

# Stormwater Management Plan (SWMP)

for construction activities at:

Town of Monument Waterline & Storage Tank  
744 Forest View Way

Monument, Colorado 80132

SWMP Preparation Date: **8/16/2021**

SWMP Revision Date: **Insert Revision Date**

Revision No.0

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# SECTION 1: SITE EVALUATION, ASSESSMENT, AND PLANNING

## 1.1 Project/Site Information

Project/Site Name: Town of Monument New Waterline & Storage Tank

Project Location: 744 Forest View Way

City: Monument

State: CO ZIP Code: 80132

Subdivision/Project: Forest View Estates

State of Colorado - CDPS Stormwater Discharge Permit associated with Construction Activities

Permit Number: COR-XXXXXX

## 1.2 Contact Information/Responsible Parties

### Operator:

[Town of Monument](#)

[Tom Tharnish](#)

[645 Beacon Lite Rd, Monument, CO 80132](#)

Office #: 719-884-8039

Cell #: [\(xxx\)-xxx-xxxx](#)

Email:

[ttharnish@tomgov.org](mailto:ttharnish@tomgov.org)

### Site Superintendent:

[Company: TBD](#)

[Name: TBD](#)

[Address: TBD](#)

Office #: [\(xxx\)-xxx-xxxx](#)

Cell #: [\(xxx\)-xxx-xxxx](#)

Email: [xxx@xxx.com](#)

**Qualified Stormwater Manager:** Individual responsible for implementing, maintaining, and revising the SWMP, knowledgeable in the principles and practices of ESC and pollution prevention, with the skills to:

- Assess conditions at construction sites that could impact stormwater quality, and
- Assess the effectiveness of stormwater controls.
- Perform inspections

[Company: TBD](#)

[Name: TBD](#)

[Title: TBD](#)

[Address: TBD](#)

Office #: [\(xxx\)-xxx-xxxx](#)

Cell #: [\(xxx\)-xxx-xxxx](#)

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\*To add additional Qualified Stormwater Managers please click on the blue plus sign.



**SWMP prepared by:**

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## 1.3 Nature and Sequence of Construction Activity

Project scope of work: The project consists of a 2-million-gallon potable water storage tank and approximately 5.6 miles of buried 12-inch C900 PVC waterline.

Type of construction activity:

☐ Residential

☐ Commercial

☐ Industrial

☐ Road Construction

☒ Linear Utility

☒ Other (please specify): Potable water storage tank

Estimated Project Start Date: October 11, 2021

Estimated Project Completion Date: March 11, 2022

Estimated Project Final Stabilization: March 21, 2022

Major phases of Construction:

☒ Initial CM

☐ Demolition

☒ Grading

☒ Utility Installation

☒ Interim CM

☐ Road Construction

☒ Vertical Construction

☐ Final Grade

☒ Final Stabilization CM

☐ Other: [INSERT TEXT HERE](#)

Earth Work Summary:

Cut: [9,150 \(CY\)](#)

Fill: [150 \(CY\)](#)

## 1.4 Soils, Drainage Patterns, and Vegetation

Soil type:

The proposed water storage tank site is approximately 2.55 acres and is covered in native grasses and vegetation. The soil profile is generally a gravelly sandy loam with slopes ranging from 15% to 25%. The soil type across the site consists approximately of 88% kettle gravelly loamy sand at 8% to 40% slopes; 11% perry park gravelly sandy loam at 3% to 9% slopes; and 0.7% Boyett-frenchcreek complex at 2% to 15% slopes.

Soil's erosion potential:

The soil profile is generally a gravelly sandy loam with slopes ranging from 15% to 25%.

Drainage pattern - Describe existing drainage patterns, slopes and changes due to the proposed grading:

The water storage tank site slopes from the southwest to the northeast at 15% to 25%. Soil properties generally resemble Hydrologic Soil Group (HSG) B category. Post construction drainage patterns shall remain the same with no significant changes to drainage patterns or slopes.

The pipeline corridors lie in roadside and shoulder areas with variable slopes. Post construction slopes and grading shall match existing conditions.

Vegetation - Describe pre-disturbance vegetation:

Pre-disturbance vegetation on the water storage tank site consists of native grasses and vegetation, with evergreen trees scattered sporadically around the site.

Vegetation - Estimate the percentage of pre-existing vegetation cover of the entire site (%):

Vegetation cover is estimated at 100%.

Vegetation - Describe method for determining the percentage:

Vegetative cover was estimated using aerial imagery and site reconnaissance.

## 1.5 Construction Site Estimates

Total site area: 4.93 acres

Construction site area to be disturbed: 3.32 acres

Are there any control measures (CMs) located outside of the permitted area, that are utilized by the Permittee's construction site for compliance with this permit, but not under the direct control of the Permittee?: ☐ Yes / ☒ No

## 1.6 Receiving Waters

Name and description of watershed:

The project is located within the Monument Creek watershed.

Name and description of ultimately receiving water(s), including stream segment designation:

Stormwater from the entire project site ultimately discharges to Monument Creek via surface flow and existing drainageways. Stormwater from the tank site discharges to a roadside swale at the northern corner of the tank site parcel. The roadside swale subsequently discharges to a tributary drainageway of Monument Creek.

The remainder to the project site will not produce stormwater discharges. The potable water pipelines will be installed via open trench (excepting the HDD locations), minimizing if not eliminating the possibility of stormwater discharges during construction.

Distance from the project to the closest receiving water:

Distance to the closest receiving water is variable.

Is the stream segment impaired? ☐ Yes / ☒ No

Description of all stream crossings located within the construction site boundary:

There are two locations where a stream crosses the construction site boundary. Specifically, these stream crossings coincide with the potable water pipeline installations. The pipelines in these locations shall be installed via a trenchless installation method using Horizontal Directional Drill (HDD) to eliminate stream impacts.

## 1.7 Protected Site Features and Sensitive Areas

Describe unique site feature or sensitive area to be preserved during construction:

No areas have been identified. Existing vegetation outside the potable water tank construction limits will be preserved.

Describe measures to preserve unique site feature or sensitive area during construction:

N/A

Describe any known soil or groundwater contamination:

There is no known soil or groundwater contamination.

Describe management plan for contaminated soils and/or groundwater:

N/A

Attach applicable Permits (check if applicable):

- ☐ 404 Permit
- ☐ 401 Permit
- ☐ Dewatering Permit
- ☐ Remediation Permit
- ☐ Other: [INSERT TEXT HERE](#)

## 1.8 Potential Sources of Pollution

Potential Pollution Source	Potential on this site?	Control Measures (CM)	CM Implementation (as needed)
Disturbed & Stored Soils - grading - spoils - stockpiles	Yes	ESC CMs (IP, SF, SSA, TRM, RECP, TOP, SCL, SBB, RS, SB, ST) Preservation of existing vegetation (PV, VB, CF, CP) Materials management Solid waste management (SP, GH) Stockpile management (SP) Vehicle tracking control (VTC)	1. Delineate protected areas prior to construction. 2. Install CMs prior to construction. 3. Manage materials effectively once they arrive on site. 4. Place trash receptacles prior to construction. 5. Implement spill response. 6. Implement stockpile mgnt controls. 7. Delineate vehicle travel areas prior to construction, adjust as needed.
Vehicle Tracking - all permitted vehicle traffic	Yes	ESC CMs (IP, SF, SSA, TRM, RECP, TOP, SCL, SBB, RS, SB, ST) Vehicle traffic controls Vehicle tracking controls (VTC) Street sweeping (SS)	1. Install CMs prior construction. 2. Delineate vehicle travel areas prior to construction, adjust as needed. 3. Install VTC prior to construction. 4. Implement SS as needed, in conjunction with start of construction.
Contaminated Soils	No	Hazardous materials management (GH, CT) Spill response & notification (GH) Stockpile management (SP)	1. Implement hazardous materials management. 2. Implement spill response procedures. 3. Implement stockpile mgnt controls.

\* Refer to Section 2, for acronyms used to identify CM details.

Potential Pollution Source	Potential on this site?	Control Measures (CM)	CM Implementation
Loading & Unloading - construction materials	Yes	Material management (GH) Vehicle traffic controls (VTC)	1. Manage materials effectively once they arrive on site. 2. Delineate vehicle travel areas prior to construction, adjust as needed.
Vehicle/equipment maint. & fueling - gas, oil,	No	Spill prevention controls (GH) Designated fuel storage area (GH)	1. Designate fuel storage area. 2. Implement spill prevention controls.

- diesel - lubricants - hydraulic fluids		Spill response & notification (GH)	3. Implement spill response and notification procedures.
Outdoor storage - building materials - fertilizers - chemicals	Yes	Material storage procedures (GH)	1. Designate material storage areas prior to delivery. 2. Materials left outdoors must be covered if they can pollute stormwater. 3. Secondary containment must be used for hazardous materials.
Dust - wind transport - saw cutting	No	Dust control (DC) Temporary soil stabilization (SF, SD, GB, SSA, TRM, RECP, TOP) Street sweeping (SS) Preservation of existing vegetation (PV, VB, CF)	1. Delineate protected areas prior to construction. 2. Implement dust control in conjunction with soil disturbing activities. 3. Implement temporary soil stabilization measures as soon as practical. 4. Implement street sweeping at the start of major construction and maintain as needed.
Routine Maintenance Activities - fertilizers - pesticides - detergents - solvents - fuels, oils, etc.	No	Material storage (GH) Hazardous waste management (GH, CT) ESC CMs (IP, SF, SSA, TRM, RECP, TOP, SCL, SBB, RS, SB, ST)	1. Designate materials storage areas prior to site arrival. 2. Practice hazardous waste management procedures during the storage of such materials. 3. Install ESC measures prior to landscape work.
Non-industrial Waste - worker trash - portable toilets	No	Sanitary waste (GH) Solid waste management (GH)	1. Place temporary sanitary facilities on site and prevent off-site discharges. 2. Place trash receptacles on site.
On-site Industrial Waste - construction debris, etc	Yes	Waste management (GH) Liquid waste management (GH) Hazardous waste management (GH, CT)	1. Place trash receptacles on site. 2. Place designated watertight receptacles or washout area(s) prior to activities that produce liquid waste. 3. Implement hazardous waste management procedures.

\* Refer to Section 2, for acronyms used to identify CM details.

Potential Pollution Source	Potential on this site?	Control Measures (CM)	CM Implementation
Concrete Truck Chute/Tool Washing	Yes	Concrete washout area (CWA)	Install designated concrete washout(s) prior to concrete work.
Drywall Mud and Paint	No	Liquid waste management (GH)	Place designated watertight receptacles or washout area(s) prior to activities that produce liquid waste.
Fly Ash - concrete - flow fill	Yes	Concrete washout area (CWA) Hazardous waste management (GH)	1. Install designated CWA prior to concrete activities.

			2. Implement hazardous waste management procedures.
<b>Dedicated:</b> - asphalt plants - concrete batch plants - masonry mixing stations	No	Secondary containment Concrete washout area (CWA) Solid waste management (GH) Materials management (GH)	1. Install secondary containment CMs prior to using dedicated batch plants. 2. Establish dedicated washout area before construction begins. 3. Place trash receptacles on site. 4. Manage materials effectively once they arrive on site.
<b>Waste from:</b> - geo-tech test - potholing - saw cutting - utility borings for locates	Yes	Dust control (DC) Material storage (GH) Solid waste management (GH)	1. Implement dust control in conjunction with soil disturbing activities. 2. Designate materials storage areas prior to their arrival on site. 3. Place trash receptacles on site.
<b>Demolition of infrastructure:</b> - concrete curb - asphalt road - steel/rebar	No	Dust control (DC) Solid waste management (GH)	1. Implement dust control in conjunction with soil disturbing activities. 2. Place trash receptacles.
<b>Electric Generator</b> - pump	No	Secondary containment Spill response & notification (GH) Hazardous waste management (GH, CT)	1. Install secondary containment CMs prior to using generators. 2. Implement hazardous waste management procedures.
<b>Areas where <u>potential spills</u> can occur</b>	Yes	Hazardous waste management (GH) Spill response & notification (GH)	1. Implement hazardous waste management. 2. Implement spill response and notification procedures.

\* Refer to Section 2, for acronyms used to identify CM details.

## Potential hazardous material & chemical pollutants to stormwater:

Potentially on Site?	Material/ Chemical	Physical Description	Stormwater Pollutants	Location
Yes	Fertilizer	Liquid or solid grains	Nitrogen, phosphorous	Newly seeded areas
Yes	Cleaning solvents	Colorless, blue, or yellow-green liquid	Perchloroethylene, methylene chloride, trichloroethylene, petroleum distillates	Staging areas
Yes	Asphalt	Black solid	Oil, petroleum distillates	Streets
Yes	Concrete and Grout	White solid/grey liquid	Limestone, sand, pH, chromium	Curb and gutter, sidewalk, building construction
Yes	Curing compounds	Creamy white liquid	Naphtha	Curb and gutter, sidewalk, driveways, concrete slabs
Yes	Hydraulic oil/ fluids	Brown, oily petroleum hydrocarbon	Mineral oil	Leaks or broken hoses from equipment
Yes	Gasoline	Colorless, pale brown or pink petroleum hydrocarbon	Benzene, ethyl benzene, toluene, xylene, MTBE	Secondary containment/staging area
Yes	Antifreeze/ coolant	Clear green/yellow liquid	Ethylene glycol, propylene glycol, heavy metals (copper, lead, zinc)	Leaks or broken hoses from equipment or vehicles
Yes	Sanitary toilets	Various colored liquid	Bacteria, parasites, and viruses	Staging areas

## 1.9 Anticipated Sources of Authorized Non-stormwater Discharge

### Instructions:

- Check box for presence of any anticipated allowable sources of non-stormwater discharge at the site such as: uncontaminated springs, landscape irrigation return flows, construction dewatering, concrete washout, super-chlorinated water for pipeline testing, etc.

Description and location of any anticipated allowable sources of non-stormwater discharge at the site. Check if applicable:

☐ Natural springs, only if:

- Uncontaminated, and
- Spring flows are not exposed to land disturbance

☒ Landscape irrigation return flow

☒ Emergency fire fighting

☒ Concrete washout (CWA), only if:

- Liquids from washing concrete tools and concrete mixer chutes are properly contained, and
- No concrete washout water leaves the site as surface runoff or reaches receiving waters

Liner under CWA is required if:

- The groundwater table level is high.
- CWA is within 400 feet of any natural drainage pathway or waterbody, or
- CWA is within 1,000 feet of any wells or drinking water sources.

☒ Check if the CWA liner is needed for this site.

Description of any other anticipated allowable sources of non-stormwater discharge at the site:  
Potable water main flushing

## SECTION 2: EROSION & SEDIMENT CONTROL MEASURES

### 2.1 Sediment Control Measures

**Instructions:**

- Describe how each unique site feature or sensitive area identified earlier will be protected during construction activity. Include these areas and associated measures on the ESC Plan (site map).
- Indicate applicable measure by selecting the blue **Yes/No** then type "**Yes**" or "**No**". Identify the phase of construction during which the CM will be implemented: **1, 2, 3 or N/A**, and check whether the CM is **Permanent** (structural) or **Temporary** (non-structural). Add any additional CMs as needed.

Silt Fence (SF)		Used: Yes	Phase(s): 1
<input type="checkbox"/> Permanent		<input checked="" type="checkbox"/> Temporary	
What: Description	SF is a woven geotextile fabric attached to wooden posts and trenched into the ground. It is use to intercept sheet flow runoff from disturbed areas.		
When: Installation	SF shall be installed prior to land disturbing activities. SF shall be removed when the upstream area is stabilized.		
Where: Location	SF shall be installed at the locations identified on the SWMP. SF is typically installed along the contour of slopes, which is down slope of a disturbed area to accept sheet flow, and placed along the perimeter of a construction site. <b><i>SF is not designed to receive concentrated flow, or to be used a filter fabric.</i></b>		
How: Maintenance & Inspection	SF shall be installed per detail (Appendix 4). Inspect regularly and maintain SF throughout construction. Any section of SF that has a tear, hole, slumping, undercutting or has been bypassed shall be replaced. Accumulated sediment shall be removed before it reaches a depth of ½ the height of the of the silt fence usually 6 inches.		



<b>Sediment Control Log (SCL)</b>		Used: <b>Yes</b>	Phase(s): <b>2</b>
<input type="checkbox"/> <b>Permanent</b> <input checked="" type="checkbox"/> <b>Temporary</b>			
<b>What: Description</b>	SCL, aka "Straw Wattle", is a linear roll made of natural materials (straw, coconut fiber or other fibrous material), trenched into the ground and held with wooden stakes, used to intercept sheet flows from disturbed areas.		
<b>When: Installation</b>	SCL shall be installed during land disturbing activities and it may also be installed after formation of a stockpile. Once the upstream area is stabilized, remove and properly dispose of the SCL. If disturbed areas exist after removal, the area shall be covered with top soil, seeded and mulched.		
<b>Where: Location</b>	SCL shall be installed at the locations identified on the ECSP. SCL are typically used for stockpile control, IP, and CD in small drainage ditches, on disturbed slopes to shorten flow lengths and/or as part of multi-layered perimeter control along receiving water such as a stream, pond or wetland. SCL work well in combination with other layers of erosion and sediment controls. Stockpiles stored on impervious surfaces shall not be placed in a flowline and SCL shall be weighted. Stockpiles stored on pervious surfaces may be protected by pervious SCL, SF or adequate vegetative cover.		
<b>How: Maintenance &amp; Inspection</b>	SCL shall be installed per detail (Appendix 4), along (parallel) the slope contour to avoid concentrating flows. Inspect regularly and maintain SCL throughout construction as they will eventually degrade. Accumulated sediment shall be removed before the depth is ½ the height of the SCL.		
<b>Sediment Basin (SB)</b>		Used: <b>No</b>	Phase(s): <b>N/A</b>
<input type="checkbox"/> <b>Permanent</b> <input type="checkbox"/> <b>Temporary</b>			
<b>What: Description</b>	SB is a temporary structure designed to capture sediment transported in runoff and slowly release flows to allow time for settling of the sediment prior to discharge from the site		
<b>When: Installation</b>	Install SB prior to land disturbing activities. SBs are typically converted to permanent detention basins. For conversion, remove accumulated sediment and re-configure the basin and outlet to meet the requirements of the final design. For SB that are temporary, remove when is no longer needed by filling in the excavated area with soil and stabilizing accordingly.		
<b>Where: Location</b>	SB shall be installed at the locations identified on the SWMP. Where feasible, the SB shall be installed in the same location where a permanent post-construction detention basin will be located.		
<b>How: Maintenance &amp; Inspection</b>	The SB shall be installed per detail (Appendix 4). Inspect regularly and maintain SB to be effective. Accumulated sediment shall be dredged from the basin when it reaches no more than ⅓ of the design storage volume.		

<b>Sediment Trap (ST)</b>		Used: <b>Yes</b>	Phase(s): <b>2</b>
<input type="checkbox"/> <b>Permanent</b>		<input checked="" type="checkbox"/> <b>Temporary</b>	
<b>What: Description</b>	ST is an excavated or bermed area designed to capture drainage, allowing settling of sediment from upstream disturbed area smaller than 1 acre.		
<b>When: Installation</b>	Install ST prior to land disturbing activities. The ST shall not be removed until the upstream area is sufficiently stabilized.		
<b>Where: Location</b>	Install ST in the locations identified on the SWMP. It shall be installed across a low area or drainage swale.		
<b>How: Maintenance &amp; Inspection</b>	ST shall be installed per detail (Appendix 4). Inspect regularly and maintain the ST throughout construction. Inspect the embankments for stability and seepage, and the outlet for sediment, debris and damage. Repair damage to the outlet, and remove all obstructions. Accumulated sediment shall be removed when it reaches ½ the height of the outflow embankment.		

<b>Inlet Protection (IP)</b>	Used: <b>No</b>	Phase(s): <b>N/A</b>
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☐ **Permanent**

☐ **Temporary**

<b>What: Description</b>	IP is a permeable barrier that is installed around an inlet drain to filter runoff and remove sediment before entering the storm system. IP can be constructed of: RS, SCL, SF, blocks and RS, or other materials.
<b>When: Installation</b>	Install IP for existing catch basins prior to land disturbing activities upslope from the inlet. IP for proposed catch basins shall be installed immediately after the drain is constructed. IP and associated sediment must be removed and properly disposed of when the drainage area upstream is stabilized.
<b>Where: Location</b>	Install IP at the locations identified on the EC Plan. IP is not a stand-alone measure. It shall be used in conjunction with other up gradient measures.
<b>How: Maintenance &amp; Inspection</b>	Install IP per detail (Appendix 4). IP shall enable the drain to function without completely blocking the flow. Inspect regularly and maintain IP throughout construction as it is the final measure before runoff enters the storm drain. Accumulated sediment shall be removed when it has reached ½ of the height of the IP or loses functionality, whichever comes first. IP is not standalone measure and shall be part of redundant system.

<b>Rock Sock (RS)</b>	Used: <b>No</b>	Phase(s): <b>N/A</b>
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☐ **Permanent**

☐ **Temporary**

<b>What: Description</b>	RS is an elongated cylindrical filter constructed of gravel wrapped by wire mesh or woven geotextile (aka “curb socks” if placed at angles at curb line).
<b>When: Installation</b>	Install RS prior to land disturbing activities; once upstream stabilization is complete. Accumulated sediment shall be removed and properly disposed of.
<b>Where: Location</b>	RS shall be installed at the locations identified on the EC Plan. They are use for perimeter control of a disturbed area, or as part of IP.
<b>How: Maintenance &amp; Inspection</b>	Install RS per detail (Appendix 4). Inspect regularly and maintain RS as they are susceptible to displacement and breakage due to vehicle traffic. Accumulated sediment shall be removed to maintain functionality.

## 2.2 Erosion Control Measures

<b>Surface Roughening (SR)</b>		Used: No	Phase(s): N/A
<input type="checkbox"/> <b>Permanent</b>		<input checked="" type="checkbox"/> <b>Temporary</b>	
<b>What: Description</b>	SR is tracking, scarifying, imprinting or tilling a disturbed area to provide temporary stabilization. Variations in the soil are created to help minimize wind and water erosion.		
<b>When: Installation</b>	SR shall be performed either after final grading or to temporarily stabilize an area during active construction.		
<b>Where: Location</b>	SR shall be used in the locations identified on the SWMP. It can be used on mild and steep slopes.		
<b>How: Maintenance &amp; Inspection</b>	SR shall be installed per detail (Appendix 4). SR shall always be perpendicular to the slope. Continuously inspect and maintain all surfaces that are roughened throughout construction. SR shall be inspected for erosion as it is only a temporary control. Vehicles and equipment shall not be driven over areas that have been surface roughening. Refresh SR as needed.		
<b>Temporary and Permanent Seeding (TS/PS)</b>		Used: Yes	Phase(s): 3
<input checked="" type="checkbox"/> <b>Permanent</b>		<input type="checkbox"/> <b>Temporary</b>	
<b>What: Description</b>	Seed is applied to disturbed areas in an effort to establish vegetation. TS is used to stabilize disturbed areas that will be inactive for an extended period. PM is used to stabilize areas at final grade that will not be otherwise stabilized. Effective seeding includes preparation of a seedbed, selection of an appropriate seed mixture, proper planting techniques, and protection of the seeded area with mulch, geotextile, or other appropriate measures. Mulching helps to protect the bare soil and must be secured by crimping, tackifiers, netting or other measures.		
<b>When: Installation</b>	TS/PS shall be performed on temporary inactive surfaces and following the completion of final grading.		
<b>Where: Location</b>	TS/PS shall be completed in the locations identified on the SWMP to stabilize areas at final grade that will not otherwise be stabilized.		
<b>How: Maintenance &amp; Inspection</b>	TS/PS and secured mulching shall be installed per seed mix specifications and detail (Appendix 4). Continuously inspect and maintain TS/PS and secured mulch throughout construction. Prepare the seedbed, select an appropriate seed mixture, use proper planting techniques and protect the seeded area with secured mulch.		

<b>Soil Binders (SB)</b>		Used: No	Phase(s): N/A
<input type="checkbox"/> <b>Permanent</b>		<input checked="" type="checkbox"/> <b>Temporary</b>	
<b>What: Description</b>	SB involves a broad range of treatments that can be applied to exposed soils for temporary stabilization to reduce wind and water erosion.		
<b>When: Installation</b>	Use SB for short term temporary stabilization. Soil binders can break down fast due to natural weathering.		
<b>Where: Location</b>	SB can be used on mild and steep slopes including stockpiles. They are often used in areas where work has temporarily stopped, but is expected to resume before revegetation can be established.		
<b>How: Maintenance &amp; Inspection</b>	SB shall be used per detail (Appendix 4). Continuously inspect and maintain all areas where SB have been applied throughout construction. SB can fail after heavy rainfall events and may require re-application. In particular, SB will generally experience spot failures during heavy rainfall events.		
<b>Mulching (MU)</b>		Used: Yes	Phase(s): 3
<input type="checkbox"/> <b>Permanent</b>		<input checked="" type="checkbox"/> <b>Temporary</b>	
<b>What: Description</b>	MU consists of evenly applying straw, hay, shredded wood mulch, bark or compost to disturbed soils and securing the mulch by crimping, tackifiers or netting.		
<b>When: Installation</b>	MU is used in conjunction with TS/PS to help protect the seed bed and stabilize the soil. Mulch can also be used as a temporary cover on low to mild slopes to help temporarily stabilize disturbed area where there are growing season constraints. After MU application, there shall not be bare ground surface exposed. Reapply mulch, as needed, to cover bare areas.		
<b>Where: Location</b>	Temporary and/or permanent MU shall be completed in the locations identified on the SWMP.		
<b>How: Maintenance &amp; Inspection</b>	MU shall be installed per detail (Appendix 4). After MU, the bare ground surface shall not be more than 10% exposed. Re-apply mulch, as needed, to cover bare areas.		

<b><i>Rolled Erosion Control Product (RECP)</i></b>		Used: Yes	Phase(s): 3
<input type="checkbox"/> <b><i>Permanent</i></b> <input checked="" type="checkbox"/> <b><i>Temporary</i></b>			
<b><i>What: Description</i></b>	RECP consist of a variety of temporary or permanently installed manufactured products designed to control erosion and enhance vegetation establishment and survivability, especially on slopes and in channels. Categories of RECP: mulch control netting, open weave textile, erosion control blanket, and turf reinforcement mat.		
<b><i>When: Installation</i></b>	RECP shall be installed upon completion of slope grading and when revegetation measures are completed. RECP are biodegradable typically and do not need to be removed after construction.		
<b><i>Where: Location</i></b>	RECP shall be installed at the locations identified on the SWMP. Install RECP according to manufacturer's specifications.		
<b><i>How: Maintenance &amp; Inspection</i></b>	RECP shall be installed per (Appendix 4). Continuously inspect and maintain all RECP throughout construction. Check for signs of erosion, including voids under the mat. Also check for damaged or loose stakes and secure loose sections of the blanket.		
<b><i>Temporary Slope Drains (TSD)</i></b>		Used: No	Phase(s): N/A
<input type="checkbox"/> <b><i>Permanent</i></b> <input type="checkbox"/> <b><i>Temporary</i></b>			
<b><i>What: Description</i></b>	TSD is a pipe or culvert use to convey water down a slope where there is high potential for erosion. A collection system at the top of the slope directs runoff to the conveyance. The pipe outlet must be equipped with outlet protection.		
<b><i>When: Installation</i></b>	Install TSD prior to up-gradient land disturbing activities and maintain in place until no longer needed, but remove prior to the end of construction.		
<b><i>Where: Location</i></b>	TSD shall be installed at the locations identified on the SWMP. They are for long, steep slopes where there is a high potential for flow concentration.		
<b><i>How: Maintenance &amp; Inspection</i></b>	TSD shall be installed and maintained per detail (Appendix 4). Inspect and maintain all TSD throughout construction. Inspect the entrance for sediment accumulation. Inspect the downstream outlet for signs of erosion and stabilize, as needed. Remove accumulated sediment at the entrance and outfall, and inspect pipe anchors to ensure they are secure.		

<b>Temporary Outlet Protection (TOP)</b>		Used: <b>Yes</b>	Phase(s): <b>2</b>
<input type="checkbox"/> <b>Permanent</b>		<input checked="" type="checkbox"/> <b>Temporary</b>	
<b>What: Description</b>	TOP consist of riprap rock placed at the outlet to help reduce erosion immediately downstream of a pipe, culvert, slope drain rundown or other conveyance with concentrated flow. TOP is intended to be used for less than two years.		
<b>When: Installation</b>	TOP shall be installed immediately upon the completion of grading and removed once the pipe is no longer draining upstream area or once the downstream area has been sufficiently stabilized.		
<b>Where: Location</b>	TOP shall be installed at the locations identified on the SWMP. It shall be installed where a conveyance discharges onto a disturbed area where there is a potential for accelerated erosion due to concentrated flow.		
<b>How: Maintenance &amp; Inspection</b>	TOP shall be installed and maintain per (Appendix 4). The Inspect regularly and maintain TOP as the rocks may be displaced. Accumulated sediment shall be removed before the TOP becomes buried and ineffective.		
<b>Earth Dikes/Drainage Swales (ED/DS)</b>		Used: <b>No</b>	Phase(s): <b>N/A</b>
<input type="checkbox"/> <b>Permanent</b>		<input type="checkbox"/> <b>Temporary</b>	
<b>What: Description</b>	ED/DS are temporary storm conveyance channels used to divert runoff around slopes or to convey runoff to additional sediment control CMs prior to discharge from the site.		
<b>When: Installation</b>	Install ED/DS immediately upon completion of channel grading and maintain in place until the end of construction.		
<b>Where: Location</b>	ED/DS shall be installed at the locations identified on the SWMP. Typically installed around steep slopes or as temporary conveyance feature leading to a sediment basin or trap.		
<b>How: Maintenance &amp; Inspection</b>	ED/DS shall be installed per detail (Appendix 4). Continuously inspect and maintain all ED/DS for stability, compaction and signs of erosion and repair. Inspect side slopes for erosion and damage to erosion control fabric. Stabilize slopes and repair fabric as necessary. Accumulated sediment shall be removed when the sediment has accumulated to ½ of the depth of the ED/DS.		

<b>Terracing (TER)</b>	Used: <b>No</b>	Phase(s): <b>N/A</b>
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☐ **Permanent**

☐ **Temporary**

<b>What: Description</b>	TER consists of grading steep slopes into a series of relatively flat sections separated at intervals by steep slope segments. They shorten the uninterrupted flow lengths on steep slopes, reducing the development of rills and gullies.
<b>When: Installation</b>	TER shall be completed during grading activities; when slope is at final grade, and vegetation shall be established as soon as possible.
<b>Where: Location</b>	TER shall be installed at the locations identified on the SWMP. It is usually used to control erosion on slopes that are steeper than 4:1.
<b>How: Maintenance &amp; Inspection</b>	TER shall be installed per detail (Appendix 4). TER shall be used in combination with other stabilization measures that provide cover for exposed soils. Inspect regularly and maintain all TER throughout construction. Remove accumulated sediment and repair rill erosion as necessary.

<b>Check Dams (CD)</b>	Used: <b>Yes</b>	Phase(s): <b>2</b>
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☐ **Permanent**

☒ **Temporary**

<b>What: Description</b>	CDs are temporary or permanent grade control structures use in drainage channels to reduce the velocity of runoff and concentrated flows. They can be constructed from rock, gravel bags, sand bags or proprietary devices.
<b>When: Installation</b>	CD shall be installed prior to earth disturbing activities or immediately upon completion of channel grading. Temporary CDs shall be removed and area shall be stabilized. Permanent CDs shall be cleaned and remain in place.
<b>Where: Location</b>	CD shall be installed at the locations identified on the SWMP. Typically they are placed in drainage channels, swales or on mild to moderately steep slopes.
<b>How: Maintenance &amp; Inspection</b>	CDs shall be installed per detail (Appendix 4). They shall be placed at regularly spaced intervals along the drainage swale or ditch. The height of the CD shall allow for pooling of the runoff. Inspect regularly and maintain CD as rocks can be displaced and gravel bags or sandbags can be torn. Accumulated sediment shall be removed before it reaches ½ the height of the CD.



<b>Streambank Stabilization (SS)</b>		Used: <b>No</b>	Phase(s): <b>N/A</b>
<input type="checkbox"/> <b>Permanent</b> <input type="checkbox"/> <b>Temporary</b>			
<b>What: Description</b>	SS is a combination of erosion and sediment control measures to protect streams, banks, and in-stream habitat from accelerated erosion. Some of the measures include PV, CD, TS/PS and RECP.		
<b>When: Installation</b>	SS shall be installed prior to earth disturbing activities to protect existing vegetation, preserve exposed streambank, or mitigate erosion rates from disturbed area. SS measures that will not remain in place as a part of final stabilization, such as silt fence, shall be removed when all land disturbing activities have ceased and the area has been permanently stabilized.		
<b>Where: Location</b>	SS shall be installed at the locations identified on the SWMP. They shall be installed along the banks of streams or waterways.		
<b>How: Maintenance &amp; Inspection</b>	SS shall be installed per detail (Appendix 4). Inspect regularly and maintain SS throughout construction.		
<b>Wind Erosion/Dust Control (DC)</b>		Used: <b>Yes</b>	Phase(s): <b>2</b>
<input type="checkbox"/> <b>Permanent</b> <input checked="" type="checkbox"/> <b>Temporary</b>			
<b>What: Description</b>	DC helps keep sediments (from soils and stockpiles) from entering the air as a result of land disturbing construction activities. A variety of practices that focus on grading disturbed areas may be used.		
<b>When: Installation</b>	Implement DC during conditions which result in the formation of dust from either construction activities or from naturally occurring winds. Do not overwater.		
<b>Where: Location</b>	Dust abatement shall be completed throughout the project area where any material exists that has the potential to become airborne.		
<b>How: Maintenance &amp; Inspection</b>	DC measures shall be performed per detail (Appendix 4). Apply water or magnesium chloride, seed and mulch or use spray-on soil binders on disturbed areas. Water and magnesium chloride shall be applied such that concentrated flows do not form.		
Used:		Phase(s):	
<input type="checkbox"/> <b>Permanent</b> <input type="checkbox"/> <b>Temporary</b>			
<b>What – Description</b>			
<b>When – Installation</b>			
<b>Where – Location</b>			
<b>How – Maintenance and Inspection</b>			

\*To add additional CMs please click on the blue plus sign.

