STORMWATER COMPREHENSIVE DEVELOPMENT PLAN
SANTA ROSA COUNTY
FL
Feb 1988

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AUTHENTICATED
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INFORMATION
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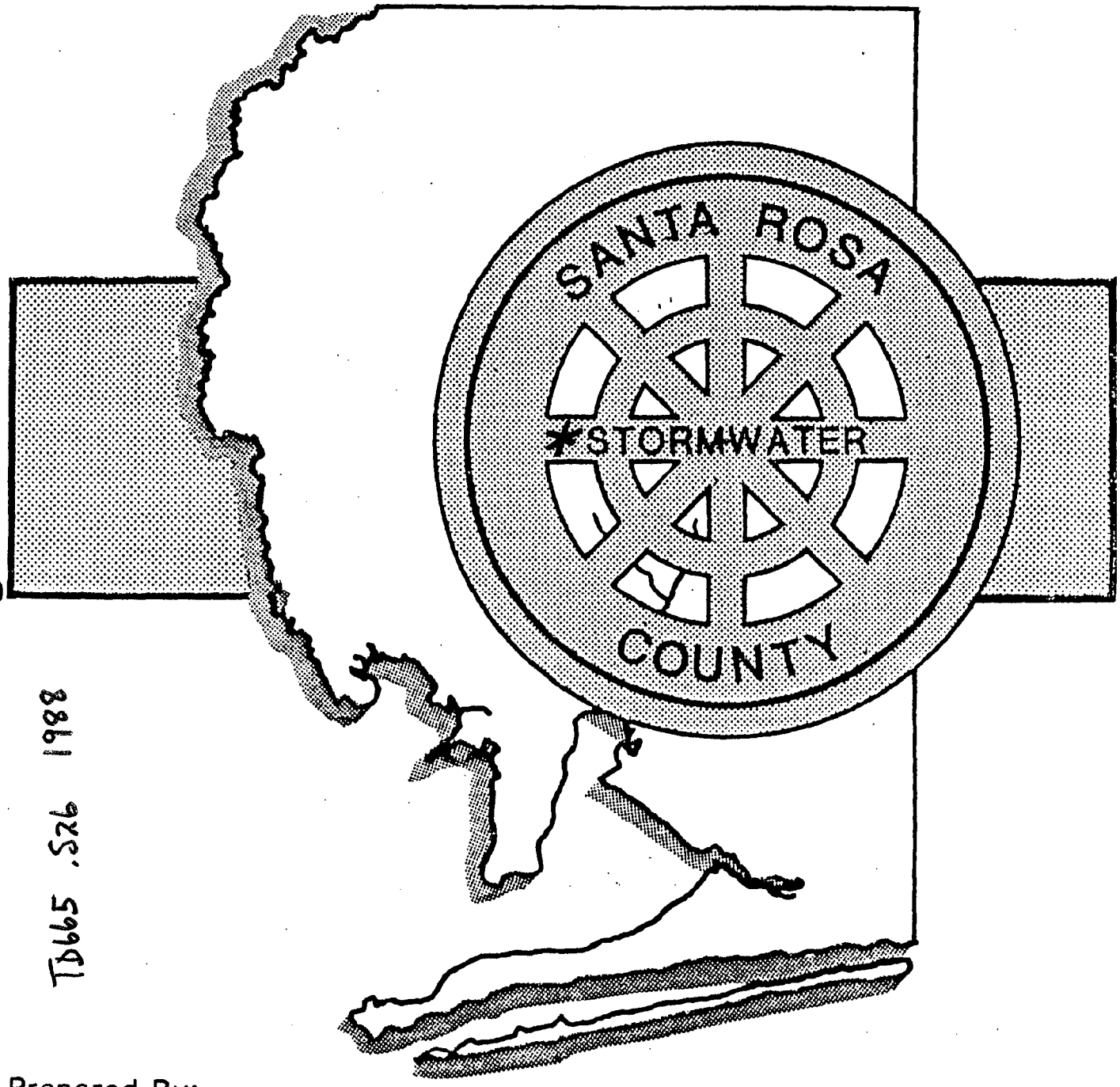
CZ095 CM-187
Task 3.14

EXECUTIVE SUMMARY



TD665 .S26 1988

Prepared By:

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In Association With:

PBSJ ENGINEERING • PLANNING • ARCHITECTURE • LANDSCAPE ARCHITECTURE

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This project was partially funded by a grant from the Office of Coastal Management, Department of Environmental Regulation, with funds provided by the National Oceanic and Atmospheric Administration under the Coastal Zone Management Act of 1972, as amended.

SANTA ROSA COUNTY
COMPREHENSIVE STORMWATER DEVELOPMENT PLAN

EXECUTIVE SUMMARY

February 4, 1988

EXISTING NEEDS

A. Capital Improvement Projects

		Construction Cost	Total Cost
1	Major New System	$1,800,000	$2,070,000
46	Remedial Projects	1,755,685	2,019,000
	TOTAL	$3,555,685	$4,089,000

B. Comprehensive Stormwater Management Ordinance
C. Formalized Technical Design Standards and Criteria
D. Systematic Stormwater Management Program
E. Baseline Conditions Analysis
F. Stormwater Facilities Inventory
G. Stormwater Atlas
H. Enhanced O & M Program
I. Enhanced CIP Program

FUTURE NEEDS

A. Potential Capital Improvement Projects

		Construction Cost	Total Cost
15	Major Conveyance Structures	$ 833,700	$ 962,000
8	Minor Culverts	168,800	192,000
	TOTAL	$1,000,500	$1,118,000

B. Increased O & M Requirements
C. Repair and Replacement Program for Existing Facilities
D. Regulation and Monitoring of Development Activities
E. Regulation of Private Stormwater Facility Design and Construction
F. Development of Long-Term Financing for County Stormwater Management Program.

STUDY PRODUCTS

A. Initial Stormwater Facility Inventory
   * 430 Major Facilities
   * Unique Structure Numbering System
   * Size, Type and Location of Facilities

B. Stormwater Atlas of Entire County
   * Basin and Subbasin Delineations
   * Structure Identification

C. Draft Stormwater Management Ordinance
   * Provides for Floodplain Management
   * Requires Stormwater Improvements
   * Provides for Erosion and Sediment Control
   * Requires Permits
   * Provides for Penalties
   * Includes an Appeals Process
   * Regionally Consistent

D. Draft Stormwater Engineering Technical Manual
   * Provides Requirements for a Stormwater Management Plan
   * Establishes Engineering Standards and Criteria
   * Defines Acceptable Analytical Methods
   * Provides for Development of Administrative Guidelines by County

E. Capital Improvements Program
   * Identification of 47 Currently Needed Projects costing approximately $4,089,000
   * Preliminary Identification of 23 Potential Projects that may be required after 1998 costing approximately $1,118,000
   * Prioritization of CIP Projects for Implementation

F. Implementation Program for County Stormwater Management Program
   * Identified CIP Projects
   * Potential CIP Projects
   * Strategic Basin Studies
   * O & M Program
   * Repair and Replacement Program
   * 20-Year Strategy

G. Draft Goals, Objectives and Policies for the Stormwater Management Program

H. Detailed Report Which Summarizes the Various Aspects of the Comprehensive Stormwater Development Plan

RECOMMENDATIONS

A. Adopt the Stormwater Management Ordinance for the Regulation of Stormwater in Santa Rosa County

B. Approve the Stormwater Engineering Technical Manual to Direct the Design of Stormwater Management Facilities in Santa Rosa County

C. Fund the First Year of the Drainage Facilities Survey and Atlas Updating

D. Authorize a Functional Needs Assessment to:

* Identify Detailed Stormwater Funding Needs
* Define Organizational Needs and Structure
* Define Appropriate Funding Mechanisms
* Evaluate Suitability of Funding Mechanisms to Meet Long-term Revenue Needs

E. Develop a Detention/Retention Pond Policy Which Addresses:

* Standards for Pond Design for Public vs. Private Ownership
* Procedures for Accepting Ponds for Public Ownership and Maintenance
* Conditions and Funding Mechanisms for Accepting Ponds for Public Maintenance
* Provision of a Continuing and Increasing Source of Funding for Pond Maintenance

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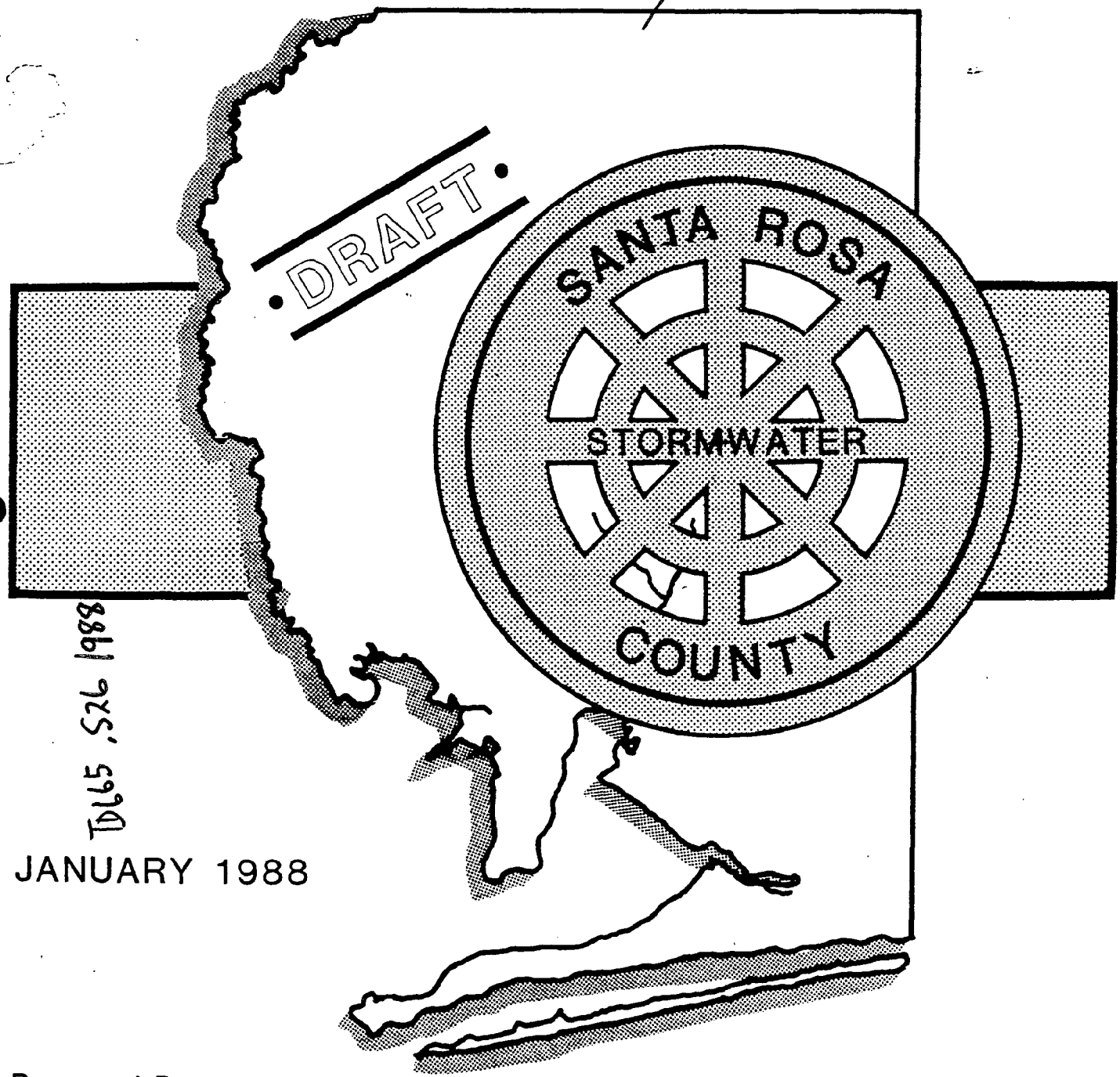
SANTA ROSA COUNTY
COMPREHENSIVE STORMWATER DEVELOPMENT PLAN



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SANTA ROSA COUNTY
COMPREHENSIVE STORMWATER DEVELOPMENT PLAN

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SECTION ONE

Section 1

INTRODUCTION

1.1. BACKGROUND

Unless specifically stated otherwise, any proposed designs in conflict with this Manual will require either a waiver of the applicable County ordinance or approval of the County Engineer, whichever is applicable. In addition, the County Engineer shall be solely responsible for interpreting any criteria in this Manual which may be deemed vague or uncertain. Furthermore, the interpretation shall be in the best interest of the citizens of Santa Rosa County.

In the past twenty years, Santa Rosa County has been undergoing dramatic development and growth. All predictions of future development indicate that growth patterns will not only continue but will, in fact increase. Growth trends indicate that by the beginning of the next century, Florida is expected to experience the third highest state-wide population growth in the nation.

Impacts of urbanization and land development impose technological, economic, environmental, social and political implications upon the quality of life for the future. Stormwater management affects all governmental jurisdictions and all parcels of property. As a result, regulation is often passed between jurisdictional boundaries. This necessitates the development of a stormwater management design plan which balances public and private interests.

1.2 PURPOSE

The purpose of this Manual is to guide engineers, architects, planners, and developers in the design of stormwater management systems in Santa Rosa County. The Manual integrates recommended methodologies, design procedures and standards into a single-source criteria. This manual represents a coordinated effort to bring water resource managers, developers and designers up-to-date with the regulations and criteria imparted upon stormwater management in Santa Rosa County. This manual will be utilized by Santa Rosa County for permitting, study, review, and design.

SECTION TWO

Section 2

STORMWATER MANAGEMENT PLAN

2.1 GENERAL

It is the responsibility of the Applicant to include in the Stormwater Management Plan sufficient information for the County Engineer to evaluate the environmental characteristics of the affected areas, the potential and predicted impacts of the proposed activity on County receiving waters, and the effectiveness and acceptability of those measures proposed by the Applicant for reducing adverse impacts. The Stormwater Management Plan shall contain maps, graphs, tables, photographs, narrative descriptions, explanations and the information required by this section.

2.2 PREPARATION OF STORMWATER MANAGEMENT PLANS

It is the responsibility of the Applicant to prepare and submit a Stormwater Management Plan.

2.2.1 Preparation by Qualified Professional

A. The Stormwater Management Plan shall be prepared, signed and sealed by a Professional Engineer registered in the State of Florida.

B. The Engineer of Record shall be responsible for his stormwater management system design.

2.2.2 Submission Standards

The County Engineer shall establish standards for the Stormwater Management Plan and materials submitted as supporting documents. Minimum standards are

2.3 CONTENTS OF PLAN

The Stormwater Management Plan shall consist of the Application, the Engineer's Report, the plans for site alteration clearly indicating the Applicant's proposed stormwater management facilities, and supporting documents as required by the County Engineer or considered to be essential by the Engineer of Record.

2.3.1 Application Information

The name, address and telephone number of the applicant.

2.3.2 Engineer's Report

The Engineer's Report shall address, at a minimum, the following aspects of stormwater management on the Applicant's property:

A. Site Location Information

A location map, legal description and an aerial photo with boundary lines clearly outlining the project extent.

B. Existing/Predevelopment Conditions

The existing predevelopment environmental and hydrologic conditions of the site and/or receiving waters and wetlands described in detail with appropriate site plan including the following:

1. The direction, flow rate, and volume of stormwater runoff for existing conditions and, to the extent practicable, predevelopment conditions.

2. The location of natural storage areas on the site where stormwater presently collects and/or percolates into the ground.

3. A description of all upland acreage, watercourses, waterbodies and wetlands on or adjacent to the site or into which stormwater flows.

4. Groundwater levels, including seasonal fluctuations.

5. Location of floodplains.

6. Vegetation.

7. Topography.

8. Soils.

9. Basin and subbasin delineations.

10. Points of discharge and estimated discharge rates.

C. Proposed Site Alteration and Impacts

1. Any proposed alterations of the site described in detail, including changes in topography; areas where vegetation will be cleared or killed; areas that will be covered with an

impervious surface with a description of the surfacing material; and, the size and location of any buildings or other structures.

2. Predicted impacts of the proposed development on existing conditions described in detail, including change in water quality; changes in groundwater levels; changes in the incidence and duration of flooding on the site and properties upstream and downstream from it; impacts on wetlands; and, impacts on vegetation.

3. All components of the stormwater management system and any measure for the detention, retention, or infiltration of water or for the protection of water quality, described in detail, including:

   a. The channel, direction, flow rate, and volume of stormwater that will be conveyed from the site, with a comparison to existing conditions and, to the extent practicable, predevelopment conditions.

   b. Detention and retention areas, including plans for the discharge of contained water, and maintenance plans.

   c. Areas of the site to be used or reserved for percolation.

d. A plan for the control of erosion and sedimentation which describes in detail the type and location of control measures, the stage of development at which they will be put into place or used, provisions for their maintenance, and disposal of collected sediment.

e. Any other information which the applicant or the County Engineer believes is reasonably necessary for an evaluation of the proposed development.

2.4 CONSTRUCTION PLANS AND SPECIFICATIONS

Signed and sealed construction plans and specifications for all components of the stormwater management system.

2.5 OPERATION AND MAINTENANCE PLAN

An Operation and Maintenance Plan for proposed facilities which sets forth scheduled maintenance needs and includes an operation/maintenance manual to be provided to the designated entity responsible for maintenance of the stormwater management system.

SECTION THREE

Section 3

ENGINEERING STANDARDS

3.1 GENERAL DESIGN CRITERIA

3.1.1 Design Method

The design method used shall be the state-of-the-art except that the Rational Method shall not be used for drainage areas over ten (10) acres unless approved by the County Engineer.

3.1.2 Design Frequency

Rainfall data is to be obtained using the Florida DOT Zone 1 Rainfall Curves. Specific design storm information and requirements are further described in Section 4.4 of this Manual. The design storm frequency and duration shall be as listed below:

Facility	Frequency	Duration
Bridges	50-Year	Critical Duration
Crossdrains, ditches, side-drains and storm sewers for external subdivision drainage	25-Year	Critical Duration
Crossdrains, ditches, side-drains and storm sewers for internal subdivision drainage	25-Year	Critical Duration
Detention basins	25-Year	24-hour
Retention basins without an overflow outlet	100-Year	24-hour

Facility	Frequency	Duration
Retention basins with an overflow outlet	25 Year	24-hour
Floor elevations	Floor elevations shall be designed to be 2.0 feet above the water level associated with the 100-Year storm event (except that near retention basins without an overflow outlet the floor elevations shall be no lower than 3.0' above the retention basin 100-year design high water elevation)	

3.1.3 Coefficient of Runoff

The coefficient of runoff for roofed and paved areas shall be 0.95. The coefficient of runoff for bodies of water shall be 1.00. The coefficient of runoff for other areas shall be determined by the Engineer of Record by considering vegetation, slope, soil type and season high groundwater elevation using common engineering standard values. Guidelines for selection of appropriate runoff coefficients are established in Table 3-1.

3.1.4 Elevation of the Low Edge of Street Pavement

A. The low edge of street pavement near marine waters of the Gulf of Mexico, Santa Rosa Sound, Pensacola Bay, Blackwater Bay and Escambia Bay, shall be no lower than elevation 7.0 NGVD.

TABLE 3-1

SUGGESTED RATIONAL METHOD RUNOFF COEFFICIENTS[a]

FOR 2 TO 10 YEAR DESIGN FREQUENCY STORMS

Slope	Land Use	Sandy Soils Min.	Sandy Soils Max.	Clay Soils Min.	Clay Soils Max.
Flat (0-2%)	Woodlands	0.10	0.15	0.15	0.20
	Pasture, grass, and farmland[b]	0.15	0.20	0.20	0.25
	Rooftops and pavement	0.95	0.95	0.95	0.95
	Pervious pavements[c]	0.75	0.95	0.90	0.95
	SFR: ½-acre lots and larger	0.30	0.35	0.35	0.45
	Smaller lots	0.35	0.45	0.40	0.50
	Duplexes	0.35	0.45	0.40	0.50
	MFR: Apartments, townhouses, and condominiums	0.45	0.60	0.50	0.70
	Commercial and Industrial	0.50	0.95	0.50	0.95
Rolling (2-7%)	Woodlands	0.15	0.20	0.20	0.25
	Pasture, grass, and farmland[b]	0.20	0.25	0.25	0.30
	Rooftops and pavement	0.95	0.95	0.95	0.95
	Pervious pavements[c]	0.80	0.95	0.90	0.95
	SFR: ½-acre lots and larger	0.35	0.50	0.40	0.55
	Smaller lots	0.40	0.55	0.45	0.60
	Duplexes	0.40	0.55	0.45	0.60
	MFR: Apartments, townhouses, and condominiums	0.50	0.70	0.60	0.80
	Commercial and Industrial	0.50	0.95	0.60	0.95
Steep (7%+)	Woodlands	0.20	0.25	0.25	0.30
	Pasture, grass, and farmland[b]	0.25	0.35	0.30	0.40
	Rooftops and pavement	0.95	0.95	0.95	0.95
	Pervious pavements[c]	0.85	0.95	0.90	0.95
	SFR: ½-acre lots and larger	0.40	0.55	0.50	0.65
	Smaller lots	0.45	0.60	0.55	0.70
	Duplexes	0.45	0.60	0.55	0.70
	MFR: Apartments, townhouses, and condominiums	0.60	0.75	0.65	0.85
	Commercial and Industrial	0.60	0.95	0.65	0.95

[a] Weighted coefficient based on percentage of impervious surfaces and green areas must be selected for each site.

[b] Coefficients assume good ground cover and conservation treatment.

[c] Depends on depth and degree of permeability of underlying strata.

Note: SFR = Single Family Residential
MFR = Multi-Family Residential

Soure: FDOT Drainage Manual (1987)

B. The low edge of street pavement shall be no lower than 0.5' above the twenty-five (25) year design high water elevation for external subdivision drainage except that when and/or sand-clay base is used the low edge of street pavement shall be no lower than 1.0' above the twenty-five (25) year design high water elevation.

C. The low edge of street pavement shall be no lower than 1.0' above the twenty-five (25) year design high water elevation for internal subdivision drainage.

D. The low edge of street pavement near detention basins with an outflow outlet shall be no lower than 1.0' above the twenty-five (25) year design high water elevation.

E. The low edge of street pavement near retention basins without an overflow outlet shall be no lower than 1.0' above the one hundred (100) year design high water elevation.

F. The low edge of street pavement near retention basins with an overflow outlet shall be no lower than 1.0' above the twenty-five (25) year design high water elevation.

3.1.5 Elevation of the Bottom of Street Subgrade

The bottom of street subgrade shall be no lower than 0.5 foot above the design seasonal high groundwater elevation.

3.2 CULVERT DESIGN

3.2.1 Manning's Coefficient "n" for Culverts

Type of Culvert	Manning's Coefficient "n"
Reinforced concrete pipe	0.012
Concrete box culvert	0.012
Corrugated metal pipe	0.024

3.2.2 Minimum Culvert Size

Type of Culvert	Minimum Size
Crossdrains	18" or Equivalent Elliptical Pipe
Storm sewer	18" or Equivalent Elliptical Pipe
Sidedrains	18" or Equivalent Elliptical Pipe
Box culvert	3' x 3'

3.2.3 Pipe Size Increment

Pipe sizes above twenty-four (24) inch or equivalent elliptical section shall be based on six (6) inch increment.

3.2.4 Culvert Length

The maximum length of culvert to be used without an access structure shall be:

Culvert Size	Maximum Length
15" pipe or elliptical equivalent	300'
18" pipe or elliptical equivalent	400'
24" to 36" pipe or elliptical equivalent	500'
42" and larger pipe or equivalent	500'
Box culvert	500'

3.2.5 Maximum Velocity

Unless unstable or highly erosive soil conditions indicate a lower design velocity is desirable, or unless ditch paving at the outlet is provided, the maximum allowable outlet velocity for culverts shall be 5.0 feet per second.

3.2.6 Endwalls

Endwalls shall be installed on all culverts (except sidedrains which shall have mitered end sections) unless other provision is made for erosion protection. Endwalls shall conform to the latest editions of the Standard Indexes and the Florida DOT Standard Specifications for Road and Bridge Construction.

3.2.7 Minimum Clearance

The minimum clearance for all pipe culverts shall be:

To	Minimum Clearance
Bottom Roadway Subgrade	1.0' to Crown of Pipe
Utility Crossing	0.5' to Shell of Pipe

3.2.8 Conflict Manholes

A. Where it is necessary to allow a utility to pass through a manhole, inlet or junction box because of no reasonable alternative, the utility shall be ductile iron. The utility shall be located in the upper half of the storm sewer opening.

B. A minimum of 1.0' clearance between the shell of the utility and invert of a culvert, entrance or discharge point, shall be provided.

C. The manhole, inlet or junction box shall be appropriately sized to provide equivalent flow cross-section area to compensate for conflict pipe.

3.3 STORM SEWER DESIGN

3.3.1 Storm Sewer Tabulations

In subdivisions where storm sewers are planned, the Engineer of Record shall include in his Engineering Report appropriate drainage calculations prepared on a standard FDOT storm sewer tabulation form as shown in Figure 3-1. Procedures for use of this storm tabulation form is described in FDOT's Drainage Manual, Volume 24 (1987).

3.3.2 Inlets, Manholes and Junction Boxes

All inlets, manholes and junction boxes shall conform to the Santa Rosa County Standard Indexes and the Florida DOT Standard Specifications for Road and Bridge Construction, latest edition.

3.3.3 Storm Sewer Alignment

All storm sewer alignments shall avoid abrupt changes in direction or slope and shall maintain reasonable consistencies in flow velocity. Where abrupt changes in direction or slope are encountered, provisions shall be made to handle the resulting head loss. All inlets and manholes shall be designed to drop 0.10 foot in elevation for any changes in alignment of more than 45 ^{o}.

STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION

STORM DRAIN TABULATION FORM

R.I. No.

DATE ______ PROJECT NO. ______ ROAD ______ COUNTY ______ BY ______ SHEET NO. ___ OF ___

Location of Upper End: Station	Location of Upper End: Dist	Location of Upper End: S	Structure No.	Type of Structure	Type of Line	Length (Ft.)	Drainage Area (Acres) C- C- C-: Increment	Drainage Area (Acres): Sub Total	Sub-Total (CA)	Time of Concentration (Min.)	Time of Flow in Section (Min)	Intensity	Total (CA)	Total Runoff (CFS)	Inlet Elevation (Feet)	Elev. of H.G. / Crown Elev. / Flowline Elev.: Upper End	Elev. of H.G. / Crown Elev. / Flowline Elev.: Lower End	Fall (In Feet)	Diameter (In)	Slope (%)	Velocity (FPS)	Capacity (CFS)	Notes: Zone ___ -Frequency ___ Yr; n=.012 Concrete Pipe & Culverts; n=.024 Corrugated Metal Pipe. Remarks

FIGURE 3-1

3.3.4 Hydraulic Gradient Slope and Elevation

The maximum hydraulic gradient slope allowed will be that which will produce a velocity of:

Type of Culvert	Maximum Velocity
O-Ring RCP	20 feet per second
Diaper Joint RCP	12 feet per second
Gasketed CMP	10 feet per second

The maximum hydraulic gradient elevation shall be 1.0 feet below the low edge of street pavement.

3.3.5 Minimum Physical Slope

The minimum physical slope for culverts shall be that which will produce a velocity of 2.5 feet per second when the culvert is flowing full.

3.3.6 Inlet Capacity

The capacity of the inlet shall be considered to be 5.0 cubic feet per second per throat. The effects of inlet bypass shall be addressed by the Engineer of Record in his Engineering Report.

3.3.7 Maximum Gutter Run

The maximum distance in which surface water will be allowed to run in the gutter shall be controlled by the spread of flow. The spread shall be limited

to the outside lane for a five (5) year frequency rainfall having a duration of ten (10) minutes plus the overland time of concentration. In no case shall the gutter run exceed eight hundred (800) feet.

3.3.8 Inlet Location

A. Where inlets are located on returns in which one of the intersecting roadway grades exceeds one (1) percent, a return profile shall be included in the construction plans.

B. Other than at intersections and at lots which are wider than one hundred (100) feet, inlets shall be located as near as possible to common lot lines.

3.3.9 Drainage Easement or Right-of-Way

Storm sewers shall be located in a drainage easement or right-of-way dedicated to Santa Rosa County. For storm sewers not within street right-of-way, the drainage easement or right-of-way width shall be sufficient to accommodate a work trench with 1:1 sideslopes and with a bottom width of 2.0 feet wider than the storm sewer width. In no case shall the drainage easement or right-of-way width be less than 30.0 feet.

3.4 NON-ROADWAY DITCHES

3.4.1 Drainage Easement or Right-of-Way

Ditches shall have sufficient drainage easement or right-of-way dedicated to Santa Rosa County to allow for installation of the ditch plus an unobstructed 30.0-foot width maintenance berm on both sides, measured from the top of the bank, unless otherwise approved by the County Engineer. A drainage easement or right-of-way 30.0 feet in width shall be dedicated to Santa Rosa County from the street to the ditch wherever needed for ingress and egress.

3.4.2 Grading Adjacent to Ditches

Areas adjacent to ditches shall be graded to preclude the entrance of excessive stormwater runoff except at locations provided.

3.4.3 Maximum Sideslope

The maximum sideslope shall be 4:1 for ditches within the boundaries of a subdivision and 3:1 for ditches outside the boundaries of a subdivision.

3.4.4 Minimum Bottom Width

The minimum bottom width for trapezoidal ditches shall be 3.0 feet. Minimum width for other ditch cross-sections shall be established by the County Engineer.

3.4.5 Dependence on Future Units

Where projects are designed in multiple units with a phased construction schedule, no design of an individual unit shall be dependent upon the ultimate installation of a future unit.

3.4.6 Design

Ditches shall be sized using Manning's formula. In all cases, data giving drainage area, peak design flow rate, velocity and depth of flow shall be included in the drainage calculations. A hydraulic profile shall be included for all ditches which clearly shows ditch bottom, design water surface and top of bank for both left and right sides of the ditch.

3.4.7 Maximum Allowable Velocity

Unless unstable or highly erosive soil conditions indicate a lower design velocity is desirable or unless ditch paving has been provided, the maximum velocity allowed shall be 2.5 feet per second.

3.4.8 Ditch Grades

A minimum of 0.10% or the minimum required to provide for the design flow, whichever is greater shall be the minimum allowable ditch grade. Unless unstable or highly erosive soil conditions indicate a flatter grade is

desirable or unless ditch paving has been provided, the maximum allowable grade shall be that which will produce a velocity of 2.5 feet per second. The following minimum erosion protection requirements shall be provided:

Ditch Grade	Protection Required
0.1% - 1.0%	Grassing and Mulching
1.0% - 2.0%	Sodding
2.0% and Greater	Ditch Paving

Ditches shall be sodded when the ditch grade is less than 1.0% and the velocity is greater than 2.0 feet per second.

