Anionic PAM used for E&SC and Water Clarification

Seva Iwinski Bray

Applied Polymer Systems

GSWCC 2024

Why Chemical Additions?

- Many contaminants not removed by conventional erosion and storm water BMPs
- COMMON POLLUTANTS
  - *Colloidal clays and silt*
  - *Metals, Nutrients*
  - *Bacteria*
- Solution?
  - *Flocculants*
  - *Coagulants*

ANIONIC POLYACRYLAMIDE

WHAT IS IT? PAM is a polymer (long-chained molecule) that is matched to the soil/water chemistry to create particle attraction and attachment. This process forms agglomerations which can stabilize soil and be captured during dewatering and stormwater runoff.

WHY PAM?

- Extremely Low Toxicity while remaining highly effective
- Approved Federally, in most states and Under USEPA/CGP
- Widely used: anionic safe for fish/aquatic organisms
  ANSI/NSF/CAN Certification: Standard 60 Drinking water treatment chemicals (under .05% acrylamide monomer)
- Used in a wide variety of treatments including, but not limited to: Soil Stabilization, water clarification and mud thickening

GSWCC: MANUAL FOR EROSION AND SEDIMENT CONTROL IN GEORGIA
(IMPORTANT NOTES FROM SECTION 6-57)

CRITERIA

Application rates shall conform to manufacturer's guidelines for application. Only anionic forms of Fl-Co shall be used.

Following are **examples** of Fl-Co applications within construction storm water ditches or drainageways that feed into sediment basins or other BMPs:

•Fl-Co Bags or Socs that are installed directly in a ditch, pipe or culvert.

•Fl-Co treated ditch checks (i.e. fiber rolls, wattles, or compost logs inoculated or used in conjunction with Fl-Co).

•Granulated Fl-Co treated rock ditch checks

•Ditch checks with attached Fl-Co Bags or Socs.

•Addition of granular Fl-Co directly into a ditch. •Erosion control blankets and turf reinforce- ment mats that have been inoculated with a Fl-Co .

•"Pump and Treat" systems that use mechani- cal mixing with a chemical treatment of a Fl-Co.

Planning Considerations

Since settling of flocculated soil particles requires very slow moving (still) water, chemical additives should never be introduced into an outfall BMP where water leaves the property or enters state waters. In all cases where chemical additives are used to reduce turbidity, it is essential to include a sediment basin or sediment trap unless using a "pump and treat" treatment system.

Ensuring Safe and Effective Flocculant use:

1. EPA WET TEST: Acute and Chronic toxicity test reports

REPORT FOR ACUTE TOXICITY TESTING OF
APPLIED POLYMER SYSTEMS, INC.
SILT STOP PRODUCTS

NORCROSS, GEORGIA

TEST PERIOD: OCTOBER 3-18, 2000

Prepared for:

APPLIED POLYMER SYSTEMS, INC.

Norcross, Georgia

October 2000

"All decisions should be based on reasonable worst-case analysis"

Designation: E 1023 - 84 (Reapproved 2002)

Standard Guide for
Assessing the Hazard of a Material to Aquatic Organisms and Their Uses[1]

This standard is issued under the fixed designation E 1023; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This guide describes a stepwise process for using information concerning the biological, chemical, physical, and lexicological properties of a material to identify adverse effects likely to occur to aquatic organisms and their uses as a result of release of the material to the environment. The material will usually be a specific chemical, although it might be a group of chemicals that have very similar biological, chemical, physical, and toxicological properties and are usually produced, used, and discarded together.

1.2 The hazard assessment process is complex and requires decisions at a number of points; thus, the validity of a hazard assessment depends on the soundness of those decisions, as well as the accuracy of the information used. All decisions should be based on reasonable worst-case analyses so that an appropriate assessment can be completed for the least cost that is consistent with scientific validity.

