

CITY OF  
NEW PORT RICHEY



Stormwater Management  
And Erosion Control

POLICY PROCEDURES CRITERIA MANUAL

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# CHAPTER 1

## INTRODUCTION

This document has been adopted by reference in a number of City Ordinances. Unless specifically stated otherwise, any proposed designs in conflict with the criteria portion of this manual will require either a waiver of the applicable City ordinance or approval of the City Manager, whichever is applicable. In addition, the City Manager, or his designee, 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 New Port Richey.

### PURPOSE

The purpose of this manual is to guide engineers, architects, planners, and developers in the design of stormwater management systems in the City of New Port Richey.

The manual integrates recommended methodologies, design procedures, standards, and City stormwater criteria into a single-source document. The intent of this manual is to:

1. Standardize criteria and present suggested procedures and design aides;
2. Make it compatible to the Stormwater Management Element of the Comprehensive Plan. This manual represents a coordinated effort to bring water resource managers, developers, and designers in touch with the current regulations and criteria applicable to stormwater management design in the City of New Port Richey. During the preparation and implementation of the City Master Drainage Plan, this manual is intended to serve the needs of the City and will be utilized by the City of New Port Richey for permitting, study, review, and design.

### OBJECTIVES

Design criteria presented in this manual have been established to enable architects, engineers, planners, and developers to accomplish the following:

1. Protect human life, health, and welfare of the citizens of New Port Richey.
2. Minimize private and public property damage resulting from erosion, sedimentation, and flooding in and adjacent to, the proposed developments and drainage networks.
3. Provide a technically efficient drainage system.
4. Provide a cost-effective drainage design.
5. Provide an information source to alert owners, builders, and developers and the general public of potential flood hazards.

6. Maintain or enhance the quality and quantity of groundwater supplies.
7. Present guidelines to design for the beneficial use of water resources.
8. Reduce the occurrence and loading of contaminants into natural water bodies.
9. Harmonize, to the greatest practical extent, City of New Port Richey design criteria with those of other agencies.
10. Provide for the least possible disturbance to community welfare and to the environment during construction.
11. Develop Best Management Practices (BMPs) to utilize public open space for water storage while producing an aesthetically pleasing appearance.

Cooperation between the developer and the City of New Port Richey is necessary since many of the objectives are attainable only when a balance between public and private goals is reached. This is especially true since many of the objectives are controlled by the specific design.

## **BACKGROUND**

The existing natural features in the New Port Richey area offer both positive and negative impacts on the drainage system. The relatively low, flat topography of the City helps to control stormwater velocities. Also, most of the drainage basins in the City slope toward the Pithlachascotee River. Thus, the river serves as part of the natural drainage system. Negative features of the natural characteristics consist of a relatively high water table, a low coastal area, and stormwater pollution. Soils are generally poorly drained and much of the natural vegetation has been removed.

## **EXISTING CONDITIONS**

Much of the City's existing community development is located within the 100-year floodplain and took place prior to the implementation of the State's stormwater regulations. Thus, the combination of increased impermeable surfaces and decrease in vacant land and open area have created drainage problems. These problems include diminished drainage system capacities, decreased water recharge, increased stormwater pollution, and an increase in flood-prone areas. The major drainage problem facing the City is the flooding of selected intersections during heavy rains.

While it is recognized that the most logical and cost effective means of avoiding damage by flooding is through the proper location and design of community development, the application of this approach would be difficult at best since much of the flood-prone area in the City has already been built upon.

## **ENVIRONMENTAL IMPACTS**

The Pithlachascotee River and Orange Lake have been disturbed through urbanization, loss of habitat as a result of hardened shorelines and water quality degradation from stormwater runoff.

Water quality degradation of the river can be traced to stormwater runoff from agriculture and road and urban areas. The reduction in water quality or a change in the quantity of water found in the river would have a direct effect on the productivity of the nearby saltwater wetlands. The situation with Orange Lake is similar to that of the river in that it is directly affected by urban stormwater pollution.

## **PROJECTED NEEDS**

At the present time, the City of New Port Richey does have a master drainage plan. However, drainage improvements have been done on a "piece meal basis". The City is currently prioritizing the drainage projects that have been identified.

## **REGULATIONS**

The Southwest Florida Water Management District (SWFWMD) regulates drainage through the provisions of Chapters 17-25, 40D-4, 40D-40, and 40D-400 F.A.C., as amended. The amended regulations call for stricter treatment and retention permitting criteria for surface water management systems. Projects that have already received conceptual approval will be "grandfathered" under the criteria currently in effect. There are no provisions under state, regional, or local rules that provide for retrofitting stormwater systems. Therefore, correcting existing drainage problems is subject to the availability of local government funding. The City regulates drainage through its Code of Ordinances and those of the SWFWMD as they both exist and may be amended from time to time. Once a Plan has been submitted, accepted for review and approved within six (6) months of the initial submittal date, the regulations in effect at the time of the submittal will govern, until the approval expires.

It is acknowledged that under present conditions, there is no guarantee that those regulations currently in place, meet the drainage needs of the City. Therefore, in recognition of this fact, an examination of the strengths and deficiencies of existing regulations and/or the need for any additional regulations, will be made from time to time.

## **MASTER DRAINAGE PLAN**

As a result of the development pattern of the community, its physical location and natural surroundings, as well as the general lack of engineering data, information necessary to address the data and analysis requirements of Section 9J-5.011 has not been available. In recognition of the importance of such information to the health, safety, and welfare of the City, it is proposed that a master drainage plan be implemented which will incorporate drainage requirements into its base line data.

## **CAPITAL IMPROVEMENT DRAINAGE PROJECTS**

The City is in the process of implementing a master drainage improvement program, and incorporating certain drainage improvements into the City's current 5-Year Capital Improvements Budget, the full implementation remains an on-going process.

## CHAPTER 2

### GOALS, OBJECTIVES AND POLICIES

#### Goal 1

REDUCE EXISTING AND AVOID FUTURE FLOODING PROBLEMS AND IMPROVE SURFACE WATER QUALITY IN THE CITY OF NEW PORT RICHEY.

#### Objective 1.1

Establish the following Level of Service (L.O.S.) Standards for planning capital improvements and reviewing application for development approval.

##### Policy 1.1.1

Limit the rate of stormwater discharge from new developments to amounts which are equal to, or less than, the rate of discharge which existed prior to development in accordance with the Rules of Chapter 40D-4, 40D-40 and 40D-400 F.A.C., administered in the Southwest Florida Water Management District.

##### Policy 1.1.2

Regulate the volume of stormwater discharge in accordance with the Rules of Chapter 40D-4, 40D-40 and 40D-400 administered in the Southwest Florida Water Management District.

##### Policy 1.1.3

Require at minimum that on-site drainage facilities for any new project attenuate the stormwater runoff resulting from a 24-hour/25-year storm.

##### Policy 1.1.4

Require at a minimum that off-site conveyance systems for any new project carry runoff from a 24-hour/25-year storm.

##### Policy 1.1.5

Require all new projects be designed and constructed to treat the amount of rainfall/runoff prescribed by the Rules of Chapter 40D-4, 40D-40 and 40D-400 administered in the Southwest Florida Water Management District. The City of New Port Richey shall monitor the implementation of these regulations and, if necessary, develop an appropriate alternative strategy.

Policy 1.1.6

Require the placement of structures or impervious surfaces within the 25-year floodplain be limited commensurate with the ability of the project to adequately mitigate potential flood impact via compensating storage volumes, and with due consideration of potential flood impact upon adjacent properties.

Policy 1.1.7

Require that all development and redevelopment within the 100-year Riverine floodplain be compensated by creation of storage for an equal or greater volume elsewhere within the 100-year floodplain in a manner so as to be able to provide for effective compensation of the proposed encroachment. Areas solely within the Riverine 100-year floodplain, immediately adjacent to a tidally produced 100-year floodplain, influenced water body shall not be subject to this level of service performance standard on the Gulf of Mexico.

Policy 1.1.8

Rights-of-way and unused easements may be used for drainage purposes, provided this will not cause roadway flooding, are not planned for future use and are deemed appropriate for such use.

Policy 1.1.9

Regulate the use of flood plains in accordance with the City of New Port Richey Flood Damage Prevention Ordinance and to comply with Federal requirements under the National Flood Insurance Program.

Policy 1.1.10

Require that all proposed buildings within the 100-year floodplain shall be constructed so that finished floor elevations are a minimum of 12 inches above the elevation of the 100-year flood, as indicated by the Federal Insurance Rate Map in effect at the time of building permit application or as established by site survey.

Policy 1.1.11

Develop a public participation education program to provide the general public with input into stormwater management policies, procedures and practices.

Policy 1.1.12

Permit floodplains to be used for conservation, recreation and open space.

Policy 1.1.13

Regulate mining, excavation and filling of floodplains in accordance with appropriate state, federal and local regulations.

Policy 1.1.14

Amend the L.O.S. standards of this section if desired , at such time as the SWFWMD standards change or other standards are established.

Policy 1.1.15

Protect natural drainage features found within the City as follows:

- All applications for development approval within those areas identified as riverine floodplains shall be subject to site plan review;
- Impervious surface areas shall be minimized;
- The flood-carrying and flood storage capacity of the 100-year floodplain shall be maintained;
- To the maximum extent legally possible, new development shall not be located in river floodways, the area of highest velocity during flow;
- New development permitted in the flood fringe, the area of the floodplain outside the floodway , shall be required to meet flood hazard construction requirements;
- Development along the Pithlachascotee River floodplain shall be low density residential with adequate setbacks to maintain any existing areas of natural habitat;
- The prevention of erosion, retardation or runoff and protection of natural functions and values of the floodplain be considered while promoting public usage; and
- The City shall require development or redevelopment proposals to be consistent with the performance standards regulating development within the designated floodplain.

Objective 1.2

Establish major facilities design and maintenance standards criteria to identify , construct or reconstruct major drainage facilities which will be maintained by the City of New Port Richey according to a regular schedule.

Policy 1.2.1

Require all new drainageways to use swales, rather than steep-sided, cross-sections where possible.

Policy 1.2.2

Construct or require to be constructed, detention/retention basins in accordance with rules and procedures which the City of New Port Richey shall prescribe.

Policy 1.2.3

Require all new developments to provide on-site detention and treatment of stormwater runoff to remove oils, floatables, silt, sediment, nutrients, and heavy metals.

Policy 1.2.4

Require community associations, homeowner associations, developers and other third parties to retain ownership and maintenance of drainage systems except for components as the City of New Port Richey shall prescribe.

Policy 1.2.5

Prohibit excavation of any retention/detention basin to a depth which may adversely affect the Floridian aquifer.

Policy 1.2.6

Require stormwater systems to be designed to decrease velocity, enhance percolation and allow suspended solids to settle out. This policy shall not be construed to prohibit certain components such as bridge or culvert crossings which may increase velocity with no adverse impact on properties upstream.

Objective 1.3

Regulate development in a manner that will minimize adverse hydrological impacts.

Policy 1.3.1

Require development and redevelopment in any area adjacent to environmental wetlands to be situated, designed, and constructed so as to minimize the adverse impacts on the beneficial characteristics and functions of wetlands.

### Policy 1.3.2

Encourage the restoration of altered wetlands.

Goal 2 (Goal, objectives, and policies are consistent with those set forth in the City of New Port Richey Comprehensive Plan, Infrastructure Section)

AN EFFICIENT MASTER DRAINAGE SYSTEM WHICH PROTECTS HUMAN LIFE, MINIMIZES PROPERTY DAMAGES AND IMPROVES STORMWATER QUALITY AND ON-SITE RETENTION SHALL BE PROVIDED.

### Objective 2.1

As of the effective date of the Comprehensive Plan, or until such time as a Master Drainage Plan is operational, the City shall continue to maintain, and where necessary, improve the existing stormwater drainage system located within its municipal boundaries.

#### Policy 2.1.1

The following management techniques shall be, at minimum, used to implement the drainage plan (25-year frequency, 24-hour storm event):

- No more than 40 percent of residential lots and 70 percent of commercial lots shall be covered with paving or other types of impervious surfaces.
- Expansion and regular maintenance of retention swales adjacent to City roadways.
- Use of front, rear and side lot line swales in new development.
- Use of erosion and runoff control devices during development construction.
- In low areas, frequently inundated by stormwater flooding, the City shall consider construction of drainage retention areas, in the public right-of-way particularly to retain the stormwater currently being discharged into Orange Lake and overflowing into the Pithlachascotee River and basin.
- Where necessary, the City shall consider construction of drainage retention areas in the public right-of-way and the use of eminent domain condemnation to acquire property for drainage retention purposes.
- The City should continue to implement stormwater management techniques to correct the flooding on Main Street in front of City Hall, and in the N. Adams, Franklin, S. Riverview, Meadow Lane and Jasmine Heights areas.

- Where the shoreline of the Pithlachascotee River is not seawalled native vegetation shall be used for shoreline stabilization.
- The replacement material for failed or damaged rip-rap along the Pithlachascotee River concrete seawalls should be rip-rap or planting of native marine vegetation where technically feasible.
- Where cost effective, the rehabilitation of drainage facilities during road repairs and improvements shall be conducted.

Policy 2.1.2

The drainage system LOS standard is hereby established.

On-site: Retain the difference in pre- and post-development peak runoff for a 25-year, 24-hour storm event.

Off-site: Conveyance system to carry runoff from 10-year, 24-hour storm event.

Objective 2.2

The City of New Port Richey shall continue implementation of the Master Drainage Plan.

Policy 2.2.1

The City shall continue the drainage improvements fund, financed by proportionate assessment of City property owners for:

- Acquisition of required drainage easements.
- Construction bonds for required drainage improvements.
- Operation and maintenance costs.

Policy 2.2.2

Consistent with budget allocations, the City shall establish a program for retrofitting (i.e., rehabilitation during road repairs and improvements) of the system's existing deficiencies to conform to the Master Drainage Plan.

