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Back to Basics: Erosion and Sediment Control

FHWA – INDOT Quality Assurance Review (QAR) Results
Agenda

- INDOT – Office of Environmental Services
  - Landscape and Waterway Permitting Unit
- Describe Results of FHWA QAR Construction Site Investigations
  - Interviews
  - Site Inspections
Ecology and Waterway Permitting Unit

Current Role of OES’ Landscape/Waterway Permits Unit
- Reviews INDOT projects impacting aquatic resources to determine appropriate type/level of waterway permitting needed.
- Perform Woody Re-vegetation Reviews
- Develop/Review/Process
  - Landscape Design Plans
  - Waterway Permits
  - Mitigation required with waterway permits applications
- Performs site visits to ensure proper enforcement of permits
Overview

- Describe Results of FHWA QAR Construction Site Investigations
  - Interviews
  - Site Inspections

Interview Findings

- Permits Are Not Usually Posted on the Work Site

- Rule 5 (327 IAC 15-5-7) Requires Posting of the following
  - Rule 5 NOI Letter
  - Project Site Owner or Local Contact Info
  - Location of the Construction Plan
- Jobsite Project Board is an Ideal Location
Interview Findings

- Knowledge of the Requirements of the Permit Conditions Ranged from Slight to Thorough
  - About 50% of those visited were aware of many of the Rule 5 conditions

Interview Findings

- Usually Projects had Erosion and Sediment Control Plans that Varied in Quality of Design
  - Some oversized/some underdesigned
  - PE/PSs suggestions
    - Use of undistributed quantities more
    - Include more standard items in the plans
      - Otherwise need a change order to include them
Interview Findings

- Most Projects had an Erosion and Sediment Control Supervisor Assigned by the Contractor
  - PE/PSs generally weren’t aware whether this designee was “trained”
  - PE/PSs thought a majority of Contractors performing inspections
  - Only a few of the PE/PSs received inspection reports from Contractor

Interview Findings

- Locating, Constructing and Maintaining Proper Erosion and Sediment Control Measures Nearly Always Needed Improvement
  - Lack of knowledge of what permits or addendums were needed
    - Many didn’t know if/when IDEM needed an update
Interview Findings

- Almost 100% indicated a lack of existing training and a desire for more training
  - Designer
  - the PE/PS
  - the contractor
  - the erosion and sediment control supervisor
  - INDOT project inspectors

Interview Findings

- Lack of sequencing plan, and understanding of why it is needed and what it is supposed to do. If it existed, it was at times poorly designed
Interview Findings

- Lack of understanding how erosion and sediment control features function

Interview Findings

- Lack of appropriate design of the erosion and sediment control features
Interview Findings

- Lack of timely inspections and maintenance of the erosion and sediment control features to ensure proper performance
Interview Findings

- Lack of knowledge of how to construct, locate and maintain the features

Interview Findings

- Perceived lack of a means to force the contractor to make changes when needed
Interview Findings

- Lack of control of utilities

The staging area for borrow/waste as well as the concrete washout area were located in conformance with the specifications.
Interview Findings

- Expired permits
  - Before project was let
  - During construction

Interview Findings

- Erosion and Sediment Control Plan
  Lacks Pay Items for Necessary Features
Interview Findings

- There are often insufficient quantities of erosion and sediment control features in the plan

Interview Findings

- The Pre-construction Conference needs someone from either OES or district environmental to describe the permits, conditions, sensitive areas and mitigation.
Interview Findings

- The letting packages are now provided mostly online.

