# Control Measure Fact Sheets

## *Native Excavating*

## E&J MacArthur Residence
## Job #25-724

# Construction Phasing/Sequencing Fact Sheet
## *Native Excavating*

Description

Effective construction site management to minimize erosion and sediment transport includes attention to construction phasing, scheduling, and sequencing of land disturbing activities. On most construction projects, erosion and sediment controls will need to be adjusted as the project progresses and should be documented in the SWMP.

Construction phasing refers to disturbing only part of a site at a time to limit the potential for erosion from dormant parts of a site. Grading activities and construction are completed and soils are effectively stabilized on one part of a site before grading and construction begins on another portion of the site.

Construction sequencing or scheduling refers to a specified work schedule that coordinates the timing of land disturbing activities and the installation of erosion and sediment control practices.

Appropriate Uses

All construction projects can benefit from upfront planning to phase and sequence construction activities to minimize the extent and duration of disturbance. Larger projects and linear construction projects may benefit most from construction sequencing or phasing, but even small projects can benefit from construction sequencing that minimizes the duration of disturbance.

Typically, erosion and sediment controls needed at a site will change as a site progresses through the major phases of construction. Erosion and sediment control practices corresponding to each phase of construction must be documented in the SWMP.

Design and Installation

Control Measures appropriate to the major phases of development should be identified on construction drawings. In some cases, it will be necessary to provide several drawings showing construction-phase Control Measures placed according to stages of development (e.g., clearing and grading, utility installation, active construction, final stabilization). Some local governments require separate erosion and sediment control drawings for initial Control Measures, interim conditions (in active construction), and final stabilization.

Typical construction phasing Control Measures include:

- Limit the amount of disturbed area at any given time on a site to the extent practical. For example, a 100-acre subdivision might be constructed in five phases of 20 acres each.
- If there is carryover of stockpiled material from one phase to the next, position carryover material in a location easily accessible for the pending phase that will not require disturbance of stabilized areas to access the stockpile. Particularly with regard to efforts to balance cut and fill at a site, careful planning for location of stockpiles is important.

Typical construction sequencing Control Measures include:

- Sequence construction activities to minimize duration of soil disturbance and exposure. For example, when multiple utilities will occupy the same trench, schedule installation so that the trench does not have to be closed and opened multiple times.
- Schedule site stabilization activities (e.g., landscaping, seeding and mulching, installation of erosion control blankets) as soon as feasible following grading.
- Install initial erosion and sediment control practices before construction begins. Promptly install additional Control Measures for inlet protection, stabilization, etc., as construction activities are completed.

Table CP-1 provides typical sequencing of construction activities and associated Control Measures.

Maintenance and Removal

When the construction schedule is altered, erosion and sediment control measures in the SWMP and construction drawings should be appropriately adjusted to reflect actual "on the ground" conditions at the construction site. Be aware that changes in construction schedules can have significant implications for site stabilization, particularly with regard to establishment of vegetative cover.

Table CP-1 Typical Phased Control Measure Installation for Construction Projects

| Project Phase | Control Measures |
|---|---|
| Pre-Disturbance, Site Access | • Install Sediment Controls downgradient of access point (on paved streets this may consist of inlet protection)<br>• Establish Vehicle Tracking Control at entrances to paved streets. Fence as needed<br>• Use construction fencing to define the boundaries of the project and limit access to areas of the site that are not to be disturbed.<br><br>NOTE: It may be necessary to protect inlets in the general vicinity of the site, even if not downgradient, if there is a possibility that sediment tracked from the site could contribute to the inlets |
| Site Clearing and Grubbing | • Install perimeter controls downgradient of perimeter of site (silt fence, wattles, etc.)<br>• Limit disturbance to those areas planned for disturbance and protect undisturbed areas within the site (construction fence, flagging, etc.)<br>• Preserve vegetative buffer at site perimeter.<br>• Create stabilized staging area.<br>• Locate portable toilets on flat surfaces away from drainage paths. Stake in areas susceptible to high winds.<br>• Construct concrete washout area and provide signage.<br>• Establish waste disposal areas.<br>• Install sediment basins.<br>• Create dirt perimeter berms and/or brush barriers during grubbing and clearing. |

| | |
|---|---|
| | • Separate and stockpile topsoil, leave roughened and/or cover.<br>• Protect stockpiles with perimeter restriction Control Measures. Stockpiles should be located away from drainage paths and should be accessed from the upgradient side so that perimeter controls can remain in place on the downgradient side. Use erosion control blankets, temporary seeding, and/or mulch for stockpiles that will be inactive for an extended period.<br>• Leave disturbed area of site in a roughened condition to limit erosion. Consider temporary revegetation for areas of the site that have been disturbed but that will be inactive for an extended period.<br>• Water to minimize dust but not to the point that watering creates runoff. |
| Utility and Infrastructure Installation | In addition to the above Control Measures<br>• Close trench as soon as possible (generally at the end of the day).<br>• Use rough-cut street control or apply road base for streets that will not be promptly paved.<br>• Provide inlet protection as streets are paved and inlets are constructed.<br>• Protect and repair Control Measures, as necessary.<br>• Perform street sweeping as needed. |
| Building Construction | In addition to the above Control Measures<br>• Implement materials management and good housekeeping practices for home building activities.<br>• Use perimeter controls for temporary stockpiles from foundation excavations.<br>• For lots adjacent to streets, lot-line perimeter controls may be necessary at the back of curb. |
| Final Grading | In addition to the above Control Measures<br>• Remove excess or waste materials.<br>• Remove stored materials. |
| Final Stabilization | In addition to the above Control Measures<br>• Seed and mulch/tackify.<br>• Seed and install blankets on steep slopes.<br>• Remove all temporary Control Measures when site has reached final stabilization. |

# Concrete Washout Area Fact Sheet
## *Native Excavating*

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.

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 water bodies and drainage paths. If site constraints make these 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. Pre-fabricated concrete washout container information can be obtained from vendors.

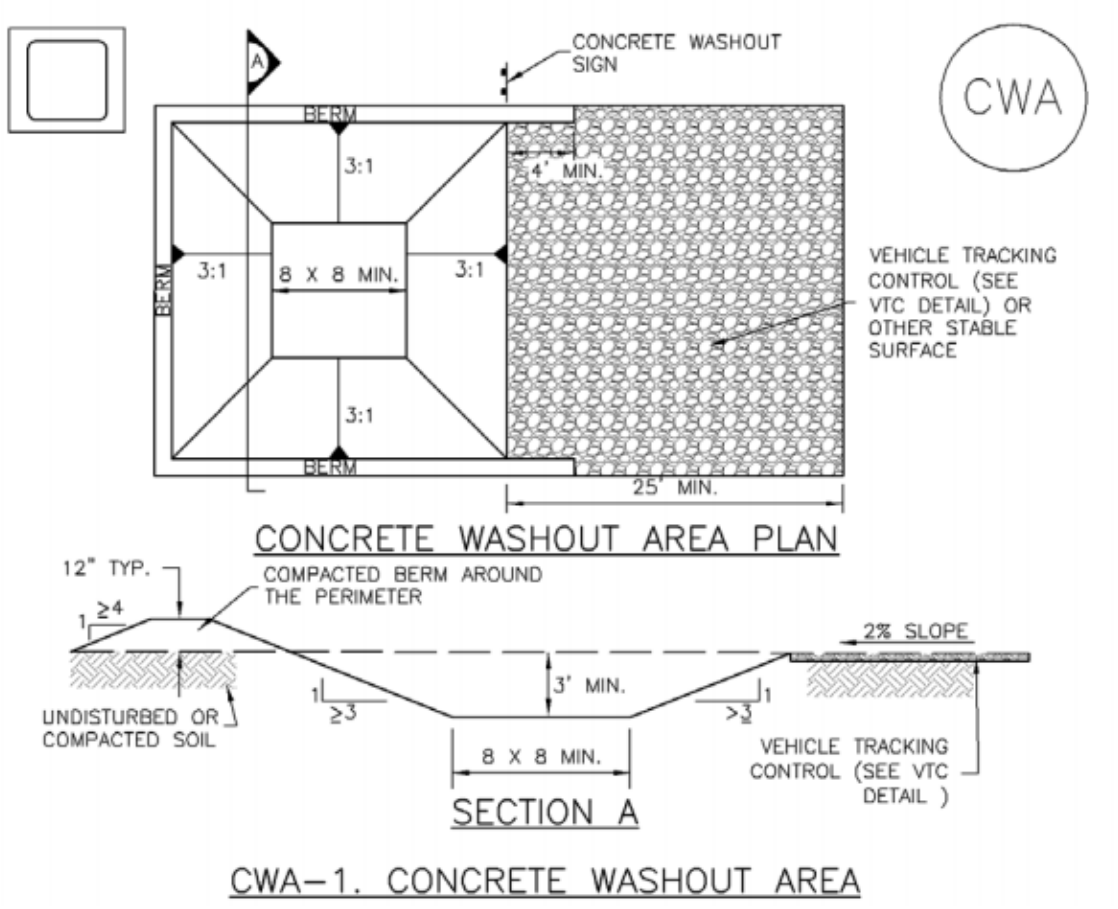
Maintenance and Removal

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 Control Measure 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.

Figure CWA-1




CWA–1. CONCRETE WASHOUT AREA

Installation Notes

- See plan view for:
  - Concrete washout area (CWA) installation location.
- Do not locate an unlined CWA within 400' of any natural drainage pathway or waterbody. Do not locate within 1000' of any wells or drinking water sources. If site constraints make this infeasible, or if highly permeable soils exist on the site, the CWA must be installed with an impermeable liner (16 mil minimum thickness) or surface storage alternatives, using prefabricated concrete washout devices or a lined above ground storage, should be used.
- The CWA shall be installed prior to concrete placement on site.
- The CWA shall include a flat sub-surface put that is at least 8' by 8'. Slopes leading out of the subsurface put shall be 3:1 or flatter. The pit shall be at least 3' deep.
- Berms surrounding the sides and back of the CWA should have a minimum height of 1'.
- The vehicle tracking pad should be sloped towards the CWA at a 2% grade.
- Signs should 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.
- Use excavated material for perimeter berm construction.

Alternate Concrete Washout Facilities:

Prefabricated – reusable washout structure.

Self-installed washout container w/ 10-mil min. plastic.

Plastic containers (from kids pools to livestock tubs may be used).

Maintenance Notes

- Inspect Control Measures each workday, and maintain them in effective operating condition. Maintenance of the Control Measures should be proactive, not reactive. Inspect the Control Measures as soon as possible following a storm that causes surface erosion, and perform necessary maintenance.
- Frequent observations and maintenance are necessary to maintain Control Measures in effective operating condition. Inspections and corrective measures should be documented thoroughly.
- Where Control Measures have failed, repair or replacement should be initiated upon discovery of the failure.
- The CWA should be repaired, cleaned, or enlarged as necessary to maintain an adequate capacity for concrete waste. Concrete materials, accumulated in pit, shall be removed once the materials have reached a depth of 2'.
- Concrete washout water, wasted pieces of concrete, and all other debris in the subsurface put shall be transported from the job site in a water tight container and disposed of properly.
- The CWA should remain in place until all concrete for the project is placed.
- When the CWA is removed, cover the disturbed area with topsoil, seed and mulch, or otherwise stabilize it in a manner approved by the local jurisdiction.

Many jurisdictions have Control Measure details that vary from this standard detail. Consult with local jurisdictions as to which detail should be used when differences are noted.

# Wind Erosion/Dust Control Fact Sheet
## *Native Excavating*

Description

Wind erosion and dust restriction Control Measures help to keep soil particles from entering the air as a result of land disturbing construction activities. These Control Measures include a variety of practices generally focused on either graded disturbed areas or construction roadways. For graded areas, practices such as seeding and mulching, use of soil binders, site watering, or other practices that provide prompt surface cover should be used. For construction roadways, road watering and stabilized surfaces should be considered.

