Lake County Contractors' Workshop
for Stormwater Protection

Best Management Practices for Construction Sites




April 23, 2014

Don Oliphant, PE, CFM, CPESC, CMS4S
Christopher B. Burke Engineering, LLC

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What is Storm Water?

- Storm water runoff, snow melt runoff, and surface runoff and drainage

- Pollutants include substances like:
  - sediment
  - concrete washout
  - paint rinse water
  - oil
  - waste
  - other substances

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Construction Site Runoff

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Getting Started

- Consider each stage of the project and phasing
- At a minimum, develop Soil Erosion and Sediment Control (SESC) Plans and Details for PROPOSED and EXISTING Conditions
- Implement the Site's Stormwater Pollution Prevention Plan (SWPPP)
- Post indication of permit coverage in prominent location
- Chapter 7 – Indiana Stormwater Quality Manual

Best Management Practices (BMPs)

- Selection
  - Erosion Control vs. Sediment Control
- Installation
- Inspection/Maintenance
- Alternatives
- Adapt. Every site is different…

Best Management Practices

- A BMP is a method, device, or practice for removing, reducing, or preventing pollution in stormwater runoff from reaching receiving waters.

- The following should be taken into consideration when selecting a BMP:
  - Drainage Area
  - Receiving Area (Field, Stream, Wetland, MS4)
  - Type of Pollutant
  - Type of Flow (Concentrated vs. Overland/Sheet)
  - Erosion or Sediment Control
  - Impact of Installation
  - Alternatives
  - Prior Enforcement Acts

Erosion Control

Implement effective erosion control, resulting in less sediment control

- Temporary Seeding
- Mulching/Polymers
- Erosion Control Blanket
- Blown and Crimped Straw
- Check Dams
- Construction Phasing
- Level Spreads and Rip Rap
- Slope Drains

Sediment Control

Sediment control is the secondary goal:

- Inlet Filters and Protection
- Sediment Traps and Basins
- Turbidity Curtains
- Floc Logs
- Sediment Filter Bags
- Silt Fence
- Coir Logs
- Filter Strips
- Construction Phasing

If the site is temporarily stabilized and the perimeter is secure, sediment control will be reduced. To start the SESC process…

Temporary Stabilization

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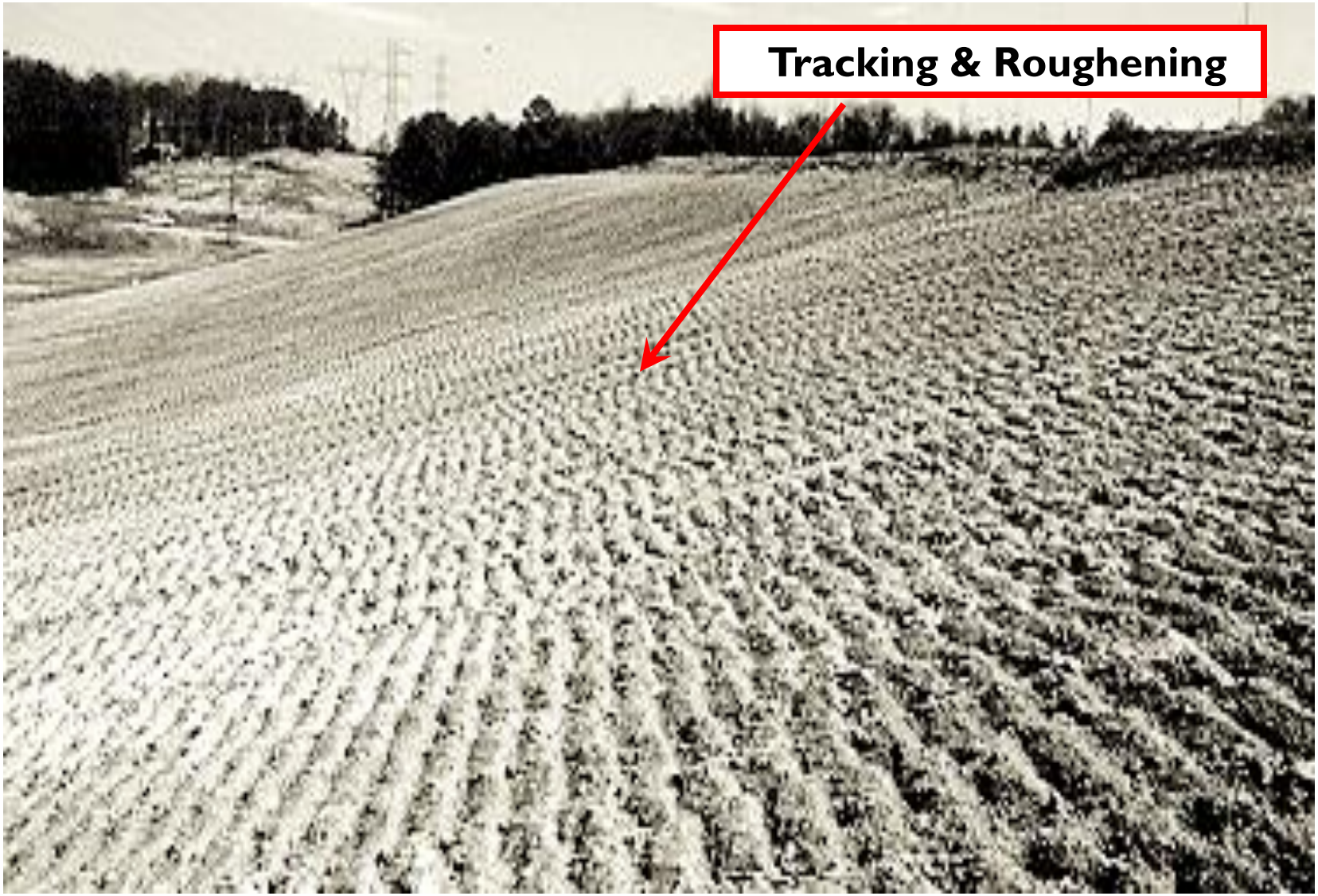
Temporary Stabilization

- Rule 5 Requirement
- If disturbed land sits idle for 15 or more calendar days, it should be stabilized.
- Best erosion control method for large areas
  - Seeding
  - Erosion Control Blanket
  - Hydro-Mulching
  - Polymers
  - Bonded Fiber Matrix
  - Combinations

Stabilization Practice: Straw Mulch



Stabilization Practice: Hydro-Mulch

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Stabilization Practice: Temporary Seeding

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Dust Control

- Spraying water and tilling are simple ways to control dust. Be careful with water application.
- New technologies continue to develop – Spray-on applications (Tackifiers, polymers, resins, emulsion chemicals, etc.).
  - Confirm they are environmentally friendly
- Can trigger a regulatory inspection

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Erosion Control Blanket

Installation

- Trenched-in
- Unrolled parallel to primary direction of flow
- Overlapped in the direction of flow
- Direct contact with soil
- Staple Patterns

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Erosion Control Blanket

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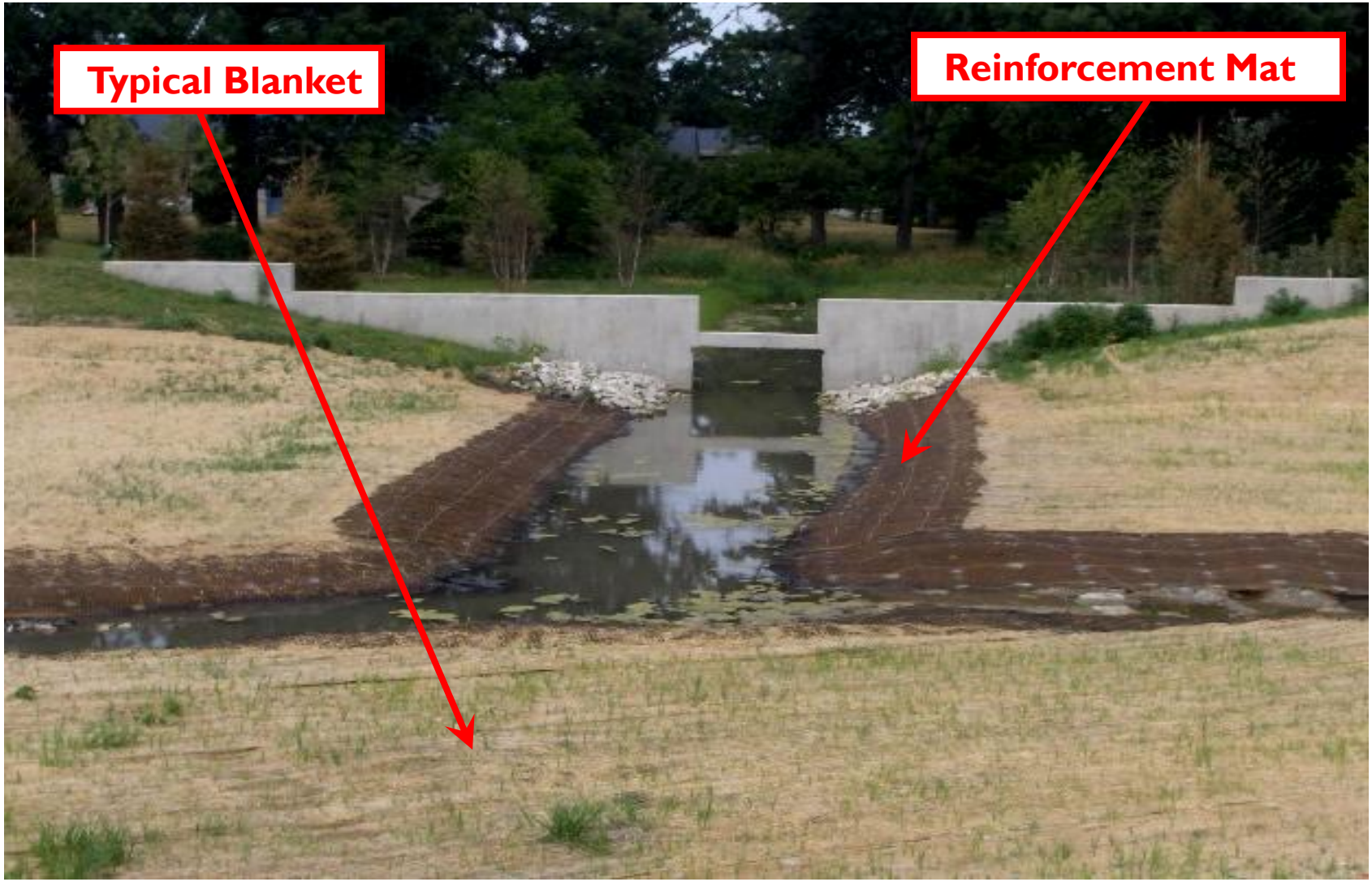
Erosion Control Blanket