Goal 3 (Goal, objectives, and policies are consistent with those set forth in the City of New Port Richey Comprehensive Plan, Infrastructure Section)

THE NATURAL GROUNDWATER AQUIFER RECHARGE AREAS WITHIN THE CITY AND WITHIN THE CITY'S FACILITY SERVICE AREA SHALL BE PROTECTED AND MAINTAINED.

Objective 3.1

Regulations shall be adopted which provide protection to prime recharge areas located within the City.

Policy 3.1.1

As presented in Objective 4.2 of the Future Land use Element and pursuant to Section 373.3095, Florida Statutes, the City shall adopt provisions within its land development regulations which provide special protection to those areas identified as prime recharge located within the City .

Policy 3.1.2

The City shall cooperate with SWFWMD in its inventory and identification of those prime recharge areas within and adjacent to the City pursuant to Sections 373.0395(3) and 373.1397, Florida Statutes.

Policy 3.1.3

Areas with the greatest recharge potential and which are undeveloped shall be classified as prime recharge areas, and they shall be considered as candidates for designation as Preservation or other suitable land use designation, as deemed appropriate by SWFWMD, on the Future Land Use Map.

Policy 3.1.4

Areas of prime recharge within the City not designated as preservation areas, shall be regulated by limiting impervious surface, water quality monitoring, and other regulations which limit intense development, and shall require retention of the 25-year frequency, 24-hour storm event on-site to allow for maximum recharge.

Policy 3.1.5

Areas of prime water recharge shall be buffered from wastewater or solid waste products.

Objective 3.2

The City will, when feasible, assist SWFWMD, WCRWSA and Pasco County to prevent saltwater intrusion and other contaminants from adversely affecting the groundwater supply serving the City of New Port Richey.

Policy 3.2.1

The City shall cooperate with SWFWMD, WCRWSA and Pasco County in identifying and analyzing saltwater intrusion and other water quality hazards that affect the City of New Port Richey and its potable water supply service areas.

Policy 3.2.2

Adverse water quality shall be reported to the affected local governments and agencies and appropriate corrective measures, suitable to the quantity, type, and nature of the contaminate, shall be cooperatively undertaken.

#### Policy 3.2.3

The City shall ensure that all land development projects which occur subsequent to the adoption of the Comprehensive Plan shall meet water quality standards contained in Southwest Florida Water Management District (SWFWMD Chapters 40D-4, 40D-40 and 40D-400, F.A.C.).

### Objective 3.3

Protect the quality of lakes, rivers, streams, marine and freshwater wetlands, other watercourses and natural drainageways and drainage basins in the City of New Port Richey.

#### Policy 3.3.1

Design drainage systems to prevent the channelization of stormwater runoff directly into natural surface waterbodies.

#### Policy 3.3.2

Encourage the appropriate use of natural waterbodies, watercourses, and wetlands for water quality improvement with all necessary environmental and design controls. Adequate erosion and sedimentation control practices shall be used to protect natural waterbodies, watercourses, and wetlands from siltation and runoff from development and agricultural activities.

#### Policy 3.3.3

Prohibit encroachment into and the drainage of wetlands and submerged lands unless permitted by the appropriate agencies (i.e., SWFWMD, FDEP).

#### Policy 3.3.4

Preserve wetland and transitional vegetation located in floodplain buffer zones as defined by the Conservation and Coastal Zone Elements.

#### Policy 3.3.5

Prohibit the widening, straightening, stabilizing, or otherwise altering of natural watercourses except in cases of overriding public interest.

## CHAPTER 3

### REQUIREMENTS FOR A STORMWATER MANAGEMENT PLAN AND REPORT

Unless specifically exempted, modified, or waived pursuant to the City's development review procedures, a copy of the issued FDEP-NPDES-NOI Permit, the issued Construction Permit or Permit Exemption from the Southwest Florida Water Management District, and a Stormwater Management Plan meeting the requirements of this Manual, must be submitted and approved before commencing development. Said plan shall comply with the following standards:

#### 3.1 General Standards

- 3.1.1 The hydrologic requirements mandated by this Manual shall be developed in accordance with the latest releases and revisions of the U.S. Department of Agriculture, Soil Conservation Service's Technical Release No. 55 entitled "Urban Hydrology for Small Watersheds", SCS National Engineering Handbook, Section 4, entitled "Hydrology", and applicable supplements thereto. Alternate methods may be used if, in the opinion of the Development Review Committee, the method produces similar results to the above listed technical guides.
- 3.1.2 Innovative approaches to stormwater management shall be encouraged and the concurrent control of erosion, sedimentation, water pollution and flooding shall be mandatory.
- 3.1.3 The design of water retention or detention structures and flow attenuation devices shall be subject to the approval of the Development Review Committee pursuant to the requirements of this regulation.
- 3.1.4 Runoff computation shall be based upon the designated regulatory criteria (rainfall duration, distribution and antecedent soil moisture condition), and conform to acceptable engineering practices using rainfall data and other local information applicable to the affected area.
- 3.1.5 All stormwater management facilities shall be designed for a minimum of twenty (20) year life, have low maintenance cost, and adequate legal access for periodic maintenance.
- 3.1.6 No site alteration shall allow water to become a health hazard or contribute to the breeding of mosquitoes.
- 3.1.7 The drainage area used in runoff calculation shall be the total existing and natural watershed area including areas beyond proposed site limits.

- 3.1.8 All proposed stormwater management systems shall be designed to prevent flood, safety or health hazards.
- 3.1.9 All stormwater management systems shall be designed to enhance groundwater recharge while reducing pollution. However, in an area designated as a groundwater recharge area, the developer shall take all possible measures to limit runoff from the proposed site. In addition, the Development Review Committee, while enforcing standards set for pollution and sedimentation control, may encourage or request innovative approaches to achieve the above-stated purpose.
- 3.1.10 A stormwater management system shall be provided for protecting lots, roads and streets from the potential adverse impacts of stormwater runoff and for handling stormwater runoff that comes into or across the site plan from the outside. Soil types shall be considered and ultimate land usage assumed for selection of proper runoff coefficients within the drainage areas involved. The system shall be designed in accordance with accepted engineering principles to attenuate to predevelopment levels.

The system shall be designed for low maintenance cost and ease of maintenance by normal maintenance methods. The City may require such data as is determined to be necessary from the applicant to provide the adequacy of the design of the water management system.

- 3.1.11 The applicant shall provide facilities to hold stormwater on-site per the requirements of this section or to drain the runoff to positive outfalls that can be legally maintained in permanent use, or to a public drainage system with adequate capacity which discharges into positive outlets. If the applicant elects to utilize a public drainage system, the applicant must have the consent of the governing body which exercises control over the public drainage system.
- 3.1.12 In the event the applicant elects to drain to a public drainage system, the applicant, at his own expense, may be required to modify the public drainage system in part or in whole, including but not limited to storm sewers, inlets, ponds, control structures, side ditches or roadside swales adjacent to public roads over which the drainage will flow. Any such modification shall be subject to the approval of any governing body having jurisdiction over the public drainage system.
- 3.1.13 Projects that are to be developed in phases will require the submission of a master plan of the applicant's contiguous land holdings. Applications for individual project phases may be considered only when the phases are consistent with the approved master plan.
- 3.1.14 All Projects and their Plans shall be designed to be fully compliant with the current Florida Department of Environmental Protection (FDEP) State of Florida Municipal Separate Storm Sewer System Permit (MS4) Number FLS 000032-003 issued 12/01/2011 and as may be amended from time to time.

3.2 Performance and Maintenance Standards - Stormwater management plans must demonstrate the proposed development activity has been planned, designed, and will be constructed and maintained to meet each of the following performance standards:

- 3.2.1 To limit the post-development hydrograph for the developed site so that rate of flow, volume (in a closed basin), and timing shall not exceed pre-development conditions;
- 3.2.2 To protect or improve the quality of ground and surface water;
- 3.2.3 To insure that there is no erosion after development;
- 3.2.4 To maintain groundwater levels and enhance groundwater recharge;
- 3.2.5 To protect the beneficial function of wetlands, such as swamps, bogs, marshes, estuaries, sloughs, floodplains, for the natural storage of surface waters and the biological reduction and assimilation of pollutants;
- 3.2.6 To prevent saltwater intrusion by adhering to applicable best management practices;
- 3.2.7 To prevent increased flooding and damage that result from improper location, construction and design of structures in areas which are presently susceptible to dangers of flooding;
- 3.2.8 To protect the natural fluctuating levels of salinity in estuarine areas;
- 3.2.9 To minimize injury to flora and fauna, and adverse impacts to fish and wildlife habitats;
- 3.2.10 Retention and detention ponds shall be used to retain and detain the increased and accelerated runoff which the development generates. Water shall be released from detention ponds into watercourses, wetlands, existing stormwater management facilities, etc., at a rate and in a manner approximating the natural flow which would have occurred before development;
- 3.2.11 The area of land disturbed by development shall be as small as practicable. Those areas which are not to be disturbed shall be protected by an adequate barrier from construction activity. Whenever possible, natural vegetation shall be retained and protected;
- 3.2.12 No grading, cutting or filling shall be commenced until erosion and sedimentation control devices have been installed between the disturbed area and water bodies, watercourses, and wetlands;
- 3.2.13 Land which has been cleared for development and upon which construction will

not commence and continue within 30 days shall be protected from erosion and sedimentation by appropriate techniques;

3.2.14 On sites greater than one acre, if more than one contiguous acre is cleared, a ground cover sufficient to prevent erosion shall be planted or otherwise provided within 10 working days on that portion of the site upon which further active construction will not be undertaken within 90 days;

3.2.15 Sediment shall be retained on the site of the development;

3.2.16 Wetlands and other water bodies shall not be used as sediment traps during development;

3.2.17 Erosion, sedimentation and all stormwater management system facilities shall receive regular maintenance to ensure that they continue to function properly. This shall be done by the Developer or the approved Operation and Maintenance Entity. Should this not be done, then the City of New Port Richey is hereby granted access and authorized to perform maintenance operations they deem necessary to protect the health, safety and welfare of the public and to charge the Developer or approved Maintenance Entity for these costs, who hereby agrees to pay and be responsible for these costs within 60 days of notification.

3.2.18 Development, including grading and contouring, shall take place in a manner that protects the roots and stability of trees.

3.3 Design and Maintenance Standards - To insure attainment of the objectives of this regulation and to insure that the performance standards will be met, the design, construction and maintenance of drainage systems shall be consistent with the following standards:

3.3.1 The hydrograph for the developed or redeveloped site shall not exceed the rate of flow, volume (in a closed basin), and timing of runoff produced by conditions existing before development or redevelopment, unless runoff is discharged into an off-site drainage facility as provided in Section 3.3.10 below.

3.3.2 Channeling runoff directly into water bodies shall be prohibited. Instead, runoff shall be routed through swales and other systems designed to increase time of concentration, decrease velocity, increase infiltration, allow suspended solids to settle and remove pollutants.

3.3.3 Natural watercourses shall not be dredged, cleared of vegetation, deepened,

widened, straightened, stabilized, or otherwise altered. Water shall be retained or detained before it enters any natural watercourse in order to preserve the natural hydro-dynamics of the watercourse in order to preserve the natural hydro-dynamics of the watercourse and to prevent siltation or other pollutions.

- 3.3.4 Artificial watercourses shall be designed, considering soil type, so that the velocity flow is low enough to prevent erosion.
- 3.3.5 Vegetated buffer strips shall be created or, where practical, retained in their natural state along the banks of all watercourses, water bodies, or wetlands. The width of the buffer shall be sufficient to prevent erosion, trap the sediment and overland runoff, provide access to the water body and allow for periodic flooding without structures.
- 3.3.6 Detention and retention areas shall be designed so that shore lines are sinuous rather than straight and so that the length of shoreline is maximizing, thus offering more space for the growth of littoral vegetation.
- 3.3.7 The banks of wet detention and retention areas shall slope at a gentle grade (maximum 4:1) into the waters as a safeguard against drowning, personal injury or other accidents, to encourage the growth of vegetation, and to allow the alternate flooding and exposure of areas along the shore as water levels periodically rise and fall. Fencing (6 feet tall chain link - from existing ground) may be allowed as an alternative.
- 3.3.8 The use of drainage detention and vegetated buffer zones as open space, recreation and conservation areas shall be encouraged.
- 3.3.9 The developer shall be responsible for obtaining any necessary permits for the stormwater management system required by local, state or federal agencies.
- 3.3.10 The Development Review Committee may allow stormwater runoff to be discharged into drainage facilities off the site of development if each of the following conditions is met:
  - a. It is not practicable to completely manage runoff on the site in a manner that meets the performance and design standards;
  - b. The off-site drainage facilities and conveyance system leading to them are designed, constructed and maintained in accordance with the requirements of this manual;
  - c. Adequate provision and written agreements for use of the land are made for the sharing of construction, maintaining and operating costs of the facilities. The developer may be required to pay a portion of the cost of constructing the

facilities as a condition to receiving approval of the drainage plans; and

- d. Adverse environmental impacts on the site of development will be minimized.
- e. A request to use off-site drainage facilities and all information related to the proposed off-site facilities shall be made a part of the developer's approved stormwater management plan.

3.4 Contents of a Stormwater Management Plan - It is the responsibility of the applicant to include in the stormwater management plan sufficient information for the Development Review Committee to evaluate the environmental characteristics of the affected area, the potential and predicted impacts of the proposed activity on community waters, and the effectiveness and acceptability of those measures proposed by the applicant for reducing adverse impacts. The stormwater management plan shall contain maps, charts, graphs, tables, photographs, computations, narrative descriptions and explanations, and citations to supporting references, as appropriate to communicate the information required by this section.