3.4.9 Pavement

All new non-roadway ditches within the boundaries of a subdivision with side slopes steeper than 4:1 or design velocities higher than 3.0 feet/per second shall be paved. The pavement shall be in accordance with the latest editions of the Standard Indexes and the Florida DOT Standard Specifications for Road and Bridge Construction.

3.4.10 Grassing and Mulching

Drainage easements or rights-of-way shall be grassed and mulched in accordance with latest edition of the Florida DOT Standard Specifications for Road and Bridge Construction.

3.4.11 Utilities Crossing Drainage Easement or Right-of-Way

Where it is necessary for a utility to cross the drainage easement or right-of-way, the following minimum requirements shall be adhered to:

A. Aerial Crossing: Minimum of 3.0' clearance to design high water.

B. Underground: Minimum of 3.0' clearance to the invert of the ditch.

C. Utilities shall be adequately marked to protect against accidental damage during maintenance operations.

D. No aerial supports shall be allowed in the confines of the ditch cut unless authorized by the County Engineer.

E. All sleeves or crossings shall be ductile iron, or other suitable material subject to the approval of the County Engineer.

3.5 DETENTION AND RETENTION BASINS

3.5.1 General Requirements

A peak flow attenuating basin shall be provided to reduce the peak discharge rate unless otherwise approved by the County Engineer. The instantaneous peak

discharge from the undeveloped site due to a twenty-five (25) year rainfall shall not be exceeded by the instantaneous peak discharge from the developed site due to this same storm event. Existing storage shall be considered when calculating the instantaneous peak discharge from the undeveloped site. A peak discharge analysis shall be included in the drainage calculations.

3.5.2 Drainage Easement or Right-of-Way

Sufficient drainage easement or right-of-way shall be dedicated to Santa Rosa County to allow for installation of the basin plus an unobstructed 20.0-foot wide maintenance berm around the perimeter of the basin unless otherwise approved by the County Engineer. The 30.0-foot width is measured from the top of the bank. However, a retention basin with sideslopes of 6:1 or flatter may have a maintenance berm 10.0 feet in width. A drainage easement or right-of-way 30.0 feet in width shall be dedicated to Santa Rosa County from the street to the basin wherever needed for ingress and egress.

3.5.3 Stormwater Ingress

Areas adjacent to the basin shall be graded to preclude the entrance of excessive stormwater runoff. Runoff ingress shall be by culvert with endwall.

3.5.4 Maximum Sideslope

The maximum sideslope shall be 4:1 for fenced basins or 8:1 for unfenced basins.

3.5.5 Fencing

Unless otherwise approved by the County Engineer, all fenced basins shall be enclosed by 8'-high galvanized chain link fencing on poles at 10' on center, top rails and bottom tension wires. Fence shall be topped with three strands of barbed wire and have a double swing gate with a clear opening of no less than 24'.

3.5.6 Minimum Freeboard

The minimum freeboard for basins shall be 1.0 foot between design high water and top of bank.

3.5.7 Grassing, Mulching and Sodding

The basin drainage easement or right-of-way shall be grassed and mulched in accordance with the latest editions of the Florida DOT Standard Specifications for Road and Bridge Construction. The sideslopes of the basin shall be sodded and maintained until the grass is established and the bottom of the basin shall be grassed and mulched (if designed as a dry bottom basin).

3.5.8 Detention Basins

A. The seasonal high groundwater elevation shall be determined for a location proposed to be utilized as a detention basin.

B. The outlet of a detention basin shall have a water level control structure that enables the basin to function as shown in the drainage calculations. The water level control structure shall not be a pipe riser and shall not be adjustable. The water level control structure shall be an endwall or ditch bottom inlet constructed in accordance with the Standard Indexes and the Florida DOT Standard Specifications for Road and Bridge Construction unless an endwall or ditch bottom inlet will not enable the basin to function as designed. In the event an endwall or ditch bottom inlet will not enable the basin to function as shown in the drainage calculations, the water level control structured used shall be approved by the County Engineer.

C. In the event the water level control structure is an endwall, the design low water elevation of the detention basin shall be the endwall invert elevation. In the event the water level control structure is a ditch bottom inlet, the inlet shall have a slot and the design low water elevation of the detention basin shall be the slot invert elevation. For a man-made detention basin with standing water below the design low water elevation, the basin bottom shall be a minimum of 6.0 feet below the design low water elevation.

D. Conditions downstream of the water level control structure (i.e., tailwater) shall be such that enable the water level control structure to function as indicated in the design calculations.

E. Percolation may be considered in the design of a detention basin provided the criteria for retention basins is met. In the event percolation is considered in the design of a detention basin, the design low water elevation of the detention basin shall be the bottom elevation of the basin. Percolation shall be determined in accordance with Section 3.5.9.

3.5.9 Retention Basins

A. A suitable overflow outlet (man-made or natural) shall be provided for retention basins where practical.

B. Retention basins shall have a subsoil investigation report including one boring for each one-third (1/3) acre of basin bottom. However, there shall be no less than two borings per retention basin. The borings shall extend fifteen (15) feet below the proposed basin bottom and be uniformly distributed. The soil profile, and existing groundwater elevations and seasonal high groundwater elevation shall be determined for each boring. The soils shall be sampled and classified in accordance with the American Society for Testing and Materials Standard Method D2487. The subsoil investigation report shall be included in the drainage calculations.

C. Retention basins shall have an infiltration rate test performed for each one-third (1/3) acre of basin bottom. The infiltration rate test shall be ASTM Standard Method D3385-75 (as modified below) and

shall be performed on the least permeable strata below and within 5.0-feet of the retention basin bottom. The County Engineer may authorize an alternate infiltration rate test. ASTM D3385-75 shall be modified as follows:

1. The outer ring shall be thirty-six (36) inches in diameter.

2. The allowable water depth may be up to twelve (12) inches.

3. The test shall be run for a minimum of four (4) hours. The water level shall be maintained at least six (6) inches deep for the duration of the test.

4. As an alternate to ASTM D3385-75(5.5) - Measurements and ASTM D3385-75(6) - Calculations, the infiltration rate may be determined by shutting off the water and recording the time required for water to drop 3.0 inches.

5. In lieu of ASTM D3385-75(7) Report - the infiltration rate shall be the lowest rate measured during the last two (2) hours, except when the rates decrease by more than five (5) percent between the third and fourth hour measurements. If this occurs, the test duration shall be extended as necessary to reach a point of stability when the rate does not vary by over five (5) percent between successive one (1) hour measurements.

The County Engineer shall be notified 24 hours prior to the infiltration test. Test results certified by a qualified testing laboratory or the Engineer of Record shall be included in the drainage calculations portion of the Engineering Report.

D. The retention basin bottom shall be no less than fifteen (15) feet above SM, SC, ML, CL, OL, MH, CH, OH and PT soils as defined by ASTM Standard Method D2487 and shall be no less than twenty (20) feet above bedrock. The seasonal high groundwater shall be at least five (5.0) feet below the retention basin bottom for drainage CA (C = coefficient of runoff and A = area in acres) of 2.0 or less. This clearance shall increase linearly to 10.0 feet between CA = 2.0 to CA = 4.0. For a CA of 4.0 or more, the clearance to seasonal high groundwater shall be at least 10.0 feet unless sufficient data is provided by the Engineer of Record to show the infiltration rate will not be reduced by mounding of the groundwater.

E. The retention basin design shall be based on an infiltration rate that is one-half (1/2) of the lowest infiltration rate obtained from the tests. The infiltration through sideslopes shall be considered at the same rate as that for the basin bottom but shall be considered over the plan area of the sideslopes.

F. The retention basin bottom shall be uniformly graded to provide a

low point twelve (12) inches below the bottom perimeter elevation. The final grading of the basin bottom shall remove the final six (6) inches and shall be the last work in the construction of the project.

3.6 UNDERDRAINS

A. Underdrains may be approved or required by the County Engineer to facilitate groundwater control during construction and may be left in place. When the use of underdrains is required, construction plans shall include all details necessary to clearly indicate the underdrain construction.

B. Underdrains are considered to be a permanent control of the groundwater table. The design of the roadway may be based on long term groundwater level control through the use of underdrains.

C. A filler fabric envelope shall be used with underdrains and shall be an approved strong, porous nylon, polyester, polypropylene or other fabric approved by the County Engineer which completely covers the underdrain surface in such a way as to prevent infiltration of surrounding material. The filter envelope shall weigh a minimum of 2.5 ounces per square yard, shall retain soil particles larger than two hundred twelve (212) microns (no. 70 sieve) and shall pass particles finer than twenty-five (25) microns. When tested in

accordance with ASTM D1682, the grab strength (wet) of the filter fabric shall not be less than one hundred (100) pounds and the grab elongation shall not be less than sixty (60) percent. Storage and handling of the filter fabric shall be in accordance with the manufacturer's recommendations. Torn or punctured filter fabric shall not be used. The filter fabric shall not be exposed to sunlight for periods exceeding the manufacturer's recommendation or six (6) weeks, whichever is shorter.

D. Underdrain pipe shall be of sufficient size to effectively control the flow. Underdrain pipe shall be concrete, corrugated aluminum, polyvinyl-chloride, corrugated polyethylene or other material approved by the County Engineer. Concrete, corrugated aluminum and polyvinyl-chloride underdrain shall be in accordance with the Florida DOT Standard Specifications for Road and Bridge Construction, latest edition. Corrugated aluminum underdrain shall also meet the requirements of Section 3.7.1 b. 2. Corrugated polyethylene tubing underdrain installations shall conform to the following:

1. Corrugated polyethylene tubing and fittings shall meet the requirements of AASHTO M252, latest edition. The minimum wall thickness of the crown, sidewalls or valley shall be 0.025 inches. Coiling of tubing is not permitted.

2. The tubing shall not be exposed to sunlight for periods exceeding the manufacturer's recommendation of six (6) weeks, whichever is shorter. Tubing shall be placed and maintained true to line and grade until secured with compacted backfill. Tubing shall not be placed under street pavement. Underdrain sections which deflect or collapse greater than five (5) percent shall be rejected.

3. Fine aggregate for cement concrete, in accordance with the Florida DOT Standard Specifications for Road and Bridge Construction, latest edition, shall be used to backfill the trench, except that the County Engineer may approve other backfill material provided tests are submitted indicating the material will adequately serve as a filter. The minimum density of the backfill shall be ninety-five (95) percent of the standard laboratory density determined in accordance with AASHTO T99 (Method A). A three (3) inch layer of the approved backfill shall be placed under the pipe.

3.7 MATERIAL SPECIFICATIONS FOR CULVERTS

3.7.1 General Specifications

A. Acceptable Materials

1. Reinforced Concrete Pipe (Round and Elliptical).

2. Corrugated Aluminum Alloy Pipe and Pipe Arch.

3. Cast-in-Place and Precast Reinforced Concrete Box Culvert.

4. Aluminum Alloy Box Culvert (subject to the approval of the County Engineer).

5. Corrugated Polyethylene Pipe (subject to approval of the County Engineer)

Notes:

1. Corrugated Metal Pipe and metal box culverts will not be permitted south of Highway 90.

2. Corrugated metal pipe shall not be used under roadways accepted for ownership or maintenance by Santa Rosa County.

B. Minimum Specifications

1. Workmanship and pipe materials shall conform to the Florida DOT Standard Specifications for Road and Bridge Construction, latest edition.

2. Corrugated Aluminum Alloy Pipe and Pipe Arch may not be used in tidal areas.

3. Concrete and reinforcing steel for cast-in-place reinforced concrete box culverts shall conform to the Florida DOT Standard

Specifications for Road and Bridge Construction, latest edition.

4. Precast reinforced concrete box culvert shall conform to the applicable American Society for Testing and Materials Standard Specifications (C789 or C850). The methods for construction of trench and foundation, and for laying and backfilling shall conform to the requirements specified in Section 430 of the Florida DOT Standard Specifications for Road and Bridge Construction, latest edition, with the following additional requirements: the bedding shall consist of a maximum of six (6) inch depth of coarse concrete sand placed below the culvert to a minimum width of one (1) foot outside the exterior walls of the culvert between graded forms set one (1) foot outside each exterior wall of the box culvert. The sand shall be uniformly compacted and then graded off using the forms. The forms shall be removed after placement of the precast box culvert section. Holes provided for lifting or joint restraint shall be sealed by plugging using a non-shrinking mortar in accordance with Section 450-11.2 of the Florida DOT Standard Specifications for Road and Bridge Construction, latest edition. The mortar shall be properly cured to insure a sound and watertight plug.

3.7.2 Culvert Joints

Joints and joint material for culverts shall conform to the Florida DOT

Standard Specifications for Road and Bridge construction, latest edition.

Field joints for precast concrete box culvert shall be made with butyl rubber based preformed plastic gasket material. Culverts shall be subject to the requirements of Section 430-7.3 of the Florida DOT Standard Specifications for Road and bridge construction, latest edition, with the following additional requirements:

- The culvert producer shall furnish to the Engineer of Record a written recommendation of the size (cross-sectional area) of gasket material which will create a watertight seal.
- This recommendation shall be the minimum quantity of gasket material permitted.

In addition, the outside of each joint shall be completely wrapped with either a woven or non-woven filter fabric. The fabric shall be a minimum of two (2) feet in width and secured tightly against the box culvert section by metal strapping. The joint shall be secured by a device capable of holding the sections to line and grade as well as fully home. These devices shall be removed after sufficient backfill has been placed and compacted to secure the sections.

SECTION FOUR

Section 4

ANALYTICAL METHODS

4.1 GENERAL

Santa Rosa County will consider all sound analytical methods which are routinely used in Florida for use in the preparation of the Stormwater Management Plan by the Engineer of Record. However, techniques which are not specifically discussed in this section may require longer review periods than allowed under standard guidelines in order that the County Engineer can assess the validity and accuracy of these techniques for use in Santa Rosa County.

4.2 TIME OF CONCENTRATION

The Time of Concentration is a common parameter required of hydrologic and hydraulic methods. The time of concentration shall be determined by the velocity method for specific project conditions. The velocity method is a segmental approach that cam be used to account for overland, shallow channel, and main channel flows by considering the average velocity for each flow segment, and by calculating a travel time using the following equation:

$$Ti = Li / (60) \times Vi$$

Ti = Travel time for velocity segment (i), in minutes

Li = Length of the flow path for segment (i), in ft

Vi = Average velocity for segment (i), in ft/sec

The time of concentration is then calculated by summing the individual segment travel times as follows:

$$TC = T1 + T2 + T3 + \ldots + TL$$

Where:

TC = Time of concentration, in minutes

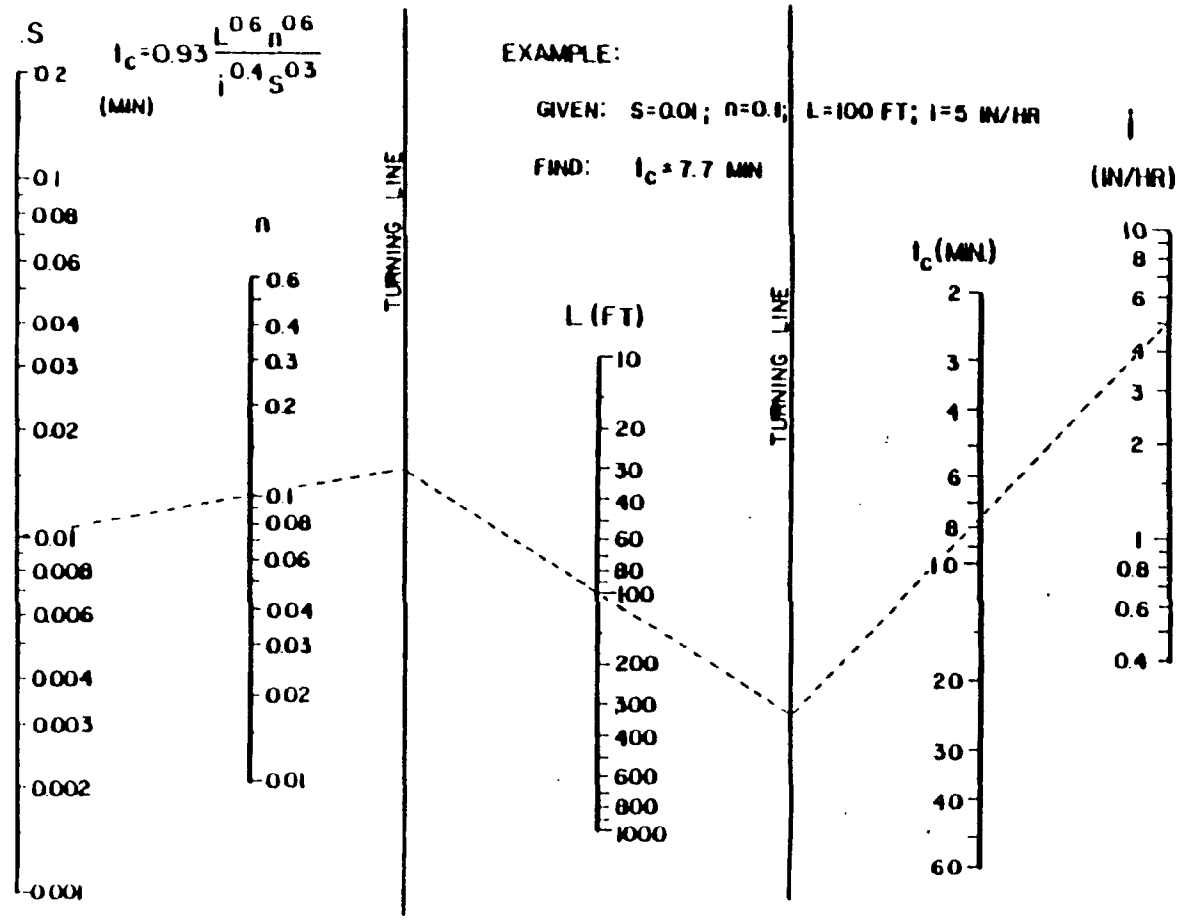
T1 = Overland flow travel time, in minutes

T2 = Shallow channel travel time (typically rill or gutter flow), in minutes

TL = Travel time for the last segment, in minutes

4.2.1 Overland Flow

The Kinematic Wave Equation developed by Ragan (1971) shall be used for calculating the travel time for overland flow conditions. Figure 4-1 presents a nomograph that can be used to solve this equation, which is express as:



Reference USDOT, FHWA, HEC 12 (1984)

Figure 4-1

OVERLAND FLOW NOMOGRAPH

$$T1 = 0.93 \ (L^{0.6} \ N^{0.6})/(I^{0.4} \ S^{0.3})$$

Where:

T1 = Overland flow travel time, in minutes

L = Overland flow length, in ft

N = Surface roughness coefficient for overland flow (see Table 4-1)

I = Rainfall intensity, in inches/hr, corresponding to the design storm frequency storm

S = Average slope of the overland flow path, in ft/ft

It should be noted that the surface roughness coefficient values shown in Table 4-1 were determined specifically for overland flow conditions and are not to be used for conventional open channel flow calculations.

TABLE 4-1

ACCEPTABLE "N" VALUES FOR USE IN THE KINEMATIC WAVE FORMULA

Land Use	"N" Value
Pavement	0.015
Bare Soil (Average Roughness)	0.05
Poor Grass Cover	0.2
Average Grass Cover or Lawns	0.4
Dense Grass Cover or Woodlands	0.6
Forest With Thick Humus/Litter Layer and Dense Undergrowth	0.8

4.2.2 Shallow Channel Flow

Average velocities for shallow channel flows, also known as swale and gutter flows, can be evaluated using Mannings Equation or Figure 4-2.

4.2.3 Main Channel Flow

Average velocities for main channel flows, also known as ditch or stream flows, should be evaluated using Mannings Equation or appropriate modelling techniques.

4.3 STORMWATER RUNOFF

This section outlines the approved methods available to the Engineer of Record for estimating storm runoff. Of the many methods available, this Manual makes use of four, which have proved convenient and reliable. In addition, other recognized methods may be used if their applicability can be demonstrated to the satisfaction of the County Engineer.

- The Rational Method
  (For Areas of Ten (10) Acres or Less)

- The Modified Rational Method For Volume and Hydrograph Generation
  (For Areas of Ten (10) Acres or Less)

- SCS Synthetic Unit Hydrograph Method

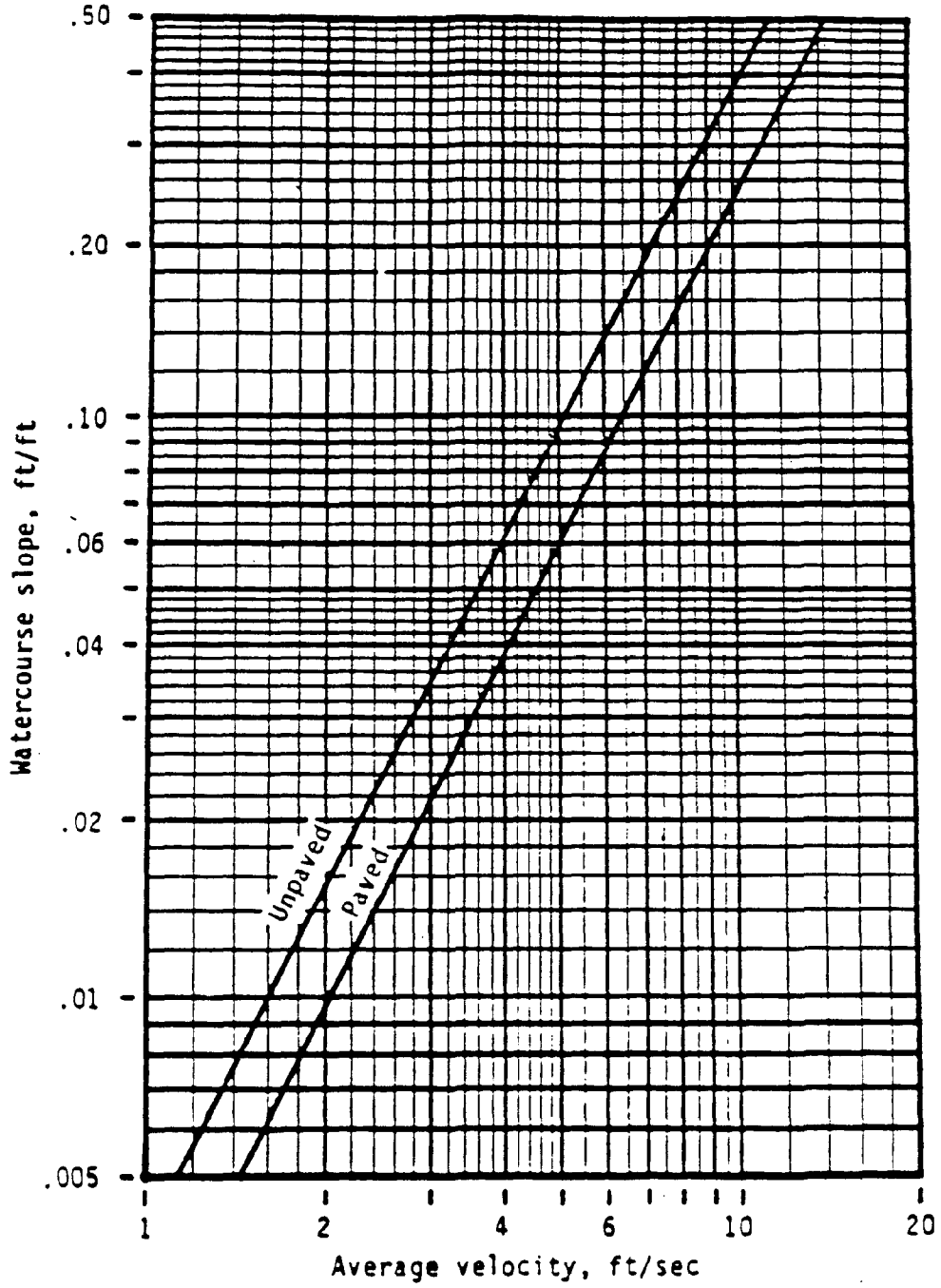


Figure 4-2

SHALLOW CHANNEL FLOW VELOCITY

Source: FDOT Drainage Manual (1987)

- Santa Barbara Urban Hydrograph Method

These methods should be used to calculate the discharge and runoff volumes resulting from rainfall events of specified frequency and duration.

4.3.1 Rational Method

The Rational method uses an empirical equation to estimate peak discharge and has gained wide acceptance because of its simplicity. This method relates peak rate of runoff or discharge to rainfall intensity, surface area and surface characteristics. The Rational Method tends to over estimate the rates of flow for larger areas, therefore the application of a more sophisticated runoff computation technique is usually warranted on large drainage areas. A detailed discussion of this method is presented in FDOT's Drainage Manual, Volumes 2A - Procedures (1987).

4.3.2 Modified Rational Method

For small drainage areas (less than 10 acres) a inflow hydrograph can be developed by utilizing the Modified Rational Method. Using the project drainage area (A), the project runoff coefficient (C), and the rainfall intensities (I) taken from the FDOT Zone 1 intensity-duration-frequency curves, an inflow hydrograph can be developed.

4.3.3 Synthetic Unit Hydrograph Method

The unit hydrograph of a drainage basin (watershed) is defined as the runoff hydrograph which represents the time response to one (1) inch of rainfall excess (runoff) distributed uniformly over the basin during a specified period of time (time step). The SCS has derived general dimensionless unit hydrographs from a large number of observed unit hydrographs for watersheds of various sizes and geographic locations. Once the time to peak and peak flow for a particular unit hydrograph have been defined, the entire shape of the unit hydrograph can be estimated using the appropriate dimensionless unit hydrograph. A more detailed analysis of the unit hydrograph procedure can be found in "SCS National Engineering Handbook, Section 4, Hydrology, Revised 1969" and other publications.

4.3.4 Santa Barbara Urban Hydrograph Method

The Santa Barbara Urban Hydrograph Method (SBUH Method) was developed by Stubchaer (1975) for the Santa Barbara County (California) Flood Control and Water Conservation District. In many respects, the SBUH method is similar to some of the time-area-concentration curve procedures for hydrograph computation in which an instantaneous hydrograph in a basin was developed and then routed through an element of linear storage to determine basin response. However, in the SBUH method the final design (outflow) hydrograph is obtained by routing the instantaneous hydrograph for each time period (obtained by multiplying the various incremental rainfall excesses by the watershed area in acres) through an imaginary linear reservoir with a routing constant which is

related to the time of concentration of the drainage basin. As a result, the intermediate process of preparing a time-area-concentration curve for the basin is eliminated.

4.4 DESIGN STORM

The usual analytical methodology adopted for the design of stormwater management facilities is to evaluate the flooding conditions that would be caused by selected critical rainstorms. The same critical rainstorms are used to evaluate the stormwater runoff impacts occurring due to land use changes due to development within a basin.

The four facets which define a particular design storm are (1) the frequency of occurrence, (2) the storm duration, (3) the total volume of rainfall for the particular frequency and duration; and (4) the temporal distribution of that amount over the storm duration.

4.4.1 Rainfall Frequency

The 25-year design storm tends to be the most commonly used "extreme" event for stormwater facility design in Florida. Santa Rosa County drainage regulations stipulate its use in design of external subdivision drainage facilities and detention basins. The justification for selecting the 25-year event for stormwater facility design is that it is more conservative than the 10-year design storm typically used for local storm sewer design, but less conservative than the 50- and 100-year events which would require more extensive runoff control measures that would be used infrequently.

4.4.2 Rainfall Duration

From various studies of past major rainfall events that have occurred in the southeastern portion of the United States, and in the northwest portion of Florida in particular, it is apparent that a large portion of the total rainfall of most major storms occurs within a 24-hour period.

From the design perspective for stormwater conveyances such as ditches, inlets, storm sewers, and culverts, it is the peak rate of runoff that is the critical design factor, not the total volume of runoff. Hence a shorter duration storm event can be utilized in the evaluation and design of these facilities.

A 6-hour duration design rainfall will be used for design of ditches, inlets, storm sewers and on-site culverts for projects in Santa Rosa County. In accordance with the design criteria for hydrologic studies which mandates that the duration of the design rainfall should be approximately equal to or greater than the time of concentration of the basin, a 6-hour duration should be sufficient for any application within the County for determination of design peak flow rates.

A 24-hour storm will be used to check stormwater attenuation, detention and retention facilities for proper function and response to FDER's "drain-down" requirements.

4.4.3 Rainfall Volume

Water Management Districts, excluding the NWFWMD, typically approve the use of the Department of Commerce's Technical Paper No. 40 as a reference for the design storm rainfall volume within the state. FDOT's new Drainage Manual (1987) utilizes this reference in addition to the more recent NOAA Technical Memorandum NWS HYDRO-35 "five to 60-Minute Precipitation Frequency for the Eastern and Central United States" publication to develop its set of rainfall intensity-duration-frequency (IDF) curves.

Table 4-2 presents an appropriate set of IDF curves and design rainfall volumes for use within the County. These IDF curves were derived from these sources specifically for the Santa Rosa County. Figure 4-3 presents a family of intensity-duration-frequency curves for storms with recurrence intervals of 2-, 3-, 5-, 10-, 25-, 50-, and 100-years.

4.4.4 Rainfall Distribution

Peak runoff rates for a small (less than 100 acres in size and less than 30-minute time-of-concentration) urban drainage basin can be determined using the Rational Method. This method requires only a design rainfall intensity which corresponds to the time-of-concentration at the design point for the specified design return period. Table 4-2 presents a set of rainfall intensity-duration-frequency (IDF) relationships for Santa Rosa County to be used in the Rational Method.

