STORMWATER POLLUTION PREVENTION PLAN

Designed in accordance with the Missouri State Operating Permit

MCPL East Lee's Summit Branch

Permit Tracking # MORA13270

Owner/Operator:

Mid-Continent Public Library
5616 E US Hwy 24
Independence, MO 64050

Prepared by:

Olsson
7301 W 133rd Street, Suite 200
Overland Park, KS 66213
913.381.1170

February 2019

SWPPP Certification (to be signed by permittee):

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Name: _____ Title: _____

Signature: _____ Date: _____

olsson

TABLE OF CONTENTS

SECTION 1

Delegation Statements & Contractor Certifications

Delegation Statement(s) for applicable personnel should be kept in this section. Contractor Certification Statements that contain contact information for those responsible for specific activities on the project should also be kept here.

Delegation of Authority

I,_____, hereby designate the person(s) or specifically described position(s) below to be a duly authorized representative(s) for the purpose of overseeing compliance with environmental requirements, including the Missouri State Operating Permit, at Project Name.

Duly Authorized Representative:

Name or Position: _____

Company: _____

Address: _____

Phone: _____

Email: _____

By signing the certification below, I certify that I meet the signing requirements J.5.a of the Missouri State Operating Permit, 40 CFR 122.22 and 10 CSR 20-6.010 for this project.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Permittee Name: _____

Company: _____

Title: _____

Signature: _____

Date: _____

Contractor/Subcontractor Certification

Project Name: _____

Permit Number: _____

Project Owner: _____

As a contractor/subcontractor, you are required to comply with the Stormwater Pollution Prevention Plan (SWPPP) for any work that you perform on-site. Any person or group who violates any condition of the SWPPP may be subject to substantial penalties or loss of contract. You are encouraged to advise each of your employees working on this project of the requirements of the SWPPP. A copy of the SWPPP is available for your review upon request.

Each subcontractor engaged in activities at the construction site that could impact stormwater should be identified and sign the following certification statement:

I certify under the penalty of law that I have read and understand the terms and conditions of the SWPPP for the above designated project and agree to follow the practices described in the SWPPP.

This certification is hereby signed in reference to the project named above:

Service Provided: _____

Company Name: _____

Address: _____

_____

Telephone: _____

Representative: _____

Title: _____

Signature: _____

Date: _____

SECTION 2

Permit Authorization & Missouri State Operating Permit

Permit authorization from the MDNR and a copy of the Missouri State Operating Permit will be kept in this section.

The Application for Land Disturbance Stormwater General Permit was completed through the Missouri Gateway for Environmental Management at https://dnr.mo.gov/mogem/.

SECTION 3

SWPPP Narrative

SWPPP NARRATIVE CONTENTS

1.0. PROJECT CONTACT INFORMATION

Parties directly related to the compliance of the site are listed below. Any blank contacts were not known at the time of SWPPP creation and should be filled in when contractors are assigned.

Owner/Operator

Mid Continent Public Library
Jacob Wimmer
15616 East 24 Highway
Independence, MO 64050
816-836-5200
jwimmer@mymcpl.org

General Contractor

JE Dunn
Bobby Miller
1001 Locust Street
Kansas City, MO 64106
816-283-9056
Bobby.Miller@jedunn.com

SWPPP Preparer

Olsson Associates
Terry M. Parsons
7301 W. 133rd Street, Ste 200
Overland Park, KS 66213
913-634-0903
tparsons@olsson.com

SWPPP Inspections

Company Name
Contact Name
Address
City, State Zip Code
Phone
Email

Best Management Practices (BMP) Installation

Company Name
Contact Name
Address
City, State Zip Code
Phone
Email

BMP Maintenance

Company Name
Contact Name
Address
City, State Zip Code
Phone
Email

Should any of the above personnel change, tables will be updated and noted on the Amendment Log found in Section 7 and additional Contractor Certification Sheets will be added to Section 1 of this SWPPP.

2.0. INTRODUCTION AND DEFINITIONS

This document was created to comply with the Missouri State Operating Permit (MO-RA) in compliance with the Missouri Clean Water Law (Chapter 644 R.S. Mo. as amended) and the Federal Water Pollution Control Act (Public Law 92-500, 92nd Congress). Relevant local ordinances are incorporated in Section 8 of this SWPPP. Permit language incorporated into this document will be denoted by *italics*.

The purpose of the SWPPP is to ensure the design, implementation, management, and maintenance of best management practices (BMPs) in order to prevent sediment and other pollutants in stormwater discharges associated with the land disturbance activities; compliance with the Missouri Water Quality Standards; and compliance with the terms and conditions of the general permit.

2.1. ACRONYMS

AST .....aboveground storage tank
BMP .....best management practice
MDNR .....Missouri Department of Natural Resources
ESA.....environmental site assessment
ESC .....erosion and sediment control
MO-RA.....Missouri State Operating Permit
MS4 .....municipal separate storm sewer system
NRC .....National Response Center
REC .....recognized environmental condition
SPCC.....spill prevention control and countermeasures plan
SVOC.....semivolatile organic compound
SWPPP.....stormwater pollution prevention plan
TMDL .....total maximum daily load
TOC .....total organic carbon
VOC .....volatile organic compound

2.2. DEFINITIONS

Department
The Missouri Department of Natural Resources

Duly Authorized Representative
The representative authorized by the permittee. The duly authorized representative is responsible for the overall operation of the facility from which the discharge occurs. The authorization is made in writing by the permittee and is submitted to the director.

Permit

Missouri State Operating Permit (MO-RA)

Signatory Requirements

All permit applications, reports required by the permit, or information requested by the Department shall be signed and certified (MDNR 2017).

- Signatory for a corporation: an individual having responsibility for the overall operation of the regulated facility or activity, such as the plant manager, or by an individual having overall responsibility for environmental matters at the facility.
- Signatory for a partnership or sole proprietorship: a general partner or the proprietor, respectively.
- Signatory for a municipal, state, federal, or other public facility: either a principal executive officer or an individual having overall responsibility for environmental matters at the facility.

Documents submitted to the MDNR should be certified by the following statement:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

3.0. SITE DESCRIPTION

Project Name: Mid Continent Public Library – East Lee's Summit Branch

Project Location: NE Corner of Little Blue Parkway and Battery Drive in Lee's Summit, MO

Total project area: 3.8 acres

Area to be disturbed: 3.6 acres

Anticipated start date: March 2019

Anticipated end date: January 2020

Past use: Undeveloped

Historic Preservation Information: (insert text)

Endangered Species Information: (insert text)

Existing conditions: Undeveloped. Currently the proposed site with turf and some natural vegetation. There is an existing roadside ditch on the south side of the site along Little Blue Parkway and a natural drainage swale to the north.

Description of Construction Activity: Construct a 1 story 18,500 sf public library with associated drives and parking, and detention facility.

Table 1. Anticipated Sequence of Construction.

EROSION CONTROL STAGING CHART				
PROJECT STAGE	EROSION CONTROL BMP REFERENCE NO.	BMP DESCRIPTION	REMOVE AFTER STAGE	NOTES:
A – PRE-CONSTRUCTION	A1	TEMPORARY CONSTRUCTION ENTRANCE	C	INSTALL AS INDICATED ON PLANS
	A2	CONCRETE WASHOUT	C	INSTALL AS INDICATED ON PLANS
	A3	TEMPORARY SLOPE BARRIER (SEDIMENT FENCE)	D	INSTALL AS INDICATED ON PLANS
	A4	STAGING / STOCKPILE AREA	C	INSTALL AS INDICATED ON PLANS
	A5	EXISTING CURB INLET PROTECTION – TEMPORARY SEDIMENT BARRIER – CONDITION A	C	INSTALL AS INDICATED ON PLANS
	A6	TEMPORARY SEDIMENT TRAP	C	INSTALL AS INDICATED ON PLANS
	A7	TEMPORARY DIVERSION BERM	C	INSTALL AS INDICATED ON PLANS
B – STORM SEWER & UTILITY CONSTRUCTION (STABILIZE ANY DISTURBED ARES OUTSIDE OF BUILDING PADS AND PARKING LOTS)	B1	TEMPORARY SEDIMENT BARRIER – CURB INLET – CONDITION A	C	INSTALL AS INDICATED ON PLANS
	B2	TEMPORARY SEDIMENT BARRIER – JUNCTION BOX – CONDITION A	C	INSTALL AS INDICATED ON PLANS
	B3	TEMPORARY EROSION CONTROL BLANKET (LANDLOK S2)	C	INSTALL AS INDICATED ON PLANS
C – BUILDING AND PAVEMENT CONSTRUCTION	C1	TEMPORARY SEDIMENT BARRIER – CURB INLET – CONDITION B	D	INSTALL AS INDICATED ON PLANS
	C2	TEMPORARY SEDIMENT BARRIER – JUNCTION BOX – CONDITION B	D	INSTALL AS INDICATED ON PLANS
D – FINAL STABILIZATION	D1	REPLACE TOP SOIL, SEED MULCH, SOD, LANDSCAPE	N/A	ESTABLISH PERENNIAL VEGETATION WITH A 70% DENSITY OVER 100% OF DISTURBED AREA.

Location of nearby or on-site surface waters: Roadside ditch on south side of site.

Table 2. Outfalls.

#	Type	Location	Drainage Area
1	Natural Swale to Curb Inlet	NW corner of property	3.6 Acres
2	Existing roadside ditch	Southern edge of property	0.2 Acres

Receiving Waters: East Fork of the Little Blue River

4.0. EROSION AND SEDIMENT CONTROLS

Temporary BMPs used during active construction of the project will be listed below. Specific erosion and sediment control requirements found in the permit are also located here and should be addressed in the erosion and sediment control (ESC) plan sheets located in Section 5 of this SWPPP.

Table 3. Anticipated BMPs.

BMP	
Site Preparation	
SWPPP Sign	☒
Construction exit	☒
Wash rack	☒
Temporary stream crossing	☐
Surface roughening	☐
Tree protection	☒
Erosion Control	
Dust control	☒
Mulch	☒
Erosion control blankets	☐
Temporary seeding	☒
Permanent seeding	☒
Hydroseeding	☐
Sodding	☒
Slope protection	☒

BMP	
Sediment Control	
Silt fence	☒
Inlet protection	☒
Diversion berm	☐
Filter berm	☐
Outlet protection	☒
Check dam	☐
Sediment trap	☒
Sediment basin	☐
Pollution Prevention	
Stockpile	☒
Concrete washout	☒
Solid waste management	☒
Sanitary waste management	☒
Material staging areas	☒
	☐

Specification and detail sheets can be found in Section 6 of this SWPPP.

During construction, if additional BMPs not listed in Table 3 are required, the SWPPP will be amended. The BMP specification and detail sheets of the new BMPs should be added to Section 6 of this SWPPP, the locations noted on the BMP Tracking Map located in Section 5, and the change noted in the Log of Amendments located in Section 7 of this SWPPP.

4.1. EROSION AND SEDIMENT CONTROL DESIGN REQUIREMENTS

ESC plans for the project can be found in Section 5 of this SWPPP. Excerpts of these plans will be used as the basis of the BMP Tracking Map located in Section 5 of this SWPPP.

Ensure the design, installation and maintenance of effective erosion and sediment controls to minimize the discharge of pollutants. At a minimum, such controls must be designed, installed and maintained to:

a. *Control stormwater volume and velocity within the site to minimize soil erosion;*
b. *Control stormwater discharges, including both peak flow rates and total stormwater volume, to minimize erosion at outlets and to minimize downstream channel and stream bank erosion;*
c. *Minimize the amount of soil exposed during construction activity;*
d. *Minimize the disturbance of steep slopes;*
e. *Minimize sediment discharges from the site. Design, install and maintain erosion and sediment controls that address factors such as the amount, frequency, intensity and duration of precipitation, the nature of resulting stormwater runoff, and soil characteristics, including the range of soil particle size expected to be present on the site;*
f. *Provide and maintain natural buffers around surface waters as detailed in 8.f* (of the permit)*, direct stormwater to vegetated areas to increase sediment removal and maximize stormwater infiltration and filtering, unless infeasible; and*
g. *Minimize soil compaction and, unless infeasible, preserve topsoil.*
h. *Capture or treat a 2-year, 24-hour storm event. A 2-year, 24-hour storm event shall be determined for the project location using the National Oceanic and Atmospheric Administration's National Weather Service Atlas 14 which can be located at http://hdsc.nws.noaagov/hdsc/pfds/* (MDNR 2017).

4.2. TREE AND VEGETATION PRESERVATION

Areas where existing trees and vegetation are preserved on-site can be found on the ESC plan sheets located in Section 5 of this SWPPP.

4.3. NATURAL BUFFERS

When applicable, natural buffers will be identified on the ESC plans located in Section 5 of this SWPPP.

For surface waters of the state, defined as "all waters within the jurisdiction of this state, including all rivers, streams, lakes and other bodies of surface and subsurface water lying within or forming a part of the boundaries of the state which are not entirely confined and located completely upon lands owned, leased or otherwise controlled by a single person or by two or more persons jointly or as tenants in common, located on or adjacent to the site, the permittee must:

a. *Provide and maintain a 50-foot undisturbed natural buffer;*

b. *Provide and maintain an undisturbed natural buffer that is less than 50 feet and is supplemented by erosion and sediment controls that achieve the sediment load reduction equivalent to a 50-foot undisturbed natural buffer; or*
c. *If infeasible to provide and maintain an undisturbed natural buffer of any size, implement erosion and sediment controls to achieve the sediment load reduction equivalent to a 50-foot undisturbed natural buffer.*
d. *Where you are retaining a buffer of any size, the buffer should be measured perpendicularly from any of the following points, whichever is further landward from the water:*
    a. *The ordinary high water mark of the water body, defined as the line on the shore established by fluctuations of the water and indicated by physical characteristics such as a clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, and/or the presence of litter and debris; or*
    b. *The edge of the stream or river bank, bluff, or cliff, whichever is applicable* (MDNR 2017).

4.4. STABILIZATION REQUIREMENTS

The permit requires specific stabilization schedules depending on activity level and slope characteristics.

Table 4. Stabilization Requirements.

Situation	Stabilization Requirement
Soil-disturbing activities that have temporarily ceased on any portion of the site and will not resume for more than 14 calendar days.	Construct BMPs to establish interim stabilization; stabilization must be initiated immediately and completed within 14 calendar days. *
Soil-disturbing activities that have permanently ceased.	Final stabilization of disturbed areas must be initiated immediately and completed within 14 calendar days. *
Slopes with a greater than 3:1 ratio or slopes greater than 3% and greater than 150 feet in length.	Establish interim stabilization within 7 days of ceasing operations.

**Allowances to the 14-day completion period for temporary and final stabilization may be made because of weather and equipment malfunctions. The use of the allowances shall be documented in the SWPPP* (MDNR 2017) and can be found in Section 5 of this SWPPP.

5.0. STORMWATER MANAGEMENT CONTROLS

When applicable, permanent stormwater management BMPs will be listed and described here. Design specifications and details can be found in Section 6 of this SWPPP if applicable. These BMPs will remain in place to provide for stormwater management after construction has completed and the permit terminated.

Table 5. Post Construction Stormwater Management BMPs.

Type	Location	Receiving Water	Area Treated
Extended Dry Detention Basin	Northern portion of property	Greenspace, Roof Drains and Parking Lot surface water	3.6 Acres

6.0. POLLUTION PREVENTION AND SPILL REPORTING

Good housekeeping practices shall be maintained at all times to keep waste from entering waters of the state. Below are lists of prohibited discharges, authorized non-stormwater discharges, and potential pollutants that will likely be on-site during construction. Suggested BMPs to help resolve potential discharges from non-stormwater discharges as well as potential pollutants are discussed.

6.1. PROHIBITED DISCHARGES

- *Any hazardous material, oil, lubricant, solid waste or other non-naturally occurring substance from the site, including fuels, oils, or other pollutants used in vehicle and equipment operation and maintenance;*
- *Soaps or solvents used in vehicle and equipment washing;*
- *Hazardous substances or petroleum products from an on-site spill or handling and disposal practices;*
- *Wash and/or rinse waters from concrete mixing equipment including ready mix concrete trucks, unless managed by an appropriate control. Any such pollutants must be adequately treated and addressed in the SWPPP, and cannot be discharged to waters of the state;*
- *Wastewater from washout and cleanout of stucco, paint, form release oils, curing compounds and other construction materials;*
- *Domestic wastewaters, including gray waters; or*
- *Industrial stormwater runoff* (MDNR 2017).

6.2. AUTHORIZED NON-STORMWATER DISCHARGES

The below signified discharges are anticipated to occur on-site.

☒ *De-watering activities if there are no contaminants other than sediment present in discharge, and the discharge is treated as specified in Section C.8.m of the permit*
☒ *Flushing water hydrants and potable water lines*
☒ *Water only (i.e., without detergents and additives) rinsing of streets and buildings*
☒ *Site watering to establish vegetation*

Potential BMPs used for authorized non-stormwater discharges:

<u>Dewatering activities if there are no contaminants other than sediment present in discharge, and the discharge is treated as specified in Section C.8.m of the permit</u>
Discharges from dewatering activities, including discharges from dewatering of trenches and excavations, are prohibited unless managed by appropriate controls. Estimations of the volume of water discharged from these dewatering activities can be recorded in Section 5 of this SWPPP.

Dewatering of sediment-laden water should be discharged to a temporary or permanent sediment basin when possible, so the sediment may be allowed to settle out of suspension. If basins will be used, the existing water level should be inspected and drawn down if necessary.

Dewatering bags may also be used to filter sediment out of the water. They should be placed on a level surface away from slopes to prevent scouring, and water should ideally flow to a vegetated area toward perimeter controls. Premanufactured dewatering bags should be installed and maintained per manufacturer's recommendations.

Flushing water hydrants and potable water lines
Waters from hydrants and waterline flushing can be erosive and can lead to perimeter controls being overwhelmed. These waters should ideally be directed to clean, paved streets where water may enter the storm sewer system. On projects where this is not possible, diffusers should be used to prevent erosive water velocities, and flush water should be directed to relatively flat, vegetated portions of the project or to temporary or permanent basins.

Water only (i.e., without detergents and additives) rinsing of streets and buildings
Streets should be inspected to confirm sediment and spills have been removed before they are rinsed with water. Inlet protections should remain in place, so water may be filtered before leaving the site.

Stabilization typically occurs before buildings are washed down. Washwater should be directed to stabilized areas or perimeter controls. Water that escapes through paved surfaces should be treated by inlet protections before leaving the site.

Site watering to establish vegetation
Efforts should be taken to time watering activities that are intended to help establish vegetation so watering does not occur prior to or during precipitation. Areas should be watered only in amounts necessary for vegetation to establish or thrive. Irrigated areas should be monitored for overwatering and, if identified, amounts and timing of watering should be adjusted.

6.3. POTENTIAL POLLUTANTS

Potential pollutant sources that are anticipated to be on-site during the project can be found in the table below.

Table 6. Anticipated Potential Pollutants.
The below listed suggested BMPs are meant as initial examples and should be adjusted as site conditions necessitate different BMPs. The table should be amended should additional pollutants and BMPs be utilized onsite that were not originally anticipated.

Material/Activity	Potential Pollutants	Suggested BMPs
Concrete Curing Substances	Sediment, metals, hydrocarbons	Provide secondary containment in preparation and cleanup areas.

		Leftover curing substances should to be removed from the site or disposed of in a designated washout bin or pit designed to contain curing substances. Do not use materials during or directly prior to an anticipated rain event, and ensure excess materials are stored in a covered area to minimize contact with stormwater. Curing compounds should not be washed into a gutter, onto the ground, or into a storm drain inlet.
Concrete Washwater and Masonry Washwater	pH, heavy metals, silica	Concrete washwater will be controlled /contained at a designated location on-site such as a leak-proof container or settling basin of adequate size. Refer to Concrete Washout Specification located in Section 6 of this SWPPP for proper design criteria and use of concrete washout area. The concrete washout area should be cleaned out when it has reached 75% capacity, and dried concrete material should be disposed of in accordance with state and local regulations.
Detergents	pH, chlorine, surfactant	Use of detergents on-site should be discouraged. Washing of vehicles or equipment that requires the use of detergents should occur off-site.
Drywall and Joint Compound	Vinyl acetate, acetaldehyde, calcium sulfate dehydrate, formaldehyde, silica	Drywall and joint compound will be used on the interior of structures. Ideally these materials should be stored inside the structure out of contact of stormwater. If storage inside the structure is not practical, the materials should be placed in a storage container, contractor vehicle, or trailer or otherwise covered to minimize contact with stormwater. Waste products can be disposed of with construction debris as soon as possible and should not be allowed to accumulate on lots.
Fertilizers	Nutrients	Fertilizers can be kept on-site in amounts necessary for immediate use. In the event fertilizers must remain on-site longer, they should be stored in a covered area to minimize contact with precipitation. Refer to the manufacturer's recommendations for application and disposal. Do not over apply or apply before an anticipated runoff-producing rain event.
Form Release Oil	Petroleum hydrocarbons	Do not remove the original product label from container. Store containers in a covered area or in contractor vehicles to minimize contact with stormwater. Follow the manufacturer's recommended usage instructions.

		Do not use before or during any precipitation event. Use all of the product before disposing of the container and only place in a waste receptacle designated to receive this type of waste.
Fuels and Oils	Petroleum hydrocarbons and distillates	If aboveground storage tanks (ASTs) are required, locations will be tracked on the SWPPP map. A separate spill prevention containment and countermeasure (SPCC) plan will be developed should one or more of the following be present on-site: • A single AST for oil with 660 gallons or more capacity • Two or more ASTs with an aggregate of 1,320 gallons or more capacity (include storage vessels stored above ground with a capacity of 55 gallons or more with the aggregate total capacity) • Belowground oil storage vessels of 42,000 gallons or more Smaller fuel containers and gas-powered equipment should be kept in secondary containment vessels to prevent spills or leaks during fueling and operation. Small gas cans can be kept in the back of trucks when not in use. Drip pans should be used for parked vehicles where leaks have been identified. Soil stained with fuel or other petroleum products should be removed and disposed of in compliance with federal, state, and local requirements.
Grease / Lubricants	Petroleum hydrocarbons	If grease is to be stored on-site, it should be stored in a covered location to minimize contact with stormwater. The application of lubricants should be conducted off-site or in an area with sufficient secondary containment measures to contain any leaks or spills. Lubricants should not be applied in rain or on exposed areas of machinery when precipitation is expected.
Glue / Adhesives	Organic aromatic compounds, semivolatile organic compounds (SVOC)	Glue and adhesives may be used on-site for construction in interior work. Adhesives should be stored in covered areas and out of contact of precipitation. Materials will be used and disposed of in accordance with manufacturers recommendations. Exterior adhesives should not be applied during or immediately before anticipated precipitation events.
Landscape Materials	Nutrients, sediment, pH	Landscape materials include—but are not limited to—items such as topsoil, compost, mulch, polymers, gypsum, and lime.

		If the materials are to be stored on-site they should be stored in a covered area or covered with plastic sheeting, tarps, or similar products to minimize contact with stormwater. Soil amendments should not be used before anticipated runoff producing rain events.
Material Storage	Solid waste, hydrocarbons, nutrients, sediment, hazardous materials	As necessary and as space on the project allows, material storage areas should be dedicated on-site. The number of access points to the material storage area should be limited, and materials should be stored away from drainage courses and low areas. Hazardous materials should be stored in containers or structures or otherwise covered to minimize contact with stormwater. Secondary containment should be provided for the area not only to contain spills but also to limit multiple access points.
Paint	pH, ethylene glycol, titanium oxide, volatile organic compounds (VOC)	Paint washwater should be properly contained on-site in a designated area and handled similarly to concrete washwater. Used materials (i.e., soiled brushes, rollers, sprayers) and dried latex paint should be disposed of in appropriate waste receptacles, preferably off-site. Unused quantities of paint should be removed from site by trades and not disposed of on-site. Any quantities stored on-site should be stored in covered areas to minimize contact with stormwater.
Pesticides, Herbicides	Organophosphates, carbamates, triazines, chloroacetanilides, salts, heavy metals	Pesticides and herbicides should be used and disposed of per manufacturer's recommendations. Avoid overapplying products and avoid applying products before anticipated runoff-producing storm events. Storage of pesticides and herbicides on-site should be discouraged. Should storage on-site be required, items should be stored in covered areas to minimize contact with precipitation and stormwater. Spilled material should be promptly cleaned up per manufacturer's recommendations.
Refrigerants	Various -fluoroethanes and -fluoromethanes	Refrigerants will be used in heating, ventilation, and air-conditioning (HVAC) systems in built structures on-site. Refrigerants should not be stored on-site other than the volume needed for the HVAC systems. Refrigerants will be handled and disposed of by properly trained technicians.
Sanitary Waste	Bacteria, viruses, parasites	Sanitary stations should be located where accidental discharge cannot flow to storm drains, gutters, surface waters, or conveyance channels.

		Locate stations on a level, permeable surface, away from drainage courses and low areas. These stations should not be located on streets, sidewalks, or on top of inlets. Stations will be inspected and maintained by a qualified person at frequent and regular intervals to assure cleanliness and proper operation.
Sediment / Total Suspended Solids	Turbidity, nutrients	Surface water impairments caused by sediment and total suspended solids will have a higher risk of occurring in areas where soils have been disturbed for construction activities. Temporary controls are described in this SWPPP to control and contain this potential pollutant during land-disturbing activities of the project. Vegetation (temporary or permanent stabilization) is a very efficient BMP for controlling sediment and should be used whenever possible.
Solid Waste	Floatable and blowable trash and debris	Solid waste created from construction activities (including but not limited to scrap building material, product/material shipping waste, food containers, and cups) should be properly contained on-site and removed frequently from the site for disposal. Dumpsters should to be emptied at regular intervals and as needed during times of high activity on the site. Efforts should be taken to minimize exposure of solids wastes generated on the site to stormwater.
Solvents	VOC, SVOC	If solvents are stored on-site, they should be stored in a covered and secured area to prevent spills and minimize contact with stormwater. The materials will be used and disposed of per manufacturer's recommendations and federal, state, and local regulations.
Stains, Stucco, and Associated Materials	Ethylene glycol, SVOC, VOC, silica, pH	Secondary containment should be provided in mixing and cleanup areas. Leftover materials should be removed from the site or disposed of in an area designated to receive this type of waste. Do not use materials during a precipitation event, and ensure all excess materials are stored in a covered area to minimize contact with stormwater. Materials should not be washed into a gutter, on the ground, or into a storm drain inlet. If washing on-site, consider using a designated containment bin or pit for washwater.
Vehicle Washing, Wheel Washwater	Sediment, petroleum hydrocarbons, heavy metals	If vehicle washing and/or wheel washing is to occur on-site, it should be done in designated areas where washwater can collect in a basin or alternative control. Use of detergents should be discouraged.

Washing on paved surfaces should be discouraged unless water can be sufficiently treated before leaving the site.

6.4. NONREPORTABLE SPILL PROTOCOL

Most spills can be cleaned up following manufacturer's recommendations. Absorbent materials, sealable containers, plastic bags, and shovels/brooms are suggested as minimum spill response items that should be available at this location.

- Check for hazards (flammable material, noxious fumes). If flammable liquid, turn off engines and nearby electrical equipment. If serious hazards are present, leave the area and call 911.
- Make sure the spill area is safe to enter and that it does not pose an immediate threat to health or safety of any person.
- Stop the spill source.
- Call co-workers and supervisor for assistance and to make them aware of the spill and potential dangers.
- If possible, stop the spill from entering drains (use absorbent or other material as necessary).
- Stop spill from spreading (use absorbent or other material).
- If spilled material has entered a storm sewer, contact the locality at the below number.
- Clean up spilled material according to manufacturer's specifications. For liquid spills, use absorbent material and do not flush the contaminated area with water.
- Properly dispose of cleaning materials and used absorbent material according to manufacturer specifications.

6.5. REPORTABLE SPILLS

Requirements for reporting spills of hazardous materials and typical site pollutants and spill report documentations can be found in Section 9 of this SWPPP.

Release of a hazardous substance must be reported to the department in accordance with 10 CSR 24-3.010. A record of each reportable spill shall be retained with the Stormwater Pollution Prevention Plan (SWPPP) and made available to the department upon request. The department may also require the submittal of a written or electronic report detailing measures taken to clean up the spill within five (5) days of the spill. Such a report must include the type of material spilled, volume, date of spill, date clean-up was completed, clean-up method, and final disposal method. If the spill occurs outside normal business hours, or if the permit holder cannot reach regional office staff for any reason, the permit holder is instructed to report the spill to the department's 24 hour Environmental Emergency Response hotline at (573) 634-2436 at the earliest practicable moment after discovery. Leaving a message on a department staff member voice-mail does not satisfy this reporting requirement (MDNR 2017).

Table 7. (City/County Entity Name for Spill Reporting) Contact.

Name/Position	Contact Number
Kara Taylor, Public Works – City of LS	816-969-1800

Report to:	Contact Number
Kansas City Regional Office 500 NE Colbern Road Lee's Summit, MO 64086-4710	816.251.0700
MDNR 24-Hour Spill Response	573.634.2436
National Response Center (NRC)	800.424.8802

7.0. SWPPP IMPLEMENTATION

7.1. PUBLIC NOTIFICATION

The locations of the site posting will be noted on the site BMP Tracking Map located in Section 5 of this SWPPP. The location will be updated should the posting move.

The permittee shall post a copy of the public notification sign described by the Department at the main entrance to the site. The public notification sign must be visible from the public road that provides access to the site's main entrance. An alternate location is acceptable provided the public can see it and it is noted in the SWPPP. The public notification sign must remain posted at the site until the permit has been terminated (MDNR 2017).

7.2. INSPECTIONS

Site inspections should be conducted by qualified personnel at the frequency indicated below. Site inspection reports can be stored in Section 12 of this SWPPP unless otherwise noted.

The permittee (or a representative of the permittee) shall conduct regularly scheduled inspections. These inspections shall be conducted by a qualified person, one who is responsible for environmental matters at the site, or a person trained by and directly supervised by the person responsible for environmental matters at the site. For disturbed areas that have not been finally stabilized, all installed BMPs and other pollution control measures shall be inspected for proper installation, operation and maintenance. All stormwater outfalls shall be inspected for evidence of erosion or sediment deposition. When practicable the receiving stream shall also be inspected for 50 feet downstream of the outfall. Any structural or maintenance problems shall be noted in an inspection report and corrected as soon as possible but no more than seven calendar days after the inspection. All BMPs must be inspected in accordance to one of the two schedules listed below, and any changes to the frequency of inspections, including switching between the options listed below, must be documented in the SWPPP:

☐ *At least once every seven calendar days and within 48 hours after any storm event equal to or greater than a 2-year, 24-hour storm has ceased during a normal work day and within 72 hours if the rain event ceases during a non-work day such as a weekend or holiday;*

or

☐ *Once every 14 calendar days and within 24 hours of the occurrence of a storm event of 0.25 inches of precipitation or greater, or the occurrence of runoff from snowmelt. To determine a storm event of 0.25 inches or greater has occurred on your site, you must either keep a properly maintained rain gauge on site, or obtain the storm event information from a weather station for your location.*

a. *Inspections are only required during the project's normal working hours.*
b. *You must conduct an inspection within 24 hours once a storm event has produced 0.25 inches within a 24 hour period, even if the storm event is still continuing.*

c. *If you have elected to inspect every 14 calendar days and there is a storm event at your site that continues for multiple days, and each day of the storm produces 0.25 inches or more of rain, you are required to conduct an inspection within 24 hours of the first day of the storm and within 24 hours after the end of the storm* (MDNR 2017).

7.3. CORRECTIVE ACTIONS

Structural or maintenance problems with BMPs used in this project and noted as a result of an inspection shall be corrected as soon as possible but no more than seven calendar days after the inspection.

7.4. MODIFICATION AND AMENDMENTS

Modifications and amendments to the SWPPP can be tracked in Section 7 of this SWPPP. Below are minimum guidelines for when the SWPPP should be updated.

The permittee shall amend the SWPPP at a minimum whenever the:

a. *Design, operation, or maintenance of BMPs is changed;*
b. *Design of the construction project is changed that could significantly affect the quality of the stormwater discharges;*
c. *Permittee's inspections indicate deficiencies in the SWPPP or any BMP;*
d. *Department notifies the permittee in writing of deficiencies in the SWPPP;*
e. *SWPPP is determined to be ineffective in minimizing or controlling erosion and sedimentation (e.g., there is visual evidence of excessive site erosion or excessive sediment deposits in streams or lakes); and/or*
f. *Department determines violations of water quality standards may occur or have occurred* (MDNR 2017).

7.5. TRANSFER OF OWNERSHIP

As necessary, permit transfers or records of sale should be placed in Section 2 of this SWPPP.

If the permittee sells any portion of the permitted site to a developer for commercial, industrial, or residential use, this land remains a part of the common sale and the new owner must obtain a permit prior to conducting any land disturbance activity. Therefore, the original permittee must amend the SWPPP to show that the property has been sold and therefore no longer under the original permit coverage.

If the entire tract is sold to a single entity, then this permit shall be terminated when the new owner obtains a new land disturbance permit for the site (MDNR 2017).

7.6. TERMINATION OF PERMIT

When the project is completed and has reached final stabilization, a copy of the notice of termination and confirmation from the MDNR should be placed in Section 14 of this SWPPP.

This permit may be terminated when the project is stabilized. The project is considered to be stabilized when perennial vegetation, pavement, buildings, or structures using permanent materials cover all areas that have been disturbed. With respect to areas that have been vegetated, vegetation cover shall be at least 70% over 100% of the site. In order to terminate the permit, the permittee shall notify the Department by submitting Form H Request for Termination of a General Permit (MDNR 2017).

7.7. RECORDS

When the project is complete, and the notice of termination has been accepted by the MDNR, records should be removed from the site and retained.

The permittee shall retain copies of this general permit, the SWPPP and all amendments for the site named in the State Operating Permit, results of any monitoring and analysis and all site inspection records required by this general permit. The records shall be accessible during normal business hours. The records shall be retained for a period of at least three years from the date of the Letter of Termination.

The permittee shall provide a copy of the SWPPP to the Department, USEPA, or any local agency or government representative if they request a copy in the performance of their official duties.

The permittee shall provide a copy of the SWPPP to those who are responsible for installation, operation, or maintenance of any BMP. The permittee, their representative, and/or the contractor(s) responsible for installation, operation and maintenance of the BMPs shall have a current copy of the SWPPP with them when on the project site (MDNR 2017).

8.0. REFERENCES

California Stormwater Quality Association. (November 2009). *Stormwater Best Management Practice Handbook Portal: Construction*. Retrieved from http://www.buenapark.com/home/showdocument?id=2557.

Missouri Department of Natural Resources. (February 2017). *Missouri State Operating Permit*. Retrieved from https://dnr.mo.gov/env/wpp/permits/issued/docs/RA00000.pdf.

Missouri Department of Natural Resources, ABC's of BMP's LLC and Shockey Consulting Services. (January 2011). *Protecting Water Quality: A field guide to erosion, sediment and stormwater best management practices for development sites in Missouri and Kansas*. Retrieved from https://dnr.mo.gov/env/wpp/wpcp-guide/docs/wpcp-guide.pdf.

United States Environmental Protection Agency. (May 2007). *Developing Your Stormwater Pollution Prevention Plan, A Guide for Construction Sites*. Retrieved from https://www.epa.gov/sites/production/files/2015-10/documents/sw_swppp_guide.pdf.

Virginia Department of Environmental Quality. (July 2014). *Single Family Residence Common Plan of Development or Sale Stormwater Pollution Prevention Plan Template*. Retrieved from http://www.deq.virginia.gov/Programs/Water/StormwaterManagement/VSMPPermits/ConstructionGeneralPermit.aspx.

SECTION 4

Location/Topographical Map(s), FIRM Maps & Soils Maps

This section contains:

-Required Location, Vicinity and Topographical Maps (as needed)

-FIRM Maps

-Soils Maps if needed

Hydrologic Soil Group—Jackson County, Missouri
(MCPL Lee's Summit)

Map Scale: 1:1,410 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 20 40 80 120

Feet
0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 15N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Jackson County, Missouri
Survey Area Data: Version 19, Sep 13, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 11, 2017—Sep 22, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
10082	Arisburg-Urban land complex, 1 to 5 percent slopes	C	9.6	100.0%
Totals for Area of Interest			**9.6**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

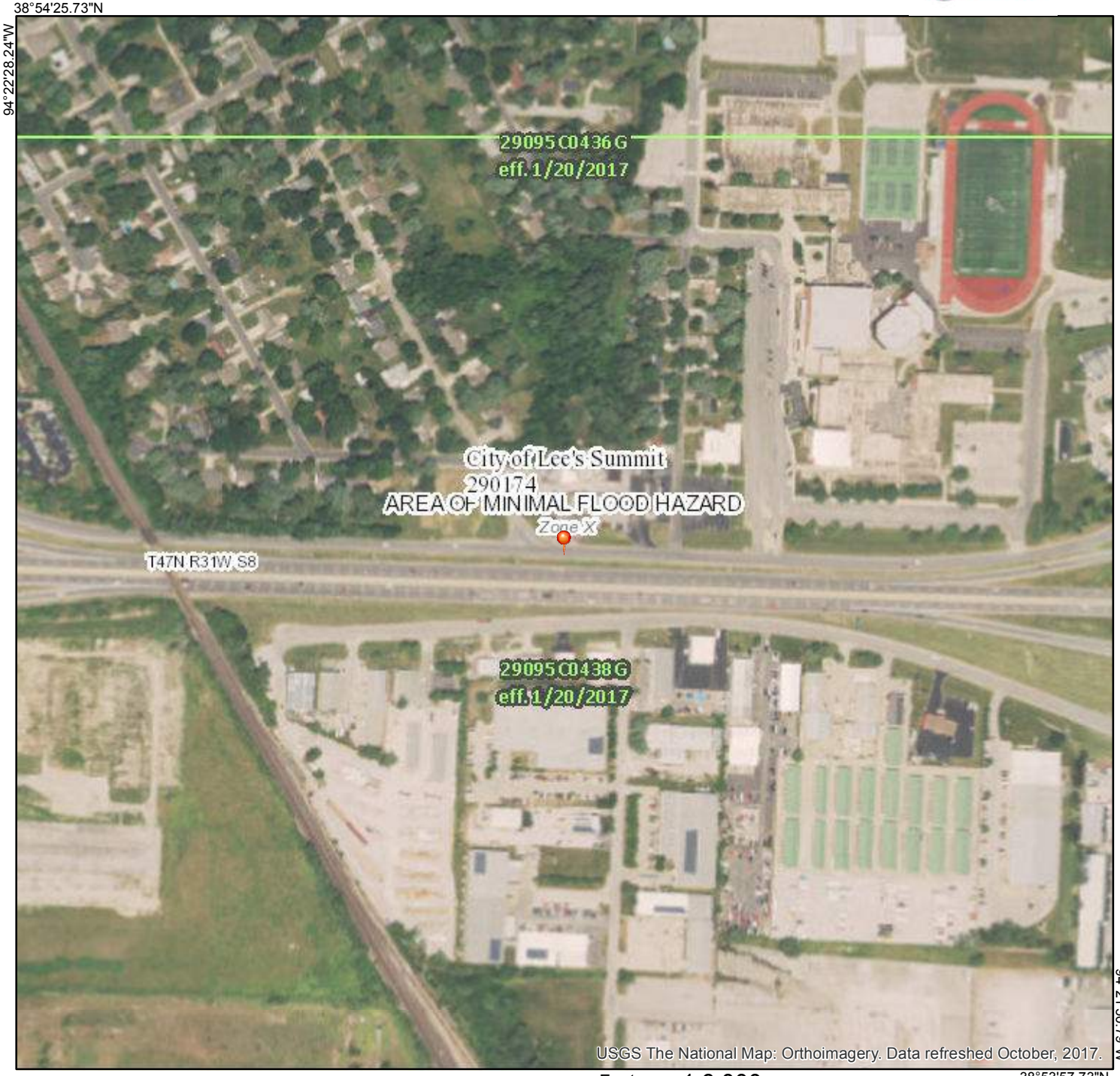
Tie-break Rule: Higher

National Flood Hazard Layer FIRMette

FEMA

38°54'25.73"N

94°22'28.24"W



94°21'50.79"W

38°53'57.73"N

Feet

0 250 500 1,000 1,500 2,000

1:6,000

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

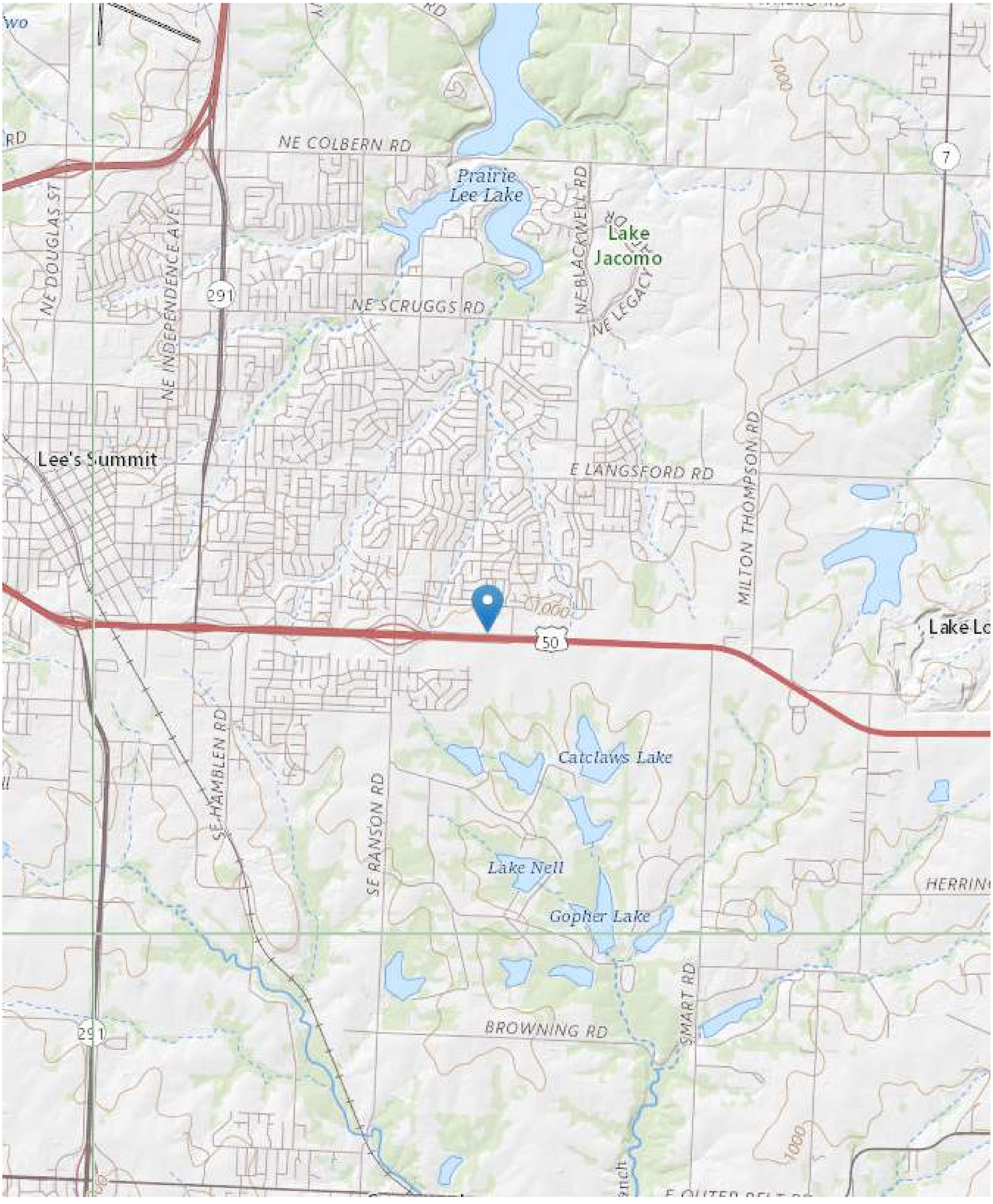
This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 2/6/2019 at 6:19:38 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

The National Map
US Topo



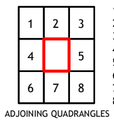
Produced by the United States Geological Survey

North American Datum of 1983 (NAD83)
World Geodetic System of 1984 (WGS84). Projection and
1 000-meter grid:Universal Transverse Mercator, Zone 15S

This map is not a legal document. Boundaries may be generalized for this map scale. Private lands within government reservations may not be shown. Obtain permission before entering private lands.

Imagery	NAIP,	June 2016 - October 2016
Roads	U.S. Census Bureau,	2016
Names	GNIS,	1980 - 2017
Hydrography	National Hydrography Dataset,	2001 - 2016
Contours	National Elevation Dataset,	2008
Boundaries	Multiple sources; see metadata file	2014 - 2016
Public Land Survey System	BLM,	2017
Wetlands	FWS National Wetlands Inventory	1981 - 1983

QUADRANGLE LOCATION



ADJOINING QUADRANGLES

1 Independence
2 Blue Springs
3 Oak Grove
4 Lees Summit
5 Tarsney Lakes
6 Raymore
7 Pleasant Hill
8 Strasburg

ROAD CLASSIFICATION

Expressway
Secondary Hwy
Ramp
Local Connector
Local Road
4WD
Interstate Route
US Route
State Route

LAKE JACOMO, MO
2017

USGS
science for a changing world

U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

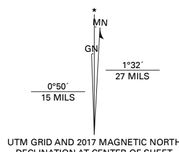
The National Map
US Topo

LAKE JACOMO QUADRANGLE
MISSOURI - JACKSON COUNTY
7.5-MINUTE SERIES

Produced by the United States Geological Survey
North American Datum of 1983 (NAD83)
World Geodetic System of 1984 (WGS84). Projection and
1 000-meter grid:Universal Transverse Mercator, Zone 15S

This map is not a legal document. Boundaries may be generalized for this map scale. Private lands within government reservations may not be shown. Obtain permission before entering private lands.