The Stormwater Management Plan shall, at a minimum, contain the following information:

3.4.1 The name, address, and telephone number of the applicant and the engineer.

3.4.2 A location map.

3.4.3 The existing environmental, topographic (1 ft. contours and basis) and hydrologic conditions of the site and/or receiving waters and wetlands, and all drainage basins - on and off site shall be described in detail, including the following:

- a. The direction, flow rate, and volume (in a closed basin) of stormwater runoff existing conditions, pre-development conditions; and post-development conditions;
- b. The location of areas on the site where stormwater collects or percolates into the ground;
- c. A description of all watercourses, water bodies, and wetlands on or adjacent to the site or into which stormwater flows;
- d. Groundwater levels, including seasonal fluctuations; location of floodplains;

- e. Vegetation;
- f. Topography;
- g. Soils.
- h. Other items consistent with the SWFWMD criteria.

3.4.4 Proposed alterations of the site shall be described in detail, including:

- a. Changes in topography;
- b. Areas where vegetation will be cleared or otherwise killed;
- c. Areas that will be covered with an impervious surface and a description of the surfacing material; the size and location of any buildings or other structures.

3.4.5 All components of the proposed storm water management drainage system and any measures for the detention, retention, or infiltration of water or for the protection of water quality shall be described in detail, including:

- a. The channel, direction, flow rate, volume (in a closed basin), and quality of stormwater that will be conveyed from the site, with a comparison to existing conditions and pre-development and post-development conditions; detention and retention areas, including plans for the discharge of contained water, maintenance plans, and predictions of water quality in those areas; areas of the site to be used or reserved for percolation;
- b. 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, and provisions for their maintenance.
- c. Any other information which the developer or the Development Review Committee believes is reasonably necessary for an evaluation of the development.

3.4.6 Construction plans and specifications for all components of the Stormwater Management System.

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

## CHAPTER 4

### GENERAL DRAINAGE STANDARDS/CRITERIA

All proposals for development or redevelopment shall include a detailed stormwater management plan to be submitted for approval by the City of New Port Richey. The plan shall illustrate the means by which compliance with the intent of the stormwater management policies of the City will be achieved. Maintenance overlays of existing parking lots shall require a certification that the proposed maintenance overlay construction activity will be made in a manner that does not change the existing drainage pattern within the parking lot or have an adverse effect on adjacent off-site areas. All plans, maps, data, computations, certifications, etc. required by this manual shall be prepared and sealed by a Professional Engineer registered in the State of Florida.

#### GENERAL

All new developments and redevelopments shall be required to provide a detention/retention system in order to detain/retain increased runoff caused by the development/redevelopment. Where public or private lakes, ponds, borrow pits, or similar type water detention/retention areas are incorporated in a comprehensive drainage plan, drainage calculations shall demonstrate that the facilities have sufficient capacity for the design storm. In the design of detention/retention facilities, the effective volume shall be based on the pond bottom or the seasonal high groundwater level, whichever is higher, as a minimum starting elevation of the stage/storage computations.

#### REQUIREMENTS APPLICABLE TO ALL DEVELOPMENTS REQUIRING REVIEW

##### 4.1 Drainage Review

4.1.1 A drainage review will be required regardless of size for all of the following types of developments.

- a. Residential/Subdivision
- b. Commercial
- c. Industrial
- d. Multi-family/Non-subdivision

4.1.2 Impervious areas shall include, but not be limited to:

- a. Buildings
- b. Asphalt surface
- c. Concrete
- d. Shell
- e. Limerock
- f. Water
- g. Paver Block/Turf Block

- h. Any other material either temporary or permanent which will shed over 70% of the water falling upon it.

4.1.3 These standards, unless otherwise noted, shall apply to all developments requiring review.

## 4.2 Outfall Conditions

All outfall conditions are classified by the City as more than adequate, adequate, peak sensitive or volume sensitive. It is the responsibility of the Developer's Design Engineer to study the outfall condition for a project site area based upon the following criteria:

### 4.2.1 More than adequate outfall:

- a. These outfalls are usually located adjacent to sizable water bodies (i.e. large streams and rivers, etc. which are large enough to allow an increase in discharge without causing harm. The requirements for any proposed construction or upgrading of connecting facilities to these sizable water bodies will be established on a case-by-case basis by the City Engineer and will include a minimum design event of the 100-year return frequency assuming post-development conditions. It is strongly recommended that the Developer's Design Engineer have a pre-design meeting with the City Engineer prior to submitting the site design of more than adequate outfalls in the City.
- b. The Developer must submit a drainage plan along with his design which demonstrates that direct discharge to the outfall without attenuation of flow will not result in any adverse impacts.
- c. This in no way precludes the Detention Treatment Requirements of any other local, state, or federal agency.

### 4.2.2 Adequate outfalls

- a. These outfalls have no known inadequacies or flooding conditions but would experience an increase in water elevation if the discharge rate were increased.
- b. Developments discharging into this type outfall must be designed with post-development peak discharge rates due to a 25-year, 24-hour storm event not to exceed the pre-development peak discharge rate for the 25-year, 24-hour storm event.
- c. Sheetflow is not considered to be an adequate outfall unless specifically approved by the City Engineer.

#### 4.2.3 Peak Sensitive (Outfalls with inadequate flow capacity):

- a. These outfalls generally have histories of flooding problems related to resistance and restrictions within the channel and/or inadequate conveyance structures.
- b. Developments discharging into this type outfall must be designed to meet the more stringent of the following conditions:
  1. Post-development peak discharge rate for the 25-year, 24-hour storm event is not to exceed pre-development peak discharge rate for the 10-year 24-hour storm event.
  2. The post-development flow rate is not to exceed the area weighted capacity of the outfall unless the Developer's Design Engineer can demonstrate that a different discharge rate should be used for the design. The outfall capacity shall be that which does not result in adverse flooding or erosion of adjacent properties.

#### 4.2.4 Volume Sensitive

- a. This classification pertains to development which drains into areas that do not have a positive outfall.
  1. A positive outfall is defined as a man-made or natural canal, swale, waterway or other conveyance system. Sheetflow is not a positive outfall unless specifically approved by the City.
  2. In such areas the site shall be designed in accordance with either of the following criteria:
    - The difference between the pre-development and post-development runoff volumes, due to the 100-year, 24-hour rainfall event, shall be retained on-site. The design storage volume must be again available within 72 hours after the end of the design storm event. The Developer's Design Engineer must demonstrate that percolation, alone, is sufficient to discharge the design volume within the 72-hour period.
    - The total post-development runoff volume due to the 100-year, 24-hour rainfall event shall be retained or detained on site. The pond shall be designed to bleeddown, during the 100-year design event, at a rate which will result in a discharge of no more than and no less than approximately one inch of runoff from the total area contributing to the pond within 24 hours of the inception of inflow to the pond. An exception can be made by the City when other

agency bleeddown criteria is more stringent. When percolation is the only means of discharge from the pond, then one inch of runoff is the minimum volume to be discharged in the 24-hour period described above. The Developer's Design Engineer must demonstrate this.

#### 4.3 Frequency

The system at a minimum, shall be designed for "design storms" resulting from rainfall of the following frequencies as stated below.

4.3.1 10-Year - All storm sewers and culverts, except those crossing arterial roads. A minimum time of concentration of 15 minutes to the first inlet may be utilized in determining design flows.

4.3.2 25-Year/24-Hour - All floodways, ditches, channels, and detention/retention areas with outfalls (open drainage basin).

4.3.3 50-Year - All storm sewer and culverts crossing arterial roads.

4.3.4 100-Year/24-Hour - All retention areas without outfalls (closed drainage basin).

Rainfall intensity factors shall come from accepted meteorological and rainfall sources applicable to the City of New Port Richey.

#### 4.4 Development Criteria in Floodplains

4.4.1 The criteria for development in floodplains pertains to all floodplains and is not limited to those defined on FEMA maps. The Developer's Design Engineer is responsible for determining the on-site 100-year flood elevations if not defined by a FEMA detailed study. The Developer's Design Engineer is encouraged to submit a Letter of Map Amendments to FEMA for any changes in flood zone designations as determined by detailed study of the area.

4.4.2 No development (structures and/or fill) shall be allowed in the conveyance portion of any 100-year frequency floodplain associated with any stream, channel, lake or waterway unless provisions are made to effectively compensate for any reduction in conveyance caused by the development.

This does not apply to the 100-year floodplain immediately adjacent to a tidally produced 100-year floodplain influenced water body for on-site areas. Off-site areas shall not be impacted in any way.

4.4.3 No development (structures and/or fill) shall be allowed in the Riverine 100-year frequency floodplain unless provisions are made to effectively compensate for the reduction in storage volume areas due to the proposed development.

- a. Any compensation volumes must be provided in addition to water detention or retention ponds otherwise required to reduce peak runoff rates from the development. Credit for partial usage of pond storage volume for both compensation storage volume and peak discharge attenuation storage volume shall be appropriate if the Developer's Design Engineer can show that it is applicable by a detailed analysis of the hydrologic timing of the water surface elevations within the watershed. For developed conditions, the controlled seasonal high groundwater table elevation will be used in the analysis and design. Controlled seasonal high groundwater is the elevation of the seasonal high groundwater after site modifications are completed.
- b. No earth fill may be placed within the Riverine 100-year floodplain area unless an effective equal amount of flood storage volume is created by excavation below the 100-year flood elevation and above the seasonal high groundwater table elevation or controlled seasonal high groundwater table elevations, whichever is appropriate.
- c. Exceptions are allowed if the floodplain is associated with a landlocked waterbody and is under one ownership.

#### 4.5 Determination of Storm Runoff

4.5.1 Runoff and routing analysis shall be based on current hydrological design procedures. Computations shall include a tabulation of inflow, discharge, storage capacity, minimum and maximum water elevations, and retention/detention time to peak.

4.5.2 Basic hydrological calculations shall be based on commonly accepted procedures such as those of:

- a. Soil Conservation Services (S.C.S.)
  - 1. "A method for Estimating Volume and Rate of Runoff in Small Watersheds", U.S. Department of Agriculture, S.C.S. Technical Paper No. 149.
  - 2. "Urban Hydrology for Small Watersheds", U.S. Department of Agriculture, S.C.S. Technical Release No. 55.
  - 3. "National Engineering Handbook, Section 4, Hydrology", U.S. Department of Agriculture, S.C.S., latest edition.

The Soil Conservation Service, Type II, Florida Modified Rainfall Distribution with Antecedent Moisture Condition II will be used. Other rainfall distributions may be utilized for design with the prior approval of the City. The same shape factor shall be used for pre-development and post-development calculations, unless otherwise approved by the City of New Port Richey.

- b. Rational or Modified Rational Method
  - 1. "Drainage Manual", See the 2008 Drainage Manual by the Florida Department of Transportation. Volumes 2A and 2B may be used as reference documents from the 1987 FDOT Drainage Manual.
  - 2. Standard Engineering Texts.

The rational method of routing analysis may be used for systems serving projects with one (1) acre or less of total contributing area.

- c. Others as approved by the City of New Port Richey

Ultimate land usage shall be assumed for selection of proper runoff coefficients, or curve numbers with in the basin involved. Weighted runoff coefficients, or curve numbers shall be utilities where different coefficients, or curve numbers exist within the area comprising the basin

#### 4.6 Rainfall Criteria

##### 4.6.1 Rational and Modified Rational Methods

- a. The FDOT Zone 6 IDF curves (fig. 2) shall be used in the City of New Port Richey when designing by the Rational or Modified Rational Methods.

##### 4.6.2 S.C.S. Synthetic unit Hydrograph Methods

- a. The SWFWMD rainfall depths found in Figures 3 through 6 are to be used in the City of New Port Richey when designing by the S.C.S. methods.
- b. The only allowable rainfall distribution for design use in the City of New Port Richey is the S.C.S. Type II Florida Modified rainfall distribution. This distribution can be found in Table 10-A and B. The same design rainfall distribution shall be used in the calculation of both pre- and post-development runoff hydrographs.

#### 4.7 Time of Concentration Determination

4.7.1 The Time of Concentration is a common parameter of the above methods. It is recommended that the time of concentration be determined by the Velocity Method.

- a. The velocity method is a segmented approach that can 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:

$$t_i = \frac{L_i}{(60) V_i} \quad (4-1)$$

Where:

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

$L_i$  = Length of the flow path for segment (i), in feet

$v_i$  = Average velocity for segment (i), in feet/second

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

$$t_c = t_1 + t_2 + t_3 + \dots + t_i$$

Where:

$t_c$  = Time of concentration, in minutes

$t_1$  = Overland travel time, in minutes

$t_2$  = Shallow channel travel time (typically shallow swale or gutter flow), in minutes

$t_3$  = Main channel travel time (typically storm sewer, swale, ditch, canal, etc.), in minutes

$t_i$  = Travel time for the  $i^{\text{th}}$  segment, in minutes

## 1. Overland Flow

The 1987 FDOT Drainage Manuals 2A and 2B serve as useful guidance documents.

The Kinematic Wave Equation developed by Ragan (1971) should be used for calculating the travel time for overland flow conditions. The Kinematic Wave method is the recommended method for calculating the time of concentration for overland flow. Other methods may be acceptable, however, the design will be checked with the Kinematic Wave Equation. Any significant differences in the calculation of the time of concentration for overland flow by methods other than the Kinematic Wave Equation must be approved by the City. This equation, which is expressed as:

$$t_i = 0.93 \frac{L^{0.6} N^{0.6}}{I^{0.4} S^{0.3}} \quad (4.2)$$

Where:

- $t_1$  = Overland flow travel time, in minutes
- $L$  = Overland flow length, in feet
- $N$  = Surface roughness coefficient for overland flow (see Table 2)
- $I$  = Rainfall intensity, in inches/hour, corresponding to the design storm frequency
- $S$  = Average slope of the overland flow path, in feet/feet

The Figure 11 Nomograph is a design aid.

Table 2 It should be noted that the surface roughness coefficient values shown in Table 2 were determined specifically for overland flow conditions and are not to be used for conventional open channel flow calculations.

