

OPERATIONS & MAINTENANCE PLAN (O&M)

WATER QUALITY POND

for

7315 COLE VIEW

Colorado Springs, Colorado

February 2024

PCD File No. PPR2344

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1.0 BACKGROUND

This document provides General Guidelines and Standard Operating Procedures for Operation and Maintenance of stormwater facilities.

Water Quality ponds are a common type of Stormwater BMP utilized within the Front Range of Colorado. A Water Quality pond is a sedimentation basin designed to provide water quality treatment to the Water Quality Capture Volume (WQCV) only. It is not designed to capture the flows from a 100-year storm event or to treat them. The flows captured in the Water Quality pond are released slowly over a 40-hour period through the use of an orifice plate and an outlet structure. Water Quality ponds are considered to be “dry” because the majority of the basin is designed not to have a significant permanent pool of water remaining between runoff events.

2.0 SITE SPECIFIC INFORMATION

7315 Cole View is located in Colorado Springs, El Paso County, Colorado, within the northeast quarter of Section 8, Township 14 South, Range 65 West of the 6th P.M. The property is bounded by Sand Creek to the west, a commercial lot to the north, a vacant commercial lot to the east and a residential neighborhood to the south. The lot is approximately 1.83 acres in size and is proposed as a Commercial property. The proposed site is to consist of a permanent 10,000 sf building, parking lot, storage yard and a water quality pond.

The proposed Water Quality pond is required to be 0.024 ac-ft for the WQCV, the actual pond has been designed to be 0.133 ac-ft, which is significantly larger than required and therefore will capture more than the Water Quality Capture Volume. This will also aid in runoff reduction for the larger storm events. The Water Quality pond captures and treats nearly the entire site. Although not required for a Water Quality pond, the proposed facility will include a concrete forebay where the flows enter the pond for sediment removal, a concrete trickle channel, and a micropool to hold a small amount of water to keep sediment and floatables from blocking the outlet orifice.

3.0 INSPECTING WATER QUALITY PONDS

Access & Easements

Inspection or maintenance personnel may utilize the figures located in the appendix containing the location(s) of the access points and potential maintenance easements of the facility within this development. The gravel maintenance access road to the bottom of the pond has been designed to be 10' wide, which is less than the required 15' width, therefore a skid steer will be required to access the pond bottom. The access road has also been designed at a 15% slope, which is less than the required 12% max slope. These minor deviations are acceptable due to the small size of the pond.

Features

Water Quality facilities have a number of features that are designed to serve a particular function. Many times the proper function of one feature depends on another. For

example, if a forebay is not properly maintained, it could negatively affect the performance of a feature downstream (trickle channel, micropool, etc.). Therefore, it is critical that each feature of the Water Quality facility is properly inspected and maintained to ensure that the overall facility functions as it was intended. Below is a list and description of the most common features within a facility and the corresponding maintenance inspection items that can be anticipated:

Typical Inspection & Maintenance Requirements Matrix

Facility Features	Sediment Removal	Mowing/ Weed control	Trash & Debris Removal	Erosion	Overgrown Vegetation Removal	Standing Water (mosquito/ algae control)	Structure Repair
Inflow Points (outfalls)	X		X	X	X		X
Forebay	X		X			X	X
Low-flow channel	X		X	X	X		X
Bottom Stage	X	X	X	X	X	X	
Micropool	X		X		X	X	X
Outlet Works	X		X			X	X
Emergency Spillway			X	X	X		X
Upper Stage		X	X	X	X		
Embankment		X	X	X	X		

Inflow Points

Inflow Points or Outfalls are the point source of the stormwater discharge into the facility. An inflow point is commonly a storm sewer pipe with a flared end section that discharges into the facility. In some instances, an inflow point could be a drainage channel or ditch that flows into the facility.

An energy dissipater (riprap or hard armor protection) is typically immediately downstream of the discharge point into the facility to protect from erosion. In some cases, the storm sewer outfall can have a toe-wall or cut-off wall immediately below the structure to prevent undercutting of the outfall from erosion.

The typical maintenance items that are found with inflow points are as follows:

a. *Riprap Displaced* – Many times, because the repeated impact/force of water, the riprap can shift and settle. If any portion of the riprap apron appears to have settled, soil is present between the riprap, or the riprap has shifted, maintenance may be required to ensure future erosion is prevented.

b. *Erosion Present/Outfall Undercut* – In some situations, the energy dissipater may not have been sized, constructed, or maintained appropriately and erosion has occurred.

Any erosion within the vicinity of the inflow point will require maintenance to prevent damage to the structure(s) and sediment transport within the facility.

c. *Sediment Accumulation* – Because of the turbulence in the water created by the energy dissipater, sediment often deposits immediately downstream of the inflow point. To prevent a loss in hydraulic performance of the upstream infrastructure, sediment that accumulates in this area must be removed in a timely manner.

d. *Structural Damage* – Structural damage can occur at anytime during the life of the facility. Typically, for an inflow, the structural damage occurs to the pipe flared end section (concrete or steel). Structural damage can lead to additional operating problems with the facility, including loss of hydraulic performance.

e. *Woody Growth/Weeds Present* – Undesirable vegetation can grow in and around the inflow area to a facility that can significantly affect the performance of the drainage facilities discharging into the facility. This type of vegetation includes trees (typically cottonwoods) and dense areas of shrubs (willows). If woody vegetation is not routinely mowed/removed, the growth can cause debris/sediment to accumulate, resulting in blockage of the discharge. Also, tree roots can cause damage to the structural components of the inflow. Routine maintenance is essential for trees (removing a small tree/sapling is much cheaper and “quieter” than a mature tree). In addition, noxious weeds growing in the facility can result in the loss of desirable native vegetation and impact adjacent open spaces/land.

Forebay

A forebay is a solid surface (pad), typically constructed of concrete, immediately downstream of the inflow point. The forebay is designed to capture larger particles and trash to prevent them from entering the main portion of the facility. The solid surface is designed to facilitate mechanical sediment removal (skid steer). The forebay typically includes a small diameter discharge pipe or v-notch weir on the downstream end and designed to drain the forebay in a specified period of time to promote sedimentation. The forebays vary in size and depth depending on the design and site constraints.

