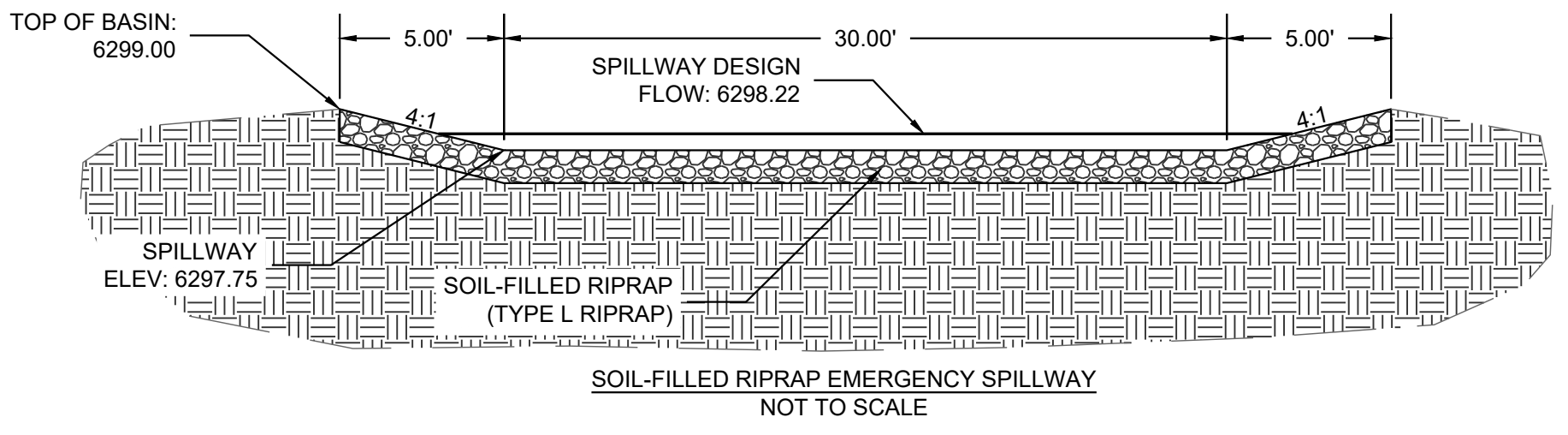
SAND FILTER BASIN COORDINATES				
POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
500	2079.94	1009.84	6294.50	BOB
501	2114.70	1133.20	6294.50	BOB
502	2113.04	1135.70	6294.50	BOB
503	2057.02	1143.38	6294.50	BOB
504	2054.76	1141.67	6294.50	BOB
505	2038.44	1022.65	6294.50	BOB
506	2039.90	1020.45	6294.50	BOB
507	2082.39	1011.26	6294.50	BOB
508	2075.33	992.44	6299.00	TOB
509	2132.10	1128.59	6299.00	TOB
510	2115.48	1153.53	6299.00	TOB
511	2059.46	1161.22	6299.00	TOB
512	2027.51	1075.47	6299.00	TOB / EOS
513	2022.08	1035.85	6299.00	TOB / EOS
514	2035.29	1003.05	6299.00	TOB
515	2099.79	1006.65	6299.00	TOB
516	2027.03	1035.17	6297.75	EOS
517	2032.47	1074.79	6297.75	EOS
518	2010.67	1077.78	6297.59	EOS*
519	2005.23	1038.16	6297.57	EOS*
520	2027.71	1040.12	6297.75	EOS
521	2031.66	1069.86	6297.75	EOS
522	2026.83	1070.52	6297.75	EOS
523	2022.76	1040.80	6297.75	EOS
524	2005.91	1043.11	6297.58	EOS*
525	2009.99	1072.83	6297.61	EOS*
526	2020.60	1025.10	6299.00	TOB
527	2036.93	1144.12	6299.00	TOB

RADIUS POINTS				
POINT #	NORTHING	EASTING	RADIUS'	DESCRIPTION
600	2080.45	1011.77	2.00' / 20.00'	RAD
601	2112.77	1133.72	2.00' / 20.00'	RAD
602	2056.75	1141.40	2.00' / 20.00'	RAD
603	2040.42	1022.38	2.00' / 20.00'	RAD

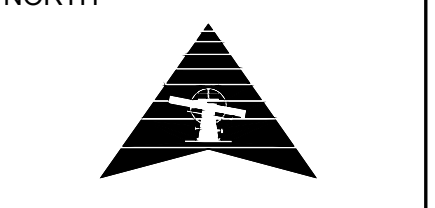
*FOR LISTED RADII VALUES: BOP RADIUS / TOP RADIUS

LEGEND

- ASPHALT MILLINGS
- PROPOSED SAND FILTER BASIN
- SAND FILTER BASIN FILTER AREA
- PROPOSED RIPRAP
- BOB (BOTTOM OF BASIN)
- TOB (TOP OF BASIN)
- EOS (EDGE OF EMERGENCY SPILLWAY)
- RAD (RADIUS)
- MATCH EXISTING
- RADIUS POINT
- ELEVATION POINT



REVISION	DESCRIPTION
000000	



SCALE: 1" = 20'

PROJECT #: 2403-0094
 CHECKED BY: BML
 DRAWN BY: EDM

DATE: 10/02/2024

SHEET # **G.4**

REVISION	DESCRIPTION
1	
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10	
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REVISION DATE: 000000
NORTH

SCALE: NTS

PROJECT #: 2403-0094
CHECKED BY: BML
DRAWN BY: EDM

DATE: 10/02/2024

SHEET # **G.5**

SM-6 Stabilized Staging Area (SSA)

STABILIZED STAGING AREA MAINTENANCE NOTES

- STABILIZED STAGING AREA SHALL BE ENLARGED IF NECESSARY TO CONTAIN PARKING, STORAGE, AND UNLOADING/LOADING OPERATIONS.
- 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, SEEDED AND MULCHED OR OTHERWISE STABILIZED IN A MANNER APPROVED BY LOCAL JURISDICTION.

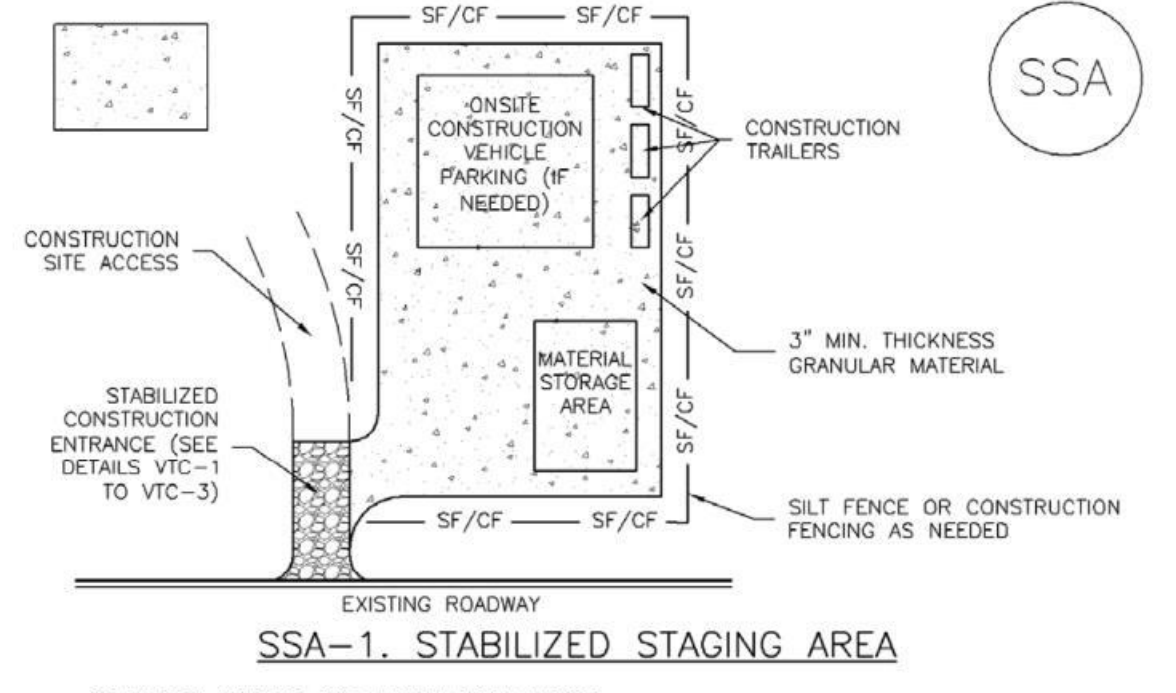
NOTE: MANY MUNICIPALITIES PROHIBIT THE USE OF RECYCLED CONCRETE AS GRANULAR MATERIAL FOR STABILIZED STAGING AREAS DUE TO DIFFICULTIES WITH RE-ESTABLISHMENT OF VEGETATION IN AREAS WHERE RECYCLED CONCRETE WAS PLACED.

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

(DETAILS ADAPTED FROM DOUGLAS COUNTY, COLORADO, NOT AVAILABLE IN AUTOCAD)

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

Stabilized Staging Area (SSA) SM-6



SSA-1. STABILIZED STAGING AREA

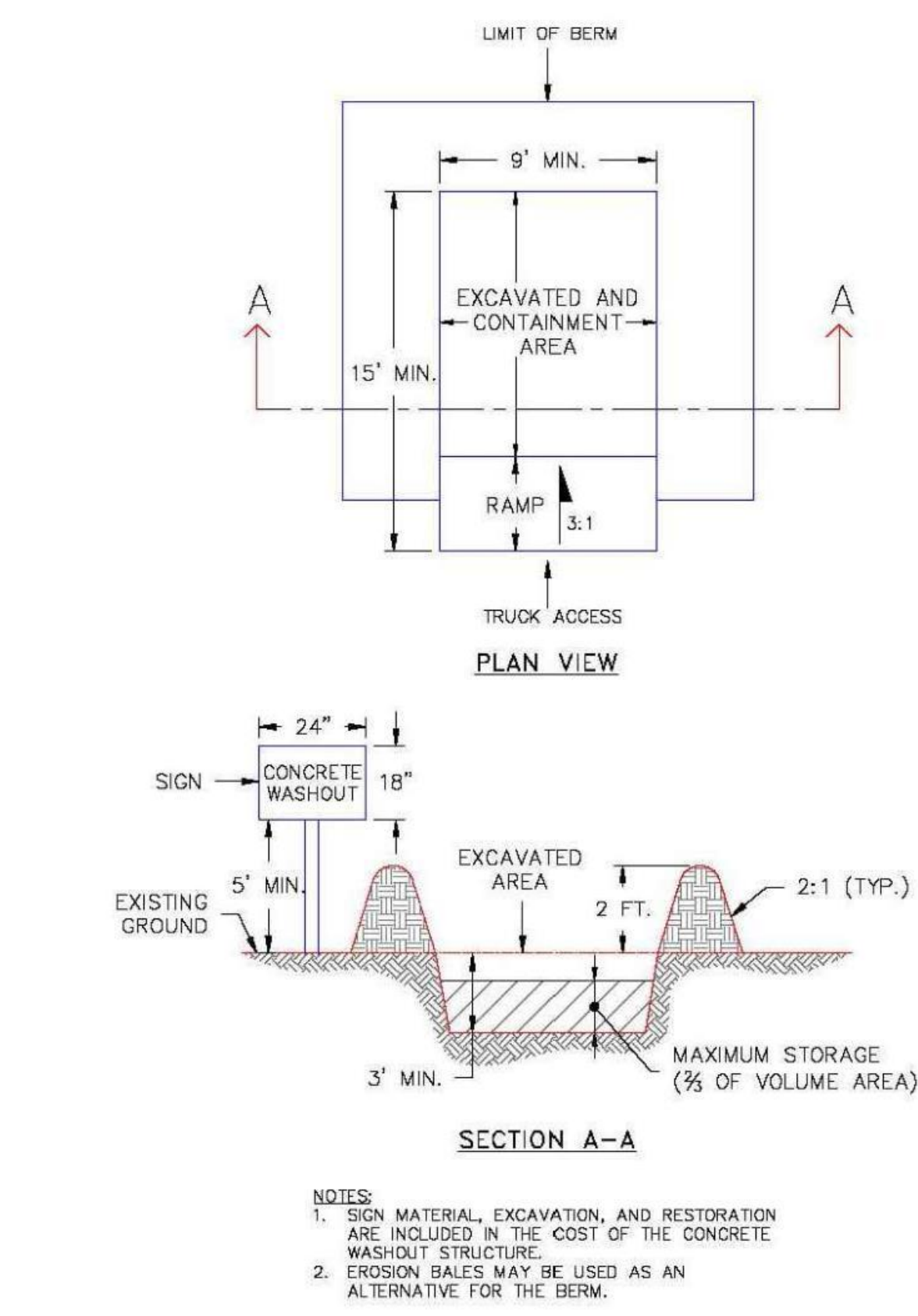
STABILIZED STAGING AREA INSTALLATION NOTES

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

STABILIZED STAGING AREA 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.
- ROCK SHALL BE REAPPLIED OR REGRADED AS NECESSARY IF RUTTING OCCURS OR UNDERLYING SUBGRADE BECOMES EXPOSED.