Equation 4-2 is solved by a trial and error process as follows:

- Assume a trial value of rainfall intensity ( $I$ ).
- Determine the corresponding overland travel time ( $t_1$ ) using Figure 11 or

Equation 4-2.

- Use  $t_1$  from Step 2 as the critical storm duration and determine the actual rainfall intensity for this critical storm duration. Select the appropriate intensity-duration-frequency (IDF) curve from Figure 2.
- Compare the trial and actual rainfall intensities. If they are different, select a new trial rainfall intensity and repeat the process.

2. Shallow Channel Flow (e.g. shallow swale, gutter, etc.)

Average velocities for shallow channel flow can be calculated using Manning's Equation.

3. Main Channel Flow (e.g. Ditch, pipes, etc.)

Average velocities for main channel flow should be calculated using Manning's Equation.

#### 4.8 Erosion Control Measures

- 4.8.1 It shall be the responsibility of the developer to control soil erosion by wind or water from the date of groundbreaking until such time as the responsibility is transferred to an acceptable entity in accordance with this code.
- 4.8.2 The Developer 's Design Engineer must provide for use of sediment basins, strawbale dams, velocity checks, hydroseeding applications, etc., to minimize erosion within the limits of the site being developed and prevent damage to wetland systems which are to remain in the development.
- 4.8.3 Design of canals, streams, ditches, and any other waterways shall be based on current open channel design procedures using the Chezy, Talbot, and/or Manning's Formula. Design velocities without erosion protection shall not exceed the maximums for soil types as shown in Table 7. Where design levels exceed top of banks for the required design storm (i.e. 25-year for major waterways), and berms are not provided, the extent of flooding in the floodplain shall be shown. Runoff and roughness coefficients, safe velocities, nomographs, erosion control, and practical limitations on use of design formulas shall be based on current practice in the field of hydraulics, notwithstanding any requirements of this section.
- 4.8.4 Conditions such as alignment, and presence of severe irregularities in smoothness will alter the allowable velocities. Maximum flow velocities for various soil types without erosion protection are shown in Table 7.

4.8.5 All roadway construction or repair activities performed by, or under the supervision of the City of New Port Richey Public Works Department shall be conducted in accordance with the standards set forth in the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (Section 104 Erosion Control) and the policies shall comply with the requirements of Chapter 62-25 Florida Administrative Code CFAC), Environmental Permitting Rules 40D-4, 40D-40 and 40D-400 of Southwest Florida Water Management District and with local environmental codes, and the current FDEP-NPDES Permit for MS4 systems.

#### 4.9 General Criteria for Detention and Retention Ponds

4.9.1 Purpose - The purpose of detention and retention ponds is to serve as a buffer to attenuate peak flows and/or excess runoff volume from urbanized and developed areas.

#### 4.9.2 Minimum Criteria for Detention/Retention Ponds (All Development/Redevelopment )

- a. A detention or retention pond shall be provided unless otherwise approved by the City. The minimum edge of pavement elevation shall be at or above the design high water elevation, unless otherwise allowed.
- b. For the design of detention ponds in an open basin, the instantaneous peak discharge expected for the undeveloped site due to a 25-year/24-hour rainfall shall not be exceeded by the instantaneous peak discharge from the developed site due to a 25-year/24-hour rainfall unless the site is considered "peak or volume sensitive". The 100-year/24-hour rainfall shall be utilized for a closed basin design.
- c. Calculation of the instantaneous peak discharge from the undeveloped site shall consider the affect of existing storage in attenuating this peak. Pre- and post-development initial elevations for estimating storage shall be the seasonal high water elevation as determined by biological indicators, soil indicators, or other suitable methods and controlled season high water elevations, respectively.
- d. Drainage calculations shall include peak discharge .
- e. Off-site runoff shall be routed around or through the project without combining with on-site runoff unless the pond and discharge structure are designed to accept this off-site runoff.
- f. The 100-year event shall be routed around the project or through the detention/retention pond. If designed to accept the off-site runoff, it shall be used to establish the minimum residential floor slab elevation or floodproofing elevation (commercial sites only). In no case should residential floor slab elevations or floodproofing elevations be any lower than 1 (one)

foot above the flood elevations established by FEMA.

- g. For commercial sites, a minimum of six inches of freeboard is to be provided for the 25-year/24-hour storm or the 100-year/24-hour storm, whichever is the design storm event.
- h. For commercial sites, no more than 50% of the required freeboard may be provided outside of the designated pond area.
- i. For commercial sites, some storage may be allowed on top of paved parking areas when designing to the 100-year criteria, for all outfall conditions, provided:
  - 1. Developed runoff volume for the 25-year storm event is entirely stored in the pond.
  - 2. Depth of storage on the pavement does not exceed four inches.
- j. Hydrologic and hydraulic calculations shall be provided for each facility and shall include:
  - 1. Drainage calculations and support information such as: stage-storage data, stage-discharge data (if applicable), inflow hydrographs, outflow hydrographs, etc.
  - 2. Input data, when computerized flood routing techniques are utilized including: basin areas, curve numbers, Rational coefficients, inflow hydrographs, S.C.S. peak rate factor, time of concentration values, rainfall distribution data, stage/storage information, etc.
- k. For commercial sites, the maximum sideslope for ponds shall be no steeper than 4:1. If a request for steeper slopes is granted by the City, the entire areas of the pond shall be fenced with a minimum six (6) foot high chain link fence with a twenty (20) foot double swing gate.
- l. For subdivisions, the maximum sideslopes for ponds shall be no steeper than 4:1. (horizontal:vertical)

- m. For subdivisions, wet detention ponds shall have a minimum depth of 6 feet below normal water level and shall have sideslopes no steeper than 4:1 (horizontal:vertical) to a depth of at least 6 feet below normal water level. The minimum depth requirement will not apply to littoral zones, however, the sideslope requirements stated above will apply below normal water level.
- n. For subdivisions, the minimum freeboard for ponds shall be six inches between design high water and top of bank for the 25-year/24-hour storm or the 100-year/24-hour storm, whichever is the design storm event. All points within the adjacent maintenance areas shall be at or above the elevation of the top of bank. When the adjacent property slopes upward from the outer edge of the maintenance area then credit will be given for freeboard to the external limit of the maintenance area. If the outside edge of the maintenance area slopes downward (maintenance areas is on an embankment) then six inches of freeboard above design high water at the inside edge of the maintenance area shall be included in the design. The cross slope of the maintenance area shall be not steeper than 20:1 (horizontal:vertical). The maintenance area shall be at least 15 feet wide unless otherwise approved by the City. If the maintenance area is on an embankment, the external slope of the embankment shall be no steeper than 4:1 (horizontal:vertical) and the toe of the external slope shall not extend beyond the boundary of the subdivision. The external slope of the embankment shall be stabilized in accordance with Section 4.9.3 of this manual.
- o. For City maintained and private subdivisions detention/retention ponds, inflow into the pond shall occur by an enclosed pipe system. Mitered end and flared end sections (no endwalls) shall be used inside detention/retention ponds. Other designs, as approved by the City, may be used which account for the structural stability of the end treatment for pipe entrances and exists within ponds.
- p. Recovery of flood storage and pollution abatement volume for detention/retention ponds is considered to be the storage available 72 hours after the end of the storm event. There is an exception to this criteria for detention ponds in volume sensitive areas.

#### 4.9.3 Grassing and Mulching

- a. The pond maintenance areas shall be grassed and mulched in accordance with the Florida DOT Standard Specifications for Road and Bridge Construction (latest edition).
- b. All retention and detention ponds shall be stabilized to the normal water line with suitable vegetation. Sideslopes steeper than

6:1 (horizontal:vertical) shall be sodded.

- c. Plans and specifications submitted to the City shall include provisions for establishing vegetation on:
  - 1. Berms
  - 2. Sideslopes
  - 3. Other locations to be stabilized with suitable vegetation as necessary to prevent erosion, silting and maintenance problems.
- d. When pond sideslopes or soil conditions warrant, sod should be staked to ensure stabilization.

#### 4.9.4 Detention Ponds

- a. Seasonal High Groundwater Elevation
  - 1. The seasonal high groundwater elevation shall be determined by a geotechnical engineer licensed in the State of Florida from existing soil conditions, site borings and profiles, existing water levels, etc., for the location(s) proposed to be utilized as detention ponds based on S.C.S. criteria.
  - 2. No storage credit will be given below the controlled seasonal high water table elevation as established by a geotechnical engineer licensed in the State of Florida.
- b. Water level Control Structures
  - 1. The outlet of detention ponds shall have a water level control structure that enables the pond to function as indicated in the hydraulic calculations.
  - 2. The water level control structure shall not be a pipe riser and shall not be adjustable, unless a proven and State Certified product is utilized and certified by an Engineer licensed in the State of Florida.
  - 3. Acceptable water level control structures include:

- A ditch bottom inlet constructed in accordance with the Standard Indexes and the Florida DOT Standard Specifications for Road and Bridge Construction (latest editions).
  - In the event a ditch bottom inlet will not enable the pond to function as indicated in the hydraulic calculations, the water level control structure used shall meet the approval of the City Engineer.
4. All control structures shall be designed to prohibit the entrance of floating debris into the structure. This shall be achieved by attaching a skimming device to the outfall structure. The bottom of the skimming device should be at least 6 inches below the normal water level and the top no lower than the design highwater elevation. Appropriate hydraulic design of the device will be required to insure that the skimming device will not control pond discharge. At least 1 foot of open clearance shall be provided below the skimmer bottom elevation to the pond grade at that point.
  5. The control structure shall have a slot or orifice dimension of no less than three (3) inches and the design low water elevation of the detention pond shall be at the slot or orifice invert elevation. The top of the control structure should be at the elevation of the design high water.

Since weir coefficients have been developed only for flow conditions where the length of the weir (L) is much greater than the head on the weir (H), (depth of water above weir crest), an orifice rather than a slot should be used if  $H/L > 1$  at any time during the design storm event.

6. Credit for water quality storage volume will be given only:
  - If the pond is for retention only and meets the requirements for percolation,
  - For that portion of the pollution abatement volume which is bled down within 36 hours after the end of the storm through a positive discharge structure such as an orifice and the orifice opening is at least one (1) inch in diameter. If rectangular, the smallest dimension is at least one (1) inch. If a Cipoletti weir is used, the bottom weir length shall be no less than one (1) inch.

7. Tailwater conditions downstream of the water level control structure shall be accounted for in the design of the water level control structure.
8. Underdrains are not considered to be a positive means of low water control, therefore, no credit is given for the storage volume dissipated by underdrains below the slot or orifice elevation of the outlet structure.
9. Control structures are not to be placed within City road rights-of-way.

c. Detention Pond Outfall Control Design

1. Direct discharge by means of control structures, into storm drains or through culverts will be permitted if the receiving systems have the capacity for such discharges. Such systems include:
  - Storm sewer systems
  - Man-made ditches
  - Natural waterways
  - Lakes
2. When direct discharge may tend to degrade waters of natural streams, marshes, environmentally sensitive areas, and lands naturally receiving sheetflow, the discharge structures shall direct the flow to an intermediate spreader swale system.
3. In designing detention ponds where direct discharge is allowed, discharge may be controlled by the use of a weir or orifice structure. The designer should refer to standard hydraulic references for the theory and equations which govern weir and orifice flow.
4. The designer must also check the capacity of the outfall pipe to determine whether the outfall pipe controls the discharge at any time during the design runoff event. The Site Designer shall consider local losses in the evaluation of detention pond outfall pipe systems regardless of flow velocities in the pipe(s).

d. Natural Depressed Areas

1. Natural depressed areas located entirely within the project boundaries may be used for detention purposes when not adversely affecting off-site water levels.
2. The storage above the seasonal high water level in natural

depressed areas shall be considered in the determination of pre-development flows.

#### 4.9.5 Retention Ponds

##### a. Seasonal High Groundwater Elevation

1. The seasonal high groundwater table shall be determined or estimated by a qualified geotechnical soils engineer registered as an Engineer in the State of Florida, based upon S.C.S. methodologies and the following factors:

- Existing soil conditions (spodic stain lines, where applicable)
- Soil profiles
- Measured groundwater water levels
- Measured water levels of surrounding water bodies

2. This elevation shall be included in the drainage plans.

##### b. Design Criteria For Retention Ponds

The following criteria shall be used to design retention ponds:

1. A suitable over flow outlet (man-made or natural) shall be provided for retention ponds where practical.

2. Retention ponds shall have a subsoil investigation report which includes one boring for each one acre of pond bottom if percolation will primarily be through the pond bottom. One boring will be needed for each 1000 foot of pond perimeter if percolation will primarily be through the pond sideslopes.

- There shall be a minimum of two (2) borings per retention ponds.
- The borings shall extend twenty (20) feet below the pond bottom and shall be uniformly distributed.
- The soil profile and existing groundwater elevation and estimated seasonal highwater elevation shall be determined for each boring.
- The soils shall be sampled and classified in accordance with the American Society of Testing and materials (ASTM) Standard Method D2487.

- The seasonal high groundwater table elevation shall be determined by a qualified geotechnical soils engineer registered as an Engineer in the State of Florida and the results included in the soils report.
  - Existing surface elevations at each boring location shall be provided.
  - The subsoil investigation report shall be included with the Drainage Calculations.
3. Retention ponds shall have an Double Ring infiltration rate test performed for each one acre of pond bottom if percolation will primarily be through the pond bottom. One infiltration rate test will be needed for each 1000 feet of perimeter if percolation will primarily be through the pond sideslopes.
    - There shall be a minimum of one infiltration rate test for each retention pond.
    - The infiltration rate test shall be performed at the depth and location which will provide representative test results for use in design of the retention pond. The test elevation, reference NGVD or NAVD, shall be furnished. The same vertical datum shall be used for all elements/phases of the same project.
    - The soils report shall provide detailed information on all test procedures, test depths and locations and data measurements and results.
  4. The retention pond design shall be based on an infiltration rate that is one-half (1/2) of the lowest infiltration rate obtained from the tests.
  5. Depth - The detention or retention area shall not be excavated to a depth that breaches an aquitard, such that it would allow for lesser quality water to pass, either way, between the two systems. In those geographical areas where there is not an aquitard present, the depth of the pond shall not be excavated to within two (2) feet of the underlying limestone which is part of a drinking water aquifer.
  6. The retention pond bottom shall be uniformly graded.
  7. All pertinent information and calculations described above shall be included with the drainage plan.

