Erosion and Sediment Control Practical Solutions

Leon Cordeau, P.Eng.

Project Engineer

EHL Construction Services Inc.

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My Background

- Civil Engineer
  - Structural Design and Site Supervision (2-3yrs)
- Operations Supervisor and Project Engineer with NSTIR for 12 years.
- Instructor at NSCC for 8 years
  - Previously taught “Green Card” Certification in cooperation with NSTIR.
- Quality Manager – Emera Utility Services

My Concerns

Objective

1. Understand the processes of practical solutions to Erosion and Sediment Control problems.
2. Interpret Fact Sheets from the ESC Manual.

Link to NSPI ESC Manual

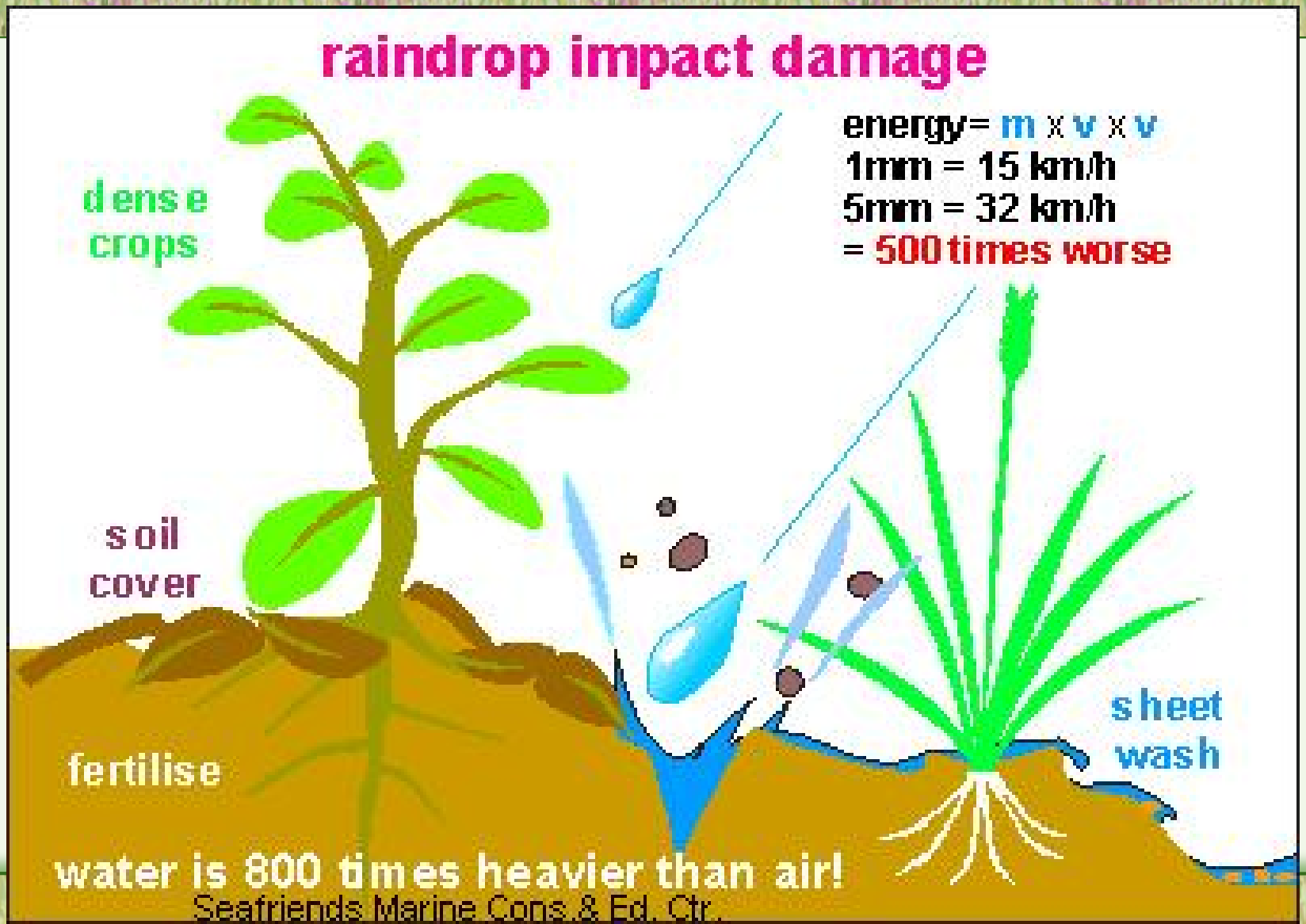
Link to NSTIR Handbook for ESC

http://www.gov.ns.ca/tran/works/enviroservices/enviroErosion.asp

Erosion Prevention vs. Sediment Control

http://upload.wikimedia.org/wikipedia/commons/7/79/Water_and_soil_splashed_by_the_impact_of_a_single_raindrop.jpg

