



CLAYTON COUNTY WATER AUTHORITY
1600 Battle Creek Road, Morrow, Georgia 30260

STORMWATER DEVELOPMENT GUIDELINES

Second Edition
November 2006

Program Management & Engineering Department
Office: (770) 961-2130
Fax: (770) 960-5229

**CLAYTON COUNTY WATER AUTHORITY
STORMWATER DEVELOPMENT GUIDELINES
CLAYTON COUNTY STORMWATER UTILITY**

TABLE OF CONTENTS

Section 1: Scope and Intent	1
1.01 Introduction to the Stormwater Utility	1
1.02 Purpose	1
1.03 Applicability	3
1.04 Amendments to Guidelines.....	3
Section 2: Definitions	4
Section 3: Design Approval	7
3.01 Design Basis	7
3.02 Technical Review	7
3.03 Plan and Plat Review Process	7
3.04 Modifications to Plans	10
3.05 Approval by Regulatory Agencies	10
3.06 Period of Plan Approval	11
3.07 Acceptance of Stormwater Management Systems – Final Plat Review	11
3.08 Acceptance of Stormwater management Systems – As-Built Drawings	12
3.09 Requirements for Sites with a Floodplain Management/Flood Damage Prevention Plan	13
Section 4: Inspection Policy	14
4.01 Notification	14
4.02 Inspection.....	14
Section 5: Design Requirements	15
5.01 Components of Stormwater Management Plan	15
5.02 Stormwater Management Design and Plan Requirements	15
5.03 Design Professional	16
5.04 Additional Criteria.....	16
5.05 Floodplain Management/Flood Damage Prevention Plan	24
Section 6: Appendices	31
Appendix A. Detailed Components of Stormwater Management Plan.....	31
1. Stormwater Management Report	31
2. Stormwater Management Systems Drawing	33
3. Construction-Phase Erosion and Sedimentation Control Plan	33
4. Landscaping and Open Space Plan	33

**CLAYTON COUNTY WATER AUTHORITY
STORMWATER DEVELOPMENT GUIDELINES
CLAYTON COUNTY STORMWATER UTILITY**

TABLE OF CONTENTS

5. Operations and Maintenance Plan	34
6. Maintenance Access Easements	34
7. Floodplain Management / Flood Damage Prevention Plan	34
Appendix B. Operation and Maintenance Plan	37
1. Inspection and Maintenance Agreement	37
2. Stormwater Management Facility Maintenance Checklist	40
Appendix C. Stormwater Detention, Storage and Water Quality Structure Certification Form	41
Appendix D. Stormwater Technical Review Checklist.....	42
Appendix E. Preliminary Plat Review Checklist	61
Appendix F. Final Plat Review Checklist	62
Appendix G. Inspection Report	63
Appendix H. FEMA Procedures for No-Rise Certification for Proposed Development in Regulatory Floodway	65
Appendix I. Clayton County Water Authority Standard and Specifications.....	70
1. Specifications for HDPE Pipe	70
2. CCWA Detail Number 100.1: Typical Open Channel	71
3. CCWA Detail Number 100.2: Typical Weir Inlet	72
4. CCWA Detail Number 100.3: HDPE Pipe Bedding.....	73
Appendix J. Georgia Department of Transportation Standard Details.....	74
1. GDOT Std Number 1019A: Standard Drop Inlets (Built-in-Place) ...	75
2. GDOT Std Number 1019A-P: Standard Precast Drop Inlets	76
3. GDOT Std Number 1019B: Standard Drop Inlets V-1 and V-2.....	77
4. GDOT Std Number 1030D: Standard Concrete & Metal Pipe Culverts (Trench Construction, Bedding, Backfilling).....	78
5. GDOT Std Number 1030D: Standard Concrete & Metal Pipe Culverts (Fill Heights for Concrete and Corrugated Metal Pipe).....	79
6. GDOT Std Number 1030D: Standard Concrete & Metal Pipe Culverts (Fill Heights for Spiral Rib Metal Pipe and for Pipe Arch)	80
7. GDOT Std Number 1033D: Standard Catch Basins	81
8. GDOT Std Number 1033D-P: Standard Precast Catch Basins for Use with Curb (6" or 8" HT) & Gutter	82
9. GDOT Std Number 1034D: Standard Catch Basins for Use with Curb (6" or 8" HT) & Gutter (In Sags or Low Points)	83

**CLAYTON COUNTY WATER AUTHORITY
STORMWATER DEVELOPMENT GUIDELINES
CLAYTON COUNTY STORMWATER UTILITY**

TABLE OF CONTENTS

10. GDOT Std Number 1034D-P: Standard Precast Catch Basins for Use with Curb (6" or 8" HT) & Gutter (In Sags or Low Points)84

11. GDOT Std Number 1040: Standard Circular Base Units and Risers for Catch Basins and Drop Inlets (Construction Alternates)85

12. GDOT Std Number 1120: Standard Flared End Sections for Pipes86

13. GDOT Std Number 1125: Standard Tapered Inlet Headwall-Outlet Headwall (Built-in-Place)87

14. GDOT Std Number 1401: Standard Pavement Patching Details (Storm Drain or Utility Installations by Open Cut Across Existing Pavement).....88

15. GDOT Std Number 9031N: Chain Link Wire Fence.....89

16. GDOT Std Number 9031U: Standard Precast or Built-in-Place Junction Boxes Pipe Collars, Pipe Elbow and Pipe Curved Alignment90

| Appendix K. Hydrologic Models Meeting the Minimum Requirement of NFIP91

**CLAYTON COUNTY WATER AUTHORITY
STORMWATER DEVELOPMENT GUIDELINES
CLAYTON COUNTY STORMWATER UTILITY**

SECTION 1: SCOPE AND INTENT

1.01 Introduction to the Stormwater Utility

- A. The Clayton County Water Authority (CCWA), Clayton County and Cities of Forest Park, Jonesboro, Lake City, Lovejoy, Morrow and Riverdale have developed a Stormwater Utility to manage the County and referenced cities stormwater management programs.
- B. CCWA is authorized by intergovernmental agreements and ordinances to administer the Stormwater Utility on behalf of the County and Cities.

1.02 Purpose

- A. The purpose of these guidelines is to incorporate the requirements of each jurisdiction participating in the Stormwater Utility into a consistent set of guidelines for all jurisdictions.
- B. These guidelines set forth the design requirements, material requirements and construction standards of the Stormwater Utility as to comply with all applicable local, state and federal laws for the design and installation of stormwater management systems and controls.
- C. Public and private stormwater management system designs in Clayton County shall be based on the guidance provided in the Georgia Stormwater Management Manual except as otherwise noted in these guidelines.
- D. In addition to these guidelines, the Design Professional shall refer to other local jurisdiction's related ordinances but it is the intent of these guidelines to incorporate all requirements related to stormwater management activities. A copy of these ordinances is available upon request from CCWA or the local jurisdiction. Table 1 outlines local ordinances related to stormwater management activities:

**CLAYTON COUNTY WATER AUTHORITY
STORMWATER DEVELOPMENT GUIDELINES
CLAYTON COUNTY STORMWATER UTILITY**

SECTION 1: SCOPE AND INTENT

Table 1. Local Ordinances Related to Stormwater Management

Jurisdiction	Ordinance Title	Ordinance Number	Adoption Date
Clayton County	Clayton County Stormwater Utility Ordinance	2006-44	3-21-2006
	Stormwater Management (Chapter 38 Article IV)	95-19	2-21-1995
	Post-Development Stormwater Management for New Development and Redevelopment (Chapter 38 Article V)	2004-39	4-6-2004
	Floodplain Management (Chapter 38 Article VI)	2004-38	4-6-2004
	Illicit Discharge and Illegal Connection (Chapter 38 Article VII)	2004-40	4-6-2004
	Stream Buffer Protection (Chapter 38 Article VIII)	2005-34, 2005-87	3-15-2005, 8-16-2005
	Zoning Ordinance (Clayton County Watershed Protection Section 823)	*	10-6-1987
City of Forest Park	City of Forest Park Stormwater Utility Ordinance	06-15	4-3-2006
	Floodplain Management/Flood Damage Prevention (Title 8 Chapter 6)	04-17	3-30-2004
	Post-Development Stormwater Management - includes illicit connections (Title 5 Chapter 4)	04-18	3-30-2004
	Stream Buffer Protection (Title 8 Chapter 9)	04-20	3-30-2004
City of Jonesboro	City of Jonesboro Stormwater Utility Ordinance	2006-02	3-13-2006
	Flood Damage Prevention (Section 34 Article V)	04-06	3-8-2004
	Illicit Discharge and Illegal Connection (Section 34 Article VI)	04-15	5-17-2004
	Post-Development Stormwater Management (Section 34 Article VII)	04-17	8-9-2004
City of Morrow	City of Morrow Stormwater Utility Ordinance	2006-04	4-11-2006
	Flood Damage Prevention (Title 8 Chapter 4)	2004-06	4-27-2004
	Conservation Subdivision (Title 8)	2004-07	4-27-2004
	Post-Development for Stormwater Management (Title 5 Chapter 3)	2004-08	4-27-2004
	Stream Buffer Protection (Title 8 Chapter 6)	2004-10	4-27-2004
	Wetlands Protection (Title 8 Chapter 9)	2000-09	5-9-2000
City of Riverdale	City of Riverdale Stormwater Utility Ordinance	05-18	10-10-2005
	Stormwater Management (Chapter 30 Article VI)	95-5	4-20-1995
	Flood Damage Prevention (Chapter 38)	Code 1976	1976
City of Lake City	City of Lake City Stormwater Utility Ordinance	06-04	4-10-2006
City of Lovejoy	City of Lovejoy Stormwater Utility Ordinance	06-02	*

* Not specified

**CLAYTON COUNTY WATER AUTHORITY
STORMWATER DEVELOPMENT GUIDELINES
CLAYTON COUNTY STORMWATER UTILITY**

SECTION 1: SCOPE AND INTENT

- E. The Design Professional shall also consult the local jurisdiction where work is to be performed on subdivision regulations, erosion and sediment control, zoning and other land use related requirements.

1.03 Applicability

- A. CCWA shall review stormwater management plans for land development activities that meet any of the following criteria:

- 1. New development that involves the creation of 5,000 square feet or more of impervious cover or that involves other land development activities of one (1) acre or more;
- 2. Redevelopment that includes the creation, addition or replacement of 5,000 square feet or more impervious cover or that involves other land development activities of one (1) acre or more;
- 3. Any new development or redevelopment, regardless of size, that is defined by the CCWA or his designee to be a hotspot land use; or
- 4. Land development activities that are smaller than the minimum applicability criteria set forth in items (i) and (ii) above if such activities are part of larger common plan of development, even though multiple, separate and distinct land development activities may take place at different times on different schedules.

- B. The following activities are exempted from the local jurisdictions' Post-Development Stormwater Management Ordinance and therefore will not be reviewed by CCWA:

- 1. Individual single family or duplex residential lots that are not part of a subdivision or phased development project;
- 2. Additions or modifications to existing single-family or duplex residential structures;
- 3. Agricultural or silvicultural land management activities within areas zoned for these activities; or
- 4. Repairs to any stormwater management facility or practice deemed necessary by CCWA.

1.04 Amendments to Guidelines

CCWA shall amend the *Stormwater Development Guidelines* as required due to changes in applicable local, state and federal regulations. The Department Manager of Program Management and Engineering of the Clayton County Water Authority shall approve amendments in writing.

**CLAYTON COUNTY WATER AUTHORITY
STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
CLAYTON COUNTY STORMWATER UTILITY**

SECTION 2: DEFINITIONS

The listed words or acronyms shall mean the following:

Area of Special Flood Hazard: The land subject to a one percent or greater chance of flooding in any given year. This includes all floodplain and flood prone areas at or below the base flood elevation (including A, A1-30, A-99, AE, AO, AH and AR on the FHBM or the FIRM), all floodplain and flood prone areas at or below the future-conditions flood elevation, and all other flood prone areas as referenced in the Flood Insurance Study, any flood or flood related study conducted by any local, State or Federal agency applicable to the local jurisdiction or any base or future-conditions flood study authored by a registered professional engineer in the State of Georgia which has been prepared by FEMA approved methodology and approved by CCWA. In addition, all streams with a drainage area of 100 acres or more have an area of special flood hazard.

Base Flood Elevation: The highest water surface elevation anticipated at any given point during the base flood or 100-year flood.

CCWA: Clayton County Water Authority.

CCWA Engineer: Clayton County Water Authority Department Manager of Program Management and Engineering or authorized representative.

Cities: Cities of Forest Park, Jonesboro, Lake City, Lovejoy, Morrow and Riverdale.

Developer: Any person, firm, corporation, association or partnership or an agent thereof who undertakes or proposes to undertake the development of land so as to constitute a residential subdivision, apartment complex, condominium or commercial/industrial/institutional establishment.

FBFM: Flood Boundary and Floodway Map

FEMA: Federal Emergency Management Agency

Flood Insurance Study or FIS: The official report by the Federal Insurance Administration evaluating flood hazards and containing flood profiles and water surface elevations of the base flood.

FIRM: Flood Insurance Rate Map

Floodway or “Regulatory Floodway”: The channel of a stream or other watercourse and the adjacent areas of the floodplain which is necessary to contain

CLAYTON COUNTY WATER AUTHORITY
STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
CLAYTON COUNTY STORMWATER UTILITY

SECTION 2: DEFINITIONS

and discharge the base flood flow without cumulatively increasing the base flood elevation more than one foot.

Floodplain: Any land area susceptible to flooding.

Future-Conditions Floodplain: Any land area susceptible to flooding by the future-conditions flood (the flood having a one percent chance of being equaled or exceeded in any given year based on future-conditions hydrology. Also known as the 100-year future-conditions flood).

GDOT: Georgia Department of Transportation

Georgia Stormwater Management Manual (GSMM): A document containing policy, criteria and technical specifications and standards adopted by the County and Cities for preparing stormwater management plans and designing stormwater management systems.

Hotspot: An area where the use of the land has the potential to generate highly contaminated runoff, with concentrations of pollutants in excess of those typically found in stormwater.

Non-Structural Stormwater Control: Any natural or planted vegetation or other nonstructural component of the stormwater management plan that provides for or enhances stormwater quantity and/or quality control or other stormwater management benefits, and includes, but is not limited to, riparian buffers, open and greenspace areas, overland flow filtration areas, natural depressions and vegetated channels.

Stormwater Control: Refer to structural and non-structural stormwater controls.

Stormwater Management: Collection, conveyance, storage, treatment and disposal of stormwater runoff in a manner intended to prevent increased flood damage, streambank channel erosion, habitat degradation and water quality degradation, and to enhance and promote the public health, safety and general welfare.

Stormwater Management System: The entire set of structural and nonstructural stormwater management facilities and practices that are used to capture, convey and control the quantity and quality of the stormwater runoff from a site.

Stormwater Management Plan: A document describing how existing runoff characteristics will be affected by a land development project and containing

**CLAYTON COUNTY WATER AUTHORITY
STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
CLAYTON COUNTY STORMWATER UTILITY**

SECTION 2: DEFINITIONS

measures for complying with the provisions of the ordinances shown on Table 1 (Local Ordinances Related to Stormwater Management).

Structural Stormwater Control: Stormwater management facility or device that controls stormwater runoff and changes the characteristics of that runoff including, but not limited to, the quantity and quality, the period of release and the velocity of flow of such runoff.

Subdivision: The division of a tract or parcel of land resulting in one or more new lots or building sites for the purpose, whether immediately or in the future, of sale, other transfer or land development, and includes divisions of land resulting from or made in connection with the layout or development of a new street or roadway or a change in an existing street or roadway.

Substantial Damage: Damage of any origin sustained by a structure whereby the cost of restoring the structure to its before damaged condition would equal or exceed 50 percent of the market value of the structure before the damage occurred.

Substantial Improvement: Any combination of repairs, reconstruction, alteration, or improvements to a building, taking place during a 10-year period, in which the cumulative cost equals or exceeds 50% of the market value of the structure prior to the improvement. The market value of the building means (1) the appraised value of the structure prior to the start of the initial repair or improvement, or (2) in the case of damage, the value of the structure prior to the damage occurring. This term includes structures which have incurred “substantial damage” regardless of the actual amount of repair work performed. For the purposes of this definition, “substantial improvement” is considered to occur when the first alteration of any wall, ceiling, floor or other structural part of the building commences, whether or not that alteration affects the external dimensions of the building. The term does not, however, include those improvements of a building required to comply with existing health, sanitary, or safety code specifications which are solely necessary to assure safe living conditions, which have been pre-identified by the Code Enforcement Official, and not solely triggered by an improvement or repair project.

**CLAYTON COUNTY WATER AUTHORITY
STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
CLAYTON COUNTY STORMWATER UTILITY**

SECTION 3: DESIGN APPROVAL

3.01 Design Basis

Public and private stormwater management system designs shall be based on the criteria in the Georgia Stormwater Management Manual and these guidelines.

3.02 Technical Review

- A. Proposed stormwater management plans shall be reviewed by CCWA under the supervision of a Georgia Licensed Professional Engineer for technical adequacy and conformance to applicable local, state and federal regulations.
- B. CCWA's review comments on stormwater management plans shall be marked on the Technical Review Checklist and noted on development plans in the color red (Red Line Comments). The Technical Review Checklist used during the CCWA review is included in Appendix D.