#### 4.9.6 Detention/Retention Pond Analysis

a. General

A computer routing analysis is required in the design of all detention ponds. A computer routing analysis is also required for retention ponds where percolation is considered during the runoff event. Tailwater conditions must be considered in the routing calculations.

b. Straight Line (Constant) Discharge

Straight line or constant, non-varying discharge is not acceptable.

4.10 Lot Drainage

4.10.1 The finished grade of individual lots shall be shown on the construction plans. Generally, lots shall be drained in accordance with the Type A, B, or C typical grading plans. When topography or other features make such lot drainage impractical, alternate methods may be presented for the City's review and approval (see typical lot grading schematics in Figure 10-A, B and C)).

4.10.2 The proposed minimum finished floor elevation of all structures which may be constructed shall be included on the construction plans. As a minimum, the finished floor elevation shall be at least 16 inches above the highest crown line of the street lying between the projection of the side building lines, unless otherwise approved by the City of New Port Richey (see Type C grading plan). Finished floor elevations shall be a minimum of 1 foot above the 100-year floodplain as designated by the Federal Insurance Administration Flood Hazard boundary Maps. When a detailed study from FEMA has not been provided, the Developer's Design Engineer shall establish the 100-year base flood elevation for review by the City.

4.11 Nonroadway Ditch Design General Design Criteria

4.11.1 Design Frequency and General Criteria

Refer to Sections 4.3 and 4.9.

4.11.2 Design Discharge

The determination of design flows for an open channel system shall be in accordance with the methods and procedures set forth in this chapter.

4.11.3 Design Methodology

a. A ditch shall be initially sized using Manning's formula. The initial

ditch size shall then be evaluated relative to additional potential energy losses (i.e., bends, expansions, constrictions, etc.) and the impacts of tailwater (backwater). If required, the initial ditch section shall be increased or otherwise modified to properly accommodate the design flow. In all cases, data including drainage area, velocity and depth of flow shall be provide in the Drainage Calculations along with typical sections. The Site Designer is referred to standard hydraulics texts for the definitions and applications of Manning's Equation.

- b. No credit for stormwater storage will be given for ditches. A ditch is considered to be a means of conveyance only.
- c. No ditch blocks will be permitted in road rights-of-way for internal subdivision drainage.

#### 4.11.4 Maximum Sideslope

The maximum sideslopes shall be 3:1 (4:1 preferred) for ditches within the boundaries of a subdivision and 2:1 for ditches outside the boundaries of a subdivision.

#### 4.11.5 Minimum of Bottom With

The minimum bottom width for ditches shall be 2.0 feet.

#### 4.11.6 Design Tailwater

- a. All systems shall be designed taking into consideration the tailwater of the receiving facility or body of water.
- b. The appropriate tailwater elevations must be determined by calculations based upon the design criteria and frequencies contained in Section 4-3.

#### 4.11.7 Maximum Allowable Velocities for Unlined and Lined Open Channels

- a. The maximum allowable velocities for unlined open channels (bare soil condition) are listed in Table 7.
- b. The maximum allowable velocities for lined open channels are listed in Table 8

#### 4.11.8 Minimum Longitude Grade

For open channels that are intended to remain dry except during runoff conditions, the minimum physical grade allowable shall be 0.10%.

#### 4.11.9 Ditch Alignment

The alignment of existing ditches should be preserved whenever practical. For skewed ditch crossings, the culvert shall be skewed to maintain the existing ditch alignment.

#### 4.11.10 Channel Curvature

A minimum centerline radius of fifty (50) feet or ten (10) times the bottom width, whichever is larger, shall be utilized. Channel protection shall be provided when channel curvature produces erosive velocities in excess of those shown in Table 8.

#### 4.11.11 Minimum Freeboard

A minimum freeboard of six inches shall be maintained between design water surfaces and the edge of pavement, gutter line or adjacent property lines, whichever is lower.

#### 4.11.12 Ditch Erosion Protection

- a. Ditches shall be provided with permanent erosion protection. Erosion protection may be turf, using an approved type grass, or an approved type of liner.
- b. When turf protection is used, ditches shall be sodded, sprigged or seeded for a lateral distance extending from within one (1) foot of the road pavement to the top of the swale ditch backslope.
- c. Ditches shall be grassed and mulched in accordance with the Florida DOT Standard Specifications for Road and Bridge Construction, latest edition.

- d. Ditch pavement shall be in accordance with the Standard Indexes and the Florida DOT Standard Specifications for Road and Bridge Construction, latest edition.
- e. Sideslopes above the paved section shall be shaped and sodded except if they are on a slope of six horizontal to one vertical or flatter.
- f. All sod shall be secured as necessary to prevent displacement.

#### 4.11.13 Grading Adjacent to Ditches

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

### 4.12 Storm Sewer Design

The purpose of this section is to outline design criteria for all storm sewer systems constructed within the City of New Port Richey. This criteria is intended to govern the design of new systems as well as the analysis and/or redesign of existing systems. Design information and criteria for evaluating the drainage of street and roadway pavement prior to discharge into the storm sewer system is included in Chapter 5.

#### 4.12.1 Design Criteria

- a. Design Frequency

Refer to Section 4-3. b. Design Discharges

The determination of design flows for internal storm sewer systems shall be in accordance with the Rational Method as set forth in Section 5-3 (individual subareas drainage inlets are typically less than 1 acre due to constraints on inlet capacity and spread-of-flow on pavement criteria). For calculated time of concentrations of 15 minutes or less, a minimum time of concentration of 15 minutes shall be used in the storm sewer analysis.

- c. Allowable Materials

- Reinforced concrete pipe (round and elliptical)
- Corrugated aluminum alloy pipe and pipe arch
- Cast-in-place and precast reinforced concrete box culvert
- Aluminum alloy box culvert (subject to the approval of the City)

Manager)

Additional materials such as bituminous coated corrugated metal or plastic pipe may be used to provide internal drainage of privately owned and maintained sites only, upon approval by the City Engineer.

d. Roughness Coefficients for Storm Sewer Systems

Refer to Table 3.

e. Minimum Pipe Size and Pipe Size Increment

Refer to Tables 4 and 5.

f. Minimum Physical Slope

The minimum physical slope for culverts shall be that which will produce a velocity of 2.0 feet per second when the culvert is flowing full with the hydraulic grade line at the crown of the pipe.

g. Maximum Hydraulic Gradient Slope and Elevation

1. The maximum hydraulic gradient slope allowed will be that which will produce a velocity as in Table 6.
2. For storm sewer outfalls to open channels, the maximum velocity should be consistent with channel stability requirements at the pipe outlet. If the velocities exceed permissible velocities for the outlet material (see Table 6), the installation of energy dissipaters may be required. Erosion and scour shall be controlled in all cases.
3. The maximum hydraulic gradient elevation shall be no higher than the edge of pavement at the inlet throat for internal drainage collection systems.

h. Maximum Length of Pipe

Refer to Table 5.

i. Miscellaneous Minimum Pipe Clearances

All storm sewer pipes and culverts shall have a minimum of 24 inches of cover from the lowest edge of pavement to the top of pipe. The minimum cover of pipe in swale areas shall be 18 inches, unless otherwise permitted by the City.

J. Design Tailwater

All storm sewer systems shall be designed taking into consideration the potential tailwater of the receiving facility or body of water. Generally, the tailwater must be determined by calculations considering the same design storm frequency used to estimate the design storm sewer flows.. or the water quantity overflow weir elevation of the main discharge structure. The incoming crown of pipe should be below this weir elevation. If a tailwater elevation cannot be determined, the hydraulic gradient shall begin at the crown of the discharge pipe into the receiving facility or the estimated tailwater corresponding to the design frequency of the storm sewer system, whichever is higher.

k. Storm Sewer Tabulations

In developments where storm sewers are planned, the Drainage Calculations shall include the Storm Sewer Tabulation Form (Figure 8).

l. Inlets, Manholes, and Junction Boxes

All inlets, manholes, and junction boxes shall conform to the Florida DOT Standard Specifications for Road and Bridge Construction, latest edition. All inlets are to have manhole lids for maintenance access. All pipes are to be cut flush with the inside wall of manholes and junction boxes. Conflict manholes shall be included in the design where conflicts occur with other utilities.

m. Storm Sewer Alignment

All storm sewer layouts 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 headloss. Any abrupt changes to alignment hydraulic slope and velocity shall take place within manholes or junction boxes.

n. Determination of Design Hydraulic Gradient Line

Local losses at structures shall be determined for inlets, manholes, wye branches, or bends in the design of closed conduits.

The energy losses associated with the turbulence in the individual manholes are minor for an open channel or gravity storm sewer system and can typically be overcome by adjusting (increasing) the upstream pipe invert elevations in a manhole by a small amount. However, the energy losses associated with the turbulence in the individual manholes can be significant for a pressure or surcharged storm sewer system and must be

accounted for in establishing a reasonable hydraulic gradient line. A table of acceptable head loss coefficients (K) for various types of surcharged manholes/catch basins/junctions is given in Figure 9.

o. Inlet Capacities

1. FDOT inlet capacity charts shall be utilized to determine inlet capacities.
2. In all cases, the effects of an inlet bypass shall be considered and quantified in the drainage calculations.

p. Inlet Locations

The location and spacing of inlets and manholes shall be as necessary to provide proper drainage for each individual project.

The location and spacing of inlets and manholes shall not exceed the maximum allowable pipe lengths, pipe lengths, inlet capacity, and spread-of-flow criteria - see Section 5.2. Water shall not be carried across intersections or in gutters for distances exceeding 800 feet.

#### 4.12.2 Design Procedure

a. General

There are several general rules to be observed when designing storm sewer systems to alleviate or eliminate the common mistakes made in storm sewer design. These rules are as follows:

1. Select pipe size and slope so that the velocity of flow will increase progressively, or at least will not appreciably decrease, at inlets, bends, or other changes in geometry or configuration.
2. Do not discharge the contents of a larger pipe into a smaller one, even though the capacity of the smaller pipe may be greater due to steeper slope.
3. In gravity systems where changes in pipe sizes occur, the Site Designer should match the crowns of the two pipes at the same level, rather than matching flow lines. (When necessary for minimal fall, match the "0.8 x Diameter" point of each pipe.)
4. Conduits should be checked at the time of their design with reference to critical slope. If the slope of the line is greater than critical slope, the unit will likely be operating under entrance

control instead of the originally assumed normal flow. Conduit slope should be kept below critical slope if at all possible. This also removes the possibility of a hydraulic jump within the line.

b. Preliminary Design Procedure

1. Prepare a drainage map of the entire area to be drained by proposed improvements using topographic maps and field reconnaissance.
2. Make a preliminary layout of the proposed storm drainage system, locating all inlets, manholes, mains, laterals, ditches, culverts, etc.
3. Delineate the drainage area to each proposed inlet.
4. Label each drainage area and include the size of area, the direction of surface runoff by small arrows, and the coefficient of runoff (rational coefficient) for the area.
5. Show all existing underground utilities.
6. Establish design rainfall frequency (Section 4-3).
7. Establish minimum inlet time of concentration.
8. Establish the typical cross-section of each street.
9. Establish permissible spread of flow on all streets within the drainage area (see Section 5-2).
10. Include 1 through 9 on the paving and drainage plans and/or in the Stormwater Management Plan and Report to be submitted for review.

c. Inlet System

Determining the size and location of inlets is largely a trial and error procedure. The following steps will serve as a guide to the procedure to be used:

1. Beginning at the upstream end of the project drainage basin, outline a trial subarea and calculate the expected flow from it using the Rational Method.
2. Compare the calculated flow to allowable street capacity.

- If the calculated flow is greater than the allowable street capacity, reduce the size of the trial subarea.
  - If the calculated flow is less than street capacity, increase the size of the trial subarea.
  - Repeat this procedure until the calculated flow equals the allowable street capacity. This is the first point at which a portion of the flow must be removed from the street by an inlet.
3. Record the drainage area, time of concentration, Rational coefficient, and calculated flow for the subarea. This information shall be recorded in the storm sewer tabulation form.
  4. If an inlet is to be used, determine the inlet size, type, amount of intercepted flow, and amount of flow carried over (bypassing the inlet).
  5. Continue the above procedure for other subareas until a complete system of inlets has been established. Remember to account for any carry-over from one inlet to the next.
  6. After a complete system of inlets has been established, modification should be made to accommodate special situations such as point sources of large flow, and variation of street alignments and grades.
  7. Record information as in (3) and (4) for all proposed inlets in the Stormwater Management Plan and Report and submit for review.
  8. After the inlets have been located and sized, the inlet pipes can be designed.

d. Storm Sewer System

After the computation of the rate of storm runoff entering each inlet, the storm sewer system required to carry the flow is designed. The rate of flow to be carried by any particular section of the storm sewer system is not the sum of the contributing inlet design flows to that section, but is less than this arithmetic total. The lesser value results from the fact that, in actuality, the individual inlet design flows do not enter and instantaneously move through the storm sewer system.