The typical maintenance items that are found with forebays are as follows:

a. *Sediment/Debris Accumulation* – Because this feature of the facility is designed to provide the initial sedimentation, debris and sediment frequently accumulate in this area. If the sediment and debris is not removed from the forebay on a regular basis, it can significantly affect the function of other features within the facility. Routine sediment removal from the forebay can significantly reduce the need for dredging of the main portion of the facility using specialized equipment (long reach excavators). Routine removal of sediment from the forebay can substantially decrease the long-term sediment removal costs of a facility.

b. *Concrete Cracking/Failing* – The forebay is primarily constructed of concrete, which cracks, spalls, and settles. Damage to the forebay can result in decreased performance and impact maintenance efforts.

c. *Drain Pipe/Weir Clogged* – Many times the drainpipe or weir can be clogged with debris, and prevent the forebay from draining properly. If standing water is present in the forebay (and there is not a base flow), the forebay is most likely not draining properly. This can result in a decrease in performance and create potential nuisances with stagnant water (mosquitoes).

d. *Weir/Drain Pipe Damaged* – Routine maintenance activities, vandalism, or age may cause the weir or drain pipe in the forebay to become damaged. Weirs are typically constructed of concrete, which cracks and spalls. The drainpipe is typically smaller in diameter and constructed with plastic, which can fracture.

Trickle Channel (Low-Flow)

The trickle channel conveys stormwater from the forebay to the micro-pool of the facility. The trickle channel is typically made of concrete. However, grass lined (riprap sides protected) is also common and can provide for an additional means of water quality within the facility. The trickle channel is typically 6-9 inches in depth and can vary in width.

The typical maintenance items that are found with trickle channels are as follows:

a. *Sediment/Debris Accumulation* – Trickle channels are typically designed with a relatively flat slope that can promote sedimentation and the collection of debris. Also, if a trickle channel is grass lined it can accumulate sediment and debris at a much quicker rate. Routine removal of accumulated sediment and debris is essential in preventing flows from circumventing the trickle channel and affecting the dry storage portion of the pond.

b. *Concrete/Riprap Damage* – Concrete can crack, spall, and settle and must be repaired to ensure proper function of the trickle channel. Riprap can also shift over time and must be replaced/repared as necessary.

c. *Woody Growth/Weeds Present* – Because of the constant moisture in the area surrounding the trickle channel, woody growth (cottonwoods/willows) can become a problem. Trees and dense shrub type vegetation can affect the capacity of the trickle channel and can allow flows to circumvent the feature.

d. *Erosion Outside of Channel* – In larger precipitation events, the trickle channel capacity will likely be exceeded. This can result in erosion immediately adjacent to the trickle channel and must be repaired to prevent further damage to the structural components of the facility.

Bottom Stage

The bottom stage is at least 1.0 to 2.0 feet deeper than the upper stage and is located in front of the outlet works structure. The bottom stage is designed to store the smaller runoff events, assists in keeping the majority of the basin bottom dry resulting in easier maintenance operations, and enhances the facilities pollutant removal capabilities. This area of the facility may develop wetland vegetation.

The typical maintenance items that are found with the bottom stage are as follows:

a. *Sediment/Debris Accumulation* – The micro-pool can frequently accumulate sediment and debris. This material must be removed to maintain pond volume and proper function of the outlet structure.

b. *Woody Growth/Weeds Present* - Because of the constant moisture in the soil surrounding the micro-pool, woody growth (cottonwoods/willows) can create operational problems for the facility. If woody vegetation is not routinely mowed/removed, the growth can cause debris/sediment to accumulate outside of the micro-pool, which can cause problems with other facility features. Also, tree roots can cause damage to the structural components of the outlet works. Routine management is essential for trees (removing a small tree/sapling is much cheaper and “quieter” than a mature tree).

c. *Bank Erosion* – The micro-pool is usually a couple feet deeper than the other areas of the ponds. Erosion can be caused by water dropping into the micro-pool if adequate protection/armor is not present. Erosion in this area must be mitigated to prevent sediment transport and other facility feature damage.

d. *Mosquitoes/Algae Treatment* – Nuisance created by stagnant water can result from improper maintenance/treatment of the micro-pool. Mosquito larvae can be laid by adult mosquitoes within the permanent pool. Also, aquatic vegetation that grows in shallow pools of water can decompose causing foul odors. Chemical/mechanical treatment of the micro-pool may be necessary to reduce these impacts to adjacent homeowners.

e. *Petroleum/Chemical Sheen* – Many indicators of illicit discharges into the storm sewer systems will be present in the micro-pool area of the facility. These indicators can include sheens, odors, discolored soil, and dead vegetation. If it is suspected that an illicit discharge has occurred, contact the supervisor immediately. Proper removal/mitigation of contaminated soils and water in the facility is necessary to minimize any environmental impacts downstream.

Micro-pool

The micro-pool is a concrete or grouted boulder walled structure directly in front of the outlet works. At a minimum, the micropool is 2.5 feet deep and is designed to hold water. The micro-pool is critical in the proper function of the facility; it allows suspended sediment to be deposited at the bottom of the micro-pool and prevents these sediments from being deposited in front of the outlet works causing clogging of the outlet structure, which results in marshy areas within the top and bottom stages.

The typical maintenance items that are found with micro-pools are as follows:

a. *Sediment/Debris Accumulation* – The micro-pool can frequently accumulate sediment and debris. This material must be removed to maintain pond volume and proper function of the outlet structure.

b. *Woody Growth/Weeds Present* - Because of the constant moisture in the soil surrounding the micro-pool, woody growth (cottonwoods/willows) can create operational problems for the facility. If woody vegetation is not routinely mowed/removed, the growth can cause debris/sediment to accumulate outside of the micro-pool, which can cause problems with other facility features. Also, tree roots can cause damage to the structural components of the outlet works. Routine management is essential for trees (removing a small tree/sapling is much cheaper and "quieter" than a mature tree).

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Outlet Works

The outlet works is the feature that drains the facility in specified quantities and periods of time. The outlet works is typically constructed of reinforced concrete into the embankment of the facility. The concrete structure typically has steel orifice plates anchored/embedded into it to control stormwater release rates. The larger openings (flood control) on the outlet structure typically have trash racks over them to prevent clogging. The water quality orifice plate (smaller diameter holes) will typically have a well screen covering it to prevent smaller materials from clogging it. The outlet structure is the single most important feature in the facility operation. Proper inspection and maintenance of the outlet works is essential in ensuring the long-term operation of the facility.