Appropriate Uses

Dust control measures should be used on any site where dust poses a problem to air quality. Dust control is important to control for the health of construction workers and surrounding waterbodies.

Design and Installation

The following construction Control Measures can be used for dust control:

- An irrigation/sprinkler system can be used to wet the top layer of disturbed soil to help keep dry soil particles from becoming airborne.
- Seeding and mulching can be used to stabilize disturbed surfaces and reduce dust emissions.
- Protecting existing vegetation can help to slow wind velocities across the ground surface, thereby limiting the likelihood of soil particles to become airborne.
- Spray-on soil binders form a bond between soil particles keeping them grounded. Chemical treatments may require additional permitting requirements. Potential impacts to surrounding waterways and habitat must be considered prior to use.
- Placing rock on construction roadways and entrances will help keep dust to a minimum across the construction site.
- Wind fences can be installed on site to reduce wind speeds. Install fences perpendicular to the prevailing wind direction for maximum effectiveness.

Maintenance and Removal

When using an irrigation/sprinkler control system to aid in dust control, be careful not to over water, as over watering will cause construction vehicles to track mud off-site.

# Trash Storage Areas/Dumpsters Fact Sheet
## *Native Excavating*

Description

Trash storage areas are areas where a trash receptacle(s) are located for use as a repository for solid wastes. Stormwater runoff from areas where trash is stored or disposed of can be polluted. In addition, loose trash and debris can be easily transported by water or wind into nearby storm drain inlets, channels, and/or creeks. Waste handling operations that may be sources of stormwater pollution include dumpsters, litter control, and waste piles.

Appropriate Uses

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment. (Detached residential single-family homes are typically excluded from this requirement.)

Design and Installation

Design requirements for waste handling areas are governed by Building and Fire Codes, and by current local agency ordinances and zoning requirements. The design criteria described in this fact sheet are meant to enhance and be consistent with these code and ordinance requirements. Hazardous waste should be handled in accordance with local regulations.

Wastes from commercial and industrial sites are typically hauled by either public or commercial carriers that may have design or access requirements for waste storage areas. The design criteria in this fact sheet are recommendations and are not intended to be in conflict with requirements established by the waste hauler. The waste hauler should be contacted prior to the design of your site trash collection areas. Conflicts or issues should be discussed with the local agency.

Designing New Installations

Trash storage areas should be designed to consider the following structural or treatment regulation Control Measures:

- Design trash container areas so that drainage from adjoining roofs and pavement is diverted around the area(s) to avoid run-on. This might include berming or grading the waste handling area to prevent run-on of stormwater.
- Make sure trash container areas are screened or walled to prevent off-site transport of trash.
- Use lined bins or dumpsters to reduce leaking of liquid waste.
- When provided by the vendor roofs, awnings, or attached lids will be used on all trash containers to minimize direct precipitation and prevent rainfall from entering containers.
- Pave trash storage areas with an impervious surface to mitigate spills.
- Do not locate storm drains in immediate vicinity of the trash storage area.
- Post signs on all dumpsters informing users that hazardous materials are not to be disposed of therein.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of "redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Maintenance and Removal

The integrity of structural elements that are subject to damage (i.e., screens, covers, and signs) must be maintained by the owner/operator. Maintenance agreements between the local agency and the owner/operator may be required. Some agencies will require maintenance deed restrictions to be recorded of the property title. If required by the local agency, maintenance agreements or deed restrictions must be executed by the owner/operator before improvement plans are approved.

# Rolled Erosion Control Products Fact Sheet
## *Native Excavating*

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 mat (TRMs) can be used. In particular, turf reinforcement mats are designed for discharges that exert velocities and sheer stresses that exceed the typical limits of mature natural vegetation.

Appropriate Uses:
RECPs can be used to control erosion in conjunction with revegetation efforts, providing seedbed protection from wind and water erosion. These products are often used on disturbed areas on steep slopes, in areas with highly erosive soils, or as part of drainage way 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 RECPs are generally characterized 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.
- 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, non-reinforced 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

| Product Description | Slope Applications* | | Channel Applications* | Minimum Tensile Strength[1] | Expected Longevity |
|---|---|---|---|---|---|
| | Maximum Gradient | C Factor[2,5] | Max Shear Stress[3,4,6] | | |
| Mulch Control Nets | 5:1 (H:V) | ≤0.10 at 5:1 | 0.25 lbs/ft$^2$ | 5 lbs/ft | Up to 12 Months |
| Netless Rolled Erosion Control Blankets | 4:1 (H:V) | ≤0.10 at 4:1 | 0.50 lbs/ft$^2$ | 5 lbs/ft | |
| Single-Net Erosion Control Blanket & Open Weave Textiles | 3:1 (H:V) | ≤0.15 at 3:1 | 1.5 lbs/ft$^2$ | 50 lbs/ft | |
| Double-Net Erosion Control Blankets | 2:1 (H:V) | ≤0.20 at 2:1 | 1.75 lbs/ft$^2$ | 75 lbs/ft | |
| Mulch Control Nets | 5:1 (H:V) | ≤0.10 at 5:1 | 0.25 lbs.ft$^2$ | 25 lbs/ft | 24 months |
| Erosion Control Blankets & Open Weave Textiles | 1.5:1 (H:V) | ≤0.25 at 1.5:1 | 2.00 lbs/ft$^2$ | 100 lbs/ft | 24 months |
| Erosion Control Blankets & Open Weave Textiles | 1:1 (H:V) | ≤0.25 at 1:1 | 2.25 lbs/ft$^2$ | 125 lbs.ft | 36 months |

* C Factor and shear stress for mulch control nettings must be obtained with netting used in conjunction with pre-applied mulch material.
[1] Minimum Average Roll Values, Machine direction using ECTC Mod. ASTM D 5035.
[2] C Factor calculated as ratio of soil loss from RECP protected slope (tested at specified or greater gradient, H:V) to ratio of soil loss from unprotected (control) plot in large-scale testing.
[3] Required minimum shear stress RECP (un-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.
[4] The permissible shear stress levels established for each performance category are based on historical experience with products characterized by Manning's roughness coefficients in the range of 0.01 - 0.05.
[5] Acceptable large-scale test methods may include ASTM D 6459, or other independent testing deemed acceptable by the engineer.
[6] Per the engineer's discretion. Recommended acceptable large-scale testing protocol may include ASTM D 6460, or other independent testing deemed acceptable by the engineer.

Table RECP-2. ECTC Standard Specifications for Pemanent[1] Rolled Erosion Control Products

| Product Type | Slope Applications | Channel Applications | |
|---|---|---|---|
| TRMs with a minimum thickness of 0.25" (6.35 mm) per ASTM D 6525 and UV Stability of 80% per ASTM D (500 hour exposure) | Maximum Gradient | Maximum Shear Stress[4,5] | Minimum Tensile Strenght[2,3] |
| | 0.5:1 (H:V) | 6.0 lbs/ft$^2$ | 125 lbs/ft |
| | 0.5:1 (H:V) | 8.0 lbs/ft$^2$ | 150 lbs/ft |
| | 0.5:1 (H:V) | 10 lbs/ft$^2$ | 175 lbs/ft |

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

Design and Installation

RECPs should be installed according to manufacturer's specifications and guidelines. Regardless of the type of product used, it is important to ensure no gaps or voids exist under the material and that all corners of the material are secured using stakes and trenching. Continuous contact between the product and the soil is necessary to avoid failure. 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 Control Measure Fact Sheet 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

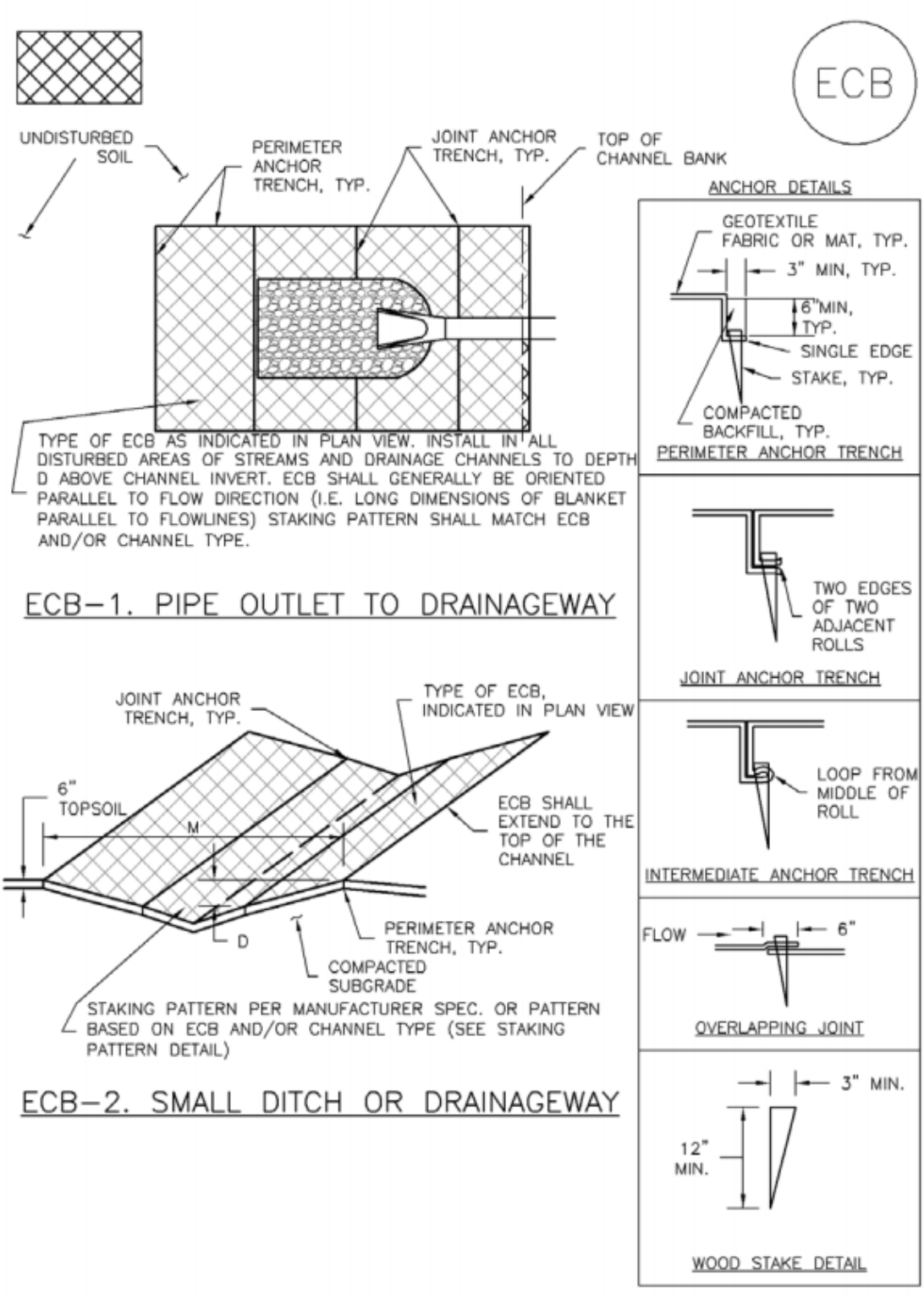
Inspection of erosion control blankets and other RECPs includes:

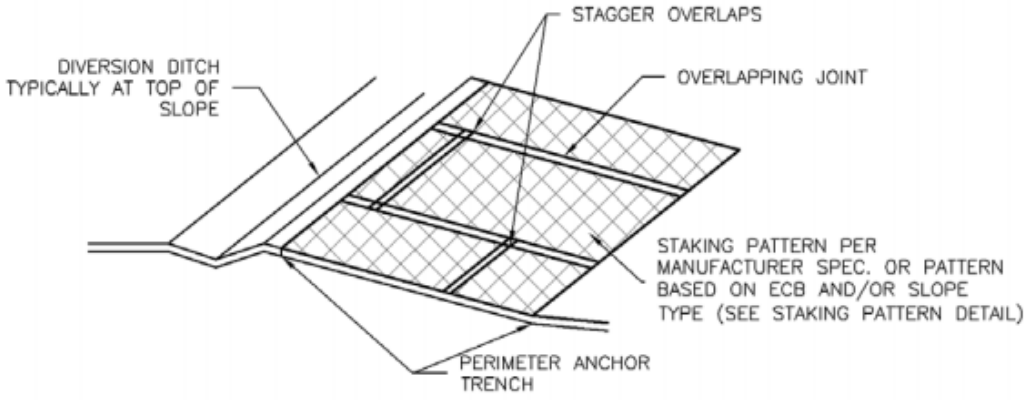
- Check for general signs of erosion, including voids beneath the mat. If voids are apparent, fill the void with suitable soil and replace the erosion control blanket, following the appropriate staking pattern.
- Check for damaged or loose stakes and secure loose portions of the blanket.