3.03 Plan and Plat Review Process

- A. Water distribution system, sanitary sewer system and stormwater management system plans shall be submitted to the CCWA. The flowchart shown on Figure 1 outlines the CCWA's plan processing sequence on water distribution system, sanitary sewer system and stormwater management system plans. The flowchart also shows CCWA's review process on preliminary and final plats.
- B. Preliminary Plat Review
 - 1. Preliminary plats shall be submitted to the local jurisdiction's Planning and Zoning Department. The Design Professional shall consult with the local Planning and Zoning Department on the number of submittals required. The local jurisdiction will route one (1) copy of the plat to the CCWA.
 - 2. CCWA shall review preliminary plats based on the Preliminary Plat Checklist shown in Appendix E. Any deficiencies will be noted on the plat in red color (Red Line Comments).
 - 3. CCWA shall return plats containing Red Line Comments to the local jurisdiction's Planning and Zoning Department.

**CLAYTON COUNTY WATER AUTHORITY
STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
CLAYTON COUNTY STORMWATER UTILITY**

SECTION 3: DESIGN APPROVAL

4. The Design Professional shall address all comments and resubmit corrected and original plats containing Red Line Comments to the local jurisdiction's Planning and Zoning Department.
5. CCWA shall return approved plats to the local jurisdiction's Planning and Zoning Department.

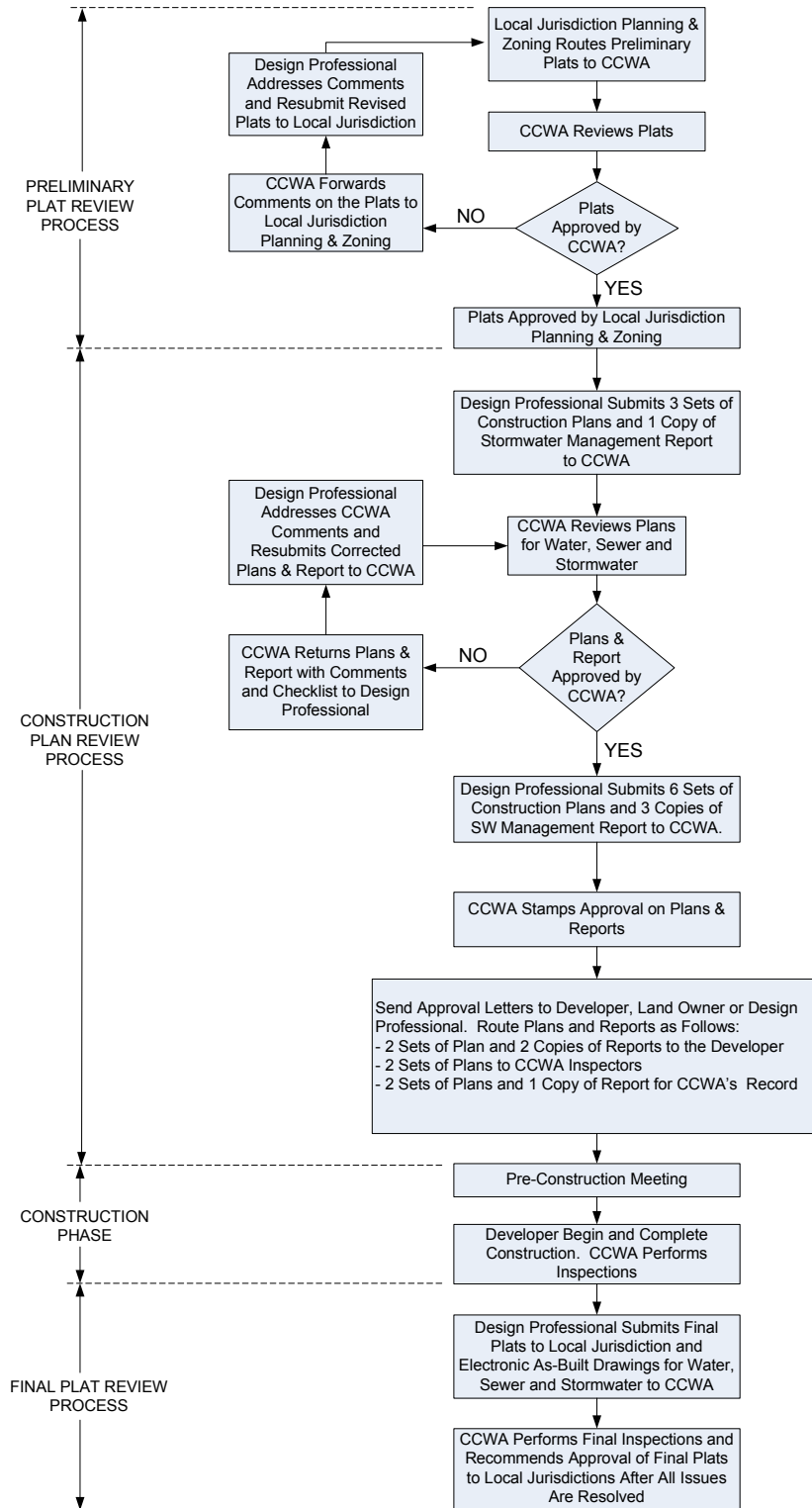
C. Construction Plan Review

1. A total of three (3) separate sets of construction plans and 1 copy of the stormwater management report are required for each submittal during the CCWA review process.
2. The construction plan shall contain the water distribution system, sanitary sewer system and stormwater management system plans.
3. CCWA shall review the water distribution system and/or sanitary sewer system plans for conformance with the Standard Specifications for Water Distribution Systems and Sanitary Sewer Systems. The stormwater management system plans and reports shall be reviewed for conformance with the requirements outlined in these guidelines and the Georgia Stormwater Management Manual.
4. CCWA review comments shall be marked on the Technical Review Checklist and noted on the construction plans in the color red (Red Line Comments). The Technical Review Checklist used during CCWA review is included in Appendix D.
5. The Design Professional shall address CCWA review comments. Plans containing the original Red Line Comments shall accompany each re-submittal during the CCWA review process.
6. The Design Professional shall submit six (6) sets of construction plans and three (3) copies of stormwater management reports for final CCWA approval.
7. CCWA shall stamp approval on all sets of plans and reports. CCWA will send an approval letter to the Developer and Design Professional and provide one copy of each stormwater management plan and report to the local jurisdiction. The Developer shall not commence construction until the local jurisdiction issue a Land Disturbance Activity permit for the development.

**CLAYTON COUNTY WATER AUTHORITY
 STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
 CLAYTON COUNTY STORMWATER UTILITY**

SECTION 3: DESIGN APPROVAL

Figure 1. CCWA Plat and Plan Review Process



**CLAYTON COUNTY WATER AUTHORITY
STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
CLAYTON COUNTY STORMWATER UTILITY**

SECTION 3: DESIGN APPROVAL

8. CCWA shall distribute the stamped plans and reports as follows:

Distribution	Construction Plan	Stormwater Report
Developer or Land Owner	2 sets	2 copies
CCWA	4 sets	1 copy

9. The Developer or Land Owner will be responsible for forwarding 1 set of the stamped plan and 1 copy of the stamped report to the local jurisdiction.

3.04 Modifications to Plans

Stormwater management plans approved by CCWA shall not be modified or deviated from during construction unless the CCWA Engineer approves the modifications or deviations in writing.

3.05 Approval by Regulatory Agencies

- A. The Design Professional shall address all deficiencies and resubmit plans in accordance with Section 3.03. Plans shall not be approved until all deficiencies have been addressed to the satisfaction of the CCWA Engineer.
- B. Note the plan approval by the CCWA Engineer shall not be construed, in any manner, to relieve the Developer of his responsibility for strict compliance with these guidelines and any applicable laws and regulations.
- C. Installation of stormwater management systems shall not commence on any development until CCWA has granted final approval of stormwater management system plans and the local jurisdiction has issued a Land Disturbance Activity permit.
- D. Note that other agencies may have regulatory authority and the Developer is responsible for obtaining other agency approval. Other agencies could be, but are not limited to, State of Georgia Department of Natural Resources, State of Georgia Department of Transportation, United States Army Corps of Engineers, United State Environmental Protection Agency, Georgia Power Company and Southern Natural Gas.

**CLAYTON COUNTY WATER AUTHORITY
STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
CLAYTON COUNTY STORMWATER UTILITY**

SECTION 3: DESIGN APPROVAL

3.06 Period of Plan Approval

The approval period of stormwater management system plans shall be six (6) months. Approved plans that are not initiated or are inactive for a six (6) month period shall become invalid. Should an approved plan be invalidated, the CCWA Engineer shall determine whether the plan is still valid or whether a new system design is required.

3.07 Acceptance of Stormwater Management Systems - Final Plat Review

A. The Design Professional shall submit a final plat of the development to the local jurisdiction's Planning and Zoning Department after construction is complete. The Design Professional shall consult with the local Planning and Zoning Department on the number of copies required. The local jurisdiction will forward one (1) copy of the plat to CCWA.

B. The following statement shall be included on the final plat:

"The Developer warrants the stormwater management systems within the right-of-way and directly connected to the right-of-way to be free from defects in materials and workmanship for a period of twenty-four months from the date of acceptance by the Clayton County Water Authority".

C. In addition to the plat, the Design Professional shall submit to CCWA the following documentation:

1. Stormwater Detention, Storage and Water Quality Structure Certification Form (Appendix C) for every detention, storage or water quality treatment structure constructed at the site and an electronic as-built drawing of the development. The form shall be stamped and signed by the Design Professional.
2. For sites with natural conservation areas used to obtain site design credits and to avoid the need for stormwater quality structural controls, a copy of the deed restrictions will be required to prevent these areas from being developed in the future without stormwater quality structural controls.

D. CCWA shall review the accuracy of the stormwater management information provided on the plat using the Final Plat Review Checklist in Appendix F. Any deficiencies will be noted on the plat in red color (Red Line Comments).

**CLAYTON COUNTY WATER AUTHORITY
STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
CLAYTON COUNTY STORMWATER UTILITY**

SECTION 3: DESIGN APPROVAL

- E. CCWA shall return plats containing Red Line Comments to the local jurisdiction's Planning and Zoning Department.
- F. The Design Professional shall address all comments and resubmit corrected plats and the original plat containing Red Line Comments to the local jurisdiction's Planning and Zoning Department.
- G. CCWA shall return approved plats to the local jurisdiction's Planning and Zoning Department.

3.08 Acceptance of Stormwater Management Systems - As-Built Drawings

- A. The Design Professional shall refer to the CCWA As-Built CAD Standards for As-Built Drawings submittal requirements. The standards are available on CCWA's website at <http://www.ccwa1.com/customer.service/developer.information.aspx>. General requirements are outlined below.
- B. As-Built Drawings for stormwater management systems shall be submitted to CCWA along with the As-Built Drawings for the water distribution system and/or sanitary sewer system.
- C. As-Built Drawings shall show all street names, right-of-way widths, related easements, lot number, location, size and material of all stormwater management system components.
- D. As-Built Drawings shall be prepared using a survey that ties the development's stormwater management systems horizontally and vertically to the following state plane coordinate system or as amended by the CCWA.

Horizontal Control: North American Datum 83/94
Vertical Control: National Geodetic Vertical Data 88
Georgia West 1002

- E. The following certification shall be included on the As-Built Drawings and signed by the Design Professional:

"I certify that the stormwater management system depicted by this As-Built Drawing was constructed in accordance with the plans approved by Clayton County Water Authority. The information submitted on this As-Built Drawing is to the best of my knowledge and belief, true, accurate and complete".

**CLAYTON COUNTY WATER AUTHORITY
STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
CLAYTON COUNTY STORMWATER UTILITY**

SECTION 3: DESIGN APPROVAL

- F. The Developer's stormwater management system shall not be considered completed until the As-Built Drawings have been reviewed and approved by the CCWA Engineer. Note that one (1) reproducible set of the approved As-Built Drawings shall be submitted to the CCWA Engineer. The approved As-Built Drawings shall also be submitted to the CCWA Engineer in digital format (AUTOCAD Version 14 or newer version).

3.09 Requirements for Sites with a Floodplain Management / Flood Damage Prevention Plan

- A. For all substantial improvements of residential and non-residential structures located in an Area of Special Flood Hazard, the Developer shall provide to the CCWA a certified as-built Elevation Certificate. The certificate must contain the elevations of the finished floors of the structure and the highest and lowest adjacent grades. The above certification shall be prepared by or under the direct supervision of a registered professional engineer or land surveyor and certified by same.
- B. For all substantial improvements of non-residential structures located in an Area of Special Flood Hazard authorized by CCWA to be floodproofed, the Developer shall provide to the CCWA a certified as-built Floodproofing Certificate. The above certification shall be prepared by or under the direct supervision of a registered professional engineer or architect and certified by same.
- C. The above certification must be submitted to the CCWA after the structure and final grading are complete and before a water meter may be purchased for the structure.
- D. The FEMA Elevation Certificate and Floodproofing Certificate must be used and may be downloaded from CCWA's website (<http://www.ccwa1.com/customer.service/developer.information.aspx>).

**CLAYTON COUNTY WATER AUTHORITY
STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
CLAYTON COUNTY STORMWATER UTILITY**

SECTION 4: INSPECTION POLICY

4.01 Notification

The Developer shall provide the CCWA Engineer a 48-hour notice prior to commencing construction on a stormwater management system.

4.02 Inspection

- A. CCWA Inspector shall inspect stormwater management systems during all phases of construction to ensure systems are being constructed in accordance with the plans approved by the CCWA and these guidelines.
- B. The Developer shall, at all times, permit and facilitate inspection of work by the CCWA. The presence of a CCWA Inspector or CCWA Engineer on the site of work shall not be construed to, in any manner, relieve the Developer of their responsibility for strict compliance with the approved plans and these guidelines.
- C. The CCWA Inspector shall not change or modify the approved stormwater management system plans.
- D. The CCWA Inspector shall inform the Developer when construction is deficient from the approved plans. Deficiencies shall be addressed in a timely manner as determined by the CCWA Inspector. Construction activities and other pertinent information shall be recorded on an Inspection Report included in Appendix G.
- E. Deficiencies not addressed in a timely manner shall be justification for the CCWA to stop work on a project. The CCWA Engineer shall issue a Stop Work Order to the Developer in writing. Continued work on a project after being issued a Stop Work Order shall be justification to inform the appropriate legal counsel or Clayton County Government Agency for necessary enforcement actions.

**CLAYTON COUNTY WATER AUTHORITY
STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
CLAYTON COUNTY STORMWATER UTILITY**

SECTION 5: DESIGN REQUIREMENTS

5.01 Components of Stormwater Management Plan

- A. The Design Professional shall refer to Appendix A for the information that is required to be included in the stormwater management plan.
- B. In summary, the stormwater management plan shall consist of the following:
 - 1. Stormwater management report,
 - 2. Stormwater management systems drawings,
 - 3. Landscaping and open space plan,
 - 4. Operations and maintenance plan,
 - 5. Maintenance access easements, and,
 - 6. Floodplain management/flood damage prevention plan (required only if any Area of Special Flood Hazard is located on the development site).
- C. A stormwater management report shall accompany the stormwater management plan. The report shall consist of the following:
 - 1. Existing and post-development hydrologic analysis for stormwater runoff rates, volumes and velocities,
 - 2. Design calculations of stormwater management systems,
 - 3. Stormwater quality performance analysis,
 - 4. Post-development downstream analysis, and,
 - 5. Evidence of acquisition of applicable permits.
- D. Floodplain Management / Flood Damage Prevention: If any Area of Special Flood Hazard is located on the development site, the Design Professional shall include a floodplain management / flood damage prevention plan in the stormwater management plan. The floodplain management / flood damage prevention plan shall consist of the information outlined in Appendix A. Additional requirements regarding floodplain management / flood damage prevention are shown in Section 5.05.

5.02 Stormwater Management Design and Plan Requirements

- A. CCWA shall review the stormwater management plan based on the following design guidelines and ordinances.
- B. The design, installation and construction of the stormwater management system shall follow the criteria in the Georgia Stormwater Management Manual and these guidelines.

**CLAYTON COUNTY WATER AUTHORITY
STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
CLAYTON COUNTY STORMWATER UTILITY**

SECTION 5: DESIGN REQUIREMENTS

- C. The Design Professional shall also review local ordinances (Table 1) for floodplain management, stream buffer, wetlands protection and other stormwater management related requirements.
- D. Certain pipes and structures shall be designed according to the appropriate Georgia DOT standards and/or CCWA standards. These standards are included in Appendix I and J. If there is no standard provided for the pipe or structure proposed for the development site, then the design shall follow the Georgia Stormwater Management Manual.
- E. At a minimum, the stormwater management plan shall include the information detailed on the Stormwater Technical Review Checklist in Appendix D.

5.03 Design Professional

The stormwater management plan and associated stormwater management report shall be prepared by or under direct supervision of a Professional Engineer (P.E.) licensed in the State of Georgia. The plan and report must be stamped and signed by the P.E. preparing or supervising the preparation of the plan.

5.04 Additional Criteria

The following outlines additional criteria that are not specified by the GSMM.

- A. Rainfall Intensities: Table A-2 in GSMM for Atlanta, GA shall be used to determine rainfall intensities.
- B. Impervious Cover: The area of impervious cover of the development site and for each parcel within the development site shall be shown on the stormwater management plan. Additionally, the building footprint for each parcel shall be shown on the plan.
- C. Pipes and Culverts:
 - 1. Design Storm: Storm drainage systems and pipes that do not convey runoff under public roadways or as part of lateral closed systems shall be designed to accommodate the 25-year peak discharge. Cross drainage systems that transport stormwater runoff under public roadways shall be designed to accommodate the 100-year peak discharge.

**CLAYTON COUNTY WATER AUTHORITY
STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
CLAYTON COUNTY STORMWATER UTILITY**

SECTION 5: DESIGN REQUIREMENTS

2. Design Velocity: Pipes shall be designed so that the velocity is at least 2.5 feet per second for the 2-year flow to ensure self-cleaning. The maximum allowable velocity for corrugated metal pipe is 15 feet per second. There is no specified maximum allowable velocity for concrete pipe but outlet protection shall be provided where discharge velocities will cause erosion problems.