The typical maintenance items that are found with the outlet works are as follows:

a. *Trash Rack/Well Screen Clogged* – Floatable material that enters the facility will most likely make its way to the outlet structure. This material is trapped against the trash racks and well screens on the outlet structure (which is why they are there). This material must be removed on a routine basis to ensure the outlet structure drains in the specified design period.

b. *Structural Damage* - The outlet structure is primarily constructed of concrete, which can crack, spall, and settle. The steel trash racks and well screens are also susceptible to damage.

c. *Orifice Plate Missing/Not Secure* – Many times residents, property owners, or maintenance personnel will remove or loosen orifice plates if they believe the pond is not draining properly. Any modification to the orifice plate(s) will significantly affect the designed discharge rates for water quality and/or flood control. Modification of the orifice plates is not allowed without approval from El Paso County.

d. *Manhole Access* – Access to the outlet structure is necessary to properly inspect and maintain the facility. If access is difficult or not available to inspect the structure, chances are it will be difficult to maintain as well.

e. *Woody Growth/Weeds Present* - Because of the constant moisture in the soil surrounding the outlet works, woody growth (cottonwoods/willows) can create operational problems for the facility. If woody vegetation is not routinely mowed/removed, the growth can cause debris/sediment to accumulate around the outlet works, which can cause problems with other facility features. Also, tree roots can cause damage to the structural components of the outlet works. Routine management is essential for trees (removing a small tree/sapling is much cheaper and “quieter” than a mature tree).

Emergency Spillway

An emergency spillway is designed to serve as the overflow in the event the volume of the pond is exceeded. The emergency spillway is typically armored with riprap (or other hard armor) and is sometimes buried with soil. The emergency spillway is typically a weir (notch) in the pond embankment. Proper function of the emergency spillway is essential to ensure flooding does not affect adjacent properties.

The typical maintenance items that are found with emergency spillways are as follows:

a. *Riprap Displaced* – As mentioned before, the emergency spillway is typically armored with riprap to provide erosion protection. Over the life of the facility, the riprap may shift or dislodge due to flow.

b. *Erosion Present* – Although the spillway is typically armored, stormwater flowing through the spillway can cause erosion damage. Erosion must be repaired to ensure the integrity of the basin embankment, and proper function of the spillway.

c. *Woody Growth/Weeds Present* – Management of woody vegetation is essential in the proper long-term function of the spillway. Larger trees or dense shrubs can capture larger debris entering the facility and reduce the capacity of the spillway.

d. *Obstruction Debris* – The spillway must be cleared of any obstruction (man-made or natural) to ensure the proper design capacity.

Upper Stage (Dry Storage)

The upper stage of the facility provides the majority of the water quality flood detention volume. This area of the facility is higher than the micro-pool and typically stays dry, except during storm events. The upper stage is the largest feature/area of the basin.

Sometimes, the upper stage can be utilized for park space and other uses in larger facilities. With proper maintenance of the micro-pool and forebay(s), the upper stage should not experience much sedimentation; however, bottom elevations should be monitored to ensure adequate volume.

The typical maintenance items that are found with upper stages are as follows:

a. *Vegetation Sparse* – The upper basin is the most visible part of the facility, and therefore aesthetics is important. Adequate and properly maintained vegetation can greatly increase the overall appearance and acceptance of the facility by the public. In addition, vegetation can reduce the potential for erosion and subsequent sediment transport to the other areas of the pond.

b. *Woody Growth/Undesirable Vegetation* – Although some trees and woody vegetation may be acceptable in the upper basin, some thinning of cottonwoods and willows may be necessary. Remember, the basin will have to be dredged to ensure volume, and large trees and shrubs will be difficult to protect during that operation.

c. *Standing Water/Boggy Areas* – Standing water or boggy areas in the upper stage is typically a sign that some other feature in the pond is not functioning properly. Routine maintenance (mowing, trash removal, etc) can be extremely difficult for the upper stage if the ground is saturated. If this inspection item is checked, make sure you have identified the root cause of the problem.

d. *Sediment Accumulation* – Although other features within the facility are designed to capture sediment, the upper storage area will collect sediment over time. Excessive amounts of sedimentation will result in a loss of storage volume. It may be more difficult to determine if this area has accumulated sediment without conducting a field survey.

Below is a list of indicators:

1. Ground adjacent to the trickle channel appears to be several inches higher than concrete/riprap
2. Standing water or boggy areas in upper stage
3. Uneven grades or mounds
4. Micro-pool or Forebay has excessive amounts of sediment

e. *Erosion (banks and bottom)* – The bottom grades of the dry storage are typically flat enough that erosion should not occur. However, inadequate vegetative cover may result in erosion of the upper stage. Erosion that occurs in the upper stage can result in increased dredging/maintenance of the micro-pool.

f. *Trash/Debris* – Trash and debris can accumulate in the upper area after large events, or from illegal dumping. Over time, this material can accumulate and clog the facility outlet works.

g. *Maintenance Access* – Most facilities typically have a gravel/concrete maintenance access path to either the upper stage or forebay. This access path should be inspected to ensure the surface is still drivable. Some of the smaller facilities may not have maintenance access paths; however, the inspector should verify that access is available

from adjacent properties.

Miscellaneous

There are a variety of inspection/maintenance issues that may not be attributed to a single feature within the facility.

a. Access – Access needs to be maintained.

b. *Graffiti/Vandalism* – Damage to the facility infrastructure can be caused by vandals. If criminal mischief is evident, the inspector should forward this information to the local enforcement agency.

c. *Public Hazards* – Public hazards include items such as vertical drops of greater than 4-feet, containers of unknown/suspicious substances, exposed metal/jagged concrete on structures. If any hazard is found within the facility area that poses an immediate threat to public safety, contact the local emergency services at 911 immediately.

d. *Burrowing Animals/Pests* – Prairie dogs and other burrowing rodents may cause damage to the facility features and negatively affect the vegetation within the facility.

4.0 MAINTAINING WATER QUALITY PONDS

Maintenance Personnel

Maintenance personnel must be qualified to properly maintain the facility. Inadequately trained personnel can cause additional problems resulting in additional maintenance costs.

Equipment

It is imperative that the appropriate equipment and tools are taken to the field with the operations crew. The types of equipment/tools will vary depending on the task at hand. Below is a list of tools, equipment, and material(s) that may be necessary to perform maintenance on a facility:

1. Loppers/Tree Trimming Tools
2. Mowing Tractors
3. Trimmers (extra string)
4. Shovels
5. Rakes
6. All Surface Vehicle (ASVs)
7. Skid Steer
8. Back Hoe
9. Track Hoe/Long Reach Excavator
10. Dump Truck
11. Jet-Vac Machine
12. Engineers Level (laser)
13. Riprap (Minimum - Type M)

14. Filter Fabric
15. Erosion Control Blanket(s)
16. Seed Mix (Native Mix)
17. Illicit Discharge Cleanup Kits
18. Trash Bags
19. Tools (wrenches, screw drivers, hammers, etc)
20. Chain Saw
21. Confined Space Entry Equipment
22. Approved Inspection and Maintenance Plan

Some of the items identified above may not be needed for every maintenance operation. However, this equipment should be available to the maintenance operations crews should the need arise.

