



CONSTRUCTION STORMWATER POLLUTION PREVENTION PLAN

FOR

RAVENSDALE RECLAMATION TRENCH FILLING AND RESTORATION PROJECT KING COUNTY, WASHINGTON

JUNE 2020

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Project # 09-040

I hereby state that this Construction Stormwater Pollution Prevention Plan for the Ravensdale Reclamation Trench Filling and Restoration Project has been prepared by me or under my supervision and meets the standard of care and expertise that is usual and customary in this community of professional engineers. I understand that King County does not and will not assume liability for the sufficiency, suitability or performance of drainage facilities prepared by Contour Engineering LLC. This analysis is based on data and records either supplied to, or obtained by, Contour Engineering, LLC. These documents are referenced within the text of the analysis. The analysis has been prepared utilizing procedures and practices within the standard accepted practices of the industry.

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PROJECT DESCRIPTION

This Construction Stormwater Pollution Prevention Plan (CSWPPP) accompanies the Site Development permit application associated with the reclamation of eight trenches. The site is located at 26900 Block of SE Ravensdale Way, Ravensdale, WA King County in portions of Section 1, Township 21 North, Range 6 East; Section 36, Township 22 North, Range 6 East; and Section 31, Township 22 North, Range 7 East, W.M.

The 2016 King County, Washington Surface Water Design Manual (KCSWDM), the 2016, Washington Surface Water Design Manual, the King County Stormwater Pollution Prevention Manual, and the latest edition of the LID Technical Guidance Manual for Puget Sound establish the design methodology and design criteria used for this project.

The following is a description of pertinent site information associated with the proposed project:

Location – 26900 Block SE Ravensdale Way, Ravensdale, WA

Tax Parcel Numbers – 3122079040, 3122079080, 3122079035, 3622069009, 3622069064, 0121069001, 0121069007

Site Area – 698 Acres

EXISTING CONDITIONS SUMMARY

Topography

The following topographic information was compiled from King County IMAP, limited topographic survey of the project site, and available LIDAR data. Generally, the northern portion of the project site, consisting of tax parcels 0121069001, 3622069009, 3122079080, 3122079040, 3122079035, and 3622069064 slopes downward from south to northwest, with a total vertical relief of 270 feet from high point to low point. These parcels generally also slope into Trench G on Parcel 3622069009, and into a small creek. The southern portion of the project site, consisting of tax parcels 0121069001 and 0121069007, generally slopes downward from north to southwest, with a total vertical relief of 100 feet from high to low point. The slopes range from 0% to 80%+.

Soils

The Natural Resources Conservation Service (NRCS) soil survey identifies four primary types of soil group within the project area: Alderwood gravelly sandy loam, Beausite gravelly sandy loam, Everett very gravelly sandy loam, and Chuckanut gravelly ashy sandy loam. See Appendix A for the NRCS soil map and soil descriptions.

Groundcover

The site currently is covered in multiple different uses; presently, there are multiple previously excavated mining trenches that will be filled and replanted. The site also has gravel access roads which will be maintained throughout reclamation. The site also has scattered clear areas around the trenches. The majority of the site, however, is forested with dense underbrush.

Adjacent Land Uses

The site is bounded as follows:

- North: Town of Ravensdale (Zoned RA-5)
- West: Mining Facilities (Zoned M)
- East: Forested Parcels (Zoned F)
- South: Single-family Residences, Zoned UR-P, and mining facilities, zoned M

Drainage Patterns

The Project is located within two drainage basins. The northern parcels are mostly within the Covington Creek drainage basin, a sub-basin of the Duwamish – Green River (WRIA 9) Watershed. The southern parcels are mostly within the Lower Cedar River drainage basin, a sub-basin of the Cedar River / Lake Washington (WRIA 8) Watershed.

Stormwater runoff from the northern parcels, north of tax parcel 0121069001, sheet flows into a small creek which begins in the center of tax parcel 3622069009, and flows to the northwest. Runoff from parcels south of tax parcel 0121069001 either sheet flow east into unnamed tributaries to Rock Creek River, or sheet flow southwest onto adjacent properties. The dividing line between watersheds, which generally follows the high point in topography, runs through the centers of tax parcels 0121069005, 0121069006, and 0121069007. Maps illustrating these drainage patterns can be found in Appendix A.

Critical and Sensitive Areas

SLOPES

The project area features slopes in excess of 30%. There are landslide and erosion hazard areas located across the subject parcels per King County IMAP, in the area of the existing trenches that will be filled. There are no landslide hazard areas on site.

STREAMS

There is a stream to the southeast of the project site. Located onsite is Buck Lake, as well as several streams. These were identified in a report titled Technical Memorandum dated 05.30.2018, by Soundview Consultants.

WETLANDS

There are six wetlands located on site. These were identified in a report titled Technical Memorandum dated 05.30.2018, by Soundview Consultants.

AQUIFER RECHARGE

There is a critical aquifer recharge area just north of the project site. See Appendix A for an exhibit from King County IMAP.

FLOODPLAIN

The proposed development is not located within 300-ft of any identified floodplains.

Other Existing Site Information

No wells were identified in the immediate vicinity of the project site. There are no known underground tanks or septic systems on or adjacent to the project site.

Storm Drainage and Utilities

The site currently has no known existing storm drainage system or any known utilities extended onto the site.

Developed Site Description & Proposed Work

The developed site will consist of eight reclaimed and reforested historical mining trenches. No new permanent impervious surfaces are being proposed as part of this development; all proposed impervious surfaces are temporary gravel access points for use during reclamation and will be removed except for the existing main site access roads. After each trench is filled, one foot of native top soil will be spread over the disturbed areas, and then replanted and brought back to the original forested condition. Some trenches are already partially filled, and some are still untouched. The following table details the current status of each trench, and how much fill each trench will receive.

Trench Name	Permitted 2011 Import Quantity (CY)	As-built Import Quantity 2017 (CY)	Proposed Additional Import Quantity (CY)	Total Import Quantity (Bank Yards) (CY)
Trench A	96,300	Not As-built	162,358	258,658
Trench K	0	0	621	621
Trench C	213,207	Not As-built	140,190	353,397
Trench D	11,125	20,723	0	20,723
Trench G	0	0	107,914	107,914
Trench H	0	0	21,196	21,196
Trench I	0	0	2,620	2,632
Trench J	0	0	7,882	7,882
Totals	320,632	20,723	661,320	773,023

Construction Stormwater Pollution Prevention Elements

The Elements have been addressed and the appropriate BMPs have been incorporated into the Civil Plans. See Appendix B for the plan exhibits. Appendix C contains the BMPs used in the sites TESC Plan along with some others that may be needed if site conditions change as construction progresses. The list of BMPs was taken from the 2016 King County Surface Water Design Manual and Volume II Chapter 4 of the 2012 Department of Ecology Stormwater Management Manual for Western Washington and are as follows:

- BMP D.2.1: ESC Measures
- BMP D.2.1.1: Clearing Limits
- BMP D.2.1.1.1: Plastic or Metal Fence
- BMP D.2.1.2.2: Mulching
- BMP D.2.1.2.3: Nets and Blankets
- BMP D.2.1.2.4: Plastic Covering
- BMP D.2.1.2.5: Straw Wattles
- BMP D.2.1.2.6: Temporary and Permanent Seeding
- BMP D.2.1.3.1: Silt Fence
- BMP D.2.1.4.1: Stabilized Construction Entrance
- BMP D.2.1.4.3: Wheel Wash
- BMP D.2.1.8: Dust Control

If necessary, contractor shall employ any additional BMPs per Appendix D of the KCSWDM or Appendix E of the DOE Manual to provide proper erosion, sediment, and pollutant control onsite.

Element #1: Clearing Limits

Prior to beginning land disturbing activities, including clearing and grading, clearly delineate all clearing limits, sensitive areas and their buffers, and trees (if any) that are to be preserved within the construction area. The clearing limits are typically marked with the Silt Fencing, construction fence or other appropriate BMP; however, a continuous length of brightly colored survey tape should be sufficient for the areas where silt fence is not required. The tape should be supported by vegetation or stakes at a height of 3-6 ft. The ESC Plan shows the clearing limits for the project.

Element #2: Cover Measures

Exposed and un-worked soils, such as soil stockpiles, shall be stabilized by application of effective erosion control measures that protect the soil from the erosive forces of raindrops, flowing water, and wind. Such measures include Plastic Covering and Temporary and Permanent Seeding.

Selected soil stabilization measures shall be appropriate for the time of year, site conditions, estimated duration of use, and the water quality impacts that stabilization agents may have on downstream waters or ground water.

The "Wet Season" is from October 1 to April 30. Within this period, no soils shall remain exposed and un-worked for more than 2 days. The "Dry Season" is from May 1 to September 30. Within this period, no soils shall remain exposed and un-worked for more than 7 days. This stabilization requirement applies to all soils on-site, whether at final grade or not. Soils shall be stabilized at the end of each shift before a holiday or weekend (if needed) based on the weather forecast.

Element #3: Perimeter Protection

Perimeter protection to filter sediment from sheetwash shall be located downslope of all disturbed areas and shall be installed prior to upslope grading. Perimeter protection includes constructed measures, such as silt fences, fiber rolls, sand/gravel barriers, brush or rock filters, triangular silt dikes and other methods. During the wet season, 50 linear feet of silt fence (and the necessary stakes) per acre of disturbed area must be stockpiled on site.

Silt Fence is specified in some areas due to topography and length of native vegetation area to halt any sediment laden stormwater from leaving the site perimeter. Additional silt fence shall be added as needed. Straw Wattles can be used in place of silt fence if installed per BMP and properly maintained.

Element #4: Traffic Area Stabilization

Unsurfaced entrances, roads, and parking areas used by construction traffic shall be stabilized to minimize erosion and tracking of sediment off site. Stabilized construction entrances shall be installed as the first step in clearing and grading. At the County's discretion, road and parking area stabilization is not required during the dry season (unless dust is a concern) or if the site is underlain by coarse-grained soils. Roads and parking areas shall be stabilized immediately after initial grading.

Construction vehicle ingress and egress shall be limited to the Stabilized Construction Entrances (BMP D2.1.4) shown on the TESC Plan (Figure C.3.1.A). The entrance shall be stabilized with quarry spalls or crushed rock to minimize the tracking of sediment onto public roads per the approved plan and ESC Measure D2.1.4. It shall be maintained and repaired as needed.

Sediment shall be removed from roads and transported to a controlled sediment disposal area. No street washing of sediments to the storm drain system will be allowed. If deemed necessary, a Wheel Wash (BMP D.3.4.3) may be needed or an approved mobile wheel wash system may be utilized.

Element #5: Sediment Retention

It is anticipated that the site can be treated solely with perimeter protection which includes silt fencing and vegetated strips. If sedimentation becomes an issue, it is recommended that the

project install further perimeter protection BMPs and stabilize disturbed areas prior to constructing a sediment pond or trap.

Element #6: Surface Water Collection

It is anticipated that the site can be treated solely with perimeter protection which includes silt fencing and vegetated strips. It is anticipated that much of the runoff from the site will be un-concentrated sheet flow.