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.

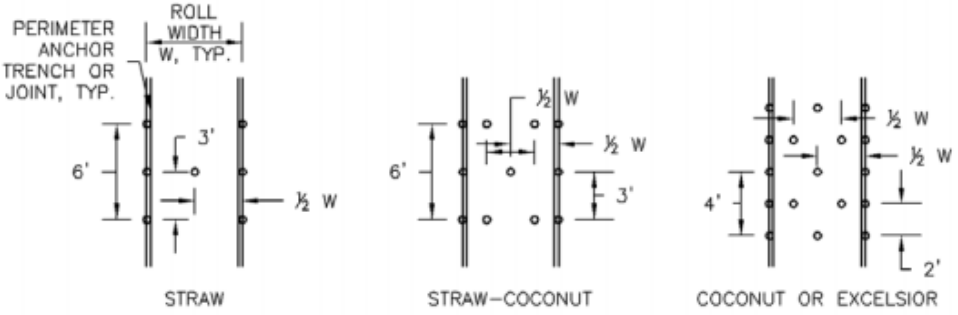
Turf reinforcement mats, although generally resistant to biodegradation, are typically left in place as a dense vegetated cover grows in through the mat matrix. The turf reinforcement mat provides long-term stability and helps the established vegetation resist erosive forces.

Figures ECB 1-3

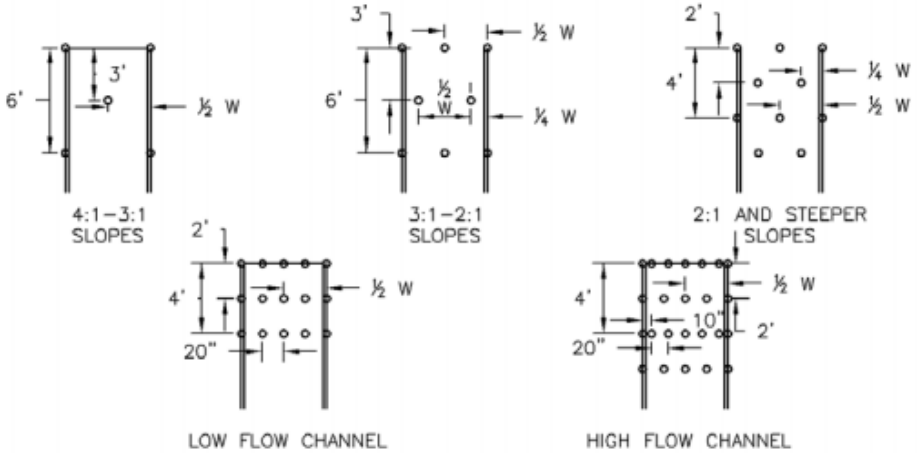





## ECB–3. OUTSIDE OF DRAINAGEWAY




## STAKING PATTERNS BY ECB TYPE




## STAKING PATTERNS BY SLOPE OR CHANNEL TYPE

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
- The preference is for 100% biodegradable materials in 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 should 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.
- A 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.
- The intermediate anchor trench should 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.
- Materials specifications of ECBs shall conform to Table ECB-1.
- Any areas of seeding and mulching disturbed in the process of installing ECBs shall be re-seeded and mulched.
- Details on design plans for major drainage way stabilization will govern if different from those shown here.

Table ECB-1 ECB Material Specifications

| Type | Coconut Content | Straw Content | Excelsior Content | Recommended Netting[1] |
|---|---|---|---|---|
| Straw[2] | - | 100% | - | Double/Natural |
| Straw-Coconut | 30% minimum | 70% maximum | - | Double/Natural |
| Coconut | 100% | - | - | Double Natural |
| Excelsior | - | - | 100% | Double/Natural |

[1] – Alternate netting may be acceptable in some jurisdictions.
[2] – Straw ECBs may only be used outside of streams and drainage channel.

Maintenance Notes:

- Inspect Control Measures each workday, and maintain them in effective operating condition. Maintenance of Control Measures should be proactive, not reactive, inspect Control Measures 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 Control Measures in effective operating condition. Inspections and corrective measures should be documented thoroughly.
- Where Control Measures 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 sub-grade areas below the geotextile that have been eroded to create a void under the blanket, or that remain devoid of grass shall be repaired, reseeded, and mulched and the ECB reinstalled.

# Protection of Existing Vegetation Fact Sheet
## *Native Excavating*

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).

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.

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

- 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

| | Distance from Trunk (ft) per inch of DBH | | |
|---|---|---|---|
| Species Tolerance to Damdage | Young | Mature | Over Mature |
| Good | 0.5’ | 0.75’ | 1.0’ |
| Moderate | 0.75’ | 1.0’ | 1.25’ |
| Poor | 1.0’ | 1.25’ | 1.5’ |
| Notes: DBH = Diameter at Breast Height (4.5’ 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 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 Control Measures.
- 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.

# Good Housekeeping Practices Fact Sheet
## *Native Excavating*

Description:

Implementation of construction site good housekeeping practices to prevent pollution associated with solid, liquid, or hazardous construction-related materials and wastes. Storm Water Management Plans (SWMPs) should clearly specify Control Measures including these good housekeeping practices:

- Providing for waste management
- Establishing proper building materials storage areas
- Designate concrete washout areas
- Establish proper equipment/vehicle fueling and maintenance practices
- Develop a spill prevention and response plan

Appropriate Uses:

Good housekeeping practices are necessary at all construction sites.

Design and Installation:

The following principles and actions should be addressed:

- Provide for Waste Management: Implement management procedures and practices to prevent or reduce the exposure and transport of pollutants in storm water from solid, liquid, and sanitary wastes that will generated on site. Practices such as trash disposal, recycling, proper materials handling, and cleanup measures can reduce the potential for storm water 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 are:
    - Solid or Construction Waste
        - Designate trash and bulk waste-collection areas on-site.
        - Recycle materials whenever possible (e.g. paper, wood, concrete, oil)
        - Segregate and provide proper disposal options for hazardous materials waste
        - Clean up litter and debris from the site daily
        - Locate waste collection areas away from streets, gutters, watercourses, and storm drains.
        - Locate waste collection devices near the site entrance so as to minimize the disturbance of native soils.
        - Consider secondary containment around waste collection areas to minimize the chance of contaminated discharges.
        - Empty waste containers before they are full or overflowing.

- Sanitary or 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 storm water.
  - Maintain clean restroom facilities and empty portable 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.
  - 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 storm water 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 or machines, 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 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 Sheets).
- Provide storage in accordance with Spill Protection, Control, and Countermeasures (SPCC) requirements and plans, as well as 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 Area

  Concrete contractors should be encouraged to use the washout facilities at their own plants or dispatch facilities when feasible. However, concrete washout commonly will occur on construction sites. If it is necessary to provide for concrete washout areas onsite, designate specific washout areas and design facilities to handle anticipated washout water. Due to the fact that 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 further guidance.

  Both self-constructed and prefabricated washout containers can fill up quickly when concrete, paint or Stucco work is 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 move convenient locations, or providing the 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 storm water. 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. Daily inspections will also help 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.
  - Concrete wash water can be highly polluted and should not be discharged to any surface water, storm sewer system, or allowed to infiltrate into the ground in the vicinity of water bodies.
  - Wash water 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 be trained in how to use it. Consider the following practices to help prevent the discharge of pollutants to storm water 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, which may include, but are not limited to:
    - Stay with the vehicle during fueling
    - Proper use of the pumps
    - Location of and operation of emergency shut off valves
  - Inspect on-site vehicles and equipment regularly for leaks, equipment damage, and other service problems.
  - Clearly mark the washing areas and inform workers that all washing must occur in this area.
  - Contain wash water and treat it using Control Measures. Infiltrate wash water when possible, but maintain separation from drainage paths and water bodies.
  - 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 repairs, in the wash area.
  - Include the location of the washing facilities, as well as 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 cleat 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 water bodies 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. Safety Data Sheets (SDS) for each chemical used on site will be kept on site.
- Establish an education program for employees and subcontractors on the potential hazards to humans and the environment from spills and leaks.
- Specify hot 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 and 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 s 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.

Reporting Oil Spills

In the event of an oil spill, contact the National Response Center toll free at 800-424-8802 for assistance.

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 clean up 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

Concrete Washout Area
Stockpile Management
Vehicle Tracking Control

Design details are not necessary for other good housekeeping practices. However, wherever specific practices will occur on the site should be noted on the appropriate construction drawings.

# Mulching Fact Sheet
## *Native Excavating*

Description

Mulching consists of evenly applying straw, hay, shredded wood mulch, rock, bark or compost to disturbed soils and securing the mulch by crimping, tackifiers, netting or other measures. Mulching helps reduce erosion by protecting bare soil from rainfall impact, increasing infiltration, and reducing runoff. Although often applied in conjunction with temporary or permanent seeding, it can also be used for temporary stabilization of areas that cannot be reseeded due to seasonal constraints. Mulch can be applied either using standard mechanical dry application methods or using hydromulching equipment that hydraulically applies a slurry of water, wood fiber mulch, and often a tackifier.

Appropriate Uses

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

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

Do not apply mulch during windy conditions.

Design and Installation

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

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:

- 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 Control Measure 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 Control Measure 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.

See attached details for the particular mulch being used on this project.

# Rock Sock Fact Sheet
## *Native Excavating*

Description

A rock sock is constructed of gravel that has been wrapped by wire mesh or a geotextile to form an elongated cylindrical filter. Rock socks are typically used either as a perimeter control or as part of inlet protection. When placed at angles in the curb line, rock socks are typically referred to as curb socks. Rock socks are intended to trap sediment from stormwater runoff that flows onto roadways as a result of construction activities.

Appropriate Uses

Rock socks can be used at the perimeter of a disturbed area to control localized sediment loading. A benefit of rock socks as opposed to other perimeter controls is that they do not have to be trenched or staked into the ground; therefore, they are often used on roadway construction projects where paved surfaces are present.

Use rock socks in inlet protection applications when the construction of a roadway is substantially complete and the roadway has been directly connected to a receiving storm system.

Design and Installation

When rock socks are used as perimeter controls, the maximum recommended tributary drainage area per 100 lineal feet of rock socks is approximately 0.25 acres with disturbed slope length of up to 150 feet and a tributary slope gradient no steeper than 3:1. A rock sock design detail and notes are provided in Detail RS-1. Also see the Inlet Protection Fact Sheet for design and installation guidance when rock socks are used for inlet protection and in the curb line.

