

MULCH

PHYSICAL DESCRIPTION - A layer of organic material designed to protect exposed soil or freshly seeded areas from erosion by eliminating direct impact of precipitation and slowing overland flow rates. Mulch materials may include, but are not limited to, such things as grass, hay, straw, wood chips, wood fibers, hydro mulch and shredded bark. Type 1 mulch is prohibited in the flood plain.

- Type I Mulch-Vegetative (includes grass, hay, straw).
- Type II Mulch-Vegetative with asphalt emulsion (includes grass, hay, straw).
- Type III Mulch-Vegetative with overspray (includes grass, hay, straw).
- Type V Mulch-Hydro mulch (includes wood fiber, wood cellulose).
- Shredded Hardwood Bark Mulch.
- Wood Chips, (not recycled lumber).

WHERE BMP IS TO BE INSTALLED - Typically installed on seeded areas for temporary use, and in landscaped areas for permanent use.

CONDITIONS FOR EFFECTIVE USE OF BMP

Type of Flow:	Sheet flow only
Slopes:	See attached chart for types of mulch acceptable as a function of slope length and steepness
Mulching Rates:	See attached table

WHEN BMP IS TO BE INSTALLED - Immediately after grading landscaped areas or seeding other areas.

INSTALLATION / CONSTRUCTION PROCEDURES

- Install upstream BMP's to protect area to be mulched
- Rough grade area and remove all debris larger than 1 inch if area is to be vegetated and mowed in the future, larger than 2 inches if area is to be permanently mulched
- If area is to be seeded, follow requirements of Seeding BMP
- Spread mulch and anchor by punching it into the ground, using netting, peg and twine, or tacking with liquid binder
- For additional information see Section 802 of St. Louis County's Standard Specifications for Highway Construction.