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



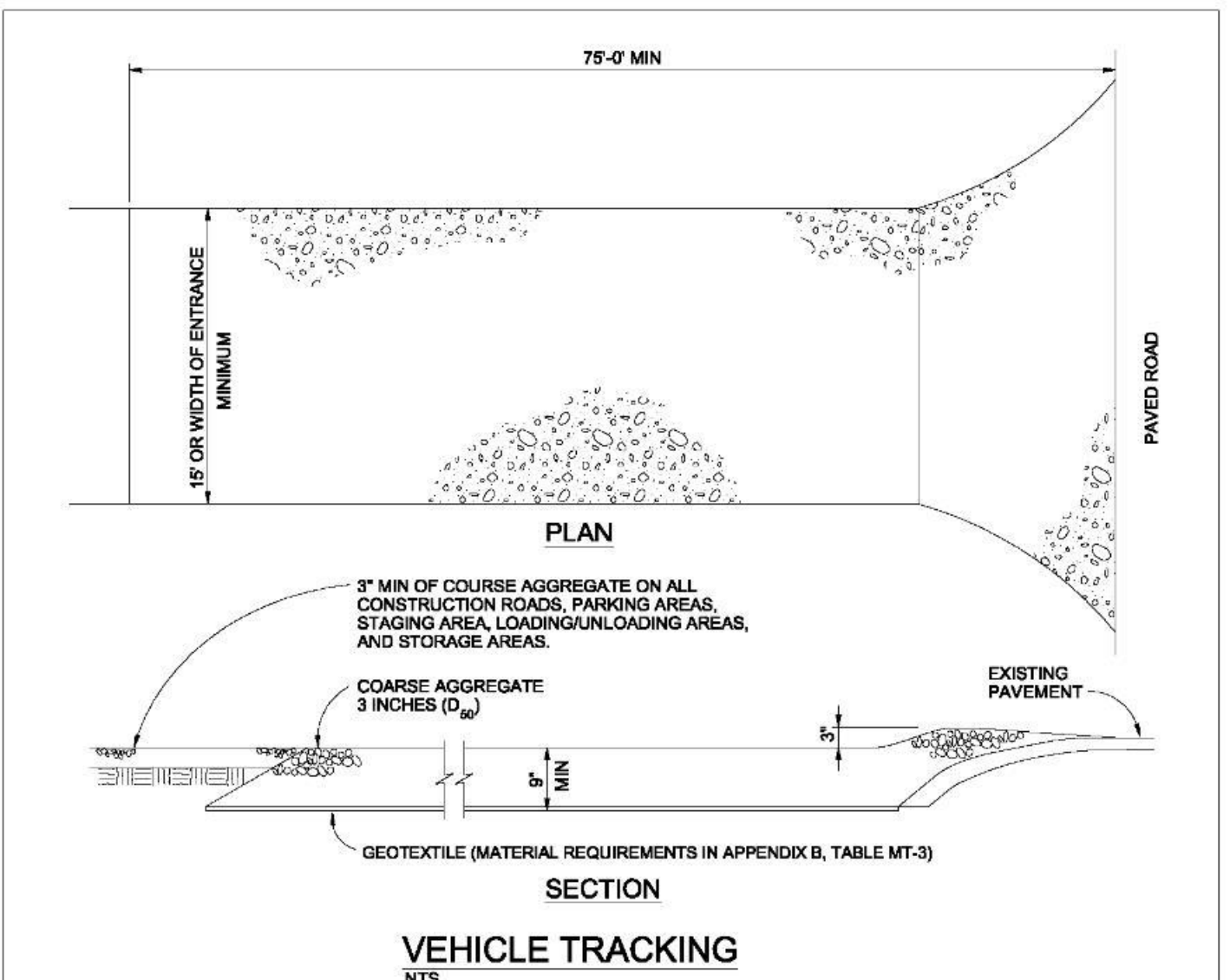
NOTES:

- SIGN MATERIAL, EXCAVATION, AND RESTORATION ARE INCLUDED IN THE COST OF THE CONCRETE WASHOUT STRUCTURE.
- EROSION BALES MAY BE USED AS AN ALTERNATIVE FOR THE BERM.

1/1/08
DATE APPROVED: John A. McCarty
DEPARTMENT OF TRANSPORTATION

Concrete Washout Structure
Standard Drawing
REVISION DATE: 7/17/07
FILE NAME: SD_3-84

EL PASO COUNTY
DEPARTMENT OF TRANSPORTATION



VEHICLE TRACKING NOTES

INSTALLATION REQUIREMENTS

- ALL ENTRANCES TO THE CONSTRUCTION SITE ARE TO BE STABILIZED PRIOR TO CONSTRUCTION BEGINNING.
- CONSTRUCTION ENTRANCES ARE TO BE BUILT WITH AN APRON TO ALLOW FOR TURNING TRAFFIC, BUT SHOULD NOT BE BUILT OVER EXISTING PAVEMENT EXCEPT FOR A SLIGHT OVERLAP.
- AREAS TO BE STABILIZED ARE TO BE PROPERLY GRADED AND COMPACTED PRIOR TO LAYING DOWN GEOTEXTILE AND STONE.
- CONSTRUCTION ROADS, PARKING AREAS, LOADING/UNLOADING ZONES, STORAGE AREAS, AND STAGING AREAS ARE TO BE STABILIZED.
- CONSTRUCTION ROADS ARE TO BE BUILT TO CONFORM TO SITE GRADES, BUT SHOULD NOT HAVE SIDE SLOPES OR ROAD GRADES THAT ARE EXCESSIVELY STEEP.

MAINTENANCE REQUIREMENTS

- REGULAR INSPECTIONS ARE TO BE MADE OF ALL STABILIZED AREAS, ESPECIALLY AFTER STORM EVENTS.
- STONES ARE TO BE REAPPLIED PERIODICALLY AND WHEN REPAIR IS NECESSARY.
- SEDIMENT TRACKED ONTO PAVED ROADS IS TO BE REMOVED DAILY BY SHOVELING OR SWEEPING. SEDIMENT IS NOT TO BE WASHED DOWN STORM SEWER DRAINS.
- STORM SEWER INLET PROTECTION IS TO BE IN PLACE, INSPECTED, AND CLEANED IF NECESSARY.
- OTHER ASSOCIATED SEDIMENT CONTROL MEASURES ARE TO BE INSPECTED TO ENSURE GOOD WORKING CONDITION.

City of Colorado Springs
Stormwater Quality

Figure VT-2
Vehicle Tracking
Application Examples

MULCHING NOTES
INSTALLATION REQUIREMENTS

- ALL DISTURBED AREAS MUST BE MULCHED WITHIN 21 DAYS AFTER FINAL GRADE AND SEEDED AREAS ARE TO BE MULCHED WITHIN 24 HOURS AFTER SEEDING.
- MATERIAL USED FOR MULCH CAN BE CERTIFIED CLEAN, WEED- AND SEED-FREE LONG STEMMED FIELD OR MARSH HAY, OR STRAW OF OATS, BARLEY, WHEAT, RYE, OR TRITICALE CERTIFIED BY THE COLORADO DEPARTMENT OF AGRICULTURE WEED FREE FORAGE CERTIFICATION PROGRAM.
- HYDRAULIC MULCHING MATERIAL SHALL CONSIST OF VIRGIN WOOD FIBER MANUFACTURED FROM CLEAN WHOLE WOOD CHIPS. WOOD CHIPS CANNOT CONTAIN ANY GROWTH OR GERMINATION INHIBITORS OR BE PRODUCED FROM RECYCLED MATERIAL. GRAVEL CAN ALSO BE USED.
- MULCH IS TO BE APPLIED EVENLY AT A RATE OF 2 TONS PER ACRE.
- MULCH IS TO BE ANCHORED EITHER BY CRIMPING (TUCKING MULCH FIBERS 4 INCHES INTO THE SOIL), USING NETTING (USED ON SMALL AREAS WITH STEEP SLOPES), OR WITH A TACKIFIER.
- HYDRAULIC MULCHING AND TACKIFIERS ARE NOT TO BE USED IN THE PRESENCE OF FREE SURFACE WATER.

MAINTENANCE REQUIREMENTS

- REGULAR INSPECTIONS ARE TO BE MADE OF ALL MULCHED AREAS.
- MULCH IS TO BE REPLACED IMMEDIATELY IN THOSE AREAS IT HAS BEEN REMOVED, AND IF NECESSARY THE AREA SHOULD BE RESEDED.

City of Colorado Springs
Stormwater Quality

Figure MU-1
Mulching
Construction Detail and Maintenance Requirements

RECOMMENDED ANNUAL GRASSES

SPECIES (COMMON NAME)	GROWTH SEASON	SEEDING DATE	POUNDS OF PURE LIVE SEED (PLS) (PLS/ACRE)	PLANTING DEPTH (INCHES)
1. OATS	COOL	MARCH 16 - APRIL 30	35-50	1-2
2. SPRING WHEAT	COOL	MARCH 16 - APRIL 30	25-35	1-2
3. SPRING BARLEY	COOL	MARCH 16 - APRIL 30	25-35	1-2
4. ANNUAL RYEGRASS	COOL	MARCH 16 - JUNE 30	15-15	1-2
5. MILLET	WARM	MAY 16 - JULY 15	3-15	1/2-3/4
6. SUDANGRASS	WARM	MAY 16 - JULY 15	5-10	1/2-3/4
7. SORGHUM	WARM	MAY 16 - JULY 15	5-10	1/2-3/4
8. WINTER WHEAT	COOL	SEPTEMBER 1 - 30	20-35	1-2
9. WINTER BARLEY	COOL	SEPTEMBER 1 - 30	20-35	1-2
10. WINTER RYE	COOL	SEPTEMBER 1 - 30	20-35	1-2
11. TRITICALE	COOL	SEPTEMBER 1 - 30	25-40	1-2

THIS TABLE WAS TAKEN FROM UDFCD 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