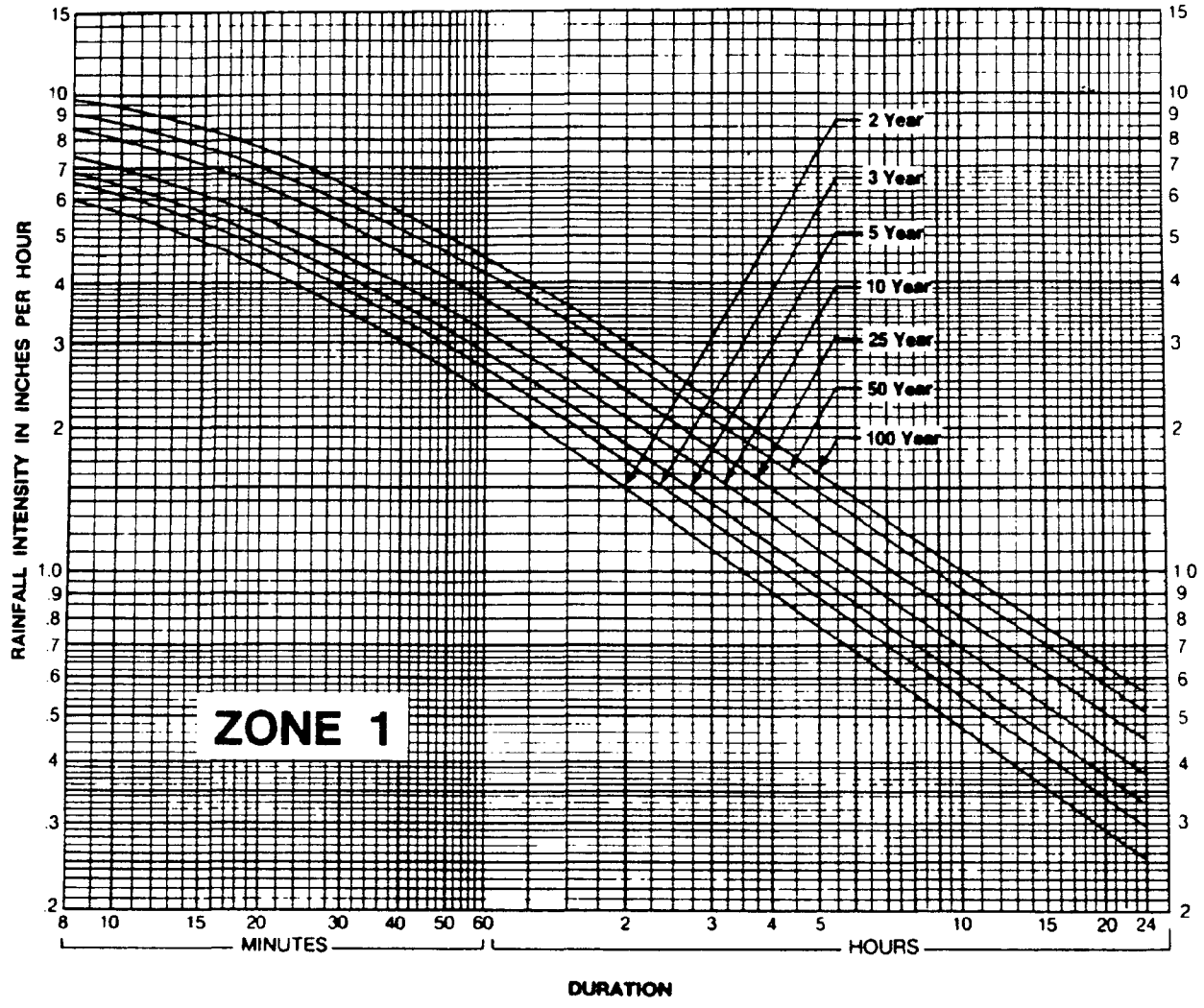


Figure 4-3

RAINFALL INTENSITY-DURATION-FREQUENCY CURVES

Since the Rational Method generates design peak flow rates, it is inappropriate to develop design storm hydrographs or determine runoff volumes. For these purposes, or for large basins (greater than 100 acres in size or longer than 30-minute time-of-concentration) an alternate methodology which uses unit hydrograph theory must be used. This method requires a design storm hyetograph which distributes a design storm rainfall volume over its duration at discrete time steps.

The 24-hour storm distribution, listed in 30-minute increments in Table 4-3, is the SCS Type II Florida - Modified Distribution. The 6-hour storm distribution presented in Table 4-4 and is broken down into smaller, 10-minute time increments, and should be used to generate design peak flows and hydrographs for applications on which the smallest drainage subbasin being analyzed has a time-of-concentration less than 30 minutes.

The 6-hour duration design storm distribution was derived by the methodology originally employed by the SCS to derive the Type II Florida-Modified distribution. This procedure, as documented in "Interim Runoff Procedure for Florida", SCS Florida Bulletin Number 210-1-2, utilizes the rainfall volumes listed in NWS publications HYDRO-35 and TP-40 to obtain a set of design storm rainfall increments for a storm of given recurrence interval and duration.

Table 4-2

RAINFALL INTENSITY, IN/HR (VOLUME, IN.)

RETURN PERIOD, YEARS

DURATION	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR
5-min	6.60 (0.55)	7.45 (0.62)	8.15 (0.68)	9.10 (0.76)	9.95 (0.83)	10.80 (0.90)
10-min	5.70 (0.95)	6.45 (1.07)	7.10 (1.18)	8.00 (1.33)	8.70 (1.45)	9.50 (1.58)
15-min	4.90 (1.22)	5.55 (1.39)	6.10 (1.53)	6.90 (1.73)	7.55 (1.89)	8.20 (2.05)
20-min	4.30 (1.43)	5.00 (1.67)	5.50 (1.83)	6.35 (2.18)	7.00 (2.33)	7.60 (2.53)
30-min	3.55 (1.75)	4.20 (2.10)	4.70 (2.35)	5.40 (2.70)	6.00 (3.00)	6.55 (3.30)
45-min	2.80 (2.10)	3.35 (2.50)	3.70 (2.80)	4.35 (3.25)	4.85 (3.65)	5.30 (4.00)
1-hr	2.35 (2.35)	2.85 (2.85)	3.20 (3.20)	3.75 (3.75)	4.15 (4.15)	4.55 (4.55)
1.5-hr	1.80 (2.70)	2.25 (3.40)	2.50 (3.75)	2.90 (4.35)	3.20 (4.80)	3.55 (5.35)
2-hr	1.50 (3.00)	1.90 (3.80)	2.10 (4.20)	2.40 (4.80)	2.70 (5.40)	2.95 (5.90)
3-hr	1.10 (3.30)	1.40 (4.20)	1.60 (4.80)	1.80 (5.40)	2.05 (6.10)	2.25 (6.70)
4-hr	0.90 (3.60)	1.15 (4.60)	1.30 (5.20)	1.52 (6.10)	1.70 (6.80)	1.90 (7.60)
6-hr	0.68 (4.08)	0.87 (5.25)	1.00 (6.00)	1.17 (7.00)	1.30 (7.80)	1.45 (8.70)
9-hr	0.51 (4.60)	0.66 (5.95)	0.75 (6.75)	0.88 (7.90)	1.00 (9.00)	1.10 (9.90)
12-hr	0.42 (5.10)	0.54 (6.50)	0.62 (7.50)	0.73 (8.80)	0.81 (9.70)	0.91 (10.9)
18-hr	0.31 (5.60)	0.41 (7.40)	0.46 (8.30)	0.55 (9.90)	0.62 (11.2)	0.69 (12.4)
24-hr	0.25 (6.00)	0.33 (7.80)	0.38 (9.10)	0.45 (10.7)	0.50 (12.0)	0.57 (13.6)

SOURCES:

(1) NOAA Technical Memorandum NWS HYDRO-35, FIVE TO 60 MINUTE PRECIPITATION FREQUENCY FOR THE EASTERN AND CENTRAL UNITED STATES, 1977.

(2) Technial Paper No. 40, RAINFALL FREQUENCY ATLAS OF THE UNITED STATES FOR DURATIONS FROM 30 MINUTES TO 24 HOURS AND RETURN PERIODS FROM 1 TO 100 YEARS, 1961.

(3) STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION, DRAINAGE MANUAL, VOLUME 2, PROCEDURES, 1987.

tm:SANTA ROSA:Z

TABLE 4-3

DESIGN STORM RAINFALL DISTRIBUTION
24-HOUR DURATION STORM WITH 30-MINUTE TIME INCREMENT USING
SCS TYPE II FLORIDA - MODIFIED DISTRIBUTION

TIME, HRS.	ACCUMULATED FRACTION OF TOTAL 24-HOUR RAINFALL	INCREMENTAL FRACTION OF TOTAL 24-HOUR RAINFALL
0.0	0.000	0.000
0.5	0.006	0.006
1.0	0.012	0.006
1.5	0.019	0.007
2.0	0.026	0.007
2.5	0.034	0.008
3.0	0.042	0.008
3.5	0.050	0.008
4.0	0.059	0.008
4.5	0.068	0.009
5.0	0.078	0.010
5.5	0.088	0.010
6.0	0.099	0.011
6.5	0.110	0.011
7.0	0.122	0.012
7.5	0.135	0.013
8.0	0.149	0.014
8.5	0.164	0.015
9.0	0.180	0.016
9.5	0.200	0.020
10.0	0.224	0.024
10.5	0.253	0.029
11.0	0.289	0.036
11.5	0.343	0.054
12.0	0.593	0.250
12.5	0.689	0.096
13.0	0.731	0.042
13.5	0/763	0.032
14.0	0.789	0.026
14.5	0.811	0.022
15.0	0.829	0.018
15.5	0.844	0.015
16.0	0.858	0.014
16.5	0.871	0.013
17.0	0.883	0.012

TABLE 4-3
(Continued)

DESIGN STORM RAINFALL DISTRIBUTION
24-HOUR DURATION STORM WITH 30-MINUTE TIME INCREMENT USING
SCS TYPE II FLORIDA - MODIFIED DISTRIBUTION

TIME, HRS.	ACCUMULATED FRACTION OF TOTAL 24-HOUR RAINFALL		INCREMENTAL FRACTION OF TOTAL 24-HOUR RAINFALL
17.5	0.894		0.011
18.0	0.905		0.011
18.5	0.915		0.010
19.0	0.925		0.010
19.5	0.934		0.009
20.0	0.943		0.009
20.5	0.951		0.008
21.0	0.959		0.008
21.5	0.967		0.008
22.0	0.974		0.007
22.5	0.981		0.007
23.0	0.988		0.007
23.5	0.994		0.006
24.0	1.000		0.006
		TOTAL	1.000

TABLE 4-4

DESIGN STORM RAINFALL DISTRIBUTION
24-HOUR DURATION STORM WITH 30-MINUTE TIME INCREMENT USING
SCS TYPE II FLORIDA - MODIFIED DISTRIBUTION

TIME, HRS.	ACCUMULATED FRACTION OF TOTAL 6-HOUR RAINFALL	INCREMENTAL FRACTION OF TOTAL 6-HOUR RAINFALL
0	0.000	0.000
0.17	0.010	0.010
0.33	0.020	0.010
0.50	0.030	0.010
0.67	0.041	0.011
0.83	0.053	0.012
1.00	0.065	0.012
1.17	0.078	0.013
1.33	0.092	0.014
1.50	0.107	0.015
1.67	0.123	0.016
1.83	0.140	0.017
2.00	0.159	0.019
2.17	0.181	0.022
2.33	0.209	0.028
2.50	0.244	0.035
2.67	0.290	0.046
2.83	0.370	0.080
3.00	0.559	0.189
3.17	0.672	0.113
3.33	0.732	0.060
3.50	0.772	0.040
3.67	0.803	0.031
3.83	0.828	0.025
4.00	0.848	0.020
4.17	0.866	0.018
4.33	0.882	0.016
4.50	0.897	0.015
4.67	0.911	0.014
4.83	0.924	0.013
5.00	0.937	0.013
5.17	0.949	0.012
5.33	0.960	0.011
5.50	0.971	0.011
5.67	0.981	0.010
5.83	0.991	0.010
6.00	1.000	0.009
	TOTAL	1.000

SECTION FIVE

Section 5

ADMINISTRATIVE GUIDELINES

5.1 GENERAL

Santa Rosa County has adopted administrative guidelines in the form of procedures and regulations for the administration and enforcement of the Stormwater Management Ordinance. These procedures and regulations cover the submission and review, and permitting of stormwater management facilities within Santa Rosa County.

5.2 APPLICATIONS

(To be developed by Santa Rosa County)

5.3 APPLICATION PACKAGES

(To be developed by Santa Rosa County)

5.4 REVIEW PROCEDURES AND TIME FRAMES

(To be developed by Santa Rosa County)

5.5 ISSURANCE OF PERMITS

(To be developed by Santa Rosa County)

Jim #3-2

APPENDIX A

Jim #3-2

SANTA ROSA COUNTY
STRUCTURE INVENTORY DIRECTORY
BY
BASIN AND SUBBASIN

BASIN 01: ESCAMBIA RIVER BASIN

SUBBASINS:		LOCATION	NO./SIZE/TYPE
01	BEALE CREEK		
	-905	SR 197-A	1-36" RCP
	-910	SR 197-A	1-30" RCP
	-915	SR 197-A	1-36" RCP
	-920	SR 197-A	1-30" RCP
	-925	SR 197	8'x3' Box Culvert
	-930	SR 197-A	2-30" RCP
	-935	SR 184	1-36" CMP
	-940	SR 184	3-36" RCP
	-945	SR 184	2-8'x4' Box Culvert
	-950	SR 184	2-48" RCP
	-955	SR 184	2-30" RCP
	-960	SR 184	1-30" RCP
	-965	SR 184	1-36" CMP
	-970	SR 184	1-36" RCP
	-975	SR 197	1-30" RCP
	-980	SR 197	8'x4' Box Culvert
	-985	SR 197	8'x4' Box Culvert
02	TENMILE CREEK		
	-005	SR 184	3-10'x10' Box Culvert
	-010	SR 184	4-10'x3' Box Culvert
	-015	SR 184	2-12'x5' Box Culvert
	-905	SR 184	8'x4' Box Culvert
	-910	SR 184	2-10'x5' Box Culvert
	-915	SR 197	6'x4' Box Culvert
	-920	SR 197	2-40" & 1-36" RCP
	-925	SR 197	1-24" RCP
	-930	SR 197	1-24" RCP
	-935	SR 197	1-3' RCP
	-940	SR 197	1-30" CMP
03	THOMAS CREEK		
	-905	SR 197	30"x48" CMPA
	-910	SR 197	1-30" CMP
	-915	SR 197	30"x48" CMPA
	-920	SR 197	2-24" CMP

Continued

BASIN 01: ESCAMBIA RIVER BASIN (concluded)

SUBBASINS:		LOCATION	NO./SIZE/TYPE
04	MOORE CREEK		
	-005	SR 164	2-8'x10' Box Culvert
	-010	SR 197	8'x12' Box Culvert
	-015	Bell Creek & SR 182	30'x3' Bridge
	-905	SR 164	2-24"
	-910	SR 164	1-30" RCP
	-915	SR 197	2-4'x6' Box Culvert
	-920	SR 182	2-24" RCP
	-925	SR 182	2-24" RCP
	-930	SR 182	2-24" RCP
	-935	SR 182	1-30" RCP
05	CAMPBELL CREEK		
	No structures identified		
06	HOLLY CREEK		
	-005	SR 4	U
	-010	SR 4	U
	-015	SR 4	U
	-020	SR 4	U
	-025	SR 4	U
	-030	Holly Creek & unnamed road	U
	-035	County Line	U
	-905	SR 197	1-36" RCP
	-910	SR 4	1-36" RCP
	-915	SR 4	3-4'x8' Box Culvert
	-920	SR 197	1-36" RCP
	-925	SR 197	1-30" RCP

BASIN 02: ESCAMBIA BAY COASTAL REGION

SUBBASINS:			
01	BARNETT MILL CREEK		
	-005	SR 10 & ___?	12'x4' Box Culvert
	-010	SR 197	24"x30" CMPA
	-015	SR 197	U
	-020	Barnett Mill Creek - North End	2-36"
	-905	SR 197	3-48" RCP

Continued

BASIN 02: ESCAMBIA BAY COASTAL REGION (continued)

SUBBASINS:		LOCATION	NO./SIZE/TYPE
01	BARNETT MILL CREEK (concluded)		
	-910	SR 197	2-36" RCP
	-915	SR 197	2½'x3½' CMPA
	-920	SR 197	1-24' CMP
	-925	SR 191-A	2-24" RCP
	-930	SR 191-A	2-54" RCP
	-935	SR 191-A	1-30" CMP
	-940	SR 191-A	3-30" RCP
	-945	SR 191-A	3-36" RCP
	-950	SR 197	2-24" CMP
	-955	SR 197 & SR 10	2-3' RCP
	-960	SR 10	1-72" RCP
	-965	SR 10	1-36" RCP
	-970	SR 197	1-30" RCP
	-975	SR 197-B	1-30" RCP
	-980	SR 197-B	1-48" RCP
	-985	SR 197	1-30" CMP
	-990	SR 197	1-30" CMP
	-995	SR 197	1-30" CMP
	-996	SR 197	1-48" RCP
02	INDIAN BAYOU		
	-005	SR 281 & Mulatto Bayou	Bridge 98'±x10±
	-010	SR 281 & Mulatto Bayou	Bridge 98'±x10±
	-015	SR 281	U
	-905	SR 97-A	1-24" RCP
	-910	SR 191-B	2-24" RCP
	-915	SR 191-A	3-24" RCP
	-920	SR 191-A	2-30" RCP
	-925	SR 281-A	U
	-930	SR 191-A	2-36" RCP
	-935	SR 191-A	1-36" RCP
	-940	SR 281	2-24" RCP
	-945	SR 281	1-36" RCP
	-950	SR 281	1-36" RCP
	-955	SR 281-A	1-36" RCP
	-960	SR 281-A	10'x6' Box Culvert
	-965	SR 8	2-30" CMP
	-970	SR 8	2-24" CMP & 42" Pipe Culvert
	-975	SR 8	1-36" CMP
	-980	SR 8	3-2'x7' Box Culvert

Continued

BASIN 02: ESCAMBIA BAY COASTAL REGION (concluded)

SUBBASINS:		LOCATION	NO./SIZE/TYPE
02	INDIAN BAYOU (concluded)		
	-985	SR 8	6'x8' Box Culvert
	-986	SR 281	2-24" RCP
	-987	SR 281	1-24" RCP & 1-30" RCP
	-988	SR 281	4-30" RCP
	-989	SR 281	Bridge 168'x30' Indian Bayou
	-990	SR 281	Bridge 114'x22' Trout Bayou
	-991	SR 281	3-24" RCP
	-992	SR 281	3-24 RCP
	-993	SR 281	2-24" RCP & 1-24"
	-994	SR 281	Drainage Ditch towards Bay
	-995	SR 281	Drainage Ditch towards Bay
	-996	SR 281	5' Box Culvert
	-997	SR 281	5' Box Culvert

BASIN 03: POND CREEK BASIN

SUBBASINS:

01	POND CREEK		
	-005	SR 191	Gutter 363'x13'
	-010	Pond Creek	Bridge 300'±x12'±
	-905	Unnamed E. of Spencer Olf	1-30" RCP
	-910	"	1-30" CMP
	-915	"	1-30" CMP
	-920	"	2-18"x30" CMPA
	-925	SR 191-A	1-30" CMP
	-930	SR 191-A	24" V.C.
	-935	SR 191-A	1-24" RCP
	-940	SR 191-A	1-24" CMP
	-945	SR 191-A	1-30" RCP
	-950	SR 10	10'x4' Box Culvert
	-955	SR 97-A	2-24" RCP
	-960	SR 197-A	1-24" RCP
02	POND CREEK		
	-905	SR 184-A	2-30" RCP
	-910	SR 184-A	2-24" RCP

Continued

BASIN 03: POND CREEK BASIN (continued)

SUBBASINS:		LOCATION	NO./SIZE/TYPE
02	POND CREEK (continued)		
	-915	SR 184-A	2-48" RCP
	-920	SR 184-A	12'x14' Box Culvert
	-925	SR 184-A	2-10'x3' Box Culvert
	-930	SR 191	1-30" RCP
	-935	SR 191	1-30" RCP
	-940	SR 191	1-24" RCP
	-945	SR 191	1-36" RCP
03	POND CREEK		
	-005	SR 191 & Reader Creek	U
	-010	N. off 191	U
	-015	N. off 191	U
	-020	Reader Creek & unnamed road	U
	-905	SR 191	1-24" RCP
	-910	SR 191	2-42" RCP
	-915	SR 191	1-24"
	-920	SR 191	1-24" RCP
	-925	SR 191	1-24" RCP
	-930	SR 191	1-24" RCP
	-935	SR 191	1-24" RCP
	-940	Off 197 & 191	2-30" RCP
	-945	Off 197 & 191	2-24" CMP
	-950	Off 197 & 191	3-24" RCP
	-955	Off 197 & 191	3-24" RCP
	-960	Off 197 & 191	Bridge 26'x6'±
	-965	SR 89	3-24" CMP
	-970	SR 89	2-24" CMP
	-975	SR 89	1-24" CMP
	-980	SR 89	1-24" CMP
	-985	SR 89	1-24" CMP
04	POND CREEK		
	-905	SR 182	8'x6' Box Culvert
	-910	SR 182	2-24"
	-915	SR 197	2-30"x48" CMPA
	-920	SR 197	1-24"

Continued

BASIN 03: POND CREEK BASIN (concluded)

SUBBASINS:		LOCATION	NO./SIZE/TYPE
05	POND CREEK		
	-905	SR 197	1-30"
	-910	SR 197	1-24"
	-915	SR 197	1-30"
	-920	SR 178	10'x10' Box Culvert
	-925	SR 178	1-36"
	-930	SR 89	1-48"

BASIN 04: EAST BAY COASTAL BASIN

SUBBASINS:

01	WHITEOAK BAYOU		
	-105	SR 191	3-10' Box Culvert
	-110	SR 8	U
	-205	SR 191	8' Box Culvert
	-210	SR 8	U
	-905	SR 191	2-24"
	-910	SR 191	Ditch towards Bay
	-915	SR 191	1-36"
	-920	SR 191	1-30"
	-925	SR 191	2-24"
	-930	SR 191	2-30"
	-935	SR 8	1-30" CMP & 36" Pipe Culvert
	-940	SR 191	1-36"
	-945	SR 191	2-42"
	-950	SR 191 & SR 8	10'x3' Box Culvert
02	BLACKWATER BAY		
	-905	SR 191	1-18" RCP w/4 Inlet
	-910	SR 191	1-36" RCP
	-915	SR 191	1-40" CMP
	-920	SR 191	2-24" RCP
	-925	SR 191	1-24"

Continued

BASIN 04: EAST BAY COASTAL BASIN (continued)

SUBBASINS:		LOCATION	NO./SIZE/TYPE
03	BLACKWATER BAY		
	-005	SR 8	U
	-010	SR 8	U
	-015	SR 10	1-30"
04	BLACKWATER BAY		
	-005	SR 89 & unnamed Creek	3-42"x60" CMP
	-010	Unnamed road off SR 89 & SR 184	2'x30"
	-015	S. off SR 184 unnamed road	U
	-905	SR 89	1-30"
	-910	SR 89	2-36"
	-915	SR 89	1-30"
	-920	SR 89	3-78"
	-925	Unnamed road off SR 89 & SR 184	2'x24"
	-930	SR 184	1'x24"
05	CATFISH BRANCH		
	No structures identified		
06	FUNDY BAYOU		
	No structures identified		
07	ALABAMA HOLLOW		
	No structures identified		
08	DEAN CREEK		
	-005	SR 87	Dean Creek 80'x9' (to water)
	-010	SR 87	U
	-015	Holley Pt. & unnamed road	U
	-020	Unnamed road	U
	-905	SR 87	1-30"
	-910	SR 87	3-24"

Continued

BASIN 04: EAST BAY COASTAL BASIN (concluded)

SUBBASINS:		LOCATION	NO./SIZE/TYPE
09	TOM KING BAYOU		
	-905	SR 30	1-30"
	-910	SR 399	2-36"
	-915	SR 399	2-36"
	-920	Sr 399	1-30"
	-925	SR 399	2-30"
	-930	SR 399	12'x3¼' Box Culvert
	-935	SR 399	1-30"
	-940	SR 399	1-30"
	-945	SR 399	1-24" & 1-36" & 1-42"
	-950	SR 399	2-36"
	-955	SR 399	1-30"
	-960	SR 399	1-36"
	-965	SR 399	2-30"
	-970	SR 399	Bridge 120'x14'
	-975	SR 399	12'x4' Box Culvert
	-980	Sr 399	2-29"
	-990	Sr 399	8'x3' Box Culvert
10	EAST BAY		
	-905	SR 399	1-36" CMP
	-910	SR 399	2-36" CMP & 1-18" CMP
	-915	SR 399	2-30"
11	PENSACOLA BAY		
	No structures identified		

BASIN 05: BLACKWATER RIVER BASIN

SUBBASINS:			
01	WRIGHT BASIN		
	-005	SR 191	Bridge 60'±x9±
	-010	SR 10	U
	-011	SR 10	U
	-015	SR 191	Bridge 98'±x10'±
	-020	SR 191	2-60" CMP
	-905	SR 191	Bridge 60'±x0'±
	-915	SR 184-A	2-24" RCP
	-920	SR 191	2-24" RCP
	-925	SR 191	2-24" RCP

Continued

BASIN 05: BLACKWATER RIVER BASIN (continued)

SUBBASINS:		LOCATION	NO./SIZE/TYPE
01	WRIGHT BASIN (concluded)		
	-930	SR 87	36"x24" Box Culvert
	-935	SR 89	1-30" RCP
	-940	SR 89	1-30" RCP
	-945	SR 89	7'x2' Box Culvert
02	CLEAR CREEK		
	-005	Off of SR 191	Woodpile supported Bridge L15'x14'±H
	-010	SR 191	40'± Wood Bridge 4'±High
	-015	SR 87-A	Bridge being replaced
	-020	SR 87	Bridge 100'Lx9'±H
	-905	Off of SR 191	20'± Woodbridge 4'±
	-910	SR 89	1-30" CMP
	-915	SR 89	1-30" CMP
	-920	SR 89	2-24" CMP
	-925	SR 89	3'x2' Box Culvert
	-930	SR 87	36"x24" Box Culvert
	-935	SR 87	1-30" RCP
	-940	SR 87	24"x18" Box Culvert
	-945	SR 87	1-30" CMP
	-950	SR 87	1-36" CMP
	-955	SR 87	1-36" CMP
	-960	Off of SR 182 & SR 87	1-36" CMP
03	BLACKWATER RIVER		
	-905	SR 191	1-30"
	-910	SR 191	DBL 5'x5' Box Culvert
04	BLACKWATER RIVER		
	-005	Unnamed road	16' Wood bridge 6'± high
	-905	Unnamed road	1-60" CMP & 1-36" RCP
	-910	SR 191	2-36" CMP

BASIN 05: BLACKWATER RIVER BASIN (concluded)

SUBBASINS:		LOCATION	NO./SIZE/TYPE
05	BLACKWATER RIVER		
	-005	Blackwater River & BWR State Park	210' Bridge
	-010	Green Br N of BWR	Wood Bridge 40'x45'
	-015	Shingle Bridge & unnamed road	3-24"
	-020	BWR & County Line	U
	-025	Wolftrap Branch	U
	-030	Shingle Branch	U
06	ATES CREEK		
	No structures identified		
07	MIDDLE CREEK		
	-905	SR 4	3'x3' Box Culvert
	-910	SR 4	3'x2' Box Culvert

BASIN 06: COLDWATER CREEK BASIN

SUBBASINS:			
01	BIG COLDWATER CREEK		
	-005	SR 191 & Coldwater Creek Bridge	Coldwater River 1300'±
	-010	SR 191	2-36"
	-015	N. of R.R. unnamed road	1-36" CMP
	-020	SR 191	12'x4' High wood Box Culvert
	-025	off SR 87-A	1-30" CMP
	-905	SR 87-A	12'x4' Box Culvert
	-910	SR 87-A	2 6'x3' Box Culvert
	-915	SR 87-A	3-36"
	-920	SR 87-A	8'x2' Box Culvert
02	BIG COLDWATER CREEK		
	No structures identified		

Continued

BASIN 06: COLDWATER CREEK BASIN (continued)

SUBBASINS:		LOCATION	NO./SIZE/TYPE
03	EARNEST MILL CREEK		
	-905	SR 191	1-30" CMP
04	WOLFE CREEK		
	-005	Wolfe Creek	Wood Bridge 10'x5'
	-010	W. of Baas Brinks unnamed road	Wood Bridge 30'x8'
05	EAST FORK COLDWATER CREEK		
	-005	E. Fork off SR 87	Wood Bridge 110'x6'±
	-010	SR 4 & Coldwater Creek	Coldwater Bridge 425'x25'
	-015	SR 4 & Thompson Branch	10'x8' Box Culvert
	-905	SR 4	1-30" CMP
	-910	SR 4	7'x2' Box Culvert
	-915	SR 4	4'x3' Box Culvert
	-920	SR 4	5'x3' Box Culvert
06	EAST FORK COLDWATER CREEK		
	No structures identified		
07	DIXON CREEK		
	-905	Off SR 87	2-24" & 2-18" CMP
08	COLDWATER CREEK		
	-005	SR 87	5'x5' Box Culvert
	-010	SR 87 & Manning Creek	Bridge
	-015	Unnamed road S. of SR 399	Wood Bridge 40'x10'
	-020	SR 399	U
	-025	SR 89	1-30"
	-905	SR 87	3'x2' Box Culvert
	-910	SR 87	2-24"
	-915	SR 87	2-36"

BASIN 06: COLDWATER CREEK BASIN (continued)

SUBBASINS:		LOCATION	NO./SIZE/TYPE
08	COLDWATER CREEK (concluded)		
	-920	SR 87	1-36"
	-925	SR 87	8'x10' Box Culvert
	-930	SR 87	1-30"
	-935	OFF SR 87, unnamed road	1-24" RCP & 1-24" CMP
	-940	unnamed road	2-24" CMP
	-945	S. of E. end of SR 399, unnamed road	Wood Bridge 50'x6'
	-950	SR 399	Wood Bridge 30'x6'
	-955	Unnamed road, S. of SR 4	2-18"
	-960	Unnamed road, N. of SR 4	10'x3' Box Culvert
	-965	SR 89	3-18"
09	JUNIPER CREEK		
	-005	West Fork & off of 87 & 87-A	4'x8' Box Culvert
	-010	SR 399 & Juniper Creek	2-10'x10' Box Culvert
	-015	SR 178	Bridge 250'
	-905	SR 87-A	1-24"
	-910	SR 399	1-36"
	-915	SR 399	8'x4' Box Culvert
	-920	SR 87	1-48"
10	MARE BRANCH		
	-005	SR 164	Bridge 100'
	-010	Blackjack Creek off 164	Bridge 70'
	-015	Off of SR 164	Bridge 50'
	-020	N. off of 178	Bridge 40'
	-025	SR 178 & Mare Bridge	3-10'x6' Box Culverts
	-030	SR 89 & Mare Bridge	Bridge 20'x3' to water
	-905	SR 164	1-24"
	-910	SR 164	1-30"
	-915	SR 178	1-30"

Continued

BASIN 06: COLDWATER CREEK BASIN (concluded)