Element #7: Dewatering Control

Any runoff generated by dewatering shall be treated through construction of a sediment trap (D.2.1.5.1) when there is sufficient space or by releasing the water to a well vegetated, gently sloping area. Since pumps are used for dewatering, it may be possible to pump the sediment-laden water well away from the surface water so that vegetation can be more effectively utilized for treatment. Discharge of sediment-laden water from dewatering activities to surface and storm waters is prohibited. If dewatering occurs from areas where the water has come in contact with new concrete, such as tanks, vaults, or foundations, the pH of the water must be monitored and must be neutralized prior to discharge. Clean non-turbid dewatering water, such as well point ground water can be discharged to systems tributary to, or directly to surface waters provided the flows are controlled so no erosion or flooding occurs. Clean water must not be routed through a stormwater sediment pond. Highly turbid or contaminated dewatering water must be handled separately from stormwater.

It is anticipated that dewatering will not be needed. If dewatering is needed the following guidance is provided.

Discharge foundation, vault, and trench dewatering water that has similar characteristics to site stormwater runoff into a controlled conveyance system prior to discharge to a stabilized outfall location.

Clean, non-turbid dewatering water, such as well-point groundwater, can be discharged to systems tributary to state surface waters, provided the dewatering flow does not cause erosion or flooding of receiving waters. These clean waters should not be routed through stormwater sediment ponds/tanks.

Element #8: Dust Control

Preventative measures to minimize the wind transport of soil shall be taken when a traffic hazard may be created or when sediment transported by wind is likely to be deposited in water resources or adjacent properties.

Water is the most common dust control (or palliative) used in the area. When using water for dust control, the exposed soils shall be sprayed until wet, but runoff shall not be generated by spraying. Calcium chloride, Magnesium chloride, Lignin derivatives, Tree Resin Emulsions, and Synthetic Polymer Emulsions may also be used for dust control. Exposed areas shall be re-sprayed as needed. Oil shall not be used for dust control.

Element #9: Flow Control

It is anticipated that the site can be treated solely with perimeter protection which includes silt fencing and vegetated strips. If a flow control facility is required the contractor or owner should contact the project engineer.

Element #10: Control Pollutants

Stormwater pollution prevention (SWPPS) measures are required to prevent, reduce, or eliminate the discharge of pollutants to onsite or adjacent stormwater systems or watercourses from construction-related activities such as materials delivery and storage, onsite equipment fueling and maintenance, demolition of existing buildings and disposition of demolition materials and other waste, and concrete handling, washout and disposal.

Secondary containment is required for hazardous material storage, dispensing, refueling, use and handling areas.

Spill kits containing adequate response materials must be maintained to ensure the immediate containment and cleanup of any release of hazardous substances used at the construction site.

Leaking construction vehicles and equipment shall be removed immediately or repaired on-site immediately, provided the leakage is completely contained and cleaned up.

Releases shall immediately be contained, cleaned up and reported to (425) 649-7000.

Designate a person who will be on-site and responsible for spill prevention, handling of hazardous materials and cleanup of spills.

Maintenance and repair of heavy equipment and vehicles involving oil changes, hydraulic system drain down, solvent and de-greasing cleaning operations, fuel tank drain down and removal, and other activities which may result in discharge or spillage of pollutants to the ground or into surface water runoff must be conducted using spill prevention measures, such as drip pans. Contaminated surfaces shall be cleaned immediately following any discharge or spill incident. Emergency repairs may be performed on-site using temporary plastic placed beneath and, if raining, over the vehicle.

Application of agricultural chemicals including fertilizers and pesticides shall be conducted in a manner and at application rates that will not result in loss of chemical to surface water runoff. Manufacturers' recommendations for application rates and procedures shall be followed.

All applicable BMPs shall be used to prevent or treat contamination of surface water runoff by pH modifying sources. These sources include bulk cement, cement kiln dust, fly ash, new concrete washing and curing waters, waste streams generated from concrete grinding and sawing, exposed aggregate processes, and concrete pumping and mixer washout waters. Some applicable BMPs from the DOE Manual include Concrete Handling (BMP C151), Sawcutting and Surfacing Pollution Prevention (BMP C152), and other Volume IV – Source Control BMPs.

It is important for any development to preserve the environmental elements within the County, so the conservation of and protection of critical areas shall be adhered to. There shall be no contamination of the groundwater as the project is in a well head protection Zone II. All necessary steps must be taken to prevent contamination such as following the requirements of this SWPPP document, due diligence and awareness by the contractor and sub-contractors, and the utilization of any and all BMPs (construction and source control) applicable to ensure protection of the County's groundwater.

Any chemical treatment must be approved by the County

Element #11: Protect Existing and Proposed Flow Control BMPs

Protection measures shall be applied/installed and maintained so as to prevent adverse impacts to existing flow control BMPs and areas of proposed flow control BMPs for the project. Adverse impacts can prompt the requirement to restore or replace affected BMPs. There are no proposed flow control BMP's.

Element #12: Maintain BMPs

Protection measures shall be maintained to assure continued performance of their intended function, to prevent adverse impacts to existing flow control BMPs and areas of proposed flow control BMPs, and protect other disturbed areas of the project.

Sediment control BMPs shall be inspected weekly or after a runoff-producing storm event during the "Dry Season" and daily during the "Wet Season". The inspection frequency for stabilized, inactive sites shall be determined by the County based on the level of soil stability and potential for adverse environmental impacts.

Temporary erosion and sediment control BMPs shall be removed on the approval of the County inspector after final site stabilization is achieved or after the temporary BMPs are no longer needed. Trapped sediment shall be removed or stabilized on site via approved measures. Disturbed soil resulting from removal of BMPs or vegetation shall be permanently stabilized.

Element #13: Manage the Project

Development projects shall be phased in order to prevent the transport of sediment from the development site during construction, unless the project engineer can demonstrate that construction phasing is infeasible. Re-vegetation of exposed areas and maintenance of that vegetation shall be an integral part of the clearing activities for any phase.

Clearing and grading activities for developments shall be permitted only if conducted pursuant to an approved site development plan (e.g., subdivision approval) that establishes permitted areas of clearing, grading, cutting, and filling. When establishing these permitted clearing and grading areas, consideration should be given to minimizing removal of existing trees and minimizing disturbance and compaction of native soils except as needed for building purposes. These permitted clearing and grading areas and any other areas required to preserve critical or sensitive areas, buffers, native growth protection easements, or tree retention areas as may be required by the County, shall be delineated on the site plans and the development site.

Seasonal Work Limitations are from October 1 to April 30 where clearing, grading, and other soil disturbing activities shall only be permitted if shown to the satisfaction of the County that the transport of sediment from the construction site will be prevented. Based on the information provided and local weather conditions, the County may expand or restrict the seasonal limitation on site disturbance. The County may take enforcement action (such as a notice of violation, administrative order, penalty, or stop-work order) if violations are noticed, required BMPs are not be maintained or the approved plans are not be followed. The following activities are exempt from the seasonal clearing and grading limitations:

1. Routine maintenance and necessary repair of erosion and sediment control BMPs;
2. Routine maintenance of public facilities or existing utility structures that do not expose the soil or result in the removal of the vegetative cover to soil; and
3. Activities where there is one hundred percent infiltration of surface water runoff within the site in approved and installed erosion and sediment control facilities.

All BMPs shall be inspected, maintained, and repaired as needed to assure continued performance of their intended function. Additional BMPs and erosion control measures shall be installed as deemed necessary to protect adjacent properties and County right-of-ways.

Whenever inspection and/or monitoring reveals that the BMPs identified in the Construction SWPPP are inadequate, due to the actual discharge of or potential to discharge a significant amount of any pollutant, the SWPPP shall be modified, as appropriate, in a timely manner.

Spillage and/or discharge of pollutants shall be reported within 24-hours.

Maintenance and repair of heavy equipment and vehicles involving oil changes, hydraulic system drain down, solvent and de-greasing cleaning operations, fuel tank drain down and removal, and other activities which may result in discharge or spillage of pollutants to the ground or into surface water runoff must be conducted using spill prevention measures, such as drip pans. Contaminated surfaces shall be cleaned immediately following any discharge or spill incident. Emergency repairs may be performed on-site using temporary plastic placed beneath and, if raining, over the vehicle.

The Construction SWPPP shall be retained on-site or within reasonable access to the site. The Construction SWPPP shall be modified whenever there is a significant change in the design, construction, operation, or maintenance of any BMP. The County Inspector shall be notified of any changes to the Construction SWPPP. The inspector may require a plan modification to go through the County review process.

CONSTRUCTION SEQUENCE

1. Obtain required permits and hold a pre-construction meeting with the County.
2. Pothole any existing utilities for verification of depth and location.
3. Establish clearing and grading limits.
4. Install silt fence and other erosion control measures as needed.
5. Schedule an erosion control inspection with the County
6. Construct improvements per plan.
7. Stabilize all exposed soils
8. Arrange final inspection with the County.
9. Silt fence and other applicable TESC measures to remain until the site is stabilized to the approval of the County Inspector
10. Remove TESC measures when allowed by County Inspector

CONSTRUCTION SCHEDULE

Construction is anticipated to begin when all necessary permits have been issued. Construction will be done in a single phase.