Safety

Vertical drops may be encountered in areas located within and around the facility. Avoid walking on top of retaining walls or other structures that have a significant vertical drop. Note if a vertical drop is identified within the facility that is greater than 48" in height.

Maintenance Categories and Activities

A typical Maintenance Program will consist of three broad categories of work: Routine, Restoration (minor), and Rehabilitation (major). Within each category of work, a variety of maintenance activities can be performed on a facility. A maintenance activity can be specific to each feature within the facility, or general to the overall facility. This section of the SOP explains each of the categories and briefly describes the typical maintenance activities for a facility.

A variety of maintenance activities are typical of facilities. The maintenance activities range in magnitude from routine trash pickup to the reconstruction of drainage infrastructure. Below is a description of each maintenance activity, the objectives, and frequency of actions:

Routine Maintenance Activities

The majority of this work consists of regularly scheduled mowing and trash and debris pickups for stormwater management facilities during the growing season. This includes items such as the removal of debris/material that may be clogging the outlet structure well screens and trash racks. It also includes activities such as weed control, mosquito treatment, and algae treatment. These activities normally will be performed numerous times during the year.

The Maintenance Activities are summarized below, and further described in the following sections.

Maintenance Activity	Minimum Frequency	Look for:	Maintenance Action
Mowing	Twice annually	Excessive grass height/aesthetics	Mow grass to a height of 4" to 6"
Trash/Debris Removal	Twice annually	Trash & debris in EDB	Remove and dispose of trash and debris
Outlet Works Cleaning	As needed -after significant rain events – twice annually min.	Clogged outlet structure; ponding water	Remove and dispose of debris/trash/sediment to allow outlet to function properly
Weed control	Minimum twice annually	Noxious weeds; Unwanted vegetation	Treat w/ herbicide or hand pull; Consult the local weed specialist
Mosquito Treatment	As needed	Standing water/mosquito habitat	Treat w/ EPA approved chemicals
Algae Treatment	As needed	Standing water/ Algal growth/green color	Treat w/ EPA approved chemicals

Summary of Restoration Maintenance Activities

Mowing

Occasional mowing is necessary to limit unwanted vegetation and to improve the overall appearance of the facility. Native vegetation should be mowed to a height of 4-to-6 inches tall. Grass clippings should be collected and disposed of properly.

Frequency – Routine - Minimum of twice annually or depending on aesthetics.

Trash/Debris Removal

Trash and debris must be removed from the entire facility area to minimize outlet clogging and to improve aesthetics. This activity must be performed prior to mowing operations.

Frequency – Routine – Prior to mowing operations and minimum of twice annually.

Outlet Works Cleaning

Debris and other materials can clog the outlet work's well screen, orifice plate(s) and trash rack. This activity must be performed anytime other maintenance activities are conducted to ensure proper operation.

Frequency - Routine – After significant rainfall event or concurrently with other maintenance activities.

Weed Control

Noxious weeds and other unwanted vegetation must be treated as needed throughout the facility. This activity can be performed either through mechanical means (mowing/pulling) or with herbicide. Consultation with the local Weed Inspector is highly recommended prior to the use of herbicide.

Frequency – Routine – As needed based on inspections.

Mosquito/Algae Treatment

Treatment of permanent pools is necessary to control mosquitoes and undesirable aquatic vegetation that can create nuisances. Only EPA approved chemicals/materials can be used in areas that are warranted.

Frequency – As needed.

Restoration Maintenance Activities

This work consists of a variety of isolated or small-scale maintenance or operational problems. Most of this work can be completed by a small crew, tools, and small equipment.

Maintenance Activity	Minimum Frequency	Look for:	Maintenance Action
Sediment Removal	As needed; typically every 1 –2 years	Sediment build-up; decrease in pond volume	Remove and dispose of sediment
Erosion Repair	As needed, based upon inspection	Rills/gullies forming on side slopes, trickle channel, other areas	Repair eroded areas Revegetate; address source of erosion
Vegetation Removal/Tree Thinning	As needed, based upon inspection	Large trees/wood vegetation in lower chamber of pond	Remove vegetation; restore grade and surface
Drain Cleaning/Jet Vac	As needed, based upon inspection	Sediment build-up /non draining system	Clean drains; Jet Vac if needed

Major Sediment Removal

Major sediment removal consists of removal of large quantities of sediment or removal of sediment from vegetated areas. Care shall be given when removing large quantities of sediment and sediment deposited in vegetated areas. Large quantities of sediment need to be carefully removed, transported and disposed of. Vegetated areas need

special care to ensure design volumes and grades are preserved.

Frequency – Nonroutine – Repair as needed based upon inspections.

Major Erosion Repair

Major erosion repair consist of filling and revegetating areas of severe erosion. Determining the cause of the erosion as well as correcting the condition that caused the erosion should also be part of the erosion repair. Care should be given to ensure design grades and volumes are preserved.

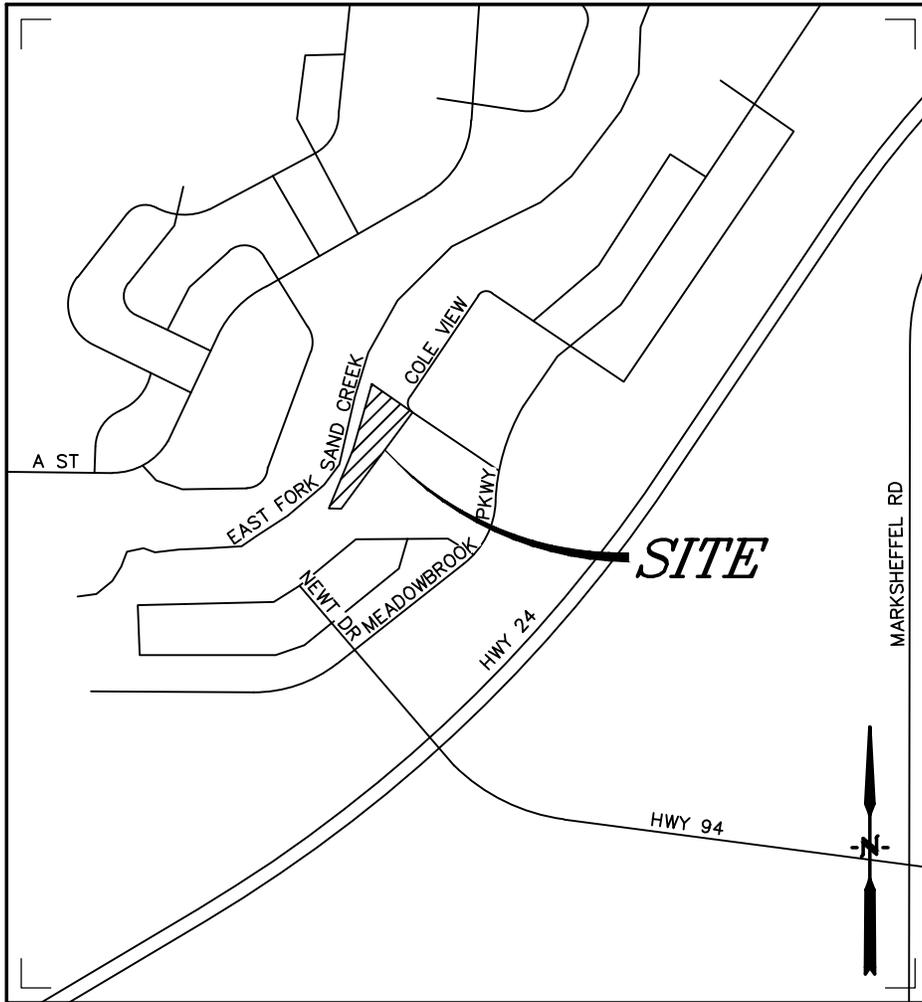
Frequency – Nonroutine – Repair as needed based upon inspections.