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Log Matting Access Roads

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Silt Fence

- Tributary area to fence is appropriate
- Trenched into ground
- Backfilled
- Stake spacing w/ lath
  - 6 ft. no mesh, 8 ft. w/
- Wire Backing (if required)
- Sometimes double row
- Not for Concentrated Flow
- Initial Installations
- **NOT A FIX ALL!**

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Silt Fence Indicating Natural Resource Area

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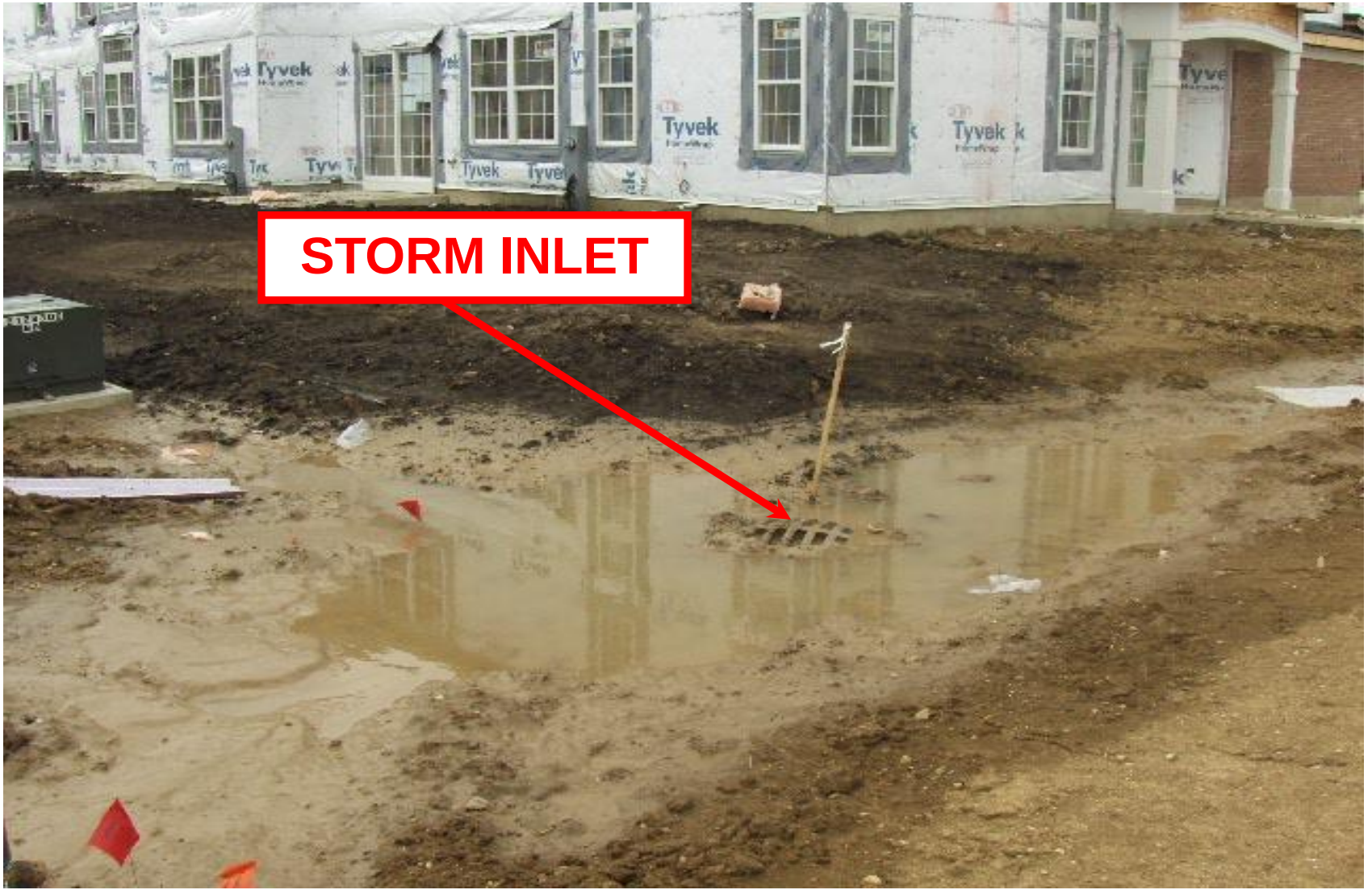
Silt Fence Indicating an Erosion Problem…

Inlet Protection

- Choose the appropriate BMP for each situation.
- Types of inlet protection include:
  - Pre-Fabricated Devices
  - Filter Baskets
  - Wattles
  - Stone
  - Vegetated Buffers
  - Silt Fence (if installed correctly), not under RIMs
  - Any combination of the above

Inlet Protection



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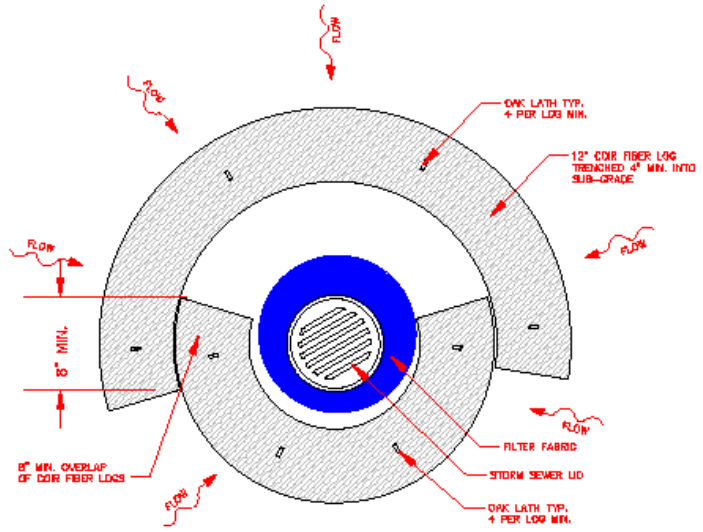
Wattles to Replace Straw Bales

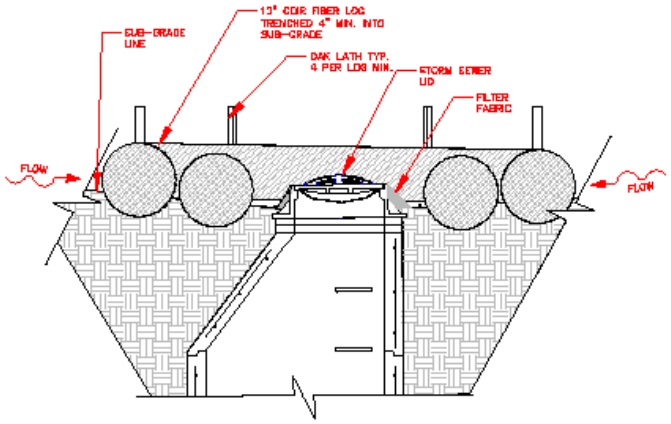
- Can be used in different applications
  - Ditch Checks
  - Bank Stabilization
  - Perimeter Control

Inlet Protection: Wattles



YARD GRATE INLET PROTECTION

PLAN VIEW



YARD GRATE INLET PROTECTION

SECTION

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Inlet Protection: Wattles

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Inlet Protection: Wattles Shortcomings…