Imagery.....NAIP, June 2016 - October 2016
Roads.....U.S. Census Bureau, 2016
Names.....GNIS, 1980 - 2017
Hydrography.....National Hydrography Dataset, 2001 - 2016
Contours.....National Elevation Dataset, 2008
Boundaries.....Multiple sources; see metadata file 2014 - 2016
Public Land Survey System.....BLM, 2017
Wetlands.....FWS National Wetlands Inventory 1981 - 1983



UTM GRID AND 2017 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

U.S. National Grid
100,000 - m Square ID
UD
Grid Zone Designation 15S

SCALE 1:24 000

1 0.5 0 KILOMETERS 1 2
1000 500 0 METERS 1000 2000
1 0.5 0 1
MILES
1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000
FEET

CONTOUR INTERVAL 10 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

This map was produced to conform with the National Geospatial Program US Topo Product Standard, 2011.
A metadata file associated with this product is draft version 0.6.18

QUADRANGLE LOCATION

1	2	3
4		5
6	7	8

ADJOINING QUADRANGLES

1 Independence
2 Blue Springs
3 Oak Grove
4 Lees Summit
5 Tarsney Lakes
6 Raymore
7 Pleasant Hill
8 Strasburg

ROAD CLASSIFICATION

Expressway
Secondary Hwy
Ramp
Local Connector
Local Road
4WD
Interstate Route
US Route
State Route

LAKE JACOMO, MO
2017

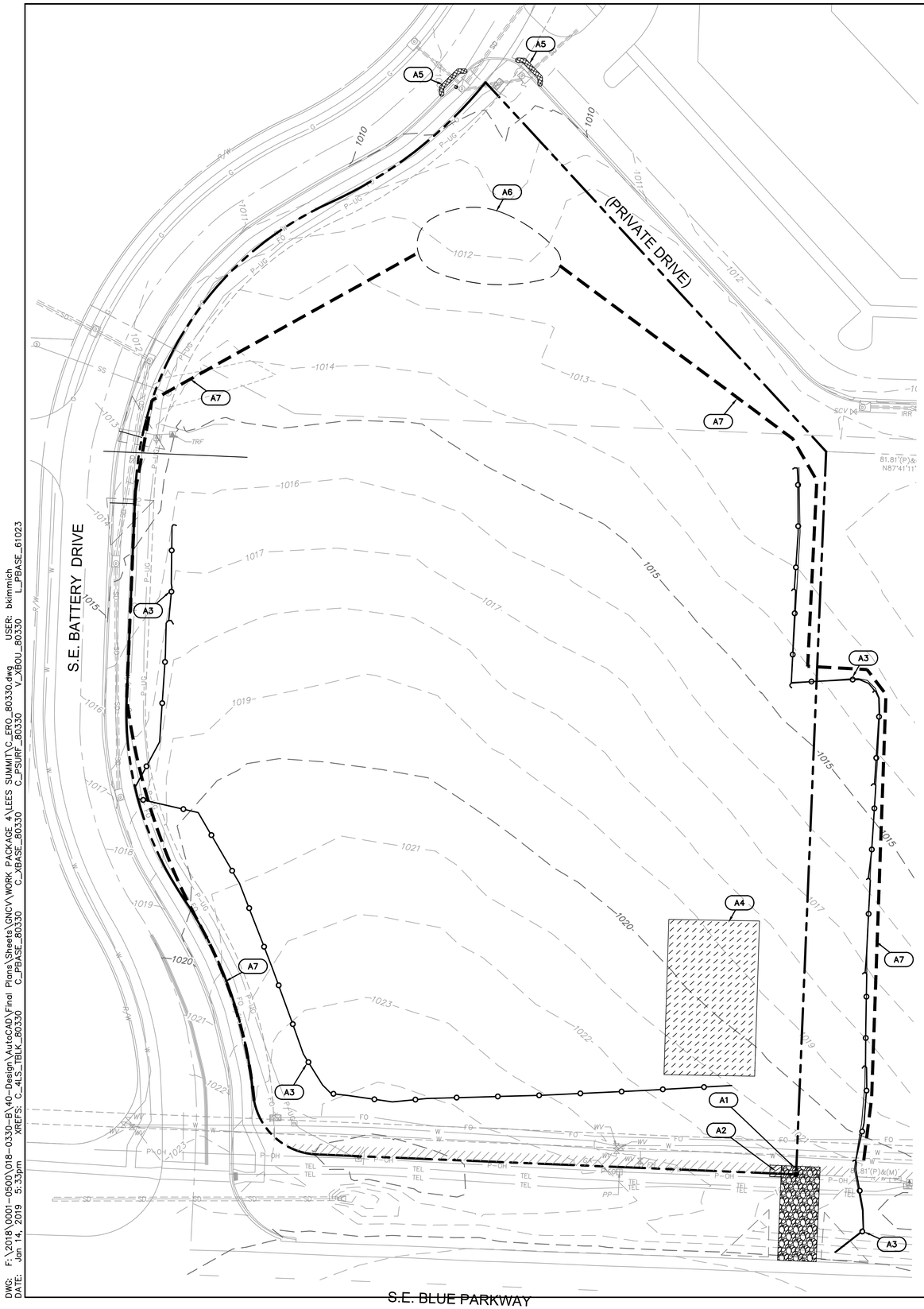
7643016374218
NSN. 7643016374218
NGA REF NO. USGSX24K24486

SECTION 5

BMP Tracking Map & Land Disturbance Tracking Log

This section contains:

- -Erosion and Sediment Control Plan sheet experts
- -Post Construction Stormwater Management Plan sheets if applicable
- -BMP Tracking Map (Working SWPPP Map)
  - -Record of Land Disturbance, Stabilization and BMP installation and removal
  - -Record of Dewatering Activities (e.g. dates and estimated volume of water discharged)

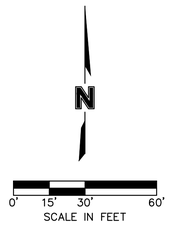


LEGEND

- RIGHT OF WAY LINE
- LOT LINE
- EXISTING GRADE CONTOUR
- FINISHED GRADE CONTOUR
- GRAVEL FILTER BAGS
- SEDIMENT FENCE
- TEMPORARY 18" DIVERSION BERM (SEE DETAILS)
- LIMITS OF DISTURBANCE (XX ACRES)
- TEMPORARY CONSTRUCTION ENTRANCE
- CONCRETE WASHOUT
- STAGING/STOCKPILE AREA
- X1 — EROSION CONTROL REFERENCE NUMBER
- STABILIZATION. "LANDLOK (S2)" SHALL BE USED OR APPROVED EQUAL. CONTACTOR TO SUBMIT SHOP DRAWINGS TO THE ENGINEER FOR APPROVAL. SEED WITH PERENNIAL SEEDING TO MEET SWPPP REQUIREMENTS. INSTALL PER DETAIL AND MANUFACTURER RECOMMENDATIONS.

EROSION CONTROL STAGING CHART

PROJECT STAGE	EROSION CONTROL BMP REFERENCE NO.	BMP DESCRIPTION	REMOVE AFTER STAGE	NOTES:
A – PRE–CONSTRUCTION	A1	TEMPORARY CONSTRUCTION ENTRANCE	C	INSTALL AS INDICATED ON PLANS
	A2	CONCRETE WASHOUT	C	INSTALL AS INDICATED ON PLANS
	A3	TEMPORARY SLOPE BARRIER (SEDIMENT FENCE)	D	INSTALL AS INDICATED ON PLANS
	A4	STAGING / STOCKPILE AREA	C	INSTALL AS INDICATED ON PLANS
	A5	EXISTING CURB INLET PROTECTION – TEMPORARY SEDIMENT BARRIER – CONDITION A	C	INSTALL AS INDICATED ON PLANS
	A6	TEMPORARY SEDIMENT TRAP	C	INSTALL AS INDICATED ON PLANS
	A7	TEMPORARY DIVERSION BERM	C	INSTALL AS INDICATED ON PLANS
B – STORM SEWER & UTILITY CONSTRUCTION (STABILIZE ANY DISTURBED ARES OUTSIDE OF BUILDING PADS AND PARKING LOTS)	B1	TEMPORARY SEDIMENT BARRIER – CURB INLET – CONDITION A	C	INSTALL AS INDICATED ON PLANS
	B2	TEMPORARY SEDIMENT BARRIER – JUNCTION BOX – CONDITION A	C	INSTALL AS INDICATED ON PLANS
	B3	TEMPORARY EROSION CONTROL BLANKET (LANDLOK S2)	C	INSTALL AS INDICATED ON PLANS
C – BUILDING AND PAVEMENT CONSTRUCTION	C1	TEMPORARY SEDIMENT BARRIER – CURB INLET – CONDITION B	D	INSTALL AS INDICATED ON PLANS
	C2	TEMPORARY SEDIMENT BARRIER – JUNCTION BOX – CONDITION B	D	INSTALL AS INDICATED ON PLANS
D – FINAL STABILIZATION	D1	REPLACE TOP SOIL, SEED MULCH, SOD, LANDSCAPE	N/A	ESTABLISH PERENNIAL VEGETATION WITH A 70% DENSITY OVER 100% OF DISTURBED AREA.



DWG: F:\2018\0001-0500\018-0330-B\40-Design\AutoCAD\Final Plans\Sheets\GNCV\WORK PACKAGE 4\LEE'S SUMMIT\C_ERO_80330.dwg USER: bkimmich
DATE: Jan 14, 2019 5:33pm XREFS: C_4LS_TBLK_80330 C_PBASE_80330 C_XBASE_80330 C_PSURF_80330 V_XBDU_80330 L_PBASE_61023

SAPP DESIGN ARCHITECTS
3750 S. Fremont Ave.
Springfield, MO 65804 417.877.9600
Sapp Design Associates Architects, P.C.
Missouri State Certificate of Authority #000607

helix.
1629 Walnut
Kansas City, MO 64108 816.300.0300

SPECIAL NOTICES

Mid-Continent Public Library
CONSTRUCTION DOCUMENT PLANS FOR

EAST LEE'S SUMMIT BRANCH

2240 SE BLUE PARKWAY
LEE'S SUMMIT, MO 64063
JACKSON COUNTY

PACKAGE 04

Engineer of Record

Terry M Parsons, Engineer MO PE-2018010505

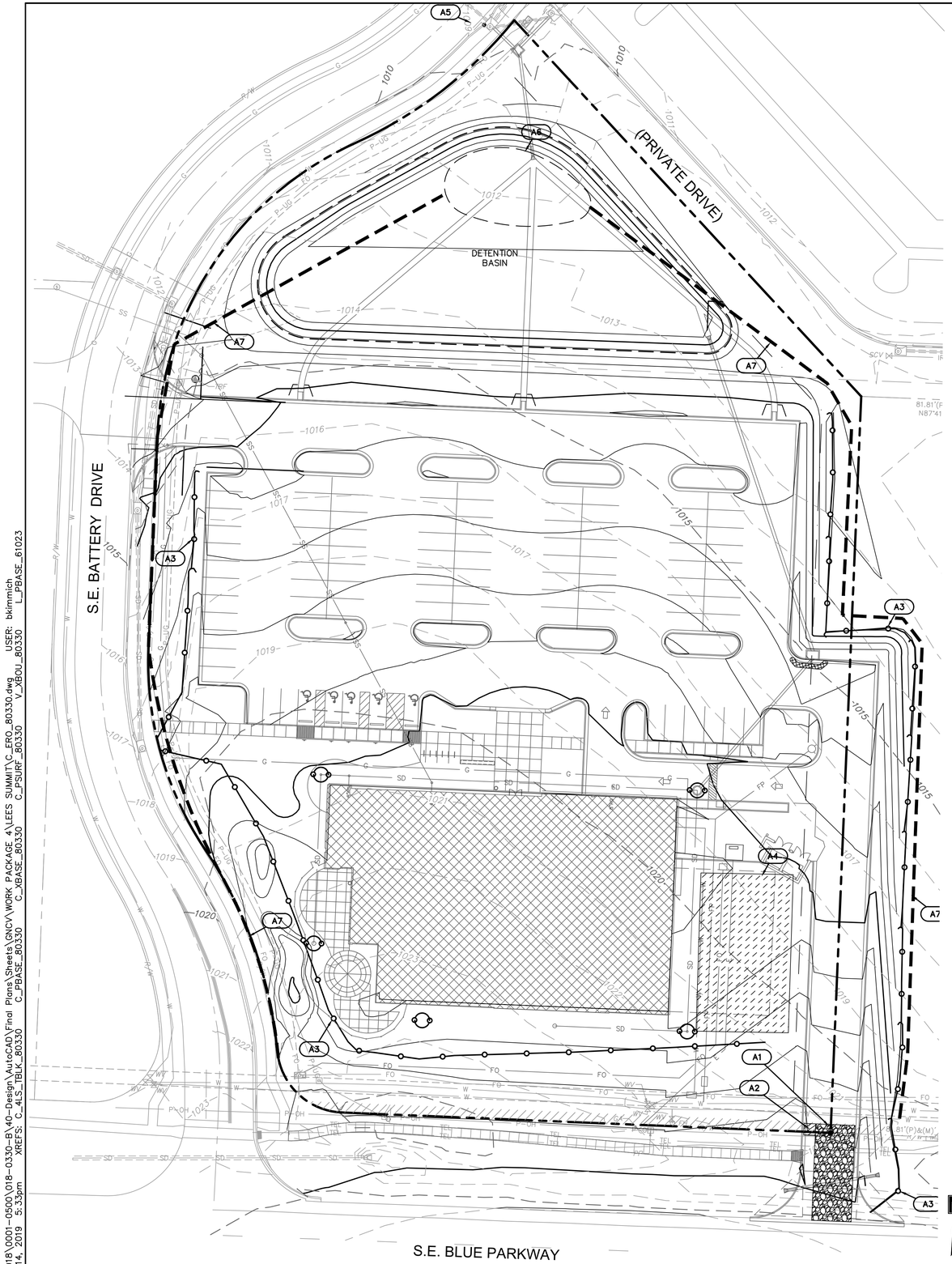
olsson
7301 West 133rd Street, Suite 200
Overland Park, KS 66213
TEL 913.381.1170
FAX 913.381.1174
www.olsson.com
Olsson
Missouri State Certificate of Authority #001592

Revision No.	Description	Date
1	ASI#1	01.14.19

Project No.	Date	Drawn
B18-0330	12.07.18	RLK

Drawing No. **C9.0**

EROSION CONTROL PLAN - PRE CONSTRUCTION



LEGEND

- RIGHT OF WAY LINE
- LOT LINE
- EXISTING GRADE CONTOUR
- FINISHED GRADE CONTOUR
- GRAVEL FILTER BAGS
- SEDIMENT FENCE
- TEMPORARY 18" DIVERSION BERM (SEE DETAILS)
- LIMITS OF DISTURBANCE (3.75 ACRES)
- TEMPORARY CONSTRUCTION ENTRANCE
- CONCRETE WASHOUT
- STAGING/STOCKPILE AREA
- X1 — EROSION CONTROL REFERENCE NUMBER
- STABILIZATION. "LANDLOK (S2)" SHALL BE USED OR APPROVED EQUAL. CONTACTOR TO SUBMIT SHOP DRAWINGS TO THE ENGINEER FOR APPROVAL. SEED WITH PERENNIAL SEEDING TO MEET SWPPP REQUIREMENTS. INSTALL PER DETAIL AND MANUFACTURER RECOMMENDATIONS.

EROSION CONTROL STAGING CHART

PROJECT STAGE	EROSION CONTROL BMP REFERENCE NO.	BMP DESCRIPTION	REMOVE AFTER STAGE	NOTES:
A – PRE–CONSTRUCTION	A1	TEMPORARY CONSTRUCTION ENTRANCE	C	INSTALL AS INDICATED ON PLANS
	A2	CONCRETE WASHOUT	C	INSTALL AS INDICATED ON PLANS
	A3	TEMPORARY SLOPE BARRIER (SEDIMENT FENCE)	D	INSTALL AS INDICATED ON PLANS
	A4	STAGING / STOCKPILE AREA	C	INSTALL AS INDICATED ON PLANS
	A5	EXISTING CURB INLET PROTECTION – TEMPORARY SEDIMENT BARRIER – CONDITION A	C	INSTALL AS INDICATED ON PLANS
	A6	TEMPORARY SEDIMENT TRAP AND STORM SEWER LINE D	C	INSTALL AS INDICATED ON PLANS
	A7	TEMPORARY DIVERSION BERM	C	INSTALL AS INDICATED ON PLANS
	A8	SWPP SIGN	C	INSTALL AS INDICATED ON PLANS
B – STORM SEWER & UTILITY CONSTRUCTION (STABILIZE ANY DISTURBED ARES OUTSIDE OF BUILDING PADS AND PARKING LOTS)	B1	TEMPORARY SEDIMENT BARRIER – CURB INLET – CONDITION A	C	INSTALL AS INDICATED ON PLANS
	B2	TEMPORARY SEDIMENT BARRIER – JUNCTION BOX – CONDITION A	C	INSTALL AS INDICATED ON PLANS
	B3	TEMPORARY EROSION CONTROL BLANKET (LANDLOK S2)	C	INSTALL AS INDICATED ON PLANS
C – BUILDING AND PAVEMENT CONSTRUCTION	C1	TEMPORARY SEDIMENT BARRIER – CURB INLET – CONDITION B	D	INSTALL AS INDICATED ON PLANS
	C2	TEMPORARY SEDIMENT BARRIER – JUNCTION BOX – CONDITION B	D	INSTALL AS INDICATED ON PLANS
D – FINAL STABILIZATION	D1	REPLACE TOP SOIL, SEED MULCH, SOD, LANDSCAPE	N/A	ESTABLISH PERENNIAL VEGETATION WITH A 70% DENSITY OVER 100% OF DISTURBED AREA.

SAPP DESIGN ARCHITECTS
3750 S. Fremont Ave.
Springfield, MO 65804 417.877.9600
Sapp Design Associates Architects, P.C.
Missouri State Certificate of Authority #000607

helix.
1629 Walnut
Kansas City, MO 64108 816.300.0300

SPECIAL NOTICES

Mid-Continent Public Library
CONSTRUCTION DOCUMENT PLANS FOR

EAST LEE'S SUMMIT BRANCH

2240 SE BLUE PARKWAY
LEE'S SUMMIT, MO 64063
JACKSON COUNTY

PACKAGE 04

Engineer of Record

Terry M Parsons, Engineer MO PE-2018010505

olsson
7301 West 133rd Street, Suite 200
Overland Park, KS 66213
TEL 913.381.1170
FAX 913.381.1174
www.olsson.com
Olsson
Missouri State Certificate of Authority #001592

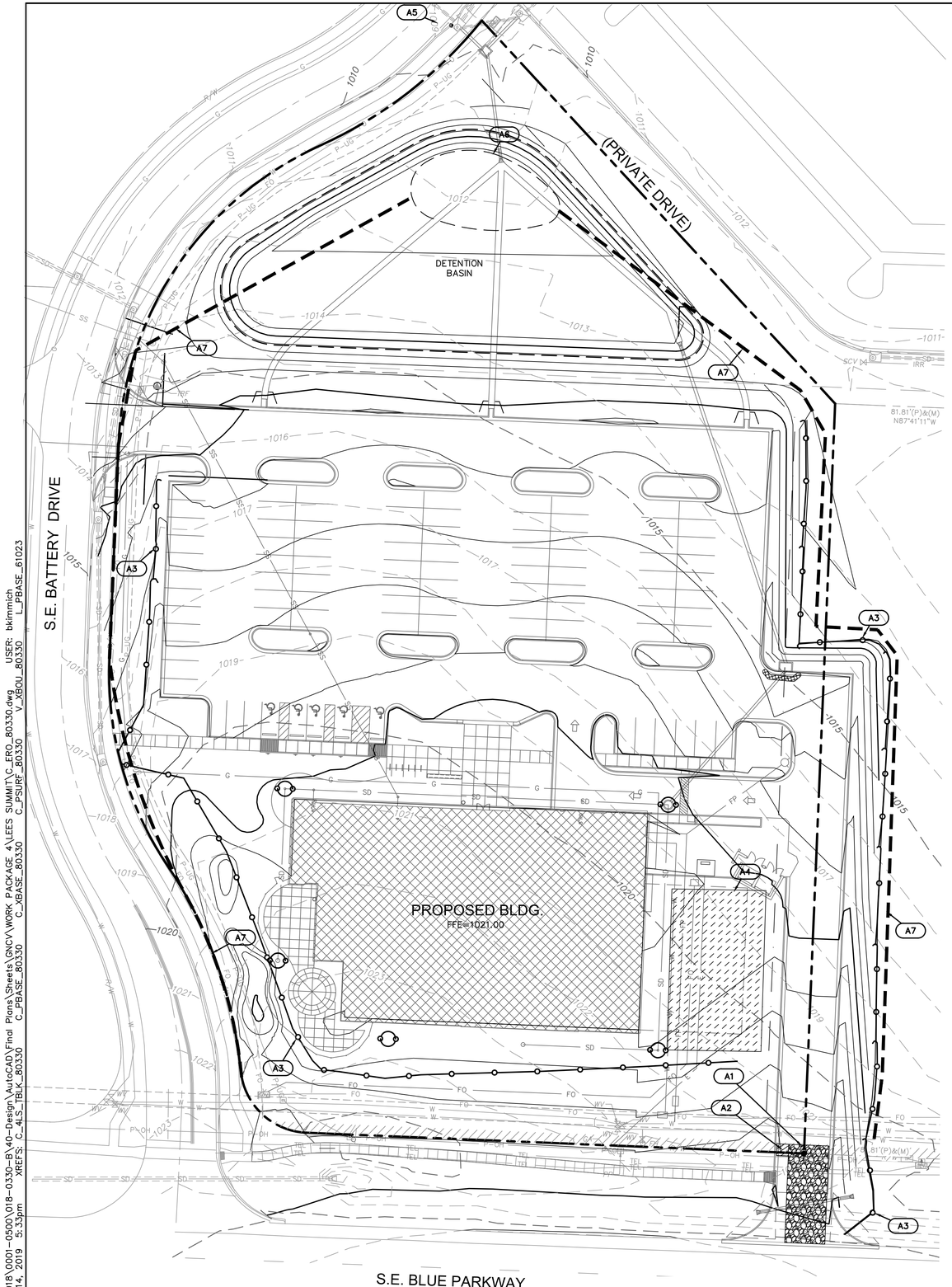
Revision No.	Description	Date
1	ASI#1	01.14.19

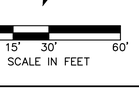
Project No.	Date	Drawn
B18-0330	12.07.18	RLK

Drawing No. **C9.1**

EROSION CONTROL - CONSTRUCTION

DWG: F:\2018\0001-0500\018-0330-B\40-Design\AutoCAD\Final Plans\Sheets\GNCV\WORK PACKAGE 4\LEE'S SUMMIT\C_ERO_80330.dwg USER: bkimmich
DATE: Jan 14, 2019 5:33pm XREFS: C_4LS_TBLK_80330 C_PBASE_80330 C_XBASE_80330 C_PSURF_80330 V_XBOU_80330 V_XBOU_80330 L_PBASE_61023





0' 15' 30' 60'
SCALE IN FEET

LEGEND

- RIGHT OF WAY LINE
- LOT LINE
- EXISTING GRADE CONTOUR
- FINISHED GRADE CONTOUR
- GRAVEL FILTER BAGS
- WADDLE
- SEDIMENT FENCE
- TEMPORARY 18" DIVERSION BERM (SEE DETAILS)
- LIMITS OF DISTURBANCE (3.75 ACRES)
- TEMPORARY CONSTRUCTION ENTRANCE
- CONCRETE WASHOUT
- STAGING/STOCKPILE AREA
- X1 — EROSION CONTROL REFERENCE NUMBER
- STABILIZATION. "LANDLOK (S2)" SHALL BE USED OR APPROVED EQUAL. CONTACTOR TO SUBMIT SHOP DRAWINGS TO THE ENGINEER FOR APPROVAL. SEED WITH PERENNIAL SEEDING TO MEET SWPPP REQUIREMENTS. INSTALL PER DETAIL AND MANUFACTURER RECOMMENDATIONS.

EROSION CONTROL STAGING CHART

PROJECT STAGE	EROSION CONTROL BMP REFERENCE NO.	BMP DESCRIPTION	REMOVE AFTER STAGE	NOTES:
A – PRE–CONSTRUCTION	A1	TEMPORARY CONSTRUCTION ENTRANCE	C	INSTALL AS INDICATED ON PLANS
	A2	CONCRETE WASHOUT	C	INSTALL AS INDICATED ON PLANS
	A3	TEMPORARY SLOPE BARRIER (SEDIMENT FENCE)	D	INSTALL AS INDICATED ON PLANS
	A4	STAGING / STOCKPILE AREA	C	INSTALL AS INDICATED ON PLANS
	A5	EXISTING CURB INLET PROTECTION – TEMPORARY SEDIMENT BARRIER – CONDITION A	C	INSTALL AS INDICATED ON PLANS
	A6	TEMPORARY SEDIMENT TRAP	C	INSTALL AS INDICATED ON PLANS
	A7	TEMPORARY DIVERSION BERM	C	INSTALL AS INDICATED ON PLANS
B – STORM SEWER & UTILITY CONSTRUCTION (STABILIZE ANY DISTURBED ARES OUTSIDE OF BUILDING PADS AND PARKING LOTS)	B1	TEMPORARY SEDIMENT BARRIER – CURB INLET – CONDITION A	C	INSTALL AS INDICATED ON PLANS
	B2	TEMPORARY SEDIMENT BARRIER – JUNCTION BOX – CONDITION A	C	INSTALL AS INDICATED ON PLANS
	B3	TEMPORARY EROSION CONTROL BLANKET (LANDLOK S2)	C	INSTALL AS INDICATED ON PLANS
C – BUILDING AND PAVEMENT CONSTRUCTION	C1	TEMPORARY SEDIMENT BARRIER – CURB INLET – CONDITION B	D	INSTALL AS INDICATED ON PLANS
	C2	TEMPORARY SEDIMENT BARRIER – JUNCTION BOX – CONDITION B	D	INSTALL AS INDICATED ON PLANS
D – FINAL STABILIZATION	D1	REPLACE TOP SOIL, SEED MULCH, SOD, LANDSCAPE	N/A	ESTABLISH PERENNIAL VEGETATION WITH A 70% DENSITY OVER 100% OF DISTURBED AREA.

SAPP DESIGN ARCHITECTS
3750 S. Fremont Ave.
Springfield, MO 65804 417.877.9600
Sapp Design Associates Architects, P.C.
Missouri State Certificate of Authority #000607

helix.
1629 Walnut
Kansas City, MO 64108 816.300.0300

SPECIAL NOTICES

Mid-Continent Public Library
CONSTRUCTION DOCUMENT PLANS FOR

EAST LEE'S SUMMIT BRANCH

2240 SE BLUE PARKWAY
LEE'S SUMMIT, MO 64063
JACKSON COUNTY

PACKAGE 04

Engineer of Record

Terry M Parsons, Engineer MO PE-2018010505

olsson
7301 West 133rd Street, Suite 200
Overland Park, KS 66213
TEL 913.381.1170
FAX 913.381.1174
www.olsson.com
Olsson
Missouri State Certificate of Authority #001592

Revision No.	Description	Date
1	ASI#1	01.14.19

Project No.	Date	Drawn
B18-0330	12.07.18	RLK

Drawing No. **C9.2**

EROSION CONTROL - POST CONSTRUCTION

DWG: F:\2018\0001-0500\018-0330-B\40-Design\AutoCAD\Final Plans\Sheets\GNCV\WORK PACKAGE 4\LEE'S SUMMIT\C_ERO_80330.dwg USER: bkimmich
DATE: Jan 14, 2019 5:33pm XREFS: C_4LS_TBLK_80330 C_PBASE_80330 C_XBASE_80330 C_PSURF_80330 V_XBOU_80330 V_XBOU_80330

Grading, Stabilization and Dewatering Activities Log

Date Activity Initiated	Description of Grading/Dewatering Activity	Date Activity Ceased (Indicate Temporary or Permanent)	Date When Stabilization Measures Initiated	Description of Stabilization Measure and Location

SECTION 6

BMP Specification & Detail Sheets

DIVISION III STANDARD DRAWINGS
EROSION & SEDIMENT CONTROL

Sheet No.	Sheet Title	Purpose
ESC-TC	Cover Page/Table of Contents	Cover Page and Table of Contents
ESC-01	Construction Entrance and Concrete Washout	Sediment Control
ESC-02	Erosion Control Blankets and Turf Reinforment Mats	Erosion Control
ESC-03	Silt Fence	Sediment Control
ESC-04	Wattles/Biodegradable Logs and Mulch/Compost Filter Berms	Sediment Control
ESC-05	Diversion Berms and Slope Drains	Erosion Control
ESC-06	Curb Inlet Protection	Sediment Control
ESC-07	Area Inlet Protection	Sediment Control
ESC-08	Sediment Traps	Sediment Control
ESC-09	Silt Fence and Wattle/Biodegradable Log Ditch Checks	Sediment Control
ESC-10	Rock Ditch Checks	Sediment Control
ESC-11	Sediment Basins	Sediment Control
ESC-12	Sediment Basin - Details	Sediment Control
ESC-13	Stream Crossings and Diversion Channels	Erosion Control
ESC-14	Outlet Protection	Erosion Control

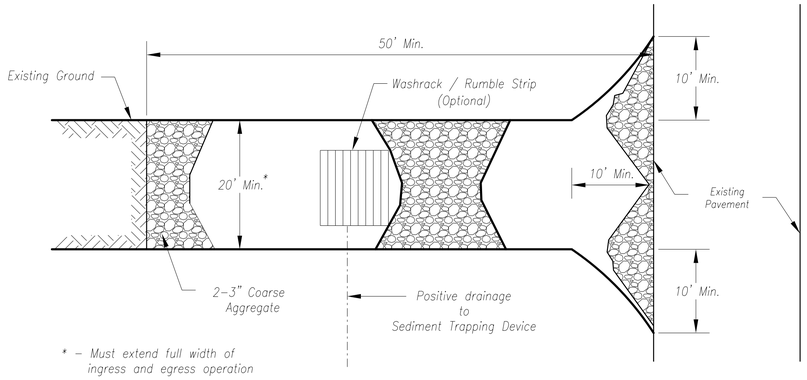
AMERICAN PUBLIC WORKS ASSOCIATION

KANSAS CITY METRO CHAPTER

COVER PAGE / TABLE OF CONTENTS

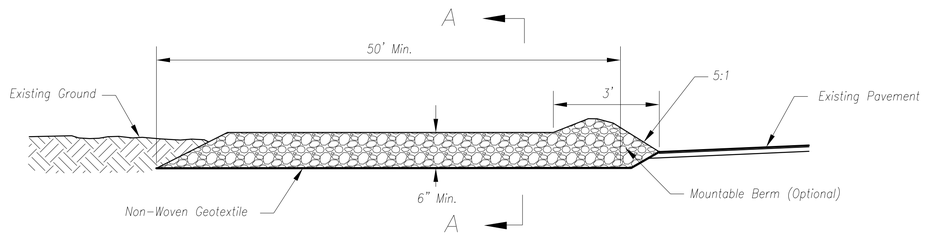
STANDARD DRAWING NUMBER ESC-TC

ADOPTED: 10/24/2016



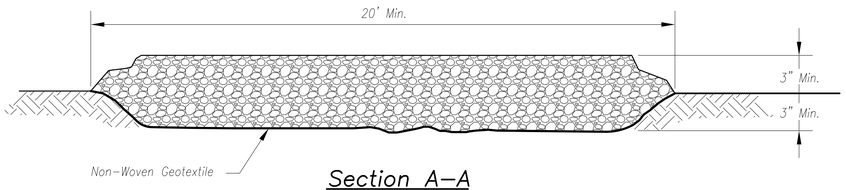
Plan View

Not to Scale



Side Elevation

Not to Scale



Section A-A

Not to Scale

Notes for Construction Entrance:

1. Avoid locating on steep slopes, at curves on public roads, or downhill of disturbed area.
2. Remove all vegetation and other unsuitable material from the foundation area, grade, and crown for positive drainage.
3. If slope towards the public road exceeds 2%, construct a 6- to 8-inch high ridge with 3H:1V side slopes across the foundation approximately 15 feet from the edge of the public road to divert runoff from it.
4. Install pipe under the entrance if needed to maintain drainage ditches along public roads.
5. Place stone to dimensions and grade as shown on plans. Leave surface sloped for drainage.
6. Divert all surface runoff and drainage from the entrance to a sediment control device.
7. If conditions warrant, place geotextile fabric on the graded foundation to improve stability.

Maintenance for Construction Entrance:

1. Reshape entrance as needed to maintain function and integrity of Installation. Top dress with clean aggregate as needed.

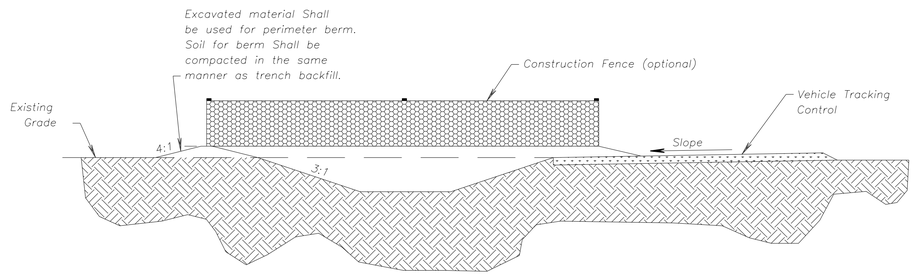
CONSTRUCTION ENTRANCE

Notes for Concrete Washout:

1. Concrete washout areas shall be installed prior to any concrete placement on site.
2. Concrete washout area shall include a flat subsurface pit sized relative to the amount of concrete to be placed on site. The slopes leading out of the subsurface pit shall be 3:1. The vehicle tracking pad shall be sloped towards the concrete washout area.
3. Vehicle tracking control is required at the access point to all concrete washout areas.
4. Signs shall be placed at the construction site entrance, washout area and elsewhere as necessary to clearly indicate the location(s) of the concrete washout area(s) to operators of concrete truck and pump rigs.
5. A one-piece impervious liner may be required along the bottom and sides of the subsurface pit in sandy or gravelly soils.

Maintenance for Concrete Washout:

1. Concrete washout materials shall be removed once the materials have filled the washout to approximately 75% full.
2. Concrete washout areas shall be enlarged as necessary to maintain capacity for wasted concrete.
3. Concrete washout water, wasted pieces of concrete and all other debris in the subsurface pit shall be transported from the job site in a water-tight container and disposed of properly.
4. Concrete washout areas shall remain in place until all concrete for the project is placed.
5. When concrete washout areas are removed, excavations shall be filled with suitable compacted backfill and topsoil, any disturbed areas associated with the installation, maintenance, and/or removal of the concrete washout areas shall be stabilized.



CONCRETE WASHOUT

Construction Entrance modified from 2015 Overland Park Standard Details for Erosion and Sediment Control; Concrete Washout modified from 2009 City of Great Bend Standard Drawings.

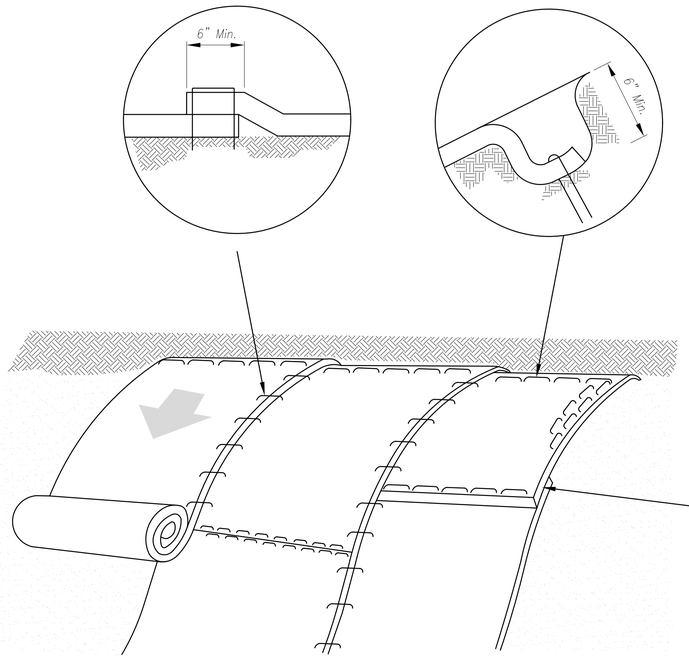
AMERICAN PUBLIC WORKS ASSOCIATION

KANSAS CITY METRO CHAPTER

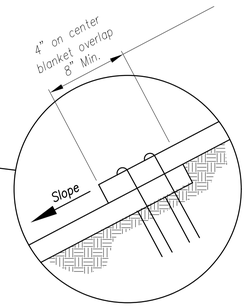
CONSTRUCTION ENTRANCE AND CONCRETE WASHOUT

STANDARD DRAWING NUMBER ESC-01

ADOPTED: 10/24/2016



Installation on Slopes



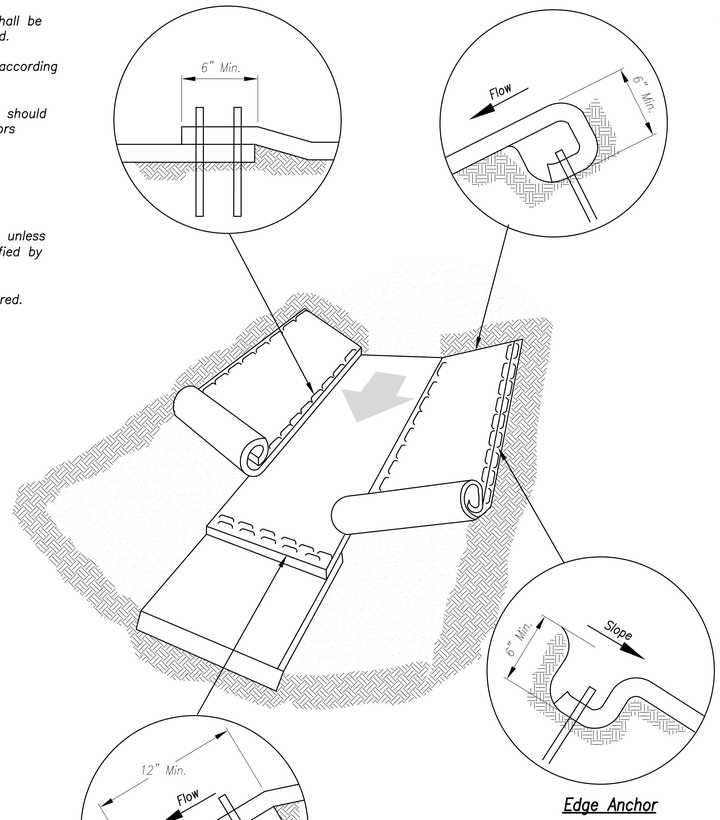
Splice Seam

General Notes:

1. APWA Specifications 2150 and Design Guidance 5100 shall be referenced to select type of blanket or mat to be used.
2. Typical anchors and pattern/spacing shall be installed according to the manufacturers instructions.
3. LONGITUDINAL SEAMS: The edges of the blanket or mat should overlap each other a minimum of 6 inches, with anchors catching the edges of both blankets.

Maintenance:

1. Torn or degraded product shall be repaired or replaced, unless such degradation is within the functional longevity specified by the manufacturer.
2. Edges or seams that are loose or frayed shall be secured.

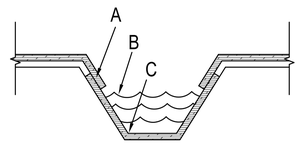


Edge Anchor

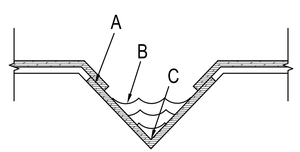
Splice Seam

Notes for Installation in Channels:

1. Erosion Control Blankets and TRMs shall be laid in the direction of the flow, with the first course at the centerline of channel, where applicable. In order for the mat to be in contact with the soil, lay the mat loosely, avoiding stretching.
2. ANCHOR FOLD: The top of the mat should be folded under, buried and secured with wood or other approved anchors placed 6 inches apart. The top edge of the mat should be buried in a slot 6 inches wide x 6 inches deep, anchored in the bottom of the slot, backfilled, and the mat folded over the top as shown in detail.
3. SPLICE SEAM: When splices are necessary, overlap end a minimum of 12 inches in direction of water flow. Stagger splice seams.
4. CHECK SLOTS: Establish check slots transverse to slope every 30 feet. The slots should be 6 inches wide x 6 inches deep. The mat shall be cut to a length 12 inches beyond the slot. The top of the downstream mat shall be slotted in, secured and buried similar to the edge anchor fold. The upstream mat shall then cover the slot and be anchored as shown.
5. EDGE ANCHORS: Lay outside edge of mat into trench at top of the slope and anchor.
6. TERMINUS: The bottom edge of the mat shall be anchored.



Trapezoidal Channel



V Channel

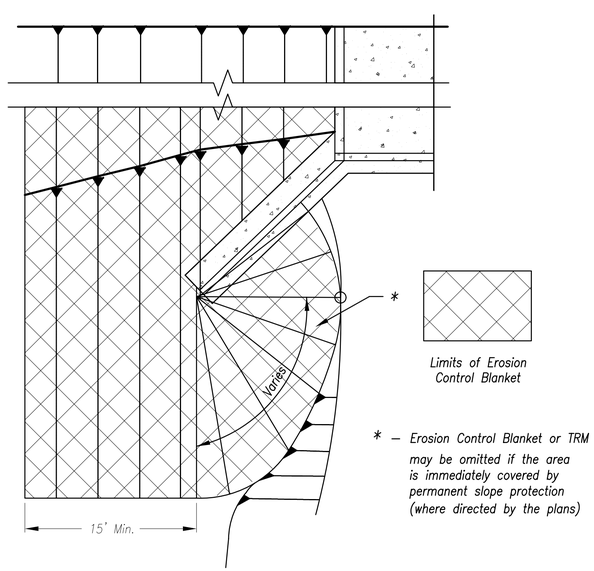
Critical Points:

A – Overlaps and seams;

B – Projected water line;

C – Channel bottom / side slope vertices;

Installation in Channels



* – Erosion Control Blanket or TRM may be omitted if the area is immediately covered by permanent slope protection (where directed by the plans)

Partial Box Culvert Plan

Not to Scale

Installation Around Culvert Slope

Notes for Installation on Slopes:

1. Erosion Control Blankets and TRMs shall be laid in the direction of the slope. In order for blanket to be in contact with the soil, lay blanket loosely, avoiding stretching.
2. ANCHOR SLOTS: The top of the blanket should be "slotted in" at the top of the slope and anchored in place with anchors 6 inches apart. The slots should be 6 inches wide x 6 inches deep with the blanket anchored in the bottom of the slot, then backfilled, tamped and seeded.
3. SPLICE SEAM: When splices are necessary, overlap end a minimum of 8 inches in direction of water flow. Stagger splice seams.
4. TERMINAL FOLD: The bottom edge of the blanket shall be turned under a minimum of 4 inches, then anchored in place with anchors 9 inches apart.

Modified from 2015 Overland Park Standard Details for Erosion and Sediment Control.

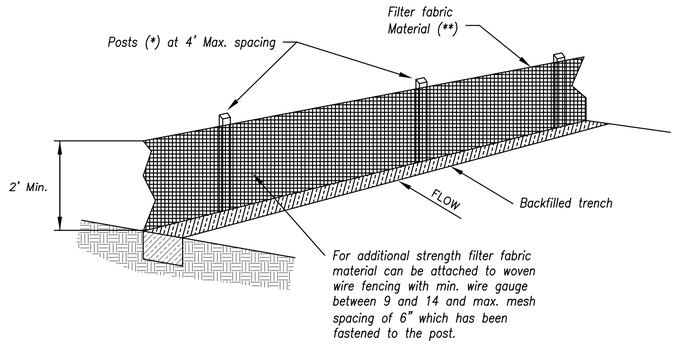
AMERICAN PUBLIC WORKS ASSOCIATION

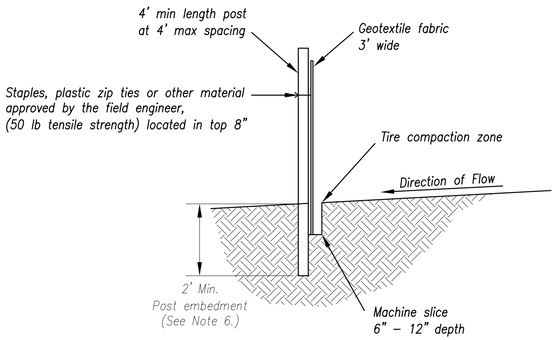
KANSAS CITY METRO CHAPTER

EROSION CONTROL BLANKETS AND TURF REINFORMENT MATS

STANDARD DRAWING NUMBER ESC-02

ADOPTED: 10/24/2016





(*) POSTS

- MIN, LENGTH 4'
- HARDWOOD 1 3/16" x 1 3/16"
- NO.2 SOUTHERN PINE 2 5/8" x 2 5/8"
- STEEL 1.33 LB/FT

(**) – Geotextile Fabric shall meet the requirements of AASHTO M288

SILT FENCE DETAILS

Not to Scale

Notes:

1. In order to contain water, the ends of the silt fence must be turned uphill (Figure A).
2. Long perimeter runs of silt fence must be limited to 100'. Runs should be broken up into several smaller segments to minimize water concentrations (Figure A).
3. Long slopes should be broken up with intermediate rows of silt fence to slow runoff velocities.
4. Attach fabric to upstream side of post.
5. Install posts a minimum of 2' into the ground.
6. Trenching will only be allowed for small or difficult installation, where slicing machine cannot be reasonably used.

Maintenance:

1. Remove and dispose of sediment deposits when the deposit approaches ⅓ the height of silt fence.
2. Repair as necessary to maintain function and structure.

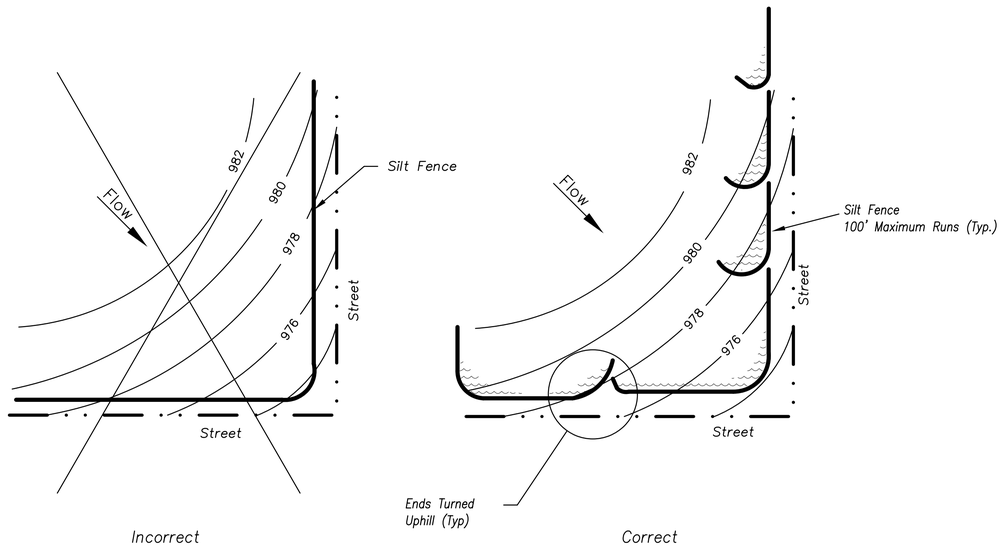
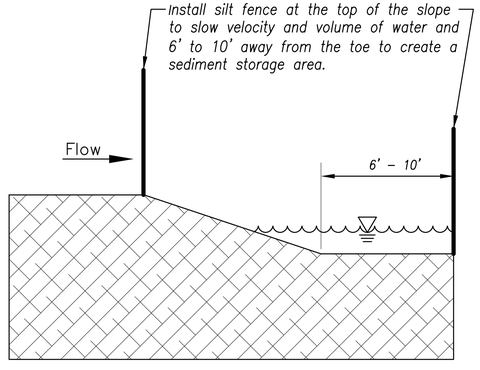
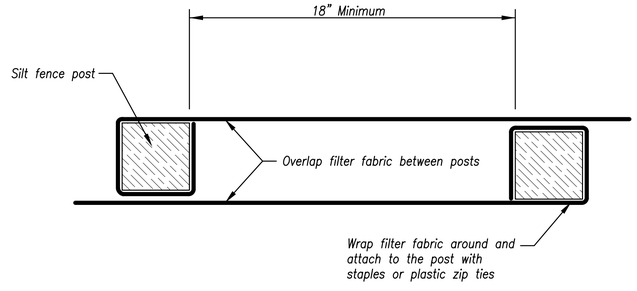


Figure A

SILT FENCE LAYOUT

Not to Scale





JOINING FENCE SECTIONS

Not to Scale

Modified from 2015 Overland Park Standard Details for Erosion and Sediment Control.