Structural Repair

A facility includes a variety of structures that can deteriorate or be damaged during the course of routine maintenance. These structures are constructed of steel and concrete that can degrade or be damaged and may need to be repaired or re-constructed from time to time. These structures include items like outlet works, trickle channels, forebays, inflows and other features. Inhouse operations staff can perform some of the minor structural repairs. Major repairs to structures may require input from a structural engineer and specialized contractors.

Frequency – Nonroutine – Repair as needed based upon inspections.

APPENDIX



Vicinity Map
Not to scale



**7315 COLE VIEW
COLORADO SPRINGS, CO
VICINITY MAP**

Drexel, Barrell & Co.
Engineers • Surveyors

DATE:

DWG. NO.

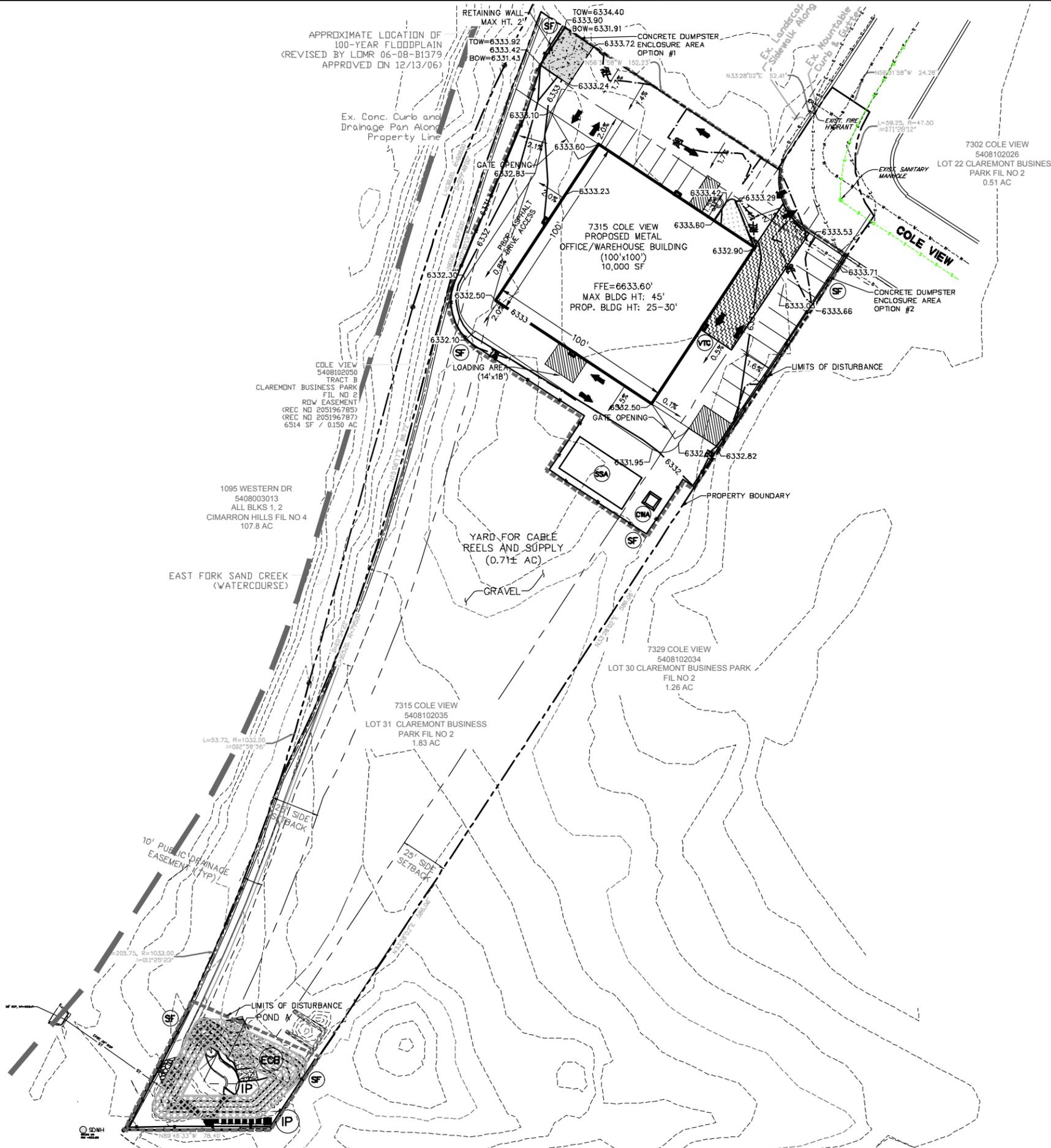
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VMAP

SHEET 1 OF 1

APPROXIMATE LOCATION OF 100-YEAR FLOODPLAIN (REVISED BY LDMR 06-08-B1379 APPROVED ON 12/13/06)

