

07.3



dandelion.com

© 2008 AGI Information Management Consultants
May be used for personal purposes only or by
libraries associated to dandelion.com network.

Bibliothek

INSTITUT FÜR WASSERBAU
UND WASSERWIRTSCHAFT
TECHNISCHE UNIVERSITÄT DARMSTADT
PETERSENSTR. 13, 64287 DARMSTADT
Tel. 0 61 51 / 16 21 43 • Fax: 16 32 43

Ino. -Nr.: 4079

Advances in

MODELING *the*
MANAGEMENT *of*
STORMWATER
IMPACTS

Volume 6

Technische Universität Darmstadt
Bibliothek Wasser und Umwelt
Petersenstraße 13
D-64287 Darmstadt

Telefon 06151 / 163659
Fax 06151 / 163758

edited by William James

Contents

Preface	vii
1. Integrating Better Stormwater Management Practices in Urban Stormwater Pollution Modeling	
<i>Ralf Mehler and Manfred Ostrowski</i>	1
1.1 Introduction	1
1.2 Design Standards of German Federal States	2
1.3 Extended Technologies for Stormwater Treatment	3
1.4 Simulation of Extended and Alternative Measures	5
1.5 Comparative Assessment	6
1.6 Considering BSMPs during Planning	8
1.7 Summary	9
2. Unique Features of the Source Loading and Management Model (SLAMM)	
<i>Robert Pitt</i>	13
2.1 SLAMM Process Descriptions	15
2.2 Unique Attributes of SLAMM	18
2.3 Current Work	35
3. A Stormwater Retrofit Plan for an Urban Creek Subwatershed	
<i>James Li, Don Weatherbe, Derek Mack-Mumford, and Michael D'Andrea</i>	39
3.1 Description of the Study Area	41
3.2 Goals and Objectives of the Stormwater Quality Management ...	42
3.3 Identification of Feasible RSWMPs	43
3.4 Formulation of Alternative Stormwater Quality Management Strategies	46

3.5	Evaluation of Alternative Stormwater Quality Management Strategies	47
3.6	Recommendation of the Preferred Strategy	53
3.7	Conclusions and Recommendations	55
4.	“Stormwater Management on Somebody Else’s Land!”	
	<i>Ronald B. Scheckenberger and Raymond T. Guther</i>	59
4.1	Introduction	60
4.2	Rationale	60
4.3	Case Study	62
4.4	Montgomery Creek Class Environmental Assessment	62
4.5	Detailed Evaluation	65
4.6	Selection of Alternative	73
4.7	Conclusion	74
5.	Long-Term Continuous SWMM Modeling of Combined Sewers	
	<i>Agnes Ayuso and Mitch Heineman</i>	77
5.1	Model Input Development	77
5.2	Model Calibration	88
5.3	Baseline Simulation	95
5.4	Conclusions	97
6.	Effective use of a Catchment Modeling Approach as a Diagnostic Tool for Integrated Water Management	
	<i>Luc Vescovi and Jean Pierre Villeneuve</i>	99
6.1	The Study Area and the Environmental Issues	102
6.2	Strategy and Tools	103
6.3	Data Origin and Collection	105
6.4	Results	106
6.5	Discussion and Conclusion	113
7.	Robust Data Analysis Systems for Urban Watershed Management Decision Support	
	<i>Colleen L. Hughes and Ralph H. Kummler</i>	115
7.1	Introduction	116
7.2	Water Quality Data Analysis for Urban Watershed Management	117
7.3	A Robust Water Quality Data Analysis System: the Rouge Project Application	120
7.4	Case Studies	130
7.5	Summary and Conclusions	132

8. On the Optimization of Uncertainty, Complexity and Cost for Modeling Combined Sewer Systems	
<i>William James, Taymour El-Hosseiny and Hugh R. Whiteley</i>	135
8.1 Introduction	136
8.2 Procedure for Determining Optimal Complexity	137
8.3 Application to Columbus, Ohio	139
8.4 Uncertainty Analysis	148
8.5 Cost Functions for CSO Control	151
8.6 Results and Discussion	153
8.7 Conclusions	156
9. Sensitivity-calibration Decision-support Tools for Continuous SWMM Modeling: a Fuzzy-logic Approach	
<i>William James and Anthony William Kuch</i>	159
9.1 Introduction	159
9.2 Background Review	161
9.3 Parameter Sensitivity and Fuzzification Methodology	165
9.4 Fuzzification of the Hydrological Processes	181
9.5 Manual Calibration Procedure	181
9.6 Conclusions	186
10. Sensitivity and Cross-Calibration of Two Types of Continuous Stormwater Models	
<i>Glen W. Thoman and Barry J. Adams</i>	189
10.1 Introduction	189
10.2 Analysis by Continuous Simulation	191
10.3 Analysis By Analytical Probabilistic Models	194
10.4 Factorial Experimental Design	198
10.5 Calibration of the Analytical Model Results	206
10.6 Verification of the Calibration Procedure	213
10.7 Conclusions	215
11. ArcView Applications in SWMM Modeling	
<i>Uzair M. Shamsi</i>	219
11.1 Introduction	219
11.2 ArcView	221
11.3 Interchange	224
11.4 Interface	226
11.5 Integration	231
11.6 Summary	232