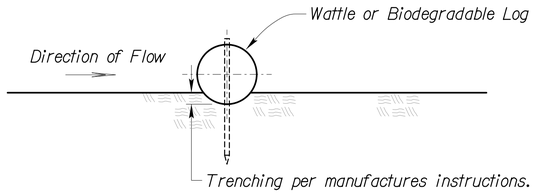
AMERICAN PUBLIC WORKS ASSOCIATION

KANSAS CITY METRO CHAPTER

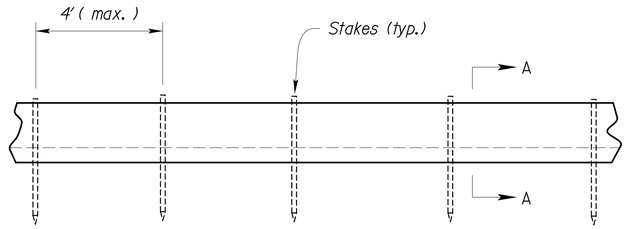
SILT FENCE

STANDARD DRAWING NUMBER ESC-03

ADOPTED: 10/24/2016



Section A–A



Typical Elevation

WATTLES AND BIODEGRADABLE LOG

Notes for Wattles and Biodegradable Log Slope Protection:

1. The Slope barriers shall be placed along contour lines, with a short section turned upgrade at each end of the barrier. The maximum length of the slope barrier shall not exceed 250 feet, and the barrier ends need to be staggered.
2. Install wattles and biodegradable logs per manufacturer's instructions.
3. Spacing of stakes per manufacturer's instructions with 4' max. spacing. Length of stakes shall be a minimum of 2 times the diameter of the log with minimum of 24".

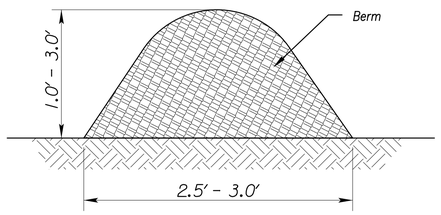


Figure 1
(Perimeter Control)

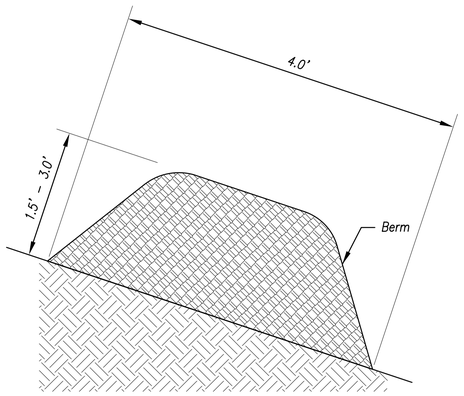


Figure 2
(Steep Slopes)

Notes for Mulch and Compost Filter Beam:

1. The sediment control berm shall be placed uncompacted in a windrow at locations shown on the plans or as directed by the engineer.
2. Parallel to the base of the slope, or around the perimeter of other affected areas, construct a 1 to 3 foot high by 2.5 to 3 foot wide berm (see Figure 1). For maximum water treatment ability or for steep slopes, construct a 1.5 to 3 foot high trapezoidal berm that is a minimum of 4 feet wide at the base (see Figure 2). In extreme conditions, or where specified by the engineer, a second berm shall be constructed at the top of the slope. Engineer will specify berm requirements.
3. If berm is to be left as permanent or part of the natural landscape, the compost berm may be seeded during application for permanent vegetation.
4. Do not use compost or wood mulch berms in any runoff channels or concentrated flow areas.
5. Wood mulch shall consist of tree and shrub debris resulting from clearing and grubbing and shall be ground by the mechanical means such as a chipper, hammermill, tub grinder or other approved method. Mulch sizing varies with a maximum width of 2" and a maximum length of 10".

Maintenance for Mulch and Compost Filter Beam:

1. Berm shall be reshaped and material added as necessary to maintain function and dimensions.
2. Breaches in the berm shall be repaired promptly.

MULCH OR COMPOST FILTER BERMS

Modified from 2015 Overland Park Standard Details for Erosion and Sediment Control.

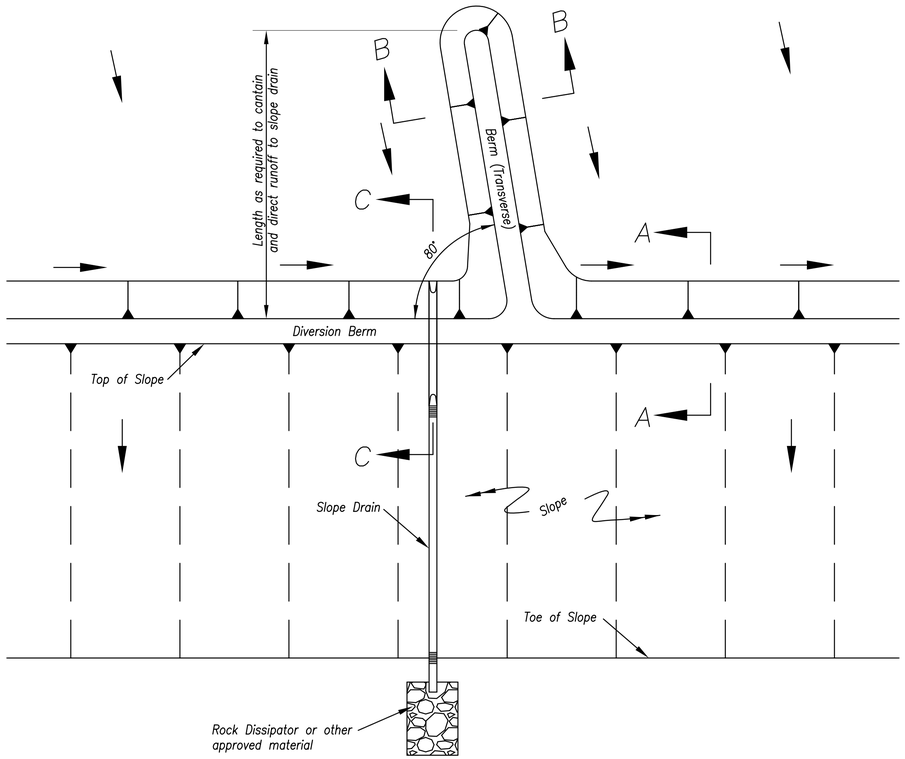
AMERICAN PUBLIC WORKS ASSOCIATION

KANSAS CITY METRO CHAPTER

WATTLES/BIODEGRADABLE LOG AND MULCH/COMPOST FILTER BERM

STANDARD DRAWING NUMBER ESC-04

ADOPTED: 10/24/2016



TYPICAL PLAN VIEW OF DIVERSION BERM AND SLOPE DRAIN

Notes for Diversion Berm:

1. Slope drains are optional, but may be required by the engineer if the berm is at the top of a steep slope.
2. Diversion berms must be installed as a first step in the land–disturbing activity and must be functional prior to upslope land disturbance.
3. The berm should be adequately compacted to prevent failure.
4. Temporary or permanent seeding and mulch shall be applied to the berm immediately following its construction.
5. Place the berm so to minimize damages by construction operations and traffic.
6. The berm must discharge to a temporary sediment trap or stabilized area.
7. All trees, brush, stumps, obstructions and other objectionable material shall be removed and disposed of so as not to interfere with the proper functioning of diversion.
8. The diversion shall be excavated or shaped to line, grade and cross–section as required to meet the criteria specified herein, free of irregularities which will impede flow.
9. Fills shall be compacted as needed to prevent unequal settlement that would cause damage in the completed diversion. Fill shall be composed of soil which is free from excessive organic debris, rocks or other objectionable materials.

Maintenance:

1. Berm shall be reshaped, compacted, and stabilized as necessary to maintain its function.
2. Breaches in the berm shall be repaired immediately.

Notes for Slope Drain:

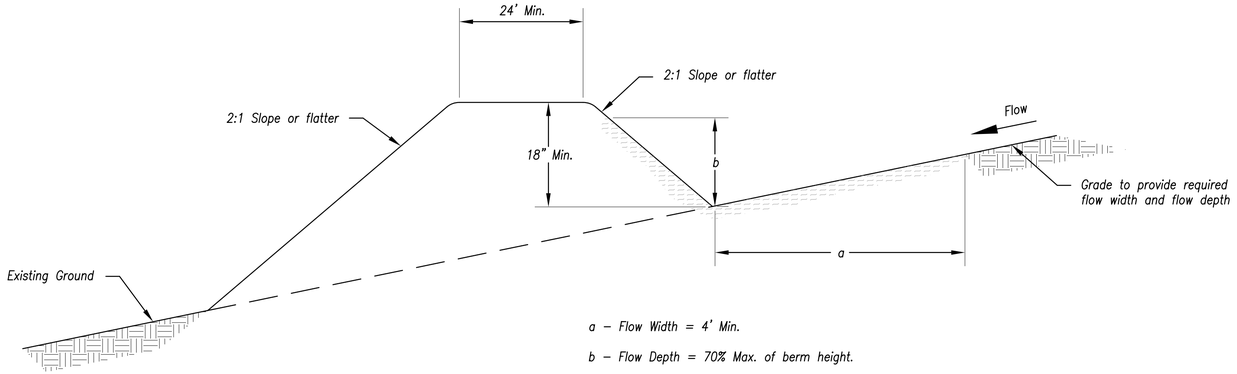
1. Slope Drain and Diversion Berm may be used on either project foreslopes or project backslopes.
2. Discharge of Slope Drains shall be into stabilized ditch or area, or into Sediment Basin.
3. Pipe shall be secured in place as approved by Engineer.

Maintenance:

1. Accumulation of any visible sediment at the inlet and outlet shall be removed promptly.
2. Outlet conditions shall be repaired if scour is observed. Leaking or damaged section of pipe shall be repaired immediately.
3. Barriers directing water to the inlet shall be monitored for continuity and effectiveness.

TYPICAL PROFILE OF DIVERSION BEAM

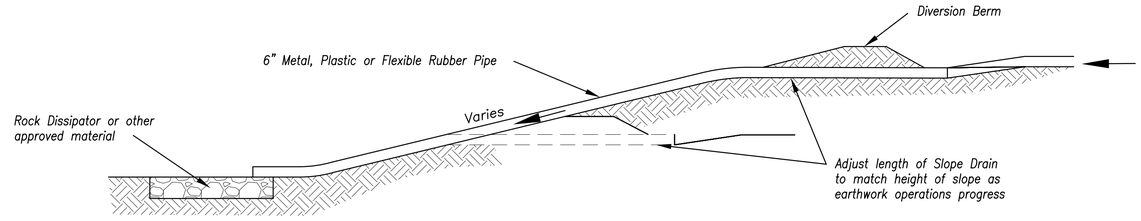
Not to Scale

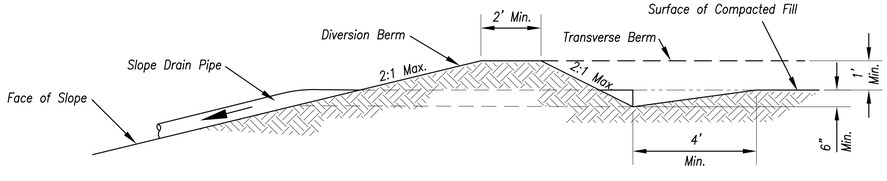


a – Flow Width = 4' Min.

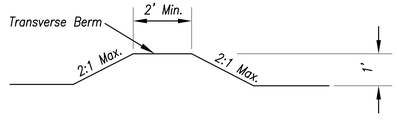
b – Flow Depth = 70% Max. of berm height.

TYPICAL PROFILE OF DIVERSION BERM





Section C–C



Section B–B

TYPICAL PROFILE OF DIVERSION BERM WITH SLOPE DRAIN

Modified from 2015 Overland Park Standard Details for Erosion and Sediment Control.

AMERICAN PUBLIC WORKS ASSOCIATION

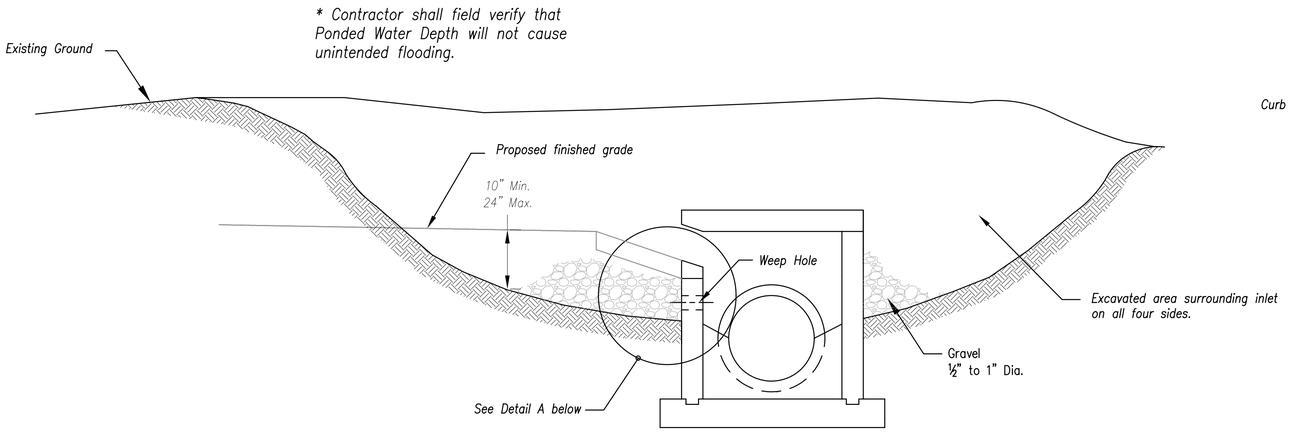
Kansas City Metro Chapter APWA American Public Works Association

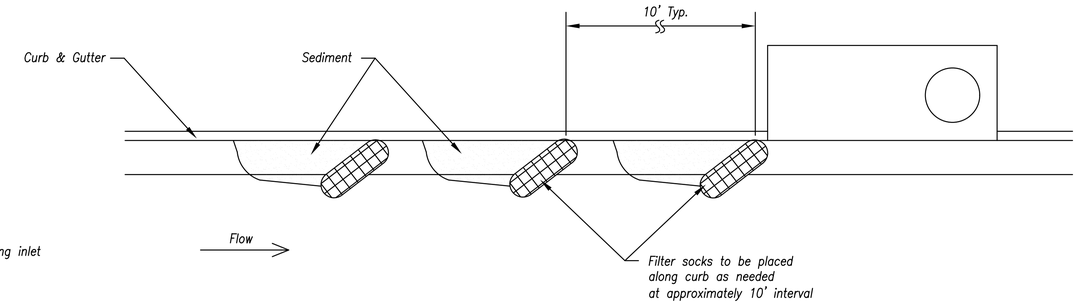
KANSAS CITY METRO CHAPTER

DIVERSION BERMS AND SLOPE DRAINS

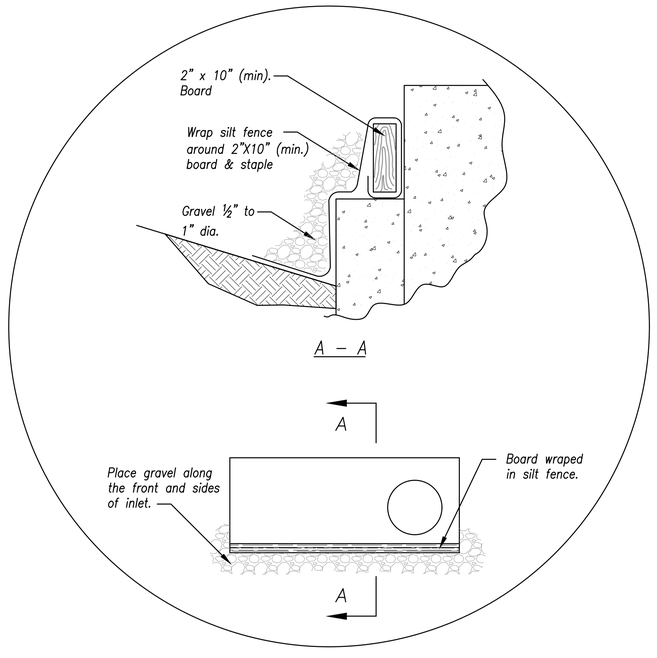
STANDARD DRAWING NUMBER ESC-05

ADOPTED: 10/24/2016





On Grade Curb Inlet Protection



Detail A

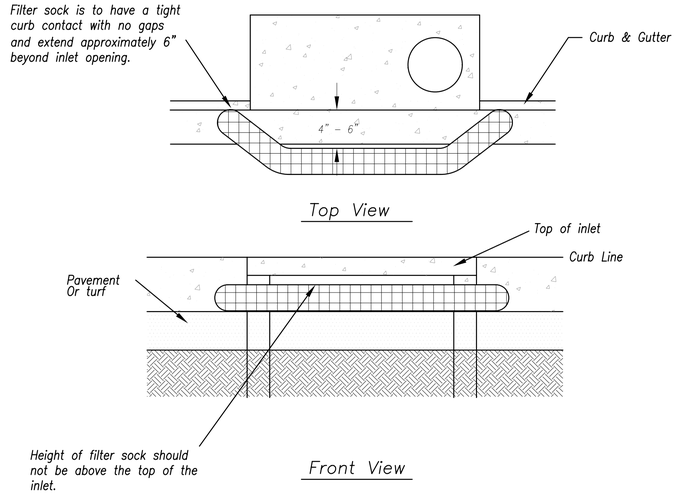
EARLY STAGE CURB INLET
(Open Box and Prior to Pouring Curb and Inlet Throat)

Notes:

1. Immediately following inlet construction and prior to construction of curb and inlet throat, protect inlet opening by installing 2" X 10" (min.) board wrapped in silt fence. Structures shall have excavated storage area on all four sides to allow settling of sediment (Early Stage Curb Inlet).
2. When inlet is completed and curb poured, filter socks or approved equal should be used (Late Stage Curb Inlet). Straw wattles are not approved for curb inlet use.
3. Contractor to field verify ponding water shall not create a traffic hazard.

Maintenance:

1. Remove deposited sediment from excavated storage areas when available storage has been reduced by 20%.
2. Remove deposited sediment from filter socks or similar when any accumulation of sediment is visible.
3. Repair or replace as necessary to maintain function and integrity of installation.



Sump Inlet Sediment Filter

LATE STAGE CURB INLET
(After Pouring Curb and Inlet Throat)

Modified from 2015 Overland Park Standard Details for Erosion and Sediment Control.

AMERICAN PUBLIC WORKS ASSOCIATION

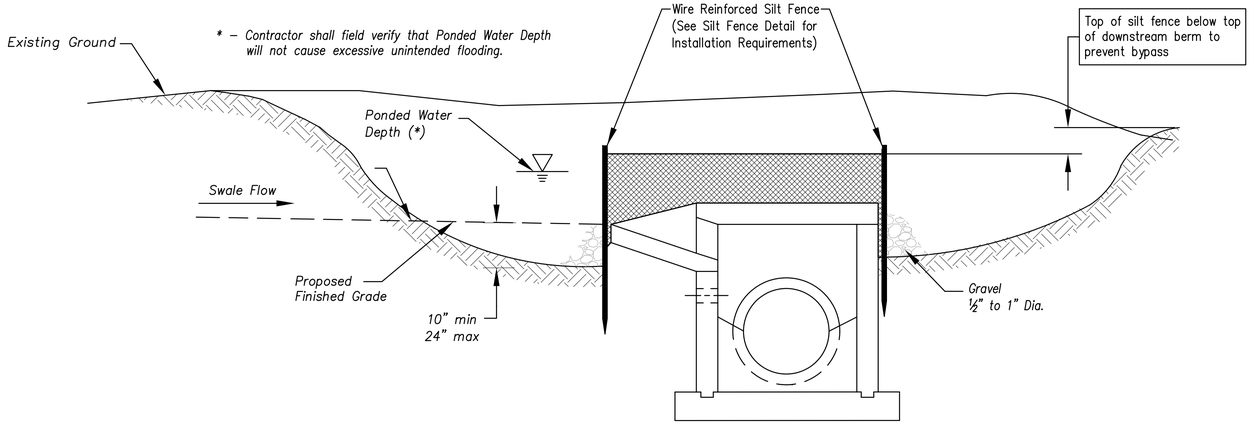
Kansas City Metro Chapter APWA American Public Works Association

KANSAS CITY METRO CHAPTER

CURB INLET PROTECTION

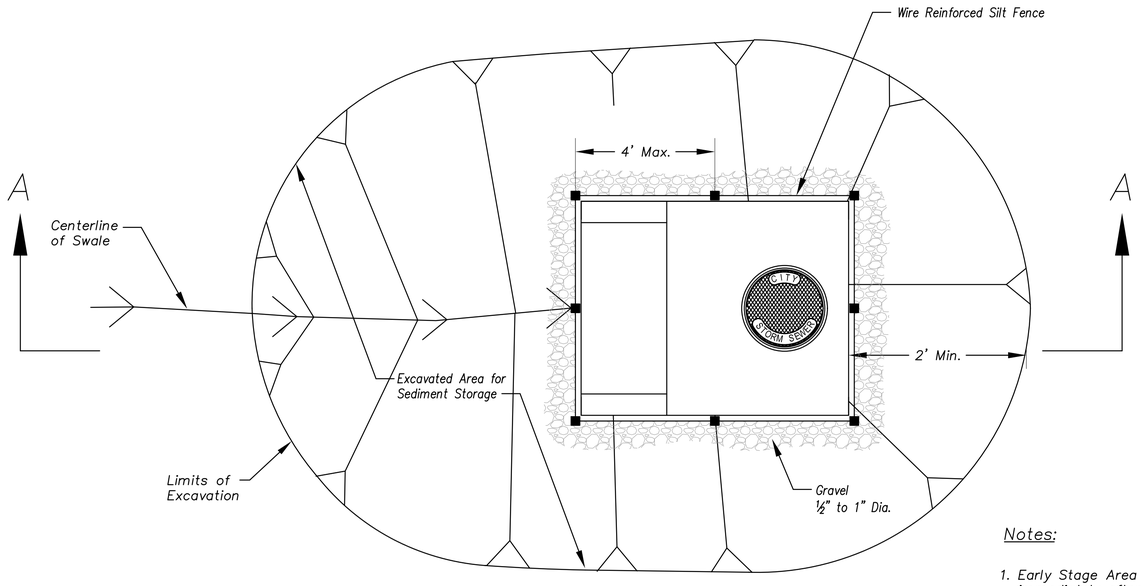
STANDARD DRAWING NUMBER ESC-06

ADOPTED: 10/24/2016



Section A–A

Not to Scale

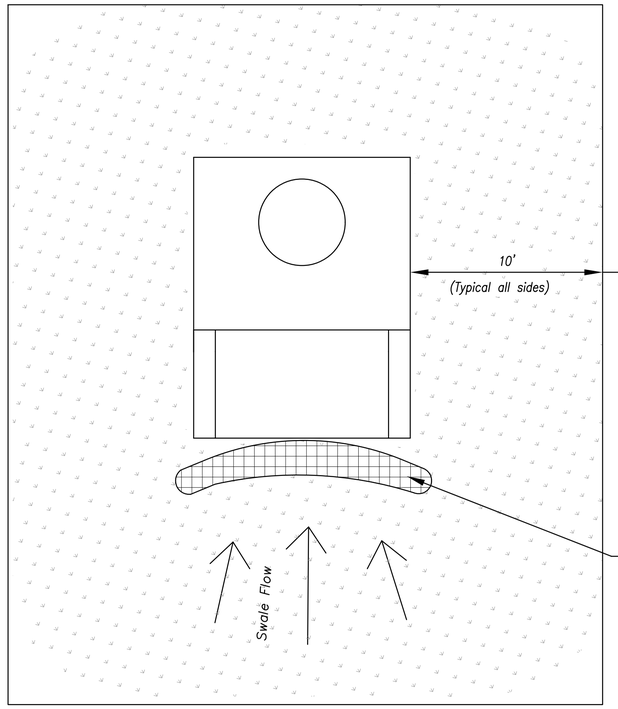


Plan

Not to Scale

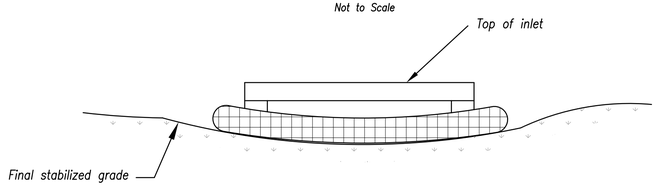
EARLY STAGE AREA INLET

(All open boxes and inlets not at final grade)



Plan

Not to Scale



Front View

LATE STAGE AREA INLET

(Area inlets at final grade and existing inlets)

Notes:

1. Early Stage Area Inlet Sediment Barrier to be installed immediately after inlet or junction box is constructed.
2. Silt fence shall remain in place until excavated area is removed and Late Stage Area Inlet is being installed.
3. Backfill excavated area ONLY after final grading of the site. Stabilization of the site is to immediately follow.
4. Wire reinforced silt fence may be used in place of silt fence attached to wood frame.

Maintenance:

1. Remove deposited sediment from excavated storage areas when available storage has been reduced by 20%.
2. Remove deposited sediment from filter socks or similar when any accumulation of sediment is visible.
3. Repair or replace as necessary to maintain function and integrity of installation.

Modified from 2015 Overland Park Standard Details for Erosion and Sediment Control.

AMERICAN PUBLIC WORKS ASSOCIATION

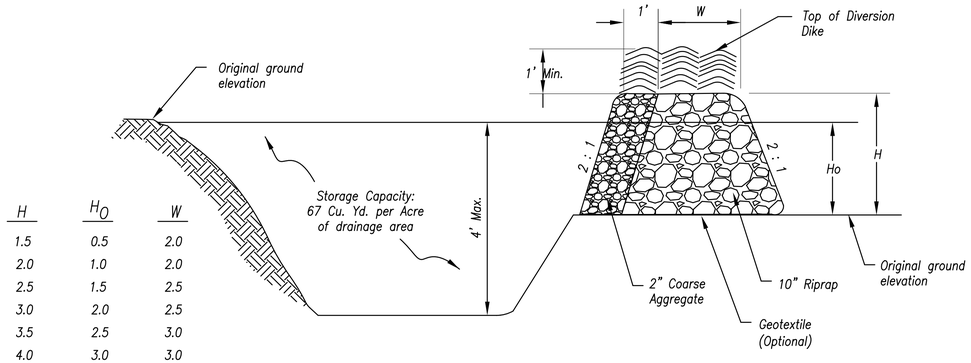
Kansas City Metro Chapter APWA American Public Works Association

KANSAS CITY METRO CHAPTER

AREA INLET AND JUNCTION BOX PROTECTION

STANDARD DRAWING NUMBER ESC-07

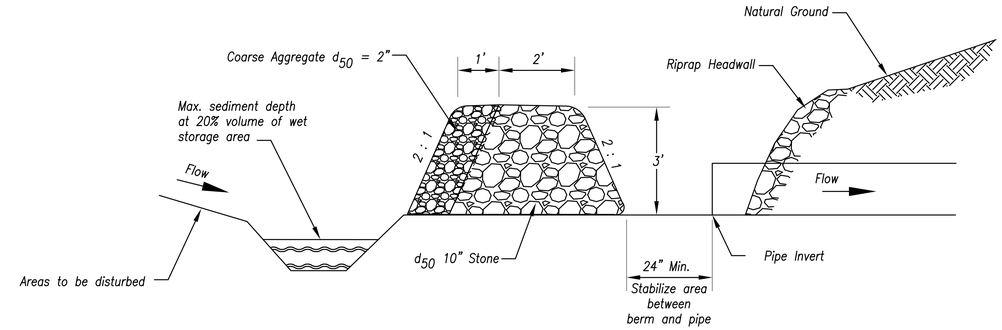
ADOPTED: 10/24/2016



H	H_O	W
1.5	0.5	2.0
2.0	1.0	2.0
2.5	1.5	2.5
3.0	2.0	2.5
3.5	2.5	3.0
4.0	3.0	3.0
4.5	3.5	4.0
5.0	4.0	4.5

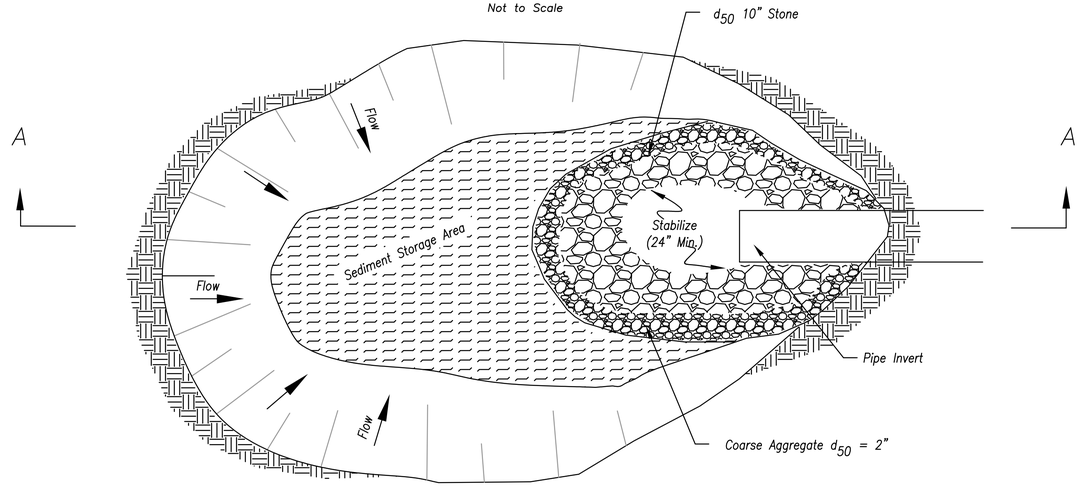
(*) Cross Section of Outlet

Not to Scale



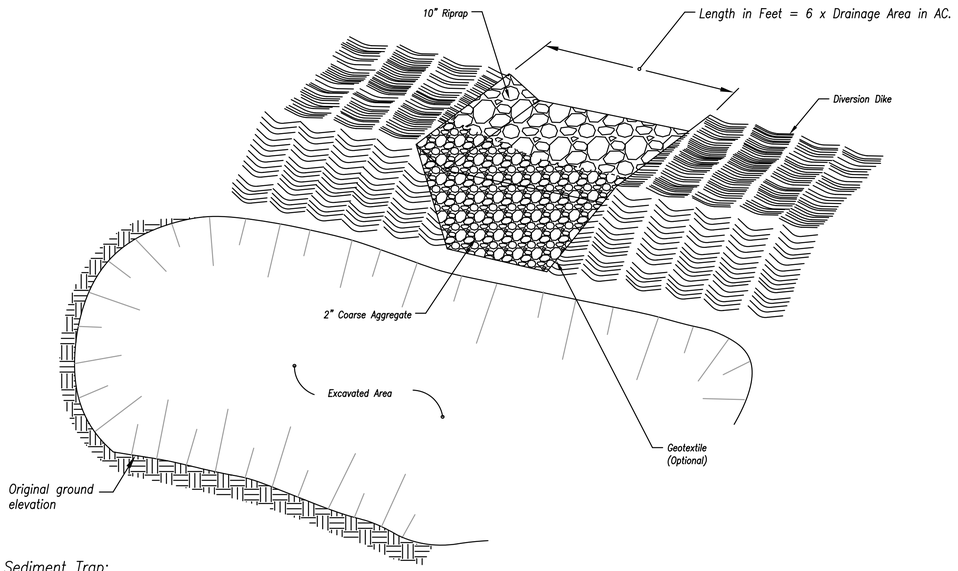
Section A–A

Not to Scale



Plan View

Not to Scale



(*) Perspective View of Outlet

Not to Scale

(*) – The perspective view and cross section are schematic in nature. Construction plans must provide specific site construction arrangements.

Notes for Sediment Trap:

1. The area under the embankment shall be cleared, grubbed, and stripped of any vegetation and root mat.
2. Fill material for the embankment shall be free of roots or other woody vegetation, organic material, large stones, and other objectionable material. The embankment should be compacted in 6–inch layers by traversing with construction equipment.
3. The earthen embankment shall be stabilized immediately after installation.
4. Construction operations shall be carried out to minimize erosion and water pollution.
5. The structure shall be removed and the area stabilized when the upslope drainage area has been stabilized.
6. All cut and fill slopes shall be 2H : 1V or flatter, except for excavated, wet storage areas which may be at a maximum 1H : 1V grade.

Maintenance for Sediment Trap:

1. Check sediment traps after periods of significant runoff.
2. Remove sediment and restore the trap to its original dimensions when sediment accumulates to 20% of the storage capacity.
3. Immediately repair any erosion damage to the embankment and outlet.
4. Keep outlet and pool area free of all trash and other debris.

SEDIMENT TRAP

Notes for Sediment Trap at Culvert Opening:

1. The inlet protection device shall be constructed in a manner that will facilitate clean–out and disposal of trapped sediment and minimize interference with construction activities.
2. The inlet protection devices shall be constructed in such manner that any resultant ponding stormwater will not cause excessive inconvenience or damage to adjacent areas or structures.
3. Geometry of the design will be a horseshoe shape around the culvert inlet.
4. The toe of the riprap shall be no closer than 24" from the culvert opening to provide an acceptable emergency outlet for flows from larger storm events.
5. Storage requirements equivalent to that of temporary sediment trap.
6. 67 C.Y./Acre wet storage below base of stone.
7. 67 C.Y./Acre dry storage from base of stone to top of stone berm.

Maintenance for Sediment Trap at Culvert Opening:

1. Check sediment traps after periods of significant runoff.
2. Remove sediment and restore the trap to its original dimensions when sediment accumulates to 20% of the storage capacity.
3. Immediately repair any erosion damage to the embankment and outlet.
4. Keep outlet and pool area free of all trash and other debris.

SEDIMENT TRAP AT CULVERT OPENING

Modified from 2015 Overland Park Standard Details for Erosion and Sediment Control.

AMERICAN PUBLIC WORKS ASSOCIATION

Kansas City Metro Chapter APWA American Public Works Association

KANSAS CITY METRO CHAPTER

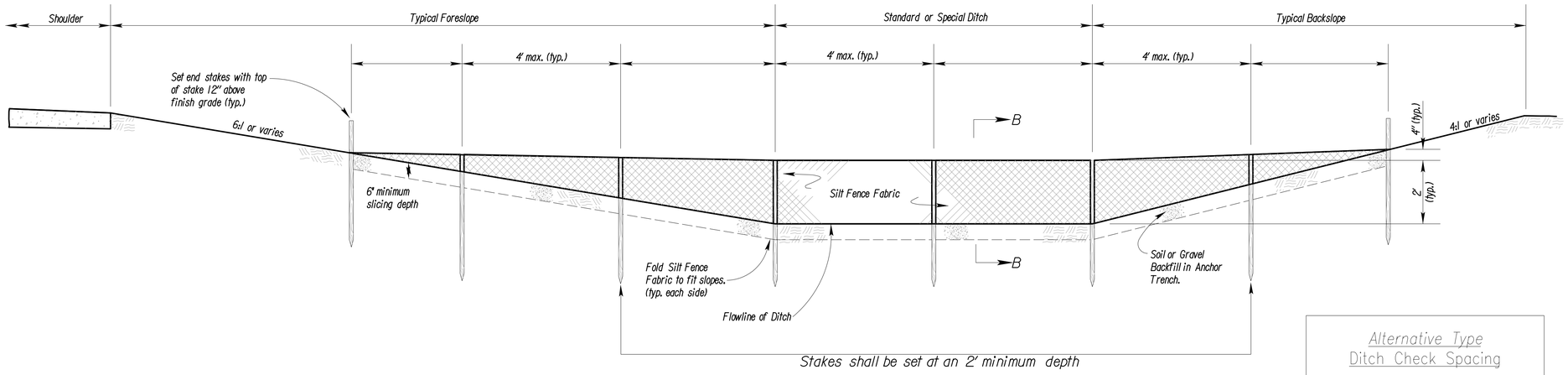
SEDIMENT TRAPS

STANDARD DRAWING NUMBER ESC-08

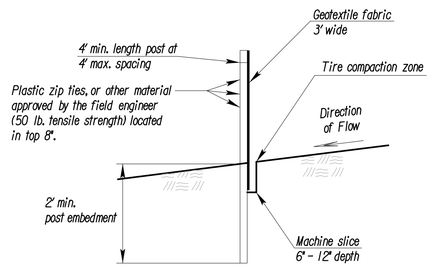
ADOPTED: 10/24/2016

Notes for Silt Fence Ditch Check:

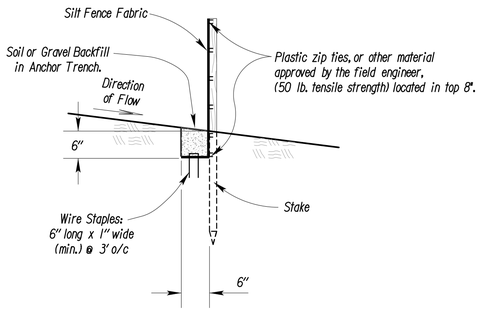
1. Stakes shall be 4' (min.) long and one of the following materials:
   a. Hardwood – 1 3/16" x 1 3/16";
   b. Southern Pine (No. 2) – 2 5/8" x 2 5/8";
   c. Steel U, T, L, or C Section – .95 lbs. per 1'–0";
   d. Synthetic – same strength as wood stakes.
2. Cross pieces shall be of same material as stakes.
3. Attach fence fabric securely on 6" centers (max.).
4. Use of high flow material is acceptable.
5. Refer to plan sheets to estimate the length of silt fence required.
6. Use support fencing when tributary area is greater than 2.4 acres or when ditch gradient is greater than 2 percent.
7. Silt fence sliced in to a 6" minimum depth.
8. Elevation at tie in points shall be a minimum of 4" higher than the center.



TYPICAL ELEVATION



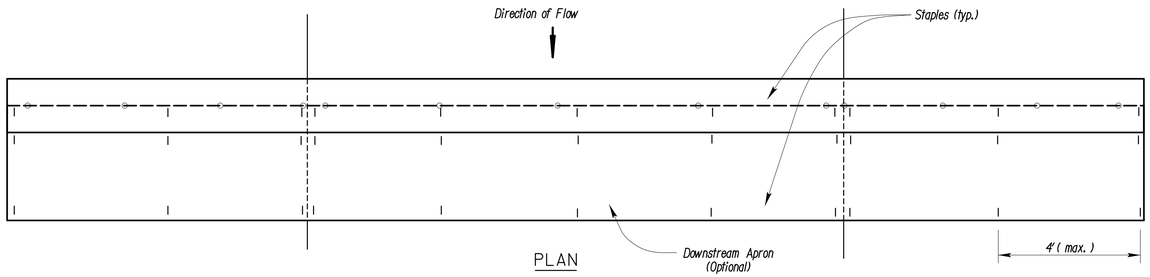
SECTION B-B



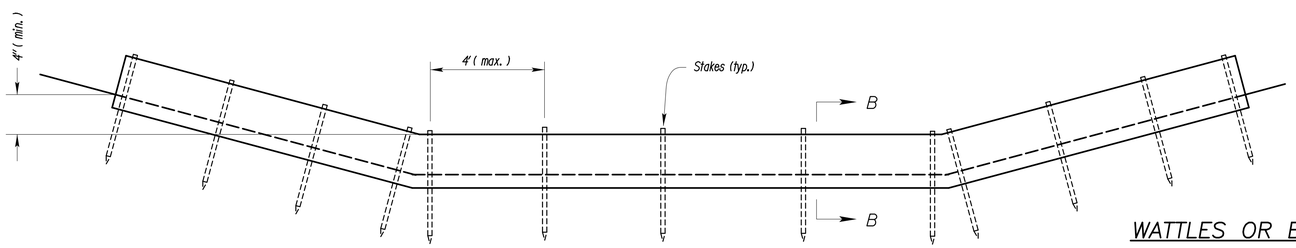
Alternative Type Ditch Check Spacing	
Ditch Centerline Slope (%)	Spacing Interval (Feet)
1.0	200
2.0	100
3.0	65
4.0	50
5.0	40
6.0	33
Note: Use this spacing for all except Rock Ditch Checks.	

SILT FENCE DITCH CHECK

NO SCALE



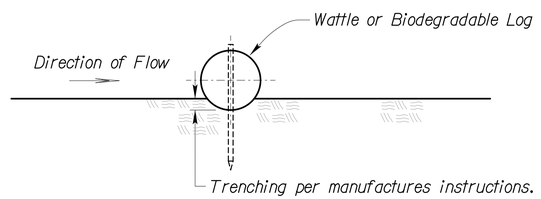
PLAN



TYPICAL ELEVATION

Notes for Wattles and Biodegradable Log Ditch Check:

1. Use as many biodegradable log sections as necessary to ensure water does not flow around end of ditch check.
2. Overlap sections a minimum of 18"
3. Stakes shall be per manufacturer's instructions. Length of stakes shall be a minimum of 2 times the diameter of the log or 24" minimum.
4. Use Erosion Control (Class 1) (Type C) as the downstream apron when directed by the Engineer.
5. Use 9" diameter logs when used with Erosion Control (Class 2) (Any Type) channel lining. Smaller diameter logs may be used with Erosion Control (Class 2) (Any Type) channel lining as directed by the Engineer.



SECTION B - B

WATTLES OR BIODEGRADABLE LOG DITCH CHECKS

OR Filter Sock Ditch Check

NO SCALE

Modified from Kansas Department of Transportation Standard Details for Erosion Control and Sediment Control.

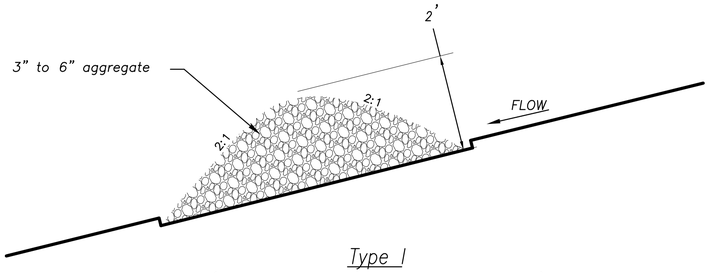
AMERICAN PUBLIC WORKS ASSOCIATION

KANSAS CITY METRO CHAPTER

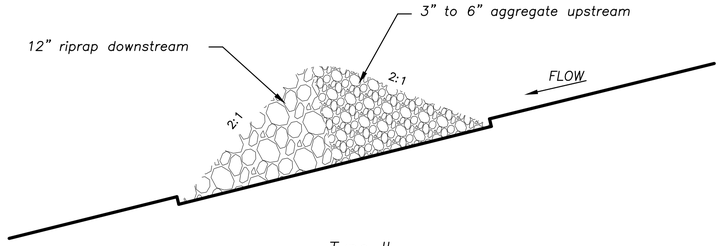
SILT FENCE AND WATTLE/ BIODEGRADABLE LOG DITCH CHECKS

STANDARD DRAWING NUMBER ESC-09

ADOPTED: 10/24/2016



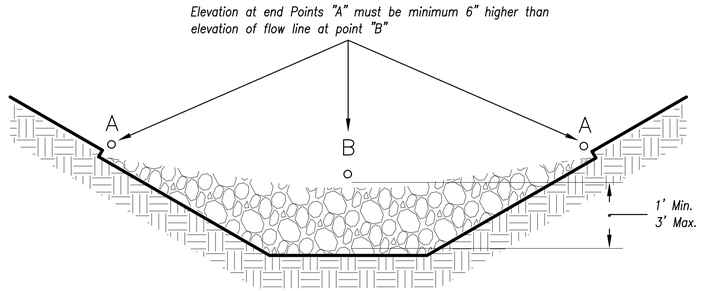
Type I
(2 Acres or less of Drainage Area)
Not to Scale



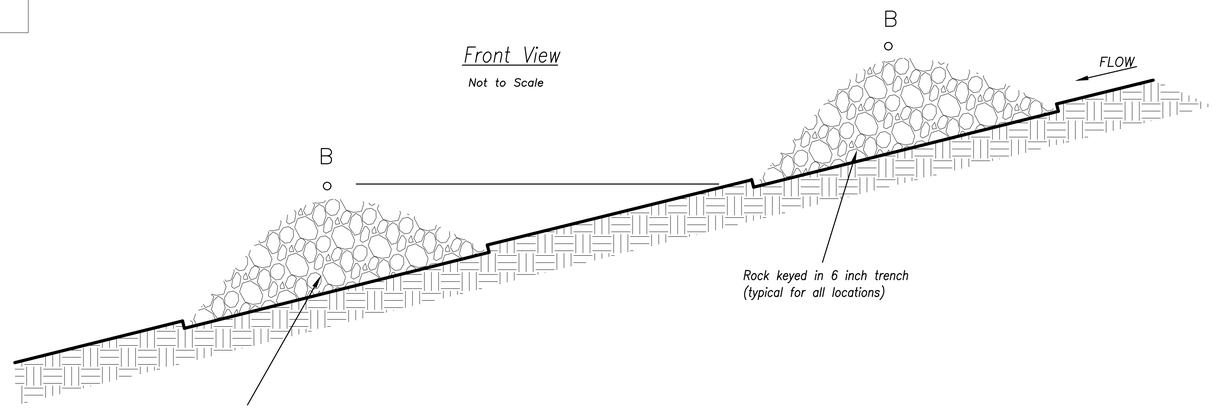
Type II
(2–10 Acres of Drainage Area)
Not to Scale

ROCK DITCH CHECK

Temporary Rock Ditch Check Spacing	
Ditch Centerline Slope (%)	Spacing Interval (Feet)
5.0	60
6.0	50
7.0	43
8.0	36
9.0	33
10.0	29
Note: Use this spacing only for Rock Ditch Checks.	



Front View
Not to Scale



Spacing Between Check Dams (all types)
Not to Scale

Notes:

1. Rock check dams shall be used only for drainage areas less that 10 acres unless approved by the City Engineer.
2. Use rock checks only in situations where the ditch slope exceeds 6%.

Maintenance:

1. Remove and dispose of sediment deposits when the deposit approaches ½ the height of the ditch check.
2. Replace and reshape as necessary to maintain function and integrity of installation.

Modified from 2015 Overland Park Standard Details for Erosion and Sediment Control.