SUBBASINS:		LOCATION	NO./SIZE/TYPE
10	MARE BRANCH (concluded)		
	-920	SR 178	8'x12' Box Culvert
	-925	SR 89	1-30"
	-930	SR 89	1-30"
	-935	SR 89	1-24"
	-940	SR 89	10'x8' Box Culvert
	-945	SR 89	8'x10' Box Culvert
	-950	SR 89	1-30"
	-955	SR 89	8'x10' Box Culvert
11	COBB BRIDGE		
	-005	West Fork & SR 399	4-8'x12' Box Culvert
	-010	SR 4	U
	-015	Off 89	U
12	WEST FORK COLDWATER CREEK		
	-005	SR 197 & Cobb Creek	1-36"
	-010	SR 197	1-36"
	-015	SR 4	4'x8' Box Culvert
	-020	SR 4	Bridge 70'
	-025	SR 87-A	U
	-030	SR 197	U
	-035	Sr 197	U
	-905	SR 87-A	3'x8' Box Culvert
	-910	SR 4	1-24"
	-915	SR 4	2'x3' Box Culvert

BASIN 07: BIG JUNIPER CREEK BASIN

SUBBASINS:			
01	BIG JUNIPER CREEK		
	-005	Big Juniper & unnamed road	Wood Bridge being replaced w/10'x400'
	-010	West of Juniper on unnamed road	Wood Bridge 25'x4'±

BASIN 07: BIG JUNIPER CREEK BASIN (continued)

SUBBASINS:		LOCATION	NO./SIZE/TYPE
01	BIG JUNIPER CREEK (concluded)		
	-905	Unnamed road	1-36" CMP
	-910	Unnamed road	1-36" CMP
02	ALLIGATOR CREEK		
	No identified structures		
03	JUNIPER CREEK		
	-005	Unnamed road at Maria Brook	U
04	SWEETWATER CREEK		
	-005	SR 191	Bridge 215'x21'
	-010	SR 191 & Pittman Creek	4-36" CMP
	-905	SR 191	1-30" CMP
	-910	SR 191	1-36" CMP
	-915	SR 191	2-30" CMP
05	HOG PEN BRIDGE		
	-005	SR 4	5'x3' Box Culvert
	-905	SR 4	4'x4' Box Culvert
	-910	SR 4	11'x3'
06	JUNIPER CREEK		
	-005	SR 4 & Big Juniper Creek	Bridge 300'x28'
	-010	SR 191	Bridge 175'x4'
	-015	SR 191	Wood Bridge 75'x10'
	-020	Turkey Creek & unnamed road	Wood Bridge 40'x10'
	-905	SR 191	2-18"
	-910	SR 191	2-18"
	-915	SR 191	12'x2' Box Culvert
	-920	SR 191	8'x4' Box Culvert
	-925	SR 191	1-30"

Continued

BASIN 07: BIG JUNIPER CREEK BASIN (concluded)

SUBBASINS:		LOCATION	NO./SIZE/TYPE
07	BIG JUNIPER CREEK		
	-005	SR 191	9'x3' Box Culvert
	-010	SR 191	2-36"
	-015	SR 191	2-10'x6' Box Culvert
	-905	SR 191	1-36"
	-910	SR 191	1-36"
	-915	SR 191	12'x2' Box Culvert
	-920	SR 191	1-42"
	-925	SR 191	2-36"
	-930	SR 191	1-48"
	-935	SR 191	1-30"
08	SWEETWATER CREEK		
	-005	SR 4	Bridge 375'x18'
	-010	SR 4	4'x3' Box Culvert
	-905	SR 4	2-24"
	-910	SR 191	2-7'x4' Wood Box Culvert
	-915	SR 191	1-36" CMP
09	SWEETWATER CREEK		
	-905	SR 191	2-36"
10	SWEETWATER CREEK		
	No structures identified		
11	SWEETWATER CREEK		
	No structures identified		

BASIN 08: YELLOW RIVER BASIN

SUBBASINS:			
01	YELLOW RIVER		
	-005	SR 87 & Palmer Slough	Bridge 0.9 miles
	-905	SR 184	2-24"
	-910	SR 184 & SR 87	2-24"
	-915	SR 8	1-30" CMP

Continued

BASIN 08: YELLOW RIVER BASIN (concluded)

SUBBASINS:		LOCATION	NO./SIZE/TYPE
02	YELLOW RIVER		
	-905	SR 184	2-60" CMP
	-910	SR 184	1-84" CMP
	-915	SR 8	2-24" CMP
	-920	SR 8	1-48" CMP
	-925	SR 8	2-24" CMP
	-930	SR 8	2-24" CMP
	-935	SR 8	2-24" CMP
03	BOILING CREEK		
	No structures identified		
04	YELLOW RIVER		
	-905	SR 8	2'-7'x4' Box Culvert
	-910	SR 8	1-36" CMP
	-915	SR 8	1-30" CMP
05	GARNIER CREEK		
	-005	SR 8	6'x5' Box Culvert
	-905	SR 8	2-30" CMP
	-910	SR 8	1-36" CMP
	-915	SR 8	6'x4' Box Culvert

BASIN 09: EAST BAY RIVER BASIN

SUBBASINS:			
01	EAST BAY RIVER		
	-005	East Bay River & SR 87	East Bay River Bridge 260'x12' to Water
02	EAST BAY RIVER		
	No structures identified		

BASIN 10: SANTA ROSA SOUND BASIN

SUBBASINS:		LOCATION	NO./SIZE/TYPE
01	ENGLISH NAVY COVE		
	No structures identified		
02	ORIOLE BEACH		
	-005	SR 191 & Oriole Beach	32'x10' Bridge
	-905	SR 30	1-30"
	-910	SR 30	1-36"
	-915	SR 30	1-36"
	-920	SR 191	3-36"
	-925	SR 191	3-36"
	-930	SR 30	1-36"
	-935	SR 191	2-30"
	-940	SR 191	2-24"
	-945	SR 191	1-48"
	-950	SR 191	8'x6' Box Culvert
03	WILLIAMS CREEK		
	-905	US 98	6'x5' Box Culvert
	-910	US 98	10'x6' Box Culvert
	-915	US 98	6'x3' Box Culvert
	-920	US 98	2-10'x8' Box Culvert
	-925	US 98	8'x8'
	-930	US 98	1-30"
	-935	US 98	1-36"
	-940	US 98	6'x3' Box Culvert
	-945	US 98	6'x3' Box Culvert
	-950	US 98	8'x2' Box Culvert
	-955	US 98	8'x2' Box Culvert
	-960	US 98	1-36"
	-965	US 98	1-30"
	-970	SR 19	2-36"
	-975	SR 19	2-24"
04	NAVARRE		
	-905	SR 30	5'x4' Box Culvert
	-910	SR 30	36" CMP & 10'x3' Box Culvert
	-915	SR 30	
	-920	SR 30	1-36" CMP
	-925	SR 30	1-30" CMP

Continued

BASIN 10: SANTA ROSA SOUND BASIN (concluded)

SUBBASINS:		LOCATION	NO./SIZE/TYPE
04	NAVARRE (concluded)		
	-930	SR 30	1-30" CMP
	-935	SR 30	1-36" CMP & 36" Pipe Culvert
	-940	SR 30	1-36" Pipe Culvert
	-945	SR 30	2-30" Pipe Culvert
	-950	SR 30	1-36" CMP
	-955	SR 30	1-36" CMP
	-960	SR 87	1-30"

APPENDIX B

APPENDIX B-1

SUMMARY OF CURRENT IDENTIFIED CIP PROJECTS

PROBLEM NUMBER	BASIN/ SUBBASIN	LOCATION	PROBLEM DESCRIPTION	SEVERITY	PRELIMINARY PRIORITY	ESTIMATED COST
	Escambia River Basin					
1	01-05	1.5 miles west of S-164 and S-197 intersection	Structure Flooding	8	4	$30,000
2	01-05	1.3 miles west of S-164 and S-197 intersection	Ditch Erosion	1	45	$3,400
3	01-05	Sandy Hollow, 0.6 miles west of S-197	Ditch Erosion	1	46	$11,700
4	01-06	Camors Road @ end of existing pavement	Erosion	4	21	$81,500
5	01-06	2 miles west of High School	No Drainage Outlet	2	43	$5,400
					BASIN SUBTOTAL	$132,000
	Escambia River Coastal Basin					
6	02-01	Charles Street. 0.5 miles east of S-197	Low Area - Periodic Flooding	3	33	$30,600
7	02-01	Hamilton Lane	Yard/Street Flooding	6	8	$6,700
8	02-01	Floridatown Area	Yard/Street Flooding	7	7	* $1,800,000
9	02-01	Todd Estates	Road Flooding	3	30	$25,000
10	02-02	Trout Bayou -Howard Circle	Yard/Street Flooding	6	9	$7,700
11	02-02	Angia Drive	Yard/Street Flooding - No Side Ditches	6	10	$10,300
12	02-02	Dolphin Road @ Raughton Road	Side Ditches Flood	3	28	$18,750
13	02-02	Pearson Road	Side Ditches Flood and do not Drain	3	36	$37,500
14	02-02	Holiday Lane and Raughton Road	Intersection Floods	5	14	$4,475
					BASIN SUBTOTAL	$1,941,925

PROBLEM NUMBER	BASIN/ SUBBASIN	LOCATION	PROBLEM DESCRIPTION	SEVERITY	PRELIMINARY PRIORITY	ESTIMATED COST
	Pond Creek Basin					
15	03-01	Santa Villa Area	Yard/Street Flooding	7	6	$437,500
16	03-02	Luther Fowler Road (Grifith to Evergreen)	Road Flooding	5	18	$40,700
17	03-05	Church on S-164	Church and Cemetery Flooding	9	1	$4,200
					BASIN SUBTOTAL	$482,400

PROBLEM NUMBER	BASIN/ SUBBASIN	LOCATION	PROBLEM DESCRIPTION	SEVERITY	PRELIMINARY PRIORITY	ESTIMATED COST
	East Bay Coastal Basin					
18	04-01	Highland Wood S/D	Street Flooding	3	25	$10,750
19	04-01	Hungaria Estates	Street Flooding	3	29	$24,500
20	04-01	S-191, 2 miles south of Whitaker Bayou	Road S-191 Floods	5	15	$8,975
21	04-01	S-191, 3 miles south of Whitaker Bayou	Road S-191 Floods	5	17	$23,400
22	04-01	Dickerson City	Inadequate Ditches and Culverts	3	35	$34,975
23	04-01	Hwy. 191-C	Water Standing in Ditches and Discharge affected by Tidal Fluc.	3	24	$7,800
24	04-02	Levon Street	Flooding - Ditches do not Drain	3	37	$38,610
25	04-03	Ward Basin Road	Sediment Build up on US-87 from Adjoining Clay Road	5	16	$18,750
26	04-08	Holley Pit Road	Clay Road Flooding	3	34	$33,000
27	04-09	Clay Circle	Flooding	3	26	$13,000
28	04-09	East Bay Heights S/D	Road and Yard Flooding	3	31	$25,875
29	04-10	Coral Strip Parkway	Pond and Road Flooding	3	39	$50,000
30	04-10	Whisper Bay Blvd.	Flooding	3	38	$40,000
31	04-10	Rosa Del Villa	No Drainage System	2	44	$21,500
32	04-10	Bay Ridge Estates	Structure/Yard Flooding	8	5	$32,500
33	04-10	Bal Alex Estates	Structure/Road/Property	8	3	$20,250
					BASIN SUBTOTAL	$404,685

PROBLEM NUMBER	BASIN/ SUBBASIN	LOCATION	PROBLEM DESCRIPTION	SEVERITY	PRELIMINARY PRIORITY	ESTIMATED COST
	Blackwater River Basin					
34	05-01	East Milton in existing S/D	Street Flooding	5	19	$59,000
35	05-03	East of Hwy. 87 and Hwy. 90 Intersection	Road Flooding	5	20	$59,625
					BASIN SUBTOTAL	$118,625
	Coldwater Creek Basin					
36	06-09	Hall Road, east of Hwy. 164	Erosion around Drainage Pipe Could Undermine Highway	1	47	$12,000
37	06-09	Hwy. 4 @ Jordan Road	Structure Flooding	8	2	$6,325
					BASIN SUBTOTAL	$18,325
	Yellow River Basin					
38	08-04	Shangrala S/D	Erosion in Drainage Ditch	3	40	$55,500
					BASIN SUBTOTAL	$55,500
	East Bay River Basin					
39	09-01	Navarre East S/D	Roadway Intersection Floods	3	22	$5,500
					BASIN SUBTOTAL	$5,500

PROBLEM NUMBER	BASIN/ SUBBASIN	LOCATION	PROBLEM DESCRIPTION	SEVERITY	PRELIMINARY PRIORITY	ESTIMATED COST
	Santa Rosa Sound Basin					
40	10-02	Villa East S/D	Street/Lot Flooding	6	12	$44,000
41	10-02	Woodlore S/D	Street/Lot Flooding	6	11	$30,000
42	10-02	Savannah Estates	Street/Lot Flooding	6	13	$111,000
43	10-02	Villa Venyae	Road Flooding	3	42	$94,000
44	10-02	Blue Herron Cove	Road Flooding	3	41	$64,500
45	10-02	Laurel Drive	Street and Pond Flooding	3	32	$30,500
46	10-04	Janet Street and Nina Street	Flooding	3	27	$16,750
47	10-04	Bandero S/D	Road Flooding	3	23	$6,875
					BASIN SUBTOTAL	$397,625
				GRAND TOTAL COST		$3,555,685

*This project is included in FDOT budget

APPENDIX B-2

SUMMARY OF POTENTIAL FUTURE CIP PROJECTS

CIP Number	Structure Number	Description of Work	Predesign Cost
Escambia River Basin			
1.	0101-925	Add Parallel 8'x3' Box Culvert	$ 30,400
2.	0101-930	New Twin 48" Culverts	22,600
3.	0101-980	New Parallel 8'x4' Box Culvert	34,500
		Basin Subtotal:	$ 87,500
Escambia Bay Coastal Basin			
4.	0201-905	New Twin 8'x4' Box Culverts	$ 55,000
5.	0201-910	New Twin 48" Culverts	22,600
6.	0201-915	New Twin 48" Culverts	22,600
7.	0201-930	Add Parallel 54" Culvert	18,500
8.	0201-945	New Triple 60" Culverts	48,900
9.	0201-980	New Triple 54" Culverts	41,300
10.	0202-915	New Triple 54" Culverts	41,300
11.	0202-960	New 40' Bridge	64,800
		Basin Subtotal	$315,000
Pond Creek Basin			
12.	0302-915	Add Parallel 48" Culvert	$ 14,200
East Bay Coastal Basin			
13.	0401-105	New 40' Bridge	$ 64,800
14.	0401-950	New Twin 5'x10' Box Culverts	77,000
		Basin Subtotal	$141,800
Blackwater River Basin			
15.	0501-020	Add Parallel 60" Culvert	$ 22,500
16.	0501-930	New 48" Culvert	14,200
17.	0501-945	New 5'x10' Box Culvert	47,700
		Basin Subtotal	$ 84,400

APPENDIX B-2
(Continued)

CIP Number	Structure Number	Description of Work	Predesign Cost
Coldwater Creek Basin			
18.	0601-910	New Twin 4'x8' Box Culverts	$ 55,000
19.	0601-915	New Twin 4'x8' Box Culverts	55,000
20.	0601-920	New Twin 4'x8' Box Culverts	55,000
		Basin Subtotal	$165,000
Yellow River Basin			
21.	0802-905	New Twin 4'x8' Box Culverts	$ 55,000
22.	0802-905	New 60' Girder Bridge	108,000
		Basin Subtotal	$163,000
Santa Rosa Sound Coastal Basin			
23.	1002-945	New Twin 54" Culverts	$ 29,600
COUNTY-WIDE TOTAL:			$1,000,500

APPENDIX B-3

SUMMARY OF REVENUE NEEDS FOR PROGRAM IMPLEMENTATION

Program Year	Calendar Year	Identified CIP Projects	Repair and Replacement Costs	Operations & Maintenance Costs	Strategic Basin Studies	Potential Future CIP Projects	Total Funding Required
1	1988	$202,000	$25,000	$125,000			$352,000
2	1989	$202,000	$25,000	$130,000			$357,000
3	1990	$202,000	$30,000	$135,000	$75,000		$442,000
4	1991	$202,000	$35,000	$140,000	$75,000		$452,000
5	1992	$202,000	$40,000	$145,000	$75,000		$462,000
6	1993	$202,000	$45,000	$150,000	$75,000		$472,000
7	1994	$202,000	$50,000	$155,000	$75,000		$482,000
8	1995	$202,000	$55,000	$160,000	$75,000		$492,000
9	1996	$202,000	$65,000	$165,000	$50,000		$482,000
10	1997	$202,000	$75,000	$170,000	$50,000		$497,000
11	1998		$85,000	$175,000	$50,000	$115,000	$425,000
12	1999		$95,000	$180,000	$50,000	$115,000	$440,000
13	2000		$105,000	$185,000	$50,000	$115,000	$455,000
14	2001		$120,000	$190,000	$50,000	$115,000	$475,000
15	2002		$135,000	$195,000	$50,000	$115,000	$495,000
16	2003		$150,000	$200,000		$115,000	$465,000
17	2004		$165,000	$205,000		$115,000	$485,000
18	2005		$180,000	$210,000		$115,000	$505,000
19	2006		$200,000	$215,000		$115,000	$530,000
20	2007		$220,000	$220,000		$115,000	$555,000
Total Funds Required		$2,020,000	$1,900,000	$3,450,000	$800,000	$1,150,000	$9,320,000
Percent of Total Need		21.67%	20.39%	37.02%	8.58%	12.34%	100.00%

APPENDIX C

SANTA ROSA COUNTY
STORMWATER MANAGEMENT ORDINANCE
PRELIMINARY DRAFT
OCTOBER 16, 1987

Article I
OVERVIEW

1.01 TITLE

This Ordinance shall be known as "The Stormwater Management Ordinance of Santa Rosa County, Florida."

1.02 AUTHORITY

This Ordinance is adopted pursuant to the General Laws of the State of Florida, and all provisions and sections contained herein shall be construed as having been adopted in the interest of public health, safety and general welfare of the people of Santa Rosa County, Florida.

1.03 SCOPE

This ordinance amends and supplements the following ordinances:

1. (Subdivision Ordinance)
2. (Zoning Ordinance)
3. (Building and Building Regulations Ordinance)
4. (Plumbing Ordinance)

1.04 INTENT

It is the intent of this Ordinance to allow landowners reasonable use of their property while protecting surface and groundwater resources of Santa Rosa County by insuring that stormwater run-off peak rates and pollution loads after development should approximate existing pre-development conditions and that precautions are taken to prevent erosion, sedimentation, flooding and water pollution.

1.05 JURISDICTION

The area subject to this Ordinance shall be the unincorporated area of Santa Rosa County, Florida and all discharges entering the County's system(s) originating in areas outside the unincorporated area of the County.

Article II

DEFINITIONS

For the purpose of this ordinance, the following definitions shall apply:

2.01 Adverse Impacts - any modifications, alterations or effects on a feature or characteristic of water or flood prone lands including their quality, quantity, hydrodynamics, surface area, species composition, living resources, aesthetics or usefulness for human or natural uses which are or potentially may be harmful or injurious to human health, welfare, safety or property, to biological productivity, diversity, or stability or which unreasonably interfere with the enjoyment of life or property, including outdoor recreation. The term includes secondary and cumulative as well as direct impacts.

2.02 Applicant - person applying for or one granted a permit to proceed with a project (may be used synonomously with developer and owner).

2.03 Channel - a natural or artificial watercourse of perceptible extent, with a definite bed and banks to confine and conduct continuously or periodically flowing water. Channel flows thus is that water which is flowing within the limits of the defined channel.

2.04 Coastal High Hazard Zone - area(s) subject to high velocity waters, including but not limited to, hurricane wave wash, designated on Federal Insurance Rate Maps as Zones VI-30.

2.05 Critical Duration - means, for a given frequency, the duration storm event (between 1-hour and 10-days) that results in the largest stormwater discharge peak rate and/or net stormwater volume to be stored (post-improvement runoff less pre-improvement runoff).

2.06 Detention - storm runoff collected and stored for a short period of time and then released at a rate much less than the inflow rate.

2.07 Developer - any person who acts in high own behalf or as the agent of an owner of property and engages in alteration of land or vegetation in preparation for construction activity.

2.08 Development - any action in preparation or construction activity which results in an alteration of either land or vegetation.

2.09 Development Permit - permit issued by the County which is needed before any development operations can be started (including clearing, grubbing, grading, dredging, filling, excavation, or any other development operations).

2.10 Discharge - volume of fluid per unit time flowing along a pipe or channel from a project, site, stormwater management facility, basin, discharge or outfall point.

2.11 Stormwater Management - a general term applied to the removal of surface or subsurface water from a given area either by gravity or by pumping,

commonly applied herein to surface water (may be used synonomously with drainage).

2.12 Stormwater Management System - the surface and subsurface system for the removal of water from the land, including both the natural elements of streams, marshes, swales and ponds, whether of an intermittent or continuous nature, and man-made elements which include culverts, ditches, channels, storage facilities, and the storm sewer system.

2.13 Elevation - height in feet above mean sea level references to the USC&GS (N.O.S.).

2.14 Engineer - means a Professional Engineer registered in Florida pursuant to the provisions of Chapter 471, Florida Statutes, who as appropriate is competent in the fields of hydraulics, hydrology, stormwater management of stormwater pollution control.

2.15 Erosion - the general process whereby soils are moved by flowing surface or subsurface water.

2.16 Facility - means all man-made or natural features within a development project or the County's right-of-way or easement including, but not limited to curbs, gutter, swales, ditches, canals, channels, culverts, pipes, retention areas and detention areas. Facility thus includes but is not limited to anything stormwater will run on or through.

2.17 Flood - a temporary rise in the level of rivers, streams, watercourses, ponds and lakes which results in inundation of areas not ordinarily covered by water.

2.18 100-Year Flood - a flood which has the statistical probability of occurring once every 100 years or having a one (1) percent chance of occurring each year.

2.19 Flood Plain - the land adjacent to a watercourse or body of water which has been or may be covered by flood water including but not limited to the 100-year flood.

2.20 Flood Prone Lands - lands which are subject to being covered by water (1) including the flood plain associated with the 100-year flood, (2) those lands delineated as the Coastal High Hazard Zone, and (3) those lands frequently subject to inundation by storms with design frequencies of 5-years to 25-years due to frequent small localized flooding problems.

2.21 Flood-Proofing - a combination of structural provisions, changes, or adjustments to properties and structures subject to flooding primarily for the reduction of elimination of flood damages to properties, water and sanitary facilities, structures, and contents of building.

2.22 Floodway - the normal channel of a watercourse and the adjacent land areas that must remain unobstructed to convey the regulatory flood

discharge without raising flood elevations above specified levels as determined in Article IV.

2.23 Hydrologic and Hydraulic Study - an engineering study to determine rates, volumes, and distribution of storm runoff, to evaluate the performance of designed stormwater facilties, and to analyze the effect of development project discharge on the County's and/or other private downstream watercourses and water bodies.

2.24 Impervious Surface - a surface which has been compacted or covered with a layer of material so that it is highly resistant to infiltration by water. It includes surfaces such as compacted sand, shell material, lime rock, or clay, as well as most conventionally surfaced streets, roofs, sidewalks, parking lots and other similar structures.

2.25 Obstruction - any dam, wall, wharf, embankment, levee, dike, pile, abutment, projection, excavation, channel rectification, bridge, conduit, culvert, building, wire, fence, rock, gravel, refuse, fill, structure, or matter in, along, across, or projecting into any channel, watercourse, or flood plain area which may impede, retard, or change the direction of the flow of water, either in itself or by catching or collecting debris carried by such water, or that is placed where the flow of water might carry the same downstream to the damage of life or property.

2.26 Predeveloped Conditions - those conditions which existed before any individual, firm, corporation, government agency, business trust, estate,

trust, partnership, association, two or more persons having a joint or common interest, or any other legal entity initiated any development or construction activity which results in an alteration of land or vegetation.

2.27 Project - the particular structures, pavements and improvements to a site proposed by applicant on a particular land area which may be part of a common plan of development and shall include the subdivision of land.

2.28 Receiving Bodies of Water - any water bodies, watercourses or wetlands into which surface water flow either naturally, in man-made ditches, or in a closed conduit system.

2.29 Retention - storm runoff collected and stored with no direct surface water release after the storm runoff has ended.

2.30 Runoff - amount of stormwater from which flows from a catchment area past a given point over a certain period. It is total rainfall, less infiltration and evaporation losses.

2.31 Sediment - fine particulate material, whether mineral or organic, that is in suspension or has settled in a water body or watercourse.

2.32 Site Plan - the plan required to acquire a development, construction, building or stormwater permit which shows the means by which the developer will conform with applicable ordinances and provide the flow

attenuation and water quality treatment required in this Stormwater Management Ordinance.

2.33 Storage Facility Study - engineering study to determine if retention and/or detention storage facilities are needed to control storm runoff from a development, evaluate the proper size, and determine their resultant impact on flow attenuation and/or water quality treatment.

2.34 Subdivide - the division of lands comprising one acre or more in total size into lots, blocks, parcels, tracts or other portions, however designated, so as to comprise three (3) or more such to the acre, or, the division of lands into lots, blocks, parcels, tracts or other portions, however designated, so as to provide for or necessarily require the establishment or extension of streets, alleys, or other rights-of-way.

2.35 Swale - a manmade trench which: (a) has a top width-to-depth ratio of the cross-section equal to or greater than 6:1, or side slopes equal to or greater than 3 feet horizontal to 1 foot vertical; (b) contains contiguous areas of standing or flowing water only following a rainfall event; and, (c) is planted with or has established vegetation suitable for soil stabilization, stormwater treatment, and nutrient uptake; and (d) is designed to take into account the soil erodibility, soil percolation, slope, slope length, and drainage area so as to prevent erosion and reduce pollutant concentration of any discharge.

2.36 Watercourse - any natural or artificial channel, ditch, canal, stream, river, creek, waterway or wetland through which water flows in a definite direction, either continuously or intermittently, and which has a definite channel, bed, banks or other discernible boundary.

2.37 Water Body - any natural or artificial pond, lake, reservoir or other area which ordinarily or intermittently contains water and which has a discernible shoreline.

2.38 Watershed - means the region draining or contributing water to a common outlet, such as a stream, lake or other receiving area, or, the drainage area that contributes to a point under consideration.

2.39 Wetland - land that is inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances does support, a prevalence of vegetation typically adopted for life in saturated soil conditions.

Article III

STATEMENT OF OBJECTIVES

The following are the adopted objectives of stormwater management for the purposes of this Ordinance.

3.01 Protect human life and health.

3.02 Minimize public and private property damage resulting from erosion, sedimentation, flooding and excessive maintenance requirements.

3.03 Regulate use of flood plains for development, fill, dumping, storage of materials, structures, buildings, utilities, or any other work which acting alone or in combination with other existing or future uses will increase flood heights and velocities, upstream or downstream from proposed use, by obstructing flows and reducing storage.

3.04 Regulate development which may, when acting alone or in combination with other developments, create a demand for public investment in flood-control works by requiring protection against flood damage at the time of initial construction and afterwards.

3.05 Ensure, as far as possible, an efficient stormwater management system that will not result in excessive public or private moneys being used for maintenance and replacement of portions of the system.

3.06 Ensure that the design of the stormwater management system will be consistent with good engineering practice and design.

3.07 Provide temporary and permanent erosion and sediment control measures to protect individuals occupying land adjacent to the downstream from proposed developments from being damaged by sediment originating from within or because of the proposed development.

3.08 Control flood plain uses to be consistent with approved land use plans for the flood plain areas and coordinated with plans for the total community to prevent flooding while recognizing that natural fluctuations in water levels are beneficial.

3.09 Provide for development of areas with minimum adverse effects to the natural environment.

3.10 Encourage wise use of the County's economic and fiscal resources through reducing capital expenditures for flooding proofing and storm drainage systems where feasible by routing runoff through swales or other natural retention/detention systems to increase stormwater infiltration, settle suspended solids and remove pollutants.

3.11 Discourage development in areas subject to flooding problems.

3.12 Encourage economical uses and designs in flood plain areas.

3.13 Provide a means of placing potential owners, builders, developers, and the general public on notice of existing and potential flood hazards.

3.14 Utilize existing channel capacity for flood flows before using on-site storage or other structural measures.

3.15 Utilize appropriate public open space for both open space uses (parks, recreational uses, etc.) and the temporary storage of excess storm waters.

3.16 Keep the drainage system as natural and aesthetically pleasing as possible.

3.17 Develop a comprehensive stormwater management plan for the County to handle storm runoff safely and efficiently.

3.18 Provide for public awareness of the flooding potential.

3.19 Develop interagency relationships with other federal, state, regional, and local governmental units involved in stormwater management in order to solve stormwater problems which cross County boundaries.

3.20 Protect, restore and maintain the chemical, physical and biological quality and quantity of ground and surface water.

3.21 Facilitate recharge of groundwater systems.

3.22 Protect, restore and maintain natural salinity levels in estuarine areas.

3.23 Protect, restore and maintain the natural habitats of fish and wildlife and prevent damage to wetlands.

3.24 Ensure the attainment of these objectives by requiring approval and implementation of stormwater management plans for all activities which may have adverse impacts on community waters.

Section IV

FLOODPLAIN MANAGEMENT

4.1 ESTABLISHMENT OF FLOOD PRONE LANDS CLASSIFICATIONS

4.1.1 Application of this Section - This section applies to the following three general caregories of flood prone lands: (1) All of that area inside the 100-year flood contour elevations; (2) All of that area inside the delineated Coastal High Hazard Zone; and (3) Lands within the County which are subjected to frequent inundation due to topographic contour characteristics when subjected to storms with 5-year to 50-year recurrence intervals.

4.1.2 Delineation of Flood Prone Lands - The recommended procedures to be followed in order to determine the appropriate elevations of the 100-year flood plain, Coastal High Hazard Zone, and other categories of flood prone lands are outlined and discussed in the County's Stormwater Engineering Manual. In addition, this manual lists all approved reports and maps relating to flood prone areas.

4.1.3 Warnings and Disclaimer of Liability - The degree of regulation required by this ordinance is considered to provide a reasonable level of flood protection and is based on engineering and scientific methods of study. Larger floods may occur or flood heights may be increased by man-made or natural causes, such as congested channels and bridge openings constricted by debris. **This ordinance does not imply or guarantee that areas outside the delineated flood prone lands or land uses permitted within such a district will be free from flooding or flood damages.** This ordinance shall not create liability on the part of the Santa Rosa County or any officer or employee thereof for any flood damages that result from reliance on this ordinance or any administrative decision lawfully made thereunder.

