Erosion Control 101 for Puerto Rico -- FACTSHEET

Puerto Rico Erosion & Sediment Control Law & Handbook

- *Regulation for the Control of Erosion and Prevention of Sedimentation*, Resolution Number R-97-46-2, December 30, 1997, Rule 1200 – 1270
- *Puerto Rico Erosion and Sediment Control Handbook for Developing Areas*, Puerto Rico Environmental Quality Board & USDA Natural Resources Conservation Service, March 2005

Contents of Handbook

- Planning Principles for Erosion and Sediment Control (ESC)
- ESC Best Management Practices (BMPs)
    - Minimum BMPs for Construction Sites
    - Construction Sequence
    - Vegetative Practices
    - Structural Practices
- Storm and Runoff Practices
- Guidelines for Use of the Revised Universal Soil Loss Equation (RULSE)
- Hydrology
- Many Appendices

Priority Practices for Implementation in Puerto Rico

The Handbook is a comprehensive list of practices that should be implemented on construction sites. However, implementation of all the BMPs in the Handbook will take time. The priority practices for Puerto Rico are those that may be implemented first to gain experience with BMPs. Priority practices have the following characteristics:

- Specifications in PR Handbook
- Good fit for island conditions (slopes, rainfall, etc.)
- Simple but effective
- Good cost/benefit
- Ease of implementation

Priority practices are as follows:

1. Minimize Site Clearing
2. Construction Phasing
3. Construction Entrance
4. Silt Fence, properly installed
5. Rapid Soil Stabilization
6. Traps, Basins & Diversions

Note: Estimated costs are based on Mid-Atlantic costs. Actual costs in Puerto Rico may vary depending on the availability and cost of materials.

1. MINIMIZE SITE CLEARING			
Description	**Reference to PR ESC Handbook**	**Issues With Implementation**	**Estimated Cost**
• Clearing ONLY areas necessary for construction • Buffering sensitive features and keeping construction equipment and vehicle parking out of those areas (including temporary fencing & signage)	Sections 2.6 & 2.8: Restrict construction to least critical areas; retain existing vegetation; avoid streams, flood plains, steep slopes, erodible soils; pay attention to drainageways, outlets, and stream crossings; physically mark limits of construction Section 3.2, Minimum ESC BMPs: Use "more conservative" BMPs next to sensitive areas Section 3.4.1, Tree Preservation & Protection: Protect important trees during construction Section 3.4.10, Riparian Forest Buffer: Preserve and protect vegetation along waterways	• Demands change in site plan procedure • Requires strong link from plan to field • Requires education of contractor and all subcontractors about limits of clearing • Requires clear delineation in the field; different types of fencing (silt, orange, chain link) are variably effective • Some "protected" areas provide shelter to predators (important if there are rare/endangered species	Variable – may be extra cost for plan preparation and review and for fencing. However, this technique can also save money by limiting structural ESC controls, repairs, and maintenance.

2. CONSTRUCTION PHASING			
Description	**Reference to PR ESC Handbook**	**Issues With Implementation**	**Estimated Cost**
• Disturbing limited areas and stabilizing before moving to next area. • May require temporary stockpiles. • Good tool if site goes into rainy season before final stabilization. • 15 acre threshold recommended.	Section 2.8, Implementing the Plan: Limit size of areas exposed at any one time Sections 3.3 & 3.3.1, Construction Sequence: Work schedule that coordinates timing of construction with installation of ESC practices (NOTE: construction sequence is only one component of construction phasing)	• Can be challenging to balance cuts & fills within limited areas, • Certain equipment may need to be mobilized more than once • Phases should correspond to drainage boundaries • Need to coordinate with dry/rainy seasons in terms of stabilization.	Variable – may entail extra costs for mobilization and stockpiling. However, this technique can also save money by limiting structural ESC controls, repairs, and maintenance.

3. CONSTRUCTION ENTRANCE			
Description	**Reference to PR ESC Handbook**	**Issues With Implementation**	**Estimated Cost**
• Defined and stabilized entrance to construction site from paved road • May also include vehicle wash rack for tire washing; wash water must go to silt trap, dirt bag, or vegetated area	Section 3.2, Minimum ESC BMPs: Don't wash equipment or vehicles near waterways Section 3.5.1., Stabilized Construction Entrance: Define ingress and egress from paved roads.	• 1st thing to do at site. • Requires careful oversight by contractor to make sure that all vehicles & subcontractors are using entrance • Wash water must be managed (diverted to trap, dirt bag, or vegetated area) • Requires periodic maintenance (replace stone)	$2,000 -- $3,000 for "deluxe" version (paved with wash rack). Less for simple entrance with stone and filter fabric.