## 2.3 Materials Management Control Measures

<b>Concrete Washout Areas (CWA)</b>		Used: <a href="#">Yes</a>	Phase(s): <a href="#">2</a>
<input type="checkbox"/> <b>Permanent</b> <input checked="" type="checkbox"/> <b>Temporary</b>			
<b>What: Description</b>	A CWA is a specific area of the construction site designated and managed for concrete washing activities. Options available: excavation of a pit in the ground, use of an above ground storage area or use of prefabricated haul-away concrete washout containers.		
<b>When: Installation</b>	CWA shall be installed prior to any concrete delivery to the construction site; and remove upon termination of use of the washout. Accumulated solid waste, including concrete waste and any contamination soils, must be removed from the site to a designated disposal location.		
<b>Where: Location</b>	CWA shall be installed at the locations identified on the SWMP. If the groundwater table is high; or if the CWA will be placed within 400 ft of a natural drainage pathway/waterbody; or within 1,000 ft of a wells or drinking water source it must be lined.		
<b>How: Maintenance &amp; Inspection</b>	CWA shall be installed per detail (Appendix 4). Inspect regularly and maintain CWA throughout construction. Ensure adequate signage is in place identifying the location of the CWA. Remove concrete waste when filled to about ¾ of CWA capacity to maintain functionality.		
<b>Stockpile Management (SP)</b>		Used: <a href="#">Yes</a>	Phase(s): <a href="#">2</a>
<input type="checkbox"/> <b>Permanent</b> <input checked="" type="checkbox"/> <b>Temporary</b>			
<b>What: Description</b>	SP includes measures to minimize erosion and sediment transport from stockpiles. SP shall be used when soils or other erodible materials are stored at a construction site.		
<b>When: Installation</b>	SP locations shall be determined during construction. If temporary removal of a CM is necessary to access the SP, ensure CMs area re-installed per detail drawing. When SP is no longer needed, properly dispose of excess materials and re-vegetate or stabilize the ground surface where the SP was located.		
<b>Where: Location</b>	SP locations shall be placed away from areas where concentrated stormwater flow is anticipated, major drainage ways, gutters, and storm sewer inlets. SP locations shall be noted on the SWMP.		
<b>How: Maintenance &amp; Inspection</b>	SP shall be installed per detail (Appendix 4). Inspect regularly and maintain SP throughout construction. It is recommended to place SP on a pervious surface and protected from sediment transport with measures such as SCL, VB and/or SF. SP are only allowed on impervious surfaces if no other practical alternative		

	exists. Provide weighted sediment control measures around the perimeter of the SP, such as RS or sand bags.
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<b>Street Sweeping (SS)</b>	Used: <b>Yes</b>	Phase(s): <b>2</b>
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☐ **Permanent** ☒ **Temporary**

<b>What: Description</b>	SS is used where vehicles track sediment onto paved roadways to reduce the transport of it into storm drain systems or surface waterways.
<b>When: Installation</b>	Manual SS or mechanical vacuuming SS shall be conducted when there is noticeable sediment accumulation on roadways adjacent to the construction site. SS shall be completed prior to any precipitation events, at the end of the workday as needed, and at the end of construction.
<b>Where: Location</b>	SS shall be utilized throughout the site and also on adjacent areas to construction.
<b>How: Maintenance &amp; Inspection</b>	SS shall be performed per detail (Appendix 4). Use standard SS equipment to adequately remove sediment from roadways adjacent to the construction site.

Used: Phase(s):

☐ **Permanent** ☐ **Temporary**

<b>What – Description</b>	
<b>When – Installation</b>	
<b>Where – Location</b>	
<b>How – Maintenance and Inspection</b>	

\*To add additional CMs please click on the blue plus sign.

## 2.4 Site Management Control Measures

<b>Limits of Construction (LOC)</b>	Used: <b>Yes</b>	Phase(s): <b>1</b>
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☐ **Permanent** ☒ **Temporary**

<b>What: Description</b>	LOC is use to designate the area of land that will be disturbed by construction activities.
<b>When: Installation</b>	The permitted LOC shall be designated prior to land disturbing activities. If land is disturbed <u>outside</u> of the limits, then the State and Local stormwater construction discharge permits and SWMP/EC Plan must be amended.
<b>Where: Location</b>	The permitted LOC shall be identified on the EC Plan.

<b>How: Maintenance &amp; Inspection</b>	LOC are typically delineated by silt fence or construction fence. Inspect LOC continuously and maintain the permitted LOC in an effort to not disturb land outside of the boundaries.
<hr/>	
<b>Construction Fence (CF)</b>	Used: <b>No</b> Phase(s): <b>N/A</b>
<input type="checkbox"/> <b>Permanent</b>	<input type="checkbox"/> <b>Temporary</b>
<b>What: Description</b>	CF restricts site access to designated entrances and exits, delineates construction site boundaries, and keeps construction out of sensitive locations such as natural areas to be preserved as open space, wetlands and riparian areas.
<b>When: Installation</b>	CF shall be installed prior to earth disturbing activities; and removed once construction is complete.
<b>Where: Location</b>	Install CF along the site perimeter or any area within the site where access shall be restricted.
<b>How: Maintenance &amp; Inspection</b>	CF shall be installed, maintained and removed per detail (Appendix 4). Inspect CF for damages and slumping. The CF shall be tight and any areas with slumping or fallen posts shall be reinstalled or replaced.

<b>Vehicle Tracking Control (VTC)</b>		Used: <b>Yes</b>	Phase(s): <b>1</b>
<input type="checkbox"/> <b>Permanent</b> <input checked="" type="checkbox"/> <b>Temporary</b>			
<b>What: Description</b>	VTC is a stabilized site access point that helps remove sediment from vehicle tires and reduces tracking of sediment onto paved surfaces.		
<b>When: Installation</b>	Install VTC prior to any land disturbing activities; and removed when there is no longer the potential for vehicle tracking to occur.		
<b>Where: Location</b>	VTC shall be installed at the location identified on the SWMP. Locate VTC where frequent vehicle traffic will exit the construction site onto a paved roadway.		
<b>How: Maintenance &amp; Inspection</b>	VTC shall be installed per detail (Appendix 4). All VTC must have non-woven geotextile fabric between the soil and rock pad. <u>Recycled concrete aggregate is not allowed because concrete dust elevates pH in stormwater.</u> Inspect regularly and maintain VTCs throughout construction. If the area becomes clogged with sediment, remove and dispose of excess sediment or replace material with a fresh layer of rock. Any sediment that is tracked onto adjacent roadways shall be cleaned with brooms, shovels (no water washing), or mechanically cleaned with a street vacuum sweeper.		
<b>Stabilized Construction Roadway (SCR)</b>		Used: <b>No</b>	Phase(s): <b>N/A</b>
<input type="checkbox"/> <b>Permanent</b> <input type="checkbox"/> <b>Temporary</b>			
<b>What: Description</b>	SCR is a temporary method to control sediment runoff, vehicle tracking, and dust from roads during construction activities consisting of aggregate base course of 3-inch diameter granular material ( <u>recycled concrete aggregate is not allowed because concrete dust elevates pH in stormwater</u> ).		
<b>When: Installation</b>	SCR is installed on high traffic construction roads to minimize dust and erosion, and use in place of rough cut street controls on roadways with frequent construction and vehicle traffic. Gravel shall be removed once the road is ready to be paved. Prior to paving, the road should be inspected for grade changes and damage. Re-grade and repair as necessary.		
<b>Where: Location</b>	SCR shall be installed at the locations identified on the SWMP. Apply gravel to disturbed areas that are used as a route for vehicles.		
<b>How: Maintenance &amp; Inspection</b>	SCR shall be installed per detail (Appendix 4). Inspect regularly and maintain SCR throughout construction. A stable surface cover of rigid gravel shall be maintained as well as repairing any perimeter controls. Inspect drainage ditches along the roadway for erosion and stabilize as needed.		
<b>Stabilized Staging Area (SSA)</b>		Used: <b>Yes</b>	Phase(s): <b>1</b>
<input type="checkbox"/> <b>Permanent</b> <input checked="" type="checkbox"/> <b>Temporary</b>			
<b>What: Description</b>	SSA is a clearly designated area where construction equipment and vehicles, stockpiles, waste bins and other construction-related materials are stored. If the construction site is big, more than one SSA may be necessary.		

<b>When: Installation</b>	SSA shall be installed prior to any land disturbing activities.
<b>Where: Location</b>	SSA shall be installed at the location identified on the SWMP.
<b>How: Maintenance &amp; Inspection</b>	SSA shall be installed per detail (Appendix 4). Inspect regularly and maintain SSA throughout construction. A stable surface cover of rigid gravel shall be maintained as well as repairing any perimeter controls and following good housekeeping practices.

<b>Temporary Diversion Channel (TDC)</b>	Used: No	Phase(s): N/A
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☐ **Permanent** ☒ **Temporary**

<b>What: Description</b>	TDC diverts water from a stream to allow for construction activities to take place underneath or in the stream.
<b>When: Installation</b>	TDC shall be installed prior to the start of any construction activities within a stream. The TDC shall be removed when the work at the down gradient or natural channel is no longer required. The TDC shall be backfilled and stabilized.
<b>Where: Location</b>	TDC shall be installed at the location identified on the SWMP. TDC can be used in the following locations: construction of detention ponds, dams, in-stream grade control structures, utility installations or any activity that requires work in a waterway.
<b>How: Maintenance &amp; Inspection</b>	TDC shall be installed per detail (Appendix 4). Inspect frequently and maintain all TDC throughout construction. Inspect flow barriers at the start and end of each workday. Inspect TDC for signs of erosion. Repair or replace the lining if necessary.

<b>Temporary Stream Crossing (TSC)</b>	Used: No	Phase(s): N/A
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☐ **Permanent** ☒ **Temporary**

<b>What: Description</b>	TSC is needed where an actively flowing watercourse must be crossed. Crossing methods: culvert crossing, stream ford and temporary bridge. A 404 permit is required for placement of fill in a waterway from the U.S. Army Corps of Engineers per Section 404 of the Clean Water Act.
<b>When: Installation</b>	Install a TSC only when it is necessary to cross a stream; and remove it when the crossing is no longer needed for construction.
<b>Where: Location</b>	TSC shall be installed at the locations identified on the SWMP.
<b>How: Maintenance &amp; Inspection</b>	TSC shall be installed per detail (Appendix 4). Inspect and maintain TSC throughout construction. Inspect for bank erosion and in-stream degradation.

<b>Paving and Grinding Operations (PGO)</b>		Used: <b>No</b>	Phase(s): <b>N/A</b>
<input type="checkbox"/> <b>Permanent</b> <input type="checkbox"/> <b>Temporary</b>			
<b>What: Description</b>	Runoff management practices shall be used during all PGO. A variety of management practices can be used such as: IP, perimeter controls, store materials away from the storm sewer system, drainages and waterways, and keep a spill kit onsite.		
<b>When: Installation</b>	PGO shall be scheduled during dry weather. Recycle asphalt and pavement material when feasible. Material that cannot be recycled must be disposed of properly.		
<b>Where: Location</b>	Use runoff management practices during all paving and grinding operations such as surfacing, resurfacing, and saw cuts.		
<b>How: Maintenance &amp; Inspection</b>	PGO shall be installed per detail (Appendix 4). Inspect regularly and maintain PGO throughout construction.		
Used:		Phase(s):	
<input type="checkbox"/> <b>Permanent</b> <input type="checkbox"/> <b>Temporary</b>			
<b>What – Description</b>			
<b>When – Installation</b>			
<b>Where – Location</b>			
<b>How – Maintenance and Inspection</b>			

\*To add additional CMs please click on the blue plus sign.

## SECTION 3: CONSTRUCTION SITE PHASING & ESC PLAN

### 3.1 Construction Site Phasing Summary

Phase I – Initial Construction Measures (CMs) and Best Management Practices (BMPs).

Phase II – Interim CMs and BMPs.

Phase III – Final CMs and BMPs.

### 3.2 General Notes

#### El Paso County General Erosion and Sediment Control Notes:

- 1) Stormwater discharges from construction sites shall not cause or threaten to cause pollution, contamination, or degradation of State Waters. All work and earth disturbance

shall be done in a manner that minimizes pollution of any on-site or offsite waters, including wetlands.

- 2) Notwithstanding anything depicted in these plans in words or graphic representation, all design and construction related to roads, storm drainage and erosion control shall conform to the standards and requirements of the most recent version of the relevant adopted El Paso County standards, including the Land Development Code, the Engineering Criteria Manual, the Drainage Criteria Manual, and the Drainage Criteria Manual Volume 2. Any deviations to regulations and standards must be requested, and approved, in writing.
- 3) A separate Stormwater Management Plan (SMWP) for this project shall be completed and an Erosion and Stormwater Quality Control Permit (ESQCP) issued prior to commencing construction. During construction the SWMP is the responsibility of the designated Qualified Stormwater Manager or Certified Erosion Control Inspector and shall be located on site at all times during construction and shall be kept up to date with work progress and changes in the field.
- 4) Once the ESQCP is approved and a "Notice to Proceed" has been issued, the contractor may install the initial stage erosion and sediment control measures as indicated on the approved GEC. A Preconstruction Meeting between the contractor, engineer, and El Paso County will be held prior to any construction. It is the responsibility of the applicant to coordinate the meeting time and place with County staff.
- 5) Control measures must be installed prior to commencement of activities that may contribute pollutants to stormwater. Temporary sediment and erosion control measures for all slopes, channels, ditches, or any disturbed land area shall be completed immediately upon completion of the disturbance.
- 6) All temporary sediment and erosion control measures shall be maintained and remain in effective operating condition until permanent soil erosion control measures are implemented and final stabilization is established. All persons engaged in land disturbance activities shall assess the adequacy of control measures at the site and identify if changes to those control measures is needed to ensure the continued effective performance of the control measures. All changes to temporary sediment and erosion control measures must be incorporated into the Stormwater Management Plan prior to implementation.
- 7) Temporary stabilization shall be implemented on disturbed areas and stockpiles where ground disturbing construction activity has permanently ceased or temporarily ceased for longer than 14 days. An area that is going to remain in an interim state for more than 60 days shall also be stabilized.
- 8) Final stabilization must be implemented at all applicable construction sites. Final stabilization is achieved when all ground disturbing activities are complete and all disturbed areas either have a uniform vegetative cover with individual plant density of 70 percent of pre-disturbance levels established or equivalent permanent alternative stabilization method is implemented. All temporary sediment and erosion control measures shall be removed upon final stabilization and before permit closure.
- 9) All permanent stormwater management facilities shall be installed as defined in the approved plans. Any proposed changes that effect the hydrology or hydraulics of a permanent stormwater management structures must be approved by the ECM Administrator prior to implementation.
- 10) Any earth disturbance shall be conducted in such a manner so as to effectively minimize accelerated soil erosion and resulting sedimentation. All disturbances shall be designed, constructed, and completed so that the exposed area of any disturbed land shall be limited



- to the shortest practical period of time. Pre-existing vegetation shall be protected and maintained within 50 horizontal feet of a waters of the state, unless infeasible.
- 11) Compaction of soil must be prevented in areas designated for infiltration control measures or where final stabilization will be achieved by vegetative cover. Areas designated for infiltration control shall also be protected from sedimentation during construction until final stabilization is achieved.
  - 12) Any temporary or permanent facility designed and constructed for the conveyance of stormwater around, through, or from the earth disturbance area shall be a stabilized conveyance designed to minimize erosion and the discharge of sediment off site.
  - 13) Concrete wash water shall be contained and disposed of in accordance with the SWMP. No wash water shall be discharged to or allowed to runoff to State Waters, including any surface or subsurface storm drainage system or facilities. Concrete washout shall not be located in an area where shallow groundwater may be present, or within 50 feet of a surface water body.
  - 14) Dewatering operations: uncontaminated ground water may be discharged on site, but may not leave the site in the form of surface runoff.
  - 15) Erosion control blanketing is to be used on slopes steeper than 3:1.
  - 16) Building, construction, excavation, or other waste materials shall not be temporarily placed or stored in the street, alley, or other public way, unless in accordance with an approved Traffic Control Plan. BMP's may be required by El Paso County Engineering if deemed necessary, based on specific conditions and circumstances.
  - 17) Vehicle tracking of soils and construction debris off-site shall be minimized. Materials tracked offsite shall be cleaned up and properly disposed of immediately.
  - 18) Contractor shall be responsible for the removal of all wastes from the construction site for disposal in accordance with local and State regulatory requirements. No construction debris, tree slash, building material wastes or unused building materials shall be buried, dumped, or discharged at the site.
  - 19) The owner, site developer, contractor, and/or their authorized agents shall be responsible for the removal of all construction debris, dirt, trash, rock, sediment, and sand that may accumulate in the storm sewer or other drainage conveyance system and stormwater appurtenances as a result of site development.
  - 20) The quantity of materials stored on the project site shall be limited, as much as practical, to that quantity required to perform the work in an orderly sequence. All materials stored on-site shall be stored in a neat, orderly manner, in their original containers, with original manufacturer's labels.
  - 21) No chemicals are to be used by the contractor, which have the potential to be released in stormwater unless permission for the use of a specific chemical is granted in writing by the ECM Administrator. In granting the use of such chemicals, special conditions and monitoring may be required.
  - 22) Bulk storage of petroleum products or other liquid chemicals in excess of 55 gallons shall have adequate secondary containment protection to contain all spills and prevent any spilled material from entering State Waters, including any surface or subsurface storm drainage system or facilities.
  - 23) No person shall cause the impediment of stormwater flow in the flow line of the curb and gutter or in the ditch flow line.
  - 24) Individuals shall comply with the "Colorado Water Quality Control Act" (Title 25, Article 8, CRS), and the "Clean Water Act" (33 USC 1344), in addition to the requirements included in

the DCM Volume II and the ECM Appendix I. All appropriate permits must be obtained by the contractor prior to construction (NPDES, Floodplain, 404, fugitive dust, etc.). In the event of conflicts between these requirements and laws, rules, or regulations of other Federal, State, or County agencies, the more restrictive laws, rules, or regulations shall apply.

- 25) All construction traffic must enter/exit the site at approved construction access points.
- 26) Prior to actual construction the permittee shall verify the location of existing utilities.
- 27) A water source shall be available on-site during earthwork operations and utilized as required to minimize dust from earthwork equipment and wind.
- 28) The soils report for this site has been prepared by Ninyo & Moore and shall be considered a part of these plans.
- 29) At least ten (10) days prior to the anticipated start of construction, for projects that will disturb 1 acre or more, the owner or operator of construction activity shall submit a permit application for stormwater discharge to the Colorado Department of Public Health and Environment, Water Quality Division. The application contains certification of completion of a stormwater management plan (SWMP), of which this grading and erosion control plan may be a part. For information or application materials contact:

This list is not intended to be all-inclusive, but is intended to identify the general note identified by the County to be included as part of the SWMP for compliance with the County's stormwater management requirements for construction activities.

## SECTION 4: WASTE MANAGEMENT PLAN

### 4.1 Covering Outdoor Storage and Handling Areas

**Instructions:**

- Practices for outdoor storage and handling areas are required to be implemented in all 3 phases of construction (initial, interim and final).

<b><i>Covering Outdoor Storage and Handling Areas</i></b>	Used: Yes	Phase(s): 1, 2, 3
<div style="display: flex; justify-content: space-between;"> <span><input type="checkbox"/> <b><i>Permanent</i></b></span> <span><input checked="" type="checkbox"/> <b><i>Temporary</i></b></span> </div>		
<p><b>Description:</b> When raw materials, byproducts, finished products, storage tanks, and other materials are stored or handled outdoors, stormwater runoff that comes in contact with the materials can become contaminated. Proactively covering storage and handling areas can be an effective source control for such areas. Coverings can be permanent or temporary and consist of tarp, plastic sheeting, roofing, enclosed structures, or other approaches that reduce exposure of materials to precipitation and wind.</p> <p><b>Uses:</b> Covering is appropriate for areas where solids (e.g., gravel, compost, building materials) or liquids (e.g., oil, gas, tar) are stored, prepared, or transferred. Cover the following areas that are applicable to this construction site:</p> <ul style="list-style-type: none"> <li>▪ <b>Loading and Unloading:</b> Loading and unloading operations usually take place at outside storage or staging area on the construction site. Materials may be spilled during transfer between storage facilities and trucks during pumping of liquids, pneumatic transfer of dry</li> </ul>		

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chemicals, and mechanical transfer of bags, boxes, drums, or other containers by material handling equipment.

- **Aboveground Tanks/Liquid Storage:** Accidental releases of chemicals from above-ground liquid storage can contaminate stormwater with a variety of pollutants. Several common causes of accidental releases from above-ground storage include: external corrosion and structural failure, problems due to improper installation, spills and overfills due to operator error, failure of piping systems, and leaks or spills during pumping of liquids or gases between trucks to a storage facility.
- **Outside Manufacturing:** Common outside manufacturing activities may include parts assembly, rock grinding or crushing, metals painting or coating, grinding or sanding, degreasing, concrete manufacturing, parts cleaning or operations that use hazardous materials. These activities can result in dry deposition of dust, metal and wood shavings and liquid discharges of dripping or leaking fluids from equipment or process and other residuals being washed away in storm runoff. In addition, outside storage of materials and waste products may occur in conjunction with outside manufacturing.
- **Waste Management:** Wastes spilled, leached, or lost from outdoor waste management areas or outside manufacturing activities may accumulate in soils or on other surfaces and be carried away by storm runoff. There is also the potential for liquid wastes from surface impoundments to overflow to surface waters or soak the soil where they can be picked up by runoff. Possible stormwater contaminants include toxic compounds, oil and grease, oxygen-demanding organics, paints and solvents, heavy metals and high levels of suspended solids. Lack of coverage of waste receptacles can result in precipitation seeping through the material and collecting contaminants or the material being blown around the site and into the storm sewer system. Containment sources include waste piles, wastewater and solid waste treatment and disposal, land application sites, dumpsters, or unlabeled drums.
- **Outside Storage of Materials:** Raw materials, intermediate products, byproducts, process residuals, finished products, containers, and materials storage areas can be sources of pollutants such as metals, oils and grease, sediment and other contaminants. Pollutant transport can occur when solid materials wash off or dissolve into water, or when spills or leaks occur.

#### Practice Procedures:

- Where practical, conduct operations indoors. If outdoors, then select a temporary or permanent covering to reduce exposure of materials to precipitation and runoff.
- The type of covering selected depends on a variety of factors such as the type and size of activity being conducted and materials involved. Types of cover range from relatively inexpensive tarps and plastic sheeting to overhead structures or fully enclosed buildings equipped with ventilation, lighting, etc.
- Covering practices should be combined with Good Housekeeping to be most effective.
- Tarps and plastic sheets require more frequent inspection and maintenance.

---

Place site-specific information here:

[INSERT TEXT HERE](#)

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## 4.2 Spill Prevention and Response Plan

**Instructions:** Implement spill prevention, containment and control practices during all 3 phases of construction.

<b>Spill Prevention &amp; Response Plan</b>	Used: Yes	Phase(s): 1, 2, 3
<input type="checkbox"/> <b>Permanent</b>	<input checked="" type="checkbox"/> <b>Temporary</b>	

Spills and leaks of solid and liquid materials processed, handled or stored outdoors can be a source of stormwater pollution. Spilled substances can reach receiving waters when runoff washes these materials from impervious surfaces or when spills directly enter the storm system during dry weather conditions. Effective controls depend on spill prevention and response measures, proper training, and may include structural spill containment or control devices. Spill containment measures include temporary or permanent curbs or berms that surround a potential spill site. Berms may be constructed of concrete, earthen material, metal, synthetic liners, or other material. Spill control devices include valves, slide gates, or other devices that can control and contain spilled material.

### Spill Prevention Measures

- Train key employees in plan and provide clear, common-sense spill prevention practices and clean-up procedures to be strictly followed.
- Identify equipment that is exposed to precipitation, pollutants that may be generated and possible sources of leaks or discharges.
- Perform inspections and preventative maintenance of equipment for proper operation and to check for leaks or evidence of discharge (stains). Ensure repairs are completed or provide temporary leak containment until such repairs can be made.
- Drain used motor oil and other automotive fluids in a designated area away from storm inlets. Collect spent fluids and recycle or dispose of properly. Never dispose into storm or sanitary sewer.
- In fueling areas, clean up spills with dry methods (absorbents) and use damp cloths on gas pumps and damp mops on paved surfaces.
- Never hose down a spill or absorbent materials into the storm drain, or down into an interior floor drain which leads to the sanitary sewer system.
- Reduce stormwater contact with equipment and materials by implementing covered storage, reduce stormwater run-on and follow good housekeeping practices.
- Post signs at critical locations with Spill Prevention and Response Plan information.

**Identification of Spill Areas:** Spill prevention and response measures shall be implemented at construction sites in areas where materials may be spilled in quantities that can adversely impact receiving waters or the storm system. Identify potential spill areas, potential spill volumes, material types, frequency of material used, and drainage paths from spill areas with relation to storm sewer inlets, adjacent water bodies, structural CMs, and containment structures. Use this information to determine the types of spill prevention and control measures needed specific to the site conditions. Show the potential spill areas on the EC Plan:

- 
- Loading and unloading areas
  - Outdoor storage areas
  - Outdoor manufacturing or processing activities
  - Waste disposal
  - Areas that generate significant dust or particulates that may later deposit on the ground
  - Areas prone to spills based on past experience at the site
  - Locations where other routine maintenance activities occur
  - Areas where smaller leaks may occur (parking lots)

**Material Handling Procedures:** From a water quality perspective, the primary principle behind effective material handling practices is to minimize exposure to precipitation. Store the material indoors, otherwise implement the following outdoor materials handling procedures:

- Divert stormwater around materials storage areas.
- Keep bulk solid materials (raw materials, sand, gravel, topsoil, compost, concrete, packing materials, metal products, etc) covered and protected from stormwater.
- When practical, store materials on impermeable surfaces.
- Store hazardous materials according to federal, state, and local requirements.
- Adopt procedures to reduce spills or leaks during filling or transfer of materials.
- Substitute less toxic or nontoxic materials for toxic materials.
- Store containers that are easily punctured or damaged away from high traffic areas.
- Add waste-capture containers such as collection pans for lubricating fluids.
- Store drums and containers with liquids on impermeable surfaces and provide secondary containment. Place drums stored outdoors on pallets to minimize contact with runoff.

**Spill Response Procedures:** Tailor spill response procedures to site-specific conditions and industry-specific regulatory requirements. Follow procedures:

- Contain and cleanup spills promptly after the spill is discovered.
- Sweep up small quantities of pollutants to reduce exposure to runoff.
- Place absorbents at fueling areas or areas susceptible to spills.
- Wipe up small spills with a rag, store rags in appropriate containers, dispose of rags properly or use a professional industrial cleaning service.
- Contain medium-sized spills with absorbents and use berms or absorbent "snakes" as temporary booms for the spill. Store and dispose of absorbents properly. Wet/dry vacuums may be used, but not for volatile fluids.
- Install drip pans below minor equipment leaks until a repair can be made.
- For large spills, first contain the spill and plug storm inlet where the liquid may migrate off-site, then clean up the spill.

- Excavation of spill areas to removed contaminated material may be required where large liquid spills occur on unpaved surfaces.
- Maintain an inventory of cleanup materials onsite and strategically locate them based on the types and quantities of chemicals present.
- Records of spills, leaks, or overflows that result in the discharge of pollutants must be documented and maintained.

Two approaches are used when implementing spill containment measures: 1) Design system to contain the entire spill; or 2) Use curbing to route spilled material to a collection basin. Both containment berming and curbing should be sized to safely contain or convey to a collection basin a spill from the largest storage tank, tanker truck, or other containment device in the possible spill area. The spill containment area must have an impermeable surface (impermeable liner, asphalt or concrete) to prevent groundwater contamination. Design containment system to enable collection and removal of spilled material through a pump or vacuum trucks, sorbent or gelling material, etc. Material removed must be disposed of or recycled according to local, state, and federal standards. If the capacity of the spill containment is exceeded, supplemental measures should be available such as a portable containment device, sorbent materials, or gelling agents to solidify the material. Water that collects within containment areas due to rainfall or snowmelt must be appropriately treated before release from the spill area.

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**Emergency 24-Hour Site Contact (with spill response and clean-up authority):**

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TBD

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TBD

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Office #: (xxx)-xxx-xxxx

Cell #: (xxx)-xxx-xxxx

Email: xxx@xxx.com

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**Notification Procedures:** Some spills may need to be reported to the State of Colorado, Water Quality Control Division and Adams County Stormwater Division immediately upon discovery. Releases of chemical, oil, petroleum product, sewage, etc., which may enter State Waters must be reported to: State of Colorado, 24-hour Emergency Spill Reporting Line: 1-877-518-5608. <https://www.colorado.gov/pacific/cdphe/wq-environmental-spills>.

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## 4.3 Good Housekeeping

<b>Instructions:</b> Implement good housekeeping practices during all 3 phases of construction (initial, interim & final).
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**Good Housekeeping Practices**

Used: Yes

Phase(s): 1, 2, 3

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☐ **Permanent**

☒ **Temporary**

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**Description:** Good housekeeping practices are designed to maintain a clean and orderly work environment. The most effective first steps towards preventing stormwater pollution at

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construction sites simply involve using common sense to improve the site's basic housekeeping methods. Poor housekeeping practices result in increased waste and potential for stormwater contamination. A clean and orderly work site reduces the possibility of accidental spills caused by mishandling of chemicals and equipment and should reduce safety hazards to personnel. A well-maintained material and chemical storage area will reduce the possibility of stormwater mixing with pollutants. Some simple procedures a site can use to promote good housekeeping include improved operation and maintenance of machinery and processes, material storage practices, material inventory controls, routine and regular clean-up schedules, maintaining well organized work areas, signage, and educational program for employees and the general public.

**Practice Procedures for Operation and Maintenance:**

- Maintain dry and clean floors and ground surfaces by using brooms, shovels, vacuums or cleaning machines, rather than wet clean-up methods.
- Regularly collect and dispose of garbage and waste material.
- Routinely inspect equipment to ensure that it is functioning properly without leaking and conduct preventative maintenance and needed repairs.
- Train employees on proper clean up and spill response procedures.
- Designate separate areas for auto parking, vehicle refueling and routine maintenance.
- Promptly clean up leaks, drips and other spills.
- Cover and maintain dumpsters and waste receptacles. Add additional dumpsters or increase frequency of waste collection if overflowing conditions reoccur.
- For outdoor painting and sanding: Conduct activities in designated areas that provide adequate protection to prevent overspray and uncontrolled emissions. All operations should be conducted on paved surfaces to facilitate cleanup. Use portable containment as necessary for outside operations. Clean up and properly dispose of excess paint, paint chips, protective coatings, grit waste, etc.
- Maintain vegetation on facility grounds in a manner that minimizes erosion. Follow the Landscape Maintenance and Pesticide, Herbicide and Fertilizer Usage CMs to ensure that minimum amounts of chemicals needed for healthy vegetation are applied to minimize transport of these materials in runoff.

**Practice Procedures for Material Storage Practices:**

- Provide adequate aisle space to facilitate material transfer and access for inspection.
- Store containers, drums, and bags away from direct traffic routes to reduce container damage resulting in accidental spills.
- Stack containers according to manufacturer's instructions to avoid damaging the containers from improper weight distribution. Also store materials in accordance with directions in Safety Data Sheets (SDSs).
- Store containers on pallets or similar devices to prevent corrosion of containers that results from containers coming in contact with moisture on the ground.
- Store toxic or hazardous liquids within curbed areas or secondary containers.

**Practice Procedures for Material Inventory Practices:** An up-to-date materials inventory can keep material costs down by preventing overstocking, track how materials are stored and

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handled onsite, and identify which materials and activities pose the most risk to the environment. Assign responsibility of hazardous material inventory to individuals trained to handle such materials. A material inventory should include these steps:

- Identify all chemical substances present at work site. Perform a walk-through of the site, review purchase orders, list all chemical substances used and obtain Safety Data Sheets (SDS) for all chemicals.
- Label all containers with name and type of substance, stock number, expiration date, health hazards, handling suggestions, and first aid information. Find info on the SDS.
- Clearly identify special handling, storage, use and disposal considerations for hazardous materials on the material inventory.
- Institute a shelf-life program to improve material tracking and inventory to reduce the amount of materials overstocked and ensure proper disposal of expired materials. Careful tracking of materials ordered can result in more efficient materials use. Decisions on the amounts of hazardous materials that are stored on site should include an evaluation-of any emergency control systems that are in place. All storage areas for hazardous materials should be designed to contain spills.

**Practice Procedures for Training and Participation:** Provide frequent and proper training in good housekeeping techniques to reduce mishandling of chemicals or equipment. Educate by:

- Discussing good housekeeping practices in training programs and meetings.
- Publicizing pollution prevention concepts through posters or signs.
- Posting bulletin boards with updated good housekeeping procedures and tips.