Prefabricated: Long Term and High Flow

Prefabricated: Long Term and High Flow

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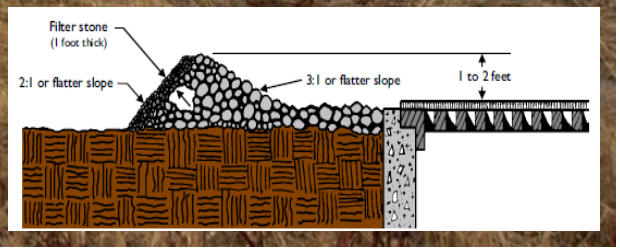
Stone Inlet Protection

Existing Vegetation Undisturbed

INDOT Agg. No. 5



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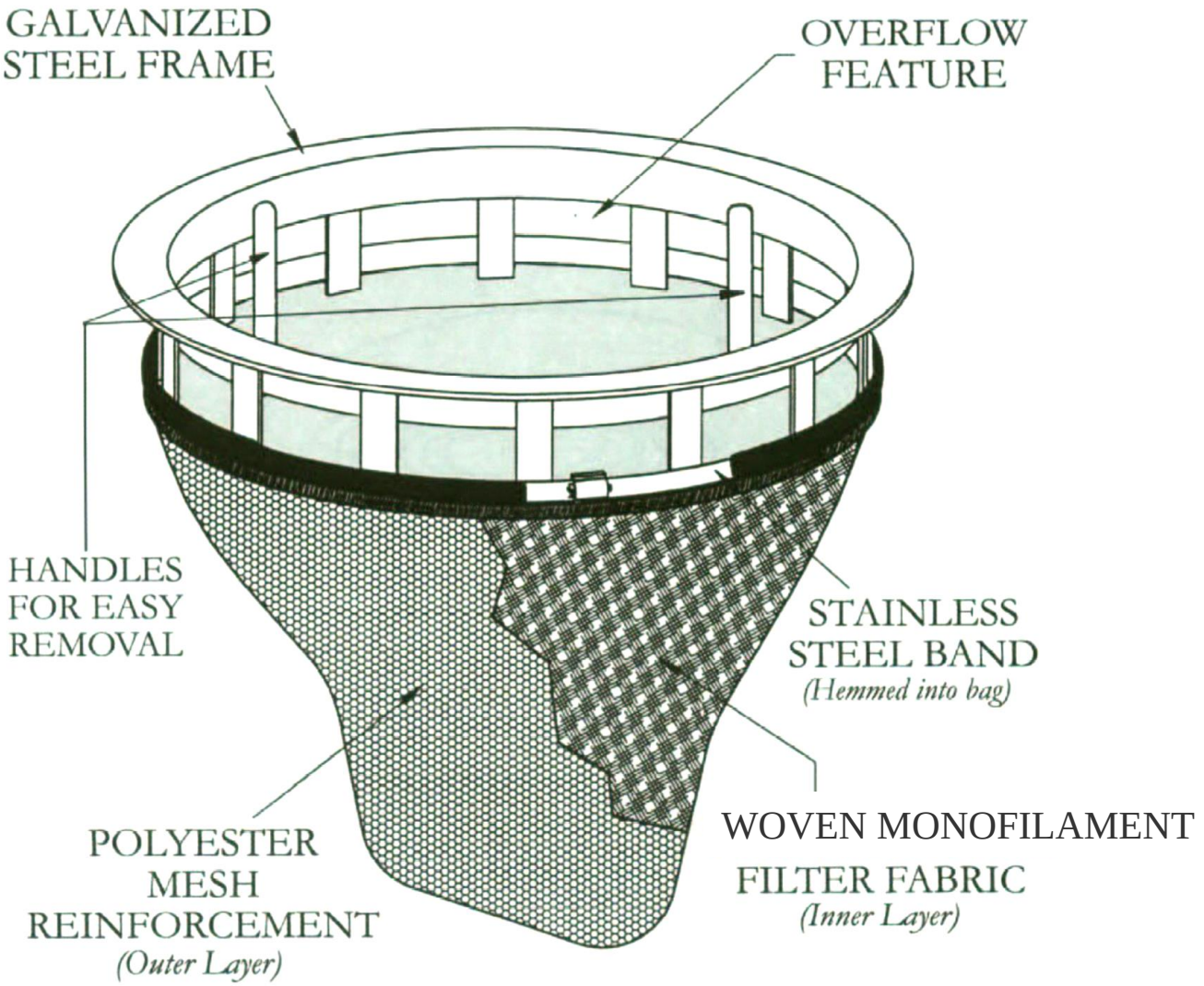
Street Inlet Protection

Inlet Protection: Filter Baskets



Filter Basket

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Result of Failing to Maintain Inlet Protection

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Vegetated Buffers

- Establish dense vegetation
- Width is determined by drainage area
- Combine with other BMPs
- Slows flow to promote infiltration and trapping
- Works well along paved roads/right of ways
- Not intended for concentrated flows
- More common is rural settings

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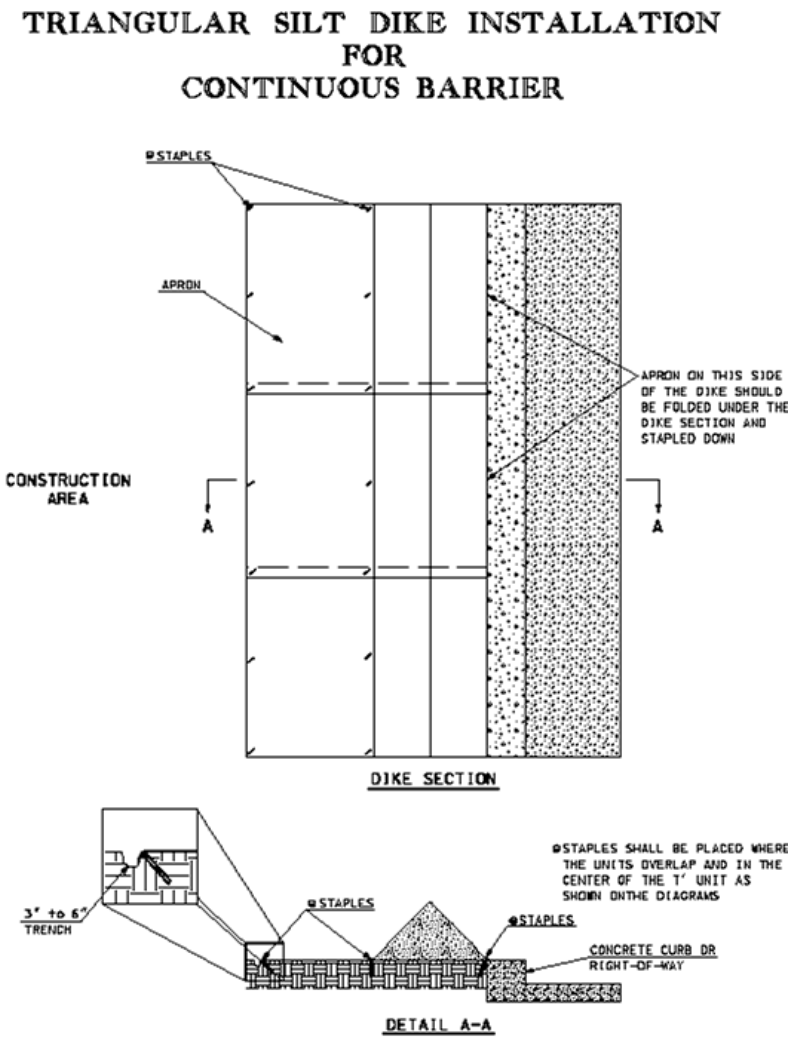
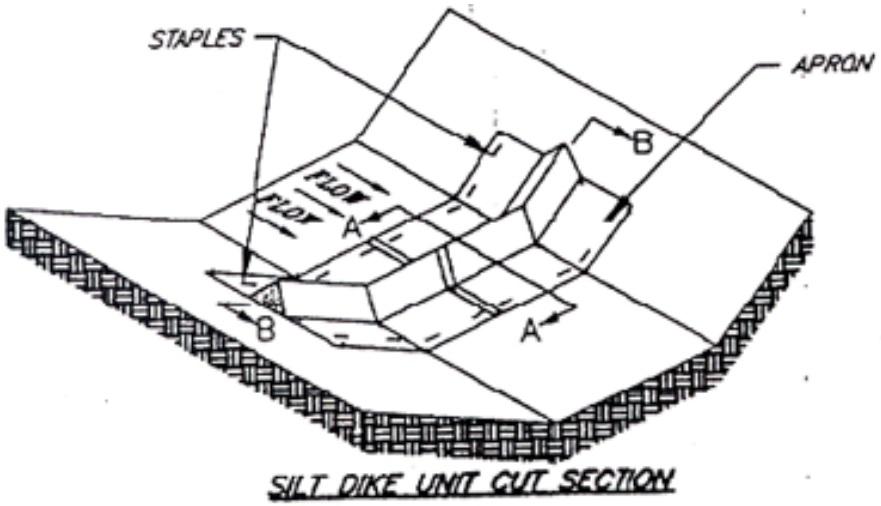
Triangular Silt Dikes





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Silt Dike Versatility

- Bale Alternative
- Durable
- Used in Direct Flows
- Perimeter Control
- Diversions
- Reusable

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Check Dams…Looks Good?