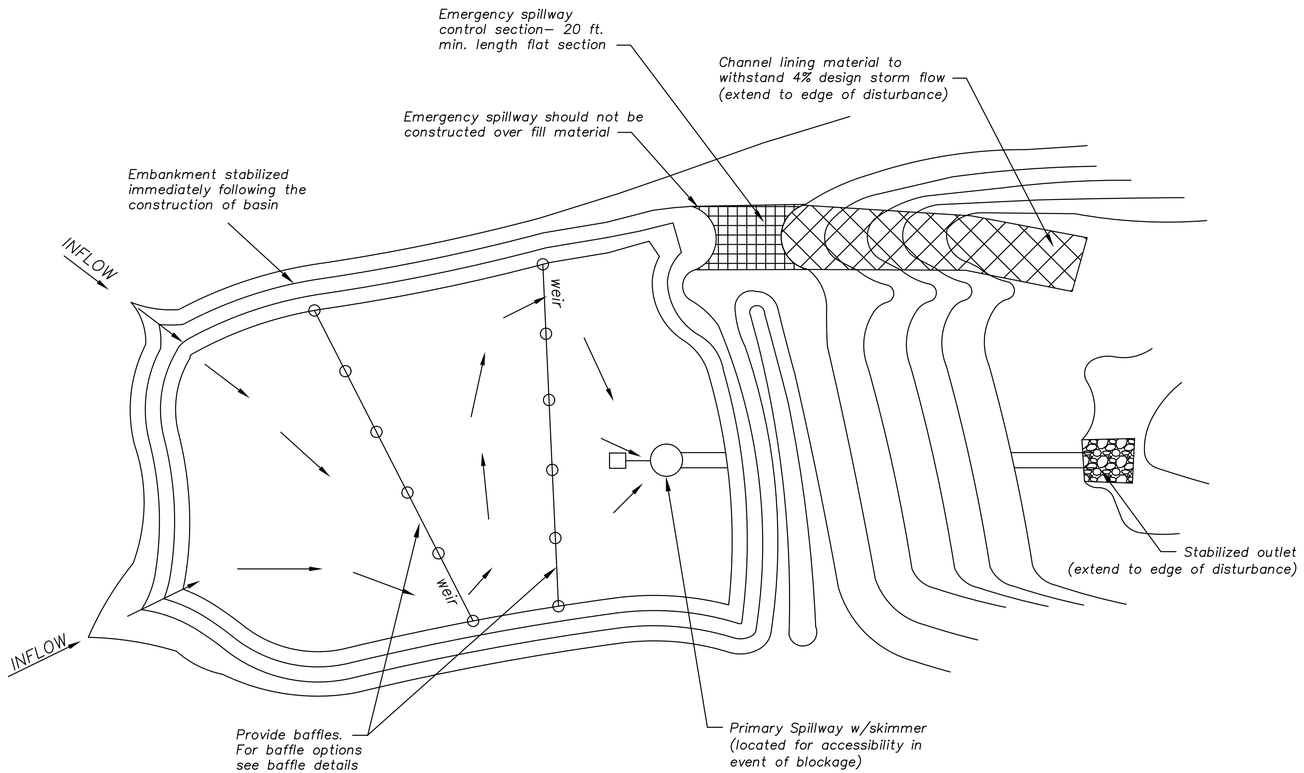
AMERICAN PUBLIC WORKS ASSOCIATION

KANSAS CITY METRO CHAPTER

ROCK DITCH CHECKS

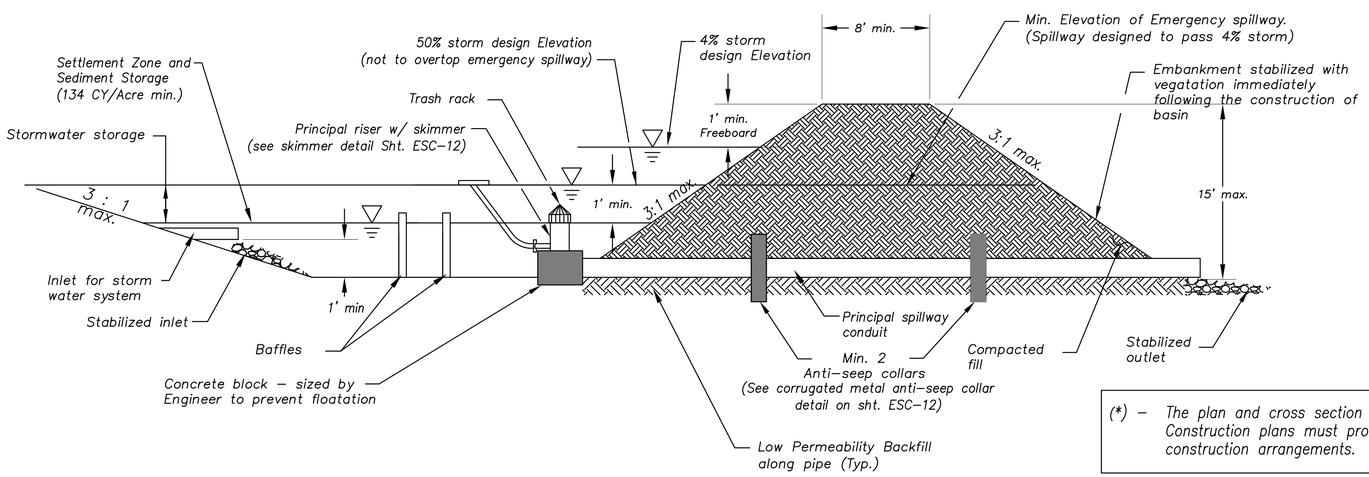
STANDARD DRAWING NUMBER ESC-10

ADOPTED: 10/24/2016



Plan View (*)

Not to Scale



Cross Section (*)

Not to Scale

(*) – The plan and cross section are schematic in nature. Construction plans must provide specific site construction arrangements.

Sediment Basin Design Summary (**)

Design Item	Basin #1	Basin #2	Units	Notes
Site Data:				
Tributary Drainage Area to Pond			Acres	
50% (2 yr) Design Flow			cfs	
4% (25 yr) Design Flow			cfs	
Pond Data:				
Minimum Sediment Storage Volume			cu yd	134 cy/acre required minimum
Provided Sediment Storage Volume			cu yd	
Bottom Elevation			Ft	
Sediment Cleanout Elevation			Ft	Elevation equal to 20% of original design volume
Top of Riser Elevation			Ft	Top of dry storage volume
Emergency Spillway Elevation			Ft	at or above Q–2 elevation. 1.0 ft min above principal spillway
Top of Dam Elevation			Ft	1.0 ft min above Q–25 elevation
Basin Shape Data:				
A = Area at Normal Pool			SF	
L = Length of Flow Path			Ft	
We = Effective Width = A/L			Ft	
Length to Width Ratio = L/We				
Principal Spillway Data:				
Riser Pipe dia			in	15" min. Size for 2 year flow minimum
Barrel Pipe dia			in	15" min. Size for 2 year flow minimum
Concrete Base size for Riser Pipe			CY	Size to prevent flotation. 1.25 safety factor required
Skimmer Size				Designer to provide specific details and calculations per application to dewater in 48 to 72 hours
Emergency Spillway Data:				
Design Depth in Spillway			ft	
Design Velocity in Spillway			ft/sec	
Lining Material				Designer to provide specific details and calculations per application

(**) – Required on all Sediment Basin Plan Sheets

Sediment Basin Notes:

1. Interior baffles shall be provided to reduce short–circuiting of the basin. See Sht. ESC–12 for approved baffle options.
2. Emergency spillways to be located in a non–fill location when feasible and shall be lined with a non–erodible material such as Riprap or Turf Reinforcement Mat.
3. When directed, sediment basins shall be fenced using construction fence or other material for safety reasons and include warning signs, reading: "Danger – KEEP OUT".

Maintenance:

1. Check temporary sediment basins after periods of significant runoff.
2. Remove sediment and restore the basin to its original dimensions when sediment accumulates to 20% of the storage capacity.
3. Immediately repair any erosion damage to the embankment and outlets.
4. Repair and/or replace baffles as necessary to maintain function and integrity of installation.
5. Keep outlet, skimmer and pool area free of all trash and other debris.

Modified from 2015 Overland Park Standard Details for Erosion and Sediment Control.

AMERICAN PUBLIC WORKS ASSOCIATION

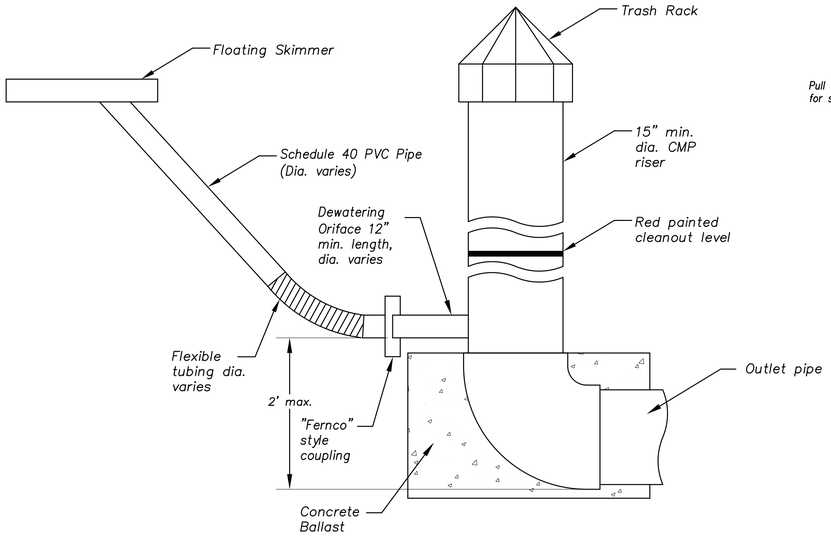
Kansas City Metro Chapter APWA AMERICAN PUBLIC WORKS ASSOCIATION

KANSAS CITY METRO CHAPTER

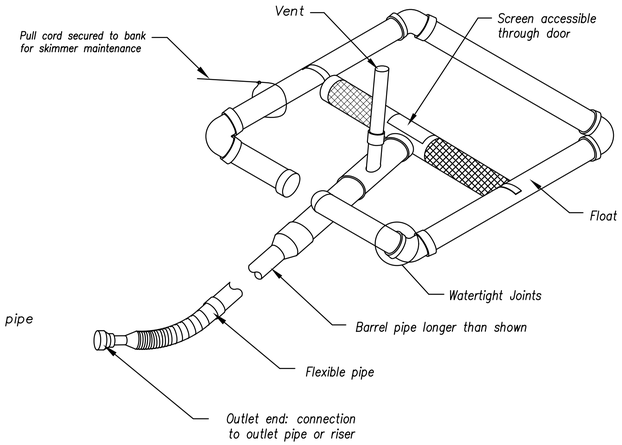
SEDIMENT BASIN

STANDARD DRAWING NUMBER ESC-11

ADOPTED: 10/24/2016

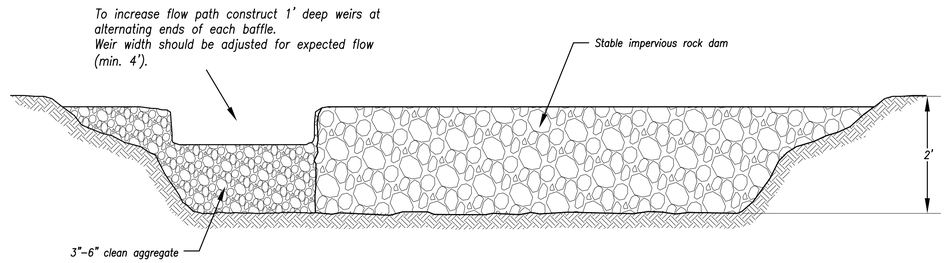


PRINCIPAL SPILLWAY DETAIL

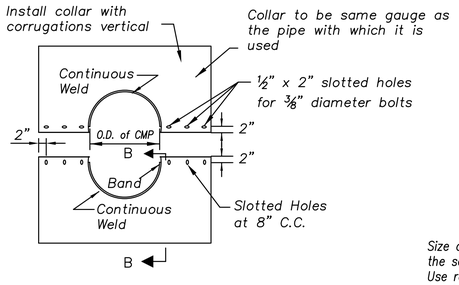


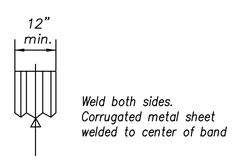
SKIMMER DETAIL (Typ.) *

* Designer to provide specific details per application (e.g. pipe sizes, screen sizes, perforation, etc.) as required.



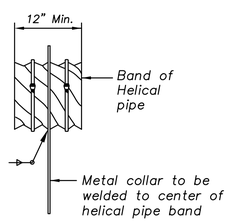
Option A – Rock with Weir



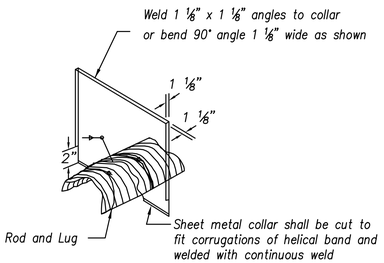


SECTION B–B

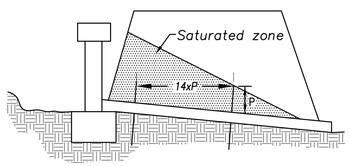
Size and spacing of slotted openings shall be the same as shown for CM collar. Use rods and lugs to clamp bands securely to pipe.



PARTIAL ELEVATION



ISOMETRIC VIEW



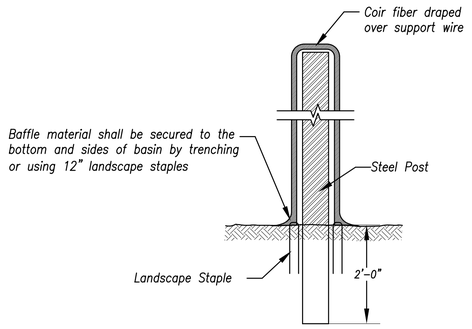
ANTI–SEEPAGE COLLAR LOCATIONS

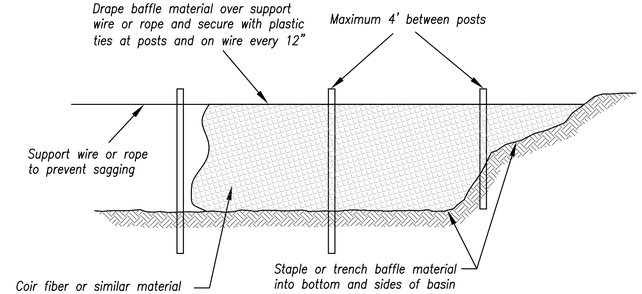
CORRUGATED METAL ANTI–SEEPAGE COLLAR DETAIL

Not to Scale

Anti–Seepage Collar Notes:

1. Connections between the anti–seepage collar and the barrel must be watertight.
2. P = projection distance. Sized as required to achieve at least a 10% increase in seepage length.
3. 14xP = Max. spacing between collars.
4. Collars shall generally be placed in the middle third of the embankment, and within the saturated zone.
5. All materials to be in accordance with construction material specifications.
6. When specified on the plans, coating of collars shall be in accordance with construction material specifications.
7. Unassembled collars shall be marked by painting or tagging to identify matching pairs.
8. The lap between the two half sections and between the pipe and connecting band shall be caulked with asphalt mastic at the time of installation.
9. Each collar shall be furnished with two (2) ½" diameter rods with standard tank lugs for connecting the collars to the pipe.
10. For bands and collars, modification of the details shown may be used providing equal water tightness is maintained and detailed drawings are Submitted and approved by the Engineer prior to delivery.
11. Two other types of anti–seep collars are:
    a. Corrugated metal, similar to above, except shop welded to a 4 ft. section of the pipe and connected to the pipe with connecting bands.
    b. Concrete, 6 inches thick, formed around the pipe with #3 rebar spaced 15".





Option B – Coir Fiber Material

BAFFLE DETAILS

Not to Scale

Modified from 2015 Overland Park Standard Details for Erosion and Sediment Control.

AMERICAN PUBLIC WORKS ASSOCIATION

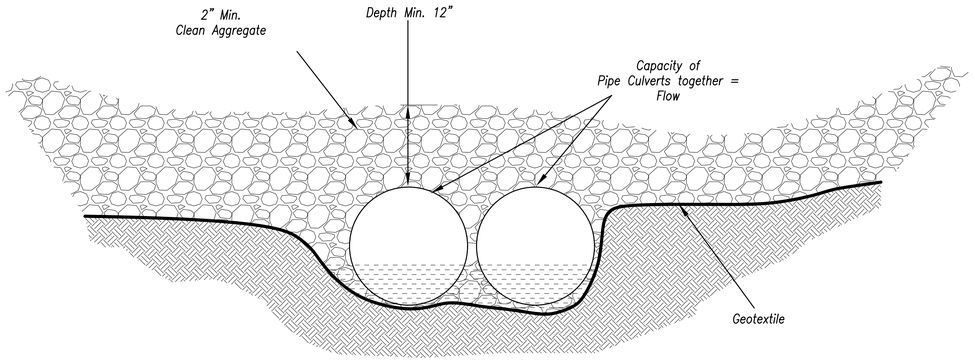
Kansas City Metro Chapter APWA American Public Works Association

KANSAS CITY METRO CHAPTER

SEDIMENT BASIN - DETAILS

STANDARD DRAWING NUMBER ESC-12

ADOPTED: 10/24/2016



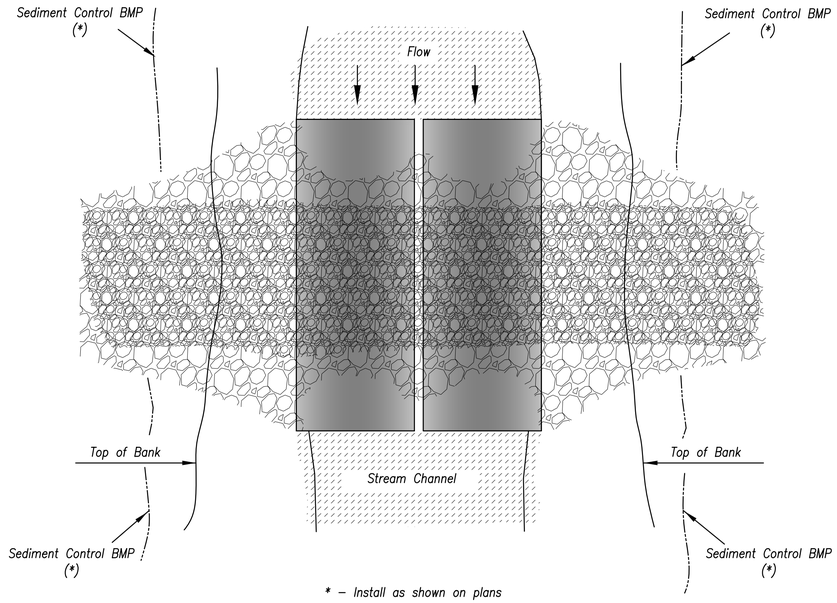
ELEVATION

Maintenance:

1. Repair stream bank erosion by stabilizing with erosion control BMPs such as erosion control blankets.
2. For in-stream degradation, armor the culvert outlet(s) with riprap to dissipate energy.
3. If sediment or debris is accumulating upstream of the crossing, remove as needed to maintain the functionality of the crossing.
4. If a temporary crossing is requiring excessive maintenance, replacement with a larger culvert or alternate design may be necessary.

Notes for Temporary Stream Crossing:

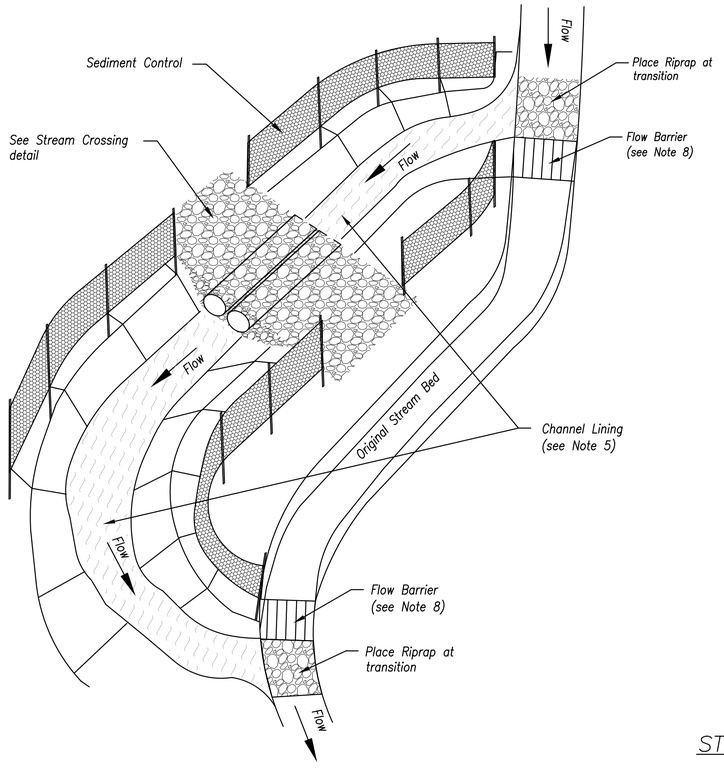
1. Clearing and excavation of the stream bed and banks shall be kept to a minimum.
2. Place one pipe, buried 6" into the stream bottom, at the lowest point of the channel to allow the passage of aquatic organisms. Additional pipes shall be placed along the remainder of the stream channel bottom such that ordinary high water (OHW) flows designated in the Contract Documents shall flow through the pipes without overtopping the crossing. (See Specification for more information).
3. Geotextile shall be placed on the streambed and streambanks prior to placement of the pipe culvert and aggregate. The geotextile shall cover the streambed and extend a minimum of 6 inches and a maximum of 1 foot beyond the end of culvert and bedding material. Filter cloth reduces settlement and improves crossing stability.
4. The culvert shall extend a minimum of 1 foot beyond the upstream and downstream toe of the aggregate placed around the culvert. In no case shall the culvert exceed 40 feet in length.
5. The culvert shall be covered with a minimum of 1 foot of aggregate. If multiple culverts are used, they shall be separated by at least 12" of compacted aggregate fill.
6. As soon as crossing no longer needed, all structures including culverts, bedding and geotextile materials shall be removed. Removal of the structure and clean-up of the area shall be accomplished without construction equipment working in the channel.
7. Upon removal of the structure, the stream and banks shall immediately be shaped to its original cross-section and properly stabilized. Take care to minimize the amount of sediment lost into the stream.



* – Install as shown on plans

PLAN VIEW

TEMPORARY STREAM CROSSING



Notes for Temporary Diversion Channel:

1. The diversion channel crossing must be operational before work is done in the stream. Construction will be performed in the dry.
2. Minimum width of bottom shall be 6 feet or equal to bottom width of existing streambed, whichever is less.
3. Maximum steepness of side slopes shall be 2H:1V. Depth and grade may be variable, dependent on site conditions, but shal be sufficient to ensure continuous flow of water in diversion.
4. Channel must be lined with riprap or turf reinforcement mat depending on the expected velocity and shear stress in the channel.
5. Stream diversion liners shall be secured at the upstream and downstream sides with non-erodible weights such as riprap. These weights shall allow normal flow of the stream. Soil shall not be mixed with stream diversion weights. Weights may also be needed along the diversion's length to secure liner.
6. Stream diversion liners shall be entrenched at the top of slopes along with a sediment control BMP.
7. Non-erodible materials such as riprap, Jersey barriers. sand bags, plywood, or sheet piling shall be used as flow barriers to divert the stream away from it's original channel and prevent or reduce water backup into the construction area.
8. Stream should be re-diverted only after backfilling and re-stabilization of original streambed and banks is completed.

STREAM DIVERSION CHANNEL

Modified from 2015 Overland Park Standard Details for Erosion and Sediment Control.

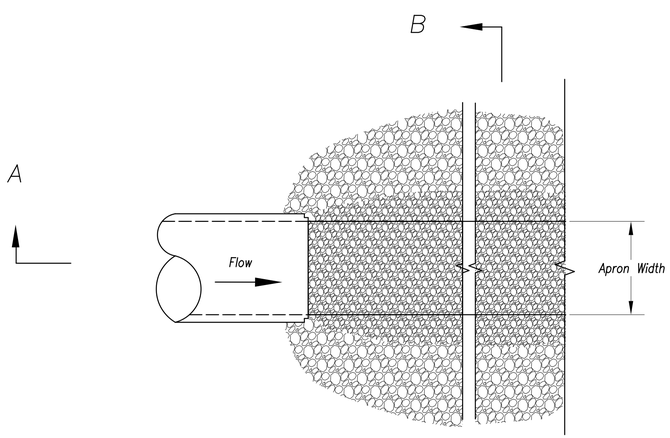
AMERICAN PUBLIC WORKS ASSOCIATION

KANSAS CITY
METRO CHAPTER

STREAM CROSSINGS AND
DIVERSION CHANNELS

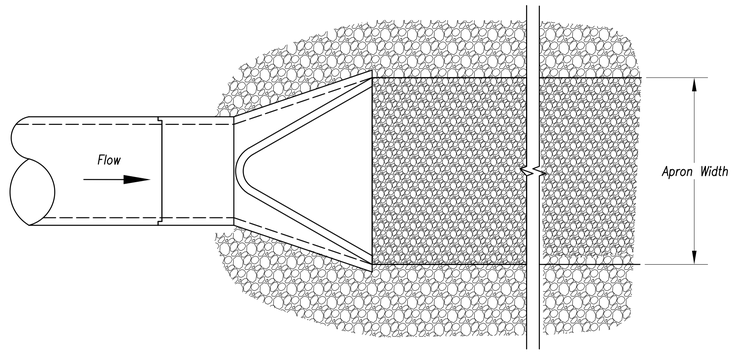
STANDARD DRAWING
NUMBER ESC-13

ADOPTED:
10/24/2016



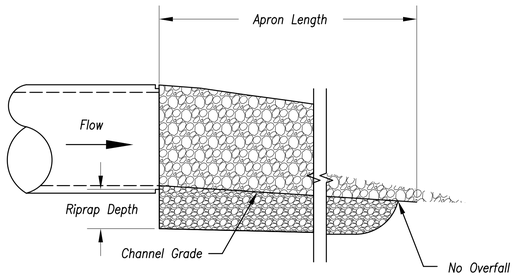
Plan View

Not to Scale



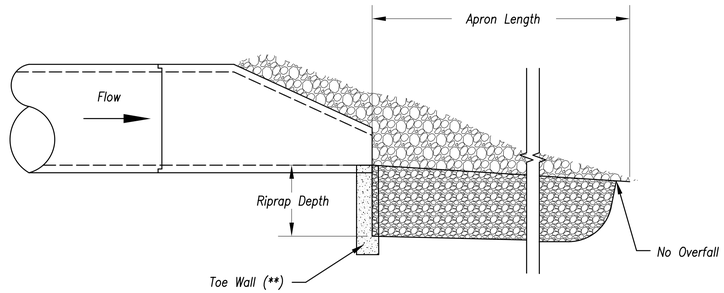
Plan View

Not to Scale



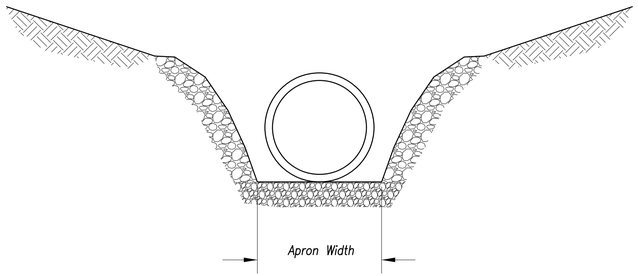
Section A–A

Not to Scale



Section A–A

Not to Scale



Section B–B

Not to Scale

OUTLET PROTECTION W/O END SECTION

OUTLET PROTECTION WITH END SECTION

Notes:

1. Rock all sides steeper than 3:1.
2. Stabilize all disturbed areas downstream of outlet to the limits of disturbance.
3. Alternative outlet protection and slope stabilization measures may be used with approval by the Engineer.
4. Install riprap apron so that it is no higher than flowline of pipe.
5. Reference APWA Specification 2650 for rock type, size, and placement.

Modified from 2015 Overland Park Standard Details for Erosion and Sediment Control.

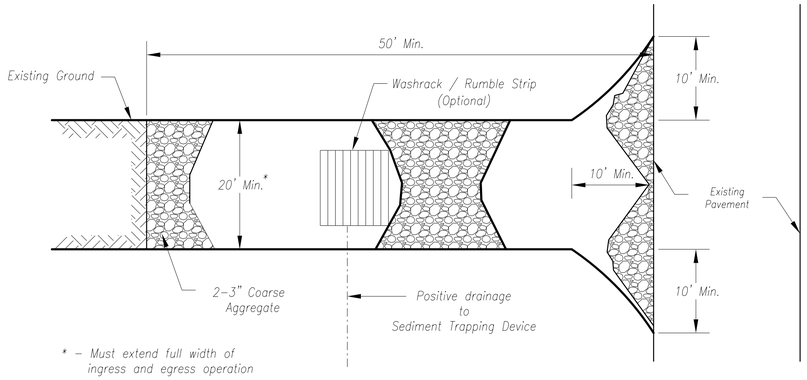
AMERICAN PUBLIC WORKS ASSOCIATION

KANSAS CITY METRO CHAPTER

OUTLET PROTECTION

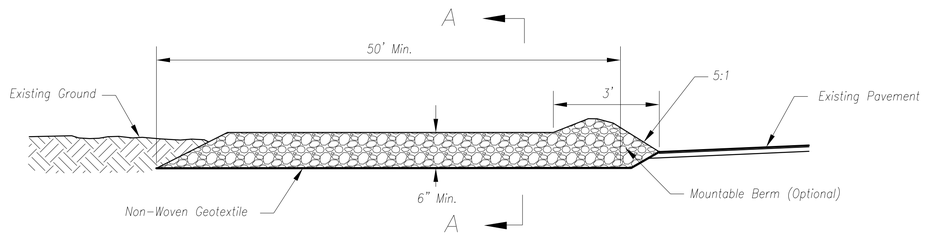
STANDARD DRAWING NUMBER ESC-14

ADOPTED: 10/24/2016



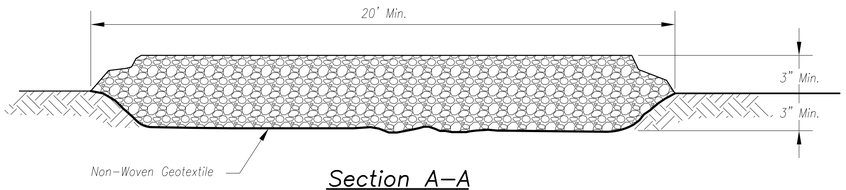
Plan View

Not to Scale



Side Elevation

Not to Scale



Section A-A

Not to Scale

Notes for Construction Entrance:

1. Avoid locating on steep slopes, at curves on public roads, or downhill of disturbed area.
2. Remove all vegetation and other unsuitable material from the foundation area, grade, and crown for positive drainage.
3. If slope towards the public road exceeds 2%, construct a 6- to 8-inch high ridge with 3H:1V side slopes across the foundation approximately 15 feet from the edge of the public road to divert runoff from it.
4. Install pipe under the entrance if needed to maintain drainage ditches along public roads.
5. Place stone to dimensions and grade as shown on plans. Leave surface sloped for drainage.
6. Divert all surface runoff and drainage from the entrance to a sediment control device.
7. If conditions warrant, place geotextile fabric on the graded foundation to improve stability.

Maintenance for Construction Entrance:

1. Reshape entrance as needed to maintain function and integrity of Installation. Top dress with clean aggregate as needed.

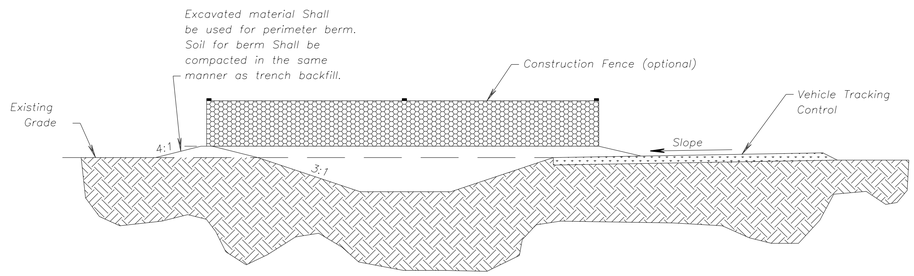
CONSTRUCTION ENTRANCE

Notes for Concrete Washout:

1. Concrete washout areas shall be installed prior to any concrete placement on site.
2. Concrete washout area shall include a flat subsurface pit sized relative to the amount of concrete to be placed on site. The slopes leading out of the subsurface pit shall be 3:1. The vehicle tracking pad shall be sloped towards the concrete washout area.
3. Vehicle tracking control is required at the access point to all concrete washout areas.
4. Signs shall be placed at the construction site entrance, washout area and elsewhere as necessary to clearly indicate the location(s) of the concrete washout area(s) to operators of concrete truck and pump rigs.
5. A one-piece impervious liner may be required along the bottom and sides of the subsurface pit in sandy or gravelly soils.

Maintenance for Concrete Washout:

1. Concrete washout materials shall be removed once the materials have filled the washout to approximately 75% full.
2. Concrete washout areas shall be enlarged as necessary to maintain capacity for wasted concrete.
3. Concrete washout water, wasted pieces of concrete and all other debris in the subsurface pit shall be transported from the job site in a water-tight container and disposed of properly.
4. Concrete washout areas shall remain in place until all concrete for the project is placed.
5. When concrete washout areas are removed, excavations shall be filled with suitable compacted backfill and topsoil, any disturbed areas associated with the installation, maintenance, and/or removal of the concrete washout areas shall be stabilized.



CONCRETE WASHOUT

Construction Entrance modified from 2015 Overland Park Standard Details for Erosion and Sediment Control; Concrete Washout modified from 2009 City of Great Bend Standard Drawings.

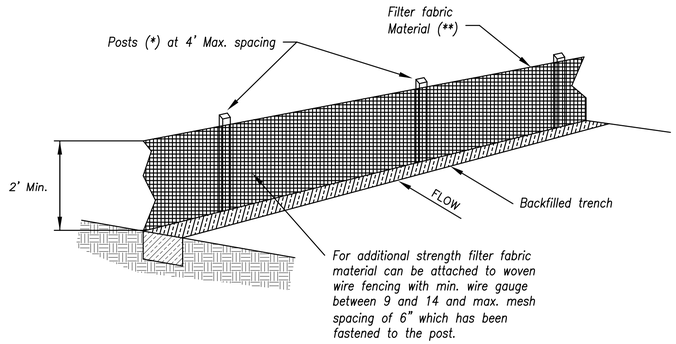
AMERICAN PUBLIC WORKS ASSOCIATION

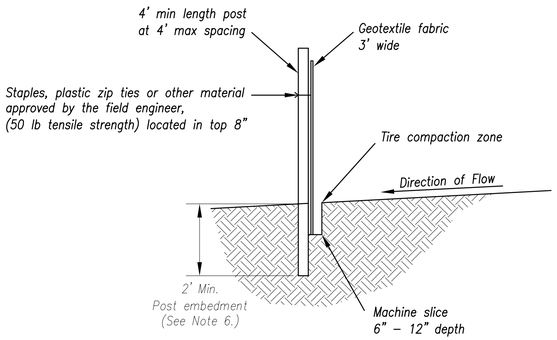
KANSAS CITY METRO CHAPTER

CONSTRUCTION ENTRANCE AND CONCRETE WASHOUT

STANDARD DRAWING NUMBER ESC-01

ADOPTED: 10/24/2016





(*) POSTS

- MIN, LENGTH 4'
- HARDWOOD 1 3/16" x 1 3/16"
- NO.2 SOUTHERN PINE 2 5/8" x 2 5/8"
- STEEL 1.33 LB/FT

(**) – Geotextile Fabric shall meet the requirements of AASHTO M288

SILT FENCE DETAILS

Not to Scale

Notes:

1. In order to contain water, the ends of the silt fence must be turned uphill (Figure A).
2. Long perimeter runs of silt fence must be limited to 100'. Runs should be broken up into several smaller segments to minimize water concentrations (Figure A).
3. Long slopes should be broken up with intermediate rows of silt fence to slow runoff velocities.
4. Attach fabric to upstream side of post.
5. Install posts a minimum of 2' into the ground.
6. Trenching will only be allowed for small or difficult installation, where slicing machine cannot be reasonably used.

Maintenance:

1. Remove and dispose of sediment deposits when the deposit approaches ⅓ the height of silt fence.
2. Repair as necessary to maintain function and structure.

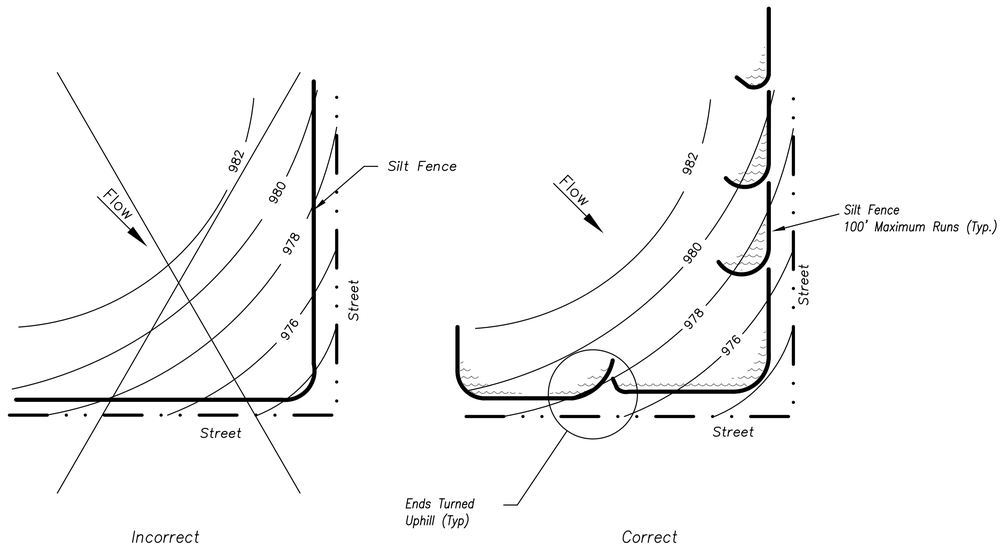
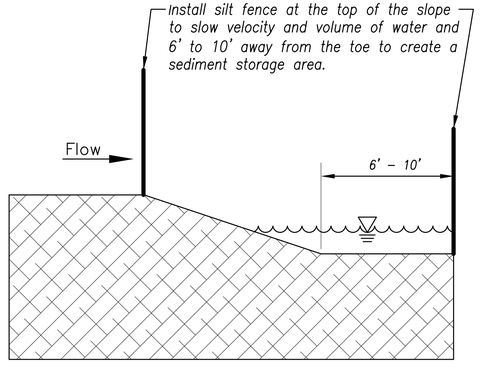
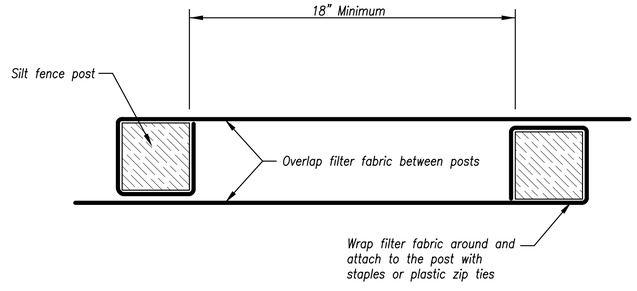


Figure A

SILT FENCE LAYOUT

Not to Scale





JOINING FENCE SECTIONS

Not to Scale

Modified from 2015 Overland Park Standard Details for Erosion and Sediment Control.

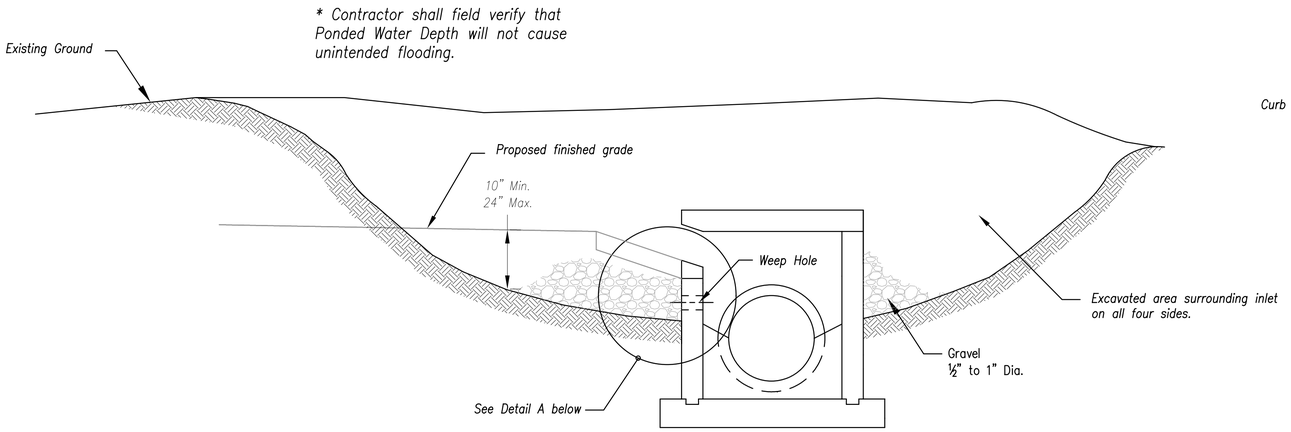
AMERICAN PUBLIC WORKS ASSOCIATION

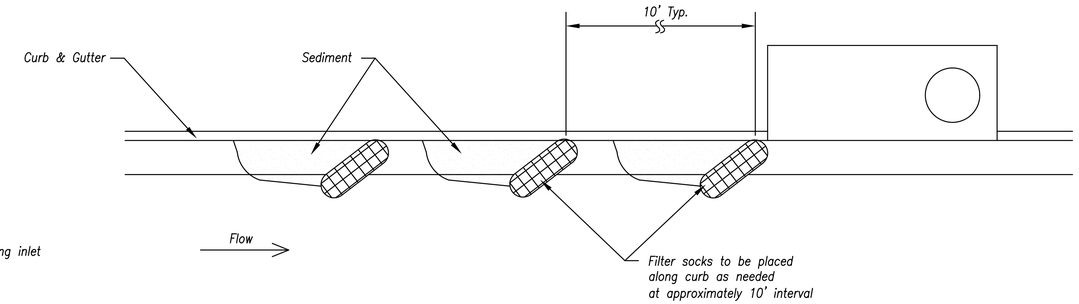
KANSAS CITY METRO CHAPTER

SILT FENCE

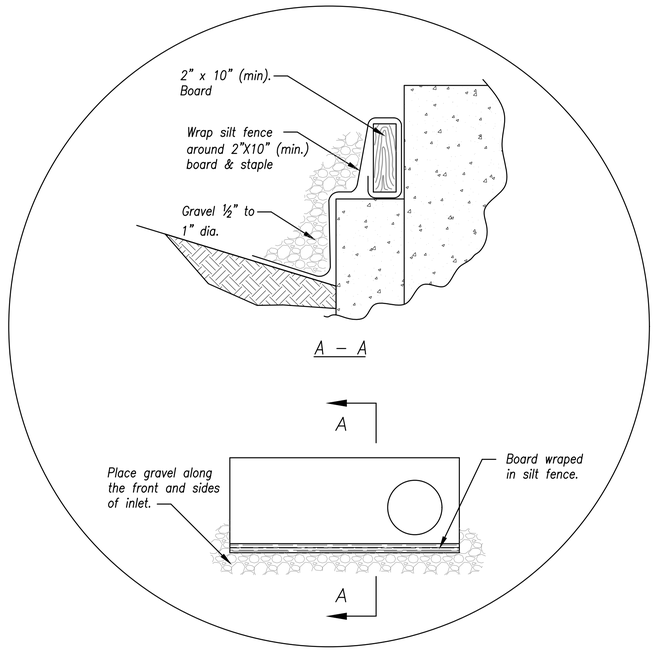
STANDARD DRAWING NUMBER ESC-03

ADOPTED: 10/24/2016





On Grade Curb Inlet Protection



Detail A

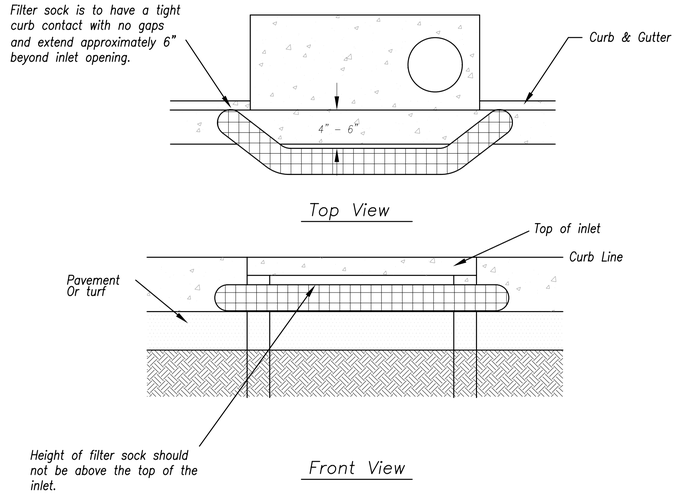
EARLY STAGE CURB INLET
(Open Box and Prior to Pouring Curb and Inlet Throat)

Notes:

1. Immediately following inlet construction and prior to construction of curb and inlet throat, protect inlet opening by installing 2" X 10" (min.) board wrapped in silt fence. Structures shall have excavated storage area on all four sides to allow settling of sediment (Early Stage Curb Inlet).
2. When inlet is completed and curb poured, filter socks or approved equal should be used (Late Stage Curb Inlet). Straw wattles are not approved for curb inlet use.
3. Contractor to field verify ponding water shall not create a traffic hazard.

Maintenance:

1. Remove deposited sediment from excavated storage areas when available storage has been reduced by 20%.
2. Remove deposited sediment from filter socks or similar when any accumulation of sediment is visible.
3. Repair or replace as necessary to maintain function and integrity of installation.



Sump Inlet Sediment Filter

LATE STAGE CURB INLET
(After Pouring Curb and Inlet Throat)

Modified from 2015 Overland Park Standard Details for Erosion and Sediment Control.