INSTALLATION REQUIREMENTS

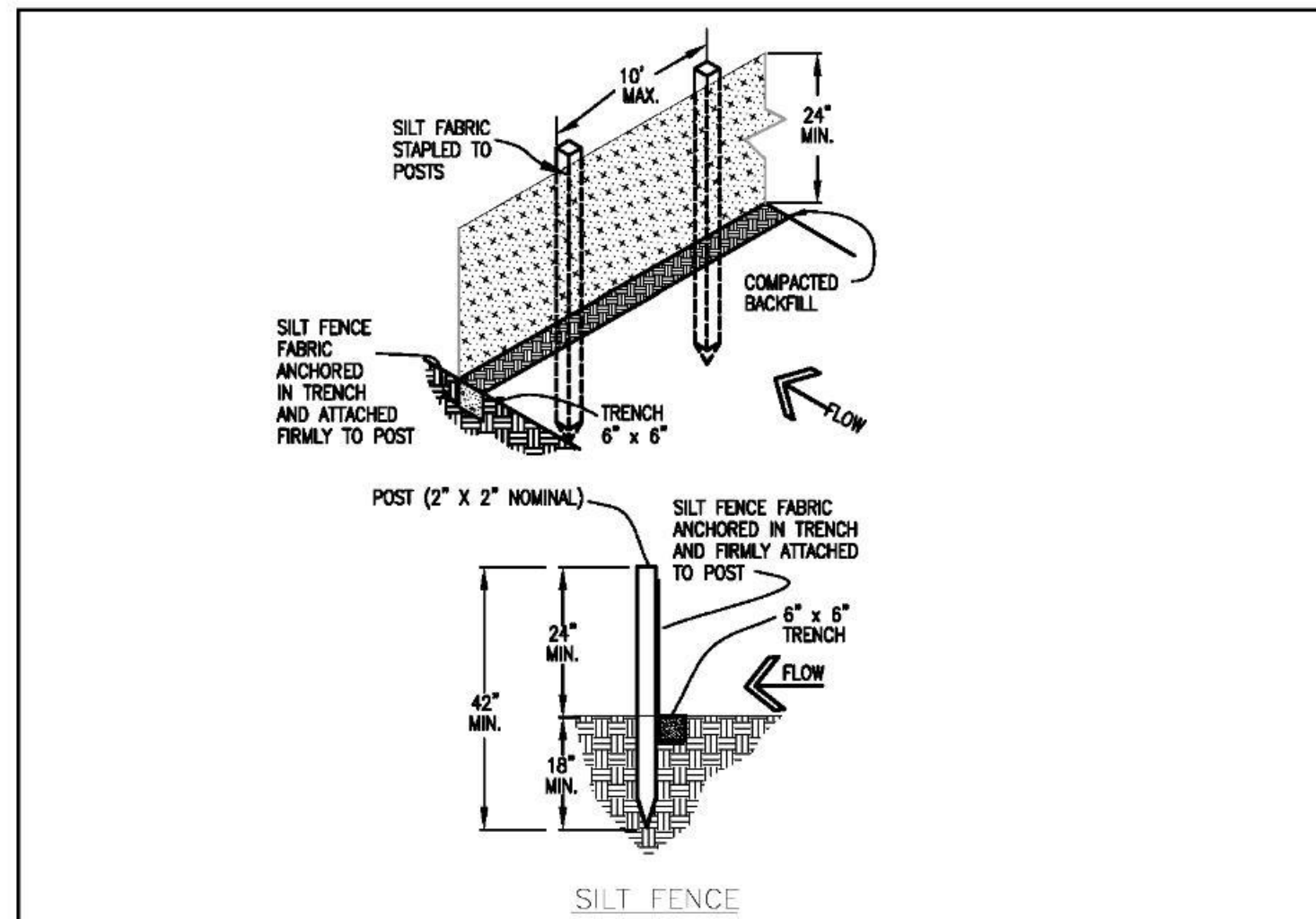
- DISTURBED AREAS ARE TO BE SEEDED WITHIN 21 DAYS AFTER CONSTRUCTION ACTIVITY OR GRADING ENDS IF SEASON ALLOWS.
- IF NECESSARY, SOIL IS TO BE CONDITIONED FOR PLANT GROWTH BY APPLYING TOPSOIL, FERTILIZERS, OR LIME.
- SOIL IS TO BE TILLED IMMEDIATELY PRIOR TO APPLYING SEEDS. COMPACT SOILS ESPECIALLY NEED TO BE LOOSENED.
- 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, KNAPWEED, PURPLE LOOSESTRIKE, EUROPEAN BINDWEED, JOHNSON GRASS, AND LEAFY 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 SEEDED 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.

MAINTENANCE REQUIREMENTS

- REGULAR INSPECTIONS ARE TO BE MADE OF ALL SEEDED AREAS TO ENSURE GROWTH.
- AREAS WHERE GROWTH IS NOT OCCURRING QUICKLY OR THE MULCH HAS BEEN REMOVED SHALL BE RE-SEEDED AS SOON AS POSSIBLE AND RE-MULCHED IF NEEDED.
- SEEDED 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



SILT FENCE NOTES

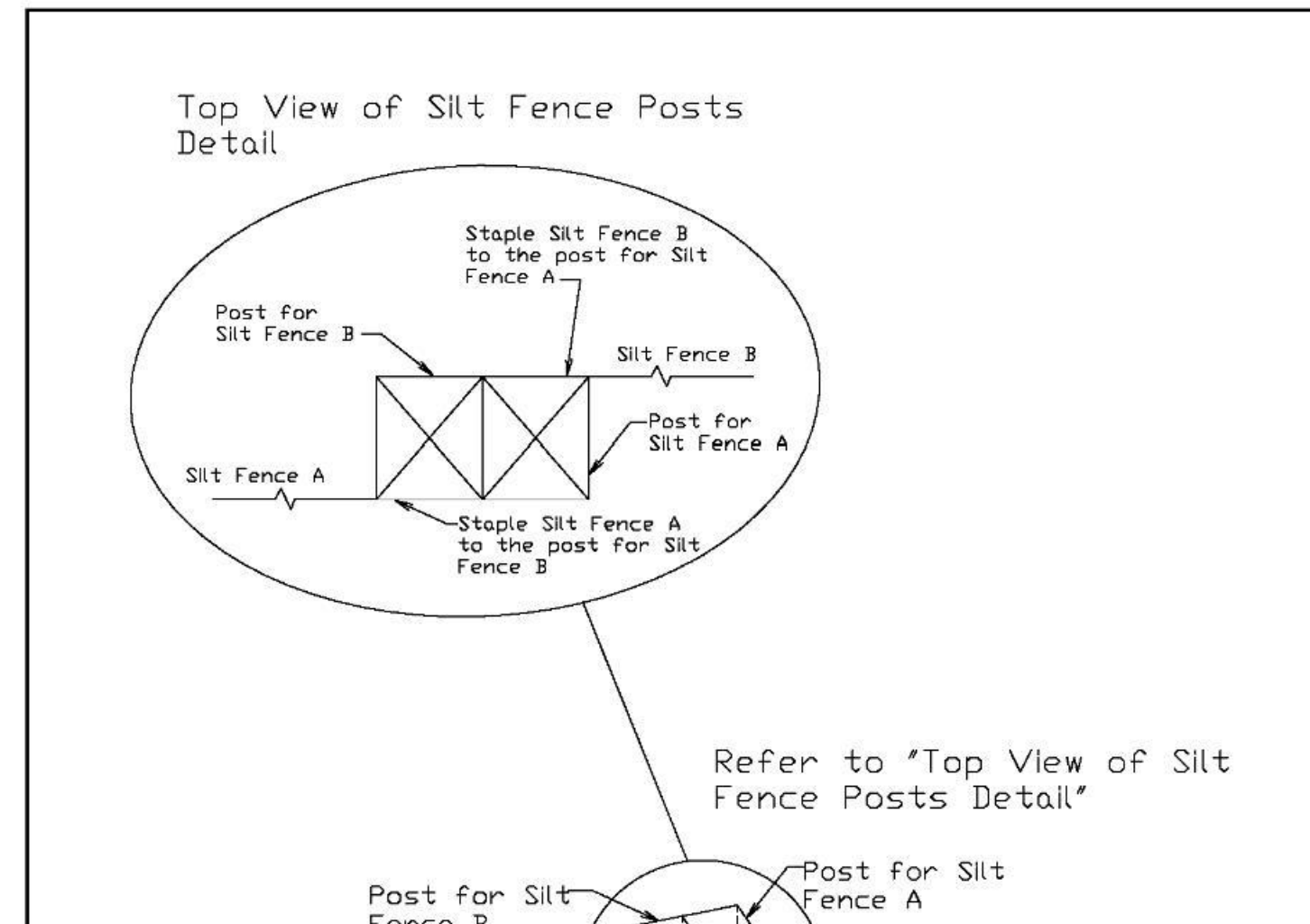
INSTALLATION REQUIREMENTS

- SILT FENCES SHALL BE INSTALLED PRIOR TO ANY LAND DISTURBING ACTIVITIES.
- WHEN JOINTS ARE NECESSARY, SILT FENCE GEOTEXTILE SHALL BE SPLICED TOGETHER ONLY AT SUPPORT POST AND SECURELY SEALED.
- METAL POSTS SHALL BE "STUDDED TEE" OR "U" TYPE WITH MINIMUM WEIGHT OF 1.33 POUNDS PER LINEAR FOOT. WOOD POSTS SHALL HAVE A MINIMUM DIAMETER OR CROSS SECTION DIMENSION OF 2 INCHES.
- THE FILTER MATERIAL SHALL BE FASTENED SECURELY TO METAL OR WOOD POSTS USING WIRE TIES, OR TO WOOD POSTS WITH 3/4" LONG #9 HEAVY-DUTY STAPLES. THE SILT FENCE GEOTEXTILE SHALL NOT BE STAPLED TO EXISTING TREES.
- WHILE NOT REQUIRED, WIRE MESH FENCE MAY BE USED TO SUPPORT THE GEOTEXTILE. WIRE FENCE SHALL BE FASTENED SECURELY TO THE UPSLOPE SIDE OF THE POSTS USING HEAVY-DUTY WIRE STAPLES AT LEAST 3/4" LONG. TIE WIRES OR HOOD RINGS. THE WIRE SHALL EXTEND INTO THE TRENCH A MINIMUM OF 6" AND SHALL NOT EXTEND MORE THAN 3' ABOVE THE ORIGINAL GROUND SURFACE.
- ALONG THE TOE OF FILLS, INSTALL THE SILT FENCE ALONG A LEVEL CONTOUR AND PROVIDE AN AREA BEHIND THE FENCE FOR RUNOFF TO POND AND SEDIMENT TO SETTLE. A MINIMUM DISTANCE OF 5 FEET FROM THE TOE OF THE FILL IS RECOMMENDED.
- THE HEIGHT OF THE SILT FENCE FROM THE GROUND SURFACE SHALL BE MINIMUM OF 24 INCHES AND SHALL NOT EXCEED 36 INCHES. HIGHER FENCES MAY IMPOUND VOLUMES OF WATER SUFFICIENT TO CAUSE FAILURE OF THE STRUCTURE.

MAINTENANCE REQUIREMENTS

- CONTRACTOR SHALL INSPECT SILT FENCES IMMEDIATELY AFTER EACH RAINFALL, AT LEAST DAILY DURING PROLONGED RAINFALL, AND WEEKLY DURING PERIODS OF NO RAINFALL. DAMAGED, COLLAPSED, UNINTRENCHED OR INEFFECTIVE SILT FENCES SHALL BE PROMPTLY REPAIRED OR REPLACED.
- SEDIMENT SHALL BE REMOVED FROM BEHIND SILT FENCE WHEN IT ACCUMULATES TO HALF THE EXPOSED GEOTEXTILE HEIGHT.
- SILT FENCES SHALL BE REMOVED WHEN ADEQUATE VEGETATIVE COVER IS ATTAINED AS APPROVED BY THE CITY.