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Check Dams…
Take Your Mulligan

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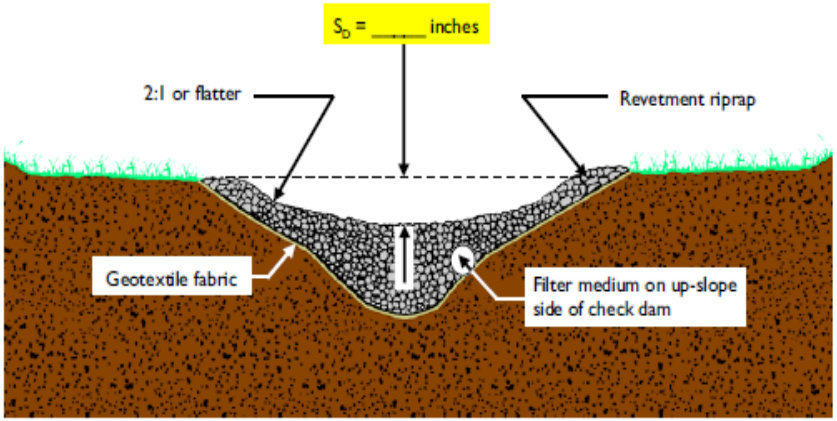
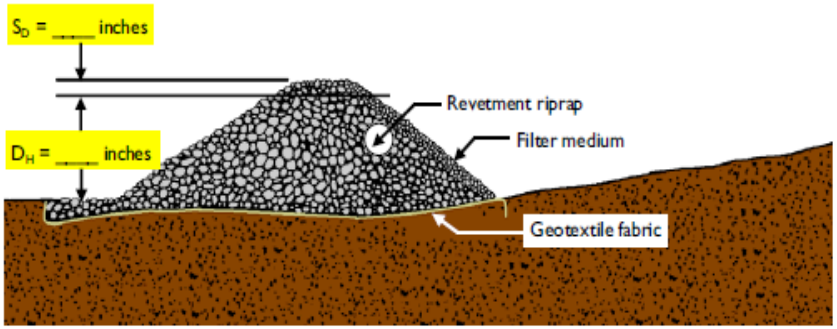
Rock Check Dams

- Proper Stone Size
  - Riprap (INDOT Agg. No. 8)
  - 3-Inch Face stone
- Concentrated Flow
- Require Maintenance
- 2:1 Max Side Slopes
- 2-ft Max Height
- Maximum Height
- Drainage Area
  - 2 Ac or less



S_D = Spillway Depth

NOTE: For minimum dimensions see the "Specifications" section of this measure.



D_H = Dam Height
S_D = Spillway Depth

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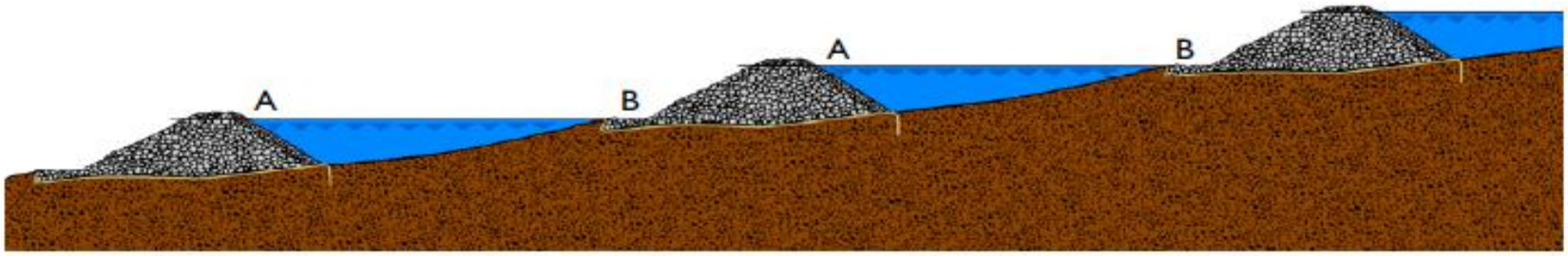
Rock Check Dams



A = Crest of Dam

B = Toe of Dam

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Diversions

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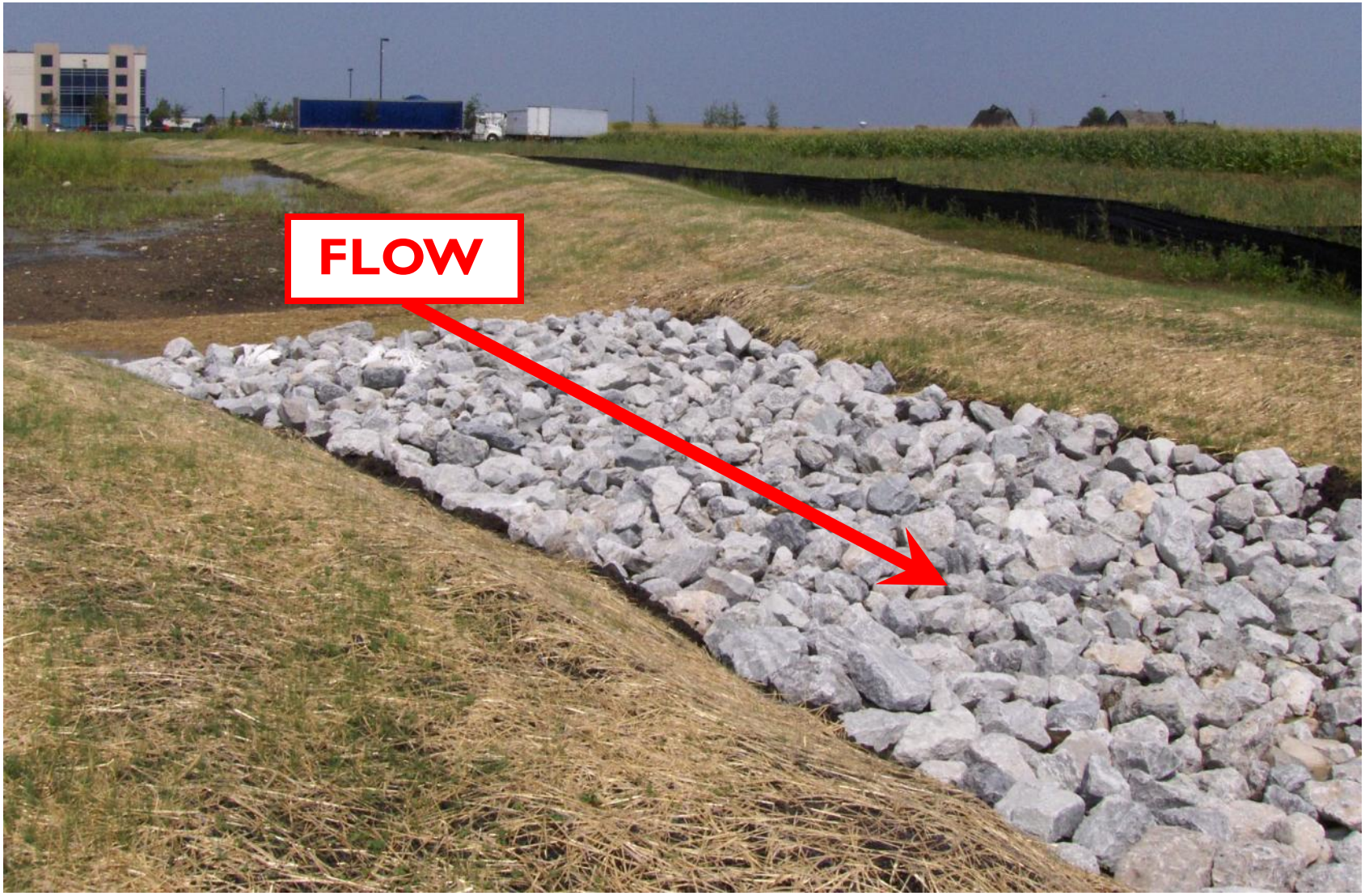
Diversion with Riprap Swale



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Pump Around Diversion

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Hard Pipe Diversion

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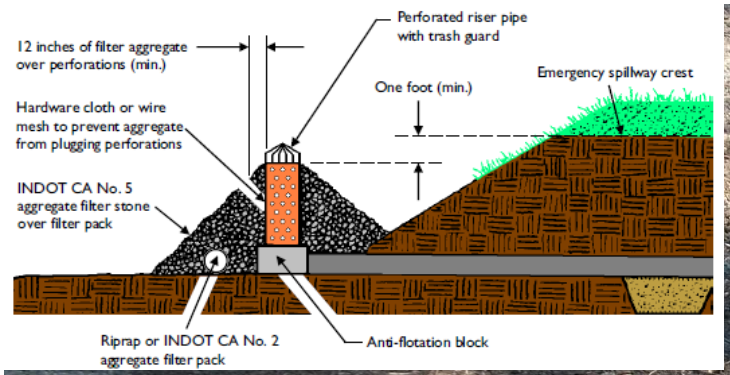
Detention Basins

- Basins are a BMP.
- Can be over excavated and used as a sediment basin.
- Construct as soon as possible
- Immediately stabilize after grading.
- Install BMPs at outfalls
- Monitor Discharges

Perforated Riser Detention Basins



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Basin Management: Construction Phasing…Looks Good?

