Data Reporting Guidelines for Certification of Manufactured Stormwater BMPs: Part II

ASCE/EWRI Task Committee on
Guidelines for Certification of Manufactured Stormwater BMPs
Subcommittee on Data Reporting
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ASCE 2009 EWRI Annual Meeting

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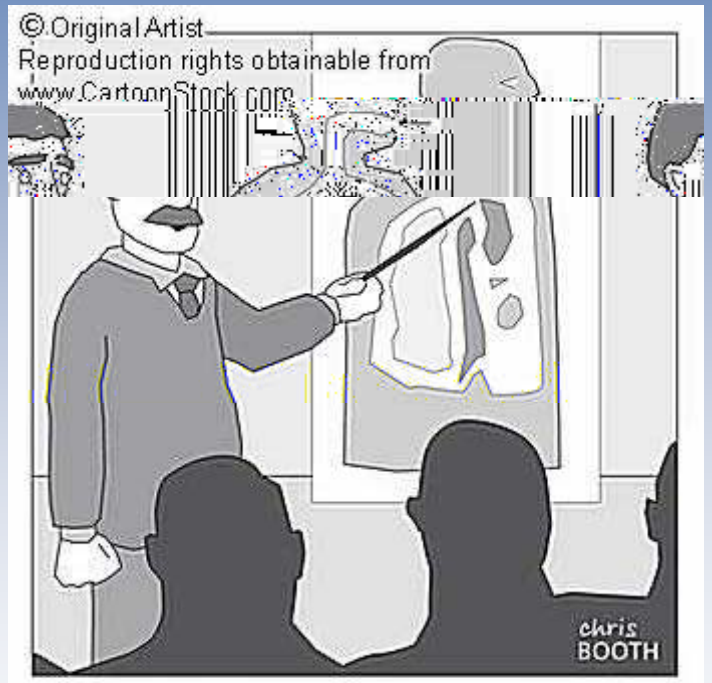
Data Reporting Objective

- A clear and consistent data reporting approach that ensures testing biases are minimized and managed such that representative field testing can be effectively evaluated by the regulatory agency
- Will be based on the guidelines for field testing, and data reporting



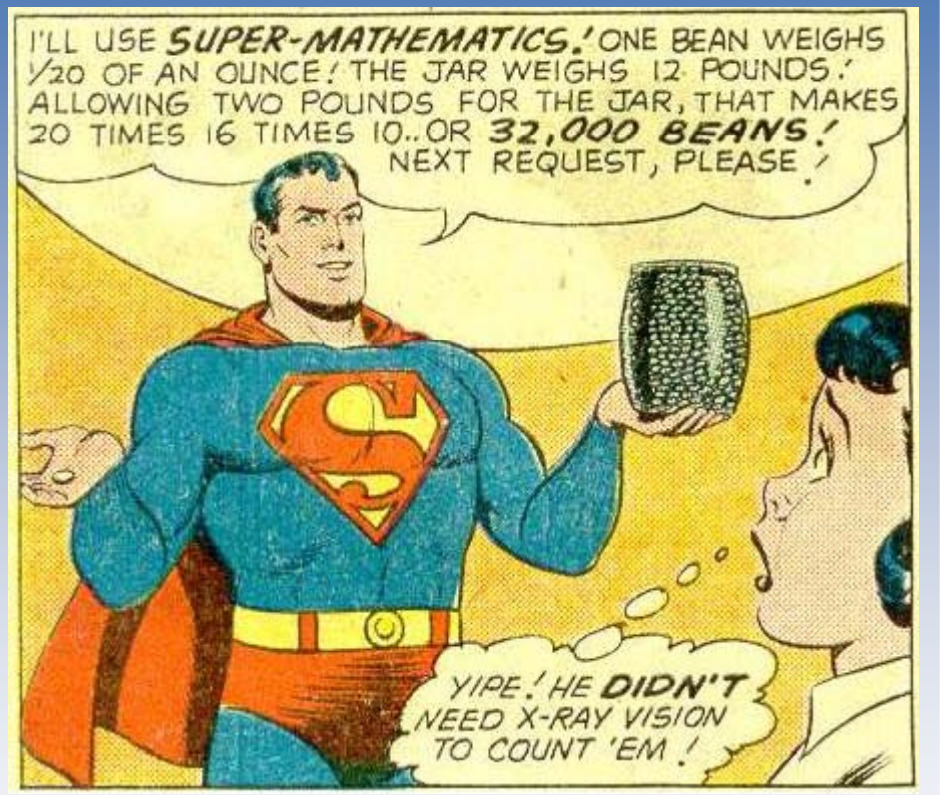
"We don't know *what* this is called"

Purpose

1. Provide a uniform testing environment, and
2. An accelerated review process for manufactured BMPs to support the stormwater management community.
   - Arguably, the current protocols have mixed success.