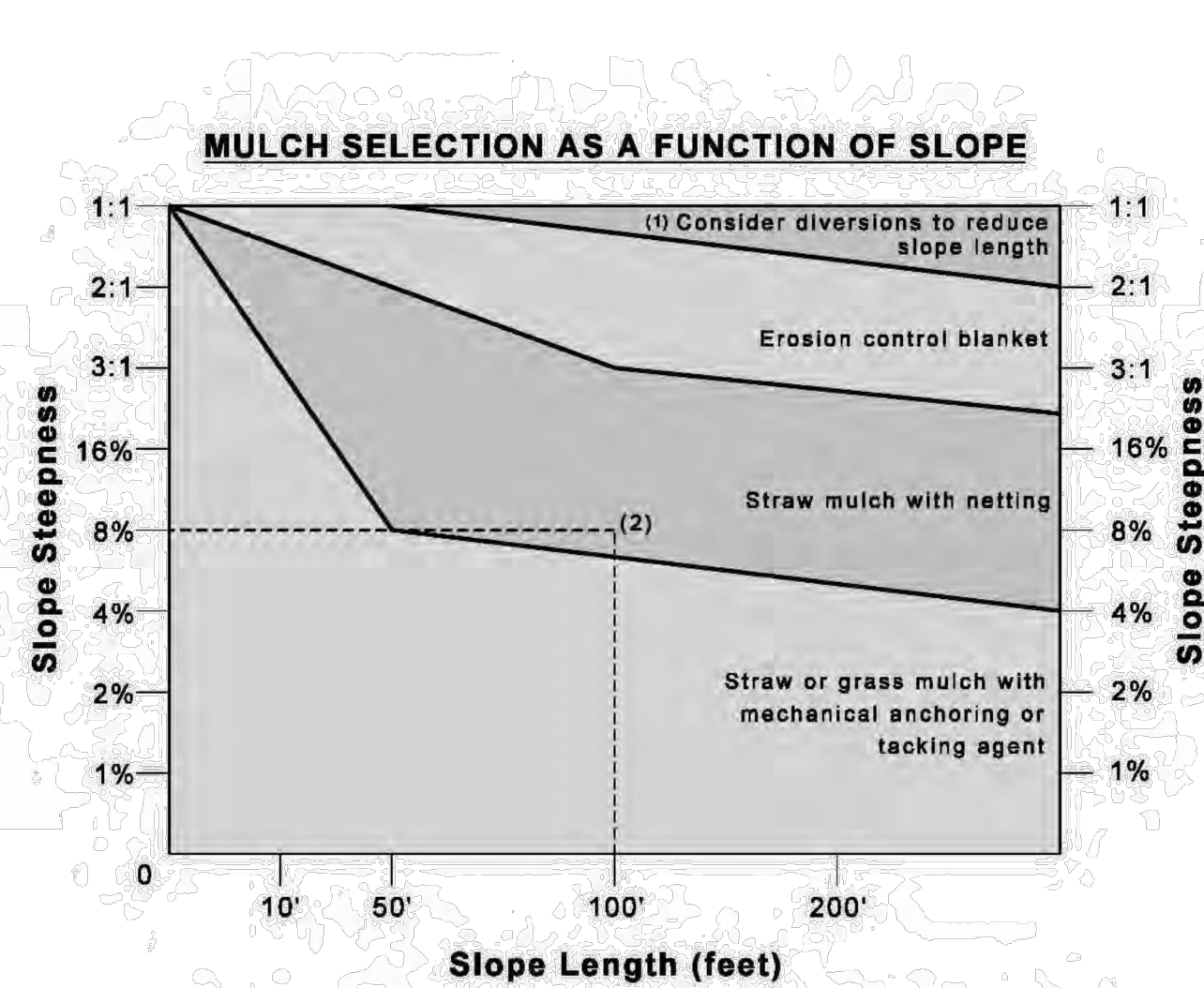
O&M PROCEDURES

- Inspect every week and after every storm until adequate vegetation is established; annually for permanent mulch.
- Protect from vehicular and foot traffic.
- Repair damaged, degraded or eroded areas - reseed as needed and replace mulch.

SITE CONDITIONS FOR REMOVAL

Temporary mulch should be removed when adequate vegetation is established.

TYPICAL DETAILS - Type of mulch required for various slopes and application rates attached.



- For slopes steeper than 1:1, consider building a diversion above slope to divert water.
- Example: An 8% slope, 100 feet long, requires straw mulch with netting.

GENERAL MULCH RECOMMENDATIONS TO PROTECT FROM SPLASH AND SHEET FLOW

Material	Rate Per Acre	Requirements	Notes
Straw	2 to 2.5 tons	Dry, unchopped unweathers, avoid weeds	Spread by hand or machine, must be tacked or tied down
Wood Fiber or Wood Cellulose	0.5 to 1 ton		Use with hydro seeder, may be used to tack straw. Do not use in hot, dry weather.
Wood Chips	5 to 6 tons	Air dry. Add nitrogen fertilizer at 12 lb per ton	Apply with blower, chip handler, or by hand. Not for fine turf areas.
Bark	35 cu. yds.	Air dry, shredded, or hammermilled, or chips	Apply with mulch blower, chip handler or by hand. Do not use asphalt tack.

O&M PROCEDURES

- Inspect every week and after every storm.
- Remove sediment buildup deeper than 1/2 the fence height or 12", whichever is less.
- Replace torn or clogged fabric; repair loose fabric.
- Repair unstable or broken posts.
- Stabilize any areas susceptible to undermining.
- Extend fence or add additional row(s) of fence if necessary to provide adequate protection.

SITING AND DESIGN CONSIDERATIONS - The material for silt fences should be a pervious sheet of synthetic fabric such as polypropylene, nylon, and polyester or polyethylene yarn. Choose the material based on the minimum synthetic fabric requirements shown in Table 1 below.