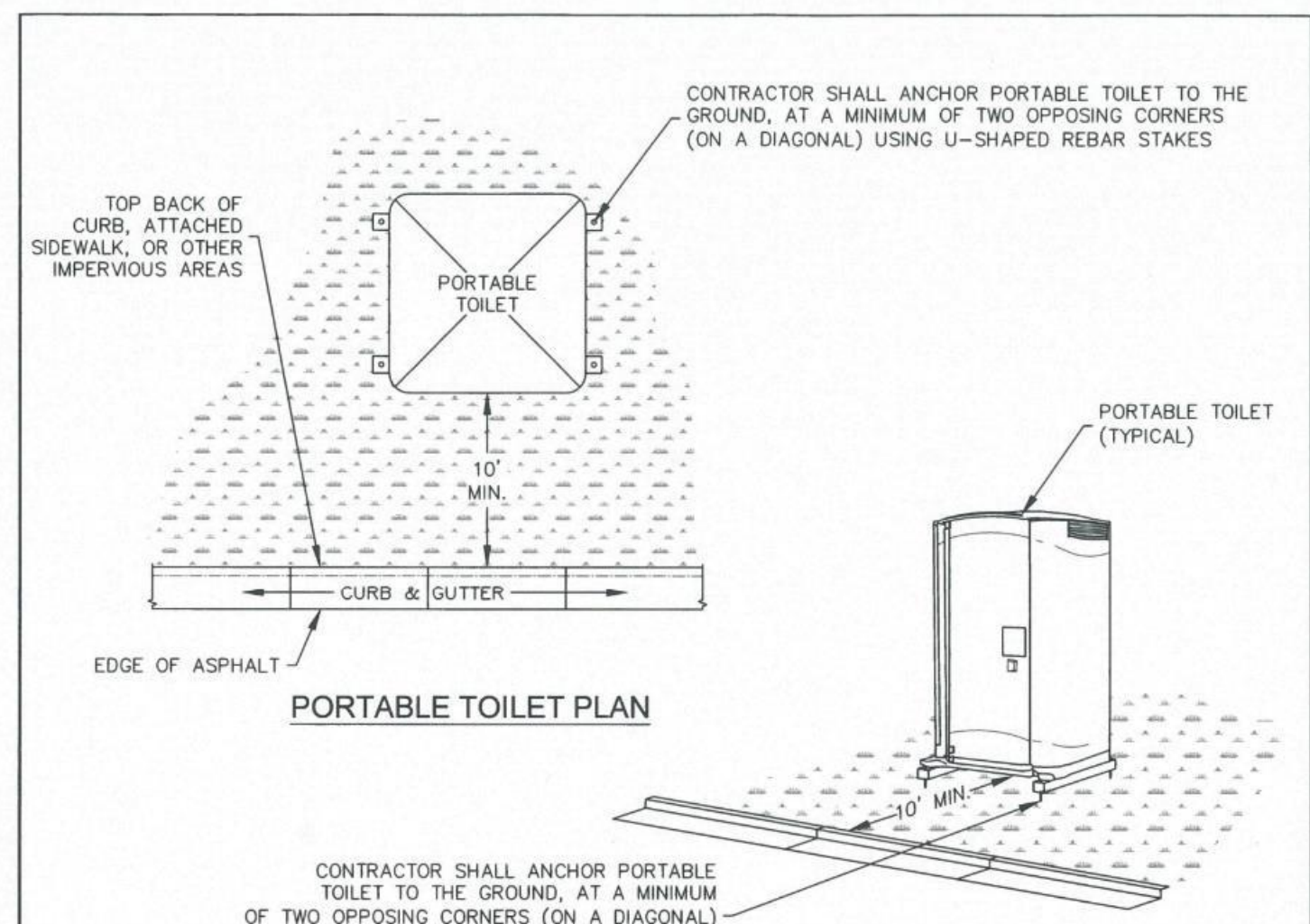
City of Colorado Springs Stormwater Quality
Figure SF-2 Silt Fence Construction Detail and Maintenance Requirements



Top View of Silt Fence Posts Detail

Refer to "Top View of Silt Fence Posts Detail"

City of Colorado Springs Stormwater Quality
Figure SF-3 Silt Fence Joint Tying Construction Detail and Maintenance Requirements



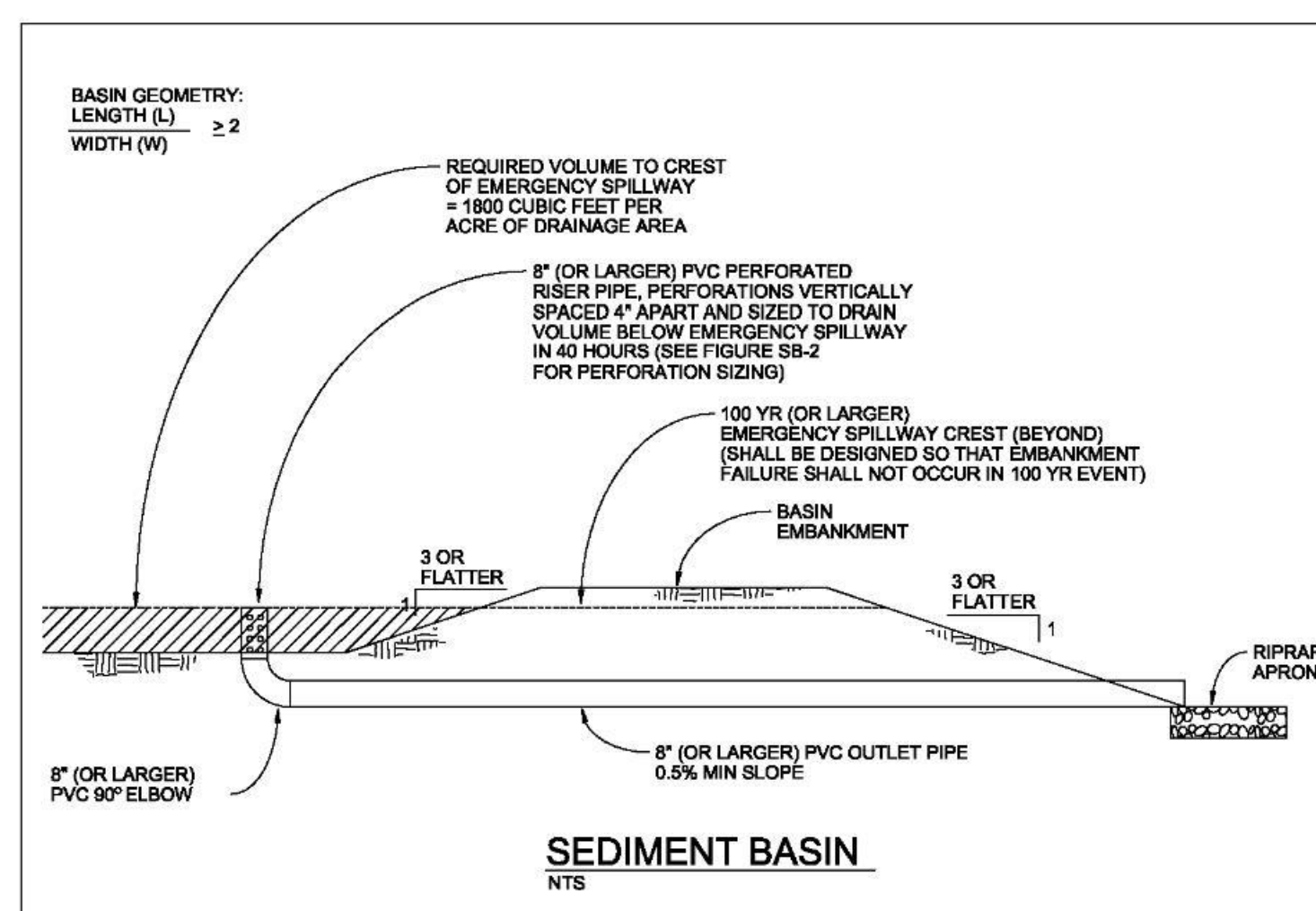
INSTALLATION NOTES

- PORTABLE TOILETS SHALL BE PLACED A MINIMUM OF 10 FEET BEHIND ALL CURBS, SIDEWALKS, AND OTHER IMPERVIOUS AREAS; 50 FEET FROM STORM INLETS, AND 100 FEET FROM WATERWAYS.
- PORTABLE TOILETS IN THE RIGHT-OF-WAY ARE REQUIRED TO BE PLACED ON MOBILE TRAILERS AND MUST BE ANCHORED OR WEIGHTED DOWN. PORTABLE TOILETS MAY BE INSTALLED IN ACCORDANCE WITH NOTE #1 IN STAGING AREAS/YARDS.
- PORTABLE TOILETS SHALL BE SECURELY ANCHORED TO THE GROUND USING U-SHAPED REBAR STAKES, OR OTHER EFFECTIVE ANCHORING.
- ANCHORING SHALL BE POSITIONED ON AT LEAST TWO OPPOSING (DIAGONAL) CORNERS.
- TOILET CONTAINMENT PANS MAY BE USED IN PLACE OF A TRAILER AT THE GEC INSPECTOR'S DISCRETION. TOILET CONTAINMENT PANS MUST BE ANCHORED IN PLACE AND MUST NOT BE USED WITHIN THE CITY R.O.W.

MAINTENANCE NOTES

- FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN CONTROL MEASURES IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
- PORTABLE TOILETS SHALL BE SERVICED AT THE NECESSARY INTERVALS TO ELIMINATE THE POSSIBILITY OF OVERFLOW.
- WHEN THE PORTABLE TOILETS ARE REMOVED, ANY DISTURBED AREAS ASSOCIATED WITH THE INSTALLATION, MAINTENANCE, AND/OR REMOVAL OF THE TOILETS MUST BE PERMANENTLY STABILIZED.