Subcommittee Task

- By 2009, the Data Reporting subcommittee will prepare reporting guidelines for the presentation of testing results
- A System Performance Evaluation Report will provide information to evaluate if the BMP meets the requisite performance standards within a reasonable level of statistical confidence.



System Performance Evaluation Report

- The report would include:
  1. Summary data outlining performance with respective to performance criteria
  2. Detailed appendices of the experimental data.
- Based on a critical review of leading testing protocols

Need for Testing Protocol

- Prescriptive testing protocols are needed because the range of influence upon testing and performance data is wide and not always well understood.
- Influences include watershed characteristics, storm event characteristics, maintenance requirements, system sizing, and testing methodologies.
- A testing protocol that does not dictate methods introduces biases that are challenging to account for—at the least

Need for Data Reporting Protocol

- Testing results must be presented so a committee of scientists is not necessary for interpretation.
- Staff of the many regulatory agencies that will be reviewing the test results can not be expected to interpret the range of factors influencing the system performance.
- Reporting results must indicate whether the systems met the requisite performance standards within a reasonable level of statistical confidence.

While experts remain at odds over the issue of when life begins, most agree it's sometime after work.

Major Technology Protocols and Reports

- Technology Assessment Protocol- Ecology's (TAPE) by the State of Washington, Department of Ecology. (WADOE, 2002).
- TARP Tier II Guidance Document: Protocol for Stormwater Best Management Practice Demonstrations. (NJCAT, 2003).
- New Jersey Tier II Stormwater Test Requirements - Amendments to Tarp Tier II Protocol. (NJCAT, 2006).
- TARP (Technology Acceptance Reciprocity Partnership) Tier I Guidance Document. TARP. (2001).
- Edwards Aquifer Technical Guidance Manual. Texas Commission on Environmental Quality. (TXCEQ, 2005).
- ETV Verification Protocol Stormwater Source Area Treatment Technologies. US EPA Environmental Technology Verification Program, Washington DC. (USEPA, 2002).
- Improved Protocol for Classification and Analysis of Stormwater-Borne Solids. Water Environment Research Foundation, Alexandria, Virginia. (WERF, 2007)
- Urban Stormwater BMP Performance Monitoring. (USEPA and ASCE 2002)
- International Stormwater BMP Database. (ASCE and EPA, 1996)

- The reporting framework broadened to include data reporting criteria that will also meet the requirements for inclusion in the BMPDB
- Continued population of the database and assessment of its data will lead to a better understanding of factors influencing BMP performance and help to promote improvements in BMP design, selection, and implementation.
- Statistical performance reporting requirements consistent with those used in the BMPDB are proposed as part of the MTD reporting framework.

Work Plan

YEAR 1

1. Collection and assembly of existing data of some BMP devices that have been used in the engineering design and installed on the sites.
2. Status reviews for the collected existing data and the needs of more existing data in depth or data assessment
3. 1st Draft Work Plan and Reporting Framework Outline (August 07)
4. Abstract (September 2007)
5. Article (December 2007)
6. Draft of Reporting Framework: Develop consensus on Framework including review of existing protocols, literature, and technology evaluation reports.
    1. Framework in the form of an annotated outline (April 08)
7. Presentation for 2008 EWRI Congress (May 2008)

YEAR 2

1. Draft of Reporting Framework: reviews and comments again solicited from subcommittee based on input from EWRI whether additional information is required (Sep 08).
2. Final Draft of Reporting Framework (Feb 09).
3. Full Committee Sign-Off of Reporting Framework, to be circulated amongst full committee. (May 09, responses by Jan 09)
4. Update Framework and produce draft final mock-up with representative examples
5. Final Data Reporting Guidelines Report (Dec 09).
6. Full Committee guidelines will be presented at the EWRI Annual Meeting (May 2010).