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Basin Management: Construction Phasing

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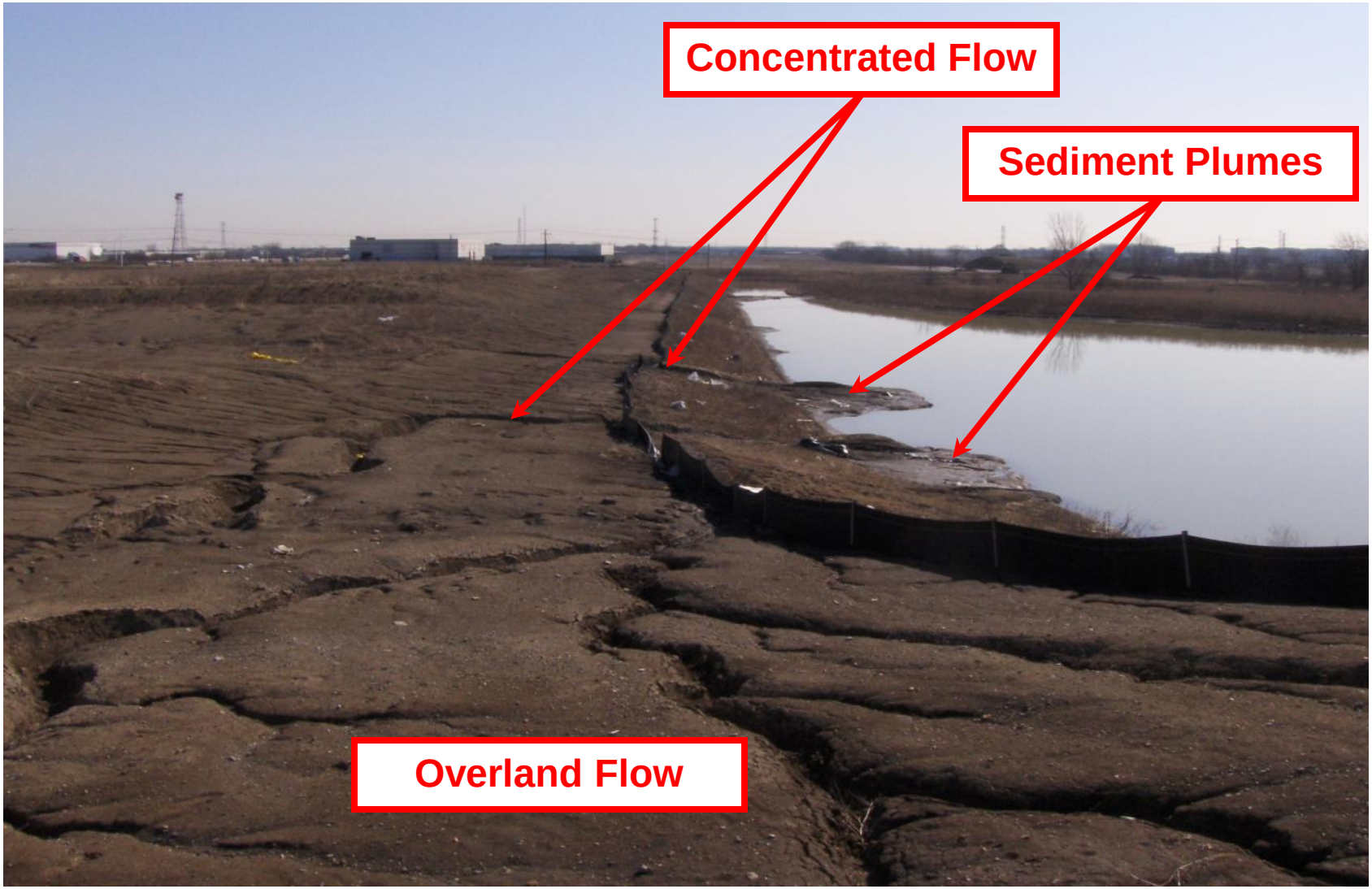
Basin Management



Control Overland Flow

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Riprap Swale for Overland Flow

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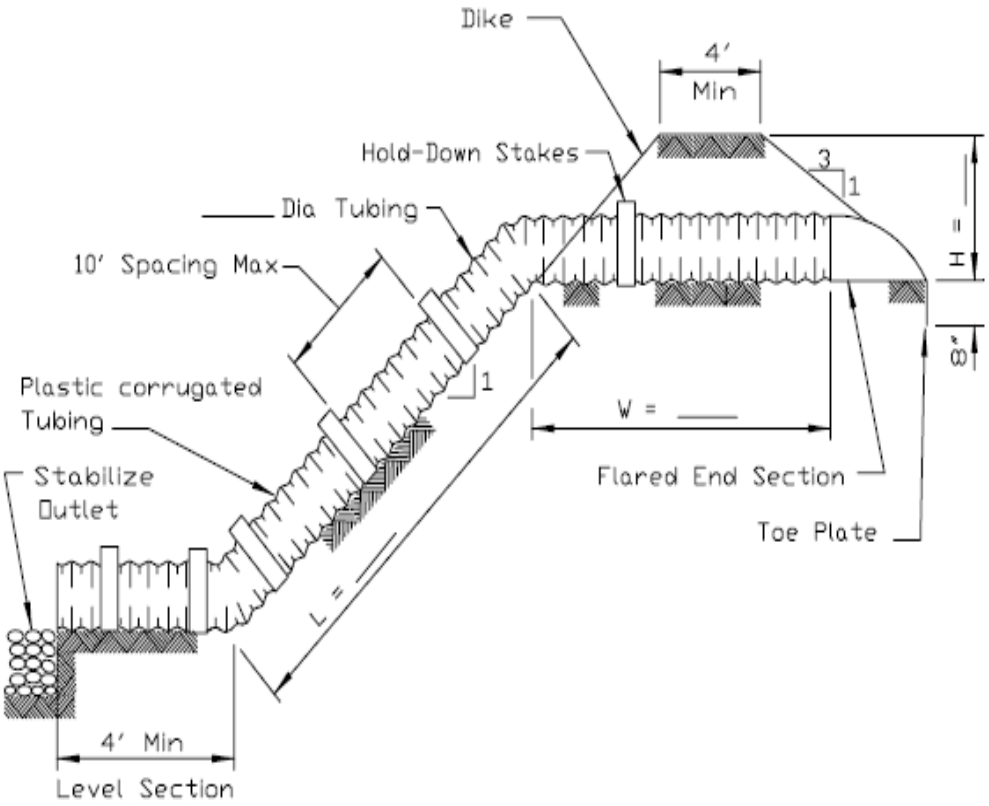
Slope Drains

- HDPE or PVC Plastic
- Used on slopes with temporary concentrated flow
- Stabilize inlet and outlet
- Alternative to stone swale.
- Allows for vegetation to establish
- Combine with Floc?



Slope Drains

Outlet Protection: Rip Rap

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Riprap Outlet Protection

- Apron Sizing
- Stone Sizing
- Evidence of erosion, scour, slumping, etc?
- Sediment deposited on stone…check inlet protection?