4.2 FLOOD PLAIN DISTRICT USES

4.2.1 Permitted Uses - Within the flood plain district the following uses are permitted with the exception that none of these uses, when acting alone or in combination with other uses, are to be allowed to affect adversely the capacity of the channels or floodways of any tributary to the main stream and/or the main stream, drainage ditch, or any other drainage facility or system, or in any way affect the free flow of flood waters. This must be documented by appropriate engineering plans and studies as discussed in the County's Stormwater Engineering Manual. Specific uses which are not permitted in each of the four categories of the flood prone lands classification are specifically listed in the Stormwater Engineering Manual. Determinations of land use suitability will be made by the Stormwater Management division. The following list of uses is not intended to be all inclusive but only to given typical examples.

a) Agricultural uses such as general farming, pasture, grazing, outdoor plant nurseries, horticulture, truck farming, forestry, and wildcrop harvesting.

b) Industrial commercial uses such as loading areas, parking areas, airport landing strips, and other nonstructural uses.

c) Private and public recreation uses such as golf courses, tennis courts, driving ranges, archery ranges, picnic grounds, swimming areas, parks, wildlife and nature preserves, target ranges, trap and skeet ranges, hunting and fishing areas, bicycle, hiking and horseback riding trails.

4.2.2 Special Permit Uses - The following uses which involve structures (temporary or permanent), fill, cut, or storage of materials or equipment may be permitted only upon application for a special use permit. Details on such permits are given in Article VI of this

ordinance. These uses are also subject to the provisions of Section 4.2.3 which applies to all flood prone lands special-permit uses. The following list of uses is not intended to be all inclusive:

a) Uses or structures accessory to open space or Special Permit Uses.

b) Circuses, carnivals and similar transient amusement enterprises.

c) Drive-in theaters, road-side stands, signs and billboards.

d) Extraction of sand, gravel and other materials.

e) Marinas, boat rentals, docks, piers, wharves.

f) Railroads, streets, bridges, utility transmission lines and pipe lines.

g) Storage yards for equipment, machinery or materials.

h) Supports for structures (excluding fill) where the flood level of the structure is above the 100-year Flood Contour Elevation but the supports are within the flood plain area.

4.2.3 Standards for Flood Prone Lands Special Permit Uses - The County's Stormwater Manager shall establish appropriate standards and design criteria for designated uses of Flood Prone Lands which shall be promulgated in the County's Stormwater Engineering Manual. The stormwater manager shall annually review and revise the Stormwater Design Manual as required to meet the intent of this Ordinance and accommodate state-of-the-art procedures for stormwater management.

Article V

NONCONFORMING USES

5.1 A structure or the use of a structure or premises which was lawful before passage or amendment of this ordinance but which is not in conformity with the provisions of this ordinance may be continued subject to the following conditions:

a) No such use shall be expanded, changed, enlarged, or altered in a way which increases its degree of nonconformity.

b) The cumulative alterations, additions and/or repairs to any nonconforming structure shall exceed 25 percent of its value at the time of its becoming a nonconforming use, unless the structure is permanent changed to a conforming use.

c) If such use is discontinued for 6 consecutive months, any future use of the building premises shall conform to this ordinance.

d) If any nonconforming use or structure is destroyed by any means, including fire, wind damage and floods, to an extent of 25 percent or more of its value at the time it became nonconforming, it shall not be reconstructed except in conformity with the provisions of this ordinance.

e) Uses which become nuisances under conditions of prevailing ordinances shall not be entitled to continue as nonconforming uses.

f) Except as provided in Section 5.1, any use which has been permitted as a special permit use shall be considered a conforming use.

g) Any alteration, addition, or repair to any nonconforming structure which would result in substantially increasing its flood-damage potential is prohibited.

h) The County shall prepare a list of those nonconforming uses which have been flood-proofed or otherwise adequately protected in conformity with Section 10.3.5 (1) - (5). This list shall be presented to the Board which may issue a certificate to the owner stating that as a result of these corrective measures such uses are in conformity with the provisions of this ordinance.

i) If the restrictions placed on a particular use change (e.g., lowering of the 100-year Flood Contour Elevation), a certificate will be issued to the owner stating that as a result of these measures such use is in conformity with the provisions of this ordinance.

Article VI

STORMWATER IMPROVEMENTS

6.1 IMPROVEMENTS REQUIRED

If the required hydrologic and hydraulic studies reveal that the proposed development would cause increased flood stages so as to increase the flood damages to existing developments or property, or increase flood elevations beyond the vertical limits set for the delineated flood prone lands, then the development permit shall be denied unless one or more of the following requirements are met:

a) On-Site Storage - Provide on-site storage for the increased volumes of stormwater that results from the proposed development, and provide a release mechanism to limit the storm runoff peak rate and timing from the storage facility to that which would have been expected from the development site under natural or predeveloped conditions for all design floods which have an adverse effect on existing drainage, up to and including the 100-year flood. Limit the 100-year flood runoff peak from the development so that the vertical limits of the flood prone lands are not exceeded.

b) Off-Site Storage - Provide or contribute appropriate funds for the construction of off-site storage facilities that will control storm runoff so that the limits of the flood plain district are not exceeded and upstream and downstream property is not damaged by increased storm runoff. In using off-site storage, an engineering

study must be done to show that property located between the proposed development and the storage facilities will not be damaged by increased runoff.

c) Improvements of Existing Drainage System - Improve or contribute funds to improve the existing drainage system, without causing damage to upstream and downstream property or increase flood elevations beyond the vertical limits set for the delineated flood prone lands, to safely accommodate the increased runoff from the proposed development. Care must be exercised in utilizing this option so that the natural environment of the existing drainage system is not unduly harmed.

6.2 COST OF DRAINAGE IMPROVEMENTS

The following requirements will determine the appropriate contribution of drainage improvement costs resulting from the proposed development.

6.2.1 If all the proposed drainage improvements are contained within and are solely for the benefit of the proposed development, then the total cost of these improvements will be borne by the developer of the proposed development.

6.2.2 If some of the proposed drainage improvements are not contained within the proposed development but are necessitated by and accrue benefits solely to the proposed development then the total costs of these improvements will be borne by the developer of the proposed development.

6.2.3 If off-site drainage improvements are required as the result of more than one development then the costs of these improvements will be proportional among the developers benefited. Computation procedures for prorating the drainage costs will be determined by the _____.

6.2.4 If a developer wants to develop a portion of an area draining to a proposed off-site drainage improvement, before this improvement is constructed, he may use either of the following options:

a) Construct the proposed off-site drainage improvement which will serve the entire area draining to this facility, or

b) Provide the funds along with othger benefitted parties for the construction of this drainage facility in lieu of constructing the facility providing that stormwater manager supports this approach.

This will allow the developer to proceed with the improvements of his land without damaging the properties of others (assuming, if option B is selected, the County constructs the drainage facility before improvements are made). The County will endeavor to collect, on pro-rata basis, any excess funds plus interest expended by this developer beyond his proportionate share of the cost of such improvements from future properties within the watershed served by such drainage improvements when such properties are development within a period of ten years from the date that the drainage

improvements are financed or constructed. These funds plus interest, if collected, will be turned over to the initial developer or his assigns.

6.2.5 If the County chooses to provide drainage facilities, the cost of these facilities will be prorated and assessed as a development cost when and if development occurs on the affected lands within a ten year period.

Article VII

EROSION AND SEDIMENTATION CONTROL

7.1 EROSION AND SEDIMENT CONTROL PLANS

Proposed temporary and permanent erosion and sediment control plans shall be submitted with each application for a development permit. These plan shall specify in detail the erosion and sediment control measures to be used during all phases of clearing, grading, filling, construction, and permanent development and accurately describe their proposed operation. These erosion and sediment control measures shall apply to all features of the construction site, including street and utility installations as well as to the protection of individual lots. In addition, these plans shall be in accordance with the latest specifications and recommendations as outlined in the County's Stormwater Engineering Manual.

7.2 INSTALLATION OF MEASURES

No clearing, grading, excavating, filling or otherwise disturbing natural terrain will be permitted until County approved erosion and sediment control measures have been installed except those operations needed to install these measures. All erosion and sediment control measures shall be continuously maintained during the construction phase of the development.

Article VIII

MAINTENANCE OF STORMWATER MANAGEMENT SYSTEMS

8.1 MAINTENANCE REQUIREMENT

The installed system(s) required by this Ordinance shall be maintained by the owner except that the County may select certain systems for County maintenance. The selection of critical areas and/or structures to be maintained by the County shall be recommended to the Board of County Commissioners by the County Engineer. All areas and/or structures to be maintained by the County must be dedicated to the County by plant or separate instrument and accepted by the Board of County Commissioners. The system(s) to be maintained by the owner shall have adequate easements to permit the County right-of-entry to inspect and if necessary, to take corrective action if the owner fails to maintain the system(s). If the owner fails to maintain his system(s), the County Engineer shall give the owner written notice of the nature of corrective action required. If the owner fails, to take corrective action, within thirty (30) days from the date of the notice, the Board of County Commissioners may take the necessary corrective action and place a lien on the property of the owner to recover the costs thereof.

8.1.1 Owner Maintenance - Any portion of the drainage system, including on-site and off-site storage facilities, that is constructed by the developer will be continuously maintained by the owner or owners subsequent in title of the affected lands unless it is officially accepted by the Board of County Commissioners for County maintenance. In addition, where debris or sediment has accumulated

in such a manner as to interfere with the free flow of water or adequate functioning of drainage facilities, the Stormwater Management Division shall require the owner of such properties to clear and remove the debris or obstruction to permit the drainage system to function efficient.

8.1.2 County Maintenance of Private Property at Owner's Expense - After notice and reasonable diligent efforts to have the owner of the property remove the debris or obstruction, County forces are hereby authorized to enter upon such drainageways and clear or remove the debris or obstructions. The cost thereof shall be charged to the owner of the property where said debris and/or obstruction was generated. The County shall not charge such costs to the owners where the debris or obstruction within the drainageway was not generated from his own property or caused by the owner's negligence or action.

8.1.3 County Maintenance - The County will maintain County stormwater management facilities according to a planned maintenance schedule to be established by the County's stormwater manager. If it cannot be determined from what property the debris or obstruction was generated, or if the debris or obstruction was not caused by anyone's negligence or action, then the County will arrange for its removal.

Article IX

SUBDIVISION PLATS

9.1 Proposed tentative and final subdivision plats located contiguous to or within the flood plain district shall not be approved except in accord with the following requirements:

9.1.1 100-Year Flood Contour Elevation - Each plat shall contain a notation clearly stating the 100-Year Flood Contour Elevation as approved and accepted by the Stormwater Management Division. This elevation shall be designated on the plat by a heavy contour line.

9.1.2 Flood Prone Lands Delineation - Each plat shall contain a notation clearly identifying each of the four categories of the flood prone lands classification where present as determined by the Stormwater Management Division. These areas shall be designated on the plat by suitable shading and contour designation.

9.1.3 Minimum Lot Area Above 100-Year Flood Contour - No lot shall be approved which has less than 7,000 square feet above the level of the 100-Year Flood Contour Elevation.

9.1.4 Drainage Easement - Where a proposed subdivision is transversed by a watercourse, drainageway, canal or stream, appropriate dedication or suitable easement provisions shall be made to accommodate stormwater and drainage through and from the proposed subdivision. Said dedication or easement shall conform substantially with the lines of said watercourse and be of sufficient width or construction, or both, as to be adequate for providing both access and maintenance.

The specific details pertaining to the size and extent of dedications or easements are contained in the County's Stormwater Engineering Manual.

Article X

PERMITS

10.1 GENERAL STORMWATER MANAGEMENT PERMIT

10.1.1 Activities Requiring a General Stormwater Management Permit

No person may subdivide or make any change in the use of land or construct or change the size of a structure except as exempted in Section 10.2, without first obtaining a General Stormwater Management Permit from the _____ Department.

The following activities may alter or disrupt existing stormwater runoff patterns and, unless exempted by Section 10.2, will require a General Stormwater Management Permit prior to initiation of a project:

a) Clearing and/or drainage of land prior to construction of a project;
b) Clearing and/or drainage or non-agricultural land for agricultural purposes;
c) Converting agricultural land to non-agricultural uses;
d) Subdividing land;

e) Changing the use of land causing a change in natural flow patterns or predevelopment conditions;

f) Construction of a structure or substantial alteration size of one or more structures;

g) Altering the shoreline or bank of any surface waterbody;

h) Altering of any ditches, dikes, terraces, berms, swales, or other water management facility;

i) Redevelopment of a previously developed property.

10.2 ACTIVITIES REQUIRING SPECIAL USE PERMITS

10.2.1 Application for Special Use Permit - Any use listed in this ordinance as requiring a special use permit may be allowed only upon application and issuance of a Special Use Permit by the Board of County Commissioners (hereafter referred to as the Board).

10.2.2 Procedure to be Followed by the Board in Passing on Special Use Permits - Upon receiving an application for a Special Use Permit the Board shall, prior to rendering a decision thereon:

a) Require the applicant to furnish as much of the following information as is necessary for determining the suitability of the particular site for the proposed use:

(1) Plans showing the nature, location, dimensions, and elevation of the lot, existing or proposed structures, fill, excavation, storage of materials, flood-proofing measures and the relationship of the above to the location of the channel and flood plain district.

(2) A typical cross-section showing the channel of the stream, elevation of land areas adjoining each side of the channel, cross-sectional areas to be occupied by the proposed development, 100-Year Floor Contour Elevation, and flood prone lands delineation.

(3) Plans showing elevations or contours of the ground; delineated flood prone lands, pertinent structures, fill or storage elevations; size, locations and spatial arrangement of all proposed and existing structures on the site; location and elevations of streets, water supply, sanitary facilities; photographs showing existing land uses and vegetation upstream and downstream, soil types and other pertinent information.

(4) A profile showing the slope of the bottom of the channel or flow line of the stream.

(5) Specifications for building construction and materials, flood-proofing, filling, dredging, grading, channel improvement, storage of materials, water supply, and sanitary facilities.

b) Transmit a copy of the above information to the Stormwater Management Division for their review and comment.

c) Based upon the technical evaluation of the Stormwater Management Division, the Board shall determine the specific flood hazard at the site and shall evaluate the suitability of the proposed use in relation to the flood hazard.

10.2.3 Factors Upon Which the Decision of the Board Shall be Based - In passing upon application for special use permits, the Board shall consider all relevant factors specified in other sections of this ordinance and:

a) An evaluation to show that the proposed use will not reduce the capacity of the floodway or increase flood heights beyond those allowed in this ordinance.

b) The danger that materials may be swept into other lands or downstream.

c) The proposed water supply and sanitation systems and the ability of these systems to prevent disease, contamination, and unsanitary conditions.

d) The importance to the community of the services provided by the proposed facility.

e) The requirements of the facility for a waterfront location.

f) The availability of alternative locations not subject to flooding.

g) The compatibility of the proposed use with existing development and development anticipated in the near future.

h) The relationship of the use to the comprehensive plans and flood prone lands management programs for the County.

i) The safety in times of flood of access of ordinary and emergency vehicles to the property.

j) The expected heights, velocity, duration, rate of rise, and sediment transport of the flood waters expected at the site (if the Board feels this information is needed).

k) Such other factors as are relevant to the purpose of this ordinance.

10.2.4 Time for Acting on Application - The Board shall act on an application in the manner described within days from receiving the application, except when additional information is required by the Board or the Stormwater Management Division to prepare recommendations. The Board shall render a written decision within 60 days from the receipt of such information.

10.2.5 Conditions Attached to Special Use Permits - Upon consideration of the factors listed above and the purposes of this ordinance, the Board shall request the Stormwater Management Division to prepare

specific conditions (as required) for the Permit and may attach such conditions to the granting of special use permits or variances as it deems necessary to further the purposes of this ordinance. Following are some examples of such restrictions:

a) Modification of waste disposal and water-supply facilities.

b) Limitations on periods of use and operation.

c) Imposition of operational controls, sureties and deed restrictions.

d) Requirements for construction of channel modifications, dikes, levees and other protective measures.

e) Flood-proofing measures consistent with the standards and specification for flood-proofing contained in the County's Stormwater Engineering Manual.

10.3 ACTIVITIES ELIGIBLE FOR EXEMPTION FROM PERMITS

Any development which will not increase the peak discharge rate, the volume of runoff or deposit additional pollution materials beyond the boundaries of the development shall be exempted from the requirements of this Ordinance. In addition, the following structures and activities are also exempted.

a) Single-family residences and their customary accessory structures, provided they are not parts of larger developments.

b) Farming activities on agricultural lands, including the farming on forest management lands, assessed under provisions of section 193.461, Florida Statutes of farming activities which are conducted in accordance with a Soil Conservation Service Conservation Plan, or forestry activities conducted in accordance with the Florida Division of Forestry's Silviculture Best Management Practice Manual (latest edition).

c) Maintenance work on existing mosquito and arthropod drainage structures for public health and welfare purposes.

d) Maintenance, alteration or improvement of an existing structure which will not change the rate, volume or pollution load of stormwater runoff from the site on which that structure is located.

e) Construction of any structure or addition to an existing structure creating one thousand square feet or less of new impervious surface.

f) Construction or improvements in compliance with the Subdivision Regulations of Santa Rosa County, Ordinance No. _____, as amended provided that:

(1) Stormwater management provisions for the subdivision were previously reviewed and approved for a General Stormwater Management Permit;

and

(2) The development is constructed in accordance with the stormwater management provisions approved on the final plat and approved construction plans which the development's General Stormwater Management Permit was issued.

g) Emergencies requiring immediate action to prevent material harm or danger to persons when obtaining a permit is impractical and would cause undue hardship in protection of property from fire, violent storms, hurricanes or other hazards. A report of the emergency action shall be made to the County's Stormwater Manager as soon as practicable.

Any project which qualified as an exemption pursuant to this section will be required to submit a Certificate of Exemption Application, which provides the basis of the exemption, that is signed and sealed by a Registered Engineer. The Stormwater Management will review the application and issue within 21 calendar days of the receipt of a completed application, a Certificate of Exemption for all projects meeting the exemption critiera requirements of this Ordinance.

10.4 PERMIT APPLICATION PROCEDURES

10.4.1 Preliminary Permit Application - Any persons proposing to make any change in the size of any structure or th euse of land or to construct a new structure, except as exempted in Section 10.1.2, when in doubt as to whether a Standard Permit Application is necessary, may furnish a completed preliminary application form to the Stormwater Management Department. No fee shall be charged for a preliminary application. The preliminary application form must be filed by the owner/applicant or his/her agent and shall contain the following elements.

a) a location map and an aerial photo with contours outlining the project boudaries.
b) a statement and sketch expressing the intent and scope of the proposed project.
c) a legal description of the property.

10.4.2 Review - The preliminary application shall be reviewed by the County Engineer. Within ten (10) working days after submission of the complete preliminary application, the County Engineer will notify the applicant that either the project is approved, is exempt, or that a permit application must be filed for the project for either a General Stormwater Management Permit or a Special Use Permit. If

the county Engineer determines that a permit application must be filed the following considerations shall apply:

a) whether the proposed project is exempt.

b) whether the proposed project appears to increase the rate or volume of run-off from the existing site.

c) whether there are other criteria which would require a General Stormwater Management Permit Application or a Special Use Permit Application.

10.4.3 General Stormwater Management - If a General Permit Application is required for the project, the applicant shall furnish to the Stormwater Management Department five (5) copies of the following:

a) Completed General Stormwater Management Permit Application.

b) Stormwater Management Plan as described in the Stormwater Engineering Manual.

c) Applicable permit fee.

d)

e) Any other information which the applicant or the County Stormwater Manager believes is reasonably necessary for an evaluation of the proposed development.

10.4.4 Special Use Permit Application - If a Special Use Permit is required for the project, the applicant shall furnish to the Stormwater Management Department five (5) copies of the following:

a) completed Special Use Permit Application.

b) Stormwater Management Plan as described in the Stormwater Engineering Manual.

c) Applicable Permit fee.

d)

e)

f) Any other information which the applicant or the County Stormwater Manager believes is reasonably necessary for an evaluation of the proposed development.

10.4.5 Complete Application Required - The County Engineer shall ascertain the completeness of the permit application within five working days of receipt. If there are deficiencies, he shall notify the applicant that further processing of the Standard Permit Application is held in abeyance until the application is complete.

10.4.6 Permit Application Approval Considerations - In approving or denying a Permit Application the County Engineer shall consider the following factors:

a) The characteristics and limitations of the soil at the proposed site;

b) The existing topography of the proposed site and the extent of topographical changes after development;

c) The existing vegetation of the proposed site and the extent of vegetational changes after development;

d) The existing hydrology of the proposed site and the impact of the proposed alterations on the existing hydrology;

e) The impact the proposed project will have on the natural recharge capabilities of the site;

f) The impact the proposed project will have on downstream water quantity and quality and specifically the potential for downstream flooding conditions;

g) The plans and specifications of structures of devices the applicant intends to employ for on-site water retention, detention, erosion control and flow attenuation;

h) The effect the proposed water retention or detention structures will have upon mosquito and arthropod breeding habitats.

i) Conformity of Stormwater Management Plan to the requirements of this Ordinance and the Engineering Procedures and criteria of the Stormwater Engineering Manual.

10.4.7 Permit Review Period - Within ten (10) working days after submission of the completed Permit Application package, the Stormwater Manager

shall approve, with or without specified conditions or modification, or reject the proposed Plan and shall notify the applicant accordingly. If the Stormwater Manager has not rendered a decision within ten (10) working days after Plan submission, he shal inform the applicant of the status of the review process and the anticipated completion date. If the Plan is rejected or modified, the Representative shall state the reasons for rejection or modification. If the applicant feels aggrieved due to rejection, or modification or delay, he may request a hearing before the Santa Rosa County Board of Adjustment and Appeals pursuant to Section 12 of this Ordinance.

10.5 PERMIT FEES

If authorized by the Board of County Commissioners, a permit fee may be collected at the time the Application Package is submitted. The permit fee should reflect only the cost of administration and management of the permitting process. The Board of County Commissioners may establish by resolution, a pro rated fee schedule based upon the relative complexity of the project. The fee schedule may be amended from time to time by resolution of the Board of County Commissioners. Notice of intent to adopt or amend such a resolution shall be published in a newspaper of general circulation in the County at least fifteen (15) days prior to adoption, excluding Sundays and legal holidays. Where work for which a permit is required by the Ordinance is commenced prior to obtaining said

permit, the fees herein specified shall be tripled. The payment of such triple fees shall not relieve any persons from fully complying with the requirements of this Ordinance in the execution of the work, nor from any other penalties prescribed herein.

Article XI

VIOLATION AND PENALTY

11.1 VIOLATIONS

Any person, firm or corporation violating any of the provisions of this ordinance shall be deemed guilty of an offense and upon conviction thereof shall be punished as provided by (cite local law section regarding fine, jail time, or both). Each day's continuance of a violation shall be considered a separate offense. The owner of any lands or parts thereof, where anything in violation of this ordinance shall be placed or shall exist, and any person who may have assisted in the commission of any such violation, shall be guilty of a separate offense.

In any case in which any land is or is proposed to be used in violation of this ordinance or adopted amendment, the County Attorney may, in addition to other remedies provided by law, institute injunction, abatement or any appropriate action or actions to prevent, enjoin, or abate unlawful use. In addition, upon a finding by the Stormwater Management Division that any provisions of this ordinance has been violated, all development and building permits issued to the violator will be suspended until the violation has been corrected to the satisfaction of the Stormwater Management Division.

11.2 ENFORCEMENT

The County Administrator or his duly authorized representative shall be the Enforcing Officer. If the Enforcing Officer determines that a project is not being carried out in accordance with the approved Plan or if any project subject to this Ordinance is being carried out without a permit, he is authorized to:

a) Issue written notice to the applicant specifying the nature and location of the alleged noncompliance; with a description of the remedial actions necessary to bring the project into compliance within three (3) working days. Upon request, if weather or other mitigating circumstances prevent timely compliance, the County Representative may extend this three-day compliance period.

b) If remedial action is not completed within the compliance period, issue a Stop-Work-Order directing the applicant to cease and desist all or any portion of the work which violates the provisions of this Ordinance. The applicant shall then bring the project into compliance or be subject to immediate revocation of his permit and to penalties set forth in Section 11.1.

Any order issued pursuant to subparagraphs a) or b) above shall become final unless the person or persons named herein requests, in writing, an appeal hearing before the Santa Rosa County Board of Adjustment and Appeals no later than fourteen (14) days including Sundays and holidays,

after the date the Stop Work Order is served. Failure to act in accordance with the Order after receipt of written notice shall be grounds for revocation of the Permit.

11.3 INSPECTIONS

The owner shall arrange with the County Engineer for scheduling the following inspections:

a) Erosion and Sediment Control Inspection: as necessary to ensure effective control of erosion and sedimentation. Prior to land clearing control measures shall be installed and stabilized between any waters and any areas to be cleared.

b) Bury Inspections: prior to the burial of any underground drainage structure.

c) Final Inspection: when all work including installation of all stormwater management system facilities has been completed. After inspecting the work the enforcement officer shall approve it or notify the applicant in writing of any failure to comply with the requirements of the approved Permit. Any portion of the work which does not comply shall be corrected within 72 hours by the applicant, or be subject to the penalty provisions of Section 11.1.

11.4 PLAN ADHERENCE

The applicant shall be required to adhere to the Plan as approved and permitted. Any changes or amendments to the Plan must be approved by the Stormwater Management Department in accordance with the procedures set forth in Section 10 above. After completion of the project, the County shall require a signed and sealed State of Certification by a Registered Engineer that the project complies with the approved plans and specifications. Applicant shall grant access to the project to the County _____ so that necessary inspections can be completed in order to ascertain the compliance of the project with the requirements of this Ordinance.

Article XII

APPEALS

12.1

In case of dissatisfaction with an act or determination in the exercise of the authority granted herein to the County Departments charged with the administration of this ordinance, any person, firm or corporation shall have the right to appeal to the County Commission.

12.2 BOARD OF ADJUSTMENTS AND APPEALS

a) Makeup of the Board. There is hereby established a Board to be called the "Board of Adjustments and Appeals", whose members shall be appointed by the Board of County Commissioners which shall consist of: the County Attorney or his designee, the County Engineer, the County Planner, the County Building Official, a member of the Association of General Contractors of Northwest Florida, a member of the Home Builders Association of West Florida, a member of the insurance industry, a member-at-large from the construction industry, and an engineer. The County Attorney and County Planner shall be ex-officio, non-voting members of the Board of Adjustments and Appeals.

b) Term of office for appointed members shall be two years from date of appointment by the Board of County Commissioners. In the event an

appointed member is unable to serve his full term of office, the Board of County Commissioners shall nominate the representative for the unexpired portion of the term.

c) Four members of the Board shall constitute a quorum to make a recommendation to the Board of County Commissioners for varying any provisions of this Ordinance or in modifying an order of the County Engineer. Not less than four affirmative votes shall be required for each action. No Board member shall act in a case in which he has a personal interest.

d) The Board of Adjustments and Appeals may adopt their own rules and regulations for administrative procedures within the framework of the intent of this Ordinance.

The Board of Adjustments and Appeals shall hear any appeal from a decision of any administrative official enpowered under this Ordinance, and shall make recommendations on the appeal to the Board of County Commissioners.

Article XIII

BONDING

13.1

The Bonding requirements for subdivision and site plans shall include a cash escrows guarantee which would assure the County that emergency flood and erosion control measures could be taken by the County at the developer's expense if he did not initiate such action within such period as determined by the Stormwater Management Division. The amount of such bond will be determined by the Stormwater Management Division and will be held by the County until all drainage and erosion control meaures have been accepted by the County.

Article XIV

RELATIONSHIP TO OTHER ORDINANCES AND CHANGES

14.1 REPEAL OF CONFLICTING ORDINANCES

The following ordinances or parts thereof are hereby repealed:

_____

_____

_____

14.2 REVISION AND AMENDMENT

This Ordinance may be revised, amended or repealed by the the Board of County Commissioners at a regular or special meeting called for such purpose in accordance with the general law.

Article XV

EFFECTIVE DATE

In accordance with Section 15.66(2), Florida Statutes, a certified copy of this Ordinance shall be filed with Florida Department of State by the Clerk of the Board of County Commissioners within ten (10) days after enactment by said Board and shall take effect upon receipt of official acknowledgement from that office that this Ordinance has been filed.

PASSED AND ADOPTED by the Board of County Commissioners of Santa Rosa County, Florida, this _____, day of _____, 1987.