Table 1- Temporary Silt Fence Property Requirements

Physical Property	Test Method	Units	MARV Geotextile Requirements		
			Supported Silt Fence ²	Unsupported Silt Fence	
				Woven	Non-Woven
Post Spacing (Maximum)		feet	4	4	6
Height of Wire / Polymer Fence (Minimum)		inches	30	---	---
Graib Strength (Minimum): Machine Direction Cross Machine Direction	ASTM D 4632	pounds	90 90	125 100	125 100
Permittivity (Minimum)	ASTM D 4491	sec ⁻¹	0.05	0.05	0.05
Apparent Opening Size (AOS) ¹	ASTM D 4751	Sieve Number	30	30	30
Ultraviolet Stability (Minimum) (retained strength)	ASTM D 4355		70% after 500 h of exposure		

Notes:

MARV Minimum Average Roll Value

¹ Elongation measured in accordance with ASTM D 4632

² Silt Fence Support - 14-gauge steel wire with a mesh spacing of 6 inches by 6 inches (or a prefabricated polymeric mesh of equivalent strength)

³ Maximum Average Roll Value

SITE CONDITIONS FOR REMOVAL - After permanent vegetation of slope is established. Remove fence and post, re-grade trench area and vegetation.

TYPICAL DETAIL - 806-70.0

SEEDING

PHYSICAL DESCRIPTION - Establishment of vegetation by spreading grass seed designed to protect exposed soil from erosion by eliminating direct impact of precipitation and slowing overland flow rates. Once established, the vegetative cover will also filter pollutants from the runoff. Use only perennial vegetation for final stabilization.

WHERE BMP IS TO BE INSTALLED - To exposed soil after a phase of rough or finish grading has been completed, or areas where no activity will occur for 30 days.

CONDITIONS FOR EFFECTIVE USE OF BMP

Type of Flow:	Sheet flow
Contributing Slope Length:	30 foot maximum for 3:1 slopes 50 foot maximum for slope between 3:1 and 10:1 100 foot maximum for slopes under 10%
Minimum Rates:	See attached chart(s)
Acceptable Dates:	See attached chart

WHEN BMP IS TO BE INSTALLED - Immediately after rough or finished grading is completed.

INSTALLATION / CONSTRUCTION PROCEDURES

- Install upstream BMP's to protect area to be seeded.
- Rough grade area and remove all debris larger than 1-inch in diameter and concentrated areas of smaller debris.
- Install stabilization grids, if needed.
- Mix soil amendments (lime, fertilizer, etc.) into top 3 to 6 inches of soil as needed.
- Plant seed 1/2 to 1/2 inch deep.
- Roll lightly to firm surface.
- Cover seeded area with mulch unless seeding completed during optimum spring and summer dates.
- Install additional stabilization (netting, bonded fiber matrix, etc.) as required.
- Water immediately - enough to soak 4 inches into soil without causing runoff.
- If contract / permit allows seeding to be used for final stabilization, only perennial vegetation seeds shall be used.
- For additional information see Sections 805 and 806.50 of St. Louis County's Standard Specification for Highway Construction.

O&M PROCEDURES:

- Inspect every week and after every storm
- Protect area from vehicular and foot traffic
- Re-seed areas that have not sprouted within 21 days of planting.
- Repair damaged or eroded areas and reseed and stabilize as needed
- Do not mow until 4 inches of growth occurs
- During the first 4 months, mow no more than 1/2 the grass height
- Re-fertilize during 2nd growing season

SITE CONDITIONS FOR REMOVAL - Does not require removal, but temporary seeding can be removed immediately prior to work returning to an area

SEEDING REQUIREMENTS

Dates for Seeding											
Permanent Seeding	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov
Tall Fescue	O	O	O	O	O	O	O	O	O		
Smooth Brome	O	O	O	O	O	O	O	O	O		
Fescue & Brome	O	O	O	O	O	O	O	O	O		
Fescue, Rye & Bluegrass	A	A	O	O	O	P	P	O	O	P	P
Temporary Seeding	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov
Rye or Sudan	A	A	O	O	O	O	O	O	O	O	A
Os	A	O	O	O	O	O	O	O	O		

O = Optimum seeding dates
A = Acceptable seeding dates
P = Permitted seeding dates with reseeding 2 months later - Initially use 50% of seed and 75% of fertilizer. Reseed with additional 75% seed and remaining fertilizer.

