

CHAPTER 8

EROSION CONTROL AND SEDIMENT MANAGEMENT

Sediment Control- General Principles.....	8-1
Minor Slide Repair.....	8- 6
Spoils Handling and Disposal.....	8 - 11



SEDIMENT CONTROL – GENERAL PRINCIPLES

DESCRIPTION

Controlling erosion and managing the run-off of sediment is a “first line of defense” action in protecting water quality and salmonid habitat. Salmon lay their eggs in nests of streambed gravels (redds), burying them deep in the substrate of the channel. The flow of water and the oxygen it brings with it, are critical to the survival of the eggs and the young salmon that hatch from them. If the gravels are clogged or embedded with sediment, the eggs can smother from lack of oxygen or become toxic with metabolic waste that cannot be flushed from the gravels. Sediment can also negatively impact in stream insect populations, causing further harm to aquatic wildlife further up the food chain. Excessive sediment in our streams is one of the key factors in the decline of salmon populations on our coast. This chapter emphasizes the importance of implementing erosion control to keep sediment onsite, avoiding run-off situations whenever possible. We also provide tools for controlling run-off, in order to keep mobile sediment out of our rivers and wetlands. Erosion control is an integral part of all phases in the life of county maintenance projects, including:

- (a) planning;
- (b) control of run off and sediment coming onto or leaving the site during construction; (*temporary BMPs*),
- (c) incorporation of appropriate BMPs into constructed infrastructure (*permanent BMPs*); and
- (d) monitoring/maintenance or removal of temporary BMPs after the project is complete.



Permanent Inlet Filter

ENVIRONMENTAL CONCERNS

- Discharge of sediment or debris to streams or watercourses.
- Alteration of stream channel shape and function through erosion and/or sedimentation.
- Damage to or destruction of riparian and aquatic habitat through erosion and/or downstream sedimentation.
- Lethal and sublethal impacts to salmonids Creation of a barrier to fish passage.
- Damage to or destruction of upslope vegetation and loss of topsoil.
- Creation of habitat favorable for noxious weeds or invasive plant species.
- Progression of erosion processes resulting in catastrophic slope or embankment failure.
- Damage to or destruction of public infrastructure or natural features.

Erosion and Sediment Control

BMP OBJECTIVES

- Protect water quality, aquatic habitat and riparian habitat by reducing erosion and sedimentation.
- Maintain proper functioning of stream channel and in-stream structures.
- Prevent the formation of fish passage barriers.
- Maintain healthy riparian and up slope vegetation. Retain topsoil.
- Avoid erosion before it creates chronic problems or future catastrophic hillslope or embankment failure.

APPROACH AND STANDARDS

1) Incorporate erosion control into the planning, construction and follow up phases for all maintenance activities. Review the standards contained in this manual, select applicable BMPs for which materials are available and plan to have the necessary materials on hand for implementation before starting work.

2) If working during times when rain might be possible, always have erosion control measures onsite in case of a storm event. Have materials needed for erosion control BMPs available at the site before work is started (125% of what is necessary)

3) Plan for projects involving disturbance of soil (earthwork) to occur during the dry season between April 15 and October 15, whenever possible. If work must be performed during the rainy season, work during dry weather conditions whenever possible. Guidelines for necessary unscheduled emergency earthwork conducted during the rainy season (October 15 through April 15) should comply with our county's Grading Ordinance and winter time grading guidelines., if available.

SLO COUNTY 2006 ROAD MAINTENANCE 8 - 2

4) Use the following hierarchy to select and prioritize the erosion control BMPs referenced below and in Appendix A. Separate planning and prioritization may be required for BMPs implemented only during construction as opposed to BMPs left in place when the project is complete.

I) Keep the disturbed area dry and keep water from flowing off-site when possible. Use Water Management BMPs to control or divert run off coming onto or leaving the site.

II) Keep sediment in place to the extent possible. Use Erosion Control or Streambank Protection BMPs to stabilize disturbed soil.

III) If it is not practical to stop run-off from leaving the site, use Water Management and Sediment Control BMPs to minimize the amount of entrained sediment leaving the site.