1. Preliminary Sizing - Assumption of Gravity System

- Storm Sewer Design Equations

All storm drains shall be designed by the application of the continuity equation and Manning's Equation either through the appropriate charts and nomographs or by direct solution of the equations as follows:

$$\text{(Continuity)} \quad Q = AV, \text{ and} \quad (4-3)$$

$$\text{(Manning's)} \quad Q = \frac{1.49 AR^{2/3} S_f^{2/3}}{n} \quad (4-4)$$

Where:

- Q = Pipe Flow, in cubic feet per second
- A = Cross-sectional area of pipe, in square feet
- V = Velocity of flow, in feet per second
- n = Coefficient of roughness for pipe
- R = Hydraulic radius of pipe = A/WP, in feet
- S<sub>f</sub> = Friction or energy slope for flow in pipe, in foot per foot
- W<sub>p</sub> = Wetted perimeter within pipe, in feet

- Storm Sewer Pipe
  - The ground line profile is now used in conjunction with the previous runoff calculations determined for each inlet.
  - The elevation of the hydraulic gradient is initially established at approximately the ground surface or the inlet throat elevation, whichever is applicable. The final elevation of the hydraulic grade line must conform to Section 4-12.
  - When this gradient is set and the design discharge is determined, a Manning's flow chart may be used to determine the pipe size and velocity.
  - Velocities can be read directly from a Manning's flow chart based on given discharge, pipe size and gradient slope.

## 2. Final Design - Determination of Expected Hydraulic Gradient Line

The designer is referred to standard texts for theory and equations describing energy grade line (EGL) and hydraulic grade line. It is recommended that the EGL be computed first and then used to determine the hydraulic grade line. The effects of tailwater must be accounted for in the calculations.

Include the final storm sewer system design calculations in the Stormwater Management Plan and Report and submit for review.

### 4.13 Pavement to SHWL Minimum Separation

The minimum separation between the bottom of the pavement base to the design seasonal high water table (SHWT) shall be no less than two (2) feet where a limerock base is provided. Where soil cement, ABC-3 asphaltic concrete, or crushed concrete base material is used, the minimum separation between the bottom of the pavement base to the design SHWT shall be no less than one (1) foot.

Design SHWT is the elevation to which the ground or surface water can be expected to rise due to the worst wet season within a ten (10) year period. The project engineer shall make a recommendation as to the SHWT elevation based on the assessment of historical records or other available data.

When required, either by the geotechnical report or as determined by the City of New Port Richey, underdrains shall consist of aggregate, pipe, and filter fabric as indicated in the FDOT Index Drawing No. 286 and as referenced in any other FDOT index drawings and standard specifications. Underdrain inverts shall be located a minimum of two (2) feet below the bottom of the base. The engineer responsible for the project shall certify to the City of New Port Richey that the underdrains have been properly installed prior to the installation of any asphalt. Certification shall strictly comply with the underdrain certification form available from the City of New Port Richey. This form is an attachment to this Manual as Appendix D-1. An inspection and maintenance program shall be established by the design engineer designating an entity on the design drawings that shall be responsible for maintenance.

## CHAPTER 5

### MISCELLANEOUS TECHNICAL ASSISTANCE

#### 5.1 Storm Sewer Tabulation Form (From FDOT Drainage Manual, 2008)

##### 5.1.1 General

- a. The form for tabulating the results of hydrologic and hydraulic calculations for storm sewer systems is presented in Figure 8. This form is for representative purposes only. The items to be recorded on this form have been identified by number on the figure and are briefly described below:

Note: All elevations should be given to the nearest 0.01 foot.

1. Selection of Rational Coefficients (C)

Various contributing areas for each inlet should be broken down into high and low rational coefficient areas. Guidance for selecting runoff coefficients is presented in Section 5-3.

2. Notes

This space should contain information such as the design storm frequency, roughness coefficient, minimum cover for culverts, and other data pertinent to the entire system.

3. Station

This column should show the survey station number for the structure being used.

4. Distance (Dist)

This column should give the distance of the centerline of the structure from the reference station.

5. Side (S)

This column should give the side, right (Rt) or left (Lt), of the reference station.

6. Structure No.

This column gives the sequential numbers of the drainage structures in the system (S-1, S-2, etc.).

7. Type of Structure

The type of structure is usually indicated by abbreviations for inlets; ditch bottom inlets (DBI); manhole (MH). For standard FDOT structures, the inlet or manhole type should be specified as indicated in the FDOT Standard Specifications for Road and Bridge Construction, latest edition.

8. Type of Line

The type of line is shown as (M) for mainline and (S) for stub line.

9. Length (feet)

This is the length, in feet, from the centerline of the structure in question to the centerline of the next structure. Nearest foot.

10. Increment

Increment refers to the incremental area (in acres) corresponding to the rational coefficient being used. It is normally an area of overland flow contribution to the particular inlet. However, a contribution through an existing pipe should also be noted in this column. Nearest 0.01 acres.

11. Subtotal

This is the subtotal of the total area, for each Rational coefficient value used, contributing flow to or through the structure in question.

12. Subtotal (CA)

To arrive at this figure, the individual subtotal areas are multiplied by their corresponding Rational coefficient.

13. Time of Concentration (min)

The time of concentration is the time required for runoff to travel from the most hydraulically representative distant point of the total area drained to the point of the storm drain system under

consideration. This time consists of overland flow, gutter flow, and pipe flow time within the system. Nearest 0.1 minute.

See Section 4-7 for procedures to estimate time of concentration.

14. Time of Flow in Section (min)

This is the time it takes the flow to pass through the section of pipe in question; it depends on the computed velocity in the pipe segment. Nearest 0.1 minute.

15. Intensity (Rainfall)

Rainfall intensity values are determined from the intensity duration-frequency (IDF) curves (Zone 6) developed by the FDOT (Figure 2). Design Rainfall Intensity at any point in the system depends on the design frequency and the time of concentration to that point in the system. Nearest 0.1inch.

16. Total (CA)

The total (CA) is the sum of the subtotal CAs.

17. Total Runoff (cfs)

Total runoff is the product of the intensity and the total CA, plus or minus any anticipated inlet bypass flows. Nearest 0.1 cfs.

18. Inlet Elevation (feet)

This column lists the elevation of the edge of pavement at the inlet throat if the structure is a curb inlet. In the case of manholes and ditch bottom inlets, either the top or grate elevation and any slot elevation are shown. Nearest 0.01 foot.

19. Upper End (Hydraulic Gradient)

This column shows the elevation of the hydraulic gradient at the upper end of the pipe section. Nearest 0.1 foot.

20. Lower End (Hydraulic Gradient)

The elevation of the hydraulic gradient at the lower end of the pipe section is shown. Nearest 0.1 foot.

21. Upper End (Crown Elevation)  

This elevation is the inside crown elevation at the upper end of the pipe section being designed. Nearest 0.01 foot.
22. Lower End (Crown Elevation)  

This is the inside crown elevation at the lower end of the pipe section being designed. Nearest 0.01 foot.
23. Upper End (Flow Line)  

This elevation is the flow line of the pipe section at the upper end. Nearest 0.01 foot.
24. Lower End (Flow Line)  

This elevation is the flow line of the pipe section at the lower end. Nearest 0.01 foot.
25. Fall (feet)  

The hydraulic gradient fall is shown Nearest 0.01 foot.
26. Fall (feet)  

The total physical fall of the pipe section is shown Nearest 0.01 foot.
27. Diameter (inches)  

This column shows the diameter of the pipe used for the section, (in inches) or, if a box culvert is used, the width and height (in feet).
28. Slope (%)  

The hydraulic gradient slope is shown above the physical slope of the pipe. Nearest 0.01 percent.
29. Velocity (fps)  

The velocity produced by the gradient slope is shown above the velocity produced by the physical slope of the pipe. Nearest 0.1 fps

30. Capacity (cfs)

The capacity of the pipe on the hydraulic gradient slope is shown above the physical slope. Nearest 00.1 cfs.

31. Remarks

This space is available to record specific remarks on the storm drain system. The anticipated design flow rate for the typical drainage area should be provided and the intercepted flow used to establish the pipe size. The bypass flow should be recorded and accounted for. Energy Grade Line elevations and structure loss coefficient/values should also be noted.

5.2 **Spread of Flow Calculations**

5.2.1 General

- a. The maximum length of gutter prior to the need for an inlet shall be controlled by the allowable spread of flow on the pavement.
- b. For local and internal systems the spread of flow shall be limited to the crown of the road, or to a point on the road corresponding to a maximum depth of 4 inches at the edge of pavement, whichever is more restrictive, during the design storm which has a frequency equal to that for which the storm sewer system will be designed. The time of concentration for spread of flow calculations shall be equal to the appropriate overland flow travel time.
- c. Water shall not be carried across street intersections and in no case shall the gutter run exceed eight hundred (800) feet.
- d. Streets that exceed a 1% longitudinal slope shall have inlets constructed at intersections to intercept upstream flow.

5.2.2 Gutter Flow Calculations

The designer is referred to standard hydraulic texts for the proper use of Manning's Equation in determining the spread of flow in gutters. The FDOT 2008 Drainage Manual provides guidance. This applies to other than local and internal systems.

## 5.3 Determination of Storm Runoff Using the Rational Method

### 5.3.1 General

- a. The Rational Method is an empirical method which is used to estimate peak discharge and has gained wide acceptance because of its simplicity.
- b. This method relates peak rate of runoff or discharge to rainfall intensity, surface area and surface characteristics by the equation:

$$Q = CiA \quad (5-1)$$

Where:

Q = Peak rate of runoff, in cubic feet per second

C = Rational coefficient representing a ratio of runoff rate to rainfall intensity (dimensionless)

i = Average rainfall intensity, in inches/hour which is expected to occur for a duration equal to the basin time of concentration.

A = Area of the drainage basin, in acres

### 5.3.2 Assumptions

- a. The peak rate of runoff at any point is a direct function of the average uniform rainfall intensity which occurs for a duration equal to the time of concentration to that point in the drainage basin.
- b. The time of concentration of the drainage basin refers to the travel time required for the runoff to flow along the representative basin flowpath which is typically defined to be from the most hydraulically remote point of the drainage basin to the point of design. Overland flow, storm sewer or gutter flow, and channel flow are commonly used in computing travel time.
- c. The storm duration equals or exceeds the time of concentration of the basin.
  1. The Rational Method, in general, 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.
  2. Utilizing the Rational Method for determining pre-development discharge conditions and a hydrograph method for determining post-development discharge conditions is prohibited by the City because of differences in the methodologies used for determining peak discharge.
  3. Uniform rainfall distribution and intensity become less appropriate as the drainage area increases.

### 5.3.3 Components

a. Peak runoff rate, (Q)

1. The peak runoff rate occurs when the duration of the precipitation event equals or exceeds the time of concentration of the drainage basin for a uniform rainfall intensity.

b. Rainfall coefficient, (C)

1. The Rational coefficient, (C), accounts for abstractions (losses) between precipitation (rainfall) and runoff
2. Losses may result from:
  - interception by vegetation
  - infiltration into permeable soils
  - surface water retention
  - evapotranspiration
3. Additional considerations in determining C include:
  - climatological and seasonal variations
  - antecedent moisture conditions
  - intensity and frequency of the design storm
  - surface slope
4. Rational coefficients should be estimated by using the values listed *in* Table 1 for the 2- to 10-year design frequency storms. For 25- to 100- year frequency storms a correction factor (Table 2) is to be applied to the previous areas unless flood routing computations are appropriate for the basin. When using these tables one should consider the following conditions:
  - level of development
  - surface types and percentages
  - soil type
  - slope
5. For basins with varying cover a weighted Rational coefficient can be determined for the basin by the following equation:

$$\text{Weighted C} = \frac{\sum L_i C_i A_i}{\sum L_i A_i} \quad (5-2)$$

Where:

$C_i$  = Rational coefficient for area A (dimensionless)

$A_i$  = Portion of basin with a relatively uniform land cover, soil types and slope, in acres

c. Rainfall Intensity, (i)

1. Rainfall intensity, (i), is the average rate of rainfall in inches per hour.
2. Design rainfall intensity is selected according to:
  - design frequency of occurrence
  - critical storm duration
3. Critical storm duration equals the time of concentration of the drainage basin.
4. Rainfall intensity is determined through the utilization of the FDOT Zone VI rainfall curves (Figure 2).

d. Drainage Area, (A)

A specified portion of the hydrologic system which is bounded by drainage divides.

#### 5.4 Determination of Storm Runoff Using the Modified Rational Method Inflow Hydrograph Approach

For small drainage areas (less than 1 acre) an 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 Zoning 6 intensity-duration-frequency curves, an inflow hydrograph can be developed.

#### 5.5 Determination of Storm Runoff Using the S.C.S. Synthetic Unit Hydrograph Method

##### 5.5.1 General

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).

- a. Rainfall excess in the portion of the rainfall remaining after all losses or abstractions have been subtracted.

- b. The specified period of time (time step) is the duration of the rainfall excess which, when chosen for design purposes, should be a fraction of the basin time of concentration.

### 5.5.2 Determination of Rainfall Excess (Runoff)

Rainfall excess (runoff) by the S.C.S. method can be expressed mathematically as:

$$R = \frac{(P - 0.2S)^2}{P + 0.8S} \quad (5-3)$$

$$S = \frac{1000}{CN} - 10 \quad (5-4)$$

Where:

R = total rainfall excess for design storm event, in inches

P = total precipitation for design storm, in inches

S = soil storage parameters, in inches

CN = S.C.S. Curve Number

### 5.5.3 S.C.S. Curve Numbers

The curve number is a dimensionless parameter that reflects vegetative cover condition, hydrologic soil group land use, and antecedent moisture condition.