FINANCIAL/OWNERSHIP RESPONSIBILITIES

Ravensdale LLC
4425 S. Orchard Street
Tacoma, WA 98466

EROSION CONTROL SPECIALIST

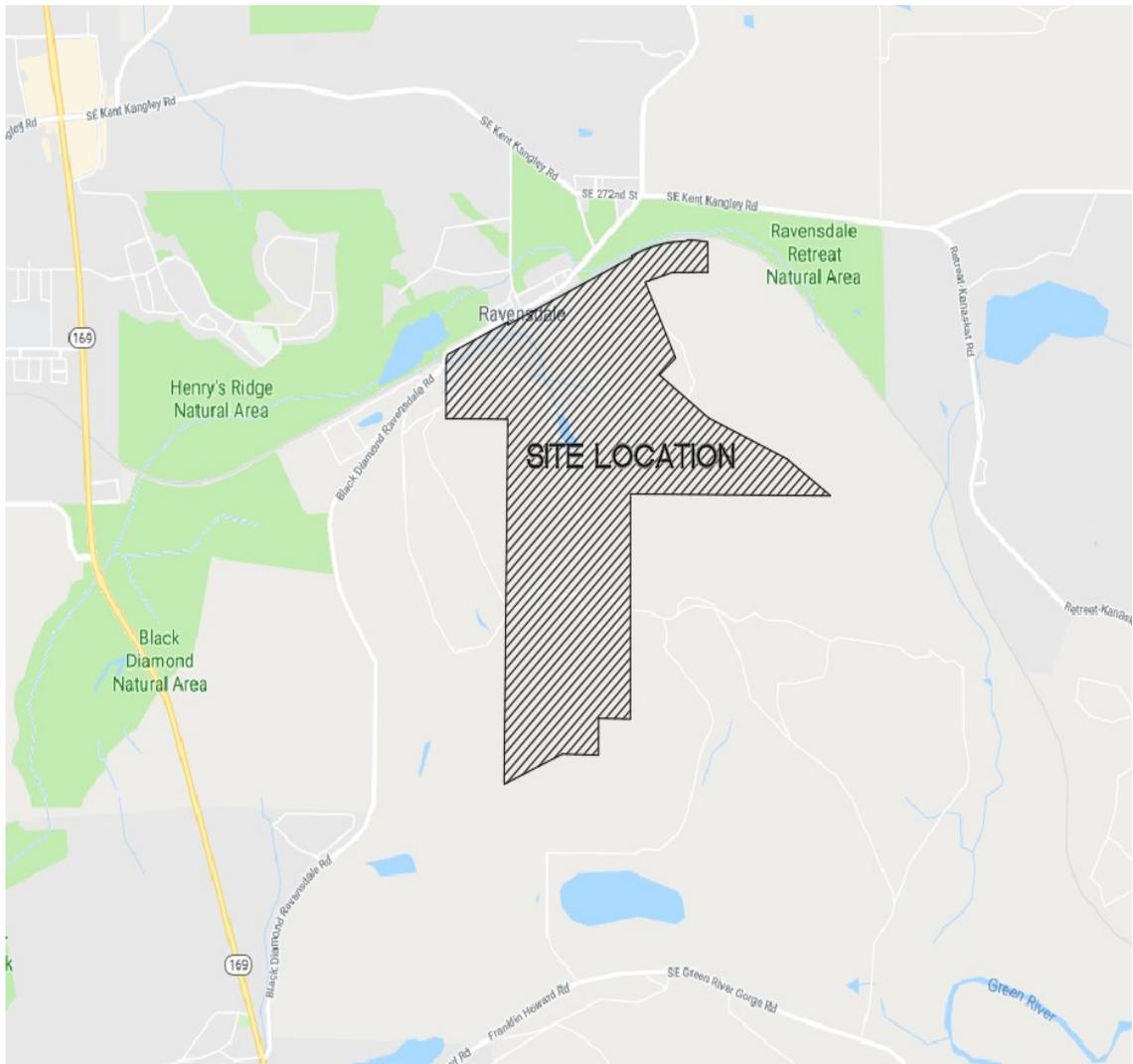
A Certified Professional in Erosion and Sediment Control shall be identified in the Construction SWPPP and shall be on-site or on-call at all times. Certification may be through the WSDOT/AGC of Washington Education Foundation Construction Site Erosion and Sediment Control Certification Program or any equivalent local or national certification and/or training program.

Name: _____

Phone: _____

APPENDIX A

General Exhibits



Vicinity Map

APPENDIX B

TESC Plan Exhibits

APPENDIX C

Construction BMP's

D.2.1 ESC MEASURES

This section details the ESC measures that are required to minimize erosion and sediment transport off a construction site and protect areas of existing and proposed flow control BMPs. These ESC measures represent Best Management Practices (BMPs)⁶ for the control of erosion and entrained sediment as well as other impacts related to construction such as increased runoff due to land disturbing activities. The measures and practices are grouped into nine sections corresponding to each of the nine categories of ESC measures in Core Requirement #5, Section 1.2.5 of the King County *Surface Water Design Manual*. The introductory paragraphs at the beginning each section present the basic requirement for that category of measures, the purpose of those measures, installation requirements relative to construction activity, guidelines for the conditions of use, and other information relevant to all measures in the section/category. Compliance with each of the nine categories of the ESC measures, to the extent applicable and necessary to meet the performance criteria in Section D.2.1, and compliance with the ESC implementation requirements in Section D.2.4, constitutes overall compliance with King County's ESC Standards.

Note: Additional measures shall be required by the County if the existing standards are insufficient to protect adjacent properties, drainage facilities, or water resources.

The standards for each individual ESC measure are divided into four sections:

1. Purpose
2. Conditions of Use
3. Design and Installation Specifications
4. Maintenance Requirements.

A code and symbol for each measure have also been included for ease of use on ESC plans. Note that the "Conditions of Use" always refers to site conditions. As site conditions change, ESC measures must be changed to remain in compliance with the requirements of this appendix.

Whenever compliance with King County ESC Standards is required, all of the following categories of ESC measures must be considered for application to the project site as detailed in the following sections:

1. **Clearing Limits:** Prior to any site clearing or grading, areas to remain undisturbed during project construction shall be delineated on the project's ESC plan and physically marked on the project site.
2. **Cover Measures:** Temporary and permanent cover measures shall be provided when necessary to protect disturbed areas. The intent of these measures is to prevent erosion by having as much area as possible covered during any period of precipitation.
3. **Perimeter Protection:** Perimeter protection to filter sediment from sheet flow shall be provided downstream of **all** disturbed areas prior to upslope grading.
4. **Traffic Area Stabilization:** Unsurfaced entrances, roads, and parking areas used by construction traffic shall be stabilized to minimize erosion and tracking of sediment offsite.
5. **Sediment Retention:** Surface water collected from all disturbed areas of the site shall be routed through a sediment pond or trap prior to release from the site, except those areas at the perimeter of the site small enough to be treated solely with perimeter protection. Sediment retention facilities shall be installed prior to grading any contributing area.
6. **Surface Water Collection:** Surface water collection measures (e.g., ditches, berms, etc.) shall be installed to intercept all surface water from disturbed areas, convey it to a sediment pond or trap, and discharge it downstream of any disturbed areas. Areas at the perimeter of the site, which are small enough to be treated solely with perimeter protection, do not require surface water collection.

⁶ *Best Management Practices (BMPs)* means the best available and reasonable physical, structural, managerial, or behavioral activities, that when singly or in combination, eliminate or reduce the contamination of surface and/or ground waters.

Significant sources of upstream surface water that drain onto disturbed areas shall be intercepted and conveyed to a stabilized discharge point downstream of the disturbed areas. Surface water collection measures shall be installed concurrently with or immediately following rough grading and shall be designed, constructed, and stabilized as needed to minimize erosion.

7. **Dewatering Control:** The water resulting from construction site de-watering activities must be treated prior to discharge or disposed of as specified.
8. **Dust Control:** Preventative measures to minimize wind transport of soil shall be implemented when a traffic hazard may be created or when sediment transported by wind is likely to be deposited in water resources.
9. **Flow Control:** Surface water from disturbed areas must be routed through the project's onsite flow control facility or other provisions must be made to prevent increases in the existing site conditions 2-year and 10-year runoff peaks discharging from the project site during construction (flow control BMP areas (existing or proposed) shall not be used for this purpose).
10. **Control Pollutants:** Stormwater pollution prevention (SWPPS) measures are required to prevent, reduce, or eliminate the discharge of pollutants to onsite or adjacent stormwater systems or watercourses from construction-related activities such as materials delivery and storage, onsite equipment fueling and maintenance, demolition of existing buildings and disposition of demolition materials and other waste, and concrete handling, washout and disposal. Section D.2.2 describes BMPs specific to this purpose; additionally, several of the ESC BMPs described herein are applicable.
11. **Protect Existing and Proposed Flow Control BMPs:** Sedimentation and soil compaction reduce the infiltration capacity of native and engineered soils. Protection measures shall be applied/installed and maintained so as to prevent adverse impacts to existing flow control BMPs and areas of proposed flow control BMPs for the project. Adverse impacts can prompt the requirement to restore or replace affected BMPs.
12. **Maintain BMPs:** Protection measures shall be maintained to assure continued performance of their intended function, to prevent adverse impacts to existing flow control BMPs and areas of proposed flow control BMPs, and protect other disturbed areas of the project.
13. **Manage the Project:** Coordination and timing of site development activities relative to ESC concerns, and timely inspection, maintenance and update of protective measures are necessary to effectively manage the project and assure the success of protective ESC and SWPPS design and implementation.

D.2.1.1 CLEARING LIMITS

Prior to any site clearing or grading, those areas that are to remain undisturbed during project construction shall be delineated. At a minimum, clearing limits shall be installed at the edges of all critical area buffers and any other areas required to be left uncleared such as portions of the site subject to clearing limits under KCC 16.82.150, areas around significant trees identified to be retained, flow control BMP areas to be protected, and other areas identified to be left undisturbed to protect sensitive features.

Purpose: The purpose of clearing limits is to prevent disturbance of those areas of the project site that are not designated for clearing or grading. This is important because limiting site disturbance is the single most effective method for reducing erosion. Clearing limits may also be used to control construction traffic, thus reducing the disturbance of soil and limiting the amount of sediment tracked off site.

When to Install: Clearing limits shall be installed prior to the clearing and/or grading of the site.

Measures to Use: Marking clearing limits by delineating the site with a continuous length of brightly colored survey tape is sometimes sufficient. The tape may be supported by vegetation or stakes, and it shall be 3 to 6 feet high and highly visible. Critical areas and their buffers require more substantial protection and shall be delineated with plastic or metal safety fences or stake and wire fences. Fencing may be required at the County's discretion to control construction traffic or at any location where greater

protection is warranted. Permanent fencing may also be used if desired by the applicant. Silt fence, in combination with survey flagging, is also an acceptable method of marking critical areas and their buffers.

D.2.1.1.1 PLASTIC OR METAL FENCE

Code: FE

Symbol:



Purpose

Fencing is intended to (1) restrict clearing to approved limits; (2) prevent disturbance of critical areas, their buffers, and other areas required to be left undisturbed; (3) limit construction traffic to designated construction entrances or roads; and (4) protect areas where marking with survey tape may not provide adequate protection.

Conditions of Use

To establish clearing limits, plastic or metal fence may be used:

1. At the boundary of critical areas, their buffers, and other areas required to be left uncleared.
2. As necessary to control vehicle access to and on the site (see Sections D.2.1.4.1 and D.2.1.4.2).

Design and Installation Specifications

1. The fence shall be designed and installed according to the manufacturer's specifications.
2. The fence shall be at least 3 feet high and must be highly visible.
3. The fence shall not be wired or stapled to trees.

Maintenance Requirements

1. If the fence has been damaged or visibility reduced, it shall be repaired or replaced immediately and visibility restored.
2. Disturbance of a critical area, critical area buffer, native growth retention area, or any other area required to be left undisturbed shall be reported to the County for resolution.

D.2.1.2 COVER MEASURES

Temporary and permanent cover measures shall be provided to protect all disturbed areas, including the faces of cut and fill slopes. Temporary cover shall be installed if an area is to remain unworked for more than seven days during the dry season (May 1 to September 30) or for more than two consecutive working days during the wet season (October 1 to April 30). These time limits may be relaxed if an area poses a low risk of erosion due to soil type, slope gradient, anticipated weather conditions, or other factors. Conversely, the County may reduce these time limits if site conditions warrant greater protection (e.g., adjacent to significant aquatic resources or highly erosive soils) or if significant precipitation (see Section D.2.4.2) is expected. Any area to remain unworked for more than 30 days shall be seeded or sodded, unless the County determines that winter weather makes vegetation establishment infeasible. During the wet season, slopes and stockpiles at 3H:1V or steeper and with more than ten feet of vertical relief shall be covered if they are to remain unworked for more than 12 hours. Also during the wet season, the material necessary to cover all disturbed areas must be stockpiled on site. The intent of these cover requirements is to have as much area as possible covered during any period of precipitation.