## 4.4 Vehicle Maintenance, Fueling and Storage

<b>Vehicle Maintenance, Fueling and Storage</b>	Used: Yes	Phase(s): 1, 2, 3
<input type="checkbox"/> <b>Permanent</b>	<input checked="" type="checkbox"/> <b>Temporary</b>	

**Description:** Areas where vehicles are fueled, maintained, and stored/parked can be pollutant "hot spots" that can result in hydrocarbons, trace metals, and other pollutants being transported in precipitation runoff. Proper fueling operations, storage of automotive fluids and effective spill cleanup procedures can help reduce contamination of stormwater runoff from vehicle maintenance and fueling facilities. Fuel-related spills can occur due to lack of attention during fueling or "topping off" fuel tanks. Common activities at construction sites include vehicle fluid replacement and equipment replacement and repair. Some of the wastes generated maintaining automobiles include solvents (degreasers, paint thinners, etc.), antifreeze, brake fluid, brake pad dust, battery acid, motor oil, fuel, and lubricating grease.

**Uses:** procedures are applicable to vehicle maintenance and fueling. Vehicle wash water is considered process wastewater that will not be discharged to the storm sewer system.

**Practice Procedures for Vehicle Maintenance:** The most effective way to minimize wastes generated by automotive maintenance activities is to prevent their production in the first place. The following practices will be implemented:



- 
- Perform maintenance activities inside or under cover. When repairs cannot be performed indoors, use drip pans or absorbents.
  - Keep equipment clean and free of excessive oil and grease buildup.
  - Promptly cleanup spills using dry methods and properly dispose of waste. When water is required, use as little as possible to clean spills, leaks, and drips.
  - Use a solvent collection service to collect spent solvent used for parts cleaning.
  - When using liquids for cleaning, use a centralized station to ensure that solvents and residues stay in one area. Locate drip pans and draining boards to direct solvents back into a solvent sink or holding tank for reuse.
  - Store used oil for recycling in labeled tanks. Locate used oil tanks and drums away from storm sewer, flowing streams, and preferably indoors.
  - Use non-hazardous or less hazardous alternatives when practical. For example, replace chlorinated organic solvents with non-chlorinated ones like kerosene or mineral spirits.
  - Properly recycle or dispose of grease, oil, antifreeze, brake fluid, cleaning solutions, hydraulic fluid, batteries, transmission fluid, worn parts, filters, and rags.
  - Drain and crush oil filters before recycling or disposal.
  - Drain all fluids and remove batteries from salvage vehicles and equipment.
  - Closely monitor parked vehicles for leaks and place pans under leaks to collect the fluids for proper disposal or recycling.
  - Install berms or other measures to contain spills and prevent work surface runoff from entering storm sewer system.
  - Develop a spill prevention plan with measures such as spill kits, and information about location of storm drains and how to protect them if a large spill occurs.
  - Conduct periodic employee training to reinforce proper disposal practices.
  - Promptly transfer used fluids to recycling drums or hazardous waste containers.
  - Store cracked batteries in leak-proof secondary containers.
  - Inspect outdoor storage areas regularly for drips, spills and improperly stored materials (for example: unlabeled containers, auto parts that might contain grease or fluids, etc). This is particularly important for parking areas for vehicles awaiting repair.
  - Structural CMs, such as traps, installed in vehicle hotspot areas require routine cleanout of oil and grease. During heavy rainfall, cleanout is required more often to ensure that pollutants are not washed through the trap. Sediment removal is also required on a regular basis to keep the CM working efficiently.

#### **Practice Procedures for Vehicle Fueling:**

- Fueling areas should be designed to prevent stormwater runoff and spills. Fuel-dispensing areas should be paved with concrete or equivalent impervious surface, with an adequate slope to prevent ponding, and separated from the rest of the site by a grade break or berm to prevent run-on of precipitation.
-

- For sites using a mobile fuel truck, establish a designated fueling area. Place temporary "caps" over nearby catch basins or manhole covers so that if a spill occurs, it is prevented from entering the storm sewer. Secondary containment should be used when transferring fuel from the tank truck to the fuel tank. Cover storm drains in the vicinity. Install vapor recovery nozzles to help control drips, and reduce air pollution.
- Keep spill response information and spill cleanup materials onsite and readily available.
- Employ dry cleanup methods cleaning up fuel spills. Such methods include sweeping to remove litter and debris, and using rags and absorbents for leaks and spills.
- Water should not be used to wash fuel spill areas. During routine cleaning, use a damp cloth on the pumps and a damp mop on the pavement. Fuel dispensing nozzles should be fitted with automatic shutoff except where prohibited by fire department. Post signs at the fuel dispenser warning operators against "topping off" vehicle fuel tanks.
- Provide written procedures describing CMs to employees who will be fueling.

Place site-specific information here:

[INSERT TEXT HERE](#)

## 4.5 Street Sweeping and Cleaning

<b>Street Sweeping (SS)</b>	Used: Yes	Phase(s): 1, 2, 3
<input type="checkbox"/> <b>Permanent</b>	<input checked="" type="checkbox"/> <b>Temporary</b>	

**Description:** SS uses either manual or mechanical pavement cleaning practices to collect or vacuum sediment, litter and other debris from the streets before being washed into storm sewers by runoff. This practice can reduce pollutant loading to receiving waters, reduce clogging of storm sewer pipes, prolong the life of infiltration CMs and reduce clogging of outlet structures in detention ponds. Mechanical designs include: broom and conveyor belt sweeper, wet or dry vacuum-assisted sweepers, and regenerative-air sweepers. The effectiveness depends upon particle loadings being swept, street texture, moisture conditions, parked cars, equipment conditions and frequency of cleaning.

**Uses:** SS is a technique in urban areas where sediment and litter accumulated on streets is of concern for aesthetic, sanitary, water and air quality reasons. SS is required at construction sites per SWMP to reduce off-site tracking.

### Procedures:

1. SS may be performed manually (broom and shovel) or with a vacuum sweeper (no kick-broom). Choose the most effective approach for site conditions.
2. SS shall be completed when there is sediment tracking from the construction site exits into the public road or right-of-way.
3. SS frequency depends on presence of sediment tracking. If tracking is occurring, either a VTC shall be installed, the VTC needs maintenance, or the VTC is inadequate; all require SWMP updates.

- 
4. Off-site sediment tracking from the construction site shall be swept immediately.
  5. Conduct SS prior to precipitation events.
  6. Operate sweepers at manufacturer recommended optimal speed levels.
  7. Regularly inspect vehicles and equipment for leaks and repair promptly.
  8. Keep accurate logs of number of curb-miles swept and amount of waste collected.
  9. Dispose of SS debris and dirt at a landfill.
  10. Do not store swept material along the side of the street or near a storm drain inlet.
- 

## 4.6 Storm Sewer Cleaning

<b><i>Storm Sewer System Cleaning</i></b>	Used: N/A	Phase(s): N/A
<input type="checkbox"/> <b><i>Permanent</i></b>	<input checked="" type="checkbox"/> <b><i>Temporary</i></b>	
<p><b>Description:</b> Periodic storm sewer cleaning can help remove accumulated sediment, trash, and other pollutants from the storm system including inlets, pipes and also construction CMs. Routine cleaning reduces the amount of pollutants in the storm system and in receiving waters. Clogged drains can cause overflow, leading to increase erosion. Cleaning increases dissolved oxygen, reduces levels of bacteria, and supports in-stream habitat. Areas with flat grades or low flows should be given special attention because they rarely achieve high enough flows to flush themselves. Water used in storm drain cleaning must be collected and properly disposed of, typically at a sanitary wastewater treatment facility. Simpler methods in localized areas can also include manual trash collection and shoveling sediment and debris from inlets and outlets. Frequency and prioritization of storm sewer cleaning is affected by the activity and intensity of construction and the proper installation and maintenance for construction CMs.</p> <p><b>Uses:</b> Inspection of the existing storm system is recommended prior construction to document condition. The storm sewer shall be cleaned at minimum at completion of construction.</p> <p><b>Practice Guidelines:</b> Inspect the storm system as part of the required stormwater inspection.</p> <ul style="list-style-type: none"> <li>▪ <b>Technology available:</b> manual cleaning (shovel), vacuum cleaning and vacuum combination jet cleaning. Choose the most effective approach for site conditions.</li> <li>▪ <b>Staff training:</b> train about maintenance, waste collection and disposal methods.</li> <li>▪ <b>Waste disposal:</b> Most catch basin waste is acceptable for landfills. If hazardous material is suspected, it should be tested and disposed of accordingly.</li> </ul>		

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# SECTION 5: STORMWATER INSPECTIONS

## 5.1 Inspections

### **1. *Qualified Stormwater Management Inspection Personnel:***

Inspection personnel TBD.

### **2. *Inspection Frequency:***

Inspections shall start within 7 calendar days of commencement of construction activities.

**Minimum Stormwater Inspection Schedule:** A thorough inspection of the site inspection shall be performed in accordance with one of the following minimum frequencies:

- At least one inspection every 7 calendar days, **or**
- At least one inspection every 14 calendar days, if post-storm event inspections are conducted within 24 hours after the end of any precipitation or snowmelt event that causes surface erosion. Post-storm inspections may be used to fulfill the 14-day routine inspection requirement.

**Post-Storm Inspections at Temporarily Idle Sites** - For permittees choosing to combine 14-day inspections and post-storm-event inspections, if no construction activities will occur following a storm event, post-storm event inspections must be conducted prior to re-commencing construction activities, but no later than 72 hours following the storm event. The delay of any post-storm event inspection must be documented in the inspection record. Routine inspections must still be conducted at least every 14 calendar days.

**Inspections at Completed Sites/Areas** - When the site, or portions of a site are awaiting establishment of a vegetative ground cover and final stabilization, the permittee must conduct a thorough inspection of the stormwater management system at least once every 30 days. Post-storm event inspections are not required under this schedule. This reduced inspection schedule is allowed if all of the following criteria are met:

- i. All construction activities resulting in ground disturbance are complete;
- ii. All activities required for final stabilization, in accordance with the SWMP, have been completed, with the exception of the application of seed that has not occurred due to seasonal conditions or the necessity for additional seed application to augment previous efforts; and
- iii. The SWMP has been amended to locate those areas to be inspected in accordance with the reduced schedule allowed for in this paragraph.

The minimum inspection frequency required does not affect the permittee's responsibility to implement and maintain effective control measures as prescribed in the SWMP. Proper maintenance may require more frequent inspections.

### **3. *Inspection Procedures:***

- At minimum, inspect the construction site perimeter, all disturbed area, designated haul routes, material and/or waste storage areas that are exposed to precipitation,

discharge location(s), and locations where vehicles exit the site shall be inspected for evidence of, or the potential for, pollutants leaving the Permitted boundaries, entering the storm sewer system, or discharging to the MS4.

- Refer to **Section 5.2 Inspection Sequence**.
- Visually verify whether all implemented CMs are in effective operational condition and are working as designed in their specifications to minimize pollutant discharges.
- Determine if there are new potential sources of pollutants.
- Assess the adequacy of CMs at the site to identify areas requiring new or modified CMs to minimize pollutant discharges.
- Identify all areas of non-compliance and implement corrective action.

#### **4. Correcting Problems:**

Take steps to minimize the discharge of pollutants until a CM is implemented and operational, or an inadequate CM is replaced or corrected, and returned to effective operating condition. If it is infeasible to install or repair the CM immediately after discovering the deficiency, the following must be documented:

- (a) Describe why it is infeasible to initiate the installation or repair immediately; and
- (b) Provide a schedule for installing or repairing the CM and returning it to an effective operating condition asap.

Remove and properly dispose of any unauthorized release or discharge. Clean up any contaminated surfaces to minimize discharges of the material in subsequent storm events.

[INSERT ADDITIONAL INFORMATION ABOUT CORRECTING ISSUES HERE](#)

Responsible staff or company for making corrections: [INSERT NAME HERE](#)

#### **5. Inspection Form:**

Use the form<sup>1</sup> in **Appendix 6** for all Capital Improvement Projects. Place completed inspections or refer to where the inspections are kept electronically in **Appendix 7**. At a minimum the form should document:

- Inspection date;
- name & title of inspector;
- weather conditions;
- phase of construction;
- estimated acreage of disturbance at the time of inspection;
- location(s) of discharges of sediment or other pollutants from the site; location(s) of CMs needing maintenance;
- location(s) and identification of inadequate CMs;
- location(s) and identification of additional CMs needed that were not in place at the time of inspection;
- description of the minimum inspection frequency;
- deviations from the minimum inspection schedule; certification statement for corrective action(s) or inspection (if no actions).

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<sup>1</sup> An equivalent form may be used for all projects except Capital Improvement Projects.

## 5.2 Inspection Sequence

### 1. Plan your stormwater inspection

- Use the inspection form (or equivalent) under **Appendix 6**.
- Obtain a copy of the EC Plan (Site Map) with CMs locations marked.
- Plan to walk the entire site, including discharge points from the site and any off-site support activities.
- Follow a consistent pattern each time to ensure you inspect all areas.

### 2. Determine Inspection frequency

- Site inspections must be conducted at least once every 7; or 14 calendar days.
- If 14-day inspections, then post-storm inspections must be conducted within 24 hours after the end of any precipitation or snowmelt event that causes surface erosion.
- 30-day inspections are conducted once construction is complete, temporary stabilizations has been installed and the site is waiting to reach final stabilization.

### 3. Inspect discharge points and downstream, off-site areas

- Inspect discharge locations to determine whether erosion and sediment control measures are effective.
- Inspect nearby downstream locations.
- Walk down the street to inspect off-site areas for signs of discharges.
- Inspect down slope existing catch basins to ensure they are free of sediment and other pollutants and to ensure that they are adequately protected.

### 4. Inspect perimeter controls and slopes

- Inspect perimeter controls to determine if sediment should be removed.
- Check the structural integrity of the CM. Determine if CM replacement is needed.
- Inspect slopes and temporary stockpiles to determine if erosion controls are effective.

### 5. Compare CMs in the EC Plan with the construction site conditions.

- Determine whether CMs are in place as required by the EC plan.
- Evaluate whether CMs have been adequately installed and maintained.
- Look for areas where CMs are needed but are missing on the field, or are not documented on the SWMP.

### 6. Inspect construction site entrances

- Inspect the construction exits to determine if there is tracking of sediment from the site onto the street.
- Refresh or replace the rock in designated entrances and concrete washout areas.
- Look for evidence of additional construction exits being used that are not in the SWMP or are not stabilized.

- Sweep the street if there is evidence of sediment accumulation.

## 7. Inspect sediment controls

- Inspect any sediment basins for sediment accumulation.
- Remove sediment when it reduces the capacity of the basin by  $\frac{1}{3}$  of the design storage volume.

## 8. Inspect pollution prevention and good housekeeping practices

- Inspect trash areas to ensure that waste is properly contained.
- Inspect material storage and staging areas to verify that potential pollutant sources are not exposed to stormwater runoff.
- Verify that concrete, paint, and stucco washouts are being used properly and are correctly sized for the volume of wash water.
- Inspect vehicle/equipment fueling and maintenance areas for signs of stormwater pollutant exposure.

## 9. Inspect for final stabilization

- Inspect all temporary and permanent CMs for correct application and installation with the CM details.
- Remove sediment from the private storm sewer system - do not jet pollutants down into the public storm sewer system.

# SECTION 6: RECORDKEEPING

## 6.1 Recordkeeping

The following records shall be available at the construction site, or be on-site when construction activities are occurring:

- ✓ An updated SWMP, reflecting current conditions and CMs.
- ✓ Keep record of SWMP/EC Plan changes made including the date and identification of the changes (\*).
- ✓ Completed inspection reports, can be placed or electronically stored and the location referenced in **Appendix 7**
- ✓ Any document or plan incorporated by reference to the SWMP.

(\*) The SWMP must be amended when the following occurs:

- 1) A change in design, construction, operation, or maintenance of the site requiring implementation of new or revised control measures;
- 2) The SWMP proves ineffective in controlling pollutants in stormwater runoff in compliance with the permit conditions;
- 3) Control measures identified in the SWMP are no longer necessary and are removed; and
- 4) Corrective actions are taken onsite that result in a change to the SWMP.

A notation must be included in the SWMP to identify the date of the site change, the control measure removed, or modified, the location(s) of those control measures, and any changes to the control measure(s). The permittee must ensure the site changes are reflected in the SWMP. The permittee is non-compliant with the permit until the SWMP revisions have been made

SWMP documentation required under this permit are considered reports that must be available to the public under Section 308(b) of the CWA and Section 61.5(4) of the CDPS regulations. The permittee must make plans available to members of the public upon request. However, the permittee may claim any portion of a SWMP as confidential in accordance with 40 CFR Part 2.

Records will be retained for a minimum period of at least 3 years after the CDPHE permit is terminated.

## **SECTION 7: FINAL STABILIZATION**

### **7.1 Final Stabilization Requirement**

Final Stabilization is reached when all ground disturbing activities are complete, and all disturbed areas have either been built on, paved over or a uniform vegetative cover has been established per SWMP. Prior to closing the State Stormwater Permit, all the items listed below must be completed in order for the construction site to be considered to have final stabilization.

1. The site has a uniform vegetative cover with a density of at least 70% compared to the original undisturbed site. Such cover must be capable of adequately controlling soil erosion.
2. If applicable, proper installation and maintenance of all approved, permanent, post-construction stormwater quality treatment drainage facilities.
3. Removal of all stockpiles of soil, construction material/debris, construction equipment, etc. from the construction site.
4. Streets, parking lots and other surrounding paved surfaces are clean and free of any sediment or debris.
5. Removal of sediment, debris or other pollutants within the private and adjacent public storm drainage system.
6. Restoration of any damaged public infrastructure caused by the construction activities.



## 7.2 Final Stabilization Measures

<b>Permanent Seeding (PS)</b>		Used: Yes	Phase(s): 3
<input checked="" type="checkbox"/> <b>Permanent</b> <input type="checkbox"/> <b>Temporary</b>			
<b>Seed Mix Selection According to Soil Type</b>	See ESC Plans		
<b>Seed Application Method</b>	INSERT TEXT HERE		
<b>Soil Preparation</b>	INSERT TEXT HERE		
<b>Soil Amendment</b>	INSERT TEXT HERE		
<b>Crimped Straw</b>		Used: Yes	Phase(s): 3
<input type="checkbox"/> <b>Permanent</b> <input checked="" type="checkbox"/> <b>Temporary</b>			
INSERT TEXT HERE			
<b>Hydromulch</b>		Used: Yes	Phase(s): 3
<input type="checkbox"/> <b>Permanent</b> <input checked="" type="checkbox"/> <b>Temporary</b>			
INSERT TEXT HERE			
<b>Rolled Erosion Control Products (RECP)</b>		Used: Yes	Phase(s): 3
<input type="checkbox"/> <b>Permanent</b> <input checked="" type="checkbox"/> <b>Temporary</b>			
INSERT TEXT HERE			
		Used:	Phase(s): 3
<input type="checkbox"/> <b>Permanent</b> <input type="checkbox"/> <b>Temporary</b>			

## 7.3 Removal of Temporary CMs

Once the site has met the final stabilization conditions, the remaining temporary CMs such as perimeter controls, inlet protection, silt fence, etc. shall be removed and disposed of properly.

## 7.4 Stormwater Permits Close-out

Submit the CDPS Stormwater Discharge Permit Inactivation Form to CDPHE.

## 7.5 Long Term Stormwater Management

No long term permanent BMPs are planned for the site at this time.



# SWMP APPENDICES

Attach the following documentation:

<b><i>Appendix 1 - Project Vicinity Map</i></b>	<b><i>(Section 1.1)</i></b>
<b><i>Appendix 2 - State CDPS Stormwater Construction Permit and Additional Permits (if applicable)</i></b>	<b><i>(Section 1.2)</i></b>
<b><i>Appendix 3 - Pre-disturbance Photos</i></b>	<b><i>(Section 1.4)</i></b>
<b><i>Appendix 4 - Erosion and Sediment BMPs/CMs Details</i></b>	<b><i>(Section 1.10)</i></b>
<b><i>Appendix 5 - Erosion and Sediment Control Plan (ESC Plan) - Site Map</i></b>	<b><i>(Section 2.10)</i></b>
<b><i>Appendix 6 - Stormwater Inspection Form</i></b>	<b><i>(Section 5.1)</i></b>
<b><i>Appendix 7 - Completed Stormwater Inspection Logs</i></b>	<b><i>(Sections 5.3 &amp; 5.5)</i></b>
<b><i>Appendix 8 - Agreement for off-site Control Measures (not applicable)</i></b>	<b><i>(Section 1.5)</i></b>

**APPENDIX 1: Project Vicinity Map**

## **APPENDIX 2: CDPHE Stormwater Construction Permit and Additional Permits (not applicable)**

**NOT USED**

## APPENDIX 3: Pre-Disturbance Photos

### POTABLE WATER STORAGE TANK SITE





# POTABLE WATER PIPELINES















## **APPENDIX 4: Erosion & Sediment CMs/BMPs Details**

## Description

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

Permanent seeding should be used to stabilize areas at final grade that will not be otherwise stabilized. Effective seeding includes preparation of a seedbed, selection of an appropriate seed mixture, proper planting techniques, and protection of the seeded area with mulch, geotextiles, or other appropriate measures.



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

## Appropriate Uses

When the soil surface is disturbed and will remain inactive for an extended period (typically 30 days or longer), proactive stabilization measures should be implemented. If the inactive period is short-lived (on the order of two weeks), techniques such as surface roughening may be appropriate. For longer periods of inactivity, temporary seeding and mulching can provide effective erosion control. Permanent seeding should be used on finished areas that have not been otherwise stabilized.

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

## Design and Installation

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

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

Drill seeding is the preferred seeding method. Hydroseeding is not recommended except in areas where steep slopes prevent use of drill seeding equipment, and even in these instances it is preferable to hand seed and mulch. Some jurisdictions do not allow hydroseeding or hydromulching.

## Seedbed Preparation

Prior to seeding, ensure that areas to be revegetated have soil conditions capable of supporting vegetation. Overlot grading can result in loss of topsoil, resulting in poor quality subsoils at the ground surface that have low nutrient value, little organic matter content, few soil microorganisms, rooting restrictions, and conditions less conducive to infiltration of precipitation. As a result, it is typically necessary to provide stockpiled topsoil, compost, or other

Temporary and Permanent Seeding	
Functions	
Erosion Control	Yes
Sediment Control	No
Site/Material Management	No

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

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

Topsoil should be salvaged during grading operations for use and spread on areas to be revegetated later. Topsoil should be viewed as an important resource to be utilized for vegetation establishment, due to its water-holding capacity, structure, texture, organic matter content, biological activity, and nutrient content. The rooting depth of most native grasses in the semi-arid Denver metropolitan area is 6 to 18 inches. At a minimum, the upper 6 inches of topsoil should be stripped, stockpiled, and ultimately respread across areas that will be revegetated.

Where topsoil is not available, subsoils should be amended to provide an appropriate plant-growth medium. Organic matter, such as well digested compost, can be added to improve soil characteristics conducive to plant growth. Other treatments can be used to adjust soil pH conditions when needed. Soil testing, which is typically inexpensive, should be completed to determine and optimize the types and amounts of amendments that are required.

If the disturbed ground surface is compacted, rip or rototill the surface prior to placing topsoil. If adding compost to the existing soil surface, rototilling is necessary. Surface roughening will assist in placement of a stable topsoil layer on steeper slopes, and allow infiltration and root penetration to greater depth.

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

### **Seed Mix for Temporary Vegetation**

To provide temporary vegetative cover on disturbed areas which will not be paved, built upon, or fully landscaped or worked for an extended period (typically 30 days or more), plant an annual grass appropriate for the time of planting and mulch the planted areas. Annual grasses suitable for the Denver metropolitan area are listed in Table TS/PS-1. These are to be considered only as general recommendations when specific design guidance for a particular site is not available. Local governments typically specify seed mixes appropriate for their jurisdiction.

### **Seed Mix for Permanent Revegetation**

To provide vegetative cover on disturbed areas that have reached final grade, a perennial grass mix should be established. Permanent seeding should be performed promptly (typically within 14 days) after reaching final grade. Each site will have different characteristics and a landscape professional or the local jurisdiction should be contacted to determine the most suitable seed mix for a specific site. In lieu of a specific recommendation, one of the perennial grass mixes appropriate for site conditions and growth season listed in Table TS/PS-2 can be used. The pure live seed (PLS) rates of application recommended in these tables are considered to be absolute minimum rates for seed applied using proper drill-seeding equipment.

If desired for wildlife habitat or landscape diversity, shrubs such as rubber rabbitbrush (*Chrysothamnus nauseosus*), fourwing saltbush (*Atriplex canescens*) and skunkbrush sumac (*Rhus trilobata*) could be added to the upland seedmixes at 0.25, 0.5 and 1 pound PLS/acre, respectively. In riparian zones, planting root stock of such species as American plum (*Prunus americana*), woods rose (*Rosa woodsii*), plains cottonwood (*Populus sargentii*), and willow (*Populus spp.*) may be considered. On non-topsoiled upland sites, a legume such as Ladak alfalfa at 1 pound PLS/acre can be included as a source of nitrogen for perennial grasses.

Seeding dates for the highest success probability of perennial species along the Front Range are generally in the spring from April through early May and in the fall after the first of September until the ground freezes. If the area is irrigated, seeding may occur in summer months, as well. See Table TS/PS-3 for appropriate seeding dates.

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

Species <sup>a</sup> (Common name)	Growth Season <sup>b</sup>	Pounds of Pure Live Seed (PLS)/acre <sup>c</sup>	Planting Depth (inches)
1. Oats	Cool	35 - 50	1 - 2
2. Spring wheat	Cool	25 - 35	1 - 2
3. Spring barley	Cool	25 - 35	1 - 2
4. Annual ryegrass	Cool	10 - 15	½
5. Millet	Warm	3 - 15	½ - ¾
6. Sudangrass	Warm	5-10	½ - ¾
7. Sorghum	Warm	5-10	½ - ¾
8. Winter wheat	Cool	20-35	1 - 2
9. Winter barley	Cool	20-35	1 - 2
10. Winter rye	Cool	20-35	1 - 2
11. Triticale	Cool	25-40	1 - 2
<p><sup>a</sup> Successful seeding of annual grass resulting in adequate plant growth will usually produce enough dead-plant residue to provide protection from wind and water erosion for an additional year. This assumes that the cover is not disturbed or mowed closer than 8 inches.</p> <p>Hydraulic seeding may be substituted for drilling only where slopes are steeper than 3:1 or where access limitations exist. When hydraulic seeding is used, hydraulic mulching should be applied as a separate operation, when practical, to prevent the seeds from being encapsulated in the mulch.</p> <p><sup>b</sup> See Table TS/PS-3 for seeding dates. Irrigation, if consistently applied, may extend the use of cool season species during the summer months.</p> <p><sup>c</sup> Seeding rates should be doubled if seed is broadcast, or increased by 50 percent if done using a Brillion Drill or by hydraulic seeding.</p>			

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

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

Common <sup>a</sup> Name	Botanical Name	Growth Season <sup>b</sup>	Growth Form	Seeds/ Pound	Pounds of PLS/acre
<b>Alakali Soil Seed Mix</b>					
Alkali sacaton	<i>Sporobolus airoides</i>	Cool	Bunch	1,750,000	0.25
Basin wildrye	<i>Elymus cinereus</i>	Cool	Bunch	165,000	2.5
Sodar streambank wheatgrass	<i>Agropyron riparium 'Sodar'</i>	Cool	Sod	170,000	2.5
Jose tall wheatgrass	<i>Agropyron elongatum 'Jose'</i>	Cool	Bunch	79,000	7.0
Arriba western wheatgrass	<i>Agropyron smithii 'Arriba'</i>	Cool	Sod	110,000	5.5
<b>Total</b>					<b>17.75</b>
<b>Fertile Loamy Soil Seed Mix</b>					
Ephriam crested wheatgrass	<i>Agropyron cristatum 'Ephriam'</i>	Cool	Sod	175,000	2.0
Dural hard fescue	<i>Festuca ovina 'duriuscula'</i>	Cool	Bunch	565,000	1.0
Lincoln smooth brome	<i>Bromus inermis leyss 'Lincoln'</i>	Cool	Sod	130,000	3.0
Sodar streambank wheatgrass	<i>Agropyron riparium 'Sodar'</i>	Cool	Sod	170,000	2.5
Arriba western wheatgrass	<i>Agropyron smithii 'Arriba'</i>	Cool	Sod	110,000	7.0
<b>Total</b>					<b>15.5</b>
<b>High Water Table Soil Seed Mix</b>					
Meadow foxtail	<i>Alopecurus pratensis</i>	Cool	Sod	900,000	0.5
Redtop	<i>Agrostis alba</i>	Warm	Open sod	5,000,000	0.25
Reed canarygrass	<i>Phalaris arundinacea</i>	Cool	Sod	68,000	0.5
Lincoln smooth brome	<i>Bromus inermis leyss 'Lincoln'</i>	Cool	Sod	130,000	3.0
Pathfinder switchgrass	<i>Panicum virgatum 'Pathfinder'</i>	Warm	Sod	389,000	1.0
Alkar tall wheatgrass	<i>Agropyron elongatum 'Alkar'</i>	Cool	Bunch	79,000	5.5
<b>Total</b>					<b>10.75</b>
<b>Transition Turf Seed Mix<sup>c</sup></b>					
Ruebens Canadian bluegrass	<i>Poa compressa 'Ruebens'</i>	Cool	Sod	2,500,000	0.5
Dural hard fescue	<i>Festuca ovina 'duriuscula'</i>	Cool	Bunch	565,000	1.0
Citation perennial ryegrass	<i>Lolium perenne 'Citation'</i>	Cool	Sod	247,000	3.0
Lincoln smooth brome	<i>Bromus inermis leyss 'Lincoln'</i>	Cool	Sod	130,000	3.0
<b>Total</b>					<b>7.5</b>

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

Common Name	Botanical Name	Growth Season <sup>b</sup>	Growth Form	Seeds/ Pound	Pounds of PLS/acre
<b>Sandy Soil Seed Mix</b>					
Blue grama	<i>Bouteloua gracilis</i>	Warm	Sod-forming bunchgrass	825,000	0.5
Camper little bluestem	<i>Schizachyrium scoparium</i> 'Camper'	Warm	Bunch	240,000	1.0
Prairie sandreed	<i>Calamovilfa longifolia</i>	Warm	Open sod	274,000	1.0
Sand dropseed	<i>Sporobolus cryptandrus</i>	Cool	Bunch	5,298,000	0.25
Vaughn sideoats grama	<i>Bouteloua curtipendula</i> 'Vaughn'	Warm	Sod	191,000	2.0
Arriba western wheatgrass	<i>Agropyron smithii</i> 'Arriba'	Cool	Sod	110,000	5.5
<b>Total</b>					<b>10.25</b>
<b>Heavy Clay, Rocky Foothill Seed Mix</b>					
Ephriam crested wheatgrass <sup>d</sup>	<i>Agropyron cristatum</i> 'Ephriam'	Cool	Sod	175,000	1.5
Oahe Intermediate wheatgrass	<i>Agropyron intermedium</i> 'Oahe'	Cool	Sod	115,000	5.5
Vaughn sideoats grama <sup>e</sup>	<i>Bouteloua curtipendula</i> 'Vaughn'	Warm	Sod	191,000	2.0
Lincoln smooth brome	<i>Bromus inermis</i> leyss 'Lincoln'	Cool	Sod	130,000	3.0
Arriba western wheatgrass	<i>Agropyron smithii</i> 'Arriba'	Cool	Sod	110,000	5.5
<b>Total</b>					<b>17.5</b>
<sup>a</sup> All of the above seeding mixes and rates are based on drill seeding followed by crimped straw mulch. These rates should be doubled if seed is broadcast and should be increased by 50 percent if the seeding is done using a Brillion Drill or is applied through hydraulic seeding. Hydraulic seeding may be substituted for drilling only where slopes are steeper than 3:1. If hydraulic seeding is used, hydraulic mulching should be done as a separate operation. <sup>b</sup> See Table TS/PS-3 for seeding dates. <sup>c</sup> If site is to be irrigated, the transition turf seed rates should be doubled. <sup>d</sup> Crested wheatgrass should not be used on slopes steeper than 6H to 1V. <sup>e</sup> Can substitute 0.5 lbs PLS of blue grama for the 2.0 lbs PLS of Vaughn sideoats grama.					



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

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

Seeding Dates	Annual Grasses (Numbers in table reference species in Table TS/PS-1)		Perennial Grasses	
	Warm	Cool	Warm	Cool
January 1–March 15			✓	✓
March 16–April 30	4	1,2,3	✓	✓
May 1–May 15	4		✓	
May 16–June 30	4,5,6,7			
July 1–July 15	5,6,7			
July 16–August 31				
September 1–September 30		8,9,10,11		
October 1–December 31			✓	✓

### Mulch

Cover seeded areas with mulch or an appropriate rolled erosion control product to promote establishment of vegetation. Anchor mulch by crimping, netting or use of a non-toxic tackifier. See the Mulching BMP Fact Sheet for additional guidance.

### Maintenance and Removal

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

An area that has been permanently seeded should have a good stand of vegetation within one growing season if irrigated and within three growing seasons without irrigation in Colorado. Reseed portions of the site that fail to germinate or remain bare after the first growing season.

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

Protect seeded areas from construction equipment and vehicle access.

## Description

Mulching consists of evenly applying straw, hay, shredded wood mulch, rock, bark or compost to disturbed soils and securing the mulch by crimping, tackifiers, netting or other measures. Mulching helps reduce erosion by protecting bare soil from rainfall impact, increasing infiltration, and reducing runoff. Although often applied in conjunction with temporary or permanent seeding, it can also be used for temporary stabilization of areas that cannot be reseeded due to seasonal constraints.