Permanent Seeding ¹	Minimum Fertilizer and Seeding Rates	
	Pounds per acre	Pounds Per 1000 sq. ft.
Tall Fescue	300	7.0
Smooth Brome	200	4.6
Mixture # 1	250	5.7
Mixture # 2	210	4.6

Mixture # 1 = Tall Fescue @ 150 pounds per acre and Brome @ 100 pounds per acre.
Mixture # 2 = Tall Fescue @ 100 pounds per acre; Perennial Rye grass @ 100 pounds per acre; and Kentucky Blue grass @ 10 pounds per acre.
* Seeding rate for slopes in excess of 20% (5:1), shall be 10 pounds per 1000 sq. ft.

Temporary Seeding	Pounds per acre	Pounds Per 1000 sq. ft.
Rye or Sudan	150	3.5
Os	200	2.5

Fertilizer	Permanent Seeding (pounds per acre)		Temporary Seeding (pounds per acre)	
	Nitrogen	Phosphate	Nitrogen	Phosphate
	45	30	30	30
	65	30	30	30
	60	60	60	60

ENM = Effective neutralizing material per State evaluation of quarried rock.

WASHDOWN STATION

PHYSICAL DESCRIPTION - An area located at construction entrances designed to wash sediment from the tires and undercarriage of exiting vehicles and prevent sediment from being tracked onto existing roadways.

WHERE BMP IS TO BE INSTALLED - Across or immediately adjacent to exit paths from unpaved construction sites.

CONDITIONS FOR EFFECTIVE USE OF BMP

Drainage: Downstream BMP sized to treat dirty runoff from washdown station

WHEN BMP IS TO BE INSTALLED - First order of work, along with construction entrance, prior to vehicles or equipment accessing unpaved areas.

INSTALLATION/CONSTRUCTION PROCEDURES

- Grade and compact area for drainage under washdown pad.
- Install steel-ribbed plate on frame or other support to allow a 2" drain space.
- Grade and vegetate downstream BMP (V-ditch shown on detail).
- Install water supply and hose.
- Post sign in advance of station indicating that all exiting vehicles and equipment must use station prior to exiting site.

O&M PROCEDURES:

- Remove sediment daily.
- Repair settled areas.
- Replace rock if necessary to maintain clean surface.

SITE CONDITIONS FOR REMOVAL - Remove when vehicles and equipment will no longer access unpaved areas.

TYPICAL DETAIL - 806-46.00

CONSTRUCTION ENTRANCE

PHYSICAL DESCRIPTION - A stabilized entrance to a construction site designed to minimize the amount of sediment tracked from the site on vehicles and equipment. Stabilization generally consists of aggregate over geogrid and geosynthetic material. Mud and sediment fall off of tires as they travel along the stabilized entrance; however, additional measures in the form of a washdown area should also be included on site. The stabilized entrance also distributes the axle load of vehicles over a larger area; thereby mitigating the rutting impact vehicles normally have on unpaved areas. See additional information in the "Construction Site Access Requirements" section of this manual.

WHERE BMP IS TO BE INSTALLED - At locations where it is safe for construction vehicles and equipment to access existing streets - preferably at location of future streets or drives.

CONDITIONS FOR EFFECTIVE USE OF BMP

Drainage: Ditches or pipes, if needed, sized for 15 year, 20 minute storm; HGL 6" below surface of entrance

WHEN BMP IS TO BE INSTALLED - First order of work, along with washdown area, prior to vehicles or equipment accessing unpaved areas.

