Approaches to Dealing with Turbidity on Your Construction Site

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During Development: Consequences
Options for Getting There

- Improved practices to retain sediment
- Reduce exposed soil area
- Treat water to remove fine sediment
Improvement from Surface Outlet/Porous Baffles

• Will increase sediment capture from 60% to 90+%
• This will increase maintenance needs.
• Turbidity will still be an issue
• Now what?
Turbidity Standard?

- Construction site runoff > 1,000 NTU
- Remember 280 NTU?
- Biological response at 10-20 NTU
Answer? Flocculation!

Add a chemical to cause the sediment to settle
How well does flocculation work?

**Sediment Concentration @ 1 m**

- **Total Suspended Solids (mg/L)**
  - **Settling Time (min)**
    - 0.25 0.5 0.75 1 2 3 4 5 10 15 60

- **With PAM**
- **Without PAM**

[Graph showing sediment concentration over time with and without PAM]
Traditional Jar Testing

1. Mix for set time
2. Add soil, PAM
3. Measure turbidity
Mixing Time/Energy Effects

![Graph showing mixing time and energy effects with turbidity (NTU) on the y-axis and energy (time x speed) on the x-axis. The graph compares turbidity under different conditions: 300 RPM (blue), 100 RPM (green), and 50 RPM (red). The energy values are 12800, 19200, 38400, 76800, 96000, and 192000. The turbidity values range from 0 to 140 NTU. The graph indicates that higher energy levels lead to lower turbidity, with 300 RPM showing the highest and 50 RPM showing the lowest turbidity at each energy level.](image-url)
Optimizing Methods to Introduce PAM

- Current practice: place granular PAM onto fiber check dams and, if present, ditch liner.
- Could distribution along liner provide more contact and surface area?
- Could a natural fiber liner provide more mixing/turbulence and/or floc removal?
Testing Flocculation Methods

Soil addition

Water source (900 m³)

Jute matting

Wattle

Sampling location

Wattle with jute matting

Wattle without jute matting

PAM on the weir of wattle

PAM on jute matting
Three Simulated Storm Events
Results: Turbidity Reduction

Different letters within an event denote statistically significant differences.
Conclusions

- Adding PAM to the swale system significantly reduced turbidity (as expected)
- The different methods of distributing the PAM didn’t have clear differences
- The addition of the jute liner also did not clearly change turbidity
Flocculation in the Field: Wattles for PAM delivery

- Function as an alternative to rock checks dams
- Effective delivery devices for polyacrylamide (PAM)
- Requires matting underneath and proper staking

Coir

Excelsior
Sprinkle 2 oz. of PAM on the weir (lower, center portion) and 1 oz. on both sides of the wattle.

Reapply after rainfall of ½”
PAM on Check Dams
Wattles biodegrade...rock doesn’t
Other Wattle Uses

- Slope
- Interrupter

Perimeter control (small area)
Review of Other Turbidity Control Methods
Tiered Basin: Sediment + Turbidity

Flocs Settle Here

Sediment Trapped Here

PAM Dosing Here
Pumped Water: Lots of Options
Dosing System: Solution vs. Solid Block

- Turbidity Reduction (%)

- Without: Solution, Anionic PAM, Floc Log
- With: Solution, Anionic PAM, Floc Log

Baffles

- No PAM

NC STATE UNIVERSITY
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Sediment Bag and PAM

Source Pond

- Source Pond
- Sediment Bag Alone
- Sediment Bag + PAM

Sediment Bag

Sediment Bag + PAM Injected at Pump Intake
Sediment Bags and Flocculants
Pores Will Clog, Need More Bags
Surface PAM Solution Application?
Surface PAM Solution Application?

Graph showing the effect of agitation on turbidity over time.

- **No Agitation**
- **Agitation**
- **Untreated Basin**
New Zealand Flocculant Doser

Figure 3. Rainfall Activated Flocculation System Housing Detail – Side View
North Carolina Version of New Zealand Doser

Rain collected into Tank floating in Flocculant reservoir

Inner tank sinks, displacing Flocculant solution into Hose, dosing the runoff In the pipe.
Pump, Flocculate, Filter
Pump and Treat: Hillsborough Street in Raleigh