

07.3



dandelion.com

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

Bibliotheks

INSTITUT FÜR WASSERBAU  
UND WASSERWIRTSCHAFT  
TECHNISCHE UNIVERSITÄT DARMSTADT  
PETERSENSTR. 13, 64287 DARMSTADT

Tel. 0 61 51 / 16 21 43 · Fax: 16 32 43

Juv. - Nr.: 4080

*Advances in*

---

MODELING *the*  
MANAGEMENT *of*  
STORMWATER  
IMPACTS

*Volume 5*

---

*edited by William James*

# Contents

<b>Preface</b> .....	
<b>1. Models for Water Quality Control by Stormwater Ponds</b>	
<i>Papa, Adams and Bryant</i> .....	1
1.1 Introduction .....	2
1.2 Continuous Simulation Model .....	3
1.3 Analytical Modeling of Stormwater Management Ponds .....	4
1.4 Discussion of Results .....	11
1.5 Investigation of Active Storage Volume to Permanent Pool Volume Ratio .....	17
1.6 Summary and Conclusions .....	19
<b>2. Integration of US Army Corps of Engineers' Time-Series Data Management System with Continuous SWMM Modeling</b>	
<i>Wang and James</i> .....	23
2.1 Introduction .....	24
2.2 Time-Series Manager Development .....	29
2.3 Time-Series Data Manager Evaluation .....	35
2.4 Conclusions .....	41
<b>3. On Integrating Continuous Simulation* and Statistical Methods for Evaluating Urban Stormwater Systems</b>	
<i>Heaney and Wright</i> .....	45
3.1 Performance of Detention Systems .....	45
3.2 Inflow Characteristics .....	46
3.3 Covariance between Flow and Concentration .....	50
3.4 Basin Characteristics .....	53
3.5 Evaluation of Detention Systems Performance .....	56
3.6 Comparison of Methods .....	62

3.7	Statistical Method .....	63
3.8	Computational Methods for Risk Analysis .....	64
3.9	Towards More Robust Evaluation Methods .....	65
3.10	Case Study of Boulder, Colorado .....	66
3.11	Summary and Conclusions .....	71
<b>4.</b>	<b>Use of Continuous Simulation for Evaluation of Stormwater Management Practices to Maintain Base Flow and Control Erosion</b>	
	<i>Guther, Scheckenberger, and Blackport</i> .....	77
4.1	Background .....	77
4.2	Baseline Conditions .....	79
4.3	Alternative Stormwater Management Strategies .....	81
4.4	HSP-F Analysis Approach .....	82
4.5	Results .....	87
4.6	Preferred Stormwater Management Strategy .....	98
4.7	Conclusions .....	99
<b>5.</b>	<b>The Feasibility of Using Continuous SWMM for Water Resources Conservation Planning</b>	
	<i>Schmidt, Cunningham, and Mack</i> .....	101
5.1	Introduction .....	101
5.2	Methodology .....	104
5.3	Rainfall .....	106
5.4	Evapotranspiration .....	107
5.5	Runoff .....	108
5.6	Infiltration .....	109
5.7	Groundwater Recharge and Baseflow .....	110
5.8	Direct Surface Runoff .....	112
5.9	Mass Balance .....	112
5.10	Control Structure Considerations .....	113
5.11	Results .....	116
<b>6.</b>	<b>Development and Initial Refinement of a Water Balance Model as a Planning Tool for Stormwater Management Application</b>	
	<i>Graham, Whiteley and Thomson</i> .....	117
6.1	Introduction .....	117
6.2	Methodology .....	118
6.3	Example .....	123
6.4	Conclusions .....	125