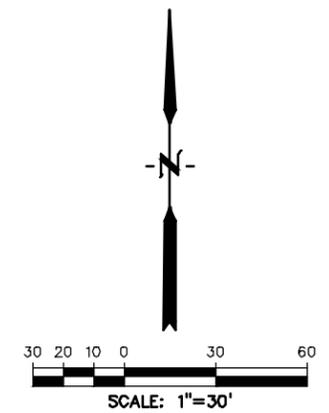


LEGEND

- EX. MINOR CONTOUR
- EX. MAJOR CONTOUR
- PR. MINOR CONTOUR
- PR. MAJOR CONTOUR
- CURB FLOWLINE
- PROPERTY BOUNDARY
- 100-YR FLOODPLAIN
- EXISTING GAS LINE
- EXISTING ELECTRIC LINE
- DIRECTION OF FLOW
- LIMITS OF DISTURBANCE/ CONSTRUCTION BOUNDARY
- CUT/FILL LINE
- SILT FENCE (INITIAL)
- VEHICLE TRACKING CONTROL (INITIAL)
- CONCRETE WASHOUT AREA (INTERIM)
- STABILIZED STAGING AREA (INITIAL)
- INLET PROTECTION (INTERIM)
- EROSION CONTROL BLANKET (INTERIM)

NOTES:

1. REFERENCE APPROVED FINAL LANDSCAPE PLANS FOR PERMANENT STABILIZATION REQUIREMENTS AND PROPOSED VEGETATION. NO EXISTING VEGETATION ON SITE IS TO REMAIN.
2. NON-STRUCTURAL CONTROLS SUCH AS STREET SWEEPING WILL BE REQUIRED ON AN AS NEEDED BASIS TO BE DETERMINED DURING CONSTRUCTION.
3. WASTE DISPOSAL BIN LOCATIONS ARE TBD AND WILL BE ADDED TO THE SWMP ONCE DETERMINED BY THE CONTRACTOR.
4. ONSITE LOCATION OF THE SWMP IS TBD AND WILL BE ADDED TO THE SWMP ONCE DETERMINED BY THE CONTRACTOR.
5. THE NEED FOR DEWATERING IS NOT ANTICIPATED. IN THE EVENT THAT DEWATERING BECOMES NECESSARY THE CONTRACTOR, WITH INPUT FROM THE COUNTY STORMWATER INSPECTOR, WILL DESIGN THE LOCATIONS OF DIVERSION, PUMP & DISCHARGES.
6. LOCATION OF AREAS USED FOR STORAGE OF BUILDING MATERIALS, SOILS, OR WASTES ARE TBD AND WILL BE ADDED TO THE SWMP ONCE DETERMINED BY THE CONTRACTOR.
7. THERE ARE NO DEDICATED ASPHALT/CONCRETE BATCH PLANTS.



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CONTACT: RYAN FOSTER
(719) 306-4478

DEVELOPMENT PLAN FOR:

7315 COLE VIEW

EL PASO COUNTY, COLORADO

ISSUE	DATE
INITIAL ISSUE	10/9/23
LATEST ISSUE	1/18/24
DESIGNED BY:	SBN
DRAWN BY:	SBN
CHECKED BY:	TDM
FILE NAME:	21813-00GEC



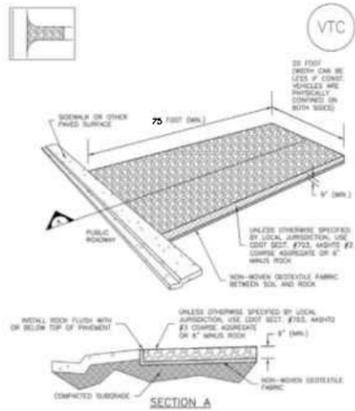
PREPARED UNDER MY DIRECT SUPERVISION FOR AND ON BEHALF OF DREXEL, BARRELL & CO.
DRAWING SCALE:
HORIZONTAL: 1"=30'
VERTICAL: N/A

GRADING & EROSION CONTROL PLAN

PROJECT NO. 21813-00GECV
DRAWING NO.



Vehicle Tracking Control (VTC) SM-4



VTC-1. AGGREGATE VEHICLE TRACKING CONTROL

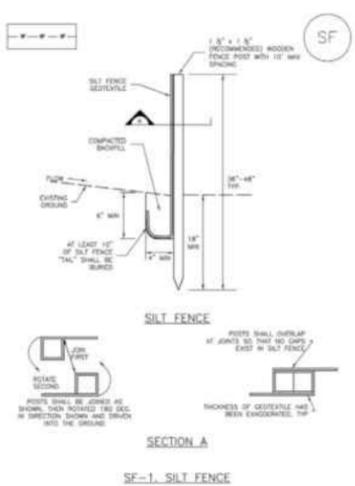
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SM-4 Vehicle Tracking Control (VTC)

- STABILIZED CONSTRUCTION ENTRANCE/EXIT INSTALLATION NOTES**
- SEE PLAN VIEW FOR LOCATION OF CONSTRUCTION ENTRANCE/EXIT(S) (TYPE OF CONSTRUCTION ENTRANCE/EXIT(S) (OPEN/W/OUTSIDE WHEEL WASH CONSTRUCTION MAT OR MATS).
 - CONSTRUCTION MAT OR THE STABILIZED CONSTRUCTION ENTRANCE ARE ONLY TO BE USED ON SHORT DURATION PROJECTS (TYPICALLY RANGING FROM A WEEK TO A MONTH) WHERE THERE WILL BE LIMITED VEHICULAR ACCESS.
 - A STABILIZED CONSTRUCTION ENTRANCE/EXIT SHALL BE LOCATED AT ALL ACCESS POINTS WHERE VEHICLES ACCESS THE CONSTRUCTION SITE FROM PAVED RIGHT-OF-WAYS.
 - STABILIZED CONSTRUCTION ENTRANCE/EXIT SHALL BE INSTALLED PRIOR TO ANY LAND DISTURBING ACTIVITIES.
 - A NON-WOVEN GEOTEXTILE FABRIC SHALL BE PLACED UNDER THE STABILIZED CONSTRUCTION ENTRANCE/EXIT PRIOR TO THE PLACEMENT OF ROCK.
 - UNLESS OTHERWISE SPECIFIED BY LOCAL JURISDICTION, THE MAT SHALL CONSIST OF 3/4" (MIN.) ROCK.
 - UNLESS OTHERWISE SPECIFIED BY LOCAL JURISDICTION, THE MAT SHALL CONSIST OF 3/4" (MIN.) ROCK.
- STABILIZED CONSTRUCTION ENTRANCE/EXIT MAINTENANCE NOTES**
- INSPECT MATS EACH MORNING, AND MONITOR THEM IN EFFECTIVE OPERATING CONDITION. MAINTENANCE OF MATS SHOULD BE PROACTIVE, NOT REACTIVE. INSPECT MATS 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 MATS IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
 - WHERE MATS HAVE FAILED, REPAIR OR REPLACEMENT SHOULD BE INITIATED UPON DISCOVERY OF THE FAILURE.
 - ROCK SHALL BE REAPPLIED OR REFINISHED AS NECESSARY TO THE STABILIZED ENTRANCE/EXIT TO MAINTAIN A CONSISTENT DEPTH.
 - REPAIR TRACKS (DUST PAVED ROADS) IS TO BE REMOVED THROUGHOUT THE DAY AND AT THE END OF THE DAY BY BRUSHING OR BLOWING. STORMS MAY NOT BE WASHED DOWN WITH WATER.
- NOTE: MANY JURISDICTIONS HAVE BMP DETAILS THAT VARY FROM LISTED STANDARD DETAILS. CONTACT WITH LOCAL JURISDICTIONS AS TO WHICH DETAIL SHOULD BE USED WHEN DIFFERENCES ARE NOTED.**
- DETAILS ADAPTED FROM CITY OF DENVER'S CRITICAL CHANNELS NOT AVAILABLE IN ARIAZO**