1.3 This guide assumes that the reader is knowledgeable in aquatic toxicology and related pertinent areas. A list of general references is provided (1).[2]

1.4 This guide does not describe or reference detailed procedures for estimating or measuring environmental concentrations, or procedures for determining the maximum concentration of test material that is acceptable in the food of predators of aquatic life. However, this guide does describe how such information should be used when assessing the hazard of a material to aquatic organisms and their uses.

1.5 Because assessment of hazard to aquatic organisms and their uses is a relatively new activity within aquatic toxicology, most of the guidance provided herein is qualitative rather than quantitative. When possible, confidence limits should be calculated and taken into account.

1.6 This guide provides guidance for assessing hazard but does not provide guidance on how to take into account social considerations in order to judge the acceptability of the hazard. Judgments concerning acceptability are social as well as scientific, and are outside the scope of this guide.

1.7 This guide is arranged as follows:

[1] This guide is under the jurisdiction of ASTM Committee E47 on Biological Effects and Environmental Fate and is the direct responsibility of Subcommittee E47.04 on Environmental Fate of Chemical Substances.
Current edition approved Sept. 28, 1984. Published June 1985.

[2] Boldface numbers in parentheses refer to the list of references at the end of this standard.

Note: Floc Log testing was conducted using worst case analysis. All toxicity tests were conducted using ASTM procedure at full chemical exposure.
* Chitosan tests were conducted using effluent after reaction and filtration. This is not worst-case analysis and does not follow the ASTM procedure.

Ensuring Safe and Effective Flocculant use:

2. SAMPLE ANALYSIS: Site Specific Soil and Water Testing To Select Effective Flocculants

Smith Samples

Sample Location 2/15/2013	Description Sample Type	APS Application Floc Log Type	Results and Special Instructions Reaction Time / NTU Reading
Smithville, Inc. 1111 One Way Drive Anyplace, FL 12345 321-867-5309 jsmith@aol.com	**Water Sample** pH: 6.88 NTUs: 3486 Hardness: 120 CaCO3	706b **Powder** 712	40 - 45 sec. with filtering / 24.9
	Soil Sample pH: 7.21 NTUs: 2742 Hardness: 50 CaCO3	706b **Powder** 712	40 - 45 sec with filtering / 9.20

Note: For detailed instructions and application rates, please refer to the Polymer Enhanced Best Manaagement (PEBMP) Application Guide which is located on the bottom right hand corner of our website at www.SiltStop.com.

Floc Logs are designed to work in flowing water conditions. Mixing / reaction times will be very important when using the Floc Log listed above. **Mixing must be continuous and in contact with the Floc Logs for the time stated to obtain the best results.** A mixing ditch, pipe or flume system may be used with either a pump or gravity flow to meet this requirement. Particulate formed may be captured by filtering through or across a series of jute matting after the mixing and reaction has been completed. (Please see page 42 of the PEBMP for more on Particle Collection.) The dosage rate should be 50 to 60 gpm per Floc Log placed in series or row.

Stabilization of the soil at the source may be obtained by spreading the site-specific Silt Stop powder onto the soil surface (can be mixed with other additives such as seed, fertilizer, etc.), then covering the soil with open-weave jute, coconut matting, mulch, or straw. This will perform as a stabilizer for reducing soil and clay movement into the runoff water, as a tackifier to hold the soil/organic matrix in place, as well as providing surface area for attachment of flocculated sediment. For detailed application rates and instructions, please see the Soil Stabilization section beginning on page 5 of the PEBMP.

Areas where high water velocity may occur (ditch lines, swales, etc.) should be "soft armored" by placing jute or coconut matting flush to the ground surface then spreading powder (dry) over the jute or coconut matting (please refer to PEBMP page 5-10). This will greatly reduce erosion in these areas. When used with the Silt Stop powder, soft armoring binds the soil particles to the matting, stopping them from eroding and entering the water system.

We recommend using both systems for best results.