Board of County Commissioners
Santa Rosa County, Florida

_____
CHAIRMAN

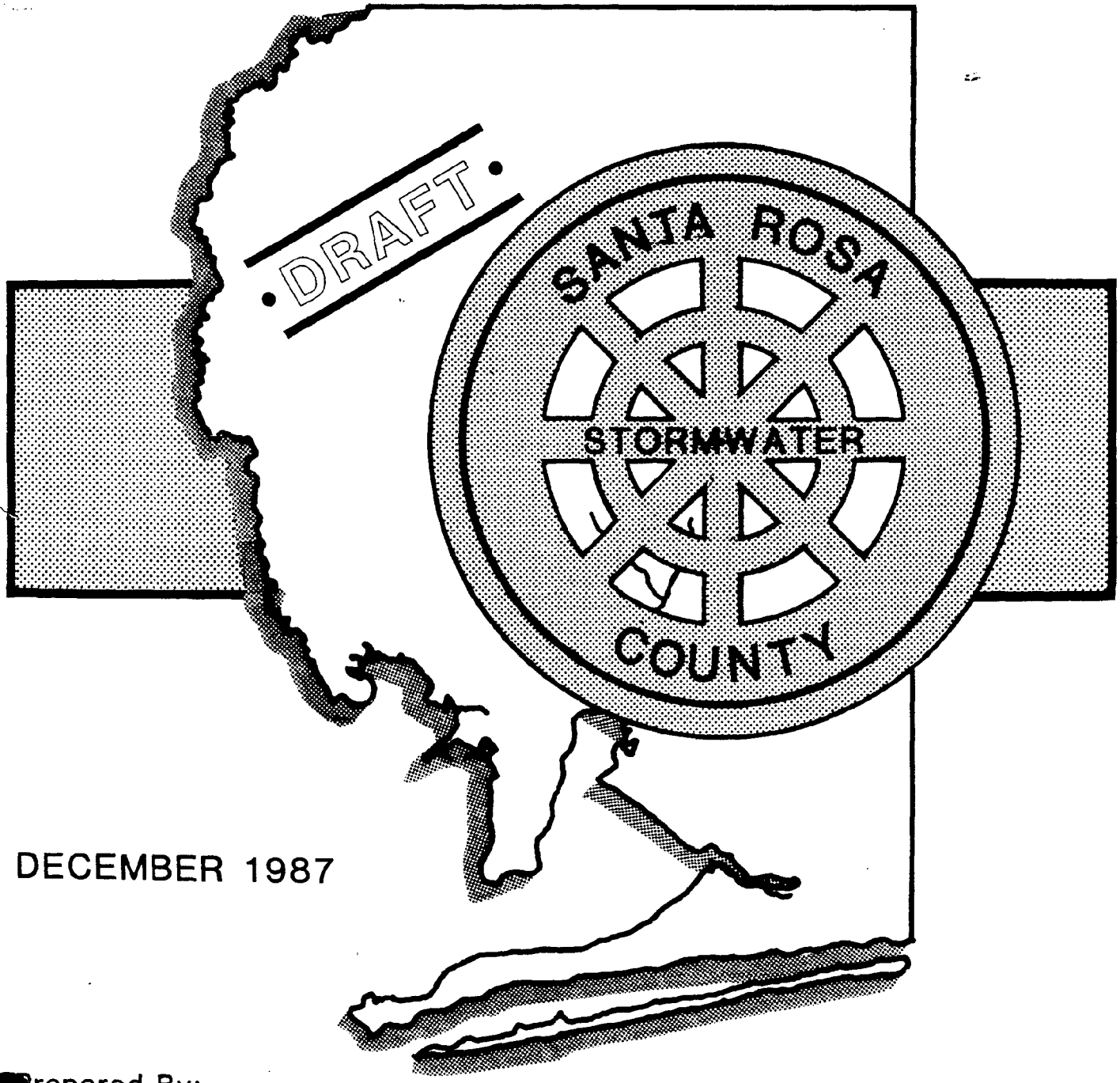
ATTEST:

BY: _____

(SEAL)

Jim #3-1

SANTA ROSA COUNTY STORMWATER ENGINEERING TECHNICAL MANUAL



DECEMBER 1987

Prepared By:

JOHNSON/CREEKMORE/FABRE
CONSULTING ENGINEERS

In Association With:

DRC

SANTA ROSA COUNTY
COMPREHENSIVE STORMWATER DEVELOPMENT PLAN

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SECTION ONE

Section 1

INTRODUCTION

1.1 BACKGROUND

The County of Santa Rosa has retained Johnson/Creekmore/Fabre (J/C/F) and Post, Buckley, Schuh & Jernigan, Inc., (PBS&J), to prepare the County's Comprehensive Stormwater Development Plan. Funding is being provided by the State of Florida through a grant from the Department of Environmental Regulatio administered by the Department of Community Affairs, Division of Resource Planning and Management.

The recently enacted Chapter 9J-5 F.A.C. outlines the minimum criteria requirements of the Local Government Comprehensive Plans and Determination of Compliance Act (Chapter 163, F.S.). The Act generally requires, with respect to stormwater, that an appraisal of a municipal entity's existing system be made, and, based upon projections of future land use, an assessment of future needs. In conjunction with this assessment, Chapter 9J-5 requires that a capital improvement plan be devised with funding means for the necessary stormwater construction improvements.

1.2 PURPOSE AND SCOPE

The purpose of this study is to create a plan which will generally meet the minimum requirements of State's Comprehensive Plan, commonly called the

Growth Management Act, with regard to stormwater and also provide a vital ongoing planning and implementation tool for satisfying Santa Rosa County's stormwater needs.

The work tasks break down into four categories. They are 1) goals, objectives and policies, 2) a stormwater ordinance, 3) existing drainage facility inventory and 4) an assessment of drainage problems including solutions, priorities, costing and implementation incorporating a capital improvements funding program.

The scope of this study is county-wide with regard to goals and ordinances but is generally limited to developed portions of the county with regard to problem assessments listed above.

1.3 AUTHORIZATION

The Board of County Commissioners of Santa Rosa County, Florida approved and the contract for a Comprehensive Stormwater Development Plan dated January 16, 1987.

SECTION TWO

Section 2

DATA COLLECTION

2.1 GENERAL

To obtain an overview of the existing environments in Santa Rosa County, as much data was readily available was obtained and reviewed. This included published reports on climatological data, topography and terrain mapping, roadway network maps, FEMA flood maps and local stormwater management regulations.

2.2 REGULATIONS

Two state entities are responsible for stormwater/surface water regulations within Santa Rosa County. The Northwest Florida Water Management District (NWFWMD) is primarily concerned with surface water management. NWFWMD requires permits to construct works which may:

- Divert or impound water and which are 25 feet or more in height from the natural bed of the watercourse.

- Will have an impounding capacity of 100 acre-feet or more; will remove water from a water body with an impounding capacity of 100 acre-feet or more by means of levees, fills, or canals.

- Which reroute, restrict, or alter a stream which drains an area exceeding five square miles.

All other surface water management works are either exempt or have been issued general permits. The rules of NWFWMD have been the least complex and most limited of all the water management districts within the State.

The Department of Environmental Regulation (DER) regulates stormwater runoff and its impact on receiving waters through Chapter 17-25 F.A.C. The DER requires as a minimum that the discharges of new stormwater sources design discharges to attain certain treatment levels and notify the Department 30 days prior to construction activities. There are exemptions from this rule which involve small residential projects and agricultural and silvicultural activities.

The Florida Department of Transportation (FDOT) has recently promulgated a comprehensive drainage criteria manual pursuant to Chapter 14-86 F.A.C. which must be adhered to for new development or redevelopments that discharge into or through State road rights-of-way. The FDOT manual outlines policies, facilities design criteria and procedures and hydraulic theory which is to be used for the regulation or analysis and design.

The United States Environmental Protection Agency (EPA) has general regulatory purview for water quality in streams, lakes and estuaries throughout the State. EPA has developed the National Pollutant Discharge Elimination System (NPDES) for regulating point source discharges through monitoring and

permitting. In the last few years EPA has been bringing the NPDES permitting process to bear on stormwater discharges and, in the future, this program may well dictate the extent of attenuation and treatment required from stormwater discharges in the County.

Santa Rosa County does have a Flood Plain Management Ordinance (75-04) which regulates development of low-lying flood hazard areas as its primary objective. This ordinance, however, is construction specific and does not deal with attenuation of new stormwater flow which can produce increased flooding levels. This is an area of concern that currently lacks regulation. Part of the intent of this study is to develop quantities for a more comprehensive stormwater management ordinance.

2.3 DRAINAGE FACILITY INVENTORY

A Drainage Facility Inventory was conducted to help assess drainage problems within the county. Location, condition and capacities of the over 430 stormwater structures were documented. This inventory concentrated on major conduits due to the limited funds available for field work. Major structures were defined as conduits of 30" diameter (or equivalent) in size or larger.

J/C/F, through published mapping, identified conduit locations and then field verified each structure and determined its size. If a pipe met the size criterion it was recorded and assigned a structure number. All field verified structures were located on a general highway map which comprises the base sheets of the stormwater atlas.

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2.4 STORMWATER ATLAS

The County was divided into ten basins and 67 subbasins using USGS 7.5' quadrangle maps to determine drainage basins and subbasins. Each basin was given a name based on its proximity to a major waterbody or conveyance and each subbasin was likewise named for its major watercourse. In some instances two or more subbasins are identified by the same name but have different numbers assigned.

The next step was to convert each field assigned structure number into a discrete nomenclature so its loction could be readily identified. A seven digit number was assigned to each structure in the following style:

Structure Number AABB-CDD

AA - Denotes Basin

BB - Denotes Subbasin;

C - is a qualifier where 0-8 denotes the structure is on a major watercourse and 9 denotes a structure on a non-defined watercourse; and

DD - Denotes the structure number, usually by increments of five.

Using this numbering system, the drainage atlas was completed which divided the County into six map sheets disregarding the drainage divides. Superimposed on these map sheets were the drainage divides with structure locations identified. Appendix "A" contains a copy of the drainage atlas.

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2.5 HYDROLOGIC DATA

Three primary sources were drawn upon for hydrologic data collection. They are the USDA Soil Conservation Service (SCS), the U.S. Geological Survey and (USGS), the U.S. Department of Commerce, National Oceanic and Atmospheric Administration (NOAA).

The SCS published a comprehensive document entitled Soil Survey, Santa Rosa County, Florida (1980) which identifies, by aerial interpretation and field investigation, the types of soils present within the County and presents their engineering properties. This documents presents valuable data with regard to runoff and ground water recharge.

The USGS, in addition to publishing one inch = 2000 feet scale quadrangle maps with five foot interval contours, collects and publishes water resource data for Santa Rosa County. Volume four, the Northwest Florida Edition of the Water Resources Data, Florida, Water Year 1985, has recorded information on seven wells and two stream gaging stations (Escambia River and Big Cold Water Creek). No lake gaging stations are presently monitored by the USGS in Santa Rosa County.

Lastly, NOAA is responsible for monitoring and documenting climatological data with published data for stations located in Pensacola and Milton. Information includes temperature and precipitation presented by normals, means and extremes.

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2.6 HYDRAULIC DATA

The primary source of hydraulic data is the Federal Emergency Management Agency's Flood Insurance Study for Santa Rosa County. The study, published in 1985, addresses flood problems in the County's extensive riverine and coastal areas. Flood profiles were determined for the Escambia, Yellow, Blackwater and East Bay Rivers. This study was incorporated into the Flood Plain Management Ordinance.

2.7 HISTORICAL FLOODING

Santa Rosa County does not have a formal flood complaint tracking system. Major flood events, particularly hurricanes, have been generally documented. As for more frequent flooding, the County Road Department has identified areas which are particularly susceptible to flooding. These areas are attributed to alteration of drainage patterns and inadequate treatment of runoff due to development.

SECTION THREE

Section 3

GOALS, OBJECTIVES AND POLICIES

3.1 GENERAL - GOALS PHILOSOPHY

Santa Rosa County's population is average in number when compared with other counties in Florida and is one of the larger in physical size although it ranks fifteenth statewide. A significant portion of the County will remain undeveloped due to the controlled public ownership associated with the Backwater River State Forest and the numerous military bases.

Population growth in the County is predicted to continue at the average state growth rate. This would indicate that tax base cannot be expected to provide significant additional funding in the future without a significant millage rate increasd and would therefore impact goal development and attainment.

The County will have to develop methods to control and direct growth with a minimum of expenditure of funds. The goals formulated in this Section take that into consideration along with the fact that even though state-of-the-art methods can be implemented in Santa Rosa County in the same fashion that they are used in metropolitan population centers with vastly greater funding sources, the County cannot expect to replicate their stormwater management programs with their current revenue base.

The stormwater needs for Santa Rosa County can be broken into three components stemming from the protection of the health, safety and welfare of the public. The three areas are flooding, pollution and funding to prevent or mitigate the first two.

Pollution is addressed in this report from the perspective of stormwater runoff only. Two other water pollution sources that must be addressed by the County and State are wastewater and industrial/commercial.

3.2 SPECIFIC SUPPORTING GOALS

Goal I: Protect people and property from the hazards of flooding.

Objective I-A: Assure the health, safety and welfare of the public from both direct and indirect effects of uncontrolled flooding.

Policies:

- Prohibit any development activity that would potentially endanger lives and/or have an adverse effect on property, water discharge quality or quantity, or valued environmental systems as a result of alteration of existing structures and natural drainage systems.

- Assure that designated natural drainage corridors are maintained in an open and unobstructed condition in order to conserve their function and prevent flooding.

- Require developers of industrial sites, subdivisions and PUD's to provide stormwater retention systems to minimize flooding (and non-point source pollution).

- Assure that flood plain uses are consistent with approved land use plans for the flood plain areas and are coordinated with plans for the total community.

- Regulate use of flood plains for development, fill, dumping, storage of materials, structures, buildings, utilities, or any other work which acting alone or in combination with other existing or future uses will increase flood heights and velocities, upstream or downstream from proposed use, by obstructing flows and reducing storage. Discourage development in areas subject to flooding problems.

- Regulate development which may, when acting alone or in combination with other developments, create a demand for public investment in flood-control works by requiring protection against flood damage at the time of initial construction and afterwards.

- Ensure that the design of the drainage system will be consistent with good engineering practice and design through the adoption and periodic updating of a comprehensive drainage criteria and procedures manual.

- Utilize existing channel capacity for routing flood flows before using on-site storage or other structural measures to provide treatment and flow attenuation.

- Provide for public education of the causes and potential for flooding.

- Provide a means of placing potential owners, builders, developers, and the general public on notice of existing and potential flood hazards.

- Administer the FEMA regulatory program requirements of local communities and adopt the FIRM flood plain and floodway delineation mapping in the absence of site specific study mapping.

Goal II: Minimize the adverse impacts of stormwater runoff on the surface and groundwater resources of Santa Rosa County.

Objective IIA: Take all necessary action to protect all waters and specially designated waters. As Santa Rosa County has been afforded special water quality protection by virtue of Outstanding Florida Waters (O.F.W.) designations to the Blackwater River and the Gulf Islands National Seashore and Aquatic Preserve (A.P.) status to Yellow River Marsh and Fort Pickens State A.P., all reasonable efforts should be made

to continue cooperation toward, and enforcement of, the intent of these designations.

Policies:

- Prevent stormwater runoff from degrading water quality below those levels prescribed by statute, rule and regulation.

- Prevent sewage or industrial effluent from degrading water quality as above.

Objective II-B: Protect the fish and shellfish environments of the sound, bays, estuaries, and waterways of the County, and as far as practicable, adjoining counties.

Policies:

- Create through ordinance proscriptive laws to regulate water degradation.

- Implement enforcement program.

- Cooperate with Escambia and Okaloosa Counties to assure area-wide compliance.

- Require that stormwater runoff be treated to reduce the load of pollutants carried into receiving waters.

o Protect and maintain natural salinity level in estuarine areas.

Objective II-C: Protect the functions of natural groundwater quality and recharge.

Policies:

o Discourage development practices which create over-drainage of land and soil.

o Encourage on-site detention and/or retention facilities in upland areas.

Objective II-D: Protect the functions of natural drainage systems.

Policies:

o Regulate land use and development to protect natural drainage systems.

o Protect natural resource systems which attenuate runoff quantity and/or quality.

o Mandate that all new development or redevelopment not adversely impact water quality.

o Encourage development which beneficially impacts natural features and resources including preservation of storage capacities.

- o Maintain all natural drainage systems in as natural a condition as possible.

- o Provide for development of areas with minimum adverse effects to the natural environment.

Goal III: Develop the full potential of the existing stormwater system and system financing methods and explore new financing avenues.

Objective III-A: Remedy existing facility deficiencies.

Policies:

- o Define suitable levels of service criteria.

- o Identify existing problems.

- o Prioritize identified problems.

- o Implement C.I.P. program with funding.

- o Ensure, as far as possible, an efficient drainage system that will not result in excessive public or private moneys being used for maintenance and replacement of portions of the system.

- o Minimize public and private property damage resulting from erosion, sedimentation, flooding and excessive maintenance requirements.

- o Require temporary and permanent erosion and sediment control measures to protect individuals occupying land adjacent to and downstream from proposed developments from being damaged by sediment originating from within or because of proposed development.

Objective III-B: Maintain existing facility capacities.

Policies:

- o Determine existing capacities of all major conveyance systems.

- o Devise, develop and revise, as necessary, a suitable O&M criteria and work program to maintain the existing facilities in optimum conditions.

- o Implement program.

Objective III-C: Coordinate up-grading and expansion of major facilities to meet the adopted level of service standards and to provide for future needs.

Policies:

- o Identify current facility needs to meet the adopted level of service standard.

- o Identify future facility needs.

- o Prioritize identified facility needs.

- o Implement C.I.P. program with funding.

- o Reduce capital expenditures for flood proofing and storm drainage systems where feasible by routing runoff through swales or other natural retention/detention systems to increase stormwater infiltration, settle suspended solids and remove pollutants.

Objective III-D: Encourage developer participation in upgrading deficient drainage systems as impacted by their projects.

Policies:

- o Publish an assessment of problem areas within the County.

- o Set standards for participation in joint developer/County projects to provide suitable outfalls for new development and maintenance of suitable conveyance in existing facilities.

Objective III-E: Coordinate stormwater management programs with other public works projects to derive the maximum use from budget dollars.

Policies:

- New road projects should incorporate suitably detailed drainage studies using appropriate evaluation methods to ensure the proper sizing of new and replacement structures, demonstration of both upstream and downstream impacts, and site specific delineation of flood plain boundaries.

- The Planning Department should work with public works in zoning and land use matters to determine whether certain areas have adequate drainage facilities or are part of or need to be part of future drainage projects.

SECTION FOUR

Section 4

BASIN CHARACTERIZATION

4.1 BASIN DELINEATION

One of the initial steps in reviewing and establishing the physical setting for all basins involves the careful evaluation and interpretation of the topographic features of each basin. The topography of the basins in Santa Rosa County is such that smaller, well defined subbasins can be identified. These subbasins are formed by a combination of natural and man-made features which include ridges, depressions and highways.

The procedure generally used for the delineation of watersheds involved successive stages of basin identification and refinement. It is a procedure best begun on a large scale where major basin divides are identified by the reach of the tributary water courses. Once the major basin divides are determined, the process of identifying and delineating the smaller tributary basins, which further subdivide the major basins, requires assessment of natural topographic features and manmade improvements. The discretization of individual major and minor subbasins requires detailed examination may also require field investigations in the study area.

The nature and physical characteristics of the watersheds within the County have been altered during the last century through man's attempt to utilize and control available water resources. Benefits of these works are improved

public health and safety and the availability of water related livelihoods for the citizens for Santa Rosa County.

4.2 BASIN ASSESSMENT

The basin planning assessment is intended to provide a comprehensive overview of the ten basins in Santa Rosa County. The evaluation covers such topics as physical setting, basin and subbasin delineations and drainage complaints. The discussions of physical setting provides an overview of he general patterns and direction of drainage in the subbasins and basins. Review of drainage complaints discussed with County staff and investigated in the field is addressed and recurring chronic problems are reviewed and categorized.

J/C/F made an assessment of problem areas, within the urban areas, which resulted in the identification of 47 different problem areas. The problems ranged from lack of adequate drainage systems to erosion. In some cases the problems involve structure flooding. Of the 47 identified areas, twelve are clustered on the west end of the peninsula near Gulf Breeze. Other locations with general problems are the Floridatown and Dickerson City areas. The majority of the problems exist in the southern portion of the County where land development activities have been historically focused.

The remaining problem areas are scattered throughout the County and range from coastal to inland water course flooding, again mostly caused by inadequate systems. Other problems may exist throughout the County but have not been

recorded by County staff. This observation is particularly valid in the State forest and other military bases.

Sections 4.2.1 through 4.2.10 provides an overview through a basin by basin discussion.

4.2.1 Escambia River Basin

The Escambia River Basin is located in the western portion of Santa Rosa County and the river forms the county line between Santa Rosa and Escambia Counties. The river originates in Alabama and approximately one-mile south of Florida-Alabama state line. The Conecuh River and Escambia Creek join to form the Escambia River. The river flows south and enters the Gulf of Mexico through Escambia and Pensacola Bays. The river flows approximately 57 miles through Santa Rosa County and the basin covers approximately 4,200 square miles of which only 10% is located in Florida. Of the some 420 square miles located in Florida only 38% or approximately 160 square miles are in Santa Rosa County. The average flow of the river is 6,500 cfs; however, the flow rate is highly variable. During periods of low flow, a saltwater wedge penetrates as much as 8 miles upstream.

The basin is divided into six (6) subbasins which have the following characteristics:

BASIN/ SUBBASIN	AREA (SQ MI)	UPSTREAM AREA (SQ MI)	CHANNEL LENGTH MI)	AVERAGE* WIDTH	NUMBER OF INVENTORIED STRUCTURES
ESCAMBIA RIVER BASIN**					
01-01	25.27	25.27	8.0**	3.2	17
01-02	20.34	20.34	4.0**	5.1	11
01-03	33.52	33.52	7.0**	4.8	4
01-04	25.92	25.92	10.0**	2.6	10
01-05	29.77	29.72	4.0**	7.4	-0-
01-06	25.23	25.23	3.0**	8.0	12
SUBTOTAL	160.1				

*Average width of channel bottom.
**Cumulative upstream area and basin extends beyond Santa Rosa County.

The Escambia River Basin is very rural in nature with very low intensity land use, which is primarily forest and agriculture. Portions of the towns of Jay and Pace are located within this basin.

4.2.2 Escambia Bay Coastal Basin

The Escambia Bay Coastal Basin is located in the southwestern portion of Santa Rosa County and is the point of inflow for the Escambia River into Escambia Bay. This coastal basin is 40.5 square miles in size and is divided into two (2) subbasins of 18.28 and 22.23 square miles.

The basin is divided into two (2) subbasins which have the following characteristics:

BASIN/ SUBBASIN	AREA (SQ MI)	UPSTREAM AREA (SQ MI)	CHANNEL LENGTH (MI)	AVERAGE* WIDTH	NUMBER OF INVENTORIED STRUCTURES
ESCAMBIA BAY COASTAL BASIN					
02-01	18.28	18.28	4.0	4.6	24
02-02	22.23	22.23	3.5	6.4	32
SUBTOTAL	40.5				

*Average width of channel bottom.

The Escambia Bay Coastal Basin is the most urban in nature with single family residential being the predominate land use. Additionally there are areas of medium and medium-high density residential, planned business, a small area of federal and some agricultural lands. The town of Pace is the primary population center in this basin.

4.2.3 Pond Creek Basin

The Pond Creek Basin is located in the west-central part of Santa Rosa County and is 99.6 square miles in size. The basin is completely contained in Santa Rosa County and flows south for approximately 20 miles before entering Blackwater Bay just below the town of Milton. The average flow in Pond Creek, at a point approximately 10 miles upstream from its mouth, is 79.6 cfs.

The basin is divided into five (5) subbasins which have the following characteristics:

BASIN/ SUBBASIN	AREA (SQ MI)	UPSTREAM AREA (SQ MI)	CHANNEL LENGTH (MI)	AVERAGE* WIDTH	NUMBER OF INVENTORIED STRUCTURES
POND CREEK BASIN					
03-01	13.35	99.58	5.0	2.7	14
03-02	15.00	86.23	3.5	4.3	9
03-03	33.19	71.23	6.0	5.5	21
03-04	20.25	38.04	3.0	6.8	4
03-05	17.79	17.79	2.0	8.9	6
SUBTOTAL	99.6				

*Average width of channel bottom.

Land use in the Pond Creek Basin is fairly evenly divided between agriculture and single family residential uses with some small areas of medium density residential and commercial.

4.2.4 East Bay Coastal Basin

The East Bay Coastal Basin is located in the south central and southeastern part of Santa Rosa County. The basin fronts on Blackway Bay, East Bay and a small subbasin which is in the extreme southwest fronts on Pensacola Bay. This coastal basin is 90.1 square miles in size and is divided into eleven (11) subbasins which range in size from 2.64 square miles up to 21.76 square miles. The following table lists the basins and subbasin characteristics:

BASIN/ SUBBASIN	AREA (SQ MI)	UPSTREAM AREA (SQ MI)	CHANNEL LENGTH (MI)	AVERAGE* WIDTH	NUMBER OF INVENTORIED STRUCTURES
EAST BAY COASTAL BASIN					
04-01	16.31	16.31	3.0	5.4	14
04-02	2.64	2.64	1.0	2.6	5
04-03	7.62	7.62	1.0	7.6	3
04-04	3.35	3.35	1.5	2.2	9
04-05	4.07	4.07	1.3	3.1	-0-
04-06	5.99	5.99	2.0	3.0	-0-
04-07	7.46	7.46	4.0	1.9	-0-
04-08	21.76	21.76	4.0	5.4	6
04-09	12.57	12.57	2.2	5.7	17
04-10	4.59	4.59	0.4	11.5	3
04-11	3.69	3.69	NA	NA	-0-
SUBTOTAL	90.1				

*Average width of channel bottom.

The East Bay Coastal Basin is heavily urbanized with single family and medium density residential being the primary land uses. In the southeastern portion of the basin, four subbasins include large sections of the Eglin Wildlife Management Area in their land uses.

4.2.5 Blackwater River Basin

The Blackwater River Basin originate north of Bradley, Alabama and the Blackwater River flows south approximately 58 miles before entering Blackwater Bay in Santa Rosa County. The river flows through portions of Santa Rosa and Okaloosa Counties draining about 860 square miles of which 109.2 square miles are in Santa Rosa County. The average discharge of the Blackwater River is approximately 400 cfs, at a location some 35 miles upstream of the mouth. Groundwater provides the principle source of water in this system. Salt water encroachment has been reported six

miles upstream from the mouth of the river. Major tributaries of the Blackwater River include Big Juniper Creek, Coldwater Creek and Pond Creek. The basin is divided into seven (7) subbasins which have the following characteristics:

BASIN/ SUBBASIN	AREA (SQ MI)	UPSTREAM AREA (SQ MI)	CHANNEL LENGTH (MI)	AVERAGE* WIDTH	NUMBER OF INVENTORIED STRUCTURES
BLACKWATER RIVER BASIN**					
05-01	19.66	109.17	4.0	4.9	13
05-02	21.97	21.97	7.5	2.9	16
05-03	8.09	89.51	3.5	2.3	2
05-04	13.42	59.45	3.5	3.8	3
05-05	23.56	46.03	7.0**	3.4	6
05-06	9.60	22.47	3.0**	3.2	-0-
05-07	12.87	12.87	8.0**	1.6	2
SUBTOTAL	109.2				

*Average width of channel bottom.
**Cumulative upstream area and basin extends beyond Santa Rosa County.

Land use in the Blackwater River Basin is divided between state lands, agriculture and single family residential. The lower end of the basin contains medium density residential, some planned business and industrial areas and the City of Milton.

4.2.6 Coldwater Creek Basin

The Coldwater Creek Basin is located in central and north-central Santa Rosa County and is the largest basin with 232.3 square miles. Coldwater Creek is tributary to the Blackwater River and has an average flow of 533 cfs as recorded 3 miles upstream from its junction with the Blackwater River. The basin is divided into twelve (12) subbasins which range in size from 5.42 square miles to 32.31 square miles in size. The twelve subbasins have the following characteristics:

BASIN/ SUBBASIN	AREA (SQ MI)	UPSTREAM AREA (SQ MI)	CHANNEL LENGTH (MI)	AVERAGE* WIDTH	NUMBER OF INVENTORIED STRUCTURES
COLDWATER CREEK BASIN**					
06-01	9.70	232.27	3.0	3.2	9
06-02	5.42	222.57	2.0	2.7	-0-
06-03	6.55	6.55	2.5	2.6	1
06-04	18.87	210.68	3.5	5.4	2
06-05	32.31	80.12	10.0	3.2	7
06-06	20.33	20.33	7.0**	2.9	-0-
06-07	27.48	27.48	7.0**	3.9	1
06-08	28.84	111.61	6.0	4.8	18
06-09	18.12	18.12	7.5	2.4	7
06-10	25.17	64.65	5.0	5.0	17
06-11	16.69	38.48	1.0	16.7	3
06-12	22.79	22.79	8.0**	2.8	10
SUBTOTAL	232.3				

*Average width of channel bottom.
**Cumulative upstream area and basin extends beyond Santa Rosa County.

Land use in the Coldwater Creek Basin is primarily agriculture and state lands (Blackwater River State Forest) with some single family residential in the south end of the basin and in the north around the town of Jay. In the north end of the basin there are three (3) small areas designated as commercial land use.

4.2.7 Big Juniper Creek Basin

The Big Juniper Creek Basin is located in north east Santa Rosa County and is 131.9 square miles in size. Big Juniper Creek is tributary to the Blackwater River and has an average flow of 220 cfs at a point 8.3 miles upstream from its junction with the Blackwater River. The basin is divided into eleven (11) subbasins which range in size from 4.81 square miles to 19.62 square miles in size. The eleven (11) subbasins have the following characteristics:

BASIN/ SUBBASIN	AREA (SQ MI)	UPSTREAM AREA (SQ MI)	CHANNEL LENGTH (MI)	AVERAGE* WIDTH	NUMBER OF INVENTORIED STRUCTURES
BIG JUNIPER CREEK BASIN**					
07-01	4.81	131.87	3.0	1.6	4
07-02	10.85	10.85	6.0	1.8	-0-
07-03	10.74	116.21	3.0	3.6	1
07-04	17.33	105.47	3.5	5.0	5
07-05	6.77	37.98	1.5	4.5	3
07-06	11.59	31.21	2.0	5.8	9
07-07	19.62	19.62	8.0**	2.5	10
07-08	12.83	50.16	2.5	5.1	5
07-09	11.37	37.33	2.2	5.2	1
07-10	11.25	25.96	3.0	3.8	-0-
07-11	14.71	14.71	6.0**	2.5	-0-
SUBTOTAL	131.9				

*Average width of channel bottom.
**Cumulative upstream area and basin extends beyond Santa Rosa County.

Land use in this basin is agriculture and state lands (Blackwater River State Forest) and would not be expected to change anytime in the near future.

4.2.8 Yellow River Basin

The Yellow River Basin originates in Covington County, Alabama and flows southward for approximately 92 miles emptying into Blackwater Bay in south-central Santa Rosa County. The Yellow River Basin drains roughly 860 square miles located in Santa Rosa County. The rate of flow for the Yellow River (40 miles above the mouth) averages 1,500 cfs. The basin is divided into five (5) subbasins which have the following characteristics:

BASIN/ SUBBASIN	AREA (SQ MI)	UPSTREAM AREA (SQ MI)	CHANNEL LENGTH (MI)	AVERAGE* WIDTH	NUMBER OF INVENTORIED STRUCTURES
YELLOW RIVER BASIN**					
08-01	25.84	118.64	7.0	3.6	4
08-02	16.67	93.60	2.0	8.3	7
08-03	28.55	28.55	8.0**	3.6	-0-
08-04	25.61	48.38	4.0	6.4	3
08-05	22.77	22.77	5.0**	4.6	4
SUBTOTAL	118.6				

*Average width of channel bottom.
**Cumulative upstream area and basin extends beyond Santa Rosa County.

Land use in the Yellow River Basin is primarily forest, federal lands, agriculture and preservation lands and in the lower end of the basin, some areas of single family residential use.

4.2.9 East Bay River Basin

The East Bay River Basin is located in the southeastern corner of Santa Rosa County and is 19.4 square miles in size making it the smallest basin in the County. The East Bay River flows west from the Okaloosa County line approximately 4.5 miles before emptying into the east bay.