AMERICAN PUBLIC WORKS ASSOCIATION

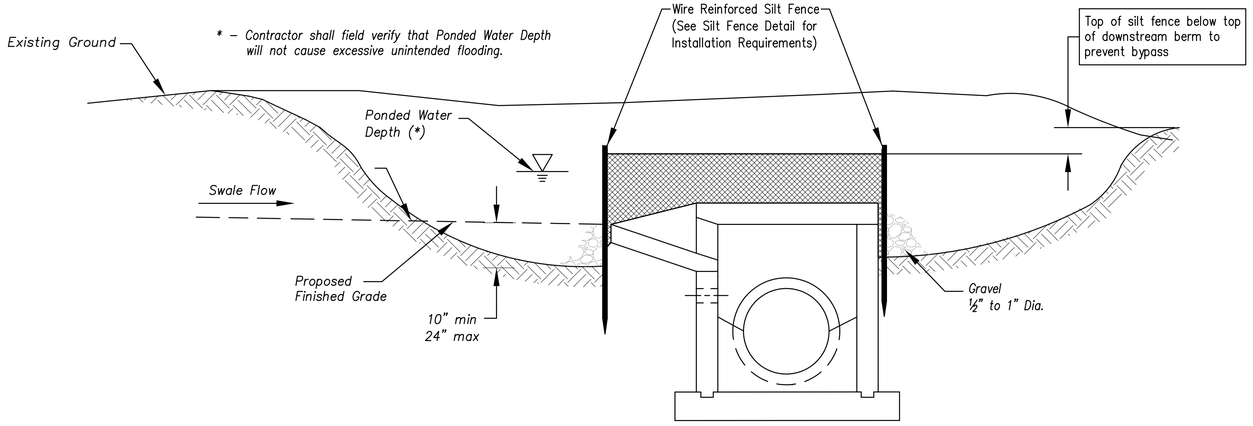
Kansas City Metro Chapter APWA American Public Works Association

KANSAS CITY METRO CHAPTER

CURB INLET PROTECTION

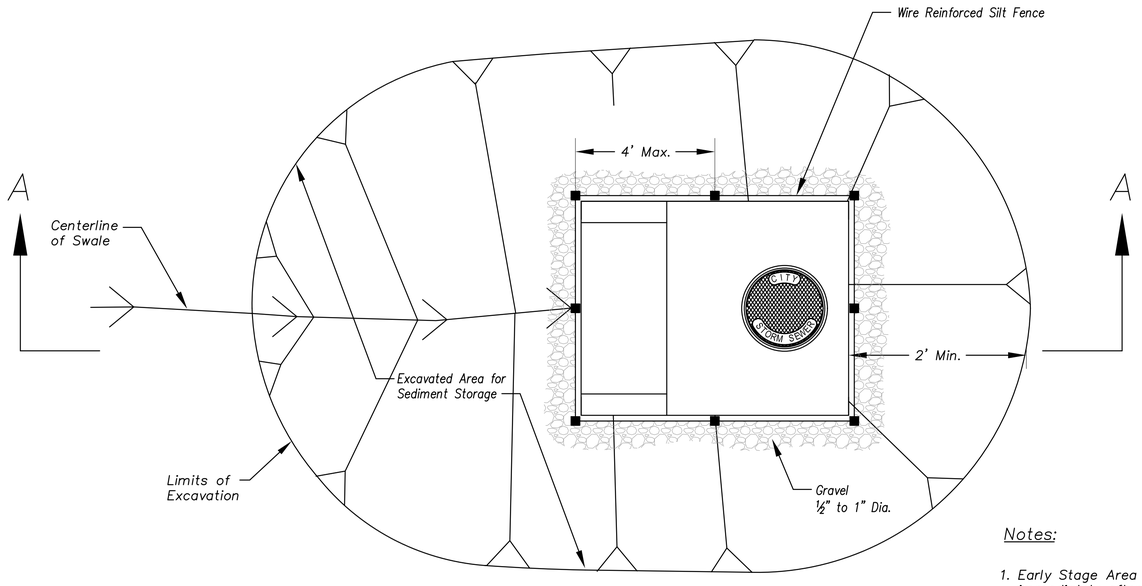
STANDARD DRAWING NUMBER ESC-06

ADOPTED: 10/24/2016



Section A–A

Not to Scale

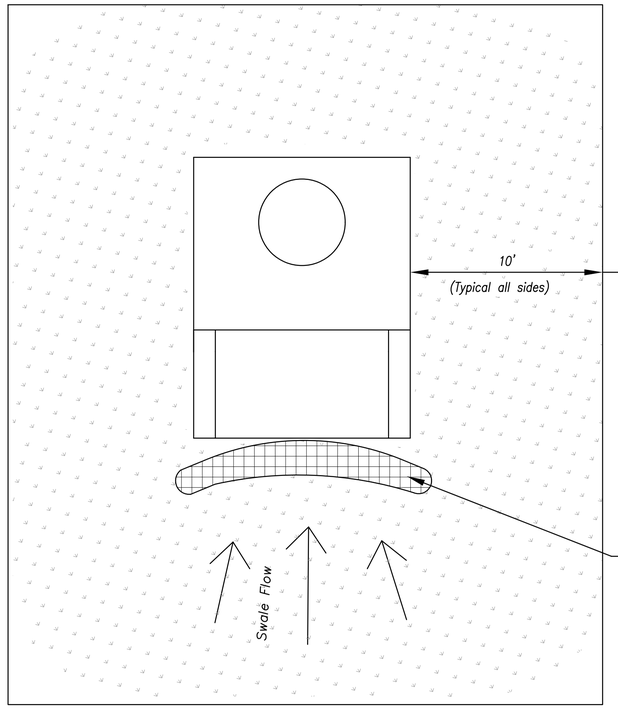


Plan

Not to Scale

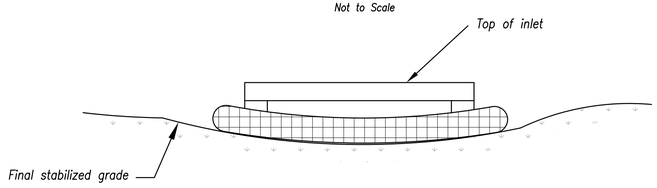
EARLY STAGE AREA INLET

(All open boxes and inlets not at final grade)



Plan

Not to Scale



Front View

LATE STAGE AREA INLET

(Area inlets at final grade and existing inlets)

Notes:

1. Early Stage Area Inlet Sediment Barrier to be installed immediately after inlet or junction box is constructed.
2. Silt fence shall remain in place until excavated area is removed and Late Stage Area Inlet is being installed.
3. Backfill excavated area ONLY after final grading of the site. Stabilization of the site is to immediately follow.
4. Wire reinforced silt fence may be used in place of silt fence attached to wood frame.

Maintenance:

1. Remove deposited sediment from excavated storage areas when available storage has been reduced by 20%.
2. Remove deposited sediment from filter socks or similar when any accumulation of sediment is visible.
3. Repair or replace as necessary to maintain function and integrity of installation.

Modified from 2015 Overland Park Standard Details for Erosion and Sediment Control.

AMERICAN PUBLIC WORKS ASSOCIATION

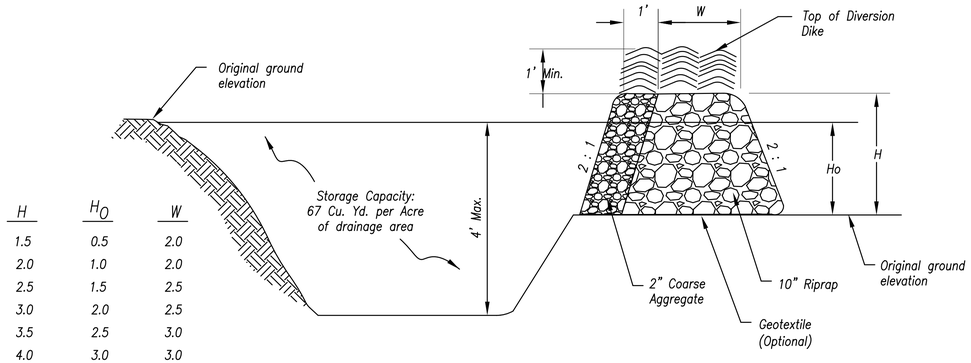
Kansas City Metro Chapter APWA American Public Works Association

KANSAS CITY METRO CHAPTER

AREA INLET AND JUNCTION BOX PROTECTION

STANDARD DRAWING NUMBER ESC-07

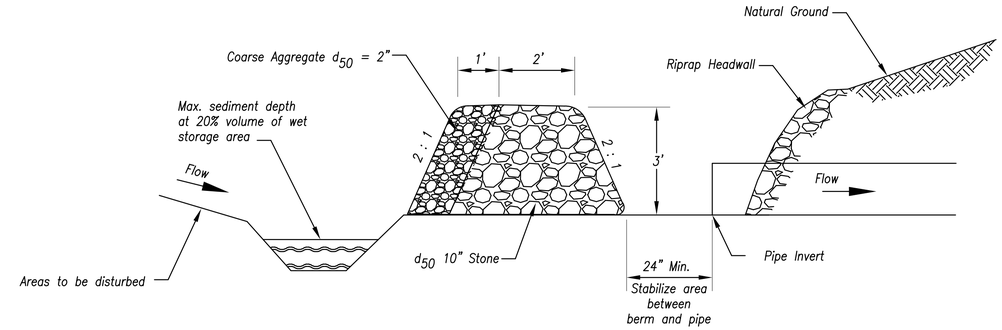
ADOPTED: 10/24/2016



H	H_O	W
1.5	0.5	2.0
2.0	1.0	2.0
2.5	1.5	2.5
3.0	2.0	2.5
3.5	2.5	3.0
4.0	3.0	3.0
4.5	3.5	4.0
5.0	4.0	4.5

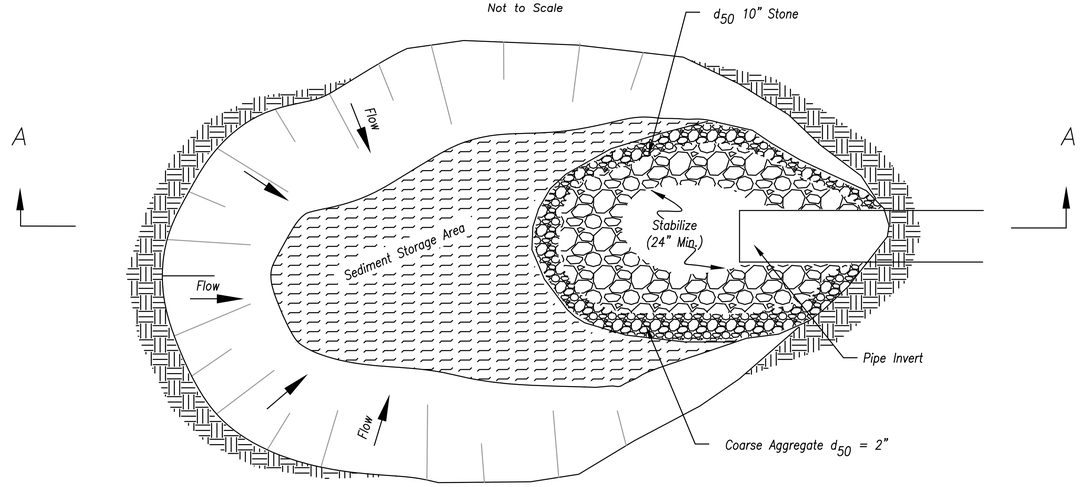
(*) Cross Section of Outlet

Not to Scale



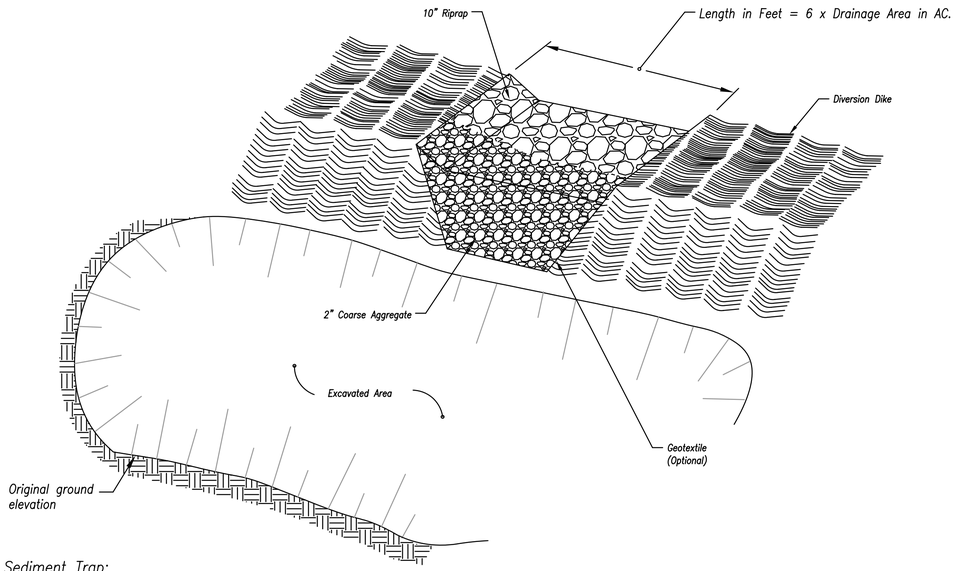
Section A–A

Not to Scale



Plan View

Not to Scale



(*) Perspective View of Outlet

Not to Scale

(*) – The perspective view and cross section are schematic in nature. Construction plans must provide specific site construction arrangements.

Notes for Sediment Trap:

1. The area under the embankment shall be cleared, grubbed, and stripped of any vegetation and root mat.
2. Fill material for the embankment shall be free of roots or other woody vegetation, organic material, large stones, and other objectionable material. The embankment should be compacted in 6–inch layers by traversing with construction equipment.
3. The earthen embankment shall be stabilized immediately after installation.
4. Construction operations shall be carried out to minimize erosion and water pollution.
5. The structure shall be removed and the area stabilized when the upslope drainage area has been stabilized.
6. All cut and fill slopes shall be 2H : 1V or flatter, except for excavated, wet storage areas which may be at a maximum 1H : 1V grade.

Maintenance for Sediment Trap:

1. Check sediment traps after periods of significant runoff.
2. Remove sediment and restore the trap to its original dimensions when sediment accumulates to 20% of the storage capacity.
3. Immediately repair any erosion damage to the embankment and outlet.
4. Keep outlet and pool area free of all trash and other debris.

SEDIMENT TRAP

Notes for Sediment Trap at Culvert Opening:

1. The inlet protection device shall be constructed in a manner that will facilitate clean–out and disposal of trapped sediment and minimize interference with construction activities.
2. The inlet protection devices shall be constructed in such manner that any resultant ponding stormwater will not cause excessive inconvenience or damage to adjacent areas or structures.
3. Geometry of the design will be a horseshoe shape around the culvert inlet.
4. The toe of the riprap shall be no closer than 24" from the culvert opening to provide an acceptable emergency outlet for flows from larger storm events.
5. Storage requirements equivalent to that of temporary sediment trap.
6. 67 C.Y./Acre wet storage below base of stone.
7. 67 C.Y./Acre dry storage from base of stone to top of stone berm.

Maintenance for Sediment Trap at Culvert Opening:

1. Check sediment traps after periods of significant runoff.
2. Remove sediment and restore the trap to its original dimensions when sediment accumulates to 20% of the storage capacity.
3. Immediately repair any erosion damage to the embankment and outlet.
4. Keep outlet and pool area free of all trash and other debris.

SEDIMENT TRAP AT CULVERT OPENING

Modified from 2015 Overland Park Standard Details for Erosion and Sediment Control.

AMERICAN PUBLIC WORKS ASSOCIATION

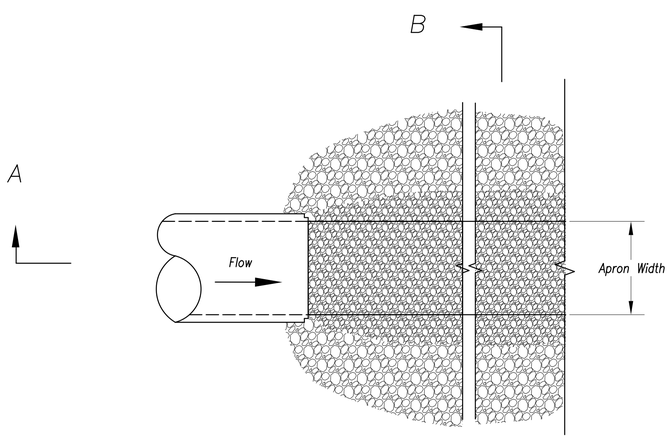
Kansas City Metro Chapter APWA American Public Works Association

KANSAS CITY METRO CHAPTER

SEDIMENT TRAPS

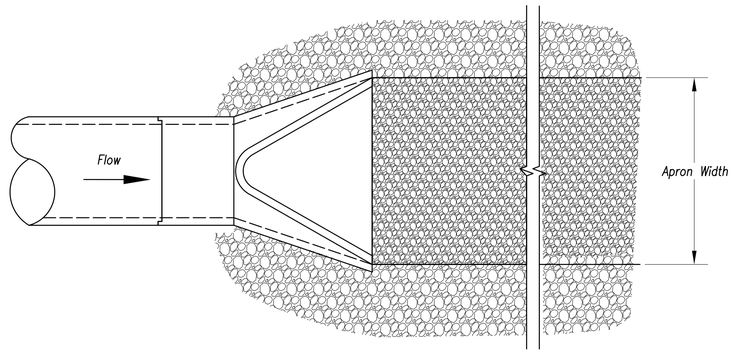
STANDARD DRAWING NUMBER ESC-08

ADOPTED: 10/24/2016



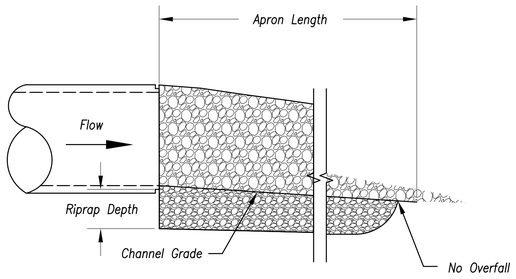
Plan View

Not to Scale



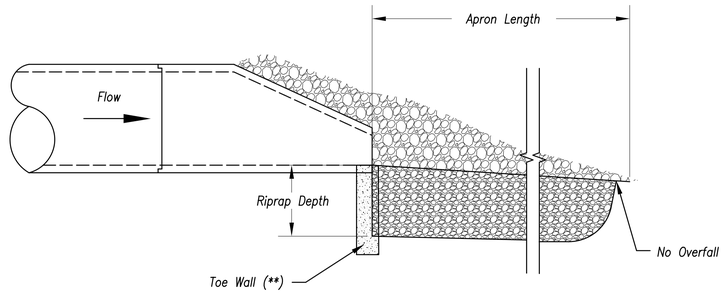
Plan View

Not to Scale



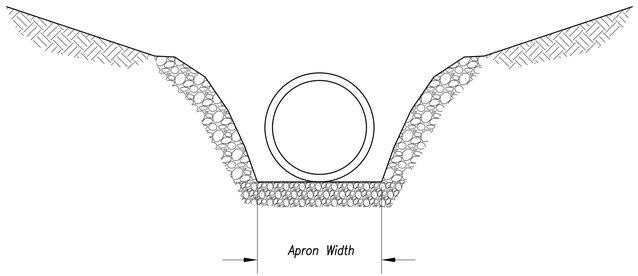
Section A–A

Not to Scale



Section A–A

Not to Scale



Section B–B

Not to Scale

OUTLET PROTECTION W/O END SECTION

OUTLET PROTECTION WITH END SECTION

Notes:

1. Rock all sides steeper than 3:1.
2. Stabilize all disturbed areas downstream of outlet to the limits of disturbance.
3. Alternative outlet protection and slope stabilization measures may be used with approval by the Engineer.
4. Install riprap apron so that it is no higher than flowline of pipe.
5. Reference APWA Specification 2650 for rock type, size, and placement.

Modified from 2015 Overland Park Standard Details for Erosion and Sediment Control.

AMERICAN PUBLIC WORKS ASSOCIATION

KANSAS CITY METRO CHAPTER

OUTLET PROTECTION

STANDARD DRAWING NUMBER ESC-14

ADOPTED: 10/24/2016

Temporary Rock Construction Exit Pad

Figure 6.1 A temporary rock construction exit can reduce sediment and resulting safety hazards on public streets. This pad needs maintenance due to sediment filling the void spaces between the rocks making the rock exit pad ineffective. Source: ABC's of BMP's, LLC

Practice Description

A temporary rock construction exit is a stone base installed to provide an exit area where construction vehicles can drop the mud and caked soil from their tires to avoid transporting it onto public roads. The mud and dirt that ends up on the street is called "track out" and is the number one complaint associated with construction projects. The rock will jar and flex the tire treads so dirt and mud on the tires will become dislodged and collect in the voids of the rock exit pad. This device should be incorporated anywhere traffic will be leaving a construction site and moving directly onto a public road or other paved area.

The rock exit pad is often not effective by itself and requires a lot of maintenance. High-clay content soils may not adequately separate from the tires, and the rocks must be reconditioned as void space is filled with sediment. You may need to install additional practices, some of which are described below. Superior practices may be available in the construction industry, although the temporary rock construction exit pad is most commonly used.

Prior to the start of construction, temporary rock construction exit pads should be designed by a qualified professional. The site superintendant and field personnel should refer to plans and specifications throught the construction process.

The design professional should give consideration to the following:

- Limit the points of entrance and exit to the site.
- Designate combination or single purpose access points to the construction site, and require all employees, subcontractors and others to use them.
- Properly grade each construction entrance and exit to prevent runoff from leaving the construction site.
- Route runoff from a stabilized pad through a sediment-trapping device before discharge.
- Design the pad to support the heaviest vehicles and equipment that will use it.
- Avoid placing the exit pad in low areas where stormwater accumulates or discharges off-site.

Recommended Minimum Requirements

Aggregate Size

2- to 3-inch washed stone.

Pad Design

- Thickness: 6 inches minimum.
- Width: 12 feet minimum or full width of roadway, whichever is greater.
- Length: 50 feet minimum.

Signage

Clearly designate these areas to be used for exiting the construction site and make sure everyone involved with the project is aware that track out is not tolerated.

Wheel Wash (Optional)

Level the area with a minimum of 3 inches of washed stone. Remember if a wheel wash station is installed, all wash water must be collected and treated before it is discharged from the construction site. A simple sediment trap can be added next to the rock pad to collect the wash water and allow it to discharge over a check dam and into the road ditch. See additional information on wheel wash devices later in this section.

Geotextile Fabric

An underliner of woven geotextile (fabric) should be used under the rock to provide stability.

Construction

Avoid locating on steep slopes or at curves on public roads. If possible, locate where permanent roads will eventually be constructed. Limit the number of access roads to limit the inspection and maintenance of these devices and areas where sediment could be tracked onto public roads.

Site Preparation

Remove all vegetation and other unsuitable material from the foundation area; grade and crown for positive drainage. If wheel washing is indicated, provide a sediment trap adjacent to the rock pad to collect the discharged wash water for treatment before it is released off-site.

Grading

- If the slope towards the road exceeds 2 percent, construct a 6- to 8-inch high ridge with 3:1 side slopes across the foundation approximately 15 feet from the entrance to divert runoff away from the public road.
- Place geotextile filter fabric on the graded foundation to improve stability.

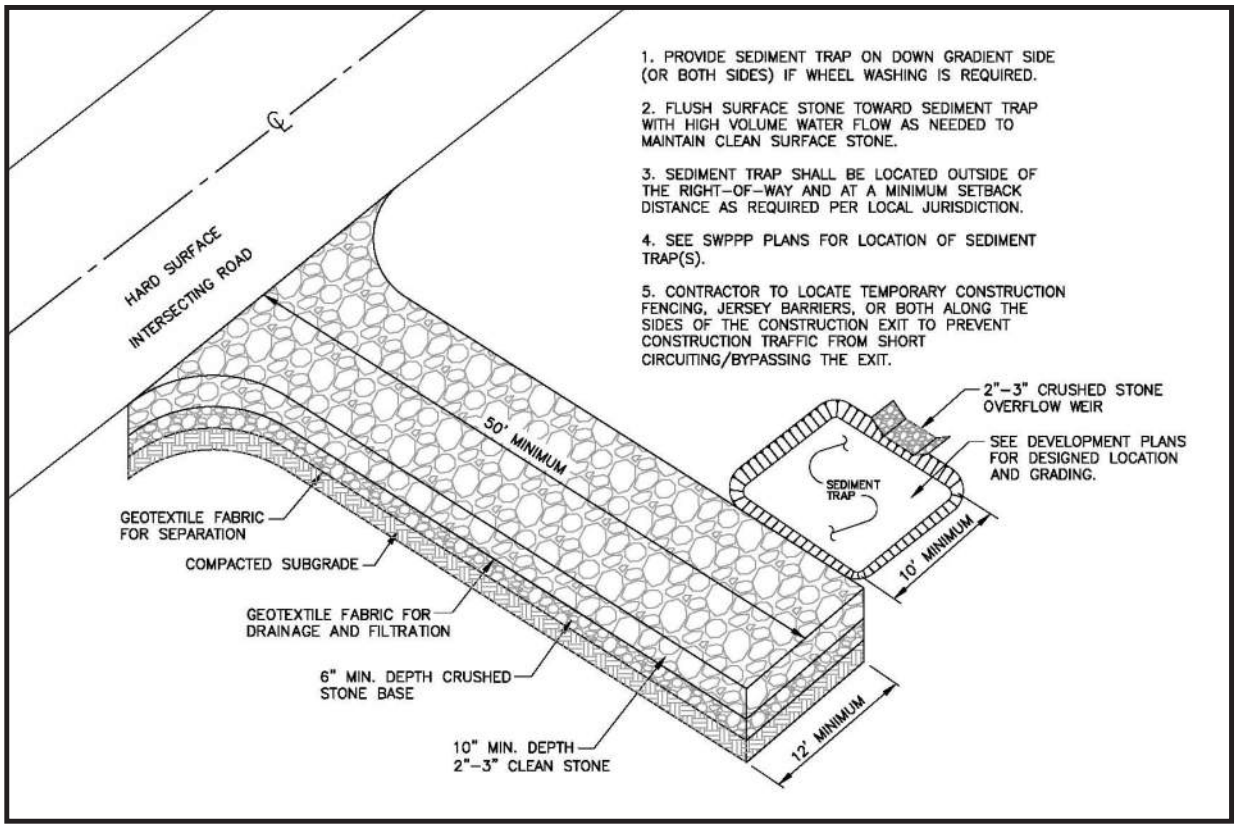


Figure 6.2 Typical Temporary Rock Construction Exit. Source; BFA Inc.

- Place stone to dimensions and grade shown on plans. Stone size should not be less than 2 inches or greater than 3 inches. Stones in the dimensions of 4- to 6-inches may become trapped between the dual tires on some construction vehicles and be transported off-site to later be thrown from the trucks tires and cause damage to vehicles or their drivers. Leave the surface smooth and sloped for drainage.
- Divert all surface runoff and drainage from the stone pad to a sediment trap or basin.

Maintenance, Inspection and Removal

- Inspect stone pad and sediment disposal areas weekly and after storm events or heavy use. When the voids between stones are filled with sediment or the pad becomes smooth and does not function to jar the truck and flex the rubber, it is not functioning properly and should be repaired. Add more rock or turn the existing stone over to move sediment below the stone so the stone pad will again have proper roughness and void spaces.
- Reshape pad as needed for drainage and runoff control.
- Topdress with clean 2- to 3-inch stone as needed.
- Immediately remove mud or sediment tracked or washed onto public road within 24 hours.
- Keep all temporary roadway ditches clear.
- Repair any broken road pavement immediately.
- Remove this temporary device and stabilize the site stabilized prior to filing *Form H: Request for Termination of a General Permit*, Form--MO 780-1409 (see Chapter One - Missouri Permit Requirements).

Common Problems and Solutions

Problem	Solution
Inadequate runoff control; sediment washes onto public road.	Install diversions or other runoff control measures.
Stone too small, pad too thin or geotextile fabric absent; results in ruts and muddy conditions as stone is pressed into soil.	Increase stone size or pad thickness, or add geotextile fabric. Stone should not be more than 4-inches in diameter, to avoid rocks being caught and thrown from dual tires.
Pad too short for heavy construction traffic.	Extend pad beyond the minimum 50-foot length as necessary.

Wheel Wash

Figure 6.3 Industrial wheel wash unit with self contained and recycled wash water. Source: *Innovative Equipment Solutions.*

Practice Description

A wheel wash device can consist of a range of tools from a simple compressor, hose and water source to a large scale industrial truck wash system. A wheel wash is designed to complement the rock construction exit pad to reduce the amount of sediment that might leave the construction site via construction vehicle traffic. Several portable wheel wash systems are available on the market today.

Recommended Minimum Requirements

While the installation of a wheel wash on the construction site will minimize mud tracking onto the roads, it is necessary to collect and treat the wash water to keep it from discharging off-site. Whatever type of wheel wash device is used at the construction site, a collection of the wash water is required in the form of a sediment trap or other such device. The water must be allowed to settle so the sediment is retained on-site and the treated water is allowed to discharge.

The size of the device and quantity of wash water will depend on the quantity and size of trucks treated. Some devices such as the one pictured above have self contained wash water collection systems that do not discharge the runoff.

Construction

Whether you install a portable wheel wash, or construct one on-site, you will need a water source and a collection system for the wash water. How the wheel wash is constructed and installed will depend on the type of system used. Make sure the installation of the system allows for a drip area between the device and public road so as little as possible of the wash water is transported to the public road to decrease wetting of the road. This is extremely important in cold weather when freezing is a possibility and the wash water could create hazardous conditions.

Maintenance, Inspection and Removal

- Capture all sediment from the wash water on-site and dispose of it in an appropriate manner.
- Clean out wash water capture device when sediment fills it to greater than 50 percent.
- Removal of this temporary device must be performed and the site stabilized prior to filing *Form H - Request for Termination of a General Permit*, Form--MO 780-1409 (see Chapter One-Missouri Permit Requirements).

Common Problems and Solutions

Problem	Solution
Sediment laden water drops onto the public road from the trucks exiting the construction site.	Increase the amount of washing to remove sediment from truck and increase the distance from wash area to road to provide a drip/dry pad for trucks. This will reduce water getting onto the public road.
Sediment-laden wash water from the trucks leaving the site drips onto the public road creating slick conditions.	Increase the washing of the vehicle on the site and allow the truck to drip-dry before driving onto the public street. Provide a sediment trap for wheel wash run-off as necessary.
Temperatures are near or below freezing creating ice from the wash water.	Discontinue the use of water to remove sediment from the construction vehicles before they enter the public street.

Tree Protection

Practice Description

Tree protection preserves and protects trees during construction. Trees provide aesthetic and economic value, and aid in energy conservation, landscaping, air purification and erosion control. This practice applies to any construction site where desirable trees are present and need to be protected.

Trees can be damaged or killed by direct contact with construction equipment, compaction of the soil within the root zone of the tree, changes in the elevation of the water table due to site grading, and by construction chemicals and refuse. Although damage may be unseen, it can result in tree death within three or four years. Damage to the root zone is the leading factor in the unintentional destruction of trees.

Recommended Minimum Requirements

Prior to start of construction, desirable trees (including sensitive species) should be selected and marked for protection by a registered design professional. A grading plan that indicates the location of protected trees, utility trenches and other protected areas (e.g., floodplains, steep slopes, wetlands and streambanks) should be made available to field personnel. Areas for parking equipment should be designated away from the canopy (drip line) to protect the root zones of desired trees, shrubs, stream buffer vegetation and other protected areas. The root zone of plants is generally as broad as the drip line.

Temporary Fences

Placement

Around the dripline or tree canopy perimeter to restrict traffic, excavation, parking, storing materials and filling under the tree canopy. (For tree species sensitive to root damage, place the fence at the critical root radius to ensure tree's survival.)

Materials

Snow, board, plastic or cord fence.

Restricted Activities

Use temporary fence to restrict traffic, excavation, parking, storing materials and filling under the tree canopy (or at the critical root radius to ensure survival of sensitive species).

Permanent Drains

Install permanent drains in areas where site grading may be expected to cause water table saturation of the root zone (See Subsurface Drain).

Grading

Minimize cut and fill near trees by following the natural contours, and locating roadways, storage areas and parking pads away from desired tree stands.

Trenching

Minimize trenching near tree canopy perimeter and place several utilities in one trench when possible.

Up to 90 percent of trees' roots may be in the top 12 inches of soil. Typically, roots spread out from two to three times the width of the canopy or tree's branches.

Build a barrier at the dripline (or at the critical root radius for sensitive species) to prevent damage from soil compaction, cut and fill operations physical wounds.

To calculate the critical root radius: measure the tree's diameter in inches at breast height (4.5 feet above the ground), multiply that number by 1.5 feet. This will provide you with the critical root radius in feet.

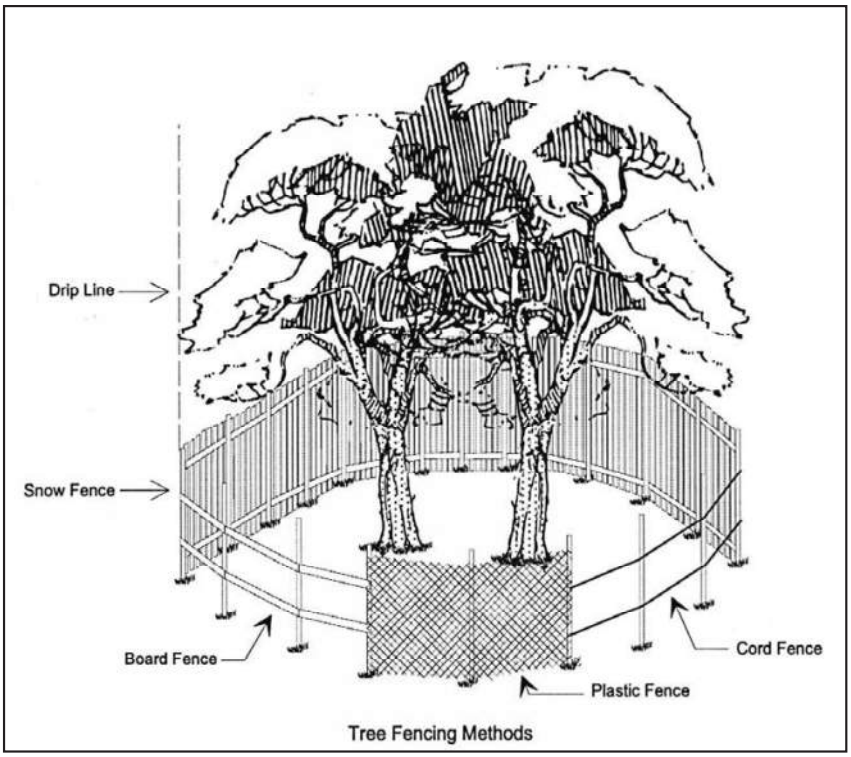


Figure 6.8 Erecting Barriers for Tree Protection Source: *Adapted from MU Guide 6885*

For example, a tree with a diameter (breast height) of 20 inches will have a critical root radius of 30 feet (60 foot diameter).

Construction

- Install temporary fences at tree driplines (at the critical root radius for sensitive tree species). To avoid compaction of the soil around desired trees, keep traffic, equipment and supplies off of the root systems. Figure 6.8 shows the correct method of erecting barriers for tree protection.
- Route the underground utilities according to plan. If possible, combine in one trench and route away from trees and potential planting sites.
- Use a brush cutter, rotary axe, or cut by hand instead of grading off brush to maintain the area within the tree canopy perimeter.

  Note: If grading beneath a tree's canopy is indicated on the plan:

  - Prior to construction activities, prune low hanging branches that may be damaged by equipment. To avoid tearing the bark from the tree while pruning, remove large branches with a stub-cut method. Figure 6.9 illustrates correct methods of pruning.
  - Minimize grading beneath the tree canopy. Avoid placing fill, or removing leaf litter or soil in the ungraded areas. Cut large roots instead of tearing them with equipment.

Stub-cut Method

First, make an undercut about one foot from the trunk. Then, cut through the branch near the first cut. Leave the tree's branch collar intact during the final cut to promote healing. Source: *Adapted from MU Guide 6866*

Construction Verification

Check the construction site to verify protective measures are being observed.

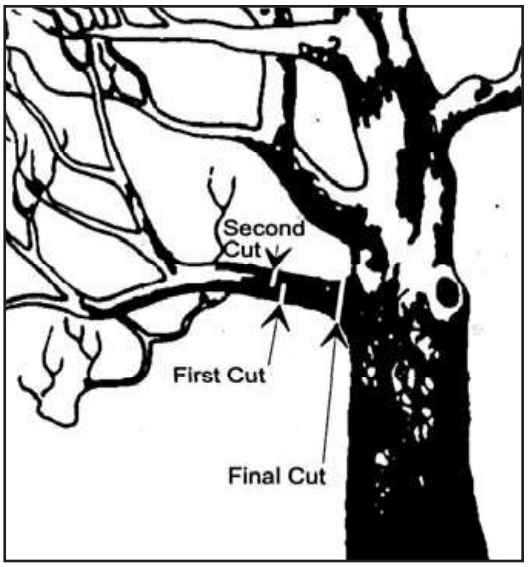


Figure 6.9 Proper Method of Pruning
Source: *Adapted from MU Guide 6866*

Troubleshooting

Consult with registered design professional such as an arborist or silviculturist if any of the following occur:

- A protected tree is accidentally injured by construction activities.
- If grade around a protected tree must be raised.

Maintenance, Inspection and Removal

- Remove fence around protected trees only after all construction is complete and all disturbed soil is stabilized.
- In spite of these precautionary steps some damage may occur to desired trees. If minor damage occurs, repair it immediately. Repair damage to limbs or roots by cutting off the damaged areas. Repair damage to bark by trimming the perimeter of the damaged area. If there is any question about the correct course of action, enlist the service of a professional arborist or silviculturist.
- Inspect trees for signs of stress, such as insect, disease and drought damage. Stressed trees should be watered during dry periods. Soak area under the canopy to a depth of 12- to 18-inches. Avoid fertilizing severely stressed trees until they become reestablished a year or two later. Treat insect and disease problems with a pesticide, if necessary, but be sure to follow instructions on the label. Or, employ a certified pesticide applicator to treat the problem.
- Remove temporary devices and stabilize the site prior to filing *Form H - Request for Termination of a General Permit*, Form--MO 780-1409 (see Chapter One - Missouri Permit Requirements).

Common Problems and Solutions

Problem	Solution
Trees show signs of damage such as wilting, early leaf drop in the fall or slow growth often caused by compaction.	Aerate the soil by pulling 12- to 18- inch deep cores in the soil within the dripline to assist movement of moisture and oxygen into the soil, then backfill with compost.
Trees killed during construction.	Remove after site completion and replace with new trees.

Topsoiling: Removal, Stockpiling and Replacement

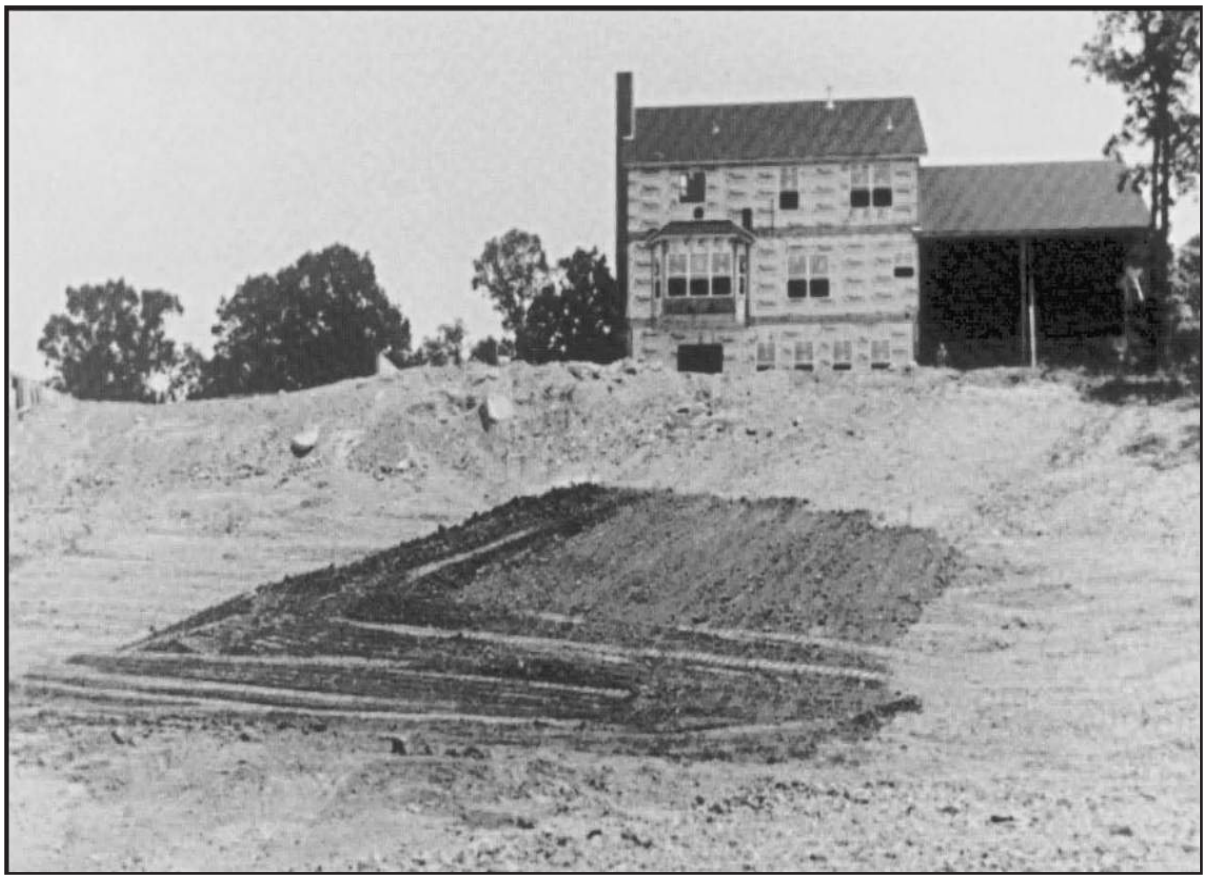


Figure 6.16 It's important to mix or incorporate topsoil with the underlying subsoil to prevent sloughing on sloping soils.
Source: *C. Rahm, NRCS. St. Louis Co.*

Practice Description

Topsoiling is a method of preserving the topsoil prior to construction, stockpiling it and using it after construction to help establish vegetation on a construction site. Stockpiling is also used for storage of other soils and construction material such as fill material. These practices apply to areas on a site to be disturbed by excavation, compaction or filling, and where vegetation is to be reestablished.

Recommended Minimum Requirements

Prior to the start of construction, topsoiling should be designed by a qualified professional. The existing soil should be tested to ensure the material to be saved is topsoil and helps with vegetation establishment and long-term, permanent growth. The location of other material to be stockpiled on the site should be shown on the site map and stabilized according to the regulations. Refer to the plans and specifications throughout the construction process.

Topsoil

- Surface soil or top layer of undisturbed soil, usually richest in organic matter and nutrients.
- Should be free of debris, trash, stumps, large rocks, roots and noxious weeds. It should contain no substance potentially toxic to plant growth.

Minimum Soil Depth

- 24 inches of total soil depth over bedrock (combined topsoil and subsoil); from 8- to 12-inches of total soil depth over loose sand or rock.
- The top 4- to 6-inches of soil must be good topsoil, rich with organic matter, microorganisms and not more than 50 percent clay content to ensure good vegetation establishment and growth on a permanent basis.

pH Range

- From 6.0 to 7.5.
- If the pH is less than 5.2, lime should be incorporated in accordance with soil test results.

Construction

Site Preparation

- Establish all perimeter erosion and sediment control practices, (e.g., sediment barriers, diversions, grade stabilization structures, berms, dikes, sediment basins) before stripping.

Stripping

- Strip topsoil from areas that will be disturbed by excavation, filling or compaction by equipment.
- Determine depth of stripping by taking soil cores at several locations within each area to be stripped.
- Make sure the soil being saved is topsoil. It should have a minimum of five percent organic material and a clay content of less than 50 percent.

Stockpiling

- Do not place topsoil or other stockpiles near areas of water (e.g., conveyances, ditches, swales).
- Do not place stockpiles on impervious surfaces or within 50 feet of storm drain inlets.
- Avoid placing topsoil or stockpiling other material on steep slopes. Side slopes of stockpile should not exceed 2:1.
- Use sediment fences or other barriers where necessary to retain sediment.
- Protect topsoil and other stockpiles with temporary seeding or other soil stabilization techniques as soon as possible, but not more than 14 working days after formation of the stockpile. If stockpiles will not be used within 12 months, they should be stabilized by permanent vegetation to control erosion and weed growth.

Grading

Established grades should be maintained according to the approved plan and should not be altered by adding topsoil.

Liming of Subsoil

Where the pH of the existing subsoil is below 5.2, incorporate agricultural limestone in amounts indicated by soil tests or specified for the seeding mixture to be used (See Temporary or Permanent Seeding). Incorporate lime into the subsoil to a depth of at least two inches by disking. Retest the soil to determine the pH and if pH is not 5.2 or higher, repeat the process.

Roughening

Immediately prior to spreading topsoil, loosen the subgrade by disking or scarifying to a depth of at least two inches to ensure bonding of the topsoil and subsoil.

Spreading Topsoil

- Spreading frozen or muddy topsoil can prevent proper grading or seeding. Uniformly spread topsoil to a minimum compacted depth of four inches. For long-term growth of vegetation without irrigation, minimum soil depth (subsoil and topsoil) should be 8- to 12-inches over loose sand or rock fragments, and 24 inches over bedrock.
- Prior to the establishment of final vegetation, the topsoil should be final graded so it is smooth with no clods greater than one inch in diameter.

Construction Verification

Verify that topsoil was spread evenly and incorporated with underlying subsoil.

Maintenance and Inspection

- Maintain erosion control devices over topsoil until vegetation is fully established with a density of 70 percent over the entire area.
- Inspect topsoiled areas frequently until vegetation is established.
- Repair eroded or damaged areas and revegetate.

Common Problems and Solutions

Problem	Solution
Poor or no vegetation establishment caused by topsoil pH too low.	Add agricultural limestone to adjust pH.
Poor or no vegetation establishment caused by topsoil containing sterilants or toxic chemicals.	Remove contaminated topsoil and replace.
Poor or no vegetation establishment caused by topsoil being too high in clay content or too low in organic material and microorganisms.	Add organic material.
Poor vegetation establishment caused by topsoil being compacted too much during application.	Loosen by disking or scarifying and reseed.
Poor drainage and possible sloughing on steep slopes caused by topsoil not properly bonded to subsoil.	Remove topsoil, roughen subgrade and respread topsoil.
Inadequate vegetation establishment caused by topsoil removed during construction and not replaced.	Add topsoil with a minimum of 5 percent organic material, a clay content under 50 percent, fertilize according to soil test results, reseed or sod site, and apply water to establish vegetation.

Materials Management

Material delivery, handling and storage can generate significant pollution. The site superintendent needs to ensure best management practices are followed to minimize or eliminate the discharge of material pollutants to the storm drain system or watercourse.

Inventory

The site superintendent should develop and maintain an inventory of materials that will be stored outside on the site during construction. For example:

- ☐ Pipe, fittings and joint compounds for underground utility piping.
- ☐ Gravel and stone bedding material.
- ☐ Concrete forming materials.
- ☐ Other. (Specify) _____

Delivery

Locations for delivery should be determined and clearly marked. Where beneficial, visibly place signs with delivery instructions for the drivers. Employees trained in emergency spill clean-up procedures need to be present when dangerous materials or liquid chemicals are unloaded.

Storage

Fuels, oils and other petroleum products (e.g., forming oils and compounds; fertilizers; pesticides) or any other hazardous or toxic compounds should be stored under cover and not allowed to come in contact with stormwater on the site. On-site storage should meet all local, state and federal secondary containment rules and regulations. Additionally, local ordinances may require fencing and security measures for storage of these products.

Do not store hazardous chemicals, drums, or bagged materials directly on the ground. Place these items on a pallet and under cover in secondary containment.

Do not store incompatible materials, such as chlorine and ammonia in the same temporary containment facility.

Solid Waste Management

Figure 6.17 This dumpster is in need of routine maintenance and the trash and debris around the area must be disposed of in a proper manner. Source: ABC's of BMP's, LLC

The general contractor is responsible for disposing of all solid waste from the site in accordance with state and local laws and regulations. Dumpsters or other collection containers should be provided as needed and should be covered at all times to reduce the spread of litter and avoid public nuisance and vector concerns. Solid waste may not be buried on the site and may not be open burned except in conformance with the Missouri Air Conservation Law and regulations. Open burning violations are also a violation of the Missouri Solid Waste Management Law.

All solid wastes removed from the construction site must go to a permitted transfer station or landfill and cannot be taken to another unpermitted location for consolidation or processing. Material may be sorted on-site and diverted to acceptable reuse or recycling.