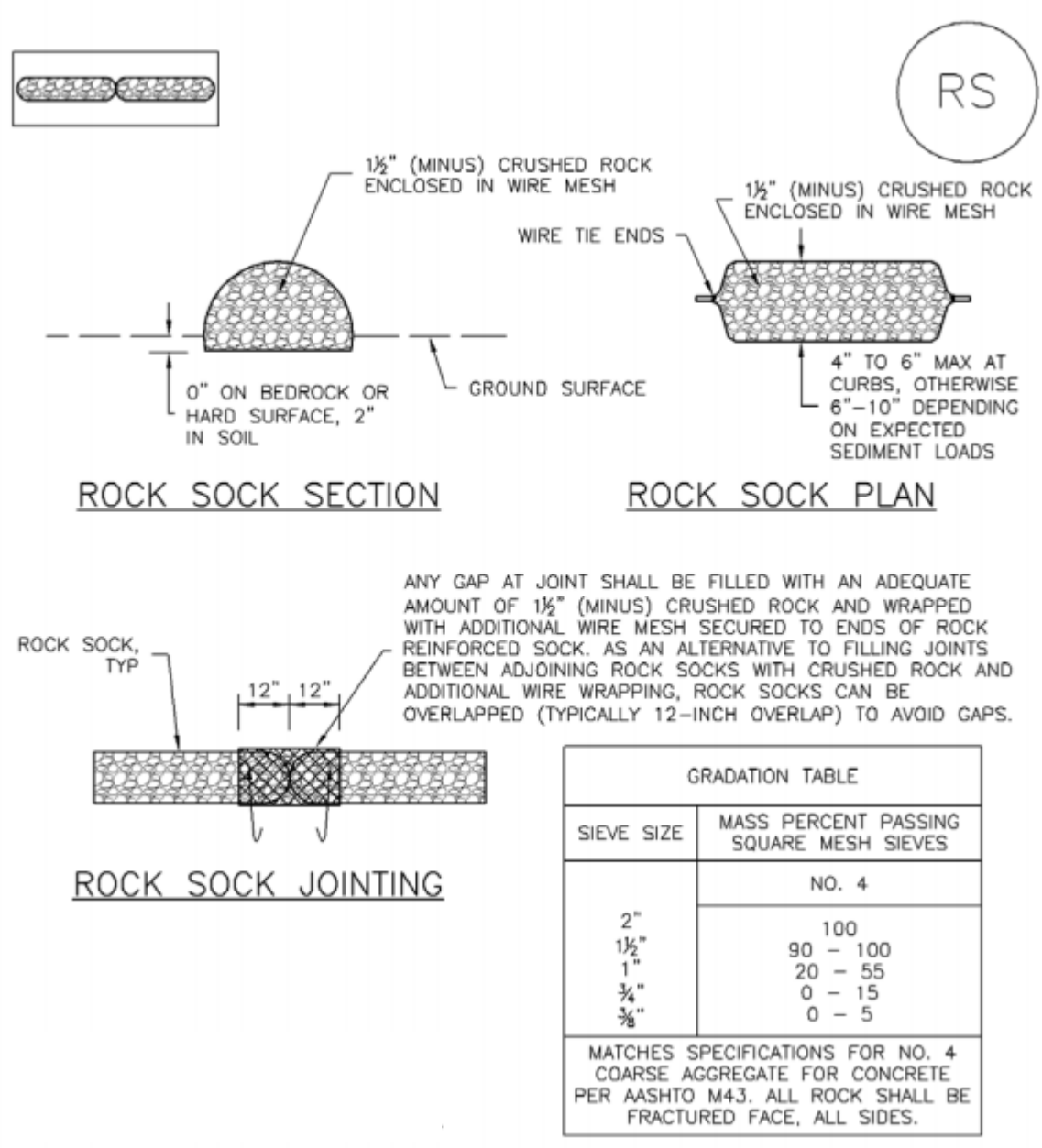
When placed in the gutter adjacent to a curb, rock socks should protrude no more than two feet from the curb in order for traffic to pass safely. If located in a high traffic area, place construction markers to alert drivers and street maintenance workers of their presence

Maintenance and Removal

Rock socks are susceptible to displacement and breaking due to vehicle traffic. Inspect rock socks for damage and repair or replace as necessary. Remove sediment by sweeping or vacuuming as needed to maintain the functionality of the Control Measure, typically when sediment has accumulated behind the rock sock to one-half of the sock's height.

Once upstream stabilization is complete, rock socks and accumulated sediment should be removed and properly disposed.

Figure RS-1




| GRADATION TABLE | |
|---|---|
| SIEVE SIZE | MASS PERCENT PASSING SQUARE MESH SIEVES |
| | NO. 4 |
| 2" | 100 |
| 1½" | 90 – 100 |
| 1" | 20 – 55 |
| ¾" | 0 – 15 |
| ⅜" | 0 – 5 |
| MATCHES SPECIFICATIONS FOR NO. 4 COARSE AGGREGATE FOR CONCRETE PER AASHTO M43. ALL ROCK SHALL BE FRACTURED FACE, ALL SIDES. | |

Installation Notes

- See plan view for:
  - Locations of rock socks
- Crushed rock shall be 1-1/2” (minus) in size with a fractured face (all sides) and shall comply with gradation shown on this sheet.
- Wire mesh shall be fabricated of 10 gage poultry mesh, or equivalent, with a maximum opening of ½”, recommended minimum roll width of 48”.
- Wire mesh shall be secured suing “hog rings” or wire ties at 6” centers along all joints and at 2” centers on the ends of the socks.

- Some municipalities may allow the use of filter fabric as an alternative to wire mesh for the rock enclosure.

Maintenance Notes

- Inspect Control Measures each workday, and maintain them in effective operating condition. Maintenance of the Control Measures should be proactive, not reactive. Inspect the Control Measures as soon as possible following a storm that causes surface erosion, and perform necessary maintenance.
- Frequent observations and maintenance are necessary to maintain Control Measures in effective operating condition. Inspections and corrective measures should be documented thoroughly.
- Where Control Measures have failed, repair or replacement should be initiated upon discovery of the failure.
- Rocks socks shall be replaced if they become heavily soiled or damaged beyond repair.
- Sediment accumulated upstream of rock socks shall be removed as needed to maintain functionality of the Control Measure, typically when depth of accumulated sediments is approximately ½ of the height of the rock sock.
- Rock socks are to remain in place until the upstream disturbed area is stabilized and approved by the local jurisdiction.
- When rock socks are removed, all disturbed areas shall be covered with topsoil, seeded and mulched, or otherwise stabilized as approved by the local jurisdiction.

Many jurisdictions have Control Measure details that vary from this standard detail. Consult with local jurisdictions as to which detail should be used when differences are noted.

# Straw Bale Barrier Fact Sheet
## *Native Excavating*

Description
A straw bale barrier is a linear wall of straw bales designed to intercept sheet flow and trap sediment before runoff exits a disturbed area.

Appropriate Uses
Appropriate uses of properly installed straw bale barriers may include:

- As a perimeter control for a site or soil stockpile.
- As a sediment control at the toe of an erodible slope.
- Along the edge of a stream or drainage pathway to reduce sediment laden runoff from entering the waterway.
- As part of an inlet protection design in sump conditions (See Inlet Protection Control Measure).

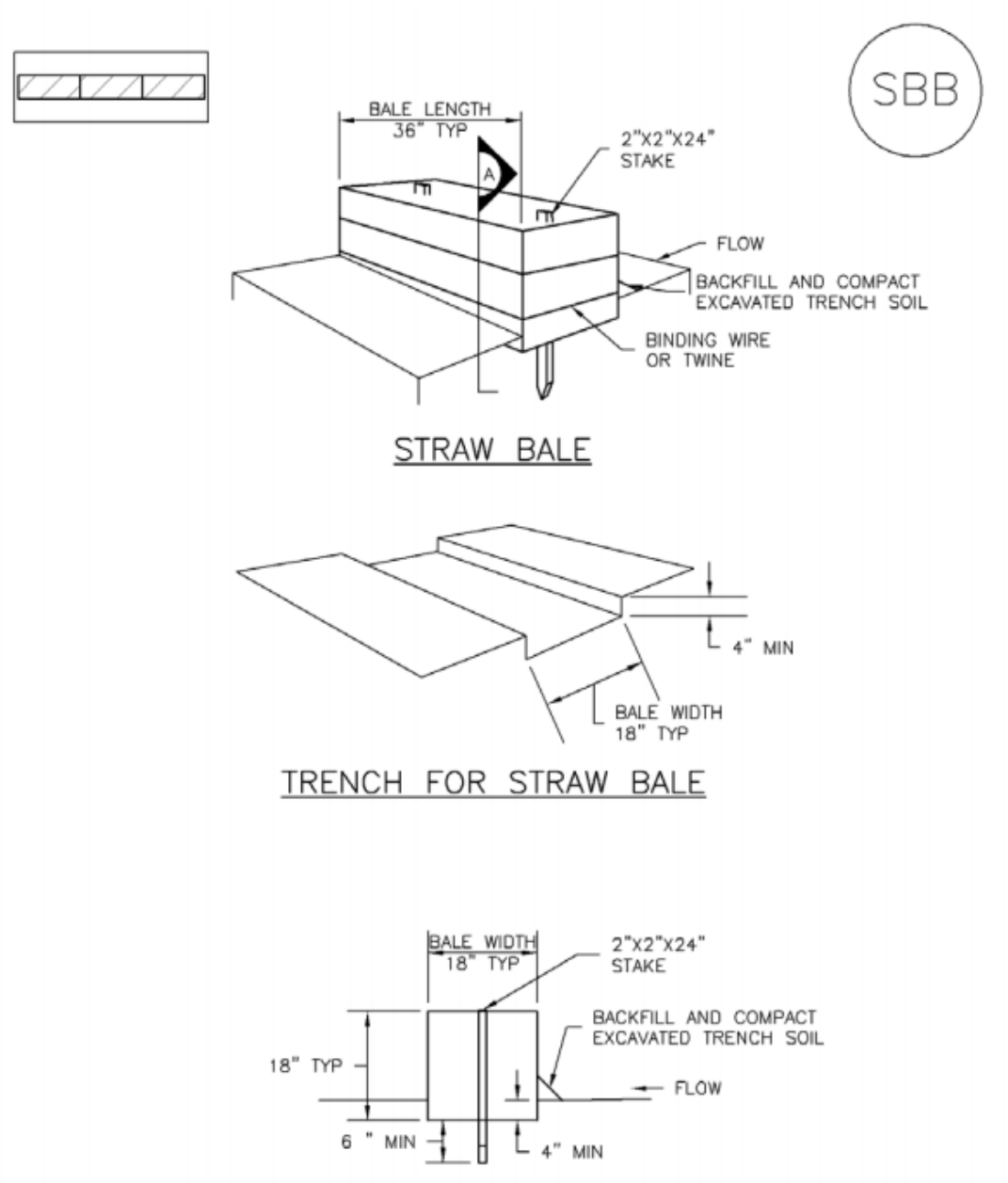
Do not use straw bale barriers in areas of concentrated flow or in areas where ponding is not desirable. Straw bales tend to degrade quickly, so they should generally not be used in areas where longer term disturbance is expected.

Due to a history of inappropriate placement, poor installation, and short effective lifespan, the use of straw bales is discouraged or prohibited by some communities.

Design and Installation
The maximum recommended tributary drainage area per 100 lineal feet of straw bale barrier is 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. Design details with notes are provided in Detail SBB-1. To be effective, bales must be installed in accordance with the design details with proper trenching, staking, and binding. Jute and cotton string must not be used to bind the straw bale. The bales should be certified weed-free prior to use.

Maintenance and Removal
Check bales for rotting and replace as necessary. Straw bales degrade, and rotting bales require replacement on a regular basis (as often as every three months) depending on environmental conditions. Check for undercutting, bypassed flows, and displacement. Repair by properly re-installing the straw bale barrier and repairing washouts around the bales. Remove sediment accumulated behind the bale when it reaches one-quarter of the bale height. Remove and properly dispose of the straw bale once the upstream area has been stabilized. Areas of disturbance beneath the bale should be seeded and mulched when the bale is removed.