Purpose: The purpose of covering exposed soils is to prevent erosion, thus reducing reliance on less effective methods that remove sediment after it is entrained in runoff. Cover is the only practical method of reducing turbidity in runoff. Structural measures, such as silt fences and sediment ponds, are only capable of removing coarse particles and in most circumstances have little to no effect on turbidity.

D.2.1.2.2 MULCHING

Code: MU

Symbol:

**Purpose**

The purpose of mulching soils is to provide immediate temporary protection from erosion. Mulch also enhances plant establishment by conserving moisture, holding fertilizer, seed, and topsoil in place, and moderating soil temperatures. There is an enormous variety of mulches that may be used. Only the most common types are discussed in this section.

Conditions of Use

As a temporary cover measure, mulch should be used:

1. On disturbed areas that require cover measures for less than 30 days
2. As a cover for seed during the wet season and during the hot summer months
3. During the wet season on slopes steeper than 3H:1V with more than 10 feet of vertical relief.

Design and Installation Specifications

For mulch materials, application rates, and specifications, see Table D.2.1.2.A. *Note: Thicknesses may be increased for disturbed areas in or near critical areas or other areas highly susceptible to erosion.*

Maintenance Standards

1. The thickness of the cover must be maintained.
2. Any areas that experience erosion shall be remulched and/or protected with a net or blanket. If the erosion problem is drainage related, then the drainage problem shall be assessed and alternate drainage such as interceptor swales may be needed to fix the problem and the eroded area remulched.

TABLE D.2.1.2.A MULCH STANDARDS AND GUIDELINES

Mulch Material	Quality Standards	Application Rates	Remarks
Straw	Air-dried; free from undesirable seed and coarse material	2"-3" thick; 5 bales per 1000 sf or 2-3 tons per acre	Cost-effective protection when applied with adequate thickness. Hand-application generally requires greater thickness than blown straw. Straw should be crimped to avoid wind blow. The thickness of straw may be reduced by half when used in conjunction with seeding.
Wood Fiber Cellulose	No growth inhibiting factors	Approx. 25-30 lbs per 1000 sf or 1500-2000 lbs per acre	Shall be applied with hydromulcher. Shall not be used without seed and tackifier unless the application rate is at least doubled. Some wood fiber with very long fibers can be effective at lower application rates and without seed or tackifier.
Compost	No visible water or dust during handling. Must be purchased from supplier with Solid Waste Handling Permit.	2" thick min.; approx. 100 tons per acre (approx. 1.5 cubic feet per square yard)	More effective control can be obtained by increasing thickness to 3" (2.25 cubic feet per square yard). Excellent mulch for protecting final grades until landscaping because it can be directly seeded or tilled into soil as an amendment. Compost may not be used in Sensitive Lake ⁷ basins unless analysis of the compost shows no phosphorous release.
Hydraulic Matrices (Bonded Fiber Matrix)	This mulch category includes hydraulic slurries composed of wood fiber, paper fiber or a combination of the two held together by a binding system. The BFM shall be a mixture of long wood fibers and various bonding agents.	Apply at rates from 3,000 lbs per acre to 4,000 lbs per acre and based on manufacturers recommendations	The BFM shall not be applied immediately before, during or immediately after rainfall so that the matrix will have an opportunity to dry for 24 hours after installation. Application rates beyond 2,500 pounds may interfere with germination and are not usually recommended for turf establishment. BFM is generally a matrix where all fiber and binders are in one bag, rather than having to mix components from various manufacturers to create a matrix. BFMs can be installed via helicopter in remote areas. They are approximately \$1,000 per acre cheaper to install.
Chipped Site Vegetation	Average size shall be several inches.	2" minimum thickness	This is a cost-effective way to dispose of debris from clearing and grubbing, and it eliminates the problems associated with burning. Generally, it should not be used on slopes above approx. 10% because of its tendency to be transported by runoff. It is not recommended within 200 feet of surface waters. If seeding is expected shortly after mulch, the decomposition of the chipped vegetation may tie up nutrients important to grass establishment.

⁷ *Sensitive lake* means a lake that has proved to be particularly prone to eutrophication; the County gives this designation when an active input plan has been adopted to limit the amount of phosphorous entering the lake.

D.2.1.2.3 NETS AND BLANKETS

Code: NE

Symbol:



Purpose

Erosion control nets and blankets are intended to prevent erosion and hold seed and mulch in place on steep slopes and in channels so that vegetation can become well established. In addition, some nets and blankets can be used to permanently reinforce turf to protect drainage ways during high flows. Nets are strands of material woven into an open, but high-tensile strength net (for example, jute matting). Blankets are strands of material that are not tightly woven, but instead form a layer of interlocking fibers, typically held together by a biodegradable or photodegradable netting (for example, excelsior or straw blankets). They generally have lower tensile strength than nets, but cover the ground more completely. Coir (coconut fiber) fabric comes as both nets and blankets.

Conditions of Use

Erosion control nets and blankets should be used:

1. For permanent stabilization of slopes 2H:1V or greater and with more than 10 feet of vertical relief.
2. In conjunction with seed for final stabilization of a slope, not for temporary cover. However, they may be used for temporary applications as long as the product is not damaged by repeated handling. In fact, this method of slope protection is superior to plastic sheeting, which generates high-velocity runoff (see Section D.2.1.2.4).
3. For drainage ditches and swales (highly recommended). The application of appropriate netting or blanket to drainage ditches and swales can protect bare soil from channelized runoff while vegetation is established. Nets and blankets also can capture a great deal of sediment due to their open, porous structure. Synthetic nets and blankets may be used to permanently stabilize channels and may provide a cost-effective, environmentally preferable alternative to riprap.

Design and Installation Specifications

1. See Figure D.2.1.2.B and Figure D.2.1.2.C for **typical orientation and installation** of nettings and blankets. *Note: Installation is critical to the effectiveness of these products. If good ground contact is not achieved, runoff can concentrate under the product, resulting in significant erosion.*
2. With the variety of products available, it is impossible to cover all the details of appropriate use and installation. Therefore, it is critical that the design engineer thoroughly consults the **manufacturer's information** and that a site visit takes place in order to insure that the product specified is appropriate.
3. Jute matting must be used in conjunction with mulch (Section D.2.1.2.2). Excelsior, woven straw blankets, and coir (coconut fiber) blankets may be installed without mulch. There are many other types of **erosion control nets and blankets** on the market that may be appropriate in certain circumstances. Other types of products will have to be evaluated individually. In general, most nets (e.g., jute matting) require mulch in order to prevent erosion because they have a fairly open structure. Blankets typically do not require mulch because they usually provide complete protection of the surface.
4. Purely synthetic blankets are allowed but shall only be used for long-term stabilization of waterways. The organic blankets authorized above are better for slope protection and short-term waterway protection because they retain moisture and provide organic matter to the soil, substantially improving the speed and success of re-vegetation.

Maintenance Standards

1. Good contact with the ground must be maintained, and there must not be erosion beneath the net or

blanket.

2. Any areas of the net or blanket that are damaged or not in close contact with the ground shall be repaired and stapled.
3. If erosion occurs due to poorly controlled drainage, the problem shall be fixed and the eroded area protected.

FIGURE D.2.1.2.B WATERWAY INSTALLATION

- DO NOT STRETCH BLANKETS/MATTINGS TIGHT - ALLOW THE ROLLS TO MOLD TO ANY IRREGULARITIES.
- SLOPE SURFACE SHALL BE SMOOTH BEFORE PLACEMENT FOR PROPER SOIL CONTACT.
- ANCHOR, STAPLE, AND INSTALL CHECK SLOTS AS PER MANUFACTURER'S RECOMMENDATIONS.
- AVOID JOINING MATERIAL IN THE CENTER OF THE DITCH.
- LIME, FERTILIZE AND SEED BEFORE INSTALLATION.

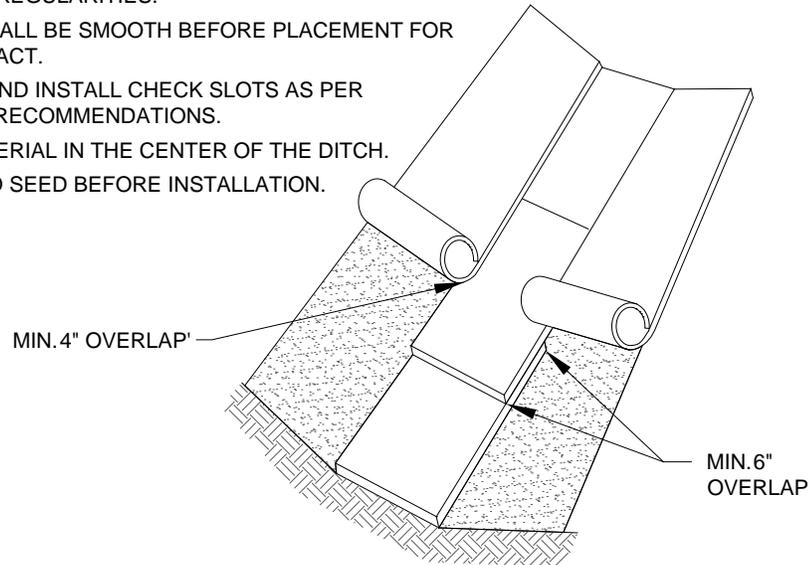
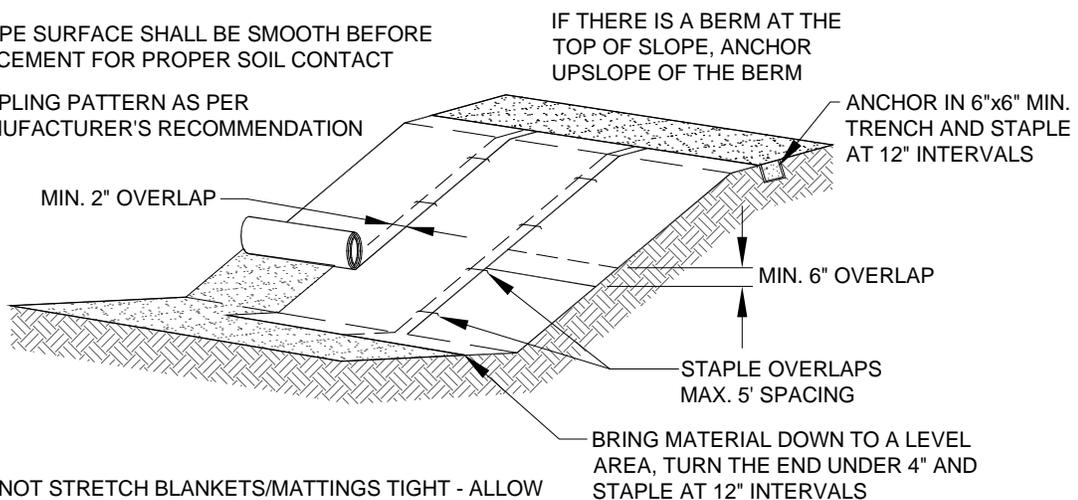


FIGURE D.2.1.2.C SLOPE INSTALLATION

SLOPE SURFACE SHALL BE SMOOTH BEFORE PLACEMENT FOR PROPER SOIL CONTACT

STAPLING PATTERN AS PER MANUFACTURER'S RECOMMENDATION



DO NOT STRETCH BLANKETS/MATTINGS TIGHT - ALLOW THE ROLLS TO MOLD TO ANY IRREGULARITIES

FOR SLOPES LESS THAN 3H:1V, ROLLS MAY BE PLACED IN HORIZONTAL STRIPS

IF THERE IS A BERM AT THE TOP OF SLOPE, ANCHOR UPSLOPE OF THE BERM

ANCHOR IN 6"x6" MIN. TRENCH AND STAPLE AT 12" INTERVALS

LIME, FERTILIZE AND SEED BEFORE INSTALLATION. PLANTING OF SHRUBS, TREES, ETC. SHOULD OCCUR AFTER INSTALLATION

D.2.1.2.4 PLASTIC COVERING

Code: PC

Symbol:

**Purpose**

Plastic covering provides immediate, short-term erosion protection to slopes and disturbed areas.