IV) If it is not possible to stop runoff with entrained sediment from leaving the site, use Sediment Control BMPs to capture the entrained sediment before it is delivered to a stream or watercourse.

5) Set up the work and staging area to minimize the area of soil that will be disturbed and the tracking of soil out of the work area by vehicles and equipment. Avoid staging projects in areas where runoff will be concentrated. Avoid staging equipment in riparian areas or adjacent to streams. Use the appropriate Erosion and Sediment Control BMPs to secure the staging area.

6) Protect storm drain inlets and watercourses using Water Management and Sediment Control BMPs as referenced below.

7) Reuse (replace) excavated soil at the site to the extent possible

8) Avoid sidecasting of soil in all cases where it could be delivered into a watercourse, riparian area, roadside ditch or storm drain. Do not sidecast outside of the County right-of-way, without landowner's permission. In some instances, under the following guidelines (See Table below), sidecasting is allowable given remote distances from spoils storage sites. In these cases, the setback distance required depends on slope and vegetation. The presence of vegetation helps to slow the travel of sediment downslope, so good judgment is needed to assess the situation. *Do not sidecast at all* if the slope is sparsely vegetated and it appears that sediment will travel with rain runoff into a stream or estuary system, even if setback distances are applied. On slopes of 5:1 (20% gradient) or less, sidecasting is allowed beyond 150 feet of a watercourse, stream crossing, riparian area, roadside ditch or storm drain. On 2:1 slopes (50%) or less, sidecasting is allowed beyond 300 feet of a watercourse, stream crossing, riparian area, roadside ditch or storm drain. On slopes greater than 2:1, typically sidecasting is *not allowed at all*, however there may be rare instances on slopes greater than 2:1 where sidecasting is acceptable given very long distances from water bodies and good vegetative cover. Seek advice from San Luis Obispo County Environmental Staff when in doubt. Avoid concentrating sidecasting repeatedly in the same place. Never sidecast large amounts of soil from major landslides.

SLO COUNTY 2006 ROAD MAINTENANCE 8 - 3

9) Temporarily stockpile excavated soil away from streams, watercourses or areas where run off will concentrate, until reused or removed to a permanent disposal site. Implement erosion control BMPs on and around stockpiles to keep materials from eroding.

10) The performance of erosion control BMPs should be monitored daily during construction. Added attention should be given to monitoring of BMPs after storm events, and BMPs should be maintained, upgraded or augmented with additional BMPs as needed.

SLOPE GRADIENT	DISTANCE FROM WATERCOURSE, STREAM CROSSING, RIPARIAN AREA, ROADSIDE DITCH, STORM DRAIN	SIDECASTING RULE
Any slope	Appears that sediment will travel with rainwater into watercourse.	Not allowed
5:1 (20%) or less	150 feet or more	Allowed using good judgment
2:1 (50%) or less	300 feet or more	Allowed using good judgment
Greater than 5:1 (50%)	Vegetated slope long distance from watercourse	Allowed
Greater than 5:1 (50%)	Sparsely vegetated slope and it appears that sediment will travel with rain into watercourse	Not allowed

SLO COUNTY 2006 ROAD MAINTENANCE 8 - 4

- 11) Projects should not be considered complete until the appropriate long-term erosion control BMPs are in place.
- 12) Use of biotechnical BMPs and native vegetation is preferable over hardscape techniques when appropriate for the site conditions.
- 13) For biotechnical BMPs that require the establishment of vegetative cover, plan and implement ongoing vegetation maintenance and irrigation as needed. Regularly evaluate the replanted area to ensure vegetation is establishing itself. Implement a follow-up revegetation program if the first attempt fails!
- 14) Implement adequate cover cropping or mulching; both are ***quick and economic methods*** to control or prevent surface erosion.
- 15) After completion of construction, monitor the performance of long-term BMPs periodically, particularly after significant storm events. Perform immediate repairs or upgrades as necessary.