Applied Polymer Systems, Inc. 519 Industrial Drive Woodstock, GA 30189 www.siltstop.com

- https://www.youtube.com/watch?v=JJDf24A0sOw

ANIONIC PAM FORMS & APPLICATIONS

- Powder/ Granular
  - Soil Stabilization, Water Treatment, BMP enhancement
- Flocculant (FLOC) Log
  - Water Treatment
- Emulsions/ Liquid
  - Soil stabilization, hydroseeding, Water Treatment*, dust control

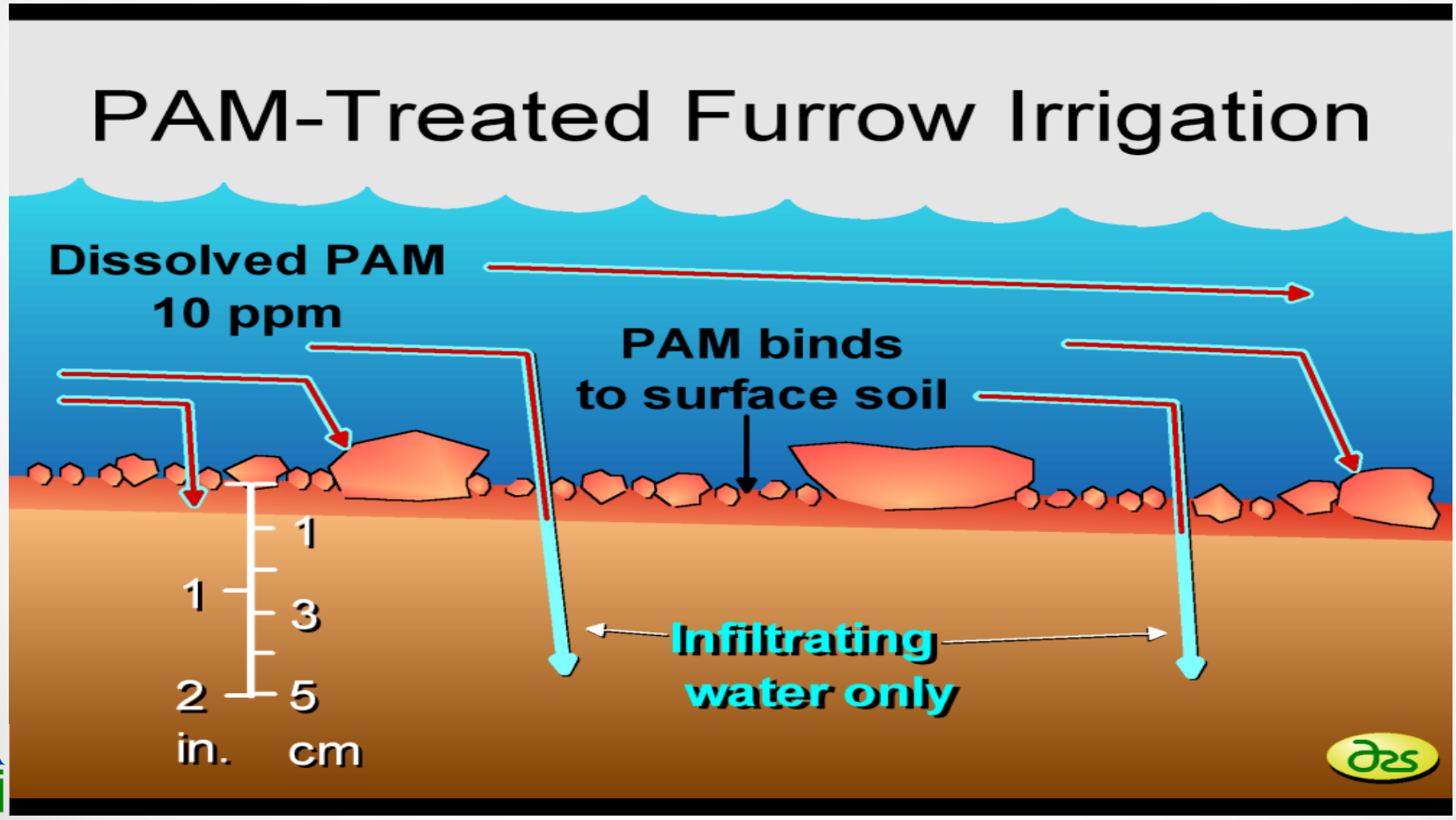
APPLICATIONS: SOIL STABILIZATION

E&SC: Soil Stabilization

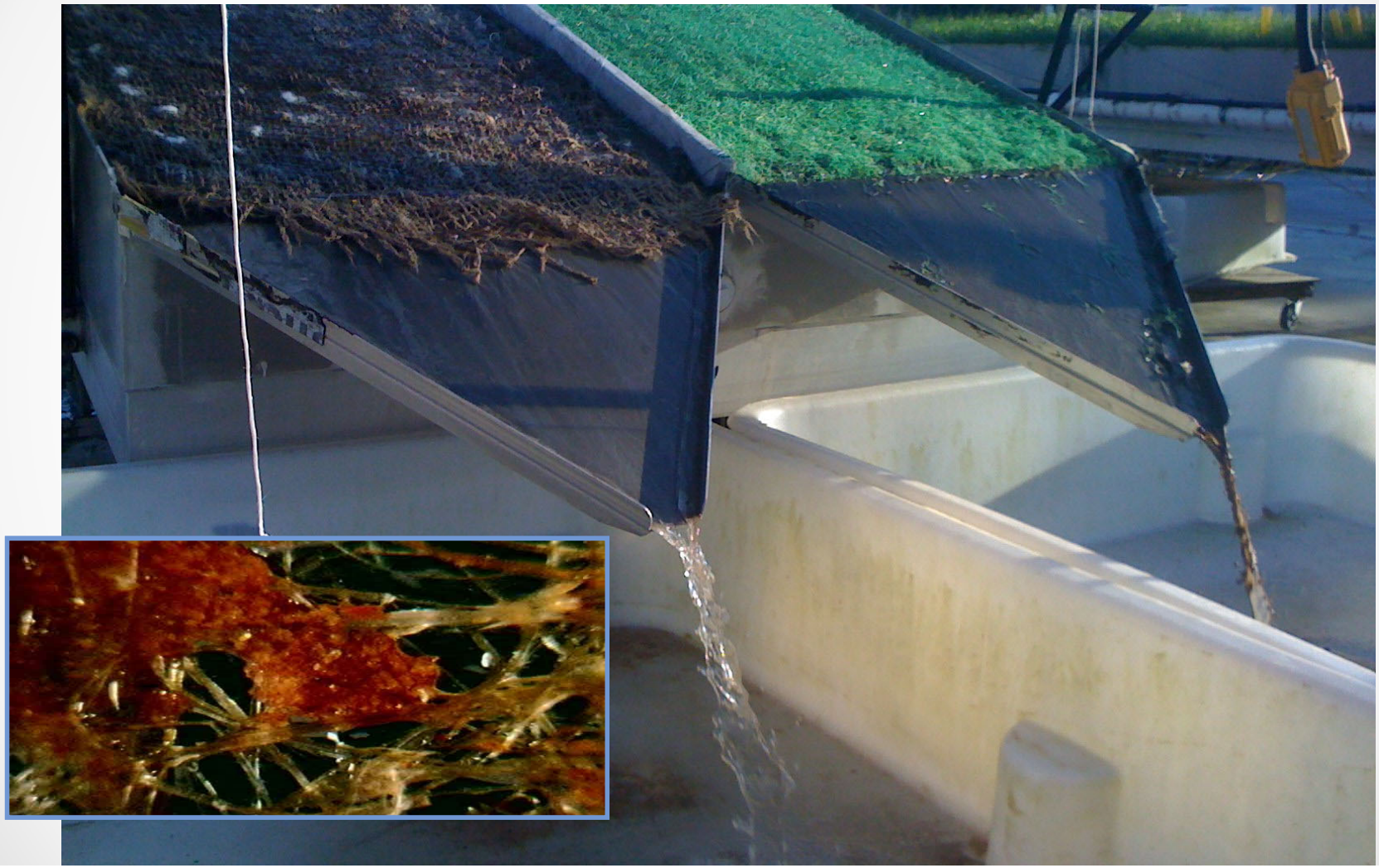
- Bind soil, seed, fertilizer
- Decreases soil loss
- Increases runoff clarity
- Increased permeability, POROSITY, soil structure, water infiltration
- Rapid vegetation growth