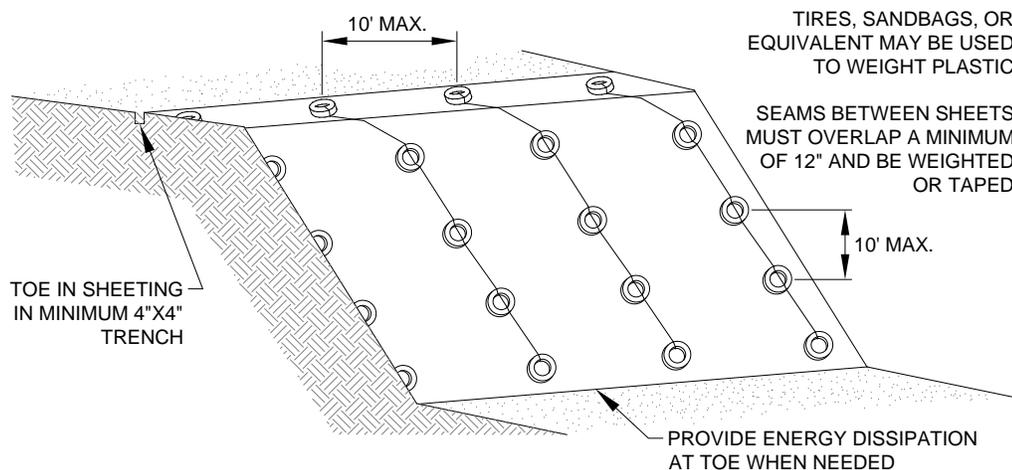
Conditions of Use

1. Plastic covering may be used on disturbed areas that require cover measures for less than 30 days.
2. Plastic is particularly useful for protecting cut and fill slopes and stockpiles. *Note: The relatively rapid breakdown of most polyethylene sheeting makes it unsuitable for long-term applications.*
3. Clear plastic sheeting may be used over newly-seeded areas to create a greenhouse effect and encourage grass growth. Clear plastic should not be used for this purpose during the summer months because the resulting high temperatures can kill the grass.
4. Due to rapid runoff caused by plastic sheeting, this method shall not be used upslope of areas that might be adversely impacted by concentrated runoff. Such areas include steep and/or unstable slopes.

Note: There have been many problems with plastic, usually attributable to poor installation and maintenance. However, the material itself can cause problems, even when correctly installed and maintained, because it generates high-velocity runoff and breaks down quickly due to ultraviolet radiation. In addition, if the plastic is not completely removed, it can clog drainage system inlets and outlets. It is highly recommended that alternatives to plastic sheeting be used whenever possible and that its use be limited.

Design and Installation Specifications

1. See Figure D.2.1.2.D for details.
2. Plastic sheeting shall have a minimum thickness of 0.06 millimeters.
3. If erosion at the toe of a slope is likely, a gravel berm, riprap, or other suitable protection shall be installed at the toe of the slope in order to reduce the velocity of runoff.

FIGURE D.2.1.2.D PLASTIC COVERING

Maintenance Standards for Plastic Covering

1. Torn sheets must be replaced and open seams repaired.
2. If the plastic begins to deteriorate due to ultraviolet radiation, it must be completely removed and replaced.
3. When the plastic is no longer needed, it shall be completely removed.

D.2.1.2.5 STRAW WATTLES

Code: SW

Symbol:



Purpose

Wattles are erosion and sediment control barriers consisting of straw wrapped in biodegradable tubular plastic or similar encasing material. Wattles may reduce the velocity and can spread the flow of rill and sheet runoff, and can capture and retain sediment. Straw wattles are typically 8 to 10 inches in diameter and 25 to 30 feet in length. The wattles are placed in shallow trenches and staked along the contour of disturbed or newly constructed slopes.

Conditions of Use

1. Install on disturbed areas that require immediate erosion protection.
2. Use on slopes requiring stabilization until permanent vegetation can be established.
3. Can be used along the perimeter of a project, as a check dam in unlined ditches and around temporary stockpiles
4. Wattles can be staked to the ground using willow cuttings for added revegetation.
5. Rilling can occur beneath and between wattles if not properly entrenched, allowing water to pass below and between wattles

Design and Installation Specifications

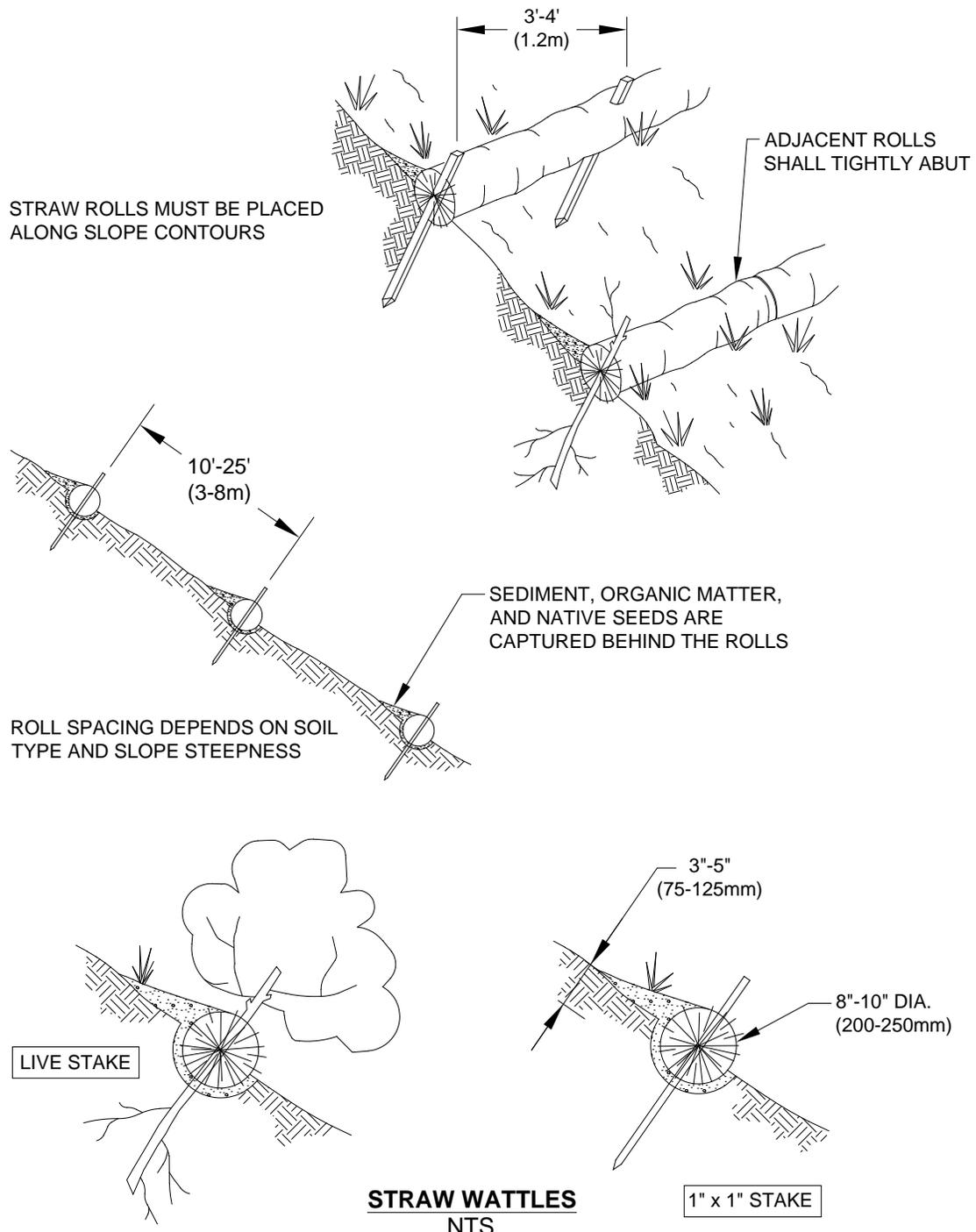
1. It is critical that wattles are installed perpendicular to the flow direction and parallel to the slope contour.
2. Narrow trenches should be dug across the slope, on contour, to a depth of 3 to 5 inches on clay soils and soils with gradual slopes. On loose soils, steep slopes, and during high rainfall events, the trenches should be dug to a depth of 5 to 7 inches, or $\frac{1}{2}$ to $\frac{2}{3}$ of the thickness of the wattle.
3. Start construction of trenches and installing wattles from the base of the slope and work uphill. Excavated material should be spread evenly along the uphill slope and compacted using hand tamping or other method. Construct trenches at contour intervals of 3 to 30 feet apart depending on the steepness of the slope, soil type, and rainfall. The steeper the slope the closer together the trenches should be constructed.
4. Install the wattles snugly into the trenches and abut tightly end to end. Do not overlap the ends.
5. Install stakes at each end of the wattle, and at 4 foot centers along the entire length of the wattle.
6. If required, install pilot holes for the stakes using a straight bar to drive holes through the wattle and into the soil.
7. At a minimum, wooden stakes should be approximately $\frac{3}{4}$ x $\frac{3}{4}$ x 24 inches. Willow cuttings or $\frac{3}{8}$ inch rebar can also be used for stakes.

8. Stakes should be driven through the middle of the wattle, leaving 2 to 3 inches of the stake protruding above the wattle.

Maintenance Standards

1. Inspect wattles prior to forecasted rain, daily during extended rain events, after rain events, weekly during the wet season, and at two week intervals at all other times of the year.
2. Repair or replace split, torn, raveling, or slumping wattles
3. Remove sediment accumulations when exceeding $\frac{1}{2}$ the height between the top of the wattle and the ground surface.

FIGURE D.2.1.2.E STRAW WATTLES



NOTES:

1. STRAW ROLL INSTALLATION REQUIRES THE PLACEMENT AND SECURE STAKING OF THE ROLL IN A TRENCH, 3" x 5" (75-125mm) DEEP, DUG ON CONTOUR.
2. RUNOFF MUST NOT BE ALLOWED TO RUN UNDER OR AROUND ROLL.

D.2.1.2.6 TEMPORARY AND PERMANENT SEEDING

Code: SE

Symbol:

**Purpose**

Seeding is intended to reduce erosion by stabilizing exposed soils. A well-established vegetative cover is one of the most effective methods of reducing erosion.