Interview Findings

- A good field manual for erosion and sediment control measures would be very helpful.
Interview Findings

- NEPA Document Not at the Project Office. Neither were the Commitments Forms.
- NOT RULE 5

Site Inspection Findings

- Failure to fully meet the permit conditions in the field was a common occurrence – Especially Rule 5
Overview

- Erosion Vs. Sedimentation
- Example Projects
  - What are some of the problems INDOT and FHWA encountered on a majority of the sites?
  - Good vs. Bad Practices
  - Erosion and Sediment Control Sequencing

Construction Activities Expose Soil

- Grading
- Excavation
- Structure Replacements
- Pavement Replacement
- New Fill
Construction Activity Causes Sedimentation

- Frequency: Common
  - Sediment is the #1 pollutant in IN waterways (by volume)
  - Construction sites erode at rates 100x that of Ag land

- Activity
  - Erosion and subsequent sedimentation is allowed to discharge into streams and wetlands

- Conclusions
  - Rule 5 violation
  - Potential §404/§401 violation if it changes the bottom elev. of the stream

Examples of Sedimentation

- INDOT Road Project
Examples of Sedimentation

More Examples
Where is the stream?

What Can INDOT Do?

- Follow IDEM Rule 5 Notice of Intent (NOI)
  - INDOT intends to
    - Reduce Erosion
    - Prevent Sedimentation
    - Install Erosion and Sediment Control Measures
    - Maintain Erosion and Sediment Control Measures
    - Permanently Stabilize Soils Post-construction
Erosion Control VS Sediment Control

- Reducing Erosion = Reducing Sedimentation
  - Erosion of bare, exposed soil
    - Mulch Cover Reduces Erosion by 90%!
    - Vegetation Reduces Erosion by 97%!!

- Increase in Erosion Control Measures on site = Decreased need for Sediment Control Measures

Erosion Control Measures

- Minimize Vegetation Clearing
  - Retain Existing Vegetation

- Stabilize Exposed Areas ASAP
  - Temporary
    - Seeding within 15 days of Exposure
    - Anchored Mulches
    - Soil Treatments
      - Polyachrylamide (PAM)
  - Permanent
    - Final Seeding/Planting
    - As Designed Rip Rap Placement
    - Erosion Control Blankets and Matting
### Erosion Control Measures (cont.)

- Others
  - Flumes
  - Temporary Slope Drains
  - Check Dams
  - Temporary Diversion Dikes
  - Diversion Channel
  - Dewatering
    - Temporary Pump Around
    - Coffer Dams
    - Stable Diversion Channel

### Sediment Control Measures

- Silt Fence
- Straw Bale Barrier
- Sediment Traps
- Turbidity Curtain
- Stable Construction Entrance
- De-watering Structures
  - Filter Bag
  - Straw Bale/Silt Fence Pit
Examples

- Example Projects
  - Erosion and Sediment Control Measure Recommendations
  - Sequencing Recommendations

- The Good:
  - Sediment Trap with Stable Outlet to Stream
  - Existing Vegetation

- The Bad
  - Sediment Trap Size Too Small
  - No Silt Fence Protecting Unvegetated Area
  - No Temporary Seeding of Ditch OR Slopes OR Exposed Soil
Notes:
- Identify Locations Where Sediment Leaves the Project (i.e. this stream)
- These Areas Should be Protected FIRST with Sediment Control Measures!!!
- Maintain/Establish Vegetation to Reduce Erosion

The Good?
The Bad
- Re-energized Stream without Stable Banks
  - Finalized Grades, Erosion Control Blanket, Vegetation etc…
- No Erosion or Sediment Control Measures Present!
- **The Good?**
- **The Bad**
  - Re-energized Stream without Stable Banks
  - No Erosion or Sediment Control Measures Present!

- **Already Flow in the Ditch**
  - Need Stabilized Ditch Prior to Energizing with Flow
- Dry Retention Basin
  - Stable Channel Flow Path
  - Must be Vegetated PRIOR to Energizing Stormwater Outlet

- Dry Retention Basin Outlet
  - Straw Bale Barriers won’t last once channel is energized
  - Channel must be Vegetated PRIOR to Energizing Stormwater Outlet
- **Dry Retention Basin Outlet**
  - Outlets into this Stream Which is filling in with Sediment

- **Dry Retention Basin Outlet and Stream Meet**
  - Island of Fill
  - Stream is Sediment Laden
  - No channel
  - Worst Case Scenario is Dry Retention Basin is Energized and then all of this sediment goes downstream!!!
The Good?

