Shoreline Erosion and Sediment Control for Residential Development:

Best Management Practices

Introduction

This report is a follow up to the *Single Family Residential Development Stormwater Management Review* (July 2, 2014) which addressed the County's minimum requirements for erosion and sediment control. This report goes a step further to specifically address erosion and sediment control along shorelines, including best management practices for controlling shoreline sedimentation, analysis of current code requirements, and recommendations for improvements.

Shoreline Erosion and Sedimentation

Simply stated, erosion is the movement of soil and sedimentation is the deposition of soil. When erosion and sedimentation occur adjacent to the shoreline, it is has the potential to cause serious damage to environmentally sensitive aquatic environments. Erosion and sedimentation are naturally occurring processes, but are frequently exacerbated by development activity.

Aquatic environmental damage occurs in two ways: (1) Small particles that remain suspended in the water reduce the amount of sunlight and heat reaching aquatic vegetation; and (2) heavier particles sink to the water bottom smothering aquatic life in those areas. This results in loss of important nursery habitat and food sources for fish and other species. Not only does shoreline erosion have the potential to cause more harm than upland erosion, it is also be more difficult to clean up or reverse.

Santa Rosa County has approximately 108 miles of shoreline along the Gulf of Mexico, Santa Rosa Sound, and numerous bays, basins, and bayous. Most of the land adjacent to those shorelines is zoned for low density residential development. While individually those projects are often small in scale with limited potential for erosion of large amounts of soils, the cumulative damage from erosion and sedimentation could have far-reaching effects.

Regulatory Goal

With regard to erosion and sedimentation, the regulatory goal is straightforward: keep all soil, whether naturally occurring or brought in as fill, on the subject property during and after development.

Best Management Practices

The *Florida Stormwater Erosion and Sedimentation Control Inspector's Manual*, (Florida Department of Environmental Protection, 2008) identifies best management practices for erosion and sedimentation control including structural and non-structural practices. Those practices that seem most suited for residential shoreline development are summarized below. Excerpts from the Manual with more specific information are included in the appendix.

Construction Sequencing

Construction sequencing is the process of coordinating the construction schedule to minimize the amount of area disturbed at any one time and coordinating land clearing with the installation of erosion control measures. As it applies to shoreline development, activities should be coordinated to achieve stabilization of the area between construction and the water's edge early in the development process.

Silt Fence

Silt fences are temporary barriers consisting of a filter fabric stretched across and attached to supporting posts and entrenched. Some silt fence is wire reinforced for support. Silt fences slow the velocity of water and retain sediment onsite.

The Manual notes that the most effective application is to install two parallel silt fences spaced a minimum of three feet apart. As noted below, hay bales are physically sturdy and are therefore good to use in conjunction with site fencing. Specifically, a row of hay bales between the two row of silt fencing would be a good option.

Because the proper installation of silt fencing requires the fabric to be trenched into the ground, this method may not be best suited for shoreline areas that are not otherwise disturbed by lot grading or fill, such as vegetated shorelines.

Hay Bales

Silt fences trap a higher percentage of suspended sediments than hay bales; therefore, the Manual does not include hay bales as a stand-along best management practice. Other resources note that because they do filter stormwater and are physically sturdy, properly staked hay bales can provide beneficial physical support for silt fences without the added land disturbing that occurs with trenched silt fences. When hay bales are used in shoreline areas, two rows of staked hay bales with a row of silt fencing between them is recommended.

Filter Sock

A filter sock is a three-dimensional, tubular sediment control and stormwater runoff filtration devise, typically used for the perimeter control of sediment and soluble pollutants. The filter sock is used similarly to silt fencing, but does not require trenching and, therefore, may be more appropriate in vegetated areas.

Seeding and Mulch

Seeding is one method that can be used to establish vegetative cover on disturbed areas. When used in shoreline areas, seeding should be accompanied by other erosion control methods such as silt fencing until the vegetation is established.

Mulch should always be used in conjunction with seed when the goal is to control erosion. Mulch protects the soil surface from raindrop impacts, reduces the velocity of overland flow, and fosters the growth of vegetation by increasing available moisture and providing insulation

against extreme heat and cold. Products such as grass seed mats are also available that combine seed with fertilizer and a binding agent which allows for ease of installation, fast germination, and added erosion control.

For residential shoreline development, mulch should be laid down between the structure and the shoreline after rough grade is established. This will provide temporary erosion control until final grade is established and permanent vegetation is installed.

Sodding

Sod is used to stabilize fine-graded disturbed areas by immediately establishing permanent grass stands. Sod serves to both stabilize the soils to prevent erosion and catches soil particles that have been suspended in the flow of stormwater before they reach the water body.

Trees, Shrubs, Vines, and Ground Covers

Disturbed areas can be stabilized by establishing vegetative cover with trees, shrubs, vines, or ground covers in areas where vegetation other than turf is preferred. When used along shorelines, the combination of plantings and mulch must ensure that the goal of erosion prevention is accomplished and other erosion control methods such as silt fencing should be used until the vegetation is established.

Tree Preservation and Protection

The protection of trees and other natural vegetation from mechanical and other injury during land-disturbing and construction activities can protect shorelines from erosion and sedimentation, depending on the location and composition of the natural vegetation. This option can also serve to provide habitat for native wildlife, landscape beautification, shade, and other environmental benefits.

Natural vegetation heavy enough to prevent erosion may also block water views and is, therefore, typically thinned or removed. In such cases, other erosion control methods should supplement the natural vegetation and should remain in place for the duration of the construction period and until all disturbed areas are stabilized by vegetation.