3. Design Slope: The maximum slope of concrete pipe shall be 10% and corrugated metal pipe is 14% before restraining methods (i.e. anti-seep collar) are used. The maximum drop in a drainage structure shall not exceed 10 ft.

4. Culverts: Culverts shall be designed with a maximum 18" of freeboard measured from the low-point of the road.

5. Minimum Pipe Size: The minimum pipe size in the public right-of-way shall be 18 inches, except for residential driveway pipes, which may be 15 inches.

6. Pipe Material and Class / Wall Thickness: Only reinforced concrete pipes shall be used under public roadways. Other pipe materials specified below may be used in the public right-of-way but not under the road or gutter. The Design Professional shall use the pipe class or thickness specified below except for corrugated metal pipes exceeding 102" in diameter and concrete pipes, the GDOT Standard No. 1030D Table Number 1: Round Pipe – Concrete – Corrugated Steel – Corrugated Aluminum shall be used to determine the minimum class or thickness required for each pipe location. The class or thickness shall be determined based on the maximum height of fill above the top of the pipe.
 - (a) Minimum 14 Gauge Type 1 Bituminous Coated Corrugated Metal Pipe
 - (b) Reinforced Concrete Pipe
 - (c) Minimum 14 Gauge Corrugated Metal Pipe with Aluminized Coating
 - (d) HDPE Pipe Meeting CCWA Standards and Specifications as shown on Appendix I.
 - (e) Reinforced Concrete Pipe, Reinforced Box Culvert or HDPE Pipe in flowing streams
 - (f) Reinforced Concrete or HDPE Pipe in structural controls' outlet devices

**CLAYTON COUNTY WATER AUTHORITY
STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
CLAYTON COUNTY STORMWATER UTILITY**

SECTION 5: DESIGN REQUIREMENTS

Transitions between pipe materials shall be made using a junction box or other structure.

7. Pipe and Culvert Backfill:

The trench and bedding construction and backfill materials for concrete and metal pipes and culverts shall comply with the GDOT Standard 1030D (Trench Construction, Bedding and Backfilling of Concrete and Metal Pipe Culverts). The trench and bedding construction and backfill materials for HDPE pipes and culverts shall comply with the CCWA Standard 100.3 (HDPE Pipe Bedding).

All pipes and culverts shall be backfilled with materials that meet the Georgia Department of Transportation Specification for Roadway Materials, Section 810, Roadway Materials, Class I or Class II soils. Backfills will be constructed in six to twelve inch vertical layers and thoroughly compacted. The compacted dry weight per cubic foot for each layer of backfill will be at least ninety-five (95%) percent of the maximum laboratory dry weight per cubic foot.

8. Extent of Stormwater Pipe: In residential subdivisions, stormwater pipes carrying water from the street shall extend to a minimum of:
- (a) to within 10 feet of the rear property line or vegetated buffer if required;
 - (b) 140 feet from the back of curb; or
 - (c) the 100 year flood plain boundary.
9. Inlet/Discharge Points: All inlet and discharge points for longitudinal systems and pipe culverts (except under residential driveways) shall have concrete headwalls or flared end sections. Concrete headwalls shall be designed and constructed according to the GDOT Standard 1125: Tapered Inlet Headwall-Outlet Headwall (Built-in-Place). Flared end sections shall be designed and constructed according to the GDOT Standard 1120: Flared End Sections for Pipes. Wingwalls for box culverts shall be designed according to the criteria in the GA Stormwater Management Manual. All discharge points shall have rip-rap for energy dissipation.
10. Drainage Easements for Pipes: All pipes located outside the right-of-way shall be contained in a drainage easement. The easement width must be a minimum of 20 feet or 2 times the depth of the bottom of the pipe in feet, whichever is greater. No permanent structure can be built in this easement. Easements in residential areas for pipes

**CLAYTON COUNTY WATER AUTHORITY
STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
CLAYTON COUNTY STORMWATER UTILITY**

SECTION 5: DESIGN REQUIREMENTS

directly connected to the right-of-way drainage system shall be donated to CCWA. All other easements will be privately owned but set aside for the purpose of conveying stormwater.

11. Installation of Pipes and Culverts by Open Cut: Installation of pipes and culverts under existing pavement must comply with the GDOT Standard 1401: Pavement Patching Details (Storm Drain or Utility Installations by Open Cut across Existing Pavement).
12. Qualified Products: All pipes and box culverts used for installation in the public right-of-way and that are directly connected to the public right-of-way must be listed on the GDOT list of qualified products. A statement indicating this requirement must be shown on the stormwater management plan. A list of approved pipe manufacturers is available at <http://tomcat2.dot.state.ga.us/thesource/index.html>. The following Qualified Product List numbers are applicable for the types of pipes approved by CCWA:
 - (a) Reinforced Concrete Pipe and Precast Concrete Box Culverts: QPL-4
 - (b) Corrugated HDPE Pipe: QPL-51
 - (c) Corrugated Metal Pipe: QPL-56

D. Inlets:

1. Design Storm: All inlets shall be designed to accommodate the 25-year peak discharge. Sumped inlets shall be designed to accommodate the 50-year peak discharge.
2. General Requirements: All storm drain inlets shall contain access covers and steps for maintenance purposes. If the depth of the inlet exceeds three (3) feet, the access cover must be located over the steps. The Design Professional shall provide dimensions and invert elevations of all inlets on the stormwater management plan.
3. Catch Basins: Catch basins should be located no more than 400 feet apart or a distance that will allow no more than an 8-foot gutter spread from the face of the curb for twenty-five (25) year peak flows. Catch basins shall be designed and constructed according to one of the following standards depending on the basin location:
 - (a) GDOT Standard 1033D or 1033D-Precast: Catch Basins for Use with Curb (6" or 8" ht) and Gutter.
 - (b) GDOT Standard 1034D or 1034D-Precast: Catch Basins for Use with Curb (6" or 8" ht) and Gutter (in Sags or Low Points).

**CLAYTON COUNTY WATER AUTHORITY
STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
CLAYTON COUNTY STORMWATER UTILITY**

SECTION 5: DESIGN REQUIREMENTS

- (b) GDOT Standard 1019B: Drop Inlet Types V-1 and V-2.
 - (c) GDOT Standard 1040: Circular Base Units and Risers for Catch Basins and Drop Inlets.
 - 4. Drop Inlets without Weirs: Drop inlets without weirs shall be designed and constructed according to the following standard:
 - (a) GDOT Standard 1019A or 1019A-Precast: Standard Drop Inlets.
 - 5. Drop Inlets with Weirs: Drop inlets with weirs shall be designed and constructed according to the CCWA Standard 100.2: Typical Weir Inlet.
 - 6. Junction Boxes: Junction boxes are required where there are changes in direction, slope, size, elevation or material of pipes. Junction boxes shall be designed and constructed according to the GDOT Standard 9031U: Precast or Built-in-Place Junction Boxes. All junction boxes shall contain access covers and steps for maintenance purposes. If the depth of the box exceeds three (3) feet, the access cover must be located over the steps.
 - 8. Qualified Products: All precast stormdrain inlets including catch basins, drop inlets (with or without weirs) and junction boxes and steps used for installation in the public right-of-way and that are directly connected to the public right-of-way must be listed on the GDOT list of qualified products. A statement indicating this requirement must be shown on the stormwater management plan. A list of approved precast inlet manufacturers is available at <http://tomcat2.dot.state.ga.us/thefsource/index.html>. The following Qualified Product List numbers are applicable:
 - (a) Precast Stormdrain Inlets: QPL-4
 - (b) Inlet steps: QPL-31
- E. Stormwater Best Management Practices:
- 1. General Requirements: All BMP shall be designed to meet the GSMM requirements. If a proprietary structural control is used, the Design Professional shall provide a certification from the manufacturer that the structure meets the GA Stormwater Management Manual requirements and capable of removing 80% or greater total suspended solids.
 - 2. Storage Facilities in Residential Developments: Storage facilities in residential developments should be located on a separate, individual

CLAYTON COUNTY WATER AUTHORITY
STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
CLAYTON COUNTY STORMWATER UTILITY

SECTION 5: DESIGN REQUIREMENTS

platted lot with a 20-foot wide public right-of-way access. Exemption may be granted on a case by case basis. This facility and the property it occupies may be donated to CCWA if all requirements of this section are met as certified by an as-built certification provided by a professional engineer or registered surveyor. Alternatively, these facilities may be owned and maintained by the homeowners association or other private entity provided an operation and maintenance plan is provided as shown in Appendix B.

3. Drainage Easements for Storage Facilities: All storage facilities located in residential developments must be contained within a drainage easement that extends 20 feet outside the 100-year ponding elevation and includes access to a public right-of-way. The 20-foot wide access easement shall not be located over a designated drainage easement.
4. Cut and Fill Slopes: Cut and fill slopes for storage ponds shall be 3:1 (horizontal to vertical) or flatter.
5. Parking Lot Storage: Parking lot shall not be utilized for detention of runoff.
6. Fencing of Storage Facilities: Storage facilities greater than 4 feet in depth must be enclosed behind a 5-foot PVC-coated chain link fence. The fence shall be installed according to the GDOT standard 9031N (Chain Link Wire Fence) shown in Appendix J. The fence is to be located 20 feet outside the 100-year ponding elevation limits. A minimum 16-foot PVC-coated chain link double gate access to the pond shall be provided through the fence.
7. Centralized or Regional Detention Facilities: Centralized or regional detention facilities may be approved for multiple sites provided that the facility is constructed and certified before a certificate of occupancy is issued for any development. Regional or centralized storage facilities should be contained in an easement similar to residential storage facilities.
8. As-Built Certification: An as-built certification must be provided for all stormwater detention, storage and water quality structures by the Design Professional that they were constructed as designed to provide the appropriate detention, storage or pollutant removal capacity.

**CLAYTON COUNTY WATER AUTHORITY
STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
CLAYTON COUNTY STORMWATER UTILITY**

SECTION 5: DESIGN REQUIREMENTS

9. Downstream Analysis: Stormwater storage facilities are required if the hydrology analysis determines that detrimental impacts will result after development without storage facilities. Detrimental downstream impacts could include flooding of existing stormwater structures, flooding of structural property, increased flooding of private property below the development site, and increased stream bank erosion because of high velocity flows. The Design Professional shall evaluate the downstream system to a point where the proposed developed area being studied is one-tenth of the overall watershed for the downstream system. The hydrology analysis shall also consider the areas upstream of the point of analysis to be fully developed based on their current zoning classification. If it is determined that storage is necessary, the structure shall be designed and built to insure that the post-developed rate of runoff will not exceed the pre-developed rate of runoff for storm frequencies of 2, 5, 10 and 25 years. The need for emergency overflow facilities for the hundred-year storm shall be evaluated. The emergency overflow device is to provide storage for the 100-year storm.

 10. Identification Number: CCWA Engineer will assign a unique identification number to each of the public and private best management practices (BMP) shown on the plan during the preliminary review phase. The Design Professional shall show the identification numbers for all of the BMP on the approved plan and electronic as-built drawing of the development.
- F. Open Channels:
1. Design Storm: Open channels shall be designed to accommodate the 25-year peak discharge.

 2. Design Standard: Open channels shall be designed according to the CCWA Standard Detail 100.1 (Appendix I). The channel dimensions shall be designed according to the criteria in the GA Stormwater Management Manual.

 3. Cut and Fill Slopes: Cut and fill slopes for drainage ditches shall be 4:1 (horizontal to vertical) or flatter.
- G. Soil Erosion and Sediment Control: The Design Professional shall consult the local jurisdiction on erosion and sediment control requirements.

CLAYTON COUNTY WATER AUTHORITY
STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
CLAYTON COUNTY STORMWATER UTILITY

SECTION 5: DESIGN REQUIREMENTS

- H. Stream Buffer Protection: If a stream is located on the development site, the Design Professional shall provide a 50-foot buffer measured horizontally on both banks of the stream as measured from the top of the stream bank. An additional setback shall be maintained for 25 feet, measured horizontally, beyond the undisturbed natural vegetative buffer, in which all impervious cover shall be prohibited. The stream buffer and the non-impervious setback shall be delineated on the stormwater management plan. The Design Professional shall review the Stream Buffer Protection Ordinance of the local jurisdiction where the development site is located for additional requirements.

- I. Watershed Protection: If a site is located within an area zoned as the Watershed Protection District (WP) by Clayton County, the Design Professional shall provide the required buffer and setbacks along the watercourses as specified in the Clayton County Zoning Ordinance on the stormwater management plan.

- J. Wetlands: The stormwater management plan shall identify any wetlands and jurisdictional waters on the property or immediately adjacent to the development site. If necessary, the Developer will be requested to submit a site specific Wetlands Identification prepared by the United States Army Corps of Engineers and/or his qualified Wetlands Specialist. If wetlands disturbance is indicated at the development site, CCWA will not approve the plan until documentation has been provided to show the applicant has approval from the United States Army Corps of Engineers in the form of a "Letter of Permission" or a Section 404 permit. Wetlands containing standing water could be considered State Waters and a buffer variance may be required to disturb these areas. The Design Professional shall consult the local jurisdiction on the buffer variance requirements.

- K. Dams: All dams classified by the State of Georgia as Category 1 dams, that are greater than 25 feet in height or impounding greater than 100 acre-feet and where the operation or failure of the dam would result in probable loss of human life, are regulated by the Georgia Department of Natural Resources' Safe Dams Program

Any development proposes to construct a Category 1 dam must obtain a permit from the Georgia Safe Dams Program (GA SDP). The Design Professional shall review the Georgia Rules for Dam Safety 391-3-8 for design requirements. CCWA shall not approve the stormwater management plan until the GA SDP approves the construction of the dam and a copy of the permit is submitted to CCWA.

**CLAYTON COUNTY WATER AUTHORITY
STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
CLAYTON COUNTY STORMWATER UTILITY**

SECTION 5: DESIGN REQUIREMENTS

The design of dams not exceeding either one of the above criteria shall be reviewed by CCWA. However, when a development site is located downstream of a Category 2 dam, where the operation or failure of the dam would not expect to cause probable loss of human life, the Design Professional shall submit appropriate documentation to the GA SDP. The Design Professional shall consult the GA SDP on what type of documentation is needed to determine the classification of the dam. If the GA SDP changes the classification of the dam to a Category 1 Dam, the Developer must submit a copy of the classification letter to CCWA. CCWA shall not approve the stormwater management plan until the dam is brought up to compliance with the requirements of the GA SDP and a copy of the permit from the GA SDP is received or the Developer moves the development outside of the dam break zone.

5.05 Floodplain Management / Flood Damage Prevention Plan:

- A. The Design Professional shall prepare a floodplain management / flood damage prevention plan in accordance to this section if any Area of Special Flood Hazard is located on the development site. The Area of Special Flood Hazard is the land subject to a one percent or greater chance of flooding in any given year. This includes all floodplain and flood prone areas at or below the base flood elevation (including A, A1-30, A-99, AE, AO, AH and AR on the Flood Hazard Boundary Map or the Flood Insurance Rate Map), all floodplain and flood prone areas at or below the future-conditions flood elevation, and all other flood prone areas shown on:
1. The Flood Insurance Study (FIS),
 2. Any flood or flood related study conducted by the United States Army Corps of Engineers, the United States Geological Survey or any other local, State or Federal agency, or,
 3. Any base flood and future-conditions flood study authored by a registered professional engineer in the State of Georgia which has been prepared using FEMA-approved methodology and approved by CCWA.
- B. The Design Professional shall show the floodplain boundaries on the floodplain management plan. The base flood elevations for studied "A" zones shall be established using the flood data provided in the Flood Insurance Study. The future-conditions flood elevations shall be determined using a method approved by FEMA. A list of hydrologic models approved by FEMA is included in Appendix K.

CLAYTON COUNTY WATER AUTHORITY
STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
CLAYTON COUNTY STORMWATER UTILITY

SECTION 5: DESIGN REQUIREMENTS

- C. The Design Professional shall show the boundaries or limits of the floodway and topographic information on the floodplain management plan. The width of the floodway shall be determined using the Flood Insurance Study or FEMA approved flood study.
- D. General Standards for Floodplain Encroachment:
Any development proposed in the floodplain shall meet the following requirements:
1. The development shall not raise the future-conditions flood elevation beyond the boundaries of the ownership of the property being developed unless contained in a drainage easement obtained by the developer.
 2. The development shall not reduce the future-conditions flood storage capacity. All compensation for storage capacity shall occur either within the boundaries of ownership of the property being developed, or within a permanent, recorded flood control easement and shall be within a reasonable proximity to the location of the encroachment. All cut areas are to be graded to a slope no less than 1.0 percent. The required compensation may be provided by lowering the natural ground elevations within the floodplain, lowering the adjoining land areas to create additional floodplain or raising the future-conditions flood elevation within the boundaries of ownership of the property being developed. In no case shall any required compensation be provided via bottom storage or by excavating below the elevation of the top of the pre-development stream channel unless such excavation results from widening or relocation of the stream channel. A step-backwater analysis will be required to determine the volume of flood storage created by raising the future-conditions flood elevation.
 3. The development shall not change the flow characteristics of the waters of the future-conditions flood as they pass both the upstream and the downstream boundaries of the property. Verification shall be provided via a step-backwater analysis.
 4. The development shall not create hazardous or erosive velocities or result in excessive sedimentation. In all cases, effective transitions must be provided such that flow velocities occurring both upstream and downstream properties are not increased or decreased.