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

Silt Fence (SF) SC-1



SF-1. SILT FENCE

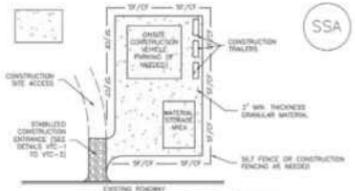
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SC-1 Silt Fence (SF)

- SILT FENCE INSTALLATION NOTES**
- SILT FENCES MUST BE PLACED AWAY FROM THE TOE OF THE SLOPE TO ALLOW FOR WATER FLOWING TO THE TOE OF A SLOPE SHOULD BE INSTALLED IN A FLAT LOCATION AT LEAST 10 FEET (3-10 FT) FROM THE TOE OF THE SLOPE TO ALLOW ROOM FOR FLOWING AND DEPOSITION.
 - A MINIMUM 4" x 4" ANCHOR TRENCH SHALL BE EXCAVATED USING TRENCHER OR SILT FENCE INSTALLATION DEVICE. NO ROAD GRADERS, BACKHOES, OR SIMILAR EQUIPMENT SHALL BE USED.
 - CONTRACT ANCHOR TRENCH BY HAND WITH A "TAMPING JACK" OR BY MEANS BEARING. TRENCH SHALL BE SUCH THAT SILT FENCE ANCHORS BEING PULLED OUT OF TRENCH BY HAND.
 - SILT FENCES SHOULD BE PLACED TOGETHER AS IT IS ANCHORED TO THE SLOPE. THERE SHOULD BE NO NOTICABLE GAPS BETWEEN STAKES AFTER IT HAS BEEN INSTALLED TO THE SLOPE.
 - SILT FENCE FABRIC SHALL BE ANCHORED TO THE SLOPE USING 1" HEAVY DUTY STAPLES OR NAILS WITH 1" HEADS. STAPLES AND NAILS SHOULD BE PLACED 1" ALONG THE FABRIC DOWN THE SLOPE.
 - AT THE END OF A ROW OF SILT FENCE ALONG A CONTOUR, THE SILT FENCE SHOULD BE TURNED PERPENDICULAR TO THE CONTOUR TO CREATE A "T-JUNCTION." THE "T-JUNCTION" EXTENDING PERPENDICULAR TO THE CONTOUR SHOULD BE OF SUFFICIENT WIDTH TO KEEP RAINFALL FROM PLUNGING 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 MATS EACH MORNING, AND MONITOR THEM IN EFFECTIVE OPERATING CONDITION. MAINTENANCE OF MATS SHOULD BE PROACTIVE, NOT REACTIVE. INSPECT MATS 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 MATS IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
 - WHERE MATS HAVE FAILED, REPAIR OR REPLACEMENT SHOULD BE INITIATED UPON DISCOVERY OF THE FAILURE.
 - REPAIR OR REPLACE SILT FENCE WHEN THERE ARE SIGNS OF WEAR, SUCH AS TACKING, COLLAPSE, 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 PERMANENT EROSION CONTROL BMP.
 - WHEN SILT FENCE IS REMOVED, ALL DISTURBED AREAS SHALL BE COVERED WITH TOPSOIL, SEEDS AND MULCH OR OTHERWISE STABILIZED AS APPROVED BY LOCAL JURISDICTION. (DETAIL ADAPTED FROM CITY OF DENVER'S CRITICAL CHANNELS NOT AVAILABLE IN ARIAZO)
- NOTE: MANY JURISDICTIONS HAVE BMP DETAILS THAT VARY FROM LISTED STANDARD DETAILS. CONTACT WITH LOCAL JURISDICTIONS AS TO WHICH DETAIL SHOULD BE USED WHEN DIFFERENCES ARE NOTED.**

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Stabilized Staging Area (SSA) SM-6



SSA-1. STABILIZED STAGING AREA

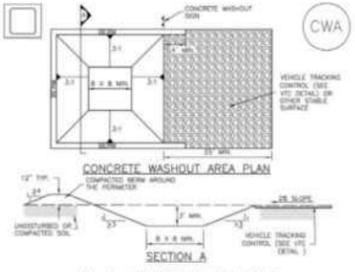
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SM-6 Stabilized Staging Area (SSA)

- STABILIZED STAGING AREA MAINTENANCE NOTES**
- STABILIZED STAGING AREA SHALL BE ENLARGED AS NECESSARY TO CONTAIN PARKING, STORAGE, AND UNLOADING/LOADING OPERATIONS.
 - THE STABILIZED STAGING AREA SHALL BE REMOVED AT THE END OF CONSTRUCTION OR DEMOLITION, SHALL BE REFINISHED OR, IF APPROVED BY THE LOCAL JURISDICTION, USED ON SITE AND THE AREA COVERED WITH TOPSOIL, SEEDS AND MULCH OR OTHERWISE STABILIZED IN A MANNER APPROVED BY LOCAL JURISDICTION.
- NOTE: MANY JURISDICTIONS PROHIBIT THE USE OF RECYCLED CONCRETE AS STAGING MATERIAL. PLEASE CONSULT WITH LOCAL JURISDICTIONS AS TO WHICH DETAIL SHOULD BE USED WHEN DIFFERENCES ARE NOTED.**
- NOTE: MANY JURISDICTIONS HAVE BMP DETAILS THAT VARY FROM LISTED STANDARD DETAILS. CONTACT WITH LOCAL JURISDICTIONS AS TO WHICH DETAIL SHOULD BE USED WHEN DIFFERENCES ARE NOTED.**
- DETAILS ADAPTED FROM DENVER COUNTY CRITICAL CHANNELS NOT AVAILABLE IN ARIAZO**

SSA-4 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

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MM-1 Concrete Washout Area (CWA)