APPLICATION METHODS

HOW IT WORKS


PAM-Treated Furrow Irrigation
Dissolved PAM
10 ppm
PAM binds
to surface soil
Infiltrating
water only
1
1
3
2
5
in.
cm

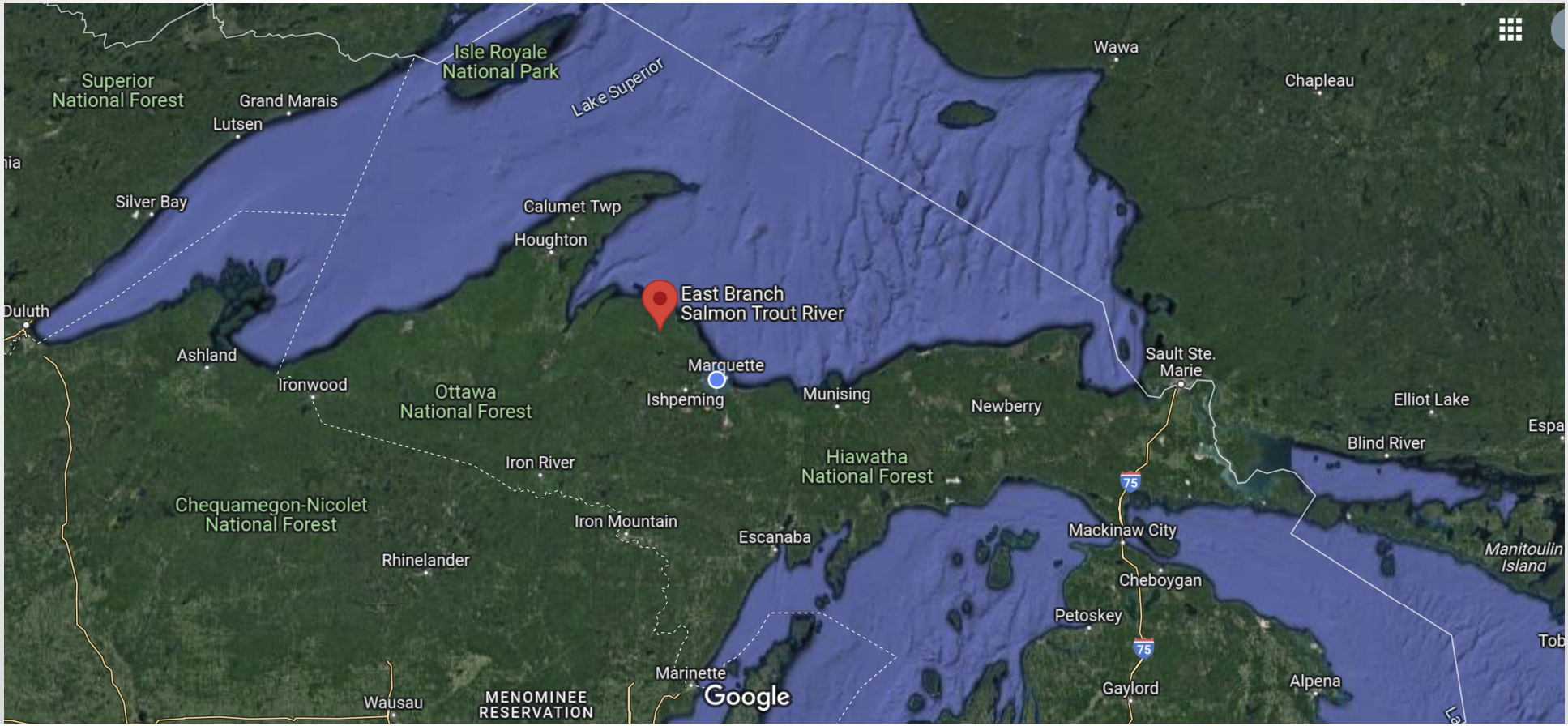
SUGGESTED APPLICATION: POLYMER ENHANCED SOFT ARMORING