**CLAYTON COUNTY WATER AUTHORITY
STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
CLAYTON COUNTY STORMWATER UTILITY**

SECTION 5: DESIGN REQUIREMENTS

5. All proposed development shall have public utilities and facilities, such as sewer, gas, electrical and water system, located and constructed to minimize flood damage.
 6. Any changes or revisions to the flood data adopted by CCWA and shown on the Federal Insurance Rate Map shall be submitted as a Conditional Letter of Map Revision (CLOMR) or Conditional Letter of Map Amendment (CLOMA), whichever is applicable. The CLOMR submittal shall be subject to approval by CCWA using the Community Acknowledgment Form before forwarding the submittal package to FEMA for final approval.
 7. Within 6 months of the completion of construction, the applicant shall submit as-built surveys to request for a Letter of Map Revision (LOMR) or Letter of Map Amendment (LOMA), which demonstrate general conformance to the approved designs as submitted in the CLOMR application.
- E. Standards for Floodway Encroachment:
Floodway encroachments are prohibited, including earthen fill, new construction, substantial improvements or other development within the regulatory floodway. CCWA may allow encroachments for bridges, culverts, roadways and utilities provided the Design Professional demonstrate through hydrologic and hydraulic analysis that the encroachment shall not result in any increase to the pre-project base flood elevations, floodway elevations, or floodway widths during the base flood discharge. The Design Professional shall submit a completed No-Rise Certification Form along with the hydrologic and hydraulic analysis supporting the certification to CCWA. The form and procedures for submitting the analysis are shown in Appendix H.
- F. Alteration to the Floodway Boundaries:
If the development proposes to revise the floodway boundaries, CCWA shall not approve the stormwater management plan until an affirmative Conditional Letter of Map Revision (CLOMR) or Conditional Letter of Map Amendment (CLOMA), whichever is applicable, is issued by FEMA.
- G. General Standards for Buildings Located within the Floodplain:
New construction and substantial improvement of structures in the floodplain must meet the following requirements:

**CLAYTON COUNTY WATER AUTHORITY
STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
CLAYTON COUNTY STORMWATER UTILITY**

SECTION 5: DESIGN REQUIREMENTS

1. New construction of principal residential buildings and non-residential buildings, including manufactured homes are not allowed within the limits of the floodplain.
2. Substantial improvement of any residential structure or manufactured home shall have the lowest floor, including basement, elevated to no lower than three (3) feet above the base flood elevation adjacent to the building or at least as high as the future-conditions flood elevation, whichever is highest. Should solid foundation perimeter walls be used to elevate a structure, openings sufficient to facilitate the unimpeded movements of floodwaters shall be provided in accordance with Section 5.05G(4).
3. Substantial improvement of any non-residential structure located in A1-30, AE or AH zones may be authorized by CCWA to be floodproofed in lieu of elevation, provided that it is not a critical facility (i.e. hospital, manufacturing facility, school, etc.). The structure, together with the attendant utility and sanitary facilities, must be designed to be water tight to one (1) foot above the base flood elevation, or at least as high as the future-conditions flood elevation, whichever is highest, with walls substantially impermeable to the passage of water, and structural components having the capability of resisting hydrostatic and hydrodynamic loads and the effect of buoyancy. The design and methods of construction must be certified by a registered Professional Engineer or architect.
4. All substantial improvements of existing structures that include any fully enclosed area located below the lowest floor formed by foundation and other exterior walls shall be designed as to be an unfinished or flood resistant enclosure. The enclosure shall be designed to equalize hydrostatic flood forces on exterior walls by providing openings that will allow automatic entry and exit of floodwater through the enclosure. The enclosure shall be designed to meet the following minimum criteria and certified by a professional engineer or architect:
 - a. Provide a minimum of two openings having a total net area of not less than one square inch for every square foot of enclosed area subject to flooding,
 - b. The bottom of all openings shall be no higher than one foot above grade, and,

**CLAYTON COUNTY WATER AUTHORITY
STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
CLAYTON COUNTY STORMWATER UTILITY**

SECTION 5: DESIGN REQUIREMENTS

- c. Openings may be equipped with screens, louvers, valves or other coverings or devices provided they permit the automatic flow of floodwater in both directions.
 - d. The unfinished or flood resistant enclosure shall only be used for parking of vehicles, limited storage of maintenance equipment used in connection with the premises, or entry to the elevated area, and
 - e. The interior portion of such enclosed area shall not be partitioned or finished into separate rooms.
5. Manufactured homes shall be anchored to prevent flotation, collapse, or lateral movement.
6. Accessory structures and facilities such as barns, sheds, gazebos, detached garages, parking lots, recreational facilities and other similar structures and facilities which are permitted by CCWA to be located within the limits of floodplain shall be designed and constructed to pass all floodwater.

H. Standards for Buildings Located Adjacent to the Floodplain:

- 1. New construction or substantial improvement of any principal residential building or manufactured home shall have the lowest floor, including basement and access to the building, elevated to at least three (3) feet above the level of the highest base flood elevation adjacent to the building or at least as high as the future-conditions flood elevation, whichever is highest.
- 2. New construction or substantial improvement of any principal non-residential building shall have the lowest floor, including basement and access to the building elevated to at least one (1) foot above the level of the highest base flood elevation adjacent to the building or at least as high as the future-conditions flood elevation, whichever is highest.

I. Standard for Buildings Located in Areas where Streams Without Established Base Flood Elevations and/or Floodway Exist (A-Zones):

The Design Professional shall review and reasonably utilize any available scientific or historic base flood elevation or future-conditions flood elevation and floodway data available from a Federal, State, or other source. If sufficient data are not available from these sources, the

**CLAYTON COUNTY WATER AUTHORITY
STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
CLAYTON COUNTY STORMWATER UTILITY**

SECTION 5: DESIGN REQUIREMENTS

Design Professional may conduct a hydrologic assessment to determine the future-conditions flood and floodway elevations.

J. Standards for Buildings Located in Areas of Shallow Flooding (AO-Zones):

1. All substantial improvements of residential and non-residential structures shall have the lowest floor, including basement elevated to the flood depth number specified on the FIRM, above the highest adjacent grade. If no flood depth number is specified, the lowest floor, including basement, shall be elevated to at least three (3) feet above the highest adjacent grade. Openings sufficient to facilitate movements of flood waters shall be provided in accordance with Section 5.05G(4).
2. Substantial improvement of a non-residential structure may be flood-proofed in lieu of elevation, provided that it is not a critical facility (i.e. hospital, manufacturing facility, school, etc.). The structure, together with attendant utility and sanitary facilities shall be designed to be water tight to the specified FIRM flood level plus one (1) foot above the highest adjacent grade, with walls substantially impermeable to the passage of water, and structural components having the capability of resisting hydrostatic and hydrodynamic loads and the effect of buoyance. The design and methods of construction of the above shall be in accordance with accepted standards of practice and certified by a registered professional engineer or architect.
3. Drainage paths shall be provided to guide flood water around and away from any proposed structure.

K. Standards for Subdivisions:

1. All subdivision proposals shall identify the special flood hazard area and provide base flood and future-conditions flood elevation data.
2. All subdivision plans shall provide the elevation of proposed structure(s) and pad(s). If the site is filled above the base flood or future-conditions flood elevation, the lowest flood and pad elevations shall be certified by a registered professional engineer or surveyor and provided to CCWA.
3. All subdivision proposals shall have public utilities and facilities such as sewer, gas, electrical and water systems located and constructed

**CLAYTON COUNTY WATER AUTHORITY
STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
CLAYTON COUNTY STORMWATER UTILITY**

SECTION 5: DESIGN REQUIREMENTS

to minimize flood damage and have adequate drainage to reduce exposure to flood hazards.

L. Standards for Utilities:

All new and replacement water supply and sanitary sewerage systems shall be designed to minimize or eliminate infiltration of flood waters into the systems and discharges from the systems into flood waters. In addition, on-site waste disposal systems shall be located outside the floodplain to avoid impairment to them, or contamination from them during flooding.

**CLAYTON COUNTY WATER AUTHORITY
STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
CLAYTON COUNTY STORMWATER UTILITY**

SECTION 6: APPENDICES

Appendix A. Detailed Components of Stormwater Management Plan

1. Stormwater Management Report

The stormwater management report shall consist of the following:

(i) *Existing Conditions Hydrologic Analysis*

The existing conditions hydrologic analysis shall include:

- A topographic map of existing site conditions with the drainage basin boundaries indicated,
- Acreage, soil types and land cover of areas for each subbasin affected by the project,
- All perennial and intermittent streams and other surface water features,
- All existing stormwater conveyances and structural control facilities,
- Direction of flow and exits from the site,
- Analysis of runoff provided by off-site areas upstream of the project site, and,
- Methodologies, assumptions, site parameters and supporting design calculations used in analyzing the existing conditions site hydrology.

(ii) *Post-Development Hydrologic Analysis:*

The post-development hydrologic analysis shall include:

- A topographic map of developed site conditions with the post development drainage basin boundaries indicated,
- Total area of post-development impervious surfaces and other land cover areas for each subbasin affected by the project,
- Calculations for determining the runoff volumes that need to be addressed for each subbasin for the development project to meet the post-development stormwater management performance criteria specified in the Georgia Stormwater Management Manual (water quality treatment,
- Stream channel protection, overbank flooding protection and extreme flooding protection),
- Location and boundaries of proposed natural feature protection and conservation areas,
- Documentation and calculations for any applicable site design credits that are being utilized,
- Methodologies, assumptions, site parameters and supporting design calculations used in analyzing the existing conditions site hydrology.

Note: If the land development activity on a redevelopment site constitutes more than 50 percent of the site area for the entire site, then the performance criteria specified in the Georgia Stormwater Management Manual must be met for the stormwater runoff from the entire site.

CLAYTON COUNTY WATER AUTHORITY
STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
CLAYTON COUNTY STORMWATER UTILITY

SECTION 6: APPENDICES

(iii) *Stormwater Management Systems Design*

The design shall include:

- Narrative describing how the selected structural controls will be appropriate and effective,
- Supporting calculations showing the facility is designed according to the design criteria of the Georgia Stormwater Management Manual,
- Hydrologic and hydraulic analysis of the stormwater management system for all applicable design storms (including stage-storage or outlet rating curves, and inflow and outflow hydrographs),
- Documentation and supporting calculations to show that the stormwater management system adequately meets the post-development stormwater management performance criteria specified in the Georgia Stormwater Management Manual,
- Drawings, design calculations, elevations for all existing and proposed stormwater conveyance elements including stormwater drains, pipes, culverts, catch basins, channels, swales and areas of overland flow; and where applicable,
- A narrative describing how the stormwater management system corresponds with any watershed protection plans and/or local greenspace protection plan.

(iv) *Stormwater Quality Performance Analysis*

The stormwater quality performance analysis shall include water quality volume calculations and the Georgia Stormwater Management Manual's (GSMM) Site Development Review Tool. The Design Professional must be able to show the designed stormwater structural and non-structural controls are capable of removing 80% of the average annual post-development total suspended solids load. An electronic copy of the Tool can be downloaded from the Metropolitan North Georgia Water Planning District's website (<http://www.northgeorgiawater.com>).

When limiting impervious surface percentages to avoid the need for stormwater quality structural controls, deed restrictions will be required to insure these areas are not developed later without stormwater quality structural controls.

(v) *Post-Development Downstream Analysis*

The downstream peak flow analysis shall include assumptions, results and supporting calculations to show safe passage of post-development design flows downstream. The analysis of downstream conditions in the report shall address each and every point or area along the project site's boundaries at which runoff will exit the property. The analysis shall focus on

**CLAYTON COUNTY WATER AUTHORITY
STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
CLAYTON COUNTY STORMWATER UTILITY**

SECTION 6: APPENDICES

the portion of the drainage channel or watercourse immediately downstream of the project. This area shall extend downstream from the project to a point in the drainage basin where the project area is 10 percent of the total basin area. In calculating runoff volumes and discharge rates, consideration may need to be given to any planned future upstream land use changes. The analysis shall be in accordance with the Georgia Stormwater Management Manual.

(vi) Evidence of Acquisition of Applicable Permits

If the development site requires permits from the State or Federal agencies, the Developer shall include documentation showing all other applicable permits have been acquired for the site in the stormwater management report.

2. Stormwater Management Systems Drawings

The stormwater management systems drawings shall include:

- (i) The location of nonstructural design features and the placement of existing and proposed structural stormwater controls,
- (ii) Design water surface elevations,
- (iii) Storage volumes available from zero to maximum head,
- (iv) Location of inlets and outlets,
- (v) Location of bypass and discharge systems,
- (vi) All orifice/restrictor sizes,
- (vii) Cross-section and profile drawings and design details for each of the structural controls in the system, and
- (viii) Drawings, design calculations and elevations for all existing and proposed stormwater conveyance elements including stormwater drains, pipes, culverts, catch basins, swales and areas of overland flow.

3. Construction-Phase Erosion and Sedimentation Control Plan

The construction-phase erosion and sedimentation control plan will be reviewed by the local jurisdiction, however, a copy of the plan shall be included in the stormwater management plan. The Design Professional shall consult with the local jurisdiction regarding the information that needs to be included in the plan.

4. Landscaping and Open Space Plan

The landscaping and open space plan will be reviewed by the local jurisdiction, however, a copy of the plan shall be included in the stormwater management plan. The Design Professional shall consult with the local jurisdiction regarding the information that needs to be included in the plan.

**CLAYTON COUNTY WATER AUTHORITY
STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
CLAYTON COUNTY STORMWATER UTILITY**

SECTION 6: APPENDICES

5. Operations and Maintenance Plan

An operation and maintenance plan as shown on Appendix B shall be incorporated into the stormwater management plan for private stormwater structural controls. The plan shall include an inspection and maintenance agreement and stormwater management facility maintenance checklist. The agreement shall be binding on all subsequent owners. The Design Professional preparing the stormwater management facility maintenance checklist shall review the GSMM maintenance recommendations. CCWA will perform inspections on the structural controls based on this O&M plan. Any issues that may arise from these inspections will be directed to the owner.

6. Maintenance Access Easements

A 20-foot wide access easement shall be shown on the stormwater management plan to ensure access from the public right-of-way to the stormwater management facilities and practices for maintenance and inspection purposes.

7. Floodplain Management / Flood Damage Prevention Plan

(i) Site Plan

The site plan shall be drawn to scale and include:

- Existing and proposed elevations of the area in question and the nature, location and dimensions of existing or proposed structures, earthen fill placement, amount and location of excavation material, and storage of materials or equipment,
- Spot ground elevations at building corners and 20-foot or smaller intervals along the foundation footprint, or one foot contour elevations throughout the building site for all proposed structures,
- Proposed locations of water supply, sanitary sewer, and utilities,
- Proposed locations of drainage and stormwater management facilities,
- Proposed grading plan,
- Base flood elevations and future-conditions flood elevations,
- Boundaries of the base flood floodplain and future-conditions floodplain,
- If applicable, the location of the floodway, and,
- Certification of the above by a registered professional engineer or surveyor.

(ii) Digital Files

- Boundaries of the base flood and future-conditions floodplains in a digital format compatible with Arc GIS 9.1,
- Existing and future-conditions floodway in a digital format compatible with Arc GIS 9.1.

(iii) Building and Foundation Design Detail

- Elevation in relation to mean sea level (or highest adjacent grade) of the lowest floor, including basement, of all proposed structures,

**CLAYTON COUNTY WATER AUTHORITY
STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
CLAYTON COUNTY STORMWATER UTILITY**

SECTION 6: APPENDICES

- Elevation in relation to mean sea level to which any non-residential structure will be flood-proofed,
 - Certification that any proposed non-residential flood-proofed structure meets the criteria specified in the local jurisdiction's floodplain management/flood damage prevention ordinance,
 - Location and total net area of foundation openings as required by the local jurisdiction's floodplain management/flood damage prevention ordinance,
 - Design plans certified by a registered professional engineer or architect for all proposed structures(s).
- (iii) *Extent of Alteration or Relocation of Watercourses*
Description to the extent to which any watercourse will be altered or relocated as a result of the proposed development.
- (iv) *Flood Study*
- Hard copies and digital files of computer models
 - Copies of work maps, if any
 - Comparison of pre- and post development conditions base flood elevations
 - Future-conditions flood elevations
 - Flood protection elevations
 - Special Flood Hazard Areas and regulatory floodway widths
 - Flood profiles
 - All other computations and other information similar to that presented in the Flood Insurance Study produced by the FEMA.
- (v) *Permits*
Copies of all applicable State and Federal permits necessary for proposed development
- (vi) *Certifications*
Certification by the Developer stating all development activities will be performed according to the approved plan and or previous approved revisions.
- (vii) *Engineering Study for Floodplain Encroachment*
An engineering study shall be prepared by the Design Professional and shall include the following:
- Description of the extent to which any watercourse or floodplain will be altered or relocated as a result of the proposed development,
 - Computations of new base flood profiles and future-conditions flood profiles using step-backwater analysis using a methodology approved by FEMA.
 - Calculations of floodplain storage based on cross-sections (at least one every 100 feet) showing existing and proposed floodplain conditions to show

**CLAYTON COUNTY WATER AUTHORITY
STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
CLAYTON COUNTY STORMWATER UTILITY**

SECTION 6: APPENDICES

- that base flood floodplain and future-conditions floodplain storage capacity would not be diminished by the development.
- Site plan in Section 6(7)(i) above which clearly define all floodplain encroachments.

**CLAYTON COUNTY WATER AUTHORITY
STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
CLAYTON COUNTY STORMWATER UTILITY**

SECTION 6: APPENDICES

Appendix B. Operation and Maintenance Plan

The Land Owner shall complete and sign the following agreement and return it to the Clayton County Water Authority.