Light rain vs. Heavy rain



Light rain vs. Heavy rain

Mass of a 1mm diameter rain drop = 0.5 mg

$KE = \frac{1}{2} * m * V^2 = \frac{1}{2} (0.5)(15)^2 = 56$

125x

Mass of a 5 mm diameter rain drop = 65 mg

$KE = \frac{1}{2} * m * V^2 = \frac{1}{2} (65)(32)^2 = 33{,}000+$

33,000/56 = 500+ times more energy!!!

Rain & Runoff

- Once soil is exposed, we have to prevent rain drops from dislodging sediment.

Photo by Melissa Martin – EUS Environment Specialist

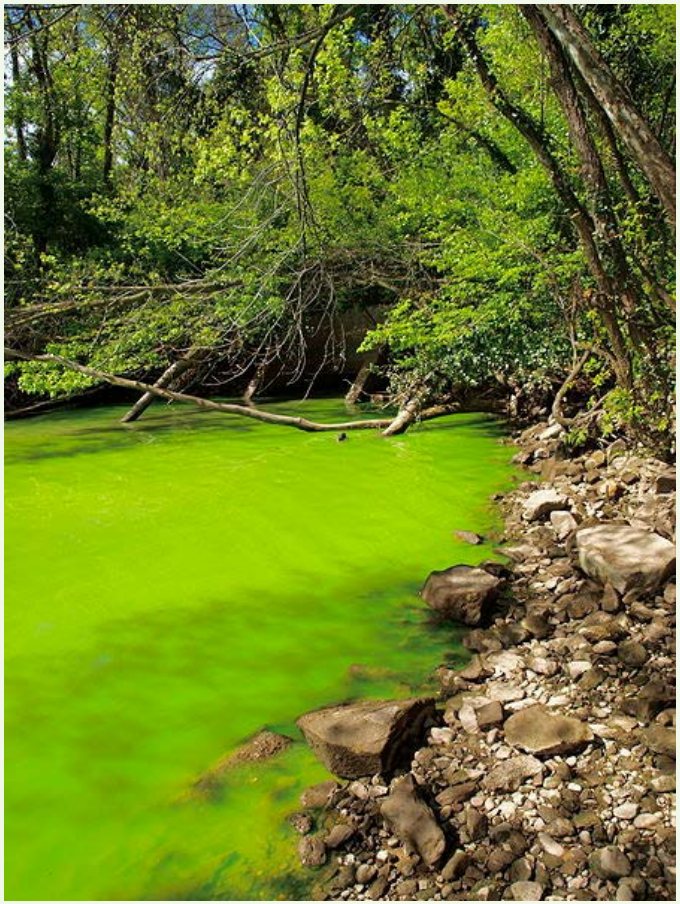
Mother Nature

- The power of water…

Culvert Washout.wmv

Eutrophication

- Depletion of oxygen & increase of phytoplankton due to increased levels of nutrients or chemicals.
  - Nitrogen
  - Untreated sewage
  - Fertilizers



Source: http://en.wikipedia.org/wiki/Eutrophication, May 4,2014

Retrieved from http://en.wikipedia.org/wiki/Eutrophication, May 4,2014

Eutrophication

- Eutrophication has a direct effect on the ecosystem
  - Decreases water transparency
  - Kills fish or
    - Loss of desirable fish species
  - Color, smell, and water treatment problems
  - Toxic or inedible phytoplankton species

Source: http://en.wikipedia.org/wiki/Eutrophication, May 4,2014

Undesirable Fish Species

- Chain Pickerel

Erosion Prevention and Control

- Once *sediment* has *eroded*, … it is very costly to *control*.