Polymer Enhanced BMP EXAMPLES

Salmon Trout River Bridge:

A Soil Stabilization + Polymer Enhanced BMP Case Study



Salmon Trout River Bridge Project

- East Branch Salmon Trout River
- Upper Peninsula of Michigan
- Road and bridge widening project to support copper and nickel mine
- Ecologically sensitive project
- River contains a breeding population of coaster brook trout
- Flows to Lake Superior

Sedimentation and Citizen Complaints

Blog > Road Work on County Road AAA Polluting Wetland

Road Work on County Road AAA Polluting Wetland

to MI DEQ and EPA

Implemented BMPs used on Salmon Trout River Project

Beginning of bridge construction over Salmon Trout River tributary

Salmon Trout River

SRBs lined all riparian areas to catch large particulate and prevent fines from escaping

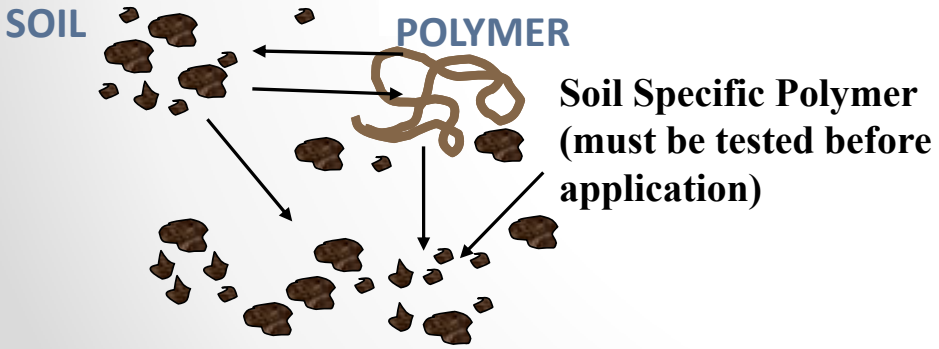
All slopes draining to stream were polymer enhanced soft armored to stabilize

SRBs lined all riparian areas to catch large particulate and prevent fines from escaping

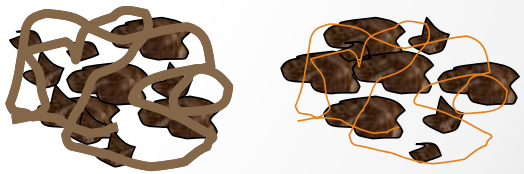
Conclusions

- Minimal erosion of sediment loss throughout bridge construction
- Absence of toxicity to coasters and other aquatic organisms
- PEBMP treatment train allowed achievement of optimal results
- Vegetation was successfully established
- Project in compliance with rules and regulations