INSTALLATION / CONSTRUCTION PROCEDURES

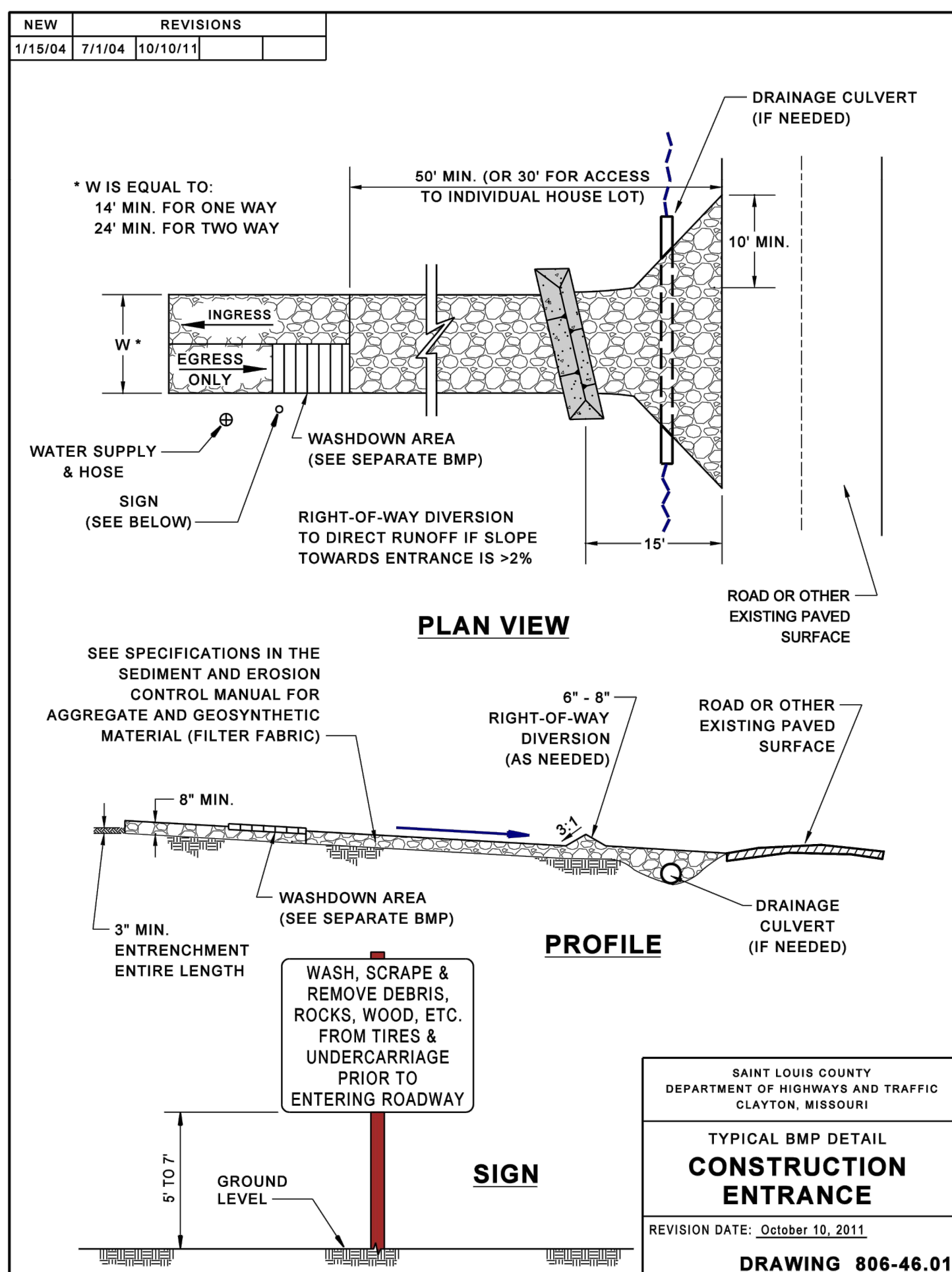
- Grade and compact area of construction entrance.
- Install culvert under entrance if needed to maintain positive drainage.
- Place geosynthetic material next to compacted soil, lay geogrid on top of this, and cover with aggregate, forming diversion across entrance if needed to direct runoff away from roadway.
- See Washdown Station BMP for additional steps.