PORTABLE TOILET
APPROVED: [Signature]
ISSUED: 2/19/19
REVISION: 8/19/2020
DRAWING NO. 900-PTM



SEDIMENT BASIN NOTES

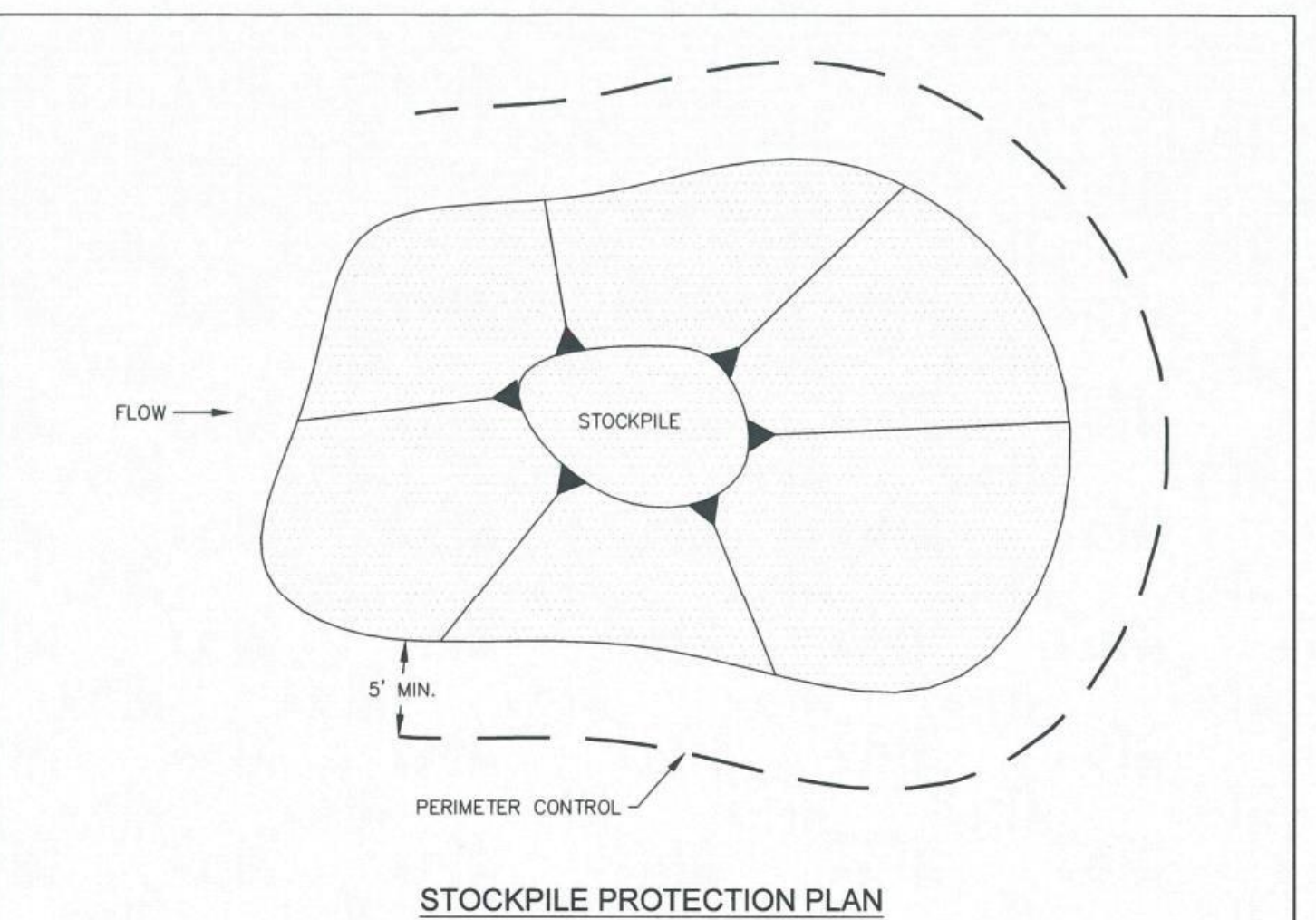
INSTALLATION REQUIREMENTS

- SEDIMENT BASINS SHALL BE INSTALLED BEFORE ANY CLEARING AND/OR GRADING IS UNDERTAKEN.
- THE AREA UNDER WHICH THE EMBANKMENT IS TO BE INSTALLED SHALL BE CLEARED, GRUBBED, AND STRIPPED OF ALL VEGETATION AND ROOT MAT.
- THE OUTLET OF THE BASIN SHALL BE DESIGNED TO DRAIN ITS VOLUME IN 40 HOURS.
- THE OUTLET IS TO BE LOCATED AT THE FURTHEST DISTANCE FROM THE INLET OF THE BASIN. Baffles may be needed to INCREASE THE FLOW LENGTH AND SETTLING TIME.
- EMBANKMENT MATERIAL SHALL CONSIST OF SOIL WITH A MINIMUM OF 15% PASSING A #200 SIEVE. EXCAVATED SOIL CAN BE USED IF IT MEETS THIS REQUIREMENT.
- EMBANKMENT IS TO BE COMPACTED TO AT LEAST 90% OF MAXIMUM DENSITY AND WITHIN 2% OF OPTIMUM MOISTURE CONTENT ACCORDING TO ASTM D 698.
- WHEN A BASIN IS INSTALLED NEAR A RESIDENTIAL AREA, FOR SAFETY REASONS, A SIGN SHALL BE POSTED AND THE AREA SECURED WITH A FENCE.

MAINTENANCE REQUIREMENTS

- CONTRACTOR SHALL INSPECT SEDIMENT BASINS AFTER EACH RAINFALL, AT LEAST DAILY DURING PROLONGED RAINFALL, AND WEEKLY DURING PERIODS OF NO RAINFALL.
- SEDIMENT BASINS SHALL BE CLEANED OUT BEFORE SEDIMENT HAS FILLED HALF THE VOLUME OF THE BASIN.
- SEDIMENT BASINS SHALL REMAIN OPERATIONAL AND PROPERLY MAINTAINED UNTIL THE SITE AREA IS PERMANENTLY STABILIZED WITH ADEQUATE VEGETATIVE COVER AND/OR OTHER PERMANENT STRUCTURE AS APPROVED BY THE CITY.

City of Colorado Springs Stormwater Quality
Figure SB-1 Sediment Basin Construction Detail and Maintenance Requirements



INSTALLATION NOTES

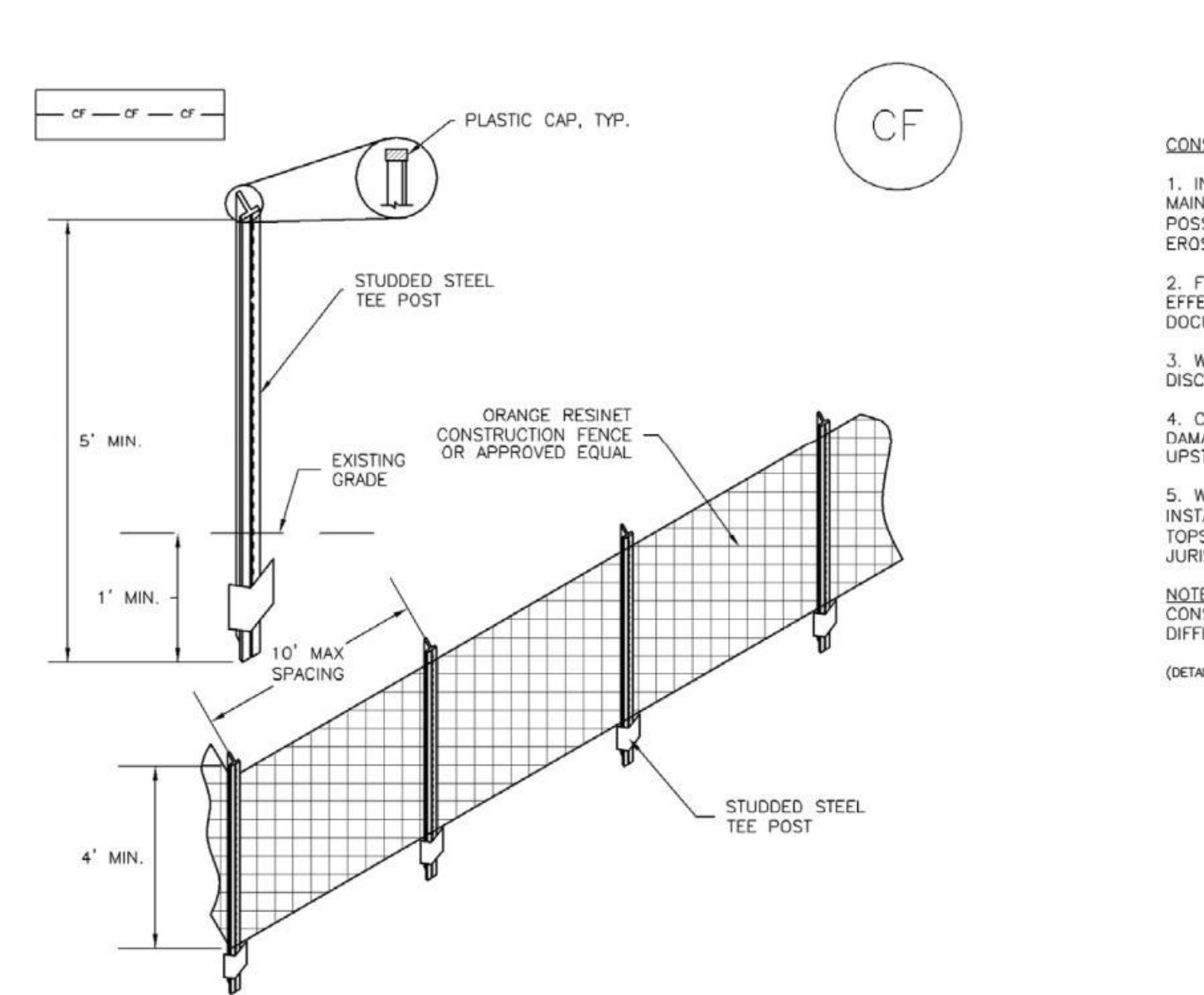
- INSTALL PERIMETER CONTROL AROUND STOCKPILE ON DOWNGRADIENT SIDE. PERIMETER CONTROL MUST BE SUITABLE TO SITE CONDITIONS AND INSTALLED ACCORDING TO THE RELEVANT DETAIL.
- FOR STOCKPILES ON THE INTERIOR PORTION OF A CONSTRUCTION SITE, WHERE OTHER DOWNGRADIENT CONTROLS INCLUDING PERIMETER CONTROL ARE IN PLACE, STOCKPILE PERIMETER CONTROLS MAY NOT BE REQUIRED.

MAINTENANCE NOTES

- FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN CONTROL MEASURES IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
- IF PERIMETER CONTROLS MUST BE MOVED TO ACCESS STOCKPILE, REPLACE PERIMETER CONTROLS BY THE END OF THE WORK DAY.
- ACCUMULATED SEDIMENT MUST BE REMOVED ACCORDING TO PERIMETER CONTROL DETAIL.

STOCKPILE PROTECTION
APPROVED: [Signature]
ISSUED: 10/7/19
REVISION: 8/19/2020
DRAWING NO. 900-SP

SM-3 Construction Fence (CF) Construction Fence (CF) SM-3



CONSTRUCTION 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.
- CONSTRUCTION FENCE SHALL BE REPAIRED OR REPLACED WHEN THERE ARE SIGNS OF DAMAGE SUCH AS RIPS OR SACS. CONSTRUCTION FENCE IS TO REMAIN IN PLACE UNTIL THE UPSTREAM DISTURBED AREA IS STABILIZED AND APPROVED BY THE LOCAL JURISDICTION.
- WHEN CONSTRUCTION FENCES ARE REMOVED, ALL DISTURBED AREAS ASSOCIATED WITH THE INSTALLATION, MAINTENANCE, AND/OR REMOVAL OF THE FENCE SHALL BE COVERED WITH TOPSOIL, SEEDED AND MULCHED, OR OTHERWISE STABILIZED AS APPROVED BY LOCAL JURISDICTION.

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.

(DETAIL ADAPTED FROM TOWN OF PARKER, COLORADO, NOT AVAILABLE IN AUTOCAD)

CONSTRUCTION FENCE INSTALLATION NOTES

- SEE PLAN VIEW FOR: -LOCATION OF CONSTRUCTION FENCE.
- CONSTRUCTION FENCE SHOWN SHALL BE INSTALLED PRIOR TO ANY LAND DISTURBING ACTIVITIES.
- CONSTRUCTION FENCE SHALL BE COMPOSED OF ORANGE, CONTRACTOR-GRADE MATERIAL THAT IS AT LEAST 4' HIGH. METAL POSTS SHOULD HAVE A PLASTIC CAP FOR SAFETY.
- STUDDED STEEL TEE POSTS SHALL BE UTILIZED TO SUPPORT THE CONSTRUCTION FENCE. MAXIMUM SPACING FOR STEEL TEE POSTS SHALL BE 10'.
- CONSTRUCTION FENCE SHALL BE SECURELY FASTENED TO THE TOP, MIDDLE, AND BOTTOM OF EACH POST.