Flocculant Applications for Water Clarification



POLYMER + SOIL MATRIX FORMS AN AGGLOMERATION

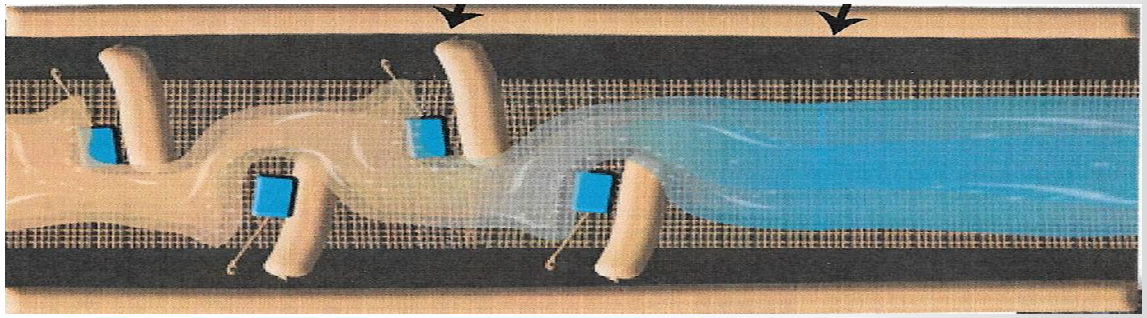


FLOCCULANT LOGS USED FOR WATER TREATMENT

- Flocculates
  - *Sediment*
  - *Nutrients*
  - *Metals*
  - *pH and chlorine reduction*
- Can decrease settling pond size or eliminates need
- Helps meet discharge requirements

FUNADAMENTAL RULES OF EFFECTIVE FLOCCULATION (SAME RULES APPLY IN EVERY MIXING SYSTEM/INTRODUCTORY SYSTEM)

- Adequate mixing (i.e. Vigorous)
- Full reaction time achieved (Full contact
- Particle collection or deposition of formed flocs
- Correct dosage (1-10 mg/L)
  - 10 pounds per 50-70 GPM or 10 pounds per 500k Gal



Important Notes:
1) Sample analysis must be completed.
2) Ensure NO NEW SEDIMENT OR PARTICULATE ENTERS THE SYSTEM AFTER CONTACT WITH THE LOGS

PARTICLE CAPTURE = CLEAR DISCHARGE

EXAMPLES OF OPEN PIPE/DITCH MIXING SYSTEMS

EXISTING STORMWATER STRUCTURES

Passive Dosing In Storm Drain System

TROUBLESHOOTING

- Sample analysis completed: NTUi= 300, NTUf=18
- Results showed turbid discharge out of ditch
- What is wrong with this set up?

CORRECT SET UP FOR SPLIT PIPE/OPEN DEWATERING DITCH

(FOLLOWING RULES OF FLOCCULATION)

FULL REACTION TIME COMPLETE WITH PARTICLE CAPTURE TO ENSURE FLOCS COLLECTED AND CLEAR WATER DISCHARGED

FLOCCULANT INTRODUCTORY/ MIXING SYSTEMS FOR LINEAR CONSTRUCTION PROJECTS

SAND MINE PIT FOR DISNEYS STAR WARS PROJECT

Turbid water (300-400 NTUs)
Volume approximately 300 million gallons

Used a pipe mixing system to start dosing and create mixing and reaction

- Treatment systems were connected in a series for higher flow rates

Modular Particulate Capture System

Final discharge 12 NTUs
97% Turbidity Reduction
Wetlands ecosystem protected


Pond stabilized, operations resume.


10/2019
Tatooine Alley
Cypress Dr
Stage 4
World Dr
S Rio Grande Dr
Finished pond
Google Earth
1995
Imagery Date: 10/10/2019 28°21'07.55" N 81°33'51.48" W elev 0 ft eye alt 4678 ft

DETAILS:

- 540,000 gph x 24 hours =12,960,000 gpd
- 12,960,000 x 180 days =2.3 billion gallons pumped
- Final discharge 12 NTUs (target limit 32 NTUs)
- 97% Turbidity Reduction