<b>7.</b>	<b>SWMM Graphics</b>	
	<i>Shamsi</i> .....	129
	7.1 Introduction .....	129
	7.2 SWMM Problems .....	131
	7.3 Graphical User Interface .....	132
	7.4 Recommended GUI Features .....	133
	7.5 GUI Review .....	139
	7.6 Results .....	149
	7.7 Recommendations .....	151
<b>8.</b>	<b>Thermal Enrichment of Stormwater by Urban Pavement</b>	
	<i>James and Verspagen</i> .....	155
	8.1 Earlier Research .....	156
	8.2 Processes of Thermal Enrichment of Stormwater .....	157
	8.3 Development of a Design Methodology .....	165
	8.4 The Laboratory and Test Pavements .....	169
	8.5 Results for Various Rain Intensities .....	170
	8.6 Asphalt and Permeable Concrete Pavers Compared .....	173
	8.7 Conclusions and Recommendations .....	175
<b>9.</b>	<b>Contrary to Conventional Wisdom, Street Sweeping Can be an Effective BMP</b>	
	<i>Sutherland and Jelen</i> .....	179
	9.1 Previous Research .....	180
	9.2 Sweeping Technologies .....	181
	9.3 Evaluation Procedure .....	182
	9.4 Pickup Performance Model .....	183
	9.5 Pollutant Washoff Reduction Comparison .....	188
	9.6 Conclusions .....	189
<b>10.</b>	<b>Observations of Infiltration Through Clogged Porous Concrete Block Pavers</b>	
	<i>Kresin, James and Elrick</i> .....	191
	10.1 Introductory Background .....	192
	10.2 Previous Research .....	192
	10.3 Surface Crusting .....	193
	10.4 Spatial Variability and Scale Effects .....	194
	10.5 Experimental Methodology .....	195
	10.6 Results and Discussion .....	198
	10.7 Conclusions .....	202

<b>11. Contaminants from Four New Pervious and Impervious Pavements in a Parking-lot</b>	
<i>James and Thompson</i> .....	207
11.1 Introductory Background .....	207
11.2 Previous Work .....	208
11.3 Pollutants in Pavement Runoff and their Pathways .....	209
11.4 Contaminants Examined .....	211
11.5 Results .....	212
11.6 Conclusions .....	219
<b>12. Energy Losses in a Tangential Helicoidal-Ramp Inlet for Dropstructures</b>	
<i>Ansar and Jain</i> .....	223
12.1 Introduction .....	223
12.2 Experiments .....	224
12.3 Energy Loss Coefficient .....	227
12.4 Conclusion .....	231
<b>13. Uncertainties in Metering Stormwater Flows</b>	
<i>Wright</i> .....	233
13.1 Sources of Metering Uncertainty .....	234
13.2 Case Study .....	236
13.3 Conclusions .....	249
<b>14. City of Toronto Experience: the Process of Environmental Approval for the Western Beaches Storage Tunnel</b>	
<i>Green</i> .....	253
14.1 Recommended Scheme .....	255
14.2 Western Beaches Tunnel .....	258
14.3 Approval Process for the Tunnel Project .....	258
14.4 Conclusions .....	261
<b>15. A Study of the Impacts and Control of Wet Weather Sources of Pollution on Large Rivers</b>	
<i>Hill, Lyons and Hulley</i> .....	263
15.1 Introduction .....	264
15.2 Description of the Study Area .....	265
15.3 Model Development .....	267
15.4 Model Calibration .....	270
15.5 Model Results .....	274
15.6 Future Program .....	274

<b>16. Cost Effectiveness of Urban Runoff and Combined Sewer Control Options</b>	
<i>Hill and Adams</i> .....	277
16.1 Background .....	278
16.2 Methodology .....	278
16.3 Cost of Control Options .....	280
16.4 Cost Effectiveness Analysis Methodology .....	282
16.5 Cost Effectiveness Analysis Results .....	283
16.6 Conclusions .....	286
<b>17. Modeling Methodology for Determining Pollutant Concentrations and Loadings for Combined Sewer Overflows: A Simplified CSO Model</b>	
<i>Rhee, Huang and Kummeler</i> .....	289
17.1 Theoretical Modeling Background .....	291
17.2 Modeling Methodology .....	295
17.3 Modeling Results and Discussion .....	299
17.4 Conclusion .....	304
<b>18. Modeling Fecal Coliform In Mill Creek</b>	
<i>Xie, Gray, Zettler, and Yingling</i> .....	307
18.1 Study Area .....	308
18.2 Model Set-Up .....	309
18.3 Model Calibration .....	312
18.4 Water Quality Simulations .....	315
18.5 Conclusions .....	319
<b>19. Storm Treat System Installation at Elm Street, Kingston, Massachusetts</b>	
<i>Horsley</i> .....	321
19.1 Procedure and Analysis .....	321
19.2 Results .....	325
<b>20. Issues Regarding the Application of a Mass-Balance Equation to an Urban Creek</b>	
<i>Hicks, McBean, Quigley and Polan</i> .....	327
20.1 Background .....	327
20.2 Elements of Canagigue Creek Model .....	330
20.3 Determination of Flow Values .....	335
20.4 Determination of Water Quality Chemical Profiles .....	337
20.5 Simulation of Existing Conditions .....	341
20.6 Predicted Improvement in Creek Quality .....	343
20.7 Conclusions .....	348