1. Inspection and Maintenance Agreement

THIS AGREEMENT, made and entered into this _____ day of _____, 20_____, by and between **(INSERT FULL NAME OF OWNER)** hereinafter called the "*Landowner*", and the Clayton County Water Authority, hereinafter called the "CCWA" WITNESSETH, that

WHEREAS, the Landowner is the owner of certain real property described as **(INSERT TAX MAP/PARCEL IDENTIFICATION NUMBER)** as recorded by deed in the land records of Clayton County, Georgia, Deed Book _____ Page _____, hereinafter called the "*Property*".

WHEREAS, the *Landowner* is proceeding to build on and develop the property; and

WHEREAS, the Site Plan/Subdivision Plan known as **(INSERT NAME OF PLAN/DEVELOPMENT PLAN/SUBDIVISION PLAN)** hereinafter called the "*Plan*", which is expressly made a part hereof, as approved or to be approved by the CCWA, provides for detention of stormwater within the confines of the property; and

WHEREAS, the CCWA and the *Landowner*, its successors and assigns, including any homeowners association, agree that the health, safety, and welfare of the residents of **(INSERT THE NAME OF LOCAL JURISDICTION)**, Georgia, require that on-site stormwater management facilities be constructed and maintained on the *Property*; and

WHEREAS, the **(INSERT THE NAME OF LOCAL JURISDICTION)** requires that on-site stormwater management facilities as shown on the *Plan* be constructed and adequately maintained by the *Landowner*, its successors and assigns, including any homeowners association.

NOW, THEREFORE, in consideration of the foregoing premises, the mutual covenants contained herein, and the following terms and conditions, the parties hereto agree as follows:

1. The on-site stormwater management facilities shall be constructed by the *Landowner*, its successors and assigns, in accordance with the plans and specifications identified in the *Plan*.
2. The *Landowner*, its successors and assigns, including any homeowners association, shall adequately maintain the stormwater management facilities. This includes all pipes, channels or other conveyances built to convey stormwater to the facility, as well as all structures, improvements, and vegetation provided to control the quantity and quality of the stormwater. Adequate maintenance is herein defined as good working condition so

CLAYTON COUNTY WATER AUTHORITY
STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
CLAYTON COUNTY STORMWATER UTILITY

SECTION 6: APPENDICES

that these facilities are performing their design functions. The Stormwater Management Facility Maintenance Checklist is to be used to establish what good working condition is acceptable to the CCWA.

3. The *Landowner*, its successors and assigns, shall inspect the stormwater management facility based on the Stormwater Management Facility Maintenance Checklist. The purpose of the inspection is to assure safe and proper functioning of the facilities. The inspection shall cover the entire facilities, berms, outlet structure, pond areas, access roads, etc. The *Landowner*, its successors and assigns, shall maintain records of any deficiencies, maintenance and repairs made on the stormwater management facility.

4. The *Landowner*, its successors and assigns, hereby grant permission to the CCWA, its authorized agents and employees, to enter upon the *Property* and to inspect the stormwater management facilities whenever the CCWA deems necessary. The purpose of inspection is to follow-up on reported deficiencies and/or to respond to citizen complaints. The CCWA shall provide the *Landowner*, its successors and assigns, copies of the inspection findings and a directive to commence with the repairs if necessary.

5. In the event the *Landowner*, its successors and assigns, fails to maintain the stormwater management facilities in good working condition acceptable to the CCWA, the CCWA may enter upon the *Property* and take whatever steps necessary to correct deficiencies identified in the Inspection Report and to charge the costs of such repairs to the *Landowner*, its successors and assigns. This provision shall not be construed to allow the CCWA to erect any structure of permanent nature on the land of the *Landowner* outside of the easement for the stormwater management facilities. It is expressly understood and agreed that the CCWA is under no obligation to routinely maintain or repair said facilities, and in no event shall this Agreement be construed to impose any such obligation on the CCWA.

6. The *Landowner*, its successors and assigns, will perform the work necessary to keep these facilities in good working order as appropriate. In the event a maintenance schedule for the stormwater management facilities (including sediment removal) is outlined on the approved plans, the schedule will be followed.

7. In the event the CCWA pursuant to this Agreement, performs work of any nature, or expends any funds in performance of said work for labor, use of equipment, supplies, materials, and the like, the Landowner, its successors and assigns, shall reimburse the CCWA upon demand, within thirty (30) days of receipt thereof for all actual costs incurred by the CCWA hereunder.

8. This Agreement imposes no liability of any kind whatsoever on the CCWA and the *Landowner* agrees to hold the CCWA harmless from any liability in the event the stormwater management facilities fail to operate properly.

9. This Agreement shall be recorded among the land records of Clayton County, Georgia, and shall constitute a covenant running with the land, and shall be binding on the

**CLAYTON COUNTY WATER AUTHORITY
STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
CLAYTON COUNTY STORMWATER UTILITY**

SECTION 6: APPENDICES

Landowner, its administrators, executors, assigns, heirs and any other successors in interests, including any homeowners association.

WITNESS the following signatures and seals:

Company/Corporation/Partnership Name (Seal)

By: **(INSERT NAME AND TITLE)**

The foregoing Agreement was acknowledged before me this ____ day of _____,
20____, by _____.

NOTARY PUBLIC
My Commission Expires: _____
COUNTY OF _____, GEORGIA

**CLAYTON COUNTY WATER AUTHORITY
STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
CLAYTON COUNTY STORMWATER UTILITY**

SECTION 6: APPENDICES

The following checklist shall be completed and attached to the inspection and maintenance agreement.

2. Stormwater Management Facility Maintenance Checklist

Date: _____

Name of Land Owner: _____

Name of Development: _____

Address of Development: _____

TYPE OF STORMWATER MANAGEMENT FACILITY	ACTIVITY	SCHEDULE

Signature of Land Owner:

**CLAYTON COUNTY WATER AUTHORITY
STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
CLAYTON COUNTY STORMWATER UTILITY**

SECTION 6: APPENDICES

**Appendix C: Stormwater Detention, Storage and Water Quality
Structure Certification Form**

To: Clayton County Water Authority
1600 Battle Creek Road
Morrow, GA 30260

General Information

Date: _____

Project Name: _____

Project Address: _____

Developer: _____

Engineer: _____

Design Information

Designed Storage Volume: _____

As-Built Storage Volume: _____

Designed Outlet Device: _____

As-Built Outlet Device: _____

Designed Outlet Device Dimension: _____

As-Built Outlet Device Dimension: _____

By placing my professional stamp and signature on this paper, I certify that this stormwater detention, storage or water quality structure is constructed according to the approved design on file with the Clayton County Water Authority at the above stated address. I further certify that all the drainage areas designed to drain to the detention or storage structure in fact does drain to said structure and the outflow from the structure is equal to or less than the maximum allowable outflow for the 10 and 100 year storms.

Signature and Seal of Design Professional:

**CLAYTON COUNTY WATER AUTHORITY
STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
CLAYTON COUNTY STORMWATER UTILITY**

SECTION 6: APPENDICES

Appendix D. Stormwater Technical Review Checklist

A. STORMWATER MANAGEMENT REPORT REQUIREMENTS

A.1. General Information

1. Yes No NA : Project Title shown.
2. Yes No NA : Developer/Owner name, address, telephone and fax number shown.
3. Yes No NA : Design Professional name, address, telephone and fax number shown.
4. Yes No NA : Detailed Project Site Location Map with street names and north arrow shown.
5. Yes No NA : Cover page of the stormwater management report is stamped and signed by a professional engineer.
6. Yes No NA : Narrative explaining the purpose of the stormwater management report and the condition upstream and downstream of the development site.
7. Yes No NA : For developments adjacent to or encroaching into wetland areas, documentation of contact with the U.S. Corp of Engineers regarding appropriate permits is provided.
8. Yes No NA : For developments proposing to construct a dam greater than 25 feet in height or impounding more than 100 acre.ft, permit from the Georgia Safe Dams Program is provided.
9. Yes No NA : If a stream is located on the site, the drainage area of the stream is provided. If the drainage area exceeds 100 acres (but less than 1 square mile, the future-conditions floodplain data are provided).
10. Yes No NA : A statement indicating if any portion of the site is located within the base and/or future-conditions floodplains.
11. Yes No NA : The boundary of the floodplain shown.

CLAYTON COUNTY WATER AUTHORITY
STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
CLAYTON COUNTY STORMWATER UTILITY

SECTION 6: APPENDICES

12. Yes No NA : A statement indicating if any development activity will occur within the floodplain.
13. Yes No NA : A statement indicating if any development activity will occur in the areas designated by FEMA as regulatory floodway.
14. Yes No NA : A maintenance agreement and an inspection and maintenance checklist (Appendix B in design guidelines) are attached to the stormwater management report.
15. Yes No NA : The document used to determine the boundary and elevation of the floodplain shown.
16. Yes No NA : For developments located downstream of a Category 2 dam, documentation of contact with the Georgia Safe Dams Program is provided.

A.2. Existing Conditions Hydrologic Analysis

1. Yes No NA : A topographic map of existing site conditions provided (minimum 2-foot contour interval) showing basin boundaries (on-site and off-site), drainage area for each basin and drainage paths for time of concentration calculations.
2. Yes No NA : Acreage, soil types and land cover of areas for each subbasin affected by the project provided.
3. Yes No NA : All perennial and intermittent streams and other water features shown.
4. Yes No NA : All existing stormwater conveyances and structural control facilities shown.
5. Yes No NA : Direction of flow and exits from the site shown.
6. Yes No NA : Analysis of runoff from off-site areas upstream of the project site shown.
7. Yes No NA : Time of concentration calculations shown.
8. Yes No NA : Curve number calculations shown.

CLAYTON COUNTY WATER AUTHORITY
STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
CLAYTON COUNTY STORMWATER UTILITY

SECTION 6: APPENDICES

9. Yes No NA : Methodologies, assumptions, site parameters and supporting design calculations used in analyzing the existing conditions site hydrology provided.

A.3. Post Development Hydrologic Analysis

1. Yes No NA : A topographic map of developed site conditions provided (minimum 2-foot contour interval) showing post-development basin boundaries (on-site and off-site), drainage area for each basin and drainage paths for time of concentration calculations.
2. Yes No NA : Total area of post-development impervious surfaces and other land cover areas for each subbasin affected by the project shown.
3. Yes No NA : Location and boundaries of proposed natural feature protection and conservation areas shown.
4. Yes No NA : Time of concentration calculations shown.
5. Yes No NA : Curve number calculations shown.
6. Yes No NA : A summary of pre-developed flow, post-developed flow, routed flow to pond and flow bypasses the pond for 1, 2, 5, 10, 25, 50 and 100 year storm for each drainage basin provided.
7. Yes No NA : The post-developed flows are less than or equal to the pre-developed flows for all drainage basins.
8. Yes No NA : Methodologies, assumptions, site parameters and supporting design calculations used in analyzing the post development conditions site hydrology provided.

A.4. Stormwater Management System Design

1. Yes No NA : Unified stormwater sizing criteria runoff calculations for water quality, channel protection, overbank flooding protection and extreme flood protection for each subbasin provided.
2. Yes No NA : Stage-storage or outlet rating curves shown.

CLAYTON COUNTY WATER AUTHORITY
STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
CLAYTON COUNTY STORMWATER UTILITY

SECTION 6: APPENDICES

3. Yes No NA : Inflow and outflow hydrographs shown.
4. Yes No NA : Channel protection orifice designed with a 24-hour drawdown.
5. Yes No NA : Design calculations and elevations of all existing and proposed stormwater conveyance elements shown and include storm drains, pipes, culverts, catch basins, channels, swales and areas of overland flow.
6. Yes No NA : Design calculations for structural controls' outlet orifices shown.
7. Yes No NA : Spillway design calculations shown.

A.5. Stormwater Quality Performance Analysis

1. Yes No NA : Narrative describing how the selected structural control will be appropriate and effective.
2. Yes No NA : Georgia SW Manual's Site Review Development Tool is provided and correct.
3. Yes No NA : Total TSS removal is 80% or greater.
4. Yes No NA : Documentation and calculations for any applicable site design credits shown.
5. Yes No NA : Site design credits used do not meet the criteria in Section 1.4.4 of GSMM.
6. Yes No NA : A map showing locations of non-structural controls provided.

A.6. Post-Development Downstream Analysis

1. Yes No NA : A narrative discussing the impact of the development to downstream property.
2. Yes No NA : A map showing any known drainage problems and existing stormwater system and drainage path between the point where stormwater leaves the site and the 10% point.
3. Yes No NA : Hydrograph for the 1, 2, 5, 10, 25, 50 and 100 year storms at the point where the stormwater leaves the site and the 10% point.

CLAYTON COUNTY WATER AUTHORITY
STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
CLAYTON COUNTY STORMWATER UTILITY

SECTION 6: APPENDICES

4. Yes No NA : Analysis of existing culverts or pipe systems located between the point where stormwater leaves the site to the 10% point showing they would handle the 100 year flow in the post-development condition.

A.7. Energy Dissipation Design

1. Yes No NA : Riprap apron or riprap outlet basin is used for Froude Number less than or equal to 2.5.
4. Yes No NA : Baffled outlet is used for Froude Number between 1 and 9.
6. Yes No NA : Drawing and dimension of outlet protection shown.

B. STORMWATER MANAGEMENT PLAN SHEET REQUIREMENTS

1. Yes No NA : Plan is sealed and signed by a professional engineer.
2. Yes No NA : Vicinity map showing location of proposed site.
3. Yes No NA : North arrow shown.
4. Yes No NA : Common address and legal description of site are provided.
5. Yes No NA : Drawing scale shown.
6. Yes No NA : Drawing to scale shown.
7. Yes No NA : Grading Plan shown in grayscale.
8. Yes No NA : Total acreage of site shown.
9. Yes No NA : Total impervious acreage of site and of each parcel within the site shown.
10. Yes No NA : Building footprints within each parcel shown.
11. Yes No NA : Acreage of floodplain/wetlands shown.
12. Yes No NA : Acreage to be disturbed in floodplain/wetlands shown.
13. Yes No NA : Name, address and telephone number of owner, Developer and engineer shown.
14. Yes No NA : 24-hour contact information shown.
15. Yes No NA : The type of business that will ultimately occupy the site shown.
16. Yes No NA : Existing and proposed stormwater system shown.

CLAYTON COUNTY WATER AUTHORITY
STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
CLAYTON COUNTY STORMWATER UTILITY

SECTION 6: APPENDICES

17. Yes No NA : A map showing drainage areas for pipe design is provided.
18. Yes No NA : Stormwater drainage systems that are part of lateral closed systems (pipes and inlets) are designed to accommodate the peak discharge from the 25-year storm.
19. Yes No NA : Culverts are designed to accommodate the peak discharge from the 100-year storm.
20. Yes No NA : Sumped inlets are designed to accommodate the peak discharge from the 50-year storm.
21. Yes No NA : Open channels are designed to accommodate the peak discharge from the 25-year storm.
22. Yes No NA : Reinforced concrete pipe is used under public road.
23. Yes No NA : Reinforced concrete pipes, reinforced concrete box culverts or HDPE pipes are used to convey flowing streams.
24. Yes No NA : Culvert skews shall not exceed 45% as measured from a line perpendicular to the roadway.
25. Yes No NA : Maximum slope for concrete pipe culvert is 10%, if slope is greater than 10%, restraining method is used (i.e. anti-seep collar).
26. Yes No NA : Maximum slope for corrugated metal pipe culvert is 14%, if slope is greater than 14%, restraining method is used (anti-seep collar).
27. Yes No NA : The following statement is included on the plan: **“All stormwater structures located in the public right-of-way and directly connected to the public right-of-way must be on the Georgia Department of Transportation Qualified Products List”.**
28. Yes No NA : Maximum drop in a drainage structure is 10 feet.
29. Yes No NA : Culverts are designed with a maximum of 18” of freeboard measured from the lowest point of the road.
30. Yes No NA : Velocity of pipe does not exceed 15 fps.
31. Yes No NA : Minimum velocity for 2-year flow is 2.5 fps.

**CLAYTON COUNTY WATER AUTHORITY
STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
CLAYTON COUNTY STORMWATER UTILITY**

SECTION 6: APPENDICES

32. Yes No NA : Pipes used in the public right-of-way and directly connected to the public right-of-way are approved by CCWA.

33. Yes No NA : All pipes are numbered.

34. Yes No NA : A pipe or culvert chart is shown and includes the following information:

Pipe ID	
Time of Concentration	
Drainage Area	
Rainfall Intensity	
Runoff Coefficient	
Design Discharge	
Manning's n	
Velocity	
Pipe Material	
Pipe Diameter	
Pipe Slope	
Pipe Length	
Pipe Gage or Class	
Inlet Invert	
Outlet Invert	
Headwater Depth	
Pipe Coating	
Structure at Entrance of Pipe	i.e. headwall
Structure at Outlet of Pipe	i.e. flared end section, headwall, etc.

*Enter NA if not applicable.

35. Yes No NA : All culverts and numbered and culvert chart is shown and includes the following information:

Culvert ID	
Type	i.e. box, pipe
Number of Barrels	

**CLAYTON COUNTY WATER AUTHORITY
STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
CLAYTON COUNTY STORMWATER UTILITY**

SECTION 6: APPENDICES

Culvert Material	
Class/Gage	
Design Discharge	
Drainage Area	
Manning's n	
Width	
Height	
Slope	
Velocity	
Inlet Invert	
Outlet Invert	
Headwater Depth	
Structure at Entrance of Culvert	i.e. headwall
Structure at Outlet of Culvert	i.e. flared end section, headwall, etc.

* For circular culverts, width = length.

36. Yes No NA : All inlets are shown and inlet chart (for junction boxes, drop inlets with or without weirs and catch basins) includes the following information:

Inlet ID	Diameter of Inlet Pipe	GDOT/CCWA Standard Number	Invert of Inlet Pipe	Diameter of Outlet Pipe	Invert of Outlet Pipe	Precast or Built-in-Place	Material	Dimension		
								Width	Length	Depth

* For circular inlets, width = length.