Photo by Melissa Martin – EUS Environment Specialist

How do you control this?

http://www.cbc.ca/news/canada/british-columbia/mount-polley-spill-blamed-on-design-of-embankment-1.2937387

ESC Handbook for Construction Sites

- Introduction
- Principles Overview
- Main Portion
  - ESC Fact Sheets (Two categories)
    1. Surface Stabilization
    2. Drainage Control

1. Surface Stabilization

- Grading Practices
- Riprap lining
- Geotextiles
- Buffer zones
- Temporary Matting
- Etc.

2. Drainage Control

- Diversion Ditch
- Dispersion Ditch
- Outlet Protection
- Chute
- Flow Check
- Siltation Pond
- Etc.

Fact Sheets

- Information includes
  - Purpose
  - Conditions where applicable
  - Advantages
  - Disadvantages
  - Design Considerations
  - Design Steps
  - Implementation Steps
  - Maintenance

Popular ESC Measures

- Filter Fabric Barrier – “Silt Fence”
- Flow Check
- Hay Bale Barrier
- Hay Mulch
- Rock Blanket
- Hydro-seeding
- ECB’s

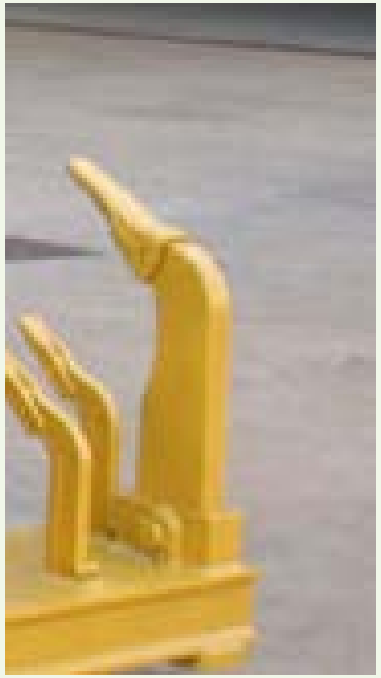
Photo by Melissa Martin – EUS Environment Specialist

Main Issue with Silt fence

Photo by Melissa Martin – EUS Environment Specialist

Installing Silt Fence

- Challenges – key in the silt fence



http://www.gessner.com.au/web-brochures/cat-grader-ripper

http://pixabay.com/en/excavator-buckets-backhoe-bucket-167743/

Check Dams - Fact Sheet 2.7

- Within the handbook, much attention to flow checks. 6 types described…
  - Brush
  - Rock
  - Gabion Basket
  - Plank
  - Sodded Earth Fill
  - Sandbag