<b>21.</b>	<b>Setting of Total Maximum Daily Loads for an Urban Water Body</b>	
	<i>Crawford and Abrahms</i> .....	351
21.1	The TMDL Process .....	353
21.2	Beneficial Uses and Water Quality Limitations .....	354
21.3	Water Quality Modeling .....	357
21.4	Conclusions .....	360
<b>22.</b>	<b>Wastewater Information Management System: Flow Modeling and Sewer Connection Permit Applications</b>	
	<i>Crawford and Limtiaco</i> .....	365
22.1	System Complexity .....	367
22.2	Sewer Flow Analysis System (SFAS) .....	369
22.3	Sewer Connection Application System (SCAS) .....	371
22.4	Conclusions .....	373
<b>23.</b>	<b>Application of WASP5E to Model Phosphorus Removal Dynamics in a Stormwater Wetland</b>	
	<i>Lopez, James, Heathcote, Fitzgibbon</i> .....	375
23.1	Models Description .....	376
23.2	Description of the Study Area .....	383
23.3	Modeling Methodology .....	384
23.4	WASP5E Application to the Hidden Valley Wetland .....	393
23.5	Discussion .....	398
23.6	Sources of Error .....	400
23.7	Conclusions .....	402
<b>24.</b>	<b>Modeling Retrofitted Extended-Detention Wet Ponds and Wetland Pockets</b>	
	<i>Lam and Palmer</i> .....	407
24.1	Introduction .....	408
24.2	Description of Projects .....	409
24.3	Project Goals and Objectives .....	411
24.4	Description of Preferred Retrofit Options .....	412
24.5	Results and Discussion .....	421
<b>25.</b>	<b>Techniques Used in an Urban Watershed Planning Study</b>	
	<i>Avery and LaBombard</i> .....	429
25.1	Introduction .....	429
25.2	Tunnel-Quarry Plan Model Development .....	430
25.3	Assessing Effects of Disconnecting Directly- Connected Impervious Areas .....	434
25.4	Model Results .....	436
25.5	Recommendations for Additional Modeling .....	438

<b>26. An Alternate Method of Finding the USDA Soil Conservation Service Runoff Curve Number for a Small Watershed</b>	
<i>Hamlet and Huebner</i> .....	441
26.1 Introduction .....	442
26.2 Study Objective .....	442
26.3 Methodology .....	443
26.4 Results .....	444
26.5 Discussion .....	448
26.6 Conclusions and Recommendations .....	452
<b>27. Role of Municipal Stormwater Management Guidelines: the Markham Experience</b>	
<i>Wisner and Arishenkoff</i> .....	455
27.1 Needs .....	455
27.2 Organization of the Town of Markham Stormwater Management Guidelines .....	457
27.3 Review and Comparison with Provincial Guidelines .....	458
27.4 Discussion of Some SWM Issues .....	459
27.5 Final Remarks .....	462
<b>28. Software and Database on a CDROM for Finding Titles of 4000 Papers in the Less-accessible Literature on Urban Drainage and Related Modeling</b>	
<i>James, Rowe, and James</i> .....	465
28.1 Introduction .....	465
28.2 Sources .....	466
28.3 Installation .....	466
28.4 Instructions .....	466
28.5 Retrieval of Papers .....	467
<b>Acronyms and Abbreviations</b> .....	<b>475</b>
<b>Programs and Models</b> .....	<b>483</b>
<b>SI-US Unit Conversion</b> .....	<b>487</b>
<b>Editor and Reviewers: Affiliations and Photographs</b> .....	<b>489</b>
<b>Chapter Authors: Affiliations and Photographs</b> .....	<b>493</b>
<b>Index</b> .....	<b>499</b>