Figure SBB-1




Installation Notes

- See plan view for
  - Locations of straw bales
- Straw bales shall consist of certified weed free straw or hay. Local jurisdictions may require proof that bales are weed free.
- Straw bales shall consist of approximately 5 cubic feet of straw or hay and weigh not less than 35 pounds.

- When straw bales are used in series as a barrier, the end of each bale should tightly abut the next.
- Straw bale dimensions should be approximately 36”x18”x18”.
- A uniform anchor trench shall be excavated to depth of 4”. Straw bales shall be placed so that the binding twine is encompassing the vertical sides of the bales. All excavated soils shall be placed on the uphill side of the straw bale and compacted.
- Two wooden stakes shall be used to hold each bale in place. Wooden stakes should be 2”x2”x24”. Stakes should be driven at least 6” into the ground.

Maintenance Notes

- Inspect Control Measures each workday, and maintain them in effective operating condition. Maintenance of the Control Measures should be proactive, not reactive. Inspect the Control Measures as soon as possible following a storm that causes surface erosion, and perform necessary maintenance.
- Frequent observations and maintenance are necessary to maintain Control Measures in effective operating condition. Inspections and corrective measures should be documented thoroughly.
- Where Control Measures have failed, repair or replacement should be initiated upon discovery of the failure.
- Straw bales shall be replaced id they become heavily soiled, rotten, or damaged upon repair.
- Sediment accumulated upstream of straw bale barrier shall be removed as needed to maintain functionality of the Control Measure, typically when depth of accumulated sediments is approximately ¼ of the height of the straw bale barrier.
- Straw bales are to remain in place until the upstream disturbed areas is stabilized and approved by the local jurisdiction.
- When straw bales are removed, all disturbed areas shall be covered with topsoil, seeded and mulched, or otherwise stabilized as approved by local jurisdiction.

Many jurisdictions have Control Measure details that vary from this standard detail. Consult with local jurisdictions as to which detail should be used when differences are noted.

# Silt Fence Fact Sheet
## *Native Excavating*

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

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

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

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

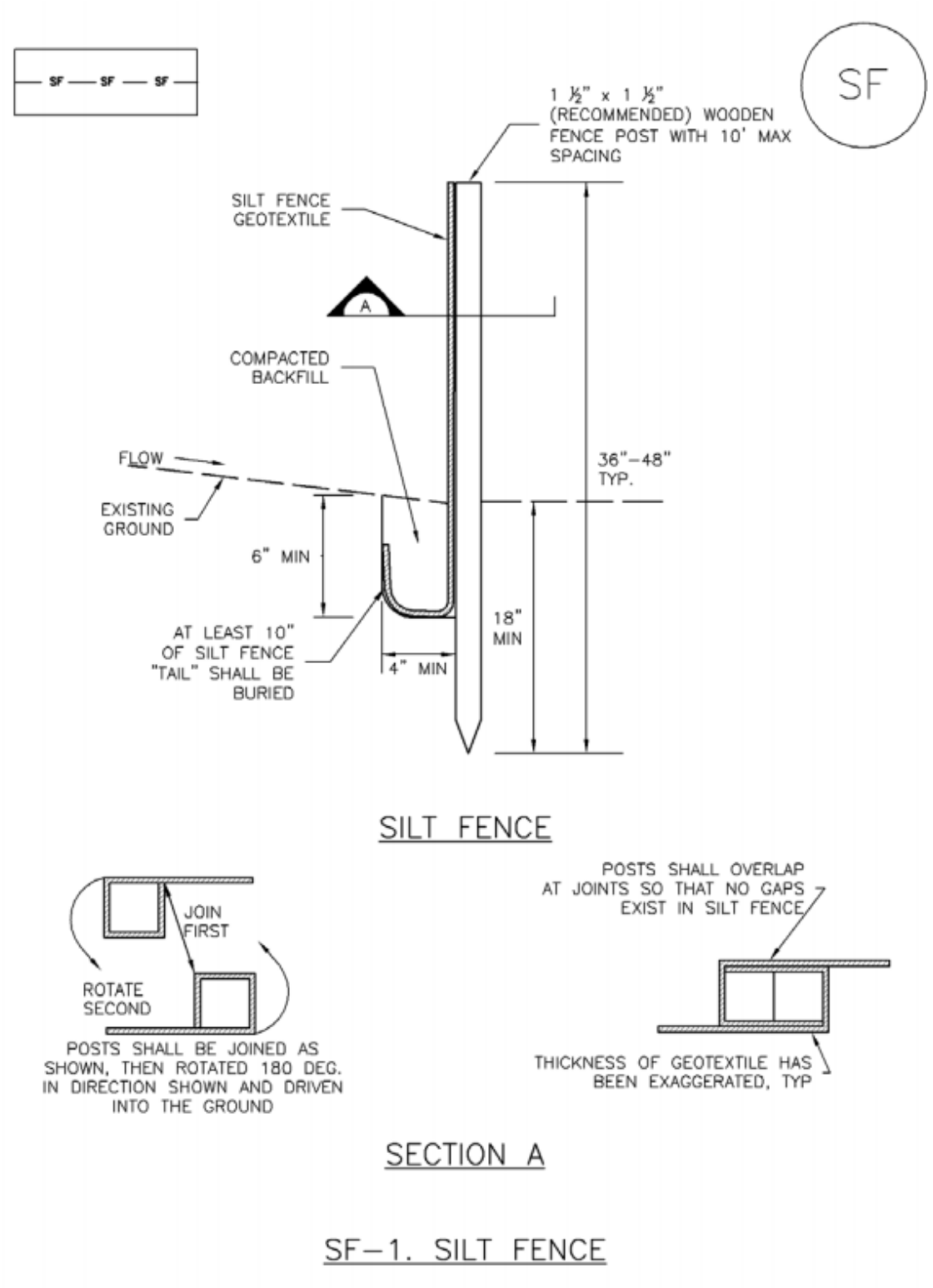
See Detail SF-1 for proper silt fence installation, which involves proper trenching, staking, securing the fabric to the stakes, and backfilling the silt fence. Properly installed silt fence should not be easily pulled out by hand and there should be no gaps between the ground and the fabric.

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

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 Control Measure effectiveness, typically before it reaches a depth of 6 inches.

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

Figure SF-1


SF — SF — SF
SF
1 ½" x 1 ½" (RECOMMENDED) WOODEN FENCE POST WITH 10' MAX SPACING
SILT FENCE GEOTEXTILE
A
COMPACTED BACKFILL
FLOW
EXISTING GROUND
6" MIN
36"–48" TYP.
18" MIN
AT LEAST 10" OF SILT FENCE "TAIL" SHALL BE BURIED
4" MIN
SILT FENCE
JOIN FIRST
ROTATE SECOND
POSTS SHALL BE JOINED AS SHOWN, THEN ROTATED 180 DEG. IN DIRECTION SHOWN AND DRIVEN INTO THE GROUND
POSTS SHALL OVERLAP AT JOINTS SO THAT NO GAPS EXIST IN SILT FENCE
THICKNESS OF GEOTEXTILE HAS BEEN EXAGGERATED, TYP
SECTION A
SF–1. SILT FENCE

Installation Notes

- Silt fence must be placed away from the toe of the slope to allow for water ponding. Silt fence at the toe of a slope should be installed in a flat location at least 2 to 5' from the toe of the slope to allow room for ponding and deposition.
- A uniform 6"x4" anchor trench should be excavated using a trencher or silt fence installation device.
- The anchor trench should be compacted by hand with a jumping jack or by wheel rolling. Compaction should be such that the silt fence can not be pulled out of the anchor trench by hand.
- The silt fence should be pulled tight as it anchored to the stakes. There should not be any noticeable sag between stakes after it has been anchored to the stakes.
- The fabric should be attached to the stakes using 1" staples or nails with 1" heads. The staples and nails should be placed at 3" intervals along the fabric down the stake.
- At the end of a run of silt fence along a contour, the silt fence should be turned perpendicular to the contour to create a J-hook. The J-hook extending perpendicular to the contour should be of sufficient length to keep runoff from flowing around the end of the silt fence, typically 10 to 20'.
- Any silt fence should be installed prior to any land disturbing activities.

Maintenance Notes

- Inspect Control Measures each workday, and maintain them in effective operating condition. Maintenance of the Control Measures should be proactive, not reactive. Inspect the Control Measures as soon as possible following a storm that causes surface erosion, and perform necessary maintenance.
- Frequent observations and maintenance are necessary to maintain Control Measures in effective operating condition. Inspections and corrective measures should be documented thoroughly.
- Where Control Measures have failed, repair or replacement should be initiated upon discovery of the failure.
- Sediment accumulation upstream of the silt fence shall be removed as needed to maintain the functionality of the Control Measure, typically when the depth of the accumulated sediment is approximately 6".
- Repair or replace silt fence when there are signs of wear, such as sagging, tearing, or collapse.
- Silt fence is to remain in place until the upstream disturbed area is stabilized and approved by the local jurisdiction, or is replaced by an equivalent perimeter sediment regulation Control Measure.
- When silt fence is removed, all disturbed areas shall be covered with topsoil, seeded and mulched, or otherwise stabilized as approved by the local jurisdiction.

Many jurisdictions have Control Measure details that vary from this standard detail. Consult with local jurisdictions as to which detail should be used when differences are noted.

Amendment:

- Reinforced Silt Fence
  - Installation Notes:
    - Use either T-posts or short sections of rebar to install the silt fence. If using rebar, be sure to install caps on the rebar.
    - Use tie wire or something similar to attach the fence to the posts.
    - When joining sections of reinforced silt fence overlap the section by a minimum of 12", securing each end to the other section of silt fence.
    - All other applicable installation notes still apply
  - Maintenance Notes:
    - If holes appear above the half way mark they may be repaired using tape.
    - If holed appear below the halfway mark then the section of silt fence must be replaced. Use the applicable overlap rule in the Installation Notes.
    - All other applicable maintenance notes still apply.

# Temporary and Permanent Seeding Fact Sheet
## *Native Excavating*

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.

Appropriate Uses

When the soil surface is disturbed and will remain inactive for an extended period, usually 30 days or longer, proactive stabilization measures should be implemented. If the inactive period is short-lived, as in the order of two weeks or less, 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.

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.

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 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 on the western slope of the Rockies is 15 to 19 inches. At a minimum, the upper 15 inches of topsoil should be stripped, stockpiled, and ultimately re-spread 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 area are generally available to be locally sourced. If a specific mix is required it will be specified below.

Seed Mix for Permanent Vegetation

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.

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

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 Control Measure 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.

The required seed mixture for this project is not currently designated.

# Stockpile Management Fact Sheet
## *Native Excavating*

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.

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 regulation Control Measures around the perimeter of the stockpile, such as sediment control logs, rock socks, silt fence, straw bales and sand bags. 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 Control Measure 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 Control Measure is necessary to access a stockpile, ensure Control Measures are reinstalled in accordance with their respective design detail section.

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.

# Spill Prevention, Containment, and Control Fact Sheet
## *Native Excavating*

Description

Spills and leaks of solid and liquid materials processed, handled or stored outdoors can be a significant source of stormwater pollutants. Spilled substances can reach receiving waters when runoff washes these materials from impervious surfaces or when spills directly enter the storm sewer system during dry weather conditions.

Effective spill control includes both spill prevention and spill response measures and depends on proper employee training for spill response measures and may also include structural spill containment, particularly at industrial locations. Structural spill containment measures typically 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 that will safely contain the spill. Spill control devices may also include valves, slide gates, or other devices that can control and contain spilled material before it reaches the storm sewer system or receiving waters.