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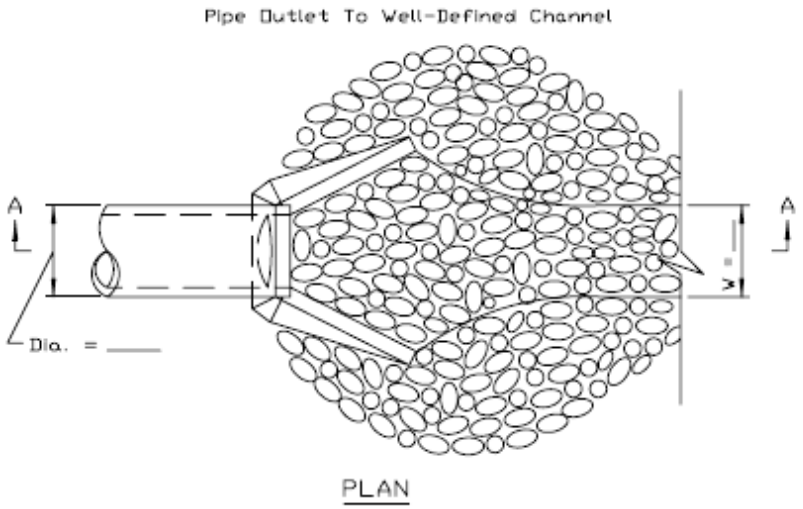
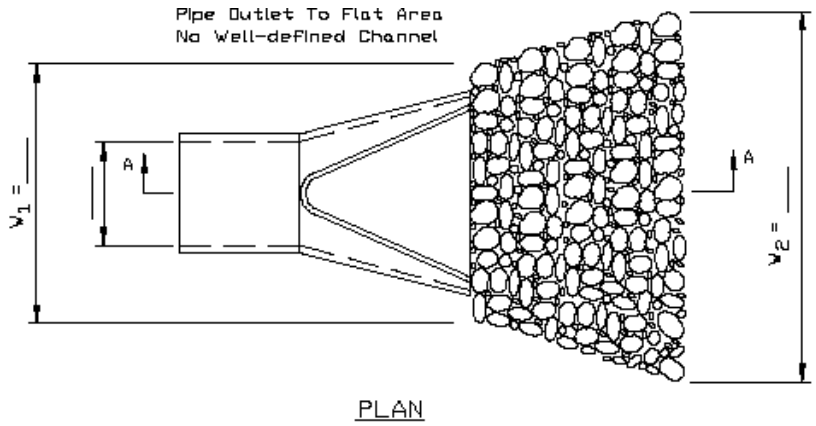
Outlet Protection: Rip Rap





NOTES:
1. The filter fabric shall meet the re
   specification 592 GEOTEXTILE Table
2. The rock riprap shall meet the IDOT
   gradation ____ .
3. The riprap shall be placed according to construction specification
   61 LOOSE ROCK RIPRAP. The rock may be equipment placed.

GEO-TEXTILE FABRIC

NOTES:
1. The filter fabric shall meet the requirements in material
   592 GEOTEXTILE Table 1 or 2, class I, II or III.
   shall shall meet the IDOT requirements for the
   tion: RR ____, Quality ____.
   l be placed according to construction specification
   61 LOOSE ROCK RIPRAP. The rock may be equipment placed.

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Sedimentation

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Proper Outlet Protection

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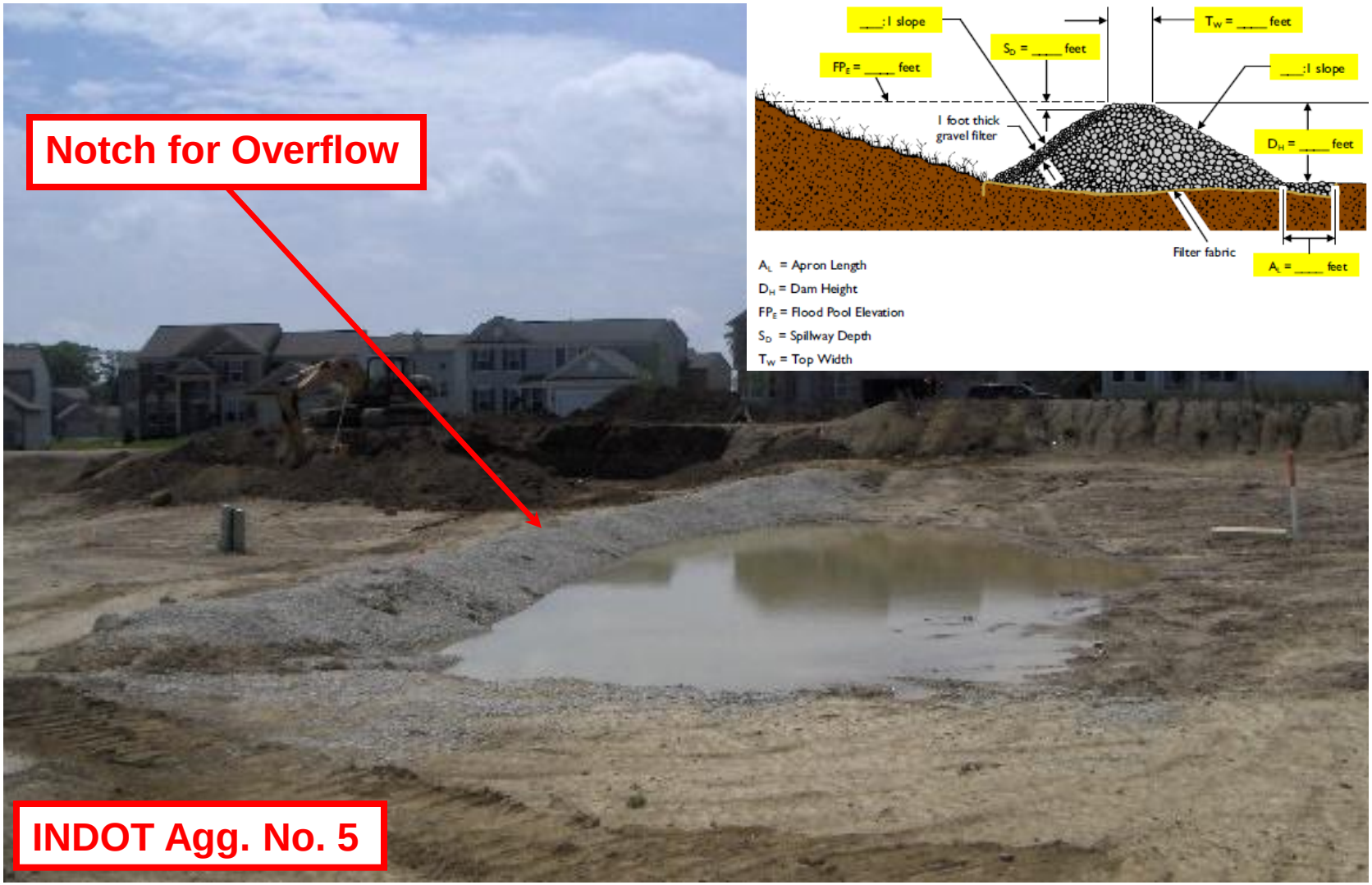
Sediment Traps/Basins

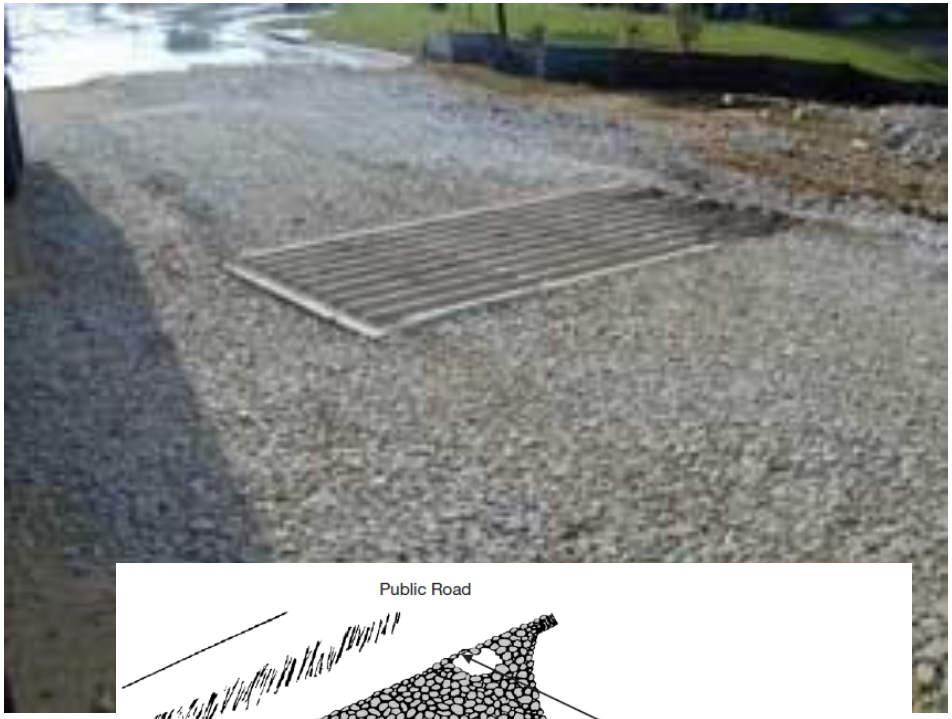
- Appropriately sized for tributary
  - Traps for drainage area of 1-5 acre
  - Basins for drainage area greater than 5 acres.
  - Basins have an outfall
- Appropriate Residence Time (2 Yr Max)
- Outflow is stabilized
- Pre-sized on plans by design engineer
- Perform maintenance as necessary (1/2 full)