CF-1, PLASTIC MESH CONSTRUCTION FENCE
APPROVED: [Signature]
ISSUED: 10/7/19
REVISION: 8/19/2020
DRAWING NO. 900-CF

T-4 SAND FILTERS

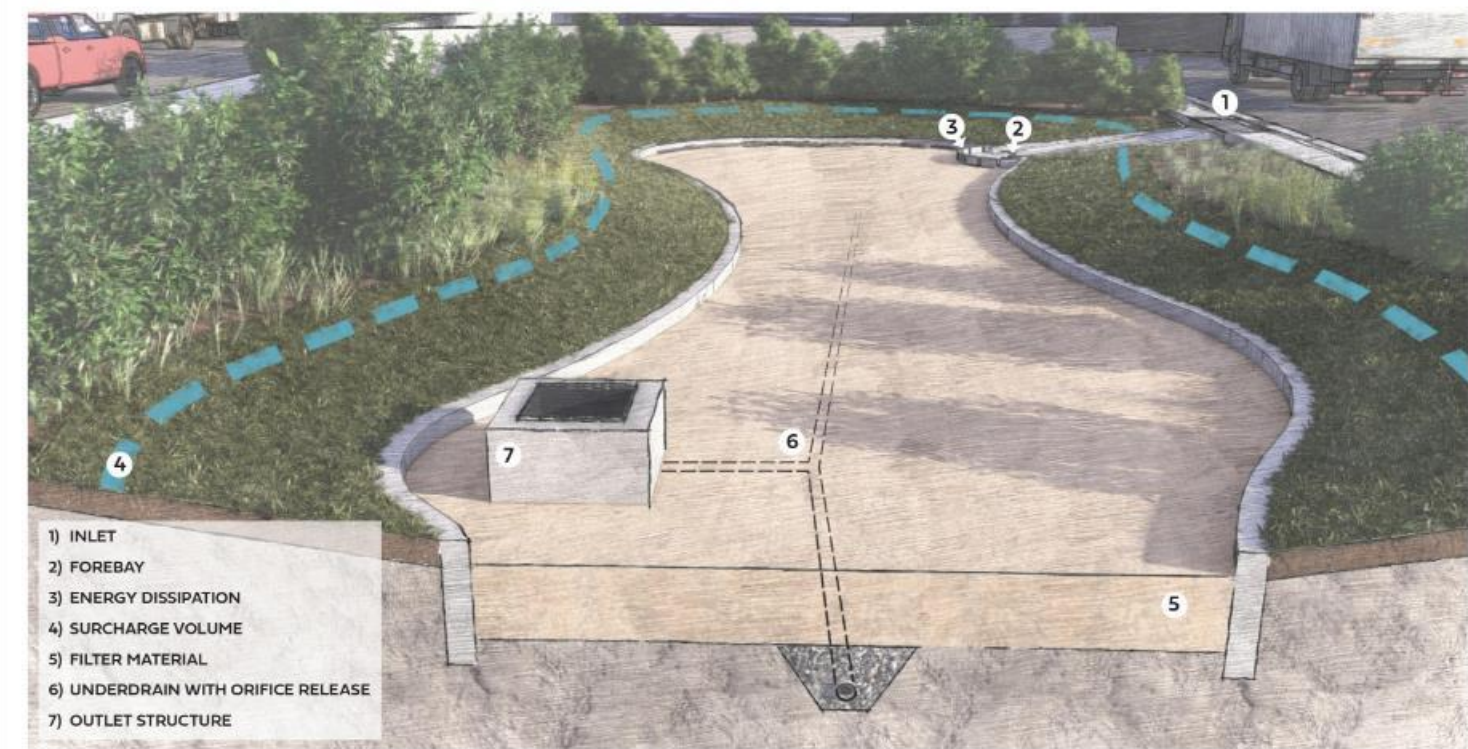


Figure SF-1. Sand Filter Components

DESCRIPTION

A sand filter treats runoff by filtration and also provides infiltration when unlined systems are used. A sand filter consists of a surcharge zone underlain by a sand bed, often with an underdrain system (Urbanas 1999). During a storm, runoff collects in the surcharge zone and gradually infiltrates into the underlying sand bed, filling the void spaces of the sand. The underdrain gradually releases the runoff that is filtered through the sand bed and discharges the runoff to a nearby channel, swale, or storm drain. When suitable based on site conditions, a partial or full infiltration section can be used to infiltrate some or all of the runoff from the water quality design event.

A sand filter is similar to bioretention in terms of filtration and infiltration treatment mechanisms but differs in that it is not specifically designed for vegetative growth. The absence of vegetation in a sand filter allows for active maintenance of the surface of the filter (i.e., raking to loosen the surface layer or to remove accumulated sediments). For this reason, sand filter criteria allow for a larger contributing area and greater depth of storage than bioretention but will also require more frequent maintenance at the surface of the filter to ensure adequate infiltration. A sand filter can be designed to include the Excess Urban Runoff Volume (EURV) and 100-year flood storage volume, released through a surface-release outlet structure. Sand filters can be placed in a vault for subsurface applications. However, these types of installations are more difficult to inspect and maintain and should only be used if surface treatment is infeasible.

TABLE SF-1. SF OVERVIEW

SAND FILTERS	
MS4 Permit Applicability (Dependent on design and level of treatment)	Potential'
Meets Runoff Reduction Standard	Potential'
Meets WQCV Capture Standard	Yes
Meets Pollutant Removal Standard	Yes
Typical Effectiveness for Targeted Pollutants	
Sediment/Solids	High
Total Phosphorus	Medium
Total Nitrogen	Low
Total Metals	High
Bacteria	Medium
Common Applications	
Runoff Reduction (General)	Potential'
Used for Pretreatment	No
Integrated with Flood Control	Yes

'Depends on design including full-infiltration, partial infiltration or no-infiltration section.



Photograph SF-1. This sand filter, constructed on two sides of a parking garage, is accessible for maintenance, yet screened from public view by a landscape buffer.

BENEFITS OF SAND FILTERS

- Filtration processes effectively remove a range of pollutants, including phosphorus.
- Filter surface area does not require irrigation.
- Straightforward maintenance procedures.

LIMITATIONS OF SAND FILTERS

- Less attractive than vegetated bioretention systems unless additional aesthetic or vegetative screening is provided.
- Not suitable for installation while construction or major landscaping activities are taking place in the watershed.
- Susceptible to clogging if not properly equipped with a forebay and regularly maintained.
- Typical lined installations do not provide significant volume reduction.
- Ammonification and nitrification of organic nitrogen may occur in the media, resulting in nitrate export (Barrett 2003, Clary et al. 2020).

SCM COMPONENTS

The primary components of a sand filter include inlet(s), energy dissipation and forebay(s), the surcharge volume, filter material, an underdrain (for no- and partial-infiltration sections), and an outlet structure (Figure SF-1 and Table SF-2). The primary outlet for the Water Quality Capture Volume (WQCV) is typically an underdrain or infiltration into the underlying soil. Surface outlet structures are provided to convey flows that exceed the WQCV design volume and for facilities designed to manage the EURV and 100-year design events.

TABLE SF-2. SF COMPONENTS

COMPONENT	INTENT
Inlet	Allows stormwater to enter the SCM.
Forebay	Facilitates removal of trash and coarse sediments.
Energy Dissipation	Minimizes potential for erosion of sand filter surface. Often incorporated into forebay.
Surcharge Volume	Provides temporary storage volume needed for attenuation of design flows.
Filter Material	Removes pollutants in runoff by filtration through porous media (sand).
Underdrain with Orifice Release	Collects and slowly releases the WQCV over 12 hours to reduce erosion in the receiving stream and enhance treatment by increasing contact time with the media.
Outlet Structure	Conveys stormwater flows that exceed the design volume.

SITE CONSIDERATIONS

When the tributary watershed includes ongoing phased construction, sparsely vegetated areas, or steep slopes in sandy soils, consider another stormwater control measure (SCM) or provide robust pretreatment before runoff from these areas reach the sand filter. Sand filters are susceptible to clogging and are better suited to stable watersheds without excessive sediment loading.

See Section 3.0 Site Assessment and Section 4.3 Filtration and Infiltration Section Development of this chapter to determine the section of the sand filter based on site-specific conditions.

Sand filters are often used in industrial settings, where pollutants may be present that warrant use of a lined system to prevent subsurface pollutant mobilization.

COMMUNITY VALUES

Sand filters are highly functional SCMs that are well suited for industrial and large-scale commercial land uses that have generally lower aesthetic expectations. With an exposed sand bed and lack of vegetation, a sand filter is not the best SCM option for highly visible sites such as boutique commercial or mixed-use development, where aesthetics are important to business owners and property managers. Sand filters are also not generally ideal options for low-density residential or park and open space-type sites, where a more naturalistic aesthetic is generally expected. However, if properly screened with shrubs or other site elements (e.g., site walls, raised planters), a sand filter can be made inconspicuous and may be successfully integrated into almost any type of land use. When located in a visible area, frequent inspection and maintenance are critical to public acceptance because an unmaintained sand filter can become an unattractive weed patch with sediment and trash deposits.

While successfully integrating a sand filter into certain types of sites may be aesthetically challenging, their straightforward design and function provides some distinct advantages over other SCMs that require vegetation, including water conservation and a simplified maintenance regime. If creatively located and designed and well maintained, sand filters can be an appropriate and effective stormwater quality treatment solution for a wide variety of sites.

MAINTENANCE

Periodic maintenance for sand filters includes removing sediment, scarifying the filter surface, and removal and/or replacement of the top layer of the media. More detailed maintenance recommendations for sand filters are provided in Chapter 6 of this manual. During design, the following should be considered to ensure ease of maintenance over the long-term:

- Provide forebays for inlets to remove coarse sediments and trash in a manner that can be easily accessed for maintenance.
- Provide energy dissipation to minimize erosion of the filter bed.
- Do not put a filter sock on the underdrain. This is not necessary and can cause the sand filter to clog, resulting in ponded water for extended periods.
- Install cleanouts to enable camera inspection immediately following construction to ensure the underdrain pipe was not crushed during construction. Cleanouts also facilitate maintenance over the life of the facility. Consider locating cleanouts in the side slopes of the basin and above the depth of ponding to prevent short circuiting of flow through the cleanouts to the underdrain.
- For facilities with side slopes, consider vegetated side slopes to pre-treat runoff by filtering (straining). This will reduce the frequency of maintenance. Use native vegetation to limit the need for irrigation of side slopes to the initial establishment period, with supplemental irrigation as needed during prolonged drought periods. Side slopes also may be stabilized with alternative permeable, non-erosive cover such as appropriately sized aggregate.

provided that the material is designed to stay in place under design conditions up to and including the 100-year event.

- If a sand filter is located in an underground vault, design the vault in a way that allows for routine scarification of the filter surface and eventual media replacement. Multiple access manholes are typically required, and vaults must be designed with adequate clearance for access by equipment and maintenance personnel (an underground sand filter is a confined space). In some installations, grates can be used instead of solid covers, allowing for easier inspection and maintenance. Design of sand filter vaults is not addressed in detail in this fact sheet and requires additional design considerations to address issues such as biofouling, multi-chamber pretreatment considerations and other factors (DC DOEE 2020, Davis et al. 2022).
- When screening is provided for aesthetic reasons, maintenance access must still be provided.

DESIGN PROCEDURES AND CRITERIA

The following steps outline the design procedure and criteria for a sand filter:

1. **Subsurface Exploration and Determination of a No-Infiltration, Partial Infiltration or Full Infiltration Section:** See Section 3.0 Site Assessment and Section 4.0 Filtration and Infiltration Systems of this chapter to determine the most appropriate section design for the sand filter based on site conditions. Given that sand filters are often used in industrial settings where subsurface pollutant mobilization should be avoided, lined systems (no-infiltration sections) should be considered based on site conditions.
2. **Inlets, Energy Dissipation, Forebays and Pretreatment:** Use inlet features that create sheet flow or shallow flow conditions to evenly distribute flow. Provide energy dissipation and a forebay at all locations where concentrated flows enter the sand filter. The only inlets that do not require energy dissipation and a forebay are sheet flow inlets to the sand filter. All piped or channeled inlets to sand filters require energy dissipation and forebays, ranging from concrete pads for smaller facilities to more formal structures for larger installations. See Section 5.0 SCM Inflow Features of this chapter for additional guidance. In addition to properly sized forebay(s), other types of pretreatment such as grass buffers, hydrodynamic separators, and trash collection devices may also be considered. Underground sand filters in vaults must have a separate pretreatment sedimentation chamber or pretreatment device.
3. **Design Storage Volume:** Calculate the storage volume provided above the sand bed of the basin equal to the WQCV based on a 12-hour drain time, after accounting for runoff-reduction SCMs in the contributing watershed. Determine the required WQCV or EURV (watershed inches of runoff) using Figure 3-2 of Chapter 3 of this manual (for WQCV) or equations provided in the Storage chapter of Volume 2 (for EURV).



