Techniques for Successful Storm-Water Monitoring in a Mining Influenced Watershed

Presented by
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background
Techniques for Successful Storm-Water Monitoring in a Mining Influenced Watershed
1 Identification of sources of contaminants

Benefits

Identification of sources of contaminants  Identification of first flush events  Comparison of base-flow and storm-flow conditions
2 Identification of first flush events

Benefits

- Identification of sources of contaminants
- Identification of first flush events
- Comparison of base-flow and storm-flow conditions
3 Comparison of base-flow and storm-flow conditions

Benefits

- Identification of sources of contaminants
- Identification of first flush events
- Comparison of base-flow and storm-flow conditions
Source Identification
Base-Flow Dissolved Copper
December 2012 through December 2013

Cu (ug/L)

Dec-12  Mar-13  Jun-13  Sep-13  Dec-13

NP6-0  NP6-1  NP6-1A  NP6-3  FM3  800  NP7-1  NP7-4  SW8B
First Flush
Storm Flow vs. Base Flow
Base-Flow Monitoring - Dissolved Copper (ug/L)

Date: Feb-03 Aug-03 Feb-04 Aug-04 Feb-05 Aug-05 Feb-06 Aug-06 Feb-07 Aug-07 Feb-08

Concentration (ug/L)

Chronic Copper: 4.0 ug/L
**BENEFITS | STORM FLOW VS. BASE FLOW**

**Storm Water Monitoring - Dissolved Copper (ug/L)**

- **Concentration (ug/L):**
  - Feb-03: 89.5
  - Aug-03: 89.7
  - Feb-04: 975
  - Aug-04: 1500

- **Acute Copper - 4.5 ug/L**

**Dates:**
- Feb-03
- Aug-03
- Feb-04
- Aug-04
- Feb-05
- Aug-05
- Feb-06
- Aug-06
- Feb-07
- Aug-07
- Feb-08
So... when does this take place?
Annual Cumulative Rain (inches)  
2003 - 2014

Average Annual Precipitation (2003-2013) - 55.1
presence of metal salts

When: dry season
Interstitial water flow

When: wet season
Dry Season vs. Wet Season

Acute Copper - 4.5 ug/L
Analytical Suites vs Available Sample Volumes
Setup: Equipment

- Area/Velocity Meter
- Autosampler
- Hydrolab
- Rain gauge/weather station
- Field computer and printer
Set up equipment two weeks prior to anticipated sampling event
Location Considerations

Source areas
Stream Channel
Hydraulics
Security
Safety
Setup

1. Building/improving trails to the selected sample locations

2. Securing the area velocity probe onto the stream bed

3. Surveying the stream cross section

4. Installing the area velocity meter and autosampler above flood levels

...
Setup

5. Securing autosampler’s suction line from the creek to the sampler

6. Installing flow-through pipes for the Hydrolabs

7. Calibrating the meters and samplers
### Setup: Supplies

- Sample bottles
- Silicon tubing
- Filters
- Liquinox
- Shipping forms
- Calibration fluids
- Coolers
- Tape and tape guns
- Sampling forms
- Flashlights
- Vehicles
- Zip-lock bags
- Trash bags
- Di-water
- Batteries
- Trail markers
- Paper towels
- Waterproof pens
- Computer
- Printer
- Printer ink
- Computer label paper
- Chocolate
- Snacks
Safety
Safety: Use experienced field crew

- use the buddy system
- cell phones + contact info
- reflective vests
- avoid flood waters
- daily safety meetings
Safety: Establish meeting points
Safety: Alert client, site workers, and security of schedule
Startup
Check weather forecasts!

Rain events typically start on weekends and national holidays.
Startup : Auto Samplers

- install charged batteries
- install ice
- set the clock
- program start time
- confirm sample tubing is clear and in the water
Startup : Area/Velocity Meter

- Install new batteries
- Confirm instrument is recording depth and velocity
Startup: Hydrolabs

- Install batteries
- Check calibration
- Check installation
Make field-crew assignments
Duration

Water Level (ft)

Date

11/14/07  11/14/07  11/15/07  11/15/07  11/15/07  11/15/07  11/16/07  11/16/07  11/16/07

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Autosampler Typical Runtime

12 hour intervals

A.M. Schedule

P.M. Schedule
Recommendations

• Sample labelling
• Sample filtering
• Bottle setup
• Shipping
• Decontamination
• Supplies of expendable materials
Lessons Learned

• Keep it simple

• Keep the sample intervals the same at all locations

• Notify the lab once the storm-water sampling event has started

...
Lessons Learned

• Have a set process
  *(removing bottles from autosamplers, labelling, and filling out COC forms)*

• Look out for other activities within watershed
  *(treatment plant discharges, construction activities, beaver dam breaks)*
Typical problems

- Inaccurate weather forecasts
- Dead batteries
- Hydrolabs washed up on bank or surfing
- Autosampler Problems
  - Incomplete restart
  - Accidental shut off
  - Ice jam on rotator arm
  - Sample bottles floating in carrousel
  - Suction line out of water/frozen
  - Error in water detection unit
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