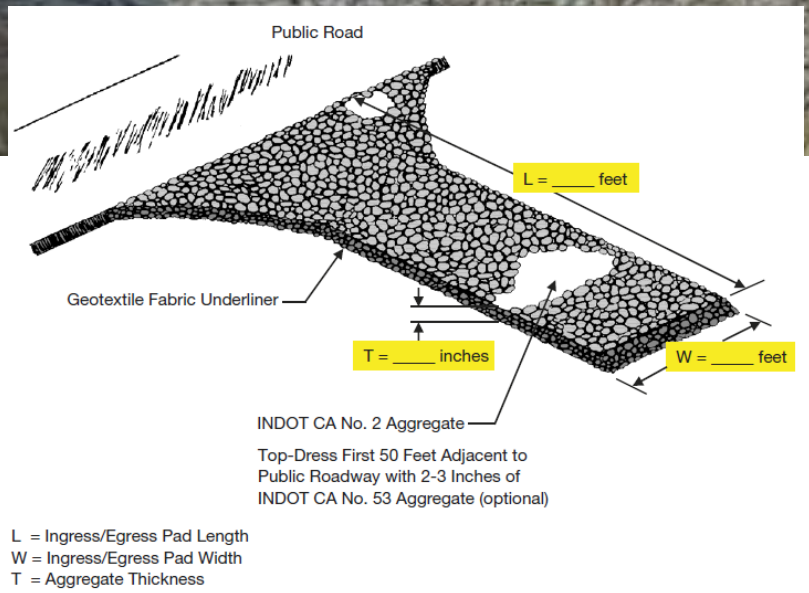
Sediment Traps/Basins



Construction Entrance / Exit

- Install at:
  - Concrete Washout
  - Construction Roads
- Proper size
- Correct materials used to construct
  - Fabric Installed
- Remove accumulated sediment, install new stone, as applicable
- Initial Installation





Construction Entrance / Exit

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Construction Entrance / Exit

Street Sweeping

- Streets are scraped, and swept to maintain sediment free roadways
- Curb ramps are constructed of non-erodible materials
- Removes dirt and debris before entering a stormwater management facility.
  - Reduces catch basin maintenance.
- Regulators will comment

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Concrete/Construction Washouts

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Concrete/Construction Washouts

- Make the drivers aware…SIGNAGE
- Washout area is located at least 50’ from storm drains or drainageways
- Must have a min 10-Mil Impermeable Liner
- One of the few BMPs that hay bale usage is acceptable
- Deposal Methods?
- Recycling?

…Didn’t Make the 50’ Mark

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Concrete/Construction Washouts

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Concrete/Construction Washouts

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Dewatering Activities

- Intake placed in sump pit or floated
- Outlet onto impervious, energy-dissipating surface
- Use filter bag to capture additional sediment and dispense flow
- Flocculants

- Once you filter the water… keep it clean, stabilize the flow path

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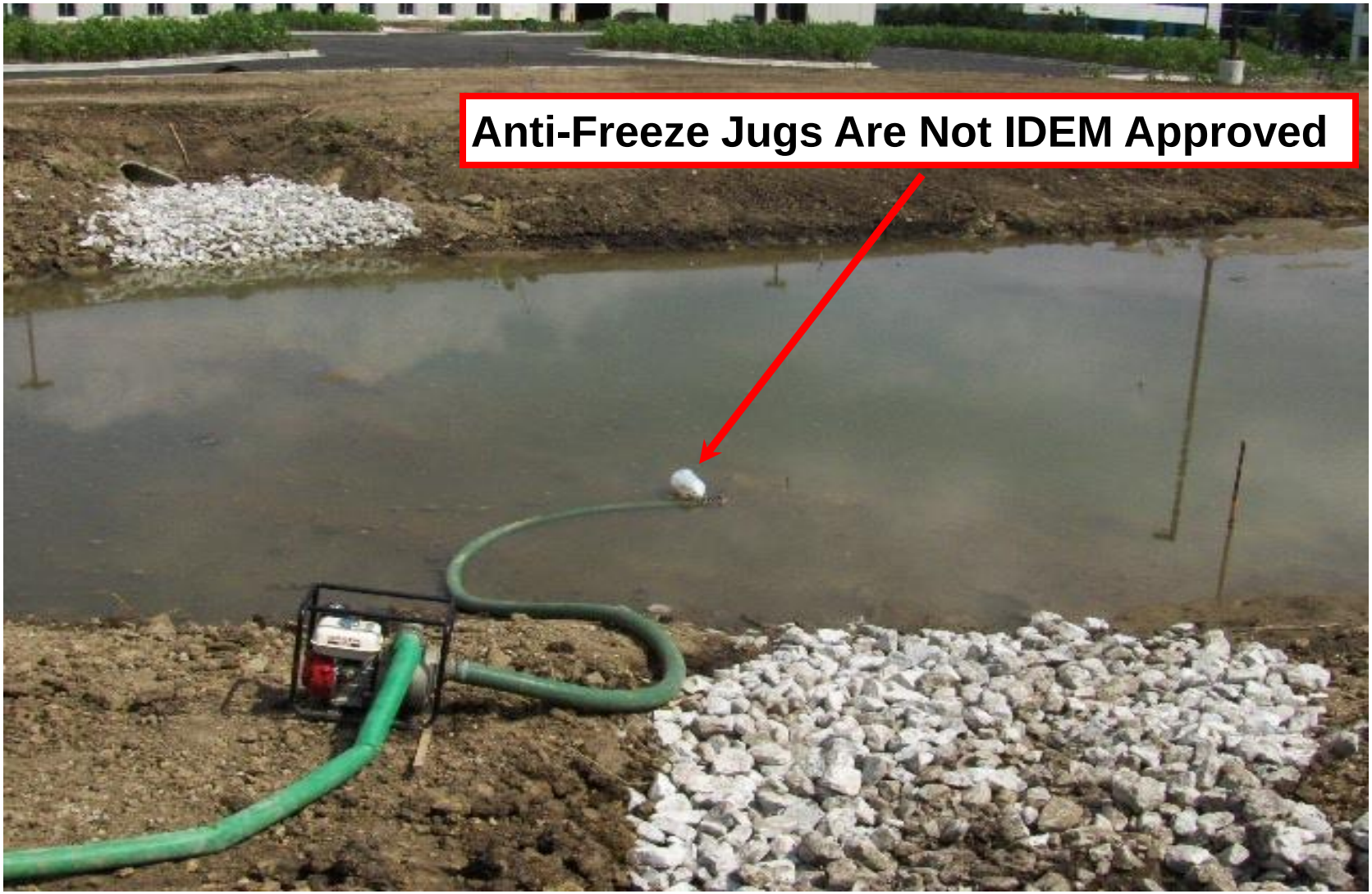
Dewatering…Floating the Pump



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Dewatering – Include a Sump Pit

Filter Bag…At Capacity

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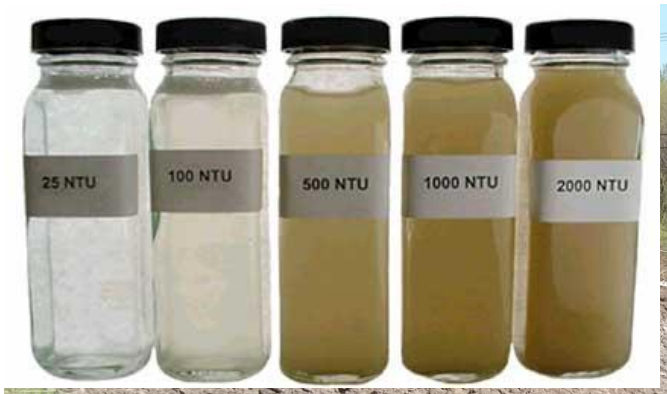
Turbidity Curtains: Corps & EPA Water Clarity



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Polymer/Flocculants Treatment Swale

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Polymer/Flocculants Treatment Swale

- Negatively charged sediment particles bind to positively charged polymers causing heavier particles to settle out. The two particles bind to form flocculants.
- Used for strict discharge and clarity requirements.
- Potential costly alternative to more standard sediment control and gravitational settling methods.
- Both synthetic and "natural" polymers available.
- Generally, selected by a known incoming flow and sediment load.
  - Proper dosing is important to reduce any increased effluent toxicity.
- Proper disposal is crucial.
- EPA Fact Sheet: http://www.epa.gov/npdes/pubs/polymer_fluc.pdf

Temporary Stream Crossing

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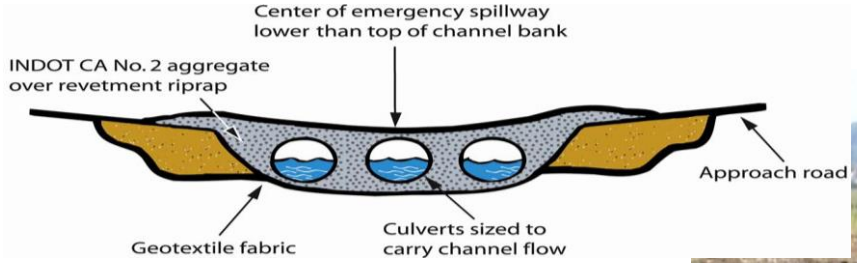
Temporary Stream Crossing



- Use INDOT rip-rap and Agg. No. 2 for driving surface
- Install filter fabric
- Stabilize immediately after use is no longer req'd
- Limit waterway disturbance as much as possible
- Follow other regulatory requirements, as necessary

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Pollutant Storage

Designate chemical storage area(s) onsite to store:

- Fuel Trucks
- Fuel Tanks
- Form Oil
- Hydraulic Oil
- Tar Buckets
- Port-a-Potty's
- Secondary Containment

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Stockpiles

- Stockpiles are surrounded by silt fence
- Stockpiles are stabilized
- Stabilized Entrances
- Tarping
- Location!