O&M PROCEDURES:

- Immediately remove any mud or debris tracked onto paved surfaces.
- Remove sediment and clods of dirt from construction entrance continuously.
- Replace rock if necessary to maintain clean surface.
- Repair settled areas.

SITE CONDITIONS FOR REMOVAL - Remove when vehicles and equipment will no longer access unpaved areas.

TYPICAL DETAIL - 806-46.01



NON-SEDIMENT POLLUTION CONTROL

PHYSICAL DESCRIPTION - Control measures designed to prohibit chemicals, hazardous materials, solid waste and construction debris from polluting stormwater. Pollutants carried in solution or as surface films on runoff will be carried through most erosion control and sediment capture BMP's. Keeping substances like fuel, oil, asphalt, paint, solvents, fertilizer, soil additives, concrete wash water, solid waste and construction debris from polluting runoff can be accomplished to a large extent through good housekeeping on the site and following the manufacturer's recommendations for disposal.

WHERE BMP IS TO BE INSTALLED - Collection, storage and fueling areas should be located onsite in an area that does not receive a substantial amount of runoff from upland areas and does not drain directly to lakes, creeks, streams, rivers, sewers, groundwater, wetlands, or road ditches.

CONDITIONS FOR EFFECTIVE USE OF BMP

- Reduction in pollutants depends heavily on how construction personnel perform their duties. An effective management system requires training and signage to promote proper storage, handling and disposal of materials. Follow up observations of actions and inspection of storage areas by management personnel is also required.
- Plans should contain notes clearly stating requirements for addressing potential pollutants.
- Fueling areas and storage areas for hazardous materials should be protected by berms or other means of catching leaks or spills. 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.

WHEN BMP IS TO BE INSTALLED - Immediately following installation of construction entrance and wash station.

INSTALLATION / CONSTRUCTION PROCEDURES

- Place waste receptacles near area of work.
- Construct protective berm or other devices around fueling and hazardous materials storage areas.
- Install appropriate signage.
- Post guidelines for proper handling, storage and disposal of materials, and emergency spill cleanup on site.

O&M PROCEDURES:

- Inspect activities on regular basis.
- Inspect storage areas and control devices at least every two weeks and after every storm.
- Make necessary corrections and repairs.

SITE CONDITIONS FOR REMOVAL - Maintain practices until all construction on the site has been completed.

TYPICAL DETAILS - General pollution prevention notes attached.

SODDING

PHYSICAL DESCRIPTION - A 3/4 inch to 1 inch thick mat of vigorous turf, free of disease, insects and weeds. Sod prevents raindrops from disrupting the soil structure and causing erosion. Sod slows water runoff and acts as a filter when sediment-laden runoff crosses over the sodded area.

WHERE BMP IS TO BE INSTALLED - Typically installed in areas requiring immediate erosion protection, such as swales or detention ponds and as filter strips, around inlets, and adjacent to curbs. Also installed in areas requiring immediate aesthetic appearance or function such as entrances to new subdivision and off site construction areas.

CONDITIONS FOR EFFECTIVE USE OF BMP - Type of Flow: Sheet flow and low concentrated flows with velocities less than 5 fps.

WHEN BMP IS TO BE INSTALLED - Immediately after finish grading, installation of area inlets, and installation of underground services and foundations of new homes.