GA Sink Hole Demucking Project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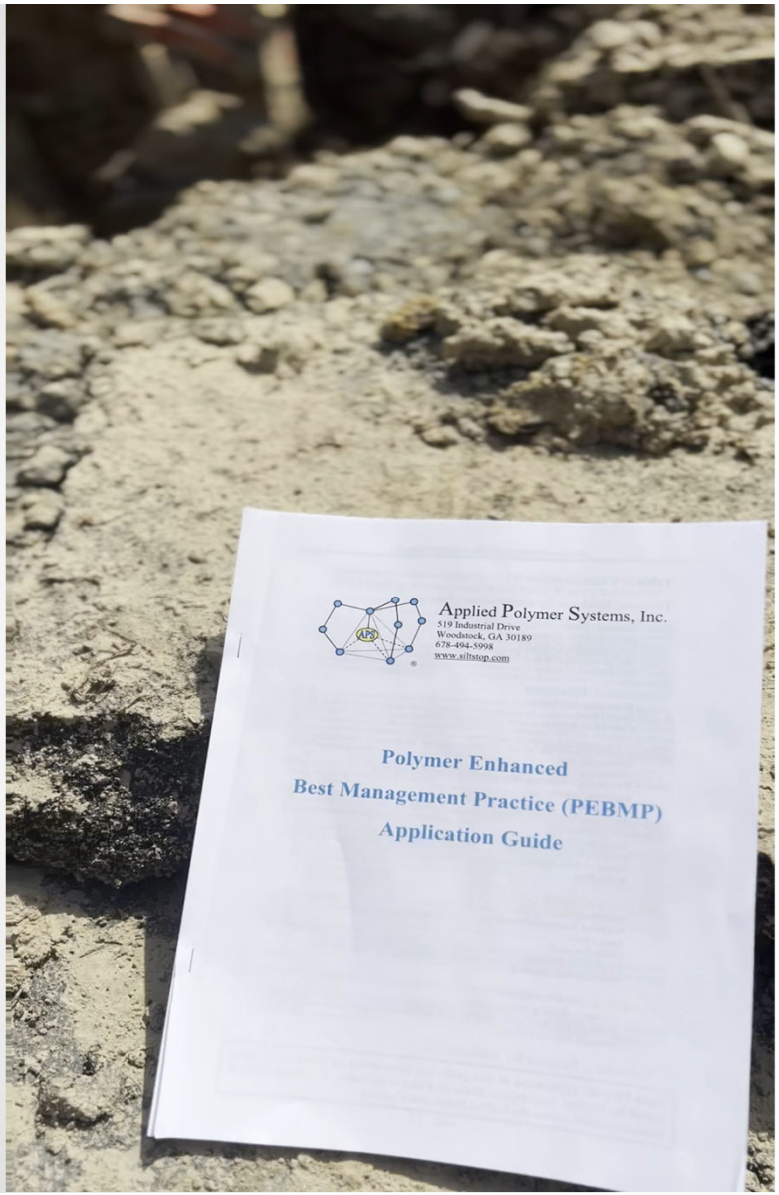
Polymer Enhanced
Best Management Practice (PEBMP)
Application Guide


Applied Polymer Systems, Inc.
519 Industrial Drive
Woodstock, GA 30189
678-494-5998
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PAM ALLOWS RECYCLING OF MUCK AS A TOPSOIL AMENDMENT

Dust control

BENEFITS:

- Erosion, Droughts, High temperatures
- HOLD SOIL PARTICLES ON SURFACE: Responsible for keeping dust down, soil onsite, and increasing particle size
- Used on Haul roads, waste piles, tailings, construction
- Replaces constant labor intensive and costly watering
- NON SALT OPTION: Replaces salts that increase salinity to receiving systems and increase toxicity
- Lifespan
  - Weeks for undisturbed
  - Days or less for disturbed


THE VISION IS CLEAR!
QUESTIONS?
APPLIED POLYMER SYSTEMS
www.siltstop.com
www.apsfloc.com
Phone: 678.494.5998
Email: info@siltstop.com or info@apsfloc.com
Seva Bray: Sevabray@gmail.com or seva@apsfloc.com