Hay bale Flow Checks

Results of Hay Bale Flow Check

Flow Checks - Purpose

Flow Checks - Purpose

1. Slow the velocity of water
2. Helps vegetation - Collect soil & moisture
3. Traps sediment & prevents siltation

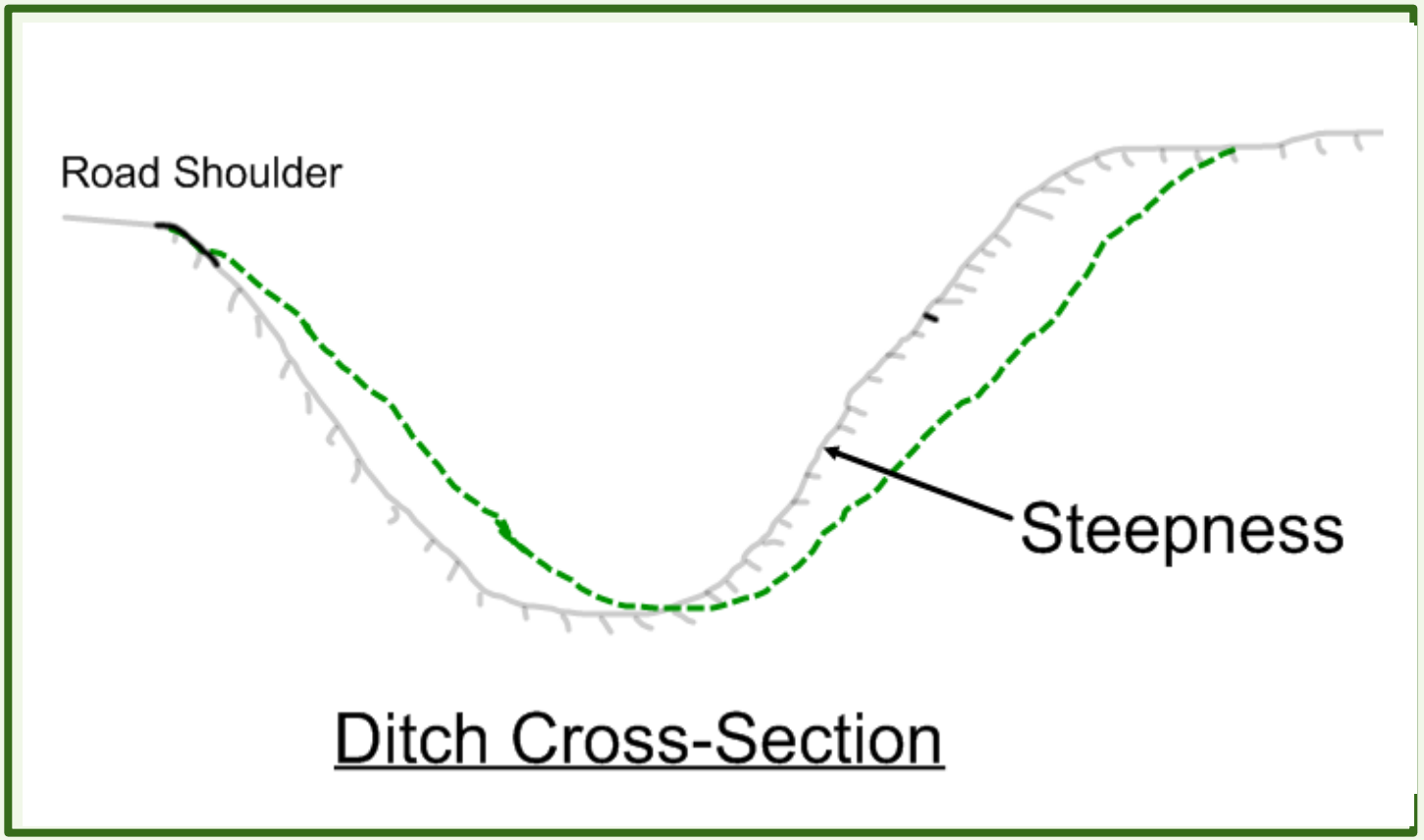
Flow Check Considerations

- DO NOT USE IN A WATERCOURSE!
- Use materials readily available
- Construct carefully to avoid washout
- Several small flow checks are preferred over a few large ones