Stabilization Practices

- Keep a record of the following dates:
  - When major grading activities occur
  - When construction activities temporarily or permanently cease on a portion of the site
  - When stabilization measures are initiated

Stabilization Practices

Major Grading/Construction Activity and Stabilization Log

Activity		Dates		
Description	Location	Begin	End	Initials

Page _____

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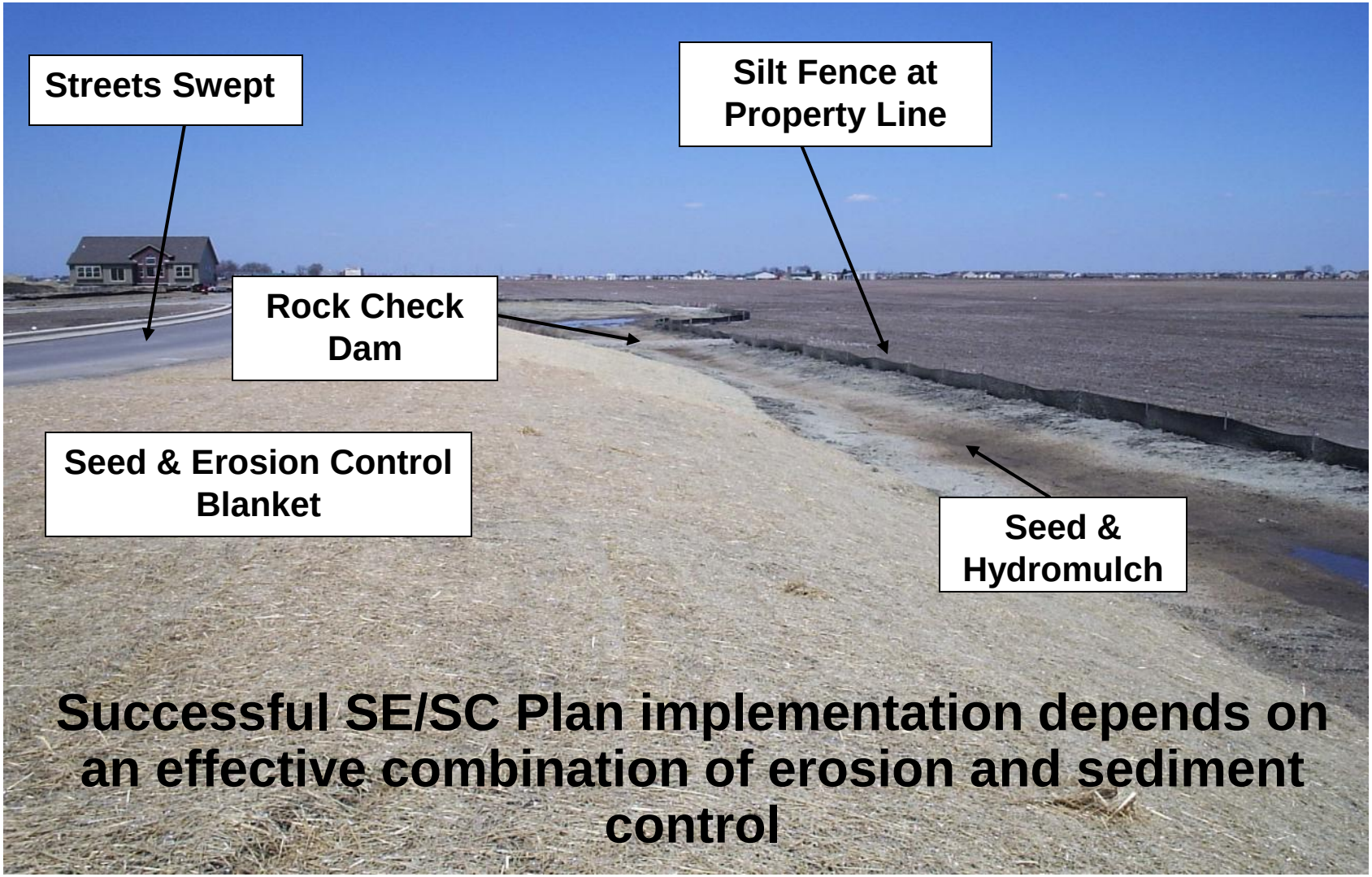
Final Stabilization

- All land disturbing activities are complete

- A uniform perennial vegetative cover with a density of 70% on pervious surface is considered functional

- Permanent structures or an equivalent permanent stabilization (e.g., riprap, gabions, geotextiles)

Erosion & Sediment Control



Successful SE/SC Plan implementation depends on an effective combination of erosion and sediment control

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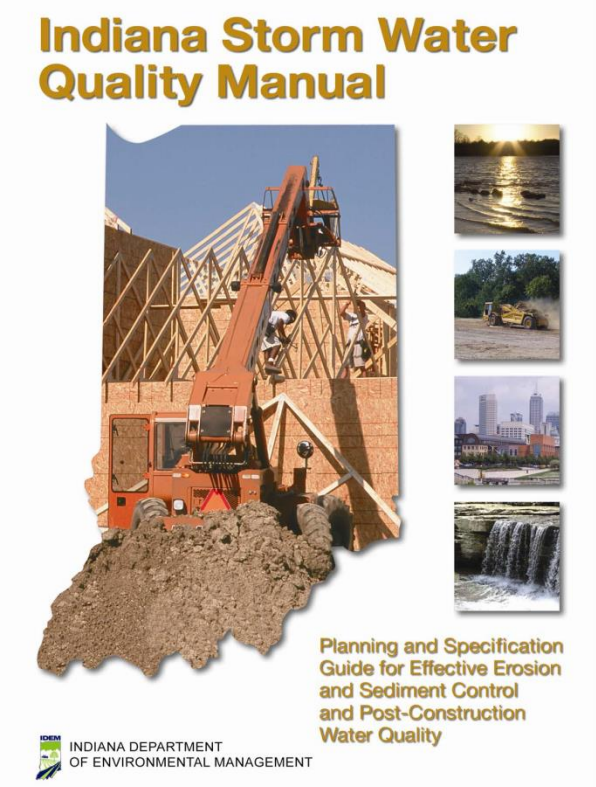
BMP Recap

- Require Proper Installation and Maintenance for Success
- Factor in BMP Costs in Pre-Construction Budgeting
- When a BMP Continually Fails Select an Alternative BMP (ADAPT)
- Stabilize Idle Disturbed Ground
- More Erosion Control = Less Sediment Control

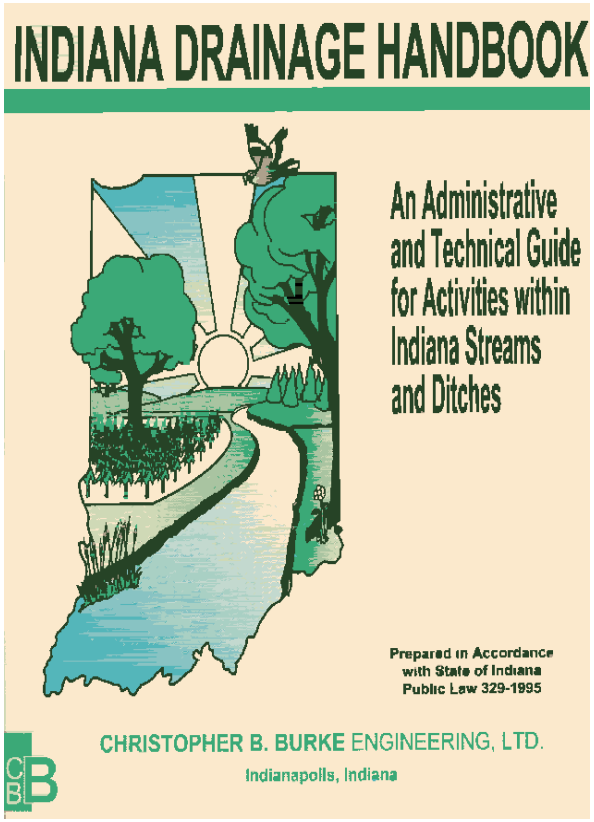
Resources

- Indiana Stormwater Quality Manual
  - http://www.in.gov/idem/4899.htm



Resources

- Indiana Drainage Handbook
  - http://www.in.gov/dnr/water/4893.htm



Resources

- Indiana LTAP Stormwater Drainage Manual
  - http://rebar.ecn.purdue.edu/LTAPmobile%20-%20Copy/Resources/GeneralPublications.aspx
- Local Ordinances and Technical Manuals

QUESTIONS?

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