Appropriate Uses

Implement spill prevention, containment and control measures at municipal, commercial and industrial facilities in areas where materials may be spilled in quantities that may adversely impact receiving waters when discharged directly or through the storm sewer system. Check local, state, and/or federal regulations to determine when spill containment and control measures are required by law. Spill Prevention, Control and Countermeasures Plans may be required for certain facilities handling oil and hazardous substances sunder Section 311(j)(1)(C) of the federal Clean Water Act.

Practice Guidelines

Spill Prevention Measures

- Train employees on potential sources of pollution on-site and provide clear, common-sense spill prevention practices. Require that these practices be strictly followed.
- Identify equipment that may be exposed to stormwater, pollutants that may be generated and possible sources of leaks or discharges.
- Perform regular inspection and preventative maintenance of equipment to ensure proper operation and to check for leaks or evidence of discharge (stains). Provide clear procedures to ensure that needed repairs are completed and provide temporary leak containment until such repairs can be implemented.
- Drain or replace motor oil and other automotive fluids in a designated area away from storm sewer inlets. Collect spent fluids and recycle or dispose of properly. Never dispose of these fluids in the storm sewer 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 use a hose to “wash down” a fuel spill.

- Where practical, reduce stormwater contact with equipment and materials by implementing indoor or covered storage, implementing stormwater run-on control measures and following good housekeeping practices.

Identification of Spill Areas

Identify potential spill areas, potential spill volumes, material types, frequency of material use, and drainage paths from spill areas with relation to storm sewer inlets, adjacent water bodies, structural Control Measures, and containment structures. Use this information to determine the types of spill prevention and control measures needed specific to the site conditions. Examples of potential spill locations include:

- Loading and unloading areas
- Outdoor storage areas
- Outdoor manufacturing or processing activities
- Waste disposal/storage areas
- Areas that generate significant dust or particulates (that may be subsequently deposited on the ground)
- Salt piles
- Areas prone to spills based on past experience at the site
- Locations where other routine maintenance activities occur such as equipment maintenance and cleaning, pesticide/fertilizer application, etc.

Additionally, areas where smaller leaks may occur such as parking should also have basic spill cleanup procedures.

Material Handling Procedures

From a water quality perspective, the primary principle behind effective material handling practices is to minimize exposure to stormwater. This can be accomplished by storing the material indoors under weather-resistant covering, elevating the material off the ground by using pallets, and diverting stormwater around materials storage areas. Representative outdoor materials handling procedures include:

- Keep bulk solid materials such as raw materials, sand, gravel, topsoil, compost, concrete, packing materials, metal products and other materials covered and protected from stormwater.
- When practical, store materials on impermeable surfaces.
- Store hazardous materials according to federal, state, and local hazardous materials requirements.
- Adopt procedures that reduce the chance of spills or leaks during filling or transfer of materials.
- Substitute less toxic or non-toxic materials for toxic materials.
- Store containers that are easily punctured or damaged away from high traffic areas (i.e., adopt a materials flow/plant layout plan).
- Add waste-capture containers such as collection pans for lubricating fluids.
- Store drums and containers with liquid materials on impermeable surfaces and provide secondary containment where appropriate. Drums stored outdoors should be located on pallets to minimize contact with runoff.

## Spill Response Procedures and Equipment

Spill response procedures should be tailored to site-specific conditions and industry-specific regulatory requirements. General spill response procedures include:

- Containment and cleanup of spills should begin promptly after the spill is observed.
- Sweep up small quantities of dry chemical or solids to reduce exposure to runoff. Shoveling may be used for larger quantities of materials.
- Absorbents should be readily accessible in fueling areas or other areas susceptible to spills.
- Wipe up small spills with a shop rag, store shop rags in appropriate containers, dispose of rags properly or use a professional industrial cleaning service.
- Contain medium-sized spills with absorbents (e.g., kitty litter, sawdust) and use inflatable berms or absorbent "snakes" as temporary booms for the spill. Store and dispose of absorbents properly. Wet/dry vacuums may also be used, but not for volatile fluids.
- Develop procedures and locations for containing and storing leaking containers.
- Install drip pans below minor equipment leaks and properly dispose of collected material until a repair can be made.
- For large spills, first contain the spill and plug storm drain inlets where the liquid may migrate offsite, then clean up the spill.
- Excavation of spill areas to removed contaminated material may be required where large liquid spills occur on unpaved surfaces.
- An inventory of cleanup materials should be maintained onsite and strategically located based on the types and quantities of chemicals present.

## Structural Spill Containment Measures

Two general approaches are often used when implementing spill containment measures. The first approach is designed to contain the entire spill. The second approach uses 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, rail car, tank truck, or other containment device in the possible spill area. The spill containment area must have an impermeable surface (e.g., impermeable liner, asphalt or concrete) to prevent groundwater contamination. The containment system must be designed to enable collection and removal of spilled material through a pump or vacuum trucks, use of sorbent or gelling material, or other measures. Material removed from the spill area must be disposed of or recycled according to local, state, and federal standards.

If the capacity of the containment berming or the collection basin is exceeded, supplemental spill control measures should be available such as a portable containment device, sorbent materials, or gelling agents that eventually solidify the material. Water that collects within containment areas due to rainfall or snowmelt must be appropriately treated before release from the spill area.

## Spill Plan Development

Many industries are required by federal law to have a Spill Prevention, Control and Countermeasures Plan (SPCC) that meets specific regulatory criteria when certain types and quantities of materials are used or processed at a site. These plans can be instrumental in developing a spill control plan for stormwater management purposes. Even if an SPCC plan is

not legally required at a site, a spill control plan for stormwater management purposes may be necessary. Representative information appropriate for a spill control plan, building on concepts previously introduced in this Fact Sheet, includes:

- Site plan showing where materials are stored and handled, and where associated activities occur.
- Notification procedures to be used in the event of an accident
- Instructions for clean-up procedures.
- A designated person with spill response and clean-up authority.
- Training of key personnel in plan and clean-up procedures.
- Signs posted at critical locations providing a summary of SPCC plan information, phone numbers, contacts, equipment locations, etc.
- Provisions requiring spills to be cleaned up, corrective actions taken, or countermeasures implemented immediately.
- Provisions for absorbents to be made available for use in fuel areas, and for containers to be available for used absorbents.
- Prohibition on washing absorbents into the storm drainage system or into the sanitary sewer system via floor drains.
- Provision for emergency spill containment and clean-up kits in accessible and convenient locations. Kits should contain the appropriate clean-up materials applicable to the materials stored at the site.

# Surface Roughening Fact Sheet
## *Native Excavating*

Description

Surface roughening is an erosion control practice that involves tracking, scarifying, imprinting, or tilling a disturbed area to provide temporary stabilization of disturbed areas. Surface roughening creates variations in the soil surface that help to minimize wind and water erosion. Depending on the technique used, surface roughening may also help establish conditions favorable to establishment of vegetation.

Appropriate Uses

Surface roughening can be used to provide temporary stabilization of disturbed areas, such as when revegetation cannot be immediately established due to seasonal planting limitations. Surface roughening is not a stand-alone Control Measure, and should be used in conjunction with other erosion and sediment controls. Surface roughening is often implemented in conjunction with grading and is typically performed using heavy construction equipment to track the surface. Be aware that tracking with heavy equipment will also compact soils, which is not desirable in areas that will be revegetated. Scarifying, tilling, or ripping are better surface roughening techniques in locations where revegetation is planned. Roughening is not effective in very sandy soils and cannot be effectively performed in rocky soil.

Design and Installation

Surface roughening should be performed either after final grading or to temporarily stabilize an area during active construction that may be inactive for a short time period. Surface roughening should create depressions 2 to 6 inches deep and approximately 6 inches apart. The surface of exposed soil can be roughened by a number of techniques and equipment. Horizontal grooves (running parallel to the contours of the land) can be made using tracks from equipment treads, stair-step grading, ripping, or tilling. Fill slopes can be constructed with a roughened surface. Cut slopes that have been smooth graded can be roughened as a subsequent operation. Roughening should follow along the contours of the slope. The tracks left by truck mounted equipment working perpendicular to the contour can leave acceptable horizontal depressions; however, the equipment will also compact the soil.

Maintenance and Removal

Care should be taken not to drive vehicles or equipment over areas that have been surface roughened. Tire tracks will smooth the roughened surface and may cause runoff to collect into rills and gullies. Because surface roughening is only a temporary control, additional treatments may be necessary to maintain the soil surface in a roughened condition. Areas should be inspected for signs of erosion. Surface roughening is a temporary measure, and will not provide long-term erosion control.

# Sediment Control Log or Straw Wattle Fact Sheet
## *Native Excavating*

Description

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

Appropriate Uses

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

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

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

Design and Installation

Sediment control logs should be installed along the contour to avoid concentrating flows. The maximum allowable tributary drainage area per 100 lineal feet of sediment control log, installed along the contour, is approximately 0.25 acres with a disturbed slope length of up to 150 feet and a tributary slope gradient no steeper than 3:1. Longer and steeper slopes require additional measures. This recommendation only applies to sediment control logs installed along the contour. When installed for other uses, such as perimeter control, it should be installed in a way that will not produce concentrated flows. For example, a "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 Control Measure.

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

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

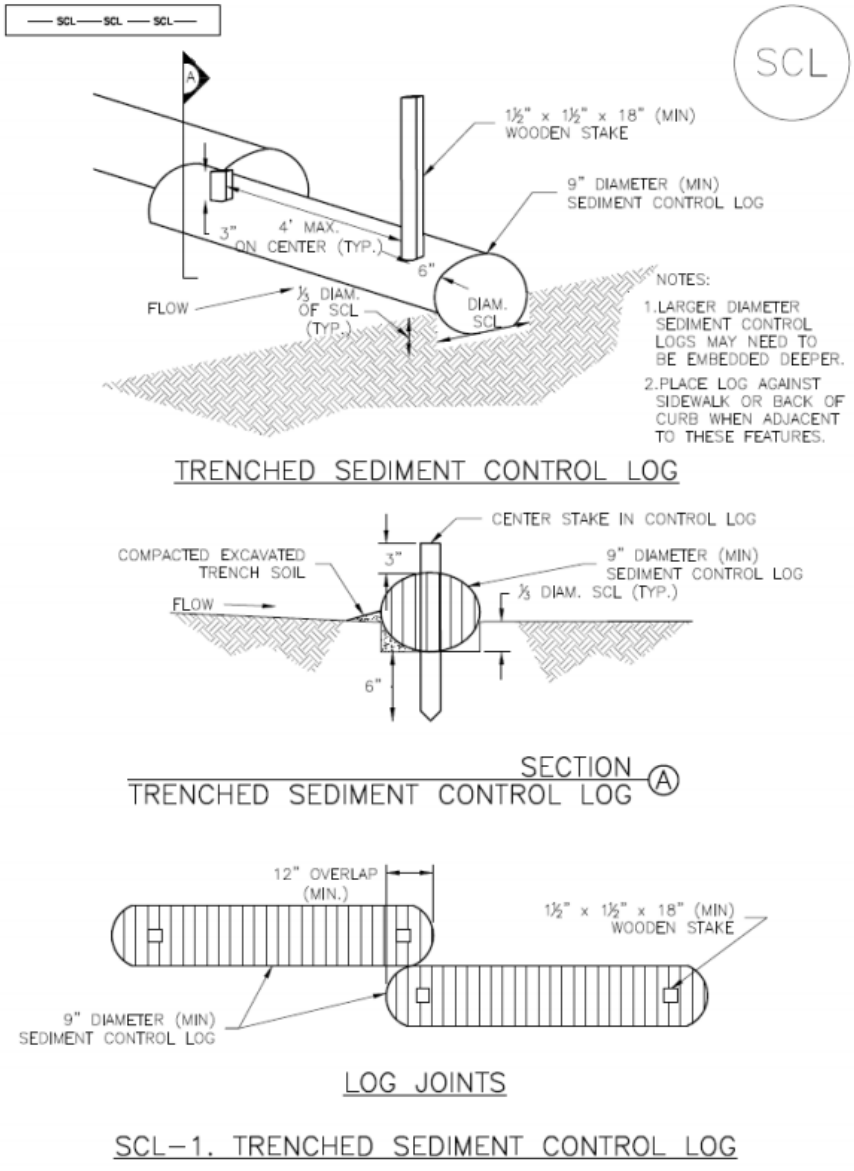
Improper installation can lead to poor performance. Be sure that sediment control logs are properly trenched (if lighter than 8 lb/foot), anchored and tightly jointed.