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



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

## Appropriate Uses

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

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

Do not apply mulch during windy conditions.

## Design and Installation

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

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

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

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

## **Maintenance and Removal**

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

## Description

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



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

## Appropriate Uses

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

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

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

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

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

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

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

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

\* C Factor and shear stress for mulch control nettings must be obtained with netting used in conjunction with pre-applied mulch material. (See Section 5.3 of Chapter 7 Construction BMPs for more information on the C Factor.)

<sup>1</sup> Minimum Average Roll Values, Machine direction using ECTC Mod. ASTM D 5035.

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

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

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

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

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

# EC-6 Rolled Erosion Control Products (RECP)

**Table RECP-2. ECTC Standard Specification for Permanent<sup>1</sup> Rolled Erosion Control Products**  
(Adapted from: Erosion Control Technology Council 2005)

Product Type	Slope Applications	Channel Applications	
TRMs with a minimum thickness of 0.25 inches (6.35 mm) per ASTM D 6525 and UV stability of 80% per ASTM D 4355 (500 hours exposure).	Maximum Gradient	Maximum Shear Stress <sup>4,5</sup>	Minimum Tensile Strength <sup>2,3</sup>
	0.5:1 (H:V)	6.0 lbs/ft <sup>2</sup> (288 Pa)	125 lbs/ft (1.82 kN/m)
	0.5:1 (H:V)	8.0 lbs/ft <sup>2</sup> (384 Pa)	150 lbs/ft (2.19 kN/m)
	0.5:1 (H:V)	10.0 lbs/ft <sup>2</sup> (480 Pa)	175 lbs/ft (2.55 kN/m)

<sup>1</sup> For TRMs containing degradable components, all property values must be obtained on the non-degradable portion of the matting alone.

<sup>2</sup> Minimum Average Roll Values, machine direction only for tensile strength determination using [ASTM D 6818](#) (Supersedes Mod. [ASTM D 5035](#) for RECPs)

<sup>3</sup> Field conditions with high loading and/or high survivability requirements may warrant the use of a TRM with a tensile strength of 44 kN/m (3,000 lb/ft) or greater.

<sup>4</sup> Required minimum shear stress TRM (fully vegetated) can sustain without physical damage or excess erosion (> 12.7 mm (0.5 in.) soil loss) during a 30-minute flow event in large scale testing.

<sup>5</sup> Acceptable large-scale testing protocols may include [ASTM D 6460](#), or other independent testing deemed acceptable by the engineer.

## Design and Installation

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

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

ECB-1 Pipe Outlet to Drainageway

ECB-2 Small Ditch or Drainageway

ECB-3 Outside of Drainageway

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

- ECB type
- Slope or channel type

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

## Maintenance and Removal

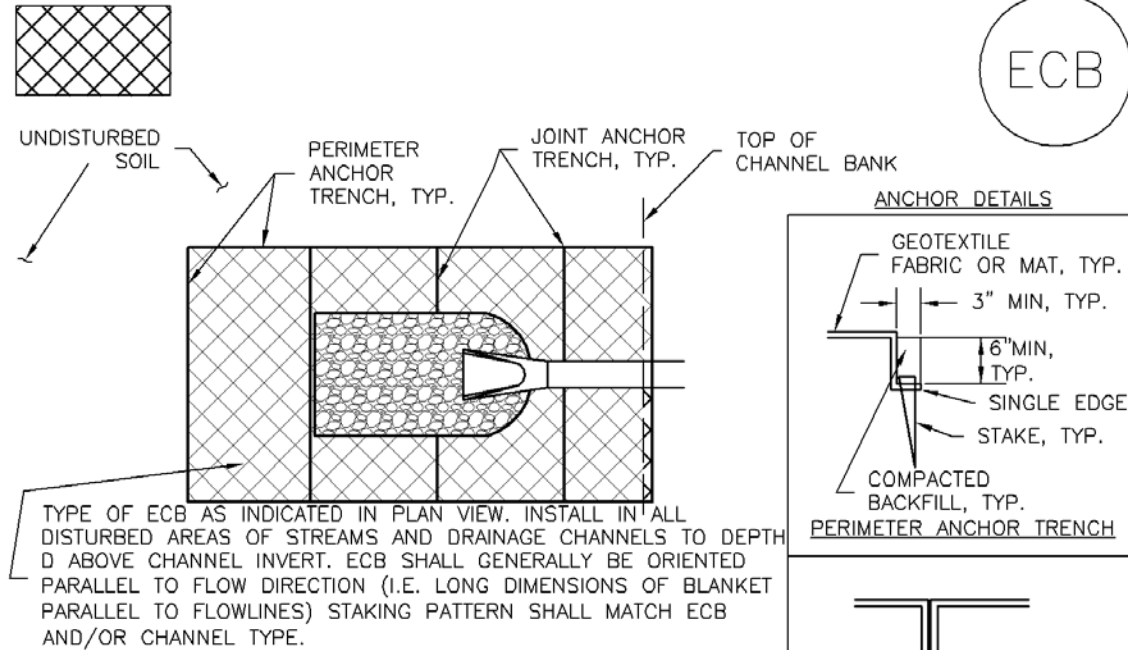
Inspection of erosion control blankets and other RECPs includes:

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

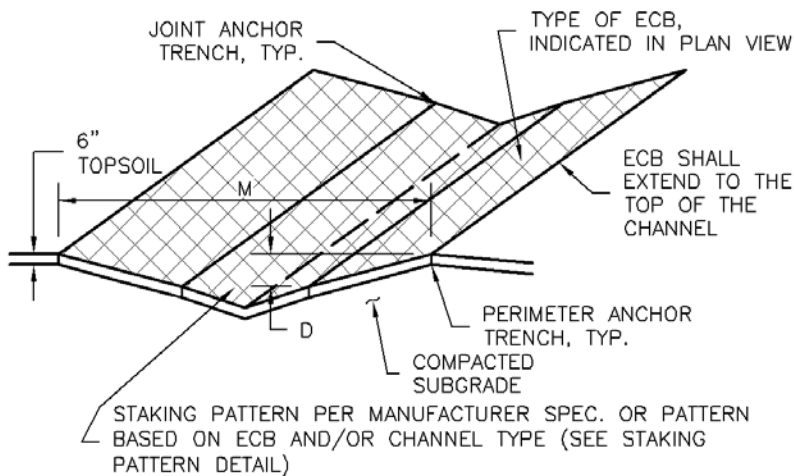
Erosion control blankets and other RECPs that are biodegradable typically do not need to be removed after construction. If they must be removed, then an alternate soil stabilization method should be installed promptly following removal.

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

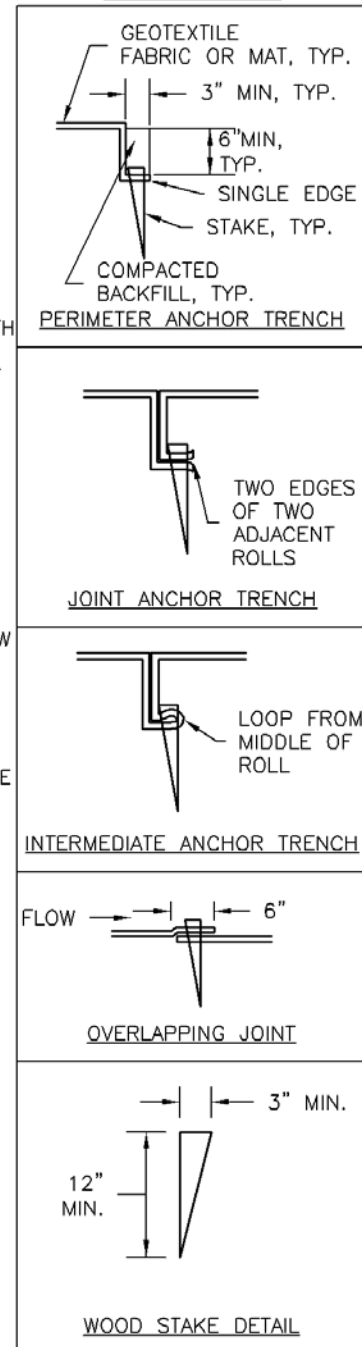


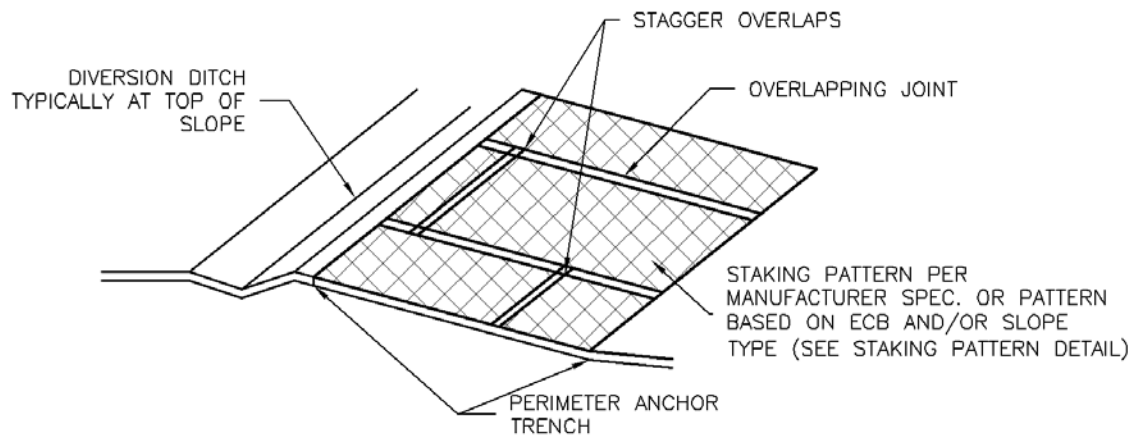


## ECB-1. PIPE OUTLET TO DRAINAGEWAY

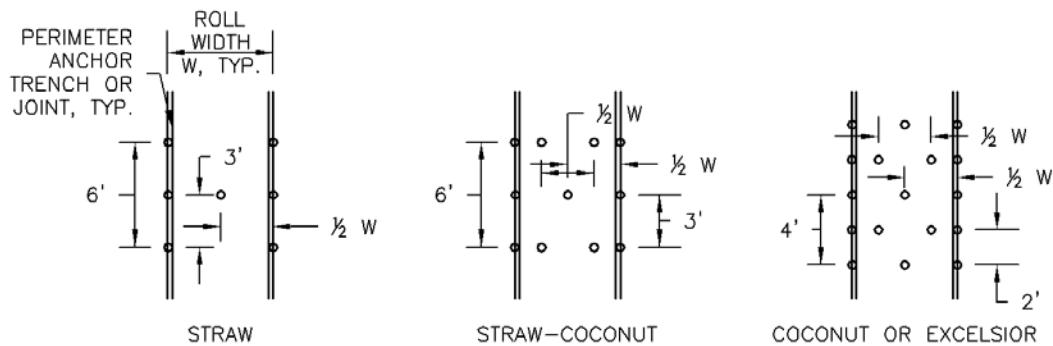


## ECB-2. SMALL DITCH OR DRAINAGEWAY

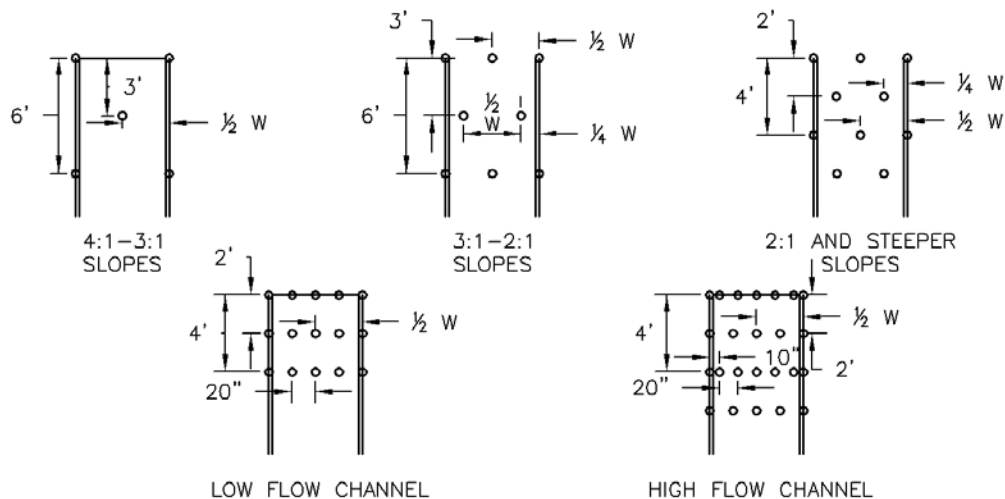




## ECB-3. OUTSIDE OF DRAINAGEWAY



## STAKING PATTERNS BY ECB TYPE



## STAKING PATTERNS BY SLOPE OR CHANNEL TYPE

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

### EROSION CONTROL BLANKET INSTALLATION NOTES

1. SEE PLAN VIEW FOR:
  - LOCATION OF ECB.
  - TYPE OF ECB (STRAW, STRAW-COCONUT, COCONUT, OR EXCELSIOR).
  - AREA, A, IN SQUARE YARDS OF EACH TYPE OF ECB.
2. 100% NATURAL AND BIODEGRADABLE MATERIALS ARE PREFERRED FOR RECPs, ALTHOUGH SOME JURISDICTIONS MAY ALLOW OTHER MATERIALS IN SOME APPLICATIONS.
3. IN AREAS WHERE ECBs ARE SHOWN ON THE PLANS, THE PERMITTEE SHALL PLACE TOPSOIL AND PERFORM FINAL GRADING, SURFACE PREPARATION, AND SEEDING AND MULCHING. SUBGRADE SHALL BE SMOOTH AND MOIST PRIOR TO ECB INSTALLATION AND THE ECB SHALL BE IN FULL CONTACT WITH SUBGRADE. NO GAPS OR VOIDS SHALL EXIST UNDER THE BLANKET.
4. PERIMETER ANCHOR TRENCH SHALL BE USED ALONG THE OUTSIDE PERIMETER OF ALL BLANKET AREAS.
5. JOINT ANCHOR TRENCH SHALL BE USED TO JOIN ROLLS OF ECBs TOGETHER (LONGITUDINALLY AND TRANSVERSELY) FOR ALL ECBs EXCEPT STRAW WHICH MAY USE AN OVERLAPPING JOINT.
6. INTERMEDIATE ANCHOR TRENCH SHALL BE USED AT SPACING OF ONE-HALF ROLL LENGTH FOR COCONUT AND EXCELSIOR ECBs.
7. OVERLAPPING JOINT DETAIL SHALL BE USED TO JOIN ROLLS OF ECBs TOGETHER FOR ECBs ON SLOPES.
8. MATERIAL SPECIFICATIONS OF ECBs SHALL CONFORM TO TABLE ECB-1.
9. ANY AREAS OF SEEDING AND MULCHING DISTURBED IN THE PROCESS OF INSTALLING ECBs SHALL BE RESEEDED AND MULCHED.
10. DETAILS ON DESIGN PLANS FOR MAJOR DRAINAGEWAY STABILIZATION WILL GOVERN IF DIFFERENT FROM THOSE SHOWN HERE.

TABLE ECB-1. ECB MATERIAL SPECIFICATIONS				
TYPE	COCONUT CONTENT	STRAW CONTENT	EXCELSIOR CONTENT	RECOMMENDED NETTING**
STRAW*	—	100%	—	DOUBLE/ NATURAL
STRAW-COCONUT	30% MIN	70% MAX	—	DOUBLE/ NATURAL
COCONUT	100%	—	—	DOUBLE/ NATURAL
EXCELSIOR	—	—	100%	DOUBLE/ NATURAL

\*STRAW ECBs MAY ONLY BE USED OUTSIDE OF STREAMS AND DRAINAGE CHANNEL.

\*\*ALTERNATE NETTING MAY BE ACCEPTABLE IN SOME JURISDICTIONS

## EROSION CONTROL BLANKET MAINTENANCE NOTES

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

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

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

## Description

Outlet protection helps to reduce erosion immediately downstream of a pipe, culvert, slope drain, rundown or other conveyance with concentrated, high-velocity flows. Typical outlet protection consists of riprap or rock aprons at the conveyance outlet.



**Photograph TOP-1.** Riprap outlet protection.

## Appropriate Uses

Outlet protection should be used when a conveyance discharges onto a disturbed area where there is potential for accelerated erosion due to concentrated flow. Outlet protection should be provided where the velocity at the culvert outlet exceeds the maximum permissible velocity of the material in the receiving channel.

**Note:** This Fact Sheet and detail are for temporary outlet protection, outlets that are intended to be used for less than 2 years. For permanent, long-term outlet protection, see the *Major Drainage* chapter of Volume 1.

## Design and Installation

Design outlet protection to handle runoff from the largest drainage area that may be contributing runoff during construction (the drainage area may change as a result of grading). Key in rock, around the entire perimeter of the apron, to a minimum depth of 6 inches for stability. Extend riprap to the height of the culvert or the normal flow depth of the downstream channel, whichever is less. Additional erosion control measures such as vegetative lining, turf reinforcement mat and/or other channel lining methods may be required downstream of the outlet protection if the channel is susceptible to erosion. See Design Detail OP-1 for additional information.

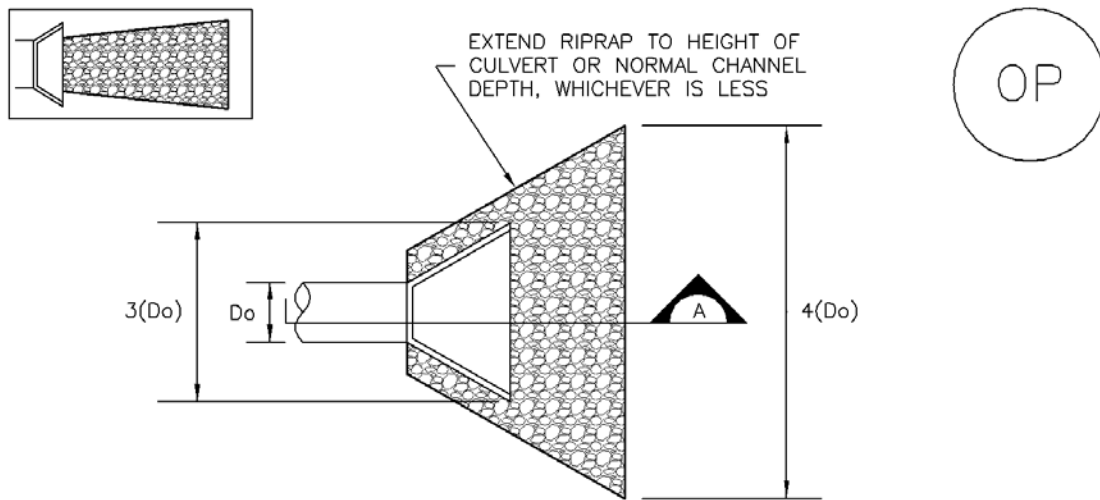
## Maintenance and Removal

Inspect apron for damage and displaced rocks. If rocks are missing or significantly displaced, repair or replace as necessary. If rocks are continuously missing or displaced, consider increasing the size of the riprap or deeper keying of the perimeter.

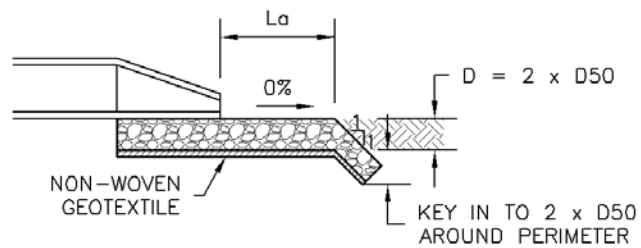
Remove sediment accumulated at the outlet before the outlet protection becomes buried and ineffective. When sediment accumulation is noted, check that upgradient BMPs, including inlet protection, are in effective operating condition.

Outlet protection may be removed once the pipe is no longer draining an upstream area, or once the downstream area has been sufficiently stabilized. If the drainage pipe is permanent, outlet protection can be left in place; however, permanent outlet protection should be designed and constructed in accordance with the requirements of the *Major Drainage* chapter of Volume 2.

Outlet Protection	
Functions	
Erosion Control	Yes
Sediment Control	Moderate
Site/Material Management	No



TEMPORARY OUTLET PROTECTION PLAN



SECTION A

TABLE OP-1. TEMPORARY OUTLET PROTECTION SIZING TABLE			
PIPE DIAMETER, D <sub>o</sub> (INCHES)	DISCHARGE, Q (CFS)	APRON LENGTH, L <sub>a</sub> (FT)	RIPRAP D50 DIAMETER MIN (INCHES)
8	2.5	5	4
	5	10	6
12	5	10	4
	10	13	6
18	10	10	6
	20	16	9
	30	23	12
	40	26	16
24	30	16	9
	40	26	9
	50	26	12
	60	30	16

OP-1. TEMPORARY OUTLET PROTECTION

## TEMPORARY OUTLET PROTECTION INSTALLATION NOTES

1. SEE PLAN VIEW FOR
  - LOCATION OF OUTLET PROTECTION.
  - DIMENSIONS OF OUTLET PROTECTION.
2. DETAIL IS INTENDED FOR PIPES WITH SLOPE  $\leq 10\%$ . ADDITIONAL EVALUATION OF RIPRAP SIZING AND OUTLET PROTECTION DIMENSIONS REQUIRED FOR STEEPER SLOPES.
3. TEMPORARY OUTLET PROTECTION INFORMATION IS FOR OUTLETS INTENDED TO BE UTILIZED LESS THAN 2 YEARS.

## TEMPORARY OUTLET PROTECTION INSPECTION AND MAINTENANCE NOTES

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

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

(DETAILS ADAPTED FROM AURORA, COLORADO AND PREVIOUS VERSION OF VOLUME 3, NOT AVAILABLE IN AUTOCAD)

## Description

Check dams are temporary grade control structures placed in drainage channels to limit the erosivity of stormwater by reducing flow velocity. Check dams are typically constructed from rock, gravel bags, sand bags, or sometimes, proprietary devices. Reinforced check dams are typically constructed from rock and wire gabion. Although the primary function of check dams is to reduce the velocity of concentrated flows, a secondary benefit is sediment trapping upstream of the structure.



**Photograph CD-1.** Rock check dams in a roadside ditch. Photo courtesy of WWE.

## Appropriate Uses

Use as a grade control for temporary drainage ditches or swales until final soil stabilization measures are established upstream and downstream. Check dams can be used on mild or moderately steep slopes. Check dams may be used under the following conditions:

- As temporary grade control facilities along waterways until final stabilization is established.
- Along permanent swales that need protection prior to installation of a non-erodible lining.
- Along temporary channels, ditches or swales that need protection where construction of a non-erodible lining is not practicable.
- Reinforced check dams should be used in areas subject to high flow velocities.

## Design and Installation

Place check dams at regularly spaced intervals along the drainage swale or ditch. Check dams heights should allow for pools to develop upstream of each check dam, extending to the downstream toe of the check dam immediately upstream.

When rock is used for the check dam, place rock mechanically or by hand. Do not dump rocks into the drainage channel. Where multiple check dams are used, the top of the lower dam should be at the same elevation as the toe of the upper dam.

When reinforced check dams are used, install erosion control fabric under and around the check dam to prevent erosion on the upstream and downstream sides. Each section of the dam should be keyed in to reduce the potential for washout or undermining. A rock apron upstream and downstream of the dam may be necessary to further control erosion.

Check Dams	
Functions	
Erosion Control	Yes
Sediment Control	Moderate
Site/Material Management	No



Design details with notes are provided for the following types of check dams:

- Rock Check Dams (CD-1)
- Reinforced Check Dams (CD-2)

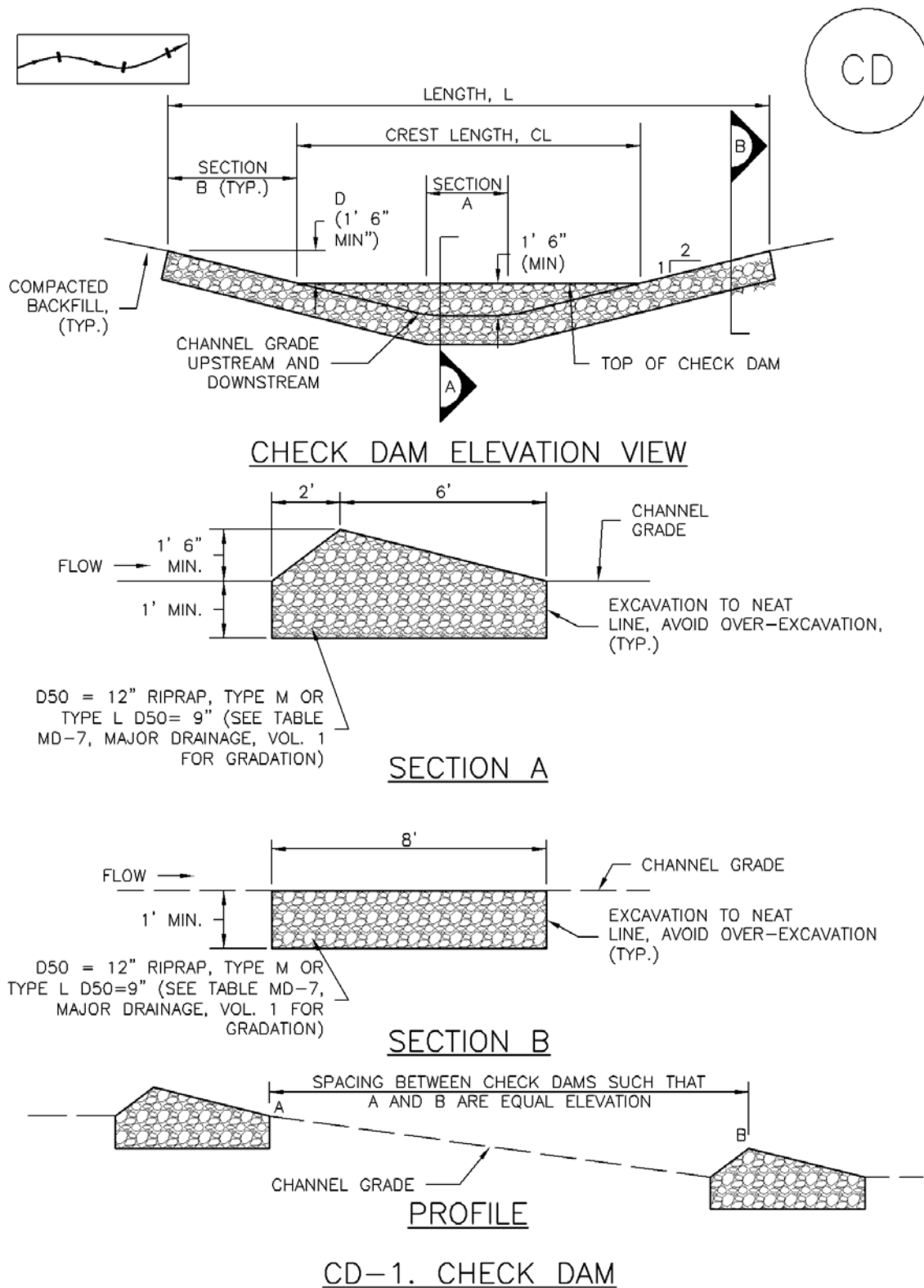
Sediment control logs may also be used as check dams; however, silt fence is not appropriate for use as a check dam. Many jurisdictions also prohibit or discourage use of straw bales for this purpose.

## Maintenance and Removal

Replace missing rocks causing voids in the check dam. If gravel bags or sandbags are used, replace or repair torn or displaced bags.

Remove accumulated sediment, as needed to maintain BMP effectiveness, typically before the sediment depth upstream of the check dam is within ½ of the crest height. Remove accumulated sediment prior to mulching, seeding, or chemical soil stabilization. Removed sediment can be incorporated into the earthwork with approval from the Project Engineer, or disposed of at an alternate location in accordance with the standard specifications.

Check dams constructed in permanent swales should be removed when perennial grasses have become established, or immediately prior to installation of a non-erodible lining. All of the rock and accumulated sediment should be removed, and the area seeded and mulched, or otherwise stabilized.



CHECK DAM INSTALLATION NOTES

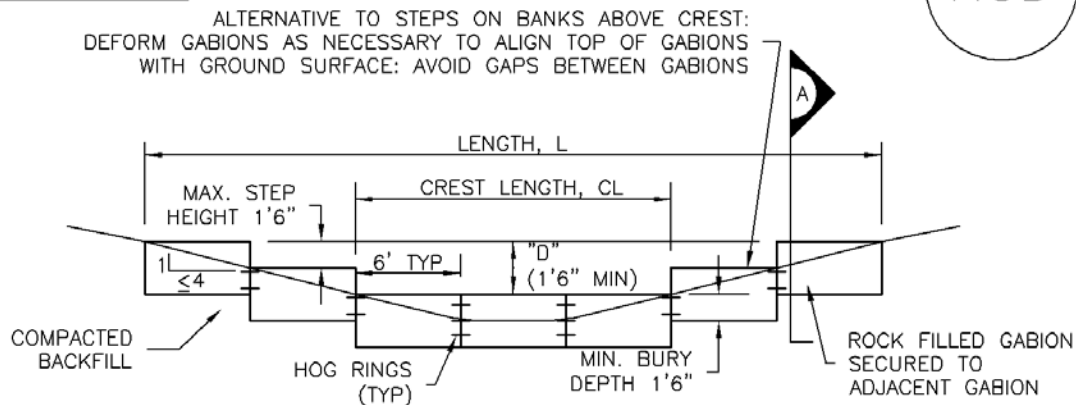
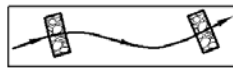
1. SEE PLAN VIEW FOR:
  - LOCATION OF CHECK DAMS.
  - CHECK DAM TYPE (CHECK DAM OR REINFORCED CHECK DAM).
  - LENGTH (L), CREST LENGTH (CL), AND DEPTH (D).
2. CHECK DAMS INDICATED ON INITIAL SWMP SHALL BE INSTALLED AFTER CONSTRUCTION FENCE, BUT PRIOR TO ANY UPSTREAM LAND DISTURBING ACTIVITIES.
3. RIPRAP UTILIZED FOR CHECK DAMS SHOULD BE OF APPROPRIATE SIZE FOR THE APPLICATION. TYPICAL TYPES OF RIPRAP USED FOR CHECK DAMS ARE TYPE M (D50 12") OR TYPE L (D50 9").
4. RIPRAP PAD SHALL BE TRENCHED INTO THE GROUND A MINIMUM OF 1'.
5. THE ENDS OF THE CHECK DAM SHALL BE A MINIMUM OF 1' 6" HIGHER THAN THE CENTER OF THE CHECK DAM.

CHECK DAM MAINTENANCE NOTES

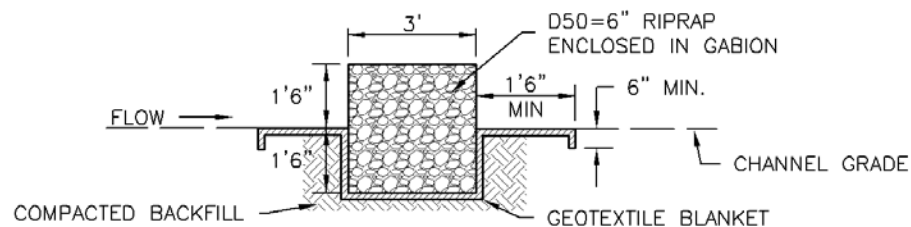
1. INSPECT BMPs EACH WORKDAY, AND MAINTAIN THEM IN EFFECTIVE OPERATING CONDITION. MAINTENANCE OF BMPs SHOULD BE PROACTIVE, NOT REACTIVE. INSPECT BMPs AS SOON AS POSSIBLE (AND ALWAYS WITHIN 24 HOURS) FOLLOWING A STORM THAT CAUSES SURFACE EROSION, AND PERFORM NECESSARY MAINTENANCE.
2. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN BMPs IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
3. WHERE BMPs HAVE FAILED, REPAIR OR REPLACEMENT SHOULD BE INITIATED UPON DISCOVERY OF THE FAILURE.
4. SEDIMENT ACCUMULATED UPSTREAM OF THE CHECK DAMS SHALL BE REMOVED WHEN THE SEDIMENT DEPTH IS WITHIN  $\frac{1}{2}$  OF THE HEIGHT OF THE CREST.
5. CHECK DAMS ARE TO REMAIN IN PLACE UNTIL THE UPSTREAM DISTURBED AREA IS STABILIZED AND APPROVED BY THE LOCAL JURISDICTION.
6. WHEN CHECK DAMS ARE REMOVED, EXCAVATIONS SHALL BE FILLED WITH SUITABLE COMPACTED BACKFILL. DISTURBED AREA SHALL BE SEEDED AND MULCHED AND COVERED WITH GEOTEXTILE OR OTHERWISE STABILIZED IN A MANNER APPROVED BY THE LOCAL JURISDICTION.