Deconstruction Waste Recycling

Recycling deconstruction waste is one way to minimize solid waste disposal costs and pollution. For information about local outlets for deconstruction materials, contact your area Solid Waste Management District.

There are 20 Solid Waste Management Districts in the State of Missouri. Search their contact information at:

- Solid Waste Management District Contacts located at www.dnr.mo.gov/env/swmp/swmd/swmdinfo.htm or by calling 800-361-4827.
- Missouri Construction and Demolition Waste Guidance www.dnr.mo.gov/env/cdwaste.htm.
- Additional information is available at:
    - Mid America Regional Council (Kansas City region) at 816-474-4240 or www.recyclespot.org.
    - Construction Industry Compliance Assistance Center at www.cicacenter.org/
    - Toolbase Services: Construction Waste Management at www.toolbase.org/Best-Practices/Construction-Waste/construction-waste-management.

Recommended Minimum Requirements

- Solid waste management procedures and practices are designed to minimize or eliminate the discharge of pollutants to the drainage system or to watercourses as a result of the creation, stockpiling or removal of construction site wastes.
- Construction projects should be designed and implemented to minimize the amount of wasted materials.
- Materials should be purchased with minimal packaging.
- Solid waste management procedures and practices must be implemented on all construction projects that generate solid wastes. Solid wastes that are commonly found on construction and demolition sites include but are not limited to:
    - Construction wastes (e.g., lumber, wood sheeting products, steel and metal scraps, sawdust, pipe and electrical cuttings, non-hazardous equipment parts, polystyrene (Styrofoam), wall board, miscellaneous types of insulation, roofing materials, empty containers and other materials used to transport and package construction materials).
    - Landscaping vegetation waste and landscape plant containers.
    - Packaging materials.
    - Litter, including food containers, beverage cans, coffee cups, paper bags, plastic wrappers and smoking materials, including litter generated by the public.

Employee Training

Employees should be trained and educated as part of good housekeeping and pollution prevention on a construction site.

- Instruct employees and subcontractors about identification of solid waste and hazardous waste.
- Educate employees and subcontractors about solid waste storage and disposal procedures.
- Hold regular meetings to discuss and reinforce disposal procedures. incorporate procedures into regular safety meetings.

- Require employees and subcontractors follow solid waste handling and storage procedures.
- Prohibit littering by employees, subcontractors and visitors.
- Minimize production of solid waste materials wherever possible.

Collection, Storage, Recycling and Disposal

- Construction and landscaping material waste should be recycled and reused as much as possible.
    - Landscaping vegetation should be shredded and used as mulch when possible.
    - Materials from demolished structures should be recovered for reuse or recycling when possible.

      Note: Any separating of recoverable materials for reuse or recycling must occur on the property of origin. Solid waste cannot be removed to another location for sorting or separating without a permit from the Department of Natural Resources' Solid Waste Management Program.
    - Salvage or recycle useful vegetation debris, packaging or surplus building materials when practical. For example, trees and shrubs from land clearing can be converted into wood chips, and then used as mulch on graded areas. Recycle wood pallets, cardboard boxes and construction scraps.
- Provide dumpsters of sufficient size and number to contain the solid waste generated by the project. Dumpsters should be covered at all times and be properly serviced.
- Provide trash receptacles in the permittee's yard, field trailer areas and at locations where workers congregate for lunch and break periods.
- Locate solid waste storage areas at least 50 feet from drainage facilities and watercourses and should not be located in areas prone to flooding or ponding of water.
- Collect construction debris and litter from work areas within the construction limits of the project site on a daily basis and place in watertight dumpsters, regardless of whether the litter was generated by the permittee, the public or others.
- Empty dumpsters weekly from the site. Dispose of the contents in accordance with Missouri State solid waste regulations. While demolition and construction debris typically do not emit a lot of odors, food waste from workers can cause an odor problem and attract public complaints.
- Properly dispose of the waste at a permitted solid waste transfer station or a permitted sanitary or demolition landfill.
- Do not place collected litter and debris in or next to drain inlets, stormwater drainage systems or watercourses.
- Prohibit littering on the project site and perform periodic litter removal from the area to reduce public nuisance concerns from airborne and waterborne litter.
- To prevent clogging of the storm drainage system, litter and debris removal from drainage grates, trash racks, and ditch lines should be a priority.
- Remove construction debris and waste from the site as necessary to maintain a safe environment and to avoid public nuisance issues related to airborne and waterborne trash or vectors.

- Store or stack construction material visible to the public in an orderly manner and manage it to protect the value of the material. Materials stored in a waste like manner are regulated by the Missouri Department of Natural Resources' Solid Waste Management Program or Kansas Department of Health and Environment's Bureau of Waste Management.
- Prevent stormwater run-on from contacting stored solid waste through the use of covered containers. Recovered or recycled materials should be covered, or the area in use should include berms, dikes, other temporary diversion structures or the use of measures to elevate waste from site surfaces to avoid contact with stormwater.
- Construction and highway planting waste not stored in watertight dumpsters need to be securely covered from wind and rain by covering the waste with tarps or plastic sheeting or protected in conformance with the applicable disturbed soil area protection section.
- Dumpster washout on the project site is typically not allowed by the permits.
- Notify trash hauling contractors that only watertight dumpsters are acceptable for use on-site.
- Store potentially hazardous waste from non-hazardous construction site waste.
- Keep the site clean of litter debris.
- Make sure that toxic liquid wastes (e.g., used oils, solvents, and paints) and chemicals (e.g., acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for construction debris.
- Dispose of non-hazardous waste in accordance Missouri State solid waste regulations.
- Remove this temporary device and stabilze the site prior to filing *Form H - Request for Termination of a General Permit*, Form--MO 780-1409 (see Chapter 1 -Missouri Permit Requirements) for termination of permit coverage.

Maintenance, Inspection and Removal

- Inspect all dumpsters on a weekly basis and after rain events.
- Remove full dumpsters from the project site and dispose the contents in accordance with Missouri Solid Waste Management Law and regulations.
- Handle and dispose litter stored in collection areas and containers properly.
- Remove construction debris and waste from the site as necessary. The debris and waste cannot cause a public nuisance or health hazard.

Common Problems and Solutions

Problem	Solution
Trash and debris blowing out of dumpster caused by lack of a cover or overfilling.	Cover dumpster and debris with a tarp or other waterproof cover until the dumpster service provider can bring a new dumpster or empty the existing one. Insist on a unit with a properly working lid or cover, if not provided.

Sanitary Waste Management

Figure 6.18 Typical port-a-potty with secondary containment and tie downs. Source: BFA Inc.

Sanitary waste management consists of procedures and practices to minimize or eliminate the discharge of sanitary or septic waste materials to the storm drain system or watercourses. The general contractor is responsible for providing sanitary facilities appropriate to the number of employees on the site. Sanitary and septic waste management practices are to be implemented on all construction sites that use temporary or portable sanitary or septic waste systems. Sanitary waste may only be disposed of in accordance with the Missouri Clean Water Law.

Recommended Minimum Requirements

Written Procedures and Practices

Written procedures and practices should be referenced in the stormwater pollution prevention plan, or SWPPP. Plans should be posted on the portable facilities and at the office. The site superintendent and field personnel should ensure procedures and practices are followed at all times.

Documentation

Log all education, maintenance, inspection and removal activities in case questions arise during inspections and for reference when troubleshooting problems.

Education

- Educate employees, subcontractors and suppliers about potential dangers to humans and the environment from sanitary or septic wastes.
- Instruct employees, subcontractors and suppliers in identification of sanitary and septic waste.
- Educate employees, subcontractors and suppliers about sanitary and septic waste storage and disposal procedures.
- Hold regular meetings to discuss and reinforce disposal procedures. Incorporate procedures into regular safety meetings.
- Establish a continuing education program to update new employees.

Location, Storage and Disposal Procedures

- In order to reduce the risk of tipping and spillage, temporary sanitary facilities should be firmly anchored to the ground and located where they are protected from high winds.
- Temporary sanitary facilities should be located a minimum of 50 feet away from drainage facilities, watercourses and traffic circulation. Avoid locating sanitary facilities on an impervious surface. Secondary containment may be required for sanitary facilities located on impervious surfaces.
- Wastewater must not be discharged onto or buried within the construction site.
- If sanitary and septic systems discharge directly into sanitary sewer systems, where permissible, the contractor needs to comply with applicable city, county or sewer district requirements. Use of portable toilet facilities on the construction site may require a permit from the local municipality or health department.
- If using an on-site disposal system, such as a septic system, the contractor may need to comply with county health department requirements.
- Properly connect temporary facilities that discharge to the sanitary sewer system to avoid illicit discharges.
- Ensure sanitary and septic facilities are maintained in good working order. It is recommended that a licensed contractor be used or consulted.
- It is recommended to use reputable, licensed sanitary and septic waste haulers.

Maintenance, Inspections and Removal

- Inspect all sanitary waste management devices weekly and after each rainfall event that results in stormwater runoff – and as strong wind conditions occur. Discuss maintenance issues and requirements with the sanitary facility provider before installation.
- Make sure routine and timely disposal of waste materials is occurring.
- Respond immediately to correct problems caused by damage to or tipping of portable units. Clean up and dispose of spills in accordance with state and local regulations. Determine response times for waste haulers and adjust the callout routine to ensure timely disposal of waste is occurring.

- Anticipate fluctuations in facility usage based on the number and location of concurrent construction activities as well as variations in the total number of workers present on the site. Relocate facilities, add units, or increase the frequency of maintenance calls to waste haulers as necessary to make sure the units are convenient for use and do not overfill.
- Remove this temporary device and stabilze the site prior to filing *Form H - Request for Termination of a General Permit*, Form--MO 780-1409 (see Chapter 1 -Missouri Permit Requirements) for termination of permit coverage.

Common Problems and Solutions

Problem	Solution
Waste management device falls over or is blown over by wind, caused by improper anchoring.	Anchor or otherwise tie down the device securely.
The sanitary or septic system facility is overflowing, caused by failure to routinely empty and dispose of the waste.	Call the sanitary facility provider to empty the waste immediately and dispose of it properly. Ensure the person in charge of the facility is clearly aware of their responsibility to oversee proper inspection and maintenance. Implement additional education for all involved.

SECTION 3: SURFACE STABILIZATION - EROSION CONTROLS

Temporary Seeding

Figure 6.24 Temporary vegetation is a relatively inexpensive way to stabilize construction sites in a hurry. As grass grows, the roots hold soil in place and the plant protects the soil surface from raindrop impacts. Source: N. Klopfenstein, NRCS. St. Charles Co.

Practice Description

Temporary seeding is the establishment of fast-growing annual vegetation to provide economical erosion control for up to 6 months and reduce the amount of sediment moving off the site. Annual plants that germinate rapidly and survive for only one growing season are suitable for establishing temporary vegetative cover.

This practice applies where short-lived vegetation needs to be established before final grading or in a season not suitable for permanent seeding.

Recommended Minimum Requirements

A qualified professional should specify plant materials, seeding rates and times of planting. The site superintendant and field personnel should refer to plans and specifications throughout the construction process. To ensure emergence, vigorous growth of seedlings and continued plant growth, prepare the seedbed and add soil amendments according to soil tests. Protect the soil and seed with mulch or other erosion control until the vegetation is fully established to a density of 70 percent over the entire vegetated area.

Soil
Make sure there is a minimum of three inches of topsoil with a sufficient percentage of organic material to sustain vegetative growth.

Seedbed Preparation
Loosen soil to depth of 3-inches for broadcast seeding or drilling. If compacted, loosen soils for no till drilling. Avoid excessively wet conditions.

Amendments
Incorporate fertilizer and lime (if soil pH is less than 5.3) incorporated 3- to 6-inches into the soil. See Table 6.2.

Seed Quality
Use certified seed, tested within the past nine months.

Plants
Select recommended temporary erosion control plant species. Rate of application and seeding dates are listed in Tables 6.3 and 6.4.

Erosion Control
Cover the seeded area with approved mulching materials or other erosion control devices to protect the soil and seed until vegetation is fully established.

General
Inspect seeded areas 2 to 4 weeks after seeding for seed germination, vegetation establishment, erosion control and weed control. Repair and reseed as necessary.

Reseed
After six months if the site is not in permanent vegetation over the entire disturbed area to a density that impedes erosion.

Installation
Successful vegetative establishment is directly dependent on the nutrients in the soil. For optimum results, take soil samples from the top 6-inches in each area to be seeded. Submit samples to a soil testing laboratory for liming and fertilizer amendment recommendations.

Seedbed Preparation
- Seedbed preparation is essential for the seed to germinate and grow.
- For broadcast seeding and drilling, loosen the soil to a depth of approximately 3-inches.
- For no-till drilling, the soil surface does not need to be loosened unless the site has surface compaction.
- Use a disk, ripper, chisel, harrow or other acceptable tillage equipment to loosen compacted, hard or crusted soil surfaces. Avoid preparing the seedbed under excessively wet conditions.

Liming
- Acid soils with an extremely low pH can prevent seeding success. However, most of the recommended temporary vegetation is tolerant of low pH soils and will establish on all but the lowest pH soils.
- If soil pH in the region is known to be extremely low, conduct a soil pH test to determine if limestone is necessary for temporary seeding. Amend soils with lime according to information in Table 6.2. Soils with a pH above 7.0 should not be limed.

Table 6.2 Liming Requirements for Temporary Sites

pH Test	Plant Response	Recommended Application of Agricultural Limestone
Below 6.0	Poor growth	Lime according to soil test
6.0 - 6.5	Adequate growth	No lime recommended
Greater than 6.5	Optimum	No lime recommended

Fertilizer

- The soil will most likely be deficient in nutrients required for growth. A soil test will provide the best guide for the amount and types of fertilizer to apply for optimum plant growth.
- A general recommendation is to broadcast Ntirogen, Phosphorus and Potassium at 90 lbs./acre for areas receiving more than 30 inches of precipitation and 50 lbs./acre in areas receiving less than 30 inches of precipitation.

  For example, to compute the bulk pounds of product to use - For 100 pounds of a 10-10-10 fertilizer mix you have 10 percent or 10 pounds of actual Nitrogen, Phosphorus and Potassium. The remaining 70 percent or 70 pounds of product in the bag is inert material that improves application consistency. You would need to apply 900 pounds of product per acre to provide 90 pounds of actual Nitrogen per acre.
- For best results incorporate the fertilizer into the top 3- to 6-inches before seeding.

Seeding

- Apply seed evenly with a broadcast seeder, drill, cultipacker seeder or hydroseeder. Plant small grains no more than 1½ inches deep. Plant grasses and legumes no more than ½ inch deep.
- Prior to mulching, harrow, rake or drag a chain to lightly incorporate broadcast seed into the soil to enhance germination. Cover applied seed with mulch (See Mulching).

Table 6.3 Temporary Seeding Plant Materials and Minimum Seeding Rate *

Species	Seeding Rate		Plant Characteristics
	lbs. per Acre	lbs. per 1,000 ft.^{2}	
Oats	80 lbs.	2 lbs	Not cold tolerant, height up to 2 feet
Cereals: Rye/Wheat	90 / 120	2 / 2.5	Cold tolerant, height up to 3 feet, low pH tolerant
Millets, Sudangrass	45 / 60	1 / 1.25	Warm season annual, aggressive growth, height up to 5 feet
Annual Ryegrass	75	2	May be added to mix, not heat tolerant, height up to 16 inches
Annual Lespedeza** plus Tall Fescue	15 plus 45	0.5 plus 1	Warm season annual legume, makes own nitrogen, tolerated low pH

* In areas receiving less than 30 inches of precipitation, use 75 percent of these rates.

** If there is any possibility the seeding will be required to control erosion for more than one year, then consider the addition of fescue or another permanent species as part of a mixture when seeding.

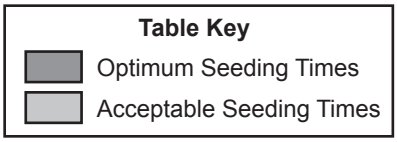
Planting Dates

- Plant according to the design plan. In absence of a plan, choose a recommended temporary species or mixture appropriate for the season from Tables 6.3 and 6.4.
- Plant during optimum seeding dates if at all possible. Always use mulch or other erosion control practices to cover and protect seed and soil during vegetation establishment. Roll and cultipack broadcast seed for good soil-to-seed contact.
- Use high quality seed and for best results, use certified seed. When using uncertified seed, use the highest recommended seeding rate.

Table 6.4 Seeding Dates for Temporary Seeding

Species	Seeding Dates Optimum and Acceptable											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Oats												
Cereals: Rye/Wheat												
Millets, Sudangrass												
Annual Ryegrass												
Annual Lespedeza plus Tall Fescue[1]												

[1] If site may not be developed within one year, consider permanent species listed in Table 6.5.



Mulching

- Mulching conserves moisture and reduces erosion during seed germination and vegetation establishment.
- Evenly cover a minimum of 75 percent of the ground surface with mulch material specified in the design plan. Tack or tie down the mulch according to plan (See Mulching).

Construction Verification

Check materials and installation for compliance with specifications.

Maintenance and Inspection

- Check temporary seeding during each weekly inspection to monitor germination, growth and to see if stands are of adequate thickness (more than 70 percent density of the ground surface vegetation over the entire area to be stabilized). Stands should be uniform and dense for best results. Fertilize, reseed and mulch bare and sparse areas immediately to prevent erosion.
- Mowing is not recommended for cereals seeded alone. Cereals seeded with a grass can be mowed when height is greater than 12-inches. However, to prevent damage to grasses, do not mow shorter than 4-inches.
- Mow millets and sudangrass before height is greater than 6-inches to allow regrowth and continued erosion protection.
- Annual lespedeza and tall fescue may be mowed after height exceeds 8-inches. Do not mow shorter than 4-inches.
- Replant temporary or permanent vegetation within 12 months as annual plants die off and no longer provide erosion control (see Permanent Seeding). Consider no-till planting

where possible.

Common Problems and Solutions

Problem	Solution
Design specifications for seed variety, seeding dates or mulching cannot be met.	Substitutions may be required. Unapproved substitutions could lead to failure.
Vegetation is not sustainable as a permanent cover caused by a lack of topsoil resulting in a lack of organic material, nutrients and water holding capacity.	Add topsoil with a minimum of three percent organic material.
Poor seedling emergence and growth with erosion of the soil caused by inadequate seedbed preparation.	Repair gullies, prepare seedbed, fertilize, lime (if necessary), mulch and reseed.
Unsuitable choice of plant materials; resulting in poor germination or inadequate stand (less than 70 percent of the ground surface covered).	Choose plant materials appropriate for season, prepare seedbed and replant.
Poor or spotty stands of vegetative cover caused by inadequate mulching, washing away of the seed and erosion of the soil surface.	Poor plant vigor, yellow color and short height caused by a lack of nitrogen - add 50 lbs. of nitrogen fertilizer per acre. Do not apply over the top of existing plants from June 1 to Aug. 15 or on frozen ground.
Poor plant vigor, yellow color and short height caused by a lack of nitrogen.	Add 50 lbs. of nitrogen fertilizer per acre. Do not apply over the top of existing plants from June 1 to Aug. 15 or on frozen ground.
Dying plants caused by a lack of topsoil or soil compaction that limits root growth and water availability to plants.	Add organic material and loosen soil if reseeding is necessary or before seeding permanent vegetation.

Permanent Seeding

Figure 6.25 Permanent vegetation can be used to stabilize many structures, such as this grassed waterway, ensuring that runoff is relatively sediment-free.

Practice Description

Permanent seeding is the establishment of perennial vegetation on disturbed areas for periods longer than 12 months. Permanent vegetation provides economical long-term erosion control and helps prevent sediment from leaving the site. This practice is used when vegetation is desired to permanently stabilize the soil or if future phases of a construction site will remain dormant for a significant period of time after grading. It is necessary to protect earthen structures such as dikes, channels and embankments. Particular care is required to establish a good, thick cover of permanent grass.

Recommended Minimum Requirements

A qualified professional should specify plant materials, seeding rates and times prior to start of construction. The site superintendant and field personnel should refer to plans and specifications throughout the construction process. To ensure germination and growth, prepare seedbed, add soil amendments according to soil tests, mulch all seeded areas and follow the seeding dates.

Seedbed Preparation

For broadcast seeding or drilling, loosen soil to depth of 3-inches. For no till drilling, loosen the soil if it's compacted. Avoid excessively wet conditions.

Soil Amendments

Incorporate fertilizer and lime (if soil pH is less than 6.0) incorporated 3- to 6-inches into the soil.

Seed Quality
Use certified seed, tested within the past 9 months.

Planting Dates
Coordinate the construction schedule with planting dates appropriate for region and species (See Table 6.5).

Plants
Select from recommended erosion control plants (grass or grass/legume mixtures) as shown in Tables 6.5 and 6.6. Rate of application and seeding dates are shown in Tables 6.4, 6.7 and 6.8.

Mulch
Cover a minimum of 75 percent of the ground surface with approved material (See Mulching).

Inspection
Inspect seeded areas during each weekly inspection. Repair and reseed as necessary.

Installation
During final grading, take soil samples from the top 6-inches in each area to be seeded. Submit sample to a soil testing laboratory for liming and fertilizer recommendations.

Seedbed Preparation
- Seedbed preparation is essential for the seed to germinate and grow.
- For broadcast seeding and drilling, loosen the soil to a depth of approximately 3-inches.
- For no-till drilling, the soil surface does not need to be loosened unless the site has surface compaction.
- Loosen compacted, hard or crusted soil surfaces with a disk, ripper, chisel, harrow or other tillage equipment.
- Avoid preparing the seedbed under excessively wet conditions.

Liming
- Follow the recommendations resulting from the soil test. Apply ground agricultural limestone unless a soil test shows a pH of 6.5 or greater.
- Incorporate lime into the top 3- to 6-inches of soil.
- Do not add lime if the pH is 7.0 or greater.

Fertilizer
Remember: Phosphorus helps roots grow and develop to get the grass plants established. Nitrogen will only be taken up after the seed has germinated and the vegetation is growing. It may wash down stream if applied heavily during seeding.

Note: Fertilizer can be blended to meet exact fertilizer recommendations. Take soil test recommendations to local fertilizer dealer for bulk fertilizer blends. This may be more economical than bagged fertilizer.

For establishment and long-term growth, apply a complete fertilizer at rates recommended by soil tests or as specified in the design plan. In the absence of soil tests, use the following as a guide:

- A typical fertilizer blend for lawn grass mixes: Apply 10-24-18 which represents 10 percent of actual nitrogen – 24 percent of actual phosphorus and 18 percent of actual potassium within the fertilizer compound. If you had 100 pounds of a 10-24-18 blend you would have 10 pounds of actual nitrogen, 24 pounds of actual phosphorus and 18 pounds of actual potassium within the bag.

- A typical application rate of fertilizer for initial establishment of vegetation after seeding is approximately 1 pound of actual nitrogen per 1,000 square feet. With the 10-24-18 fertilizer this would require the application of approximately 435 pounds of this fertilizer mix per acre since there are 43,500 square feet in an acre. This fertilizer would also provide more than 2 pounds of phosphorus per acre.
- Incorporate lime and fertilizer to a depth of 3- to 6-inches by disking or chiseling on slopes of up to 3:1.
- Grade soil to a smooth firm surface to enhance rooting of seedlings and reduce rill erosion.
- Subsequent fertilization with an additional 2 pounds per 1,000 square feet of actual Nitrogen approximately one month after initial seeding will help grass growth after germination to achieve the density of vegetation to prevent or minimize erosion. A typical fertilizer for a second application once vegetation is established would be a 20-10-5 mix at 435 pounds of fertilizer per acre.

Plant Selection

If not specified in the design plan, choose a suitable species of grass or a grass/legume mixture from Tables 6.5 and 6.6 appropriate for the season. Consider site conditions including soils, plant characteristics, region of the state and desired level of maintenance. The species shown are adapted for lawns and erosion control. If there are questions on species selection and how they may be adapted in wildlife habitat or wetland applications, contact your local Natural Resources Conservation Service or Extension office.

Developing a Mixture

A pure stand of grass provides the best erosion control. The advantage of a grass/legume mix is the legume provides nitrogen to the grass and often grows during hotter and drier months when the grass is dormant. Usually one grass and one or two legumes is sufficient in a mixture. More grasses can be mixed together, but may be of little use. Refer to Tables 6.5 and 6.6 for information about each grass and legume to determine the correct species for your site.

Nurse Crops (Temporary or Annual Species)

Nurse crops are temporary grains that have one growing season such as wheat, rye and oats and are sometimes used in a seeding mixture. These annuals can reduce weeds, control erosion and provide protection to young seedlings until the perennial species become established.

Plant nurse crops about 1-inch deep. Most permanent grasses and legumes are sown 1/4 inch deep. Permanent seedings should not be planted deeper than ¼ to ½ inch.

Aesthetic Plantings

A wide variety of native forbs and grasses are available that add diversity and beauty to permanent plantings (e.g., switchgrass as an accent). Contact your local Natural Resources Conservation Service office for species selection and seeding rates.

Planting Dates

If seeding dates are not specified in the design plan or construction has not proceeded according to schedule, use the seeding calendar shown in Table 6.5.

Plant during optimum seeding dates if at all possible. Always use mulch or other erosion control measures to protect the seed and reduce erosion until the vegetation is established. For dormant seeding dates, broadcast seed and immediately roll and cultipack for good soil-to-seed contact.

If unable to seed according to schedule, use temporary seeding until the preferred date for permanent seeding.

Seeding Rates

If seeding rates are not specified in the design plan, use rates in Table 6.8 for grasses alone. Use rates in Table 6.9 for a grass or legume mixture. These rates are based on the poor growing conditions that typically exist on a development site, a need for dense growth and high germination rates.

For best results use certified seed. When using uncertified seed, use the highest recommended seeding rate. Higher seeding rates will not substitute for good seedbed preparation.

- Apply seed uniformly using a cyclone seeder, drop-type spreader, drill, cultipacker seeder or hydroseeder.
- When using a drill seeder, plant rye or other grains about 1-inch deep; plant grasses and legumes no more than ½ inch. Calibrate equipment in the field.
- Cover seed by raking, or dragging a chain, brush or mat. Then firm the soil lightly with a roller. Seed can also be covered with hydro-mulched wood fiber and tackifier or a rolled erosion control product.
- Legumes require inoculation with nitrogen-fixing bacteria to ensure good growth. Purchase inoculum from seed dealer and mix with seed prior to planting.

Table 6.5 Planting Dates Optimum and Acceptable* Planting Dates

Species	Seeding Dates Optimum and Acceptable											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Turf Fescue		*	*			*			*			
Tall Fescue		*	*			*			*			
Kentucky Bluegrass		*	*			*			*			
Perennial Ryegrass		*	*			*			*			
Ryetop		*	*			*			*			
Reed Canary		*	*			*			*			
Bermuda - Common							*	*				
Bermuda- Hybrid							*	*				
Buffalograss[1]			*	*			*	*				
Zoysia2							*	*				
Birdsfood Trefoil	*	*	*									
Common Lespedeza												
Red Clover	*	*	*					*				
White Clover	*	*	*					*				
Wheat/Rye[3]	*							*				
Oats[3,4]		*						*				

[1] Can also be sprigged.

[2] Usually sprigged. Space plugs every 6-, 8- or 12-inches; with 4,000, 2,250 or 1,000 sprigs/1000 ft^2 respectively.

[3] Check with your local Noxious Weed Department before planting.

[4] Nurse crop only.

[5] Provides a quick temporary cover or nurse crop even if planted in the fall.

Table Key

Optimum Seeding Times

* With Mulch Cover - Acceptable Seeding Times

Table 6.6 Plant Characteristics

	Species	Kansas Adaptation	Missouri Adaptation	Maintenance	Fertility Needs	Establish-ment Ease
				L - M - H	L - M - H	P - M - G
Cool Season Grasses	Perennial ryegrass	E, C, W*	N, S	L	M	M
	Canada wildrye	E, C, W	N, S	M	L	G
	Tall fescue	E, C, W*	N, S	M	L - H	G
	Crested wheatgrass	E, C, W	N	M	L	M - G
	Kentucky bluegrass	E, C, W*	N, S	H	M - H[1]	M - G
	Bromegrass	E, C, W*	N, S	M	M - H[1]	M - G
	Redtop	S½ E	N, S	L	L	M
	Reed canary[1]	E, C, W*	N, S	H	L - M[3]	P
Warm Season Grasses	Common Bermuda	E, C, W*	S	L	L - M	M
	Hybrid Bermuda	E, C, W*	-	L	L - M	M
	Buffalograss[3]	E, C, W*	N, S	L	L	M
	Blue grama	E, C, W*	N, S	L	L	M
	Zoysia[4]	E, C, W*	-	M	M - H	M
	Sideoats grama	E, C, W*	N, S	M	L	G
	Little bluestem	E, C, W*	N, S	M	L	M
	Big bluestem	E, C, W*	N, S	M	L	M
	Indiangrass	E, C, W*	N, S	M	L	M
	Switchgrass	E, C, W*	N, S	M	L	M
Legumes[5]	Birdsfoot trefoil	E, C, W*	N, S	L	M	P - M
	Crownvetch	E, C, W*	N, S	M	M	P - M
	Annual lespedeza[6]	E, C, W*	N, S	M	M	P - M
	Red clover	E, C, W*	N, S	M	M	G
	White clover	E, C, W*	N, S	L	M	M - G
	Alfalfa	E, C, W*	N, S	M	L	P
Companion Crops/Cereal Grains	Wheat	E, C, W*			M	M
	Rye (cereal)	E, C, W*			M	M
	Oats	E, C, W*			M	M

* Adaptation limited to areas that receive additional moisture enhancement by irrigation, subirrigation or overland flow.

[1] Will be high maintenance in lawn – type or low rainfall (<30") settings.

[2] Adapted to shorelines, wet or frequently flooded areas.

[3] Responds well to fertilizer, but doesn't necessarily require it.

[4] Usually seeded, by can be sprigged.

[5] Usually sprigged, plugged or sodded.

[6] Legumes alone will not provide adequate erosion protection: use with a grass in a mixture.

[7] Will reseed each year if not mowed until after seed shatter in September.

Table Key

L = low
M = moderate,
H = high.
P = poor,
G = good.

Table 6.7 Species Tolerance for Environmental Conditions

Species		Tolerance				
		Shade	Drought	Flooding	Traffic	Soil Wetness
Cool Season Grasses	Perennial ryegrass	L	L	M	M	M
	Canada wildrye	M	M	L	M	P
	Tall fescue	M	M	M	M	P
	Crested wheatgrass	L	H	M	M	G
	Kentucky bluegrass	L	L	M	H	G
	Bromegrass	L	M	L	H	M
	Redtop	L	L	M	H	G
	Reed canary	L	M	H	H	G
Warm Season Grasses	Common Bermuda	L	H	H	H	M
	Hybrid Bermuda	L	H	H	H	M
	Buffalograss	L	H	H	H	G
	Blue grama	L	H	L	M	P
	Zoysia	L	H	M	H	P
	Sideoats grama	L	H	M	H	M
	Little bluestem	L	H	L	L	P
	Big bluestem	L	H	M	L	M
	Indiangrass	L	M	L	M	P
	Switchgrass	L	M	M	M	G
Legumes[5]	Birdsfoot trefoil	L	H	L	M	G
	Annual lespedeza	L	L	M	L	M
	Red clover	L	L	L	M	P
	White clover	L	L	L	H	M
	Alfalfa	L	L	L	L	P

1 Legumes alone will not provide adequate erosion protection: use with a grass in a mixture.

Table Key

L = Low
M = Moderate
H = High
P = Poor
G = Good

Table 6.8 Seeding Rates

Species		Kansas: Full Seeding Rate[1]	Missouri: Full Seeding Rate[1]
		lbs./acre (PLS)[2]	lbs./acre (PLS)[2]
Cool Season Grasses	Perennial ryegrass	150	150
	Canada wildrye	21	24
	Tall fescue	150	150
	Crested wheatgrass	20	16
	Kentucky bluegrass	120	120
	Bromegrass	100	100
	Redtop	8	8
	Reed canary[1]	40	40
Warm Season Grasses	Common Bermuda	2	4
	Hybrid Bermuda	20 bu./acre	-
	Buffalograss[3]	8 (grain)	8 (grain)
	Blue grama	3	6
	Zoysia[4]	20 bu./acre	-
	Sideoats grama	15	15
	Little bluestem	9	13
	Big bluestem	17	16
	Indiangrass	12.5	16
	Switchgrass	8	9
Legumes[5]	Birdsfoot trefoil	5	10
	Annual lespedeza[6]	14	16
	Red clover	8	12
	White clover	3	4
	Alfalfa	9	9
Companion Crops	Wheat	1 bu./acre	1 bu./acre
	Rye (cereal)	1 bu./acre	1 bu./acre
	Oats	1.5 bu./acre	1.5 bu./acre

[1] Note: Rates based on typical construction site conditions where seedbed is normally less than ideal. Planned future use or specific site conditions may dictate an increase or a decrease in rates. Contact your local Natural Resources Conservation Service office or consulting agronomist for specific seeding rates within your county.

[2] PLS or Pure Live Seed = the amount of seed guaranteed to grow.

[3] Legumes alone will not provide adequate erosion protection: use with a grass in a mixture.

Table 6.9 Example Seeding Mixtures for Critical Area Seeding

Grass - Legume Mixture	Seeding Rate (PLS) *	
	lbs./1000 ft.^{2} ***	lbs./acre
Reed canarygrass / White clover	5 + 0.1	40 + 1
Reed canarygrass / Red clover	5 + 0.25	40 + 2
Tall fescue** / Birdsfoot trefoil	10 + 0.25	80 + 2
Tall fescue** / White clover	10 + 0.1	80 + 1
Tall fescue** / Lespedeza	10 + 0.5	80 + 4
Tall fescue** / Lespedeza / White clover	10 + 0.25 + 0.1	80 + 4 + 1
Tall fescue** / Red clover	10 + 0.25	80 + 2
Tall fescue** / Red clover / White clover	10 + 0.25 + 0.1	80 + 2 + 1
Kentucky bluegrass / White clover	3 + 0.1	25 + 1
Kentucky bluegrass / Red clover	3 + 0.25	25 + 2
Kentucky bluegrass / Birdsfoot trefoil	3 + 0.25	25 + 2
Kentucky bluegrass / Lespedeza	3 + 0.5	25 + 4
Perennial ryegrass / Red Clover	8 + 1	70 + 10
Perennial ryegrass / Birdsfoot trefoil	8 + 0.5	70 + 5
Perennial ryegrass / Lespedeza	8 + 3	70 + 25
Big bluestem / Indiangrass / Switchgrass / Sideoats grama / Western Wheatgrass	-	3.4 + 2.5 + 2 + 3 + 4
Wheat / Rye (as nursery crop)	1.5	60
Oats (as nursery crop)	0.75	30

* PLS or Pure Live Seed = the amount of seed guaranteed to grow. To calculate amount of bulk seed needed: Read seed tag and multiply % purity X % germination = % PLS; then divide lbs of PLS recommended by % PLS. Example: 30 lbs of Reed canary is needed to seed a 1 acre waterway; 90% pure X 90% germination = 81% PLS; 30 lbs PLS / .81 = 37 lbs. bulk seed needed.

** Turf fescue may be substituted for fescue at the same rates.

***Note: Use lbs. / 1,000 ft.^{2} rate to establish dense vegetation for lawns.

Erosion Control

- Mulching or a rolled erosion control product is recommended to conserve moisture, reduce erosion and protect the seed.
- Cover at least 75 percent of the area with approved mulch materials. Crimp, tack or tie down mulch with netting. Mulching is extremely important for successful seeding (See Mulching).

Construction Verification

Check materials and installation for compliance with specifications.

Maintenance and Inspection

- Inspect seeded areas weekly and after rain events. Check for erosion and seed wash out.
- Expect emergence of grasses and legumes within 28 days after seeding, with legumes following grasses.
- Check permanent seeding at each regular weekly inspection. Look for:
  - Germination.
  - Vigorous seedlings.
  - Uniform density with at least 70 percent of the ground surface covered.
  - Uniformity with nurse plants, legumes and grasses well intermixed.
  - Green, not yellow, leaves. Perennials should remain green throughout the summer, at least at the plant bases.

Reseeding

- Inspect seedings for die out for at least a year. Inspect the soil for erosional areas. To repair bare and sparse areas, fill gullies, refertilize, reseed and mulch. Consider no-till planting where possible.
- If stand is inadequate or plant cover is patchy, identify the cause of failure and take corrective action (e.g., choice of plant materials, lime and fertilizer quantities, poor seedbed preparation, lack of topsoil or weather.) If vegetation fails to grow, have the soil tested to determine whether pH is in the correct range or nutrient deficiency is a problem.
- Depending on stand conditions, repair with complete seedbed preparation, then overseed or reseed.
- If it's the wrong time of year to plant desired species, overseed with cereal grain or millets to thicken the stand until timing is right to plant perennials or use temporary seeding.

Fertilization

Satisfactory establishment may require refertilizing the stand in the second growing season.

- Do not fertilize cool season grasses in late May through July.
- Grass that looks yellow may be nitrogen deficient. An application of 500 lbs of 10-10-10 Nitrogen, Phosphorus, and Potassium per acre in early spring will help cool season grasses compete against weeds or grow more successfully.

Remember to convert actual pounds of nutrient needed when determining how many pounds of commercial fertilizer to buy.

- Do not use nitrogen fertilizer if stand contains more than 20 percent legumes.

Mowing

- Consider mowing after plants reach a height of 6- to 8-inches.
- Mow grasses tall, at least 3-inches in height and minimize compaction during mowing process.
- Monitor the late winter and early spring growth of nurse crops to be sure that they do not smother the permanent seeding. Mowing in April may reduce the competitiveness of the nurse crop and open the canopy to allow more sunlight to permanent seedlings that are beginning to grow.
- Vegetation on structural practices such as embankments and grass-lined channels need to be mowed only to prevent woody plants from invading.

Troubleshooting

Consult with design professional if the following occurs:

- Design specifications for seed variety, seeding dates or mulching cannot be met; substitutions may be required. Unapproved substitutions could lead to failure.

Common Problems and Solutions

Problem	Solution
Poor stand of vegetation caused by inadequate topsoil.	Apply good topsoil with a minimum of 5 percent organic material and reseed.
Poor stand of vegetation caused by inadequate seedbed preparation.	Prepare well-tilled, limed and fertilized seedbed and reseed.
Vegetative stand failures caused by unsuitable choice of plant materials such as seeding Bermuda grass in the north or in the fall.	Select an appropriate species based on plant characteristics in Tables 6.8 and 6.9 and time of seeding.
Perennial vegetation overtaken by nurse crop with too high seeding mixture.	Limit rates to those shown in Table 6.9; eliminate old nurse crop, prepare seedbed and reseed.
Inadequate stand of vegetation caused by seeding at the wrong time of the year.	Consult Table 6.5 and reseed. If timing is not right, use temporary seeding to stabilize soil until preferred seeding dates.
Inadequate stand of vegetation, bare spots or eroded areas caused by inadequate mulching.	Prepare seedbed, reseed, cover seed evenly and tack or tie down mulch, especially on slopes, ridges and in channels (see Mulching).

Mulch and Hydromulch

Figure 6.27 It takes about two tons per acre of straw mulch to cover at least 75 percent of the ground surface. To prevent erosion and provide the best microclimate for seed establishment, straw mulch should be physically anchored (crimped) or tied down with a tackifier.

Practice Description

Mulch and hydromulch are the application of plant residues such as straw or other suitable materials to the soil surface to reduce erosion. Mulch protects the soil surface from the erosive force of raindrop impact and reduces the velocity of overland flow. It helps seedlings germinate and grow by conserving moisture, protecting against temperature extremes and controlling weeds. Mulch also maintains the infiltration capacity of the soil.

Hydraulic mulch consists of applying a mixture of shredded paper, wood fiber or a hydraulic matrix and a stabilizing emulsion or tackifier with hydroseeding equipment, which temporarily protects exposed soil from erosion by raindrop impact or wind.

Mulch should always be applied to seeded areas to help establish plant cover and protect the seed during establishment.

Recommended Minimum Requirements

Prior to start of construction, mulch requirements should be determined by a qualified professional. The site superintendant and field personnel should refer to plans and specifications throughout the construction process..

Material

As specified in the approved site plan. If not specified, select from mulch materials listed in Table 6.10. Base the choice upon soils, slope steepness and length, flow conditions and time of year (See Figure 6.29).

Coverage
At least 75 percent of the soil surface.

Anchoring
Anchor the light materials, such as hay and straw mechanically using a crimping disc or with hydraulic tackifiers or netting. Heavy material mulches such as wood chips will not require anchoring unless on slopes of 4:1 or greater.

Installation
Site Preparation
- Divert runoff water away from areas above the site that will be mulched.
- Remove large dirt clods, stumps, roots and other debris from the construction area.
- Grade area as needed to permit the use of equipment for seeding, mulching and maintenance. Shape area so it is relatively smooth.
- If the area will be seeded, follow seeding specifications in the design plan (See Temporary and Permanent Seeding) and apply mulch immediately after seeding.

Mulching
Spread straw or cereal grain mulch uniformly over the area with a power blower or by hand. No more than 25 percent of the ground surface should be visible after spreading.

Apply at the rates shown in Table 6.10. Use higher rates for steep slopes and other erosive areas.

Anchor straw mulch by one of the following methods:
- Crimp with a weighted, straight, notched disc or a mulch anchoring tool to punch the straw into the soil.
- Tack with a liquid tackifier designed to hold mulch in place. Use suitable spray equipment and follow manufacturer's recommendations.
- Cover with netting, using a degradable natural or synthetic mesh to hold mulch materials in more erosive areas. Anchor the netting according to manufacturer's specifications (See Erosion Control Blankets).
- Anchor wood cellulose mulch with a liquid tackifier.

Figure 6.28 shows straw that that has been crimped with a disc blade as in Figure 6.27. Notice when the blade cuts the straw into the soil to anchor it, some of the straw may become vertical and thereby exposing the soil surface to raindrop impact. The vertical straw acts more like a sediment control and you lose some erosion protection. This can be remedied by increasing the amount of mulch used to 3 or 4 tons per acre if crimping will take place. Table 6.10 provides the application rates of different mulch materials.

Use heavy natural nets without additional mulch, synthetic netting with additional mulch or erosion control mats/blankets to control erosion on steep slopes and in areas needing a higher degree of protection such as waterways, swales and diversion channels. These commercial materials vary greatly in longevity, strength, heaviness and the rate of water flow they can handle.

Install netting and mats/blankets according to manufacturer's specifications making sure materials are properly anchored (See Erosion Control Blankets).

Construction Verification
Check materials and installation for compliance with specifications.

Figure 6.27 Crimping disc. Source: ABCs of BMPs, LLC.


Figure 6.28 Crimped straw. Source: ABCs of BMPs, LLC.

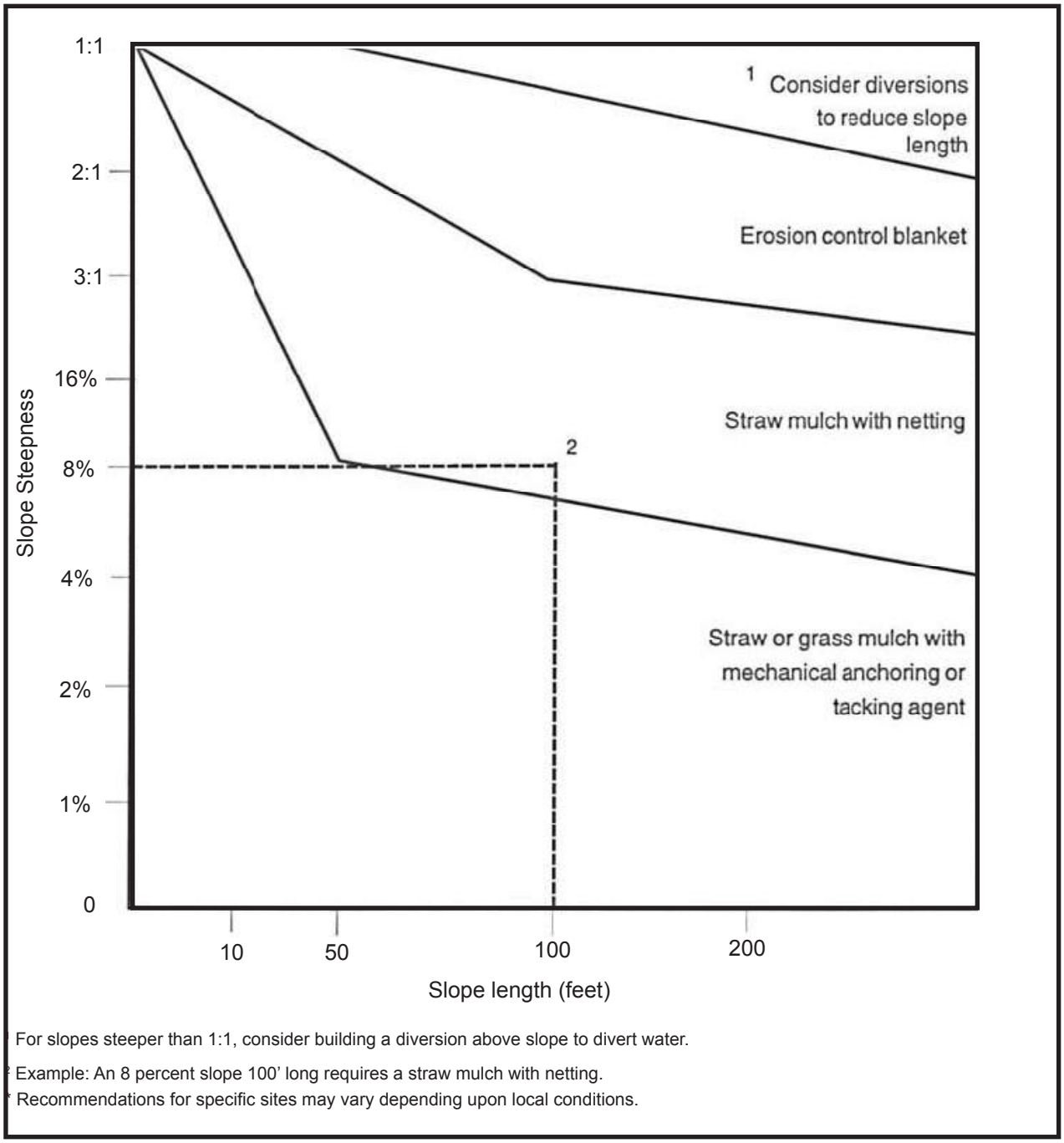
Table 6.10 Typical Mulching Materials and Application Rates

	Rate per Acre	Requirements	Installation Uses	Longevity
Organic Mulches				
Straw	3,000 - 4,500 lb./acre	Dry, unchopped, unweathered; free of weed seeds and rot	Spread by hand or machine, 1.5 to 2.5 inches deep; must be crimped or tacked with vegetative overspray	2 - 4 weeks
Paper, wood fiber, recycled newsprint	2,000 lb./acre	Can use paper on flatter areas, increase percentage of wood fiber as slopes steepen	To be used with hydroseeder, refer to seeding chart for dates to seed	2 - 4 months
Stabilized Fiber Matrix	Refer to manufacturers recommendations - usually 1,500 - 3,000 lb./acre	Typically requires wood fiber mulch to reduce rainfall impact. Requires 24-hour cure time-not used in concentrated flows	To be used on more erodible slopes, molecularly binds soil particles for improved erosion protection, can be used without seed for temporary soil protection	4 - 5 months
Bonded Fiber Matrix	Refer to manufacturers recommendations - 3,000 - 4,000 lb./acre depending on steepness of slope	24-hour cure time, can be used on slopes as steep as 2:1, not used in concentrated flows	Does not require smooth finish grade, can be used in soils with high rock content, can be used with out seed for temporary soil protection	4 - 6 months
Flexible Growth Medium	Refer to manufacturers recommendations - 3,000 - 4,500 lb./acre depending on steepness of slope	No cure time, can be used on slopes steeper than 1:1, not used in concentrated flows without TRM combination	Does not require smooth finish grade, can be used in soils with high rock content, molecularly binds soil particles, equivalent to short term erosion control blankets in many cases	up to 1 year
Wood Chips	10-20 Tons	Air dry, add nitrogen fertilizer	Apply with blower…	6 - 9 months
Bark	35 cubic yds.	Air dry…	Apply with…	6 - 9 months
Tackifiers				
Mulch tackifiers	Rates vary-refer to manufacturers specifications	Powders, liquids, crystals, etc.; most are water soluble	Mix with organic mulches to hold together, heavier rates required for steeper slopes	1 - 3 months
Straw Tackifiers	750 lb./acre	Recycled newsprint with tackifier	Spray overtop of vegetative mulching to hold together for extended time.	1 - 3 months
Soil Binders				
Chemical and Biodegradable products: Many Trade Names	Follow manufacturers specifications	Use for temporary and longer term stabilization of non-vegetative soils	Some may be harmful to plant growth, check manufacturers recommendations for seeding limitations	30 days to 6 months depending upon rate

Source: ASP, Enterprises, 2009

* See Temporary Erosion Control Blanket section for nettings and mats.