BMP TOOLBOX

Culvert BMPs

- Energy Dissipater

Erosion Control BMPs

- Blankets/Geotextile Fabrics
- Coir Log/Roll
- Mulching
- Planting
- Plastic Covering
- Rock Breast Wall
- Seeding
- Stepped or Terraced Slope
- Surface Roughening & Soil Tracking

Sediment Management BMPs

- Sedimentation Sump
- Silt Fence
- Silt Mat
- Siltation Pond/Settling Pond
- Storm Drain Inlet Protection
- Sweeping
- Turbidity Curtain

Water Management BMPs

- Asphalt Berm
- Diversion Berm
- Sandbag
- Slope Drain – Temporary
- Slope Drain – Overside
- Stream Bypass (Water Diversion)

SLO COUNTY 2006 ROAD MAINTENANCE 8 - 5

PERMITS

SEDIMENT CONTROL	
Activity or Condition	Required Permit or Limitation
Instream work	<ul style="list-style-type: none"> • COE 404 CWA • DFG 1602 Streambed Alteration Agreement • Consult with San Luis Obispo County Public Works Environmental staff
Bank Stabilization	<ul style="list-style-type: none"> • COE General Nationwide permit No. 13. • Consult with San Luis Obispo County Public Works Environmental staff.
Sediment Reduction Measures at road and stream crossings	<ul style="list-style-type: none"> • COE Regional General Permit • Consult with San Luis Obispo County Public Works Environmental staff.

MINOR SLIDE REPAIR

DESCRIPTION

Minor slides, slipouts and washouts are usually caused by the impact of heavy rainfall, concentrated runoff, subsurface water, loss of physical support, or freeze and thaw conditions on unstable or saturated soils. Slides and washouts may occur on the slope above or below roadways, private property, or sensitive areas. Minor slides, slipouts, and washouts are repaired to restore or prevent further damage to roadways and other structures, and sediment delivery to streams and watercourses. Repair of minor slides and washouts includes: clearing materials (soil, rock, organic material and debris) deposited by wind, water, or minor landslides; excavating, recontouring and/or backfilling minor slides, washouts or eroded areas; revegetation and erosion control; repairing damage to roads and other structures; and constructing, repairing or improving drainage facilities. Repair of slides under emergency conditions is discussed in *Chapter 7 - Emergency Slide and Washout Repair*. Repair of road slipouts adjacent to streambanks is described in *Chapter 6 -Streambank Stabilization*.

ENVIRONMENTAL CONCERNS

- Delivery of sediment, organic debris, asphalt, and other potential pollutants into the streams, watercourses or storm water drainage systems.
- Damage to stream or riparian habitat from the slide itself or from heavy equipment use instream or in the riparian zone.
- Damage to public infrastructure leading to further environmental damage.
- Water pollution from equipment operations.

SLO COUNTY 2006 ROAD MAINTENANCE 8 - 6

BMP OBJECTIVES

- Protect water quality, aquatic habitat and riparian habitat by reducing erosion and sedimentation.
- Prevent potential water pollution from equipment operations.
- Restore and maintain healthy riparian and upslope vegetation. Retain topsoil.

BEST MANAGEMENT PRACTICES

- 1) When a slide impacts a stream system (for example, if the natural flow of a watercourse is changed or habitat is damaged), seek the advice of appropriate experts prior to performing permanent repair work such as:
 - o Engineering, and Public Works Environmental staff
 - o Resource agency personnel (DFG, NOAA Fisheries, RWQCB)
 - o Hydrologists or Hydraulic Engineers
 - o Geologists
 - o Geomorphologists
 - o Geotechnical Engineers
 - o Fisheries Biologists
- 2) Inspect equipment for leaks, damage and buildup of oils and grease prior to performing work, and perform maintenance at designated repair facilities.
- 3) Set up the work and staging area to minimize the area of soil that will be disturbed and the tracking of soil out of the work area by vehicles and equipment. Keep equipment out of riparian areas, if possible. Avoid staging equipment in riparian areas, adjacent to streams, or in areas where runoff may concentrate or may run into a watercourse. Use the appropriate Erosion Control and Sediment Management BMPs to secure the staging area.
- 4) During the repair, protect storm drain inlets and watercourses using the Sediment Control BMPs referenced below. Remove temporary BMPs when clean up is completed.
- 5) Implement Water Management BMPs, as needed to divert runoff around the damaged area.
- 6) Avoid sidecasting of soil in all cases where it could be delivered into a watercourse, riparian area, roadside ditch or storm drain. Do not sidecast outside of the County right-of-way, without landowner's permission. In some instances, under the following guidelines (See Table below), sidecasting is allowable given remote distances from spoils storage sites. In these cases, the setback distance required depends on slope and vegetation. The presence of vegetation helps to slow the travel of sediment downslope, so good judgment is needed to assess the situation. *Do not sidecast at all* if the slope is sparsely vegetated and it appears that sediment will travel with rain runoff into a stream or estuary system, even if setback distances are applied.