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

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



## REINFORCED CHECK DAM ELEVATION VIEW



## SECTION A

### REINFORCED CHECK DAM INSTALLATION NOTES

- SEE PLAN VIEW FOR:
  - LOCATIONS OF CHECK DAMS.
  - CHECK DAM TYPE (CHECK DAM OR REINFORCED CHECK DAM).
  - LENGTH (L), CREST LENGTH (CL), AND DEPTH (D).
- CHECK DAMS INDICATED ON THE SWMP SHALL BE INSTALLED PRIOR TO AN UPSTREAM LAND-DISTURBING ACTIVITIES.
- REINFORCED CHECK DAMS, GABIONS SHALL HAVE GALVANIZED TWISTED WIRE NETTING WITH A MAXIMUM OPENING DIMENSION OF  $\frac{4}{2}$ " AND A MINIMUM WIRE THICKNESS OF 0.10". WIRE "HOG RINGS" AT 4" SPACING OR OTHER APPROVED MEANS SHALL BE USED AT ALL GABION SEAMS AND TO SECURE THE GABION TO THE ADJACENT SECTION.
- THE CHECK DAM SHALL BE TRENCHED INTO THE GROUND A MINIMUM OF 1' 6".
- GEOTEXTILE BLANKET SHALL BE PLACED IN THE REINFORCED CHECK DAM TRENCH EXTENDING A MINIMUM OF 1' 6" ON BOTH THE UPSTREAM AND DOWNSTREAM SIDES OF THE REINFORCED CHECK DAM.

## CD-2. REINFORCED CHECK DAM

REINFORCED CHECK DAM MAINTENANCE NOTES

1. INSPECT BMPs EACH WORKDAY, AND MAINTAIN THEM IN EFFECTIVE OPERATING CONDITION. MAINTENANCE OF BMPs SHOULD BE PROACTIVE, NOT REACTIVE. INSPECT BMPs AS SOON AS POSSIBLE (AND ALWAYS WITHIN 24 HOURS) FOLLOWING A STORM THAT CAUSES SURFACE EROSION, AND PERFORM NECESSARY MAINTENANCE.
2. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN BMPs IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
3. WHERE BMPs HAVE FAILED, REPAIR OR REPLACEMENT SHOULD BE INITIATED UPON DISCOVERY OF THE FAILURE.
4. SEDIMENT ACCUMULATED UPSTREAM OF REINFORCED CHECK DAMS SHALL BE REMOVED AS NEEDED TO MAINTAIN THE EFFECTIVENESS OF BMP, TYPICALLY WHEN THE UPSTREAM SEDIMENT DEPTH IS WITHIN  $\frac{1}{2}$  THE HEIGHT OF THE CREST.
5. REPAIR OR REPLACE REINFORCED CHECK DAMS WHEN THERE ARE SIGNS OF DAMAGE SUCH AS HOLES IN THE GABION OR UNDERCUTTING.
6. REINFORCED CHECK DAMS ARE TO REMAIN IN PLACE UNTIL THE UPSTREAM DISTURBED AREA IS STABILIZED AND APPROVED BY THE LOCAL JURISDICTION.
7. WHEN REINFORCED CHECK DAMS ARE REMOVED, ALL DISTURBED AREAS SHALL BE COVERED WITH TOPSOIL, SEEDED AND MULCHED, AND COVERED WITH A GEOTEXTILE BLANKET, OR OTHERWISE STABILIZED AS APPROVED BY LOCAL JURISDICTION.

(DETAIL ADAPTED FROM DOUGLAS COUNTY, COLORADO AND CITY OF AURORA, COLORADO, NOT AVAILABLE IN AUTOCAD)

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

## Description

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



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

## Appropriate Uses

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

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

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

## Design and Installation

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

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

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

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

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

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

## **Maintenance and Removal**

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

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

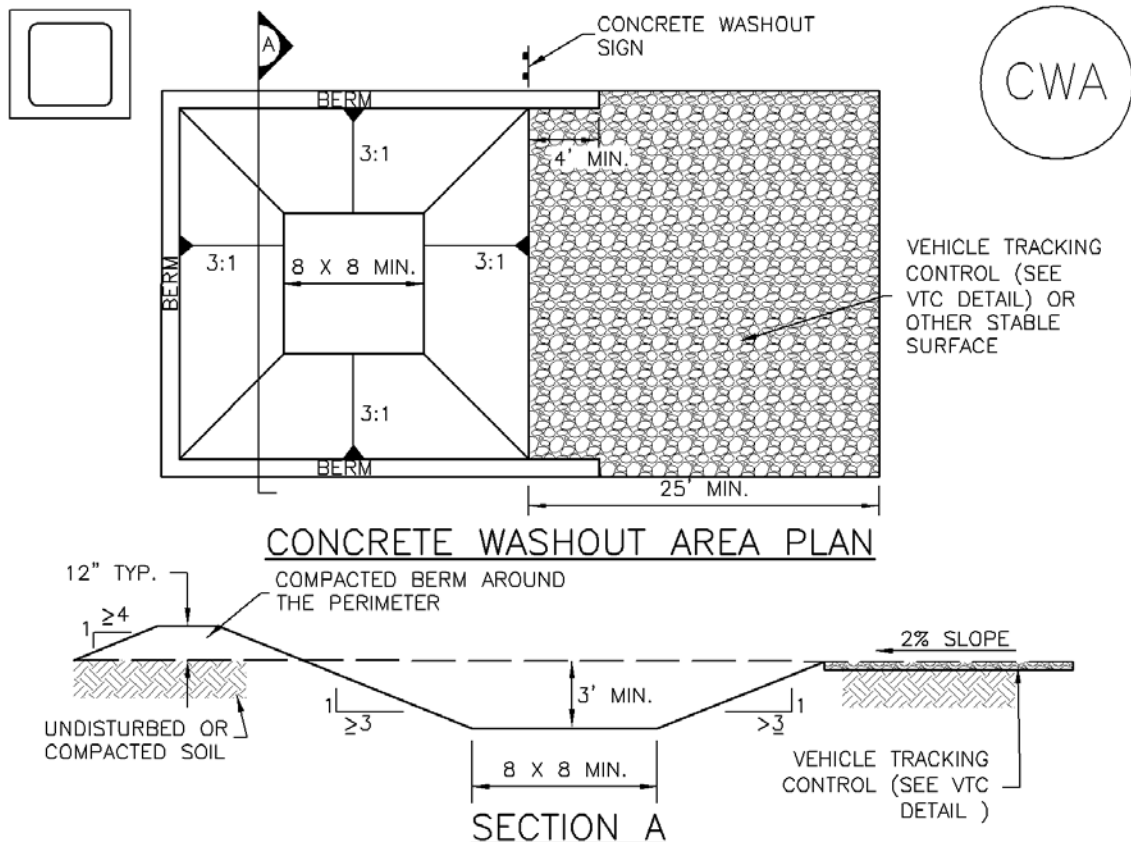
Upon termination of use of the washout site, accumulated solid waste, including concrete waste and any contaminated soils, must be removed from the site to prevent on-site disposal of solid waste. If the wash water is allowed to evaporate and the concrete hardens, it may be recycled.



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



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



## CWA-1. CONCRETE WASHOUT AREA

### CWA INSTALLATION NOTES

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



CWA MAINTENANCE NOTES

1. INSPECT BMPs EACH WORKDAY, AND MAINTAIN THEM IN EFFECTIVE OPERATING CONDITION. MAINTENANCE OF BMPs SHOULD BE PROACTIVE, NOT REACTIVE. INSPECT BMPs AS SOON AS POSSIBLE (AND ALWAYS WITHIN 24 HOURS) FOLLOWING A STORM THAT CAUSES SURFACE EROSION, AND PERFORM NECESSARY MAINTENANCE.

2. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN BMPs IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.

3. WHERE BMPs HAVE FAILED, REPAIR OR REPLACEMENT SHOULD BE INITIATED UPON DISCOVERY OF THE FAILURE.

4. THE CWA SHALL BE REPAIRED, CLEANED, OR ENLARGED AS NECESSARY TO MAINTAIN CAPACITY FOR CONCRETE WASTE. CONCRETE MATERIALS, ACCUMULATED IN PIT, SHALL BE REMOVED ONCE THE MATERIALS HAVE REACHED A DEPTH OF 2'.

5. CONCRETE WASHOUT WATER, WASTED PIECES OF CONCRETE AND ALL OTHER DEBRIS IN THE SUBSURFACE PIT SHALL BE TRANSPORTED FROM THE JOB SITE IN A WATER-TIGHT CONTAINER AND DISPOSED OF PROPERLY.

6. THE CWA SHALL REMAIN IN PLACE UNTIL ALL CONCRETE FOR THE PROJECT IS PLACED.

7. WHEN THE CWA IS REMOVED, COVER THE DISTURBED AREA WITH TOP SOIL, SEED AND MULCH OR OTHERWISE STABILIZED IN A MANNER APPROVED BY THE LOCAL JURISDICTION.

(DETAIL ADAPTED FROM DOUGLAS COUNTY, COLORADO AND THE CITY OF PARKER, COLORADO, NOT AVAILABLE IN AUTOCAD).

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

## Description

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

## Appropriate Uses

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



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

## Design and Installation

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

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

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

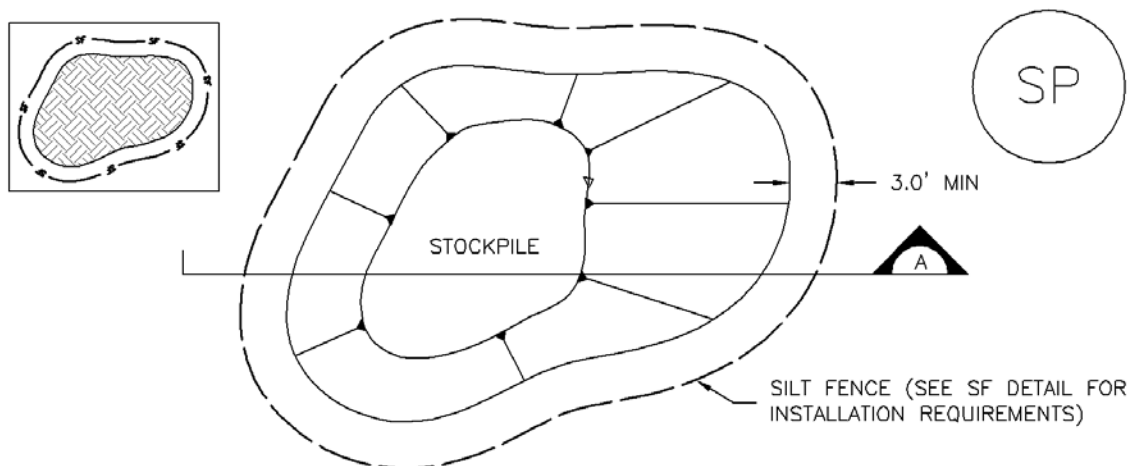
## Maintenance and Removal

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

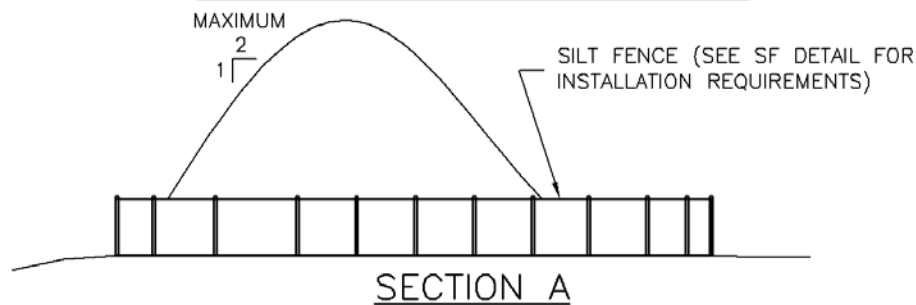
When temporary removal of a perimeter BMP is necessary to access a stockpile, ensure BMPs are reinstalled in accordance with their respective design detail section.

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

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



## STOCKPILE PROTECTION PLAN



## SECTION A

## SP-1. STOCKPILE PROTECTION

### STOCKPILE PROTECTION INSTALLATION NOTES

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

STOCKPILE PROTECTION MAINTENANCE NOTES

1. INSPECT BMPs EACH WORKDAY, AND MAINTAIN THEM IN EFFECTIVE OPERATING CONDITION. MAINTENANCE OF BMPs SHOULD BE PROACTIVE, NOT REACTIVE. INSPECT BMPs AS SOON AS POSSIBLE (AND ALWAYS WITHIN 24 HOURS) FOLLOWING A STORM THAT CAUSES SURFACE EROSION, AND PERFORM NECESSARY MAINTENANCE.

2. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN BMPs IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.

3. WHERE BMPs HAVE FAILED, REPAIR OR REPLACEMENT SHOULD BE INITIATED UPON DISCOVERY OF THE FAILURE.

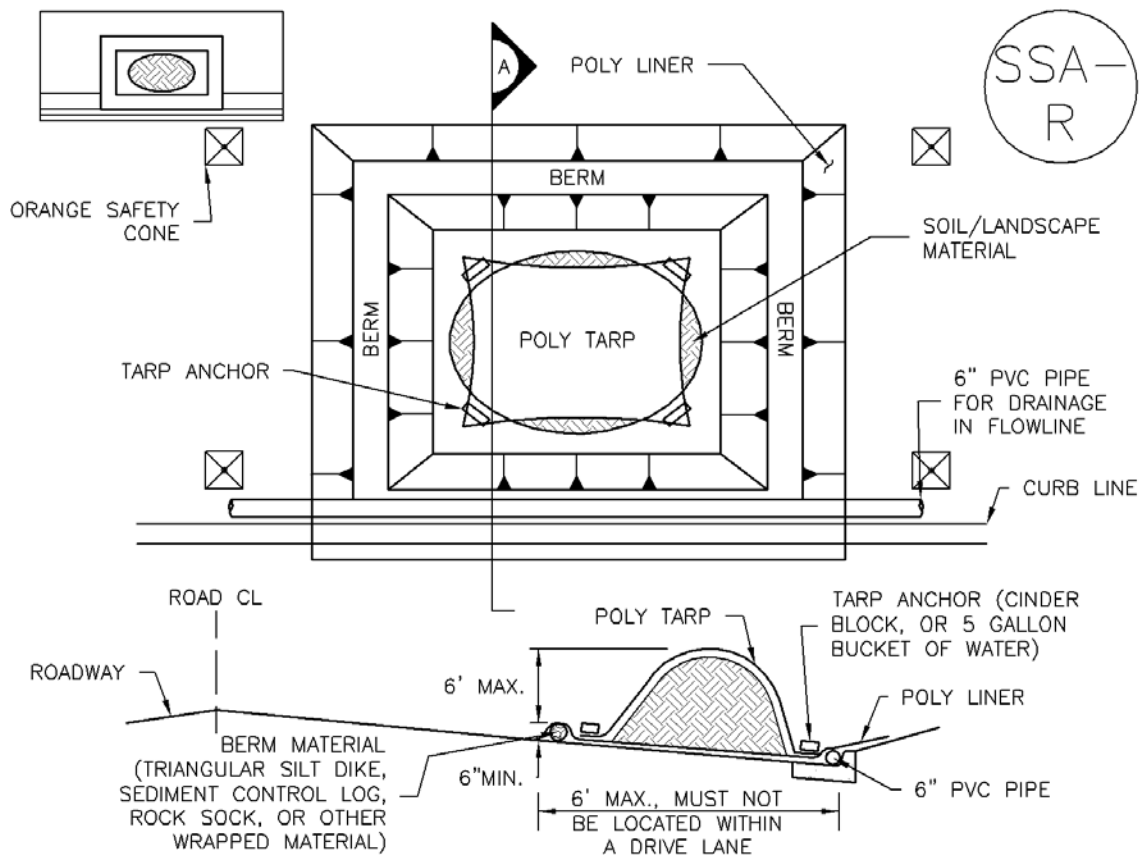
STOCKPILE PROTECTION MAINTENANCE NOTES

4. IF PERIMETER PROTECTION MUST BE MOVED TO ACCESS SOIL STOCKPILE, REPLACE PERIMETER CONTROLS BY THE END OF THE WORKDAY.

5. STOCKPILE PERIMETER CONTROLS CAN BE REMOVED ONCE ALL THE MATERIAL FROM THE STOCKPILE HAS BEEN USED.

(DETAILS ADAPTED FROM PARKER, COLORADO, NOT AVAILABLE IN AUTOCAD)

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



## SP-2. MATERIALS STAGING IN ROADWAY

### MATERIALS STAGING IN ROADWAYS INSTALLATION NOTES

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

MATERIALS STAGING IN ROADWAY MAINTENANCE NOTES

1. INSPECT BMPs EACH WORKDAY, AND MAINTAIN THEM IN EFFECTIVE OPERATING CONDITION. MAINTENANCE OF BMPs SHOULD BE PROACTIVE, NOT REACTIVE. INSPECT BMPs AS SOON AS POSSIBLE (AND ALWAYS WITHIN 24 HOURS) FOLLOWING A STORM THAT CAUSES SURFACE EROSION, AND PERFORM NECESSARY MAINTENANCE.

2. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN BMPs IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.

3. WHERE BMPs HAVE FAILED, REPAIR OR REPLACEMENT SHOULD BE INITIATED UPON DISCOVERY OF THE FAILURE.

4. INSPECT PVC PIPE ALONG CURB LINE FOR CLOGGING AND DEBRIS. REMOVE OBSTRUCTIONS PROMPTLY.

5. CLEAN MATERIAL FROM PAVED SURFACES BY SWEEPING OR VACUUMING.

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

(DETAILS ADAPTED FROM AURORA, COLORADO)

## Description

Implement construction site good housekeeping practices to prevent pollution associated with solid, liquid and hazardous construction-related materials and wastes. Stormwater Management Plans (SWMPs) should clearly specify BMPs including these good housekeeping practices:

- Provide for waste management.
- Establish proper building material staging areas.
- Designate paint and concrete washout areas.
- Establish proper equipment/vehicle fueling and maintenance practices.
- Control equipment/vehicle washing and allowable non-stormwater discharges.
- Develop a spill prevention and response plan.

**Acknowledgement:** This Fact Sheet is based directly on EPA guidance provided in *Developing Your Stormwater Pollution Prevention Plan* (EPA 2007).

## Appropriate Uses

Good housekeeping practices are necessary at all construction sites.

## Design and Installation

The following principles and actions should be addressed in SWMPs:

- **Provide for Waste Management.** Implement management procedures and practices to prevent or reduce the exposure and transport of pollutants in stormwater from solid, liquid and sanitary wastes that will be generated at the site. Practices such as trash disposal, recycling, proper material handling, and cleanup measures can reduce the potential for stormwater runoff to pick up construction site wastes and discharge them to surface waters. Implement a comprehensive set of waste-management practices for hazardous or toxic materials, such as paints, solvents, petroleum products, pesticides, wood preservatives, acids, roofing tar, and other materials. Practices should include storage, handling, inventory, and cleanup procedures, in case of spills. Specific practices that should be considered include:

### Solid or Construction Waste

- Designate trash and bulk waste-collection areas on-site.



**Photographs GH-1 and GH-2.** Proper materials storage and secondary containment for fuel tanks are important good housekeeping practices. Photos courtesy of CDOT and City of Aurora.

Good Housekeeping	
Functions	
Erosion Control	No
Sediment Control	No
Site/Material Management	Yes



- Recycle materials whenever possible (e.g., paper, wood, concrete, oil).
- Segregate and provide proper disposal options for hazardous material wastes.
- Clean up litter and debris from the construction site daily.
- Locate waste-collection areas away from streets, gutters, watercourses, and storm drains. Waste-collection areas (dumpsters, and such) are often best located near construction site entrances to minimize traffic on disturbed soils. Consider secondary containment around waste collection areas to minimize the likelihood of contaminated discharges.
- Empty waste containers before they are full and overflowing.

**Sanitary and Septic Waste**

- Provide convenient, well-maintained, and properly located toilet facilities on-site.
- Locate toilet facilities away from storm drain inlets and waterways to prevent accidental spills and contamination of stormwater.
- Maintain clean restroom facilities and empty portable toilets regularly.
- Where possible, provide secondary containment pans under portable toilets.
- Provide tie-downs or stake-downs for portable toilets.
- Educate employees, subcontractors, and suppliers on locations of facilities.
- Treat or dispose of sanitary and septic waste in accordance with state or local regulations. Do not discharge or bury wastewater at the construction site.
- Inspect facilities for leaks. If found, repair or replace immediately.
- Special care is necessary during maintenance (pump out) to ensure that waste and/or biocide are not spilled on the ground.

**Hazardous Materials and Wastes**

- Develop and implement employee and subcontractor education, as needed, on hazardous and toxic waste handling, storage, disposal, and cleanup.
- Designate hazardous waste-collection areas on-site.
- Place all hazardous and toxic material wastes in secondary containment.



**Photograph GH-3.** Locate portable toilet facilities on level surfaces away from waterways and storm drains. Photo courtesy of WWE.

- Hazardous waste containers should be inspected to ensure that all containers are labeled properly and that no leaks are present.
- **Establish Proper Building Material Handling and Staging Areas.** The SWMP should include comprehensive handling and management procedures for building materials, especially those that are hazardous or toxic. Paints, solvents, pesticides, fuels and oils, other hazardous materials or building materials that have the potential to contaminate stormwater should be stored indoors or under cover whenever possible or in areas with secondary containment. Secondary containment measures prevent a spill from spreading across the site and may include dikes, berms, curbing, or other containment methods. Secondary containment techniques should also ensure the protection of groundwater. Designate staging areas for activities such as fueling vehicles, mixing paints, plaster, mortar, and other potential pollutants. Designated staging areas enable easier monitoring of the use of materials and clean up of spills. Training employees and subcontractors is essential to the success of this pollution prevention principle. Consider the following specific materials handling and staging practices:
  - Train employees and subcontractors in proper handling and storage practices.
  - Clearly designate site areas for staging and storage with signs and on construction drawings. Staging areas should be located in areas central to the construction site. Segment the staging area into sub-areas designated for vehicles, equipment, or stockpiles. Construction entrances and exits should be clearly marked so that delivery vehicles enter/exit through stabilized areas with vehicle tracking controls (See Vehicle Tracking Control Fact Sheet).
  - Provide storage in accordance with Spill Protection, Control and Countermeasures (SPCC) requirements and plans and provide cover and impermeable perimeter control, as necessary, for hazardous materials and contaminated soils that must be stored on site.
  - Ensure that storage containers are regularly inspected for leaks, corrosion, support or foundation failure, or other signs of deterioration and tested for soundness.
  - Reuse and recycle construction materials when possible.
- **Designate Concrete Washout Areas.** Concrete contractors should be encouraged to use the washout facilities at their own plants or dispatch facilities when feasible; however, concrete washout commonly occurs on construction sites. If it is necessary to provide for concrete washout areas on-site, designate specific washout areas and design facilities to handle anticipated washout water. Washout areas should also be provided for paint and stucco operations. Because washout areas can be a source of pollutants from leaks or spills, care must be taken with regard to their placement and proper use. See the Concrete Washout Area Fact Sheet for detailed guidance.

Both self-constructed and prefabricated washout containers can fill up quickly when concrete, paint, and stucco work are occurring on large portions of the site. Be sure to check for evidence that contractors are using the washout areas and not dumping materials onto the ground or into drainage facilities. If the washout areas are not being used regularly, consider posting additional signage, relocating the facilities to more convenient locations, or providing training to workers and contractors.

When concrete, paint, or stucco is part of the construction process, consider these practices which will help prevent contamination of stormwater. Include the locations of these areas and the maintenance and inspection procedures in the SWMP.

- Do not washout concrete trucks or equipment into storm drains, streets, gutters, uncontained areas, or streams. Only use designated washout areas.
- Establish washout areas and advertise their locations with signs. Ensure that signage remains in good repair.
- Provide adequate containment for the amount of wash water that will be used.
- Inspect washout structures daily to detect leaks or tears and to identify when materials need to be removed.
- Dispose of materials properly. The preferred method is to allow the water to evaporate and to recycle the hardened concrete. Full service companies may provide dewatering services and should dispose of wastewater properly. Concrete wash water can be highly polluted. It should not be discharged to any surface water, storm sewer system, or allowed to infiltrate into the ground in the vicinity of waterbodies. Washwater should not be discharged to a sanitary sewer system without first receiving written permission from the system operator.
- **Establish Proper Equipment/Vehicle Fueling and Maintenance Practices.** Create a clearly designated on-site fueling and maintenance area that is clean and dry. The on-site fueling area should have a spill kit, and staff should know how to use it. If possible, conduct vehicle fueling and maintenance activities in a covered area. Consider the following practices to help prevent the discharge of pollutants to stormwater from equipment/vehicle fueling and maintenance. Include the locations of designated fueling and maintenance areas and inspection and maintenance procedures in the SWMP.
  - Train employees and subcontractors in proper fueling procedures (stay with vehicles during fueling, proper use of pumps, emergency shutoff valves, etc.).
  - Inspect on-site vehicles and equipment regularly for leaks, equipment damage, and other service problems.
  - Clearly designate vehicle/equipment service areas away from drainage facilities and watercourses to prevent stormwater run-on and runoff.
  - Use drip pans, drip cloths, or absorbent pads when replacing spent fluids.
  - Collect all spent fluids, store in appropriate labeled containers in the proper storage areas, and recycle fluids whenever possible.
- **Control Equipment/Vehicle Washing and Allowable Non-Stormwater Discharges.** Implement practices to prevent contamination of surface and groundwater from equipment and vehicle wash water. Representative practices include:
  - Educate employees and subcontractors on proper washing procedures.
  - Use off-site washing facilities, when available.
  - Clearly mark the washing areas and inform workers that all washing must occur in this area.
  - Contain wash water and treat it using BMPs. Infiltrate washwater when possible, but maintain separation from drainage paths and waterbodies.

- Use high-pressure water spray at vehicle washing facilities without detergents. Water alone can remove most dirt adequately.
- Do not conduct other activities, such as vehicle repairs, in the wash area.
- Include the location of the washing facilities and the inspection and maintenance procedures in the SWMP.
- **Develop a Spill Prevention and Response Plan.** Spill prevention and response procedures must be identified in the SWMP. Representative procedures include identifying ways to reduce the chance of spills, stop the source of spills, contain and clean up spills, dispose of materials contaminated by spills, and train personnel responsible for spill prevention and response. The plan should also specify material handling procedures and storage requirements and ensure that clear and concise spill cleanup procedures are provided and posted for areas in which spills may potentially occur. When developing a spill prevention plan, include the following:
  - Note the locations of chemical storage areas, storm drains, tributary drainage areas, surface waterbodies on or near the site, and measures to stop spills from leaving the site.
  - Provide proper handling and safety procedures for each type of waste. Keep Material Safety Data Sheets (MSDSs) for chemical used on site with the SWMP.
  - Establish an education program for employees and subcontractors on the potential hazards to humans and the environment from spills and leaks.
  - Specify how to notify appropriate authorities, such as police and fire departments, hospitals, or municipal sewage treatment facilities to request assistance. Emergency procedures and contact numbers should be provided in the SWMP and posted at storage locations.
  - Describe the procedures, equipment and materials for immediate cleanup of spills and proper disposal.
  - Identify personnel responsible for implementing the plan in the event of a spill. Update the spill prevention plan and clean up materials as changes occur to the types of chemicals stored and used at the facility.

**Spill Prevention, Control, and Countermeasure (SPCC) Plan**

Construction sites may be subject to 40 CFR Part 112 regulations that require the preparation and implementation of a SPCC Plan to prevent oil spills from aboveground and underground storage tanks. The facility is subject to this rule if it is a non-transportation-related facility that:

- Has a total storage capacity greater than 1,320 gallons or a completely buried storage capacity greater than 42,000 gallons.
- Could reasonably be expected to discharge oil in quantities that may be harmful to navigable waters of the United States and adjoining shorelines.

Furthermore, if the facility is subject to 40 CFR Part 112, the SWMP should reference the SPCC Plan. To find out more about SPCC Plans, see EPA's website on SPCC at [www.epa.gov/oilspill/spcc.htm](http://www.epa.gov/oilspill/spcc.htm).

**Reporting Oil Spills**

In the event of an oil spill, contact the National Response Center toll free at 1-800-424- 8802 for assistance, or for more details, visit their website: [www.nrc.uscg.mil](http://www.nrc.uscg.mil).

**Maintenance and Removal**

Effective implementation of good housekeeping practices is dependent on clear designation of personnel responsible for supervising and implementing good housekeeping programs, such as site cleanup and disposal of trash and debris, hazardous material management and disposal, vehicle and equipment maintenance, and other practices. Emergency response "drills" may aid in emergency preparedness.

Checklists may be helpful in good housekeeping efforts.

Staging and storage areas require permanent stabilization when the areas are no longer being used for construction-related activities.

Construction-related materials, debris and waste must be removed from the construction site once construction is complete.

**Design Details**

See the following Fact Sheets for related Design Details:

MM-1 Concrete Washout Area

MM-2 Stockpile Management

SM-4 Vehicle Tracking Control

Design details are not necessary for other good housekeeping practices; however, be sure to designate where specific practices will occur on the appropriate construction drawings.

## Description

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

## Appropriate Uses

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

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



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

## Design and Installation

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

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

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

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

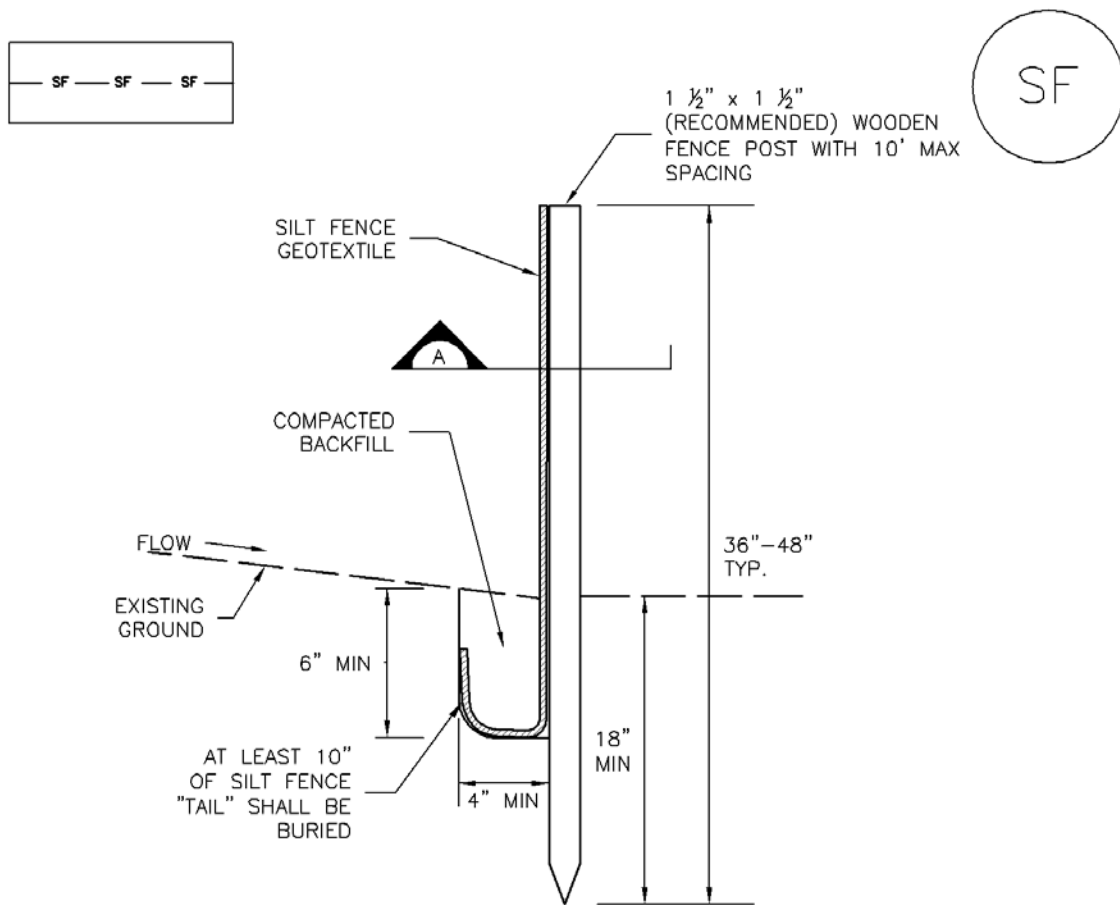
## Maintenance and Removal

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

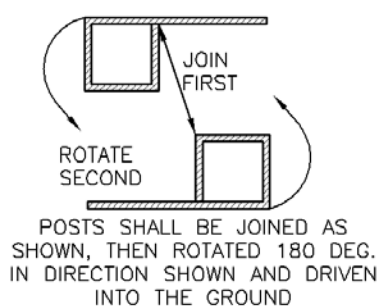
Silt fence may be removed when the upstream area has reached final stabilization.



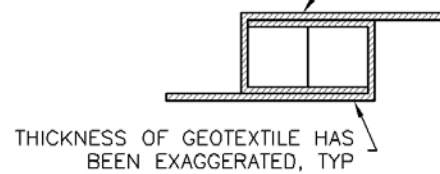
**Photograph SF-2.** When silt fence is not installed along the contour, a "J-hook" installation may be appropriate to ensure that the BMP does not create concentrated flow parallel to the silt fence. Photo courtesy of Tom Gore.



## SILT FENCE



POSTS SHALL OVERLAP AT JOINTS SO THAT NO GAPS EXIST IN SILT FENCE



## SECTION A

## SF-1. SILT FENCE



SILT FENCE INSTALLATION NOTES

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

SILT FENCE MAINTENANCE NOTES

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

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

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

## Description

A sediment control log is a linear roll made of natural materials such as straw, coconut fiber, or other fibrous material trenched into the ground and held with a wooden stake. Sediment control logs are also often referred to as "straw wattles." They are used as a sediment barrier to intercept sheet flow runoff from disturbed areas.



## Appropriate Uses

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

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



**Photographs SCL-1 and SCL-2.** Sediment control logs used as 1) a perimeter control around a soil stockpile; and, 2) as a "J-hook" perimeter control at the corner of a construction site.