4. SILT FENCE – PROPERLY INSTALLED			
Description	**Reference to PR ESC Handbook**	**Issues With Implementation**	**Estimated Cost**
• Perimeter control for small disturbed areas where runoff is sheet flow • Requires silt fence, stakes, and possibly reinforcement with wire mesh	Section 3.5.4., Silt Fence: • Designed for sheet flow • Drainage Area < 0.25 acres/100 linear feet of fence (max. 1 acre) • Flow path < 100 feet • Slope < 50%	• Commonly suffers from installation issues (not trenched in, posts too far apart, drainage area too large, etc.) • Not appropriate for drainageways with concentrated flow • Maintenance is chief issue. Requires repair after storms and/or sediment accumulation – needs to be cleaned when sediment level reaches 1/3 to ½ height of fence • Construction traffic often runs over fence, and it must be repaired	$5 per linear foot

5. RAPID SOIL STABILIZATION			
Description	**Reference to PR ESC Handbook**	**Issues With Implementation**	**Estimated Cost**
• Vegetative cover and/or anchored mulch for areas that may or may not be at final grade • Should be applied when grade will not change for a minimum of 14 to 30 days • Provides most effective erosion control	Sections 2.6 & 2.8, Planning Principles: Vegetate and mulch denuded areas Section 3.3.1., Construction Sequence Temporary stabilization during extreme weather conditions Section 3.4.3, Mulching • Organic mulch (grass hay, wood chips), Inorganic (landscaping fabric, mainly for weed control), hydroseeding w/ mulch. • Anchored with tackifiers, emulsions, pinning, netting, crimping, etc. Section 3.4.5, Temporary Seeding: • Can be used to stabilize site for up to 1 year • Species include: Ryegrass, Brown Top Millet, Habichuela deterciopela, Velvet bean, Neonotonia wightii	• Soil compaction/poor soils (need to loosen, amend, and scarify) • Poor germination requires overseeding or reseeding • Need for irrigation • Competition from weed seeds and invasives	$1,500 per acre (includes permanent seeding and stabilization). Temporary and permanent vegetative cover is the most effective erosion control, and can save money if the need for structural ESC practices (which are more expensive) is reduce or eliminated.

6. TRAPS, BASINS & DIVERSIONS*			
Description	**Reference to PR ESC Handbook**	**Issues With Implementation**	**Estimated Cost**
• Perimeter controls for larger drainage areas (greater than 3 acres) • Use either weir outlet (trap) or barrel & riser (basin). • Mostly used in conjunction with diversion dikes/berms to define and limit drainage area	<u>Section 2.6, Planning Principles:</u> Trap sediments onsite, divide site into small drainage areas for ESC measures <u>Section 3.3.1, Construction Sequence:</u> Use additional practices before storms <u>Section 3.5.2, Temporary Sediment Trap</u>: • Drainage area < 5 acres • Storage capacity of 1,800 cubic feet/acre • Designed for 2-year 24-hour storm • 3:1 length/width ratio desirable • Not located within 20' of building foundation • Embankments < 5 feet • Clean out at 1/3 of design depth <u>Section 3.5.3, Sediment Basin:</u> • Drainage area > 5 acres disturbed & < 100 acres • Storage volume based on RUSLE; 1,800 cubic feet of storage per acre • EPA requirements for 10 or more disturbed acres, including increased storage requirement • Can be designed as permanent measure • Clean out at 50% of design volume	• Construction sequence is critical; perimeter controls must be constructed prior to disturbance • Proper compaction of embankments is necessary • Requires access for maintenance (all weather road) • Maintenance and clean-out schedule must be adhered to • Phasing is needed if area used for trap or basin is within development footprint • Safety & liability issues – fencing may be needed, overflow must have safe overland route	$1,000 per disturbed acre

*** Traps & basins are the most expensive ESC practices among the priority practices. The need for these structural perimeter controls can be reduced by careful ESC planning – primarily by keeping the size of disturbed drainage areas to a minimum through the use of the other priority practices.**