**Enlist the assistance of a Certified Professional in Erosion and Sediment Control for specific recommendations.



[1] For slopes steeper than 1:1, consider building a diversion above slope to divert water.

[2] Example: An 8 percent slope 100' long requires a straw mulch with netting.

[*] Recommendations for specific sites may vary depending upon local conditions.

Figure 6.29 General mulch recommendations to protect from splash and sheet flow. Source: Adapted from *Minnesota Protecting Water Quality in Urban Areas,1991*

Troubleshooting

Consult with a qualified design professional if any of the following occur:

- Variations in topography on-site indicate the mulching materials will not function as intended; changes in the plan may be needed.
- Design specifications for mulching materials or seeding requirements cannot be met; substitution may be required. Unapproved substitutions could result in erosion or seeding failure.

Maintenance and Inspection

Inspect all mulched areas on a weekly basis and after rainstorms for erosion and damage to the mulch. Repair promptly and restore to original condition. Continue inspections until vegetation is well established. Keep mower height high if plastic netting is used to prevent netting from wrapping around mower blades or shaft.

Common Problems and Solutions

Problem	Solution
Erosion, washout and poor plant establishment.	Check for proper topsoil, repair eroded surface, reseed, remulch and anchor mulch.
Mulch is lost to wind or stormwater runoff.	Reapply mulch and anchor by crimping, netting or tacking.
Mulch not anchored in channel; resulting in channel bottom eroding	Repair damage, replace mulch and anchor or install appropriate turf reinforcement mat channel liner.
Mulch deteriorates before plant establishment.	Check for proper topsoil, reapply mulch, do not hydromulch in winter.

Dust Control

Figure 6.33 Spraying water is effective for dust control on haul roads, although it must be frequently repeated during hot days or heavy traffic periods. Source: C. Rahm, NRCS. St. Charles Co.

Dust Control

In Missouri, the contractor is required by State law to control fugitive dust blown from the site. Kansas does not have specific regulations for fugitive dust emissions; however, the Kansas Department of Health and Environment encourages contractors to implement measures to reduce such emissions. Dust can be minimized by stabilizing areas with mulch as soon as possible. Provide watering in unstabilized areas. Contact Missouri Department of Natural Resources or Kansas Department of Health and Environment for guidance.

Practice Description

Dust control includes a wide range of techniques that reduce movement of wind-borne soil particles (dust) from disturbed soil surfaces. This practice applies to construction routes and other disturbed areas where on-site and off-site damage or hazards may occur if dust is not controlled.

Recommended Minimum Requirements

Dust control measures should be designed by a qualified professional. The site superintendant and field personnel should refer to plans and specifications throughout the construction process. Whenever possible, leave undisturbed vegetated buffer areas between graded areas.

Scheduling

Plan and schedule construction operations so the smallest area is disturbed at one time.

Erosion Control

Install surface stabilization measures immediately after completing land grading.

Construction

Any combination of the following may be used to help reduce dust and air pollution at a construction site.

Vegetative Cover

For areas not subjected to traffic, vegetation provides the most practical method of dust control (See Temporary or Permanent Seeding).

Sprinkling

The site can be sprinkled with water until the surface is moist. This practice is effective for dust control on haul roads or other traffic routes, but constant repetition is required for effective control.

Soil Stabilizers and Binders

Soil stabilizers are polymers that bind the soil particles together so they are less likely to be transported in the air from the energy of the wind.

Limitations

- Soil binders are temporary in nature and may need reapplication.
- Soil binders require a minimum curing time until fully effective, as prescribed by the manufacturer, which may be 24 hours or longer. Soil binders may need reapplication after a storm event.
- Soil binders will generally experience spot failures during heavy rainfall events. If runoff penetrates the soil at the top of a slope treated with a soil binder, it is likely the runoff will undercut the stabilized soil layer and discharge at a point further down slope.
- Some soil binders do not hold up to pedestrian or vehicular traffic across treated areas. Consult manufacturers' representatives for specific applications and limitations of materials.
- Soil binders may not penetrate soil surfaces made up primarily of silt and clay, particularly when compacted. Some soil binders may not perform well with low relative humidity. Under rainy conditions, some agents may become slippery or leach out of the soil.
- Soil binders may not cure if low temperatures occur within 24 hours of application.

General Considerations

- Site-specific soil types will dictate appropriate soil binders to be used.
- A soil binder must be environmentally benign (non-toxic to plant and animal life), easy to apply, easy to maintain, economical and shall not stain paved or painted surfaces.
- Some soil binders are compatible with existing vegetation.
- Performance of soil binders depends on temperature, humidity and traffic across treated areas.
- Avoid over-spray onto the traveled way, sidewalks, lined drainage channels, and existing vegetation.

Dust Control

Water clarifying compounds may be used on mineral soils for dust control. Traffic must be kept off treated areas to prevent the product from becoming ineffective. The manufacturer or supplier shall provide written application methods for the water clarifying compounds and mixtures. The application method shall ensure uniform coverage to the target and avoid drift to non-target areas including waters of the state. The manufacturer or supplier shall also provide written instructions to ensure proper safety, storage and mixing of the product.

Mulching

This practice offers a fast and effective means of controlling dust when properly applied. Use binders or tackifiers to tack organic mulches (See Mulch and Hydromulch). Mulching is not recommended for areas with heavy traffic.

Barriers

Board fences placed perpendicular to the prevailing winds at intervals of 15 times the barrier height can control blowing soil. In areas of known dust problems, windbreak vegetation should be preserved.

If the following materials or any other chemicals are used for dust control, contact the Missouri Department of Natural Resources, Water Pollution Control Program, or the Kansas Department of Health and Environment for permit requirements.

- Calcium Chloride - This material is best used on road surfaces. It can be applied by a mechanical spreader at a rate that keeps the surface moist.

Note: This method may cause restrictions for vegetation establishment.

Maintenance and Inspection

- Maintain dust control measures continuously throughout dry weather periods until all disturbed areas have been stabilized.
- If using a soil binder, it may need to be reapplied for proper maintenance.
- High traffic areas shall be inspected daily, and lower traffic areas shall be inspected weekly.
- After any rainfall event, the permittee is responsible for maintaining all slopes to prevent erosion.

Troubleshooting

Consult with a qualified professional if the following occurs:

- Spray-on adhesives are specified. A permit may be needed.

Common Problems and Solutions

Problem	Solution
Dry soils and increase in dust problems caused by drought conditions.	Use greater precautions during these periods.

Sodding

Figure 6.34 A team is laying sod strips so the seams are not aligned and the ends and sides are against each other to reduce drying out of the roots. Source: N. Klopfenstein, NRCS. St. Charles Co.

Practice Description

Sodding is the use of a vegetative cover that includes both the grass plants as well as an established root system to provide immediate erosion control in disturbed areas. Sodding is well suited for stabilizing erodible areas such as grass-lined channels, stormwater detention basins, diversions, swales, slopes and buffer strips.

Recommended Minimum Requirements

Prior to start of installation, plant materials and amendments should be specified by a qualified professional. The site superintendant and field personnel should refer to plans and specifications throughout the construction process..

Plant Selection

Select high quality, healthy, moist, fresh sod. Select a variety that is well-adapted to the region, supports its intended use, and is appropriate for the desired level of maintenance.

Soil Amendments

Fertilizer and lime (if soil pH is less than 6.0) incorporated to a depth of 3- to 6-inches into the soil.

Soil Surface

Clear of clods, rocks, etc.; smooth and firm; not compacted clay or pesticide-treated soil.

Irrigation
Temporary irrigation is required to ensure rooting and plant establishement.

Timing
Anytime of the year, except when the soil is frozen. Check with local sod farms for availability.

Installation
Soil supplied nutrients are critical to sod establishment and continued plant growth. Test soil for nutrients and pH. Soil testing can be done at University Extension offices and private labs.

Site Preparation
Apply amendments according to soil test recommendations.
In the absence of a soil analysis, apply fertilizer amendments at the following maximum rates:

- Fertilizer: Apply 500 pounds of a 10-10-10 Nitrogen, Phosphorus and Potassium.
- Consult a qualified professional who specializes in soils and soil amendments.

Apply ground agricultural limestone unless a soil test shows a pH of 6.0 or greater.
If soil test recommendations are not available and soil pH is less than 6.0, use:

- Ground agricultural limestone: 20 lb. ENM or ECC* /1,000 ft^2 or 800 lb. ENM or ECC/acre (approx. 2 tons/acre). Missouri state agricultural lime laws require ag lime be sold as units of Equivalent Neutralizing Material (ENM)/ton. For example, soil test requires 800 lbs ENM and lime producer's material tests at 400 lb. ENM. 800/400 = 2 tons to be applied. See MU Guide #9107 for details. In Kansas, ECC (Effective Calcium Carbonate) = ENM. (See Glossary for definition.)
- Incorporate amendments to depth of 4- to 6-inches with a disk or chisel plow.
- Rake or harrow to achieve a smooth, final grade on which to lay the sod. Surface should be loose, and free of plants, trash and other debris.
- Moisten the soil immediately prior to laying sod during high temperatures to cool the soil and reduce burning and dieback.

Table 6.13 Sod Species Adaptation to Regions of the State

Species	Kansas	Missouri
Kentucky Bluegrass	East and Central	Statewide
Turf Fescue	East and Central	Statewide
Bermuda		
common	South half, east, central	Southern half
improved	South half, east, central	Southern third
Zoysia	South half, east, central	Southern half
Buffalograss	Statewide	Statewide

Laying Sod
- For best results, place the sod as soon as possible after being cut. Ideally, sod is cut and laid the same day.
- To prevent roots from drying out, moisten the soil surface and lay sod joints tightly against each other.
- Lay the first row of sod in a straight line with subsequent rows placed parallel to and laying tightly against each other. Stagger joints to create a brick-like pattern and promote more uniform growth and strength. Ensure sod is not stretched or overlapped and that all joints are butted tight to prevent spaces which cause drying of the roots. (See Figure 6.35).

- Do not lay sod on frozen soil surfaces.
- On slopes 3:1 or steeper, or wherever erosion may be a problem, lay sod with staggered joints and secure by stapling or pegging. Install sod with the length perpendicular to the water flow (on the contour).

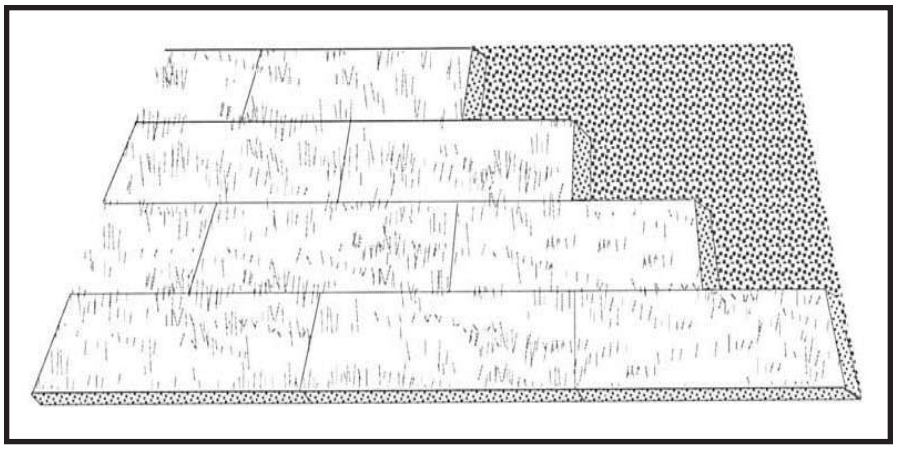


Figure 6.35 Typical installation of grass sod - lay sod in a staggered pattern with strips tightly against each other.

- Immediately after laying the sod, roll or tamp it to provide firm contact between roots and soil, then irrigate sod deeply so the underside of the sod pad and the soil 4-inches below the sod is thoroughly wet.
- Until a good root system develops, water sod as often as necessary to maintain moist soil to a depth of at least 4-inches.
- Wait until the sod is firmly rooted before mowing for the first time, usually two to three weeks. Not more than 1/3 of the grass leaf should be removed at any one cutting.

Sodded Waterways

- Sod provides quicker protection than seeding and may reduce the risk of early washout unless turf reinforcement mats are used.
- When installing sod in waterways, use the type of sod specified in the channel design.
- Lay sod strips perpendicular to the direction of water flow and stagger in a brick-like pattern. See Figure 6.36.
- Staple sod firmly at the corners and middle of each strip. Jute or synthetic netting may be pegged over the sod for further protection against washout during establishment.
- Channel velocity should not exceed 1.5 feet per second in a sodded waterway. Seek guidance from a qualified professional for additional control measures in high flow channels.

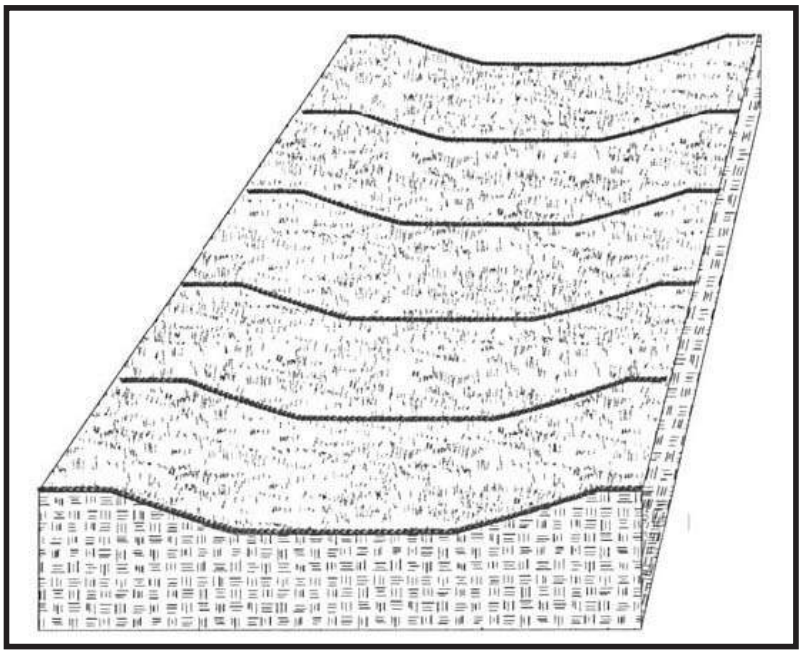


Figure 6.36 Installation of sod in waterways - lay sod across the direction of flow. Use pegs or staples to fasten sod firmly at the corners and in the center.

Construction Verification

Check materials and installation for compliance with specifications.

Maintenance and Inspection

- Inspect the sod each week and after rain events.
- Keep sod moist until it is fully rooted. Lay the sod in place at least two weeks prior to filing a Notice of Termination to allow time for sod to take root. If sod can be pulled up by hand, it has not rooted sufficiently and the site land disturbance permit can not be terminated.
- Mow to a height of 2- to 3- inches after sod is well-rooted, in two to three weeks. Do not remove more than 1/3 of the leaf blade in any mowing.
- Permanent, fine turf areas require yearly fertilization. Fertilize warm-season grass in late spring to early summer; cool-season grass in late winter and again in early fall.

Troubleshooting

Consult with a qualified design professional if any of the following occur:

- Variations in topography on-site indicate the sodding materials will not function as intended; changes in the plan may be needed.
- Design specifications for sod variety cannot be met or irrigation is not possible; substitution or seeding may be required. Unapproved substitutions could result in erosion or the sods inability to establish a root system.

Common Problems and Solutions

Problem	Solution
Grass dies because it is unable to root caused by the sod being laid on poorly prepared soil or unsuitable surface.	Remove dead sod, prepare surface and resod.
Root dieback or grass does not root rapidly and is subject to drying out caused by sod not adequately irrigated after installation.	Irrigate sod and underlying soil to a depth of 4-inches and keep moist until roots are established.
Sod may be loosened by runoff during a rain event caused by not being properly anchored.	Replace damaged areas and anchor sod.
Yellowing of leaf blades and slow growth caused by a lack of nitrogen.	Fertilize sod, but avoid fertilizing cool season grasses from late May through August.
Sod picked up and removed from soil surface caused by the hydraulic limitations of sod that may have been exceeded in the waterway.	Evaluate actual hydraulic conditions and use alterative erosion control practice, (e.g., rip rap, turf reinforcement mat, transition mats).

Soil Bioengineering for Slope Protection

Figure 6.37 Willows and other live stakes will root and sprout rapidly to protect slopes. The roots form an interlocking mat to hold soil in place, while the foliage protects the soil surface. These willows, planted along Hinkson Creek in Columbia, were 3- to 5-feet tall within six months. Source: Doug Wallace. NRCS. Boone Co.

Practice Description

Soil bioengineering consists of the use of live woody and mixed plant material to provide erosion control, slope and streambank stabilization, landscape restoration and wildlife habitat. These techniques are used alone or in conjunction with conventional engineering techniques. Soil bioengineering has the benefits of establishing permanent vegetation for decreased erosion, reduced off-site sedimentation lower runoff velocity and increased infiltration. Also, as the vegetation grows, the roots mechanically reinforce the soil and provide greater protection than just grass or a mechanical practice alone.

There are two approaches that can be used:

- Woody vegetation systems.
- Woody vegetation systems combined with reinforcing structures.

The structural part of the system helps establish vegetation on steep slopes or in areas subject to extreme erosion. Both systems provide immediate protection and grow stronger with time as the vegetation becomes established.

Soil bioengineering is advantageous where there is minimal access for equipment and workers, and in environmentally sensitive areas where minimal site disturbance is required. It is particularly suited for small, highly sensitive or steep sites. Most techniques can also be used for stream channel or bank protection. Once established, woody vegetation becomes self-repairing and needs little maintenance.

One of the best resources for soil bioengineering and slope protection is the U.S. Department of Agriculture's Natural Resources Conservation Service *Part 650: Engineering Field Handbook*. The handbook is broken into and published as many individual chapters. Chapter 16 is titled *Streambank and Shoreline Protection* and was published December 1996. Chapter 18 is titled *Soil Bioengineering for Upland Slope Protection and Erosion Reduction* and was published October 1992 with a reprinting December 1995. The *Engineering Handbook* provides standards and specifications, drawings and details of the different practices mentioned in this section. More information about bioengineering practices is available from your local National Resources Conservation Service/Soil and Water Conservation District and the Missouri Department of Conservation.

Recommended Minimum Requirements

Prior to start of construction, bioengineering practices should be designed by a registered design professional or an interdisciplinary team with knowledge of mechanical, biological and ecological concepts. The site superintendant and field personnel should refer to plans and specifications throughout the construction process.

Plant Species

Native species that root easily, such as willow. Use plants suitable for the intended use and adaptation to site conditions. While willow is one of the most common groups of plants used in bioengineering, there are several other native plants that offer function and aesthetics. Plants are usually harvested from a nearby local area. Contact your local conservation office for more information.

Cutting Size

Normally ½- to 2-inches in diameter and from 2- to 6-feet long (length will depend on project requirements).

Harvesting

Cut plant materials at a blunt angle, 8- to 10- inches from the ground, leaving enough trunk so that cut plants will regrow.

Transportation and Handling

Bundle cuttings together on harvest site, removing side branches. Keep material moist. Handle carefully during loading and unloading to prevent damage. Cover to protect cuttings from drying out.

Installation Timing

Deliver to construction site within 8 hours of harvest and install immediately, especially when temperatures are above 50^{O} F. Store up to two days if cuttings are "heeled in" moist soil, shaded and protected from wind.

Season

Install during plants' dormant season, generally late October to March.

Soil

Must be able to support plant growth with good topsoil (see Topsoiling and Stockpiling). Compact to fill voids and maintain good branch cutting-to-soil contact.

Velocities

Up to 6 feet per second for woody vegetation alone. Include simple structures with woody vegetation for velocities more than 6 feet per second. Use the velocity associated with the peak discharge of the design storm (see Streambank Protection section for structural protection alternatives).

Erosion Control

Minimize the size of all disturbed areas and stabilize as soon as each phase of construction is complete. Seed and mulch bare areas on 3:1 or flatter slopes. Use netting, tackifiers or blankets with seeding on slopes steeper than 3:1.

Construction

Site Preparation

- Observe applicable government regulations especially the U.S. Army Corps of Engineers permits for work in and around waterways.
- Prior to excavation activities of any type, call 1-800-DIG-RITE (344-7483) to obtain utility locations.
- Locate source of live rooted plants or cuttings as specified in design plan. Local sources of native plants are ideal to use. Purchase of materials from commercial sources may be necessary to comply with local regulations. Specifically, if a bioengineering project is taking place within the riparian corridor, requirements may be required under a Section 404 permit administered by the Army Corps of Engineers. In addition, local governments may also have a stream buffer ordinance requirement.
- Prepare the site by clearing, grading and shaping according to the design plan. Stockpile topsoil to be used as backfill. Stabilize the soil and slope base before any structural or streambank work is done.

Installation

- If required by the design, prepare trenches or benches in cut and fill slopes and construct structural components such as cribwalls, walls or riprap according to the plan (See Structural Protection in this section).
- Install live cuttings, checking angle of placement. Secure cuttings with stakes or as specified in plan. Schedule the work so that plants are in a dormant state to enhance the success of establishment.
- Fertilize and lime according to soil test results as specified in the design plan.
- Install filter fabric if specified in the design plan. Backfill over the vegetative cuttings, compacting the soil to achieve good live branch cutting-to-soil contact. Fill any voids around the plant materials.
- Check to see adequate soil moisture is present to encourage rooting and growth. Water, if necessary.

Woody Vegetative Protection Installation

Live staking, live fascines, brushlayers, branchpacking and live gully repair are soil bioengineering practices that use the stems or branches of living plants as a soil reinforcing and stabilizing material. Eventually the vegetation becomes a major structural component of the bioengineered system.

Live Stake

Live staking is the use of live, rootable vegetative cuttings, inserted and tamped into the ground. As the stakes grow, they create a living root mat that stabilizes the soil. Use live stakes to peg down surface erosion control materials. Most native willow species root rapidly and can be used to repair small earth slips and slumps in wet areas.

Installation

- To prepare live material, cleanly remove side branches, leaving the bark intact. Use cuttings ½- to 1½-inches in diameter and 2- to 3-feet long. Cut bottom ends at an angle to insert into soil. Cut the top of the stake square.
- Tamp the live stake into the ground at right angles to the slope, starting at any point on the slope face. Buds should point up. Install stakes 2- to 3-feet apart using triangular spacing with from two to four stakes per square yard.
- Use an iron bar to make a pilot hole in firm soil. Drive the stake into the ground with a dead blow hammer (hammer head filled with shot or sand).
- Four-fifths of the live stake should be underground with soil packed firmly around it after installation. Replace stakes that split during installation.

Live Fascine

Live fascines are long bundles of branch cuttings bound together into sausage-like structures. Place them in shallow contour trenches on dry slopes and at an angle on wet slopes to reduce erosion and shallow face sliding. This practice is suited to steep, rocky slopes, where digging is difficult.

Installation

- To prepare live materials, make cuttings from species such as young willows or shrub dogwoods that root easily and have long, straight branches.
- Make stakes 2½ feet long for cut slopes and 3 feet long for fill slopes.
- Make bundles of varying lengths from 5- to 30-feet or longer, depending on site conditions and limitations in handling. Use untreated twine for bundling.
- Completed bundles should be 6- to 8-inches in diameter. Place growing tips in the same direction. Stagger cuttings so root ends are evenly distributed throughout the length of the bundle.
- Install live fascine bundles the same day they are prepared.
- Prepare dead stakes such as 2½-foot long, untreated 2- by 4-inch lumber, cut diagonally lengthwise to make two stakes. Live stakes will also work.
- Beginning at the base of the slope, dig a trench on the contour large enough to contain the live fascine. Vary width of trench from 12- to 18-inches, depending on angle of the slope.
- Trench depth will be 6- to 8-inches, depending on size of the bundle.
- Place the live fascine into the trench.
- Drive the dead stakes directly through the bundle every 2- to 3-feet. Use extra stakes at connections or bundle overlap. Leave the top of the stakes flush with the bundle.
- Install live stakes on the down slope side of the bundle between the dead stakes.

Brushlayer

Brushlayering is similar to live fascine systems. Both involve placing live branch cuttings on slopes. However, in brushlayering, the cuttings are placed at right angles to the slope contour. Use on slopes up to 2:1 in steepness and not over 15 feet in vertical height.

Installation

- Starting at the toe of the slope, excavate benches horizontally, on the contour, or angled slightly down the slope to aid drainage. Construct benches 2- to 3-feet wide. Slope each bench so that the outside edge is higher than the inside.
- Crisscross or overlap live branch cuttings on each bench. Place growing tips toward the outside of the bench.
- Place backfill on top of the root ends and compact to eliminate air spaces. Growing tips should extend slightly beyond the fill to filter sediment. Soil for backfill can be obtained from excavating the bench above.
- Space brushlayer rows 3- to 5-feet apart, depending upon the slope angle and stability.

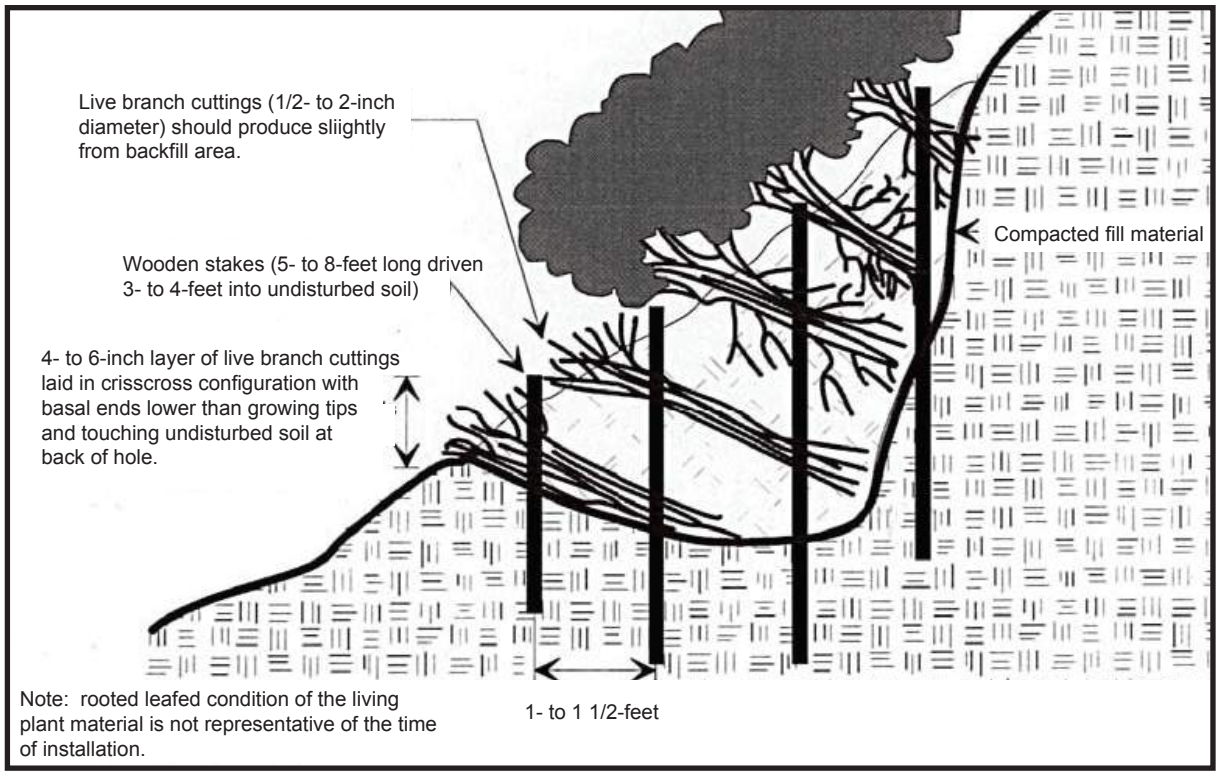


Figure 6.38 Typical branchpacking cross section. Source: *NRCS Engineering Field Handbook*, 1992.

Branchpacking

Branchpacking (see figure 6.38) consists of alternating layers of live branch cuttings and compacted backfill to repair small localized slumps and holes in slopes (no greater than 4 feet deep or 5 feet wide). Use for earth reinforcement and mass stability of small earthen fill sites.

Installation

- Make live branch cuttings from ½- to 2-inches in diameter and long enough to reach from soil at the back of the trench to extend slightly from the front of the rebuilt slope face.
- Make wooden stakes 5- to 8-feet long from 2 by 4 inch lumber or 3- to 4-inch diameter poles.
- Start at the lowest point and drive wooden stakes vertically 3- to 4-feet into the ground. Set them 1- to 1½-feet apart.

- Place a layer of living branches 4- to 6-inches thick in the bottom of the hole, between the vertical stakes, and at right angles to the slope face. Place live branches in a crisscross arrangement with the growing tips oriented toward the slope face. Some of the root ends of the branches should touch the back of the hole.
- Follow each layer of branches with a layer of compacted soil to ensure soil contact with the branch cuttings.
- The final installation should match the existing slope. Branches should protrude only slightly from the rebuilt slope face.
- Ensure that the soil is moist or moistened to ensure live branches do not dry out.

Live Gully Repair

Live gully repair uses alternating layers of live branch cuttings and compacted soil to repair small rills and gullies. This practice is limited to rills or gullies less than 2 feet wide, 1 foot deep and 15 feet long.

Installation

- Make live branch cuttings ½- to 2-inches in diameter and long enough to reach from the soil at the back of the gully and extend slightly from the front of the rebuilt slope face.
- Starting at the lowest point of the slope, place a 3- to 4-inch layer of branches at the lowest end of the rill or gully and at right angles to the slope. Cover with a 6- to 8-inch layer of fill soil.
- Install the live branches in a crisscross fashion. Place the growing tips toward the slope face with root ends lower than the growing tips.
- Follow each layer of branches with a layer of compacted soil to ensure soil contact with the live branch cuttings and root ends.

Structural Protection Installation

Live cribwalls, vegetated rock gabions, vegetated rock walls and joint plantings are soil bioengineering practices that combine a porous structure with vegetative cuttings. The structures provide immediate erosion, sliding and washout protection. As the vegetation becomes established, the structural elements become less important.

Live Cribwall

A live cribwall consists of a hollow, box-like interlocking arrangement of untreated logs or timber. Use at the base of a slope where a low wall may be required to stabilize the toe of the slope and reduce its steepness or where space is limited and a more vertical structure is required. It should be tilted back if the system is built on a smooth, evenly sloped surface.

Installation

- Make live branch cuttings ½- to 2-inches in diameter and long enough to reach the back of the wooden crib structure.
- Build constructed crib of logs or timbers from 4- to 6-inches in diameter or width. The length will vary with the size of the crib structure.
- Starting at the lowest point of the slope, excavate loose material 2- to 3-feet below the ground elevation until a stable foundation is reached.
- Excavate the back of the stable foundation (closest to the slope) slightly deeper than the front to add stability.
- Place the first course of logs or timbers at the front and back of the excavated foundation, approximately 4- to 5-feet apart and parallel to the slope contour. Place the next set of logs or timbers at right angles to the slope on top of the previous set.

- Place each set of timbers in the same manner and nail to the preceding set.
- Place live branch cuttings on each set to the top of the cribwall structure with growing tips oriented toward the slope face.
- Backfill crib, compacting soil for good root-to-soil contact, seed and mulch.

Vegetated Rock Gabions

Vegetated gabions combine layers of live branches and gabions (rectangular wire baskets filled with rock). This practice is appropriate at the base of a slope where a low wall is required to stabilize the toe of the slope and reduce its steepness. It is not designed to resist large, lateral earth stresses. Use where space is limited and a more vertical structure is required. Overall height, including the footing, should be less than 5 feet.

Installation

- Make live branch cuttings from ½- to 1-inch in diameter and long enough to reach beyond the rock basket structure into the backfill.
- Starting at the lowest point of the slope, excavate loose material 2- to 3-feet below the ground elevation until a stable foundation is reached. Excavate the back of the stable foundation (closest to the slope) slightly deeper than the front to add stability and ensure rooting.
- Place the gabions in the bottom of the excavation and fill with rock. Backfill between and behind the gabions.
- Place live branch cuttings on the gabions at right angles to the slope with the growing tips placed away from the slope and extending slightly beyond the gabions. Root ends must extend beyond the backs of the gabions into the fill material. Put soil over the cuttings and compact it.
- Repeat the construction sequence until the structure reaches the required height.

Vegetated Rock Wall

A vegetated rock wall is a combination of rock and live branch cuttings used to stabilize and protect the toe of steep slopes. This system is appropriate at the base of a slope where a low wall may be required to stabilize the toe of the slope and reduce its steepness. It is useful where space is limited and natural rock is available. Height of the rock wall, including the footing, should be less than 5 feet.

Installation

- Make live branch cuttings from ½- to 1-inch in diameter and long enough to reach the soil behind the rock structure.
- Rock should range from 8- to 24-inches in diameter. Use larger boulders for the base.
- Starting at the lowest point of the slope, remove loose soil until a stable base is reached, usually 2- to 3-feet below ground elevation. Excavate the back of the stable foundation (closest to the slope) slightly deeper than the front to add stability.
- Seat rocks firmly on the foundation material. Place rocks so that their center of gravity is as low as possible, with their long axis slanting inward toward the slope, if possible. Also attempt to imbricate the rock as much as possible for streambank application.
- Provide for drainage when a rock wall is constructed adjacent to an impervious surface or in locations subject to deep frost penetration.
- A sloping bench behind the wall can provide a base on which to place live branch cuttings during construction. Tamp or place live branch cuttings into the openings of the rock wall during construction. The root ends should extend into the soil behind the wall. Place cuttings at right angles to the slope contour with growing tips protruding from the wall face.

Joint Planting

Joint planting (see Figure 6.39) or vegetated riprap involves tamping live cuttings into soil between the joints or open spaces in rocks previously placed on a slope. Use this technique where rock riprap is required. Joint planting is used to remove soil moisture, to prevent soil from washing out below the rock and to increase slope stability over riprap alone.

Installation

- Make live branch cuttings from ½- to 1½-inches in diameter and long enough to extend into soil below the rock surface. Remove side branches from cuttings leaving the bark intact.
- Tamp live branch cuttings into the openings of the rock during construction. The root ends should extend into the soil behind the riprap. Mechanical probes may be needed to create pilot holes for the live cuttings.
- Place cuttings at right angles to the slope with growing tips protruding from the finished face of the rock.

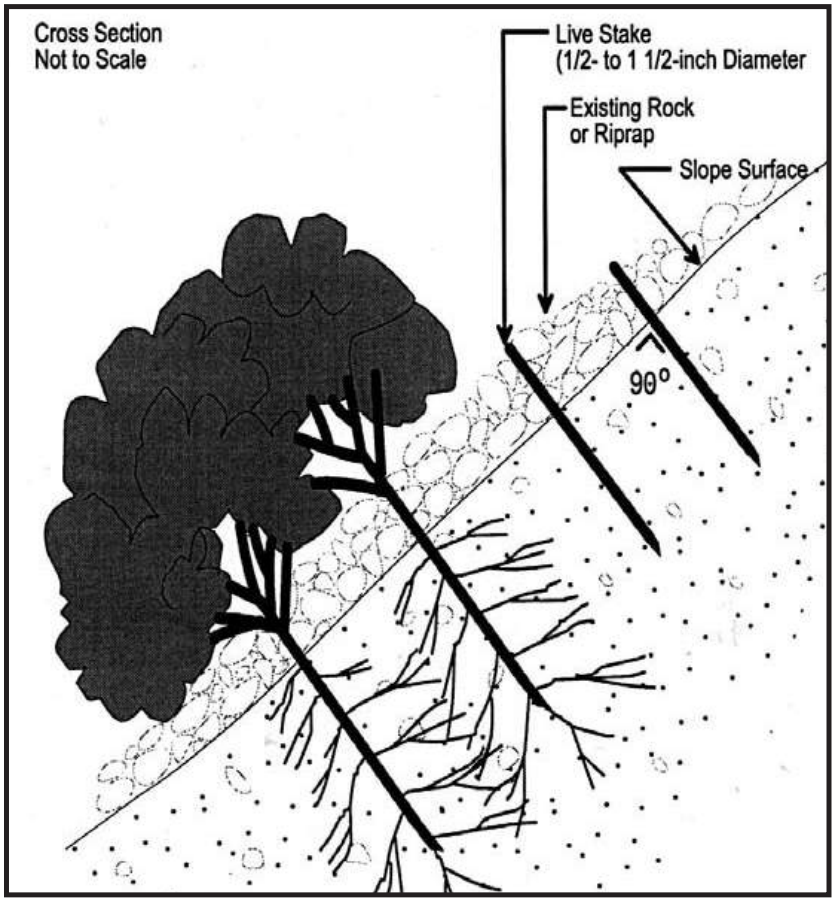


Figure 6.39 Typical Joint Planting Cross Section Source: *NRCS Engineering Field Handbook*, 1992.

Note: A detailed description, applications, effectiveness and construction guidelines for all types of bioengineering practices are discussed in Chapter 18, *Soil Bioengineering for Upland Slope Protection and Erosion Protection*, in the USDA NRCS *Part 650: Engineering Field Handbook*.

Erosion Control

Minimize the size of all disturbed areas and stabilize as soon as each phase of construction is complete. Seed and mulch bare areas on 3:1 or flatter slopes. Use netting, tackifiers or blankets with seeding on slopes steeper than 3:1 (see Temporary or Permanent Seeding, Mulching and Erosion Control Blankets).

Construction Verification

For woody vegetative protection alone, check that live stakes were installed according to the design specifications. For structural protection, check that cross section of the improvements, thickness of protection and live stake installation meet with the design specifications.

Maintenance and Inspection

- For the first two months, check the treated area weekly for insects, soil moisture and other conditions that could cause failure. Water or treat with insecticide, if needed. Follow applicable federal, state and local guidelines for using insecticides next to a waterbody.
- From four to six months, check monthly and note areas where the vegetation is not growing acceptably.
- Every six months for the first two years, replace dead plants with the same species and sizes as originally specified. Install during the dormant season.
- Check the treated area after heavy rains or during drought. Fix gaps in the vegetative cover with structural materials or new plants. Make needed repairs to structural systems with similar material.
- Protect new plantings from grazing livestock or wildlife, if needed.
- After two year establishment period, maintenance requirements should be minimal. Heavy pruning may be required to reduce competition for light or stimulate new growth. Remove undesirable vegetation every 3 to 7 years.

Common Problems and Solutions

Problem	Solution
Variations in topography on-site indicate protection will not function as intended.	Changes in plan may be needed.
Design specifications for vegetative or structural protection cannot be met.	Substitution may be required. Unapproved substitutions could result in erosion damage to the disturbed area.
There is any indication of undermining of structural elements at their sides or base.	Consult with registered design professional.
Pressure behind the structure due to slope instability is causing any deformation to the structural elements.	Consult with registered design professional.
Erosion of treated areas; caused by inadequate vegetation or improper structural protection.	Repair erosion, replace vegetation or structural protection and consider methods to reduce or divert surface runoff from the slope, including but not limited to slope drains.
Slumping failure or slides in slope; caused by steep slopes.	Repair slide by excavating failed material, replacing vegetation and properly compacting fill. Consider flattening slope.
Sinkholes in riprap; caused by failure of the filter beneath the riprap.	Remove riprap, repair filter and reinstall riprap.
Death of vegetation; caused by drought, insect damage, cuttings damaged during installation, or poor cutting/soil contact.	Repair and replace vegetation during dormant season, maintain biweekly or monthly inspection schedule and water or treat with insecticide as needed. Follow applicable federal, state and local guidelines for using insecticides next to a waterbody.

SECTION 7

Log of Amendments

The permittee shall amend the SWPPP at a minimum whenever the:

a. *Design, operation, or maintenance of BMPs is changed;*
b. *Design of the construction project is changed that could significantly affect the quality of the stormwater discharges;*
c. *Permittee's inspections indicate deficiencies in the SWPPP or any BMP;*
d. *Department notifies the permittee in writing of deficiencies in the SWPPP;*
e. *SWPPP is determined to be ineffective in minimizing or controlling erosion and sedimentation (e.g., there is visual evidence of excessive site erosion or excessive sediment deposits in streams or lakes); and/or*
f. *Department determines violations of water quality standards may occur or have occurred.*

SWPPP Amendment Log

Amendment No.	Description of the Amendment	Date of Amendment	Amendment Authorized by [Name(s) and Title]

SECTION 8

Local Regulations & Additional Permits

Local Ordinances can be located here for reference only. Additional permits (i.e. 404, NWP, grading permits if required, etc.) can be kept here for reference only.

ARTICLE II. - EROSION AND SEDIMENT CONTROL REGULATIONS

DIVISION 1. - IN GENERAL

Sec. 63-21. - Title and authority.

This article shall be known as the Kansas City, Missouri Erosion and Sediment Control Regulations and may be cited as "erosion and sediment control regulations" or "regulations". The director of city planning and development shall be responsible for the administration and enforcement of this article.

(Ord. No. 981135, § B, 2-22-99; Ord. No. 120933, § 1, 11-8-12)

Sec. 63-22. - Purpose of article.

(a) *Purpose.* The purpose of this article is to promote and protect the public interest by regulating land disturbance, land fill, and soil storage in connection with the clearing, grading and condition of land for construction related or other purposes. It is also the purpose of this article to encourage responsible development and minimize the cost to the development community as a result of the regulations in this article. This article establishes administrative, implementation, and enforcement procedures for the protection and enhancement of the water quality of watercourses, water bodies, and wetlands by controlling erosion, sedimentation, and related environmental damage caused by construction-related or other activities.

(b) *Violation.*

(1) *Prohibited conditions.* Any condition on private property which, in the event of precipitation and natural drainage, causes or permits soil. sediment, silt, dirt or mud from such private property to wash upon the private property of another without its owner's consent or upon a sidewalk, street or other public property is prohibited.

(2) *Responsible person.* It is a violation of subsection (b) of this section for any owner, occupant, land disturbance permit holder or agent thereof of any land, building or structure to cause, permit or allow to remain the conditions described in subsection (b)(1) of this section.

(3) *Penalty.* Any person convicted of a violation of subsection (b) of this section shall be sentenced to a fine of not less than $50.00 and not more than $500.00, or imprisonment in the municipal correction institution for a period not to exceed 180 days, or both such fine and such imprisonment.

(4) *Each day is a separate violation.* Each day that a violation of subsection (b) of this section continues shall be a separate offense for which the person in violation may be charged, arrested, tried, convicted and sentenced.

(Ord. No. 981135, § B, 2-22-99; Ord. No. 120933, § 1, 11-8-12)

Sec. 63-23. - Other laws.

Neither this article nor any administrative decision made under it exempts the applicant or any other person from other requirements of this code, state and federal laws, or from procuring other required permits (ex., state land disturbance permits), or limits the right of any person to maintain, at any time, any appropriate action, at law or in equity, for relief or damages against the applicant or any person arising from the activity regulated by this article.

(Ord. No. 981135, § B, 2-22-99)

Sec. 63-24. - Definitions.

For the purposes of this article, the following terms, phrases, words and their derivations shall have the following meanings. When not inconsistent with the context, words used in the present tense include the future, words in the plural number include the singular number and words in the singular number include the plural number.

The words "shall" and "will" are mandatory and "may" is permissive. Words not defined shall be given their common and ordinary meaning.

Adopted standards means any design or construction specification, including the erosion and sediment control design criteria and specifications, adopted in writing by the director of public works or director of water services.

Agricultural crop management practices means all land farming operations including plowing or tilling of land for the purpose of crop production or the harvesting of crops.

Applicant means the person who owns the affected property or the person's authorized agent who submits or is required to submit an application to the director of city planning and development for a site disturbance permit.

Best management practices (BMPs) means schedules of activities, prohibitions of practices, general good housekeeping practices, pollution prevention and educational practices, maintenance procedures, and other management practices to prevent or reduce the discharge of pollutants directly or indirectly to stormwater, receiving waters, or stormwater conveyance systems. BMPs also include treatment practices, operating procedures, and practices to control site runoff, spillage or leaks, sludge or water disposal, or drainage from raw materials storage.

Building permit means any permit issued by the director of codes administration.

Clearing means any activity which removes the vegetative ground cover including, but not limited to, root removal or top soil removal.

Code means the Code of Ordinances for the city.

Construction activity means activities subject to national pollutant discharge elimination system permits issued by the Missouri Department of Natural Resources or EPA ("NPDES construction permits") or city land-disturbance permits. Such activities include but are not limited to clearing and grubbing, grading, excavating, and demolition.

Director means the director of city planning and development of the city or the director's authorized representative.

Earth materials means any rock, natural soil or combination thereof.

Erosion means the wearing away of land by the action of wind, water, gravity, or a combination thereof.

Erosion and sediment control plan means a set of measures designed to control runoff and erosion, and to retain sediment on a particular site during pre-construction, construction, and after all permanent improvements have been erected or installed.

Erosion and sediment control regulations means this article in its entirety.

Erosion and sediment control specifications means the erosion and sediment control design criteria and specifications adopted in writing by the director of public works.

Engineer means a civil engineer that is registered as a professional engineer with the Missouri Board of Architects, Professional Engineers and Land Surveyors.

Excavate means the mechanical removal of earth materials.

Fill means the deposit or stockpiling of earth materials.

Grading means any excavating or filling of earth materials or any combination thereof.

Inspection means the periodic field review of erosion and sediment control measures as defined in the erosion and sediment control plan for the purposes of determining compliance.

Land disturbance/land disturbance activity means any activity that changes the physical conditions of landform, vegetation, and hydrology. Such activities include, but not limited to. clearing, removal of vegetation, stripping, grading, grubbing, excavating, filling, logging, and storing of materials.

Land fill means any human activity depositing soil or other earth materials.

Nuisance means any act or situation as defined in section 48-3 of the Code of Ordinances for the city.