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

## Design and Installation

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

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

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

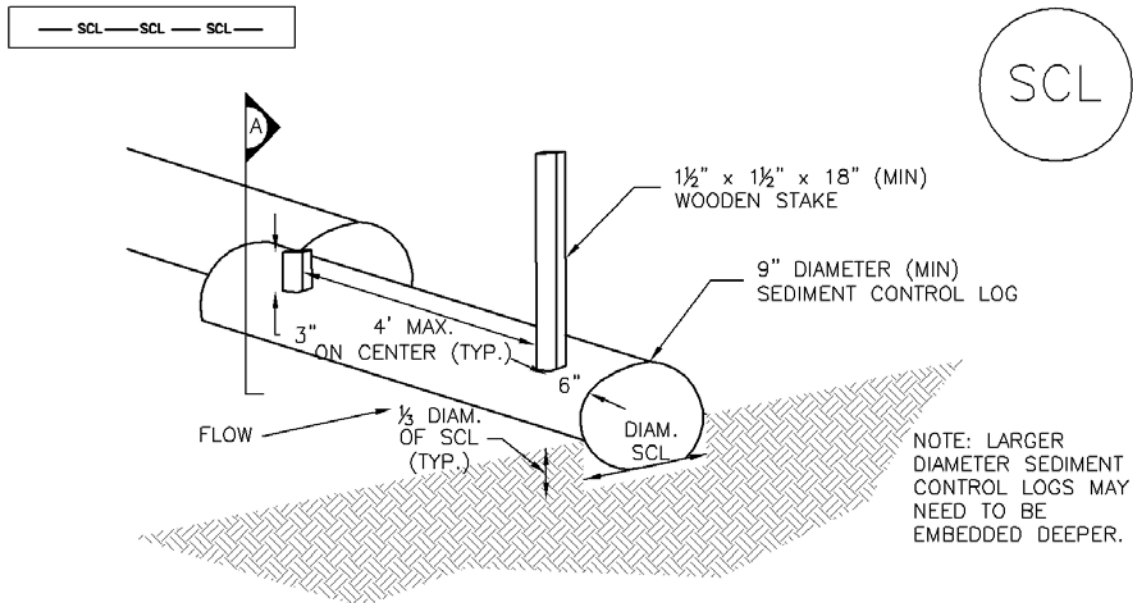
Design details and notes for sediment control logs are provided in Detail SCL-1. Sediment logs must be properly trenched and staked into the ground to prevent undercutting, bypassing and displacement. When installed on slopes, sediment control logs should be installed along the contours (i.e., perpendicular to flow).

Improper installation can lead to poor performance. Be sure that sediment control logs are properly trenched, anchored and tightly jointed.

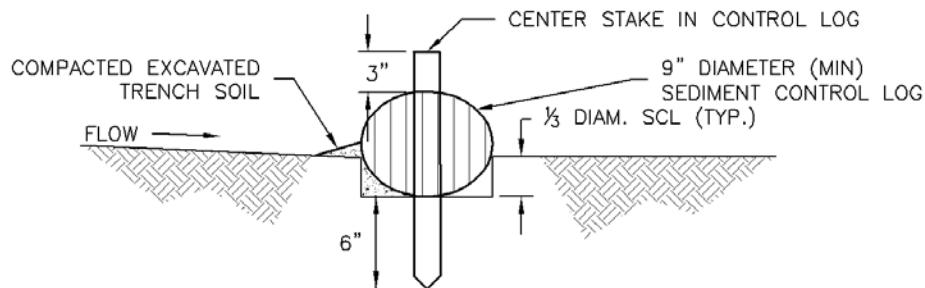
## **Maintenance and Removal**

Be aware that sediment control logs will eventually degrade. Remove accumulated sediment before the depth is one-half the height of the sediment log and repair damage to the sediment log, typically by replacing the damaged section.

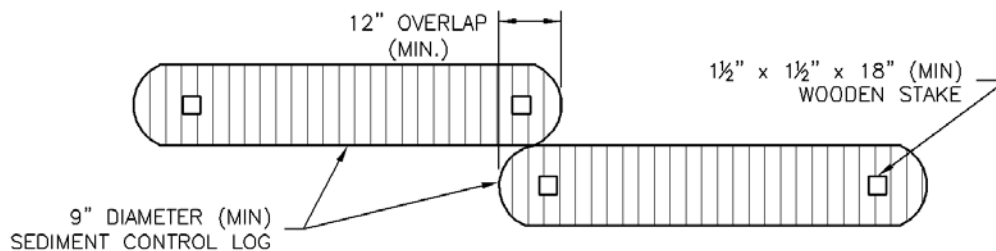
Once the upstream area is stabilized, remove and properly dispose of the logs. Areas disturbed beneath the logs may need to be seeded and mulched. Sediment control logs that are biodegradable may occasionally be left in place (e.g., when logs are used in conjunction with erosion control blankets as permanent slope breaks). However, removal of sediment control logs after final stabilization is typically recommended when used in perimeter control, inlet protection and check dam applications.



## SEDIMENT CONTROL LOG

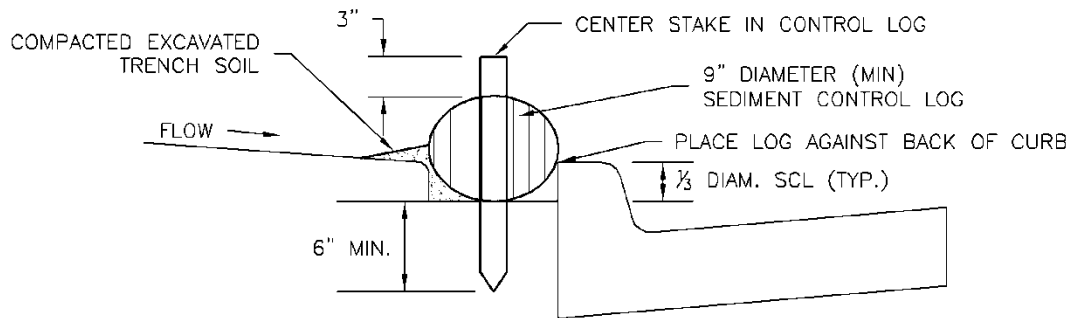


## SECTION A

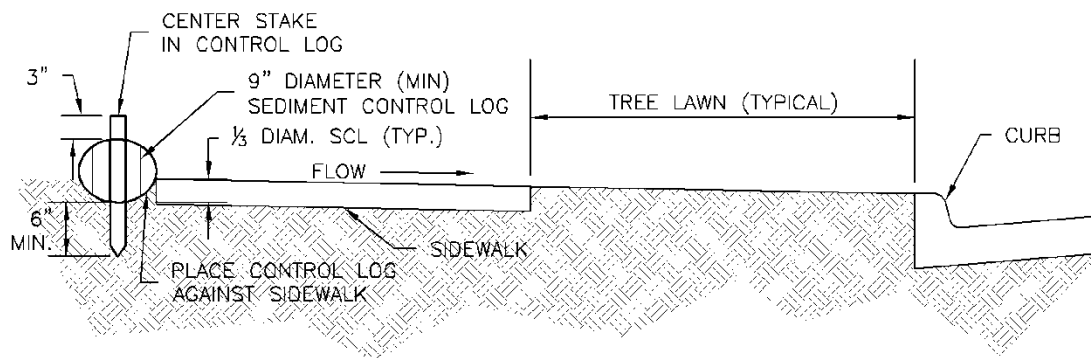


## SEDIMENT CONTROL LOG JOINTS

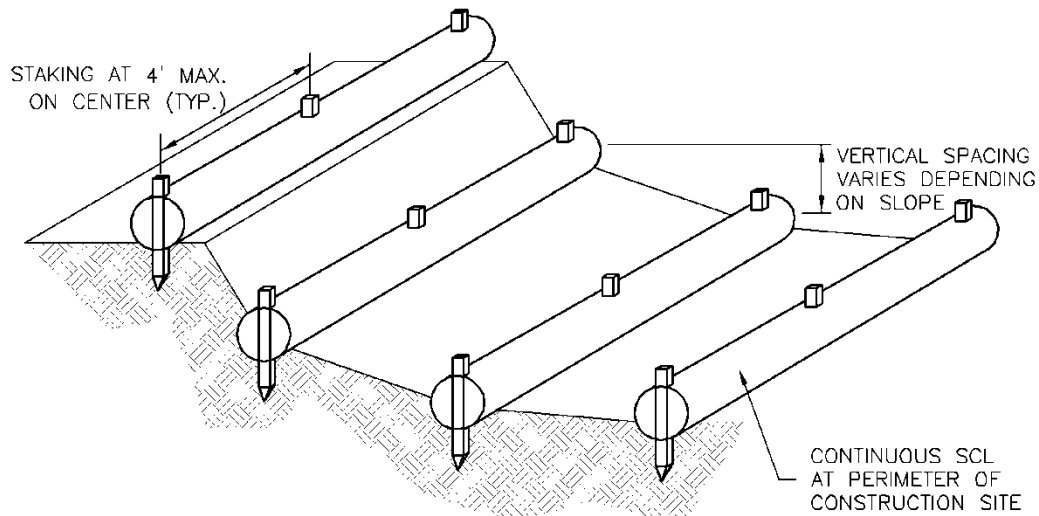
## SCL-1. SEDIMENT CONTROL LOG



SCL-2. SEDIMENT CONTROL LOG AT BACK OF CURB



SCL-3. SEDIMENT CONTROL LOG AT SIDEWALK WITH TREE LAWN



SCL-4. SEDIMENT CONTROL LOGS TO CONTROL SLOPE LENGTH

## SEDIMENT CONTROL LOG INSTALLATION NOTES

1. SEE PLAN VIEW FOR LOCATION AND LENGTH OF SEDIMENT CONTROL LOGS.
2. SEDIMENT CONTROL LOGS THAT ACT AS A PERIMETER CONTROL SHALL BE INSTALLED PRIOR TO ANY UPGRADE LAND-DISTURBING ACTIVITIES.
3. SEDIMENT CONTROL LOGS SHALL CONSIST OF STRAW, COMPOST, EXCELSIOR OR COCONUT FIBER, AND SHALL BE FREE OF ANY NOXIOUS WEED SEEDS OR DEFECTS INCLUDING RIPS, HOLES AND OBVIOUS WEAR.
4. SEDIMENT CONTROL LOGS MAY BE USED AS SMALL CHECK DAMS IN DITCHES AND SWALES. HOWEVER, THEY SHOULD NOT BE USED IN PERENNIAL STREAMS OR HIGH VELOCITY DRAINAGE WAYS.
5. IT IS RECOMMENDED THAT SEDIMENT CONTROL LOGS BE TRENCHED INTO THE GROUND TO A DEPTH OF APPROXIMATELY  $\frac{1}{2}$  OF THE DIAMETER OF THE LOG. IF TRENCHING TO THIS DEPTH IS NOT FEASIBLE AND/OR DESIRABLE (SHORT TERM INSTALLATION WITH DESIRE NOT TO DAMAGE LANDSCAPE) A LESSER TRENCHING DEPTH MAY BE ACCEPTABLE WITH MORE ROBUST STAKING
6. THE UPHILL SIDE OF THE SEDIMENT CONTROL LOG SHALL BE BACKFILLED WITH SOIL THAT IS FREE OF ROCKS AND DEBRIS. THE SOIL SHALL BE TIGHTLY COMPACTED INTO THE SHAPE OF A RIGHT TRIANGLE USING A SHOVEL OR WEIGHTED LAWN ROLLER.
7. FOLLOW MANUFACTURERS' GUIDANCE FOR STAKING. IF MANUFACTURERS' INSTRUCTIONS DO NOT SPECIFY SPACING, STAKES SHALL BE PLACED ON 4' CENTERS AND EMBEDDED A MINIMUM OF 6" INTO THE GROUND. 3" OF THE STAKE SHALL PROTRUDE FROM THE TOP OF THE LOG. STAKES THAT ARE BROKEN PRIOR TO INSTALLATION SHALL BE REPLACED.

## SEDIMENT CONTROL LOG MAINTENANCE NOTES

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

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

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

## Description

Protection of existing vegetation on a construction site can be accomplished through installation of a construction fence around the area requiring protection. In cases where upgradient areas are disturbed, it may also be necessary to install perimeter controls to minimize sediment loading to sensitive areas such as wetlands. Existing vegetation may be designated for protection to maintain a stable surface cover as part of construction phasing, or vegetation may be protected in areas designated to remain in natural condition under post-development conditions (e.g., wetlands, mature trees, riparian areas, open space).



**Photograph PV-1.** Protection of existing vegetation and a sensitive area. Photo courtesy of CDOT.

## Appropriate Uses

Existing vegetation should be preserved for the maximum practical duration on a construction site through the use of effective construction phasing. Preserving vegetation helps to minimize erosion and can reduce revegetation costs following construction.

Protection of wetland areas is required under the Clean Water Act, unless a permit has been obtained from the U.S. Army Corps of Engineers (USACE) allowing impacts in limited areas.

If trees are to be protected as part of post-development landscaping, care must be taken to avoid several types of damage, some of which may not be apparent at the time of injury. Potential sources of injury include soil compaction during grading or due to construction traffic, direct equipment-related injury such as bark removal, branch breakage, surface grading and trenching, and soil cut and fill. In order to minimize injuries that may lead to immediate or later death of the tree, tree protection zones should be developed during site design, implemented at the beginning of a construction project, as well as continued during active construction.

## Design and Installation

### General

Once an area has been designated as a preservation area, there should be no construction activity allowed within a set distance of the area. Clearly mark the area with construction fencing. Do not allow stockpiles, equipment, trailers or parking within the protected area. Guidelines to protect various types of existing vegetation follow.

Protection of Existing Vegetation	
Functions	
Erosion Control	Yes
Sediment Control	Moderate
Site/Material Management	Yes



### Surface Cover During Phased Construction

Install construction fencing or other perimeter controls around areas to be protected from clearing and grading as part of construction phasing.

Maintaining surface cover on steep slopes for the maximum practical duration during construction is recommended.

### Open Space Preservation

Where natural open space areas will be preserved as part of a development, it is important to install construction fencing around these areas to protect them from compaction. This is particularly important when areas with soils with high infiltration rates are preserved as part of LID designs. Preserved open space areas should not be used for staging and equipment storage.

### Wetlands and Riparian Areas

Install a construction fence around the perimeter of the wetland or riparian (streamside vegetation) area to prevent access by equipment. In areas downgradient of disturbed areas, install a perimeter control such as silt fence, sediment control logs, or similar measure to minimize sediment loading to the wetland.

### Tree Protection<sup>1</sup>

- Before beginning construction operations, establish a tree protection zone around trees to be preserved by installing construction fences. Allow enough space from the trunk to protect the root zone from soil compaction and mechanical damage, and the branches from mechanical damage (see Table PV-1). If low branches will be kept, place the fence outside of the drip line. Where this is not possible, place fencing as far away from the trunk as possible. In order to maintain a healthy tree, be aware that about 60 percent of the tree's root zone extends beyond the drip line.

**Table PV-1**  
**Guidelines for Determining the Tree Protection Zone**  
 (Source: Matheny and Clark, 1998; as cited in GreenCO and WWE 2008)

Species Tolerance to Damage	Distance from Trunk (ft) per inch of DBH		
	<i>Young</i>	<i>Mature</i>	<i>Over mature</i>
<i>Good</i>	0.5'	0.75'	1.0'
<i>Moderate</i>	0.75'	1.0'	1.25'
<i>Poor</i>	1.0'	1.25'	1.5'
Notes: DBH = diameter at breast height (4.5 ft above grade); Young = <20% of life expectancy; Mature = 20%-80% of life expectancy; Over mature =>80% of life expectancy			

- Most tree roots grow within the top 12 to 18 inches of soil. Grade changes within the tree protection zone should be avoided where possible because seemingly minor grade changes can either smother

<sup>1</sup> Tree Protection guidelines adapted from GreenCO and WWE (2008). *Green Industry Best Management Practices (BMPs) for the Conservation and Protection of Water Resources in Colorado: Moving Toward Sustainability, Third Release*. See [www.greenco.org](http://www.greenco.org) for more detailed guidance on tree preservation.



roots (in fill situations) or damage roots (in cut situations). Consider small walls where needed to avoid grade changes in the tree protection zone.

- Place and maintain a layer of mulch 4 to 6-inch thick from the tree trunk to the fencing, keeping a 6-inch space between the mulch and the trunk. Mulch helps to preserve moisture and decrease soil compaction if construction traffic is unavoidable. When planting operations are completed, the mulch may be reused throughout planting areas.
- Limit access, if needed at all, and appoint one route as the main entrance and exit to the tree protection zone. Within the tree protection zone, do not allow any equipment to be stored, chemicals to be dumped, or construction activities to take place except fine grading, irrigation system installation, and planting operations. These activities should be conducted in consultation with a landscaping professional, following Green Industry BMPs.
- Be aware that soil compaction can cause extreme damage to tree health that may appear gradually over a period of years. Soil compaction is easier to prevent than repair.

## Maintenance and Removal

Repair or replace damaged or displaced fencing or other protective barriers around the vegetated area.

If damage occurs to a tree, consult an arborist for guidance on how to care for the tree. If a tree in a designated preservation area is damaged beyond repair, remove and replace with a 2-inch diameter tree of the same or similar species.

Construction equipment must not enter a wetland area, except as permitted by the U.S. Army Corps of Engineers (USACE). Inadvertent placement of fill in a wetland is a 404 permit violation and will require notification of the USACE.

If damage to vegetation occurs in a protected area, reseed the area with the same or similar species, following the recommendations in the USDCM *Revegetation* chapter.

## Description

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

## Appropriate Uses

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

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

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

## Design and Installation

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

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

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



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

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

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

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

## Maintenance and Removal

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

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

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

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

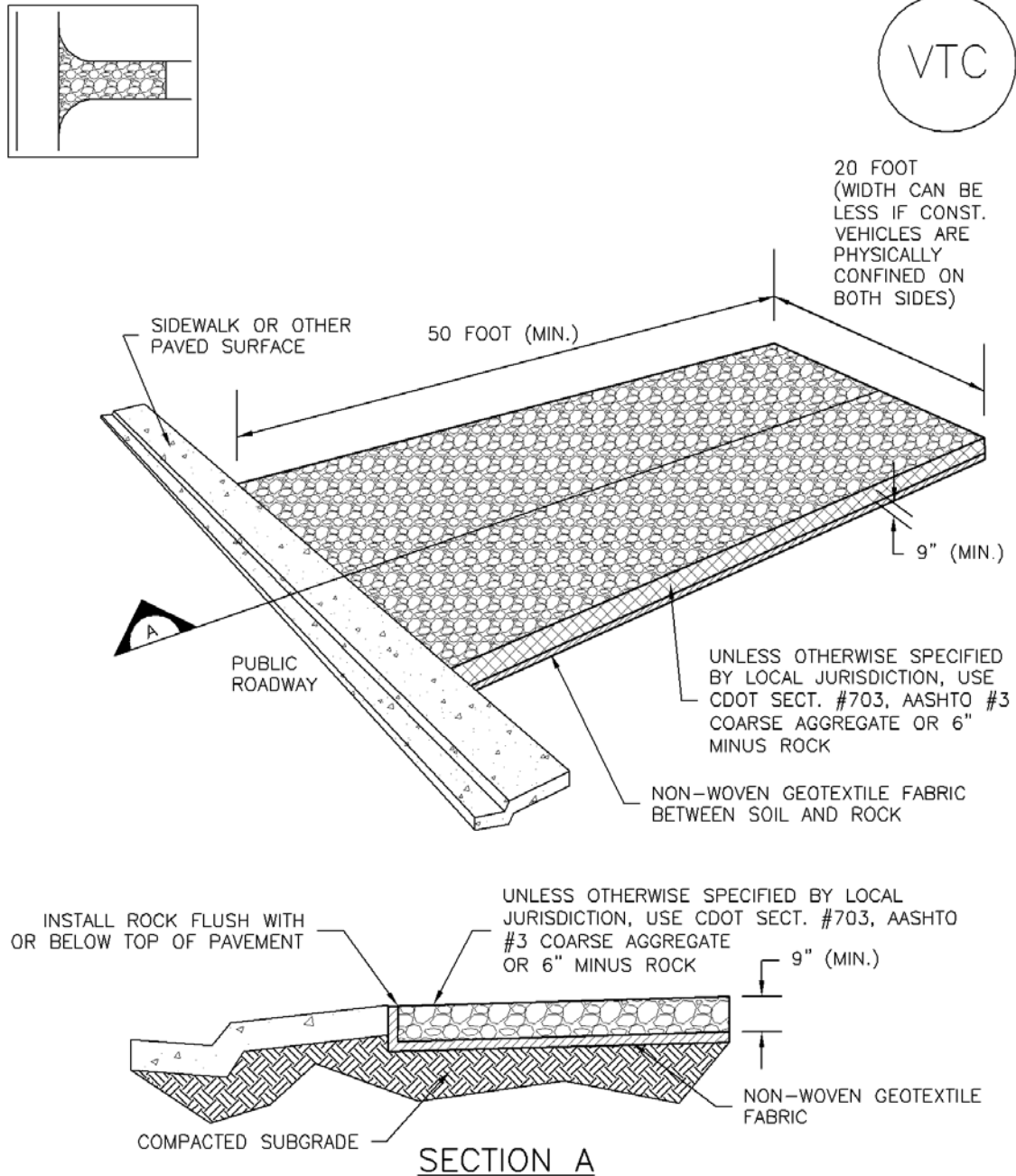
A stabilized entrance should be removed only when there is no longer the potential for vehicle tracking to occur. This is typically after the site has been stabilized.

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

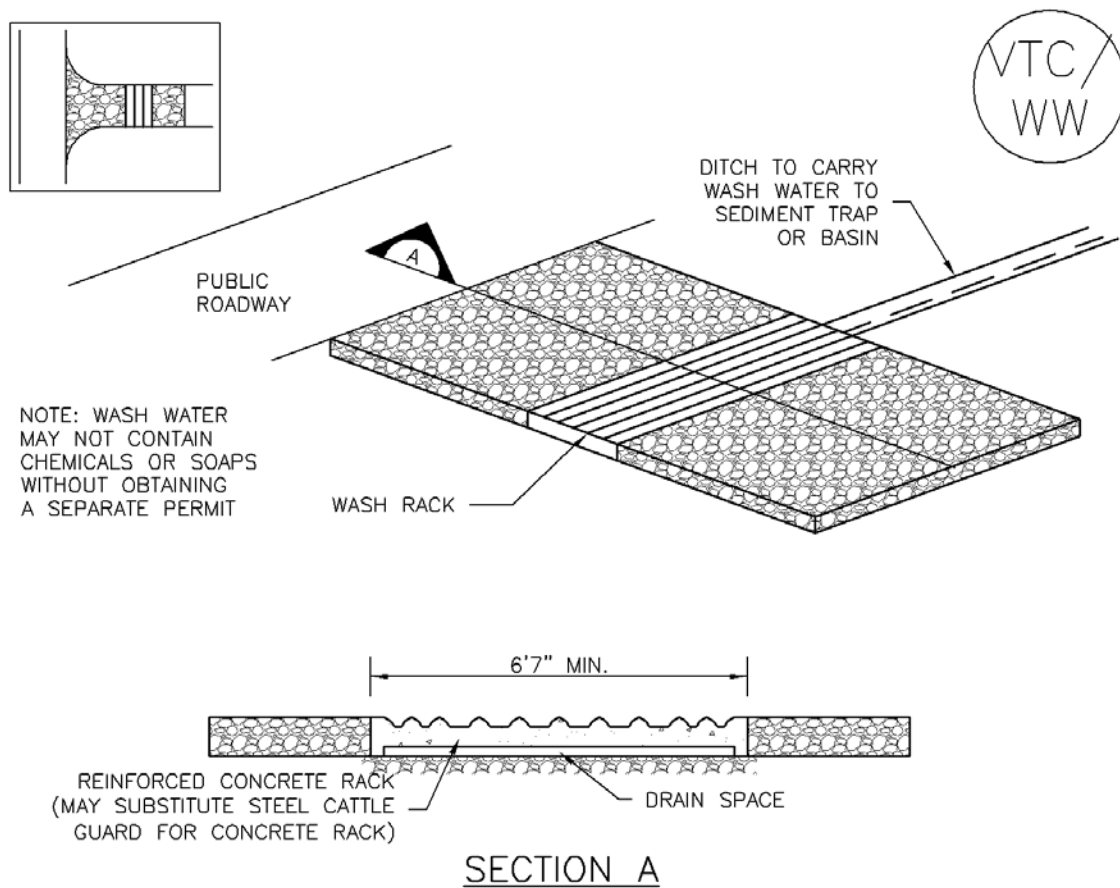
When a construction entrance/exit is removed, excess sediment from the aggregate should be removed and disposed of appropriately. The entrance should be promptly stabilized with a permanent surface following removal, typically by paving.



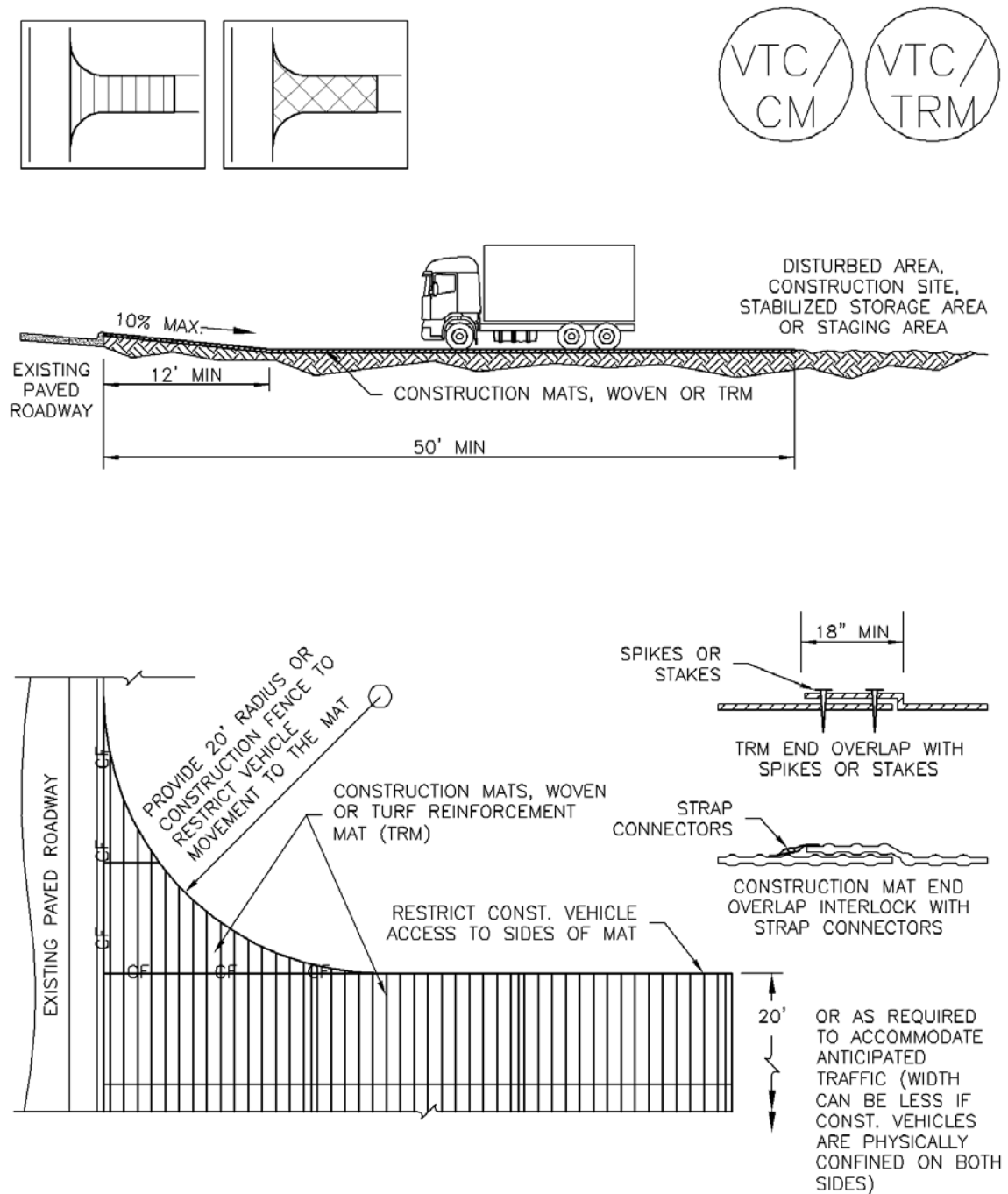
**Photograph VTC-2.** A vehicle tracking control pad with wheel wash facility. Photo courtesy of Tom Gore.



## VTC-1. AGGREGATE VEHICLE TRACKING CONTROL



VTC-2. AGGREGATE VEHICLE TRACKING CONTROL WITH WASH RACK



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

STABILIZED CONSTRUCTION ENTRANCE/EXIT INSTALLATION NOTES

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

STABILIZED CONSTRUCTION ENTRANCE/EXIT MAINTENANCE NOTES

1. INSPECT BMPs EACH WORKDAY, AND MAINTAIN THEM IN EFFECTIVE OPERATING CONDITION. MAINTENANCE OF BMPs SHOULD BE PROACTIVE, NOT REACTIVE. INSPECT BMPs AS SOON AS POSSIBLE (AND ALWAYS WITHIN 24 HOURS) FOLLOWING A STORM THAT CAUSES SURFACE EROSION, AND PERFORM NECESSARY MAINTENANCE.
2. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN BMPs IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
3. WHERE BMPs HAVE FAILED, REPAIR OR REPLACEMENT SHOULD BE INITIATED UPON DISCOVERY OF THE FAILURE.
4. ROCK SHALL BE REAPPLIED OR REGRADED AS NECESSARY TO THE STABILIZED ENTRANCE/EXIT TO MAINTAIN A CONSISTENT DEPTH.
5. SEDIMENT TRACKED ONTO PAVED ROADS IS TO BE REMOVED THROUGHOUT THE DAY AND AT THE END OF THE DAY BY SHOVELING OR SWEEPING. SEDIMENT MAY NOT BE WASHED DOWN STORM SEWER DRAINS.

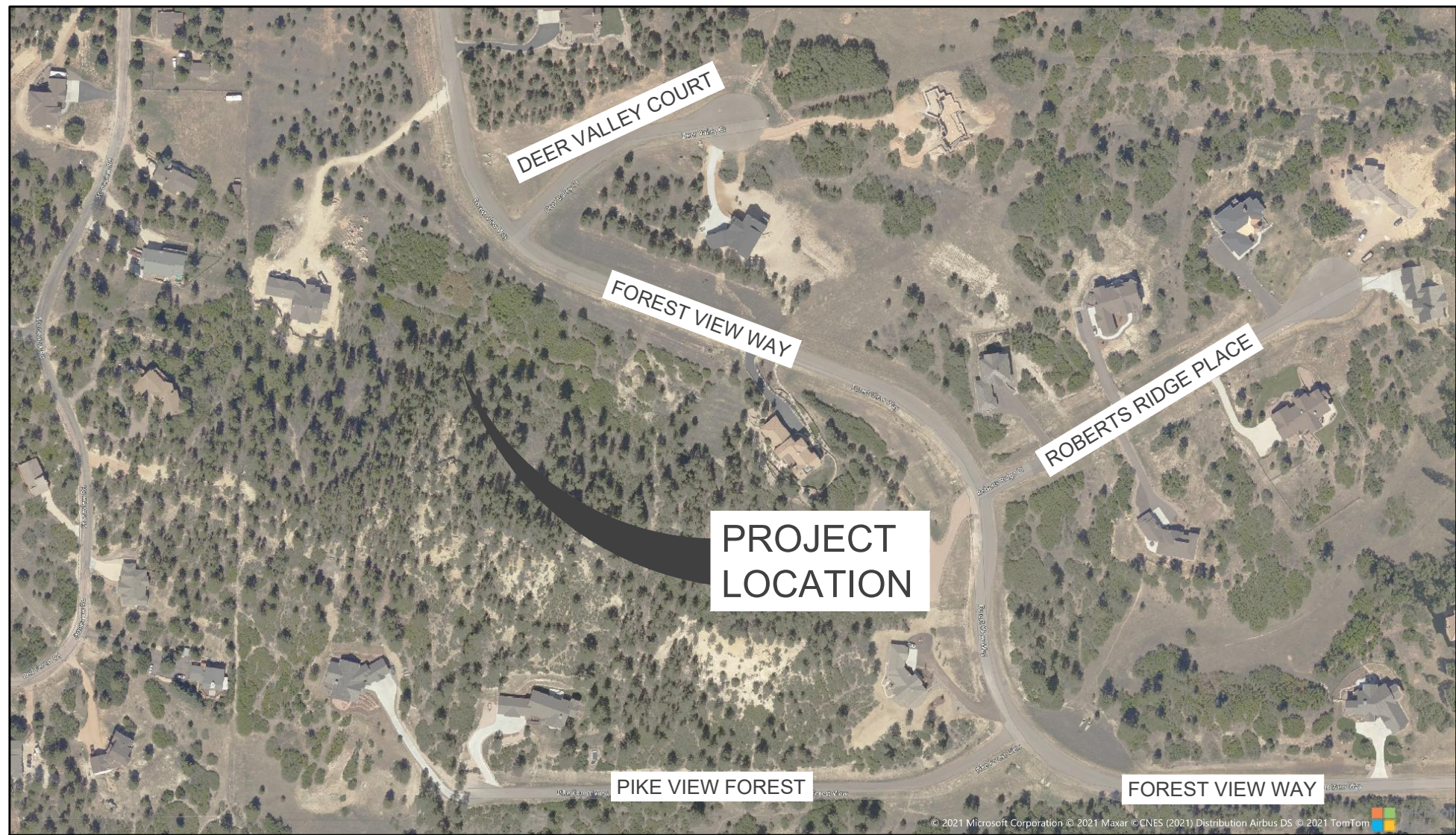
NOTE: MANY JURISDICTIONS HAVE BMP DETAILS THAT VARY FROM UDFCD STANDARD DETAILS. CONSULT WITH LOCAL JURISDICTIONS AS TO WHICH DETAIL SHOULD BE USED WHEN DIFFERENCES ARE NOTED.