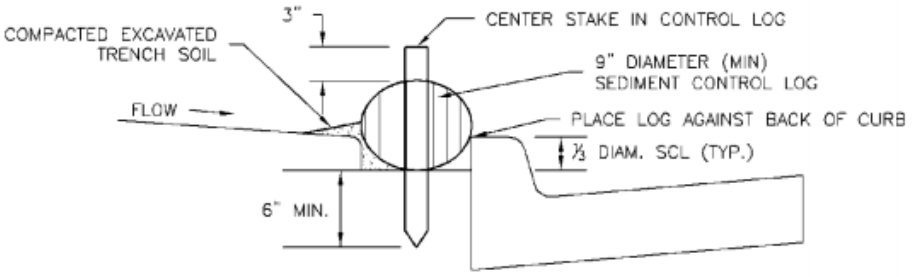
Maintenance and Removal

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

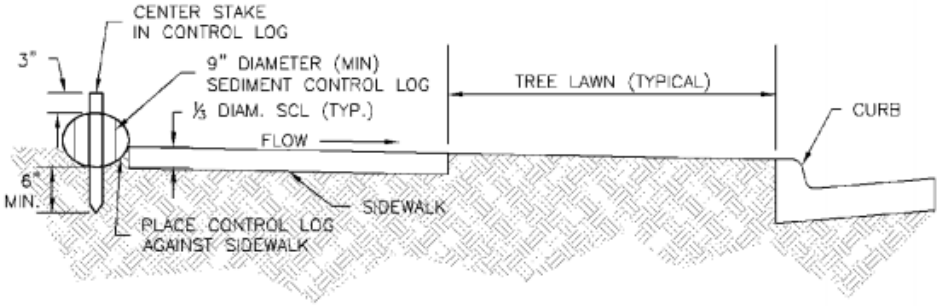
Once the upstream area is stabilized, remove and properly dispose of the logs. Areas disturbed beneath the logs may need to be seeded and mulched. Sediment control logs that are biodegradable may occasionally be left in place (e.g., when logs are used in conjunction with erosion control blankets as permanent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

Figure SW-1-4

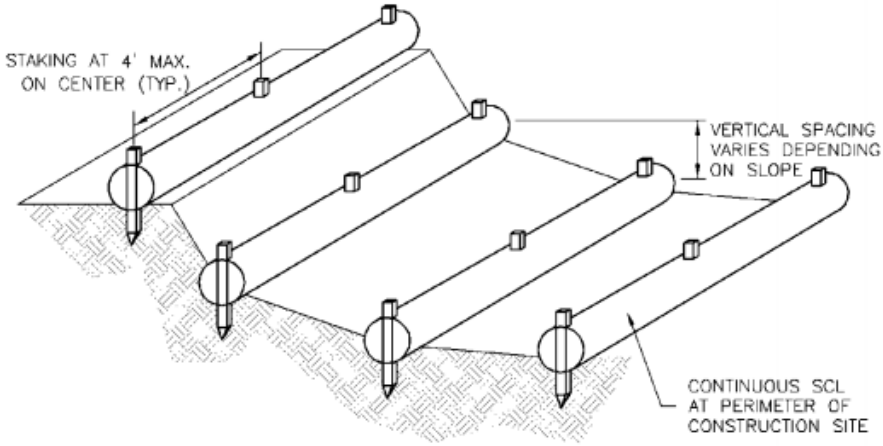





SCL–2. SEDIMENT CONTROL LOG AT BACK OF CURB




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




SCL–4. SEDIMENT CONTROL LOGS TO CONTROL SLOPE LENGTH

Installation Notes

- See plan view for location and length of sediment control logs.
- Sediment control logs that act as a perimeter control shall be installed prior to any upgradient land-disturbing activities.
- Sediment control logs should 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.

- Sediment control logs should be used as small check dams in ditches and swales. However, they should not be used in perennial streams or high velocity drainage ways.
- It is recommended that sediment control logs be trenched into the ground to a depth of approximately 1/3 of the diameter of the log. If trenching to this depth is not feasible and/or desirable (i.e. short term installation with desire not to damage the landscape) a lesser trenching depth may be acceptable, with more robust staking.
- The uphill side of the sediment control log should be backfilled with soil that is free of rocks and debris. The soil should be tightly compacted into the shape of a right triangle using a shovel or a weighted lawn roller.
- Follow manufacturers' guidance for staking. If the manufacturers' instructions do not specify placing, stakes should be placed on 4' centers and embedded a minimum of 6" into the ground. Three inches of the stake should protrude from the top of the log. Stakes that are broken prior to installation should be replaced.

Maintenance Notes

- Inspect Control Measures each workday, and maintain them in effective operating condition. Maintenance of the Control Measures should be proactive, not reactive. Inspect the Control Measures as soon as possible following a storm that causes surface erosion, and perform necessary maintenance.
- Frequent observations and maintenance are necessary to maintain Control Measures in effective operating condition. Inspections and corrective measures should be documented thoroughly.
- Where Control Measures have failed, repair or replacement should be initiated upon discovery of the failure.
- Sediment accumulated upstream of sediment control log shall be removed as need to maintain functionality of the Control Measure, typically when depth of accumulated sediments is approximately ½ of the height of the sediment control log.
- Sediment control log shall be removed at the end of construction. If disturbed areas exist after removal, they shall be covered in topsoil, seeded and mulched, or otherwise stabilized in a manner approved by the local jurisdiction.

Many jurisdictions have Control Measure details that vary from this standard detail. Consult with local jurisdictions as to which detail should be used when differences are noted.

Amendment:

When soil conditions prevent trenching then backfilling and compacting the soil surrounding the sediment control log will suffice to secure the Control Measure. The backfill should extend at least 1/3 pf the way up the sediment control log and be mechanically compacted on either side. Other applicable installation and maintenance notes still apply.

# Vegetated Buffers Fact Sheet
## *Native Excavating*

Description

Buffer strips of preserved natural vegetation or grass help protect waterways and wetlands from land disturbing activities. Vegetated buffers improve stormwater runoff quality by straining sediment, promoting infiltration, and slowing runoff velocities.

Appropriate Uses

Vegetated buffers can be used to separate land disturbing activities and natural surface waters or conveyances. In many jurisdictions, local governments require some type of setback from natural waterways. Concentrated flow should not be directed through a buffer; instead, runoff should be in the form of sheet flow. Vegetated buffers are only used in combination with other perimeter restriction Control Measures such as sediment control logs or silt fence for multilayered protection.

Design and Installation

Minimum buffer widths may vary based on local regulations. Clearly delineate the boundary of the natural buffer area using construction fencing, silt fence, or a comparable technique. In areas that have been cleared and graded, vegetated buffers such as sod can also be installed to create or restore a vegetated buffer around the perimeter of the site.

Maintenance and Removal

Inspect buffer areas for signs of erosion such as gullies or rills. Stabilize eroding areas, as needed. If erosion is due to concentrated flow conditions, it may be necessary to install a level spreader or other technique to restore sheet flow conditions. Inspect perimeter controls delineating the vegetative buffer and repair or replace as needed.

# Vehicle and Equipment Fueling Fact Sheet
## *Native Excavating*

Description

Vehicle equipment fueling procedures and practices are designed to prevent fuel spills and leaks, and reduce or eliminate contamination of stormwater. This can be accomplished by using offsite facilities, fueling in designated areas only, enclosing or covering stored fuel, implementing spill controls, and training employees and subcontractors in proper fueling procedures.

Appropriate Uses

These procedures are suitable on all construction sites where vehicle and equipment fueling takes place

Limitations

Onsite vehicle and equipment fueling should only be used where it is impractical to send vehicles and equipment offsite for fueling. Sending vehicles and equipment offsite should be done in conjunction with the Vehicle Tracking Pad and a Stabilized Staging Area (see associated Fact Sheets)

Practice Guidelines

- Use offsite fueling stations as much as possible. These businesses are better equipped to handle fuel and spills properly. Performing this work offsite can also be economical by eliminating the need for a separate fueling area at a site.
- Discourage "topping-off" of fuel tanks.
- Absorbent spill cleanup materials and spill kits should be available in fueling areas and on fueling trucks, and should be disposed of properly after use.
- Drip pans or absorbent pads should be used during vehicle and equipment fueling, unlessν the fueling is performed over an impermeable surface in a dedicated fueling area.
- Use absorbent materials on small spills. Do not hose down or bury the spill. Remove the adsorbent materials promptly and dispose of properly.
- Avoid mobile fueling of mobile construction equipment around the site; rather, transport the equipment to designated fueling areas. With the exception of tracked equipment such as bulldozers and large excavators, most vehicles should be able to travel to a designated area with little lost time.
- Train employees and subcontractors in proper fueling and cleanup procedures.
- When fueling must take place onsite, designate an area away from drainage courses to be used. Fueling areas should be identified in the SWMP.
- Dedicated fueling areas should be protected from stormwater run on and runoff, and should be located at least 50 ft away from downstream drainage facilities and watercourses. Fueling must be performed on level-grade areas.
- Protect fueling areas with berms and dikes to prevent run on, runoff, and to contain spills.
- Nozzles used in vehicle and equipment fueling should be equipped with an automatic shutoff to control drips. Fueling operations should not be left unattended.
- Use vapor recovery nozzles to help control drips as well as air pollution where required byν Air Quality Management Districts (AQMD).

- Federal, state, and local requirements should be observed for any stationary above ground storage tanks.

Inspection and Maintenance

- Inspect Control Measures in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, Control Measures be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Vehicles and equipment should be inspected each day of use for leaks. Leaks should be repaired immediately or problem vehicles or equipment should be removed from the project site.
- Keep ample supplies of spill cleanup materials onsite.
- Immediately clean up spills and properly dispose of contaminated soil and cleanup materials.

# Vehicle Tracking Control Fact Sheet
## *Native Excavating*

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.
- 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.