- CWA INSTALLATION NOTES**
- SEE PLAN VIEW FOR CWA INSTALLATION LOCATION.
 - DO NOT LOCATE AN UNPAVED CWA WITHIN 100' OF ANY NATURAL DRAINAGE FLOWLINE OR WATERWAY OR THE TOE OF A SLOPE. IF A CWA MUST BE LOCATED WITHIN 100' OF A SLOPE, THE CWA SHOULD BE INSTALLED WITH AN IMPERMEABLE LINER (E.G. 15 MIL THICKNESS OR SURFACE STORAGE ALTERNATIVES USING IMPERMEABLE LINERS PER LOCAL JURISDICTION) TO PREVENT CONCRETE WASHOUT SEWERS OF A LEAK ABOVE DRAINAGE STORMS AND SHOULD BE USED.
 - THE CWA SHALL BE INSTALLED PRIOR TO CONCRETE PLACEMENT ON SITE.
 - CWA SHALL INCLUDE A FLAT SURFACE AREA THAT IS AT LEAST 0.5% SLOPE, LEADING OUT OF THE SUBSURFACE PIT THAT IS AT LEAST 1' DEEP. THE PIT SHALL BE AT LEAST 2' DEEP.
 - BEHIND SUBSURFACE SEES AND BACK OF THE CWA SHALL HAVE MINIMUM HEIGHT OF 1'.
 - VEHICLE TRACKING PAD SHALL BE SLOPED 2% TOWARD THE CWA.
 - ROCK SHALL BE PLACED AT THE CONSTRUCTION ENTRANCE AT THE CWA AND SUBGRADE OR NECESSARY TO CLEARLY MARK THE LOCATION OF THE CWA TO OPERATIONS OF CONCRETE TRUCKS AND PUMP TRUCKS.
 - USE EXCAVATED MATERIAL FOR PERIMETER BERM CONSTRUCTION.

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

TEMPORARY SEEDING NOTES

- SOIL IS TO BE CONDITIONED FOR PLANT GROWTH BY APPLYING TOPSOIL, FERTILIZER OR LIME.
- SOIL IS TO BE TILLED IMMEDIATELY PRIOR TO APPLYING SEEDS. COMPACT SOILS ESPECIALLY NEED TO BE LOOSENED.
- SEEDBED 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 THE TABLE BELOW ARE TO BE USED FOR TEMPORARY SEEDING. SEED MIXES ARE NOT TO CONTAIN ANY NOXIOUS WEED SEEDS INCLUDING RUSSIAN OR CANADIAN THISTLE, KNAPWEED, PURPLE LOOSESTRIFE, EUROPEAN BINDWEED, JOHNSON GRASS, AND LEAFY SPURGE.
- THE TABLE BELOW 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.
- IF HYDRAULIC SEEDING IS USED THEN HYDRAULIC MULCHING SHALL BE DONE SEPARATELY TO AVOID SEEDS BECOMING ENCAPSULATED IN THE MULCH.

MULCHING NOTES

INSTALLATION REQUIREMENTS

- 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.
- 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 RESEEDED.

SEEDING PLAN

NATIVE SEEDING MIX

SOIL PREPARATION, FERTILIZER, SEEDING, MULCHING AND MULCH TACKIFIER WILL BE REQUIRED FOR DISTURBED AREAS EXCLUDING THE RIGHT-OF-WAYS.

THE FOLLOWING TYPES AND RATES SHALL BE USED:

COMMON NAME	SCIENTIFIC NAME	LBS BLS/ACRE
SAND BLUESTEM V. ELIDA	ANDROPOGON HALUI	2.0
WESTERN WHEATGRASS V. ARRIBA	PASCOPYRUM SMITHII	7.0
SIDEDATS GRAMA V. VAUGHN	BOUTELOQUIA CURTIPENDULA	4.0
GALLETA V. VIVA (CARYOPSIS)	HILARIA JAMESII	1.0
LITTLE BLUESTEM V. PASTURA	SCHIZACHYRIUM SCOPARIUM	3.0
PRARIE SANDREED V. GASHEN	CALAMAGROSTIS LONGIFOLIA	2.0
SWITCHGRASS V. NEBR 28	PANICUM VIRGATUM	1.0
BLANKETFLOWER	GAILLARDIA ARISTATA	1.0
PRARIE CONEFLOWER	RATIBIDA COLUMINIFERA	0.5
BLUE FLAX	LINUM LEWISII	1.0
OATS	AVENA SATIVA	3.0
WINTER WHEAT	TRITICUM AESTIVUM	3.0
TOTAL/POUNDS/ACRE		28.5

FERTILIZER	RATE PER ACRE
NITROGEN	27
PHOSPHORUS (P205)	69

SEEDING APPLICATION: DRILL SEED 0.25"-0.5" INTO TOPSOIL. AREA NOT ACCESSIBLE TO A DRILL SEEDER AND SLOPES STEEPER THAN 2:1 SHALL BE HAND BROADCAST AT DOUBLE THE ABOVE SEED RATE AND RAKED AT 1/4 TO 1/2 INTO THE TOPSOIL.

MULCHING APPLICATION: 1 1/2 TONS CERTIFIED WEED FREE NATIVE HAY PER ACRE MECHANICALLY CRIMED IN TOPSOIL IN COMBINATION WITH AN ORGANIC MULCH TACKIFIER.

PREPARED BY:



CLIENT:

BLACK DIAMOND CABLE

7315 COLE VIEW
COLORADO SPRINGS, CO 80915
CONTACT: RYAN FOSTER
(719) 306-4478

DEVELOPMENT PLAN FOR:
7315 COLE VIEW
EL PASO COUNTY, COLORADO

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DESIGNED BY: SBN

DRAWN BY: SBN

CHECKED BY: TDM

FILE NAME: 21813-00 ECDT



PREPARED UNDER MY DIRECT SUPERVISION FOR AND ON BEHALF OF DREXEL, BARRELL & CO.

DRAWING SCALE:
HORIZONTAL: N/A
VERTICAL: N/A

GRADING & EROSION CONTROL DETAILS

PROJECT NO. 21813-00SCV
DRAWING NO.

ECDT

SHEET: 3 OF 3

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- NOTES:**
- WASTE DISPOSAL BIN LOCATIONS ARE TBD AND WILL BE ADDED TO THE SWMP ONCE DETERMINED BY THE CONTRACTOR.
 - ONSITE LOCATION OF THE SWMP IS TBD AND WILL BE ADDED TO THE SWMP ONCE DETERMINED BY THE CONTRACTOR.
 - THE NEED FOR DEWATERING IS NOT ANTICIPATED. IN THE EVENT THAT DEWATERING BECOMES NECESSARY THE CONTRACTOR, WITH INPUT FROM THE COUNTY STORMWATER INSPECTOR, WILL DESIGN THE LOCATIONS OF DIVERSION, PUMP & DISCHARGES.