Reporting Framework I

1. Summary: Executive Summary with rated performance rating, Study Summary, Data Collection Summary

2. Site Conditions: longitude, latitude, land cover type, land use activities, site conditions, site elevations and slopes, location of sampling equipment, location of on-site stormwater collection system, and a description of any upstream BMPs

3. Technology Description:
   a) The specific device used (model number, size)
   b) Functionality of treatment mechanisms including pretreatment and bypass requirements
   c) Physical description: engineering plans, site installation requirements
   d) Cost of system and installation
   e) Sizing methodology: flows, volumes, etc.
   f) Maintenance procedures

Reporting Framework II

4. Test Methods and Procedures
   a) Particle size for influent, effluent, and residuals, mass based, concentration based
   b) Water quality parameters monitored
   c) Data Quality Objectives (DQO), QA methods, and measurement accuracy for the observations
   d) Measuring instruments, sampling frequency, and sampling program information
   e) Sampling Locations and Peak Concentration Timing

5. Testing and Sampling Event Characteristics:
   a) Storm date, depth, antecedent dry period, intensity, duration, season, type of runoff (precipitation, snowmelt, groundwater, etc.)
   b) Number of influent and effluent aliquots; storm volume, % storm treated influent, effluent, peak flow rate, calculation of peak reduction and lag coefficients, number of storms exceeding design criteria.
   c) Comparisons with Data Quality Objectives

Reporting Framework III

6. MTD Performance Results and Discussion:
   a) Event mean concentrations for influent and effluent with summary statistics (N, mean, median, coefficient of variation, standard deviation, one –tailed sign t-test)
   b) Detection limits and confidence intervals
   c) Performance metrics: removal efficiency, efficiency ratio
   d) Statistical Evaluation: time series plot, box and whisker with confidence intervals, effluent probability method, linear regression . Statistical analyses should be consistent with the International BMP Database (bmpdatabase.org).
   e) Solids characterization: influent, effluent, residuals particle size analysis
   f) Accumulated mass reductions
   g) Individual Storm Reports with event characteristics (5a and 5b), combination event hydrograph and hyetograph with sample times; system performance characteristics (6a-c), monitoring details
   h) Quality Assurance, rejection criteria and rejection summary.
   i) Maintenance findings: discussion on recommended maintenance schedules

Reporting Framework IV

7. Conclusions, Performance Claims, and Limitations

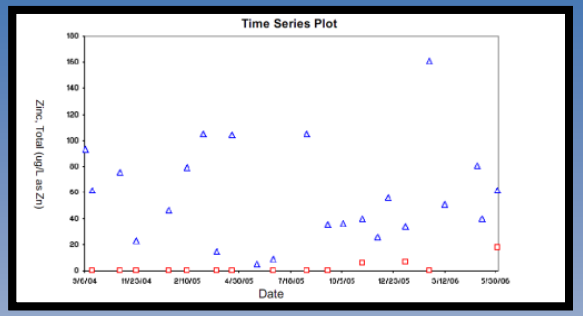
8. Appendices: Raw data and credentials

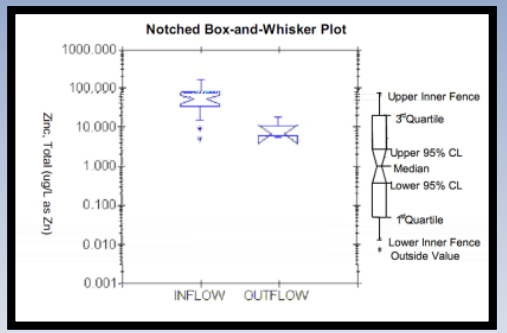
9. Third Party Review. The testing and reporting, if not performed by an independent professional third party, must be reviewed. The independent review should include a review summary and observation of at least one monitoring event.