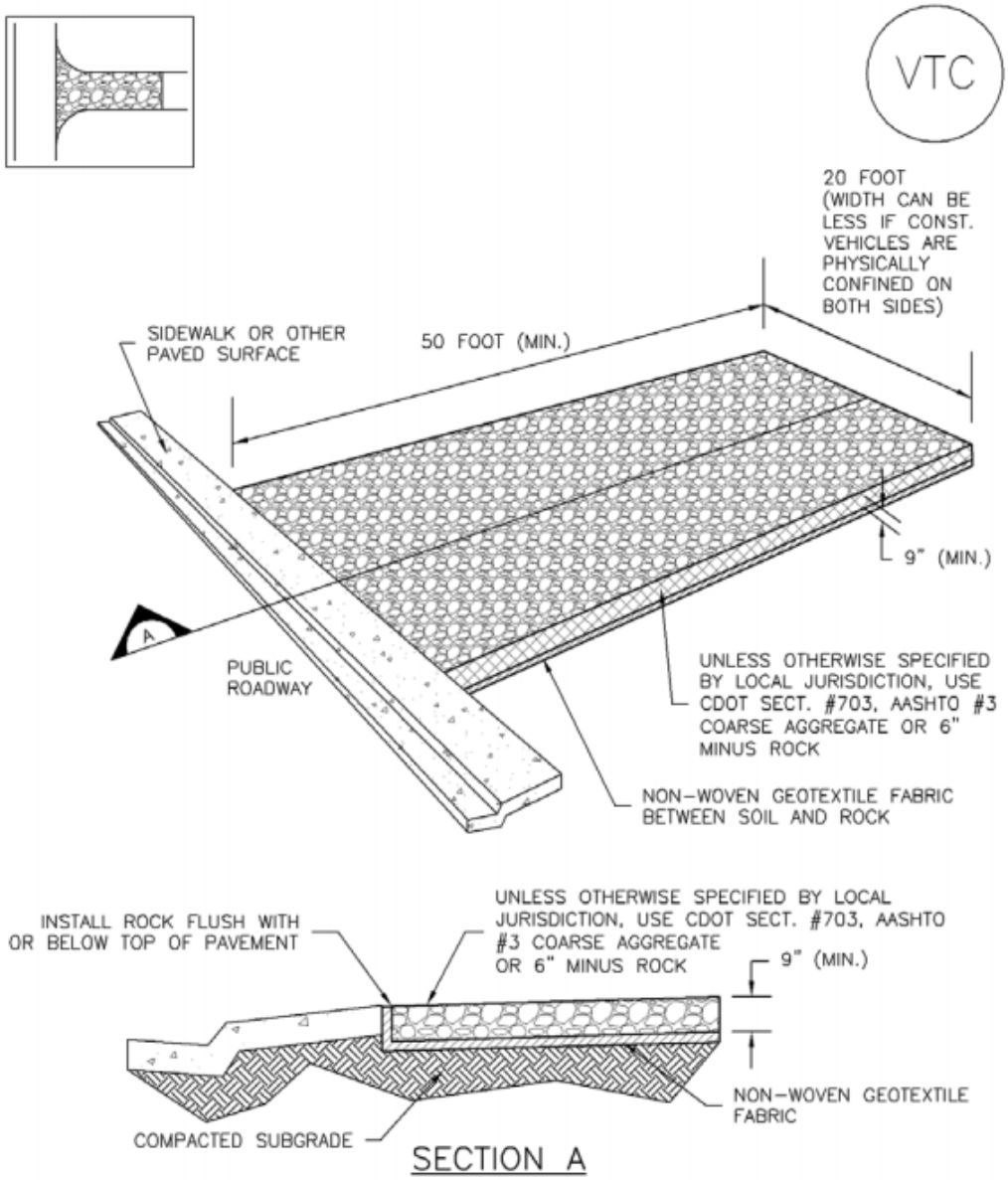
Ensure that drainage ditches at the entrance/exit area remain clear.

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.

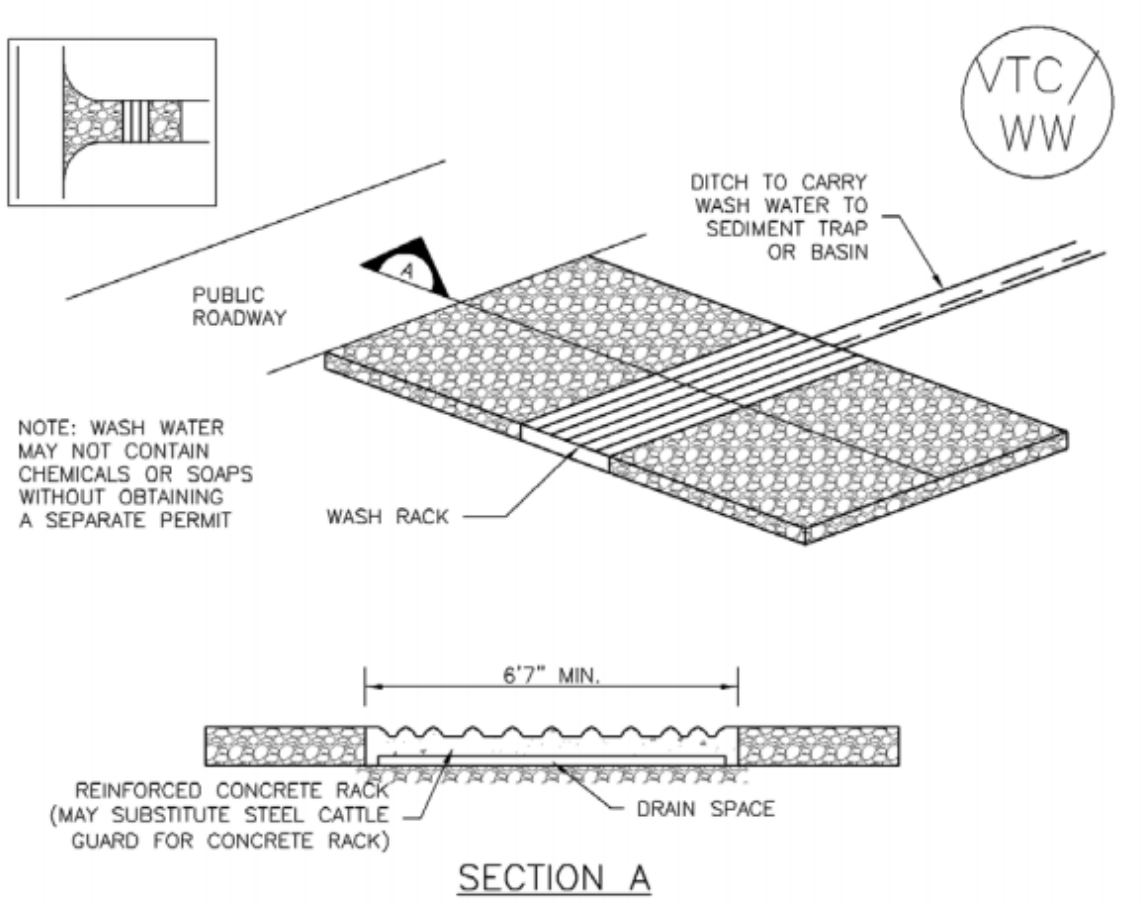
When a construction entrance/exit is removed, excess sediment from the aggregate should be removed and disposed of appropriately. The entrance should be promptly stabilized with a permanent surface following removal, typically by paving.

Figure VTC-1



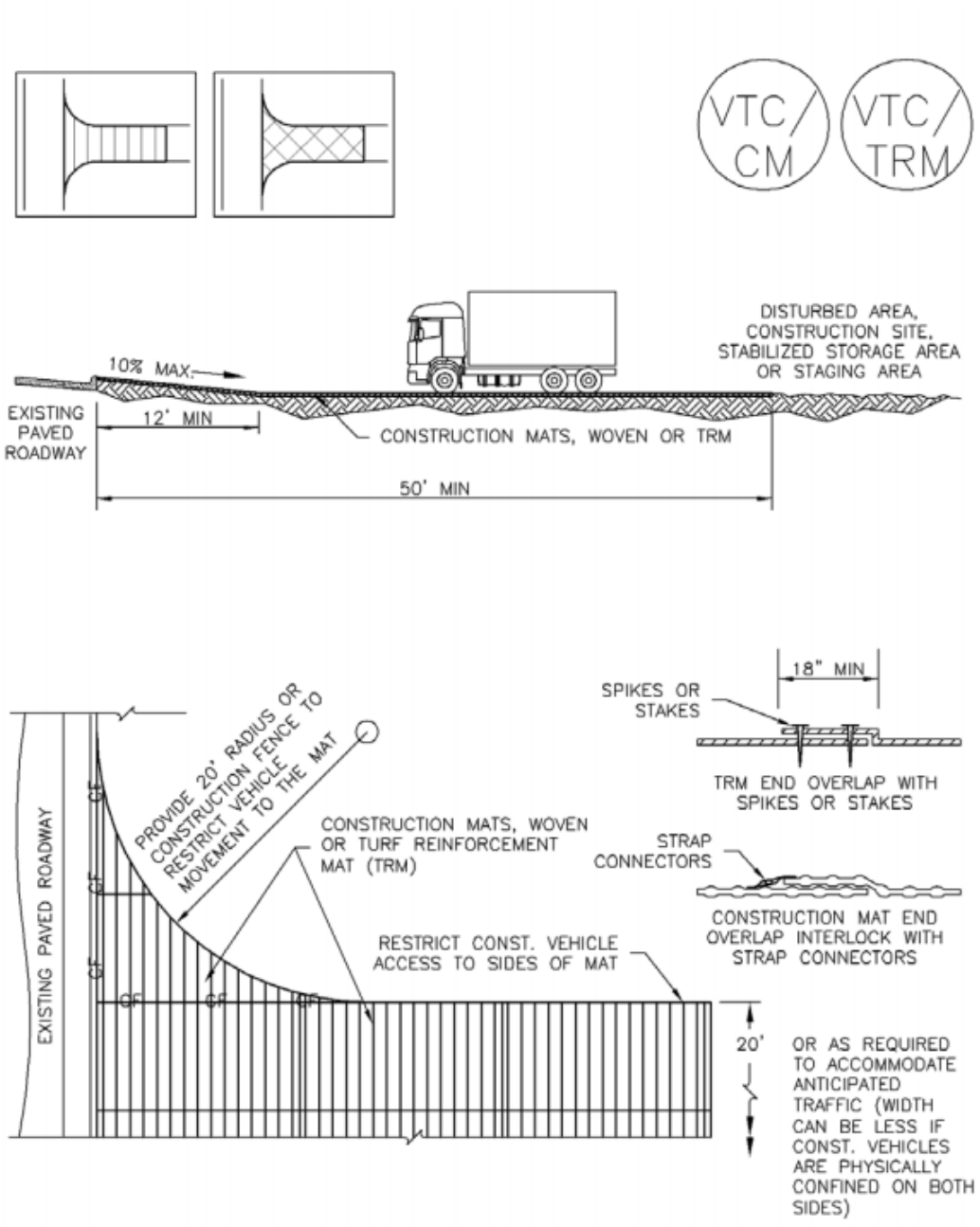

VTC-1. AGGREGATE VEHICLE TRACKING CONTROL

Figure VTC-2




VTC–2. AGGREGATE VEHICLE TRACKING CONTROL WITH WASH RACK

Figure VTC-3




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

Installation Notes

- See plan view for
  - Location of construction entrances and exits
  - Type of construction entrances or exits (with or without wheel wash, construction mat, or TRM).
- Construction mat or TRM stabilized construction entrances are only to be used on short duration projects (typically from 1 week to 1 month) where there will be limited vehicle access.
- A stabilized construction entrance or exit should be located at all access points where vehicles access the construction site from paved right-of-ways.
- Stabilized construction entrance or exits should be installed prior to any land-disturbing activities.
- A non-woven geotextile fabric may be placed under the stabilized construction entrance or exit prior to the placement of the rock.
- Unless otherwise specified by local jurisdiction, rock shall consist of DOT Sect. #703, AASHTO #3 coarse aggregate, or 6" (minus) rock.

Maintenance Notes

- Inspect Control Measures each workday, and maintain them in effective operating condition. Maintenance of the Control Measures should be proactive, not reactive. Inspect the Control Measures as soon as possible following a storm that causes surface erosion, and perform necessary maintenance.
- Frequent observations and maintenance are necessary to maintain Control Measures in effective operating condition. Inspections and corrective measures should be documented thoroughly.
- Where Control Measures have failed, repair or replacement should be initiated upon discovery of the failure.
- Rock shall be re-applied or re-graded as necessary to the stabilized entrance or exit to maintain a consistent depth.
- Sediment tracked onto paved roads is to be removed daily by shoveling or sweeping. Sediment may not be washed down storm sewer drains.

Many jurisdictions have Control Measure details that vary from this standard detail. Consult with local jurisdictions as to which detail should be used when differences are noted.