37. Yes No NA : A BMP chart is provided and include the following information:

BMP ID	BMP Type	Dimension			
		Maximum Height	Maximum Width	Maximum Depth	Maximum Side Slope

* Enter NA if not applicable. Leave BMP ID blank. CCWA Engineer will assign ID numbers to all BMP during the preliminary review phase.

**CLAYTON COUNTY WATER AUTHORITY
STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
CLAYTON COUNTY STORMWATER UTILITY**

SECTION 6: APPENDICES

38. Yes No NA : All open channels are numbered and an open channel chart is provided and include the following information:

Open Channel ID	Lining	Manning's n	Design Storm	Velocity	Dimension			
					Length	Average Bottom Width	Average Top Width	Slope

39. Yes No NA : The following statement shown on the pipe bedding detail:

“Drainage pipes and culverts shall be backfilled with materials that meet the Georgia Department of Transportation Specification for Roadway Materials, Section 810, Roadway Materials, Class I or Class II soils. Backfills will be constructed in six to twelve inch vertical layers and thoroughly compacted. The compacted dry weight per cubic foot for each layer of backfill will be at least ninety-five (95%) percent of the maximum laboratory dry weight per cubic foot.”

40. Yes No NA : Cross-section of BMP's embankment shown and include outlet pipe, emergency spillway, embankment slopes, minimum top width of embankment, outlet control structures, headwalls and riprap.

41. Yes No NA : A minimum of 1 foot of freeboard above maximum WSE is provided.

42. Yes No NA : Trash racks are provided for orifices less than 3 inch in diameter.

43. Yes No NA : Location of non-structural design features shown.

44. Yes No NA : Location of existing and proposed structural stormwater controls shown.

45. Yes No NA : Designed water surface elevation for structural stormwater controls shown.

CLAYTON COUNTY WATER AUTHORITY
STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
CLAYTON COUNTY STORMWATER UTILITY

SECTION 6: APPENDICES

46. Yes No NA : Available storage volumes (from zero to maximum head) for structural stormwater controls shown.
47. Yes No NA : Locations of inlets and outlets of structural stormwater controls shown.
48. Yes No NA : Locations of bypass and discharge systems shown.
49. Yes No NA : All orifice/restrictor sizes shown.
50. Yes No NA : Cross-section and profile drawings and design details for each of the structural stormwater control shown.
51. Yes No NA : Drawings and elevations of all existing and proposed stormwater conveyance elements shown (including storm drains, pipes, culverts, catch basins, swales and areas of overland flow shown).
52. Yes No NA : All drainage easements (for pipes and ditches) shown.
53. Yes No NA : Pipe size in the County ROW is at least 18 inches in diameter.
54. Yes No NA : Side slopes of drainage ditches are 4:1 or flatter.
55. Yes No NA : Side slopes of storage ponds are 3:1 or flatter.
56. Yes No NA : All ponds greater than 4 feet in depth are enclosed behind a 5 ft PVC-coated chain link fence.
57. Yes No NA : 20 ft access easement is provided to the stormwater management facilities from the public right-of-way.
58. Yes No NA : A minimum of 16 feet PVC-coated chain link double gate access to the pond.
59. Yes No NA : Detail of emergency spillway shown.
60. Yes No NA : Anti seep collars shown for pond outlet pipe.
61. Yes No NA : A 50 feet undisturbed buffer with additional 25 foot impervious setback is shown on both sides of stream located outside the areas zoned watershed protection district.
62. Yes No NA : A 150 ft protection buffer is provided on lots abutting the J.W. Smith Reservoir property.

**CLAYTON COUNTY WATER AUTHORITY
STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
CLAYTON COUNTY STORMWATER UTILITY**

SECTION 6: APPENDICES

63. Yes No NA : A 50 ft buffer is provided on both sides of stream located within the small drinking water supply watershed and outside the 7-mile radius. Septic tanks are located outside the 75-foot setback area on both sides of the stream.
64. Yes No NA : A 100 ft buffer is provided on both sides of stream located within the 7-mile radius of the drinking water intake. Septic tanks are located outside the 150 ft setback area on both sides of the stream.
65. Yes No NA : Structural controls are located on a separate individual platted lot.
66. Yes No NA : A description of woody and herbaceous vegetation that will be used within and adjacent to stormwater management facilities and practices shown.
67. Yes No NA : Arrangement of planted areas, natural and greenspace areas and other landscape features shown.
68. Yes No NA : Information necessary to construct landscaping elements shown.
69. Yes No NA : Descriptions and standards for the methods, materials and vegetation that will be used for construction shown.
70. Yes No NA : Density of plantings shown.
71. Yes No NA : Description of stabilization and management techniques used to establish vegetation shown.

C. FLOODPLAIN MANAGEMENT/FLOOD DAMAGE PREVENTION PLAN REQUIREMENTS

C.1. General Submittal

1. Yes No NA : Engineering study is stamped and signed by a professional engineer.
2. Yes No NA : Copies of all applicable State and Federal permits attached to the study (including the wetland permits and incidental take permits from the U.S. Army Corp and U.S. Fish and Wildlife Service).

**CLAYTON COUNTY WATER AUTHORITY
STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
CLAYTON COUNTY STORMWATER UTILITY**

SECTION 6: APPENDICES

3. Yes No NA : Site Plan provided.
4. Yes No NA : Building and Foundation details provided.
5. Yes No NA : If floodproofing is permitted, details of floodproofing methods are provided.
6. Yes No NA : If the development involves compensatory storage, the details of excavation activities are provided including the schedule of excavation activities.
7. Yes No NA : Future-conditions floodplains and elevations are shown on the plan.
8. Yes No NA : FEMA floodplain boundary, floodplain zones and base flood elevations are shown on the plan.
9. Yes No NA : Structures affected by the floodplain are shown on the plan.
10. Yes No NA : Digital files of base and future-conditions floodplains provided and are compatible with Arc GIS 9.1.
11. Yes No NA : Digital files of base and future-conditions floodway provided and are compatible with Arc GIS 9.1.

a) Note: Complete this section only when the stream on the development site has a drainage area greater than 100 acres and less than 1 square mile when the future-conditions floodplains are not available.

1. Yes No NA : Methodology is approved by FEMA.
2. Yes No NA : Q_{100} calculation based on existing and future conditions hydrology (use County/City zoning map or comprehensive land use plan).
3. Yes No NA : Manning's n for left bank, right bank and channel shown.
4. Yes No NA : 100 year elevation based on existing conditions hydrology shown.
5. Yes No NA : 100 year elevation based on future conditions hydrology shown.
6. Yes No NA : The boundaries of the existing and future conditions floodplains provided on the Site Plan.

CLAYTON COUNTY WATER AUTHORITY
STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
CLAYTON COUNTY STORMWATER UTILITY

SECTION 6: APPENDICES

7. Yes No NA : Calculation and location of floodway limits shown (only if the floodway width is not available from the FIS or FEMA approved study).

(b) Note: Complete this section only when a development is proposed within the floodplain

1. Yes No NA : A step-back water analysis provided using the original model used to obtain the results in the FIS.
2. Yes No NA : Q_{100} calculation based on existing and future conditions hydrology (use County/City zoning map or comprehensive land use plan).
3. Yes No NA : Manning's n for left bank, right bank and channel shown.
4. Yes No NA : 100 year elevation (base flood) based on existing conditions hydrology shown.
5. Yes No NA : 100 year elevation (future-conditions flood) based on future conditions hydrology shown.
6. Yes No NA : Calculations of the pre-developed and post-developed depth and velocity of the waters of the base flood upstream and downstream of the development boundaries shown based on existing conditions hydrology.
7. Yes No NA : Calculations of the pre-developed and post-developed depth and velocity of the waters of the future-conditions flood upstream and downstream of the development boundaries shown based on future-conditions hydrology.
8. Yes No NA : No change in velocity of the waters of the base flood or future-conditions flood as they pass the upstream and downstream boundaries of the development area.
9. Yes No NA : Calculations of the base flood and future-conditions flood storage volumes shown based on cross-sections (at least one cross section is used every 100 feet).

**CLAYTON COUNTY WATER AUTHORITY
STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
CLAYTON COUNTY STORMWATER UTILITY**

SECTION 6: APPENDICES

10. Yes No NA : No change in the base flood and future-conditions flood storage volumes.

11. Yes No NA : Location, extent and nature of encroachment shown on the Site Plan.

c) Note: Complete this section if the floodplain storage will be reduced.

1. Yes No NA : Description of how the storage capacity will be compensated shown.
2. Yes No NA : Method of compensation shown.
3. Yes No NA : Slope of cut areas is shown and not less than 1.0 percent.
4. Yes No NA : A schedule showing the work to be performed shown. The schedule shall be developed such that the flow velocities upstream and downstream of the boundaries of the development area will not be increased or decreased.

d) Note: Complete this section if changes are proposed to the base flood floodplain.

1. Yes No NA : A Conditional Letter of Map Revision (CLOMR) from FEMA is provided.

e) Note: Complete this section only when a development is proposed within the areas designated by FEMA as regulatory floodway.

1. Yes No NA : The Conditional Letter of Map Revision from FEMA and the Engineering No-Rise Certification Form (Appendix H in the CCWA Stormwater Development Guidelines) are provided.
2. Yes No NA : Duplicate of the original FIS step-backwater model printout shown
3. Yes No NA : Revised existing conditions step-backwater model shown.
4. Yes No NA : Proposed conditions step-backwater model shown.
5. Yes No NA : FIRM and topographic map, showing floodplain and floodway, the additional cross-sections, the site location with the proposed topographic modification superimposed onto the maps, and a photocopy of the effective FIRM or FBFM showing the current regulatory floodway provided.

**CLAYTON COUNTY WATER AUTHORITY
STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
CLAYTON COUNTY STORMWATER UTILITY**

SECTION 6: APPENDICES

6. Yes No NA : Documentation clearly stating analysis procedures provided. All modification made to the original FIS model to represent revised existing conditions, as well as those made to the revised existing conditions model to represent proposed conditions, should be well documented and submitted with all supporting data.
7. Yes No NA : Copy of effective Floodway Data Table copied from the FIS report shown.
8. Yes No NA : Statement defining source of additional cross-section topographic data and supporting information shown.
9. Yes No NA : Cross-section plots, of the added cross sections, for revised existing and proposed conditions shown.
10. Yes No NA : Certified planimetric (boundary survey) information indicating the location of structures on the property shown.
11. Yes No NA : Copy of the microfiche, or other applicable source, from which input for original FIS HEC-2 model was taken, shown.
12. Yes No NA : Disk with all input files shown.
13. Yes No NA : Printout of output files from EDIT runs for all three floodway models shown.
14. Yes No NA : Result of the computer output indicates “NO IMPACT” on the 100-year flood elevations, floodway elevations, or floodway widths.

C.2. Site Plan Requirements

1. Yes No NA : The following statement is shown: **“The developer or land owner certifies that all land development activities will be performed according to the approved floodplain management/flood damage prevention plan. The developer or land owner acknowledges that any and all development permits and/or use and occupancy certificates or permit may be revoked at any time if the construction and development**

**CLAYTON COUNTY WATER AUTHORITY
STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
CLAYTON COUNTY STORMWATER UTILITY**

SECTION 6: APPENDICES

activities are not in strict accordance with approved plans.

Signature of Developer/Land Owner: _____”

2. Yes No NA : The following statement shown: **“No excavation below the elevation of the top of the natural (pre-development) stream channel will be performed by the developer or land owner”**
3. Yes No NA : Project Title shown.
4. Yes No NA : Scale shown.
5. Yes No NA : North arrow shown.
6. Yes No NA : Developer/Owner name, address, telephone and fax number shown.
7. Yes No NA : Registered professional engineer or surveyor’s name, address, telephone and fax number shown.
8. Yes No NA : Detailed Project Site Location Map with street names and north arrow shown.
9. Yes No NA : Existing and proposed elevations of the area to be developed in the floodplain shown.
10. Yes No NA : Description of the nature of existing or proposed structures, earthen fill placement, amount and location of excavation material and storage materials or equipment provided.
11. Yes No NA : Location and dimensions of existing or proposed structures, earthen fill placement, amount and location of excavation material and storage materials or equipment shown.
12. Yes No NA : For all proposed structures, spot ground elevations at building corners and 20-foot or smaller intervals along the foundation footprint, or one foot contour elevations throughout the building site shown.
13. Yes No NA : Proposed locations of water supply, sanitary sewer and utilities shown.

**CLAYTON COUNTY WATER AUTHORITY
STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
CLAYTON COUNTY STORMWATER UTILITY**

SECTION 6: APPENDICES

14. Yes No NA : Proposed locations of drainage and stormwater management facilities shown.
15. Yes No NA : Proposed grading plan shown.
16. Yes No NA : Base flood elevations and future-conditions flood elevations shown.
17. Yes No NA : Boundaries of the floodplain and future-conditions floodplain shown.
18. Yes No NA : Location of floodway shown based on the FIS. If floodway information is not available from the FIS, a copy of study delineating the floodway boundaries provided.
19. Yes No NA : The site plan containing all of the items above sealed, signed and dated by a registered professional engineer or surveyor.

C.3. Building and Foundation Design Detail Sheet Requirements

1. Yes No NA : Registered professional engineer or surveyor's name, address, telephone and fax number shown.
2. Yes No NA : Elevation in relation to mean sea level (or highest adjacent grade) of the lowest floor, including basement of all proposed structures shown.
3. Yes No NA : Elevation in relation to mean sea level to which any non-residential structure will be floodproofed shown.
4. Yes No NA : For enclosures below the base flood elevation, location and total net area of foundation openings shown and meet the requirements of the Floodplain Management/Flood Damage Prevention Ordinance of the local jurisdiction where the development is located:
- 4.1. Yes No NA : A minimum of 2 openings provided for every square foot of enclosed area.
- 4.2. Yes No NA : Each opening has a total net area of equal to or greater than 1 in².

**CLAYTON COUNTY WATER AUTHORITY
STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
CLAYTON COUNTY STORMWATER UTILITY**

SECTION 6: APPENDICES

- 4.2. Yes No NA : The bottom of all openings is no higher than 1 foot above grade.
- 4.3. Yes No NA : No partition is shown in the interior portion of the enclosed area.
- 4.4. Yes No NA : The following statement shown: **“The unfinished and flood resistant enclosure is only intended to be used for parking of vehicles, limited storage of maintenance equipment used in connection with the premises or entry to the elevated area”.**
5. Yes No NA : The following statement shown: **“Proposed non-residential flood-proofed structure meets the criteria of the County/City Floodplain Management/Flood Damage Prevention Ordinance”.**
6. Yes No NA : No new construction of principal residential building is proposed within the floodplain.
7. Yes No NA : Substantial improvement of residential principal buildings, including manufactured homes located in and adjacent to the future-conditions floodplain meet the following requirements:
- 7.1. Yes No NA : Lowest floor is at least 3 feet above the base flood elevation or at least as high as the future-conditions flood elevation.
- 7.2. Yes No NA : Openings provided on solid foundation perimeter walls.
8. Yes No NA : No new construction of principal non-residential building is proposed within the floodplain.
9. Yes No NA : Substantial improvement of non-residential building has the lowest floor elevated to at least 3 feet above the base flood elevation or at least as high as the future-conditions flood elevation.
10. Yes No NA : Substantial improvement of non-residential principal structure (provided that it is not a critical facility, i.e. hospital, fire station,

CLAYTON COUNTY WATER AUTHORITY
STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
CLAYTON COUNTY STORMWATER UTILITY

SECTION 6: APPENDICES

police station, schools, senior homes, child care facilities, etc.)

located in A1-30, AE or AH zones is allowed to be water tight to 1 foot above the base flood elevation, or at least as high as the future conditions flood elevations with impermeable walls.

11. Yes No NA : Non-habitable structures located within the future-conditions floodplain are designed with flood-resistant materials and anchored.
12. Yes No NA : For residential buildings located in A-O zones, the lowest floor of all substantial improvements is elevated to the flood depth number (in feet) specified in the FIRM map above the highest adjacent grade. If no flood depth number is specified, the lowest floor is at least 3 feet above the highest adjacent grade.
13. Yes No NA : For non-residential buildings located in A-O zones, the building is allowed to be watertight to the specified FIRM flood level plus one (1) foot above the highest adjacent grade with substantially impermeable walls.
14. Yes No NA : Design plans for all proposed structure(s) is sealed, signed and dated by a registered professional engineer or architect.
15. Yes No NA : For any non-residential building that is proposed to be floodproofed, a statement from a registered professional engineer or architect is provided certifying the design and methods of construction are in accordance with accepted standards of practice and meet the requirements of the Floodplain Management/Flood Damage Prevention Ordinance of the local jurisdiction where the development is located.

**CLAYTON COUNTY WATER AUTHORITY
STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
CLAYTON COUNTY STORMWATER UTILITY**

SECTION 6: APPENDICES

Appendix E: Preliminary Plat Review Checklist

1. Yes No NA : A statement indicating whether any portion of the site lies within the floodplain and indicate source of floodplain information.
2. Yes No NA : Boundary of the floodplain shown.
3. Yes No NA : Water bodies, stream and other pertinent features such as wetlands and stream buffers shown.
4. Yes No NA : Locations of detention ponds shown.