The recommended procedure for determining the S.C.S. curve numbers for project areas within the City of New Port Richey is as follows:

- a. Identify soil types within the project boundaries using the S.C.S. Pasco County Soil Survey.
- b. Assign a hydrologic soil group classification to each soil type using the appropriate table in Technical Release No. 55 (S.C.S. 1987).
- c. Identify areas with uniform soil type and land use conditions.
- d. Use Tables 11A, B and 12 to select S.C.S. curve number values for each uniform area based upon land use, vegetative cover, and hydrologic soil groups.
- e. If the project area is composed of variable land uses, a composite CN can be developed as follows, if appropriate:

$$CN = \frac{A_1(CN_1) + A_2 + 1(CN_2 + 1) + \dots + A_n(CN_n)}{A_t} \quad (5-5)$$

Where:

CN = composite curve number for the watershed

CN<sub>i</sub> = curve number for each subarea

A<sub>i</sub> = land area for each subarea

A<sub>t</sub> = total land area for the watershed

#### 5.5.4 S.C.S. Synthetic Unit Hydrograph Procedure

- a. The S.C.S. has derived a general dimensionless unit hydrograph from a large number of observed unit hydrographs for watersheds of various sizes and geographic locations. This unit hydrograph is adequate when the shape factor is 484. For areas such as Florida where the unit hydrograph shape is generally flatter and wider, a different dimensionless unit hydrograph is required. Such is the case in the City of New Port Richey where a 256 shape factor is the acceptable value. Once the time to peak and peak flow for a particular unit hydrograph has been defined, the entire shape of the unit hydrograph can be estimated using the appropriate dimensionless unit hydrograph. The recommended distribution for the 256 shape factor for use in the City is found in Table 14.

The City shall only accept a 256 shape factor unless the site designer demonstrates that another shape factor is more appropriate. Shape factors other than 256 must be approved by the City Engineer.

A more detailed analysis of the unit hydrograph procedure can be found in "S.C.S. National Engineering Handbook, Section 4, Hydrology, Revised 1969" and other publications.

- b. The U.S.D.A. Soil Conservation Service developed the Synthetic Unit Hydrograph Method to calculate the peak discharge, (q<sub>p</sub>), according to the following equation:

$$q_p = \frac{P_f AR}{T_p} \quad (5-6)$$

Where:

$q_p$  = the peak unit hydrograph discharge, in cubic feet per second

$A$  = the area of the drainage basin, in square miles

$R$  = the total unit hydrograph runoff = 1.0 in

$P_f$  = unit hydrograph peak-rate or shape factor (256 – flat areas to 484 – moderately steep areas to 600± very steep areas). In the City, the 256 value shall be used unless another value is approved by the City Engineer

$T_p$  = the time of rise or time to peak from the inception of runoff, in hours

In the S.C.S. procedure, the time to peak,  $T_p$ , in hours is computed by the following equation:

$$T_p = \frac{D+L}{2} \quad (5-7)$$

Where:

$D$  = the duration of the rainfall excess, in hours (typically in the range of 0.1  $T_c$  to 0.2  $T_c$  for small urban basins)

$T_c$  = the time of concentration for the drainage basin, in hours

$L$  = the lag time, in hours (time between the centroid of the rainfall excess and the peak of the unit hydrograph)

For purposes of computing the  $T_p$ , the lag time ( $L$ ) is assumed equal to 0.6  $t_c$ . Substituting for  $L$  in the equation, one obtains:

$$T_p = \frac{D}{2} + 0.6 t_c \quad (5-8)$$

Substituting in the peak flow equation, one can compute the peak of the S.C.S. unit hydrograph using the following equation.

$$\frac{P_f AR}{D/2 + 0.6 T_c} \quad (5-9)$$

In this procedure, the time of concentration of the drainage basin is computed as defined previously in Section 4.7.

#### 5.5.5 Generation of S.C.S. Runoff Hydrograph

- a. See the literature for procedures on generating runoff hydrographs from the unit hydrographs.
- b. The following conditions apply to the use of S.C.S. runoff hydrograph generation in the City of New Port Richey:
  1. For allowable rainfall depths and distributions, refer to Section 4.6.
  2. In the City a shape factor of 256 shall be used unless another value is approved by the City Engineer.
  3. The computational time step shall be in the range of 0.1  $T_c$  to 0.2  $T_c$ .
  4. The initial abstraction shall be 0.2S.

#### 5.6 Reference Documents

- 5.6.1 Generally accepted and utilized Engineering Reference Books may be used as Reference Documents.
- 5.6.2. The first Reference Documents used shall be those in use by the Florida Department of Transportation, the Southwest Florida Water Management District, the U.S. Army Corps of Engineers and Pasco County.
- 5.6.3. Other Reference Documents may be used if the information needed is not contained or referenced in those Reference Documents stated in 5.6.2.

## **APPENDIX**

## **GLOSSARY**

### **ADEQUATE OUTFALL**

Outfall which has no known inadequacies or flooding conditions, but would experience increased water elevations if discharge areas were increased.

### **ADVERSELY IMPACT**

To destroy or damage or to contribute to the destruction or damage of something or create harmful effects.

### **ANGLE OF REPOSE**

Maximum angle in which soil slopes will not fail.

### **ANNUAL FLOOD**

The highest peak discharge in a twelve month period.

### **ANTECEDENT MOISTURE CONDITIONS**

The degree of moisture within a drainage basin and/or watershed at the beginning of a storm.

### **APPLICANT**

Any person applying for or who has been granted a permit to proceed with a project.

### **AQUIFER**

A geologic formation through which water may be percolated, transmitted, stored and yielded.

### **AREA OF SPECIAL FLOOD HAZARD**

Land in the floodplain within a community subject to a one percent or greater chance of flooding in any given year.

### **ARTERIAL STREET**

A road or thoroughfare that has been or may be designated for the movement of large volumes of traffic between distance points in the City, which said road will ordinarily have controlled or limited right of access.

## **AS-BUILT PLANS**

The amended site plans specifying the locations, dimensions, elevations, capacities of structures or facilities as they have been constructed that have been signed, dated, sealed by the Developer's Engineer/Architect/Surveyor as registered in the State of Florida.

## **AVERAGE ANNUAL FLOOD**

A flood which has a recurrence interval of 2.33 years and equals maximum annual floods during the period of record.

## **BASE FLOOD (100-YEAR FLOOD)**

A flood having a one percent chance of being equaled or exceeded in any given year.

## **BASEFLOW**

Surface water recharge which originates from ground water seepage during low flow conditions.

## **BASIN (DRAINAGE BASIN)**

Surface drainage area which is self-contained.

## **BRIDGE**

Bridge structure, including supports, erected over a depression or an obstruction, such as water, a highway, or a railway. It has a deck for carrying traffic or other moving loads.

## **CAPACITY**

The limiting amount that the conveyance channel, pond, pipe, or other hydraulic structure can manage in accordance with the criteria specified in this Manual.

## **CAPITAL IMPROVEMENT**

The acquisition of land or property and/or the construction of, or improvements to any of, but not limited to, the following: Building or structure, utility, road, park, open area, or other public place requiring the expenditure of public monies.

## **CATCH BASIN**

Structure that is usually built at the curb line of a street which permits surface water runoff to flow into a storm sewer, while retaining grit and debris below the point of overflow.

## **CATCHMENT (CATCHMENT BASIN)**

Area of surface drainage which is bounded by opposing drainage divides.

**CHANNEL**

A passageway to convey water which is defined by bed, sides, and banks.

**CHANNELIZATION**

Alteration of a stream channel's width, depth, length, and/or geometry in order to improve drainage characteristics.

**CLEARING**

The removal of trees and other vegetation from the land, but shall not include mowing.

**COLLECTOR STREET**

A street designed or designated to connect a number of local streets with arterial streets.

**COMPENSATING STORAGE**

Storage volume required to compensate for storage volume lost due to filling within the 100-year floodplain.

**CONFINED AQUIFER**

Aquifer which is confined between two layers of impermeable material.

**CONSTRUCTION**

Any new construction or redevelopment construction either off-site or on-site activity which will result in the creation of a new stormwater discharge facility, including the building, assembling, expansion, modification, or alteration of the existing contours of the site, the erection of buildings or other structures, or any part thereof, or land clearing.

**CONTROLLED SEASONAL HIGH GROUNDWATER ELEVATION**

The elevation which the groundwater can be expected to rise to due to a normal wet season after modifications to the surface and groundwater regime have occurred in the area.

**CONVEYANCE**

A path for water to move from one place to another in a continuous flow.

**CRITICAL DEPTH**

Depth of which the specific energy (sum of depth and velocity head) is a minimum.

## **CRITICAL SLOPE**

Slope required to maintain uniform flow at critical depth.

## **CUT AND FILL**

Alteration of land surface by excavating part of an area and using the excavated material for adjacent embankments or fill areas.

## **CULVERT**

Structure which conveys stormwater discharge contained in open ditches, swales, and lakes under roadways and other obstructions.

## **DESIGN HIGHWATER**

Peak elevation of a surface water body which is determined according to the flow conditions of specified design floods.

## **DESIGN LIFE**

Period of time for which a facility is intended to perform its designated function.

## **DESIGN LOW WATER**

Elevation in a surface water body below which no credit is allowed for meeting storage requirements.

## **DESIGN STORM**

Selected precipitation trend which is used to provide a characteristic amount, intensity, duration and frequency for the basis of design criteria and specifications.

## **DETENTION POND**

The collection and temporary storage of stormwater in such a manner as to provide for treatment through physical, chemical, or biological processes with subsequent gradual release of the stormwater at a rate less than the inflow.

## **DETENTION TIME**

Theoretical time required to displace a unit volume of water at a given rate of discharge.

## **DETENTION VOLUME**

Volume of water equal to the change in hydraulic head between the overflow elevation and the control elevation of the discharge structure multiplied by the average area of the open surface area behind the discharge structure.

## **DEVELOPMENT OR DEVELOPMENT ACTIVITY - FOR DEVELOPMENT OR REDEVELOPMENT PROJECTS**

- a. The construction, installation, demolition or removal of a structure, impervious service, or drainage facility; or
- b. Clearing, scraping, grubbing, killing or otherwise removing the vegetation from a site.
- c. Adding, removing, exposing, excavating, leveling, grading, digging, burrowing, dumping, piling, dredging, or otherwise significantly disturbing the soil, mud, sand, or rock of a site.

### **DIKE**

An embankment or structure which confines or controls water.

### **DISCHARGE, DISCHARGE POINT**

The outflow of water from a project site, aquifer, drainage basin, or facility.

### **DRAIN**

An open or closed conduit which transports excess surface water or groundwater.

### **DRAINAGE**

Interception and removal of surface water or groundwater by artificial or natural means.

### **DRAINAGE BASIN**

(See definition for "basin")

### **DRAINAGE DIVIDE**

Imaginary boundary across which there is no flow, and which is separated by two or more catchment basins.

### **DRAWDOWN**

Lowering the level of surface water, groundwater, or the potentiometric surface as a result of changes in outflow in the system.

### **EASEMENT**

An interest in land owned by another that entitles its holder to a specific limited use or enjoyment.

## **EMBANKMENT**

Man-made impoundment constructed of soil, rock, or other material.

## **ENCROACHMENT**

Infringement into the floodplain/floodway by development causing a reduction in volume and/or conveyance.

## **ENVIRONMENTALLY SENSITIVE AREAS**

Conservation Areas and Preservation Areas pursuant to the Conservation Element of the Comprehensive Plan. Conservation Areas include the following types of wetlands (w), natural water bodies (nwb), and uplands (u): freshwater marshes (w), shallow grassy ponds (w), hardwood swamps (w), cypress swamps (w), natural shorelines other than natural beaches and dunes (w), Class III Waters (w, nwb), and sand pine-scrub communities (u). Preservation Areas include the following types of wetlands, natural water bodies and uplands: coastal marshes (w), mangrove swamps (w), marine grassbeds (w, nwb), natural beaches and dunes (w, u), Class I and II Waters (w, nwb), aquatic preserves (w, nwb), critical habitat for endangered, threatened or rare species (w, nwb, u), and State wilderness (w, nwb, u).

These may also be/include wetland jurisdictional areas pursuant to Southwest Florida Water Management District and/or U.S. Army Corps of Engineers criteria.

## **EROSION**

Process which results in the physical movement of sediment from the bed or banks of a channel, river, canal or stream caused by flowing water. Movement of sediment at outfall of pipe to a channel's bed and banks, or pond bottom and embankment.

## **EVAPOTRANSPIRATION**

Loss of water which results from evaporation of soil, water, vegetation and other surfaces in combination with transpiration from plants.

## **EXISTING**

The average condition immediately before development or redevelopment occurs.

## **FILTER BLANKET**

Layer of sand and/or gravel which prevents the movement of fine-grained soils.

## **FILTER FABRIC**

Water-permeable material which prevents the clogging and bridging of aggregates by fine soil particles.

## **FIRST FLUSH**

First portion of stormwater runoff which is generated by a rainfall event and contains the bulk concentrations of contaminants which are washed into the drainage network by the storm.

## **FLOOD**

A general and temporary condition of partial or complete inundation of normally dry land areas from: (1) the overflow of inland or tidal waters; or (2) the unusual and rapid accumulation or runoff of surface waters from any source.

## **FLOOD HAZARD BOUNDARY MAP (FHBM)**

An official map of a community, issued by the Federal Insurance Administration, where the boundaries of the area of special flood hazards have been designated as ZONE A.

## **FLOOD INSURANCE RATE MAP (FIRM)**

An official map of a community, on which the Administrator had delineated both the special hazard areas and the risk premium zone applicable to the community.

## **FLOOD ZONE**

An area of land inundated by the overflow of a watercourse or water body, the accumulation of runoff, the rise of groundwater, or the rise of the tidal waters.

## **FLOODPLAIN OR FLOODPRONE**

Any land area susceptible to being inundated by water from any source.

## **FLOODPROOFING**

The modification of individual structures and facilities, their sites and their contents to protect against structural failure, to keep water out or to reduce effects of water entry.

## **FLOODWAY**

The channel of a stream and any adjacent floodplain areas that must be reserved in order to discharge the 10-year flood without increasing flood heights by a specified amount.

## **FREEBOARD**

A vertical distance between the elevation of the design highwater and the inside top of the bank, control structure, dam, ground level, pavement, or levee.

## **GRADING**

Leveling or planing land to a smooth horizontal or sloping surface by the use of mechanical leveling or grading equipment or, in the case of stockpile soil, other mechanical equipment.

## **GROUNDWATER**

Water beneath the surface of the ground whether or not flowing through known and definite channels.