Photograph SF-2. Underground sand filter at Denver Botanic Gardens has a grated top, which enables inspection and maintenance.



Photograph SF-3. Sand filter with incorporation of minor event flood attenuation provides water quality and detention for a substation.

4. **Sand Filter Geometry:** Sand filter geometry considerations include minimum surface area, side slope conditions and maximum ponding depth:

- **Minimum Filter Surface Area:** Use equation SF-1 to calculate the minimum filter area for the WQCV, which is the flat surface area of the sand filter. Sediment will deposit on the filter area of the sand filter. Therefore, if the filter area is too small, the filter may clog prematurely. If clogging of the filter is of particular concern, increasing the filter area will decrease the frequency of maintenance. Equation SF-1 provides the minimum filter area, allowing for some of the volume to be stored beyond the area of the filter. Note that the total volume must also equal or exceed the design volume.

$$A_p = 0.0125 \cdot A \cdot I \quad \text{Equation SF-1}$$

Where:

A_p = minimum filter area (flat surface area) (ft²)

A = area tributary to the sand filter (ft²)

I = imperviousness of area tributary to the sand filter (percent expressed as a decimal)

- **Side Slopes:** The side slopes of the basin should be stable and maintainable. For vegetated side slopes, a slope no steeper than 4:1 (horizontal: vertical) is recommended. Use vertical walls where side slopes are steeper than 3:1. Using milder side slopes is an effective way to manage the maximum ponding depth of the WQCV in the SCM when space constraints allow.

When side slopes use alternative permeable, non-erosive cover such as the aggregate shown in Photograph SF-3, the engineer must perform analysis to demonstrate the cover material placed on the slope will resist movement from tractive forces under design conditions. This analysis should consider the condition when the sand filter is filling and the side slopes may be exposed to overland runoff, as well as the condition when the facility is full and the spillway is operating.

- **Maximum Ponding Depth:** The maximum recommended ponding depth is governed by the minimum filter area and basin geometry. For Full Spectrum Detention (FSD) facilities, limiting the WQCV depth to 18 inches will generally help to avoid excessive depths for the EURV and 100-year storage volume. Greater WQCV depths will require more frequent maintenance and may drive the depths of the EURV and 100-year storage volumes to undesirable levels for FSD facilities. Particularly in publicly accessible urban areas, consider surrounding land use and public safety when greater ponding depths are included in the design.

5. **Underdrain System, Impermeable Liner, and Geotextile Separator Fabric:** See Section 4.0 Filtration and Infiltration Systems of this chapter for guidance and criteria based on the type of filtration and infiltration

SAND FILTER MEDIA AMENDMENTS

An area of evolving research for sand filter media includes various amendments that enhance performance for specific pollutants (e.g., bacteria, metals, nutrients). For example, iron-enhanced sand filter designs target phosphorus removal (MPCA 2022; Erickson and Gulliver 2010). Other examples include calcite/limestone, zeolite, aluminum-based media, fly ash, olivine and various proprietary media (Davis et al. 2022). Research has also included layering of various media types to target specific pollutants (Prabhukumar et al. 2015).

Designers may consider use of novel amendments to improve water quality performance, provided that the functions and performance of media are maintained or improved. For example, novel amendments should not cause increases in nutrient or metals export or decrease the infiltration rate relative to MHPD's recommended media.

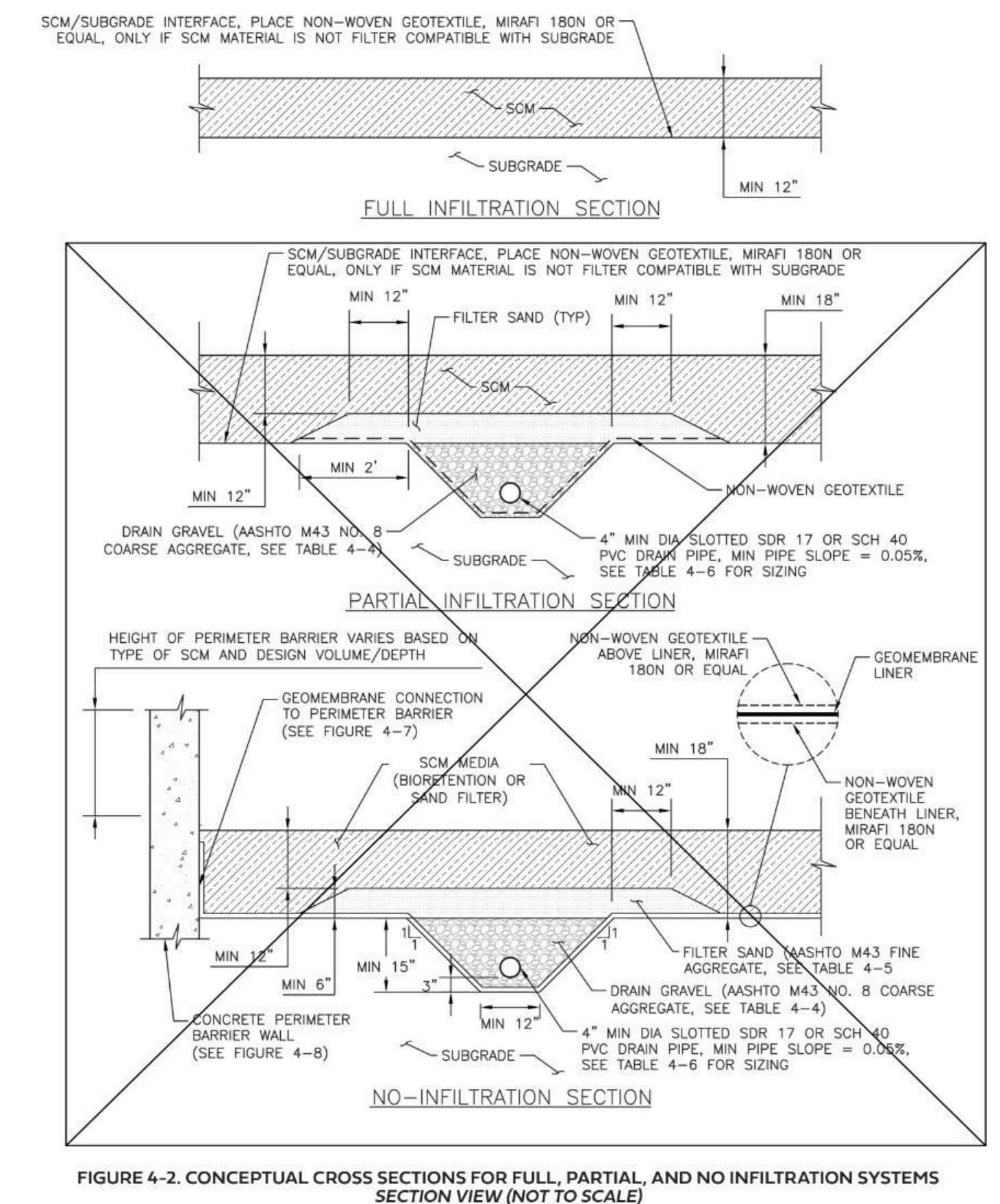
system selected. Underdrain systems in sand filter basins consist of a slotted PVC pipe placed within a layer of drain gravel beneath the filter sand.

6. **Filter Material:** Provide, at a minimum, an 18-inch layer of AASHTO M43 fine aggregate (filter sand), as shown in Table 4-5 in Section 4.3.3 of this chapter. Maintain a flat surface on the top of the sand bed.
7. **Outlet:** Drain the underdrain to the outlet structure and use an orifice plate to drain the WQCV over approximately 12 hours. Section 6.0 SCM Outflow Features of this chapter includes conceptual details for the underdrain and orifice outlet for attenuating both the WQCV and larger volumes via full spectrum detention. For facilities that are designed to treat the EURV and/or 100-year flood, flows greater than the WQCV are orifice-controlled and released to the surface, rather than forced through the sand filter. Provide a spillway for larger events that will convey overflows to the receiving drainage system without adversely affecting adjacent structures or infrastructure. Use the simplified orifice equation in Section 6.1 of this chapter or the MHPD-Detention workbook to size the orifice. MHPD-Detention also aids with the design of outlet controls for larger runoff events.

CONSTRUCTION CONSIDERATIONS

Proper construction of sand filters involves careful attention to material specifications and construction details. During construction, implement these practices:

- Protect area from excessive sediment loading during construction. The portion of the site draining to the sand filter must be stabilized before allowing flow into the sand filter.
- When using an impermeable liner, ensure enough slack in the liner to allow for backfill, compaction, and settling without tearing the liner as described in Section 4.0 Filtration and Infiltration Systems of this chapter. Concrete spray-on liners may also be used.
- Avoid application of herbicides for weed control within the sand filter and areas draining directly into the sand filter (e.g., embankments).



Partial and Full Infiltration Systems: For partial and full infiltration sections, scarify the subgrade to a minimum depth of 12 inches and level the surface. Provide only limited compaction, where necessary, to limit settlement of the SCM.

For partial and full infiltration sections, place equipment outside limits of the SCM or use low-ground-pressure (LGP) tracked equipment for subgrade grading to limit subgrade compaction.

Refer to the SCM fact sheets in this chapter for specific compaction requirements for different types of SCMs. For SCMs such as permeable pavements that include coarse aggregates, those materials may not be testable for compaction using a method based on specified density (e.g., nuclear density testing). Consider a method specification (e.g., number of passes of a specified vibratory compactor) for those materials. The appropriate number of passes is dependent on the type of equipment and depth of the layer.

REVISION DESCRIPTION (DESCRIPTION)	
REVISION DATE	
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SCALE: NTS	
PROJECT #: 2403-0094 CHECKED BY: BML DRAWN BY: EDM	
DATE: 10/02/2024	
SHEET #	G.7
8 of 11	