Land Development Code Requirements

Article 12 of the Land Development Code contains regulations designed to protect shorelines and adjacent water bodies from erosion and sedimentation. The relevant Article 12 provisions are shown below along with notes related to implementation. (Note – several lettered sections are omitted because they do not relate to this topic.)

LDC Section 12.01.02: Design Standards in Areas Adjacent to Shoreline Protection Zone

C. The development shall leave a minimum of 25 percent of the site as trees, shrubs, or other natural vegetation, or replace existing trees at a minimum ratio of 2:1.

Implementation notes:

To ensure shoreline protection, this subsection should be modified to ensure erosion and sedimentation control between the development area and the shoreline. Rather than focusing on a percentage of the lot to remain in natural vegetation, or a ratio for replacing trees, this section should allow, encourage, or require the use of natural vegetation supplemented with other erosion control methods as needed to accomplish the goal.

D. Point source and non-point source discharges are prohibited, except for stormwater, which may be discharged only if it meets the following minimum standards:

1. Stormwater discharges shall provide off-line retention or off-line detention with filtration of the first one inch of run-off.

Implementation notes:

An engineered site plan would be necessary to implement this section. Larger scale projects such as commercial, industrial, multifamily, and subdivision development must meet the stormwater standards found in LDC Article 4 which require both retention and detention.

FDEP's National Pollutant Discharge Elimination System (NPDES) Stormwater Program regulates construction activities that disturb one or more acres of land or individual projects that are part of a common plan of development cumulatively impacting more than one acre. An option for revising this section of the LDC would be to establish a similar threshold for requiring retention and detention of stormwater.

E. Siltation and erosion control measures shall be applied to stabilize sands and other un-vegetated areas during and after development. Sediment settling ponds shall be installed for stormwater runoff prior to the creation of any impervious surfaces. For lots or parcels that are cleared, silt screens shall be placed between the development site and the water body to prevent erosion and siltation. If red clay or clay-sand mixtures are used as allowed in section "K" below, silt screens must be supplemented with hay bales.

Implementation notes:

This section specifies the use of silt screens for cleared lots. This should be modified to require the best management practices described above (two rows of silt fencing with hay bales between, two rows of hay bales with silt fencing between, or filter sock), and to also require such measures when fill is brought in for development.

"Settling ponds" on smaller residential lots are impractical. For larger lots, the stormwater retention discussed in subsection D above accomplish the same purpose; therefore, it is recommended that settling ponds be removed from subsection E.

J. If no natural vegetation exists, strips of buffer vegetation shall be planted between development activities and the Shoreline Protection Zone. Such buffer may be composed of sod

or native species of trees, shrubs, or groundcover. Buffers shall be a minimum of ten (10) feet wide.

Implementation notes:

Although vegetation is an excellent means of preventing erosion and of catching sediment before it reaches the shoreline, this section should be revised to ensure achievement of the goal. For example, planting of trees alone will not prevent surface erosion and should be combined with thick plantings of undergrowth or ground cover. In addition, landscaping typically occurs at the end of a construction project after final grade is established and irrigation is installed; therefore, other erosion control measures would be needed until the vegetation is established.

K. Red clay and other discoloring materials are prohibited on Navarre Beach, consistent with section 12.05.00. The use of red clay or clay-sand mixtures is limited to foundations and driveways for parcels within and adjacent to Zone 2. Red clay or clay-sand mixtures used for driveway construction must be capped within seven (7) days. Red clay or clay-sand mixtures used for foundation construction must be capped within 45 days. White sand, oyster shell, limestone and white dolomite are among materials approved for fill or masonry mixes for new development or redevelopment projects on Navarre Beach.

Implementation notes:

In practice, limiting red clay to foundations and driveways is feasible; however, the limitation of "clay-sand mixture" has been difficult to implement since most soil found in this area contains some amount of red clay. Rather than controlling the location of soil mixtures, enhanced erosion control measures as discussed above should be used.

When shoreline setback variances are granted, the foundation and driveway areas are located closer to the shoreline which may be problematic when red clay is used. To mitigate this potential impact, shoreline setback variances should include a condition that enhanced erosion control measures be used.

Recommendations

Recommendations for improving erosion and sedimentation control along shorelines fall into three general categories:

(1) Amend Existing Regulations to Ensure that Requirements Accomplish the Goal;
(2) Improved Processes for Implementation of Regulations; and
(3) Education and Communication.

(1) Amend Existing Regulations to Ensure that Requirements Accomplish the Goal

Section 12.01.12 of the Land Development Code should be amended as noted above to ensure that the requirements actually accomplish the goal of protecting shorelines from erosion and

sedimentation. These recommendations include both removal of extraneous, hard to implement sections and adding more specific requirements for physically blocking sediment.

(2) Improved Processes for Implementation of Regulations

As recommended in the *Single Family Residential Development Stormwater Management Review*, the County has revised the permitting and inspection procedures to ensure that emphasis is placed on correct erosion control measures early in the development process.

- Require more detailed information be provided with a permit application.
    - Identify on the development plan the location and type of erosion and sedimentation control measures to be used.
- Require a site development permit for shoreline land disturbing activity.
- Require a pre-development site inspection for all shoreline development.
- Provide training for inspectors and contractors on installation and maintenance of erosion control measures.

(3) Education and Communication

Education of and communication with county staff, contractors, and the public can be accomplished in a number of ways that will serve to improve compliance with county code.

- Provide training for inspectors and contractors on erosion and sedimentation control.
- Mail out notices to targeted subcontractor groups advising of county code related to shoreline protection.
- Utilize the county website (including links to other sites as appropriate), county publications, standard media, and social media to educate property owners on shoreline protection topics.