## **GROUNDWATER RECHARGE**

Addition of water to the saturated zone by subsurface inflow or seepage as a result of natural and/or artificial means.

## **HEAD LOSS**

Loss of energy which results from friction, eddies, changes in velocity, or direction of flow.

## **HEADWATER**

Source of a stream or the water upstream from a control structure.

## **HYDRAULICS**

Study of the mechanisms of water movement.

## **HYDRAULIC CONDUCTIVITY (COEFFICIENT OF PERMEABILITY)**

The amount of water that will flow through a unit cross sectional area of aquifer per unit hydraulic gradient.

## **HYDRAULIC GRADE LINE**

The line showing the pressure head, or piezometric head at any point in a pipe.

## **HYDROGRAPH**

Graph of the stage or discharge of a water body versus time.

## **HYDROLOGIC CYCLE**

The continuous circulation of a particle of water from the ocean to the atmosphere, to the land, and ultimately discharging back into the ocean.

## **HYDROLOGY**

Study of the nature, behavior, physical and chemical characteristics of water, as well as its interaction with the ecosystem.

## **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 semi-pervious surfaces such as compacted clay, as well as most conventionally surfaced streets, roofs, sidewalks, parking lots, and other similar surfaces.

## **INFILTRATION**

Movement of water through the ground surface and into the soil zone.

## **INSIDE TOP OF BANK**

The "waterward" or internal top of bank at the highest point on the sideslopes of a pond.

## **LEVEE LAND**

Locked water body.

## **LAND ALTERATION**

Any activity which changes the physical features of the land, including vegetation and soil.

## **LANDLOCKED AREA**

An area in which runoff does not have a surface outfall up to and including the 100-year flood elevation.

## **LOCAL STREET**

A street of limited continuity used primarily for access to abutting property and the local needs of the neighborhood.

## **MAINTENANCE**

That action taken to restore or preserve the functional intent of any facility or system.

## **NATURAL FLOW PATTERN**

The rate, volume, and direction of the surface or groundwater flow occurring under natural conditions.

## **NON-POINT SOURCE POLLUTION**

Pollution that enters a water body from diffused origins in the watershed and/or drainage basin and does not result from discernible, confined or discrete conveyances.

## **NORMAL WATER LEVEL**

Normal (not seasonal high) water elevation of a surface water body or wetland. For definition purposes, this elevation is at or below the design low water elevation and the seasonal highwater elevation.

## **100-YEAR STORM EVENT**

A precipitation event which has a 1/100 (1 percent) chance of occurring in any given year.

## **ORIFICE**

An opening with a closed perimeter through which a fluid flows.

## **OUTFALL**

The point, location or structure where stormwater runoff discharges from a sewer to a receiving body of water.

## **OUTLET**

Point at which stormwater runoff discharges from a stream, river, lake or drain.

## **OUTSIDE TOP OF BANK**

The "landward" or external top of bank which is typically the highest point at the external limit of the maintenance area.

## **OVERFLOW**

Structure which transports excess stormwater into receiving water from after the maximum capacity of a limited discharge device has been exceeded.

## **PEAK DISCHARGE**

Maximum instantaneous flow from a given storm event for a specific location.

## **PEAK SENSITIVE**

Areas sensitive to changes in timing and/or magnitude of peak flows.

**PERCOLATION**

Movement of water through the soil.

**PERCOLATION TEST**

Determination of a soil's percolation rate calculated as the amount of time it takes for water of known head to drain a one-inch unit volume in a test hole.

**PERMISSIBLE VELOCITY**

Maximum velocity at which water may be transported through a structure, canal or storm drainage system without excessive drainage or erosion.

**PERSON**

An individual, corporation, governmental agency, business trust, estate, trust, partnership, association, two or more persons having a joint or common interest, or any other legal entity.

**PLAN**

This term refers to the Hillsborough County Stormwater Management Master Plan.

**POINT SOURCE**

Geometry of a contaminant plume whereby pollution is produced from a single location.

**POPOFF**

Elevation at which discharge occurs from a water body.

**POSITIVE OUTFALL**

A general, uncontrolled gravity discharge of drainage waters into a watercourse that does not significantly alter the quantity characteristics of the watercourse.

**POROSITY**

Ratio of the volume of pore space to the total unit volumes of a soil or rock.

**RATE**

Volume per unit of time.

## **RATIONAL METHOD**

Method for computing storm discharge flow rates according to the formula:

$$Q = CIA$$

Where:

C = Coefficient describing the physical drainage area.

I = The rainfall intensity expressed in inches per hour.

A = The area expressed in acres.

## **RECEIVING BODIES OF WATER**

Any water bodies, watercourses and wetlands into which surface waters flow.

## **RECHARGE**

Addition of water to the groundwater system by infiltration, percolation and surface water seepage.

## **RECHARGE BASIN**

Basin which is underlain by an unconfined aquifer composed of deep sands, gravels and cobbles that allow replenishment of groundwater supplies.

## **RETENTION**

The prevention of, or to prevent the discharge of, a given volume of stormwater runoff into surface waters by complete on-site storage where the capacity to store the given volume must be provided by a decrease of stored water caused only by percolation through soil, evaporation or evapotranspiration.

## **RIGHT-OF-WAY**

Land dedicated, deeded, used or to be used for a street, walkway, boulevard, drainage facility and access for ingress and for egress.

## **RUNOFF**

That portion of water leaving a specific site through a watercourse and not being infiltrated or evapotranspired.

**SATURATION POINT**

Point at which a soil or aquifer can no longer absorb any additional water without losing an equal amount.

**SCOUR**

Abrasive action of flowing water on sediments in pipes, channel and ponds causing sediments to move from their existing location.

**SEASONAL HIGH GROUNDWATER ELEVATION**

The elevation to which the groundwater can be expected to rise to due to a normal wet season.

**SEDIMENT**

Fine particulate material, whether mineral or organic, that is in suspension, is being transported or has moved from its site or origin by air, water or gravity.

**SEDIMENTATION FACILITY**

Any structure or area which is designed to hold runoff water until suspended sediments have settled.

**SETTLING POND**

Area of stream, channel or pond which has been physically altered and enlarged to permit suspended sediment and debris to settle out from discharging surface water.

**SHEETFLOW**

Uniform flow of water in thin layers on a sloping surface.

**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.

**SPILLWAY**

A conduit, channel or passageway for surplus water to be transmitted over and around a structure or dam.

**SPODIC STAINLINE**

Soil stainline indicating presence of groundwater at some point in time.

## **STORM FREQUENCY**

Time interval between storm events which produce similar predetermined intensity and runoff volumes which are used in designing surface and stormwater management systems.

## **STORM SEWER**

Sewer that conveys surface water discharge and stormwater runoff.

## **STRUCTURE**

That which is built or constructed, an edifice or building of any kind, or any piece of work artificially built up or composed of parts joined together in some definite manner, but shall not include fences or signs.

## **SURCHARGE**

Flow condition which occurs in a closed conduit when the hydraulic grade line is above the crown of the storm sewer.

## **SURFACE WATER MANAGEMENT SYSTEM**

Collection of facilities, improvements or natural systems whereby surface waters are collected, controlled, conveyed, impounded or obstructed. The term includes dams, impoundments, reservoirs, appurtenant works as defined in Subsections 373.403(1)-(5), Florida Statutes.

## **SURFACE WATER MANAGEMENT PERMIT/ENVIRONMENTAL RESOURCE PERMIT (ERP)**

Letter of conceptual approval, construction permit or operation permit issued by the Southwest Florida Water Management District (SWFWMD).

## **SWALE**

A natural or man-made drainage pathway which is man-made, has a 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; and has a grade as flat as the topography and design conditions will allow; and only contains contiguous areas of standing or flowing water following the occurrence of rainfall or flooding; and is planted with vegetation suitable for soil stabilization, stormwater treatment, and nutrient uptake.

## **TAILWATER DEPTH**

Depth of water at the point of discharge, immediately downstream from the discharge structure.

## **TIME OF CONCENTRATION**

Time required for the surface runoff from the most hydraulically representative distant point of the drainage basin to reach the point being considered .

## **25-YEAR STORM EVENT**

A storm which has a 1/25 (4 percent) chance of occurring in any given year.

## **UNIFIED SOIL CLASSIFICATION SYSTEM**

Identification system for classifying soils according to their physical properties, including particle size, pore space, plasticity index, and gradation.

## **UNIT HYDROGRAPH METHOD**

Time distribution of runoff from a basin created by one-inch of direct runoff from a storm of given duration.

## **URBAN RUNOFF**

Surface water runoff from an urban drainage area which discharges into a stream, storm drainage system or other watercourse.

## **VOLUME SENSITIVE**

An area, lake or depression where water does not deplete from the area except by percolating, evaporating or overflow by sheetflow.

## **WATERCOURSE**

Any natural or artificial channel, ditch, canal, stream, river, creek waterway or wetland through which water flows in a definitive channel, bed, bank or discernible boundary.

## **WATERSHED**

The region drained by or contributing to a stream, lake, or other body of water.

## **WATER SURFACE ELEVATION**

Surface water elevation expressed in terms of feet above mean sea level according to the National Geodetic Vertical Datum (NGVD) or the North American Vertical Datum (NAVD).

## **WATER TABLE**

Level in the saturated zone at which fluid pressure of the pore of a porous medium is exactly atmospheric.

**WEIR**

Instrument for measuring or regulating surface water discharge.

**WEIR NOTCH**

Opening in a weir through which water flows.

**WETLANDS**

Land that is inundated or saturated by surface or groundwater in years of normal water conditions at a frequency and duration sufficient to support and that, under normal circumstances, does support a dominance of vegetation typically adapted for life in saturated soil conditions. Wetland also includes non-vegetated beaches, mudflats and salt barrens.

This also includes wetland jurisdictional areas pursuant to SWFWMD and/or USACOE criteria.

## **NEW PORT RICHEY PRELIMINARY SITE PLAN REVIEW CHECKLIST**

Preliminary site plans shall be drawn to a minimum scale of one-inch equals one hundred (100) feet on an overall sheet size not to exceed twenty-four (24) by thirty-six (36) inches. When more than one sheet is required, an index sheet of the same size shall be included showing the entire parcel with individual sheet numbers referenced thereon. The following information is required on or in an acceptable form so as to accompany the preliminary site plans respectively.

Preliminary site plan (8 copies).

- a. Site Plan Name.
- b. The property owner's name, address, and telephone number; and the designated project applicant or representative and authorization for such representation if other than the property owner.
- c. The architect, landscape architect or engineer's name, address, and telephone number.
- d. North arrow, scale, and date prepared.
- e. Legal description.
- f. Location map.
- g. Zoning district assigned to the property which is the subject of the site plan and to the properties contiguous thereto.
- h. Identification of watercourses, wetland, tree masses and understory, ground cover vegetation and wildlife habitats or other environmentally unique areas.
- i. Gross and net site area expressed in square feet and acres.
- j. Number of units proposed, if any, and resulting net density.
- k. Floor area devoted to each category of use and floor area ratio.
- l. Delineation in mapped form and computation of the area of the site devoted to building coverage, open space for the lot, and open space for the front yard, expressed in square feet, and as a percentage of the overall site (or the front yard, if applicable).
- m. Number of parking spaces required (stated in relationship to the applicable formula) and proposed (including handicapped spaces required by code).
- n. General location of all driveways, parking areas and curb cuts.
- o. Location of all public and private easements and streets within and adjacent to the site.
- p. The location, size and height of all existing and proposed buildings and structures on the site.
- q. The location of existing public utilities.
- r. Total paved vehicular use area (including, but not limited to, all paved parking spaces and driveways), expressed in square feet.
- s. Depiction (by shading or cross hatching) of required parking lot interior landscape areas.
- t. Total land area devoted to parking lot interior landscaping, expressed in square feet and as a percentage of the paved vehicular area.
- u. The definition and location of all refuse collection facilities, including screening, to be provided.
- v. On-site and off-site existing contours that sufficiently show the existing on-site contours and off-site contours showing drainage areas, at one foot contours.

**NEW PORT RICHEY  
FINAL SITE PLAN REVIEW CHECKLIST**

Final site plan (8 copies, signed, dated and sealed by the Developer's Florida Registered Engineer/Architect). All information included on or submitted so as to accompany the preliminary site plan, as it may have been adjusted and finalized, plus the following:

- a. The surveyed location, diameter at breast height, and general type of all existing trees with a diameter at breast height of four (4) inches or more, identifying those trees proposed to be removed and those to remain.
  - b. Sufficient dimensions to enable a determination that all required landscape areas are provided. (Details regarding the location, size and species of plant materials shall be provided on the landscape plan to be submitted at a later date with construction plans.)
  - c. Full and complete details for both on and off-site inlets, storm sewer, stormwater drainage and detention related to the proposed development.
  - d. Existing and proposed utilities, including size and location of all water lines, fire hydrants, sewer lines, manholes, and lift stations.
  - e. Existing (including official records book and page numbers) and proposed utilities easements.
  - f. Existing one-foot contours and key spot elevations on and off the site, and such off-site elevations as may be specifically required and not otherwise available, which may affect the drainage or retention on the site. Off-site drainage shall be shown and accounted for.
  - g. The proposed general use and development of internal spaces, including all recreational and open space areas, plazas, and major landscaped area by function, and the general location and description of all proposed outdoor furniture (such as seating, lighting and telephones).
  - h. The location of all earth or water retaining walls, earth berms, and public and private sidewalks.
  - i. Phase lines, if development is to be constructed in phases.
  - j. Dimensions of lot lines, streets, drives, building lines, building setbacks, building height, structural overhangs, and building separations.
  - k. Shadow cast information if the proposed building is higher than any immediately adjacent building or if the height of the building is greater than the distance of the building to any lot line.
- l. Three (3) sets of signed, sealed and dated of the Stormwater Management Plan and Report by the Developer's Engineer registered in the State of Florida.m. The NPDES sheets 1 and 2, customized for this project.