(DETAILS ADAPTED FROM CITY OF BROOMFIELD, COLORADO, NOT AVAILABLE IN AUTOCAD)

## **APPENDIX 5: Erosion & Sediment Control Plan (ESC Plan) – Site Map**

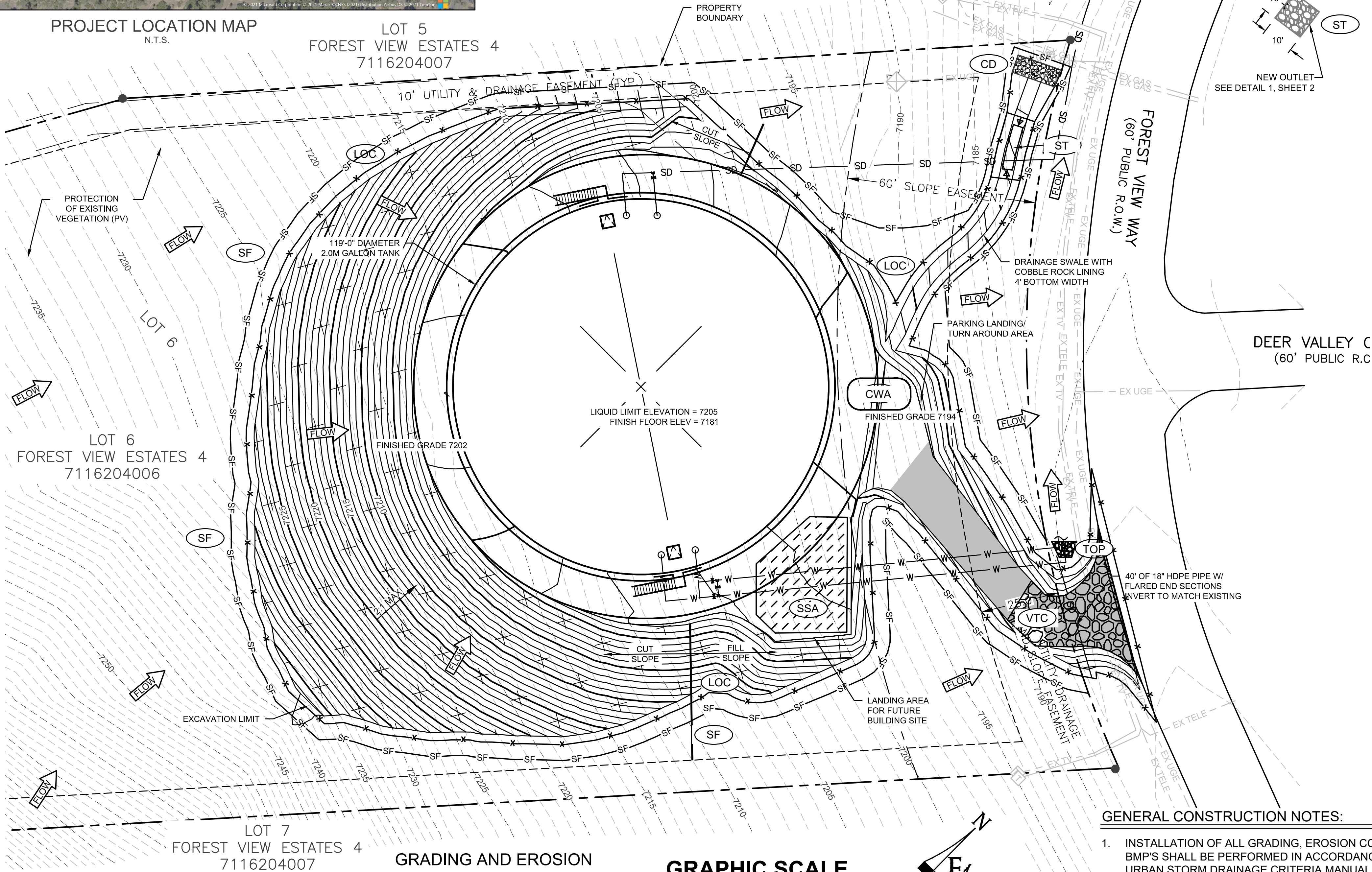
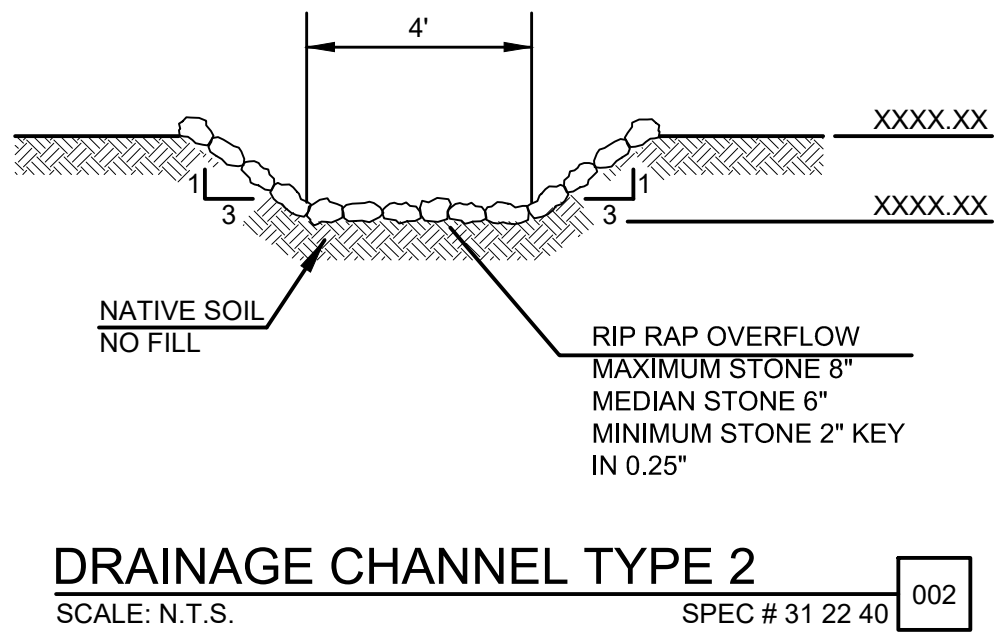


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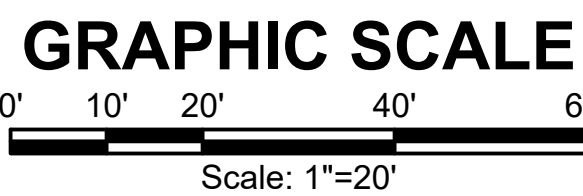


PROJECT LOCATION MAP  
N.T.S.

## TOWN OF MONUMENT - WATERLINE AND STORAGE TANK SITE DEVELOPMENT PLANS LOT 6, FOREST VIEW ESTATES FILING NO. 4



GRADING AND EROSION  
CONTROL PLAN  
SCALE: 1"= 20'



### LEGEND

(VTC)	VEHICLE TRACKING CONTROL
(SF)	SILT FENCE
(ECB)	EROSION CONTROL BLANKET
(CD)	ROCK CHECK DAM
(LOC)	LIMIT OF CONSTRUCTION
(CWA)	CONCRETE WASH AREA
(SSA)	STABILIZED STAGING AREA
(TOP)	TEMPORARY OUTLET PROTECTION
(ST)	SEDIMENT TRAP

	INITIAL
	FINAL
	INTERIM
	FINAL
	INTERIM
	INTERIM
	INTERIM

**ENGINEER'S STATEMENT:**  
THIS GRADING AND EROSION CONTROL PLAN WAS PREPARED UNDER MY DIRECTION AND SUPERVISION AND IS CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF. SAID PLAN HAS BEEN PREPARED ACCORDING TO THE CRITERIA ESTABLISHED BY THE COUNTY FOR GRADING AND EROSION CONTROL PLANS. I ACCEPT RESPONSIBILITY FOR ANY LIABILITY CAUSED BY ANY NEGLIGENT ACTS, ERRORS OR OMISSIONS ON MY PART IN PREPARING THIS PLAN.

JAMES ADAMS, PE #38375

DATE

**OWNER'S STATEMENT:**

I, THE OWNER/DEVELOPER HAVE READ AND WILL COMPLY WITH THE REQUIREMENTS OF THE GRADING AND EROSION CONTROL PLAN.

TOWN OF MONUMENT

DATE

**EL PASO COUNTY:**

COUNTY PLAN REVIEW IS PROVIDED ONLY FOR GENERAL CONFORMANCE WITH COUNTY DESIGN CRITERIA. THE COUNTY IS NOT RESPONSIBLE FOR THE ACCURACY AND ADEQUACY OF THE DESIGN, DIMENSIONS, AND/OR ELEVATIONS WHICH SHALL BE CONFIRMED AT THE JOB SITE. THE COUNTY THROUGH THE APPROVAL OF THIS DOCUMENT ASSUMES NO RESPONSIBILITY FOR COMPLETENESS AND/OR ACCURACY OF THIS DOCUMENT.

FILED IN ACCORDANCE WITH THE REQUIREMENTS OF THE EL PASO COUNTY LAND DEVELOPMENT CODE, DRAINAGE CRITERIA, AND ENGINEERING CRITERIA MANUAL AS AMENDED.

IN ACCORDANCE WITH ECM SECTION 1.12, THESE CONSTRUCTION DOCUMENTS WILL BE VALID FOR CONSTRUCTION FOR A PERIOD OF 2 YEARS FROM THE DATE SIGNED BY THE EL PASO COUNTY ENGINEER. IF CONSTRUCTION IS NOT STARTED WITHIN THOSE 2 YEARS, THE PLANS WILL NEED TO BE RESUBMITTED FOR APPROVAL, INCLUDING PAYMENT OF REVIEW FEES AT THE PLANNING AND COMMUNITY DEVELOPMENT DIRECTORS DISCRETION.

JENNIFER IRVINE, P.E.

DATE

COUNTY ENGINEER / ECM ADMINISTRATOR

### GENERAL CONSTRUCTION NOTES:

- INSTALLATION OF ALL GRADING, EROSION CONTROL BMP'S SHALL BE PERFORMED IN ACCORDANCE WITH THE URBAN STORM DRAINAGE CRITERIA MANUAL VOLUME 3, CHAPTER 7. CONTRACTOR SHALL MAKE NO DEVIATIONS FROM THIS MANUAL DURING CONSTRUCTION.
- ANY UNPAVED AREA THAT IS DISTURBED DURING CONSTRUCTION SHALL BE RESEED AND MULCHED.

PCD FILE NO. PDR-21-030

PROJECT NO. 04-20-0163		S. CALE		J. ADAMS		J. ADAMS		W. KOGER	
DRAWN		DESIGNED		APPROVED		QA/QC			
2.0M GALLON TANK		GRADING AND EROSION		CONTROL PLAN		SHEET NO. 1		DATE: JAN, 2022	
PAGE NO:									

**FORSREN Associates Inc.**

56 INVERNESS DRIVE EAST #112, ENGLEWOOD, CO 80112  
PH: 720.232.6644



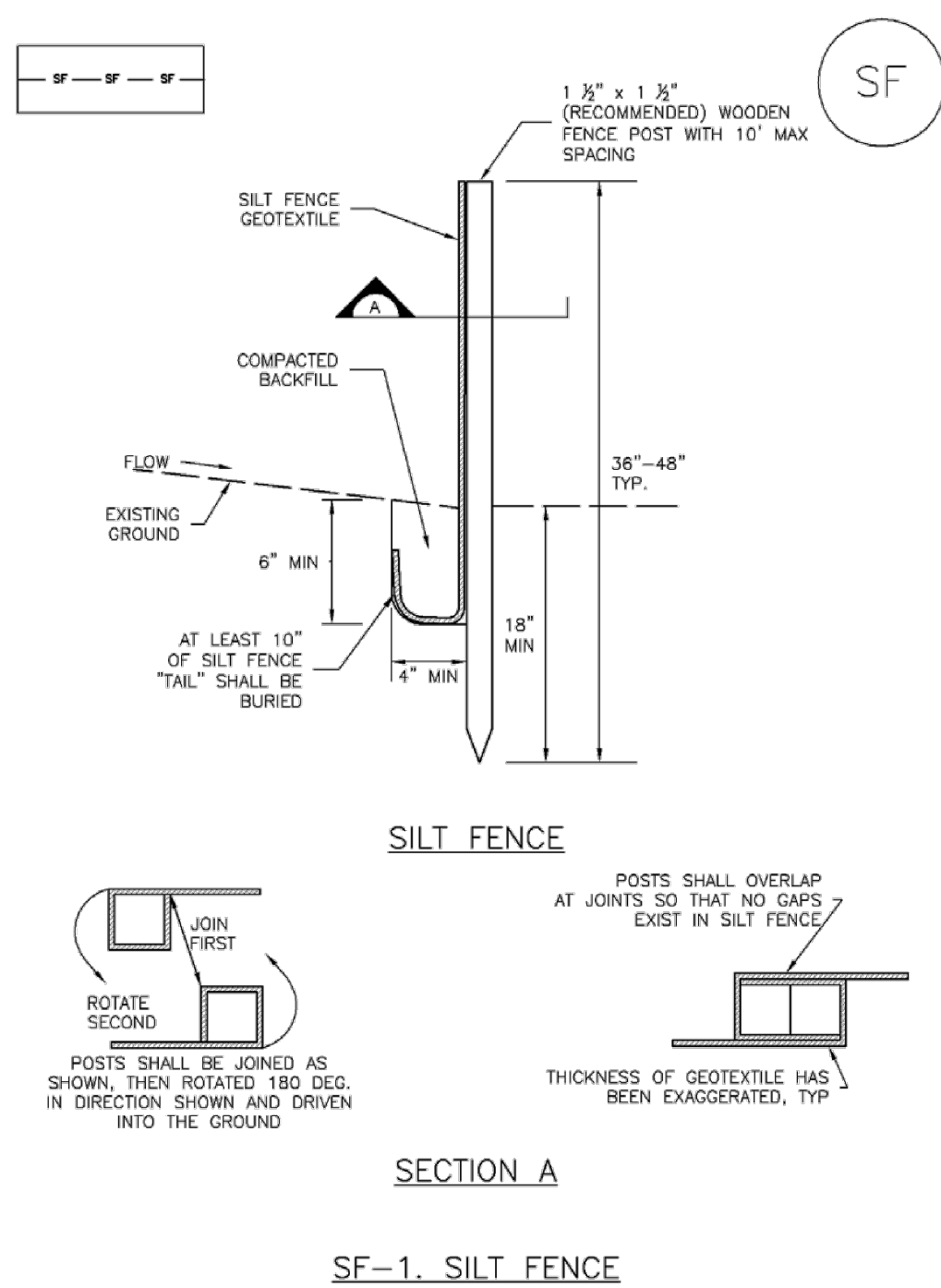




**TOWN OF MONUMENT - WATERLINE AND STORAGE TANK  
SITE DEVELOPMENT PLANS  
LOT 6, FOREST VIEW ESTATES FILING NO. 4**

### Silt Fence (SF)

SC-1



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

**SC-1**

### Silt Fence (SF)

SILT FENCE INSTALLATION NOTES

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

## SILT FENCE MAINTENANCE NOTES

1. INSPECT BMPs EACH WORKDAY, AND MAINTAIN THEM IN EFFECTIVE OPERATING CONDITION. MAINTENANCE OF BMPs SHOULD BE PROACTIVE, NOT REACTIVE. INSPECT BMPs AS SOON AS POSSIBLE AFTER A STORM EVENT TO DETERMINE IF THERE IS A NEED FOR MAINTENANCE AFTER EROSION, AND PERFORM NECESSARY MAINTENANCE.
2. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN BMPs IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
3. WHERE BMPs HAVE FAILED, REPAIR OR REPLACEMENT SHOULD BE INITIATED UPON DISCOVERY OF THE FAILURE.
4. SEDIMENT ACCUMULATED UPSTREAM OF THE SILT FENCE SHALL BE REMOVED AS NEEDED TO MAINTAIN THE FUNCTIONALITY OF THE BMP. TYPICALLY WHEN DEPTH OF ACCUMULATED SEDIMENTS IS APPROXIMATELY 6".
5. REPAIR OR REPLACE SILT FENCE WHEN THERE ARE SIGNS OF WEAR, SUCH AS SAGGING, TEARING, OR COLLAPSE.
6. 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 PERMEABLE BARRIER.

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

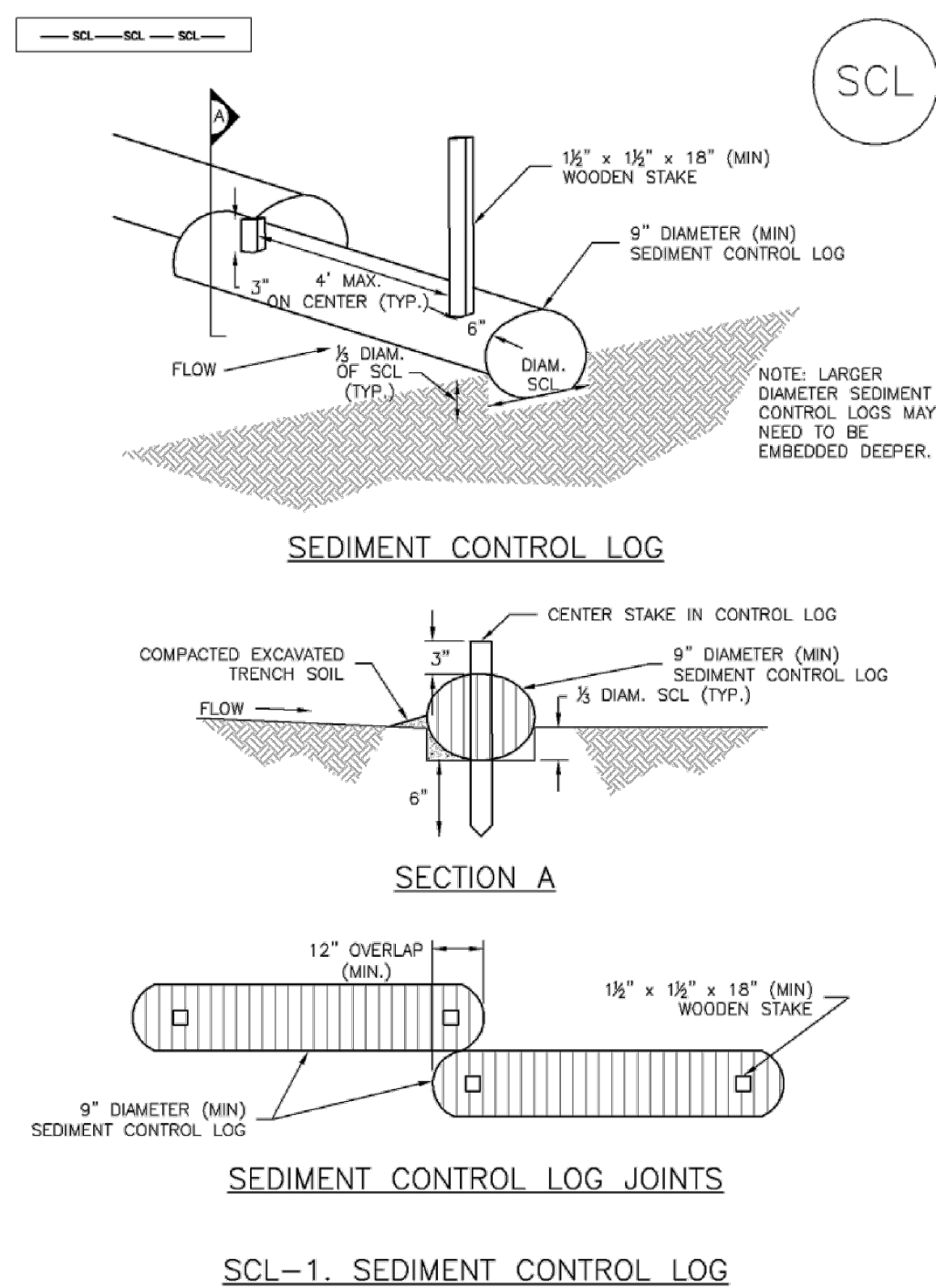
NOTE: MANY JURISDICTIONS HAVE BMP DETAILS THAT VARY FROM UDFCD STANDARD DETAILS. CONSULT WITH LOCAL JURISDICTIONS AS TO WHICH DETAIL SHOULD BE USED WHEN DIFFERENCES ARE NOTED.

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SF-4                      Urban Drainage and Flood Control District                      November 2010  
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## Sediment Control Log (SCL)

SC-2

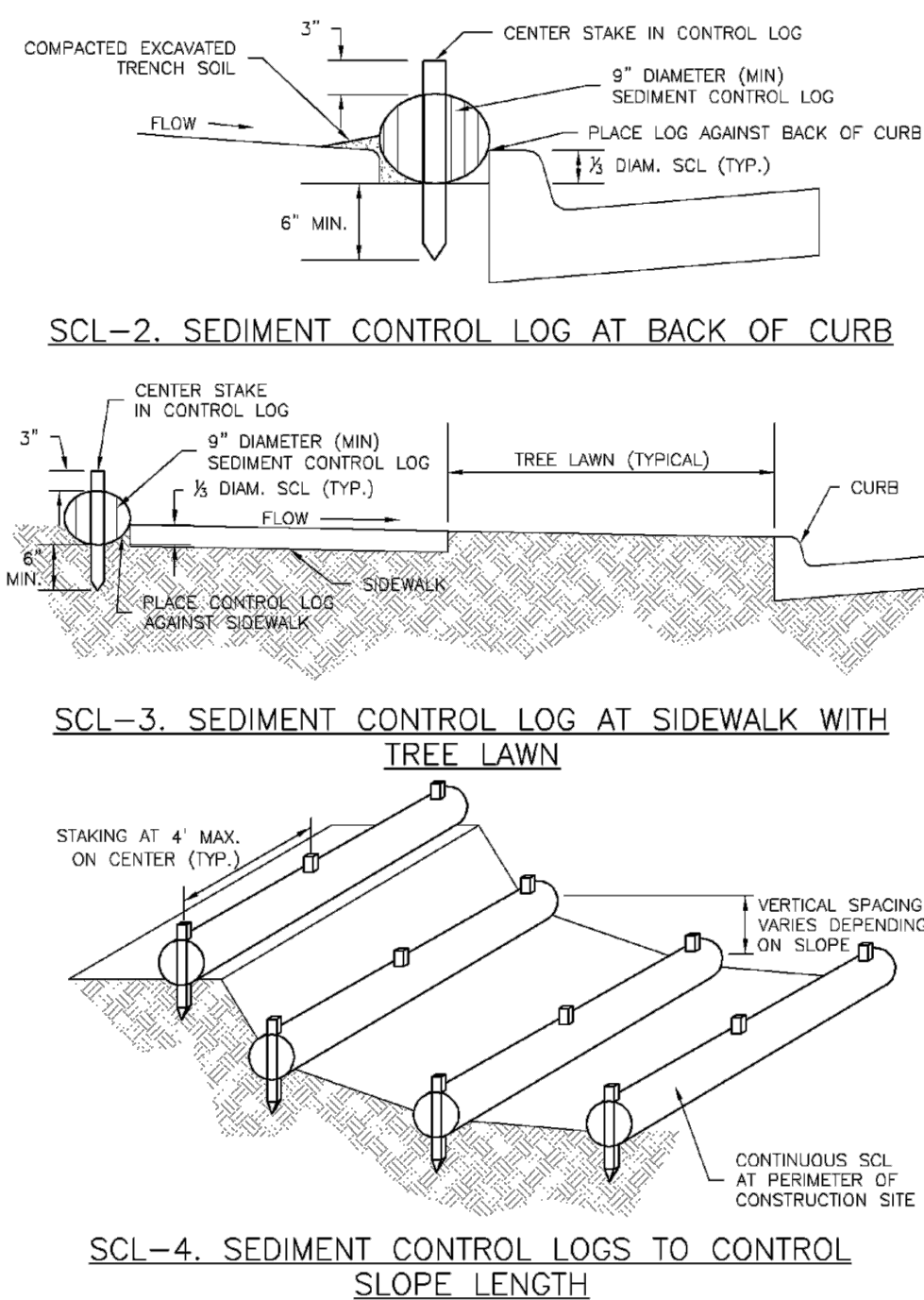


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November 2010
Urban Drainage and Flood Control District  
Urban Storm Drainage Criteria Manual Volume 3
SCL-3

## SC-2

## Sediment Control Log (SCL)



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SCL-4
Urban Drainage and Flood Control District  
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November 2010

## Revegetation

## Chapter 14

**Table 14-10. Recommended Seed Mix for Transition Areas<sup>1</sup>**

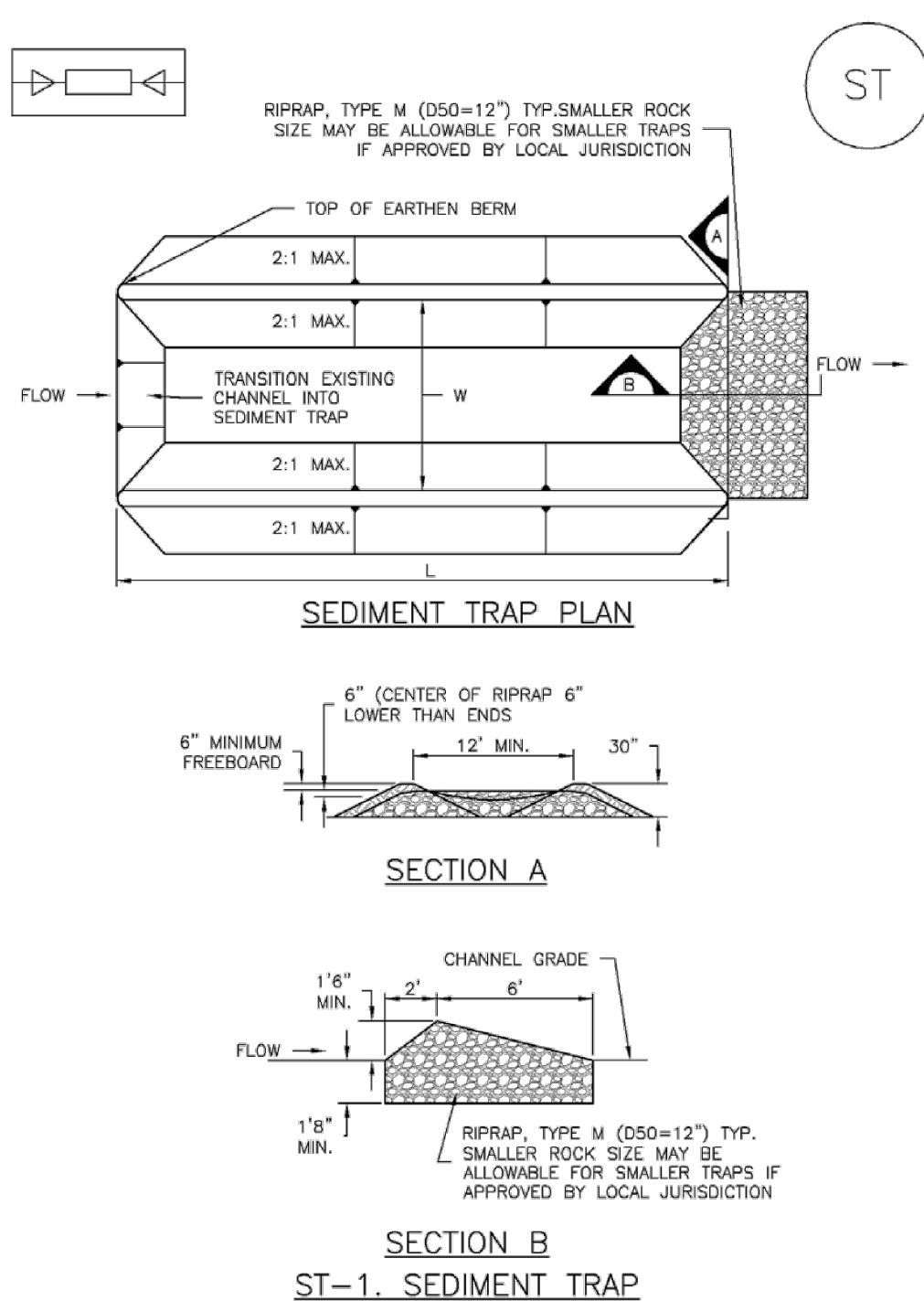
Common Name (Variety)	Scientific Name	Growth Season	Growth Form	Seeds/Lb	Lbs PLS/Acre Drilled	Lbs PLS/Acre Broadcast or Hydroseeded
Sheep fescue (Dural)	<i>Festuca ovina</i>	Cool	Bunch	680,000	1.3	2.6
Western wheatgrass (Ariba)	<i>Pascopyrum smithii</i>	Cool	Sod	110,000	7.9	15.8
Alkali sacaton	<i>Spolobolus airoides</i>	Warm	Bunch	1,758,000	0.5	1.0
Slender wheatgrass	<i>Elymus trachycaulis</i>	Cool	Bunch	159,000	5.5	11.0
Canadian bluegrass (Ruebens) <sup>1</sup>	<i>Poa compressa</i>	Cool	Sod	2,500,000	0.3	0.6
Switchgrass (Pathfinder)	<i>Panicum virgatum</i>	Warm	Sod/ Bunch	389,000	1.3	2.6
Annual rye	<i>Lolium multiflorum</i>	Cool	Cover crop	227,000	10.0	20.0
				<b>TOTAL</b>	<b>26.8</b>	<b>53.6</b>
<b>Wildflowers</b>						
Blanket flower	<i>Faillardia aristata</i>	---	---	132,000	0.25	0.50
Prairie coneflower	<i>Ratibida columnaris</i>	---	---	1,230,000	0.20	0.40
Purple prairie clover	<i>Petalostemum purpurea</i>	---	---	210,000	0.20	0.40
Gayfeather	<i>Liatris punctata</i>	---	---	138,000	0.06	0.12
Flax	<i>Linum lewisii</i>	---	---	293,000	0.20	0.40
Penstemon	<i>Penstemon strictus</i>	---	---	592,000	0.20	0.40
Yarrow	<i>Achillea millefolium</i>	---	---	2,770,000	0.03	0.06
				<b>TOTAL</b>	<b>1.14</b>	<b>2.28</b>

<sup>2</sup>Substitute 1.7 lbs PLS/acre of inland saltgrass (*Distichlis spicata*) in salty soils.

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## SC-8

### Sediment Trap (ST)



ST-2                      Urban Drainage and Flood Control District                      November 2010  
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GENERAL CONSTRUCTION NOTES:

1. PARKING DIMENSIONS ARE TO FACE OF CURB.
2. CONSTRUCTION MAY NOT COMMENCE UNTIL A CONSTRUCTION PERMIT IS OBTAINED FROM PLANNING AND COMMUNITY (PCD) AND PRECONSTRUCTION CONFERENCE IS HELD WITH PCD INSPECTIONS.
3. ANY UNPAVED AREA THAT IS DISTURBED DURING CONSTRUCTION SHALL BE RESEDED. SEE BELOW FOR GRASS SEED MIXES FOR EL PASO COUNTY.

### Recommended El Paso County Grass Seed Mixes

Grass:	Variety	PLS lbs per acre
Crested Wheat Grass	Ephraim or Hy Crest	4.0
Perennial Rye	Linn	2.0
Western Wheatgrass	Barton	3.0
Smooth Brome Grass	Lincoln or Manchac	5.0
Sideoats Grama	El Reno	2.5
	<b>Total:</b>	<b>16.5</b>

Grass mix for heavier soil areas:

Grass:	Variety	PLS lbs per acre
Crested Wheat Grass	Ephraim	3.0
Slender Wheat Grass	Soda	2.5
Western Wheatgrass	Barton	5.0
Smooth Brome Grass	Lincoln or Manchar	4.0
Sideoats Grama	El Reno	3.0
	Total:	17.5

Grass mix for sandy soils:

Grass:	Variety	PLS lbs per acre
<u>Sideoats</u>	<u>Grama</u>	3.0
Western Wheatgrass	Barton	2.5
Slender Wheat Grass	Native	2.0
Little Bluestem	<u>Pastura</u>	2.0
Sand <u>Droseed</u>	Native	0.5
Switch Grass	Nebraska 28	3.0
Weeping Love Grass	<u>Morpha</u>	1.0
Optional: <u>Perennial</u> Rye		2.0
		Total: 14-16

### Sediment Trap (ST)

SC-8

### SEDIMENT TRAP INSTALLATION NOTES

1. SEE PLAN VIEW FOR:  
--LOCATION, LENGTH AND WIDTH OF SEDIMENT TRAP.
2. ONLY USE FOR DRAINAGE AREAS LESS THAN 1 ACRE.  
SEDIMENT TRAPS SHALL BE INSTALLED PRIOR TO ANY UPGRADED LAND-DISTURBING ACTIVITIES.
4. SEDIMENT TRAP BERM SHALL BE CONSTRUCTED FROM MATERIAL FROM EXCAVATION. THE BERM SHALL BE COMPACTED TO 95% OF THE MAXIMUM DENSITY IN ACCORDANCE WITH ASTM D698.
5. SEDIMENT TRAP OUTLET TO BE CONSTRUCTED OF RIPRAP, TYPE M (D50=12") TYP. SMALLER ROCK SIZE MAY BE ALLOWABLE FOR SMALLER TRAPS IF APPROVED BY LOCAL JURISDICTION.
6. THE TOP OF THE EARTHEN BERM SHALL BE A MINIMUM OF 6" HIGHER THAN THE TOP OF THE RIPRAP OUTLET STRUCTURE.
7. THE ENDS OF THE RIPRAP OUTLET STRUCTURE SHALL BE A MINIMUM OF 6" HIGHER THAN THE CENTER OF THE OUTLET STRUCTURE.