Conditions of Use

1. Seeding shall be used throughout the project on **disturbed areas** that have reached final grade or that will remain unworked for more than 30 days.
2. **Vegetation-lined channels** shall be seeded. Channels that will be vegetated should be installed before major earthwork and hydroseeded or covered with a Bonded Fiber Matrix (BFM).
3. **Retention/detention ponds** shall be seeded as required.
4. At the County's discretion, seeding without mulch during the **dry season** is allowed even though it will take more than seven days to develop an effective cover. Mulch is, however, recommended at all times because it protects seeds from heat, moisture loss, and transport due to runoff.
5. At the beginning of the **wet season**, all disturbed areas shall be reviewed to identify which ones can be seeded in preparation for the winter rains (see Section D.2.4.2). Disturbed areas shall be seeded within one week of the beginning of the wet season. A sketch map of those areas to be seeded and those areas to remain uncovered shall be submitted to the DPER inspector. The DPER inspector may require seeding of additional areas in order to protect surface waters, adjacent properties, or drainage facilities.
6. At final site stabilization, all disturbed areas not otherwise vegetated or stabilized shall be seeded and mulched (see Section D.2.4.5).

Design and Installation Specifications

1. The best **time to seed** is April 1 through June 30, and September 1 through October 15. Areas may be seeded between July 1 and August 31, but irrigation may be required in order to grow adequate cover. Areas may also be seeded during the winter months, but it may take several months to develop a dense groundcover due to cold temperatures. The application and maintenance of mulch is critical for winter seeding.
2. To prevent seed from being washed away, confirm that **all required surface water control measures** have been installed.
3. The **seedbed** should be firm but not compacted because soils that are well compacted will not vegetate as quickly or thoroughly. Slopes steeper than 3H:1V shall be surface roughened. Roughening can be accomplished in a variety of ways, but the typical method is track walking, or driving a crawling tractor up and down the slope, leaving cleat imprints parallel to the slope contours.
4. In general, 10-20-20 N-P-K (nitrogen-phosphorus-potassium) **fertilizer** may be used at a rate of 90 pounds per acre. Slow-release fertilizers are preferred because they are more efficient and have fewer environmental impacts. It is recommended that areas being seeded for final landscaping conduct soil tests to determine the exact type and quantity of fertilizer needed. This will prevent the over-application of fertilizer. Disturbed areas within 200 feet of water bodies and wetlands must use slow-release low-phosphorus fertilizer (typical proportions 3-1-2 N-P-K).
5. The following requirements apply to **mulching**:
 - a) Mulch is always required for seeding slopes greater than 3H:1V (see Section D.2.1.2.2).

- b) If seeding during the wet season, mulch is required.
- c) The use of mulch may be required during the dry season at the County's discretion if grass growth is expected to be slow, the soils are highly erodible due to soil type or gradient, there is a water body close to the disturbed area, or significant precipitation (see Section D.2.4.2) is anticipated before the grass will provide effective cover.
- d) Mulch may be applied on top of the seed or simultaneously by hydroseeding.
6. **Hydroseeding** is allowed as long as tackifier is included. Hydroseeding with wood fiber mulch is adequate during the dry season. During the wet season, the application rate shall be doubled because the mulch and tackifier used in hydroseeding break down fairly rapidly. It may be necessary in some applications to include straw with the wood fiber, but this can be detrimental to germination.
7. Areas to be permanently landscaped shall use **soil amendments**. Good quality topsoil shall be tilled into the top six inches to reduce the need for fertilizer and improve the overall soil quality. Most native soils will require the addition of four inches of well-rotted compost to be tilled into the soil to provide a good quality topsoil. Compost used should meet specifications provided in Reference 11-C of the *SWDM*.
8. The **seed mixes** listed below include recommended mixes for both temporary and permanent seeding. These mixes, with the exception of the wetland mix, shall be applied at a rate of 120 pounds per acre. This rate may be reduced if soil amendments or slow-release fertilizers are used. Local suppliers should be consulted for their recommendations because the appropriate mix depends on a variety of factors, including exposure, soil type, slope, and expected foot traffic. Alternative seed mixes approved by the County may be used.

Table D.2.1.2.B presents the standard mix for those areas where just a temporary vegetative cover is required.

TABLE D.2.1.2.B TEMPORARY EROSION CONTROL SEED MIX			
	% Weight	% Purity	% Germination
Chewings or red fescue <i>Festuca rubra</i> var. <i>commutata</i> or <i>Festuca rubra</i>	40	98	90
Annual or perennial rye <i>Lolium multiflorum</i> or <i>Lolium perenne</i>	40	98	90
Redtop or colonial bentgrass <i>Agrostis alba</i> or <i>Agrostis tenuis</i>	10	92	85
White dutch clover <i>Trifolium repens</i>	10	98	90

Table D.2.1.2.C provides just one recommended possibility for landscaping seed.

TABLE D.2.1.2.C LANDSCAPING SEED MIX			
	% Weight	% Purity	% Germination
Perennial rye blend <i>Lolium perenne</i>	70	98	90
Chewings and red fescue blend <i>Festuca rubra</i> var. <i>commutata</i> or <i>Festuca rubra</i>	30	98	90

This turf seed mix in Table D.2.1.2.D is for dry situations where there is no need for much water. The advantage is that this mix requires very little maintenance.

TABLE D.2.1.2.D LOW-GROWING TURF SEED MIX			
	% Weight	% Purity	% Germination
Dwarf tall fescue (several varieties) <i>Festuca arundinacea</i> var.	45	98	90
Dwarf perennial rye (Barclay) <i>Lolium perenne</i> var. <i>barclay</i>	30	98	90
Red fescue <i>Festuca rubra</i>	20	98	90
Colonial bentgrass <i>Agrostis tenuis</i>	5	98	90

Table D.2.1.2.E presents a mix recommended for bioswales and other intermittently wet areas. Sod shall generally not be used for bioswales because the seed mix is inappropriate for this application. Sod may be used for lining ditches to prevent erosion, but it will provide little water quality benefit during the wet season.

TABLE D.2.1.2.E BIOSWALE SEED MIX*			
	% Weight	% Purity	% Germination
Tall or meadow fescue <i>Festuca arundinacea</i> or <i>Festuca elatior</i>	75-80	98	90
Seaside/Creeping bentgrass <i>Agrostis palustris</i>	10-15	92	85
Redtop bentgrass <i>Agrostis alba</i> or <i>Agrostis gigantea</i>	5-10	90	80
* Modified Briargreen, Inc. Hydroseeding Guide Wetlands Seed Mix			

The seed mix shown in Table D.2.1.2.F is a recommended low-growing, relatively non-invasive seed mix appropriate for very wet areas that are not regulated wetlands (if planting in wetland areas, see Section 6.3.1 of the King County *Surface Water Design Manual*). Other mixes may be appropriate, depending on the soil type and hydrology of the area. Apply this mixture at a rate of 60 pounds per acre.

TABLE D.2.1.2.F WET AREA SEED MIX*			
	% Weight	% Purity	% Germination
Tall or meadow fescue <i>Festuca arundinacea</i> or <i>Festuca elatior</i>	60-70	98	90
Seaside/Creeping bentgrass <i>Agrostis palustris</i>	10-15	98	85
Meadow foxtail <i>Alepocurus pratensis</i>	10-15	90	80
Alsike clover <i>Trifolium hybridum</i>	1-6	98	90
Redtop bentgrass <i>Agrostis alba</i>	1-6	92	85
* Modified Briargreen, Inc. Hydroseeding Guide Wetlands Seed Mix			

The meadow seed mix in Table D.2.1.2.G is recommended for areas that will be maintained infrequently or not at all and where colonization by native plants is desirable. Likely applications include rural road and utility right-of-way. Seeding should take place in September or very early October in order to obtain adequate establishment prior to the winter months. The appropriateness of clover in the mix may need to be considered as this can be a fairly invasive species. If the soil is amended, the addition of clover may not be necessary.

TABLE D.2.1.2.G MEADOW SEED MIX			
	% Weight	% Purity	% Germination
Redtop or Oregon bentgrass <i>Agrostis alba</i> or <i>Agrostis oregonensis</i>	40	92	85
Red fescue <i>Festuca rubra</i>	40	98	90
White dutch clover <i>Trifolium repens</i>	20	98	90

Maintenance Standards for Temporary and Permanent Seeding

1. Any seeded areas that fail to establish at least 80 percent cover within one month shall be reseeded. If reseeding is ineffective, an alternate method, such as sodding or nets/blankets, shall be used. If winter weather prevents adequate grass growth, this time limit may be relaxed at the discretion of the County when critical areas would otherwise be protected.

D.2.1.3 PERIMETER PROTECTION

Perimeter protection to filter sediment from sheetwash shall be located downslope of all disturbed areas and shall be installed prior to upslope grading. Perimeter protection includes the use of vegetated strips as well as, constructed measures, such as silt fences, fiber rolls, sand/gravel barriers, brush or rock filters, triangular silt dikes and other methods. During the wet season, 50 linear feet of silt fence (and the necessary stakes) per acre of disturbed area must be stockpiled on site.

Purpose: The purpose of perimeter protection is to reduce the amount of sediment transported beyond the disturbed areas of the construction site. Perimeter protection is primarily a backup means of sediment control. Most, if not all, sediment-laden water is to be treated in a sediment trap or pond. The only circumstances in which perimeter control is to be used as a primary means of sediment removal is when the catchment is very small (see below).

When to Install: Perimeter protection is to be installed prior to any upslope clearing and grading.

Measures to Use: The above measures may be used interchangeably and are not the only perimeter protection measures available. If surface water is collected by an interceptor dike or swale and routed to a sediment pond or trap, there may be no need for the perimeter protection measures specified in this section.

Criteria for Use as Primary Treatment: At the boundary of a site, perimeter protection may be used as the sole form of treatment when the flowpath meets the criteria listed below. If these criteria are not met, perimeter protection shall only be used as a backup to a sediment trap or pond.

Average Slope	Slope Percent	Flowpath Length
1.5H:1V or less	67% or less	100 feet
2H:1V or less	50% or less	115 feet
4H:1V or less	25% or less	150 feet
6H:1V or less	16.7% or less	200 feet
10H:1V or less	10% or less	250 feet

D.2.1.3.1 SILT FENCE

Code: SF

Symbol: 

Purpose

Use of a silt fence reduces the transport of coarse sediment from a construction site by providing a temporary physical barrier to sediment and reducing the runoff velocities of overland flow.

Conditions of Use

1. Silt fence may be used downslope of all disturbed areas.
2. Silt fence is not intended to treat concentrated flows, nor is it intended to treat substantial amounts of overland flow. Any concentrated flows must be conveyed through the drainage system to a sediment trap or pond. The only circumstance in which overland flow may be treated solely by a silt fence, rather than by a sediment trap or pond, is when the area draining to the fence is small (see "**Criteria for Use as Primary Treatment**" in Section D.2.1.3 above).

Design and Installation Specifications

1. See Figure D.2.1.3.A and Figure D.2.1.3.B for details.

- The geotextile used must meet the standards listed below. A copy of the manufacturer's fabric specifications must be available on site.