INSTALLATION / CONSTRUCTION PROCEDURES

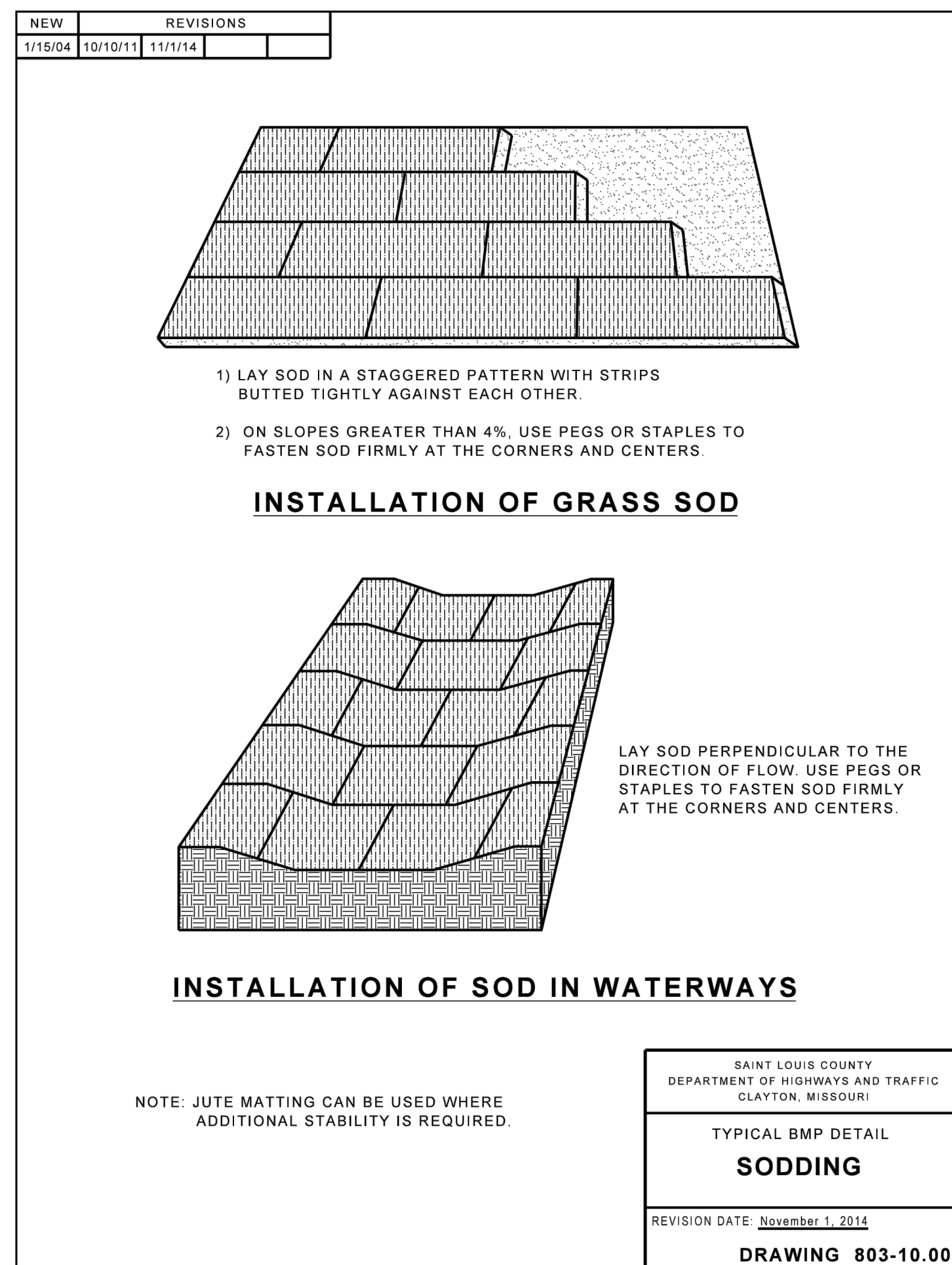
- Finish grade area and remove all debris larger than 1/2 inch in diameter and concentrated areas of smaller debris.
- Soil preparation of area to be sodded shall be determined by tests to determine lime and fertilizer requirements. Soil amendments shall be mixed into top 3 to 6 inches of soil by disk or other means.
- Level and roll soil lightly to provide an even grade and firm the surface. Soil should not be excessively wet or dry.
- Lay first row of sod perpendicular to the slope or direction of flow. Butt subsequent rows tight against previous rows with strips staggered in brick-like pattern. Fill minor gaps with good soil and roll entire surface to ensure contact.
- Stake, staple and/or net corners and centers of sod strips as required.
- Water immediately after installation enough to soak 4 inches into soil without causing runoff.
- For additional information see Section 803 of St. Louis County's Standard Specification for Highway Construction.
- Type of sod shall be as specified in the contract or on the approved plans.