APEX WASTE SOLUTIONS - 560-570 AIR LANE

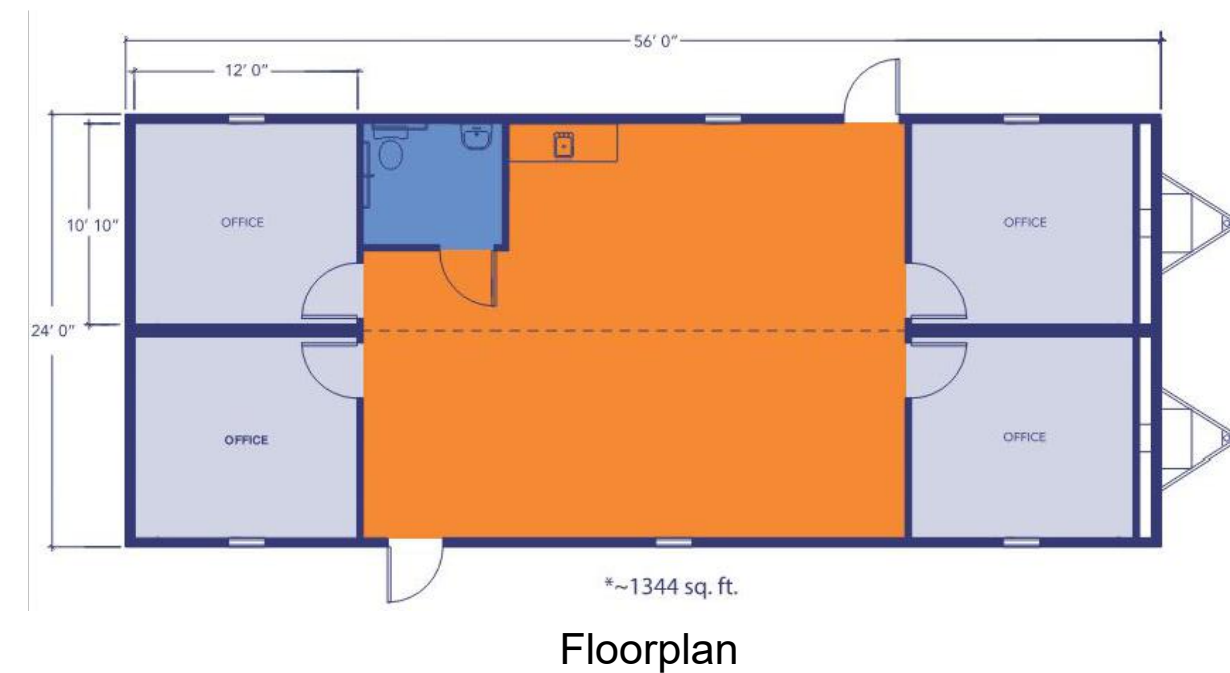
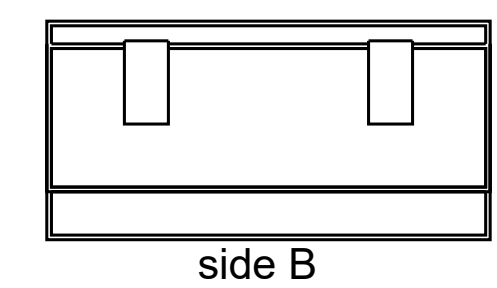
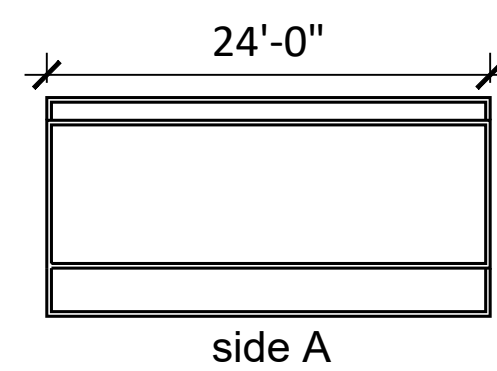
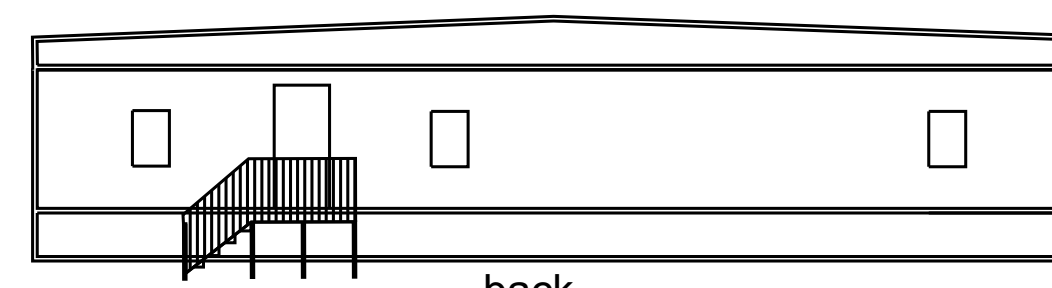
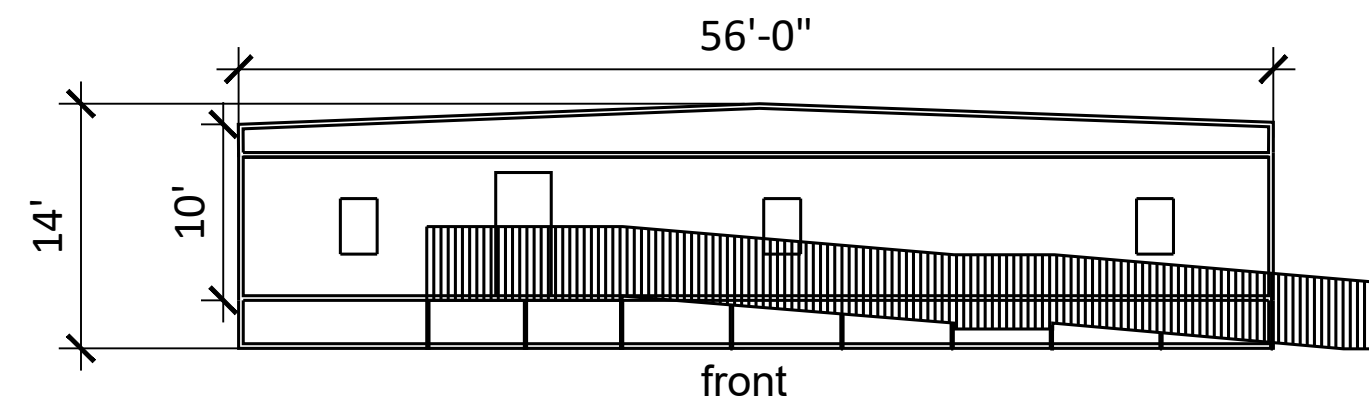
A PORTION OF THE SOUTHWEST QUARTER OF SECTION 15, TOWNSHIP 11 SOUTH,
RANGE 65 WEST OF THE 6TH P.M., EL PASO COUNTY, COLORADO
EL PASO COUNTY, COLORADO

ELEVATION AND FLOOR PLANS

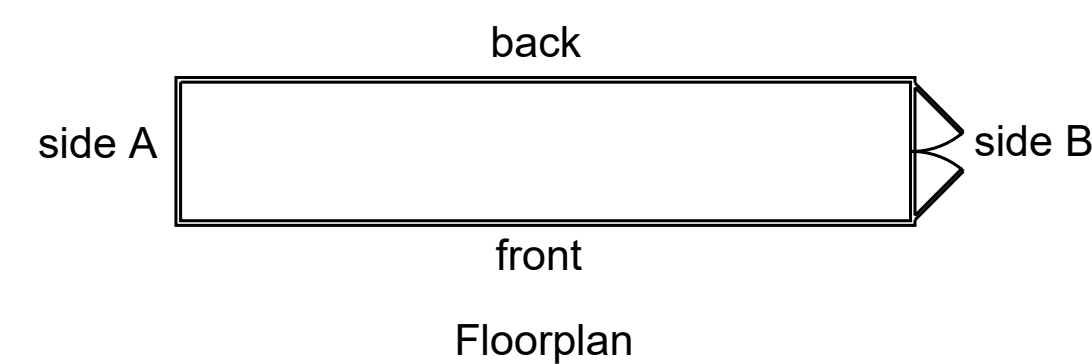
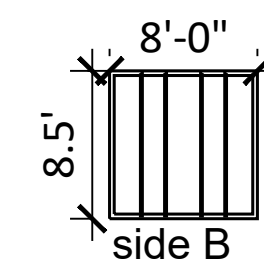
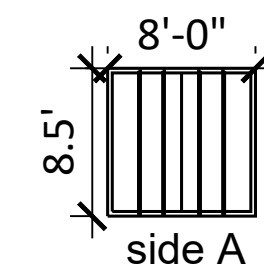
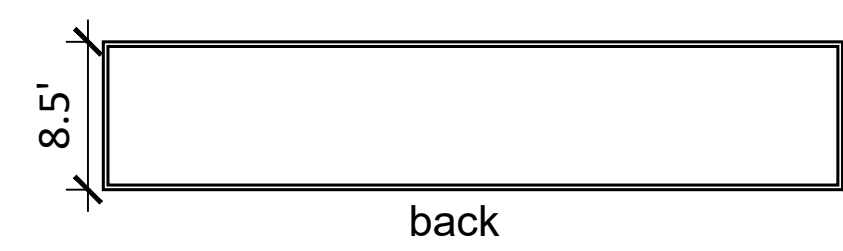
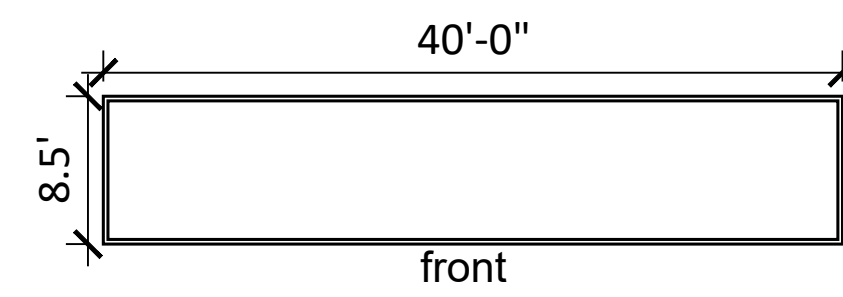
SITE SUMMARY

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Total Area: 7.62 Acres
Existing land use: Vacant Commercial
Proposed land use: Commercial
Current Zoning: I-2 CAD-O

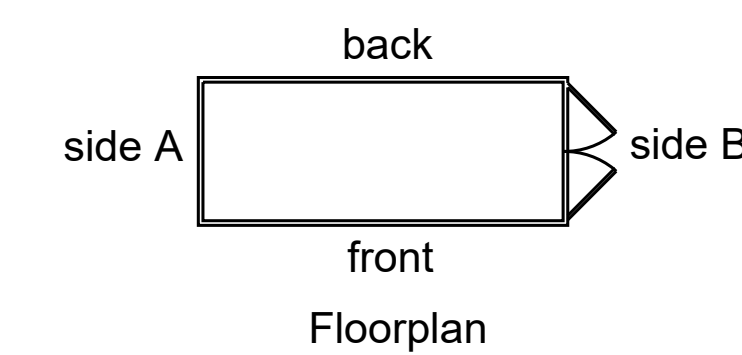
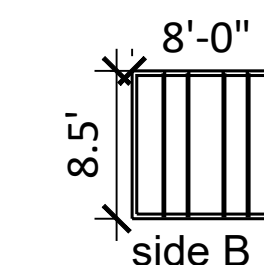
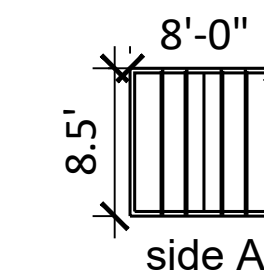
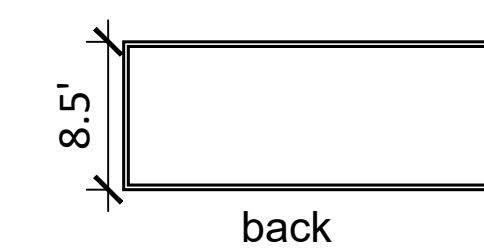
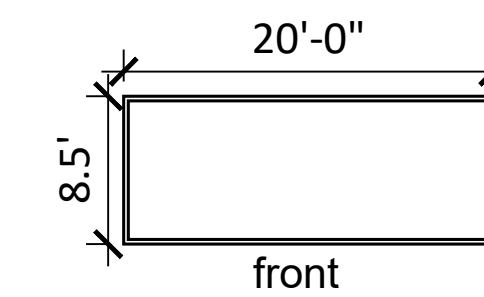
24'x56' Vesta Modular Office and Operations Trailers



40' Conex Container



20' Conex Container



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PLANNER / LANDSCAPE ARCHITECT
BY ASSOCIATION WITH

560-570 AIR LANE

SITE DEVELOPMENT PLAN

9210 MORGAN RD
COLORADO SPRINGS
CO, 80908

PROJECT INFO
DATE: 11/01/24
PROJECT MGR: K. JOHNSON
PREPARED BY: A. ROMAN

STAMP

ISSUE INFO

DATE:	BY:	DESCRIPTION:

ELEVATION AND FLOOR PLANS

11

11 of 11

PLAN FILE #