**CLAYTON COUNTY WATER AUTHORITY
STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
CLAYTON COUNTY STORMWATER UTILITY**

SECTION 6: APPENDICES

Appendix F: Final Plat Review Checklist

1. Yes No NA : All stormwater management system components located on the site and adjacent to, adjoining or opposite from the site shown.
2. Yes No NA : The location, length, diameter and type of stormwater management systems shown.
3. Yes No NA : 20 foot wide access easements to storage facilities shown.
4. Yes No NA : Fencing around storage facilities shown.
5. Yes No NA : Location and width of drainage easements shown.
6. Yes No NA : Location of water bodies, flood hazard areas, streams and other features such as wetlands and floodplain shown.
7. Yes No NA : 50 foot stream buffer and 25 foot impervious setback shown.
8. Yes No NA : Boundary and elevation of the future-conditions floodplain shown.
9. Yes No NA : Finished floor elevations for each structure located adjacent to or in the future-conditions floodplain shown.
10. Yes No NA : The Stormwater Detention, Storage and Water Quality Structure Certification Form (Appendix C) is completed, stamped and signed by a Professional Engineer.
11. Yes No NA : Proposed deed restrictions provided (for sites with stormwater quality structural controls waived because site design credits specified in Section 1.4.4 of the GSMM, i.e. natural conservation area and stream buffer) are used.
12. Yes No NA : The following statement shown:
“The developer warrants all sanitary sewer system and water distribution system improvements donated to Clayton County Water Authority for ownership and maintenance, and stormwater management systems within the right-of-way and directly connected to the right-of-way to be free from defects in materials and workmanship for a period of twenty-four months from the date of acceptance of the improvements by Clayton County Water Authority”.

**CLAYTON COUNTY WATER AUTHORITY
STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
CLAYTON COUNTY STORMWATER UTILITY**

SECTION 6: APPENDICES

Appendix G: Inspection Report

Date: _____ Inspector: _____

Project Name: _____ Permit Number: _____

Stormwater Structures (Junction Box, Catch Basin, Inlet)

1. Yes__ No__ NA__: Drainage structures are installed at the proper location per approved plans.
2. Yes__ No__ NA__: Drainage structures are installed at the proper grade and slope.
3. Yes__ No__ NA__: Steps are provided according to CCWA standard.
4. Yes__ No__ NA__: Access covers are provided.
5. Yes__ No__ NA__: For depth exceeding 3 feet, access cover is located over the steps.
6. Yes__ No__ NA__: Drainage structures are constructed of materials shown on the approved plans.
7. Yes__ No__ NA__: Structure inverts are shaped to prevent ponding water and accumulation of debris.
8. Yes__ No__ NA__: Pipes are properly grouted and fitted into each drainage structure.
9. Yes__ No__ NA__: Junction box is used to connect pipes of different materials, sizes, inverts, slope and directions.
10. Yes__ No__ NA__: Inlets used are on GDOT Qualified Products List

Stormwater Pipes

1. Yes__ No__ NA__: Proper backfill materials are used (Class I or Class II).
2. Yes__ No__ NA__: Backfills are thoroughly compacted.
3. Yes__ No__ NA__: HDPE pipe bedding agrees with CCWA standard. Bedding for other type of pipe agrees with GDOT standard.
4. Yes__ No__ NA__: Pipe size and materials are consistent with the approved plans.
5. Yes__ No__ NA__: Location and slope of pipe are consistent with the approved plans.
6. Yes__ No__ NA__: Pipe sections are joined correctly (coupling bands are used for corrugated metal pipes, joints, gaskets, etc.).
7. Yes__ No__ NA__: Pipes are in good condition and not damaged.
8. Yes__ No__ NA__: Proper outlet structures (headwalls) are in place.
9. Yes__ No__ NA__: Pipe class agrees with CCWA standard.
10. Yes__ No__ NA__: Pipes used are on GDOT Qualified Products List

Open Channels

1. Yes__ No__ NA__: Open channels are located per approved plans.
2. Yes__ No__ NA__: Open channels are constructed according to CCWA standard (slope is 4:1 or flatter).

**CLAYTON COUNTY WATER AUTHORITY
 STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
 CLAYTON COUNTY STORMWATER UTILITY**

SECTION 6: APPENDICES

3. Yes__ No__ NA__: The cross section (width, depth and slope) of the channel agrees with the approved plans.

Stormwater Pond

1. Yes__ No__ NA__: Ponds deeper than 4 feet is enclosed behind a 5-foot security fence (Depth is measured from the lowest elevation of the pond bottom to the bottom of the spillway).
2. Yes__ No__ NA__: A gate is provided for access to the pond.
3. Yes__ No__ NA__: Fence is located 20 feet outside the highest ponding elevation.
4. Yes__ No__ NA__: Slope is 3:1 or flatter.
5. Yes__ No__ NA__: Size of pond (depth and area) agrees with the approved plans (check after pond is stabilized).
6. Yes__ No__ NA__: Embankment is thoroughly compacted.
7. Yes__ No__ NA__: Outlet control structure is constructed per approved plans.
8. Yes__ No__ NA__: Sizes or orifices agree with approved plans.
9. Yes__ No__ NA__: Trash racks are installed per approved plans.
10. Yes__ No__ NA__: Pipe is grouted into the outlet control structure.
11. Yes__ No__ NA__: Pond is stabilized.
12. Yes__ No__ NA__: Size of spillway agrees with the approved plans.
13. Yes__ No__ NA__: PVC coated chain link used for fence and gate.

Other Structures

1. List variations from the approved plans below:

2. List any violations of the conditions of the approved plans below:

Overall Inspection Result

The construction is in compliance with the approved stormwater management plan:

Yes / No

**CLAYTON COUNTY WATER AUTHORITY
STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
CLAYTON COUNTY STORMWATER UTILITY**

SECTION 6: APPENDICES

**Appendix H: FEMA Procedures for No-Rise Certification for
Proposed Developments in Regulatory Floodway**



Federal Emergency Management Agency

DHS-EP&R (FEMA-FIMA) Region IV

3003 Chamblee-Tucker Road

Atlanta, Georgia 30341

R4-MT
January/04

**PROCEDURES FOR “NO-RISE” CERTIFICATION
FOR PROPOSED DEVELOPMENTS IN REGULATORY
FLOODWAYS**

Section 60.3 (d) (3) of the National Flood Insurance Program (NFIP) regulations states that a community shall *“prohibit encroachments, including fill, new construction, substantial improvements, and other developments within the adopted regulatory floodway unless it has been demonstrated through hydrologic and hydraulic analyses performed in accordance with standard engineering practice that the proposed encroachment would not result in any increase in flood levels within the community during the occurrence of the base (100-year) flood discharge.”*

Prior to issuing any building grading or development permits involving activities in a regulatory floodway, the community must obtain a certification stating the proposed development will not impact the pre-project base flood elevations, floodway elevations, or floodway data widths. The certification should be obtained from the permittee and signed and sealed by a professional engineer.

The engineering or “no-rise” certification must be supported by technical data. The supporting technical data should be based upon the standard step-backwater computer model utilized to develop the 100-year floodway shown on the community’s effective Flood Insurance Rate Map (FIRM) or Flood Boundary and Floodway Map (FBFM) and the results tabulated in the community’s Flood Insurance Study (FIS).

**CLAYTON COUNTY WATER AUTHORITY
STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
CLAYTON COUNTY STORMWATER UTILITY**

SECTION 6: APPENDICES

Although communities are required to review and approve the “no-rise” submittals, they may request technical assistance and review from the FEMA regional office. However, if this alternative is chosen, the community must review the technical submittal package and verify that all supporting data, listed in the following paragraphs, are included in the package before forwarding to FEMA.

To support a “no-rise” certification for proposed developments encroaching into the regulatory floodway, a community will require that the following procedures be followed:

Currently Effective Model

1. Furnish a written request for the step-backwater computer model for the specified stream and community, identifying the limits of the requested data. A fee will be assessed for providing the data. Send data requests to:

Federal Emergency Management Agency
Region IV HIRA Branch
3003 Chamblee-Tucker Road
Atlanta, GA 30341

Or send to:

FIS Information Specialist
Dewberry & Davis
8401 Arlington Boulevard
Fairfax, VA 22031-4666

Duplicate Effective Model

2. Upon receipt of the step-backwater computer model, the engineer should run the original step-backwater model to duplicate the data in the effective FIS.

Existing Conditions Model

3. Revise the original step-backwater model to reflect site specific existing conditions by adding new cross-sections (two or more) in the vicinity of the proposed development, without the proposed development in place. Floodway limits should be manually set at the new cross-section locations by measuring from the effective FIRM or FBFM. The cumulative reach lengths of the stream should also remain unchanged. The results of these analyses will indicate the 100-year floodway elevations for revised existing conditions at the proposed project site.

**CLAYTON COUNTY WATER AUTHORITY
STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
CLAYTON COUNTY STORMWATER UTILITY**

SECTION 6: APPENDICES

Proposed Conditions Model

4. Modify the revised existing conditions model to reflect the proposed development at the new cross-sections, while retaining the currently adopted floodway widths. The over-bank roughness coefficients should remain the same unless a reasonable explanation of how the proposed development will impact Manning's "n" values should be included with the supporting data. The results of this floodway run will indicate the 100-year floodway elevations for proposed conditions at the project site. These results must indicate NO impact on the 100-year flood elevations, floodway elevations, or floodway widths shown in the Duplicate Effective Model or in the Existing Conditions Model.

The original FIS model, the duplicate effective FIS model, the revised existing conditions model, and the proposed conditions model should all produce the same exact results.

The "no-rise" supporting data and a copy of the engineering certification must be submitted to and reviewed by the appropriate community official prior to issuing a permit.

The "no-rise" supporting data should include, but may not be limited to:

5. Duplicate of the original FIS step-backwater model printout or floppy disk.
6. Revised existing conditions step-backwater model.
7. Proposed conditions step-backwater model.
8. FIRM and topographic map, showing floodplain and floodway, the additional cross-sections, the site location with the proposed topographic modification superimposed onto the maps, and a photocopy of the effective FIRM or FBFM showing the current regulatory floodway.
9. Documentation clearly stating analysis procedures. All modification made to the original FIS model to represent revised existing conditions, as well as those made to the revised existing conditions model to represent proposed conditions, should be well documented and submitted with all supporting data.
10. Copy of effective Floodway Data Table copied from the FIS report.
11. Statement defining source of additional cross-section topographic data and supporting information.
12. Cross-section plots, of the added cross sections, for revised existing and proposed conditions.

**CLAYTON COUNTY WATER AUTHORITY
STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
CLAYTON COUNTY STORMWATER UTILITY**

SECTION 6: APPENDICES

13. Certified planimetric (boundary survey) information indicating the location of structures on the property.
14. Copy of the microfiche, or other applicable source, from which input for original FIS HEC-2 model was taken.
15. Floppy disk with all input files.
16. Printout of output files from EDIT runs for all three floodway models.

The engineering “no-rise” certification and supporting technical data must stipulate NO IMPACT on the 100-year flood elevation, floodway elevations, or floodway widths at the new cross-sections and at all existing cross-sections anywhere in the model. Therefore, the revised computer model should be run for a sufficient distance (usually 1-mile, depending on hydraulic slope of the stream) upstream and downstream of the development site to ensure proper “no-rise” certification.

Attached is a sample “no-rise” certification form that can be completed by a registered professional engineer and supplied to the community along with the supporting technical data when applying for a development permit.

**CLAYTON COUNTY WATER AUTHORITY
STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
CLAYTON COUNTY STORMWATER UTILITY**

SECTION 6: APPENDICES

ENGINEERING “NO-RISE” CERTIFICATION

This is to certify that I am a duly qualified engineer licensed to practice in the state of Georgia. It is to further certify that the attached technical data supports the fact that proposed _____

(Name of Development)

will not impact the Base Flood Elevations (100-year flood), floodway elevations and the floodway widths on

(Name of Stream)

at published sections in the Flood Insurance Study for

(Name of Community & Community ID Number)

dated _____ and will not impact the Base Flood Elevations (100-year flood), floodway elevations, and floodway widths at unpublished cross-sections in the vicinity of the proposed development.

Signature

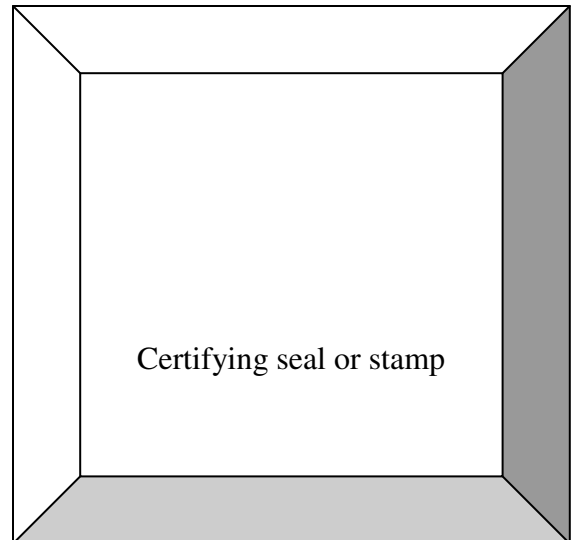
Phone Number _____ ***EMAIL*** _____

Representing _____

Address _____

City _____ ***State*** _____ ***Zip Code*** _____

(Date)



**CLAYTON COUNTY WATER AUTHORITY
STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
CLAYTON COUNTY STORMWATER UTILITY**

SECTION 6: APPENDICES

Appendix I. Clayton County Water Authority Stormwater Standard and Specifications

1. Specifications for HDPE Pipe

(i) HDPE Pipe Materials

- Pipe Sizes: 12 inches through 36 inches nominal diameter:
Type “S” smooth interior pipe in conformance with **AASHTO M294**. Note: corrugations may be annular configuration only.
- Pipe Sizes: 42 and 48 inches nominal diameter:
Type “D” smooth interior, smooth exterior pipe in conformance with **AASHTO MP6-95** type “D”.
- Pipe Joints: The joint system to be used will be integral bell and spigot with a gasket on the spigot end of the pipe over the first corrugation for deepest penetration into the bell and highest performance. The bell should span over two full corrugations at a minimum. The gasket material to be used should meet **ASTM-F477**.
- Resins: Extruded pipe and blow molded fittings – Extruded pipe and blow molded fittings shall be made of virgin PE compounds which conform with the requirements of cell class 335420C as defined and described in **ASTM D3350**, except that the carbon black content shall not exceed 5 percent. Compounds that have higher cell classifications in one or more properties are acceptable provided product requirements are met.

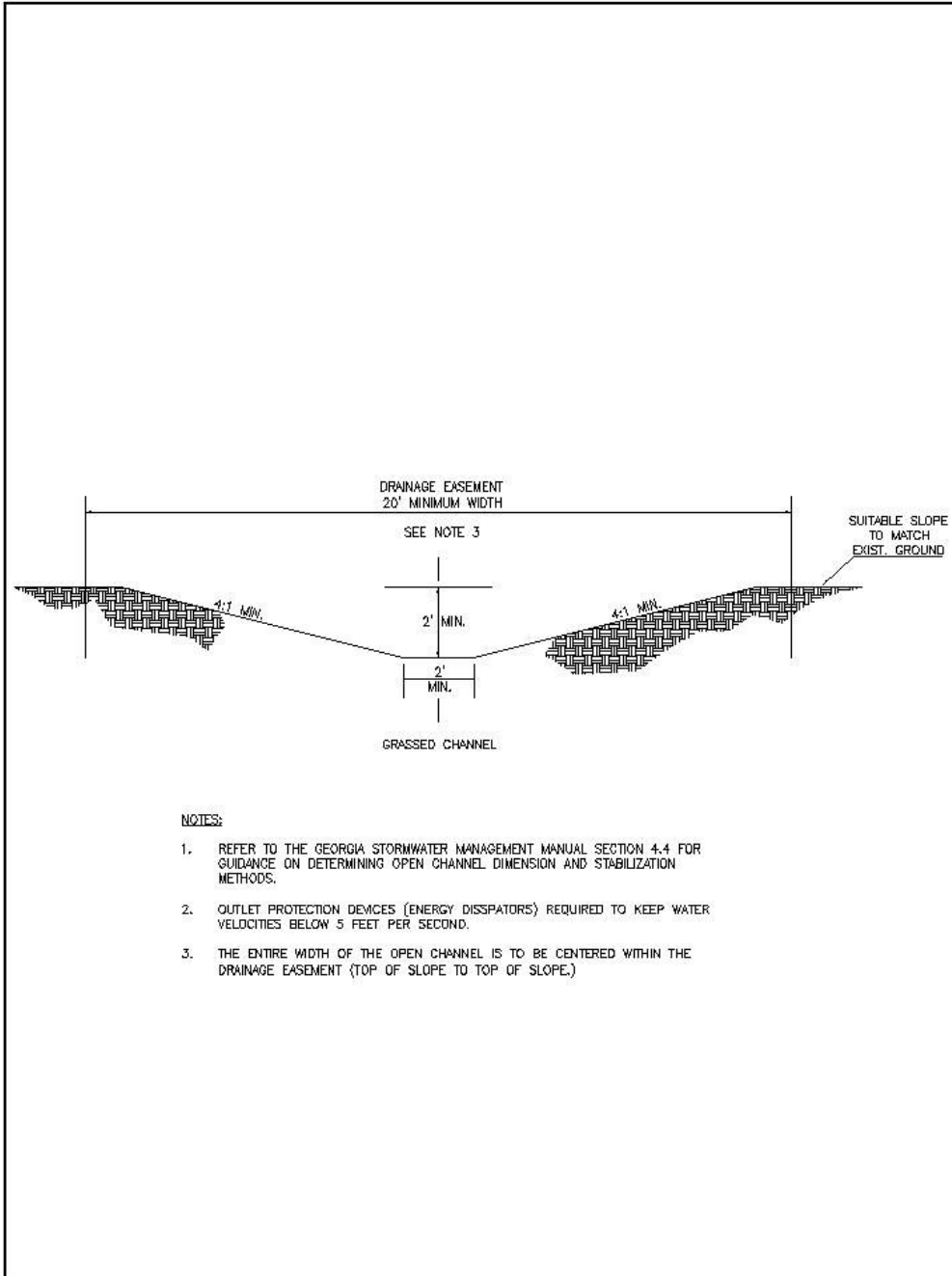
(ii) Pipe Installation

- A. Installation shall be in accordance with **ASTM D2321** and manufacturer’s recommendations. Where applicable, Contractor shall adhere to more stringent requirements within these specifications.
- B. Minimum pipe cover: Provide a minimum of 12” of cover over pipe in non-traffic applications and in H-20 applications. Allowable minimum cover is measured from top of pipe to bottom of flexible pavement or top of pipe to top of rigid pavement. Minimum cover in unpaved areas must be maintained.
- C. Excavation: Backfill and compaction shall conform to applicable requirements of Clayton County Water Authority and Georgia Department of Transportation.