The basin is divided into two (2) subbasins which have the following characteristics:

BASIN/ SUBBASIN	AREA (SQ MI)	UPSTREAM AREA (SQ MI)	CHANNEL LENGTH (MI)	AVERAGE* WIDTH	NUMBER OF INVENTORIED STRUCTURES
EAST BAY RIVER BASIN**					
09-01	7.22	19.42	2.5	2.9	1
09-02	12.20	12.20	2.0**	6.1	-0-
SUBTOTAL	19.4				

*Average width of channel bottom.
**Cumulative upstream area and basin extends beyond Santa Rosa County.

The primary land use in this basin is federal lands (Eglin Wildlife Management Area) and some large areas of single family residential and some small areas of medium density residential, commercial and industrial.

4.2.10 Santa Rosa Sound Coastal Basin

The Santa Rosa Sound Coastal Basin is the southern most basin in Santa Rosa County. The basin fronts on Santa Rosa Sound and includes a small portion of the City of Gulf Breeze which is located on the west end of the basin. The basin is 22.5 square miles in size making it one of the smallest in the County.

The basin is divided into four (4) subbasins which have the following characteristics:

BASIN/ SUBBASIN	AREA (SQ MI)	UPSTREAM AREA (SQ MI)	HANNEL LENGTH (MI)	AVERAGE* WIDTH	NUMBER OF INVENTORIED STRUCTURES
SANTA ROSA SOUND COASTAL BASIN					
10-01	1.68	1.68	NA	NA	-0-
10-02	8.72	8.72	0.5	17.4	11
10-03	8.90	8.90	2.0	4.5	15
10-04	3.19	3.19	1.0**	3.2	12
SUBTOTAL	22.5				

*Average width of channel bottom.
**Cumulative upstream area and basin extends beyond Santa Rosa County.

The Santa Rosa Sound Coastal Basin is very urban in nature with single family residential being the single largest land use. There is also medium density and medium-high density residential as well as strip commercial.

4.3 DRAINAGE PROBLEM OVERVIEW

As with most counties, Santa Rosa has specific drainage problems that have been created by any of a number or combination of reasons. Overdevelopment, urbanization without adequate drainage system upgrading, undersized systems, tidal surges, poorly maintained systems and inappropriate construction in flood plain and flood prone areas are problem sources.

Flooding needs to be characterized by severity level and frequency where adequate records are available. It is both impractical and exorbitantly expensive to design drainage systems to eliminate or prevent all flooding so it becomes necessary for the government to develop public policy of establishing a standard which describes how much flooding is acceptable. This can be done through defining levels of service. Levels of stormwater service are determined using four basic criteria

which are hazard to human life, structure flooding/damage, roadway flooding and yard flooding.

Typically, loss of life is associated with severe storm events and is usually related to hurricanes. With the advanced warning systems and evacuation administered through the National Weather Service and the Federal Emergency Management Agency, this high cost can be significantly reduced through use of preventative measures. Temporary evacuation is the best means of dealing with severe coastal flooding. This is not to say, of course, that sudden and severe freak events (no name storms) will not occur without warning, but prudent construction such as minimum elevations, anchoring and flood proofing will mitigate such damage.

For more common storm events, urban flooding may be divided into severity levels: Water contained within gutters or swales, water flooding right of way inhibiting or prohibiting transportation, water flooding yards and lastly water within buildings (structure flooding). Loss of life is always used as a criteria since it is not acceptable, nor are hazards such as potable water sources being contaminated from stormwater flooding.

Rural flooding is usually viewed differently than urban flooding because the value of rural property and structures is not as great and the consequences are usually not as intolerable. Rural citizens tend to take a more philosophical viewpoint and see flooding as a perennial occurrence.

4.4 RANKING METHODOLOGY

On a whole, the drainage problems in the County are not particularly severe, extensive in areal extent or large in magnitude. Only four areas have reported structure flooding. Individual flooding problems are summarized in Table 4-1.

Flooding problems were broken down into seven categories which helped determine the ranking system as follows:

Nature of Problem	Number of problems
Erosion	5
Inadequate (undersized) System	8
No Outfall	19
No Drainage Systems	11
Tidal Flooding	3
Sediment Build-Up	1

The level of severity of a flooding problem must be considered when developing a ranking system. Structure flooding generally receives the highest severity level with minor erosion representing the least severe problem. Table 4-2 ranks the relative severity level of nine different categories of problems.

The ranking system rationale is based on a combination of cost and ease of correction. After that, each rank can be further prioritized based upon such variables as passibility of roadways (by road classification) and value of properties protected.

TABLE 4-1

SUMMARY OF IDENTIFIED FLOODING PROBLEMS

PROBLEM NUMBER	BASIN/ SUBBASIN	LOCATION	PROBLEM DESCRIPTION	SEVERITY	PRELIMINARY PRIORITY	ESTIMATED COST
	Escambia River Basin					
1	01-05	1.5 miles west of S-164 and S-197 intersection	Structure Flooding	8	4	$30,000
2	01-05	1.3 miles west of S-164 and S-197 intersection	Ditch Erosion	1	45	$3,400
3	01-05	Sandy Hollow, 0.6 miles west of S-197	Ditch Erosion	1	46	$11,700
4	01-06	Camors Road @ end of existing pavement	Erosion	4	21	$81,500
5	01-06	2 miles west of High School	No Drainage Outlet	2	43	$5,400
					BASIN SUBTOTAL	$132,000
	Escambia River Coastal Basin					
6	02-01	Charles Street. 0.5 miles east of S-197	Low Area - Periodic Flooding	3	33	$30,600
7	02-01	Hamilton Lane	Yard/Street Flooding	6	8	$6,700
8	02-01	Floridatown Area	Yard/Street Flooding	7	7	$1,800,000
9	02-01	Todd Estates	Road Flooding	3	30	$25,000
10	02-02	Trout Bayou -Howard Circle	Yard/Street Flooding	6	9	$7,700
11	02-02	Angia Drive	Yard/Street Flooding - No Side Ditches	6	10	$10,300
12	02-02	Dolphin Road @ Raughton Road	Side Ditches Flood	3	28	$18,750
13	02-02	Pearson Road	Side Ditches Flood and do not Drain	3	36	$37,500
14	02-02	Holiday Lane and Raughton Road	Intersection Floods	5	14	$4,475
					BASIN SUBTOTAL	$1,941,025

PROBLEM NUMBER	BASIN/ SUBBASIN	LOCATION	PROBLEM DESCRIPTION	SEVERITY	PRELIMINARY PRIORITY	ESTIMATED COST
	Pond Creek Basin					
15	03-01	Santa Villa Area	Yard/Street Flooding	7	6	$437,500
16	03-02	Luther Fowler Road (Brifith to Evergreen)	Road Flooding	5	18	$40,700
17	03-05	Church on S-164	Church and Cemetery Flooding	9	1	$4,200
					BASIN SUBTOTAL	$482,400

PROBLEM NUMBER	BASIN/ SUBBASIN	LOCATION	PROBLEM DESCRIPTION	SEVERITY	PRELIMINARY PRIORITY	ESTIMATED COST
	East Bay Coastal Basin					
18	04-01	Highland Wood S/D	Street Flooding	3	25	$10,750
19	04-01	Hungaria Estates	Street Flooding	3	29	$24,500
20	04-01	S-191, 2 miles south of Whitaker Bayou	Road S-191 Floods	5	15	$8,975
21	04-01	S-191, 3 miles south of Whitaker Bayou	Road S-191 Floods	5	17	$23,400
22	04-01	Dickerson City	Inadequate Ditches and Culverts	3	35	$34,975
23	04-01	Hwy. 191-C	Water Standing in Ditches and Discharge affected by Tidal Fluc.	3	24	$7,800
24	04-02	Levon Street	Flooding - Ditches do not Drain	3	37	$38,610
25	04-03	Ward Basin Road	Sediment Build up on US-87 from Adjoining Clay Road	5	16	$18,750
26	04-08	Holley Pit Road	Clay Road Flooding	3	34	$33,000
27	04-09	Clay Circle	Flooding	3	26	$13,800
28	04-09	East Bay Heights S/D	Road and Yard Flooding	3	31	$25,875
29	04-10	Coral Strip Parkway	Pond and Road Flooding	3	39	$50,000
30	04-10	Whisper Bay Blvd.	Flooding	3	38	$40,000
31	04-10	Rosa Del Villa	No Drainage System	2	44	$21,500
32	04-10	Bay Ridge Estates	Structure/Yard Flooding	8	5	$32,500
33	04-10	Bal Alex Estates	Structure/Road/Property	8	3	$20,250
					BASIN SUBTOTAL	$404,685

PROBLEM NUMBER	BASIN/ SUBBASIN	LOCATION	PROBLEM DESCRIPTION	SEVERITY	PRELIMINARY PRIORITY	ESTIMATED COST
	Blackwater River Basin					
34	05-01	East Milton in existing S/D	Street Flooding	5	19	$59,000
35	05-03	East of Hwy. 87 and Hwy. 90 Intersection	Road Flooding	5	20	$59,625
					BASIN SUBTOTAL	$118,625
	Coldwater Creek Basin					
36	06-09	Hall Road, east of Hwy. 164	Erosion around Drainage Pipe Could Undermine Highway	1	47	$12,000
37	06-09	Hwy. 4 @ Jordan Road	Structure Flooding	8	2	$6,325
					BASIN SUBTOTAL	$18,325
	Yellow River Basin					
38	08-04	Shangrala S/D	Erosion in Drainage Ditch	3	40	$55,500
					BASIN SUBTOTAL	$55,500
	East Bay River Basin					
39	09-01	Navarre East S/D	Roadway Intersection Floods	3	22	$5,500
					BASIN SUBTOTAL	$5,500

PROBLEM NUMBER	BASIN/ SUBBASIN	LOCATION	PROBLEM DESCRIPTION	SEVERITY	PRELIMINARY PRIORITY	ESTIMATED COST
	Santa Rosa Sound Basin					
40	10-02	Villa East S/D	Street/Lot Flooding	6	12	$44,000
41	10-02	Woodlore S/D	Street/Lot Flooding	6	11	$30,000
42	10-02	Savannah Estates	Street/Lot Flooding	6	13	$111,000
43	10-02	Villa Venyae	Road Flooding	3	42	$34,000
44	10-02	Blue Herron Cove	Road Flooding	3	41	$64,500
45	10-02	Laurel Drive	Street and Pond Flooding	3	32	$30,500
46	10-04	Janet Street and Nina Street	Flooding	3	27	$16,750
47	10-04	Bandero S/D	Road Flooding	3	23	$6,875
					BASIN SUBTOTAL	$397,625
				GRAND TOTAL COST		$3,555,685

TABLE 4-2

SEVERITY LEVEL SUMMARY

Severity Level	Description of Problem	Number of Problems
9	Public Institution Structural Flooding	1
8	Privately Owned Structural Flooding	4
7	Neighborhood Non-Structural Flooding	2
6	Street and Yard Flooding	6
5	Major Street and Intersection Flooding	7
4	Major Erosion/Sedimentation	1
3	Minor Street Flooding	21
2	Closed Basin Flooding or Nuisance Tidal Flooding	2
1	Minor Erosion/Sedimentation	3

Erosion is critical because of the potential loss of property and improvements inherent to it. Inadequate or undersized systems presume adequate right-of-way which otherwise would take money and time to acquire and therefore can be less expensive and more quickly remedied than the situations of either no outfall or drainage system which presumes right-of-way easement acquisition.

Tidal problems are typically most difficult to correct because they involve low-lying land. In some instances, (one-way) flap gates can be installed but these types of solutions are subject to expensive maintenance problems and tampering by property owners.

4.5 PRIORITIZATION

The County's main drainage problems have been identified, characterized and must be prioritized. The County should review the problems in aggregate and decide to what extent they wish to act to remedy them over a finite time period.

SECTION FIVE

Section 5

DEVELOPMENT OF DESIGN STORM

5.1 GENERAL

The usual analytical methodology adopted for the design of stormwater management facilities is to evaluate the flooding conditions that would be caused by selected critical rainstorms. The same critical rainstorms are used to evaluate land use changes due to development within a basin. Because it serves as one of the major yardsticks for quantifying runoff rates and volumes, the rainstorm database is one of the most important factors in a stormwater master planning program. Consequently, selection of the critical design storm(s) requires careful evaluation.

5.2 DESIGN STORM CONCEPT

A synthetic design storm consists of a rainfall hyetograph (plot of rainfall intensity vs. time) which is based upon the characteristics of a number of historical rainstorms. The key assumption of the design storm approach is that the frequency of occurrence of the design storm and the calculated runoff peak are identical. For example, it is assumed that a 25-year design storm will produce a 25-year peak runoff event. This assumption is critical because of the difficulty in ascribing a frequency of occurrence to a rainstorm synthesized from portions of several historical storms, the importance of antecedent soil moisture conditions and initial lake levels in determining watershed response to a given rainfall event, and the statistical non-

homogeneity of rainfall and runoff data. However, the synthetic design storm concept is a theoretical method that continues to be the most widely used approach to stormwater management planning and drainage facility design.

5.3 DESIGN STORM COMPONENTS

The four facets which define a particular design storm are (1) the frequency of occurrence, (2) the storm duration, (3) the total volume of rainfall for the particular frequency and duration; and (4) the temporal distribution of that amount over the storm duration.

5.3.1 Rainfall Frequency

Stormwater planning studies have relied upon a range of design storm return periods (recurrence intervals), depending upon the area and the nature of the stormwater problem. For example, alternatives used within this region include design storms with 2-year, 5-year, 10-year, 25-year, 50-year, and 100-year return periods.

The 100-year flood event, which is the standard for FEMA's Federal Flood Insurance Program, is normally too stringent for a stormwater management master plan. Because it is such an infrequent and extreme event, the 100-year flood usually cannot be managed with traditional urban runoff controls. In the Santa Rosa County, it is likely that the majority of the streamflow peak and streamflow volume during the 100-year flood event are contributed by both urban and non-urban land uses during the frontal-type storms (i.e., long

duration and moderate rainfall intensity) which produce most 100-year events. Consequently, it is recommended that the stormwater master planning study should not rely upon a 100-year design storm as a performance standard for structural stormwater management facilities.

Nonstructural stormwater management alternatives such as floodplain management and regulatory policies should be evaluated on the basis of 100-year flood flows and it is recommended that the runoff control facilities designed for less extreme rainstorms should be tested with the 100-year design storm to ensure that the recommended runoff control plan does not aggravate the 100-year flood conditions. Presently, Santa Rosa County uses the 100-year flood elevation to determine minimum acceptable floor elevations for new development. Floodplain development regulations should also require that loss of storage and conveyance capacity within the 100-year floodplain, as the result of development activities, be compensated for by providing off-setting storage within the floodplain.

Similarly, the 50-year flood is also a rather extreme event which is likely to require extremely expensive control measures. The only facilities which are typically designed for a 50-year event are the Santa Rosa County and FDOT bridges and stream crossings. The 50-year high-water mark for small land-locked lakes may also be used as a sound standard for defining the floodplain in these basins.

The 25-year design storm tends to be the most commonly used "extreme" event for stormwater facility design in Florida. Santa Rosa County drainage

regulations should stipulate its use in design of external subdivision drainage facilities and detention basins. The justification typically given for selecting the 25-year event for stormwater facility design is that it is more conservative than the 10-year design storm typically used for local storm sewer design, but less conservative than the 50- and 100-year events which would require more expensive runoff control measures that would be used infrequently. Based upon a recent Army Corps of Engineers study of nation-wide flood damage data compiled by the Federal Insurance Administration (FIA), additional justification for selecting the 25-year flood event is now available. Using generalized relationships between flood depth and damages for different types of property and generalized elevation-frequency relationships for different severities of flood hazard, the significance of different flood return periods was evaluated. This study concluded that the average annual flood damages within the 25-year floodplain are very high, typically up to ten times greater than the damages associated with the incremental area between the 25-year and 100-year floodplains. This conclusion suggests that a 25-year design event is both a reasonable and defensible upper limit for a stormwater management facility design.

The 5- and 10-year storm events are appropriate design events for the design of closed storm sewer systems in urbanized drainage basins and subdivisions. The proposed stormwater regulations for Santa Rosa County stipulate the use of the 5-year design storm for both evaluation and design of these type of urban stormwater management facilities.

The 2-year flood event, generally described as the "mean annual flood", is typically equivalent to an open channel bankfull flow condition which will govern the cross-sectional area of the incised channel. If future development increases the 2-year flow, the stream channel will eventually be eroded until it reaches an equilibrium condition with a conveyance capacity equivalent to the 2-year flow. Thus, comparisons of pre-and post-development 2-year flows can be used to evaluate potential stream channel erosion impacts of future development.

5.3.2 Rainfall Duration

From various studies of past major rainfall events that have occurred in the southeastern portion of the United States, and in the northwest portion of Florida in particular, it is apparent that a large portion of the total rainfall of most major storms occurs within a 24-hour period. Water Management District regulations, excluding the NWFWMD, typically stipulate the use of a 25 year/24 hour duration design storm event for the design of stormwater detention ponds for new development. This requirement is dictated by the need to address the total volume of runoff from a design storm event of given frequency in the design of such facilities. Santa Rosa County stormwater regulations should be consistent with Water Management District regulations in this aspect.

From the design perspective for stormwater conveyances such as ditches, inlets, storm sewers, and culverts, it is the peak rate of runoff that is the critical design factor, not the total volume of runoff. Hence a shorter

duration storm event can be utilized in the evaluation and design of these facilities.

A 6-hour duration design rainfall is recommended for Santa Rosa County. In accordance with the design criteria for hydrologic studies which mandates that the duration of the design rainfall should be approximately equal to or greater than the time of concentration of the basin, a 6-hour duration should be sufficient for any application within the County for determination of design peak flow rates.

5.3.3 Rainfall Volume

Water Management Districts, excluding the NWFWMD, typically approve the use of the Department of Commerce's Technical Paper No. 40 as a reference for the design storm rainfall volume within the state. FDOT's new Drainage Manual (1987) utilizes this reference in addition to the more recent NOAA Technical Memorandum NWS HYDRO-35 "five to 60-Minute Precipitation Frequency for the Eastern and Central United States" publication to develop its set of rainfall intensity-duration-frequency (IDF) curves. Table 5-1 presents an appropriate set of IDF curves and design rainfall volumes for use within the County. These IDF curves were derived from these sources specifically for the Santa Rosa County.

5.3.4 Rainfall Distribution

Peak runoff rates for a small (less than 100 acres in size and less than 30-minute time-of-concentration) urban drainage basin can be determined using the Rational Method. This method requires only a design rainfall intensity which corresponds to the time-of-concentration at the design point for the specified design return period. Table 5-1 presents a set of rainfall intensity-duration-frequency (IDF) relationships for Santa Rosa County to be used in the Rational Method.

Since the Rational Method generates design peak flow rates, it is inappropriate to develop design storm hydrographs or determine runoff volumes. For these purposes, or for large basins (greater than 100 acres in size or longer than 30-minute time-of-concentration) an alternate methodology which uses unit hydrograph theory must be used. This method requires a design storm hyetograph which distributes a design storm rainfall volume over its duration at discrete time steps. Tables 5-2 and 5-3 present dimensionless design storm distributions for the design 24-hour and 6-hour duration storm events, respectively.

An example of a 24-hour storm distribution, listed in 30-minute increments, is the SCS Type II Florida - Modified Distribution; it is required for use in the design of stormwater detention and retention ponds per SWFWMD regulations. The 6-hour storm distribution is broken down into smaller, 10-minute time

TABLE 5-1

RAINFALL INTENSITY, IN/HR (VOLUME, IN.)

RETURN PERIOD, YEARS

DURATION	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR
5-min	6.60 (0.55)	7.45 (0.62)	8.15 (0.68)	9.10 (0.76)	9.95 (0.83)	10.80 (0.90)
10-min	5.70 (0.95)	6.45 (1.07)	7.10 (1.18)	8.00 (1.33)	8.70 (1.45)	9.50 (1.58)
15-min	4.90 (1.22)	5.55 (1.39)	6.10 (1.53)	6.90 (1.73)	7.55 (1.89)	8.20 (2.05)
20-min	4.30 (1.43)	5.00 (1.67)	5.50 (1.83)	6.35 (2.18)	7.00 (2.33)	7.60 (2.53)
30-min	3.55 (1.75)	4.20 (2.10)	4.70 (2.35)	5.40 (2.70)	6.00 (3.00)	6.55 (3.30)
45-min	2.80 (2.10)	3.35 (2.50)	3.70 (2.80)	4.35 (3.25)	4.85 (3.65)	5.30 (4.00)
1-hr	2.35 (2.35)	2.85 (2.85)	3.20 (3.20)	3.75 (3.75)	4.15 (4.15)	4.55 (4.55)
1.5-hr	1.80 (2.70)	2.25 (3.40)	2.50 (3.75)	2.90 (4.35)	3.20 (4.80)	3.55 (5.35)
2-hr	1.50 (3.00)	1.90 (3.80)	2.10 (4.20)	2.40 (4.80)	2.70 (5.40)	2.95 (5.90)
3-hr	1.10 (3.30)	1.40 (4.20)	1.60 (4.80)	1.80 (5.40)	2.05 (6.10)	2.25 (6.70)
4-hr	0.90 (3.60)	1.15 (4.60)	1.30 (5.20)	1.52 (6.10)	1.70 (6.80)	1.90 (7.60)
6-hr	0.68 (4.08)	0.87 (5.25)	1.00 (6.00)	1.17 (7.00)	1.30 (7.80)	1.45 (8.70)
9-hr	0.51 (4.60)	0.66 (5.95)	0.75 (6.75)	0.88 (7.90)	1.00 (9.00)	1.10 (9.90)
12-hr	0.42 (5.10)	0.54 (6.50)	0.62 (7.50)	0.73 (8.80)	0.81 (9.70)	0.91 (10.9)
18-hr	0.31 (5.60)	0.41 (7.40)	0.46 (8.30)	0.55 (9.90)	0.62 (11.2)	0.69 (12.4)
24-hr	0.25 (6.00)	0.33 (7.80)	0.38 (9.10)	0.45 (10.7)	0.50 (12.0)	0.57 (13.6)

SOURCES:

(1) NOAA Technical Memorandum NWS HYDRO-35, FIVE TO 60 MINUTE PRECIPITATION FREQUENCY FOR THE EASTERN AND CENTRAL UNITED STATES, 1977.

(2) Technial Paper No. 40, RAINFALL FREQUENCY ATLAS OF THE UNITED STATES FOR DURATIONS FROM 30 MINUTES TO 24 HOURS AND RETURN PERIODS FROM 1 TO 100 YEARS, 1961.

(3) STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION, DRAINAGE MANUAL, VOLUME 2, PROCEDURES, 1987.

tm:SANTA ROSA:Z

TABLE 5-2

DESIGN STORM RAINFALL DISTRIBUTION
24-HOUR DURATION STORM WITH 30-MINUTE TIME INCREMENT USING
SCS TYPE II FLORIDA - MODIFIED DISTRIBUTION

TIME, HRS.	ACCUMULATED FRACTION OF TOTAL 24-HOUR RAINFALL	INCREMENTAL FRACTION OF TOTAL 24-HOUR RAINFALL
0.0	0.000	0.000
0.5	0.006	0.006
1.0	0.012	0.006
1.5	0.019	0.007
2.0	0.026	0.007
2.5	0.034	0.008
3.0	0.042	0.008
3.5	0.050	0.008
4.0	0.059	0.008
4.5	0.068	0.009
5.0	0.078	0.010
5.5	0.088	0.010
6.0	0.099	0.011
6.5	0.110	0.011
7.0	0.122	0.012
7.5	0.135	0.013
8.0	0.149	0.014
8.5	0.164	0.015
9.0	0.180	0.016
9.5	0.200	0.020
10.0	0.224	0.024
10.5	0.253	0.029
11.0	0.289	0.036
11.5	0.343	0.054
12.0	0.593	0.250
12.5	0.689	0.096
13.0	0.731	0.042
13.5	0/763	0.032
14.0	0.789	0.026
14.5	0.811	0.022
15.0	0.829	0.018
15.5	0.844	0.015
16.0	0.858	0.014
16.5	0.871	0.013
17.0	0.883	0.012

TABLE 5-2
(Continued)

DESIGN STORM RAINFALL DISTRIBUTION
24-HOUR DURATION STORM WITH 30-MINUTE TIME INCREMENT USING
SCS TYPE II FLORIDA - MODIFIED DISTRIBUTION

TIME, HRS.	ACCUMULATED FRACTION OF TOTAL 24-HOUR RAINFALL		INCREMENTAL FRACTION OF TOTAL 24-HOUR RAINFALL
17.5	0.894		0.011
18.0	0.905		0.011
18.5	0.915		0.010
19.0	0.925		0.010
19.5	0.934		0.009
20.0	0.943		0.009
20.5	0.951		0.008
21.0	0.959		0.008
21.5	0.967		0.008
22.0	0.974		0.007
22.5	0.981		0.007
23.0	0.988		0.007
23.5	0.994		0.006
24.0	1.000		0.006
		TOTAL	1.000

TABLE 5-3

DESIGN STORM RAINFALL DISTRIBUTION
24-HOUR DURATION STORM WITH 30-MINUTE TIME INCREMENT USING
SCS TYPE II FLORIDA - MODIFIED DISTRIBUTION

TIME, HRS.	ACCUMULATED FRACTION OF TOTAL 6-HOUR RAINFALL		INCREMENTAL FRACTION OF TOTAL 6-HOUR RAINFALL
0	0.000		0.000
0.17	0.010		0.010
0.33	0.020		0.010
0.50	0.030		0.010
0.67	0.041		0.011
0.83	0.053		0.012
1.00	0.065		0.012
1.17	0.078		0.013
1.33	0.092		0.014
1.50	0.107		0.015
1.67	0.123		0.016
1.83	0.140		0.017
2.00	0.159		0.019
2.17	0.181		0.022
2.33	0.209		0.028
2.50	0.244		0.035
2.67	0.290		0.046
2.83	0.370		0.080
3.00	0.559		0.189
3.17	0.672		0.113
3.33	0.732		0.060
3.50	0.772		0.040
3.67	0.803		0.031
3.83	0.828		0.025
4.00	0.848		0.020
4.17	0.866		0.018
4.33	0.882		0.016
4.50	0.897		0.015
4.67	0.911		0.014
4.83	0.924		0.013
5.00	0.937		0.013
5.17	0.949		0.012
5.33	0.960		0.011
5.50	0.971		0.011
5.67	0.981		0.010
5.83	0.991		0.010
6.00	1.000		0.009
		TOTAL	1.000

increments, and should be used to generate design peak flows and hydrographs for applications on which the smallest drainage subbasin being analyzed has a time-of-concentration less than 30 minutes. The 6-hour duration design storm distribution was derived by the methodology originally employed by the SCS to derive the Type II Florida-Modified distribution. This procedure, as documented in "Interim Runoff Procedure for Florida", SCS Florida Bulletin Number 210-1-2, utilizes the rainfall volumes listed in NWS publications HYDRO-35 and TP-40 to obtain a set of design storm rainfall increments for a storm of given recurrence interval and duration. These discrete rainfall increments are arranged in the design storm by placing the largest increment in the middle of the storm event distribution. The second largest increment is placed after the first and the third largest is placed before the first. Alternating the remaining rainfall amounts continues in the same manner until the entire storm distribution is completed.

SECTION SIX

Section 6

FACILITIES ASSESSMENT

6.1 CAPACITY AND DEMAND CALCULATIONS

The assessment of the ability of stormwater facilities ability to meet the defined service levels, as previously discussed, requires an analysis of the facility capacity and an estimation of peak flow (demand) for the primary drainage systems within Santa Rosa County. By a comparison of the two, it can be determined whether specific drainage facilities are of sufficient capacity to meet the designated service level or whether an upgrade is necessary to satisfy the expected demand.

6.2. FACILITY CAPACITY ANALYSIS

Storm drainage facility capacity is a complicated technical parameter that is difficult to assess at a planning level. An accurate engineering determination requires a detailed hydraulic analysis of each element of the stormwater conveyance system including physical parameters of size, slope, elevation, roughness, and cross section area. Many of these parameters were unknown for Santa Rosa County and were estimated from USGS 7.5' quadrangle maps.

For the purpose of this analysis, critical drainage facilities within the County were identified and capacities were calculated assuming as limiting

conditions. The resulting capacity estimate for each drainage critical facility is summarized in Table 6-1 by basin.

6.3 FACILITY DEMAND AND RESIDUAL CAPACITY ANALYSIS

The estimation of a design peak flow (demand) at a given storm drainage facility was calculated using the Rational Method, appropriate basin characteristics and local experience Methodology. The residual facility capacity is calculated by subtracting the estimated demand (peak flow) from the estimated capacity for each facility. A positive residual valve indicates that the facility has adequate capacity while a negative valve indicates that the facility is unable to pass the basin/subbasin demand.

This methodology was modified somewhat in order to estimate future demands. Recognizing that under "Pre-/Post" match regulation schemes some increase in runoff will occur due to infill, gentrification, and redevelopment incentives, a method to recognize this phenomena was employed. Generally, increased land use intensity was recognized as "Net 10%" increase. However, as the degree of land use intensity changes, so does the net change for future conditions. Engineering judgement of basin development potential was used to assess flows under future conditions assuming a "net 10%" concept.

Table 6-2 presents the estimated demands and residual capacities for individual facilities for current conditions by basin. Table 6-3 presents the same information estimated for future conditions.