SLO COUNTY 2006 ROAD MAINTENANCE 8 - 7

On slopes of 5:1 (20% gradient) or less, sidecasting is allowed beyond 150 feet of a watercourse, streamcrossing, riparian area, roadside ditch or storm drain. On 2:1 slopes (50%) or less, sidecasting is allowed beyond 300 feet of a watercourse, stream crossing, riparian area, roadside ditch or storm drain. On slopes greater than 2:1, typically sidecasting is *not allowed at all*, however there may be rare instances on slopes greater than 2:1 where sidecasting is acceptable given very long distances from waterbodies and good vegetative cover. Seek advice from County Public Works Environmental staff or local fisheries agency staff when in doubt. Avoid concentrating sidecasting repeatedly in the same place. Never sidecast large amounts of soil from major landslides.

SLOPE GRADIENT	DISTANCE FROM WATERCOURSE, STREAM CROSSING, RIPARIAN AREA, ROADSIDE DITCH, STORM DRAIN	SIDECASTING RULE
Any slope	Appears that sediment will travel with rainwater into watercourse.	Not allowed
5:1 (20%) or less	150 feet or more	Allowed using good judgment
2:1 (50%) or less	300 feet or more	Allowed using good judgment
Greater than 5:1 (50%)	Vegetated slope long distance from watercourse	Allowed
Greater than 5:1 (50%)	Sparsely vegetated slope and it appears that sediment will travel with rain into watercourse	Not allowed

SLO COUNTY 2006 ROAD MAINTENANCE 8 - 8

- 8) Temporarily stockpile excavated soil away from streams, watercourses, or areas where run off will concentrate, until reuse or removal to a permanent disposal site. Implement erosion control BMPs on and around stockpiles to keep materials from eroding.
- 9) Use erosion control BMPs from the list below to repair and stabilize the slide area and the area disturbed during the repair. Use of biotechnical BMPs and native vegetation is preferable over hardscape techniques when appropriate for the site conditions. See *Chapter 8 - Erosion Control* for additional guidance about selection and implementation of appropriate BMPs, and consult with county engineering or planning as needed.
- 10) For biotechnical BMPs that require the establishment of vegetative cover, plan and implement ongoing vegetation maintenance and irrigation as needed.
- 11) After completion of construction, monitor the performance of long-term BMPs periodically, particularly after significant storm events. Perform immediate repairs or upgrades as necessary.



BMP TOOLBOX

Erosion Control BMPs

- Blankets/Geotextile Fabrics
- Coir Log/Roll
- Broadcast Seeding
- Hydroseeding
- Mulching
- Planting
- Surface Roughening & Soil Tracking
- Stepped or Terraced Slope
- Plastic Covering
- Rock Breast Wall
- Vegetated Geoberm Toe Wall

Sediment Control BMPs

- Brush Packing
- Sandbag
- Silt Mat Inlet
- Silt Mat/Vegetated Grassy Swale
- Silt Fence
- Sedimentation Trap/Sump
- Siltation Pond
- Storm Drain Inlet Protection
- Sweeping
- Turbidity Curtain
- Asphalt Berm
- Diversion Berm
- Energy Dissipater

Streambank Protection - Hardscape BMPs

- Boulder/Riprap
- Streambed Gravel

Water Management BMPs

- Diversion Berm
- Sandbag
- Slope Drain – Temporary
- Slope Drain – Overside
- Stream Bypass (Water Diversion)

PERMITS

MINOR SLIDE REPAIR	
Activity or Condition	Required Permit or Limitation
Instream Work	See chapter 6 - <i>Working is or near Stream Channels</i>
Bank Stabilization	See Chapter 6 – <i>Streambank Stabilization</i>

SPOILS HANDLING AND DISPOSAL

DESCRIPTION

Excess soil, sediment and debris are generated by a variety of county maintenance activities and must be handled and disposed of appropriately to keep these materials from eroding into streams and watercourses and impacting water quality. Activities generating these materials include excavation; grading; culvert cleaning; ditching, slide removal; drainage system maintenance; pavement removal; concrete work, and other activities. Site selection and stockpile maintenance guidelines for handling and disposal of these materials are provided below.