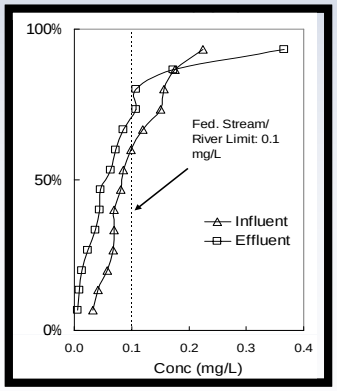
10. Appendices

Statistical Evaluation

- Time Series
- Box and whiskers (interquartile range)
- Probability distribution
- Additional items to be covered by Subcom. On Data Analysis







Individual Storm Reports

- Performance report for each storm sampled:
  - General Info
  - Storm and system hydrology (water-balance and bypass)
  - Water quality (EMC, detection limits, QC, performance)

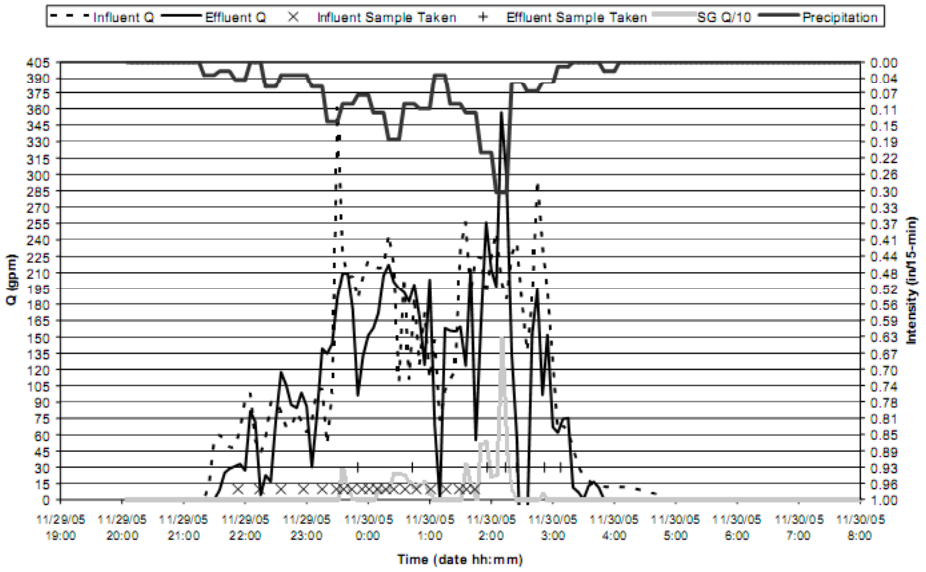
General Information

Site:	Greenville Yards, (3683), Jersey City, NJ
System Description:	8 x 18, Fine Perlite, 27 cartridges, 15 gpm
Event Date:	11/29/05
Date of Last Maintenance:	7/26/05
Antecedent Conditions:	5 days since last rain event, 0.03"

Hydrology

Total Precipitation (in):	2.06"
Peak Flow, (gpm):	362 SF Influent, 357 SF Effluent, 1477 SG Bypass
Total Runoff Volume (gal):	52334 SF Influent, 42415 SF Effluent, 30355 SG Bypass
SF Vol. Coverage (nearest 10%):	80 Influent, > 90 Effluent

Event Hydrograph



Analytical

Number of Aliquots: IN: 20 EFF: 7

Parameter	Concentrations (mg/L) Influent EMC	Effluent EMC	RDL	Dup. RPD	Discrete Removal Efficiency
SSC	42.00	ND	5.00	19%	88%
TVSS	10.00	ND	10.00	20%	undeterminable
SSC (<500µm)	26.00	ND	5.00	19%	81%
TVSS (<500µm)	ND	ND	10.00	20%	undeterminable
TSS	31.00	ND	4.000	20%	87%
Total P	0.060	0.050	0.010	0%	17%
TKN	ND	ND	0.500	20%	undeterminable
NO3-NO2	ND	ND	0.550	20%	undeterminable
Hardness	14.36	9.36	0.07	20%	35%
Total Cd	ND	ND	0.000327	13.0%	undeterminable
Total Cu	ND	ND	0.003640	0.4%	undeterminable
Total Pb	0.005760	ND	0.002180	0.2%	62%
Total Zn	0.143	0.0474	0.000611	4.8%	67%
Oil and Grease	NT	NT	---	---	---
TPH	NT	NT	---	---	---

Notes

Shaded RPD values defaulted to 20% standard due to QC complications. SSC Dup. RPD based

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Conclusions

- Guidelines produced by the Data Reporting subcommittee will be completed during 2009.
- Data reporting format is intended to facilitate a rapid review, so emerging technologies can be brought to market with the confidence of both third-party verification and regulatory approval.
- The challenge is to balance the complex science of technology verification with the need for thorough review and a clear presentation of results.

For More Information

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http://watertech.rutgers.edu