O&M PROCEDURES:

- Water sod daily for 3 weeks - enough to soak 4-inches into soil without causing runoff.
- Reposition areas of sod that has moved along the slope.
- Remove sediment accumulations - replace sod if necessary.
- Repair any eroded areas, replace sod, and stabilize as needed.
- Do not mow until 3-inches of new growth occur. During the first 4 months, mow no more than 1/2 the grass height.

SITE CONDITIONS FOR REMOVAL - Not applicable.

TYPICAL DETAIL - 803-10.00



Webster University
Interdisciplinary Science
Building

CANNONDESIGN

1100 Clark Avenue
St. Louis, Missouri 63102
T: 314.241.6250
F: 314.241.2570

William Tao & Associates, Inc.
ME/PE/FP Engineer
7955 Manchester Road, Suite 125
St. Louis, MO 63143
314-884-7600

David Mason & Associates, Inc.
Structural & Civil Engineer
MO Civil Court of Authority # 001103
800 South Vandeventer Avenue
St. Louis, MO 63110
314-534-1053

Faith Group
Technology
3101 S. Hanley Rd., Suite 100
St. Louis, MO 63143
314.991.2228

Kuhlmann Leavitt, Inc.
Environmental Graphics & Signage
7400 Pershing Ave
St. Louis, MO 63130
314.725.6616

KWA Architects
Architecture
9721 Lezinger Road
St. Louis, MO 63124
314.962.2560

Spellman Brady & Company
Interior Designer
8251 Maryland Avenue, Suite 300
St. Louis, MO 63105
314.862.0070

SWT Design
Landscape Architect
7722 Big Bend Blvd
St. Louis, MO 63119
314.544.5700

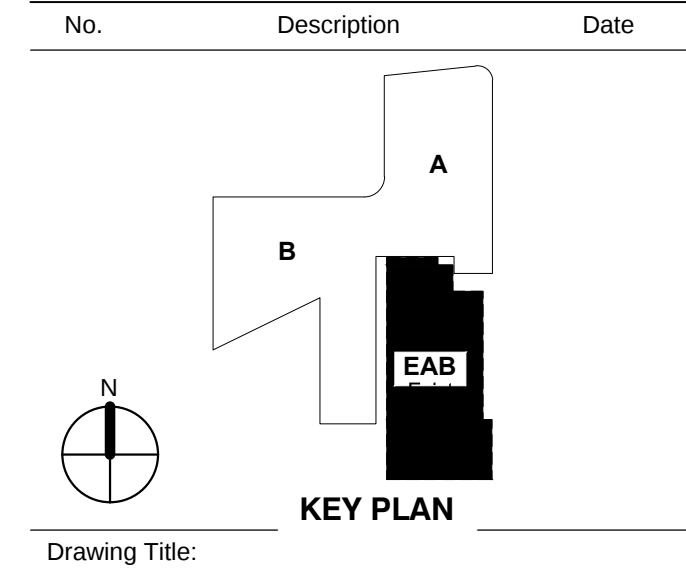
Webb Engineering Services, Inc.
Planning & Fire Protection
1400 S. 3rd Street, Suite 201
St. Louis, MO 63104
314.588.0600



CONFORMED SET

01 JUL 2016

1 ADDENDUM 1-10 5 MAY 2016
- ISSUED FOR CONSTRUCTION (BP1) 15 JAN 2016



**EROSION
CONTROL
DETAILS**

Project No.: 04561.00 Checked by:

C801

MSD P# 28874-01 MSD BASE MAP 23K2