Note: The following standards are for non-hazardous materials. For handling of wastes or hazardous materials see *Chapter 4 - Waste Handling, Storage and Disposal* and *Chapter 4 - Hazardous Materials*.

ENVIRONMENTAL CONCERNS

- Discharge of sediment, debris, concrete, asphalt or organic material to streams or watercourses.
- Surface or groundwater impacts from leachate formed in organic material disposal sites.
- Destruction or harm to aquatic, riparian or wetland habitat, or to endangered or threatened plant and animal species due to placement of fill material.
- Catastrophic fill or slope failure due to improper placement of material.

SLO COUNTY 2006 ROAD MAINTENANCE 8 -11

BMP OBJECTIVES

- Protect water quality, aquatic habitat and riparian habitat by reducing erosion and sedimentation.
- Protect water quality by placing material that could generate leachate into properly permitted disposal facilities.
- Minimize impact to habitat and threatened or endangered species by selecting appropriate short term storage and disposal locations for spoils.

BEST MANAGEMENT PRACTICES

- 1) Identify and map existing permanent disposal sites that can be used for long-term disposal of materials from routine and emergency maintenance activities and provide this information to maintenance crews. These sites should be in upland areas, such as rock pits, ridges, and benches. Locations should be above the 100-year floodplain of the closest stream and away from any groundwater seeps or wetlands.
- 2) Temporary spoils stockpiles should be located in areas that are relatively level; relatively free of vegetation and outside the riparian zone; and away from streams, watercourses, wetlands, or areas where run off will concentrate. Do not place temporary spoils piles at the top of unstable slopes or at the edges of slopes. Remove temporary stockpiles to permanent disposal locations before the rainy season, or if work is conducted during the rainy season, as soon as feasible and before the next rain storm. Implement Erosion Control BMPs as referenced below on and/or around temporary spoil stockpiles to keep materials from eroding.
- 3) The performance of erosion control BMPs should be monitored routinely during construction, especially during and after storm events. BMPs should be maintained or upgraded as needed. Any materials not used at the site should be removed to a permanent disposal site at the conclusion of the construction project.
- 4) Reuse materials from spoils piles as much as possible. For example, clean soil may be used as fill for other projects.
- 5) Segregate and reuse or remove for recycling asphalt materials, concrete, and other construction waste, when feasible. These materials may be reused as fill for projects when they are placed in upland areas where they will not enter the stream system.
- 6) For permanent disposal sites, develop a long-term erosion and sediment control plan incorporating the use of Erosion Control and Sediment Management BMPs and a monitoring program to verify the effectiveness and long term integrity of the BMPs.

7) Avoid sidecasting of soil in all cases where it could be delivered into a watercourse, riparian area, roadside ditch or storm drain. Do not sidecast outside of the County right-of-way, without landowner's permission. In some instances, under the following guidelines (See Table below), sidecasting is allowable given remote distances from spoils storage sites. In these cases, the setback distance required depends on slope and vegetation. The presence of vegetation helps to slow the travel of sediment downslope, so good judgment is needed to assess the situation. *Do not sidecast at all* if the slope is sparsely vegetated and it appears that sediment will travel with rain runoff into a stream or estuary system, even if setback distances are applied. On slopes of 5:1 (20% gradient) or less, sidecasting is allowed beyond 150 feet of a watercourse, stream crossing, riparian area, roadside ditch or storm drain. On 2:1 slopes (50%) or less, sidecasting is allowed beyond 300 feet of a watercourse, stream crossing, riparian area, roadside ditch or storm drain. On slopes greater than 2:1, typically sidecasting is *not allowed at all*, however there may be rare instances on slopes greater than 2:1 where sidecasting is acceptable given very long distances from waterbodies and good vegetative cover. Seek advice from San Luis Obispo County Environmental Staff when in doubt. Avoid concentrating sidecasting repeatedly in the same place. Never sidecast large amounts of soil from major landslides.