AOS (ASTM D4751)	30-100 sieve size (0.60-0.15 mm) for slit film 50-100 sieve size (0.30-0.15 mm) for other fabrics
Water Permittivity (ASTM D4491)	0.02 sec ⁻¹ minimum
Grab Tensile Strength (ASTM D4632) (see Specification Note 3)	180 lbs. min. for extra strength fabric 100 lbs. min. for standard strength fabric
Grab Tensile Elongation (ASTM D4632)	30% max. (woven)
Ultraviolet Resistance (ASTM D4355)	70% min.

- Standard strength fabric requires wire backing to increase the strength of the fence. Wire backing or closer post spacing may be required for extra strength fabric if field performance warrants a stronger fence.
- Where the fence is installed, the slope shall be no steeper than 2H:1V.
- If a typical silt fence (per Figure D.2.1.3.A) is used, the standard 4 x 4 trench may not be reduced as long as the bottom 8 inches of the silt fence is well buried and secured in a trench that stabilizes the fence and does not allow water to bypass or undermine the silt fence.

Maintenance Standards

- Any damage shall be repaired immediately.
- If concentrated flows are evident uphill of the fence, they must be intercepted and conveyed to a sediment trap or pond.
- It is important to check the uphill side of the fence for signs of the fence clogging and acting as a barrier to flow and then causing channelization of flows parallel to the fence. If this occurs, replace the fence or remove the trapped sediment.
- Sediment must be removed when the sediment is 6 inches high.
- If the filter fabric (geotextile) has deteriorated due to ultraviolet breakdown, it shall be replaced.

FIGURE D.2.1.3.A SILT FENCE

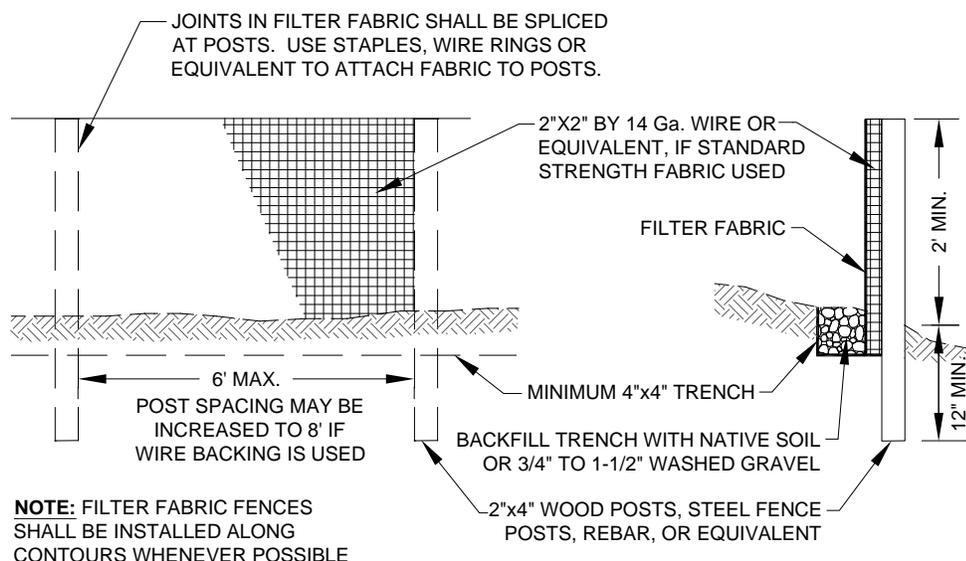
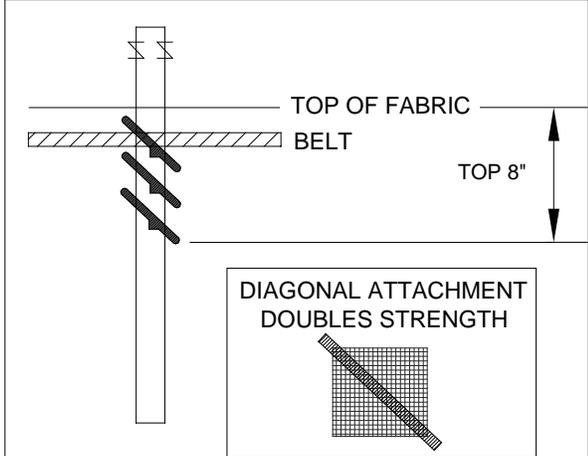
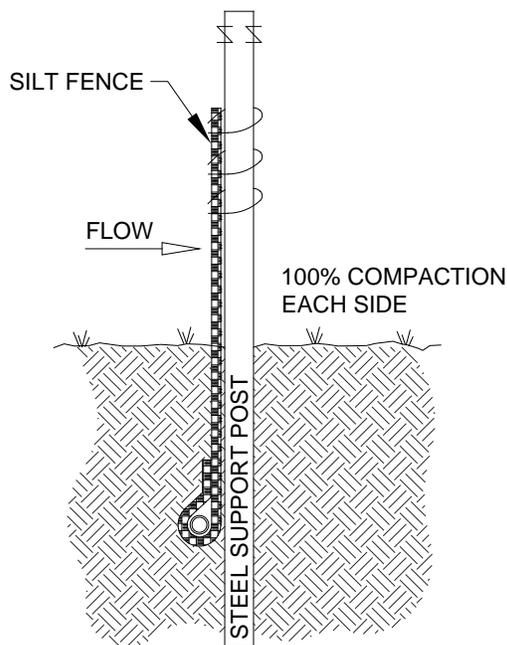


FIGURE D.2.1.3.B SILT FENCE INSTALLATION BY SLICING

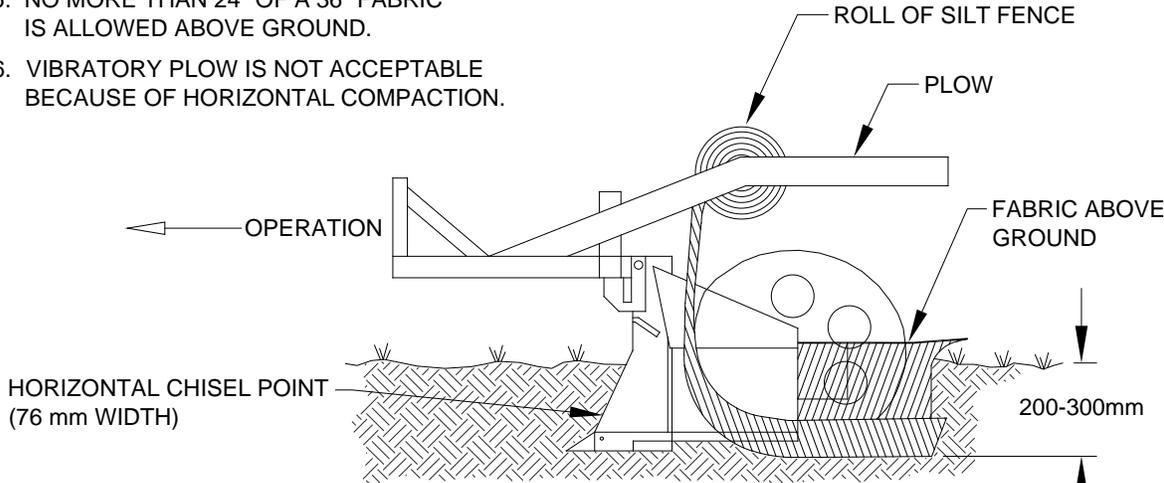


ATTACHMENT DETAILS:

1. GATHER FABRIC AT POSTS, IF NEEDED.
2. UTILIZE THREE TIES PER POST, ALL WITHIN TOP 8" OF FABRIC.
3. POSITION EACH TIE DIAGONALLY, PUNCTURING HOLES VERTICALLY A MINIMUM OF 1" APART.
4. HANG EACH TIE ON A POST NIPPLE AND TIGHTEN SECURELY. USE CABLE TIES (50 LBS) OF SOFT WIRE.

NOTES:

1. POST SPACING: 7' MAX. ON OPEN RUNS 4' MAX. ON POOLING AREAS.
2. POST DEPTH: AS MUCH BELOW GROUND AS FABRIC ABOVE GROUND.
3. PONDING HEIGHT MAX. 24" ATTACH FABRIC TO UPSTREAM SIDE OF POST.
4. DRIVE OVER EACH SIDE OF SILT FENCE 2 TO 4 TIMES WITH DEVICE EXERTING 60 P.S.I. OR GREATER.
5. NO MORE THAN 24" OF A 36" FABRIC IS ALLOWED ABOVE GROUND.
6. VIBRATORY PLOW IS NOT ACCEPTABLE BECAUSE OF HORIZONTAL COMPACTION.

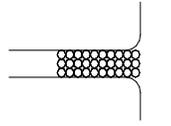


SILT FENCE INSTALLATION BY SLICING METHOD
NTS

D.2.1.4.1 STABILIZED CONSTRUCTION ENTRANCE

Code: CE

Symbol:

**Purpose**

Construction entrances are stabilized to reduce the amount of sediment transported onto paved roads by motor vehicles or runoff by constructing a stabilized pad of quarry spalls at entrances to construction sites.

Conditions of Use

Construction entrances shall be stabilized wherever traffic will be leaving a construction site and traveling on paved roads or other paved areas within 1,000 feet of the site. Access and exits shall be limited to one route if possible, or two for linear projects such as roadway where more than one access/exit is necessary for maneuvering large equipment.

For residential construction provide stabilized construction entrances for each residence in addition to the main subdivision entrance. Stabilized surfaces shall be of sufficient length/width to provide vehicle access/parking, based on lot size/configuration.