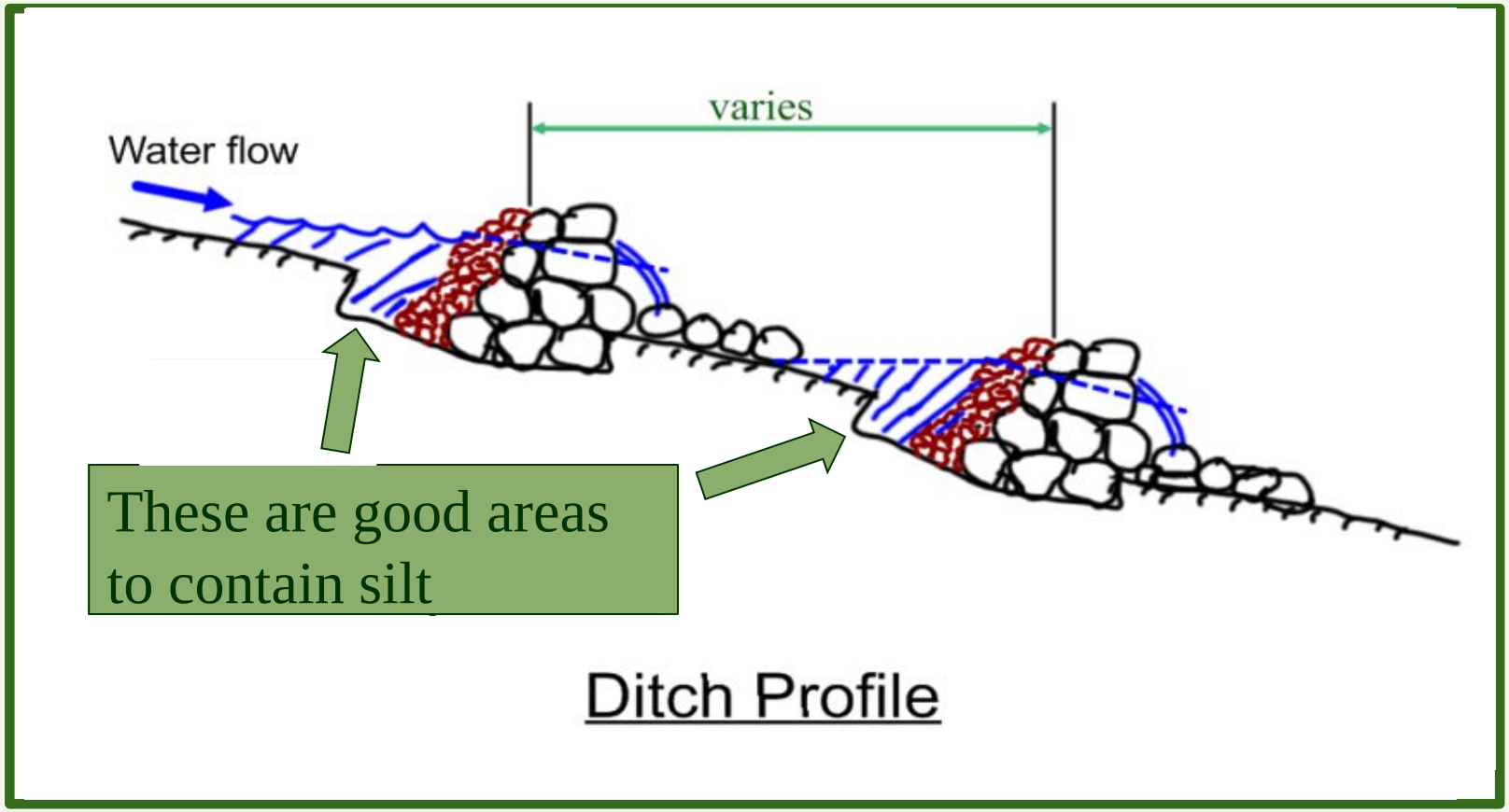
Rock Flow Check - 11 Design Steps

Cover in the next few slides

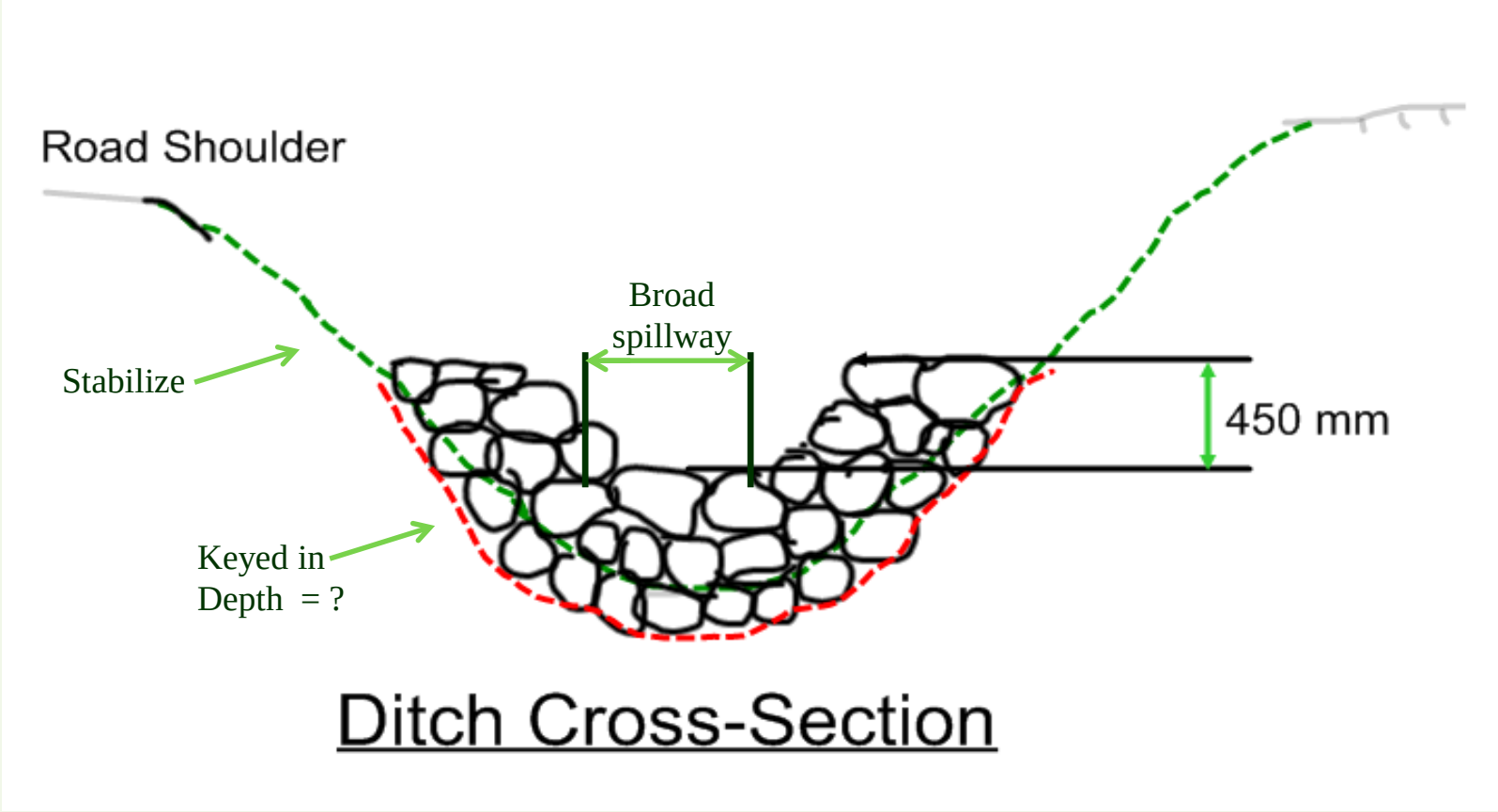
Rock Flow Check – Design (Section 2.7)