SLOPE GRADIENT	DISTANCE FROM WATERCOURSE, STREAM CROSSING, RIPARIAN AREA, ROADSIDE DITCH, STORM DRAIN	SIDECASTING RULE
Any slope	Appears that sediment will travel with rainwater into watercourse.	Not allowed
5:1 (20%) or less	150 feet or more	Allowed using good judgment
2:1 (50%) or less	300 feet or more	Allowed using good judgment
Greater than 5:1 (50%)	Vegetated slope long distance from watercourse	Allowed
Greater than 5:1 (50%)	Sparsely vegetated slope and it appears that sediment will travel with rain into watercourse	Not allowed

SLO COUNTY 2006 ROAD MAINTENANCE 8 -13

8) Except as provided in #5 below, do not leave loose soil piled in berms alongside the road or ditch. Loose or exposed soil berms are erodible and readily flushed into waterways and storm drains. Remove excess berm material before the rainy season. If placed in emergency during the rainy season, remove as soon as possible before the next rain. Dispose of all excess materials from shoulder maintenance activities in appropriate spoil disposal sites. (see Spoils Handling and Disposal).

9) Berms are used in some places for traffic delineation or public safety (i.e. line of sight along soft shoulders with steep drop-offs). If any berm is left in place it must be kept to a minimum height and be compacted and stabilized with seeding or asphalt. Use Erosion Control BMPs to stabilize berms that are being left in place for road delineation.

10) Frequent well placed breaks in the berms are necessary to allow water to drain from road and back into its original channel, preserving the natural drainage pattern of the slope. Check the areas breached to make sure they are stable. If erosion occurs at berm breaching areas, or the seeding is not in yet and rains are approaching, apply Erosion Control BMPs directly.

11) Dispose of concentrated amounts of vegetation that can generate leachate capable of affecting surface or groundwater quality only at permanent disposal sites that have Waste Discharge Requirements (WDRs) for this purpose from the RWQCB, or for which WDRs have been waived. 12) Leave large woody debris in place if it does not increase the potential for flooding or damage to structures, create a public nuisance, create a fire hazard, or impact public safety. Large woody debris that is removed should be segregated and stored for future habitat improvement, when feasible.

12) Leave cut brush and branches remaining in riparian areas, adjacent to streams, when cut vegetation:

- Does not cause a safety concern or fire hazard;
- Does not contain noxious weeds (consult with appropriate staff about types and locations of noxious weeds);
- Is not stockpiled in concentrated areas that can release leachate to surface water; and
- Does not disturb existing drainage patterns.

14) When feasible, chip removed vegetation and reuse as mulch. Avoid mixing or burying organic materials in soil stockpiles as this limits the potential for future use.

SLO COUNTY 2006 ROAD MAINTENANCE 8 -14

BMP TOOLBOX

Erosion Control BMPs

- Blankets/Geotextile Fabrics
- Coir Log/Roll
- Mulching
- Planting
- Plastic Covering
- Seeding

Sediment Management BMPs

- Sand Bag
- Silt Fence
- Storm Drain Inlet Protection

WARNING: *Discharge of pollutants into streams from stockpiles can lead to fines from the Regional Water Quality Control Board or California Department of Fish and Game.*

PERMITS

SPOILS HANDLING AND DISPOSAL	
Activity or Condition	Required Permit or Limitation
Grading	<ul style="list-style-type: none">• County Grading Ordinance• County Noxious Weeds Ordinance• Conditional Use Permit – County Planning Dept.• Waste discharge requirements issued or waived by the RWQCB
Disposing of material on United States Forest Service or Bureau of Land Management land	Special Use Permits may be required
Coastal Zone	Coastal Development Permit may be required
If spoils are placed above ordinary high water zone and away from wetlands	Permits are not required from other State or Federal agencies