Design and Installation Specifications

1. See Figure D.2.1.4.A for details.
2. A separation geotextile shall be placed under the spalls to prevent fine sediment from pumping up into the rock pad. The geotextile shall meet the following standards:

Grab Tensile Strength (ASTM D4632)	200 lbs min.
Grab Tensile Elongation (ASTM D4632)	30% max.(woven)
Puncture Strength (ASTM D6241)	495 lbs min.
AOS (ASTM D4751)	20-45 (U.S. standard sieve size)

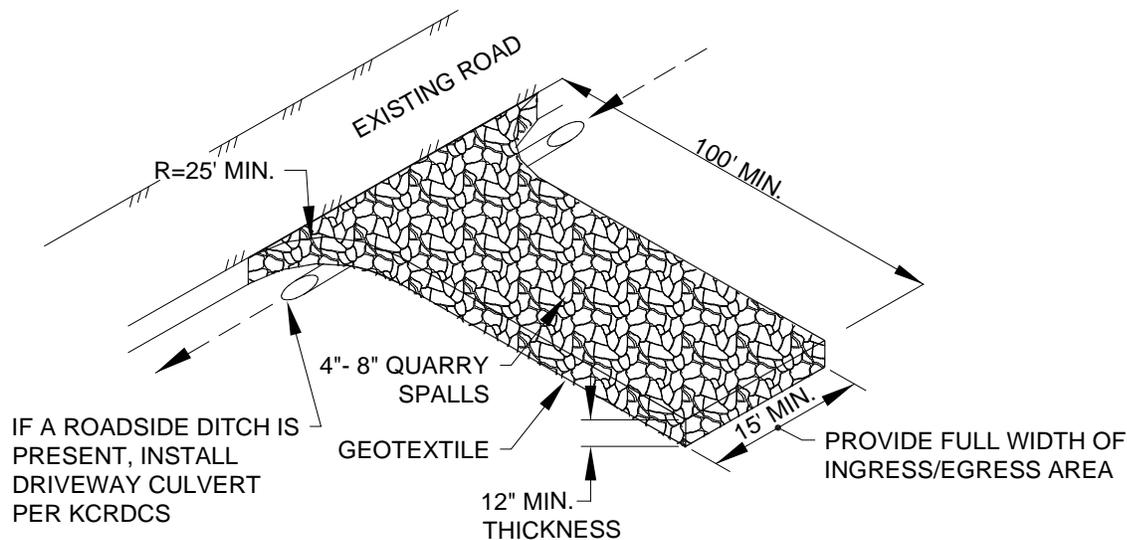
3. Do not use crushed concrete, cement, or calcium chloride for construction entrance stabilization because these products raise pH levels in stormwater and concrete discharge to surface waters of the State is prohibited.
4. Hog fuel (wood based mulch) may be substituted for or combined with quarry spalls in areas that will not be used for permanent roads. The effectiveness of hog fuel is highly variable, but it has been used successfully on many sites. It generally requires more maintenance than quarry spalls. Hog fuel is not recommended for entrance stabilization in urban areas. The inspector may at any time require the use of quarry spalls if the hog fuel is not preventing sediment from being tracked onto pavement or if the hog fuel is being carried onto pavement. Hog fuel is prohibited in permanent roadbeds because organics in the subgrade soils cause difficulties with compaction.
5. Fencing (see Section D.2.1.1) shall be installed as necessary to restrict traffic to the construction entrance.
6. Whenever possible, the entrance shall be constructed on a firm, compacted subgrade. This can substantially increase the effectiveness of the pad and reduce the need for maintenance.

Maintenance Standards

1. Quarry spalls (or hog fuel) shall be added if the pad is no longer in accordance with the specifications.

2. If the entrance is not preventing sediment from being tracked onto pavement, then alternative measures to keep the streets free of sediment shall be used. This may include street sweeping, an increase in the dimensions of the entrance, or the installation of a wheel wash. If washing is used, it shall be done on an area covered with crushed rock, and wash water shall drain to a sediment trap or pond.
3. Any sediment that is tracked onto pavement shall be removed immediately by sweeping. The sediment collected by sweeping shall be removed or stabilized on site. The pavement shall not be cleaned by washing down the street, except when sweeping is ineffective and there is a threat to public safety. If it is necessary to wash the streets, a small sump must be constructed. The sediment would then be washed into the sump where it can be controlled. Wash water must be pumped back onto the *site* and cannot discharge to systems tributary to surface waters.
4. Any quarry spalls that are loosened from the pad and end up on the roadway shall be removed immediately.
5. If vehicles are entering or exiting the site at points other than the construction entrance(s), fencing (see Section D.2.1.1) shall be installed to control traffic.

FIGURE D.2.1.4.A STABILIZED CONSTRUCTION ENTRANCE



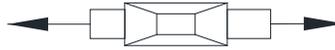
NOTES:

- PER KING COUNTY ROAD DESIGN AND CONSTRUCTION STANDARDS (KCRDCS), DRIVEWAYS SHALL BE PAVED TO EDGE OF R-O-W PRIOR TO INSTALLATION OF THE CONSTRUCTION ENTRANCE TO AVOID DAMAGING OF THE ROADWAY.
- IT IS RECOMMENDED THAT THE ENTRANCE BE CROWNED SO THAT RUNOFF DRAINS OFF THE PAD.

D.2.1.4.3 WHEEL WASH

Code: WW

Symbol:



Purpose

Wheel wash systems reduce the amount of sediment transported onto paved roadways and into surface water systems by construction vehicles.

Conditions of Use

When a stabilized construction entrance is not preventing sediment from being tracked onto pavement:

- Wheel washing is generally an effective erosion and sediment control method and BMP when installed with careful attention to topography. For example, a wheel wash can be detrimental if installed at the top of a slope abutting a right-of-way where the water from the dripping truck wheels and undercarriage can run unimpeded into the street.
- Pressure washing combined with an adequately sized and properly surfaced wash pad with direct drainage discharge to a large 10 foot x 10-foot sump can be very effective.

Design and Installation Specifications

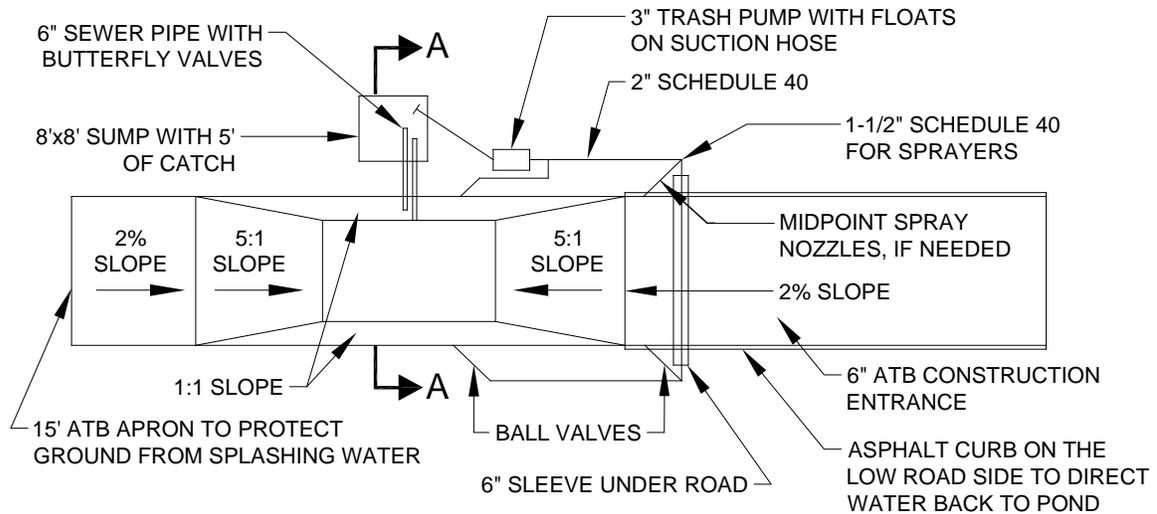
A suggested detail is shown in Figure D.2.1.4.B.

1. A minimum of 6 inches of asphalt treated base (ATB) over crushed base material or 8 inches over a good subgrade is recommended to pave the wheel wash area.
2. Use a low clearance truck to test the wheel wash before paving. Either a belly dump or lowboy will work well to test clearance.
3. Keep the water level from 12 to 14 inches deep to avoid damage to truck hubs and filling the truck tongues with water.
4. Midpoint spray nozzles are only needed in very muddy conditions.
5. Wheel wash systems should be designed with a small grade change, 6 to 12 inches for a 10-foot wide pond, to allow sediment to flow to the low side of the pond and to help prevent re-suspension of sediment.
6. A drainpipe with a 2 to 3 foot riser should be installed on the low side of the wheel wash pond to allow for easy cleaning and refilling. Polymers may be used to promote coagulation and flocculation in a closed-loop system.
7. Polyacrylamide (PAM) added to the wheel washwater at a rate of 0.25 – 0.5 pounds per 1,000 gallons of water increases effectiveness and reduces cleanup time. If PAM is already being used for dust or erosion control and is being applied by a water truck, the same truck may be used to change the washwater.

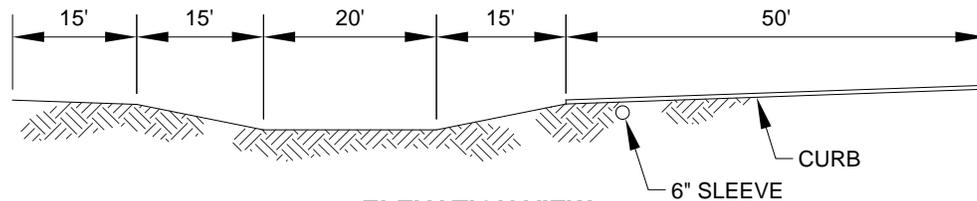
Maintenance Standards

1. The wheel wash should start out each day with clean, fresh water.
2. The washwater should be changed a minimum of once per day. On large earthwork jobs where more than 10-20 trucks per hour are expected, the washwater will need to be changed more often.
3. Wheel wash or tire bath wastewater shall be discharged to a separate on-site treatment system, such as a closed-loop recirculation system or land application, or to the sanitary sewer system with proper local sewer district approval or permits.

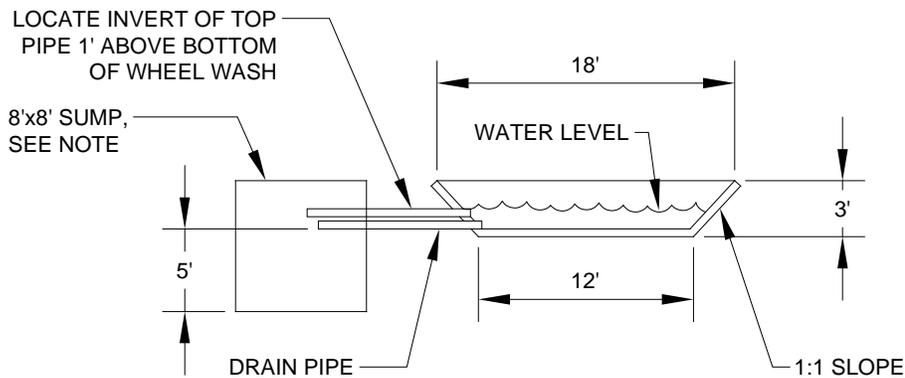
FIGURE D.2.1.4.B WHEEL WASH AND PAVED CONSTRUCTION ENTRANCE



PLAN VIEW
NTS



ELEVATION VIEW
NTS



NOTE:
BUILD 8'x8' SUMP TO ACCOMMODATE
CLEANING BY TRACKHOE.

SECTION A-A
NTS

D.2.1.8 DUST CONTROL

Preventative measures to minimize the wind transport of soil shall be taken when a traffic hazard may be created or when sediment transported by wind is likely to be deposited in water resources or adjacent properties.

Purpose: To prevent wind transport of dust from exposed soil surfaces onto roadways, drainage ways, and surface waters.

When to Install: Dust control shall be implemented when exposed soils are dry to the point that wind transport is possible and roadways, drainage ways, or surface waters are likely to be impacted. Dust control measures may consist of chemical, structural, or mechanical methods.

Measures to Install: Water is the most common dust control (or palliative) used in the area. When using water for dust control, the exposed soils shall be sprayed until wet, but runoff shall not be generated by spraying. Calcium chloride, Magnesium chloride, Lignin derivatives, Tree Resin Emulsions, and Synthetic Polymer Emulsions may also be used for dust control. Exposed areas shall be re-sprayed as needed. Oil shall not be used for dust control. The following table lists many common dust control measures. Some of the measures are not recommended for use in King County and must have prior approval prior to use from the DPER inspector assigned to specific projects.