Table 6-1

SUMMARY OF STRUCTURE CAPACITY
FOR CRITICAL DRAINAGE STRUCTURES

STRUCTURE NUMBER	STRUCTURE DESCRIPTION	UPSTREAM DRAINAGE AREA (ACRES)	STRUCTURE CAPACITY (CFS)
BASIN 01 - ESCAMBIA RIVER BASIN			
0101-925	8' x 3' box culvert	240	115
0101-930	Twin 30" RCP	70	30
0101-940	Triple 36" RCP	55	69
0101-945	Twin 8' x 4' box culverts	200	300
0101-950	Twin 48" RCP	22	100
0101-955	Twin 30" RCP	17	28
0101-980	8' x 4' box culvert	300	145
0101-985	8' x 4' box culvert	130	145
BASIN 02 - ESCAMBIA BAY COASTAL BASIN			
0201-905	Triple 48" RCP	220	138
0201-910	Twin 36" RCP	100	43
0201-915	2.5' x 3.5' CMAP	70	28
0201-930	Twin 54" RCP	140	128
0201-945	Triple 36" RCP	200	66
0201-980	Single 48" RCP	210	50
0202-915	Triple 24" RCP	176	24
0202-960	10' x 6' box culvert	735	430
BASIN 03 - POND CREEK BASIN			
0302-915	Twin 48" RCP	120	100
0302-920	12' x 14' box culvert	480	1200
0302-925	Twin 10' x 3' box culvert	160	280
BASIN 04 - EAST BAY COASTAL BASIN			
0401-105	3' x 10' box culvert	702	150
0401-205	8' x 8' box culvert	386	430
0401-945	Twin 42" RCP	69	68
0401-950	10' x 3' box culvert	425	150
0404-005	Triple 42" x 60" CMP	154	150
0404-920	Triple 78" RCP	320	540
0409-975	12' x 4' box culvert	160	275

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Table 6-1

SUMMARY OF STRUCTURE CAPACITY
FOR CRITICAL DRAINAGE STRUCTURES (CONTINUED)

STRUCTURE NUMBER	STRUCTURE DESCRIPTION	UPSTREAM DRAINAGE AREA (ACRES)	STRUCTURE CAPACITY (CFS)
BASIN 05 - BLACKWATER RIVER BASIN			
0501-020	Twin 60" CMP	279	180
0501-930	36" x 24" box culvert	18	15
0501-945	7' x 2' box culvert	96	50
BASIN 06 - COLDWATER CREEK BASIN			
0601-020	12' x 4' box culvert	224	310
0601-905	12' x 4' box culvert	320	310
0601-910	Twin 6' x 3' box culvert	205	136
0601-915	Triple 36" RCP	205	69
0601-920	8' x 2' box culvert	256	68
BASIN 07 - BIG JUNIPER CREEK BASIN (no critical structures)			
BASIN 08 - YELLOW RIVER BASIN			
0802-905	Twin 60" CMP	600	180
0802-910	Single 84" CMP	1200	210
BASIN 09 - EAST BAY RIVER BASIN (no critical structures)			
BASIN 10 - SANTA ROSA SOUND COASTAL BASIN			
1002-920	Triple 36" RCP	68	69
1002-925	Triple 36" RCP	34	66
1002-945	Single 48" RCP	89	50
1002-950	8' x 6' box culvert	154	300

Table 6-2

SUMMARY OF FACILITY CAPACITY, DEMAND AND RESIDUAL CAPACITY FOR CURRENT CONDITIONS FOR CRITICAL STRUCTURES

STRUCTURE NUMBER	STRUCTURE DESCRIPTION	STRUCTURE CAPACITY (CFS)	CURRENT DEMAND (CFS)	CURRENT RESIDUAL CAPACITY (CFS)
BASIN 01 - ESCAMBIA RIVER BASIN				
0101-925	8' x 3' box culvert	115	192	-77
0101-930	Twin 30" RCP	30	71	-41
0101-940	Triple 36" RCP	69	53	16
0101-945	Twin 8' x 4' box culverts	300	200	100
0101-950	Twin 48" RCP	100	21	79
0101-955	Twin 30" RCP	28	15	13
0101-980	8' x 4' box culvert	145	240	-95
0101-985	8' x 4' box culvert	145	130	15
BASIN 02 - ESCAMBIA BAY COASTAL BASIN				
0201-905	Triple 48" RCP	138	202	-64
0201-910	Twin 36" RCP	43	84	-41
0201-915	2.5' x 3.5' CMAP	28	56	-28
0201-930	Twin 54" RCP	128	168	-40
0201-945	Triple 36" RCP	66	208	-142
0201-980	Single 48" RCP	50	168	-118
0202-915	Triple 24" RCP	24	155	-131
0202-960	10' x 6' box culvert	430	646	-216
BASIN 03 - POND CREEK BASIN				
0302-915	Twin 48" RCP	100	120	-20
0302-920	12' x 14' box culvert	1200	442	758
0302-925	Twin 10' x 3' box culvert	280	128	152
BASIN 04 - EAST BAY COASTAL BASIN				
0401-105	3' x 10' box culvert	150	618	-468
0401-205	8' x 8' box culvert	430	340	90
0401-945	Twin 42" RCP	68	61	7
0401-950	10' x 3' box culvert	150	374	-224
0404-005	Triple 42" x 60" CMP	150	135	15
0404-920	Triple 78" RCP	540	282	258
0409-975	12' x 4' box culvert	275	147	128

Table 6-2

SUMMARY OF FACILITY CAPACITY, DEMAND AND RESIDUAL CAPACITY FOR CURRENT CONDITIONS FOR CRITICAL STRUCTUES (CONTINUED)

STRUCTURE NUMBER	STRUCTURE DESCRIPTION	STRUCTURE CAPACITY (CFS)	CURRENT DEMAND (CFS)	CURRENT RESIDUAL CAPACITY (CFS)
BASIN 05 - BLACKWATER RIVER BASIN				
0501-020	Twin 60" CMP	180	245	-65
0501-930	36" x 24" box culvert	15	33	-19
0501-945	7' x 2' box culvert	50	154	-104
BASIN 06 - COLDWATER CREEK BASIN				
0601-020	12' x 4' box culvert	310	243	67
0601-905	12' x 4' box culvert	310	282	28
0601-910	Twin 6' x 3' box culvert	136	180	-44
0601-915	Triple 36" RCP	69	180	-111
0601-920	8' x 2' box culvert	68	225	-157
BASIN 07 - BIG JUNIPER CREEK BASIN (no critical structures)				
BASIN 08 - YELLOW RIVER BASIN				
0802-905	Twin 60" CMP	180	528	-348
0802-910	Single 84" CMP	210	1056	-846
BASIN 09 - EAST BAY RIVER BASIN (no critical structures)				
BASIN 10 - SANTA ROSA SOUND COASTAL BASIN				
1002-920	Triple 36" RCP	69	60	9
1002-925	Triple 36" RCP	66	41	25
1002-945	Single 48" RCP	50	107	-57
1002-950	8' x 6' box culvert	300	154	146

Table 6 -3

SUMMARY OF FACILITY CAPACITY, DEMAND AND
RESIDUAL CAPACITY FOR FUTURE CONDITIONS
FOR CRITICAL STRUCTURES

STRUCTURE NUMBER	STRUCTURE DESCRIPTION	FUTURE DEMAND (CFS)	FUTURE RESIDUAL CAPACITY (CFS)
BASIN 01 - ESCAMBIA RIVER BASIN			
0101-925	8' x 3' box culvert	221	-106
0101-930	Twin 30" RCP	74	-44
0101-940	Triple 36" RCP	61	8
0101-945	Twin 8' x 4' box culverts	210	90
0101-950	Twin 48" RCP	23	77
0101-955	Twin 30" RCP	16	12
0101-980	8' x 4' box culvert	276	-131
0101-985	8' x 4' box culvert	150	-5
BASIN 02 - ESCAMBIA BAY COASTAL BASIN			
0201-905	Triple 48" RCP	212	-74
0201-910	Twin 36" RCP	88	-45
0201-915	2.5' x 3.5' CMAP	59	-31
0201-930	Twin 54" RCP	176	-48
0201-945	Triple 36" RCP	218	-152
0201-980	Single 48" RCP	176	-126
0202-915	Triple 24" RCP	171	-147
0202-960	10' x 6' box culvert	678	-248
BASIN 03 - POND CREEK BASIN			
0302-915	Twin 48" RCP	126	-26
0302-920	12' x 14' box culvert	464	736
0302-925	Twin 10' x 3' box culvert	141	139
BASIN 04 - EAST BAY COASTAL BASIN			
0401-105	3' x 10' box culvert	649	-499
0401-205	8' x 8' box culvert	357	73
0401-945	Twin 42" RCP	64	4
0401-950	10' x 3' box culvert	411	-261
0404-005	Triple 42" x 60" CMP	149	2
0404-920	Triple 78" RCP	310	230
0409-975	12' x 4' box culvert	169	106

Table 6 -3

SUMMARY OF FACILITY CAPACITY, DEMAND AND RESIDUAL CAPACITY FOR FUTURE CONDITIONS FOR CRITICAL STRUCTURES (CONTINUED)

STRUCTURE NUMBER	STRUCTURE DESCRIPTION	FUTURE DEMAND (CFS)	FUTURE RESIDUAL CAPACITY (CFS)
BASIN 05 - BLACKWATER RIVER BASIN			
0501-020	Twin 60" CMP	257	-77
0501-930	36" x 24" box culvert	36	-22
0501-945	7' x 2' box culvert	169	-119
BASIN 06 - COLDWATER CREEK BASIN			
0601-020	12' x 4' box culvert	255	55
0601-905	12' x 4' box culvert	296	14
0601-910	Twin 6' x 3' box culvert	189	-53
0601-915	Triple 36" RCP	189	-120
0601-920	8' x 2' box culvert	236	-168
BASIN 07 - BIG JUNIPER CREEK BASIN (no critical structures)			
BASIN 08 - YELLOW RIVER BASIN			
0802-905	Twin 60" CMP	554	-374
0802-910	Single 84" CMP	1162	-952
BASIN 09 - EAST BAY RIVER BASIN (no critical structures)			
BASIN 10 - SANTA ROSA SOUND COASTAL BASIN			
1002-920	Triple 36" RCP	78	-9
1002-925	Triple 36" RCP	55	11
1002-945	Single 48" RCP	139	-89
1002-950	8' x 6' box culvert	193	108

SECTION SEVEN

Section 7

FACILITY NEEDS ANALYSIS

7.1 GENERAL

Only in the recent past has stormwater service been likened to highway capacities by defining levels of service with the performance of stormwater management systems being ranked on a relative continuum from good to bad for a given design storm. This section examines the concept of service levels for stormwater management systems, recommends specific service level definitions and assesses both existing and anticipated future levels of service attainment for the County's current system.

7.2 SERVICE LEVEL DEFINITIONS

The selection of appropriate performance criteria is a policy issue which has significant budget consequences. If criteria are selected which are too conservative the cost of solutions to existing drainage problems become overly expensive. Conversely, if the selected criteria are too lax, the resultant system does not meet the intended level of service. Clearly a policy issue which must be resolved is the appropriate level of service.

Good performance for a rural system might be defined as minor street flooding while bad performance may be defined as structure flooding. It is fair to say that every portion of every service area does not require the highest level of service at all times for all events. Many areas can tolerate a limited amount of street or yard flooding if it does not last very long and is not frequently experienced.

Santa Rosa County experiences flooding from a variety of rainfall events. The degree of severity of flooding by its impacts: roadway flooding, yard flooding or structure flooding. Four service levels were defined based upon these severity classifications:

- o Service Level A: Ditch Flow Only
- o Service Level B: Street Flooding
- o Service Level C: Street and Yard Flooding
- o Service Level D: Street, Yard and Structure Flooding

While these definitions seem rather simplistic, they represent a classification system that facilitates evaluation of overall system performance and the prioritization of funding for stormwater management system construction, O & M and development.

The individual service levels are defined functionally in terms of the performance criteria for the stormwater management system. The development of service level criteria involves a compromise between an academic approach and the availability of usable data for cross-section profiles of the roadway, right-of-way, yard and finish floor of structures. The proposed performance criteria for each service level utilize available topographic and aerial photographic information in conjunction with functional criteria definitions which are valid in most instances:

- o Service Level A: Water Contained Within Ditches

  No flooding of major roadways, minor roadways, yards or structures. The hydraulic grade line (free water surface) is generally at or below the inlet throat.

- o Service Level B: Water Contained Within Right-of-Way

  Flooding of major roadways is limited to the outer lane but does not prevent travel, i.e., limited duration flooding of minor streets, flooding of yards generally limited to the right-of-way but no flooding of structures. The hydraulic grade line is at or slightly above the inlet throat.

- o Service Level C: Water contained Within the Front Yard

  Flooding of major roadways precludes the use of outer lane and travel in inner lanes is possible but difficult, prolonged flooding of minor streets which precludes travel, flooding of front yards up to the front face of the structure but no flooding of the structure. The hydraulic grade line is significantly above the inlet.

- o Service Level D: Structure Flooding

  Extensive flooding of streets, yards and structures for prolonged periods.

Clearly, the existence of Service Level D conditions represent a stormwater manager's nightmare and is never an acceptable design condition. However, virtually any system may suffer Service Level D performance if subjected to a severe enough rainfall event.

It is recommended that these definitions be reviewed by the County staff and then formally adopted as a basis for setting stormwater service levels, throughout the County.

7.3 SERVICE LEVEL ATTAINMENT

Specific quantitative levels of service have not been adopted for drainage facilities in Santa Rosa County. Consequently, it is not possible to evaluate performance of individual facilities against specific quantitative standards. The foregoing general service levels definitions for Service Level A-D are

recommended for adoption by the County. However, until they are formally adopted, the definitions will be used for discussion purposes.

Service Level attainment can be estimated for each facility based on the residual capacity estimated in Section 6 for both current and future conditions. Criteria used in attributing service level attainment, in the absence of detailed site-specific studies and adopted service level criteria, are briefly summarized as follows:

Service Level A:	Passes the estimated peak flow
Service Level B:	Capacity shortfall for the estimated storm is within 50% of estimated capacity
Service Level C:	Capacity shortfall for the design storm is between 50% and 110% of estimated capacity
Service Level D:	Capacity shortfall for the design storm exceeds 110% of estimated capacity

Estimated service levels for each of the critical structures preveiously analyzed in Section 6 are summarized in Table 7-1 for both current and anticipated future conditions.

7.4 ANALYSIS OF BASIN PERFORMANCE

The evaluation of estimated service levels for critical structures under current conditions indicates that the County can expect to attain Service Level A in approximately 43 % of its primary facilities with about 43 % of

Table 7-1

SUMMARY OF SERVICE LEVEL ATTAINMENT
FOR CRITICAL STRUCTURES FOR CURRENT
AND FUTURE SERVICE DEMANDS

STRUCTURE NUMBER	STRUCTURE DESCRIPTION	ESTIMATED CURRENT SERVICE LEVEL	ESTIMATED FUTURE SERVICE LEVEL
BASIN 01 - ESCAMBIA RIVER BASIN			
0101-925	8' x 3' box culvert	C	C
0101-930	Twin 30" RCP	D	D
0101-940	Triple 36" RCP	A	A
0101-945	Twin 8' x 4' box culverts	A	A
0101-950	Twin 48" RCP	A	A
0101-955	Twin 30" RCP	A	A
0101-980	8' x 4' box culvert	C	C
0101-985	8' x 4' box culvert	A	B
BASIN 02 - ESCAMBIA BAY COASTAL BASIN			
0201-905	Triple 48" RCP	B	C
0201-910	Twin 36" RCP	C	C
0201-915	2.5' x 3.5' CMAP	C	C
0201-930	Twin 54" RCP	B	B
0201-945	Triple 36" RCP	D	D
0201-980	Single 48" RCP	D	D
0202-915	Triple 24" RCP	D	D
0202-960	10' x 6' box culvert	B	C
BASIN 03 - POND CREEK BASIN			
0302-915	Twin 48" RCP	B	B
0302-920	12' x 14' box culvert	A	A
0302-925	Twin 10' x 3' box culvert	A	A
BASIN 04 - EAST BAY COASTAL BASIN			
0401-105	3' x 10' box culvert	D	D
0401-205	8' x 8' box culvert	A	A
0401-945	Twin 42" RCP	A	A
0401-950	10' x 3' box culvert	D	D
0404-005	Triple 42" x 60" CMP	A	A
0404-920	Triple 78" RCP	A	A
0409-975	12' x 4' box culvert	A	A

Table 7-1

SUMMARY OF SERVICE LEVEL ATTAINMENT
FOR CRITICAL STRUCTURES FOR CURRENT
AND FUTURE SERVICE DEMANDS (CONTINUED)

STRUCTURE NUMBER	STRUCTURE DESCRIPTION	ESTIMATED CURRENT SERVICE LEVEL	ESTIMATED FUTURE SERVICE LEVEL
BASIN 05 - BLACKWATER RIVER BASIN			
0501-020	Twin 60" CMP	B	B
0501-930	36" x 24" box culvert	D	D
0501-945	7' x 2' box culvert	D	D
BASIN 06 - COLDWATER CREEK BASIN			
0601-020	12' x 4' box culvert	A	A
0601-905	12' x 4' box culvert	A	A
0601-910	Twin 6' x 3' box culvert	B	B
0601-915	Triple 36" RCP	D	D
0601-920	8' x 2' box culvert	D	D
BASIN 07 - BIG JUNIPER CREEK BASIN (no critical structures)			
BASIN 08 - YELLOW RIVER BASIN			
0802-905	Twin 60" CMP	D	D
0802-910	Single 84" CMP	D	D
BASIN 09 - EAST BAY RIVER BASIN (no critical structures)			
BASIN 10 - SANTA ROSA SOUND COASTAL BASIN			
1002-920	Triple 36" RCP	A	B
1002-925	Triple 36" RCP	A	A
1002-945	Single 48" RCP	D	D
1002-950	8' x 6' box culvert	A	A

the facilities falling below Service Level B. Table 7-2 summarizes service level attainment for current conditions by basin.

Table 7-3 presents service level attainment results for critical structures by basin for future conditions. The County should expect to obtain Service Level A in about 38 % of its facilities which represents a 12 % decrease due to growth. Service will drop below Service Level B for approximately 48 % of its facilities.

TABLE 7-2

SUMMARY OF SERVICE LEVEL ATTAINMENT
FOR CURRENT LAND USE CONDITIONS

Basin	Service Level A	B	C	D	Number of Systems
1. Escambia River	5 62.50	0 0.00	2 25.00	1 12.50	8
2. Escambia Bay Coastal	0 0.00	3 37.50	2 25.00	3 37.50	8
3. Pond Creek	2 66.67	1 33.33	0 0.00	0 0.00	3
4. East Bay Coastal	5 71.43	0 0.00	0 0.00	2 28.57	7
5. Blackwater River	0 0.00	1 33.33	0 0.00	2 66.67	3
6. Coldwater Creek	2 40.00	1 20.00	0 0.00	2 40.00	5
7. Big Juniper Creek	0 0	0 0	0 0	0 0	0
8. Yellow River	0 0.00	0 0.00	0 0.00	2 100.00	2
9. East Bay River	0 0	0 0	0 0	0 0	0
10. Santa Rosa Sound	3 75.00	0 0.00	0 0.00	1 25.00	4
COUNTY TOTAL	17 42.50	6 15.00	4 10.00	13 32.50	40

Table 7-3

SUMMARY OF SERVICE LEVEL ATTAINMENT
FOR FUTURE LAND USE CONDITIONS

Basin	Service Level A	B	C	D	Number of Systems
1. Escambia River	4 50.00	1 12.50	2 25.00	1 12.50	8
2. Escambia Bay Coastal	0 0.00	1 12.50	4 50.00	3 37.50	8
3. Pond Creek	2 0	1 0	0 0	0 0	3
4. East Bay Coastal	5 71.43	0 0.00	0 0.00	2 28.57	7
5. Blackwater River	0 0.00	1 33.33	0 0.00	2 66.67	3
6. Coldwater Creek	2 40.00	1 20.00	0 0.00	2 40.00	5
7. Big Juniper Creek	0 0	0 0	0 0	0 0	0
8. Yellow River	0 0.00	0 0.00	0 0.00	2 100.00	2
9. East Bay River	0 0	0 0	0 0	0 0	0
10. Santa Rosa Sound	2 50.00	1 25.00	0 0.00	1 25.00	4
COUNTY TOTAL	15 37.50	6 15.00	6 15.00	13 32.50	40

SECTION EIGHT

Section 8

FUNDING NEEDS AND IMPLEMENTATION PROGRAM

8.1 GENERAL

This section evaluates Santa Rosa County's overall funding needs, develops a plan to implement the program over the next 20 years, and reviews funding mechanisms needed to provide the funds for the program.

8.2 CAPITAL NEEDS ASSESSMENT

The results of the County-wide drainage planning study has been the identification of a number of specific Capital Improvements Program (CIP) projects and the need to conduct basin specific studies to identify the cause of and solution for future problems indicated by the facilities analysis.

A total of forty-seven individual activities were identified to solve current, recurring problems which require the expenditure of approximately $3,555,685 of capital funds for new or upgraded facilities. This figure includes one project which is in the FDOT budget. When this one capital expenditure is removed, it reduces the CIP needs to $1,755,685. The individual activities are summarized in Table 4-1 found in Section 4. Additionally, twenty-three potential future CIP projects were identified and are shown in Table 8-1. Both of these tables (Table 4-1 and 8-1) are also shown in Appendix B of this report. The largest expenditure for the current recurring problems is $437,500 and is found in the Pond Creek Basin while the Big Juniper Creek Basin requires no immediate expenditure.

TABLE 8-1

SUMMARY OF POTENTIAL FUTURE CIP PROJECTS

CIP Number	Structure Number	Description of Work	Predesign Cost
Escambia River Basin			
1.	0101-925	Add Parallel 8'x3' Box Culvert	$ 30,400
2.	0101-930	New Twin 48" Culverts	22,600
3.	0101-980	New Parallel 8'x4' Box Culvert	34,500
		Basin Subtotal:	$ 87,500
Escambia Bay Coastal Basin			
4.	0201-905	New Twin 8'x4' Box Culverts	$ 55,000
5.	0201-910	New Twin 48" Culverts	22,600
6.	0201-915	New Twin 48" Culverts	22,600
7.	0201-930	Add Parallel 54" Culvert	18,500
8.	0201-945	New Triple 60" Culverts	48,900
9.	0201-980	New Triple 54" Culverts	41,300
10.	0202-915	New Triple 54" Culverts	41,300
11.	0202-960	New 40' Bridge	64,800
		Basin Subtotal	$315,000
Pond Creek Basin			
12.	0302-915	Add Parallel 48" Culvert	$ 14,200
East Bay Coastal Basin			
13.	0401-105	New 40' Bridge	$ 64,800
14.	0401-950	New Twin 5'x10' Box Culverts	77,000
		Basin Subtotal	$141,800
Blackwater River Basin			
15.	0501-020	Add Parallel 60" Culvert	$ 22,500
16.	0501-930	New 48" Culvert	14,200
17.	0501-945	New 5'x10' Box Culvert	47,700
		Basin Subtotal	$ 84,400

TABLE 8-1
(Continued)

CIP Number	Structure Number	Description of Work	Predesign Cost
Coldwater Creek Basin			
18.	0601-910	New Twin 4'x8' Box Culverts	$ 55,000
19.	0601-915	New Twin 4'x8' Box Culverts	55,000
20.	0601-920	New Twin 4'x8' Box Culverts	55,000
		Basin Subtotal	$165,000
Yellow River Basin			
21.	0802-905	New Twin 4'x8' Box Culverts	$ 55,000
22.	0802-905	New 60' Girder Bridge	108,000
		Basin Subtotal	$163,000
Santa Rosa Sound Coastal Basin			
	1002-945	New Twin 54" Culverts	$ 29,600
COUNTY-WIDE TOTAL:			$1,000,500

8.3 O&M NEEDS ASSESSMENT

Proper O&M is the keystone to keeping existing facilities in their peak operational condition. Unfortunately the County's budget for stormwater related O&M activities is only approximately $ 50,000 annually and the results of this limited budget are readily apparent.

A very brief analysis of the County's major ditches, major culverts and key structures suggests a recurring need for programmed maintenance. Based on typical unit production rates, it would appear that an O&M budget allocation of $125,000 for first year maintenance rising to $220,000 in the year 2007 would allow maintenance of these facilities once per year.

8.4 IMPLEMENTATION PROGRAM

The implementation program developed for Santa Rosa County consists of strategies for capital expenditures, annual O&M funding, continuing R&R expenditures and strategic basin-wide studies as well as an integrated funding needs assessment and a 20-year plan to solve the County's problems.

8.4.1 Capital Expenditures Strategy

The expenditure program established for capital construction projects focuses on prioritized projects and seeks to complete all of the identified projects within a ten year period. Allowing 15% of the construction cost for survey,

studies and designs, the annual expenditure required to achieve this program is $202,000 per year over the first ten years of the program. The order of the projects within the current CIP list is based on the severity of the problem as estblished in Section 4. The severity and preliminary priority ranking are shown in Appendix B-1, Summary of Current Identified CIP Projects.

A second and major capital expenditure consideration is the repair and/or replacement (R&R) of existing facilities as they reach the end of their service life and begin to fail. The average service life of concrete and corrugated metal culverts has been estimated at 30-60 years depending upon their method of manufacture, protective coatings, installation procedures and service environment. Recognizing that some of the facilities in the County have been in service since the 1940's, the County must be prepared to begin replacing and repairing these facilities as they fail.

The County should conduct a conditions survey in 1988 and 1989 to ascertain the general condition and remaining service life of its primary and secondary drainage facilities. Based upon this survey, the County should prioritize replacement and repair projects to prevent catastrophic system failures.

Funding at $50,000 should be developed for the survey during the first two years. Upon completion of the survey, appropriate funding should be allocated for system improvements. For the purposes this study , the initial R&R funding in year 3 has been established at $30,000 and allowed to grow, of an

annual rate to $220,000 by the year 2007. This growth rate seeks to compensate for the increasing rate of facilities replacement as the County's systems age.

8.4.2 Strategic Basin Studies Strategy

Evaluation of service level degradation due to the impact of growth on undersized and inadequate structures indicate that the number of facilities falling below Service Level B standards will not increase significantly, changing from 22 to 23. The high number of critical structures already falling below Service Level C standards indicates that the County should initiate a series of comprehensive basin modelling studies to identify problems and select the best and most cost effective solutions. These studies should begin in the third year of the program and should be undertaken in the following basin order:

Priority	Basin	Study Date	Study Cost
1	Escambia Bay Coastal	1990,1991	$150,000
2	Escambia River	1992, 1994	$150,000
3	Blackwater River	1995,1996	$150,000
4	Coldwater Creek	1997, 1998	$100,000
5	Yellow River	1999	$ 50,000
6	East Bay Coastal	2000	$ 50,000
7	Santa Rosa Sound	2001	$ 50,000
8	Pond Creek	2002	$ 50,000

Also indicated is the year(s) the study should be undertaken and a very rough estimated current cost to evaluate the basin. Some studies, due to the size and complexity of the basins, will be very expensive and complicated and will take more time to complete. The County should monitor in each basin the year before the studies are conducted in order to have appropriate rainfall and runoff data to conduct the hydrologic and hydraulic simulations.

8.4.3 O&M Strategy

Assuming that major facilities are maintained on a five year cycle and that the maintenance of minor systems is approximately twice as expensive but accomplished on a 10 year cycle, the County's annual O&M expenditure would be approximately $125,000 which is about two and one-half times the current annual expenditure of $50,000.

In order to achieve an adequate O&M funding program, the strategy used in this study is to raise the annual O&M funding level from its current level to the needed level of about $125,000. Thereafter, the O&M funding level would be raised at the rate of $5,000 yearly for twenty-five years to $ 220,000, which reflects the increasing O&M funding required to maintain the new facilities which are being constructed through the CIP construction projects.

8.4.4 Implementation Plan

As discussed in the foregoing sections, the capital construction funding for both identified current CIP projects and unidentified future CIP projects,

combined with the continuing need for annual O&M activities and an increasing need for R&R projects must be scheduled over a reasonable program implementation period. The results of this scheduling effort is the implementation plan.

This study has evaluated the County's current and anticipated future needs for the next 20 years in an effort to develop a viable program. Utilizing the strategies described in Sections 8.4.1 through 8.4.3 as the basis, a long-term implementation plan was developed for Santa Rosa County.

Table 8-2 summarizes planned expenditures in each area. These projections do not consider many of the daily activities already accomplished by the County's current stormwater management program. Overall, the County should try to pursue a real growth rate in its stormwater program of 2% to 5%. Inflation has not been considered in the foregoing analysis. Table 8-3 summarizes the difference in costs if a 5% continuous inflation rate is applied over the 20 years of the program.

8.5 PROGRAM FINANCING

The County's stormwater management program must develop a stable and reliable financing program if it is to be successful and solve Santa Rosa's current and future stormwater problems.

Table 8-2

SUMMARY OF STORMWATER FUNDING NEEDS

Program Year	Calendar Year	Identified CIP Projects	Repair and Replacement Costs	Operations & Maintenance Costs	Strategic Basin Studies	Potential Future CIP Projects	Total Funding Required
1	1988	$202,000	$25,000	$125,000			$352,000
2	1989	$202,000	$25,000	$130,000			$357,000
3	1990	$202,000	$30,000	$135,000	$75,000		$442,000
4	1991	$202,000	$35,000	$140,000	$75,000		$452,000
5	1992	$202,000	$40,000	$145,000	$75,000		$462,000
6	1993	$202,000	$45,000	$150,000	$75,000		$472,000
7	1994	$202,000	$50,000	$155,000	$75,000		$482,000
8	1995	$202,000	$55,000	$160,000	$75,000		$492,000
9	1996	$202,000	$65,000	$165,000	$50,000		$482,000
10	1997	$202,000	$75,000	$170,000	$50,000		$497,000
11	1998		$85,000	$175,000	$50,000	$115,000	$425,000
12	1999		$95,000	$180,000	$50,000	$115,000	$440,000
13	2000		$105,000	$185,000	$50,000	$115,000	$455,000
14	2001		$120,000	$190,000	$50,000	$115,000	$475,000
15	2002		$135,000	$195,000	$50,000	$115,000	$495,000
16	2003		$150,000	$200,000		$115,000	$465,000
17	2004		$165,000	$205,000		$115,000	$485,000
18	2005		$180,000	$210,000		$115,000	$505,000
19	2006		$200,000	$215,000		$115,000	$530,000
20	2007		$220,000	$220,000		$115,000	$555,000
Total Funds Required		$2,020,000	$1,900,000	$3,450,000	$800,000	$1,150,000	$9,320,000
Percent of Total Need		21.67%	20.39%	37.02%	8.58%	12.34%	100.00%

Table 8-3

SUMMARY OF STORMWATER FUNDING NEEDS
ASSUMING CONTINUING 5% INFLATION

(To be prepared when Table 8-2
has been finalized and reviewed
by Santa Rosa Staff)

There are several alternatives that are available to cities and counties in Florida to find a stormwater management program. These include:

Revenue for Annual Operation Expenses

- o General Fund
- o Drainage Utility Service Charges

Fundings for Major Capital Improvements

- o General Obligation Bonds Repaid by Property Taxes
- o Revenue Bonds Repaid by Utility Service Charges
- o Utility Tax Revenues
- o Community Development Block Grant Funds

Fundings for New Development Services

- o Plan Review Fees
- o On-site System Inspection Fees
- o Impact Fees
- o System Development Charges
- o In-lieu of Construction Charges
- o Latecomer Fees

Funding for Special Services

- o Local Improvement Districts
- o Utility Local Improvement Districts
- o Special-Purpose Taxing Districts

Unfortunately, only the stormwater utility and bonding programs are capable of providing adequate funding to completely meet the County's long-term needs for stormwater facilities.

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