Rock Flow Check – Design (Section 2.7)



Rock Flow Check – Design (Section 2.7)



Return to ditch profile

Rock Flow Check Maintenance

- Replace dislodged stones
- Remove silt build-up from the upstream side

Retrieved from http://www.theraincatcherinc.com/gallery_erosion_control.html

L6001 access

Photo by Leon Cordeau

L6001 access – Divert Runoff

Photo by Leon Cordeau

L6001 – Structure 209 (wet area)

Photo by Leon Cordeau

L6001 – Structure 209

Source located – plan diversion

Photo by Leon Cordeau

L6001 - Access Road Condition

Photo by Melissa Martin – EUS Environment Specialist

Needs Work!

Before

Better!

After

Photo by Miles Heffernan – EUS PLT

L5501 – Mulch & Diversion

Where to divert?

Photo by Melissa Martin – EUS Environment Specialist

L5501 - Approach to a Stream

Photo by Melissa Martin – EUS Environment Specialist

L5501

Photo by ?

Before

L5501

Photo by Melissa Martin – EUS Environment Specialist

After

Control or Eliminate Water

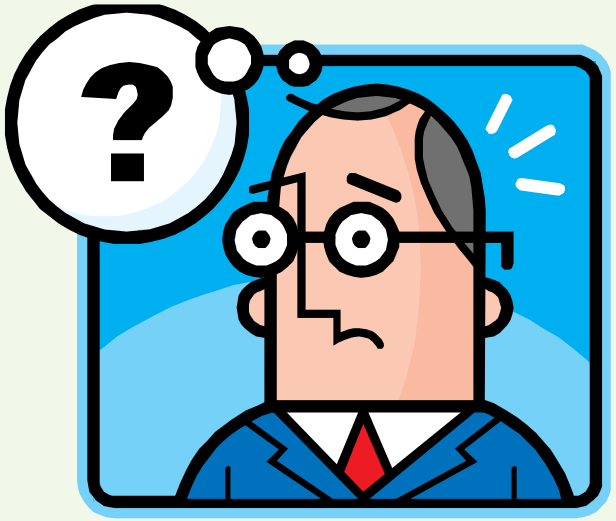
…before you start construction!

Hay Bale Berm – Issue?

Photo by Melissa Martin – EUS Environment Specialist

Thank You!

- Questions ???



- Contact information
- Leon.Cordeau@gmail.com
- (902) 222-4815