12. Towards a Shallow Groundwater Routine for Modeling Infiltration BMPs in Urban Stormwater Models	
<i>William James and Julie Anne Ulan</i>	235
12.1 Introduction	236
12.2 Background Review	236
12.3 Review of Groundwater Routines in SWMM4.3	239
12.4 Background Theory for Urban Groundwater Flow	246
12.5 New Groundwater Flow Model (JUGRND)	250
12.6 Conclusions	252
13. Spatial and Seasonal Characterization of Infiltration/Inflow for a Regional Sewer System Model	
<i>Benjamin J. Sherman, Philip N. Brink, and Mark J. TenBroek</i>	257
13.1 Introduction	257
13.2 Review of RDII	258
13.3 RDII Characterization	260
13.4 Sensitivity Analysis and Results	269
13.5 RDII Calibration	269
13.6 Conclusions	273
14. Improved Combined Sewer Area Inflow Hydrograph Representation	
<i>David A. White, Bradley M. Boddy and James D. Sherrill</i>	275
14.1 Introduction	275
14.2 Review of Existing GDRSS RUNOFF Model	276
14.3 Method to Support GDRSS Combined Sewer Area Inflow Hydrograph Shapes	278
14.4 Rainfall Data Interval and Computational Time Step Review ...	281
14.5 Improved GDRSS RUNOFF Routing Channel Development ...	283
14.6 Application of Routing Channel Formulation to GDRSS Combined Sewer Areas	290
14.7 Results	291
14.8 Recommendations	293
15. Improved Outfall Representation in EXTRAN Using HEC-2	
<i>Imad A. Salim and Karen Ridgway</i>	297
15.1 Introduction	298
15.2 GDRSS Model Outfalls	298
15.3 Single Pipe EXTRAN Representation	300
15.4 Multiple Pipe EXTRAN Representation	303
15.5 HEC-2 Outfall System Representation	303
15.6 Improved EXTRAN Representation of Outfall System	305
15.7 Conclusions	308

16. How to Develop Chemical Criteria for Airport Stormwater	
<i>Gordon R. Craig, Gerard van Arkel, James B. Williams and Jacques Leroux</i>	
Leroux	309
16.1 Introduction	309
16.2 Environmental Needs	311
16.3 Aquatic Toxicity	312
16.4 Aesthetics - Colour	314
16.5 Dissolved Oxygen Requirements	315
16.6 Glycol Limits	316
16.7 Consolidation of Data	318
16.8 Process for Developing Chemical Criteria for Stormwater	319
17. A Laboratory Examination of Pollutants Leached from Four Different Pavements by Acid Rain	
<i>William James and Reem Shahin</i>	321
17.1 Introduction	322
17.2 Background Review	323
17.3 Processes at the Pavement	327
17.4 Laboratory Experiments	330
17.5 Results	332
17.6 Discussion	337
17.7 Conclusions	345
18. High Efficiency Sweeping as an Alternative to the Use of Wet Vaults for Stormwater Treatment	
<i>Roger C. Sutherland, Seth L. Jelen and Gary Minton</i>	351
18.1 Previous Research	352
18.2 Data Collection Program	352
18.3 SIMPTM Overview	357
18.4 SIMPTM Calibration	359
18.5 Annual TSS Load Reductions from BMPs	360
18.6 Annual Pollutant Loads	367
18.7 Conclusions	368
19. Consistent and Uniform Method for the Evaluation of Stormwater BMPs	
<i>Thomas R. Adams and Robert A. Strong Jr.</i>	373
19.1 Runoff Quality	373
19.2 Analysis	375
19.3 Conclusion	380

20. Annual Loading Estimates of Selected Metals and PAHs in CSOs, using a Continuous PCSWMM Approach	
<i>K.N. Irvine, I.G. Droppo, T.P. Murphy and D.M. Stirrup</i>	383
20.1 Methods	385
20.2 Results	389
20.3 Discussion and Conclusion	394
21. Circulation and Water Quality Model for Stormwater Ponds	
<i>Ray Dewey and Harold Chard</i>	399
21.1 Introduction	399
21.2 Hydrodynamic Model Formulation	400
21.3 Hydraulic Connectivity of Stormwater Ponds	403
21.4 Sediment Removal	404
21.5 Conclusions	414
22. Estimating Volume Requirements for Runoff Storage Facilities: Old Simplicity vs. New Complexity	
<i>Fabian Papa, Barry J. Adams and Glen W. Thoman</i>	415
22.1 Simplified Method for Sizing Runoff Storage Basins	416
22.2 Simplified Approach vs Event Simulation	425
22.3 Simplified Approach vs Continuous Analysis Technology	428
22.4 Conclusions	432
22.5 Sample Spreadsheet Application	434
23. What is the Impervious Area Curve Number?	
<i>Ashok Pandit and Joanie Regan</i>	437
23.1 Introduction	438
23.2 Description of Handbook and Calibration Methods	441
23.3 Site Description and Data Collection	444
23.4 Curve Number Estimations	445
23.5 Conclusions	447
Acronyms and abbreviations	451
Programs and models	459
SI-US unit conversion	463
Editor and reviewers: affiliations and photographs	465
Chapter authors: affiliations and photographs	469
Index	475