Designing and Implementing a Stormwater Monitoring Program

Washington State Municipal Stormwater Conference
Roads and Highways Program
November 2014
Summary

- WSDOT’s municipal permit (2009 and 2014)
- WSDOT’s BMP design
- How we are monitoring
- Lessons learned
Past and present monitoring sites

2009 permit map
- Facilities characterization
- Highways characterization
- BMPs

2014 permit map
- BMPs for highways
- BMPs for facilities

Non-permit
- SR-518 bioswale
BMP MONITORING DESIGN

BMP monitoring design (VFS type)
BMP Design (VFS type)

Discharge Gaging and Stormwater Sampling System

- Sampling Tee
- Location of Weir
- Control Tee
- Slant Pipe
- Stilling well: Bubble chamber and PT mounted inside
BMP monitoring design (bioswale type)

SR-518 Bioswale study site
BMP monitoring design (bioswale type)

SR-518 Bioswale study site

Stilling well
Sampling well
Control point
BMP monitoring design (bioinfiltration swale type)

Geiger MF swale study (Spokane)
BMP monitoring design
(bioinfiltration swale type)

Geiger MF swale study (Spokane)
MONITORING AND COLLECTING SAMPLES
Weather forecasting and tracking storms

http://www.wrh.noaa.gov/forecast/wxtables/index.php?lat=47.75&lon=-122.33
HOW are we sampling?

• Many different criteria
  – Antecedent duration
  – Minimum forecast rainfall depths
  – Seasonal variations
  – T.A.P.E.

• Discharge proportional composite sampling

• Heavily automating our sampling procedures was a large key to our success
How the datalogger sees it…

- Script monitors environmental characteristics systematically to determine station status
- Station is activated when conditions meet scripted requirements
- Algorithm calculates cumulative discharge every 5 minutes
- Cumulative discharge determines sample collected based on thresholds

HOW are we sampling?

How we see it…

- Script runs every 5 minutes // Increment minute counter by 5 // Tcounter++
- Condition 1: waiting for an event to start // Status equal 0: start-up // Status equal 1: waiting for antecedent period // Status equal 2: waiting for an event to start // Status equal 3: event started // Sample while waiting for event end // Event end means no runoff // script run off is ignored // Status 3: event started // Sample while waiting for event end // a) ISCO trigger thresholds exceeded // b) event ended // Status 0: start // Status 1: waiting for antecedent period // White time & ISCO // Event start means no event

(Math is AWESOME!!!!)
Getting good data (quality assurance)

- Frequent maintenance of sites
- Using telemetry to generate redundant data
- Field QA/QC of staff and procedures
- Data verification and validation

Communicating frequently with Ecology, our labs and each other is KEY!
Managing our data

StreamTrac®

EQuIS

SERF
1. Research>Plan>Coordinate>prepare for unexpected
   • Site selection
   • Database needs
   • Parameters to sample/storm criteria

2. Budget and buy
   • Enlist the help of experts and make it your own!
   • Data management (What do you want to get from your data?)
   • Choosing an equipment/database vendor
   • Installing and construction of sites and infrastructure
     • (Most equipment and most databases are not made for stormwater monitoring so customization time is necessary.)
   • Implementation of monitoring
Lessons learned – getting good data

3. Work WITH your labs!

4. Data Verification/Validation is MANDATORY!

5. Data analysis and reporting takes TIME!

6. Most equipment and databases are not designed for stormwater
WSDOT lessons learned
Cars can inhibit your monitoring plans!

Smokey point rest area

Safety is more important than samples
Acknowledgements

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FTS

amec

DEPARTMENT OF ECOLOGY
State of Washington

Washington State Department of Transportation
A little about us...

Stormwater Monitoring Team Organizational Chart

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