Occupant means any person who has a legal or equitable interest in any land, building or structure other than a fee interest, including a life tenant, tenant, lessee, tenant at will, tenant at sufferance or adverse possessor, as well as a person in possession or a person who has charge, care or control of such land, building or structure as the agent or personal representative of the person holding legal title to a fee interest.

Owner means any person who, alone or jointly or severally with others:

(1) Shall have legal title to any land, building or structure, or part thereof, with or without having actual possession thereof; or

(2) Shall have charge, care or control of any land, building or structure, or part thereof; or

(3) Shall have possession or right to possession of any land, building or structure under contract for deed.

Person means any individual, firm, partnership, corporation, association, organization, or legal entity of any kind including governmental entities.

QCR means quality control review, a process of checking a plan submittal application or resubmitted for completeness against a certified submittal checklist that the applicant has prepared and attached to the plan prior to acceptance for technical review.

RCR means review comment resolution, a service provided to communicate and clarify review deficiencies.

Regulations means the Kansas City, Missouri Erosion and Sediment Control Regulations in its entirety.

Sampling means the procedures associated with the determination of settleable solids and may include suspended solids in a discharge sample of water.

Sediment means any solid material, mineral or organic that has been deposited in water, is in suspension in water, is being transported or has been removed from its site of origin by wind, water, or gravity as result of soil erosion.

Site disturbance permit means authorization given by the director of city planning and development noted in section 63-34, to perform land disturbance activities.

Soil means the unconsolidated mineral and organic material on the immediate surface of the earth that serves as a natural medium for the growth of land plants.

Soil storage means any human activity depositing soil or other earth materials for later use or disposal.

Timbering means the act of cutting and removing trees without disturbing the root or adjacent vegetation.

Vegetative cover means any grasses, shrubs, trees and other vegetation which hold and stabilize soils.

Water bodies means surface waters including rivers, streams, lakes and wetlands.

Wetlands means those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. This does not include the following surface waters of the state intentionally constructed from sites that are not wetlands: drainage ditches, grass-lined swales, and landscape amenities.

Work means any activity that involves construction or preparation for construction of an improvement.

(Ord. No. 981135, § B, 2-22-99; Ord. No. 020879, § A, 8-01-02; Ord. No. 120933, § 1, 11-8-12)

DIVISION 2. - ADMINISTRATION

Sec. 63-25. - Regulated activities.

No person may clear, grade, excavate, fill, store, or dispose of soil and earth materials or perform any other land disturbing activity without first obtaining a site disturbance permit from the director as set forth in this chapter except as noted in section 63-26 of this article.

(Ord. No. 981135, § B, 2-22-99)

Sec. 63-26. - Exemptions.

Persons performing land disturbance activities that meet any of the criteria below are not required to apply for a site disturbance permit pursuant to this chapter:

(1) *Land disturbances less than 1.0 acre but greater than 300 square feet.* In those cases, the land disturbance activity is required to comply with the city's adopted standards and the person shall install erosion and sediment control measures. If an application for building permit has been submitted or an application is required to be submitted to perform the land disturbance activity, the director of codes administration will be responsible for administering and enforcing the city's adopted standards through the city's building code, chapter 18 of the Code of Ordinances. If an application for building permit has not been submitted or an application is not required to perform the land disturbance activity, the director of environmental management, with assistance from the director of neighborhood and community services department, will be responsible for administering and enforcing the city's adopted standards through the city's solid waste and nuisance codes;

(2) *Land disturbances less than or equal to 300 square feet.* In those cases, the land disturbance activity does not have to comply with the city's adopted standard, however, the activity is subject to the city's solid waste and nuisance codes;

(3) *Land disturbance activities by city departments.* In those cases, the department is required to comply with the requirements of the city's general permit, if applicable, the city's adopted standards and the city's building code;

(4) *Home gardens.* Home gardening operations including plowing or tilling of land for the purposes of growing flowers and/or vegetables;

(5) *Work to correct or remedy emergencies.* This includes situations that pose an immediate danger to life or property, or substantial flood or fire hazards; and

(6) *Routine agricultural crop management practices.*

(Ord. No. 981135, § B, 2-22-99)

Sec. 63-27. - Erosion and sediment control design criteria and specifications.

The director shall adopt and maintain erosion and sediment control design criteria and performance standards and specifications to assist in the administration of the land disturbance program. The erosion and sediment control design criteria and specifications shall be based, but not limited to the following principles:

(1) Fit the development to existing site conditions.

(2) Minimize the extent and duration of exposure.

(3) Protect areas to be disturbed from storm water runoff.

(4) Stabilize disturbed areas.

(5) Keep runoff velocities low.

(6) Retain sediment on the site.

(7) Inspect and maintain control measures.

(8) Performance measures and outcomes.

(Ord. No. 981135, § B, 2-22-99)

Sec. 63-28. - Review for compliance.

Any person that requests a site disturbance permit must first submit the following items to the director for review to determine compliance with the city adopted standards:

(1) Proposed site map and grading plan;

(2) Proposed erosion and sediment control plan;

(3) Work schedule; and

(4) Any supplementary materials related to the site disturbance as required by the director.

Site disturbance permits may be issued for each land disturbance phase of a specific site. The site disturbance permit when issued in phases shall be a separate permit for each land disturbance phase. Documents submitted must be sealed by a registered professional engineer licensed in the state. The director shall review the submitted documents for compliance with the city's regulations and adopted standards. After reviewing the documents, the director shall determine whether or not the documents submitted are in compliance with the city's regulations and adopted standards. If the director finds that the documents are in compliance, the engineer who submitted the documents shall be advised in writing and may request a site disturbance permit in accordance with the requirements set forth in section 63-34 of this article. If the director finds that documents are not in compliance with the city's regulations and adopted standards, the director shall advise the engineer in writing which elements of the submitted documents are not in compliance. When documents are determined to be in compliance, the determination does not imply that the city is guaranteeing specific outcomes nor is the city accepting any responsibility for the documents submitted.

(Ord. No. 981135, § B, 2-22-99)

Sec. 63-29. - Site map and grading plan.

The site map and grading plan shall be in compliance with the city's adopted standards and shall contain all of the following information:

(1) Existing and proposed topography of the site taken at not more than a two-foot contour interval over the entire site;

(2) Contours extend a minimum of 100 feet off-site, or sufficient to show on/off-site drainage;

(3) Site's property lines shown in true location with respect to the plan's topographic information;

(4) Location and graphic representation of all existing and proposed natural and manmade drainage facilities;

(5) Location, graphic representation and legend of soil types.

(6) Location and graphic representation of proposed excavations and fills, of on-site storage of soil and other earthen material, and on-site disposal;

(7) Location and legend of existing vegetation cover the location and legend of vegetation cover to be left undisturbed;

(8) Location of surface runoff and erosion and sediment control measures;

(9) Quantity of soil or earthen materials in cubic yards to be excavated, filled, stored, or otherwise utilized on-site;

(10) Proposed sequence of excavation, filling, and soil or earthen material storage and disposal; and

(11) The signature and seal of a registered professional engineer licensed in the state.

(Ord. No. 981135, § B, 2-22-99)

Sec. 63-30. - Erosion and sediment control plan.

The following information shall be provided with respect to conditions existing on-site during land disturbing or filling activities or soil storage, and after final structures and improvements have been completed:

(1) Maximum surface runoff from the site, calculated using the adopted standard;

(2) Sediment yield, calculated using the adopted standard;

(3) A delineation and brief description of the measures undertaken to retain sediment from the site, including, but not limited to, designs and specifications for berms and sediment detention basins, and a schedule for maintenance and upkeep;

(4) A delineation and brief description of the surface runoff and erosion control measures to be implemented, including, but not limited to, types and method of applying mulches, designs and specifications for diverters, dikes and drains, and a schedule for their maintenance and upkeep;

(5) A delineation and brief description of the vegetative measures to be used, including, but not limited to seeding methods, the type, location and extent of pre-existing undisturbed vegetation types and vegetation to remain and a schedule for maintenance and upkeep;

(6) Proposed conditions of the site in accordance with the phases outlined in the adopted standards.

(7) Alternative methods of stabilizing the site when either seeding was not performed in accordance with the schedule, or was performed and was not effective;

(8) The location and description of each temporary and permanent erosion and sediment control measure; and

(9) Estimated duration of the permit as defined in Section 63-35.

(Ord. No. 981135, § B, 2-22-99)

Sec. 63-31. - Work schedule.

The director shall require the applicant to submit a master work schedule of construction activities for the development where the land disturbance activity is proposed. The master work schedule shall provide, at minimum, the following information:

(1) Proposed clearing and grading schedule;

(2) Proposed schedule for installation of temporary and permanent erosion and sediment control measures;

(3) Proposed schedule for all construction activity; and

(4) Estimated duration of site disturbance permit as defined in section 63-35 of this article.

The applicant shall be allowed to modify the proposed schedules required to be provided under this section in the event circumstances dictate such deviation and after the applicant has obtained approval from the director.

(Ord. No. 981135, § B, 2-22-99)

Sec. 63-32. - Permit fee.

Before issuance of a site disturbance permit as defined in this article, the applicant shall pay a basic plan fee in accordance with the application and review process indicated in section 63-34. The total fee shall be based on the area of land to be disturbed in accordance with the following:

$210 × acres disturbed = permit fee

(Ord. No. 981135, § B, 2-22-99; Ord. No. 020879, § A, 8-01-02)

Sec. 63-33. - Security for performance of work.

The director shall require the applicant to provide security equal to the estimated cost to install and maintain the approved erosion and sediment control measures for the duration of the site disturbance permit as defined in section 63-35 of this article if the land disturbance is within the watershed of a public or private lake or pond. The applicant has two options to secure the performance of work:

(1) *Option 1: Performance bond.* The applicant may furnish a performance bond, approved by the director of finance; or

(2) *Option 2: Letter of credit agreement.* The applicant may enter into a letter of credit agreement with the city, whereby the applicant will submit a letter of credit from a bank approved by the director of finance.

The director is authorized to apply the bonding requirements under section 64-4 of the Code if authorization to perform land disturbance activities is included in the special permit under section 64-4 of the Code.

(Ord. No. 981135, § B, 2-22-99; Ord. No. 120933, § 1, 11-8-12)

Sec. 63-34. - Application, review process and issuance of permit upon payment of fees.

(a) *Application and review process.* Any person requesting a site disturbance permit must submit an application to the director. The applicable fees pursuant this section shall be paid at the time of filing for review, resubmittal, and permit issuance. After review of an application, the director shall notify the applicant of such further action and reviews as necessary. If an application is approved, the applicant may procure the required permit for the work within 365 days. If the required permit for the work has not been procured, then the approval of the application shall be null and void, provided that the director may waive re-application for plan review or may extend the time for action by the

applicant for a period not to exceed 180 days upon request by the applicant if the director determines that there exist circumstances beyond the control of the applicant preventing procurement of the permit for the work. Not more than one extension shall be allowed. Thereafter, a new application and new fee shall be required. Plans and other data submitted for review may thereafter be returned to the applicant or destroyed by the director.

An applicant shall submit a plan to the director for QCR and certify that all of the necessary erosion and sediment control plan components are contained in the plan as required by the site disturbance submittal checklist. If as certified, all of the plan components have been submitted, but the submittal fails QCR for other omissions or deficiencies not set out in the checklist, no additional fee will be charged for subsequent QCR submissions by the applicant, if any, required by the director. If any QCR determines that plan does not contain all of the components certified by the applicant, then the applicant shall pay the city an additional fee of $65.00 for each subsequent submittal for QCR made necessary by applicants failure to satisfactorily cure the deficiencies.

If the plan passes QCR, then the plan shall be submitted for technical review of the plans and applicant shall pay the initial technical plan review fee in an amount equal to $76.00 per acre of disturbed area. If after the initial technical review the director determines that there are technical deficiencies in the plan, the director shall notify applicant of the deficiencies and offer RCR services, and applicant may resubmit the plan for a second technical review without an additional review fee. Prior to a second technical review the applicant shall submit a revised plan for QCR and certify that all of the necessary plan components, additions, or changes previously noted by the director are contained in the plan. If any QCR determines that plan does not contain all of the revised components certified by the applicant, then the applicant shall pay the city an additional fee of $65.00 for each subsequent QCR made necessary by applicants failure satisfactorily cure the QCR deficiencies. On second technical review and all technical reviews thereafter, if the director determines that the applicant has failed to satisfactorily cure the technical deficiencies previously noted on prior technical reviews, then the applicant shall pay the city an additional resubmittal technical review fee in an amount equal to 0.25 percent of the initial technical review fee for each subsequent technical review made necessary by applicants failure to satisfactorily cure such deficiencies.

If after the technical review the director determines that the plan application is in substantial compliance with city's regulations and adopted standards, the director shall notify applicant of application approval for permit issuance. The applicant shall pay the permitting fee in an amount equal to $168.00 per acre of disturbed area and such other fees as set forth herein, and procure the required permit as provide herein. The determination that the plan is in compliance with city regulations does not imply that the city is guaranteeing specific outcomes nor is the city accepting any responsibility for the plan.

The application shall be submitted on a form promulgated by the director and shall include the names, addresses, and telephone numbers of the developer/owner of the property, the applicant and lead contact, the contractors or subcontractors actually performing the land disturbing activity and their respective tasks, the engineer responsible for the preparation of the site map and grading plan, and the engineer responsible for preparation of the erosion and sediment control plan. In addition to the application form, the person shall submit the following items:

(1) A site map and clearing and grading plan that is in compliance;

(2) An erosion and sediment control plan that is in compliance;

(3) Work schedule;

(4) Site disturbance permit fees; and

(5) Security for performance of work, if required.

(b) *Issuance of permit upon payment of fees.* As a condition for issuance of a site disturbance permit, the applicant shall pay a basic plan fee in an amount equal to $243.00 per acre of disturbed area, and such other fees as set forth herein or as required, to defray the cost of plan review services, quality control review (QCR) services, review comment resolution (RCR) services, resubmittal review services, permitting services, supervision, and inspection services. The basic plan fee shall be

composed of both an initial technical plan review fee for plan review services, (QCR) services, and (RCR) services in an amount equal to $76.00 per acre of disturbed area to cover the cost of plan review services, quality control review (QCR) services, review comment resolution (RCR) services, re-submittal review services, permitting services and $168.00 per acre of disturbed area to defray the cost of supervision, and inspection services. In no case shall the basic plan fee be less than $311.00. The minimum inspection fee shall also be adjusted by a factor to account for the duration of the permit. The fact shall be individually calculated based on staff estimates for each permit duration requested. The following formula shall be utilized in computing the factor: (Requested duration divided by the product of 0.75 months times the disturbed area in acres). The computed factor shall never be less than one.

(c) *Supplementary fees.* The fee for a supplementary review of site disturbance to cover any additional area or scope not included in the original permit shall be the difference between the fee paid for the original application or permit and the fee, which would have been required, had the original application or permit included the entire area or scope of the work. The minimum supplemental site disturbance fee assessed shall be $311.00.

(d) *Optional preliminary code review design meetings or consultation services.* When requested by the applicant, meetings may be conducted to review the requirements and/or codes pertaining to the applicants project and a fee shall be assessed at the time of the meeting based on the area of the project as follows:

(1) Total project area less than or equal to three acres ..... no fee

(2) Total project area greater than three acres and less than or equal to ten acres $69.00

(3) Total project area greater than ten acres and less than or equal to 15 acres 136.00

(4) Total project area greater than 15 acres 205.00

These fees shall be in addition to any other fees required.

(e) *Priority project review fee.* When priority status is requested by the applicant, a fee of two times the review fee shall be assessed. Eligibility for priority status shall be determined by the director, or director's designate, based on the complexity of the project and availability of staff to perform the review. This fee shall be in addition to any other fees required.

(f) *Changes to reviewed plans.* Review of such changes shall be assessed a fee at the time of the review based on the scope of the review as follows:

(1) Minor changes requiring limited review $50.00

(2) Major changes requiring review of design elements…½ of basic plan fee

The director of designee shall have the authority to determine the extent of the changes requested and the fee which shall apply. This fee shall be in addition to any other fees required.

(g) *Permit extension fee.* Applicant may request an extension of a permit issued and pay a fee sufficient to cover the additional administrative and inspection costs associated with the extension. Extension fees shall be individually calculated based on staff estimates for each permit extension requested.

(h) *Enforcement fees.* When enforcement actions are necessary above normal notification of deficiencies, a fee shall be assessed to cover the additional administrative, review and inspection costs of enforcement actions. Enforcement fees shall be individually calculated based on staff estimates of additional costs for records management, research and enforcement action outside of normal inspection and review duties. This fee shall be in addition to any other fees required and paid, court finds imposed and paid, court costs or any other related expenses.

(i) *Commencement of work without permit.* Whenever any work for which a permit is required by this section has commenced without first obtaining a permit, an investigation may be made before a permit is issued for such work and all fees specified for obtaining such permit shall be tripled. In addition, the permittee shall file a bond conditioned to protect and save harmless the city from all

claims for damage or injury or death to other persons by reason of such construction work, as specified in section 64-4(g) of chapter 64. This provision shall not be construed as permission to begin work without the required permit.

(j) *Payment of fees.* All fees shall be rounded off to the next whole dollar amount. Fees may be waived at the discretion of the director during times of declared emergency.

(k) *Fee refunds.* For fees specified in this section, if no portion of the application for plan review or permit inspection has commenced, the applicant may request in writing that the application be canceled. The applicant shall then be entitled to a refund of 90 percent of the applicable fee actually paid, except that a full refund will be made when the fee was paid or collected in error. If plan reviews or permit inspections have commenced prior to receipt of a written request for cancellation of the application for a site disturbance, then a refund will not be made. No refund will be made if a request for a refund has been made more than 30 days after the site disturbance has expired and no work has commenced.

(l) *Adjustment of fees.* The city manager shall have the authority to adjust the fees listed above to reflect the change in the consumer price index (all items/all urban consumers/Kansas City, Missouri/Kansas) published by the United States Department of Labor, Bureau of Labor Statistics. The costs of processing the site disturbance permit must be increased by the CPI Index indicated above. The adjustments, if any, shall be made annually by the city manager in conjunction with the adoption of the annual budget of the city by filing a notice with the city clerk. Notwithstanding anything herein to the contrary, the council may modify or waive the imposition of the fees established herein if the council determines that it is in the public interest to do so.

(Ord. No. 981135, § B, 2-22-99; Ord. No. 020879, § A, 8-01-02; Ord. No. 080766, § 1, 8-14-08; Ord. No. 080903, § 1, 9-18-08)

Editor's note— The fees in this section have been amended at the direction of the city to reflect the fees effective as of April, 2013.

Sec. 63-35. - Duration of permit.

(a) The site disturbance permit shall be valid from the time that it is issued until the site is stabilized and erosion and sediment control measures are no longer necessary. The site will be considered stabilized when either perennial vegetation, pavement, buildings, or structures using permanent materials cover all areas that have been disturbed. In order to terminate the site disturbance permit, the applicant shall submit a request to terminate permit form to the director. The director will then inspect the site and make a determination as to whether the permit can be terminated. The applicant will be notified in writing of the determination.

(b) If the applicant sells the property before the termination of the land disturbance permit issued under this article, the permit may be assigned to the new owner, if such assignment is approved in writing by the director.

(c) If the applicant sells any portion of the property before the termination of the land disturbance permit issued under this article, the applicant will remain responsible for that portion until one of the following events occur:

(1) The new owner of the property obtains a land disturbance permit; or

(2) The new owner of the property obtains or is required to obtain a building permit. When a new owner has contiguous lots totaling less than one acre and obtains or is required to obtain a building permit they may design an erosion and sediment plan for the contiguous lots as approved by the director of codes administration.

(Ord. No. 981135, § B, 2-22-99)

Sec. 63-36. - Coordination with other permits.

When a person is developing a site, and a site disturbance permit is required in accordance with sections 63-25 and 63-26 of this article, no other construction permits shall be issued to make improvements on that site until the person has secured the site disturbance permit for the same site. This includes all permits issued by the director or any other city department. The city may simultaneously issue a site disturbance permit and a grading permit.

(Ord. No. 981135, § B, 2-22-99)

DIVISION 3. - IMPLEMENTATION

Sec. 63-37. - Installation of control measures.

The applicant shall notify the director before any land disturbance activities are performed or any erosion and sediment control measures are installed. The applicant shall ensure that all erosion and sediment control measures are installed in accordance with the erosion and sediment control plan and the city's adopted standards.

(Ord. No. 981135, § B, 2-22-99)

Sec. 63-38. - Inspection of the site.

The applicant shall inspect the land disturbance site at least every 14 days, or more frequently if required on the plan, and within 24 hours following each rainfall event of ½″ or more within any 24-hour period. For disturbed areas that have not been stabilized, all erosion and sediment control measures shall be inspected for proper installation, operation and maintenance. Locations where storm water leaves the site shall be inspected for evidence of erosion or sediment deposition. Any deficiencies shall be noted in a report of the inspection.

Inspection reports shall be kept by the applicant and shall be submitted to the director upon request. The inspection report shall include the following minimum information:

(1) Inspector's name;

(2) Date of inspection;

(3) Observations relative to the effectiveness of the erosion and sediment control measures;

(4) Actions necessary to correct deficiencies;

(5) Sampling results, if taken; and

(6) Signature of applicant or person performing the inspection if duly authorized to do so.

The director shall also perform regular inspections of the land disturbance site to ensure compliance with the erosion and sediment control plan for the site and the city's adopted standards.

(Ord. No. 981135, § B, 2-22-99)

Sec. 63-39. - Maintenance of control measures.

The applicant shall at all times maintain all erosion and sediment control measures in good order and in compliance with the erosion and sediment control plan for the site and with the city's adopted standards, for the duration of the permit as defined in section 63-35 of this article. In determining the applicant's compliance with the erosion and sediment control plan for the site, the director shall take into consideration any results the applicant has obtained through sampling.

(Ord. No. 981135, § B, 2-22-99)

Sec. 63-40. - Sampling.

The applicant shall have the option of including a system of regular sampling by individuals approved to perform such sampling by the city as a part of the applicant's erosion and sediment control plan. The director may require sampling to determine the effectiveness of the erosion control plan or to obtain information to investigate complaints regarding the site. Sampling shall not be the only item reviewed to determine compliance with the erosion and sediment control plan for the site. The director may also perform sampling.

(Ord. No. 981135, § B, 2-22-99)

Sec. 63-41. - Removal of control measures.

The applicant shall receive the director's approval before any structural erosion and sediment control measure identified on the plans is removed or made ineffective. Removal of erosion and sediment control measures must be performed in the manner described in the erosion and sediment control plan and in accordance with the city's adopted standards. When determining whether an erosion and sediment control measures may be removed or made ineffective, the director shall take into consideration testing results furnished by the applicant.

(Ord. No. 981135, § B, 2-22-99)

DIVISION 4. - ENFORCEMENT

Sec. 63-42. - Enforcement activities.

The director shall handle enforcement through the normal routine activities that include receiving inspection reports from the applicant, inspecting the site, communicating, issuing corrective orders, issuing notices of violation, and issuing citations to the applicant to resolve issues of noncompliance with this chapter. The director may also proceed with the additional enforcement actions outlined in section 63-43 of this article.

(Ord. No. 981135, § B, 2-22-99; Ord. No. 120933, § 1, 11-8-12)

Sec. 63-43. - Suspension or revocation of permit.

In addition to the enforcement activities, as defined in section 63-42, the director may take action against the security as provided under section 63-33, and may take the following actions in order to correct deficiencies:

(1) The director may suspend the site disturbance permit and other construction activity and issue a written stop work order, and the applicant shall cease all construction work on the site, except work necessary to remedy the cause of the suspension, upon notification of such suspension when:

   a. Applicant fails to submit reports timely and in accordance with section 63-38; or

   b. Inspection by the director reveals the site is not in substantial compliance with the erosion and sediment control plan, site disturbance permit, adopted standards of this Code; or

   c. Applicant fails to comply with an order to bring the site into compliance with this Code within time limits imposed by the director.

(2) The director may revoke the site disturbance permit, if a permit has been issued, and issue a stop work order if the applicant fails or refuses to cease work. A stop work order issued pursuant to this section does not affect building permits which are issued by the director. However, the director may issue a stop work orders affecting building permits in accordance with chapter 18 of the Code of Ordinances.

(3) The director shall reinstate a suspended site disturbance permit upon the applicant's correction of the cause of the suspension.

(4) The director may not reinstate a revoked site disturbance permit.

(5) The director may take other enforcement actions as necessary to enforce this Code.

(Ord. No. 981135, § B, 2-22-99; Ord. No. 120933, § 1, 11-8-12)

Sec. 63-44. - Action against the security.

The director may take action against the security if the applicant fails to install or maintain the erosion and sediment control measures in accordance with the erosion and sediment control plan for the site and the city's adopted standards for the duration of the permit as defined in section 63-35. The director will provide the applicant with ten days written notice before any action is taken against the security, and if during that ten-day period the applicant bring control measures into compliance with the plan, no action shall be taken against the security.

(Ord. No. 981135, § B, 2-22-99)

Sec. 63-45. - Fines and penalties.

Any person allowing or performing a land disturbance without obtaining a site disturbance permit as required by this article, or working with a revoked or suspended permit, upon conviction, shall be punished by a fine of not less than $50.00 and not more than $500.00, or by imprisonment in the municipal correctional institution for a period not to exceed six months, or be punished by both fine and imprisonment; provided that each day's violation thereof shall be a separate offense for the purposes of this article.

(Ord. No. 981135, § B, 2-22-99)

Sec. 63-46. - Additional notice.

A copy of all written notices sent to the applicant pursuant to or in regard to this article, including, without limitation, written communications, warnings and notices pursuant to sections 63-42, 63-43 and 63-44 shall be simultaneously sent to the party listed as the developer on the application referred to in section 63-34. Nothing in this section 63-46 shall create any right for the applicant or any other interested party to object to, challenge, delay or invalidate any action of the director on the basis of lack of notice.

(Ord. No. 981135, § B, 2-22-99)

Secs. 63-47—63-60. - Reserved.

SECTION 9

Spill Response

This section contains Missouri Code of State Regulations as they pertain to hazardous substances and emergency response. Contained within are:

Division 24 - Hazardous Substance Emergency Response Office

- -10 CSR 24-1.010 - Organization
- -10 CSR 24-2.010 - Definitions
- -10 CSR 24-3.010 - Emergency Notification Procedures

Spill Report Forms

Spill Report Form

For spills of reportable quantities that impact soil, surface water or ground water call MDNR 24-hour Environmental Emergency Response at 573-634-2436.

Site: _____ Primary Contractor: _____

Date: _____ Incident Date: _____

Complete for any type of petroleum product or hazardous materials / waste spill or incident. If the spill is of reportable quantity, report must be submitted within five (5) business days.

Keep a copy of this report with the SWPPP Log.

Person Reporting Spill or Incident	
Name	Address
Organization	
Title	
Telephone	
Email	Signature

Type of Spill:
Common Name of Spilled Substance
Estimated Quantity Spilled
Estimated Concentration
Date and Duration of Spill
Date Clean Up Completed

SPILL TO LAND	SPILL TO WATER BODY
Name of site:	Name of water body:
Street address:	Location of discharge
City	Description of area from which spilled material may reach:
County:	

Actions Taken:

To contain spill:

To clean up spill:

To remove/dispose of spilled substance and cleanup material:

To prevent reoccurrence:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Person responsible for managing spill response:	
Name	Signature
Phone	Email

Rules of
Department of Natural Resources
Division 24—Hazardous Substance Emergency Response Office
Chapter 1—Organization

Title 10—DEPARTMENT OF NATURAL RESOURCES
Division 24—Hazardous Substance Emergency Response Office
Chapter 1—Organization

10 CSR 24-1.010 General Organization

PURPOSE: This rule explains the organization and responsibilities of the Hazardous Substance Emergency Response Office. Also explained is how to obtain additional information regarding these activities and where to make submittals to this office.

(1) The Department of Natural Resources is authorized under sections 260.500–260.550, RSMo to administer the state's Hazardous Substance Emergency Response Office. The director of the Department of Natural Resources appoints a director and staff who provide day-to-day operation of the Hazardous Substance Emergency Response Office.

(A) Among its operations, the Hazardous Substance Emergency Response Office performs the following administrative and technical functions: develop and adopt rules relating to hazardous substance emergencies; develop and update the state Hazardous Substance Emergency Response plan in cooperation with other state agencies and other affected persons; respond to, investigate, document and take action regarding hazardous substance emergencies in accordance with sections 260.500–260.550, RSMo; provide technical assistance to other state agencies, to political subdivisions of the state and to other persons upon request for the prevention, control and response to hazardous substance emergencies; enter into agreements with state, local and federal agencies and with other persons as necessary to develop and implement the Hazardous Substance Emergency Response Plan and to implement sections 260.500–260.550, RSMo; monitor the statewide telephone used to notify Missouri whenever a hazardous substance emergency occurs; notify appropriate agencies of hazardous substance emergencies; and cooperate with appropriate units of government and other persons to prevent the occurrence and improve response to hazardous substance emergencies.

(B) Requests for copies of rules, reports of incident investigations, technical information and assistance and any other submissions are to be made to the department's Hazardous Substance Emergency Response Office, Environmental Services Program, P.O. Box 176, Jefferson City, MO 65102. The telephone number during office hours is (573) 526-3348. For emergencies, the Hazardous Substance Emergency Response Office can be contacted any time at (573) 634-2436.

(2) Information.

(A) The mailing address for the Hazardous Substance Emergency Response Office is: Missouri Department of Natural Resources, P.O. Box 176, Jefferson City, MO 65102.

(B) The Hazardous Substance Emergency Response Office files, except trade secrets as provided for in section 260.550, RSMo, are public information and are located at 2710 West Main Street, Jefferson City, MO 65109.

(C) Anyone wishing to review information in the Hazardous Substance Emergency Response Office files is requested to make an appointment by calling (573) 526-3348. There is no fee for reviewing file information. There is a copying fee if copies of file information are made, and it must be paid by check, money order or exact change.

(D) Any request for information shall be in writing. All requests for information shall be available during normal business hours for inspection by the public.

(E) Nonemergency information can be obtained by contacting the department at the post office box listed previously or by calling (573) 526-3348.

(F) The number to contact the department for emergency release notifications under section 260.505, RSMo is (573) 634-2436. This is for emergencies only.

AUTHORITY: section 260.520, RSMo (Supp. 1995). Original rule filed Nov. 30, 1983, effective April 12, 1984. Emergency amendment filed Dec. 2, 1992, effective Jan. 1, 1993, expired April 20, 1993. Amended: Filed Oct. 5, 1992, effective April 8, 1993. Amended: Filed June 14, 1994, effective Jan. 29, 1995. Amended: Filed July 22, 1996, effective Feb. 28, 1997.*

**Original authority 1983, amended 1993, 1995.*

Rules of
Department of Natural Resources
Division 24—Hazardous Substance Emergency Response Office
Chapter 2—Definitions

Title 10—DEPARTMENT OF NATURAL RESOURCES
Division 24—Hazardous Substance Emergency Response Office
Chapter 2—Definitions

10 CSR 24-2.010 Definitions

PURPOSE: This rule provides definitions for terms used in 10 CSR 24.

PUBLISHER'S NOTE: The secretary of state has determined that the publication of the entire text of the material which is incorporated by reference as a portion of this rule would be unduly cumbersome or expensive. Therefore, the material which is so incorporated is on file with the agency who filed this rule, and with the Office of the Secretary of State. Any interested person may view this material at either agency's headquarters or the same will be made available at the Office of the Secretary of State at a cost not to exceed actual cost of copy reproduction. The entire text of the rule is printed here. This note refers only to the incorporated by reference material.

(1) Administrator—the administrator of the United States Environmental Protection Agency.

(2) Cleanup—all actions necessary to contain, collect, control, identify, analyze, cleanup, treat, disperse, remove or dispose of a hazardous substance.

(3) Cleanup costs—all costs incurred by the state or any of its political subdivisions or their agents or by any other person participating with the approval of the Department of Natural Resources in the prevention or mitigation of damages from a hazardous substance emergency or the cleanup of a hazardous substance involved in a hazardous substance emergency.

(4) Department—the Department of Natural Resources.

(5) Director—director of the Department of Natural Resources.

(6) Extremely hazardous substance—a substance listed under 40 CFR part 355 by the administrator.

(7) Hazardous substance—any substance or mixture of substances that presents a danger to the public health or safety or the environment and includes:

(A) Any hazardous waste identified or listed by the department under sections 260.350–260.430, RSMo;

(B) Any element, compound, mixture, solution or substance designated pursuant to Sections 101(14) and 102 of the Comprehensive Environment Response, Compensation and Liability Act (CERCLA) of 1980 or designated pursuant to section 304 of the Federal Emergency Planning and Community Right-to-Know Act of 1986; and

(C) Any hazardous material designated by the secretary of the United States Department of Transportation under the Hazardous Materials Transportation Act.

(8) Hazardous substance emergency and emergency involving a hazardous substance—

(A) Any release of hazardous substances or extremely hazardous substances in quantities equal to or in excess of those determined pursuant to section 101(14) or 102 of the CERCLA of 1980 or section 304 of the Federal Emergency Planning and Community Right-to-Know Act of 1986;;

(B) Any release of petroleum including crude oil or any fraction, natural gas, natural gas liquids, liquefied natural gas or synthetic gas usable for fuel (or mixture of natural gas and synthetic gas) in excess of fifty (50) gallons for liquids or three hundred (300) cubic feet for gases;

(C) Any release of a hazardous waste which is reportable under sections 260.350–260.430, RSMo;

(D) Any release of a hazardous substance which requires immediate notice under 49 CFR part 171; and

(E) The department shall promulgate rules identifying the substances and the quantities of substances which, if released, constitute a hazardous substance emergency.

(9) Hazardous Substance Emergency Response Plan—the plan, as specified in section 260.505, RSMo, developed and maintained by the Missouri Department of Natural Resources for response to hazardous substance emergencies.

(10) Local Emergency Planning Committee (LEPC) or committee—the people appointed by the Missouri Emergency Response Commission (MERC) for the purpose of improving hazardous chemical safety and preparedness.

(11) Local government—any county, township, municipal corporation, school district or other governmental body of equivalent rank.

(12) Person—any individual, partnership, copartnership, firm, company, public or private corporation, association, joint stock company, trust, estate, political subdivision or any agency, board, department or bureau of the state or federal government or any other legal entity which is recognized by law as the subject of rights and duties.

(13) Person having control over a hazardous substance—any person producing, handling, storing, transporting, refining or disposing of a hazardous substance when a hazardous substance emergency occurs, including bailees, carriers and any other person in control of a hazardous substance when a hazardous substance emergency occurs, whether they own the hazardous substance or are operating under a lease, contract or other agreement with the legal owner.

(14) Release—any threatened or real emission, discharge, spillage, leakage, pumping, pouring, emptying or dumping of a substance into or onto the land, air or waters of the state unless done in compliance with the conditions of a federal or state permit, unless the substance is confined and is expected to stay confined to property owned, leased or otherwise controlled by the person having control over the substance or unless, in the case of pesticides, application is done in accordance with the product label.

(15) State of Missouri Basic Emergency Operations Plan—the state plan, its annexes and appendices as developed or maintained by the state emergency management agency for response to natural and man-made disasters in this state.

(16) Waters of the state—all rivers, streams, lakes and other bodies of surface and subsurface water lying within or forming a part of the boundaries of the state which are not entirely confined and located completely upon lands owned, leased or otherwise controlled by a single person or by two (2) or more persons jointly or as tenants in common and include waters of the United States lying within the state.

AUTHORITY: section 260.520, RSMo Supp. 1993. Original rule filed Nov. 30, 1983, effective April 12, 1984. Emergency amendment filed Dec. 2, 1992, effective Jan. 1, 1993, expired April 30, 1993. Amended: Filed Oct. 5, 1992, effective April 8, 1993.*

Amended: Filed June 14, 1994, effective Jan. 29, 1995.

**Original authority: 260.520, RSMo 1983, amended 1993.*

Rules of
Department of Natural Resources
Division 24—Hazardous Substance Emergency Response Office
Chapter 3—Emergency Notification Procedures

Title 10—DEPARTMENT OF NATURAL RESOURCES
Division 24—Hazardous Substance Emergency Response Office
Chapter 3—Emergency Notification Procedures

10 CSR 24-3.010 Notification Procedures for Hazardous Substance Emergencies and for Emergency Notification of Releases of Hazardous Substances and Extremely Hazardous Substances

PURPOSE: This rule establishes a statewide emergency telephone number to notify Missouri whenever a hazardous substance emergency occurs and specifies the requirements for emergency notification and follow-up written notices in the event of a hazardous substance emergency, the release of a reportable quantity of a hazardous substance and the release of a reportable quantity of an extremely hazardous substance.

PUBLISHER'S NOTE: The publication of the full text of the material that the adopting agency has incorporated by reference in this rule would be unduly cumbersome or expensive. Therefore, the full text of that material will be made available to any interested person at both the Office of the Secretary of State and the office of the adopting agency, pursuant to section 536.031.4, RSMo. Such material will be provided at the cost established by state law.

(1) Any person having control over a hazardous substance shall contact Missouri by telephone at (573) 634-2436 or the National Response Center at (800) 424-8802 at the earliest practical moment upon discovery of an emergency involving a hazardous substance under his/her control. Information to be provided to Missouri to the best ability of the person having control over the hazardous substance includes: substance(s) involved, an indication of whether the substance is an extremely hazardous substance; the medium or media into which the release occurred; any known or anticipated acute or chronic health risks associated with the release and, where appropriate, advice regarding medical attention necessary for exposed individuals; proper precautions to take as a result of the release, including evacuation; amount of the substance(s) released or in danger of being released; location of the hazardous substance emergency and directions to the site; names, addresses and phone numbers of persons that may have information on the substances involved; when the hazardous substance emergency occurred, duration of the release and when it was discovered; actions taken to cleanup the hazardous substance and to end the hazardous substance emergency and when those actions will be taken; and any other pertinent information requested by Missouri, or as specified in the Missouri hazardous waste management commission regulations at 10 CSR 25-7.264(2)(D) and (E) and 10 CSR 25-7.265(2)(D) and (E). Federal reporting requirements for releases of hazardous substances can be found in 40 CFR parts 302 and 355. In addition, state reporting requirements contained in 11 CSR 40-4.030 reference these regulations, and require that certain information be provided to Local Emergency Planning Committees (LEPCs) for reportable releases of hazardous substances and extremely hazardous substances.

(2) The person monitoring the statewide emergency telephone shall notify appropriate agencies of the hazardous substance emergency as designated in the Hazardous Substance Emergency Response Plan.

(3) Upon request, written follow-up notifications are required for releases of hazardous substances and extremely hazardous substances as listed in 40 CFR parts 302 and 355. If requested, the person having control of the hazardous substance or extremely hazardous substance shall provide a written follow-up emergency notice (or notices, as more information becomes available) to the department setting forth and updating the information with respect to—

(A) Information required in section (1);

(B) Actions taken to respond to and contain the release;

(C) Any known or anticipated acute or chronic health risks associated with the release; and

(D) Where appropriate, advice regarding medical attention necessary for exposed individuals.

(4) If requested, a written report shall be provided to the department for any other hazardous substance emergency. The requested reports shall contain the information as specified in sections (1) and (3) of this rule and any other pertinent information as requested by the department. In addition, state reporting requirements in 11 CSR 40-4.030 require that written follow-up reports be provided to the Department of Public Safety and appropriate LEPCs for any reportable releases of hazardous substances or extremely hazardous substances.

AUTHORITY: section 260.520, RSMo (Supp. 1995). Original rule filed Nov. 30, 1983, effective April 12, 1984. Emergency amendment filed Dec. 2, 1992, effective Jan. 1, 1993, expired April 30, 1993. Amended: Filed Oct. 5, 1992, effective April 8, 1993. Amended: Filed June 14, 1994, effective Jan. 29, 1995. Amended: Filed July 22, 1996, effective Feb. 28, 1997.*

**Original authority 1983, amended 1993, 1995.*

SECTION 10

Endangered Species Documentation

SECTION 11

Historic Preservation Documentation

Section 106 of the 1966 National Historic Preservation Act (as amended) aims to protect historic and cultural properties from unintentional federal action. A federal action can be through a permit, license or funding. If the preceding situations do not apply to this project a Section 106 review is not required. The permittee must still comply with relevant state and local regulations.

SECTION 12

Inspection Reports

-Log of Inspections
-Inspection Reports
-Inspector Credentials

Log of Inspections

Inspection Date	Inspector Name	Type of Inspection

Inspection Date	Inspector Name	Type of Inspection

Stormwater Construction Site Inspection Report

General Information			
Project Name		**Date of Inspection**	
Permit Number		**Time of Inspection**	
Inspector's Name(s)		**Inspector's Title**	
Inspector's Contact Information			
Describe present phase of construction			
Type of Inspection:	❑ Routine ❑ Post-storm event		

Weather Information
Has there been a storm event since the last inspection? ❑Yes ❑No **If yes, provide:** Storm Start Date: Approximate Amount of Precipitation (in):
Weather at time of this inspection? ❑ Clear ❑Cloudy ❑ Rain ❑ Sleet ❑ Fog ❑ Snowing ❑ High Winds ❑ Other: Temperature:
Were any discharges noted at the time of inspection? ❑Yes ❑No **If yes, describe:**

BMP Effectiveness
Were BMPs operating effectively during inspection? ❑Yes ❑No **If no, does SWPPP need to be amended?**
List any non-effective BMPs in the corrective action log on the next page.
List any amendments to the SWPPP that were identified as being necessary during inspection:

Areas Where Land Disturbance Operations Have Permanently or Temporarily Stopped		

CERTIFICATION STATEMENT

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Print name and title: _____

Signature: _____ **Date:**_____

#	BMP Location	Corrective Action Needed	Date Corrected	Corrective Actions Taken

SECTION 13

Regulatory Correspondence

Pertinent correspondence from regulatory agencies relating to this project can be located here.

SECTION 14

Notice of Termination

This section should contain the completed Notice of Termination for the project that can be accessed through the Missouri Gateway for Environmental Management at https://dnr.mo.gov/mogem/.

Documentation of acceptance from the DNR should also be kept here and all documents must be retained for 3 years after the date of NOT acceptance.

MISSOURI DEPARTMENT OF NATURAL RESOURCES
WATER PROTECTION PROGRAM, WATER POLLUTION CONTROL BRANCH

REQUEST FOR TERMINATION OF OPERATING PERMIT

(REPLACES TERMINATION FORMS H AND J)

FOR OFFICE USE ONLY
DATE RECEIVED

IF A FACILITY OR SITE HAS BEEN SOLD, BUT PERMITTED ACTIVITIES HAVE NOT CEASED, A TRANSFER OF OWNERSHIP FORM (MO 780-1517) MUST BE COMPLETED RATHER THAN A TERMINATION FORM.

ALL APPLICABLE SECTIONS OF THIS FORM MUST BE COMPLETED.

1. FACILITY INFORMATION

PERMIT NUMBER	COUNTY		
NAME OF FACILITY			
PHYSICAL ADDRESS	CITY	STATE	ZIP CODE

FACILITY CONTACT NAME	FACILITY CONTACT TELEPHONE NUMBER	FACILITY CONTACT EMAIL

2. OWNER

NAME	TELEPHONE NUMBER WITH AREA CODE		
ADDRESS	CITY	STATE	ZIP CODE
EMAIL			

3. CONTINUING AUTHORITY

NAME	TELEPHONE NUMBER WITH AREA CODE		
ADDRESS	CITY	STATE	ZIP CODE
EMAIL			

4. REASON FOR TERMINATION REQUEST (CHECK ONE)

☐ Permitted activities have ceased, or facility is closed (must select facility type in section five and attach photographs or any other supporting documents as required)

☐ General Permit MO-G _____or MO-R _____ has been issued and covers all regulated activities

☐ Site specific permit MO- _____ has been issued and covers all regulated activities

☐ Facility has obtained a “No Exposure” certification, MO-NX_____

☐ Industrial activity (SIC Code # _____) is not regulated

☐ For CAFOs, facility size is unregulated (Class II and smaller operations only)

☐ Other (Specify)

5. FACILITY TYPE (CHECK ONE FACILITY TYPE, COMPLETE ONLY IF PERMITTED ACTIVITY HAS CEASED OR FACILITY HAS CLOSED)

☐ For land disturbance sites, the area is stabilized; perennial vegetation, pavement, buildings, or other permanent structures cover all areas that have been disturbed; no further land disturbance activities are planned; all building construction (commercial or residential) is completed; temporary best management practices are removed, and construction equipment is removed. With respect to areas that have been vegetated, vegetation cover shall be at least 70 percent over 100 percent of the site not covered in impervious material. Attach photographs showing stabilized areas.

☐ For wastewater treatment plants, the treatment plant is removed and sludge was removed and properly disposed of, and a closure plan in accordance with 10 CSR 20-6.010(12) or 10 CSR 20-6.015(5) was approved and implemented. Attach documentation required by the approved closure plan and photographs of the closed area. See facility closure fact sheet at dnr.mo.gov/pubs/pub2568.htm for more information on closure requirements for wastewater treatment plants.

☐ For industrial facilities, regulated activities have ceased, no "significant materials" remain on site, and disturbed areas are properly stabilized and/or vegetated. The area is stabilized when perennial vegetation, pavement, buildings, or structures using permanent materials cover all areas that have been disturbed. Vegetation cover shall be at least 70 percent over 100 percent of the site not covered in impervious material. Attach applicable closure documents and photographs of the closed area that demonstrate no permitted activities or materials remain.

☐ For quarries or sand and gravel operations, submit documentation of release from the department's Land Reclamation Program.

☐ For landfills, official closure has been received from department's Solid Waste Management Program (SWMP); cap is vegetated as required by SWMP; and any additional industrial activities are permitted appropriately (i.e. transfer stations, mulching operations, land disturbance, etc.). Attach official SWMP closure letter and permit numbers of any continuing active industrial or land disturbance activities.

☐ For CAFOs

- ☐ Class I CAFOs must properly close lagoons and waste storage structures per a closure plan in accordance with 10 CSR 20-6.300(6) and approved by the department. Please attach photographs of closed lagoons. Also attach any additional information which supports closure of facility.

- ☐ Class II CAFOs must close waste storage structures in accordance with 10 CSR 20-6.300(6)(B), or shall continue to maintain all storage structures so there is no discharge to waters of the state. Attach photographs of closed or re-purposed lagoons, or an explanation of "no discharge" methods. Also attach any additional information that supports closure of facility.

6. CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to ensure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

NAME AND OFFICIAL TITLE (TYPE OR PRINT)	TELEPHONE NUMBER WITH AREA CODE
SIGNATURE	DATE SIGNED

7. MAIL COMPLETED COPY TO:

For Site Specific (MO-), Abandoned Mine And Land Reclamation (MO-G05), Land Disturbance By County Or City (MO-R100), Pesticide Application (MO-G87), Sewer Extension Construction (MO-GC) and CAFO (MO-G01, MO-GS1) Permit Terminations:

Missouri Department of Natural Resources
Water Protection Program
Water Pollution Control Branch
Attn: Operating Permits Section
P.O. Box 176
Jefferson City, MO 65102-0176

For General Permit Terminations (MO-G or MO-R):

Send to the appropriate regional office.
Regional office is determined based on the county where the facility is physically located.

To determine the correct regional office for the permitted facility, please see **dnr.mo.gov/regions/**