SEDIMENT TRAP MAINTENANCE NOTES

1. INSPECT BMPs EACH WORKDAY, AND MAINTAIN THEM IN EFFECTIVE OPERATING CONDITION. MAINTENANCE OF BMPs SHOULD BE PROACTIVE, NOT REACTIVE. INSPECT BMPs AS SOON AS POSSIBLE (AND ALWAYS WITHIN 24 HOURS) FOLLOWING A STORM THAT CAUSES SURFACE EROSION, AND PERFORM NECESSARY MAINTENANCE.
  2. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN BMPs IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
  3. WHERE BMPs HAVE FAILED, REPAIR OR REPLACEMENT SHOULD BE INITIATED UPON DISCOVERY OF THE FAILURE.
  4. REMOVE SEDIMENT ACCUMULATED IN TRAP AS NEEDED TO MAINTAIN THE FUNCTIONALITY OF THE BMP, TYPICALLY WHEN THE SEDIMENT DEPTH REACHES  $\frac{1}{2}$  THE HEIGHT OF THE RIPRAP OUTLET.
  5. SEDIMENT TRAPS SHALL REMAIN IN PLACE UNTIL THE UPSTREAM DISTURBED AREA IS STABILIZED AND APPROVED BY THE LOCAL JURISDICTION.
  6. WHEN SEDIMENT TRAPS ARE REMOVED, THE DISTURBED AREA SHALL BE COVERED WITH TOPSOIL, SEEDING AND MULCHED OR OTHERWISE STABILIZED IN A MANNER APPROVED BY THE LOCAL JURISDICTION.
- (DETAILS ADAPTED FROM DOUGLAS COUNTY, COLORADO, NOT AVAILABLE IN AUTOCAD)
- NOTE: MANY JURISDICTIONS HAVE BMP DETAILS THAT VARY FROM UFDCD STANDARD DETAILS. CONSULT WITH LOCAL JURISDICTIONS AS TO WHICH DETAIL SHOULD BE USED WHEN DIFFERENCES ARE NOTED.

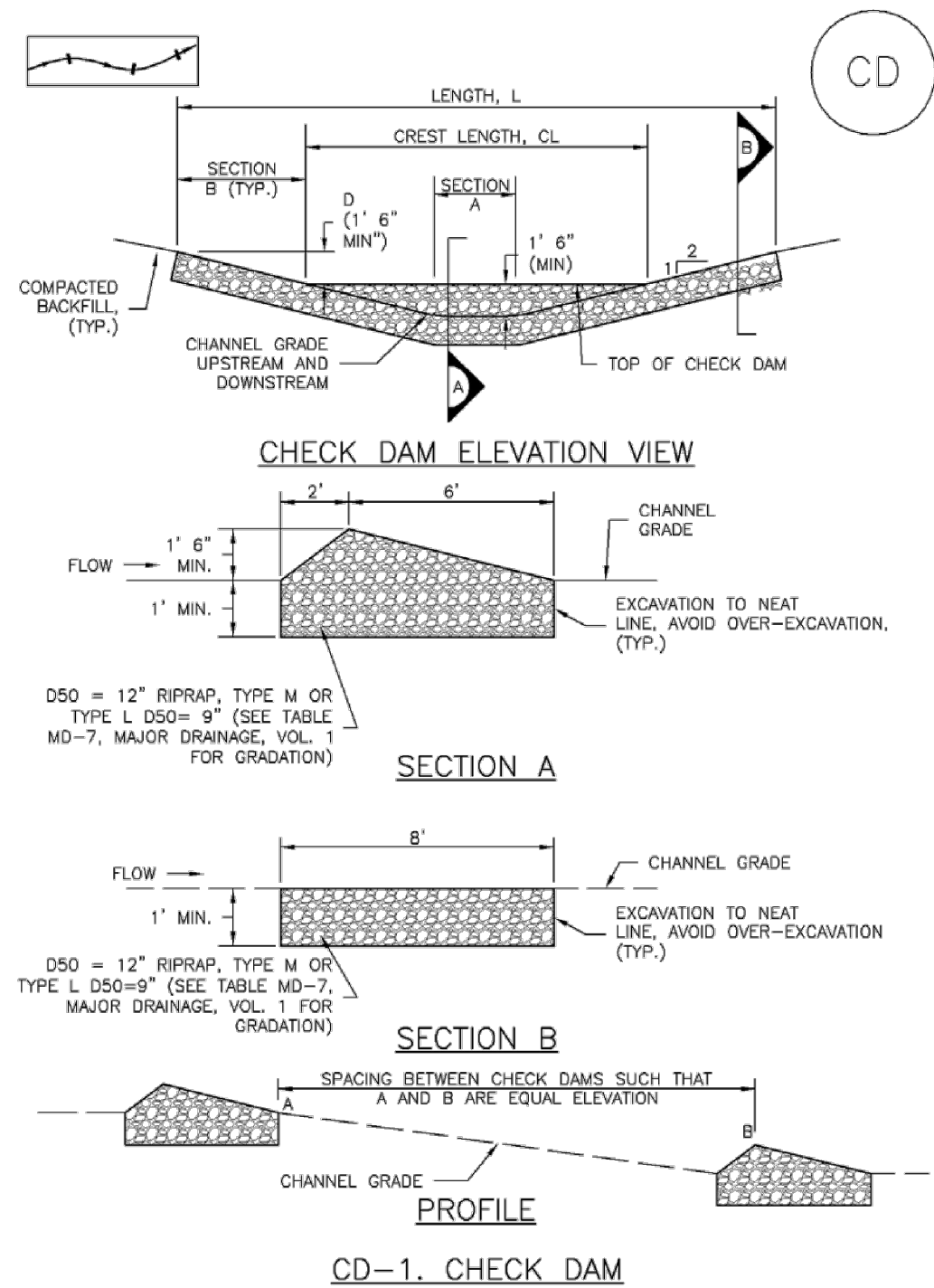
November 2010      Urban Drainage and Flood Control District      ST-3  
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P:\Clients\Monument\04-20-0163 Waterline & Storage Tank\CAD\Sheets\Standard Details\COUNTY SUBMITTAL\SGECITANK\Grading Erosion Control Details.dwg - ---- - 1/6/2022 4:38 PM

TOWN OF MONUMENT - WATERLINE AND STORAGE TANK  
SITE DEVELOPMENT PLANS  
LOT 6, FOREST VIEW ESTATES FILING NO. 4

Check Dams (CD) EC-12



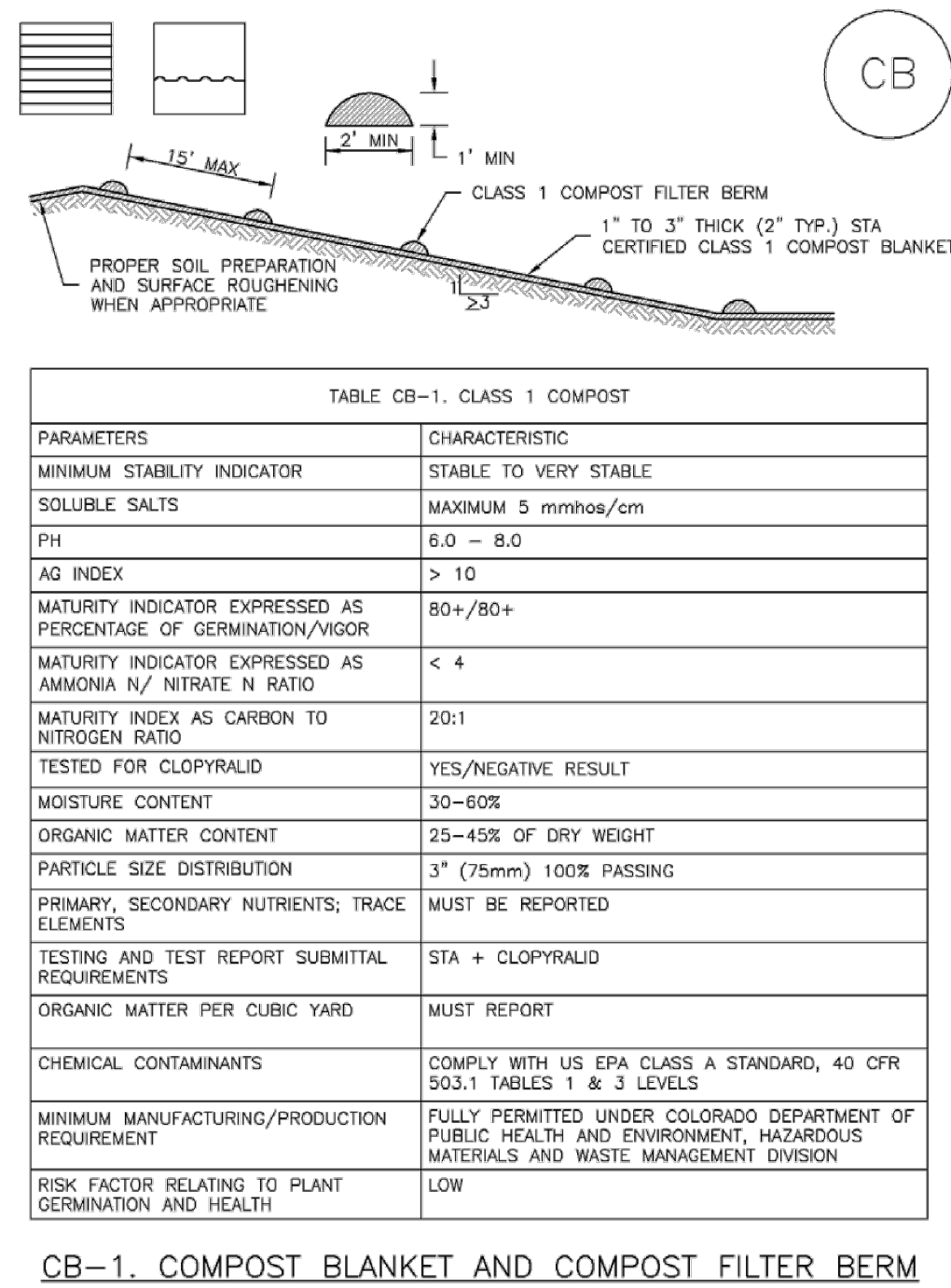
November 2010 Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual Volume 3 CD-3

EC-12 Check Dams (CD)

- CHECK DAM INSTALLATION NOTES
- SEE PLAN VIEW FOR:
    - LOCATION OF CHECK DAMS.
    - CHECK DAM TYPE (CHECK DAM OR REINFORCED CHECK DAM).
    - LENGTH (L), CREST LENGTH (CL), AND DEPTH (D).
  - CHECK DAMS INDICATED ON INITIAL SWMP SHALL BE INSTALLED AFTER CONSTRUCTION FENCE, BUT PRIOR TO ANY UPSTREAM LAND DISTURBING ACTIVITIES.
  - RIPRAP UTILIZED FOR CHECK DAMS SHOULD BE OF APPROPRIATE SIZE FOR THE APPLICATION. TYPICAL TYPES OF RIPRAP USED FOR CHECK DAMS ARE TYPE M (D50 12") OR TYPE L (D50 9").
  - RIPRAP PAD SHALL BE TRENCHED INTO THE GROUND A MINIMUM OF 1'.
  - THE ENDS OF THE CHECK DAM SHALL BE A MINIMUM OF 1' 6" HIGHER THAN THE CENTER OF THE CHECK DAM.
- CHECK DAM MAINTENANCE NOTES
- INSPECT BMPs EACH WORKDAY, AND MAINTAIN THEM IN EFFECTIVE OPERATING CONDITION. MAINTENANCE OF BMPs SHOULD BE PROACTIVE, NOT REACTIVE. INSPECT BMPs AS SOON AS POSSIBLE (AND ALWAYS WITHIN 24 HOURS) FOLLOWING A STORM THAT CAUSES SURFACE EROSION, AND PERFORM NECESSARY MAINTENANCE.
  - FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN BMPs IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
  - WHERE BMPs HAVE FAILED, REPAIR OR REPLACEMENT SHOULD BE INITIATED UPON DISCOVERY OF THE FAILURE.
  - SEDIMENT ACCUMULATED UPSTREAM OF THE CHECK DAMS SHALL BE REMOVED WHEN THE SEDIMENT DEPTH IS WITHIN  $\frac{1}{2}$  OF THE HEIGHT OF THE CREST.
  - CHECK DAMS ARE TO REMAIN IN PLACE UNTIL THE UPSTREAM DISTURBED AREA IS STABILIZED AND APPROVED BY THE LOCAL JURISDICTION.
  - WHEN CHECK DAMS ARE REMOVED, EXCAVATIONS SHALL BE FILLED WITH SUITABLE COMPACTED BACKFILL, DISTURBED AREA SHALL BE SEEDED AND MULCHED AND COVERED WITH GEOTEXTILE OR OTHERWISE STABILIZED IN A MANNER APPROVED BY THE LOCAL JURISDICTION.
- (DETAILS ADAPTED FROM DOUGLAS COUNTY, COLORADO, NOT AVAILABLE IN AUTOCAD)
- NOTE: MANY JURISDICTIONS HAVE BMP DETAILS THAT VARY FROM UDFCD STANDARD DETAILS. CONSULT WITH LOCAL JURISDICTIONS AS TO WHICH DETAIL SHOULD BE USED WHEN DIFFERENCES ARE NOTED.

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

Compost Blanket and Filter Berm (CB) EC-5



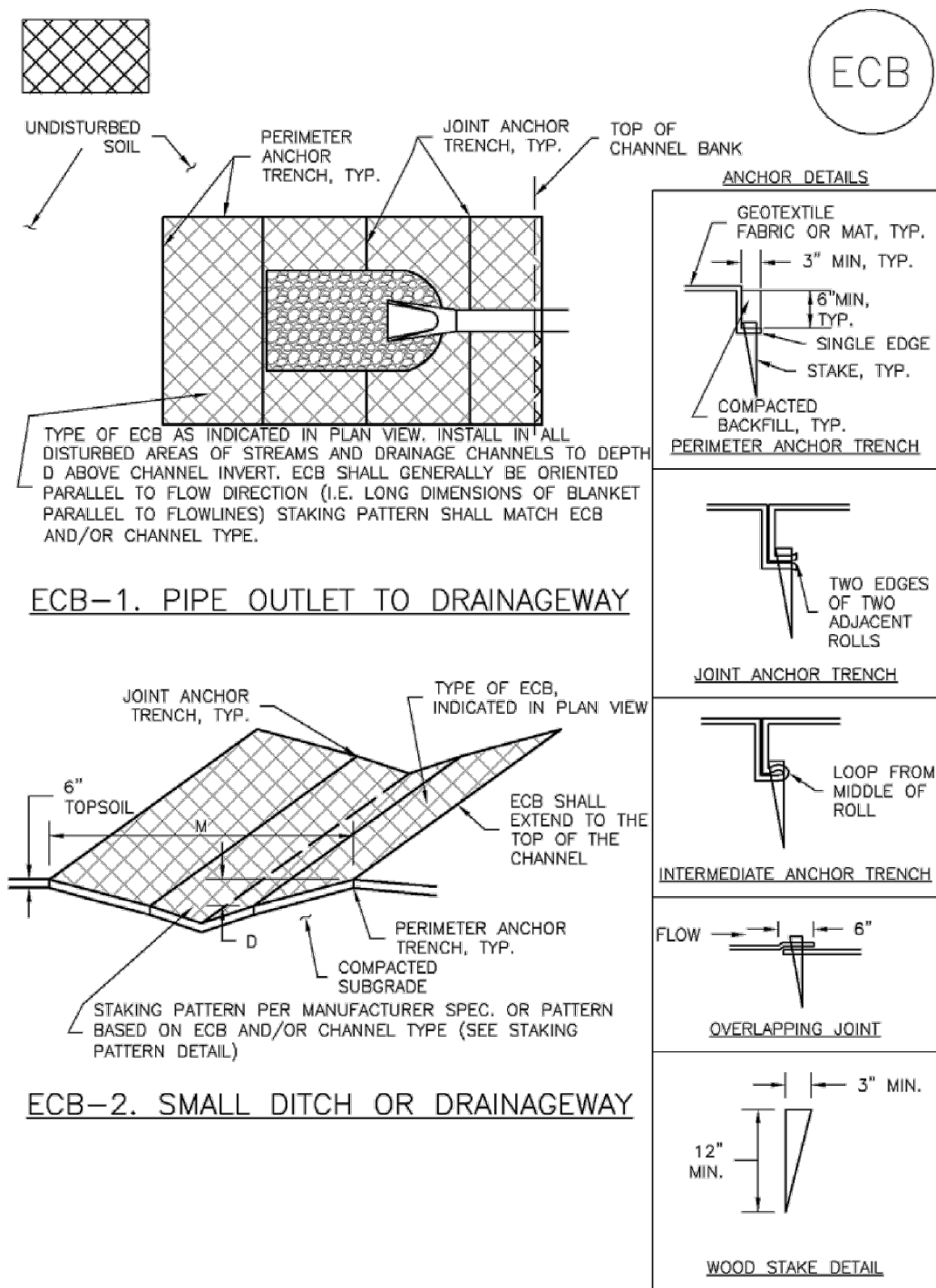
November 2010 Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual Volume 3 EC-3

EC-5 Compost Blanket and Filter Berm (CB)

- COMPOST FILTER BERM AND COMPOST BLANKET INSTALLATION NOTES
- SEE PLAN VIEW FOR:
    - LOCATION OF COMPOST FILTER BERM(S).
    - LENGTH OF COMPOST FILTER BERM(S).
  - COMPOST BERMS AND BLANKETS MAY BE USED IN PLACE OF STRAW MULCH OR GEOTEXTILE FABRIC IN AREAS WHERE ACCESS TO LANDSCAPING IS DIFFICULT DUE TO LANDSCAPING OR OTHER OBJECTS OR IN AREAS WHERE A SMOOTH TURF GRASS FINISH IS DESIRED.
  - FILTER BERMS SHALL RUN PARALLEL TO THE CONTOUR.
  - FILTER BERMS SHALL BE A MINIMUM OF 1 FEET HIGH AND 2 FEET WIDE.
  - FILTER BERMS SHALL BE APPLIED BY PNEUMATIC BLOWER OR BY HAND.
  - FILTER BERMS SHALL ONLY BE UTILIZED IN AREAS WHERE SHEET FLOW CONDITIONS PREVAIL AND NOT IN AREAS OF CONCENTRATED FLOW.
  - COMPOST BLANKETS SHALL BE APPLIED AT A DEPTH OF 1 -3 INCHES (TYPICALLY 2 INCHES). FOR AREAS WITH EXISTING VEGETATION THAT ARE TO BE SUPPLEMENTED BY COMPOST, A THIN 0.5-INCH LAYER MAY BE USED.
  - SEEDING SHALL BE PERFORMED PRIOR TO THE APPLICATION OF COMPOST. ALTERNATIVELY, SEED MAY BE COMBINED WITH COMPOST AND BLOWN WITH THE PNEUMATIC BLOWER.
  - WHEN TURF GRASS FINISH IS NOT DESIRED, SURFACE ROUGHENING ON SLOPES SHALL TAKE PLACE PRIOR TO COMPOST APPLICATION.
  - COMPOST SHALL BE A CLASS 1 COMPOST AS DEFINED BY TABLE CB-1.
- COMPOST FILTER BERM MAINTENANCE NOTES
- INSPECT BMPs EACH WORKDAY, AND MAINTAIN THEM IN EFFECTIVE OPERATING CONDITION. MAINTENANCE OF BMPs SHOULD BE PROACTIVE, NOT REACTIVE. INSPECT BMPs AS SOON AS POSSIBLE (AND ALWAYS WITHIN 24 HOURS) FOLLOWING A STORM THAT CAUSES SURFACE EROSION, AND PERFORM NECESSARY MAINTENANCE.
  - FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN BMPs IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
  - WHERE BMPs HAVE FAILED, REPAIR OR REPLACEMENT SHOULD BE INITIATED UPON DISCOVERY OF THE FAILURE.
  - COMPOST BERMS AND BLANKETS SHALL BE REAPPLIED OR REGRADED AS NECESSARY IF RILLING IN THE COMPOST SURFACE OCCURS.
- (DETAILS ADAPTED FROM ARAPAHOE COUNTY, COLORADO, NOT AVAILABLE IN AUTOCAD)
- NOTE: MANY JURISDICTIONS HAVE BMP DETAILS THAT VARY FROM UDFCD STANDARD DETAILS. CONSULT WITH LOCAL JURISDICTIONS AS TO WHICH DETAIL SHOULD BE USED WHEN DIFFERENCES ARE NOTED.

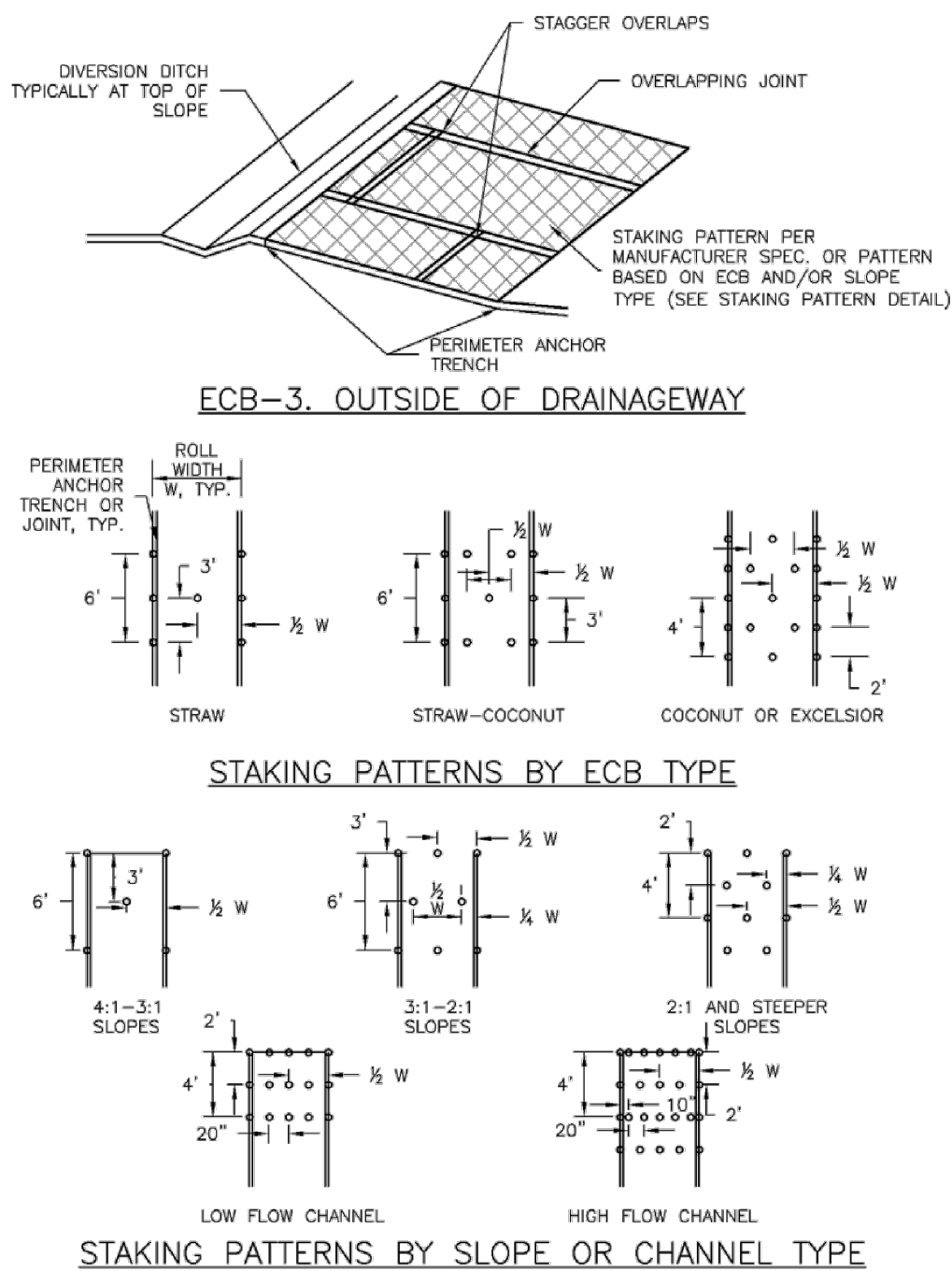
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EC-6 Rolled Erosion Control Products (RECP)



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

EC-6 Rolled Erosion Control Products (RECP)



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EC-6 Rolled Erosion Control Products (RECP)

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

TABLE ECB-1. ECB MATERIAL SPECIFICATIONS			
TYPE	COCONUT CONTENT	STRAW CONTENT	EXCELSIOR CONTENT
STRAW*	-	100%	-
STRAW-COCONUT	30% MIN	70% MAX	-
COCONUT	100%	-	-
EXCELSIOR	-	-	100%

\*STRAW ECBs MAY ONLY BE USED OUTSIDE OF STREAMS AND DRAINAGE CHANNELS.  
\*\*ALTERNATE NETTING MAY BE ACCEPTABLE IN SOME JURISDICTIONS

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EC-6 Rolled Erosion Control Products (RECP)

- EROSION CONTROL BLANKET MAINTENANCE NOTES
- INSPECT BMPs EACH WORKDAY, AND MAINTAIN THEM IN EFFECTIVE OPERATING CONDITION. MAINTENANCE OF BMPs SHOULD BE PROACTIVE, NOT REACTIVE. INSPECT BMPs AS SOON AS POSSIBLE (AND ALWAYS WITHIN 24 HOURS) FOLLOWING A STORM THAT CAUSES SURFACE EROSION, AND PERFORM NECESSARY MAINTENANCE.
  - FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN BMPs IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
  - WHERE BMPs HAVE FAILED, REPAIR OR REPLACEMENT SHOULD BE INITIATED UPON DISCOVERY OF THE FAILURE.
  - ECBs SHALL BE LEFT IN PLACE TO EVENTUALLY BIODEGRADE, UNLESS REQUESTED TO BE REMOVED BY THE LOCAL JURISDICTION.
  - ANY ECB PULLED OUT, TORN, OR OTHERWISE DAMAGED SHALL BE REPAIRED OR REINSTALLED. ANY SUBGRADE AREAS BELOW THE GEOTEXTILE THAT HAVE ERODED TO CREATED A VOID UNDER THE BLANKET, OR THAT REMAIN DEVOID OF GRASS SHALL BE REPAIRED, RESEEDED AND MULCHED AND THE ECB REINSTALLED.
- NOTE: MANY JURISDICTIONS HAVE BMP DETAILS THAT VARY FROM UDFCD STANDARD DETAILS. CONSULT WITH LOCAL JURISDICTIONS AS TO WHICH DETAIL SHOULD BE USED WHEN DIFFERENCES ARE NOTED.
- (DETAILS ADAPTED FROM DOUGLAS COUNTY, COLORADO AND TOWN OF PARKER, COLORADO, NOT AVAILABLE IN AUTOCAD)

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

PCD FILE NO. PDR-21-030

PROJECT NO.	04-20-0163	DATE	1/6/2022
DRAWN	S. CALE	BY	DATE
DESIGNED	J. ADAMS	REVISIONS	
APPROVED	J. ADAMS	NO.	
QA/QC	W. KOGER		

**FORSGREN Associates Inc.**

56 INVERNESS DRIVE EAST #112, ENGLEWOOD, CO 80112  
PH: 720.232.6644

**2.0M GALLON TANK**

**GRADING AND EROSION CONTROL DETAILS**

SHEET NO: **4**

DATE: JAN, 2022

PAGE NO:



## **APPENDIX 6: Stormwater Inspection Form (Template)**

### **Instructions:**

This inspection report has been developed to complete the 7 day (or 14 day and storm event site inspections) and 30-day inspections at completed sites.

# Contractor Construction Stormwater Site Inspection

## General Information

**Project Name:** Project Name. **Project No. :** Project No. **CDPS Cert. No.:** COR-000000  
**Location:** Location. **Date of Inspection:** Date of Inspection. **Start and End Time:** Start Time. / End Time.  
**Weather Conditions:** ☐ Clear ☐ Cloudy ☐ Rain ☐ Sleet ☐ Fog ☐ Snow ☐ High Winds ☐ Other: Other. **Temperature:** Temp.  
**Present Phase of Construction:** Phase. **Estimated Area of Disturbance (ac):** Est. Acreage.

## Inspection Information

**Type of Inspection:** Choose an item. If Post-Storm Inspection, provide the storm information below:  
 Type: Choose an item. Date: Date. Time: Time. Duration (hrs): Duration. Approximate Amount of Precipitation (in): Precipitation.  
**Has there been any deviations from the minimum inspection schedule?** ☐ Yes ☐ No If "Yes, describe: Deviation.  
**Inspector's Name:** Inspector's Name. **Inspector's Title:** Inspector's Title.  
**Is the above inspector a qualified stormwater manager?** ☐ Yes ☐ No  
**Is there evidence of, or the potential for, pollutants leaving the construction site boundaries, entering the stormwater drainage system or discharging to state waters at the following locations?** ☐ Yes ☐ No If "Yes", select all that apply below:  
☐ Construction site perimeter; ☐ All disturbed areas; ☐ Designated haul routes; ☐ Material and waste storage areas exposed to precipitation;  
☐ Locations where stormwater has the potential to discharge offsite; ☐ Locations where vehicles exit the site; ☐ Other: Other.

## Noncompliance Reporting to CDPHE

The permittee shall report the following circumstances orally within twenty-four (24) hours from the time the permittee becomes aware of the circumstances, and shall mail to the division a written report containing the information requested within five (5) working days after becoming aware of the following circumstances. The division may waive the written report required if the oral report has been received within 24 hours.

a. Endangerment to Health or the Environment

Circumstances leading to any noncompliance which may endanger health or the environment regardless of the cause of the incident (See Part II.L.6.a of the Permit)

b. Numeric Effluent Limit Violations

- ☐ Circumstances leading to any unanticipated bypass which exceeds any effluent limitations (See Part II.L.6.b of the Permit)
- ☐ Circumstances leading to any upset which causes an exceedance of any effluent limitation (See Part II.L.6.c of the Permit)
- ☐ Daily maximum violations (See Part II.L.6.d of the Permit)

*Numeric effluent limits are very uncommon in certifications under the COR400000 general permit. This category of noncompliance only applies if numeric effluent limits are included in a permit certification.*

**Has there been an incident of noncompliance requiring 24-hour notification?** ☐ Yes ☐ No If "Yes" please document below

Date and Time of Incident	Location and Description of Noncompliance	Description of Corrective Action	Date and Time of 24 Hour Oral Notification	Date of 5 Day Written Notification <sup>2</sup>
---------------------------	---	----------------------------------	--	---

<sup>2</sup> Attach copy of 5 day written notification to report. Indicate if written notification was waived, including the name of the division personnel who granted waiver.

\* If winter conditions exclusions is selected as type of inspection, please attach a copy of the required documentation from Part I.D.4.c of the Permit.

Date.	Time.	Noncompliance.	Noncompliance.	Date.	Time.	Date.
-------	-------	----------------	----------------	-------	-------	-------

Sediment Control Measures					
Type	Maintenance Needed?	Inadequate Control Measure?	Additional Control Measure Needed?	Location and description of Maintenance or Corrective Action.	Date Corrected
Choose an item.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Click or tap here to enter text.	Date.

Erosion Control Measures					
Type	Maintenance Needed?	Inadequate Control Measure?	Additional Control Measure Needed?	Location and description of Maintenance or Corrective Action.	Date Corrected
Choose an item.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Click or tap here to enter text.	Date.

Materials Management Control Measures					
Type	Maintenance Needed?	Inadequate Control Measure?	Additional Control Measure Needed?	Location and description of Maintenance or Corrective Action.	Date Corrected

Choose an item.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Click or tap here to enter text.	Date.
-----------------	--------------------------	--------------------------	--------------------------	----------------------------------	-------

Site Management Control Measures					
Type	Maintenance Needed?	Inadequate Control Measure?	Additional Control Measure Needed?	Location and description of Maintenance or Corrective Action.	Date Corrected
Choose an item.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Click or tap here to enter text.	Date.

Field Notes
Click or tap here to enter text.

Certification Statement	
<p>After adequate corrective action(s) and maintenance have been taken, or where a report does not identify any incidents requiring corrective action or maintenance, the individual(s) designated as the Qualified Stormwater Manager, shall sign and certify the below statement:</p> <p>“I verify that, to the best of my knowledge and belief, all corrective action and maintenance items identified during the inspection are complete, and the site is currently in compliance with the permit.”</p>	
<p>Name of Qualified Stormwater Manager.</p> <hr/> <p>Name of Qualified Stormwater Manager</p>	<p>Title of Qualified Stormwater Manager.</p> <hr/> <p>Title of Qualified Stormwater Manager</p>
<p>Signature of Qualified Stormwater Manager</p> <hr/>	<p>Date.</p> <hr/> <p>Date</p>



## **APPENDIX 8: Completed Stormwater Inspection Logs**

(File completed inspection forms or reference electronic location of inspections here)

**APPENDIX 9: Agreement for off-site Control Measures**  
*(Not Applicable)*

**NOT USED**