**CLAYTON COUNTY WATER AUTHORITY
 STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
 CLAYTON COUNTY STORMWATER UTILITY**

SECTION 6: APPENDICES

2. CCWA Detail Number 100.1: Typical Open Channel



NOTES:

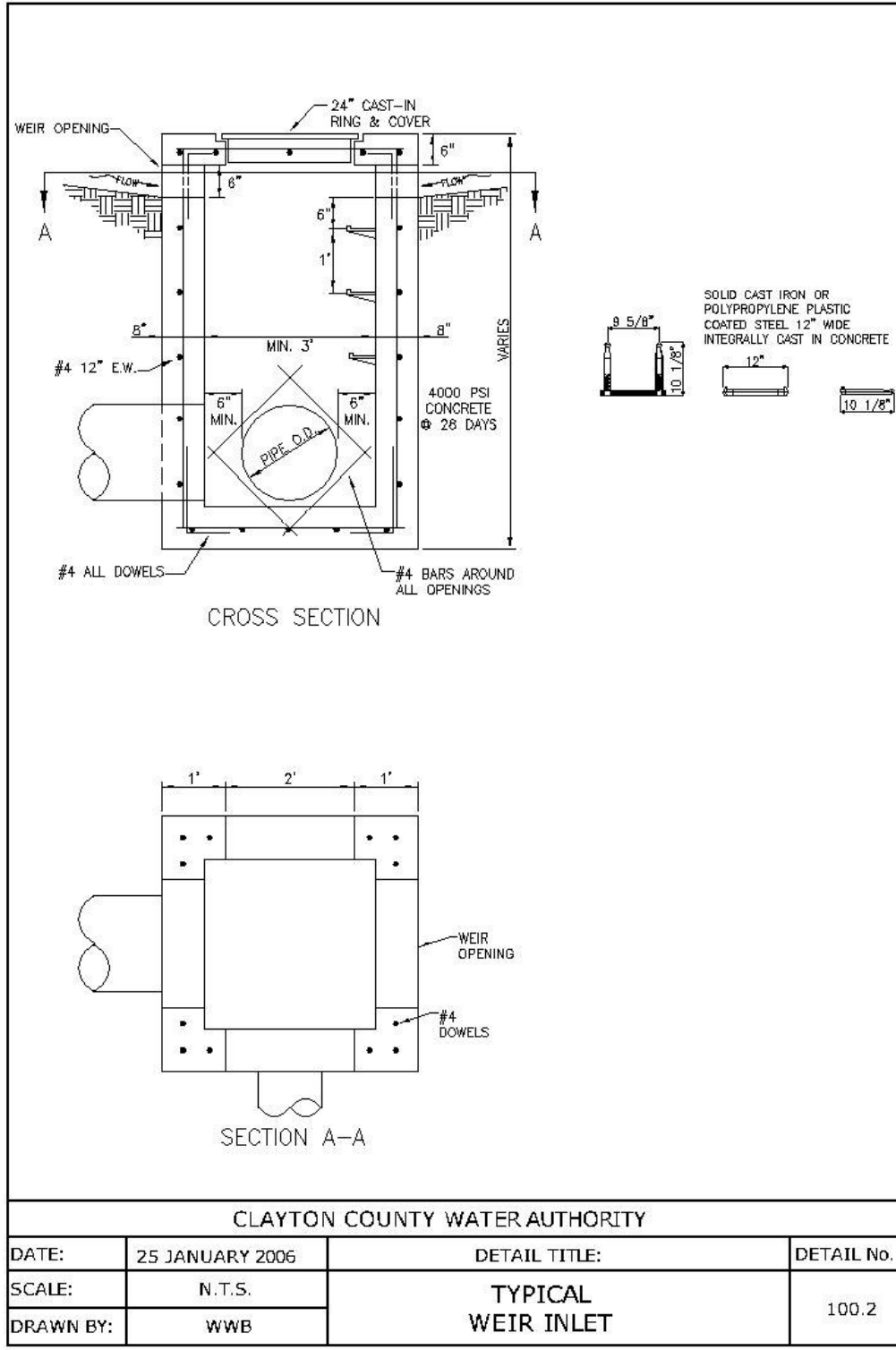
1. REFER TO THE GEORGIA STORMWATER MANAGEMENT MANUAL SECTION 4.4 FOR GUIDANCE ON DETERMINING OPEN CHANNEL DIMENSION AND STABILIZATION METHODS.
2. OUTLET PROTECTION DEVICES (ENERGY DISSIPATORS) REQUIRED TO KEEP WATER VELOCITIES BELOW 5 FEET PER SECOND.
3. THE ENTIRE WIDTH OF THE OPEN CHANNEL IS TO BE CENTERED WITHIN THE DRAINAGE EASEMENT (TOP OF SLOPE TO TOP OF SLOPE.)

CLAYTON COUNTY WATER AUTHORITY			
DATE:	25 JANUARY 2006	DETAIL TITLE:	DETAIL No.
SCALE:	N.T.S.	TYPICAL OPEN CHANNEL	100.1
DRAWN BY:	WWB		

**CLAYTON COUNTY WATER AUTHORITY
 STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
 CLAYTON COUNTY STORMWATER UTILITY**

SECTION 6: APPENDICES

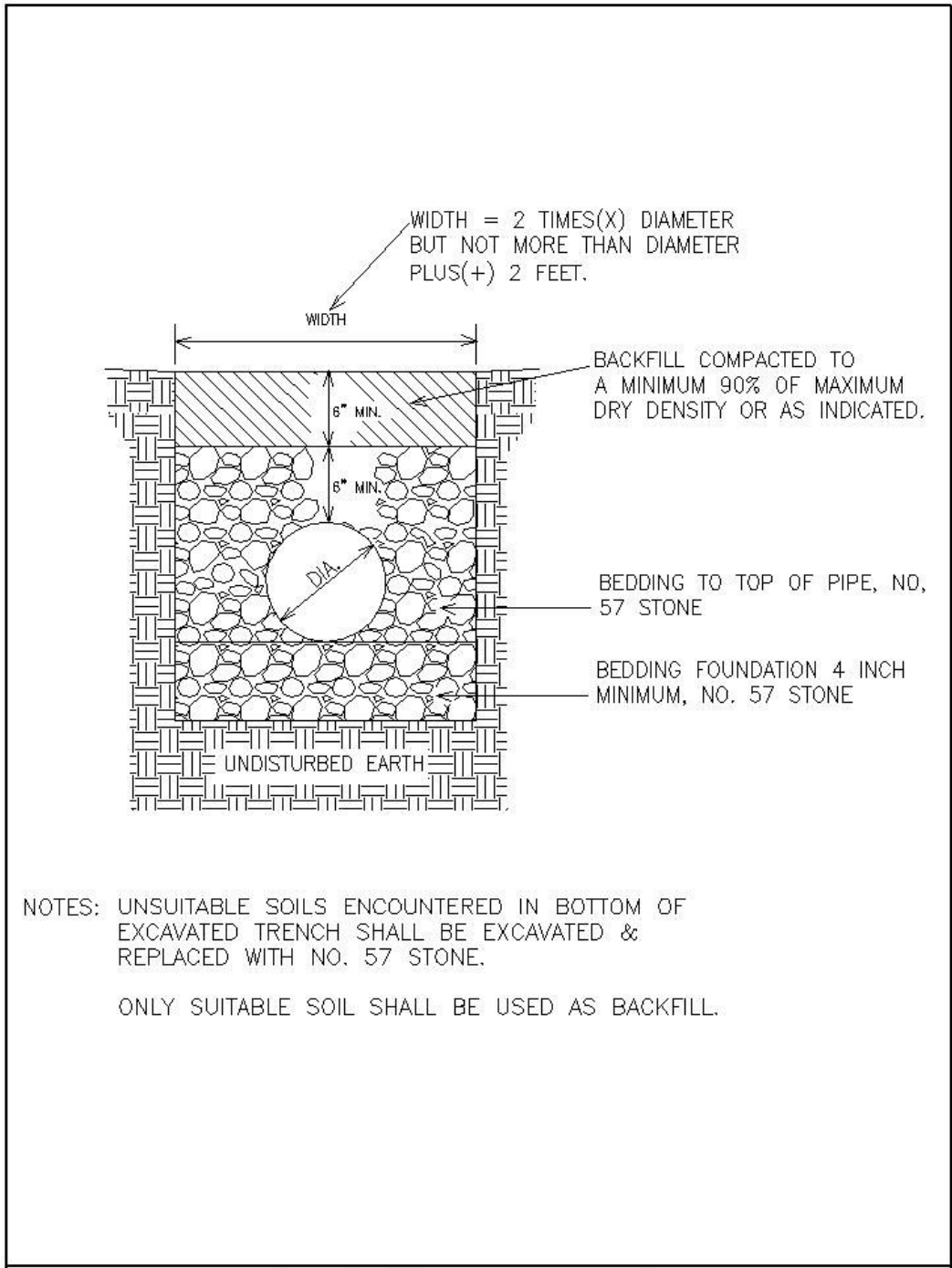
3. CCWA Detail Number 100.2: Typical Weir Inlet



**CLAYTON COUNTY WATER AUTHORITY
 STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
 CLAYTON COUNTY STORMWATER UTILITY**

SECTION 6: APPENDICES

4. CCWA Detail Number 100.3: HDPE Pipe Bedding



NOTES: UNSUITABLE SOILS ENCOUNTERED IN BOTTOM OF
 EXCAVATED TRENCH SHALL BE EXCAVATED &
 REPLACED WITH NO. 57 STONE.

ONLY SUITABLE SOIL SHALL BE USED AS BACKFILL.

CLAYTON COUNTY WATER AUTHORITY			
DATE:	25 JANUARY 2006	DETAIL TITLE:	DETAIL No.
SCALE:	N.T.S.	HDPE PIPE BEDDING	100.3
DRAWN BY:	WWB		

**CLAYTON COUNTY WATER AUTHORITY
STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
CLAYTON COUNTY STORMWATER UTILITY**

SECTION 6: APPENDICES

Appendix K: Hydrologic Models Meeting the Minimum Requirement of NFIP

(Nationally Accepted Models)
Effective: June 2005

Hydrologic Models: Determination of Flood Hydrographs

PROGRAM	DEVELOPED BY	AVAILABLE FROM	COMMENTS
Single Event			
HEC-1 4.0.1 and up ² (May 1991)	U.S. Army Corps of Engineers	Water Resources Support Center ³ Corps of Engineers Hydrologic Engineering Center (HEC) 609 Second Street Davis, CA 95616-4687	Flood hydrographs at different locations along streams. Calibration runs preferred to determine model parameters. Public Domain: Yes
HEC-HMS 1.1 and up (Mar. 1998)	U.S. Army Corps of Engineers	U.S. Army Corps of Engineers Hydrologic Engineering Center 609 Second Street Davis, CA 95616-4687	The Hydrologic Modeling System provides a variety of options for simulating precipitation-runoff processes. It has a capability to use gridded rainfall data to simulate runoff. It does not provide snowmelt and snowfall functions; it cannot be used for areas where snowmelt is an important flood hazard source and must be considered in estimation of flood discharges. Public Domain: Yes
TR-20 (Feb. 1992)	U.S. Department of Agriculture, Natural Resources Conservation Service	U.S. Department of Agriculture, Natural Resources Conservation Service	Flood hydrographs at different locations along streams. Calibration runs preferred to determine model parameters. Public Domain: Yes
TR-20 Win 1.00.002 (Jan. 2005)	U.S. Department of Agriculture, Natural Resources Conservation Service	U.S. Department of Agriculture, Natural Resources Conservation Service	The TR-20 computer model has been revised and completely rewritten as a windows based program. It is storm event surface water hydrologic model applied at a watershed scale that can generate, route, and combine hydrographs at points within a watershed. Public Domain: Yes

**CLAYTON COUNTY WATER AUTHORITY
STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
CLAYTON COUNTY STORMWATER UTILITY**

SECTION 6: APPENDICES

Hydrologic Models: Determination of Flood Hydrographs

PROGRAM	DEVELOPED BY	AVAILABLE FROM	COMMENTS
Single Event			
TR-55 (June 1986)	U.S. Department of Agriculture, Natural Resources Conservation Service	U.S. Department of Agriculture, Natural Resources Conservation Service	Peak discharges and flood hydrographs at a single location. Public Domain: Yes
WinTR-55 1.0.08 (Jan. 2005)	U.S. Department of Agriculture, Natural Resources Conservation Service	U.S. Department of Agriculture, Natural Resources Conservation Service	The new WinTR-55 uses the WinTR-20 program as the driving engine for analysis of the hydrology of the small watershed system being studied. Public Domain: Yes
SWMM (RUNOFF) 4.30 (May 1994), and 4.31 (Jan. 1997)	U.S. Environmental Protection Agency and Oregon State University	Center for Exposure Assessment Modeling U.S. Environmental Protection Agency Office of Research and Development Environmental Research Laboratory 960 College Station Road Athens, GA 30605-2720 Department of Civil, Construction, and Environmental Engineering Oregon State University 202 Apperson Hall Corvallis, OR 97331-2302	Calibration or verification to the actual flood events highly recommended. Public Domain: Yes
SWMM 5 Version 5.0.005 (May 2005)	U.S. Environmental Protection Agency	Water Supply and Water Resources Division U.S. Environmental Protection Agency	SWMM 5 provides an integrated environment for editing study area input data, running hydrologic simulations, and viewing the results in a variety of formats. These include color-coded drainage area and conveyance system maps, time series graphs and tables, profile plots, and statistical frequency analyses. Public Domain: Yes
MIKE 11 UHM (2002 D, 2004)	DHI Water and Environment	DHI, Inc. 319 SW Washington St. Suite 614 Portland, OR 97204	Simulates flood hydrographs at different locations along streams using unit hydrograph techniques. Three methods are available for calculating infiltration losses and three methods for converting rainfall excess to runoff, including SCS Unit hydrograph method. View the Rainfall-Runoff Module Description Public Domain: No

**CLAYTON COUNTY WATER AUTHORITY
 STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
 CLAYTON COUNTY STORMWATER UTILITY**

SECTION 6: APPENDICES

Hydrologic Models: Determination of Flood Hydrographs

PROGRAM	DEVELOPED BY	AVAILABLE FROM	COMMENTS
Single Event			
PondPack v.8 (May 2002) and up	Haestad Methods, Inc.	Haestad Methods, Inc. 37 Brookside Road Waterbury, CT 06708-1499	The program is for analyzing watershed networks and aiding in sizing detention or retention ponds. Only the NRCS Unit Hydrograph method and NRCS Tc calculation formulas are acceptable. Other hydrograph generation methods or Tc formulas approved by State agencies in charge of flood control or floodplain management are acceptable for use within the subject State. Public Domain: No
XP-SWMM 8.52 and up	XP-Software	XP-Software 2000 NE 42nd Ave. #214 Portland, OR 97213-1305	Model must be calibrated to observed flows, or discharge per unit area must be shown to be reasonable in comparison to nearby gage data, regression equations, or other accepted standards for 1% annual chance events. Public Domain: No

**CLAYTON COUNTY WATER AUTHORITY
STORMWATER MANAGEMENT GUIDELINES FOR LAND DEVELOPMENT
CLAYTON COUNTY STORMWATER UTILITY**

SECTION 6: APPENDICES

Hydrologic Models: Determination of Flood Hydrographs

PROGRAM	DEVELOPED BY	AVAILABLE FROM	COMMENTS
Continuous Event			
DR3M (Oct. 1993)	U.S. Geological Survey	U.S. Geological Survey National Center 12201 Sunrise Valley Drive Reston, VA 22092	Calibration to actual flood events required. Water Resources Application Software Public Domain: Yes
HSPF 10.10 and up (Dec. 1993)	U.S. Environmental Protection Agency, U.S. Geological Survey	Center for Exposure Assessment Modeling U.S. Environmental Protection Agency Office of Research and Development Environmental Research Laboratory 960 College Station Road Athens, GA 30605-2720	Calibration to actual flood events required. Water Resources Application Software Public Domain: Yes
MIKE 11 RR (2002 D, 2004)	DHI Water and Environment	DHI, Inc. 319 SW Washington St. Suite 614 Portland, OR 97204	The Rainfall-Runoff Module (RR, formerly NAM) is a lumped-parameter hydrologic model capable of continuously accounting for water storage in surface and sub-surface zones. Flood hydrographs are estimated at different locations along streams. Calibration to actual flood events is required. View the MIKE 11 Add-On Modules. Public Domain: No
PRMS Version 2.1 (Jan. 1996)	U.S. Geological Survey	U.S. Geological Survey 12201 Sunshine Valley Drive Reston, VA 22092	PRMS is a modular-designed, deterministic, distributed-parameter modeling system that can be used to estimate flood peaks and volumes for floodplain mapping studies. Calibration to actual flood events required. The program can be implemented within the Modular Modeling System (MMS) that facilitates the user interface with PRMS, input and output of data, graphical display of the data, and an interface with GIS. Public Domain: Yes