The Bad
- Lots of Exposed Soil = Lots of Erosion Potential!!!
  - Temporary Seeding, PAM Tackifier
  - No Erosion or Sediment Control Measures Present!

Erosion will Occur on the Exposed Soils
- Sediment will be Transported Downgrade
  - In this case it will follow this path to the creek crossing
    - Next Slide
- The Good
  - Existing Vegetation Protecting Stream
  - Silt Fence is Doing its Job
- The Bad
  - All the Sedimentation in the Stream
  - Coming from the Crossing...

- The Good?
- The Bad
  - No Erosion or Sediment Control Measures
The Good
- Temporary Seeding is Providing Erosion Control

The Bad?
- Seeding the Rest of the Slopes?

The Good
- Good Looking Silt Fence!

The Bad
- Good Looking Silt Fence!
  - Looks like it was installed after sedimentation into stream
  - Only on one side of stream
- Temporary Seeding?
- Lack of Erosion Control Measures…

- Creates Sedimentation Islands!
Rock Check Dams for Erosion Control (Slow the Flow)

- Lowest in Center
- Filter Medium
- Geotextile Fabric
- Toe to Crest

The Good
- Attempt at Reducing Erosion with Check Dams

The Bad
- Too Many Check Dams, Improper Construction, Waste of $$$
- Temporary Seeding and/or Mulch would work better!

Water Flows Around Dam at this Elevation
- Shallow Dam
- Stone above elevation waste of $$$
- **The Good**
  - Attempt at Reducing Erosion with Check Dams

- **The Bad**
  - Improperly Built... Where's the water going?
  - Temporary Seeding and/or Mulch would work better!

- **Check Dams Only Work if They Aren’t Run Over!**
- Sediment Control Measures
  - Silt Fence Needs to be Maintained
  - Especially where Protecting Wetland and Waters Areas
- Slit Fence Needs to be Repaired/Replaced
  - Sagging
  - Can See Under the Fence!!

- Silt Curtain
  - Floats, Tied into Banks, Weighted Anchors on Bottom
  - Protects Sediment from Polluting the Rest of Waterway
- Straw Bale Barrier
  - Sediment Control Measure
  - Recommend Straw Bales Lay on Their Side and Entrenched 4”

- Compacted fill to prevent piping
- Bale laid on its side to extend life of bindings
- Bale entrenched four inches into the soil

- Temp. or Permanent Seeding and Mulching
  - Negates Need for as many Straw Bale Barriers
- Keep Construction Debris out of the Channel!

- Temporary Crossings
  - Should have stable approaches
  - Should not effect normal flow path of stream
- **Recommended Erosion Control Features**
  - Tracking up the Slope
  - Seeding and Anchored Mulch
  - Erosion Control Blanket
  - Temporary Slope Drains
- Stable Construction Entrance
- Prevent Sediment from Tracking onto Road and into Drains!
- Good Slope Protection!
  - Anchored Erosion Control Mat
  - Rock Chute
  - Vegetation

- Stabilized Channel
  - Sod, Seed and Mulch
Erosion Control Blankets or Sod Ideal for Channel until Vegetation Comes in

Dewatering

- INDOT Bridge, Structure Replacements
  - Temporary Pump Around
  - Diversion Channel
  - Dam and Pipe
  - Coffer Dams
Stream Diversion?

Temporary Diversion Channel Should be Stabilized with Fabric, Mats or Plastic Liner
Stream Diverted into Pipe and Site Dewatered by Pump!

Dewatering Pump Outlet
- Straw Bales and Silt Fence Ideal
Sequencing

- Install Perimeter Sediment Control Features First!
  - Protect Areas Where Water Leaves ROW!!!
    - Construction Site Low Spots
      - Usually a Wetland and/or Stream
  - Avoid Clearing Herbaceous Vegetation until Necessary
  - Temporary Seed after 15 days of exposure!!!
  - Install Temporary Diversion Dikes
    - Directs sediment-laden water where YOU want it.
  - Inspect Erosion and Sediment Control Measures Weekly!